**3GPP TSG-RAN4 Meeting #104-e *R4-2214064***

**Electronic Meeting, 15th-26th August, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** | **2565** | **rev** | **-** | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Big CR for Performance Requirements for Positioning Enhancement | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh-Perf | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | To define performance requirements for positioning enhancements including PRS measurement accuracies and report mapping, PRS test configurations, applicability rules, PRS measurement delay and accuracy test cases and side conditions. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | This Big CR is based on the Big draft CR template endorsed in R4-2211059 at RAN4#103-e.  Following draft CRs endorsed at RAN4#104-e have been implemented in this Big CR defining performance requirements for positioning enhancement features:   1. R4-2214496 Draft CR on new PRS RMC based on the serving cell RF BW and RMC for PPW Huawei, HiSilicon 2. R4-2214497 Applicability rules for test cases Ericsson 3. R4-2214891 Test set 2-4:PRS-RSRPP accuracy and report mapping in FR1 and FR2 CATT 4. R4-2214892 Test set 3-5:PRS-RSRP reporting delay test case with reduced number of samples in FR1 CATT 5. R4-2214893 Test set 3-6:PRS-RSRP reporting delay test case with reduced number of samples in FR2 CATT 6. R4-2214894 Test set 3-23:UE Rx-Tx reporting delay test case in FR1 in RRC\_INACTIVE CATT 7. R4-2214895 Test set 3-24:UE Rx-Tx reporting delay test case in FR2 in RRC\_INACTIVE CATT 8. R4-2214896 Test set 4-7:UE Rx-Tx accuracy test case with reduced number of samples in FR1 CATT 9. R4-2214897 Test set 4-8:UE Rx-Tx accuracy test case with reduced number of samples in FR2 CATT 10. R4-2214898 Test set 4-23:UE Rx-Tx accuracy test case with reduced number of samples in FR1 in RRC\_INACTIVE CATT 11. R4-2214899 Test set 4-24:UE Rx-Tx accuracy test case with reduced number of samples in FR2 in RRC\_INACTIVE CATT 12. R4-2214900 Test set 4-27:RSTD accuracy test case with Rx TEG in FR1 CATT 13. R4-2214901 Test set 4-28:RSTD accuracy test case with Rx TEG in FR2 CATT 14. R4-2214931 Draft CR to Test sets 4-17 PRS-RSRPP accuracy test case in FR1 in RRC\_INACTIVE OPPO 15. R4-2214932 Draft CR to Test sets 4-25 PRS-RSRPP accuracy test case with reduced number of samples in FR1 in RRC\_INACTIVE OPPO 16. R4-2214933 Draft CR to Test sets 4-9 PRS-RSRPP accuracy test case with reduced number of samples in FR1 OPPO 17. R4-2214934 Draft CR to Test sets 4-18 PRS-RSRPP accuracy test case in FR2 in RRC\_INACTIVE OPPO 18. R4-2214935 Draft CR to Test sets 4-26 PRS-RSRPP accuracy test case with reduced number of samples in FR2 in RRC\_INACTIVE OPPO 19. R4-2214936 Draft CR to Test sets 4-10 PRS-RSRPP accuracy test case with reduced number of samples in FR2 OPPO 20. R4-2214940 Test sets 3-1: RSTD reporting delay test case with reduced number of samples in FR1 Intel Corporation 21. R4-2214941 Test sets 3-2: RSTD reporting delay test case with reduced number of samples in FR2 Intel Corporation 22. R4-2214942 [draftCR] CR for UE Rx-Tx accuracy and report mapping in FR1 and FR2 Intel Corporation 23. R4-2214944 Test sets 3-27, 3-29, 3-31: DraftCR – FR1 test cases for NR positioning measurement delay in RRC\_INACTIVE with Nsample = 1 Qualcomm Incorporated 24. R4-2214945 Test sets 3-28, 3-30, 3-32: DraftCR – FR2 test cases for NR positioning measurement delay in RRC\_INACTIVE with Nsample = 1 Qualcomm Incorporated 25. R4-2214998 Draft CR on test set 3-15:UE Rx-Tx reporting delay test cases without gaps in FR1 vivo 26. R4-2214999 Draft CR on test set 3-16:UE Rx-Tx reporting delay test cases without gaps in FR2 vivo 27. R4-2215000 Draft CR on test set 4-15:UE Rx-Tx accuracy test case in FR1 in RRC\_INACTIVE vivo 28. R4-2215001 Draft CR on test set 4-16:UE Rx-Tx accuracy test case in FR2 in RRC\_INACTIVE vivo 29. R4-2215002 Draft CR on test set 4-21:PRS-RSRP accuracy test case with reduced number of samples in FR1 in RRC\_INACTIVE vivo 30. R4-2215003 Draft CR on test set 4-22:PRS-RSRP accuracy test case with reduced number of samples in FR2 in RRC\_INACTIVE vivo 31. R4-2215032 DraftCR set 2-1 to 38.133 RSTD accuracy and report mapping in FR1 and FR2 Ericsson 32. R4-2215035 Test sets 3-19, 3-25, 3-33 CR to introduce reporting delay test cases in RRC\_INACTIVE FR1 Ericsson 33. R4-2215036 Test sets 3-1, 3-9, 3-11, 3-17, 3-35 CR to introduce reporting delay test cases in RRC\_CONNECTED state FR1 Ericsson 34. R4-2215037 Test sets 3-20, 3-26, 3-34 CR to introduce reporting delay test cases in RRC\_INACTIVE FR2 Ericsson 35. R4-2215038 Test sets 3-2, 3-10, 3-12, 3-18, 3-36 CR to introduce reporting delay test cases in RRC\_CONNECTED FR2 Ericsson 36. R4-2215039 Test sets 4-11 and 4-19 CR to introduce RSTD accuracy test cases in RRC\_INACTIVE FR1 Ericsson 37. R4-2215040 Test set 4-3 CR to introduce RSTD accuracy test case with reduced number of samples FR1 in RRC\_CONNECTED state Ericsson 38. R4-2215041 Test sets 4-12 and 4-20 CR to introduce RSTD accuracy test cases in RRC\_INACTIVE FR2 Ericsson 39. R4-2215042 Test set 4-4 CR to introduce RSTD accuracy test case with reduced number of samples in FR2 in RRC\_CONNECTED state Ericsson 40. R4-2215070 CR on general performance requirements for ePOS Huawei, HiSilicon 41. R4-2215071 Accuracy set 2-2: CR for PRS-RSRP accuracy and report mapping Huawei, HiSilicon 42. R4-2215072 Test set 3-21: CR to introduce measurement delay TCs for INACTIVE FR1 Huawei, HiSilicon 43. R4-2215073 Test set 3-7, 3-13 and 3-37: CR to introduce measurement delay TCs for CONNECTED FR1 Huawei, HiSilicon 44. R4-2215074 Test set 3-22: CR to introduce measurement delay TCs for INACTIVE FR2 Huawei, HiSilicon 45. R4-2215075 Test set 3-8, 3-14 and 3-38: CR to introduce measurement delay TCs for CONNECTED FR2 Huawei, HiSilicon 46. R4-2215076 Test set 4-13: CR to introduce measurement accuracy TCs for INACTIVE FR1 Huawei, HiSilicon 47. R4-2215077 Test set 4-1 and 4-5: CR to introduce measurement accuracy TCs for CONNECTED FR1 Huawei, HiSilicon 48. R4-2215078 Test set 4-14: CR to introduce measurement accuracy TCs for INACTIVE FR2 Huawei, HiSilicon 49. R4-2215079 Test set 4-2 and 4-6: CR to introduce measurement accuracy TCs for CONNECTED FR2 Huawei, HiSilicon 50. R4-2215103 Set 1-2: PRP and PRS Ês/Iot conditions for NR PRS-based measurements Ericsson | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | * PRS measurement accuracy, PRS measurement report mapping, PRS test configuraions, applicability rules for testing, test cases and side conditions for positioning enhancement related features will be undefined. * PRS measurement tests related to positioning enhancement features cannot be conducted. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.3, 10.1.23.1, 10.1.23.2, 10.1.23.3, 10.1.24.1, 10.1.24.2 , 10.1.25.1, 10.1.25.2, 10.1.25.3, 10.1.X, 13.x, 13.x.1, A.3.31, A.3.X1, A.3.X2. A.6.6.12, A.6.6.13, A.6.6.14, A.6.6.X, A.6.7.X, A.6.X1.Y1, A.6.X1.Y1, A.6.X1.Y2, A.6.X1.Y3, A.6.X1.Y4, A.6.X2.Y1, A.6.X2.Y2, A.6.X2.Y3, A.6.X2.Y4, A.7.6.9.X1, A.7.6.9.X2, A.7.6.9.X3, A.7.6.10.X1, A.7.6.11.X1, A.7.6.X, A.7.7.X, A.7.X1.Y1, A.7.X1.Y1, A.7.X1.Y2, A.7.X1.Y3, A.7.X1.Y4, A.7.X2.Y1, A.7.X2.Y2, A.7.X2.Y3, A.7.X2.Y4, B.2.14. | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Big CR template endorsed in R4-2211059 | | | | | | | | |

**----------------------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

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

E-UTRA Evolved UTRA

E-UTRAN Evolved UTRAN

EN-DC E-UTRA-NR Dual Connectivity

FDD Frequency Division Duplex

FR Frequency Range

HARQ Hybrid Automatic Repeat Request

HO Handover

GAP Refers to any of the measurement gap pattern, 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

LMF Location Management Function

LPP LTE Positioning Protocol

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

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 Measurenent Gap

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

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

RRM Radio Resource Management

RSSI Received Signal Strength Indicator

RSRP Reference Signal Received Power

RSRQ Reference Signal Received Quality

RSTD Reference Signal Time Difference

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

SCC Secondary Component Carrier

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-RSSI Sidelink Received Signal Strength Indicator

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

TRP Transmission-Reception Point

TTI Transmission Time Interval

UE User Equipment

UL Uplink

VIL Visible Interruption Length

VIRP Visible Interruption Repetition Period

**----------------------END OF CHANGE # 1 ----------------------------**

**----------------------START OF CHANGE # 2 ----------------------------**

10.1.23 RSTD Measurements

* + - 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.

10.1.23.2 Measurement Accuracy Requirements

The accuracy requirements for RSTD measurement shall be within ±(X+Y) Tc.

X is defined in Table 10.1.23.2-1 for AWGN channel and Table 10.1.23.2-3 for fading channel for FR1, provided that the following conditions are met.

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

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

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

X is defined in Table 10.1.23.2-2 for AWGN channel and Table 10.1.23.2-4 for fading channel for FR2, provided that the following conditions are met.

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

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

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

X is defined in Table 10.1.23.2-5 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 10.1.23.2-6 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 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.

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

When UE measures RSTD on PRS resources belonging to same PFL, Y=32 Tc, provided that the time offset between the two PRS resource instances from the reference cell and the neighbor cell, which are used for a single RSTD estimate, is no greater than 160 ms.

When UE measures RSTD on PRS resources belonging different PFLs, Y=[256] Tc, provided that the time offset between the two PRS resource instances from the reference cell and the neighbor cell, which are used for a single RSTD estimate, is no greater than [1280] ms.

[Editor notes: The margins for measurements on different PFLs shall be considered in the group delay margin]

*Editor’s Note: FFS whether and how to form the accuracy numbers considering enhanced requirements in future releases, e.g. capturing margin values in separate tables.*

**Table 10.1.23.2-1: RSTD absolute accuracy in FR1 for AWGN channel**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| [252] +ΔNote 7 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ [24] | ≥ [4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| [170] +Δ | ≥ [52] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [78] +Δ | ≥ [104] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [147] +Δ | 30 | ≥ [24] | ≥ [4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -118 | -50 |
| NR\_FDD\_FR1\_B | -117.5 | -50 |
| NR\_TDD\_FR1\_C | -117 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 | -50 |
| NR\_FDD\_FR1\_F | -115.5 | -50 |
| NR\_FDD\_FR1\_G | -115 | -50 |
| NR\_FDD\_FR1\_H | -114.5 | -50 |
| [84] +Δ | ≥ [48] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [40] +Δ | ≥ [132] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [86] +Δ | 60 | ≥ [24] | ≥ [4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -115 | -50 |
| NR\_FDD\_FR1\_B | -114.5 | -50 |
| NR\_TDD\_FR1\_C | -114 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 | -50 |
| NR\_FDD\_FR1\_F | -113.5 | -50 |
| NR\_FDD\_FR1\_G | -113 | -50 |
| NR\_FDD\_FR1\_H | -111.5 | -50 |
| [40] +Δ | ≥ [64] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [22] +Δ | ≥ [132] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: Δ=TBD. | | | | | | | |

**Table 10.1.23.2-2: RSTD absolute accuracy in FR2 for AWGN channel**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition**  **() Note 2** | **Io Note 3 range** | |
| **Minimum Io** | **Maximum Io** |
| **Tc Note 4** | **dB** | **kHz** | **RB** |  | **dBm/SCS** | **dBm/BWChannel** |
| [107] +ΔNote 6 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ [24] | ≥ [4] | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| [56] +Δ | ≥ [64] | ≥ [1] | Note 5 | Note 5 |
| [27] +Δ | ≥ [132] | ≥ [1] | Note 5 | Note 5 |
| [56] +Δ | 120 | ≥ [32] | ≥ [4] | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| [29] +Δ | ≥ [64] | ≥ [1] | Note 5 | Note 5 |
| [18] +Δ | ≥ [128] | ≥ [1] | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: Δ=TBD. | | | | | | |

**Table 10.1.23.2-3: RSTD absolute accuracy in FR1 for fading channel**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| [367] +ΔNote 7 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ [24] | ≥ [4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| [212] +Δ | ≥ [52] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [122] +Δ | ≥ [104] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [190] +Δ | 30 | ≥ [24] | ≥ [4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -118 | -50 |
| NR\_FDD\_FR1\_B | -117.5 | -50 |
| NR\_TDD\_FR1\_C | -117 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 | -50 |
| NR\_FDD\_FR1\_F | -115.5 | -50 |
| NR\_FDD\_FR1\_G | -115 | -50 |
| NR\_FDD\_FR1\_H | -114.5 | -50 |
| [145] +Δ | ≥ [48] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [44] +Δ | ≥ [132] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [183] +Δ | 60 | ≥ [24] | ≥ [4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -115 | -50 |
| NR\_FDD\_FR1\_B | -114.5 | -50 |
| NR\_TDD\_FR1\_C | -114 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 | -50 |
| NR\_FDD\_FR1\_F | -113.5 | -50 |
| NR\_FDD\_FR1\_G | -113 | -50 |
| NR\_FDD\_FR1\_H | -111.5 | -50 |
| [43] +Δ | ≥ [64] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [33] +Δ | ≥ [132] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: Δ=TBD. | | | | | | | |

**Table 10.1.23.2-4: RSTD absolute accuracy in FR2 for fading channel**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition**  **() Note 2** | **Io Note 3 range** | |
| **Minimum Io** | **Maximum Io** |
| **Tc Note 4** | **dB** | **kHz** | **RB** |  | **dBm/SCS** | **dBm/BWChannel** |
| [155] +ΔNote 6 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ [24] | ≥ [4] | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| [96] +Δ | ≥ [64] | ≥ [1] | Note 5 | Note 5 |
| [62] +Δ | ≥ [132] | ≥ [1] | Note 5 | Note 5 |
| [80] +Δ | 120 | ≥ [32] | ≥ [4] | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| [70] +Δ | ≥ [64] | ≥ [1] | Note 5 | Note 5 |
| [48] +Δ | ≥ [128] | ≥ [1] | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: Δ=TBD. | | | | | | |

**Table 10.1.23.2-5: RSTD absolute accuracy in FR1 for AWGN channel**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| [170] +ΔNOTE 7 | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 15 | ≥ [52] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [78] +Δ | ≥ [104] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [84] +Δ | 30 | ≥ [48] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [40] +Δ | ≥ [132] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [40] +Δ | 60 | ≥ [64] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [22] +Δ | ≥ [132] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: Δ=TBD. | | | | | | | |

**Table 10.1.23.2-6: RSTD absolute accuracy in FR2 for AWGN channel**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition**  **() Note 2** | **Io Note 3 range** | |
| **Minimum Io** | **Maximum Io** |
| **Tc Note 4** | **dB** | **kHz** | **RB** |  | **dBm/SCS** | **dBm/BWChannel** |
| [56] +ΔNOTE 6 | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 60 | ≥ [64] | ≥ [1] | Note 5 | Note 5 |
| [27] +Δ | ≥ [132] | ≥ [1] | Note 5 | Note 5 |
| [29] +Δ | 120 | ≥ [64] | ≥ [1] | Note 5 | Note 5 |
| [18] +Δ | ≥ [128] | ≥ [1] | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: Δ=TBD. | | | | | | |

**----------------------END OF CHANGE # 2 ----------------------------**

**----------------------START OF CHANGE # 3 ----------------------------**

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

*kmin*=0 and *kmax*=5, when configured PRS resource of both the reference cell and neighbor cell measured for the RSTD measurement are in 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 − 10.1.23.3.3-6.

**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 |

**----------------------END OF CHANGE # 3 ----------------------------**

**----------------------START OF CHANGE # 4 ----------------------------**

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. For PRS-RSRP measurement in FR2, the requirements apply with and without reduced Rx beam sweeping factor.

10.1.24.2 Measurement Accuracy Requirements

10.1.24.2.1 Absolute PRS RSRP accuracy

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

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

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

- UE does not support positioning measurements with reduced number of samples, or LMF does not indicate UE to perform positioning measurements with reduced number of samples

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

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

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

- UE does not support positioning measurements with reduced number of samples, or LMF does not indicate UE to perform positioning measurements with reduced number of samples

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

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

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

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

The absolute accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.1-3 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

- UE supports positioning measurements with reduced number of samples, and LMF indicates UE to perform positioning measurements with reduced number of samples

- AWGN channel

The absolute accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.1-4 are valid under the following conditions:

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

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

- UE supports positioning measurements with reduced number of samples, and LMF indicates UE to perform positioning measurements with reduced number of samples

- AWGN channel

**Table 10.1.24.2.1-3: PRS-RSRP absolute accuracy for FR1 with reduced sample number**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor**  **(** | **Io Note 6 range** | | | | | |
| **NR operating band groups Note 7** | **Minimum Io Note 1**  **dBm / SCSPRS** | | | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | **dBm / SCSPRS** | | | | **dBm/BWChannel** |
| **dBm/15kHz Note 5** | | **dBm/30kHz Note 5** | **dBm/60kHz Note 5** |
| ±3.5 | ±8 | ≥[TBD]dB | ≥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 |
| ±8.5 | ±13 | ≥-6dB | 48 ≤ BW ≤ 52 | All | Note 3 | | | | | |
| ±6 | ±10.5 | 52< BW≤ 104 | All | Note 3 | | | | | |
| ±4.5 | ±9 | 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 *prs-Bandwidth* in the OTDOA or DL-AoD 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 serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 5: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 6: 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 7: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | | |

**Table 10.1.24.2.1-4: PRS-RSRP absolute accuracy for FR2 with reduced sample number**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor**  **(** | **Io Note 6 range** | | |
| **Minimum Io Note 1**  **dBm / SCSPRS** | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** | **dBm / SCSPRS** | | **dBm/BWChannel** |
| **dBm/120kHz Note 5** | **dBm/60kHz Note 5** |
| ±5 | ±8 | ≥[TBD]dB | ≥48 | All | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | | -50 |
| ±8.5 | ±11.5 | ≥-6dB | 48 ≤ BW ≤ 64 | All | Note 3 | | |
| ±6 | ±9 | BW >64 | 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 *prs-Bandwidth* in the OTDOA or DL-AoD 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 serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 5: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 6: 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 7: NR operating band groups are as defined in Section 3.5.2. | | | | | | | |

10.1.24.2.2 Relative PRS RSRP accuracy

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

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

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

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

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

- UE does not support positioning measurements with reduced number of samples, or LMF does not indicate UE to perform positioning measurements with reduced number of samples

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

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

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

- UE does not support positioning measurements with reduced number of samples, or LMF does not indicate UE to perform positioning measurements with reduced number of samples

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

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

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

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

The absolute accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.2-3 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

- UE supports positioning measurements with reduced number of samples, and LMF indicates UE to perform positioning measurements with reduced number of samples

- AWGN channel

The absolute accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.2-4 are valid under the following conditions:

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

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

- UE supports positioning measurements with reduced number of samples, and LMF indicates UE to perform positioning measurements with reduced number of samples

- AWGN channel

**Table 10.1.24.2.2-3: PRS-RSRP relative accuracy for FR1 with reduced sample number**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor**  **(** | **Io Note 6 range** | | | | |
| **NR operating band groups Note 7** | **Minimum Io Note 1**  **dBm / SCSPRS** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | **dBm / SCSPRS** | | | **dBm/BWChannel** |
| **dBm/15kHz Note 5** | **dBm/30kHz Note 5** | **dBm/60kHz Note 5** |
| [±3.5] | ±5.0 | ≥[TBD]dB | ≥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 |
| ±9.5 | ±11.0 | ≥-6dB | 48 ≤ BW ≤ 52 | All | Note 3 | | | | |
| ±6.5 | ±8.0 | 52< BW≤ 104 | All | Note 3 | | | | |
| ±5.0 | ±6.5 | 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 *prs-Bandwidth* in the OTDOA or DL-AoD 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 serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 5: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 6: 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 7: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | |

**Table 10.1.24.2.2-4: PRS-RSRP relative accuracy for FR2 with reduced sample number**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor**  **(** | **Io Note 6 range** | | |
| **Minimum Io Note 1**  **dBm / SCSPRS** | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** | **dBm / SCSPRS** | | **dBm/BWChannel** |
| **dBm/120kHz Note 5** | **dBm/60kHz Note 5** |
| ±5.0 | ±8.0 | ≥[TBD]dB | ≥48 | All | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | | -50 |
| ±10 | ±13 | ≥-6dB | 48 ≤ BW ≤ 64 | All | Note 3 | | |
| ±7.5 | ±10.5 | BW >64 | 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 *prs-Bandwidth* in the OTDOA or DL-AoD 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 serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 5: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 6: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 8: NR operating band groups are as defined in Section 3.5.2. | | | | | | | |

**----------------------END OF CHANGE # 4 ----------------------------**

**----------------------START OF CHANGE # 5 ----------------------------**

10.1.25 UE Rx-Tx Time Difference Measurements

10.1.25.1 Introduction

The requirements in Clause 10.1.25 shall apply, provided the UE has received *nr-Multi-RTT-RequestLocationInformation* message from LMF via LPP [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 10.1.25 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.

10.1.25.2 Measurement Accuracy Requirements

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

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

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

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

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

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

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

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

The UE shall continue and complete a UE Rx-Tx measurement while meeting UE Rx-Tx measurement accuracy requirements defined in this clause when a serving cell change occurs during the UE Rx-Tx measurement provided that the serving cell change does not impact the SRS configuration for the UE Rx-Tx measurement.

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

*Editor’s note: In accuracy tables δ is margin and is FFS*

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

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

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

AWGN propagation condition.

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetition Note 3** | **NR operating band groupsNote 2** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± [78+δ] | -3 | ≥[24] | 15 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
|  |  |  |  |  | NR\_FDD\_FR1\_B | -120.5 |  |
|  |  |  |  |  | NR\_TDD\_FR1\_C | -120 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_F | -118.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_G | -118 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_H | -117.5 |  |
| ± [59+80] |  | ≥[52] |  | ≥[1] | Note 6 | Note 6 | Note 6 |
| ± [30+56] |  | >[104] |  | ≥[1] | Note 6 | Note 6 | Note 6 |
| ± [57+80] |  | ≥[24] | 30 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -118 | -50 |
|  |  |  |  |  | NR\_FDD\_FR1\_B | -117.5 |  |
|  |  |  |  |  | NR\_TDD\_FR1\_C | -117 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_F | -115.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_G | -115 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_H | -114.5 |  |
| ± [30+56] |  | ≥[48] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [15+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [29+56] |  | ≥[24] | 60 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -115 | -50 |
|  |  |  |  |  | NR\_FDD\_FR1\_B | -114.5 |  |
|  |  |  |  |  | NR\_TDD\_FR1\_C | -114 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_F | -113.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_G | -113 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_H | -111.5 |  |
| ± [15+24] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [7+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [101+δ] | -13 | ≥[24] | 15 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [75+80] |  | ≥[52] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [37+56] |  | >[104] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [58+80] |  | ≥[24] | 30 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [39+56] |  | ≥[48] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [16+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [36+56] |  | ≥[24] | 60 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [16+24] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [8+24] |  | ≥[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. | | | | | | | |

The accuracy requirements in Table 10.1.25.2-1a 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 10.1.25.2-1a: 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+80] | [TBD] | ≥[52] | 15 | ≥[1] | Note 6 | Note 6 | Note 6 |
| ± [30+56] |  | >[104] |  | ≥[1] | Note 6 | Note 6 | Note 6 |
| ± [30+56] |  | ≥[48] | 30 | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [15+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [15+24] |  | ≥[64] | 60 | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [7+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [75+80] | -6 | ≥[52] | 15 | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [37+56] |  | >[104] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [39+56] |  | ≥[48] | 30 | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [16+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [16+24] |  | ≥[64] | 60 | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [8+24] |  | ≥[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. | | | | | | | |

The accuracy requirements in Table 10.1.25.2-1b 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.

timing error for two UE Rx-Tx time difference measurements are in same RxTx TEG

Table 10.1.25.2-1b: UE Rx-Tx time difference relative measurement accuracy in FR1 in AWGN with TEG reporting

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| [132] +ΔNote 7 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ [24] | ≥ [4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| [98] +Δ | ≥ [52] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [42] +Δ | ≥ [104] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [75] +Δ | 30 | ≥ [24] | ≥ [4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -118 | -50 |
| NR\_FDD\_FR1\_B | -117.5 | -50 |
| NR\_TDD\_FR1\_C | -117 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 | -50 |
| NR\_FDD\_FR1\_F | -115.5 | -50 |
| NR\_FDD\_FR1\_G | -115 | -50 |
| NR\_FDD\_FR1\_H | -114.5 | -50 |
| [48] +Δ | ≥ [48] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [24] +Δ | ≥ [132] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [50] +Δ | 60 | ≥ [24] | ≥ [4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -115 | -50 |
| NR\_FDD\_FR1\_B | -114.5 | -50 |
| NR\_TDD\_FR1\_C | -114 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 | -50 |
| NR\_FDD\_FR1\_F | -113.5 | -50 |
| NR\_FDD\_FR1\_G | -113 | -50 |
| NR\_FDD\_FR1\_H | -111.5 | -50 |
| [24] +Δ | ≥ [64] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| [10] +Δ | ≥ [132] | ≥ [1] | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: Δ is the applicable timing error marign which can be selected by the UE from the pre-defined values ({1/2 Tc, 1 Tc, 2 Tc, 4 Tc, 8 Tc, 12 Tc, 16 Tc, 20 Tc, 24 Tc, 32 Tc, 40 Tc, 48 Tc, 64 Tc, 80 Tc, 96 Tc, 128 Tc.} ). | | | | | | | |

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

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

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

Fading propagation condition.

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetition Note 3** | **NR operating band groupsNote 2** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± [137+δ] | -3 | ≥[24] | 15 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
|  |  |  |  |  | NR\_FDD\_FR1\_B | -120.5 |  |
|  |  |  |  |  | NR\_TDD\_FR1\_C | -120 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_F | -118.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_G | -118 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_H | -117.5 |  |
| ± [96+80] |  | ≥[52] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [62+56] |  | >[104] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [87+80] |  | ≥[24] | 30 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -118 | -50 |
|  |  |  |  |  | NR\_FDD\_FR1\_B | -117.5 |  |
|  |  |  |  |  | NR\_TDD\_FR1\_C | -117 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_F | -115.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_G | -115 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_H | -114.5 |  |
| ± [68+56] |  | ≥[48] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [44+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [59+56] |  | ≥[24] | 60 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -115 | -50 |
|  |  |  |  |  | NR\_FDD\_FR1\_B | -114.5 |  |
|  |  |  |  |  | NR\_TDD\_FR1\_C | -114 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_F | -113.5 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_G | -113 |  |
|  |  |  |  |  | NR\_FDD\_FR1\_H | -111.5 |  |
| ± [42+24] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [36+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [180+δ] |  | ≥[24] |  | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [98+80] | -13 | ≥[52] | 15 | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [68+56] |  | >[104] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [87+80] |  | ≥[24] | 30 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [85+56] |  | ≥[48] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [44+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [139+56] |  | ≥[24] | 60 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [46+24] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [30+24] |  | ≥[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. | | | | | | | |

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

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

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

AWGN propagation condition.

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± [22+76] | -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+32] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [7+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [12+32] |  | ≥[32] | 120 | ≥[1] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [7+24] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [4+20] |  | ≥[128] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [35+76] | -13 | ≥[24] | 60 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [15+32] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [7+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [14+32] |  | ≥[32] | 120 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [9+24] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [4+20] |  | ≥[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-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. | | | | | | |

The accuracy requirements in Table 10.1.25.2-3a 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 10.1.25.2-3a: 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+32] | [TBD] | ≥[64] | 60 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [7+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [7+24] |  | ≥[64] | 120 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [4+20] |  | ≥[128] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [15+32] | -6 | ≥[64] | 60 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [7+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [9+24] |  | ≥[64] | 120 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [4+20] |  | ≥[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-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. | | | | | | |

The accuracy requirements in Table 10.1.25.2-3b 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.

timing error for two UE Rx-Tx time difference measurements are in same RxTx TEG

**Table 10.1.25.3-1b: UE Rx-Tx time difference relative measurement accuracy in FR2 in AWGN with TEG reporting**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition**  **() Note 2** | **Io Note 3 range** | |
| **Minimum Io** | **Maximum Io** |
| **Tc Note 4** | **dB** | **kHz** | **RB** |  | **dBm/SCS** | **dBm/BWChannel** |
| [107] +ΔNote 6 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ [24] | ≥ [4] | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| [56] +Δ | ≥ [64] | ≥ [1] | Note 5 | Note 5 |
| [27] +Δ | ≥ [132] | ≥ [1] | Note 5 | Note 5 |
| [56] +Δ | 120 | ≥ [32] | ≥ [4] | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| [29] +Δ | ≥ [64] | ≥ [1] | Note 5 | Note 5 |
| [18] +Δ | ≥ [128] | ≥ [1] | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: Δ is the applicable timing error marign which can be selected by the UE from the pre-defined values ({1/2 Tc, 1 Tc, 2 Tc, 4 Tc, 8 Tc, 12 Tc, 16 Tc, 20 Tc, 24 Tc, 32 Tc, 40 Tc, 48 Tc, 64 Tc, 80 Tc, 96 Tc, 128 Tc.} ).. | | | | | | |

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

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

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

Fading propagation condition.

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± [75+76] | -3 | ≥[24] | 60 | ≥[4] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [72+32] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [57+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [61+32] |  | ≥[32] | 120 | ≥[1] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [64+24] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [55+20] |  | ≥[128] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [92+76] | -13 | ≥[24] | 60 | ≥[4] | NOTE 6 | NOTE 6 |
| ± [70+32] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [57+24] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [60+32] |  | ≥[32] | 120 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [66+24] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [62+20] |  | ≥[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. | | | | | | |

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.

**----------------------END OF CHANGE # 5 ----------------------------**

**----------------------START OF CHANGE # 6 ----------------------------**

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*=[2] and *kmax*=5, when at least one of the PRS resource and SRS resource configured for the UE Rx-Tx time difference measurement is in FR1,

*kmin*=0 and *kmax*=5, when both of the PRS resource and SRS resource configured for the UE Rx-Tx time difference measurement is in 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 − 10.1.25.3.3-6.

**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 |

**----------------------END OF CHANGE # 6 ----------------------------**

**----------------------START OF CHANGE # 7 ----------------------------**

10.1.X PRS-RSRPP Measurements

10.1.X.1 Introduction

The requirements in Clause 10.1.X 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.X shall apply:

* when UE is in RRC\_CONNECTED state,
* when UE is in RRC\_INACTIVE state.

The requirements in Clause 10.1.X 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 absolute accuracy requirements for PRS-RSRPP measurement for FR1 defined in Table 10.1.X.2.1-1 and Table 10.1.X.2.1-3 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.X for a corresponding Band

The absolute accuracy requirements for PRS-RSRPP measurement for FR2 defined in Table 10.1.X.2.1-2 and Table 10.1.X.2.1-4 are valid under the following conditions:

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

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

The absolute accuracy requirements for PRS-RSRPP measurement defined in Table 10.1.X.2.1-1 and Table 10.1.X.2.1-2 apply for the UE not supporting *supportedDL-PRS-ProcessingSamples* [34] or LMF does not indicate UE to perform positioning measurements with reduced number of samples.

The absolute accuracy requirements for PRS-RSRPP measurement defined in Table 10.1.X.2.1-3 and Table 10.1.X.2.1-4 apply for the UE supporting *supportedDL-PRS-ProcessingSamples* [34].

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).

**Table 10.1.X.2.1-1: PRS-RSRPP absolute accuracy for FR1**

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

**Table 10.1.X.2.1-2: PRS-RSRPP absolute accuracy for FR2**

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

**Table 10.1.X.2.1-3: PRS-RSRPP absolute accuracy 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 | ≥TBD | TBD | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| Note 4 | | | | |
| Note 4 | | | | |
| ±TBD | ±TBD | TBD |  |  | | | | |
| ±TBD | ±TBD | ≥[-6] | TBD | All | Note 4 | | | | |
| ±TBD | ±TBD | TBD | All | Note 4 | | | | |
| ±TBD | ±TBD | TBD | All | Note 4 | | | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Void.  NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the OTDOA or DL-AoD assistance data defined in [34].  NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ [24] RB.  NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 8: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | |

**Table 10.1.X.2.1-4: PRS-RSRPP absolute accuracy for FR2 for reduced number of samples**

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

10.1.X.3 Report mapping

10.1.X.3.1 Absolute PRS-RSRPP Measurement Report Mapping

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

The mapping of measured quantity is defined in Table 10.1.X.3.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 10.1.X.3.1-1: Measurement report mapping for PRS-RSRPP**

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

10.1.X.3.2 Differential Report Mapping for PRS-RSRPP Measurement

The reporting range of differential PRS-RSRPP is defined from -30 dB to 0 dB with 1 dB resolution when *nr-DL-AoD-RequestLocationInformation* message is received.

The mapping of measured quantity is defined in Table 10.1.X.3.2-1. The range in the signalling may be larger than the guaranteed accuracy range.

For differential reporting, PRS-RSRPP is reported as the difference in dB with respect to the first reported PRS-RSRPP.

**Table 10.1.X.3.2-1: Measurement report mapping for differential PRS-RSRPP**

|  |  |  |
| --- | --- | --- |
| **Reported value** | **Measured quantity value** | **Unit** |
| DIFFRSRPP\_0 | -30≥ΔRSRPP | dB |
| DIFFRSRPP\_1 | -29≥ΔRSRPP>-30 | dB |
| DIFFRSRPP\_2 | -28≥ΔRSRPP>-29 | dB |
| DIFFRSRPP\_3 | -27≥ΔRSRPP>-28 | dB |
| DIFFRSRPP\_4 | -26≥ΔRSRPP>-27 | dB |
| DIFFRSRPP\_5 | -25≥ΔRSRPP>-26 | dB |
| DIFFRSRPP\_6 | -24≥ΔRSRPP>-25 | dB |
| DIFFRSRPP\_7 | -23≥ΔRSRPP>-24 | dB |
| DIFFRSRPP\_8 | -22≥ΔRSRPP>-23 | dB |
| DIFFRSRPP\_9 | -21≥ΔRSRPP>-22 | dB |
| DIFFRSRPP\_10 | -20≥ΔRSRPP>-21 | dB |
| DIFFRSRPP\_11 | -19≥ΔRSRPP>-20 | dB |
| DIFFRSRPP\_12 | -18≥ΔRSRPP>-19 | dB |
| DIFFRSRPP\_13 | -17≥ΔRSRPP>-18 | dB |
| DIFFRSRPP\_14 | -16≥ΔRSRPP>-17 | dB |
| DIFFRSRPP\_15 | -15≥ΔRSRPP>-16 | dB |
| DIFFRSRPP\_16 | -14≥ΔRSRPP>-15 | dB |
| DIFFRSRPP\_17 | -13≥ΔRSRPP>-14 | dB |
| DIFFRSRPP\_18 | -12≥ΔRSRPP>-13 | dB |
| DIFFRSRPP\_19 | -11≥ΔRSRPP>-12 | dB |
| DIFFRSRPP\_20 | -10≥ΔRSRPP>-11 | dB |
| DIFFRSRPP\_21 | -9≥ΔRSRPP>-10 | dB |
| DIFFRSRPP\_22 | -8≥ΔRSRPP>-9 | dB |
| DIFFRSRPP\_23 | -7≥ΔRSRPP>-8 | dB |
| DIFFRSRPP\_24 | -6≥ΔRSRPP>-7 | dB |
| DIFFRSRPP\_25 | -5≥ΔRSRPP>-6 | dB |
| DIFFRSRPP\_26 | -4≥ΔRSRPP>-5 | dB |
| DIFFRSRPP\_27 | -3≥ΔRSRPP>-4 | dB |
| DIFFRSRPP\_28 | -2≥ΔRSRPP>-3 | dB |
| DIFFRSRPP\_29 | -1≥ΔRSRPP>-2 | dB |
| DIFFRSRPP\_30 | 0≥ΔRSRPP>-1 | dB |

**----------------------END OF CHANGE # 7 ----------------------------**

**----------------------START OF CHANGE # 8 ----------------------------**

13.X UL SRS RSRPP measurement

13.X.1 Report mapping

The reporting range of UL SRS RSRPP, as defined in clause 5.2.5 of 38.215 [4], is defined from -156dBm to -31dBm with resolution 1dB.

The mapping of measured quantity is defined in Table 13.X.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 13.X.1-1: UL SRS RSRPP report mapping**

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

**----------------------END OF CHANGE # 8 ----------------------------**

**----------------------START OF CHANGE # 9 ----------------------------**

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 SSB 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 | |
| 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 | 30kHz | | | | | |
| 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 | 0-131 | 0-23 | | 0-131 | |
| 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 | |
| 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 | 120kHz | | | | | |
| 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 | 0-31 | 0-127 | 0-31 | | 0-127 | |
| PRS Start PRB | 0 | | | | | |
| Note 1: Unless otherwise specified in the test case | | | | | | |

**----------------------END OF CHANGE # 9 ----------------------------**

**---------------------START OF CHANGE # 10 ----------------------------**

A.3.X1 PRS Processing Window (PPW) configurations

**Table A.3.X1-1: Reference PPW configuration**

|  |  |  |
| --- | --- | --- |
| **PPW Parameters** | **Unit** | **Values** |
| Reference PPW |  | PPW.1 |
| Periodicity | slot | Note 1 |
| Offset | slot | Note 2 |
| Length | ms | 10 |
| Type |  | 1A |
| Priority |  | st1 |
| Note 1: Same as PRS resource set periodicity as used in the test case.  Note 2: Same as PRS resource with smallest offset as used in the test case. | | |

**----------------------END OF CHANGE # 10 ----------------------------**

**--------------------START OF CHANGE # 11 ----------------------------**

A.3.X2 Testing principles for test cases related to PRS measurements

A.3.X2.1 Introduction

In annex A test cases are defined for verifying various type of PRS measurement and accuracy requirements.

A.3.X2.2 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. 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. 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.

A.3.X2.3 Test cases for PRS measurements with gaps in RRC\_CONNECTED state

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

* A UE capable of *supportedDL-PRS-ProcessingSamples* [34] is only required to pass the test cases with reduced number of samples.
* A UE not capable of *supportedDL-PRS-ProcessingSamples* [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 with measurement gaps in RRC\_CONNECTED state. 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.

A.3.X2.4 Test cases for PRS measurements without gaps in RRC\_CONNECTED state

In Annex A, PRS measurement test cases are defined with 4 samples and with reduced number of samples without measurement gaps in RRC\_CONNECTED state. The testing principle for these test cases is as follows:

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

In Annex A, PRS measurement delay test cases are defined for both PRS-RSRP and PRS-RSRPP measurements without measurement gaps in RRC\_CONNECTED state. 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 without measurement gaps in RRC\_CONNECTED state. 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 # 11 ----------------------------**

**----------------------START OF CHANGE # 12 ----------------------------**

A.6.6.12.X1 NR RSTD measurement reporting delay test case for single positioning frequency layer with reduced number of samples in FR1 SA

A.6.6.12.X1.1 Test Purpose and Environment

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

The supported test configurations are specified in Table A.6.6.12.X1.1-1.

**Table A.6.6.12.X1.1-1: Supported test configurations**

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

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. UE can support [M-sample measurements], and the LMF indicates the UE to perform positioning measurements with reduced number of samples

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

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

The general test parameters are listed in Table A.6.6.12.X1.1-2, and cell specific test parameters are listed in Table A.6.6.12.X1.1-3.

**Table A.6.6.12.X1.1-2: 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 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.1.2 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 | 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.6.6.12.X1.1-3: 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 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | 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 | 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 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.X1.1-4: 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 |
| PRS | Config 1 | dB | -2 | -5.45 | -5.45 |
| Config 2 | dB | -2 | -5.45 | -5.45 |
| Config 3 | dB | -2 | -5.45 | -5.45 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -67.67 | -69.59 | -69.59 |
| Config 2 | dBm/  96.48MHz | -67.67 | -69.59 | -69.59 |
| Config 3 | dBm/  38.16MHz | -61.57 | -63.72 | -63.72 |
| PRS | | dB | -3 | -6 | -6 |
| 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 subframes 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. | | | | | |

A.6.6.12.X1.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.5

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration X1 specified in section 9.9.1.5 starting from the beginning of time interval T2, where X1 is 320ms.

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

A.6.6.12.X2 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA without measurement gap

A.6.6.12.X2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the gapless RSTD measurement period requirement specified in Clause 9.9.2.7 in an environment with AWGN propagation conditions in FR1 in standalone scenario when single positioning frequency layer is configured. Reporting delay test for gapless PRS measurement is conducted assuming that the PRS has higher priority, i.e., state 1, than all other DL signals/channels and is transmitted within active DL BWP of UE. Two sub-tests are defined, sub-test 1 is for Nsample = 4 and sub-test 2 is for Nsample = 1. For sub-test 2 LMF indicates UE to perform PRS measurement with Nsample = 1. The cell specific parameters for sub-test 1 and sub-test 2 are defined in Table A.6.6.12.X2.1-4.

The supported test configurations are specified in Table A.6.6.12.X2.1-1.

**Table A.6.6.12.X2.1-1: Supported test configurations**

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

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

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

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

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two 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 PPW instance containing the PRS resources.

The UE is configured with PPW before start of T2.

The general test parameters are listed in Table A.6.6.12.X2.1-2, and cell specific test parameters are listed in Table A.6.6.12.X2.1-3.

**Table A.6.6.12.X2.1-2: 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 | Config 1 | MHz | 10: NRB,c = 52 |  |
| Config 2 | 10: NRB,c = 52 |
| Config 3 | 40: NRB,c = 106 |
| 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 DL BWP configuration | Config 1,2,3 |  | DLBWP.1.1 | Cell 2 and cell 3 also transmit PRS on active DL BWP configured to the UE |
| Active UL BWP configuration | Config 1,2,3 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1 |  | PRS.1.4 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.4 FR1 |
| Config 3 |  | PRS.2.4 FR1 |
| PRS BW | Config 1,2,3 |  | 48 PRBs | Applicable to sub-test 2. |
| 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 |  |
| PPW configuration | |  | Table A.3.X-1: Reference PPW configuration | As defined in A.3.X |
| Time offset between serving and neighbour cells | | μs | * set to the UE reported capability for receive time difference threshold if the UE reported value is < 3µs * 3µs otherwise | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | 0 | 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 | Same as time offset | 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 | | ms | 10 | The length of the time interval that follows after time interval T1 and processing time of assistance data. In this test UE is configured to measure single PFL within the configured PPW. |

**Table A.6.6.12.X2.1-3: 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 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | 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 | 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 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 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.X2.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 1** | | **Cell 2** | | **Cell 3** | |
| **Sub-test 1** | **Sub-test 2** | **Sub-test 1** | **Sub-test 2** | **Sub-test 1** | **Sub-test 2** |
| 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 1,2 | dBm/SCS | -98 | | -98 | | -98 | |
| Config 3 | dBm/SCS | -95 | | -95 | | -95 | |
| PRS | | Config 1,2,3 | dB | -6 | -3 | -13 | 5 | -13 | 5 |
| Io Note 4 | | Config 1,2 | dBm/  9.36MHz | -69.59 | -69.59 | -69.93 | -67.9 | -69.93 | -67.9 |
| Config 3 | dBm/  38.16MHz | -63.72 | | -63.89 | | -63.89 | |
| PRS | Config 1,2,3 | | dB | -6 | -3 | -13 | 5 | -13 | 5 |
| PRS-RSRPNote 4 | Config 1,2 | | dBm/SCS | -104 | -101 | -111 | -93 | -111 | -93 |
| Config 3 | | -101 | -91 | -108 | -90 | -108 | -90 |
| SS-RSRPNote 4 | Config 1,2 | | dBm/SCS | -88 | | -88 | | -88 | |
| Config 3 | | -85 | | -85 | | -85 | |
| 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 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: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | |

A.6.6.12.X2.2 Test Requirements

The RSTD measurement time fulfils the gapless RSTD measurement period requirements specified in Clause 9.9.2.7.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.2.7 starting from the beginning of time interval T2.

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

A.6.6.12.X3 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA in RRC\_CONNECTED state with Rx TEG

A.6.6.12.X3.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the Rx TEG based measurement period requirements specified in Clause 9.9.2.5 in an environment with AWGN propagation conditions in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in Table A.6.6.12.X3.1-1.

**Table A.6.6.12.X3.1-1: Supported test configurations**

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

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

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

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

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two 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 test applies to the UE supporting Rx TEG indicated via *NR-UE-TEG-Capability* and is requested to provide the Rx TEG in the test via *nr-UE-RxTEG-Request-r17* in *NR-TDOA-RequestLocationInformation*. In the location request *measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17* is set to n0. The UE shall perform and optionally report the Rx TEG based RSTD measurements.

The general test parameters are listed in Table A.6.6.12.X3.1-2, and cell specific test parameters are listed in Table A.6.6.12.X3.1-3.

**Table A.6.6.12.X3.1-2: 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 | Config 1 | | MHz | 10: NRB,c = 52 |  |
| Config 2 | | 10: NRB,c = 52 |
| Config 3 | | 40: NRB,c = 106 |
| 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 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.1.4 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.4 FR1 |
| Config 3 |  | PRS.2.4 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 | | |  | 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\*]Note 1 | The length of the time interval that follows immediately after time interval T1 |
| Note 1:   * = if UE is capable of receiving the same DL PRS resource from the same TRP simultaneously from multiple Rx TEGs, where is the maximum number of Rx TEGs with which UE can support to measure the same PRS resource, and is the number of Rx TEGs UE can measure simultaneously which is reported via *measureSameDL-PRS-ResourceWithDifferentRxTEGsSimul*. | | | | | |

**Table A.6.6.12.X3.1-3: 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 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | 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 | 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 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.X3.1-4: 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 |
| PRS | Config 1 | dB | -5.45 | -11.67 | -11.67 |
| Config 2 | dB | -5.45 | -11.67 | -11.67 |
| Config 3 | dB | -5.45 | -11.67 | -11.67 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -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 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 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. | | | | | |

A.6.6.12.X3.2 Test Requirements

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

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

**----------------------END OF CHANGE # 12 ----------------------------**

**----------------------START OF CHANGE # 13 ----------------------------**

A.6.6.13.X1 PRS-RSRP reporting delay test case for reduced number of samples

A.6.6.13.X1.1 Test purpose and Environment

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

The supported test configurations are specified in Table A.6.6.13.X1.1-1.

**Table A.6.6.13.X1.1-1: Supported test configurations**

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

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

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

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

The general test parameters are listed in Table A.6.6.13.X1.1-2, and cell specific test parameters are listed in Table A.6.6.13.X1.1-3.

**Table A.6.6.13.X1.1-2: General test parameters**

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

**Table A.6.6.13.X1.1-3: 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.1.1 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 | 48 PRBs | | 48 PRBs | |
|  | 2 | 48 PRBs | | 48 PRBs | |
|  | 3 | 48 PRBs | | 48 PRBs | |
| 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 | -1.76 | -Infinity | -6.01 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | 0 | -Infinity | -3 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -98 | -Infinity | -101 |
|  |  | 2 | -Infinity | -98 | -Infinity | -101 |
|  |  | 3 | -Infinity | -95 | -Infinity | -98 |
| Io | dBm/9.36 MHz | 1 | N/A | -66.07 | N/A | -66.07 |
|  | dBm/9.36 MHz | 2 | -66.07 | -66.07 |
|  | dBm/38.16 MHz | 3 | -59.97 | -59.97 |
| 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.6.6.13.X1.2 Test Requirements

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

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

A.6.6.13.X2 PRS-RSRP reporting delay test case for single positioning frequency layer outside MG

A.6.6.13.X2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement outside MG meets the delay requirements specified in clause 9.9.3.6 in an environment with AWGN propagation conditions. There are two sub-tests in the test, sub-test 1 is to verify the delay requirements with Nsample=1, and sub-test 2 is to verify the delay requirements with Nsample=4.

The supported test configurations are specified in Table A.6.6.13.X2.1-1.

**Table A.6.6.13.X2.1-1: Supported test configurations**

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR1. The test consists of two consecutive time intervals, with duration of T1 and T2. Both cells transmit PRS during T2.The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. In sub-test 1, *requestedDL-PRS-ProcessingSamples* shall be included in the location information request and set to ‘m1’.

During T1, a PPW shall be configured for the PCell and be activated via DL MAC CE. The last PDSCH containing the MAC CE shall be transmitted before slot #n.

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

The general test parameters are listed in Table A.6.6.13.X2.1-2, and cell specific test parameters during T2 are listed in Table A.6.6.13.X2.1-3.

**Table A.6.6.13.X2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| PPW configuration |  | 1 | TBD |  |
| 2 | TBD |  |
| 3 | TBD |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | NA | OFF |
| Time offset between serving and neighbour cells | μs | 1 | 3 |  |
| 2 | 3 |  |
| 3 | 3 or 2.34 Note 1 |  |
| Expected RSTD | μs | 1, 2, 3 | 0 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | Same as time offset between serving and neighbour cells |  |
| T1 | s | 1, 2, 3 | 2 |  |
| T2 | s | 1, 2, 3 | [5] |  |
| NOTE 1: If UE indicates support of CP length for the receive time difference threshold, the time offset is set to 2.34us, otherwise 3us. | | | | |

**Table A.6.6.13.X2.1-3: Cell specific test parameters during T2**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **Sub-test 1** | **Sub-test 2** | **Sub-test 1** | **Sub-test 2** |
| 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 | |
| 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.1.3 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 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -3 | -3 | -6 | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -3 | -3 | -6 | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -101 | -101 | -104 | -108 |
|  |  | 2 | -101 | -101 | -104 | -108 |
|  |  | 3 | -98 | -98 | -101 | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -101 | -101 | -104 | -108 |
| 2 | -101 | -101 | -104 | -108 |
| 3 | -98 | -98 | -101 | -105 |
| Io | dBm/9.36 MHz | 1 | -68.28 | -68.28 | -69.07 | -69.63 |
|  | dBm/9.36 MHz | 2 | -68.28 | -68.28 | -69.07 | -69.63 |
|  | dBm/38.16 MHz | 3 | -62.19 | -62.19 | -62.98 | -63.54 |
| 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.6.6.13.X2.2 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 9.9.3.6, starting from the beginning of time interval T2, with Nsample=1 for sub-test 1 and Nsample=4 for sub-test 2.

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

**----------------------END OF CHANGE # 13 ----------------------------**

**----------------------START OF CHANGE # 14 ----------------------------**

A.6.6.14.X1 UE Rx-Tx time difference measurement for single positioning frequency layer in FR1 SA with reduced sample number

A.6.6.14.X1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 with Nsample = 1 in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations in listed in Table A.6.6.14.X1.1-1.

**Table A.6.6.14.X1.1-1: Supported test configurations**

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

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 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. *requestedDL-PRS-ProcessingSamples* shall be included in the location information request and set to ‘m1’. 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 SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.6.14.X1.1-2 and Table A.6.6.14.X1.1-3 respectively.

**Table A.6.6.14.X1.1-2: General test parameters**

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

**Table A.6.6.14.X1.1-3: 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 | |
| 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 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 | -Infinity | -6 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -6 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100 | -Infinity | -104 |
|  | 2 | -Infinity | -100 | -Infinity | -104 |
|  | 3 | -Infinity | -97 | -Infinity | -101 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -100 | -100 | -104 | -104 |
| 2 | -100 | -100 | -104 | -104 |
| 3 | -97 | -97 | -101 | -101 |
| Io | dBm/9.36 MHz | 1 | N/A | -67.92 | N/A | -69.63 |
| dBm/9.36 MHz | 2 | -67.92 | -69.63 |
| dBm/38.16 MHz | 3 | -61.83 | -63.54 |
| 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 and PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

A.6.6.14.X1.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5 with Nsample=1.

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

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

A.6.6.14.X2 UE Rx-Tx time difference measurement without gaps in FR1 SA

A.6.6.14.X2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.6 in AWGN propagation condition in FR1 in standalone scenario. There are two sub-tests in the test, sub-test 1 is to verify the delay requirements with Nsample=1, and sub-test 2 is to verify the delay requirements with Nsample=4.

The supported test configurations in listed in Table A.6.6.14.X2.1-1.

**Table A.6.6.14.X2.1-1: Supported test configurations**

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All 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 PRS processing window containing the PRS resources.

The UE is configured with PRS processing window before T2.

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.6.14.X2.1-2 and Table A.6.6.14.X2.1-3 respectively.

**Table A.6.6.14.X2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| PRS processing window |  | TBD | TBD |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 Note1 |  |
| 2 | 3 Note1 |
| 3 | 3 or 2.34 Note1 |
| Expected RSTD | μs | 1,2,3 | 0 |  |
| Expected RSTD uncertainty | μs | 1,2,3 | Same as time offset between serving and neighbour cells |  |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 10 |  |
| NOTE 1: The value is up to the UE capability. The possible UE capability value: (1/4 symbol, 1/2 symbol, CP length, half of slot). When the UE reported value is > 3us, the time offset between serving and neighbour cells is set to 3us; when the UE reported value is < 3us, the time offset between serving and neighbour cells is set to the UE reported value. | | | | |

**Table A.6.6.14.X2.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **Sub-test 1** | **Sub-test 2** | **Sub-tets 1** | **Sub-test 2** |
| 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 | |
| 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 |  |  | 48 PRBs | 24 PRBs | 48 PRBs | 24 PRBs |
| 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 | -3 | -2.41 | -6 | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -1.44 | -2 | -3.65 | -10 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -99.44 | -100 | -101.65 | -108 |
|  | 2 | -99.44 | -100 | -101.65 | -108 |
|  | 3 | -96.44 | -97 | -98.65 | -105 |
| Io | dBm/9.36 MHz | 1 | -66.73 | -67.67 | -66.73 | -67.67 |
| dBm/9.36 MHz | 2 | -66.73 | -67.67 | -66.73 | -67.67 |
| dBm/38.16 MHz | 3 | -60.62 | -61.57 | -60.62 | -61.57 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

A.6.6.14.X2.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.6.

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.

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

A.6.6.14.X3 UE Rx-Tx time difference measurement for single positioning frequency layer in FR1 SA with multiple RxTx TEGs

A.6.6.14.X3.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured, and when UE is requested to measure a PRS resource with multiple RxTx TEGs.

The supported test configurations in listed in Table A.6.6.14.X3.1-1.

**Table A.6.6.14.X3.1-1: Supported test configurations**

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All 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. In *nr-Multi-RTT-RequestLocationInformation*, *measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17* shall be set to ‘n2’.

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 SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.6.14.X3.1-2 and Table A.6.6.14.X3.1-3 respectively.

**Table A.6.6.14.X3.1-2: General test parameters**

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

**Table A.6.6.14.X3.1-3: 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 | |
| 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 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100 | -Infinity | -108 |
|  | 2 | -Infinity | -100 | -Infinity | -108 |
|  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/9.36 MHz | 1 | N/A | -67.67 | N/A | -67.67 |
| dBm/9.36 MHz | 2 | -67.67 | -67.67 |
| dBm/38.16 MHz | 3 | -61.57 | -61.57 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

A.6.6.14.X3.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5, with =2 if UE does not support or indicate value ‘n1’ for *measureSameDL-PRS-ResourceWithDifferentRxTEGsSimul*, and =1 otherwise.

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

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

**----------------------END OF CHANGE # 14 ----------------------------**

**----------------------START OF CHANGE # 15 ----------------------------**

A.6.6.X PRS-RSRPP measurements

#### A.6.6.X.1 PRS-RSRPP reporting delay test case for single positioning frequency layer in FR1 in RRC\_CONNECTED state

##### A.6.6.X.1.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRPP measurement meets the delay requirements specified in clause 9.9.6.5 in an environment with AWGN propagation conditions.

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, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

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

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

The general test parameters are listed in Table A.6.6.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 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| Measurement gap |  | 1, 2, 3 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | NA | OFF |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | 5 |  |
| T1 | s | 1, 2, 3 | 2 |  |
| T2 | s | 1, 2, 3 | [5] |  |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

Table A.6.6.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 | |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 2 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 3 | PRS.2.4 FR1 | | PRS.2.4 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -108 |
|  |  | 2 | -Infinity | -101 | -Infinity | -108 |
|  |  | 3 | -Infinity | -98 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -88 | -88 | -88 | -88 |
| 2 | -88 | -88 | -88 | -88 |
| 3 | -85 | -85 | -85 | -85 |
| Io | dBm/9.36 MHz | 1 | N/A | -62.25 | N/A | -62.25 |
|  | dBm/9.36 MHz | 2 | -62.25 | -62.25 |
|  | dBm/38.16 MHz | 3 | -56.16 | -56.16 |
| 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.6.6.X.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 9.9.6.5, starting from the beginning of time interval T2.

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

#### A.6.6.X.2 PRS-RSRPP reporting delay test case with reduced number of samples for single positioning frequency layer in FR1 in RRC\_CONNECTED state

##### A.6.6.X.2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRPP measurement meets the reduced sample measurement delay requirements specified in clause 9.9.6.5 in an environment with AWGN propagation conditions for reduced number of samples. In this test UE that supports *supportedDL-PRS-ProcessingSamples* is configured by LMF to perform PRS measurement with reduced number of samples.

The supported test configurations are specified in Table A.6.6.X.2.1-1.

Table A.6.6.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, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

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

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

The general test parameters are listed in Table A.6.6.X.2.1-2, and cell specific test parameters are listed in Table A.6.6.X.2.1-3.

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

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

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 2 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 3 | PRS.2.4 FR1 | | PRS.2.4 FR1 | |
| PRS BW |  | 1,2,3 | 48 PRBs | | 48 PRBs | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | 5 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | 5 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -93 |
|  |  | 2 | -Infinity | -101 | -Infinity | -93 |
|  |  | 3 | -Infinity | -98 | -Infinity | -90 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -88 | -88 | -88 | -88 |
| 2 | -88 | -88 | -88 | -88 |
| 3 | -85 | -85 | -85 | -85 |
| Io | dBm/9.36 MHz | 1 | N/A | -69.5 | N/A | -67.9 |
|  | dBm/9.36 MHz | 2 | -69.5 | -67.9 |
|  | dBm/38.16 MHz | 3 | -66.4 | -64.8 |
| 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.6.6.X.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 9.9.6.5, starting from the beginning of time interval T2.

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

A.6.6.X.3 PRS-RSRPP reporting delay test case for single positioning frequency layer in FR1 in RRC\_CONNECTED state without measurement gap

A.6.6.X.3.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRPP measurement meets the delay requirements specified in clause 9.9.6.6 in an environment with AWGN propagation conditions. Reporting delay test for gapless PRS measurement is conducted assuming that the PRS has higher priority, i.e., state 1, than all other DL signals/channels and is transmitted within active DL BWP of UE. Two sub-tests are defined, sub-test 1 is for Nsample = 4 and sub-test 2 is for Nsample = 1. For sub-test 2 LMF indicates UE to perform PRS measurement with Nsample = 1. The cell specific parameters for sub-test 1 and sub-test 2 are defined in Table A.6.6.X.3.1-3.

The supported test configurations are specified in Table A.6.6.X.3.1-1.

**Table A.6.6.X.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, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

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

The beginning of the time interval T2 shall be aligned with the beginning of the first PRS processing window 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 UE is configured with PPW before start of T2.

The general test parameters are listed in Table A.6.6.X.3.1-2, and cell specific test parameters are listed in Table A.6.6.X.3.1-3.

**Table A.6.6.X.3.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| PPW configuration |  | 1,2,3 | Table A.3.X-1: Reference PPW configuration | As defined in A.3.X |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | NA | OFF |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | * set to the UE reported capability for receive time difference threshold if the UE reported value is < 3µs * 3µs otherwise | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3 | 0 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | Same as time offset |  |
| T1 | s | 1, 2, 3 | 2 |  |
| T2 | ms | 1, 2, 3 | 10 | In this test UE is configured to measure single PFL within the configured PPW. |

**Table A.6.6.X.3.1-3: Cell specific test parameters T2**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **Sub-test 1** | **Sub-test 2** | **Sub-test 1** | **Sub-test 2** |
| 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 | |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 2 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 3 | PRS.2.4 FR1 | | PRS.2.4 FR1 | |
| PRS configuration |  |  | 48 PRBs for sub-test 2 | | 48 PRBs for sub-test 2 | |
| 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 | -3 | -3 | -10 | 5 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -3 | -3 | -10 | 5 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -101 | -101 | -108 | -93 |
|  |  | 2 | -101 | -101 | -108 | -93 |
|  |  | 3 | -98 | -98 | -105 | -90 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -88 | -88 | -88 | -88 |
| 2 | -88 | -88 | -88 | -88 |
| 3 | -85 | -85 | -85 | -85 |
| Io | dBm/9.36 MHz | 1 | -62.25 | -62.25 | -62.25 | -67.9 |
|  | dBm/9.36 MHz | 2 | -62.25 | -62.25 | -62.25 | -67.9 |
|  | dBm/38.16 MHz | 3 | -56.16 | -56.16 | -56.16 | -61.8 |
| 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.6.6.X.3.2 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 9.9.6.6, starting from the beginning of time interval T2.

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

**----------------------END OF CHANGE # 14 ----------------------------**

**----------------------START OF CHANGE # 15 ----------------------------**

#### A.6.7.13.X1 RSTD measurement accuracy test case with reduced number of samples for single positioning frequency layer in FR1 in RRC\_CONNECTED state

##### A.6.7.13.X1.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements for reduced number of samples specified in clause 10.1.23.2 in an environment with AWGN propagation conditions. In this test UE that supports *supportedDL-PRS-ProcessingSamples* is configured by LMF to perform PRS measurement with reduced number of samples.

The supported test configurations are specified in Table A.6.7.13.X1.1-1.

Table A.6.7.13.X1.1-1: Supported test configurations

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cells. Both cells are on the same NR RF channel in FR1. GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be longer than the UE measurement period as defined in clause 9.9.2.7.

Table A.6.7.13.X1.1-2: RSTD accuracy test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | | Test 2 | |
| Cell 1 | Cell 2 | | Cell 1 | Cell 2 |
| PRS ARFCN | 1~3 |  | freq1 | Freq1 | | freq1 | Freq1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | |
| 2 | 10: NRB,c = 52 | | | 10: NRB,c = 52 | |
| 3 | 40: NRB,c = 106 | | | 40: NRB,c = 106 | |
| Duplex mode | 1 |  | FDD | | | FDD | |
| 2 | TDD | | | TDD | |
| 3 | TDD | | | TDD | |
| TDD configuration | 1 |  | N/A | | | N/A | |
| 2 | TDDConf.1.1 | | | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - | | SR.1.1 FDD | - |
| 2 | SR.1.1 TDD |  | | SR.1.1 TDD |  |
| 3 | SR.2.1 FDD |  | | SR.2.1 FDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - | | CR.1.1 FDD | - |
| 2 | CR.1.1 TDD | - | | CR.1.1 TDD | - |
| 3 | CR.2.1 FDD | - | | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | - |
| 2 | CCR.1.1 TDD | - | | CCR.1.1 TDD | - |
| 3 | CCR.2.1 TDD | - | | CCR.2.1 TDD | - |
| SSB configuration | 1 |  | SSB.1 FR1 | | | SSB.1 FR1 | |
| 2 | SSB.1 FR1 | | | SSB.1 FR1 | |
| 3 | SSB.2 FR1 | | | SSB.2 FR1 | |
| OCNG Patterns | 1~3 |  | OP.1 | | | OP.1 | |
| TRS configuration | 1 |  | TRS.1.1 FDD | | - | TRS.1.1 FDD |  |
| 2 | TRS.1.1 TDD | |  | TRS.1.1 TDD |  |
| 3 | TRS.1.2 TDD | |  | TRS.1.2 TDD |  |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | | | DLBWP.1.1  ULBWP.1.1 | |
| Time offset with Cell 1 | 1 | μs | - | 3 | | - | 3 |
| 2,3 | - | 3 | | - | 3 |
| SMTC configuration | 1 |  | SMTC.2 | | | SMTC.2 | |
| 2,3 | SMTC.1 | | | SMTC.1 | |
| PRS configuration | 1 |  | PRS.1.4 FR1 | | | PRS.1.4 FR1 | |
| 2 | PRS.1.4 FR1 | | | PRS.1.4 FR1 | |
| 3 | PRS.2.4 FR1 | | | PRS.2.4 FR1 | |
| PRS BW | 1,2,3 |  | 48 PRBs | | | | |
| PRS muting info | 1~3 |  | ‘10’ | ‘01’ | | ‘10’ | ‘01’ |
| Expected RSTD | 1, 2, 3 | μs | N/A | 3 | | N/A | 3 |
| Expected RSTD uncertainty | 1, 2, 3 | μs | N/A | 5 | | N/A | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 | | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note2 | 1,2 | dBm/ SCS | -98 | | | -98 | |
| 3 | -95 | | | -95 | |
|  | 1~3 | dB | -3 | 5 | | -3 | 5 |
| PRS-RSRPNote3 | 1,2 | dBm/SCS | -101 | -93 | | -101 | -93 |
| 3 | -98 | -90 | | -98 | -90 |
| SS-RSRPNote3 | 1,2 | dBm/SCS | -88 | -88 | | -88 | -88 |
| 3 | -85 | -85 | | -85 | -85 |
| IoNote3 | 1,2 | dBm/  9.36MHz | -69.5 | -67.9 | | -69.5 | -67.9 |
| 3 | dBm/  38.16MHz | -63.4 | -61.8 | | -63.4 | -61.8 |
|  | 1~3 | dB | -3 | 5 | | -3 | 5 |
| 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.  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: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | |

##### A.6.7.13.X1.2 Test Requirements

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

#### A.6.7.13.X2 RSTD measurement accuracy test case with Rx TEG

A.6.7.13.X2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement when the measurements of reference cell and neighbor cell are within the same Rx TEG meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.7.13.X2.1-1.

**Table A.6.7.13.X2.1-1: Supported test configurations**

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR1. GP#24 is configured if UE supports GP#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.

The UE is requested to provide the Rx TEG in the test via *nr-UE-RxTEG-Request-r17* in *NR-TDOA-RequestLocationInformation*.

The test applies to the UE supporting *Rx TEG* defiend in *NR-UE-TEG-Capability* and reporting the same Rx TEG for the measurements of reference cell and neighbour cell.

**Table A.6.7.13.X2.1-2: RSTD accuracy test parameters**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | | | **Test 2** | |
| **Cell 1** | **Cell 2** | | **Cell 1** | **Cell 2** |
| PRS ARFCN | 1~3 |  | freq1 | Freq1 | | freq1 | Freq1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | |
| 2 | 10: NRB,c = 52 | | | 10: NRB,c = 52 | |
| 3 | 40: NRB,c = 106 | | | 40: NRB,c = 106 | |
| Duplex mode | 1 |  | FDD | | | FDD | |
| 2 | TDD | | | TDD | |
| 3 | TDD | | | TDD | |
| TDD configuration | 1 |  | N/A | | | N/A | |
| 2 | TDDConf.1.1 | | | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - | | SR.1.1 FDD | - |
| 2 | SR.1.1 TDD |  | | SR.1.1 TDD |  |
| 3 | SR.2.1 FDD |  | | SR.2.1 FDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - | | CR.1.1 FDD | - |
| 2 | CR.1.1 TDD | - | | CR.1.1 TDD | - |
| 3 | CR.2.1 FDD | - | | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | - |
| 2 | CCR.1.1 TDD | - | | CCR.1.1 TDD | - |
| 3 | CCR.2.1 TDD | - | | CCR.2.1 TDD | - |
| SSB configuration | 1 |  | SSB.1 FR1 | | | SSB.1 FR1 | |
| 2 | SSB.1 FR1 | | | SSB.1 FR1 | |
| 3 | SSB.2 FR1 | | | SSB.2 FR1 | |
| OCNG Patterns | 1~3 |  | OP.1 | | | OP.1 | |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS configuration | 1 |  | TRS.1.1 FDD | | - | TRS.1.1 FDD |  |
| 2 | TRS.1.1 TDD | |  | TRS.1.1 TDD |  |
| 3 | TRS.1.2 TDD | |  | TRS.1.2 TDD |  |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | | | DLBWP.1.1  ULBWP.1.1 | |
| Time offset with Cell 1 | 1 | μs | - | 3 | | - | 3 |
| 2,3 | - | 3 | | - | 3 |
| SMTC configuration | 1 |  | SMTC.2 | | | SMTC.2 | |
| 2,3 | SMTC.1 | | | SMTC.1 | |
| PRS configuration | 1 |  | PRS.1.1 FR1 | | | PRS.1.2 FR1 | |
| 2 | PRS.1.1 FR1 | | | PRS.1.2 FR1 | |
| 3 | PRS.2.1 FR1 | | | PRS.2.2 FR1 | |
| PRS Resource slot offset | 1~3 | slot | 0 | 4 | | 0 | 4 |
| Expected RSTD | 1, 2, 3 | μs | N/A | 3 | | N/A | 3 |
| Expected RSTD uncertainty | 1, 2, 3 | μs | N/A | 5 | | N/A | 5 |
| Note2 | 1,2 | dBm/ SCS | -98 | | | -98 | |
| 3 | -95 | | | -95 | |
| PRS | 1~3 | dB | -5.33 | -12.19 | | -5.33 | -12.19 |
| PRPNote3 | 1,2 | dBm/SCS | -103 | -109 | | -103 | -109 |
| 3 | -100 | -106 | | -100 | -106 |
| IoNote3 | 1,2 | dBm/  9.36MHz | -68.60 | -68.60 | | -68.60 | -68.60 |
| 3 | dBm/  38.16MHz | -62.51 | -62.51 | | -62.51 | -62.51 |
| PRS | 1~3 | dB | -5 | -11 | | -5 | -11 |
| 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.  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: RRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | |

A.6.7.13.X2.2 Test Requirements

The RSTD measurement for Cell 1 and Cell 2 should fulfil the absolute accuracy requirements with same Rx TEG in clause 10.1.23.2.

**----------------------END OF CHANGE # 15 ----------------------------**

**----------------------START OF CHANGE # 16 ----------------------------**

A.6.7.14.X1 SA: measurement accuracy with PRS in FR1 with reduced sample number

A.6.7.14.X1.1 Test Purpose and Environment

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

A.6.7.14.X1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.7.14.X1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.6.7.14.X1.2-2. In all test cases, Cell 1 is the PCell.

**Table A.6.7.14.X1.2-1: PRS-RSRP supported test configurations**

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

**Table A.6.7.14.X1.2-2: PRS-RSRP test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | |
|  | | |  | **Cell 1** | **Cell 2** |
| Cell ID | | |  | 489 | 0 |
| SSB ARFCN | | |  | freq1 | |
| Duplex mode | | Config 1 |  | FDD | |
|  | | Config 2,3 |  | TDD | |
| TDD configuration | | Config 1 |  | Not Applicable | |
|  | | Config 2 |  | TDDConf.1.1 | |
|  | | Config 3 |  | TDDConf.2.1 | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | |
|  | | Config 2 |  | 10: NRB,c = 52 | |
|  | | Config 3 |  | 40: NRB,c = 106 | |
| BWP BW | | Config 1 |  | 10: NRB,c = 52 | |
|  | | Config 2 |  | 10: NRB,c = 52 | |
|  | | Config 3 |  | 40: NRB,c = 106 | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | NA |
|  | | Config 2 |  | TRS.1.1 TDD | NA |
|  | | Config 3 |  | TRS.1.2 TDD | NA |
| DRX Cycle | | | ms | Not Applicable | |
| Measurement gap | | |  | GP#24 or GP#0 Note 7 | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | - |
|  | | Config 2 |  | SR.1.1 TDD |  |
|  | | Config 3 |  | SR2.1 TDD |  |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | - |
|  | | Config 2 |  | CR.1.1 TDD |  |
|  | | Config 3 |  | CR2.1 TDD |  |
| Control channel RMC | | Config 1 |  | CCR.1.1 FDD | - |
|  | | Config 2 |  | CCR.1.1 TDD |  |
|  | | Config 3 |  | CCR2.1 TDD |  |
| PRS configuration | | Config 1 |  | PRS.1.4 FR1 | PRS.1.4 FR1 |
|  | | Config 2 |  | PRS.1.4 FR1 | PRS.1.4 FR1 |
|  | | Config 3 |  | PRS.2.4 FR1 | PRS.2.4 FR1 |
| PRS BW | | Config 1 | RB | 52 | 52 |
| Config 2 | 52 | 52 |
| Config 3 | 106 | 106 |
| PRS Resource slot offset (slot) | | Config 1,2,3 | slot | 0 | 4 |
| SSB configuration | | Config 1 |  | SSB.1 FR1 | SSB.1 FR1 |
|  | | Config 2 |  | SSB.1 FR1 | SSB.1 FR1 |
|  | | Config 3 |  | SSB.2 FR1 | SSB.2 FR1 |
| Time offset with Cell 1 | | Config 1 | ms | - | 3 |
|  | | Config 2,3 | μs | - | 3 |
| SMTC configuration | | Config 1 |  | SMTC.2 | |
| Config 2,3 |  | SMTC.1 | |
| OCNG Patterns | | |  | OCNG pattern 1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | |
| Config 3 |  | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |  |
| Note2 | Config 1,2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/15KhZ | -106 | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | Not applicableNote 5 | |
| Note2 | Config 1,2 | | dBm/SCS | -106 | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | Not applicableNote 5 | |
|  | | | dB | -6 | -6 |
|  | | | dB | -6 | -6 |
| SS-RSRP | | | dB | Same as PRS-RSRP | |
| PRS-RSRP Note3 | Config 1, 2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/SCS | -112 | -112 |
|  | Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H |  | Not applicable Note 5 | Not applicable Note 5 |
| IoNote3 | Config 1,2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/9.36MHz | -77.07 | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/38.16MHz | Not applicable Note 5 | |
| Propagation condition | | |  | AWGN | |
| Antenna configuration | | |  | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and 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: Subtest 1 is not used when testing with 30kHz SSB SCS.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  Note 7: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | | |

A.6.7.14.X1.3 Test Requirements

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

**----------------------END OF CHANGE # 16 ----------------------------**

**----------------------START OF CHANGE # 17 ----------------------------**

A.6.7.15.X1 UE Rx-Tx time difference measurement accuracy with reduced number of samples in FR1 SA

A.6.7.15.X1.1 Test purpose and environment

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

The supported test configurations in listed in Table A.6.7.15.X1.1-1.

**Table A.6.7.15.X1.1-1: Supported test configurations**

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

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 6.5.12.1], shall be provided to the UE before the start of the test.

The UE is configured to measure UE Rx-Tx time difference using reduced number of samples via *requestedDL-PRS-ProcessingSamples* in *NR-Multi-RTT-RequestLocationInformation* during the test.

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

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

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

A.6.7.15.X1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.6.7.15.X1.2-1.

**Table A.6.7.15.X1.2-1: 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 | 48 PRBs | 48 PRBs |
|  | 2 | 48 PRBs | 48 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 | -1.76 | -6.01 |
|  | 2 |  |  |
|  |  | 3 |  |  |
| PRS | dB | 1 | 0 | -3 |
|  | 2 |  |
|  |  | 3 |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -98 | -101 |
|  | 2 | -98 | -101 |
|  | 3 | -95 | -98 |
| Io | dBm/9.36 MHz | 1 | -66.07 | -66.07 |
| dBm/9.36 MHz | 2 | -66.07 | -66.07 |
| dBm/38.16 MHz | 3 | -59.97 | -59.97 |
| 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.6.7.15.X1.3 Test requirements

The UE Rx-Tx time difference measurement with reduced number of samples fulfils the UE Rx-Tx measurement accuracy.

A.6.7.15.X2 UE Rx-Tx time difference measurement accuracy with RxTx TEG

A.6.7.15.X2.1 Test purpose and environment

The purpose of the test is to verify that the relative UE Rx-Tx time difference measurement accuracy when the two measurements are within the same RxTx TEG is within the specified limits. This test will verify the requirements in clause 10.1.25.x. 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.6.7.15.X2.1-1.

**Table A.6.7.15.X2.1-1: Supported test configurations**

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

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

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

The UE is requested to provide the RxTx TEG in the test via *nr-UE-RxTxTEG-Request-r17* in *NR-Multi-RTT-RequestLocationInformation*.

The test applies to the UE supporting *RxTx TEG* defiend in *NR-UE-TEG-Capability* and reporting the same RxTx TEG for the two UE Rx-Tx measurements.

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 UE Rx-Tx time difference is derived by the difference of the receiving timing and the transmit timing for each cell.

A.6.7.15.X2.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.6.7.15.X2.2-1. y requirements specified in clause 10.1.25.2 for both Cell 1 and Cell 2.

Table A.6.7.15.X2.2-2: UE Rx-Tx time difference measurement accuracy test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| RF Channel Number |  | 1,2,3 | 1 | 1 | 1 | 1 |
| Measurement gap |  | 1,2,3 | GP#24 or GP#0 Note 4 | | GP#24 or GP#0 Note 4 | |
| DRX |  | 1,2,3 | OFF | | OFF | |
| Time offset with Cell 1 | μs | 1, 2, 3 | N/A | 3 | N/A | 3 |
| TDD configuration |  | 1 | N/A | N/A | N/A | N/A |
|  | 2 | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 |
|  |  | 3 | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | N/A | SR.1.1 FDD | N/A |
|  | 2 | SR.1.1 TDD |  | SR.1.1 TDD |
|  | 3 | SR.2.1 TDD |  | SR.2.1 TDD |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | N/A | CR.1.1 FDD | N/A |
|  | 2 | CR.1.1 TDD | CR.1.1 TDD |
|  |  | 3 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | N/A | CCR.1.1 FDD | N/A |
|  | 2 | CCR.1.1 TDD | CCR.1.1 TDD |
|  | 3 | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | OP.1 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | N/A | TRS.1.1 FDD | N/A |
|  | 2 | TRS.1.1 TDD | TRS.1.1 TDD |
|  | 3 | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | N/A | DLBWP.0.1 ULBWP.0.1 | N/A |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | N/A | DLBWP.1.1 | N/A |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | N/A | ULBWP.1.1 | N/A |
| PRS configuration |  | 1 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.2 FR1 | PRS.1.2 FR1 |
|  |  | 2 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.2 FR1 | PRS.1.2 FR1 |
|  |  | 3 | PRS.2.1 FR1 | PRS.2.1 FR1 | PRS.2.2 FR1 | PRS.2.2 FR1 |
| PRS Resource slot offset | slot | 1, 2, 3 | 0 | 4 | 0 | 4 |
| SRS configuration |  | 1 | POS-SRS.1 | N/A | POS-SRS.1 | N/A |
|  |  | 2 | POS-SRS.1 | N/A | POS-SRS.1 | N/A |
|  |  | 3 | POS-SRS.2 | N/A | POS-SRS.2 | N/A |
| Note 2 | dBm/SCS | 1 | -98 | | -98 | |
|  | 2 | -98 | | -98 | |
|  | 3 | -95 | | -95 | |
| Note 2 | dBm/15 kHz | 1 | -98 | | -98 | |
|  | 2 |  | |
|  | 3 |  | |
| PRS | dB | 1 | -5.33 | -12.19 | -5.33 | -12.19 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -5 | -11 | -5 | -11 |
|  | 2 |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -103 | -109 | -103 | -109 |
|  | 2 | -103 | -109 | -103 | -109 |
|  | 3 | -100 | -106 | -100 | -106 |
| Io | dBm/9.36 MHz | 1 | -68.60 | -68.60 | -68.60 | -68.60 |
| dBm/9.36 MHz | 2 | -68.60 | -68.60 | -68.60 | -68.60 |
| dBm/38.16 MHz | 3 | -62.51 | -62.51 | -62.51 | -62.51 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | AWGN | |
| Note 1: Void.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | | | |

##### A.6.7.15.X2.3 Test requirements

The relative accuracy is derived by the difference of the UE Rx-Tx measurements on the two cells.

The UE Rx-Tx time difference measurements for Cell 1 and Cell 2 fulfil the relative UE Rx-Tx measurement accuracy requirements specified in clause 10.1.25.x.

**----------------------END OF CHANGE # 15 ----------------------------**

**----------------------START OF CHANGE # 16 ----------------------------**

A.6.7.X PRS-RSRPP measurements

A.6.7.X.1 SA: measurement accuracy with PRS in FR1

A.6.7.X.1.1 Test Purpose and Environment

The purpose of this test is to verify that the accuracy of PRS-RSRPP measurement in RRC\_CONNECTED is within the specified limits. This test will verify the requirements in clauses 10.1.X.y and 10.1. X.z.

A.6.7.X.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.7.X.1.2-1. Both absolute and relative accuracy of PRS-RSRPP measurements are tested by using the parameters in A.6.7.X.1.2-2. In all test cases, Cell 1 is the PCell.

**Table A.6.7.X.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, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table A.6.7.X.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 |  | FDD | | | | | |
|  | | Config 2,3 |  | TDD | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| BWP BW | | Config 1 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | NA | TRS.1.1 FDD | NA | |
|  | | Config 2 |  | TRS.1.1 TDD | | NA | TRS.1.1 TDD | NA | |
|  | | Config 3 |  | TRS.1.2 TDD | | NA | TRS.1.2 TDD | NA | |
| DRX Cycle | | | ms | Not Applicable | | | | | |
| Measurement gap | | |  | GP#24 or GP#0 Note 7 | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | - | SR.1.1 FDD | - | |
|  | | Config 2 |  | SR.1.1 TDD | |  | SR.1.1 TDD |  | |
|  | | Config 3 |  | SR2.1 TDD | |  | SR2.1 TDD |  | |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | - | CR.1.1 FDD | - | |
|  | | Config 2 |  | CR.1.1 TDD | |  | CR.1.1 TDD |  | |
|  | | Config 3 |  | CR2.1 TDD | |  | CR2.1 TDD |  | |
| Control channel RMC | | Config 1 |  | CCR.1.1 FDD | | - | CCR.1.1 FDD | - | |
|  | | Config 2 |  | CCR.1.1 TDD | |  | CCR.1.1 TDD |  | |
|  | | Config 3 |  | CCR2.1 TDD | |  | CCR2.1 TDD |  | |
| PRS configuration | | Config 1 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.4 FR1 | PRS.1.4 FR1 | |
|  | | Config 2 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.4 FR1 | PRS.1.4 FR1 | |
|  | | Config 3 |  | PRS.2.3 FR1 | | PRS.2.3 FR1 | PRS.2.4 FR1 | PRS.2.4 FR1 | |
| PRS Resource slot offset (slot) | | Config 1,2,3 | slot | 0 | | 4 | 0 | 4 | |
| SSB configuration | | Config 1 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 2 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 3 |  | SSB.2 FR1 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | |
| Time offset with Cell 1 | | Config 1 | ms | - | | 3 | - | 3 | |
|  | | Config 2,3 | μs | - | | 3 | - | 3 | |
| SMTC configuration | | Config 1 |  | SMTC.2 | | | | | |
| Config 2,3 |  | SMTC.1 | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | |
| Config 3 | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  |  |  | |
| Note2 | Config 1,2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/15KhZ | -106 | | | -88 | | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | Not applicableNote 5 | | | -94 | | |
| Note2 | Config 1,2 | | dBm/SCS | -106 | | | -88 | | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | Not applicableNote 5 | | | -91 | | |
|  | | | dB | 2.46 | -5.97 | | 2.46 | | -5.97 |
|  | | | dB | 6 | 1 | | 6 | | 1 |
| PRS-RSRP Note3 | Config 1, 2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/SCS | -100 | | -105 | -82 | | -87 |
|  | Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H |  | Not applicable Note 5 | | Not applicable Note 5 | -85 | | -90 |
| IoNote3 | Config 1,2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/9.36MHz | -70.09 | | | -52.09 | | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/38.16MHz | Not applicable Note 5 | | | -51.99 | | |
| 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: Subtest 1 is not used when testing with 30kHz SSB SCS.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  Note 7: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | | | | | | |

A.6.7.X.1.3 Test Requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.X.y. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1.X.z.

A.6.7.X.2 SA: measurement accuracy with reduced PRS samples in FR1

A.6.7.X.2.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRPP measurement accuracy with = 1 in FR1 is within the specified limits. This test will verify the requirements in clauses [10.1.24.Z.1] and [10.1.24.Z.2].

The UE under test should support [*supportedDL-PRS-ProcessingSamples* ], and the TE indicates the UE to perform positioning measurements with reduced number of samples. The PRS bandwidth is contained within the active BWP and the power difference between the serving cell SS-RSRP and neighbour cell PRS-RSRP is within 6dB, so that = 1 is assumed.

A.6.7.X.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.6.7.X.2.2-1. Both absolute and relative accuracy of PRS-RSRPP measurements are tested by using the parameters in A.6.7.X.2.2-2. In all test cases, Cell 1 is the PCell.

**Table A.6.7.X.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, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table A.6.7.X.2.2-2: PRS-RSRPP test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | |
|  | | |  | **Cell 1** | **Cell 2** | |
| Cell ID | | |  | 489 | 0 | |
| SSB ARFCN | | |  | freq1 | | |
| Duplex mode | | Config 1 |  | FDD | | |
|  | | Config 2,3 |  | TDD | | |
| TDD configuration | | Config 1 |  | Not Applicable | | |
|  | | Config 2 |  | TDDConf.1.1 | | |
|  | | Config 3 |  | TDDConf.2.1 | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | |
| BWP BW | | Config 1 |  | 10: NRB,c = 52 | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | NA |
|  | | Config 2 |  | TRS.1.1 TDD | | NA |
|  | | Config 3 |  | TRS.1.2 TDD | | NA |
| DRX Cycle | | | ms | Not Applicable | | |
| Measurement gap | | |  | GP#24 or GP#0 Note 5 | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | - |
|  | | Config 2 |  | SR.1.1 TDD | |  |
|  | | Config 3 |  | SR2.1 TDD | |  |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | - |
|  | | Config 2 |  | CR.1.1 TDD | |  |
|  | | Config 3 |  | CR2.1 TDD | |  |
| Control channel RMC | | Config 1 |  | CCR.1.1 FDD | | - |
|  | | Config 2 |  | CCR.1.1 TDD | |  |
|  | | Config 3 |  | CCR2.1 TDD | |  |
| PRS configuration | | Config 1 |  | PRS.1.4 FR1 | | PRS.1.4 FR1 |
|  | | Config 2 |  | PRS.1.4 FR1 | | PRS.1.4 FR1 |
|  | | Config 3 |  | PRS.2.4 FR1 | | PRS.2.4 FR1 |
| PRS bandwidth | | Config 1,2,3 |  | 48 PRBs | | 48 PRBs |
| PRS Resource slot offset (slot) | | Config 1,2,3 | slot | 0 | | 4 |
| SSB configuration | | Config 1 |  | SSB.1 FR1 | | SSB.1 FR1 |
|  | | Config 2 |  | SSB.1 FR1 | | SSB.1 FR1 |
|  | | Config 3 |  | SSB.2 FR1 | | SSB.2 FR1 |
| Time offset with Cell 1 | | Config 1 | ms | - | 3 | |
|  | | Config 2,3 | μs | - | 3 | |
| SMTC configuration | | Config 1 |  | SMTC.2 | | |
| Config 2,3 |  | SMTC.1 | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | |
| Config 3 | 30 kHz | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  |
| Note2 | Config 1,2 | | dBm/15KhZ | -98 | | |
| Config 3 | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | |
| Config 3 | | -95 | | |
|  | | | dB | 2.46 | | -5.97 |
|  | | | dB | 6 | | 1 |
| PRS-RSRP Note3 | Config 1, 2 | | dBm/SCS | -92 | | -97 |
| Config 3 | | -89 | | -94 |
| SS-RSRP Note3 | Config 1, 2 | | dBm/SCS | -92 | | -97 |
| Config 3 | | -89 | | -94 |
| IoNote3 | Config 1,2 | | dBm/9.36MHz | -70.09 | | |
| Config 3 | | dBm/38.16MHz | -63.99 | | |
| Propagation condition | | |  | [Two-tap channel] Note6 | | |
| 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: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured.  Note 6: 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.6.7.X.2.3 Test Requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause [10.1.24.Z.1]. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause [10.1.24.Z.2].

**----------------------END OF CHANGE # 16 ----------------------------**

**----------------------START OF CHANGE # 17 ----------------------------**

A.6.X1 Measurement procedure in RRC\_INACTIVE

A.6.X1.Y1 RSTD measurements

#### A.6.X1.Y1.Z1 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA in RRC\_INACTIVE state

##### A.6.X1.Y1.Z1.1 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 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.X1.Y1.Z1.1-1.

Table A.6.X1.Y1.Z1.1-1: Supported test configurations

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

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

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall 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 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.6.X1.Y1.Z1.1-2, and cell specific test parameters are listed in Table A.6.X1.Y1.Z1.1-3 and Table A.6.X1.Y1.Z1.1-4.

Table A.6.X1.Y1.Z1.1-2: 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)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.6.X1.Y1.Z1.1-3: 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 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | 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 | 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.6.X1.Y1.Z1.1-4: 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 |
| PRS | Config 1 | dB | -5.45 | -11.67 | -11.67 |
| Config 2 | dB | -5.45 | -11.67 | -11.67 |
| Config 3 | dB | -5.45 | -11.67 | -11.67 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -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.6.X1.Y1.Z1.2 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.

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

A.6.X1.Y1.Z2 NR RSTD measurement reporting delay test case with reduced number of samples in RRC\_INACTIVE, FR1 SA

A.6.X1.Y1.Z2.1 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 in an environment with AWGN propagation conditions in FR1 in standalone scenario when single-sample measurements are requested by the LMF. This test is applicable to UEs that support [FG 14-2 PRS measurement for reduced sample in RRC\_inactive state].

The supported test configurations are specified in Table A.6.X1.Y1.Z2.1-1.

**Table A.6.X1.Y1.Z2.1-1: Supported test configurations**

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

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

The test consists of two consecutive time intervals, with duration of T1 and T2. The UE shall be in RRC\_CONNECTED state during T1 and in RRC\_INACTIVE state during 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. PRS resources from all three cells are transmitted within the 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 beginning of the time interval T2 shall be aligned with the beginning of the first DRX cycle in RRC\_INACTIVE.

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 *nr-DL-TDOA-RequestLocationInformation* IE should indicate to the UE that single-sample measurements are requested, i.e. requestedDL-PRS-ProcessingSamples-r17 is set to m1.

The general test parameters are listed in Table A.6.X1.Y1.Z2.1-2, and cell specific test parameters are listed in Table A.6.X1.Y1.Z2.1-3 and Table A.6.X1.Y1.Z2.1-4.

**Table A.6.X1.Y1.Z2.1-2: 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 |  |
| PRS Configuration | Config 1 |  | PRS.1.2 FR1 | As specified in clause A.3.31. The number of PRS RBs is the same as for the channel BW. |
| Config 2 |  | PRS.1.2 FR1 |
| Config 3 |  | PRS.2.2 FR1 |
| PRS Resource slot offset | Config 1, 2, 3 | slots | Cell 1, 2, 3: 0 |  |
| 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 cycle length | | 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.6.X1.Y1.Z2.1-3: 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 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 0 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -67.05 | -67.05 | -67.05 |
| Config 2 | dBm/  9.36MHz | -67.05 | -67.05 | -67.05 |
| Config 3 | dBm/  38.16MHz | -60.94 | -60.94 | -60.94 |
| SSB RP Note4 | Config 1 | dBm/SCS | -98 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -98 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -95 | -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 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.X1.Y1.Z2.1-4: 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 |
| PRS | Config 1 | dB | 0 | -3 | -3 |
| Config 2 | dB | 0 | -3 | -3 |
| Config 3 | dB | 0 | -3 | -3 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -66.07 | -68.29 | -66.07 |
| Config 2 | dBm/  9.36MHz | -66.07 | -68.29 | -66.07 |
| Config 3 | dBm/  38.16MHz | -61.52 | -62.99 | -61.52 |
| PRS | | dB | 0 | -3 | -3 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that all active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols, except for slots where PRS is transmitted by any of the cells.  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: Io levels apply only for symbols where PRS is transmitted. | | | | | |

A.6.X1.Y1.Z2.2 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.

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

### A.6.X1.Y2 PRS-RSRP measurements

A.6.X1.Y2.Z1 PRS-RSRP reporting delay test case for single positioning frequency layer in RRC\_INACTIVE

A.6.X1.Y2.Z1.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement in RRC\_INACTIVE 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.X1.Y2.Z1.1-1.

**Table A.6.X1.Y2.Z1.1-1: Supported test configurations**

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

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

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.X1.Y2.Z1.1-2, and cell specific test parameters are listed in Table A.6.X1.Y2.Z1.1-3.

**Table A.6.X1.Y2.Z1.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | 1.28s |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | 5 |  |
| T1 | s | 1, 2, 3 | 2 |  |
| T2 | s | 1, 2, 3 | [6] |  |

**Table A.6.X1.Y2.Z1.1-3: 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 | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -108 |
|  |  | 2 | -Infinity | -101 | -Infinity | -108 |
|  |  | 3 | -Infinity | -98 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -88 | -88 | -88 | -88 |
| 2 | -88 | -88 | -88 | -88 |
| 3 | -85 | -85 | -85 | -85 |
| Io | dBm/9.36 MHz | 1 | N/A | -62.25 | N/A | -62.25 |
|  | dBm/9.36 MHz | 2 | -62.25 | -62.25 |
|  | dBm/38.16 MHz | 3 | -56.16 | -56.16 |
| 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.X1.Y2.Z1.2 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.

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

A.6.X1.Y2.Z2 PRS-RSRP reporting delay test case with reduced number of samples in RRC\_INACTIVE

A.6.X1.Y2.Z2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement meets the delay requirements specified in clause 5.6.3.5 in an environment with AWGN propagation conditions when single-sample measurements are requested by the LMF. This test is applicable to UEs that support [FG 14-2 PRS measurement for reduced sample in RRC\_inactive state].

The supported test configurations are specified in Table A.6. X1.Y2.Z2.1-1.

**Table A.6.** **X1.Y2.Z2.1-1: Supported test configurations**

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. The UE shall be in RRC\_CONNECTED state during T1 and in RRC\_INACTIVE state during T2. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2. PRS resources from both cells are transmitted within the initial DL BWP of the UE and with the same numerology as the initial DL BWP.

The beginning of the time interval T2 shall be aligned with the beginning of the first DRX cycle in RRC\_INACTIVE.

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 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-AoD assistance* data and location information request.

The *nr-DL-AoD-RequestLocationInformation* IE should indicate to the UE that single-sample measurements are requested, i.e. requestedDL-PRS-ProcessingSamples-r17 is set to m1.

The general test parameters are listed in Table A.6.X1.Y2.Z2.1-2, and cell specific test parameters are listed in Table A.6.X1.Y2.Z2.1-3.

**Table A.6.X1.Y2.Z2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX cycle 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 | 3 |  |
| T2 | s | 1, 2, 3 | [5] |  |

**Table A.6.X1.Y2.Z2.1-3: 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 | |
| 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 | |
| PRS configuration Note 5 |  | 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 |  | 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 | 0 | -Infinity | -3 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | 0 | -Infinity | -3 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -98 | -Infinity | -101 |
|  |  | 2 | -Infinity | -98 | -Infinity | -101 |
|  |  | 3 | -Infinity | -95 | -Infinity | -98 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -98 | -98 | -98 | -98 |
| 2 | -98 | -98 | -98 | -98 |
| 3 | -95 | -95 | -95 | -95 |
| Io Note 3 | dBm/9.36 MHz | 1 | N/A | -67.04 | N/A | -68.29 |
|  | dBm/9.36 MHz | 2 | -67.04 | -68.29 |
|  | dBm/38.16 MHz | 3 | -62.19 | -62.99 |
| 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 and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io levels apply only for symbols where PRS is transmitted.  Note 4: OCNG shall be used such that all active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols, except for slots where PRS is transmitted by any of the cells.  Note 5: The number of PRS RBs is the same as for the channel BW. | | | | | | |

A.6.X1.Y2.Z2.2 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.

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

### A.6.X1.Y3 UE Rx-Tx time difference measurements

A.6.X1.Y3.Z1 UE Rx-Tx time difference measurement for single positioning frequency layer in FR1 SA

A.6.X1.Y3.Z1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement in RRC\_INACTIVE state meets the requirements specified in clause 5.6.4 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.X1.Y3.Z1.1-1.

**Table A.6.X1.Y3.Z1.1-1: Supported test configurations**

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

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

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

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last 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 UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.X1.Y3.Z1.1-2 and Table A.6.X1.Y3.Z1.1-3 respectively.

**Table A.6.X1.Y3.Z1.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX cycle |  | 1, 2, 3 | 1.28s |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | [10] |  |

**Table A.6.X1.Y3.Z1.1-3: 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 | |
| PRS configuration |  | 1 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 2 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 3 | PRS.2.2 FR1 | | PRS.2.2 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.1 | | N/A | |
|  |  | 2 | POS-SRS.1 | | N/A | |
|  |  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100 | -Infinity | -108 |
|  | 2 | -Infinity | -100 | -Infinity | -108 |
|  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/9.36 MHz | 1 | N/A | -67.67 | N/A | -67.67 |
| dBm/9.36 MHz | 2 | -67.67 | -67.67 |
| dBm/38.16 MHz | 3 | -61.57 | -61.57 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: 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.X1.Y3.Z1.2 Test requirements

The UE Rx-Tx time difference measurement time in RRC\_INACTIVE state fulfils the requirements specified in clause 5.6.4.

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

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

A.6.X1.Y3.Z2 UE Rx-Tx time difference measurement with reduced number of samples in RRC\_INACTIVE, FR1 SA

A.6.X1.Y3.Z2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 5.6.4.5 in AWGN propagation condition in FR1 in standalone scenario when single-sample measurements are requested by the LMF. This test is applicable to UEs that support [FG 14-2 PRS measurement for reduced sample in RRC\_inactive state].

The supported test configurations in listed in Table A.6.X1.Y3.Z2.1-1.

**Table A.6.X1.Y3.Z2.1-1: Supported test configurations**

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All 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. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2. PRS resources from both cells are transmitted within the initial DL BWP of the UE and with the same numerology as the initial DL BWP.

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* 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 *nr-Multi-RTT-RequestLocationInformation* IE should indicate to the UE that single-sample measurements are requested, i.e. requestedDL-PRS-ProcessingSamples-r17 is set to m1.

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.X1.Y3.Z2.1-2 and Table A.6. X1.Y3.Z2.1-3 respectively.

**Table A.6.X1.Y3.Z2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX cycle length | s | 1, 2, 3 | 1.28 |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| T1 | s | 1, 2, 3 | 3 |  |
| T2 | s | 1, 2, 3 | 5 |  |

**Table A.6.X1.Y3.Z2.1-3: 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 | |
| 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 | |
| PRS configuration Note 5 |  | 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 |  | 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 | 0 | -Infinity | -3 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | 0 | -Infinity | -3 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -98 | -Infinity | -101 |
|  |  | 2 | -Infinity | -98 | -Infinity | -101 |
|  |  | 3 | -Infinity | -95 | -Infinity | -98 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -98 | -98 | -98 | -98 |
| 2 | -98 | -98 | -98 | -98 |
| 3 | -95 | -95 | -95 | -95 |
| Io Note 3 | dBm/9.36 MHz | 1 | N/A | -67.04 | N/A | -68.29 |
|  | dBm/9.36 MHz | 2 | -67.04 | -68.29 |
|  | dBm/38.16 MHz | 3 | -62.19 | -62.99 |
| 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 and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io levels apply only for symbols where PRS is transmitted.  Note 4: OCNG shall be used such that all active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols, except for slots where PRS is transmitted by any of the cells.  Note 5: The number of PRS RBs is the same as for the channel BW. | | | | | | |

A.6.X1.Y3.Z2.2 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.

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.X1.Y4 PRS-RSRP measurements

#### A.6.X1.Y4.Z1 PRS-RSRPP reporting delay test case for single positioning frequency layer in FR1 in RRC\_INACTIVE state

##### A.6.X1.Y4.Z1.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRPP measurement meets the delay requirements specified in clause 5.6.5.5 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.X1.Y4.Z1.1-1.

Table A.6. X1.Y4.Z1.1-1: Supported test configurations

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

The test 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.6. X1.Y4.Z1.1-2, and cell specific test parameters are listed in Table A.6. X1.Y4.Z1.1-3.

Table A.6. X1.Y4.Z1.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Reference cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX | s | 1, 2, 3 | 1.28 | ON |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | 5 |  |
| T1 | s | 1, 2, 3 | 2 |  |
| T2 | s | 1, 2, 3 | [5] |  |

Table A.6. X1.Y4.Z1.1-3: 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 | |
| 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 UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 2 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 3 | PRS.2.4 FR1 | | PRS.2.4 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -108 |
|  |  | 2 | -Infinity | -101 | -Infinity | -108 |
|  |  | 3 | -Infinity | -98 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -88 | -88 | -88 | -88 |
| 2 | -88 | -88 | -88 | -88 |
| 3 | -85 | -85 | -85 | -85 |
| Io | dBm/9.36 MHz | 1 | N/A | -62.25 | N/A | -62.25 |
|  | dBm/9.36 MHz | 2 | -62.25 | -62.25 |
|  | dBm/38.16 MHz | 3 | -56.16 | -56.16 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| 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. | | | | | | |

##### A.6.X1.Y4.Z1.2 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 5.6.5.5, starting from the beginning of time interval T2.

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

#### A.6.X1.Y4.Z2 PRS-RSRPP reporting delay test case for single positioning frequency layer in FR1 in RRC\_INACTIVE state for reduced number of samples

##### A.6.X1.Y4.Z2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRPP measurement meets the delay requirements specified in clause 5.6.5.5 in an environment with AWGN propagation conditions for reduced number of samples. In this test UE that supports *supportedDL-PRS-ProcessingSamples* is configured by LMF to perform PRS measurement with reduced number of samples.

The supported test configurations are specified in Table A.6.X1.Y4.Z2.1-1.

Table A.6. X1.Y4.Z2.1-1: Supported test configurations

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

The test 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 general test parameters are listed in Table A.6. X1.Y4.Z2.1-2, and cell specific test parameters are listed in Table A.6. X1.Y4.Z2.1-3.

Table A.6. X1.Y4.Z2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Reference cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX | s | 1, 2, 3 | 1.28 | ON |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | 5 |  |
| T1 | s | 1, 2, 3 | 2 |  |
| T2 | s | 1, 2, 3 | [5] |  |

Table A.6. X1.Y4.Z2.1-3: 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 | |
| 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 UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 2 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 3 | PRS.2.4 FR1 | | PRS.2.4 FR1 | |
| PRS BW |  | 1,2,3 | 48 PRBs | | 48PRBs | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | 5 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | 5 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -93 |
|  |  | 2 | -Infinity | -101 | -Infinity | -93 |
|  |  | 3 | -Infinity | -98 | -Infinity | -90 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -88 | -88 | -88 | -88 |
| 2 | -88 | -88 | -88 | -88 |
| 3 | -85 | -85 | -85 | -85 |
| Io | dBm/9.36 MHz | 1 | N/A | -69.5 | N/A | -67.9 |
|  | dBm/9.36 MHz | 2 | -69.5 | -67.9 |
|  | dBm/38.16 MHz | 3 | -63.4 | -61.8 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| 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 and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.X1.Y4.Z2.2 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 5.6.5.5, starting from the beginning of time interval T2.

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

**----------------------END OF CHANGE # 17 ----------------------------**

**----------------------START OF CHANGE # 18 ----------------------------**

A.6.X2 Measurement performance requirements in RRC\_INACTIVE

A.6.X2.Y1 RSTD measurements

#### A.6.X2.Y1.Z1 RSTD measurement accuracy test case for single positioning frequency layer in FR1 in RRC\_INACTIVE state

##### A.6.X2.Y1.Z1.1 Test purpose and Environment

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

The supported test configurations are specified in Table A.6.X2.Y1.Z1.1-1.

Table A.6.X2.Y1.Z1.1-1: Supported test configurations

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR1. The 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 UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 5.6.2.5.

Table A.6.X2.Y1.Z1.1-2: RSTD accuracy test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | | Test 2 | |
| Cell 1 | Cell 2 | | Cell 1 | Cell 2 |
| PRS ARFCN | 1~3 |  | freq1 | Freq1 | | freq1 | Freq1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | |
| 2 | 10: NRB,c = 52 | | | 10: NRB,c = 52 | |
| 3 | 40: NRB,c = 106 | | | 40: NRB,c = 106 | |
| Duplex mode | 1 |  | FDD | | | FDD | |
| 2 | TDD | | | TDD | |
| 3 | TDD | | | TDD | |
| TDD configuration | 1 |  | N/A | | | N/A | |
| 2 | TDDConf.1.1 | | | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - | | SR.1.1 FDD | - |
| 2 | SR.1.1 TDD |  | | SR.1.1 TDD |  |
| 3 | SR.2.1 FDD |  | | SR.2.1 FDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - | | CR.1.1 FDD | - |
| 2 | CR.1.1 TDD | - | | CR.1.1 TDD | - |
| 3 | CR.2.1 FDD | - | | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | - |
| 2 | CCR.1.1 TDD | - | | CCR.1.1 TDD | - |
| 3 | CCR.2.1 TDD | - | | CCR.2.1 TDD | - |
| SSB configuration | 1 |  | SSB.1 FR1 | | | SSB.1 FR1 | |
| 2 | SSB.1 FR1 | | | SSB.1 FR1 | |
| 3 | SSB.2 FR1 | | | SSB.2 FR1 | |
| OCNG Patterns | 1~3 |  | OP.1 | | | OP.1 | |
| TRS configuration | 1 |  | TRS.1.1 FDD | | - | TRS.1.1 FDD |  |
| 2 | TRS.1.1 TDD | |  | TRS.1.1 TDD |  |
| 3 | TRS.1.2 TDD | |  | TRS.1.2 TDD |  |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | | DLBWP.0.1  ULBWP.0.1 | |
| Time offset with Cell 1 | 1 | μs | - | 3 | | - | 3 |
| 2,3 | - | 3 | | - | 3 |
| SMTC configuration | 1 |  | SMTC.2 | | | SMTC.2 | |
| 2,3 | SMTC.1 | | | SMTC.1 | |
| PRS configuration | 1 |  | PRS.1.4 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 | 1~3 |  | ‘10’ | ‘01’ | | ‘10’ | ‘01’ |
| Expected RSTD | 1, 2, 3 | μs | N/A | 3 | | N/A | 3 |
| Expected RSTD uncertainty | 1, 2, 3 | μs | N/A | 5 | | N/A | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 | | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note2 | 1,2 | dBm/ SCS | -98 | | | -98 | |
| 3 | -95 | | | -95 | |
|  | 1~3 | dB | -6 | -13 | | -6 | -13 |
| PRS-RSRPNote3 | 1,2 | dBm/SCS | -104 | -111 | | -104 | -111 |
| 3 | -101 | -108 | | -101 | -108 |
| IoNote3 | 1,2 | dBm/  9.36MHz | -69.07 | -69.83 | | -69.07 | -69.83 |
| 3 | dBm/  38.16MHz | -62.98 | -63.74 | | -62.98 | -63.74 |
|  | 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.  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: 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.X2.Y1.Z1.2 Test Requirements

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

#### A.6.X2.Y1.Z2 RSTD measurement accuracy test case with reduced number of samples for single positioning frequency layer in FR1 in RRC\_INACTIVE state

##### A.6.X2.Y1.Z2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement in RRC\_INACTIVE state meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions. In this test UE that supports *supportedDL-PRS-ProcessingSamples* is configured by LMF to perform PRS measurement with reduced number of samples.

The supported test configurations are specified in Table A.6.X2.Y1.Z2.1-1.

Table A.6.X2.Y1.Z2.1-1: Supported test configurations

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR1. The 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 UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 5.6.2.5.

Table A.6.X2.Y1.Z2.1-2: RSTD accuracy test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | | Test 2 | |
| Cell 1 | Cell 2 | | Cell 1 | Cell 2 |
| PRS ARFCN | 1~3 |  | freq1 | Freq1 | | freq1 | Freq1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | |
| 2 | 10: NRB,c = 52 | | | 10: NRB,c = 52 | |
| 3 | 40: NRB,c = 106 | | | 40: NRB,c = 106 | |
| Duplex mode | 1 |  | FDD | | | FDD | |
| 2 | TDD | | | TDD | |
| 3 | TDD | | | TDD | |
| TDD configuration | 1 |  | N/A | | | N/A | |
| 2 | TDDConf.1.1 | | | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | | | TDDConf.2.1 | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - | | SR.1.1 FDD | - |
| 2 | SR.1.1 TDD |  | | SR.1.1 TDD |  |
| 3 | SR.2.1 FDD |  | | SR.2.1 FDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - | | CR.1.1 FDD | - |
| 2 | CR.1.1 TDD | - | | CR.1.1 TDD | - |
| 3 | CR.2.1 FDD | - | | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | - |
| 2 | CCR.1.1 TDD | - | | CCR.1.1 TDD | - |
| 3 | CCR.2.1 TDD | - | | CCR.2.1 TDD | - |
| SSB configuration | 1 |  | SSB.1 FR1 | | | SSB.1 FR1 | |
| 2 | SSB.1 FR1 | | | SSB.1 FR1 | |
| 3 | SSB.2 FR1 | | | SSB.2 FR1 | |
| OCNG Patterns | 1~3 |  | OP.1 | | | OP.1 | |
| TRS configuration | 1 |  | TRS.1.1 FDD | | - | TRS.1.1 FDD |  |
| 2 | TRS.1.1 TDD | |  | TRS.1.1 TDD |  |
| 3 | TRS.1.2 TDD | |  | TRS.1.2 TDD |  |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | | - | |
| Time offset with Cell 1 | 1 | μs | - | 3 | | - | 3 |
| 2,3 | - | 3 | | - | 3 |
| SMTC configuration | 1 |  | SMTC.2 | | | SMTC.2 | |
| 2,3 | SMTC.1 | | | SMTC.1 | |
| PRS configuration | 1 |  | PRS.1.4 FR1 | | | PRS.1.4 FR1 | |
| 2 | PRS.1.4 FR1 | | | PRS.1.4 FR1 | |
| 3 | PRS.2.4 FR1 | | | PRS.2.4 FR1 | |
| PRS BW | 1,2,3 |  | 48 PRBs | | | | |
| PRS muting info | 1~3 |  | ‘10’ | ‘01’ | | ‘10’ | ‘01’ |
| Expected RSTD | 1, 2, 3 | μs | N/A | 3 | | N/A | 3 |
| Expected RSTD uncertainty | 1, 2, 3 | μs | N/A | 5 | | N/A | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 | | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note2 | 1,2 | dBm/ SCS | -98 | | | -98 | |
| 3 | -95 | | | -95 | |
|  | 1~3 | dB | -3 | 5 | | -3 | 5 |
| PRS-RSRPNote3 | 1,2 | dBm/SCS | -101 | -93 | | -101 | -93 |
| 3 | -98 | -90 | | -98 | -90 |
| SS-RSRPNote3 | 1,2 | dBm/SCS | -88 | -88 | | -88 | -88 |
| 3 | -85 | -85 | | -85 | -85 |
| IoNote3 | 1,2 | dBm/  9.36MHz | -69.5 | -67.9 | | -69.5 | -67.9 |
| 3 | dBm/  38.16MHz | -63.4 | -61.8 | | -63.4 | -61.8 |
|  | 1~3 | dB | -3 | 5 | | -3 | 5 |
| 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.  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: 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.X2.Y1.Z2.2 Test Requirements

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

### A.6.X2.Y2 PRS-RSRP measurements

A.6.X2.Y2.Z1 SA: measurement accuracy with PRS in FR1 in RRC\_INACTIVE

A.6.X2.Y2.Z1.1 Test Purpose and Environment

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

A.6.X2.Y2.Z1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.X2.Y2.Z1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.6.X2.Y2.Z1.2-2. In all test cases, Cell 1 is the PCell.

**Table A.6.X2.Y2.Z1.2-1: PRS-RSRP supported test configurations**

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

**Table A.6.X2.Y2.Z1.2-2: PRS-RSRP test parameters**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | | **Test 2** | | |
|  | | |  | **Cell 1** | | **Cell 2** | **Cell 1** | **Cell 2** | |
| Cell ID | | |  | 489 | | 0 | 489 | 0 | |
| SSB ARFCN | | |  | freq1 | | | freq1 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | |
|  | | Config 2,3 |  | TDD | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| BWP BW | | Config 1 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | | |
| DRX Cycle | | | ms | 1280 | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | - | SR.1.1 FDD | - | |
|  | | Config 2 |  | SR.1.1 TDD | |  | SR.1.1 TDD |  | |
|  | | Config 3 |  | SR2.1 TDD | |  | SR2.1 TDD |  | |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | - | CR.1.1 FDD | - | |
|  | | Config 2 |  | CR.1.1 TDD | |  | CR.1.1 TDD |  | |
|  | | Config 3 |  | CR2.1 TDD | |  | CR2.1 TDD |  | |
| Control channel RMC | | Config 1 |  | CCR.1.1 FDD | | - | CCR.1.1 FDD | - | |
|  | | Config 2 |  | CCR.1.1 TDD | |  | CCR.1.1 TDD |  | |
|  | | Config 3 |  | CCR2.1 TDD | |  | CCR2.1 TDD |  | |
| PRS configuration | | Config 1 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.4 FR1 | PRS.1.4 FR1 | |
|  | | Config 2 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.4 FR1 | PRS.1.4 FR1 | |
|  | | Config 3 |  | PRS.2.3 FR1 | | PRS.2.3 FR1 | PRS.2.4 FR1 | PRS.2.4 FR1 | |
| PRS Resource slot offset (slot) | | Config 1,2,3 | slot | 0 | | 4 | 0 | 4 | |
| SSB configuration | | Config 1 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 2 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 3 |  | SSB.2 FR1 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | |
| Time offset with Cell 1 | | Config 1 | ms | - | | 3 | - | 3 | |
|  | | Config 2,3 | μs | - | | 3 | - | 3 | |
| SMTC configuration | | Config 1 |  | SMTC.2 | | | | | |
| Config 2,3 |  | SMTC.1 | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | |
| Config 3 | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  |  |  | |
| Note2 | Config 1,2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/15KhZ | -106 | | | -88 | | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | Not applicableNote 5 | | | -94 | | |
| Note2 | Config 1,2 | | dBm/SCS | -106 | | | -88 | | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | Not applicableNote 5 | | | -91 | | |
|  | | | dB | 2.46 | -5.97 | | 2.46 | | -5.97 |
|  | | | dB | 6 | 1 | | 6 | | 1 |
| PRS-RSRP Note3 | Config 1, 2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/SCS | -100 | | -105 | -82 | | -87 |
|  | Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H |  | Not applicable Note 5 | | Not applicable Note 5 | -85 | | -90 |
| IoNote3 | Config 1,2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/9.36MHz | -70.09 | | | -52.09 | | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/38.16MHz | Not applicable Note 5 | | | -51.99 | | |
| Propagation condition | | |  | AWGN | | | | | |
| Antenna configuration | | |  | 1x2 | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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: Subtest 1 is not used when testing with 30kHz SSB SCS.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | |

A.6.X2.Y2.Z1.3 Test Requirements

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

A.6.X2.Y2.Z2.1 SA: measurement accuracy with PRS in FR1

A.6.X2.Y2.Z2.1.1 Test Purpose and Environment

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

A.6.X2.Y2.Z2.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.X2.Y2.Z2.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.6.X2.Y2.Z2.1.2-2. In all test cases, Cell 1 is the PCell.

**Table A.6.X2.Y2.Z2.1.2-1: PRS-RSRP supported test configurations**

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

**Table A.6.X2.Y2.Z2.1.2-2: PRS-RSRP test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | **Test 2** | |
|  | |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Cell ID | |  | 489 | 0 | 489 | 0 |
| SSB ARFCN | |  | freq1 | | freq1 | |
| Duplex mode | Config 1 |  | FDD | | | |
|  | Config 2,3 |  | TDD | | | |
| TDD configuration | Config 1 |  | Not Applicable | | | |
|  | Config 2 |  | TDDConf.1.1 | | | |
|  | Config 3 |  | TDDConf.2.1 | | | |
| BWchannel | Config 1 | MHz | 10: NRB,c = 52 | | | |
|  | Config 2 |  | 10: NRB,c = 52 | | | |
|  | Config 3 |  | 40: NRB,c = 106 | | | |
| BWP BW | Config 1 |  | 10: NRB,c = 52 | | | |
|  | Config 2 |  | 10: NRB,c = 52 | | | |
|  | Config 3 |  | 40: NRB,c = 106 | | | |
| Downlink initial BWP configuration | |  | DLBWP.0.1 | | | |
| Uplink initial BWP configuration | |  | ULBWP.0.1 | | | |
| DRX Cycle | | s | 1.28 | | | |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
|  | Config 2 |  | SR.1.1 TDD |  | SR.1.1 TDD |  |
|  | Config 3 |  | SR2.1 TDD |  | SR2.1 TDD |  |
| RMSI CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | - | CR.1.1 FDD | - |
|  | Config 2 |  | CR.1.1 TDD |  | CR.1.1 TDD |  |
|  | Config 3 |  | CR2.1 TDD |  | CR2.1 TDD |  |
| Control channel RMC | Config 1 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
|  | Config 2 |  | CCR.1.1 TDD |  | CCR.1.1 TDD |  |
|  | Config 3 |  | CCR2.1 TDD |  | CCR2.1 TDD |  |
| PRS configuration | Config 1 |  | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.1 FR1 |
|  | Config 2 |  | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.1 FR1 |
|  | Config 3 |  | PRS.2.1 FR1 | PRS.2.1 FR1 | PRS.2.1 FR1 | PRS.2.1 FR1 |
| PRS BW | Config 1 |  | 48 PRBs | 48 PRBs | 48 PRBs | 48 PRBs |
| Config 2 | 48 PRBs | 48 PRBs | 48 PRBs | 48 PRBs |
| Config 3 | 48 PRBs | 48 PRBs | 48 PRBs | 48 PRBs |
| PRS Resource slot offset (slot) | Config 1,2,3 | slot | 0 | 4 | 0 | 4 |
| SSB configuration | Config 1 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
|  | Config 2 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
|  | Config 3 |  | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| Time offset with Cell 1 | Config 1 | ms | - | 3 | - | 3 |
|  | Config 2,3 | μs | - | 3 | - | 3 |
| SMTC configuration | Config 1 |  | SMTC.2 | | | |
| Config 2,3 |  | SMTC.1 | | | |
| OCNG Patterns | |  | OCNG pattern 1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| Config 3 | 30 kHz | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| EPRE ratio of PRS to SSS | |
| Note2 | Config 1,2 | dBm/15Khz | -98 | | -98 | |
| Config 3 |
| Note2 | Config 1,2 | dBm/SCS | -98 | | -98 | |
| Config 3 | -95 | | -95 | |
|  | | dB | -3 | -6 | -3 | -6 |
|  | | dB | -1.44 | -3.65 | -1.44 | -3.65 |
| PRS-RSRP Note3 | Config 1, 2 | dBm/SCS | -99.44 | -101.65 | -99.44 | -101.65 |
| Config 3 | -96.44 | -98.65 | -96.44 | -98.65 |
| IoNote3 | Config 1,2 | dBm/9.36MHz | -66.73 | | -66.73 | |
| Config 3 | dBm/38.16MHz | -60.62 | | -60.62 | |
| Propagation condition | |  | AWGN | | | |
| Antenna configuration | |  | 1x2 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

A.6.X2.Y2.Z2.1.3 Test Requirements

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

### A.6.X2.Y3 UE Rx-Tx time difference measurements

A.6.X2.Y3.Z1.1 UE Rx-Tx time difference measurement accuracy in FR1 SA

A.6.X2.Y3.Z1.1.1 Test purpose and environment

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

The supported test configurations in listed in Table A.6.X2.Y3.Z1.1.1-1.

**Table A.6.X2.Y3.Z1.1.1-1: Supported test configurations**

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). 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 6.5.12.1], shall be provided to the UE before the start of the test.

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.6.X2.Y3.Z1.1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.6.X2.Y3.Z1.1.2-1.

**Table A.6.X2.Y3.Z1.1.2-1: UE Rx-Tx time difference measurement accuracy test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Test 1** | | **Test 2** | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| RF Channel Number |  | 1,2,3 | 1 | 1 | 1 | 1 |
| DRX | s | 1,2,3 | 1.28 | | 1.28 | |
| Time offset with Cell 1 | μs | 1, 2, 3 | N/A | 3 | N/A | 3 |
| TDD configuration |  | 1 | N/A | N/A | N/A | N/A |
|  | 2 | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 |
|  |  | 3 | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | N/A | SR.1.1 FDD | N/A |
|  | 2 | SR.1.1 TDD |  | SR.1.1 TDD |
|  | 3 | SR.2.1 TDD |  | SR.2.1 TDD |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | N/A | CR.1.1 FDD | N/A |
|  | 2 | CR.1.1 TDD | CR.1.1 TDD |
|  |  | 3 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | N/A | CCR.1.1 FDD | N/A |
|  | 2 | CCR.1.1 TDD | CCR.1.1 TDD |
|  | 3 | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | OP.1 | OP.1 | OP.1 |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | N/A | DLBWP.0.1 ULBWP.0.1 | N/A |
| PRS configuration |  | 1 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.1 FR1 |
|  |  | 2 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.1 FR1 |
|  |  | 3 | PRS.2.1 FR1 | PRS.2.1 FR1 | PRS.2.1 FR1 | PRS.2.1 FR1 |
| PRS Resource slot offset | slot | 1, 2, 3 | 0 | 4 | 0 | 4 |
| SRS configuration |  | 1 | POS-SRS.1 | N/A | POS-SRS.1 | N/A |
|  |  | 2 | POS-SRS.1 | N/A | POS-SRS.1 | N/A |
|  |  | 3 | POS-SRS.2 | N/A | POS-SRS.2 | N/A |
| Note 2 | dBm/SCS | 1 | -98 | | -98 | |
|  | 2 | -98 | | -98 | |
|  | 3 | -95 | | -95 | |
| Note 2 | dBm/15 kHz | 1 | -98 | | -98 | |
|  | 2 |  | |
|  | 3 |  | |
| PRS | dB | 1 | -2.41 | -12.12 | -2.41 | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -2 | -10 | -2 | -10 |
|  | 2 |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -100 | -108 | -100 | -108 |
|  | 2 | -100 | -108 | -100 | -108 |
|  | 3 | -97 | -105 | -97 | -105 |
| Io | dBm/9.36 MHz | 1 | -67.67 | -67.67 | -67.67 | -67.67 |
| dBm/9.36 MHz | 2 | -67.67 | -67.67 | -67.67 | -67.67 |
| dBm/38.16 MHz | 3 | -61.57 | -61.57 | -61.57 | -61.57 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | AWGN | |
| Note 1: Void.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

A.6.X2.Y3.Z1.1.3 Test requirements

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

A.6.X2.Y3.Z2 UE Rx-Tx time difference measurement accuracy with reduced number of samples

A.6.X2.Y3.Z2.1 Test purpose and environment

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

The supported test configurations in listed in Table A.6.X2.Y3.Z2.1-1.

**Table A.6.X2.Y3.Z2.1-1: Supported test configurations**

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

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

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE before the start of the test. The UE is configured to measure UE Rx-Tx time difference using reduced number of samples via *requestedDL-PRS-ProcessingSamples* in *NR-Multi-RTT-RequestLocationInformation*.

UE shall be configured to enter into RRC\_INACTIVE state before the start of 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.X2.Y3.Z2.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.6.X2.Y3.Z2.2-1.

**Table A.6.X2.Y3.Z2.2-1: 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 |
| DRX cycle |  | 1,2,3 | 1.28s | |
| 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 |
| 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 | 48 PRBs | 48 PRBs |
|  | 2 | 48 PRBs | 48 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 | -1.76 | -6.01 |
|  | 2 |  |  |
|  |  | 3 |  |  |
| PRS | dB | 1 | 0 | -3 |
|  | 2 |  |
|  |  | 3 |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -98 | -101 |
|  | 2 | -98 | -101 |
|  | 3 | -95 | -98 |
| Io | dBm/9.36 MHz | 1 | -66.07 | -66.07 |
| dBm/9.36 MHz | 2 | -66.07 | -66.07 |
| dBm/38.16 MHz | 3 | -59.97 | -59.97 |
| 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. | | | | |

A.6.X2.Y3.Z2.3 Test requirements

The UE Rx-Tx time difference measurement with reduced number of samples in RRC\_INACTIVE state fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 10.1.25.2 for both Cell 1 and Cell 2.

### A.6.X2.Y4 PRS-RSRP measurements

A.6.X2.Y4.Z1 SA: PRS-RSRPP measurement accuracy in FR1 in RRC INACTIVE

A.6.X2.Y4.Z1.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRPP measurement accuracy in FR1 in RRC\_INACTIVE state is within the specified limits. This test will verify the requirements in clauses [10.1.24.Z.1] and [10.1.24.Z.2].

A.6.X2.Y4.Z1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.X2.Y4.Z1.2-1. Both absolute and relative accuracy of PRS-RSRPP measurements are tested by using the parameters in A.6.X2.Y4.Z1.2-2. In all test cases, Cell 1 is the PCell.

**Table A.6.X2.Y4.Z1.2-1: 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, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table A.6.X2.Y4.Z1.2-2: 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 |  | FDD | | | | | |
|  | | Config 2,3 |  | TDD | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| BWP BW | | Config 1 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | NA | TRS.1.1 FDD | NA | |
|  | | Config 2 |  | TRS.1.1 TDD | | NA | TRS.1.1 TDD | NA | |
|  | | Config 3 |  | TRS.1.2 TDD | | NA | TRS.1.2 TDD | NA | |
| DRX cycle length | | Config 1,2,3 | ms | 1280 | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | - | SR.1.1 FDD | - | |
|  | | Config 2 |  | SR.1.1 TDD | |  | SR.1.1 TDD |  | |
|  | | Config 3 |  | SR2.1 TDD | |  | SR2.1 TDD |  | |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | - | CR.1.1 FDD | - | |
|  | | Config 2 |  | CR.1.1 TDD | |  | CR.1.1 TDD |  | |
|  | | Config 3 |  | CR2.1 TDD | |  | CR2.1 TDD |  | |
| Control channel RMC | | Config 1 |  | CCR.1.1 FDD | | - | CCR.1.1 FDD | - | |
|  | | Config 2 |  | CCR.1.1 TDD | |  | CCR.1.1 TDD |  | |
|  | | Config 3 |  | CCR2.1 TDD | |  | CCR2.1 TDD |  | |
| PRS configuration | | Config 1 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.4 FR1 | PRS.1.4 FR1 | |
|  | | Config 2 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.4 FR1 | PRS.1.4 FR1 | |
|  | | Config 3 |  | PRS.2.3 FR1 | | PRS.2.3 FR1 | PRS.2.4 FR1 | PRS.2.4 FR1 | |
| PRS Resource slot offset (slot) | | Config 1,2,3 | slot | 0 | | 4 | 0 | 4 | |
| SSB configuration | | Config 1 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 2 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 3 |  | SSB.2 FR1 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | |
| Time offset with Cell 1 | | Config 1 | ms | - | | 3 | - | 3 | |
|  | | Config 2,3 | μs | - | | 3 | - | 3 | |
| SMTC configuration | | Config 1 |  | SMTC.2 | | | | | |
| Config 2,3 |  | SMTC.1 | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | |
| Config 3 | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  |  |  | |
| Note2 | Config 1,2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/15KhZ | -106 | | | -88 | | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | Not applicableNote 5 | | | -94 | | |
| Note2 | Config 1,2 | | dBm/SCS | -106 | | | -88 | | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | Not applicableNote 5 | | | -91 | | |
|  | | | dB | 2.46 | -5.97 | | 2.46 | | -5.97 |
|  | | | dB | 6 | 1 | | 6 | | 1 |
| PRS-RSRP Note3 | Config 1, 2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/SCS | -100 | | -105 | -82 | | -87 |
|  | Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H |  | Not applicable Note 5 | | Not applicable Note 5 | -85 | | -90 |
| IoNote3 | Config 1,2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/9.36MHz | -70.09 | | | -52.09 | | |
| Config 3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, NR\_SDL\_FR1\_A,  NR\_FDD\_FR1\_B,  NR\_TDD\_FR1\_C,  NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D,  NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E,  NR\_FDD\_FR1\_F,  NR\_FDD\_FR1\_G,  NR\_FDD\_FR1\_H | dBm/38.16MHz | Not applicable Note 5 | | | -51.99 | | |
| 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: Subtest 1 is not used when testing with 30kHz SSB SCS.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  Note 7: 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.6.X2.Y4.Z1.3 Test Requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause [10.1.24.Z.1]. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause [10.1.24.Z.2].

A.6.X2.Y4.Z2 SA: measurement accuracy with reduced PRS samples in FR1 in RRC INACTIVE

A.6.X2.Y4.Z2.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRPP measurement accuracy with = 1 in FR1 in RRC\_INACTIVE state is within the specified limits. This test will verify the requirements in clauses [10.1.24.Z.1] and [10.1.24.Z.2].The UE under test should support [*supportedDL-PRS-ProcessingSamples-RRC-Inactive* ], and the TE indicates the UE to perform positioning measurements with reduced number of samples. The PRS bandwidth is contained within the initial DL BWP and the power difference between the serving cell SS-RSRP and neighbour cell PRS-RSRP is within [6]dB, so that = 1 is assumed.

A.6.X2.Y4.Z2.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.2.X.Y.2-1. Both absolute and relative accuracy of PRS-RSRPP measurements are tested by using the parameters in A.6.2.X.Y.2-2. In all test cases, Cell 1 is the PCell.

**Table A.6.X2.Y4.Z2.2-1: 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, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

**Table A.6.X2.Y4.Z2.2-2: PRS-RSRPP test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | |
|  | | |  | **Cell 1** | **Cell 2** | |
| Cell ID | | |  | 489 | 0 | |
| SSB ARFCN | | |  | freq1 | | |
| Duplex mode | | Config 1 |  | FDD | | |
|  | | Config 2,3 |  | TDD | | |
| TDD configuration | | Config 1 |  | Not Applicable | | |
|  | | Config 2 |  | TDDConf.1.1 | | |
|  | | Config 3 |  | TDDConf.2.1 | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | |
| BWP BW | | Config 1 |  | 10: NRB,c = 52 | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | NA |
|  | | Config 2 |  | TRS.1.1 TDD | | NA |
|  | | Config 3 |  | TRS.1.2 TDD | | NA |
| DRX Cycle length | | Config 1,2,3 | ms | 1280 | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | - |
|  | | Config 2 |  | SR.1.1 TDD | |  |
|  | | Config 3 |  | SR2.1 TDD | |  |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | - |
|  | | Config 2 |  | CR.1.1 TDD | |  |
|  | | Config 3 |  | CR2.1 TDD | |  |
| Control channel RMC | | Config 1 |  | CCR.1.1 FDD | | - |
|  | | Config 2 |  | CCR.1.1 TDD | |  |
|  | | Config 3 |  | CCR2.1 TDD | |  |
| PRS configuration | | Config 1 |  | PRS.1.4 FR1 | | PRS.1.4 FR1 |
|  | | Config 2 |  | PRS.1.4 FR1 | | PRS.1.4 FR1 |
|  | | Config 3 |  | PRS.2.4 FR1 | | PRS.2.4 FR1 |
| PRS bandwidth | | Config 1,2,3 |  | 48 PRBs | | 48 PRBs |
| PRS Resource slot offset (slot) | | Config 1,2,3 | slot | 0 | | 4 |
| SSB configuration | | Config 1 |  | SSB.1 FR1 | | SSB.1 FR1 |
|  | | Config 2 |  | SSB.1 FR1 | | SSB.1 FR1 |
|  | | Config 3 |  | SSB.2 FR1 | | SSB.2 FR1 |
| Time offset with Cell 1 | | Config 1 | ms | - | | 3 |
|  | | Config 2,3 | μs | - | | 3 |
| SMTC configuration | | Config 1 |  | SMTC.2 | | |
| Config 2,3 |  | SMTC.1 | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | |
| Config 3 | 30 kHz | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  |
| Note2 | Config 1,2 | | dBm/15KhZ | -98 | | |
| Config 3 | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | |
| Config 3 | | -95 | | |
|  | | | dB | 2.46 | | -5.97 |
|  | | | dB | 6 | | 1 |
| PRS-RSRP Note3 | Config 1, 2 | | dBm/SCS | -92 | | -97 |
|  | Config 3 | | -89 | | -94 |
| SS-RSRP Note3 | Config 1, 2 | | dBm/SCS | -92 | | -97 |
| Config 3 | | -89 | | -94 |
| IoNote3 | Config 1,2 | | dBm/9.36MHz | -70.09 | | |
| Config 3 | | dBm/38.16MHz | -63.99 | | |
| Propagation condition | | |  | [Two-tap channel] Note5 | | |
| 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, SS-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: 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.6.X2.Y4.Z2.3 Test Requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause [10.1.24.Z.1]. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause [10.1.24.Z.2].

**----------------------END OF CHANGE # 17 ----------------------------**

**----------------------START OF CHANGE # 18 ----------------------------**

A.7.6.9.X1 NR RSTD measurement reporting delay test case for single positioning frequency layer with reduced number of samples in FR2 SA

A.7.6.9.X1.1 Test Purpose and Environment

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

Supported test configurations are shown in table A.7.6.9.X1.1-1. The test parameters are as given in Table 7.6.9.X1.1-2, Table A.7.6.9.X1.1-3 and , Table A.7.6.9.1.1-4.

**Table A.7.6.9.X1.1-1: 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. UE can support [M-sample measurements], and the LMF indicates the UE to perform positioning measurements with reduced number of samples

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

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

**Table A.7.6.9.X1.1-2: General test parameters for RSTD measurement reporting delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.2. FR2 | As specified in clause A.3. 31 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#13 | GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 16 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | [1.28] | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

**Table A.7.6.9.X1.1-3: 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 to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.7.6.9.X1.1-4: 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 | -2 | -5.44 | -5.44 |
| Io | Config 1 | dBm/  9.36MHz | -57.63 | -59.65 | -59.65 |
| PRS | | dB | -3 | -6 | -6 |
| 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 subframes 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. | | | | | |

A.7.6.9.X1.2 Test Requirements

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

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration X1 specified in section 9.9.1.5 starting from the beginning of time interval T2, where X1 is 2560ms.

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

A.7.6.9.X2 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR2 SA without measurement gap

A.7.6.9.X2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the gapless RSTD measurement requirements specified in Clause 9.9.2.7 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured. Reporting delay test for gapless PRS measurement is conducted assuming that the PRS has higher priority, i.e., state 1, than all other DL signals/channels and is transmitted within active DL BWP of UE. Two sub-tests are defined, sub-test 1 is for Nsample = 4 and sub-test 2 is for Nsample = 1. For sub-test 2 LMF indicates UE to perform PRS measurement with Nsample = 1.

Supported test configurations are shown in table A.7.6.9.X2.1-1. The test parameters are as given in Table A.7.6.9.X2.1-2, Table A.7.6.9.X2.1-3, and Table A.7.6.9.X2.1-4.

**Table A.7.6.9.X2.1-1: 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 beginning of the time interval T2 shall be aligned with the beginning of the first PRS processing window instance containing the PRS resources.

The UE is configured with PPW before T2.

**Table A.7.6.9.X2.1-2: 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 | Config 1 | MHz | 100: NRB,c = 66 |  |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.4. 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 | 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 |  |
| PPW configuration | |  | Table A.3.X-1: Reference PPW configuration | As defined in A.3.X |
| Time offset between serving and neighbour cells | | μs | * set to the UE reported capability for receive time difference threshold if the UE reported value is < 3µs * 3µs otherwise | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | 0 | 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 | Same as time offset | 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 [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 | | ms | 10 | The length of the time interval that follows after time interval T1 and processing time of assistance data. In this test UE is configured to measure single PFL within the configured PPW. |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

**Table A.7.6.9.X2.1-3: 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 to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.7.6.9.X2.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | | **Cell 3** | |
| **Sub-test 1** | **Sub-test 2** | **Sub-test 1** | **Sub-test 2** | **Sub-test 1** | **Sub-test 2** |
| 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 | -6 | -3 | -13 | 5 | -13 | 5 |
| Io | Config 1 | dBm/  9.36MHz | -59.65 | | -59.92 | | -59.92 | |
| PRS | | dB | -6 | -3 | -13 | 5 | -13 | 5 |
| PRS-RSRP Note 4 | | dBm/SCS | -95 | -92 | -102 | -84 | -102 | -84 |
| 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. | | | | | | | | |

A.7.6.9.X2.2 Test Requirements

The RSTD measurement time fulfils the gapless RSTD measurement reporting delay requirements specified in Clause 9.9.2.7.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.2.7 starting from the beginning of time interval T2.

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

A.7.6.9.X3 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR2 SA in RRC\_CONNECTED state with Rx TEG

A.7.6.9.X3.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the Rx TEG based measurement period requirements specified in Clause 9.9.2.5 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured.

Supported test configurations are shown in table A.7.6.9.X3.1-1. The test parameters are as given in Table A7.6.9.X3.1-2, Table A.7.6.9.X3.1-3 and, Table A.7.6.9.X3.1-4.

**Table A.7.6.9.X3.1-1: 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 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.

The test applies to the UE supporting Rx TEG indicated via *NR-UE-TEG-Capability* and is requested to provide the Rx TEG in the test via *nr-UE-RxTEG-Request-r17* in *NR-TDOA-RequestLocationInformation*. In the location request *measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17* is set to n0. The UE shall perform and optionally report the Rx TEG based RSTD measurements.

The UE is capable of performing Rx TEG based RSTD measurements. UE may or may not be able to receive same DL PRS resource from the same TRP simultaneously from multiple Rx TEGs*.*

**Table A.7.6.9.X3.1-2: 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 | Config 1 | MHz | 100: NRB,c = 66 |  |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.4. 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 | 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\*]Note 1 | 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 |
| Note 1:   * = if UE is capable of receiving the same DL PRS resource from the same TRP simultaneously from multiple Rx TEGs, where is the maximum number of Rx TEGs with which UE can support to measure the same PRS resource, and is the number of Rx TEGs UE can measure simultaneously which is reported via *measureSameDL-PRS-ResourceWithDifferentRxTEGsSimul*. | | | | |

**Table A.7.6.9.X3.1-3: 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 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 to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.7.6.9.X3.1-4: 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 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 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. | | | | | |

A.7.6.9.X3.2 Test Requirements

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

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

A.7.6.10.X1 PRS-RSRP reporting delay test case for reduced number of samples

A.7.6.10.X1.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement requirements for reduced number of samples specified in Clause 9.9.3.5 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.7.6.10.X1.1-1

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

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2.

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

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

The test parameters are as given in table A.7.6.10.X1.1-2, and table A.7.6.10.X1.1-3.

**Table A.7.6.10.X1.1-1: supported test configurations for PRS RSRP measurement for FR2-FR2**

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

**Table A.7.6.10.X1.1-2: General test parameters for PRS RSRP measurement reporting delay**

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

**Table A.7.6.10.X1.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  | |  | **T1** | **T2** | **T1** | **T2** |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.3.1 TDD | | - | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| PRS configuration | |  | Config 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS BW | |  | Config 1 | 48 PRBs | | 48 PRBs | |
| 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 | | dB | 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) | |  |  |  | |  | |
| EPRE ratio of PRS to SSS | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -102 | | -102 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -93 | | -93 | |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -93 | -Infinity | -96 |
| PRS | | dB | Config 1 | -Infinity | -1.76 | -Infinity | -6.01 |
| PRS | | dB | Config 1 | -Infinity | 0 | -Infinity | -3 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -60.03 | | -60.03 | |
| 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: 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 | | | | | | | |

A.7.6.10.X1.2 Test Requirements

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

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

A.7.6.10.X2 PRS-RSRP reporting delay test case for single positioning frequency layer outside MG

A.7.6.10.X2.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement outside MG requirements specified in Clause 9.9.3.6 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. There are two sub-tests in the test, sub-test 1 is to verify the delay requirements with Nsample=1, and sub-test 2 is to verify the delay requirements with Nsample=4.

Supported test configurations are shown in table A.7.6.10.X2.1-1

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. In sub-test 1, *requestedDL-PRS-ProcessingSamples* shall be included in the location information request and set to ‘m1’, and *lowerRxBeamSweepingThan8-FR2* shall be included.

During T1, a PPW shall be configured for the PCell and be activated via DL MAC CE. The last PDSCH containing the MAC CE shall be transmitted before slot #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first PPW 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 as given in table A.7.6.10.X2.1-2, and cell specific test parameters during T2 are listed in table A.7.6.10.X2.1-3.

**Table A.7.6.10.X2.1-1: supported test configurations for PRS RSRP measurement for FR2**

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

**Table A.7.6.10.X2.1-2: 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. |
| PPW configuration |  | Config 1 | TBD |  |
| 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 | OFF | DRX is not used |
| Time offset between serving and neighbour cells | μs | Config 1 | 0.58, 2.0 or 3 Note 1 |  |
| Expected RSTD | μs | Config 1 | 0 |  |
| Expected RSTD uncertainty | μs | Config 1 | Same as time offset between serving and neighbour cells |  |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 7 |  |
| NOTE 1: If UE indicates support of CP length for the receive time difference threshold, the time offset is set to 0.58us; If UE indicates support of 1/4 symbol length for the receive time difference threshold, the time offset is set to 2.0us, otherwise 3us. | | | | |

**Table A.7.6.10.X2.1-3: Cell-specific test parameters during T2 for PRS RSRP measurement reporting delay**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
|  | |  | **Sub-test 1** | **Sub-test 2** | | **Sub-test 1** | **Sub-test 2** | |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | | Rough | | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| Duplex mode | |  | Config 1 | TDD | | | TDD | | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | | N/A | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | | N/A | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | | N/A | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | | N/A | | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | | OP.1 | | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | | - | | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | | - | | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.3.1 TDD | | | - | | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | | - | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | | 120 | | |
| PRS configuration | |  | Config 1 | PRS.1.1 FR2 | | | PRS.1.1 FR2 | | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | | ‘01’ | | |
| EPRE ratio of PSS to SSS | |  |  |  | | |  | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | | |  | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | | |  | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | | |  | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | | 0 | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | | |  | | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | | |  | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | | |  | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | | |  | | |
| Note2 | | dBm/15kHz Note5 |  | -102 | | | -102 | | |
| Note2 | | dBm/SCS Note4 | Config 1 | -93 | | | -93 | | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -96 | -96 | | -99 | -103 | |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -96 | -96 | | -99 | -103 | |
| PRS | | dB | Config 1 | -3 | -3 | | -6 | -10 | |
| PRS | | dB | Config 1 | -3 | -3 | | -6 | -10 | |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -62.25 | | -62.25 | -63.04 | | -63.60 |
| 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.7.6.10.X2.2 Test Requirements

The PRS RSRP measurement time fulfils the requirements specified in Clause 9.9.3.6, with Nsample=1 for sub-test 1 and Nsample=4 for sub-test 2. 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 9.9.3.6 starting from the beginning of time interval T2.

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

#### A.7.6.11.X1 UE Rx-Tx time difference measurements for single positioning frequency layer in FR2 SA with reduced sample number

##### A.7.6.11.X1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 with Nsample = 1 in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations in listed in Table A.7.6.11.X1.1-1.

Table A.7.6.11.X1.1-1: Supported test configurations

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All cells are on 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. *requestedDL-PRS-ProcessingSamples* and shall be included in the location information request and set to ‘m1’, and *lowerRxBeamSweepingThan8-FR2* shall be included. 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 SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.6.11.X1.1-2 and Table A.7.6.11.X1.1-3 respectively.

Table A.7.6.11.X1.1-2: General test parameters

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

Table A.7.6.11.X1.1-3: 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 | |
| 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 | -Infinity | -6 |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -6 |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 | -Infinity | -95 |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -91 | -91 | -95 | -95 |
| Io | dBm/95.04 MHz | 1 | N/A | -57.88 | N/A | -59.04 |
| 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: 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.7.6.11.X1.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5 with Nsample=1.

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

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

A.7.6.11.X2 UE Rx-Tx time difference measurements without gaps in FR2 SA

A.7.6.11.X2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.6 in AWGN propagation condition in FR2 in standalone scenario. There are two sub-tests in the test, sub-test 1 is to verify the delay requirements with Nsample=1, and sub-test 2 is to verify the delay requirements with Nsample=4.

The supported test configurations in listed in Table A.7.6.11.X2.1-1.

**Table A.7.6.11.X2.1-1: Supported test configurations**

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All cells are on 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 PRS processing window containing the PRS resources.

The UE is configured with PRS processing window before T2.

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.6.11.X2.1-2 and Table A.7.6.11.X2.1-3 respectively.

**Table A.7.6.11.X2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in NR-Multi-RTT-ProvideAssistanceData [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in NR-Multi-RTT-ProvideAssistanceData [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 100: NRB,c = 66 |  |
| SSB configuration |  | 1 | SSB.2 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| PRS processing window |  | TBD | TBD |  |
| CP length |  | 1 | Normal |  |
| DRX |  | 1 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1 | 0.58, 2.25 or 3 Note 1 |  |
| Expected RSTD | μs | 1 | 0 |  |
| Expected RSTD uncertainty | μs | 1 | Same as time offset between serving and neighbour cells |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 20 |  |
| NOTE 1: The value is up to the UE capability. The possible UE capability value: (1/4 symbol, 1/2 symbol, CP length, half of slot). When the UE reported value is > 3us, the time offset between serving and neighbour cells is set to 3us; when the UE reported value is < 3us, the time offset between serving and neighbour cells is set to the UE reported value. | | | | |

**Table A.7.6.11.X2.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **Sub-test 1** | **Sub-test 2** | **Sub-tets 1** | **Sub-test 2** |
| 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 | |
| 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 | 48 PRBs | 24 PRBs | 48 PRBs | 24 PRBs |
| 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 | -3 | -2.41 | -6 | -12.12 |
| PRS | dB | 1 | -1.44 | -2 | -3.65 | -10 |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -90.44 | -91 | -92.65 | -99 |
| Io | dBm/95.04 MHz | 1 | -56.65 | -57.63 | -56.65 | -57.63 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

A.7.6.11.X2.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.6.

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.

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

A.7.6.11.X3 UE Rx-Tx time difference measurements for single positioning frequency layer in FR2 SA with multiple RxTx TEGs

A.7.6.11.X3.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured, and when UE is requested to measure a PRS resource with multiple RxTx TEGs.

The supported test configurations in listed in Table A.7.6.11.X3.1-1.

**Table A.7.6.11.X3.1-1: Supported test configurations**

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All cells are on 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. In *nr-Multi-RTT-RequestLocationInformation*, *measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17* shall be set to ‘n2’.

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 SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.6.11.X3.1-2 and Table A.7.6.11.X3.1-3 respectively.

**Table A.7.6.11.X3.1-2: General test parameters**

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

**Table A.7.6.11.X3.1-3: 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 | |
| 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 |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 | -Infinity | -99 |
| Io | dBm/95.04 MHz | 1 | N/A | -57.63 | N/A | -57.63 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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.7.6.11.X3.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5, with =2 if UE does not support or indicate value ‘n1’ for *measureSameDL-PRS-ResourceWithDifferentRxTEGsSimul*, and =1 otherwise.

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

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

**----------------------END OF CHANGE # 18 ----------------------------**

**----------------------START OF CHANGE # 19 ----------------------------**

A.7.6.X PRS-RSRPP measurements

A.7.6.X.1 PRS-RSRPP reporting delay test case for single positioning frequency layer in FR2 in RRC\_CONNECTED state

A.7.6.X.1.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRPP measurement requirements specified in Clause 9.9.6.5 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.7.6.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 beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources that is ΔT after slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The test parameters are as given in table A.7.6.X.1.1-2, and table A.7.6.X.1.1-3.

**Table A.7.6.X.1.1-1: supported test configurations for PRS RSRPP measurement for FR2**

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

**Table A.7.6.X.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. |
| Gap Pattern Id |  | Config 1 | GP#13 or GP#24Note1 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 |  |
| SMTC parameters |  | Config 1 | SMTC.1 | As specified in clause A.3.11 |
| SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1 | -6 |  |
| Hysteresis | dB | Config 1 | 0 |  |
| CP length |  | Config 1 | Normal |  |
| TimeToTrigger | s | Config 1 | 0 |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| DRX |  | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| Expected RSTD | μs | Config 1 | 3 |  |
| Expected RSTD uncertainty | μs | Config 1 | 5 |  |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 7 |  |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | |

**Table A.7.6.X.1.1-3: 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 | | 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.1.4 FR2 | | PRS.1.4 FR2 | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -102 | | -102 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -93 | | -93 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -96 | -Infinity | -103 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | -10 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | -10 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -58.56 | | -55.38 | |
| 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.7.6.X.1.2 Test Requirements

The PRS RSRPP measurement time fulfils the requirements specified in Clause 9.9.6.5.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 9.9.6.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS RSRPP measurement for each correct event shall be within the PRS RSRPP reporting range specified in Clause 10.1.X, i.e., between PRS RSRPP\_0 and PRS RSRPP\_126.

A.7.6.X.2 PRS-RSRPP reporting delay test case for single positioning frequency layer in FR2 in RRC\_CONNECTED state

A.7.6.X.2.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRPP measurement requirements specified in Clause 9.9.6.5 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.7.6.X.Y1.1-1

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

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2.

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

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

The test parameters are as given in table A.7.6.X.2.1-2, and table A.7.6.X.2.1-3.

**Table A.7.6.X.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.7.6.X.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. |
| Expected RSTD | μs | Config 1 | 3 |  |
| Expected RSTD uncertainty | μs | Config 1 | 5 |  |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 7 |  |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | |

**Table A.7.6.X.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 | | 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.1.4 FR2 | | PRS.1.4 FR2 | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -102 | | -102 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -93 | | -93 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -96 | -Infinity | -89 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | 4 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | 4 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -63.5 | | -61.9 | |
| 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.7.6.X.2.2 Test Requirements

The PRS RSRPP measurement time fulfils the requirements specified in Clause 9.9.6.5. 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 9.9.6.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS RSRPP measurement for each correct event shall be within the PRS RSRPP reporting range specified in Clause 10.1.X.Y, i.e., between PRS RSRPP\_0 and PRS RSRPP\_126.

A.7.6.X.3 PRS-RSRPP reporting delay test case for gapless measurement in FR2

A.7.6.X.3.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRPP measurement requirements specified in Clause 9.9.6.6 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. Reporting delay test for gapless PRS measurement is conducted assuming that the PRS has higher priority, i.e., state 1, than all other DL signals/channels and is transmitted within active DL BWP of UE. Two sub-tests are defined, sub-test 1 is for Nsample = 4 and sub-test 2 is for Nsample = 1. For sub-test 2 LMF indicates UE to perform PRS measurement with Nsample = 1.

The supported test configurations are shown in table A.7.6.X.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.

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 PRS processing window instance containing the PRS resources that is ΔT after slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The test parameters are as given in table A.7.6.X.3.1-2, and table A.7.6.X.3.1-3.

**Table A.7.6.X.3.1-1: supported test configurations for PRS RSRPP measurement for FR2-FR2**

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

**Table A.7.6.X.3.1-2: 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. |
| PPW configuration |  | Config 1 | Table A.3.X-1: Reference PPW configuration | As defined in A.3.X |
| 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 | μs | 1, 2, 3 | * set to the UE reported capability for receive time difference threshold if the UE reported value is < 3µs * 3µs otherwise | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3 | 0 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | Same as time offset |  |
| T1 | s | Config 1 | 5 |  |
| T2 | ms | Config 1 | 10 | In this test UE is configured to measure single PFL within the configured PPW. |

**Table A.7.6.X.3.1-3: Cell-specific test parameters during T2**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  | |  | **Sub-test 1** | **Sub-test 2** | **Sub-test 1** | **Sub-test 2** |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.3.1 TDD | | - | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| PRS configuration | |  | Config 1 | PRS.1.4 FR2 | | PRS.1.4 FR2 | |
| PRS BW | |  |  | 48 PRBs for sub-test 2 | | 48 PRBs for sub-test 2 | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -102 | | -102 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -93 | | -93 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -89.7 | -89.7 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -96 | -88 | -103 | -88 |
| PRS | | dB | Config 1 | -3 | 5 | -10 | 5 |
| PRS | | dB | Config 1 | -3 | 5 | -10 | 5 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -58.56 | | -55.38 | |
| 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 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.7.6.X.3.2 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 9.9.6.5, starting from the beginning of time interval T2.

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

**----------------------END OF CHANGE # 19 ----------------------------**

**----------------------START OF CHANGE # 20 ----------------------------**

#### A.7.7.10.X1 RSTD measurement accuracy test case with reduced number of samples for single positioning frequency layer in FR2 in RRC\_CONNECTED state

##### A.7.7.10.X1.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions. In this test UE that supports *supportedDL-PRS-ProcessingSamples* is configured by LMF to perform PRS measurement with reduced number of samples.

The supported test configurations are specified in Table A.7.7.10.X1.1-1.

Table A.7.7.10.X1.1-1: Supported test configurations

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR2. GP#24 is configured if UE supports GP#24, otherwise, GP#13 is configured for the test. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be longer than the UE measurement period as defined in clause 9.9.2.7.

Table A.7.7.10.X1.1-2: RSTD accuracy test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| PRS ARFCN |  | freq1 | | freq1 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - | Not applicable | - |
| TRS configuration |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.3 | OP.3 | OP.3 | OP.3 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| PRS configuration |  | PRS.1.4 FR2 | PRS.1.4 FR2 | PRS.1.4 FR2 | PRS.1.4 FR2 |
| PRS BW |  | 48 PRBs | | | |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| Expected RSTD | μs | N/A | 3 | N/A | 3 |
| Expected RSTD uncertainty | μs | N/A | 5 | N/A | 5 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |

Table A.7.7.10.X1.1-3: RSTD accuracy OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 5 |  | Rough | | Rough | |
| Note1 | dBm/SCSNote3 | -98 | | -98 | |
|  | dB | -3 | 5 | -3 | 5 |
| PRS-RSRPNote2 | dBm/SCS | -101 | -93 | -101 | -93 |
| SS-RSRPNote2 | dBm/SCS | -89.7 | N/A | -89.7 | N/A |
| BB Note4 | dB | -3 | 5 | -3 | 5 |
| IoNote2 | dBm/95.04 MHz Note3 | -68.5 | -66.9 | -68.5 | -66.9 |
| 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: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 4: 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 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.7.7.10.X1.2 Test Requirements

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

A.7.7.10.X2 RSTD measurement accuracy test case with Rx TEG

A.7.7.10.X2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement when the measurements of reference cell and neighbor cell are within the same Rx TEG meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.7.7.10.X2.1-1.

**Table A.7.7.10.X2.1-1: Supported test configurations**

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

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

The UE is requested to provide the Rx TEG in the test via *nr-UE-RxTEG-Request-r17* in *NR-TDOA-RequestLocationInformation*.

The test applies to the UE supporting *Rx TEG* defiend in *NR-UE-TEG-Capability* and reporting the same Rx TEG for the measurements of reference cell and neighbour cell.

**Table A.7.7.10.X2.1-2: RSTD accuracy test parameters**

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

**Table A.7.7.10.X2.1-3: RSTD accuracy OTA related test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 5 |  | Rough | | Rough | |
| Note1 | dBm/SCSNote3 | -98 | | -98 | |
| PRS | dB | -5 | -11 | -5 | -11 |
| PRPNote2 | dBm/SCS | -103 | -109 | -103 | -109 |
| PRS  Note4 | dB | -5.33 | -12.19 | -5.33 | -12.19 |
| IoNote2 | dBm/95.04 MHz Note3 | -67.57 | -67.57 | -67.57 | -67.57 |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: PRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 4: Calculation of Es/Iot includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

A.7.7.10.X2.2 Test Requirements

The RSTD measurement for Cell 1 and Cell 2 should both fulfil the absolute accuracy requirements with same Rx TEG for reference cell and neighbour cell defined in clause 10.1.23.2.

A.7.7.11.X1 SA measurement accuracy with PRS in FR2 with reduced sample number

A.7.7.11.X1.1 Test Purpose and Environment

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

A.7.7.11.X1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.11.X1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in Table A.7.7.11.X1.2-2 and A.7.7.11.X1.2-3. In all test cases, Cell 1 is the PCell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.11.X1.2-1: PRS-RSRP supported test configurations**

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

**Table A.7.7.11.X1.2-2: PRS-RSRP general test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | |
|  |  | **Cell 1** | **Cell 2** |
| Cell ID |  | 489 | 0 |
| SSB ARFCN |  | freq1 | |
| Duplex mode |  | TDD | |
| TDD configuration |  | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - |
| Measurement gap |  | GP#13 or GP#24 Note2 | |
| TRS configuration |  | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.3 | OP.3 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 |
| PRS configuration |  | PRS.1.4 FR2 | PRS.1.4 FR2 |
| PRS BW | RB | 64 | 64 |
| PRS Resource slot offset | slot | 0 | 4 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |
| Propagation conditions |  | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 |
| `Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | |

**Table A.7.7.11.X1.2-3: PRS-RSRP OTA related test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | |
|  |  | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 7 |  | Rough | |
| Note1 | dBm/15kHzNote4 | -91.6 | |
| Note1 | dBm/SCSNote4 | -82.6 | |
|  | dB | -6 | -6 |
| Es | dBm/SCSNote4 | - | - |
| PRS\_RPNote2 | dBm/SCS | -88.6 | -88.6 |
| SSB\_RP Note2 | dBm/SCS | -88.6 | -88.6 |
| BB Note6 | dB | -6 | -6 |
| IoNote2 | dBm/95.04 MHz Note4 | -52.64 | |
| 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: SSB\_RP, 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 | | | |

A.7.7.11.X1.3 Test Requirements

In the test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.24.2.1 if the reported PRS-RSRP is in the range shown in table A.7.7.11.X1.3-1. The relative PRS-RSRP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1.24.2.2.

**Table A.7.7.11.X1.3-1: PRS-RSRP absolute accuracy test requirement**

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

A.7.7.12.X1 UE Rx-Tx time difference measurement accuracy with reduced number of samples in FR2 SA

A.7.7.12.X1.1 Test purpose and environment

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

The supported test configuration is listed in Table A.7.7.12.X1.1-1.

**Table A.7.7.12.X1.1-1: Supported test configurations**

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

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

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

The UE is configured to measure UE Rx-Tx time difference using reduced number of samples via *requestedDL-PRS-ProcessingSamples* in *NR-Multi-RTT-RequestLocationInformation* during the test.

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

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

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

A.7.7.12.X1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.7.7.12.X1.2-1.

**Table A.7.7.12.X1.2-1: 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 | 48 PRBs | 48 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 | -1.76 | -6.01 |
| PRS | dB | 1 | 0 | -3 |
| PRP Note 3 | dBm/SCS kHz | 1 | -89 | -92 |
| Io | dBm/95.04 MHz | 1 | -56.03 | -56.03 |
| 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. | | | | |

A.7.7.12.X1.3 Test requirements

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

A.7.7.12.X2 UE Rx-Tx time difference measurement accuracy with RxTx TEG

A.7.7.12.X2.1 Test purpose and environment

The purpose of the test is to verify that the relative UE Rx-Tx time difference measurement accuracy when the two measurements are within the same RxTx TEG is within the specified limits. This test will verify the requirements in clause 10.1.25.x. The test is conducted in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configuration is listed in Table A.7.7.12.X2.1-1.

**Table A.7.7.12.X2.1-1: Supported test configurations**

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

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

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

The UE is requested to provide the RxTx TEG in the test via *nr-UE-RxTxTEG-Request-r17* in *NR-Multi-RTT-RequestLocationInformation*.

The test applies to the UE supporting *RxTx TEG* defiend in *NR-UE-TEG-Capability* and reporting the same RxTx TEG for the two UE Rx-Tx measurements.

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 UE Rx-Tx time difference is derived by the difference of the receiving timing and the transmit timing for each cell.

A.7.7.12.X2.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.7.7.12.X2.2-1.

**Table A.7.7.12.X2.2-1: UE Rx-Tx time difference measurement accuracy test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Test 1** | | **Test 2** | |
|  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | Setup 1 as specified in clause A.3.15 | |
| Beam AssumptionNote 7 |  | 1 | Rough | Rough | Rough | Rough |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 8 | | GP#24 or GP#13 Note 8 | |
| DRX |  | 1 | OFF | | OFF | |
| Time offset with Cell 1 | μs | 1 | N/A | 3 | N/A | 3 |
| TDD configuration |  | 1 | TDDConf.3.1 | TDDConf.3.1 | TDDConf.3.1 | TDDConf.3.1 |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | N/A | SR.3.1 TDD | N/A |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | N/A | CR.3.1 TDD | N/A |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | N/A | CCR.3.1 TDD | N/A |
| OCNG Patterns |  | 1 | OP.1 | OP.1 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | N/A | TRS.2.1 TDD | N/A |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | N/A | DLBWP.0.1 ULBWP.0.1 | N/A |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | N/A | DLBWP.1.1 | N/A |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | N/A | ULBWP.1.1 | N/A |
| PRS configuration |  | 1 | PRS.1.1 FR2 | PRS.1.1 FR2 | PRS.1.2 FR2 | PRS.1.2 FR2 |
| PRS Resource slot offset | slot | 1 | 0 | 4 | 0 | 4 |
| SRS configuration |  | 1 | POS-SRS.3 | N/A | POS-SRS.3 | N/A |
| Note 2 | dBm/SCS | 1 | -89 | | -89 | |
| Note 2 | dBm/15 kHz | 1 | -98 | | -98 | |
| PRS | dB | 1 | -5.33 | -12.19 | -5.33 | -12.19 |
| PRS | dB | 1 | -5 | -11 | -5 | -11 |
| PRP Note 3 | dBm/SCS kHz | 1 | -94 | -100 | -94 | -100 |
| Io | dBm/95.04 MHz | 1 | -58.57 | -58.57 | -58.57 | -58.57 |
| Propagation Condition |  | 1 | AWGN | | AWGN | |
| Note 1: Void.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: 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. | | | | | | |

A.7.7.12.X2.3 Test requirements

The relative accuracy is derived by the difference of the UE Rx-Tx measurements on the two cells.

The UE Rx-Tx time difference measurements for Cell 1 and Cell 2 fulfil the relative UE Rx-Tx measurement accuracy requirements specified in clause 10.1.25.x.

**----------------------END OF CHANGE # 20 ----------------------------**

**----------------------START OF CHANGE # 21 ----------------------------**

A.7.7.X PRS-RSRPP measurements

A.7.7.X.1 SA measurement accuracy with PRS in FR2

A.7.7.X.1.1 Test Purpose and Environment

The purpose of this test is to verify that the accuracy of PRS-RSRPP measurement in RRC\_CONNECTED is within the specified limits. This test will verify the requirements in clauses 10.1.24.X.y and 10.1.24.X.z.

A.7.7.X.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.X.1.2-1. Both absolute and relative accuracy of PRS-RSRPP measurements are tested by using the parameters in Table A.7.7.X.1.2-2 and A.7.7.X.1.2-3. In all test cases, Cell 1 is the PCell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.X.1.2-1: PRS-RSRPP supported test configurations**

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

**Table A.7.7.X.1.2-2: 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 = 24 | | 100: NRB,c = 24 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - | Not applicable | - |
| Measurement gap |  | GP#13 or GP#24 Note2 | | | |
| TRS configuration |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.3 | OP.3 | OP.3 | OP.3 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PRS configuration |  | PRS.1.3 FR2 | PRS.1.3 FR2 | PRS.1.4 FR2 | PRS.1.4 FR2 |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| Propagation conditions |  | 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.7.7.X.1.2-3: 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 | -91.6 | | Test 1 | |
| Note1 | dBm/SCSNote4 | -82.6 | | Test 1 | |
|  | dB | 6.0 | 1.0 | 6.0 | 1.0 |
| Es | dBm/SCSNote4 | - | - | - | - |
| PRS\_RPNote2 | dBm/SCS | -76.6 | -81.6 | -76.6 | -81.6 |
| BB Note6 | dB | 2.44 | -5.98 | 2.44 | -5.98 |
| IoNote2 | dBm/95.04 MHz Note4 | -50.05 | | -50.05 | |
| 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 | | | | | |

A.7.7.X.1.3 Test Requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.24.X.y if the reported PRS-RSRPP is in the range shown in table A.7.7.X.1.3-1. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1.24.X.z.

**Table A.7.7.X.1.3-1: 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 | |

A.7.7.X.2 SA measurement accuracy with reduced PRS samples in FR2

A.7.7.X.2.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRPP measurement accuracy with = 1 in FR2 is within the specified limits. This test will verify the requirements in clauses [10.1.24.Z.1] and [10.1.24.Z.2].

The UE under test should support [*supportedDL-PRS-ProcessingSamples* ], and the TE indicates the UE to perform positioning measurements with reduced number of samples. The PRS bandwidth is contained within the active BWP and the power difference between the serving cell SS-RSRP and neighbour cell PRS-RSRP is within [6] dB, so that = 1 is assumed.

A.7.7.X.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.7.7.X.Y1.2-1. Both absolute and relative accuracy of PRS-RSRPP measurements are tested by using the parameters in Table A.7.7.X.Y1.2-2 and A.7.7.X.Y1.2-3. In all test cases, Cell 1 is the PCell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.X.2.2-1: PRS-RSRPP supported test configurations**

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

**Table A.7.7.X.2.2-2: PRS-RSRPP general test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | |
|  |  | **Cell 1** | **Cell 2** |
| Cell ID |  | 489 | 0 |
| SSB ARFCN |  | freq1 | |
| Duplex mode |  | TDD | |
| TDD configuration |  | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 24 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - |
| Measurement gap |  | GP#13 or GP#24 Note2 | |
| TRS configuration |  | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.3 | OP.3 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 |
| PRS configuration |  | PRS.1.4 FR2 | PRS.1.4 FR2 |
| PRS bandwidth |  | 48 PRBs | 48 PRBs |
| PRS Resource slot offset | slot | 0 | 4 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |
| Propagation conditions |  | [Two-tap channel] Note3 | |
| 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: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured.  Note 3: 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). | | | |

**Table A.7.7.X.2.2-3: PRS-RSRPP OTA related test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | |
|  |  | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 7 |  | Rough | |
| Note1 | dBm/15kHzNote4 | -91.6 | |
| Note1 | dBm/SCSNote4 | -82.6 | |
|  | dB | 6.0 | 1.0 |
| Es | dBm/SCSNote4 | - | - |
| PRS\_RPNote2 | dBm/SCS | -76.6 | -81.6 |
| SS\_RPNote2 | dBm/SCS | -76.6 | -81.6 |
| BB Note6 | dB | 2.44 | -5.98 |
| IoNote2 | dBm/95.04 MHz Note4 | -50.05 | |
| 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, SS\_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. | | | |

A.7.7.X.2.3 Test Requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause [10.1.24.Z.1] if the reported PRS-RSRPP is in the range shown in table A.7.7.X.2.3-1. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause [10.1.24.Z.2].

**Table A.7.7.X.2.3-1: PRS-RSRPP absolute accuracy test requirement**

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| Cell 1 | PRS\_RP1 -δ +Gmin ≤ Reported RSRPP(dBm) ≤ PRS\_RP1 +δ +Gmax |
| Cell 2 | PRS\_RP2 -δ +Gmin ≤ Reported RSRPP(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.Z.1-2], selected according to the Io used in the test.  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.6.1-1, selected according to the UE power class | |

**----------------------END OF CHANGE # 21 ----------------------------**

**----------------------START OF CHANGE # 22 ----------------------------**

A.7.X1 Measurement procedure in RRC\_INACTIVE

A.7.X1.Y1 RSTD measurements

#### A.7.X1.Y1.Z1 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR2 SA in RRC\_INACTIVE state

##### A.7.X1.Y1.Z1.1 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 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in Table A.7.X1.Y1.Z1.1-1.

Table A.7.X1.Y1.Z1.1-1: 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 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.7.X1.Y1.Z1.1-2, and cell specific test parameters are listed in Table Table A.7.X1.Y1.Z1.1-3 and Table A.7.X1.Y1.Z1.1-4.

Table A.7.X1.Y1.Z1.1-2: General test parameters for RSTD measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| BWchannel | | MHz | 100: NRB,c = 66 |  |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.4. 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 | 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.7.X1.Y1.Z1.1-3: 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.7.X1.Y1.Z1.1-4: 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.7.X1.Y1.Z1.2 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.

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

A.7.X1.Y1.Z2 NR RSTD measurement reporting delay test case with reduced number of samples in RRC\_INACTIVE, FR1 SA

A.7.X1.Y1.Z2.1 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 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single-sample measurements are requested by the LMF. This test is applicable to UEs that support [FG 14-2 PRS measurement for reduced sample in RRC\_inactive state].

The supported test configurations are specified in Table A.7.X1.Y1.Z2.1-1.

**Table A.7.X1.Y1.Z2.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **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 3 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. 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. PRS resources from all three cells are transmitted within the 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 beginning of the time interval T2 shall be aligned with the beginning of the first DRX cycle in RRC\_INACTIVE.

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 *nr-DL-TDOA-RequestLocationInformation* IE should indicate to the UE that single-sample measurements are requested, i.e. requestedDL-PRS-ProcessingSamples-r17 is set to m1.

The general test parameters are listed in Table A.7.X1.Y1.Z2.1-2, and cell specific test parameters are listed in Table A.7.X1.Y1.Z2.1-3 and A.7.X1.Y1.Z2.1-4.

**Table A.7.X1.Y1.Z2.1-2: General test parameters for RSTD measurement reporting delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| Initial BWP configuration | Config 1 |  | DLBWP.0.1  ULBWP.0.1 |  |
| 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.1.2 FR2 | As specified in clause A.3. 31.  The number of PRS RBs is the same as for the channel BW. |
| PRS Resource slot offset | Config 1 | slots | Cell 1, 2, 3: 0 |  |
| 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 cycle length | | 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 | [5] | 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.X1.Y1.Z2.1-3: 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 | -89 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  95.04MHz | -57.01 | -57.01 | -57.01 |
| 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 to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.7.X1.Y1.Z2.1-4: 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 | 0 | -3 | -3 |
| Io Note 4 | Config 1 | dBm/  95.04MHz | -56.03 | -58.25 | -56.03 |
| PRS | | dB | 0 | -3 | -3 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that all active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols, except for slots where PRS is transmitted by any of the cells.  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: Io levels apply only for symbols where PRS is transmitted. | | | | | |

A.7.X1.Y1.Z2.2 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.

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

### A.7.X1.Y2 PRS-RSRP measurements

A.7.X1.Y2.Z1 PRS-RSRP reporting delay test case for single positioning frequency layer in RRC\_INACTIVE

A.7.X1.Y2.Z1.1 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. Supported test configurations are shown in table A.7.X1.Y2.Z1.1-1

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.X1.Y2.Z1.1-2, and table A.7.X1.Y2.Z1.1-3.

**Table A.7.X1.Y2.Z1.1-1: 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.X1.Y2.Z1.1-2: General test parameters for PRS RSRP measurement reporting delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| NR RF Channel Number |  | Config 1 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | Config 1 | NR cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| SMTC parameters |  | Config 1 | SMTC.1 | As specified in clause A.3.11 |
| SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| CP length |  | Config 1 | Normal |  |
| DRX |  | Config 1 | 0.64s |  |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| Expected RSTD | μs | Config 1 | 3 |  |
| Expected RSTD uncertainty | μs | Config 1 | 5 |  |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | [41] |  |

**Table A.7.X1.Y2.Z1.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  | |  | **T1** | **T2** | **T1** | **T2** |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
| 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 |  | -102 | | -102 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -93 | | -93 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -96 | -Infinity | -103 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | -10 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | -10 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -58.56 | | -55.38 | |
| 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.X1.Y2.Z1.2 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 starting from the beginning of time interval T2.

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

A.7.X1.Y2.Z2 PRS-RSRP reporting delay test case with reduced number of samples in RRC\_INACTIVE

A.7.X1.Y2.Z2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement meets the delay requirements specified in clause 5.6.3.5 in an environment with AWGN propagation conditions when single-sample measurements are requested by the LMF. This test is applicable to UEs that support [FG 14-2 PRS measurement for reduced sample in RRC\_inactive state].

The supported test configurations are specified in Table A.7. X1.Y2.Z2.1-1.

**Table A.7.** **X1.Y2.Z2.1-1: Supported test configurations**

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR 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. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2. PRS resources from both cells are transmitted within the initial DL BWP of the UE and with the same numerology as the initial DL BWP.

The beginning of the time interval T2 shall be aligned with the beginning of the first DRX cycle in RRC\_INACTIVE.

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 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-AoD assistance* data and location information request.

The *nr-DL-AoD-RequestLocationInformation* IE should indicate to the UE that single-sample measurements are requested, i.e. requestedDL-PRS-ProcessingSamples-r17 is set to m1.

The general test parameters are listed in Table A.7.X1.Y2.Z2.1-2, and cell specific test parameters are listed in Table A.7.X1.Y2.Z2.1-3.

**Table A.7.X1.Y2.Z2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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 |
| 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 cycle length | s | Config 1 | 0.64 |  |
| 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 | 3 |  |
| T2 | s | Config 1 | [5] |  |

**Table A.7.X1.Y2.Z2.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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 | |
| 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 configurationNote8 | |  | Config 1 | PRS.1.2 FR2 | | PRS.1.2 FR2 | |
| PRS Resource slot offset | | slots | Config 1 | 0 | | 0 | |
| 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 | -89 | -89 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -89 | -Infinity | -92 |
| PRS | | dB | Config 1 | -Infinity | 0 | -Infinity | -3 |
| PRS | | dB | Config 1 | -Infinity | 0 | -Infinity | -3 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | N/A | -57.01 | N/A | -58.25 |
| Propagation Condition | |  | Config 1 | AWGN | | | |
| Note 1: OCNG shall be used such that all active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols, except for slots where PRS is transmitted by any of the cells.  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. Io levels apply only for symbols where PRS is transmitted.  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: The number of PRS RBs is the same as for the channel BW. | | | | | | | |

A.7.X1.Y2.Z2.2 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.

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

### A.7.X1.Y3 UE Rx-Tx time difference measurements

A.7.X1.Y3.Z1 UE Rx-Tx time difference measurements for single positioning frequency layer in FR2 SA

A.7.X1.Y3.Z1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement in RRC\_INACTIVE state meets the requirements specified in clause 5.6.4 in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations in listed in Table A.7.X1.Y3.Z1.1-1.

**Table A.7.X1.Y3.Z1.1-1: Supported test configurations**

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

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

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

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last 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 UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.X1.Y3.Z1.1-2 and Table A.7.X1.Y3.Z1.1-3 respectively.

**Table A.7.X1.Y3.Z1.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 100: NRB,c = 66 |  |
| SSB configuration |  | 1 | SSB.2 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| CP length |  | 1 | Normal |  |
| DRX cycle |  | 1 | 0.64s |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 20 |  |

**Table A.7.X1.Y3.Z1.1-3: 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.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting info |  | 1 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.3 | | N/A | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 | -Infinity | -99 |
| Io | dBm/95.04 MHz | 1 | N/A | -57.63 | N/A | -57.63 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: 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: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |

A.7.X1.Y3.Z1.2 Test requirements

The UE Rx-Tx time difference measurement time in RRC\_INACTIVE state fulfils the requirements specified in clause 5.6.4.

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 specified in clause 5.6.4 starting from the beginning of time interval T2.

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

A.7.X1.Y3.Z2 UE Rx-Tx time difference measurement with reduced number of samples in RRC\_INACTIVE, FR2 SA

A.7.X1.Y3.Z2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 5.6.4.5 in AWGN propagation condition in FR2 in standalone scenario when single-sample measurements are requested by the LMF. This test is applicable to UEs that support [FG 14-2 PRS measurement for reduced sample in RRC\_inactive state].

The supported test configurations in listed in Table A.7.X1.Y3.Z2.1-1.

**Table A.7.X1.Y3.Z2.1-1: 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). All 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. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2. PRS resources from both cells are transmitted within the initial DL BWP of the UE and with the same numerology as the initial DL BWP.

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* 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 *nr-Multi-RTT-RequestLocationInformation* IE should indicate to the UE that single-sample measurements are requested, i.e. requestedDL-PRS-ProcessingSamples-r17 is set to m1.

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.X1.Y3.Z2.1-2 and Table A.7. X1.Y3.Z2.1-3 respectively.

**Table A.7.X1.Y3.Z2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in NR-Multi-RTT-ProvideAssistanceData [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in NR-Multi-RTT-ProvideAssistanceData [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 100: NRB,c = 66 |  |
| SSB configuration |  | 1 | SSB.2 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| CP length |  | 1 | Normal |  |
| DRX cycle length | s | 1 | 0.64 |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells |
| T1 | s | 1 | 3 |  |
| T2 | s | 1 | [5] |  |

**Table A.7.X1.Y3.Z2.1-3: 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 | |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | N/A | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| PRS configurationNote 9 |  | 1 | PRS.1.2 FR2 | | PRS.1.2 FR2 | |
| PRS Resource slot offset | slots | 1 | 0 | | 0 | |
| 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 | 0 | -Infinity | -3 |
| PRS | dB | 1 | -Infinity | 0 | -Infinity | -3 |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -89 | -Infinity | -92 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -89 | -89 | -89 | -92 |
| Io | dBm/95.04 MHz | 1 | N/A | -57.01 | N/A | -58.25 |
| 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: SS-RSRP/PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io levels apply only for symbols where PRS is transmitted.  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: OCNG shall be used such that all active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols, except for slots where PRS is transmitted by any of the cells.  Note 9: The number of PRS RBs is the same as for the channel BW. | | | | | | |

A.7.X1.Y3.Z2.2 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.

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.X1.Y4 PRS-RSRP measurements

#### A.7.X1.Y4.Z1 PRS-RSRPP reporting delay test case for single positioning frequency layer in FR2 in RRC\_INACTIVE state

##### A.7.X1.Y4.Z1.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRPP measurement requirements specified in Clause 5.6.5.5 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.X1.Y4.Z1.1-1.

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.7.X1.Y4.Z1.1-2, and table A.7.X1.Y4.Z1.1-3.

Table A.7.X1.Y4.Z1.1-1: 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.X1.Y4.Z1.1-2: 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 | 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 | 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.7.X1.Y4.Z1.1-3: 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 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.1.4 FR2 | | PRS.1.4 FR2 | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -102 | | -102 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -93 | | -93 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -89.7 | -89.7 | -Infinity | -86.7 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -96 | -Infinity | -103 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | -10 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | -10 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -58.56 | | -55.38 | |
| 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 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.7.X1.Y4.Z1.2 Test Requirements

The PRS RSRPP measurement time fulfils the requirements specified in Clause 5.6.5.5.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 5.6.5.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS RSRPP measurement for each correct event shall be within the PRS RSRPP reporting range specified in Clause 10.1.X, i.e., between PRS RSRPP\_0 and PRS RSRPP\_126.

#### A.7.X1.Y4.Z2 PRS-RSRPP reporting delay test with reduced number of samples for single positioning frequency layer in FR2 in RRC\_INACTIVE state

##### A.7.X1.Y4.Z2.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRPP measurement requirements specified in Clause 5.6.5.5 for single positioning frequency layer under AWGN propagation conditions in standalone scenario for reduced number of samples. In this test UE that supports *supportedDL-PRS-ProcessingSamples* is configured by LMF to perform PRS measurement with reduced number of samples. Supported test configurations are shown in table A.X1.Y4.Z2.1-1.

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.7.X1.Y4.Z2.1-2, and table A.7.X1.Y4.Z2.1-3.

Table A.7.X1.Y4.Z2.1-1: 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.X1.Y4.Z2.1-2: 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 | 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 | 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.7.X1.Y4.Z2.1-3: 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 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.1.4 FR2 | | PRS.1.4 FR2 | |
| PRS BW | |  | Config 1 | 48 PRBs | | 48 PRBs | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -102 | | -102 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -93 | | -93 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -92.7 | -92.7 | -Infinity | -85.7 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -96 | -Infinity | -89 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | 4 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | 4 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -63.5 | | -61.9 | |
| 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.X1.Y4.Z2.2 Test Requirements

The PRS RSRPP measurement time fulfils the requirements specified in Clause 5.6.5.5. 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 5.6.5.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS RSRPP measurement for each correct event shall be within the PRS RSRPP reporting range specified in Clause 10.1.X, i.e., between PRS RSRPP\_0 and PRS RSRPP\_126.

A.7.X2 Measurement performance requirements in RRC\_INACTIVE

A.7.X2.Y1 RSTD measurements

#### A.7.X2.Y1.Z1 RSTD measurement accuracy test case for single positioning frequency layer in FR2 in RRC\_INACTIVE state

##### A.7.X2.Y1.Z1.1 Test purpose and Environment

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

The supported test configurations are specified in Table A.7.X2.Y1.Z1.1-1.

Table A.7.X2.Y1.Z1.1-1: Supported test configurations

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cells. Both cells are on the same NR RF channel in FR2. The UE is configured with DRX cycle of 0.64s. 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 5.6.2.5.

Table A.7.X2.Y1.Z1.1-2: RSTD accuracy test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| PRS ARFCN |  | freq1 | | freq1 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| 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.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| PRS configuration |  | PRS.1.1 FR2 | PRS.1.1 FR2 | PRS.1.2 FR2 | PRS.1.2 FR2 |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| Expected RSTD | μs | N/A | 3 | N/A | 3 |
| Expected RSTD uncertainty | μs | N/A | 5 | N/A | 5 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |

Table A.7.X2.Y1.Z1.1-3: RSTD accuracy OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 5 |  | Rough | | Rough | |
| Note1 | dBm/SCSNote3 | -98 | | -98 | |
|  | dB | -6 | -13 | -6 | -13 |
| PRS-RSRPNote2 | dBm/SCS | -104 | -111 | -104 | -111 |
| BB Note4 | dB | -6 | -13 | -6 | -13 |
| IoNote2 | dBm/95.04 MHz Note3 | -68.04 | -68.80 | -68.04 | -68.80 |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 4: 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 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.7.X2.Y1.Z1.2 Test Requirements

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

#### A.7.X2.Y1.Z2 RSTD measurement accuracy test case with reduced number of samples for single positioning frequency layer in FR2 in RRC\_INACTIVE state

##### A.7.X2.Y1.Z2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement in RRC\_INACTIVE state meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions. In this test UE that supports *supportedDL-PRS-ProcessingSamples* is configured by LMF to perform PRS measurement with reduced number of samples.

The supported test configurations are specified in Table A.7.X2.Y1.Z2.1-1.

Table A.7.X2.Y1.Z2.1-1: Supported test configurations

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cells. Both cells are on the same NR RF channel in FR2. The UE is configured with DRX cycle of 0.64s. 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 5.6.2.5.

Table A.7.X2.Y1.Z2.1-2: RSTD accuracy test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| PRS ARFCN |  | freq1 | | freq1 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 | DLBWP.0.1 |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| 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.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| PRS configuration |  | PRS.1.4 FR2 | PRS.1.4 FR2 | PRS.1.4 FR2 | PRS.1.4 FR2 |
| PRS BW |  | 48 PRBs | | | |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| Expected RSTD | μs | N/A | 3 | N/A | 3 |
| Expected RSTD uncertainty | μs | N/A | 5 | N/A | 5 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |

Table A.7.X2.Y1.Z2.1-3: RSTD accuracy OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 5 |  | Rough | | Rough | |
| Note1 | dBm/SCSNote3 | -98 | | -98 | |
|  | dB | -3 | 4 | -3 | 4 |
| PRS-RSRPNote2 | dBm/SCS | -101 | -94 | -101 | -94 |
| SS-RSRPNote2 | dBm/SCS | -89.7 | N/A | -89.7 | N/A |
| BB Note4 | dB | -3 | 4 | -3 | 4 |
| IoNote2 | dBm/95.04 MHz Note3 | -68.5 | -66.9 | -68.5 | -66.9 |
| 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: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 4: 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 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.7.X2.Y1.Z2.2 Test Requirements

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

### A.7.X2.Y2 PRS-RSRP measurements

A.7.X2.Y2.Z1 SA measurement accuracy with PRS in FR2 in RRC\_INACTIVE

A.7.X2.Y2.Z1.1 Test Purpose and Environment

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

A.7.X2.Y2.Z1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.X2.Y2.Z1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in Table A.7.X2.Y2.Z1.2-2 and A.7.X2.Y2.Z1.2-3. In all test cases, Cell 1 is the PCell.

**Table A.7.X2.Y2.Z1.2-1: PRS-RSRP supported test configurations**

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

**Table A.7.X2.Y2.Z1.2-2: PRS-RSRP general test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Cell ID |  | 489 | 0 | 489 | 0 |
| SSB ARFCN |  | freq1 | | freq1 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 24 | | 100: NRB,c = 24 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| DRX cycle configuration |  | 1.28s | - | 1.28s | - |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.3 | OP.3 | OP.3 | OP.3 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PRS configuration |  | PRS.1.3 FR2 | PRS.1.3 FR2 | PRS.1.4 FR2 | PRS.1.4 FR2 |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |

**Table A.7.X2.Y2.Z1.2-3: PRS-RSRP OTA related test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 7 |  | Rough | | Rough | |
| Note1 | dBm/15kHzNote4 | -91.6 | | Test 1 | |
| Note1 | dBm/SCSNote4 | -82.6 | | Test 1 | |
|  | dB | 6.0 | 1.0 | 6.0 | 1.0 |
| Es | dBm/SCSNote4 | - | - | - | - |
| PRS\_RPNote2 | dBm/SCS | -76.6 | -81.6 | -76.6 | -81.6 |
| BB Note6 | dB | 2.44 | -5.98 | 2.44 | -5.98 |
| IoNote2 | dBm/95.04 MHz Note4 | -50.05 | | -50.05 | |
| 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 | | | | | |

A.7.X2.Y2.Z1.3 Test Requirements

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.24.2.1 if the reported PRS-RSRP is in the range shown in table A.7.X2.Y2.Z1.3-1. The relative PRS-RSRP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1.24.2.2.

**Table A.7.X2.Y2.Z1.3-1: PRS-RSRP absolute accuracy test requirement**

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

A.7.X2.Y2.Z2 PRS-RSRP measurements with reduced number of sample in RRC\_INACTIVE

A.7.X2.Y2.Z2.1 Test Purpose and Environment

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

A.7.X2.Y2.Z2.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.X2.Y2.Z2.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in Table A.7.X2.Y2.Z2.2-2 and A.7.X2.Y2.Z2.2-3. In all test cases, Cell 1 is the PCell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.X2.Y2.Z2.2-1: PRS-RSRP supported test configurations**

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

**Table A.7.X2.Y2.Z2.2-2: PRS-RSRP general test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Cell ID |  | 489 | 0 | 489 | 0 |
| SSB ARFCN |  | freq1 | | freq1 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| DRX cycle configuration | s | 0.64 | | | |
| 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.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PRS configuration |  | PRS.1.1 FR2 | PRS.1.1 FR2 | PRS.1.1 FR2 | PRS.1.1 FR2 |
| PRS BW |  | 48 PRBs | 48 PRBs | 48 PRBs | 48 PRBs |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | |

**Table A.7.X2.Y2.Z2.2-3: PRS-RSRP OTA related test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 7 |  | Rough | | Rough | |
| Note1 | dBm/15kHzNote4 | -98 | | Test 1 | |
| Note1 | dBm/SCSNote4 | -89 | | Test 1 | |
|  | dB | -1.44 | -3.65 | -1.44 | -3.65 |
| Es | dBm/SCSNote4 | - | - | - | - |
| PRS\_RPNote2 | dBm/SCS | -90.44 | -92.65 | -90.44 | -92.65 |
| BB Note6 | dB | -3 | -6 | -3 | -6 |
| IoNote2 | dBm/95.04 MHz Note4 | -56.65 | | -56.65 | |
| 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 | | | | | |

A.7.X2.Y2.Z2.3 Test Requirements

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.24.2.1 if the reported PRS-RSRP is in the range shown in table A.7.X2.Y2.Z2.1.3-1. The relative PRS-RSRP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1.24.2.2.

Table A.7.X2.Y2.Z2.1.3-1: PRS-RSRP absolute accuracy test requirement

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

### A.7.X2.Y3 UE Rx-Tx time difference measurements

A.7.X2.Y3.Z1 UE Rx-Tx time difference measurements in RRC\_INACTIVE

A.7.X2.Y3.Z1.1 Test purpose and environment

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

The supported test configuration is listed in Table A.7.X2.Y3.Z1.1.1-1.

**Table A.7.X2.Y3.Z1.1-1: Supported test configurations**

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

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

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

The UE is configured 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.7.X2.Y3.Z1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.7.X2.Y3.Z1.2-1.

Table A.7.X2.Y3.Z1.2-1: UE Rx-Tx time difference measurement accuracy test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Test 1** | | **Test 2** | |
|  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | Setup 1 as specified in clause A.3.15 | |
| Beam AssumptionNote 7 |  | 1 | Rough | Rough | Rough | Rough |
| DRX | s | 1 | 0.64 | | 0.64 | |
| Time offset with Cell 1 | μs | 1 | N/A | 3 | N/A | 3 |
| TDD configuration |  | 1 | TDDConf.3.1 | TDDConf.3.1 | TDDConf.3.1 | TDDConf.3.1 |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | N/A | SR.3.1 TDD | N/A |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | N/A | CR.3.1 TDD | N/A |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | N/A | CCR.3.1 TDD | N/A |
| OCNG Patterns |  | 1 | OP.1 | OP.1 | OP.1 | OP.1 |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | N/A | DLBWP.0.1 ULBWP.0.1 | N/A |
| PRS configuration |  | 1 | PRS.1.1 FR2 | PRS.1.1 FR2 | PRS.1.1 FR2 | PRS.1.1 FR2 |
| PRS Resource slot offset | slot | 1 | 0 | 4 | 0 | 4 |
| SRS configuration |  | 1 | POS-SRS.3 | N/A | POS-SRS.3 | N/A |
| Note 2 | dBm/SCS | 1 | -89 | | -89 | |
| Note 2 | dBm/15 kHz | 1 | -98 | | -98 | |
| PRS | dB | 1 | -2.41 | -12.12 | -2.41 | -12.12 |
| PRS | dB | 1 | -2 | -10 | -2 | -10 |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -91 | -99 | -91 | -99 |
| Io | dBm/95.04 MHz | 1 | -57.63 | -57.63 | -57.63 | -57.63 |
| Propagation Condition |  | 1 | AWGN | | AWGN | |
| Note 1: Void.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: 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.X2.Y3.Z1.3 Test requirements

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

A.7.X2.Y3.Z2 UE Rx-Tx time difference measurement accuracy with reduced number of samples in FR2 SA

A.7.X2.Y3.Z2.1 Test purpose and environment

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

The supported test configuration is listed in Table A.7.X2.Y3.Z2.1-1.

**Table A.7.X2.Y3.Z2.1-1: Supported test configurations**

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

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

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE before the start of the test. The UE is configured to measure UE Rx-Tx time difference using reduced number of samples via *requestedDL-PRS-ProcessingSamples* in *NR-Multi-RTT-RequestLocationInformation*.

UE shall be configured to enter into RRC\_INACTIVE state before the start of 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.X2.Y3.Z2.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.7.X2.Y3.Z2.2-1.

**Table A.7.X2.Y3.Z2.2-1: 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 |
| DRX cycle |  | 1 | 0.64s | |
| 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 |
| PRS configuration |  | 1 | PRS.1.1 FR2 | PRS.1.1 FR2 |
| PRS BW |  | 1 | 48 PRBs | 48 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 | -1.76 | -6.01 |
| PRS | dB | 1 | 0 | -3 |
| PRP Note 3 | dBm/SCS kHz | 1 | -89 | -92 |
| Io | dBm/95.04 MHz | 1 | -56.03 | -56.03 |
| 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 | | | | |

A.7.X2.Y3.Z2.3 Test requirements

The UE Rx-Tx time difference measurement with reduced number of samples in RRC\_INACTIVE state fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 10.1.25.2 for both Cell 1 and Cell 2.

### A.7.X2.Y4 PRS-RSRP measurements

A.7.X2.Y4.Z1 SA measurement accuracy in FR2 in RRC INACTIVE

A.7.X2.Y4.Z1.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRPP measurement accuracy in RRC\_INACTIVE state is within the specified limits. This test will verify the requirements in clauses [10.1.24.Z.1] and [10.1.24.Z.2].

A.7.X2.Y4.Z1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.X2.Y4.Z1.2-1. Both absolute and relative accuracy of PRS-RSRPP measurements are tested by using the parameters in Table A.7.X2.Y4.Z1.2-2 and A.7.X2.Y4.Z1.2-3. In all test cases, Cell 1 is the PCell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.X2.Y4.Z1.2-1: PRS-RSRPP supported test configurations**

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

**Table A.7.X2.Y4.Z1.2-2: 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 = 24 | | 100: NRB,c = 24 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| DRX cycle configuration | ms | 640 | | | |
| 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.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PRS configuration |  | PRS.1.3 FR2 | PRS.1.3 FR2 | PRS.1.4 FR2 | PRS.1.4 FR2 |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| Propagation conditions |  | [Two-tap channel ] Note 2 | | | |
| 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: 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). | | | | | |

**Table A.7.X2.Y4.Z1.2-3: 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 | -91.6 | | Test 1 | |
| Note1 | dBm/SCSNote4 | -82.6 | | Test 1 | |
|  | dB | 6.0 | 1.0 | 6.0 | 1.0 |
| Es | dBm/SCSNote4 | - | - | - | - |
| PRS\_RPNote2 | dBm/SCS | -76.6 | -81.6 | -76.6 | -81.6 |
| BB Note6 | dB | 2.44 | -5.98 | 2.44 | -5.98 |
| IoNote2 | dBm/95.04 MHz Note4 | -50.05 | | -50.05 | |
| 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 | | | | | |

A.7.X2.Y4.Z1.3 Test Requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause [10.1.24.Z.1]. if the reported PRS-RSRPP is in the range shown in table A.7.2.X2.Y4.Z1.3-1. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause [10.1.24.Z.2].

**Table A.7.X2.Y4.Z1.3-1: PRS-RSRPP absolute accuracy test requirement**

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| Cell 1 | PRS\_RP1 -δ +Gmin ≤ Reported RSRPP(dBm) ≤ PRS\_RP1 +δ +Gmax |
| Cell 2 | PRS\_RP2 -δ +Gmin ≤ Reported RSRPP(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.Z.1-2], selected according to the Io used in the test.  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.6.1-1, selected according to the UE power class | |

A.7.X2.Y4.Z2 SA measurement accuracy with reduced PRS samples in FR2 in RRC INACTIVE

A.7.X2.Y4.Z2.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRPP measurement accuracy with = 1 in FR2in RRC\_INACTIVE state is within the specified limits. This test will verify the requirements in clauses [10.1.24.Z.1] and [10.1.24.Z.2].The UE under test should support [*supportedDL-PRS-ProcessingSamples-RRC-Inactive* ], and the TE indicates the UE to perform positioning measurements with reduced number of samples. The PRS bandwidth is contained within the initial DL BWP and the power difference between the serving cell SS-RSRP and neighbour cell PRS-RSRP is within [6]dB, so that = 1 is assumed.

A.7.X2.Y4.Z2.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.X2.Y4.Z2.2-1. Both absolute and relative accuracy of PRS-RSRPP measurements are tested by using the parameters in Table A.7.X2.Y4.Z2.2-2 and A.7.X2.Y4.Z2.2-3. In all test cases, Cell 1 is the PCell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.X2.Y4.Z2.2-1: PRS-RSRPP supported test configurations**

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

**Table A.7.X2.Y4.Z2.2-2: PRS-RSRPP general test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | |
|  |  | **Cell 1** | **Cell 2** |
| Cell ID |  | 489 | 0 |
| SSB ARFCN |  | freq1 | |
| Duplex mode |  | TDD | |
| TDD configuration |  | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 24 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - |
| DRX cycle configuration | ms | 640 | |
| TRS configuration |  | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.3 | OP.3 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 |
| PRS configuration |  | PRS.1.4 FR2 | PRS.1.4 FR2 |
| PRS bandwidth |  | 48 PRBs | 48 PRBs |
| PRS Resource slot offset | slot | 0 | 4 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |
| Propagation conditions |  | [Two-tap channel] Note 2 | |
| 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: 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). | | | |

**Table A.7.X2.Y4.Z2.2-3: PRS-RSRPP OTA related test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | |
|  |  | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 7 |  | Rough | |
| Note1 | dBm/15kHzNote4 | -91.6 | |
| Note1 | dBm/SCSNote4 | -82.6 | |
|  | dB | 6.0 | 1.0 |
| Es | dBm/SCSNote4 | - | - |
| PRS\_RPNote2 | dBm/SCS | -76.6 | -81.6 |
| SS\_RPNote2 | dBm/SCS | -76.6 | -81.6 |
| BB Note6 | dB | 2.44 | -5.98 |
| IoNote2 | dBm/95.04 MHz Note4 | -50.05 | |
| 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, SS\_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. | | | |

A.7.X2.Y4.Z2.3 Test Requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause [10.1.24.Z.1] if the reported PRS-RSRPP is in the range shown in table A.7.X2.Y4.Z2.3-1. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause [10.1.24.Z.2].

**Table A.7.X2.Y4.Z2.3-1: PRS-RSRPP absolute accuracy test requirement**

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| Cell 1 | PRS\_RP1 -δ +Gmin ≤ Reported RSRPP(dBm) ≤ PRS\_RP1 +δ +Gmax |
| Cell 2 | PRS\_RP2 -δ +Gmin ≤ Reported RSRPP(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.Z.1-2], selected according to the Io used in the test.  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.6.1-1, selected according to the UE power class | |

**----------------------END OF CHANGE # 22 ----------------------------**

**----------------------START OF CHANGE # 23 ----------------------------**

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 | ≥ -6 Note5  ≥ -3 Note6 |
| 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 |
| 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.  NOTE 3: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, PRS-RSRP measurement, PRS-RSRPP measurement and UE Rx-Tx time difference measurement.  NOTE 4: PRS Ês/Iot for PRS-RSRP measurement, PRS-RSRPP measurement and UE Rx-Tx time difference measurement.  NOTE 5: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, PRS-RSRP measurement, PRS-RSRPP measurement and UE Rx-Tx time difference measurement when performed with reduced number of samples.  NOTE 6: PRS Ês/Iot for RSTD measurement reference cell PRS resource when performed with reduced number of samples. | | | | | | |

**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** | **1, 2, 3, 4** |
| **Conditions** | Rx Beam Peak | n257 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 | (Value for SCSPRS = 120 kHz) - 3dB | ≥ -6 Note4  ≥ -13 Note5  ≥ -3 Note6 | ≥ -6 Note7  ≥ -3 Note8 |
| n258 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 |
| n259 |  |  | -108.5 | -124.7+Y4 |
| n260 | -125.3+Y1 |  | -109.5 | -125.8+Y4 |
| n261 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 |
| Spherical coverage Note 1 | n257 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 | (Value for SCSPRS = 120 kHz) - 3dB | ≥ -6 Note4  ≥ -13 Note5  ≥ -3 Note6 | ≥ -6 Note7  ≥ -3 Note8 |
| n258 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 |
| n259 |  |  | -95.7 | -115.7+Z4 |
| n260 | -117.3+Z1 |  | -96.9 | -113.8+Z4 |
| n261 | -120.3+Z1 | -102.8 | -101.2 | -118.8+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.  NOTE 5: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, PRS-RSRP measurement, PRS-RSRPP measurement and UE Rx-Tx time difference measurement.  NOTE 6: PRS Ês/Iot for PRS-RSRP measurement, PRS-RSRPP measurement and UE Rx-Tx time difference measurement.  NOTE 7: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, PRS-RSRP measurement, PRS-RSRPP measurement and UE Rx-Tx time difference measurement when performed with reduced number of samples.  NOTE 8: PRS Ês/Iot for RSTD measurement reference cell PRS resource when performed with reduced number of samples. | | | | | | | | | |

*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 # 23 ----------------------------**