**3GPP TSG-RAN WG2 Meeting #124 *R2-2313766***

**Chicago, USA, 13th - 17th November 2023**

|  |
| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **37.355** | **CR** | **0481** | **rev** | **1** | **Current version:** | **17.6.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

|  |
| --- |
|  |
| ***Title:***  | Introduction of Expanded and improved NR positioning |
|  |  |
| ***Source to WG:*** | CATT |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_pos\_enh2 |  | ***Date:*** | 2023-12-01 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | Introduce Rel-18 positioning enhancements. |
|  |  |
| ***Summary of change:*** | Capture the agreements on RAT-dependent integrity.Capture the agreements on LPHAP.Capture the agreements on CPP. Capture the agreements on BW. Capture the agreements on Redcap positioning. Merge the TP (R2-2313643) on LPP capabilities. |
|  |  |
| ***Consequences if not approved:*** |  Not support Rel-18 positioning enhancements. |
|  |  |
| ***Clauses affected:*** | 3.1, 3.2, 5.2.1a, 5.2.2a, 6.4.2, 6.4.3, 6.5.10, 6.5.11, 6.5.12, 6.6, 7.2, 7.4.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **x** |  |  Other core specifications  | TS/TR 38.305 CR 0150TS/TR 38.331 CR 4454TS/TR 38.321 CR 1700TS/TR 38.355 CR new spec.TS/TR 38.300 CR 0722TS/TR 38.304 CR 0358TS/TR 37.340 CR 0371TS/TR 38.306 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:*** | Revision of R2-2313117. |

*START OF CHANGE*

# 3 Definitions and Abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1], TS 36.305 [2], TS 23.271 [3], 38.305 [40] and TS 23.273 [42] apply. Other definitions are provided below.

**Anchor carrier:** In NB-IoT, a carrier where the UE assumes that NPSS/NSSS/NPBCH/SIB-NB for FDD or NPSS/NSSS/NPBCH for TDD are transmitted.

**Location Server:** a physical or logical entity (e.g., E-SMLC, SUPL SLP, or LMF) that manages positioning for a target device by obtaining measurements and other location information from one or more positioning units and providing assistance data to positioning units to help determine this. A Location Server may also compute or verify the final location estimate.

**NB-IoT:** NB-IoT allows access to network services via E-UTRA with a channel bandwidth limited to 200 kHz.

**Observed Time Difference Of Arrival (OTDOA):** The time interval that is observed by a target device between the reception of downlink signals from two different TPs. If a signal from TP 1 is received at the moment *t1*, and a signal from TP 2 is received at the moment *t2*, the OTDOA is *t2* – *t1*.

**PRS-only TP**: A TP which only transmits PRS signals or DL-PRS for PRS-based TBS positioning and is not associated with a cell.

**Positioning frequency layer**: A positioning frequency layer is defined as a collection of DL PRS resource sets where each DL PRS resource set is in turn a collection of DL PRS resources. All DL PRS resources from all DL PRS resource sets from the same positioning frequency layer have some common/same PRS parameters viz. PRS subcarrier spacing, PRS resource bandwidth, PRS start PRB, PRS Point A, PRS Comb size and PRS cyclic prefix.

**Reference Source:** a physical entity or part of a physical entity that provides signals (e.g., RF, acoustic, infra-red) that can be measured (e.g., by a Target Device) in order to obtain the location of a Target Device.

**Relative Time Difference (RTD):** The relative time difference between a TRP *i* and a TRP *j*, is defined as *tj – ti*, where *ti* and *tj* are defined as the time when TRP *i* and *j* transmit the start of one subframe respectively.

**Rx Time Delay:** From a signal reception perspective, there will be a time delay from the time when the RF signal arrives at the Rx antenna to the time when the signal is digitized and time-stamped at the baseband.

**Rx Timing Error:** Result of Rx Time Delay involved in the reception of a signal before reporting measurements that are obtained from the signal. It is the uncalibrated Rx Time Delay, or the remaining delay after the UE/TRP internal calibration/compensation of the Rx Time Delay, involved in the reception of the DL-PRS/UL SRS signals. The calibration/compensation may also include the calibration/compensation of the relative time delay between different RF chains in the same UE/TRP and may also possibly consider the offset of the Rx antenna phase centre to the physical antenna centre.

**Target Device:** the device that is being positioned (e.g., UE or SUPL SET).

**Transmission Point (TP):** A set of geographically co-located transmit antennas (e.g. antenna array (with one or more antenna elements)) for one cell, part of one cell or one PRS-only TP. Transmission Points can include base station (eNodeB) antennas, remote radio heads, a remote antenna of a base station, an antenna of a PRS-only TP, etc. One cell can be formed by one or multiple transmission points. For a homogeneous deployment, each transmission point may correspond to one cell.

**Transmission-Reception Point (TRP)**: A set of geographically co-located antennas (e.g. antenna array (with one or more antenna elements)) supporting TP and/or RP functionality.

**TRP Tx Timing Error Group (TRP Tx TEG):** Tx Timing Errors, associated with TRP transmissions on one or more DL-PRS Resources, that are within a certain margin.

**Tx Time Delay:** From a signal transmission perspective, the time delay from the time when the digital signal is generated at baseband to the time when the RF signal is transmitted from the Tx antenna.

**Tx Timing Error:** Result of Tx Time Delay involved in the transmission of a signal. It is the uncalibrated Tx Time Delay, or the remaining delay after the TRP/UE internal calibration/compensation of the Tx Time Delay, involved in the transmission of the DL-PRS/UL SRS signals. The calibration/compensation may also include the calibration/compensation of the relative time delay between different RF chains in the same TRP/UE and may also possibly consider the offset of the Tx antenna phase centre to the physical antenna centre.

**UE Rx Timing Error Group (UE Rx TEG)**: Rx Timing Errors, associated with UE reporting of one or more DL measurements, that are within a certain margin.

**UE RxTx Timing Error Group (UE RxTx TEG):** Rx Timing Errors and Tx Timing Errors, associated with UE reporting of one or more UE Rx-Tx time difference measurements, which have the 'Rx Timing Errors + Tx Timing Errors' differences within a certain margin.

**UE Tx Timing Error Group (UE Tx TEG)**: Tx Timing Errors, associated with UE transmissions on one or more UL SRS resources for positioning purpose, that are within a certain margin.

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply.

ADR Accumulated Delta-Range

A‑GNSS Assisted‑GNSS

AoA Angle-of-Arrival

AoD Angle-of-Departure

AP Access Point

ARFCN Absolute Radio Frequency Channel Number

ARP Antenna Reference Point

BDS BeiDou Navigation Satellite System

BIPM Bureau International des Poids et Mesures (International Bureau of Weights and Measures)

BSSID Basic Service Set Identifier

BTS Base Transceiver Station (GERAN)

CID Cell-ID (positioning method)

CNAV Civil Navigation

CRS Cell-specific Reference Signals

DL-AoD Downlink Angle-of-Departure

DL-TDOA Downlink Time Difference Of Arrival

ECEF Earth-Centered, Earth-Fixed

ECGI Evolved Cell Global Identifier

ECI Earth-Centered-Inertial

E‑CID Enhanced Cell-ID (positioning method)

EGNOS European Geostationary Navigation Overlay Service

E-SMLC Enhanced Serving Mobile Location Centre

E-UTRA Evolved Universal Terrestrial Radio Access

E-UTRAN Evolved Universal Terrestrial Radio Access Network

EOP Earth Orientation Parameters

EPDU External Protocol Data Unit

FDMA Frequency Division Multiple Access

FEC Forward Error Correction

FKP (German) Flächen-Korrektur-Parameter (area correction parameter)

FTA Fine Time Assistance

GAGAN GPS Aided Geo Augmented Navigation

GLONASS GLObal'naya NAvigatsionnaya Sputnikovaya Sistema (Engl.: Global Navigation Satellite System)

GNSS Global Navigation Satellite System

GPS Global Positioning System

HA GNSS High-Accuracy GNSS (RTK, PPP)

HPL Horizontal Protection Level

ICD Interface Control Document

IGS International GNSS Service

IOD Issue of Data

IRNSS Indian Regional Navigation Satellite System

IS Interface Specification

LLA Latitude Longitude Altitude

LMF Location Management Function

LOS Line-of-Sight

LPP LTE Positioning Protocol

LPPa LTE Positioning Protocol Annex

LSB Least Significant Bit

MAC Master Auxiliary Concept

MBS Metropolitan Beacon System

MG Measurement Gap

MO-LR Mobile Originated Location Request

MSAS Multi-functional Satellite Augmentation System

MSB Most Significant Bit

msd mean solar day

MT-LR Mobile Terminated Location Request

Multi-RTT Multiple-Round Trip Time

NAV Navigation

NavIC NAVigation with Indian Constellation

NB-IoT NarrowBand Internet of Things

NCGI NR Cell Global Identifier

NICT National Institute of Information and Communications Technology

NI-LR Network Induced Location Request

NLOS Non-Line-of-Sight

NPRS Narrowband Positioning Reference Signals

NR NR Radio Access

NRSRP Narrowband Reference Signal Received Power

NRSRQ Narrowband Reference Signal Received Quality

NTSC National Time Service Center of Chinese Academy of Sciences

OSR Observation Space Representation

OTDOA Observed Time Difference Of Arrival

PBCH Physical Broadcast Channel

PDU Protocol Data Unit

PL Protection Level

PPP Precise Point Positioning

PPW PRS Processing Window

PRB Physical Resource Block

PRC Pseudo‑Range Correction

PRS Positioning Reference Signals

posSIB Positioning System Information Block

PZ-90 Parametry Zemli 1990 Goda – Parameters of the Earth Year 1990

QZS Quasi Zenith Satellite

QZSS Quasi-Zenith Satellite System

QZST Quasi-Zenith System Time

RF Radio Frequency

RP Reception Point

RRC Range‑Rate Correction

Radio Resource Control

RSCP Reference Signal Carrier Phase

RSCPD Reference Signal Carrier Phase Difference

RSRP Reference Signal Received Power

RSRPP Reference Signal Received Path Power

RSRQ Reference Signal Received Quality

RSTD Reference Signal Time Difference

RTK Real-Time Kinematic

RTT Round Trip Time

RU Russia

SBAS Space Based Augmentation System

SET SUPL Enabled Terminal

SFN System Frame Number

SLP SUPL Location Platform

SRS Sounding Reference Signal

SS Synchronization Signal

SSB Synchronization Signal Block, SS/PBCH Block

SSID Service Set Identifier

SSR State Space Representation

STEC Slant TEC

SUPL Secure User Plane Location

SV Space Vehicle

TB Terrestrial Beacon

TBS Terrestrial Beacon System

TEC Total Electron Content

TECU TEC Units

TEG Timing Error Group

TIR Target Integrity Risk

TLM Telemetry

TOA Time Of Arrival

TOD Time Of Day

TOW Time Of Week

TP Transmission Point

TRP Transmission-Reception Point

UDRE User Differential Range Error

ULP User Plane Location Protocol

URA User Range Accuracy

USNO US Naval Observatory

UT1 Universal Time No.1

UTC Coordinated Universal Time

VPL Vertical Protection Level

WAAS Wide Area Augmentation System

WGS‑84 World Geodetic System 1984

WLAN Wireless Local Area Network

*NEXT CHANGE*

# 5 LPP Procedures

\*\*\*\*\*\*\*\*\*skip the unchanged part\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 5.2.1a Periodic Assistance Data Transfer procedure

The Periodic Assistance Data Transfer procedure is shown in Figure 5.2.1a-1. This procedure enables a target to request a server to send assistance data periodically.

NOTE 1: In this version of the specification, periodic assistance data transfer is supported for HA GNSS (e.g., RTK) and NR DL-TDOA positioning only.

*NEXT CHANGE*

### 5.2.2a Periodic Assistance Data Delivery procedure

The Periodic Assistance Data Delivery procedure allows the server to provide unsolicited periodic assistance data to the target and is shown in Figure 5.2.2a-1.

NOTE 1: In this version of the specification, periodic assistance data delivery is supported for HA GNSS (e.g., RTK) and NR DL-TDOA positioning only.

*NEXT CHANGE*

# 6 Information Element Abstract Syntax Definition

## 6.4 Common IEs

Common IEs comprise IEs that are applicable to more than one LPP positioning method.

### 6.4.2 Common Positioning

– *CommonIEsProvideCapabilities*

The *CommonIEsProvideCapabilities* carries common IEs for a Provide Capabilities LPP message Type.

-- ASN1START

CommonIEsProvideCapabilities ::= SEQUENCE {

 ...,

 [[

 segmentationInfo-r14 SegmentationInfo-r14 OPTIONAL, -- Cond Segmentation

 lpp-message-segmentation-r14 BIT STRING { serverToTarget (0),

 targetToServer (1) } OPTIONAL

 ]],

 [[

 locationEstimateAndMeasurementReporting-r18 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

| **Conditional presence** | **Explanation** |
| --- | --- |
| *Segmentation* | This field is optionally present, need OP, if *lpp-message-segmentation-req* has been received from the location server with bit 1 (*targetToServer*) set to value 1. The field shall be omitted if *lpp‑message‑segmentation-req* has not been received in this location session, or has been received with bit 1 (*targetToServer*) set to value 0. |

| ***CommonIEsProvideCapabilities* field descriptions** |
| --- |
| ***segmentationInfo***This field indicates whether this *ProvideCapabilities* message is one of many segments, as specified in clause 4.3.5. |
| ***lpp-message-segmentation***This field, if present, indicates the target device's LPP message segmentation capabilities. If bit 0 is set to value 1, it indicates that the target device supports receiving segmented LPP messages; if bit 0 is set to value 0 it indicates that the target device does not support receiving segmented LPP messages.If bit 1 is set to value 1, it indicates that the target device supports sending segmented LPP messages; if bit 1 is set to value 0 it indicates that the target device does not support sending segmented LPP messages. |
| ***locationEstimateAndMeasurementReporting***This field, if present, indicates that the target device supports *locationEstimateAndMeasurementsRequired* in *LocationInformationType*. |

*NEXT CHANGE*

– *CommonIEsRequestLocationInformation*

The *CommonIEsRequestLocationInformation* carries common IEs for a Request Location Information LPP message Type.

-- ASN1START

CommonIEsRequestLocationInformation ::= SEQUENCE {

 locationInformationType LocationInformationType,

 triggeredReporting TriggeredReportingCriteria OPTIONAL, -- Cond ECID

 periodicalReporting PeriodicalReportingCriteria OPTIONAL, -- Need ON

 additionalInformation AdditionalInformation OPTIONAL, -- Need ON

 qos QoS OPTIONAL, -- Need ON

 environment Environment OPTIONAL, -- Need ON

 locationCoordinateTypes LocationCoordinateTypes OPTIONAL, -- Need ON

 velocityTypes VelocityTypes OPTIONAL, -- Need ON

 ...,

 [[

 messageSizeLimitNB-r14 MessageSizeLimitNB-r14 OPTIONAL -- Need ON

 ]],

 [[

 segmentationInfo-r14 SegmentationInfo-r14 OPTIONAL -- Need ON

 ]]

}

LocationInformationType ::= ENUMERATED {

 locationEstimateRequired,

 locationMeasurementsRequired,

 locationEstimatePreferred,

 locationMeasurementsPreferred,

 ...,

 locationEstimateAndMeasurementsRequired-r18

}

PeriodicalReportingCriteria ::= SEQUENCE {

 reportingAmount ENUMERATED {

 ra1, ra2, ra4, ra8, ra16, ra32,

 ra64, ra-Infinity

 } DEFAULT ra-Infinity,

 reportingInterval ENUMERATED {

 noPeriodicalReporting, ri0-25,

 ri0-5, ri1, ri2, ri4, ri8, ri16, ri32, ri64

 }

}

TriggeredReportingCriteria ::= SEQUENCE {

 cellChange BOOLEAN,

 reportingDuration ReportingDuration,

 ...

}

ReportingDuration ::= INTEGER (0..255)

AdditionalInformation ::= ENUMERATED {

 onlyReturnInformationRequested,

 mayReturnAditionalInformation,

 ...

}

QoS ::= SEQUENCE {

 horizontalAccuracy HorizontalAccuracy OPTIONAL, -- Need ON

 verticalCoordinateRequest BOOLEAN,

 verticalAccuracy VerticalAccuracy OPTIONAL, -- Need ON

 responseTime ResponseTime OPTIONAL, -- Need ON

 velocityRequest BOOLEAN,

 ...,

 [[ responseTimeNB-r14 ResponseTimeNB-r14 OPTIONAL -- Need ON

 ]],

 [[ horizontalAccuracyExt-r15 HorizontalAccuracyExt-r15 OPTIONAL, -- Need ON

 verticalAccuracyExt-r15 VerticalAccuracyExt-r15 OPTIONAL -- Need ON

 ]]

}

HorizontalAccuracy ::= SEQUENCE {

 accuracy INTEGER(0..127),

 confidence INTEGER(0..100),

 ...

}

VerticalAccuracy ::= SEQUENCE {

 accuracy INTEGER(0..127),

 confidence INTEGER(0..100),

 ...

}

HorizontalAccuracyExt-r15 ::= SEQUENCE {

 accuracyExt-r15 INTEGER(0..255),

 confidence-r15 INTEGER(0..100),

 ...

}

VerticalAccuracyExt-r15 ::= SEQUENCE {

 accuracyExt-r15 INTEGER(0..255),

 confidence-r15 INTEGER(0..100),

 ...

}

ResponseTime ::= SEQUENCE {

 time INTEGER (1..128),

 ...,

 [[ responseTimeEarlyFix-r12 INTEGER (1..128) OPTIONAL -- Need ON

 ]],

 [[ unit-r15 ENUMERATED { ten-seconds, ... } OPTIONAL -- Need ON

 ]]

}

ResponseTimeNB-r14 ::= SEQUENCE {

 timeNB-r14 INTEGER (1..512),

 responseTimeEarlyFixNB-r14 INTEGER (1..512) OPTIONAL, -- Need ON

 ...,

 [[ unitNB-r15 ENUMERATED { ten-seconds, ... } OPTIONAL -- Need ON

 ]]

}

Environment ::= ENUMERATED {

 badArea,

 notBadArea,

 mixedArea,

 ...

}

MessageSizeLimitNB-r14 ::= SEQUENCE {

 measurementLimit-r14 INTEGER (1..512) OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

Editor Notes:

FFS exact IE structure of the request for location+measurements in the agreement of RAN2#123bis.

| **Conditional presence** | **Explanation** |
| --- | --- |
| *ECID* | The field is optionally present, need ON, if E-CID or NR E-CID is requested. Otherwise it is not present. |

| ***CommonIEsRequestLocationInformation* field descriptions** |
| --- |
| ***locationInformationType***This IE indicates whether the server requires a location estimate or measurements. For '*locationEstimateRequired*', the target device shall return a location estimate if possible, or indicate a location error if not possible. For '*locationMeasurementsRequired*', the target device shall return measurements if possible, or indicate a location error if not possible. For '*locationEstimatePreferred*', the target device shall return a location estimate if possible, but may also or instead return measurements for any requested position methods for which a location estimate is not possible. For '*locationMeasurementsPreferred*', the target device shall return location measurements if possible, but may also or instead return a location estimate for any requested position methods for which return of location measurements is not possible. For '*locationEstimateAndMeasurementsRequired*', the PRU shall return both location estimate and measurements if possible, or indicate a location error if not possible.NOTE: If the PRU is requested to return both location estimate and measurements, the location information is determined independently of the reported measurements. |
| ***triggeredReporting***This IE indicates that triggered reporting is requested and comprises the following subfields:- ***cellChange***: If this field is set to TRUE, the target device provides requested location information each time the primary cell has changed.- ***reportingDuration***: Maximum duration of triggered reporting in seconds. A value of zero is interpreted to mean an unlimited (i.e. "infinite") duration. The target device should continue triggered reporting for the *reportingDuration* or until an LPP *Abort* or *LPP Error* message is received.The *triggeredReporting* field should not be included by the location server and shall be ignored by the target device if the *periodicalReporting* IE or *responseTime* IE or *responseTimeNB* IE is included in *CommonIEsRequestLocationInformation.* |
| ***periodicalReporting***This IE indicates that periodic reporting is requested and comprises the following subfields:- ***reportingAmount*** indicates the number of periodic location information reports requested. Enumerated values correspond to 1, 2, 4, 8, 16, 32, 64, or infinite/indefinite number of reports. If the *reportingAmount* is '*infinite/indefinite'*, the target device shou-ld continue periodic reporting until an LPP *Abort* message is received. The value '*ra1*' shall not be used by a sender.- ***reportingInterval*** indicates the interval between location information reports and the response time requirement for the first location information report. Enumerated values ri0-25, ri0-5, ri1, ri2, ri4, ri8, ri16, ri32, ri64 correspond to reporting intervals of 1, 2, 4, 8, 10, 16, 20, 32, and 64 seconds, respectively. Measurement reports containing no measurements or no location estimate are required when a *reportingInterval* expires before a target device is able to obtain new measurements or obtain a new location estimate. The value '*noPeriodicalReporting*' shall not be used by a sender. |
| ***additionalInformation***This IE indicates whether a target device is allowed to return additional information to that requested. If this IE indicates '*onlyReturnInformationRequested'* then the target device shall not return any additional information to that requested by the server. If this IE indicates '*mayReturnAdditionalInformation'* then the target device may return additional information to that requested by the server. If a location estimate is returned, any additional information is restricted to that associated with a location estimate (e.g. might include velocity if velocity was not requested but cannot include measurements). If measurements are returned, any additional information is restricted to additional measurements (e.g. might include E-CID measurements if A-GNSS measurements were requested but not E-CID measurements). |
| ***qos***This IE indicates the quality of service and comprises a number of sub-fields. In the case of measurements, some of the sub-fields apply to the location estimate that could be obtained by the server from the measurements provided by the target device assuming that the measurements are the only sources of error. Fields are as follows:- ***horizontalAccuracy*** indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '*accuracy*' corresponds to the encoded uncertainty as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15].- ***verticalCoordinateRequest*** indicates whether a vertical coordinate is required (TRUE) or not (FALSE)- ***verticalAccuracy*** indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '*accuracy*' corresponds to the encoded uncertainty altitude as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15].- ***responseTime***- ***time*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation*. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 128. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 1280 seconds. If the *periodicalReporting* IE is included in *CommonIEsRequestLocationInformation*, this field should not be included by the location server and shall be ignored by the target device (if included).- ***responseTimeEarlyFix*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation* containing early location measurements or an early location estimate. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 128. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 1280 seconds. When this IE is included, a target should send a *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing early location information according to the *responseTimeEarlyFix* IE and a subsequent *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing final location information according to the *time* IE. A target shallomit sending a *ProvideLocationInformation* if the early location information is not available at the expiration of the time value in the *responseTimeEarlyFix* IE. A server should set the *responseTimeEarlyFix* IE to a value less than that for the *time* IE. A target shall ignore the *responseTimeEarlyFix* IE if its value is not less than that for the *time* IE.- ***unit*** indicates the unit of the *time* and *responseTimeEarlyFix* fields. Enumerated value '*ten-seconds*' corresponds to a resolution of 10 seconds. If this field is absent, the unit/resolution is 1 second.- ***velocityRequest*** indicates whether velocity (or measurements related to velocity) is requested (TRUE) or not (FALSE).- ***responseTimeNB***If the *periodicalReporting* IE or *responseTime* IE is included in *CommonIEsRequestLocationInformation*, this field should not be included by the location server and shall be ignored by the target device (if included).- ***timeNB*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation*. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 512. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 5120 seconds.- ***responseTimeEarlyFixNB*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation* containing early location measurements or an early location estimate. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 512. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 5120 seconds. When this IE is included, a target should send a *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing early location information according to the *responseTimeEarlyFixNB* IE and a subsequent *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing final location information according to the *timeNB* IE. A target shall omit sending a *ProvideLocationInformation* if the early location information is not available at the expiration of the time value in the *responseTimeEarlyFixNB* IE. A server should set the *responseTimeEarlyFixNB* IE to a value less than that for the *timeNB* IE. A target shall ignore the *responseTimeEarlyFixNB* IE if its value is not less than that for the *timeNB* IE.- ***unitNB*** indicates the unit of the *timeNB* and *responseTimeEarlyFixNB* fields. Enumerated value '*ten-second*' corresponds to a resolution of 10 seconds. If this field is absent, the unit/resolution is 1 second.- ***horizontalAccuracyExt*** indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '*accuracyExt*' corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and 'confidence' corresponds to confidence as defined in TS 23.032 [15]. This field should not be included by the location server and shall be ignored by the target device if the *horizontalAccuracy* field is included in QoS.- ***verticalAccuracyExt*** indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '*accuracyExt*' corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15]. This field should not be included by the location server and shall be ignored by the target device if the *verticalAccuracy* field is included in QoS.All QoS requirements shall be obtained by the target device to the degree possible but it is permitted to return a response that does not fulfill all QoS requirements if some were not attainable. The single exception is *time* and *timeNB* which shall always be fulfilled – even if that means not fulfilling other QoS requirements.A target device supporting NB-IoT access shall support the *responseTimeNB* IE*.*A target device supporting HA GNSS shall support the *HorizontalAccuracyExt*, *VerticalAccuracyEx*, and *unit* fields.A target device supporting NB-IoT access and HA GNSS shall support the *unitNB* field. |
| ***environment***This field provides the target device with information about expected multipath and non line of sight (NLOS) in the current area. The following values are defined:- badArea: possibly heavy multipath and NLOS conditions (e.g. bad urban or urban).- notBadArea: no or light multipath and usually LOS conditions (e.g. suburban or rural).- mixedArea: environment that is mixed or not defined.If this field is absent, a default value of 'mixedArea' applies. |
| ***locationCoordinateTypes***This field provides a list of the types of location estimate that the target device may return when a location estimate is obtained by the target. |
| ***velocityTypes***This fields provides a list of the types of velocity estimate that the target device may return when a velocity estimate is obtained by the target. |
| ***messageSizeLimitNB***This field provides an octet limit on the amount of location information a target device can return.- ***measurementLimit*** indicates the maximum amount of location information the target device should return in response to the *RequestLocationInformation* message received from the location server.The limit applies to the overall size of the LPP message at LPP level (LPP Provide Location Information), and is specified in steps of 100 octets. The message size limit is then given by the value provided in *measurementLimit* times 100 octets. |
| ***segmentationInfo***This field indicates whether this *RequestLocationInformation* message is one of many segments, as specified in clause 4.3.5 |

*NEXT CHANGE*

### 6.4.3 Common NR Positioning Information Elements

*– NR-AdditionalPathList*

The IE *NR-AdditionalPathList* is used by the target device to provide information about additional paths in association to the TOA measurements associated to NR positioning in the form of a relative time difference and a quality value. The additional path *nr-RelativeTimeDifference* is the detected path timing relative to the detected path timing used for the TOA value, and each additional path can be associated with a quality value *nr-PathQuality.*

-- ASN1START

NR-AdditionalPathList-r16 ::= SEQUENCE (SIZE(1..2)) OF NR-AdditionalPath-r16

NR-AdditionalPathListExt-r17 ::= SEQUENCE (SIZE(1..8)) OF NR-AdditionalPath-r16

NR-AdditionalPath-r16 ::= SEQUENCE {

 nr-RelativeTimeDifference-r16 CHOICE {

 k0-r16 INTEGER(0..16351),

 k1-r16 INTEGER(0..8176),

 k2-r16 INTEGER(0..4088),

 k3-r16 INTEGER(0..2044),

 k4-r16 INTEGER(0..1022),

 k5-r16 INTEGER(0..511),

 ...,

 kMinus1-r18 INTEGER(0..32701),

 kMinus2-r18 INTEGER(0..65401) },

 nr-PathQuality-r16 NR-TimingQuality-r16 OPTIONAL,

 ...,

 [[

 nr-DL-PRS-RSRPP-r17 INTEGER (0..126) OPTIONAL

 ]]

}

-- ASN1STOP

| ***NR-AdditionalPathList* field descriptions** |
| --- |
| ***nr-RelativeTimeDifference***This field specifies the additional detected path timing relative to the detected path timing of the reference resource. The mapping of reported values and measured quantity value is defined in TS 38.133 [46] clause 10.1.23.3.3 and 10.1.25.3.3. A positive value indicates that the particular path is later in time than the detected path of the reference; a negative value indicates that the particular path is earlier in time than the detected path of the reference. |
| ***nr-PathQuality***This field specifies the target device′s best estimate of the quality of the detected timing of the additional path. |
| ***nr-DL-PRS-RSRPP***This field specifies the DL PRS reference signal received path power (DL PRS-RSRPP) of the *NR-AdditionalPath* reported, as defined in TS 38.215 [36]. The mapping of the quantity is defined as in TS 38.133 [46]. |

*NEXT CHANGE*

– *NR-AggregatedDL-PRS-ResourceSetID-Element*

The IE *NR-AggregatedDL-PRS-ResourceSetID-Element* is used by the target device to indicate each of the aggregated PRS resource set and the PRS resource to UE.

-- ASN1START

NR-AggregatedDL-PRS-ResourceSetID-Element-r18 ::= SEQUENCE {

 dl-PRS-ID-r18 INTEGER (0..255),

 nr-DL-PRS-ResourceID-r18 NR-DL-PRS-ResourceID-r16

}

-- ASN1STOP

*NEXT CHANGE*

– *NR-DL-PRS-AssistanceData*

The IE *NR-DL-PRS-AssistanceData* is used by the location server to provide DL-PRS assistance data.

NOTE 1: The location server should include at least one TRP for which the SFN can be obtained by the target device, e.g. the serving TRP.

NOTE 2: The *nr-DL-PRS-ReferenceInfo* defines the "assistance data reference" TRP whose DL-PRS configuration is included in *nr-DL-PRS-AssistanceDataList*. The *nr-DL-PRS-SFN0-Offset's* and *nr-DL-PRS-expectedRSTD's* in *nr-DL-PRS-AssistanceDataList* are provided relative to the "assistance data reference" TRP.

NOTE 3: The network signals a value of zero for the *nr-DL-PRS-SFN0-Offset*, *nr-DL-PRS-expectedRSTD*, and *nr-DL-PRS-expectedRSTD-uncertainty* of the "assistance data reference" TRP in *nr-DL-PRS-AssistanceDataList*.

NOTE 4: For NR DL-TDOA positioning (see clause 6.5.10) the *nr-DL-PRS-ReferenceInfo* defines also the requested "RSTD reference".

For DL-PRS processing, the LPP layer may inform lower layers to start performing DL-PRS measurements and provide to lower layers the information about the location of DL-PRS, e.g. DL-PRS-PointA, DL-PRS Positioning occasion information.

-- ASN1START

NR-DL-PRS-AssistanceData-r16 ::= SEQUENCE {

 nr-DL-PRS-ReferenceInfo-r16 DL-PRS-ID-Info-r16,

 nr-DL-PRS-AssistanceDataList-r16 SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-DL-PRS-AssistanceDataPerFreq-r16,

 nr-SSB-Config-r16 SEQUENCE (SIZE (1..nrMaxTRPs-r16)) OF

 NR-SSB-Config-r16 OPTIONAL, -- Need ON

 ...,

 [[

 nr-DL-PRS-AggregationInfo-r18 NR-DL-PRS-AggregationInfo-r18 OPTIONAL -- Need ON

 ]]

}

NR-DL-PRS-AssistanceDataPerFreq-r16 ::= SEQUENCE {

 nr-DL-PRS-PositioningFrequencyLayer-r16

 NR-DL-PRS-PositioningFrequencyLayer-r16,

 nr-DL-PRS-AssistanceDataPerFreq-r16 SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 NR-DL-PRS-AssistanceDataPerTRP-r16,

 ...

}

NR-DL-PRS-AssistanceDataPerTRP-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 nr-DL-PRS-SFN0-Offset-r16 NR-DL-PRS-SFN0-Offset-r16,

 nr-DL-PRS-ExpectedRSTD-r16 INTEGER (-3841..3841),

 nr-DL-PRS-ExpectedRSTD-Uncertainty-r16

 INTEGER (0..246),

 nr-DL-PRS-Info-r16 NR-DL-PRS-Info-r16,

 ...,

 [[

 prs-OnlyTP-r16 ENUMERATED { true } OPTIONAL -- Need ON

 ]],

 [[

 nr-DL-PRS-ExpectedAoD-or-AoA-r17

 NR-DL-PRS-ExpectedAoD-or-AoA-r17 OPTIONAL -- Need ON

 ]]

}

NR-DL-PRS-PositioningFrequencyLayer-r16 ::= SEQUENCE {

 dl-PRS-SubcarrierSpacing-r16 ENUMERATED {kHz15, kHz30, kHz60, kHz120, ...},

 dl-PRS-ResourceBandwidth-r16 INTEGER (1..63),

 dl-PRS-StartPRB-r16 INTEGER (0..2176),

 dl-PRS-PointA-r16 ARFCN-ValueNR-r15,

 dl-PRS-CombSizeN-r16 ENUMERATED {n2, n4, n6, n12, ...},

 dl-PRS-CyclicPrefix-r16 ENUMERATED {normal, extended, ...},

 ...

}

NR-DL-PRS-SFN0-Offset-r16 ::= SEQUENCE {

 sfn-Offset-r16 INTEGER (0..1023),

 integerSubframeOffset-r16 INTEGER (0..9),

 ...

}

NR-DL-PRS-ExpectedAoD-or-AoA-r17 ::= CHOICE {

 expectedAoD-r17 SEQUENCE {

 expectedDL-AzimuthAoD-r17 INTEGER (0..359),

 expectedDL-AzimuthAoD-Unc-r17 INTEGER (0..60) OPTIONAL, -- Need OP

 expectedDL-ZenithAoD-r17 INTEGER (0..180),

 expectedDL-ZenithAoD-Unc-r17 INTEGER (0..30) OPTIONAL -- Need OP

 },

 expectedAoA-r17 SEQUENCE {

 expectedDL-AzimuthAoA-r17 INTEGER (0..359),

 expectedDL-AzimuthAoA-Unc-r17 INTEGER (0..60) OPTIONAL, -- Need OP

 expectedDL-ZenithAoA-r17 INTEGER (0..180),

 expectedDL-ZenithAoA-Unc-r17 INTEGER (0..30) OPTIONAL -- Need OP

 }

}

NR-DL-PRS-AggregationInfo-r18 ::= SEQUENCE (SIZE (1..nrMaxNumPRS-BandWidthAggregation-r18)) OF

 NR-linkedDL-PRS-ResourceSetID-ListPRS-Aggregation-r18

NR-linkedDL-PRS-ResourceSetID-ListPRS-Aggregation-r18 ::= SEQUENCE (SIZE (2..3)) OF

 NR-DL-PRS-AggregationElement-r18

NR-DL-PRS-AggregationElement-r18 ::= SEQUENCE {

 nr-DL-PRS-FrequencyLayerIndex-r18 INTEGER (0..nrMaxFreqLayers-1-r16),

 nr-DL-PRS-TRP-Index-r18 INTEGER (0..nrMaxTRPsPerFreq-1-r16),

 nr-DL-PRS-ResourceSetIndex-r18 INTEGER (0..nrMaxSetsPerTrpPerFreqLayer-1-r16)

}

-- ASN1STOP

| ***NR-DL-PRS-AssistanceData* field descriptions** |
| --- |
| ***nr-DL-PRS-ReferenceInfo***This field specifies the IDs of the assistance data reference TRP. |
| ***nr-DL-PRS-AssistanceDataList***This field specifies the DL-PRS resources for each frequency layer.  |
| ***nr-SSB-Config***This field specifies the SSB configuration of the TRPs. |
| ***nr-DL-PRS-AggregationInfo***This field specifies the DL-PRS Resource Sets across DL-PRS Positioning Frequency Layers available for DL-PRS bandwidth aggregation. The 2 or 3 DL-PRS Resource Sets indicated by IE*NR-linkedDL-PRS-ResourceSetID-ListPRS-Aggregation* is linked for bandwidth aggregation.- ***nr-DL-PRS-FrequencyLayerIndex***: This field indicates the frequency layer provided in *nr-DL-PRS-AssistanceDataList*. Value 0 corresponds to the first frequency layer provided in *nr-DL-PRS-AssistanceDataList*, value 1 to the second frequency layer in *nr-DL-PRS-AssistanceDataList*, and so on.- ***nr-DL-PRS-TRP-Index***: This field indicates the TRP/DL-PRS ID provided in *nr-DL-PRS-AssistanceDataPerFreq*. Value 0 corresponds to the first TRP/DL-PRS ID provided in *nr-DL-PRS-AssistanceDataPerFreq*, value 1 to the second TRP/DL-PRS ID in *nr-DL-PRS-AssistanceDataPerFreq*, and so on.- ***nr-DL-PRS-ResourceSetIndex***: This field indicates the DL-PRS Resource Set in *nr-DL-PRS-ResourceSetList* in IE *NR-DL-PRS-Info*. Value 0 corresponds to the first DL-PRS Resource Set provided in *nr-DL-PRS-ResourceSetList*, value 1 to the second DL-PRS Resource Set in *nr-DL-PRS-ResourceSetList*.NOTE: The linked DL-PRS Resource Sets from two or three Positioning Frequency Layers in a *NR-linkedDL-PRS-ResourceSetID-ListPRS-Aggregation* are from the same TRP. |
| ***nr-DL-PRS-PositioningFrequencyLayer***This field specifies the Positioning Frequency Layer for the *nr-DL-PRS-AssistanceDataPerFreq* field. |
| ***nr-DL-PRS-AssistanceDataPerFreq***This field specifies the DL-PRS Resources for the TRPs within the Positioning Frequency Layer. |
| ***dl-PRS-ID***This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resource ID to uniquely identify a DL-PRS Resource, and is associated with a single TRP. |
| ***nr-PhysCellID***This field specifies the physical cell identity of the TRP. When the field *prs-OnlyTP* is included, this field is not included. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, as defined in TS 38.331 [35]. When the field *prs-OnlyTP* is included, this field is not included. |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*. When the field *prs-OnlyTP* is included, this field is not included. |
| ***nr-DL-PRS-SFN0-Offset***This field specifies the time offset of the SFN#0 slot#0 for the given TRP with respect to SFN#0 slot#0 of the assistance data reference TRP and comprises the following subfields:- ***sfn-Offset*** specifies the SFN offset at the TRP antenna location between the assistance data reference TRP and this neighbour TRP. The offset corresponds to the number of full radio frames counted from the beginning of a radio frame #0 of the assistance data reference TRP to the beginning of the closest subsequent radio frame #0 of this neighbour TRP.- ***integerSubframeOffset*** specifies the frame boundary offset at the TRP antenna location between the assistance data reference TRP and this neighbour TRP counted in full subframes. The offset corresponds to the number of full subframes counted from the beginning of a subframe #0 of the assistance data reference TRP to the beginning of the closest subsequent subframe #0 of this neighbour TRP.NOTE: The location server sets the value in accordance with the defined search window for the target device using *nr-DL-PRS-ExpectedRSTD* and *nr-DL-PRS-ExpectedRSTD-Uncertainty*. |
| ***nr-DL-PRS-ExpectedRSTD***This field indicates the RSTD value that the target device is expected to measure between this TRP and the assistance data reference TRP. The *nr-DL-PRS-ExpectedRSTD* field takes into account the expected propagation time difference as well as transmit time difference of PRS positioning occasions between the two TRPs. The resolution is 4×Ts, with Ts=1/(15000\*2048) seconds. |
| ***nr-DL-PRS-ExpectedRSTD-Uncertainty***This field indicates the uncertainty in *nr-DL-PRS-ExpectedRSTD* value.The uncertainty is related to the location server′s a‑priori estimate of the target device location. The *nr-DL-PRS-ExpectedRSTD* and *nr-DL-PRS-ExpectedRSTD-Uncertainty* togetherdefine the search window for the target device.The resolution R is- Ts if all PRS resources are in frequency range 2,- 4×Ts otherwise,with Ts=1/(15000\*2048) seconds.The target device may assume that the beginning of the subframe for the PRS of this TRP is received within the search window of size- [*-nr-*DL*-PRS-ExpectedRSTD-Uncertainty*×R *;* *nr-DL-PRS-ExpectedRSTD-Uncertainty*×R] centred at TREF*+*1 millisecond×N+*nr-DL-PRS-ExpectedRSTD*×4×Ts,where TREF is the reception time of the beginning of the subframe for the PRS of the assistance data reference TRP at the target device antenna connector, and N can be calculated based on- *nr-DL-PRS-SFN0-Offset*- *dl-PRS-Periodicity-and-ResourceSetSlotOffset*- *dl-PRS-ResourceSlotOffset.* |
| ***nr-DL-PRS-Info***This field specifies the PRS configuration of the TRP. |
| ***dl-PRS-SubcarrierSpacing***This field specifies the subcarrier spacing of the DL-PRS Resource. 15, 30, 60 kHz for FR1; 60, 120 kHz for FR2. All DL-PRS Resources and DL-PRS Resource Sets in the same Positioning Frequency layer have the same value of *dl-PRS-SubcarrierSpacing*. |
| ***dl-PRS-ResourceBandwidth***This field specifies the number of PRBs allocated for the DL-PRS Resource (allocated DL-PRS bandwidth) in multiples of 4 PRBs. All DL-PRS Resources of the DL-PRS Resource Set have the same bandwidth. All DL-PRS Resource Sets belonging to the same Positioning Frequency Layer have the same value of DL-PRS Bandwidth and Start PRB.Integer value 1 corresponds to 24 PRBs, value 2 corresponds to 28 PRBs, value 3 corresponds to 32 PRBs and so on. |
| ***dl-PRS-StartPRB***This field specifies the start PRB index defined as offset with respect to reference DL-PRS Point A for the Positioning Frequency Layer. All DL-PRS Resources Sets belonging to the same Positioning Frequency Layer have the same value of *dl-PRS-StartPRB*. |
| ***dl-PRS-PointA***This field specifies the absolute frequency of the reference resource block for the DL-PRS. Its lowest subcarrier is also known as DL-PRS Point A. A single DL-PRS Point A for DL-PRS Resource allocation is provided per Positioning Frequency Layer. All DL-PRS Resources belonging to the same DL-PRS Resource Set have the same DL-PRS Point A. |
| ***dl-PRS-CombSizeN***This field specifies the Resource Element spacing in each symbol of the DL-PRS Resource. All DL-PRS Resource Sets belonging to the same Positioning Frequency Layer have the same value of comb size N. |
| ***dl-PRS-CyclicPrefix***This field specifies the Cyclic Prefix length of the DL-PRS Resource. All DL-PRS Resources Sets belonging to the same Positioning Frequency Layer have the same value of *dl-PRS-CyclicPrefix*. |
| ***prs-OnlyTP***This field, if present, indicates that the *NR-DL-PRS-AssistanceData* is provided for a PRS-only TP. Whether the field is present or absent should be the same for all the *NR-DL-PRS-AssistanceData* of all the PRS transmitted under the same TP.The target device shall not assume that any other signals or physical channels are present for the TRP other than DL-PRS. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA***This field specifies the expected AoD or AoA in the Global Coordinate System (GCS) at the target device location together with uncertainty.- ***expectedDL-AzimuthAoD***: This field specifies the expected azimuth angle of departure.Scale factor 1 degree; range 0 to 359 degrees.- ***expectedDL-AzimuthAoD-Unc***: This field specifies the (single-sided) uncertainty of the expected azimuth angle of departure. If this field is absent, it indicates maximum uncertainty (60 degrees).Scale factor 1 degree; range 0 to 60 degrees.- ***expectedDL-ZenithAoD***: This field specifies the expected elevation angle of departure.Scale factor 1 degree; range 0 to 180 degrees.- ***expectedDL-ZenithAoD-Unc***: This field specifies the (single-sided) uncertainty of the expected elevation angle of departure. If this field is absent, it indicates maximum uncertainty (30 degrees).Scale factor 1 degree; range 0 to 30 degrees.- ***expectedDL-AzimuthAoA***: This field specifies the expected azimuth angle of arrival. Scale factor 1 degree; range 0 to 359 degrees.- ***expectedDL-AzimuthAoA-Unc***: This field specifies the (single-sided) uncertainty of the expected azimuth angle of arrival. If this field is absent, it indicates maximum uncertainty (60 degrees).Scale factor 1 degree; range 0 to 60 degrees.- ***expectedDL-ZenithAoA***: This field specifies the expected elevation angle of arrival. Scale factor 1 degree; range 0 to 180 degrees.- ***expectedDL-ZenithAoA-Unc***: This field specifies the (single-sided) uncertainty of the expected elevation angle of arrival. If this field is absent, it indicates maximum uncertainty (30 degrees).Scale factor 1 degree; range 0 to 30 degrees. |

*NEXT CHANGE*

#### – *NR-DL-PRS-BeamInfo*

The IE *NR-DL-PRS-BeamInfo* is used by the location server to provide spatial direction information of the DL-PRS Resources together with integrity information.

-- ASN1START

NR-DL-PRS-BeamInfo-r16 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-DL-PRS-BeamInfoPerFreqLayer-r16

NR-DL-PRS-BeamInfoPerFreqLayer-r16 ::= SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 NR-DL-PRS-BeamInfoPerTRP-r16

NR-DL-PRS-BeamInfoPerTRP-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 associated-DL-PRS-ID-r16 INTEGER (0..255) OPTIONAL, -- Need OP

 lcs-GCS-TranslationParameter-r16 LCS-GCS-TranslationParameter-r16

 OPTIONAL, -- Need OP

 dl-PRS-BeamInfoSet-r16 DL-PRS-BeamInfoSet-r16 OPTIONAL, -- Need OP

 ...

}

DL-PRS-BeamInfoSet-r16 ::= SEQUENCE (SIZE(1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF

 DL-PRS-BeamInfoResourceSet-r16

DL-PRS-BeamInfoResourceSet-r16 ::= SEQUENCE (SIZE(1..nrMaxResourcesPerSet-r16)) OF

 DL-PRS-BeamInfoElement-r16

DL-PRS-BeamInfoElement-r16 ::= SEQUENCE {

 dl-PRS-Azimuth-r16 INTEGER (0..359),

 dl-PRS-Azimuth-fine-r16 INTEGER (0..9) OPTIONAL, -- Need ON

 dl-PRS-Elevation-r16 INTEGER (0..180) OPTIONAL, -- Need ON

 dl-PRS-Elevation-fine-r16 INTEGER (0..9) OPTIONAL, -- Need ON

 ...,

 [[

 integrityBeamInfoBounds-r18 IntegrityBeamInfoBounds-r18 OPTIONAL -- Need OP

 ]]

}

IntegrityBeamInfoBounds-r18 ::= SEQUENCE {

 meanAzimuth-r18 INTEGER (0..128),

 stdDevAzimuth-r18 INTEGER (0..255),

 meanElevation-r18 INTEGER (0..128),

 stdDevElevation-r18 INTEGER (0..255),

 ...

}

-- ASN1STOP

| *NR-DL-PRS-BeamInfo* field descriptions |
| --- |
| ***dl-PRS-ID***This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource. This ID can be associated with multiple DL-PRS Resource Sets associated with a single TRP.Each TRP should only be associated with one such ID. |
| ***nr-PhysCellID***This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by *nr-PhysCellID*. |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*. |
| ***associated-DL-PRS-ID***This field specifies the *dl-PRS-ID* of the associated TRP from which the beam information is obtained. See the field descriptions of *dl-PRS-BeamInfoSet* and *lcs-GCS-TranslationParameter*. |
| ***lcs-GCS-TranslationParameter***This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [44]. If this field and the field *associated-DL-PRS-ID* are absent, the *dl-PRS-Azimuth* and *dl-PRS-Elevation* are provided in a GCS. If this field is absent and the *associated-DL-PRS-ID field* is present, then the *lcs-GCS-TranslationParameter* for this TRP is obtained from the *lcs-GCS-TranslationParameter* of the associated TRP. |
| ***dl-PRS-BeamInfoSet***This field provides the DL-PRS beam information for each DL-PRS Resource of the DL-PRS Resource Set associated with this TRP. If this field is absent and the field *associated-DL-PRS-ID* is present, the *dl-PRS-BeamInfoSet* for this TRP are obtained from the *dl-PRS-BeamInfoSet* of the associated TRP. |
| ***dl-PRS-Azimuth***This field specifies the azimuth angle of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.For a Global Coordinate System (GCS), the azimuth angle is measured counter-clockwise from geographical North.For a Local Coordinate System (LCS), the azimuth angle is measured measured counter-clockwise from the x-axis of the LCS.Scale factor 1 degree; range 0 to 359 degrees. |
| ***dl-PRS-Azimuth-fine***This field provides finer granularity for the *dl-PRS-Azimuth*.The total azimuth angle of the boresight direction is given by *dl-PRS-Azimuth* + *dl-PRS-Azimuth-fine.*Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***dl-PRS-Elevation***This field specifies the elevation angle of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.For a Global Coordinate System (GCS), the elevation angle is measured relative to zenith and positive to the horizontal direction (elevation 0 deg. points to zenith, 90 deg to the horizon).For a Local Coordinate System (LCS), the elevation angle is measured relative to the z-axis of the LCS (elevation 0 deg. points to the z-axis, 90 deg to the x-y plane).Scale factor 1 degree; range 0 to 180 degrees. |
| ***dl-PRS-Elevation-fine***This field provides finer granularity for the *dl-PRS-Elevation*.The total elevation angle of the boresight direction is given by *dl-PRS-Elevation* + *dl-PRS-Elevation-fine.*Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***integrityBeamInfoBounds***This field provides an overbounding model that bounds the spatial direction information of the DL-PRS Resources. If this field is absent, the *integrityBeamInfoBounds* for this instance of the *DL-PRS-BeamInfoElement* is the same as the *integrityBeamInfoBounds* of the previous instance of the *DL-PRS-BeamInfoElement* in *DL-PRS-BeamInfoResourceSet*. If integrity bounds are provided, this field shall be present at least in the first instance of the *DL-PRS-BeamInfoResourceSet*. |
| ***meanAzimuth***This field specifies the Mean Azimuth Error bound which is the mean value for an overbounding model that bounds the azimuth angle error of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.The bound is *meanAzimuth* + K \* *stdDevAzimuth* and shall be so that the probability of it to be exceeded shall be lower than IRallocation for *ir-Minimum* < IRallocation < *ir-Maximum*, where K = normInv(IRallocation / 2) and *ir-Minimum*, *ir-Maximum* as provided in IE *NR-Integrity-ServiceParameters*.This IRallocation is a fraction of the Target Integrity Risk that represents the integrity risk budget available.Scale factor 0.1 degrees; range 0-12.8 degrees. |
| ***stdDevAzimuth***This field specifies the Standard Deviation Azimuth Error bound which is the standard deviation for an overbounding model that bounds the Azimuth error of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.Scale factor 0.1 degrees; range 0-25.5 degrees. |
| ***meanElevation***This field specifies the Mean Elevation Error bound which is the mean value for an overbounding model that bounds the elevation angle error of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.The bound is *meanElevation* + K \* *stdDevElevation* and shall be so that the probability of it to be exceeded shall be lower than IRallocation for *ir-Minimum* < IRallocation < *ir-Maximum*, where K = normInv(IRallocation / 2) and *ir-Minimum*, *ir-Maximum* as provided in IE *NR-Integrity-ServiceParameters*.This IRallocation is a fraction of the Target Integrity Risk that represents the integrity risk budget available.Scale factor 0.1 degrees; range 0-12.8 degrees. |
| ***stdDevElevation***This field specifies the Standard Deviation Elevation Error bound which is the standard deviation for an overbounding model that bounds the Elevation error of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.Scale factor 0.1 degrees; range 0-25.5 degrees. |

*NEXT CHANGE*

#### *–* *NR-DL-PRS-MeasurementTimeWindowsConfig*

The IE *NR-DL-PRS-MeasurementTimeWindowsConfig* provides a set of indicated time window(s) which is configured from server to target UE or PRU to perform measurements on indicated DL PRS resource set(s) occurring within indicated time window(s) for DL CPP, DL-TDOA, Multi-RTT and DL-AoD.

-- ASN1START

NR-DL-PRS-MeasurementTimeWindowsConfig-r18 ::=

 SEQUENCE (SIZE(1..2)) OF

 NR-DL-PRS-MeasurementTimeWindowsConfigElement-r18

NR-DL-PRS-MeasurementTimeWindowsConfigElement-r18 ::= SEQUENCE {

 nr-StartSFN-TimeWindow-r18 INTEGER (0..1023),

 nr-PeriodicityAndSlotOffsetTimeWindow-r18

 NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16

 OPTIONAL, -- Need ON

 nr-SymbolOffsetTimeWindow-r18 INTEGER (0..13) OPTIONAL, -- Need ON

 nr-DurationTimeWindow-r18 ENUMERATED { n1, n2, n4, n6, n8, n12, n16, ... },

 nr-SelectedDL-PRS-FrequencyLayerIndex-r18 INTEGER (0..nrMaxFreqLayers-1-r16),

 nr-SelectedDL-PRS-IndexListPerFreq-r18

 SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 NR-SelectedDL-PRS-IndexPerTRP-r18 OPTIONAL, --Need OP

 ...

}

NR-SelectedDL-PRS-IndexPerTRP-r18 ::= SEQUENCE {

 nr-SelectedTRP-Index-r18 INTEGER (0..nrMaxTRPsPerFreq-1-r16),

 dl-SelectedPRS-ResourceSetIndexList-r18 SEQUENCE (SIZE (1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF

 INTEGER (0..nrMaxSetsPerTrpPerFreqLayer-1-r16) OPTIONAL, --Need OP

 ...

}

-- ASN1STOP

|  |
| --- |
| ***NR-DL-PRS-MeasurementTimeWindowsConfig* field descriptions** |
| ***nr-StartSFN-TimeWindow***This field specifies the start of the time window in system frame number. |
| ***nr-PeriodicityAndSlotOffsetTimeWindow***This field specifies the periodicity of the time window in slots configured per DL-PRS Resource Set and the slot offset with respect to the SFN in IE *nr-StartSFN-TimeWindow* slot #0 for the TRP where the DL-PRS Resource Set is configured. |
| ***nr-SymbolOffsetTimeWindow***This field specifies the symbol offset with respect to the slot offset in *nr-PeriodicityAndSlotOffsetTimeWindow*. |
| ***nr-DurationTimeWindow***This field specifies the desired duration of a time window for the indicated DL-PRS resource set in unit of slots. Enumerated value ‘n1’ corresponds to 1 slot, n2 to 2 slots, n4 to 4 slots and so on. |
| ***nr-SelectedDL-PRS-FrequencyLayerIndex***This field indicates the frequency layer provided in IE *NR-DL-PRS-AssistanceData*. Value 0 corresponds to the first frequency layer provided in *nr-DL-PRS-AssistanceDataList* in IE *NR-DL-PRS-AssistanceData*, value 1 to the second frequency layer in *nr-DL-PRS-AssistanceDataList*, and so on. |
| ***nr-SelectedDL-PRS-IndexListPerFreq***This field provides the list of addressed TRPs of the selected frequency layer. If this field is absent, all DL-PRS Resources of all TRPs of the indicated frequency layer are addressed. |
| ***nr-SelectedTRP-Index***This field indicates the addressed TRP of the selected frequency layer. Value 0 corresponds to the first entry in *nr-DL-PRS-AssistanceDataPerFreq* provided in IE *NR-DL-PRS-AssistanceData*, value 1 corresponds to the second entry in *nr-DL-PRS-AssistanceDataPerFreq*, and so on. |
| ***dl-SelectedPRS-ResourceSetIndexList***This field provides the list of addressed DL-PRS Resource Sets of the selected TRPs of the selected frequency layer. If this field is absent, all DL-PRS Resource Sets and Resources of the indicated TRP are addressed. |

*NEXT CHANGE*

#### *– NR-DL-PRS-ProcessingCapability*

The IE *NR-DL-PRS-ProcessingCapability* defines the common DL-PRS Processing capability. In the case of capabilities for multiple NR positioning methods are provided, the IE *NR-DL-PRS-ProcessingCapability* applies across the NR positioning methods and the target device shall indicate the same values for the capabilities in IEs *NR-DL-TDOA-ProvideCapabilities*, *NR-DL-AoD-ProvideCapabilities*, and *NR-Multi-RTT-ProvideCapabilities*.

The *PRS-ProcessingCapabilityPerBand* is defined for a single positioning frequency layer on a certain band (i.e., a target device supporting multiple positioning frequency layers is expected to process one frequency layer at a time).

-- ASN1START

NR-DL-PRS-ProcessingCapability-r16 ::= SEQUENCE {

 prs-ProcessingCapabilityBandList-r16 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

 PRS-ProcessingCapabilityPerBand-r16,

 maxSupportedFreqLayers-r16 INTEGER (1..4),

 simulLTE-NR-PRS-r16 ENUMERATED { supported } OPTIONAL,

 ...,

 [[

 dummy ENUMERATED { m1, m2, ... } OPTIONAL

 ]]

}

PRS-ProcessingCapabilityPerBand-r16 ::= SEQUENCE {

 freqBandIndicatorNR-r16 FreqBandIndicatorNR-r16,

 supportedBandwidthPRS-r16 CHOICE {

 fr1 ENUMERATED {mhz5, mhz10, mhz20, mhz40,

 mhz50, mhz80, mhz100},

 fr2 ENUMERATED {mhz50, mhz100, mhz200, mhz400},

 ...

 },

 dl-PRS-BufferType-r16 ENUMERATED {type1, type2, ...},

 durationOfPRS-Processing-r16 SEQUENCE {

 durationOfPRS-ProcessingSymbols-r16 ENUMERATED {nDot125, nDot25, nDot5, n1,

 n2, n4, n6, n8, n12, n16, n20, n25,

 n30, n32, n35, n40, n45, n50},

 durationOfPRS-ProcessingSymbolsInEveryTms-r16

 ENUMERATED {n8, n16, n20, n30, n40, n80,

 n160,n320, n640, n1280},

 ...

 },

 maxNumOfDL-PRS-ResProcessedPerSlot-r16 SEQUENCE {

 scs15-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

 n48, n64} OPTIONAL,

 scs30-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

 n48, n64} OPTIONAL,

 scs60-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

 n48, n64} OPTIONAL,

 scs120-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

 n48, n64} OPTIONAL,

 ...,

 [[

 scs15-v1690 ENUMERATED {n6, n12} OPTIONAL,

 scs30-v1690 ENUMERATED {n6, n12} OPTIONAL,

 scs60-v1690 ENUMERATED {n6, n12} OPTIONAL,

 scs120-v1690 ENUMERATED {n6, n12} OPTIONAL

 ]]

 },

 ...,

 [[

 supportedDL-PRS-ProcessingSamples-RRC-CONNECTED-r17 ENUMERATED { supported } OPTIONAL,

 prs-ProcessingWindowType1A-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

 prs-ProcessingWindowType1B-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

 prs-ProcessingWindowType2-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

 prs-ProcessingCapabilityOutsideMGinPPW-r17

 SEQUENCE (SIZE(1..3)) OF

 PRS-ProcessingCapabilityOutsideMGinPPWperType-r17

 OPTIONAL,

 dl-PRS-BufferType-RRC-Inactive-r17 ENUMERATED { type1, type2, ... } OPTIONAL,

 durationOfPRS-Processing-RRC-Inactive-r17 SEQUENCE {

 durationOfPRS-ProcessingSymbols-r17 ENUMERATED {nDot125, nDot25, nDot5, n1,

 n2, n4, n6, n8, n12, n16, n20, n25,

 n30, n32, n35, n40, n45, n50},

 durationOfPRS-ProcessingSymbolsInEveryTms-r17

 ENUMERATED {n8, n16, n20, n30, n40, n80,

 n160,n320, n640, n1280},

 ...

 } OPTIONAL,

 maxNumOfDL-PRS-ResProcessedPerSlot-RRC-Inactive-r17 SEQUENCE {

 scs15-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

 n32, n48, n64} OPTIONAL,

 scs30-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

 n32, n48, n64} OPTIONAL,

 scs60-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

 n32, n48, n64} OPTIONAL,

 scs120-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

 n32, n48, n64} OPTIONAL,

 ...

 } OPTIONAL,

 supportedLowerRxBeamSweepingFactor-FR2-r17 ENUMERATED { n1, n2, n4, n6 } OPTIONAL

 ]],

 [[

 supportedDL-PRS-ProcessingSamples-RRC-Inactive-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 prs-MeasurementWithoutMG-r17 ENUMERATED {cp, symbolDot25, symbolDot5,

 slotDot5} OPTIONAL

 ]],

 [[

 prs-BWA-TwoContiguousIntrabandInMG-RRC-Connected-r18

 PRS-BWA-TwoContiguousIntrabandInMG-r18 OPTIONAL,

 prs-BWA-ThreeContiguousIntrabandInMG-RRC-Connected-r18

 PRS-BWA-ThreeContiguousIntrabandInMG-r18 OPTIONAL,

 prs-BWA-TwoContiguousIntrabandInMG-RRC-IdleAndInactive-r18

 PRS-BWA-TwoContiguousIntrabandInMG-r18 OPTIONAL,

 prs-BWA-ThreeContiguousIntrabandInMG-RRC-IdleAndInactive-r18

 PRS-BWA-ThreeContiguousIntrabandInMG-r18 OPTIONAL,

 reducedNumOfSampleInMeasurementWithPRS-BWA-RRC-Connected-r18 BOOLEAN OPTIONAL,

 reducedNumOfSampleInMeasurementWithPRS-BWA-RRC-IdleAndInactive-r18 BOOLEAN OPTIONAL,

 dL-PRS-MeasurementWithRxFH-RRC-Inactive-r18 ENUMERATED { supported } OPTIONAL,

 dL-PRS-MeasurementWithRxFH-RRC-Idle-r18 ENUMERATED { supported } OPTIONAL,

 reducedNumOfSampleForMeasurementWithFH-RRC-Connected-r18 BOOLEAN OPTIONAL,

 reducedNumOfSampleForMeasurementWithFH-RRC\_IdleAndInacitve-r18 BOOLEAN OPTIONAL

 ]]

}

PRS-ProcessingCapabilityOutsideMGinPPWperType-r17 ::= SEQUENCE {

 prsProcessingType-r17 ENUMERATED { type1A, type1B, type2 },

 ppw-dl-PRS-BufferType-r17 ENUMERATED { type1, type2, ... },

 ppw-durationOfPRS-Processing1-r17 SEQUENCE {

 ppw-durationOfPRS-ProcessingSymbolsN-r17

 ENUMERATED { msDot125, msDot25, msDot5, ms1, ms2, ms4,

 ms6, ms8, ms12, ms16, ms20, ms25, ms30, ms32, ms35,

 ms40, ms45, ms50 },

 ppw-durationOfPRS-ProcessingSymbolsT-r17

 ENUMERATED { ms1, ms2, ms4, ms8, ms16, ms20, ms30, ms40, ms80,

 ms160, ms320, ms640, ms1280 }

 } OPTIONAL,

 ppw-durationOfPRS-Processing2-r17 SEQUENCE {

 ppw-durationOfPRS-ProcessingSymbolsN2-r17

 ENUMERATED { msDot125, msDot25, msDot5, ms1, ms2, ms3, ms4, ms5,

 ms6, ms8, ms12 },

 ppw-durationOfPRS-ProcessingSymbolsT2-r17

 ENUMERATED { ms4, ms5, ms6, ms8 }

 } OPTIONAL,

 ppw-maxNumOfDL-PRS-ResProcessedPerSlot-r17 SEQUENCE {

 scs15-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 }

 OPTIONAL,

 scs30-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 }

 OPTIONAL,

 scs60-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 }

 OPTIONAL,

 scs120-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 }

 OPTIONAL,

 ...

 },

 ...,

 [[

 ppw-maxNumOfDL-Bandwidth-r17 CHOICE {

 fr1 ENUMERATED {mhz5, mhz10, mhz20, mhz40,

 mhz50, mhz80, mhz100},

 fr2 ENUMERATED {mhz50, mhz100, mhz200, mhz400}

 } OPTIONAL

 ]]

}

PRS-BWA-TwoContiguousIntrabandInMG-r18 ::= SEQUENCE {

 maximumOfTwoAggregatedDL-PRS-Bandwidth-FR1-r18 ENUMERATED {mhz10, mhz20, mhz40, mhz50,

 mhz80, mhz100, mhz160, mhz200}

 OPTIONAL,

 maximumOfTwoAggregatedDL-PRS-Bandwidth-FR2-r18 ENUMERATED {mhz100, mhz200, mhz400, mhz800}

 OPTIONAL,

 maximumOfDL-PRS-BandwidthPerPFL-FR1-r18 ENUMERATED {mhz5, mhz10, mhz20, mhz40,

 mhz50, mhz80, mhz100} OPTIONAL,

 maximumOfDL-PRS-BandwidthPerPFL-FR2-r18 ENUMERATED {mhz50, mhz100, mhz200, mhz400}

 OPTIONAL,

 dl-PRS-BufferTypeOfBWA-r18 ENUMERATED {type1, type2},

 prs-durationOfTwoPRS-BWA-Processing-r18 SEQUENCE {

 prs-durationOfTwoPRS-BWA-ProcessingSymbolsN-r18

 ENUMERATED {msDot125, msDot25, msDot5, ms1, ms2, ms4, ms6, ms8, ms12,

 ms16, ms20, ms25, ms30, ms32, ms35, ms40, ms45, ms50},

 prs-durationOfTwoPRS-BWA-ProcessingSymbolsT-r18

 ENUMERATED {ms8, ms16, ms20, ms30, ms40, ms80, ms160, ms320, ms640, ms1280}

} OPTIONAL,

 maxNumOfAggregatedDL-PRS-ResourcePerSlot-FR1-r18 SEQUENCE {

 scs15-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL,

 scs30-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL,

 scs60-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL

 },

 maxNumOfAggregatedDL-PRS-ResourcePerSlot-FR2-r18 SEQUENCE {

 scs60-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL,

 scs120-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL

 }

}

PRS-BWA-ThreeContiguousIntrabandInMG-r18 ::= SEQUENCE {

 maximumOfThreeAggregatedDL-PRS-Bandwidth-FR1-r18

 ENUMERATED {mhz15, mhz20, mhz30, mhz40, mhz50, mhz60, mhz80, mhz100, mhz120,

 mhz140, mhz150, mhz180, mhz200, mhz240, mhz300} OPTIONAL,

 maximumOfThreeAggregatedDL-PRS-Bandwidth-FR2-r18

 ENUMERATED {mhz150, mhz200, mhz300, mhz400, mhz600, mhz800, mhz1000, mhz1200}

 OPTIONAL,

 maximumOfDL-PRS-BandwidthPerPFL-FR1-r18

 ENUMERATED {mhz5, mhz10, mhz20, mhz40, mhz50, mhz80, mhz100} OPTIONAL,

 maximumOfDL-PRS-BandwidthPerPFL-FR2-r18

 ENUMERATED {mhz50, mhz100, mhz200, mhz400} OPTIONAL,

 dl-PRS-BufferTypeOfBWA-r18 ENUMERATED {type1, type2},

 prs-durationOfThreePRS-BWA-Processing-r18 SEQUENCE {

 prs-durationOfThreePRS-BWA-ProcessingSymbolsN-r18

 ENUMERATED {msDot125, msDot25, msDot5, ms1, ms2, ms4, ms6, ms8, ms12,

 ms16, ms20, ms25, ms30, ms32, ms35, ms40, ms45, ms50},

 prs-durationOfThreePRS-BWA-ProcessingSymbolsT-r18

 ENUMERATED {ms8, ms16, ms20, ms30, ms40, ms80, ms160,

 ms320, ms640, ms1280}

} OPTIONAL,

 maxNumOfAggregatedDL-PRS-ResourcePerSlot-FR1-r18 SEQUENCE {

 scs15-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL,

 scs30-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL,

 scs60-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL

 },

 maxNumOfAggregatedDL-PRS-ResourcePerSlot-FR2-r18 SEQUENCE {

 scs60-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL,

 scs120-r18 ENUMERATED {n1, n2, n4, n6, n8, n12,

 n16, n24, n32, n48, n64 } OPTIONAL

 }

}

-- ASN1STOP

| *NR-DL-PRS-ProcessingCapability* field descriptions |
| --- |
| ***maxSupportedFreqLayers***Indicates the maximum number of positioning frequency layers supported by UE. |
| ***simulLTE-NR-PRS***Indicates whether the UE supports parallel processing of LTE PRS and NR PRS. |
| ***dummy***This field is not used in the specification. If received it shall be ignored by the receiver. |
| ***supportedBandwidthPRS***Indicates the maximum number of DL-PRS bandwidth in MHz, which is supported and reported by UE. |
| ***dl-PRS-BufferType***IndicatesDL-PRS buffering capability. Value *type1* indicates sub-slot/symbol level buffering and value *type2* indicates slot level buffering. |
| ***durationOfPRS-Processing***Indicates the duration *N* of DL-PRS symbols in units of ms a UE can process every T ms assuming maximum DL-PRS bandwidth provided in *supportedBandwidthPRS* and comprises the following subfields:- ***durationOfPRS-ProcessingSymbols***: This field specifies the values for *N*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, 25, 30, 32, 35, 40, 45, 50 ms.- ***durationOfPRS-ProcessingSymbolsInEveryTms***: This field specifies the values for *T*. Enumerated values indicate 8, 16, 20, 30, 40, 80, 160, 320, 640, 1280 ms.See NOTE 9. |
| ***maxNumOfDL-PRS-ResProcessedPerSlot***Indicates the maximum number of DL-PRS resources that UE can process in a slot. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands.  |
| ***supportedDL-PRS-ProcessingSamples-RRC-CONNECTED***Indicates the UE capability for support of measurements based on measuring M=1 or M=2 (instances) of a DL-PRS Resource Set. The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field.NOTE 1: This feature is supported for both UE-assisted and UE based positioning. |
| ***prs-ProcessingWindowType1A***Indicates the supported DL-PRS processing types subject to the UE determining that DL-PRS to be higher priority for DL-PRS measurement outside MG and in a DL-PRS Processing Window.Type 1A refers to the determination of prioritization between DL-PRS and other DL signals/channels in all OFDM symbols within the PRS Processing Window. The DL signals/channels from all DL CCs (per UE) are affected across LTE and NR. Enumerated value indicates supported priority handing options of DL-PRS:- *option1*: Support of "st1" and "st3" defined in clause 5.1.6.5 of TS 38.214 [45].- *option2*: Support of "st1", "st2", and "st3" defined in clause 5.1.6.5 of TS 38.214 [45].- *option3*: Support of "st1" only defined in clause 5.1.6.5 of TS 38.214 [45].The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field.NOTE 2: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP.NOTE 2a: When the UE determines higher priority for other DL signals/channels over the DL-PRS measurement/processing, the UE is not expected to measure/process DL-PRS. |
| ***prs-ProcessingWindowType1B***Indicates the supported DL-PRS processing types subject to the UE determining that DL-PRS to be higher priority for DL-PRS measurement outside MG and in a DL-PRS Processing Window.Type 1B refers to the determination of prioritization between DL-PRS and other DL signals/channels in all OFDM symbols within the PRS processing window. The DL signals/channels from a certain band are affected. Enumerated value indicates supported priority handing options of DL-PRS (see *prs-ProcessingWindowType1A*).The UE can include this field only if the UE supports prs-ProcessingCapabilityBandList. Otherwise, the UE does not include this field.NOTE 3: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP.NOTE 3a: When the UE determines higher priority for other DL signals/channels over the DL-PRS measurement/processing, the UE is not expected to measure/process DL-PRS. |
| ***prs-ProcessingWindowType2***Indicates the supported DL-PRS processing types subject to the UE determining that DL-PRS to be higher priority for DL-PRS measurement outside MG and in a DL-PRS Processing Window.Type 2 refers to the determination of prioritization between DL-PRS and other DL signals/channels only in DL-PRS symbols within the PRS processing window. Enumerated value indicates supported priority handing options of DL-PRS (see *prs-ProcessingWindowType1A*).The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field.NOTE 4: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP.NOTE 4a: When the UE determines higher priority for other DL signals/channels over the DL-PRS measurement/processing, the UE is not expected to measure/process DL-PRS. |
| ***prs-ProcessingCapabilityOutsideMGinPPW***Indicates the DL-PRS Processing Capability outside MG of each of the supported PPW Type in the case the UE supports multiple PPW Types in a band and comprises the following subfields:- ***prsProcessingType***: Indicates the DL-PRS Processing Window Type for which the *prs-ProcessingCapabilityOutsideMGinPPW* are provided.- ***ppw-dl-PRS-BufferType***: Indicates DL-PRS buffering capability. Value '*type1'* indicates sub-slot/symbol level buffering and value '*type2'* indicates slot level buffering.- ***ppw-durationOfPRS-Processing1***: Indicates the duration of DL-PRS symbols N in units of ms a UE can process every T ms assuming maximum DL-PRS bandwidth provided in *ppw-maxNumOfDL-Bandwidth* and comprises the following subfields:- ***ppw-durationOfPRS-ProcessingSymbolsN***: This field specifies the values for *N*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, 25, 30, 32, 35, 40, 45, 50 ms.- ***ppw-durationOfPRS-ProcessingSymbolsT***: This field specifies the values for *T*. Enumerated values indicate 1, 2, 4, 8, 16, 20, 30, 40, 80, 160, 320, 640, 1280 ms.- ***ppw-durationOfPRS-Processing2***: Indicates the duration of DL-PRS symbols N2 in units of ms a UE can process inT2 ms assuming maximum DL-PRS bandwidth provided in *ppw-maxNumOfDL-Bandwidth* and comprises the following subfields:- ***ppw-durationOfPRS-ProcessingSymbolsN2***: This field specifies the values for *N2*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 3, 4, 5, 6, 8, 12 ms.- ***ppw-durationOfPRS-ProcessingSymbolsT2***: This field specifies the values for *T2*. Enumerated values indicate 4, 5, 6, 8 ms.- ***ppw-maxNumOfDL-PRS-ResProcessedPerSlot:*** Indicates the maximum number of DL-PRS resources that UE can process in a slot. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands.- ***ppw-maxNumOfDL-Bandwidth:*** Indicates the maximum number of DL PRS bandwidth in MHz, which is supported and reported by UE for PRS measurement outside MG within the PPW.The UE can include this field only if the UE supports one of *prs-ProcessingWindowType1A*, *prs-ProcessingWindowType1B* and *prs-ProcessingWindowType2*. Otherwise, the UE does not include this field.NOTE 5: A UE that supports one of *prs-ProcessingWindowType1A*, *prs-ProcessingWindowType1B* or *prs-ProcessingWindowType2* shall always include the *prs-ProcessingCapabilityOutsideMGinPPW*.NOTE 6: The (N, T) UE capability in *ppw-durationOfPRS-Processing1* is interpreted as in NOTE 9, and the UE is expected to receive the DL-PRS within the PRS processing window but the processing of the received DL-PRS may be outside a DL-PRS processing window.NOTE 7: The (N2, T2) UE capability in *ppw-durationOfPRS-Processing2* is interpreted such that the UE is capable of measuring up to N2 ms DL-PRS within a PPW and is capable of completing the DL-PRS processing within the PPW, e.g., if the time duration from the last symbol of the measured DL-PRS resource(s) inside the PPW to the end of PPW is not smaller than T2 ms.NOTE 8: A UE which supports *prs-ProcessingCapabilityOutsideMGinPPW* shall support either *ppw-durationOfPRS-Processing1* or *ppw-durationOfPRS-Processing2*, but not both for each supported type in a band. |
| ***dl-PRS-BufferType-RRC-Inactive***IndicatesDL-PRS buffering capability in RRC\_INACTIVE state. Value '*type1'* indicates sub-slot/symbol level buffering and value '*type2'* indicates slot level buffering. |
| ***durationOfPRS-Processing-RRC-Inactive***Indicates the duration *N* of DL-PRS symbols in units of ms a UE can process every *T* ms in RRC\_INACTIVE state assuming maximum DL-PRS bandwidth provided in *supportedBandwidthPRS* and comprises the following subfields:- ***durationOfPRS-ProcessingSymbols***: This field specifies the values for *N*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, 25, 30, 32, 35, 40, 45, 50 ms.- ***durationOfPRS-ProcessingSymbolsInEveryTms***: This field specifies the values for *T*. Enumerated values indicate 8, 16, 20, 30, 40, 80, 160, 320, 640, 1280 ms.See NOTE 9. |
| ***maxNumOfDL-PRS-ResProcessedPerSlot-RRC-Inactive***Indicates the maximum number of DL-PRS resources a UE can process in a slot in RRC\_INACTIVE state. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands. |
| ***supportedLowerRxBeamSweepingFactor-FR2***Indicates support of the lower Rx beam sweeping factor than 8 for FR2. Enumerated value indicates the number of Rx beam sweeping factors supported. |
| ***supportedDL-PRS-ProcessingSamples-RRC-Inactive***Indicates the UE capability for support of reduced number of samples for PRS measurement in RRC\_INACTIVE state. The UE can include this field only if the UE supports *prs-ProcessingRRC-Inactive* defined in TS 38.331 [35]. Otherwise, the UE does not include this field. |
| ***prs-MeasurementWithoutMG***Indicates the UE capability for support of Rx timing difference between the serving cell and non-serving cell for PRS measurement within a PPW. Value '*cp*' indicates one CP length, value '*symbolDot25*' indicates 0.25 symbol length, value '*symbolDot5*' indicates 0.5 symbol length and value '*slotDot5*' indicates 0.5 slot length. The UE can include this field only if the UE supports one of *prs-ProcessingWindowType1A*, *prs-ProcessingWindowType1B* and *prs-ProcessingWindowType2*. Otherwise, the UE does not include this field. |
| ***prs-BWA-TwoContiguousIntrabandInMG-RRC-Connected***Indicates the UE capability for support of DL PRS processing capabilities for aggregated PRS processing of 2 PFLs in intra-band contiguous within a MG for RRC\_CONNECTED sate and and comprises the following subfields:* ***maximumOfTwoAggregatedDL-PRS-Bandwidth-FR1:*** Indicates the maximum aggregated DL PRS bandwidth in MHz for FR1, which is supported and reported by UE.
* ***maximumOfTwoAggregatedDL-PRS-Bandwidth-FR2:*** Indicates the maximum aggregated DL PRS bandwidth in MHz for FR2, which is supported and reported by UE.
* ***maximumOfDL-PRS-BandwidthPerPFL-FR1:*** Indicates the maximum DL PRS bandwidth in MHz for FR1, per PFL.
* ***maximumOfDL-PRS-BandwidthPerPFL-FR2:*** Indicates the maximum DL PRS bandwidth in MHz for FR2, per PFL.
* ***dl-PRS-BufferTypeOfBWA:*** Indicates the DL PRS buffering capability.
* ***prs-durationOfTwoPRS-BWA-Processing:*** Indicates the duration of DL PRS symbols N in units of ms a UE can process every T ms assuming maximum aggregated DL PRS bandwidth in MHz, which is supported and reported by UE.
* ***prs-durationOfTwoPRS-BWA-ProcessingSymbolsN:*** This field specifies the values for N. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, 25, 30, 32, 35, 40, 45, 50 ms.
* ***prs-durationOfTwoPRS-BWA-ProcessingSymbolsT:*** This field specifies the values for T. Enumerated values indicate 8, 16, 20, 30, 40, 80, 160, 320, 640, 1280, 2560 ms.
* ***maxNumOfAggregatedDL-PRS-ResourcePerSlot-FR1:*** Indicates the Maximum number of aggregated DL PRS resources across aggregated PFLs that UE can process in a slot for FR1.
* ***maxNumOfAggregatedDL-PRS-ResourcePerSlot-FR2:*** Indicates the Maximum number of aggregated DL PRS resources across aggregated PFLs that UE can process in a slot for FR2.

The UE can include this field only if the UE supports *ProcessingCapabilityPerBand*. Otherwise, the UE does not include this field.NOTE10: *dl-PRS-BufferTypeOfBWA* follows buffering capability type reported in *ProcessingCapabilityPerBand.*NOTE11: The value N should be equal or smaller than the value N reported by *ProcessingCapabilityPerBand*, or this value T should be equal or larger than the value T reported by *ProcessingCapabilityPerBand.*NOTE12: Each two linked PRS resources are counted as 1 resourceNOTE13: *maxNumOfAggregatedDL-PRS-ResourcePerSlot* should be equal or smaller than the value reported by *ProcessingCapabilityPerBand.*NOTE14: The above parameters are reported assuming a configured measurement gap and a maximum ratio of measurement gap length (MGL)/measurement gap repetition period (MGRP) of no more than 30%. |
| ***prs-BWA-ThreeContiguousIntrabandInMG-RRC-Connected***Indicates the UE capability for support of DL PRS processing capabilities for aggregated PRS processing of 3 PFLs in intra-band contiguous within a MG for RRC\_CONNECTED sate and and comprises the following subfields:* ***maximumOfThreeAggregatedDL-PRS-Bandwidth-FR1:*** Indicates the maximum aggregated DL PRS bandwidth in MHz of for FR1, which is supported and reported by UE.
* ***maximumOfThreeAggregatedDL-PRS-Bandwidth-FR2:*** Indicates the maximum aggregated DL PRS bandwidth in MHz for FR2, which is supported and reported by UE.
* ***maximumOfDL-PRS-BandwidthPerPFL-FR1:*** Indicates the maximum DL PRS bandwidth in MHz for FR1, per PFL
* ***maximumOfDL-PRS-BandwidthPerPFL-FR2:*** Indicates the maximum DL PRS bandwidth in MHz for FR2, per PFL
* dl-PRS-BufferTypeOfBWA: Indicates the DL PRS buffering capability.
* ***prs-durationOfThreePRS-BWA-Processing:*** Indicates the duration of DL PRS symbols N in units of ms a UE can process every T ms assuming maximum aggregated DL PRS bandwidth in MHz, which is supported and reported by UE.
* ***prs-durationOfThreePRS-BWA-ProcessingSymbolsN:*** This field specifies the values for N. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, 25, 30, 32, 35, 40, 45, 50 ms.
* ***prs-durationOfThreePRS-BWA-ProcessingSymbolsT:*** This field specifies the values for T. Enumerated values indicate 8, 16, 20, 30, 40, 80, 160, 320, 640, 1280, 3840 ms.
* ***maxNumOfAggregatedDL-PRS-ResourcePerSlot-FR1:*** Indicates the Maximum number of aggregated DL PRS resources across aggregated PFLs that UE can process in a slot for FR1.
* ***maxNumOfAggregatedDL-PRS-ResourcePerSlot-FR2:*** Indicates the Maximum number of aggregated DL PRS resources across aggregated PFLs that UE can process in a slot for FR2.

The UE can include this field only if the UE supports *prs-BWA-TwoContiguousIntrabandInMG-RRC-Connected****.*** Otherwise, the UE does not include this field.NOTE15: *dl-PRS-BufferTypeOfBWA* follows buffering capability type reported in *ProcessingCapabilityPerBand.*NOTE16: The value N should be equal or smaller than the value N reported by *ProcessingCapabilityPerBand*, or this value T should be equal or larger than the value T reported by *ProcessingCapabilityPerBand.*NOTE17: Each three linked PRS resources are counted as 1 resourceNOTE18: *maxNumOfAggregatedDL-PRS-ResourcePerSlot* should be equal or smaller than the value reported by *ProcessingCapabilityPerBand*.NOTE19: The above parameters are reported assuming a configured measurement gap and a maximum ratio of measurement gap length (MGL)/measurement gap repetition period (MGRP) of no more than 30%. |
| ***prs-BWA-TwoContiguousIntrabandInMG-RRC-IdleAndInactive***Indicates the UE capability for support of DL PRS processing capabilities for aggregated PRS processing of 2 PFLs in intra-band contiguous within a MG for RRC\_INACTIVE and RRC\_IDLE sate.The UE can include this field only if the UE supports DL PRS processing capabilities in RRC inactive state. Otherwise, the UE does not include this field. |
| ***prs-BWA-ThreeContiguousIntrabandInMG-RRC-IdleAndInactive***Indicates the UE capability for support of DL PRS processing capabilities for aggregated PRS processing of 3 PFLs in intra-band contiguous within a MG for RRC\_INACTIVE and RRC\_IDLE sate. The UE can include this field only if the UE supports *prs-BWA-TwoContiguousIntrabandInMG-RRC-IdleAndInactive*. Otherwise, the UE does not include this field. |
| ***reducedNumOfSampleInMeasurementWithPRS-BWA-RRC-Connected***Indicates UE whether supports reduced number of samples in positioning measurements with PRS bandwidth aggregation for RRC\_CONNECTED. TRUE means supported and FALSE means not supported. The UE can indicate TRUE only if the UE supports *prs-BWA-TwoContiguousIntrabandInMG-RRC-Connected****.*** Otherwise, the UE indicates FALSE. |
| ***reducedNumOfSampleInMeasurementWithPRS-BWA-RRC-IdleAndInactive***Indicates UE whether supports reduced number of samples in positioning measurements with PRS bandwidth aggregation for RRC\_IDLE and RRC\_INACTIVE. TRUE means supported and FALSE means not supported. The UE can indicate TRUE only if the UE supports *prs-BWA-TwoContiguousIntrabandInMG-RRC-Connected****.*** Otherwise, the UE indicates FALSE. |
| ***dl-PRS-MeasurementWithRxFH-RRC-Inactive***Indicates the UE capability for support of PRS measurement with Rx frequency hopping in RRC\_INACTIVE for RedCap UEs. The UE can include this field only if the UE supports PRS measurement with Rx frequency hopping within a MG and measurement reporting in RRC\_CONNECTED for RedCap UEs and *prs-ProcessingRRC-Inactive* defined in TS 38.331 [35]. Otherwise, the UE does not include this field. |
| ***dl-PRS-MeasurementWithRxFH-RRC-Idle***Indicates the UE capability for support of PRS measurement with Rx frequency hopping in RRC\_IDLE for RedCap UEs. The UE can include this field only if the UE supports PRS measurement with Rx frequency hopping within a MG and measurement reporting in RRC\_CONNECTED for RedCap UEs. Otherwise, the UE does not include this field. |
| ***reducedNumOfSampleForMeasurementWithFH-RRC-Connected***Indicates UE whether supports reduced number of samples for PRS based positioning measurements frequency hopping for RRC\_CONNECTED. TRUE means supported and FALSE means not supported. The UE can indicate TRUE only if the UE supports *supportOfRedCap-r17* defined in TS 38.331 [35]*,* and *supportedDL-PRS-ProcessingSamples-RRC-CONNECTED-r17*. Otherwise, the UE indicates FALSE. |
| ***reducedNumOfSampleForMeasurementWithFH-RRC\_IdleAndInactive***Indicates UE whether supports reduced number of samples for PRS based positioning measurements frequency hopping for RRC\_IDLE and RRC\_INACTIVE. TRUE means supported and FALSE means not supported. The UE can indicate TRUE only if the UE supports *supportOfRedCap-r17* defined in TS 38.331 [35], and *supportedDL-PRS-ProcessingSamples-RRC-CONNECTED-r17*. Otherwise, the UE indicates FALSE. |
| NOTE 9: When the target device provides the *durationOfPRS-Processing* capability (*N*, *T*) for any $P(\geq T)$ time window defined in TS 38.214 [45] clause 5.1.6.5, the target device should be capable of processing all DL-PRS resources within $P$, if- $N\geq K$ where K is defined in the TS 38.214 [45] clause 5.1.6.5, and- the number of DL-PRS Resources in each slot does not exceed the *maxNumOfDL-PRS-ResProcessedPerSlot*, and- the configured measurement gap and a maximum ratio of measurement gap length (MGL) / measurement gap repetition period (MGRP) is as specified in TS 38.133 [46]. |

*NEXT CHANGE*

#### – *NR-DL-PRS-TRP-TEG-Info*

The IE *NR-DL-PRS-TRP-TEG-Info* is used by the location server to provide the association information of DL-PRS Resources with TRP Tx TEGs.

-- ASN1START

NR-DL-PRS-TRP-TEG-Info-r17 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-DL-PRS-TRP-TEG-InfoPerFreqLayer-r17

NR-DL-PRS-TRP-TEG-InfoPerFreqLayer-r17 ::= SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 NR-DL-PRS-TRP-TEG-InfoPerTRP-r17

NR-DL-PRS-TRP-TEG-InfoPerTRP-r17 ::= SEQUENCE {

 dl-PRS-ID-r17 INTEGER (0..255),

 nr-PhysCellID-r17 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r17 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r17 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 dl-PRS-TEG-InfoSet-r17 SEQUENCE (SIZE(1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF

 DL-PRS-TEG-InfoPerResourceSet-r17,

 ...,

 [[

 nr-TRP-TxTEG-TimingErrorMargin-r17 TEG-TimingErrorMargin-r17 OPTIONAL -- Need ON

 ]]

}

DL-PRS-TEG-InfoPerResourceSet-r17 ::= SEQUENCE (SIZE(1..nrMaxResourcesPerSet-r16)) OF

 DL-PRS-TEG-InfoElement-r17

DL-PRS-TEG-InfoElement-r17 ::= SEQUENCE {

 dl-prs-trp-Tx-TEG-ID-r17 INTEGER (0..maxNumOfTRP-TxTEGs-1-r17),

 ...

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-PRS-TRP-TEG-Info* field descriptions |
| ***dl-PRS-ID***This field specifies the DL-PRS ID of the TRP for which the TRP Tx TEG information is provided. |
| ***nr-PhysCellID***This field specifies the physical Cell-ID of the TRP for which the TRP Tx TEG information is provided, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the TRP for which the TRP Tx TEG information is provided, as defined in TS 38.331 [35]. |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*. |
| ***dl-PRS-TEG-InfoSet***This field specifies the TRP Tx TEG ID associated with the transmissions of each DL-PRS Resource of the TRP. The *dl-prs-trp-Tx-TEG-ID* in *dl-PRS-TEG-InfoSet* is associated with the *nr-DL-PRS-ResourceID* of *NR-DL-PRS-Info* using the same structure and order. |
| ***nr-TRP-TxTEG-TimingErrorMargin***This field specifies the timing error margin value for all the TRP Tx TEGs contained within one *NR-DL-PRS-TRP-TEG-InfoPerTRP*. |

#### – *NR-IntegrityRiskParameters*

The IE *NR-IntegrityRiskParameters* is used by the location server to indicate the residual risks to UE.

-- ASN1START

NR-IntegrityRiskParameters-r18 ::= SEQUENCE {

 nr-ProbOnsetTRP-Fault-r18 INTEGER (0..255),

 nr-MeanTRP-FaultDuration-r18 INTEGER (1..3600),

 ...

}

-- ASN1STOP

|  |
| --- |
| *NR-IntegrityRiskParameters* field descriptions |
| ***nr-ProbOnsetTRP-Fault***This field specifies the Probability of Onset of TRP Fault per Time Unit which is the probability of occurrence of TRP error to exceed the error bound for more than the Time to Alert (TTA).This field specifies the onset probability that the error exceeds a bound created using the minimum allowed inflation factor *Kmin*, and bounding parameters as *mean* + *Kmin* \* *stdDev* where *Kmin* = *normInv*(*irMaximum* / 2), with *irMaximum* as provided in IE *nr-IntegrityServiceParameters*.The probability is calculated by *P*=10-0.04*n* [hour-1] where *n* is the value of *nr-ProbOnsetTRP-Fault* and the range is 10-10.2 to 1 per hour. |
| ***nr-MeanTRP-FaultDuration***This field specifies the Mean TRP Fault Duration which is the mean duration between when a TRP fault occurs, and the user is alerted by IE *NR-IntegrityServiceAlert* (or the integrity violation is over).Scale factor 1 s; range 1-3600 s. |

#### – *NR-IntegrityServiceAlert*

The IE *NR-IntegrityServiceAlert* is used by the location server to indicate whether the corresponding assistance data can be used for integrity related applications.

-- ASN1START

NR-IntegrityServiceAlert-r18 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-TRP-IntegrityServiceAlertPerFreqLayer-r18

NR-TRP-IntegrityServiceAlertPerFreqLayer-r18 ::= SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 TRP-IntegrityServiceAlertElement-r18

TRP-IntegrityServiceAlertElement-r18 ::= SEQUENCE {

 dl-PRS-ID-r18 INTEGER (0..255),

 nr-PhysCellID-r18 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r18 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r18 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 rtd-DoNotUse-r18 BOOLEAN OPTIONAL, -- Need OR

 trp-LocationDoNotUse-r18 BOOLEAN OPTIONAL, -- Need OR

 beamInfo-DoNotUse-r18 BOOLEAN OPTIONAL, -- Need OR

 beamAntennaInfo-DoNotUse-r18 BOOLEAN OPTIONAL, -- Need OR

 ...

}

-- ASN1STOP

|  |
| --- |
| *NR-IntegrityServiceAlert* field descriptions |
| ***rtd-DoNotUse***This field indicates whether the RTD info in IE *NR-RTD-Info* can be used for integrity related applications (FALSE) or not (TRUE). |
| ***trp-LocationDoNotUse***This field indicates whether the TRP/ARP location in IE *NR-TRP-LocationInfo* can be used for integrity related applications (FALSE) or not (TRUE). |
| ***beamInfo-DoNotUse*** This field indicates whether the spatial direction information in IE *NR-DL-PRS-BeamInfo* can be used for integrity related applications (FALSE) or not (TRUE). |
| ***beamAntennaInfo-DoNotUse*** This field indicates whether the beam antenna information in IE *NR-TRP-BeamAntennaInfo* can be used for integrity related applications (FALSE) or not (TRUE). |

#### – *NR-IntegrityServiceParameters*

The IE *NR-IntegrityServiceParameters* is used by the location server to provide the range of Integrity Risk (IR) for which the integrity assistance data are valid.

-- ASN1START

NR-IntegrityServiceParameters-r18 ::= SEQUENCE {

 ir-Minimum-r18 INTEGER (0..255),

 ir-Maximum-r18 INTEGER (0..255),

 ...

}

-- ASN1STOP

|  |
| --- |
| *NR-Integrity-ServiceParameters* field descriptions |
| ***ir-Minimum***This field specifies the Minimum Integrity Risk (IR) which is the minimum IR for which the error bounds provided in the IEs *IntegrityRTD-InfoBounds*, *IntegrityBeamInfoBounds*, *IntegrityBeamPowerBounds*, and *IntegrityLocationBounds* are valid.The IR is calculated by $P=10^{-0.04n}$ where n is the value of *ir-Minimum* and the range is 10-10.2 to 1. |
| ***ir-Maximum***This field specifies the Maximum Integrity Risk (IR) which is the maximum IR for which the error bounds provided in the IEs *IntegrityRTD-InfoBounds*, *IntegrityBeamInfoBounds*, *IntegrityBeamPowerBounds*,and *IntegrityLocationBounds* are valid.The IR is calculated by $P=10^{-0.04n}$ where n is the value of *ir-Maximum* and the range is 10-10.2 to 1. |

*NEXT CHANGE*

*– NR-On-Demand-DL-PRS-Configurations*

The IE *NR-On-Demand-DL-PRS-Configurations* provides a set of possible DL-PRS configurations and/or PRS bandwidth aggregation which can be requested by the target device on-demand.

-- ASN1START

NR-On-Demand-DL-PRS-Configurations-r17 ::= SEQUENCE {

 on-demand-dl-prs-configuration-list-r17 SEQUENCE (SIZE (1..maxOD-DL-PRS-Configs-r17)) OF

 On-Demand-DL-PRS-Configuration-r17,

 ...,

 [[

 onDemandDL-PRS-AggregationList-r18 SEQUENCE (SIZE (1.. maxOD-DL-PRS-Configs-r17)) OF

 OnDemandDL-PRS-AggregationInfo-r18 OPTIONAL,-- Need ON

 ]]

}

On-Demand-DL-PRS-Configuration-r17 ::= SEQUENCE {

 dl-prs-configuration-id-r17 DL-PRS-Configuration-ID-r17,

 nr-DL-PRS-PositioningFrequencyLayer-r17 NR-DL-PRS-PositioningFrequencyLayer-r16,

 nr-DL-PRS-Info-r17 NR-DL-PRS-Info-r16,

 ...

}

DL-PRS-Configuration-ID-r17 ::= SEQUENCE {

 nr-dl-prs-configuration-id-r17 INTEGER (1..maxOD-DL-PRS-Configs-r17),

 ...

}

OnDemandDL-PRS-AggregationInfo-r18 ::= SEQUENCE (SIZE (2..3)) OF DL-PRS-Configuration-ID-r17

-- ASN1STOP

| ***NR-On-Demand-DL-PRS-Configurations* field descriptions** |
| --- |
| ***dl-prs-configuration-id***This field provides an identity for the *On-Demand-DL-PRS-Configuration.* |
| ***nr-DL-PRS-PositioningFrequencyLayer***This field, together with *nr-DL-PRS-Info*, provides the On-demand DL-PRS Configuration information.Only the following fields in IE *NR-DL-PRS-PositioningFrequencyLayer* are applicable:*dl-PRS-ResourceBandwidth*, *dl-PRS-CombSizeN.*The target device shall ignore the remaining fields in IE *NR-DL-PRS-PositioningFrequencyLayer.* |
| ***nr-DL-PRS-Info***This field, together with *nr-DL-PRS-PositioningFrequencyLayer*, provides the On-demand DL-PRS Configuration information. Only the following fields in IE *NR-DL-PRS-Info* are applicable:DL-PRS periodicity in *dl-PRS-Periodicity-and-ResourceSetSlotOffset*, *dl-PRS-ResourceRepetitionFactor*, *dl-PRS-NumSymbols*, comb-size in *dl-PRS-CombSizeN-AndReOffset*, *dl-PRS-QCL-Info*.The target device shall ignore the remaining fields in IE *NR-DL-PRS-Info.* |
| ***onDemandDL-PRS-Aggregationlist***This field indicates the 2 or 3 *DL-PRS-Configuration-ID*'s whose corresponding *On-Demand-DL-PRS-Configuration*'s are available for DL-PRS aggregation. |

*NEXT CHANGE*

#### – *NR-On-Demand-DL-PRS-Information*

The IE *NR-On-Demand-DL-PRS-Information* defines the requested on-demand DL-PRS.

-- ASN1START

NR-On-Demand-DL-PRS-Information-r17 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-On-Demand-DL-PRS-PerFreqLayer-r17

NR-On-Demand-DL-PRS-PerFreqLayer-r17 ::= SEQUENCE {

 dl-prs-FrequencyRangeReq-r17 ENUMERATED { fr1, fr2, ...},

 dl-prs-ResourceSetPeriodicityReq-r17 ENUMERATED { p4, p5, p8, p10, p16, p20, p32, p40,

 p64, p80, p160, p320, p640, p1280, p2560,

 p5120, p10240, p20480, p40960, p81920, ...,

 p128-v1760, p256-v1760, p512-v1760}

 OPTIONAL,

 dl-prs-ResourceBandwidthReq-r17 INTEGER (1..63) OPTIONAL,

 dl-prs-ResourceRepetitionFactorReq-r17 ENUMERATED {n2, n4, n6, n8, n16, n32, ...}

 OPTIONAL,

 dl-prs-NumSymbolsReq-r17 ENUMERATED {n2, n4, n6, n12, ...} OPTIONAL,

 dl-prs-CombSizeN-Req-r17 ENUMERATED {n2, n4, n6, n12, ...} OPTIONAL,

 dl-prs-QCL-InformationReqTRPlist-r17 DL-PRS-QCL-InformationReqTRPlist-r17 OPTIONAL,

 ...

}

DL-PRS-QCL-InformationReqTRPlist-r17 ::= SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 DL-PRS-QCL-InformationReqPerTRP-r17

DL-PRS-QCL-InformationReqPerTRP-r17 ::= SEQUENCE {

 dl-PRS-ID-r17 INTEGER (0..255),

 nr-PhysCellID-r17 NR-PhysCellID-r16 OPTIONAL,

 nr-CellGlobalID-r17 NCGI-r15 OPTIONAL,

 nr-ARFCN-r17 ARFCN-ValueNR-r15 OPTIONAL,

 dl-prs-QCL-InformationReqSet-r17 SEQUENCE (SIZE (1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF

 DL-PRS-QCL-InfoReq-r17,

 ...

}

DL-PRS-QCL-InfoReq-r17 ::= SEQUENCE {

 nr-DL-PRS-ResourceSetID-r17 NR-DL-PRS-ResourceSetID-r16,

 dl-prs-QCL-InformationReq-r17 CHOICE {

 dl-prs-QCL-InfoRecPerResourceSet-r17 DL-PRS-QCL-Info-r16,

 dl-prs-QCL-Info-requested-r17 NULL

 },

 ...,

 [[

 dl-prs-QCL-InfoRecPerResource-r17 SEQUENCE (SIZE (1..nrMaxResourcesPerSet-r16)) OF

 DL-PRS-QCL-Info-r16 OPTIONAL

 ]]

}

-- ASN1STOP

|  |
| --- |
| *NR-On-Demand-DL-PRS-Information* field descriptions |
| ***dl-prs-FrequencyRangeReq***This field specifies the frequency range for which the on-demand DL-PRS is requested. |
| ***dl-prs-ResourceSetPeriodicityReq***This field specifies the requested periodicity of the DL-PRS Resource Set in slots. The periodicity depends on the subcarrier spacing (SCS) and takes values $2^{μ}\left\{4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120, 10240\right\}$slots, where $μ=0, 1, 2, 3 $for SCS of 15, 30, 60 and 120 kHz respectively. μ refers to the target device's current primary cell. |
| ***dl-prs-ResourceBandwidthReq***This field specifies the requested number of PRBs allocated for the DL-PRS Resource (allocated DL-PRS bandwidth) in multiples of 4 PRBs. Integer value 1 corresponds to 24 PRBs, value 2 corresponds to 28 PRBs, value 3 corresponds to 32 PRBs and so on. |
| ***dl-prs-ResourceRepetitionFactorReq***This field specifies the requested DL-PRS Resource repetition. Enumerated values *n2*, *n4*, *n6*, *n8*, *n16*, *n32* correspond to 2, 4, 6, 8, 16, 32 resource repetitions, respectively. |
| ***dl-prs-NumSymbolsReq***This field specifies the requested number of symbols per DL-PRS Resource within a slot. |
| ***dl-prs-CombSizeN-Req***This field specifies the requested Resource Element spacing in each symbol of the DL-PRS Resource. |
| ***dl-prs-QCL-InformationReqTRPlist***This field specifies the recommended or requested QCL indication with other DL reference signals.- ***dl-PRS-ID*** indicates the DL-PRS ID of the TRP for which the QCL information is recommended.- ***nr-PhysCellID*** indicates the physical Cell-ID of the TRP for which the QCL information is recommended, as defined in TS 38.331 [35].- ***nr-CellGlobalID*** indicates the NCGI, the globally unique identity of a cell in NR, of the TRP for which the QCL information is recommended, as defined in TS 38.331 [35].- ***nr-ARFCN*** indicates the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to nr-PhysCellID.- ***dl-prs-QCL-InformationReqSet*** indicates the recommended QCL information per DL-PRS Resource Set.- ***nr-DL-PRS-ResourceSetID*** indicates the DL-PRS Resource Set ID for which the QCL information is recommended.- ***dl-prs-QCL-InformationReq***- ***dl-prs-QCL-InfoRecPerResourceSet*** indicates a single recommended QCL source for the DL-PRS Resource Set.- ***dl-prs-QCL-Info-requested*** indicates that the UE requests to provide the QCL information in the assistance data.- ***dl-prs-QCL-InfoRecPerResource*** indicates a list of recommended QCL sources for the DL-PRS Resource Set. If this field is present, the *dl-prs-QCL-InformationReg* shall be ignored by the receiver. |

*NEXT CHANGE*

– *NR-On-Demand-DL-PRS-Request*

The IE *NR-On-Demand-DL-PRS-Request* is used by the target device to request on-demand DL-PRS and/or on-demand PRS bandwidth aggregation from a location server.

-- ASN1START

NR-On-Demand-DL-PRS-Request-r17 ::= SEQUENCE {

 dl-prs-StartTime-and-Duration-r17 DL-PRS-StartTime-and-Duration-r17 OPTIONAL,

 nr-on-demand-DL-PRS-Information-r17 NR-On-Demand-DL-PRS-Information-r17 OPTIONAL,

 dl-prs-configuration-id-PrefList-r17 SEQUENCE (SIZE (1..maxOD-DL-PRS-Configs-r17)) OF
 DL-PRS-Configuration-ID-r17 OPTIONAL,

 ...,

 [[

 dl-PRS-AggregationID-PrefList-r18 SEQUENCE (SIZE (1.. maxOD-DL-PRS-Configs-r17)) OF

 INTEGER (1.. maxOD-DL-PRS-Configs-r17)

 OPTIONAL,

 nr-OnDemandDL-PRS-AggregationReqList-r18 SEQUENCE (SIZE (1.. maxOD-DL-PRS-Configs-r17)) OF

 NR-OnDemandDL-PRS-AggregationReqElement-r18

 OPTIONAL

 ]]

}

DL-PRS-StartTime-and-Duration-r17 ::= SEQUENCE {

 dl-prs-start-time-r17 INTEGER (1..1024) OPTIONAL,

 dl-prs-duration-r17 SEQUENCE {

 seconds-r17 INTEGER (0..59) OPTIONAL,

 minutes-r17 INTEGER (0..59) OPTIONAL,

 hours-r17 INTEGER (0..23) OPTIONAL,

 ...

 } OPTIONAL,

 ...

}

NR-OnDemandDL-PRS-AggregationReqElement-r18 ::= SEQUENCE (SIZE (2..3)) OF

 INTEGER (1..nrMaxFreqLayers-r16)

-- ASN1STOP

|  |
| --- |
| ***NR-On-Demand-DL-PRS-Request* field descriptions** |
| ***dl-prs-StartTime-and-Duration***This field specifies the requested start time and duration for the on-demand DL-PRS and comprises the following subfields:- ***dl-prs-start-time*** specifies the desired start time for the requested DL-PRS. It indicates the time in seconds from the time the IE *NR-On-Demand-DL-PRS-Request* was received.- ***dl-prs-duration*** specifies the desired duration of the requested DL-PRS. The desired duration is the sum of the *seconds*, *minutes*, *hours* fields. If this field is included, at least one of the *seconds*, *minutes*, *hours* fields shall be present. |
| ***nr-on-demand-DL-PRS-Information***This field specifies the on-demand DL-PRS configuration information requested by the target device.NOTE: If the network provided predefined on-demand DL-PRS configurations (*NR-On-Demand-DL-PRS-Configurations*), the target device can only request explicit parameters (*nr-on-demand-DL-PRS-Information*) within the scope of those configurations. |
| ***dl-prs-configuration-id-PrefList***This field specifies the on-demand DL-PRS configuration associated with *DL-PRS-Configuration-ID* in IE *NR-On-Demand-DL-PRS-Configurations* the target device wishes to obtain in the order of preference. The first *DL-PRS-Configuration-ID* in the list is the most preferred configuration, the second *DL-PRS-Configuration-ID* the second most preferred, etc. |
| ***dl-PRS-AggregationID-PrefList***This field specifies the on-demand DL-PRS aggregated configuration associated with *onDemandDL-PRS-AggregationList* in IE *NR-On-Demand-DL-PRS-Configurations* the target device wishes to obtain in the order of preference. The first integer value in the list is the most preferred aggregated configuration; the second integer value in the list is the second most preferred, etc. The integer value corresponds to the entry in the field *onDemandDL-PRS-AggregationList* in IE *NR-On-Demand-DL-PRS-Configurations*. |
| ***nr-OnDemandDL-PRS-AggregationReqList***This field specifies the aggregated on-demand DL-PRS configuration information requested by the target device in the order of preference. The first *NR-OnDemandDL-PRS-AggregationReqElement* in the list is the most preferred aggregated configuration; the second element in the list is the second most preferred, etc. The integer value in *NR-OnDemandDL-PRS-AggregationReqElement* corresponds to the entry in the IE *NR-On-Demand-DL-PRS-Information*. |

*NEXT CHANGE*

#### *– NR-PeriodicAssistData*

The IE *NR-PeriodicAssistData* is used by the location server to provide control parameters for a periodic assistance data delivery session (e.g., interval and duration) to the target device for UE‑based carrier phase positioning.

NOTE: Omission of a particular assistance data type field in IE *NR-PeriodicAssistData* means that the location server does not provide this assistance data type in a data transaction of a periodic assistance data delivery session, as described in clauses 5.2.1a and 5.2.2a. Inclusion of no assistance data type fields in IE *NR-PeriodicAssistData* means that a periodic assistance data delivery session is terminated.

-- ASN1START

NR-PeriodicAssistData-r18 ::= SEQUENCE {

 nr-PRU-DL-Info-r18 NR-PeriodicControlParam-r18 OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

#### *– NR-PeriodicAssistDataReq*

The IE *NR-PeriodicAssistDataReq* is used by the target device to request periodic assistance data delivery from a location server.

-- ASN1START

NR-PeriodicAssistDataReq-r18 ::= SEQUENCE {

 nr-PRU-DL-InfoReq-r18 NR-PeriodicControlParam-r18 OPTIONAL, -- Cond pPRU

 ...

}

-- ASN1STOP

| *Conditional presence* | Explanation |
| --- | --- |
| *pPRU* | The field is mandatory present if the target device requests periodic *NR-PRU-DL-Info*; otherwise it is not present. |

#### – *NR-PeriodicControlParam*

The IE *NR-PeriodicControlParam* is used to specify control parameters for a periodic assistance data delivery.

-- ASN1START

NR-PeriodicControlParam-r18 ::= SEQUENCE {

 deliveryAmount-r18 INTEGER (1..32),

 deliveryInterval-r18 INTEGER (4..81920),

 ...

}

-- ASN1STOP

| *NR-PeriodicControlParam* field descriptions |
| --- |
| ***deliveryAmount***This field specifies the number of periodic assistance data deliveries. Integer values *N*=1…31 correspond to an amount of 2*N*. Integer value *N*=32 indicates an 'infinite/indefinite' amount, which means that the assistance data delivery should continue until a LPP *Abort* message is received.  |
| ***deliveryInterval***This field specifies the interval between assistance data deliveries in milliseconds.  |

*NEXT CHANGE*

#### *– NR-PositionCalculationAssistance*

The IE *NR-PositionCalculationAssistance* is used by the location server to provide assistance data to enable UE‑based downlink positioning.

-- ASN1START

NR-PositionCalculationAssistance-r16 ::= SEQUENCE {

 nr-TRP-LocationInfo-r16 NR-TRP-LocationInfo-r16 OPTIONAL, -- Need ON

 nr-DL-PRS-BeamInfo-r16 NR-DL-PRS-BeamInfo-r16 OPTIONAL, -- Need ON

 nr-RTD-Info-r16 NR-RTD-Info-r16 OPTIONAL, -- Need ON

 ...,

 [[

 nr-TRP-BeamAntennaInfo-r17 NR-TRP-BeamAntennaInfo-r17 OPTIONAL, -- Need ON

 nr-DL-PRS-Expected-LOS-NLOS-Assistance-r17

 NR-DL-PRS-ExpectedLOS-NLOS-Assistance-r17

 OPTIONAL, -- Need ON

 nr-DL-PRS-TRP-TEG-Info-r17 NR-DL-PRS-TRP-TEG-Info-r17 OPTIONAL -- Need ON

 ]],

 [[

 nr-IntegrityServiceParameters-r18 NR-IntegrityServiceParameters-r18 OPTIONAL, -- Need OR

 nr-IntegrityServiceAlert-r18 NR-IntegrityServiceAlert-r18 OPTIONAL, -- Need OR

 nr-IntegrityRiskParameters-r18 NR-IntegrityRiskParameters-r18 OPTIONAL, -- Need OR

 nr-IntegrityParametersTRP-LocationInfo-r18 NR-IntegrityParametersTRP-LocationInfo-r18 OPTIONAL, -- Cond Integrity1 nr-IntegrityParametersDL-PRS-BeamInfo-r18

 NR-IntegrityParametersDL-PRS-BeamInfo-r18 OPTIONAL, -- Cond Integrity2

 nr-IntegrityParametersRTD-Info-r18 NR-IntegrityParametersRTD-Info-r18 OPTIONAL, -- Cond Integrity3

 nr-IntegrityParametersTRP-BeamAntennaInfo-r18 NR-IntegrityParametersTRP-BeamAntennaInfo-r18 OPTIONAL, -- Cond Integrity4

 nr-PRU-DL-Info-r18 NR-PRU-DL-Info-r18 OPTIONAL -- Need ON

 ]]

}

NR-IntegrityParametersTRP-LocationInfo-r18 ::= SEQUENCE {

 trp-ErrorCorrelationTime-r18 INTEGER(0..255),

 ...

}

NR-IntegrityParametersDL-PRS-BeamInfo-r18 ::= SEQUENCE {

 dl-PRS-BeamInfoErrorCorrelationTime-r18 INTEGER (0..255),

 ...

}

NR-IntegrityParametersRTD-Info-r18 ::= SEQUENCE {

 rtd-ErrorCorrelationTime-r18 INTEGER (0..255),

 ...

}

NR-IntegrityParametersTRP-BeamAntennaInfo-r18 ::= SEQUENCE {

 trp-BeamAntennaInfoErrorCorrelationTime-r18 INTEGER (0..255),

 ...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *Integrity1* | The field is optionally present, need OR, if *NR-TRP-LocationInfo* is present and *integrityReferencePointLocationBounds*, *IntegrityLocationBounds* is present in IE *NR-TRP-LocationInfo;* otherwise it is not present. |
| *Integrity2* | The field is optionally present, need OR, if *NR-DL-PRS-BeamInfo* is present and *IntegrityBeamInfoBounds* is present in IE *NR-DL-PRS-BeamInfo;* otherwise it is not present. |
| *Integrity3* | The field is optionally present, need OR, if *NR-RTD-Info* is present and *IntegrityRTD-InfoBounds* is present in IE *NR-RTD-Info;* otherwise it is not present. |
| *Integrity4* | The field is optionally present, need OR, if *NR-TRP-BeamAntennaInfo* is present and *IntegrityBeamPowerBounds* is present in IE *NR-TRP-BeamAntennaInfo;* otherwise it is not present. |

| *NR-PositionCalculationAssistance* field descriptions |
| --- |
| ***nr-TRP-LocationInfo***This field provides the location coordinates of the TRPs and location coordinates of antenna reference points for DL-PRS Resource Set(s) and DL-PRS Resources of the TRPs. |
| ***nr-DL-PRS-BeamInfo***This field provides the spatial directions of DL-PRS Resources for TRPs. |
| ***nr-RTD-Info***This field provides the time synchronization information between the reference TRP and neighbour TRPs.  |
| ***nr-TRP-BeamAntennaInfo***This field provides the relative DL-PRS Resource power between PRS resources per angle per TRP. |
| ***nr-DL-PRS-ExpectedLOS-NLOS-Assistance***This field provides the expected likelihood of a LOS propagation path from a TRP to the target device. The information is provided per TRP or per DL-PRS Resource. |
| ***nr-DL-PRS-TRP-TEG-Info***This field provides the TRP Tx TEG ID associated with the transmission of each DL-PRS Resource of the TRP. |
| ***nr-IntegrityServiceParameters***This field specifiesthe range of Integrity Risk (IR) for which the integrity assistance data are valid. |
| ***nr-IntegrityServiceAlert***This field indicates whether the corresponding assistance data can be used for integrity related applications. |
| ***trp-ErrorCorrelationTime***This field specifies the TRP Error Correlation Time which is the upper bound of the correlation time of the TRP error. The time is calculated using:$$t=\left\{\begin{array}{c}10i, \&i\leq 180\\1800+100(i-180), 180<\&i\leq 234 \\7200+1000\left(i-234\right), \&i>234\end{array} [s]\right.$$Range is 1-28,200 s. |
| ***rtd-ErrorCorrelationTime***This field specifies the correlation time of the inter-TRP synchronization error. The correlation time is calculated using:$$t=\left\{\begin{array}{c}10i, 1\leq \&i\leq 180\\1800+100(i-180), 180<\&i\leq 234 \\7200+1000\left(i-234\right), 234<i \end{array} [s]\right.$$Where *i* is the value given by *rtdErrorCorrelationTime*. Range is 1-28,200 s. |
| ***dl-PRS-BeamInfoErrorCorrelationTime***This field specifies the Beam Boresight Direction Angle Error Correlation Time which is the upper bound of the correlation time of the DL-PRS Resource angle error. The time is calculated using:$$t=\left\{\begin{array}{c}10i, \&i\leq 180\\1800+100(i-180), 180<\&i\leq 234 \\7200+1000\left(i-234\right), \&i>234\end{array} [s]\right.$$Range is 1-28,200 s. |
| ***trp-BeamAntennaInfoErrorCorrelationTime***This field specifies the Mean Beam Power Error Correlation Time which is the upper bound of the correlation time of the mean beam power error.The time is calculated using:$$t=\left\{\begin{array}{c}10i, \&i\leq 180\\1800+100(i-180), 180<\&i\leq 234 \\7200+1000\left(i-234\right), \&i>234\end{array} [s]\right.$$Range is 1-28,200 s. |
| ***nr-PRU-DL-Info***This field provides the measurement reported by a PRU to the target UE. |

#### – *NR-PRU-DL-Info*

The IE *NR-PRU-DL-Info* is used by the location server to provide the carrier phase measurements together with the associated other measurements reported by a PRU (e.g. RSTD) with additional information of this PRU to a target UE.

-- ASN1START

NR-PRU-DL-Info-r18 ::= SEQUENCE {

 nr-PRU-LocationInfo-r18 LocationCoordinates OPTIONAL, -- Need ON

 nr-PRU-DL-TDOA-MeasInfo-r18 NR-DL-TDOA-SignalMeasurementInformation-r16

 OPTIONAL, -- Need ON nr-PRU-DL-AoD-MeasInfo-r18 NR-DL-AoD-SignalMeasurementInformation-r16

 OPTIONAL, -- Need ON

 nr-PRU-RSCP-MeasInfo-r18 NR-PRU-RSCP-MeasurementInformation-r18

 OPTIONAL, -- Need ON

 ...

}

NR-PRU-RSCP-MeasurementInformation-r18 ::= SEQUENCE (SIZE(1..nrMaxTRPs-r16)) OF

 NR-PRU-RSCP-MeasElement-r18

NR-PRU-RSCP-MeasElement-r18 ::= SEQUENCE {

 dl-PRS-ID-r18 INTEGER (0..255),

 nr-PhysCellID-r18 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r18 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r18 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 nr-DL-PRS-ResourceID-r18 NR-DL-PRS-ResourceID-r16 OPTIONAL, -- Need ON

 nr-DL-PRS-ResourceSetID-r18 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, -- Need ON

 nr-TimeStamp-r18 NR-TimeStamp-r16,

 nr-los-nlos-Indicator-r18 CHOICE {

 perTRP-r17 LOS-NLOS-Indicator-r17,

 perResource-r17 LOS-NLOS-Indicator-r17

 } OPTIONAL, -- Need ON

 nr-RSCP-r18 INTEGER (0..3600) OPTIONAL, -- Need ON

 nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL, -- Need ON

 nr-PRU-RSCP-AddSampleMeasurements-r18 SEQUENCE (SIZE (1..nrNumOfSamples-1-r18 )) OF

 NR-RSCP-AdditionalMeasurements-r18 OPTIONAL, -- Need ON

 nr-PRU-RSCP-AdditionalMeasurements-r18

 NR-PRU-RSCP-AdditionalMeasurements-r18 OPTIONAL, -- Need ON

 ...

}

NR-PRU-RSCP-AdditionalMeasurements-r18 ::= SEQUENCE (SIZE (1..3)) OF

 NR-PRU-RSCP-AdditionalMeasurementElement-r18

NR-PRU-RSCP-AdditionalMeasurementElement-r18 ::= SEQUENCE {

 nr-DL-PRS-ResourceID-r18 NR-DL-PRS-ResourceID-r16 OPTIONAL, -- Need ON

 nr-DL-PRS-ResourceSetID-r18 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, -- Need ON

 nr-PRU-RSCP-AdditionalMeasurementsList-r18 SEQUENCE (SIZE (1..nrNumOfSamples-r18 )) OF

 NR-RSCP-AdditionalMeasurements-r18 OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

| *NR-PRU-DL-Info* field descriptions |
| --- |
| ***nr-PRU-LocationInfo***This field provides the location coordinates of the PRU. |
| ***nr-PRU-DL-TDOA-MeasInfo*** This field specifies the list of carrier phase measurement RSCPD together with the other measurement information in DL-TDOA by the PRU. |
| ***nr-PRU-DL-AoD-MeasInfo***This field specifies the list of other measurement information in DL-AoD by the PRU. |
| ***nr-PRU-RSCP-MeasInfo***This field specifies the list of carrier phase measurement RSCP measured by the PRU. |

#### – *NR-RTD-Info*

The IE *NR-RTD-Info* is used by the location server to provide time synchronization information between a reference TRP and a list of neighbour TRPs.

-- ASN1START

NR-RTD-Info-r16 ::= SEQUENCE {

 referenceTRP-RTD-Info-r16 ReferenceTRP-RTD-Info-r16,

 rtd-InfoList-r16 RTD-InfoList-r16,

 ...

}

ReferenceTRP-RTD-Info-r16 ::= SEQUENCE {

 dl-PRS-ID-Ref-r16 INTEGER (0..255),

 nr-PhysCellID-Ref-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-Ref-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-Ref-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 refTime-r16 CHOICE {

 systemFrameNumber-r16 BIT STRING (SIZE (10)),

 utc-r16 UTCTime,

 ...

 },

 rtd-RefQuality-r16 NR-TimingQuality-r16 OPTIONAL, -- Need ON

 ...

}

RTD-InfoList-r16 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF RTD-InfoListPerFreqLayer-r16

RTD-InfoListPerFreqLayer-r16 ::= SEQUENCE (SIZE(1..nrMaxTRPsPerFreq-r16)) OF RTD-InfoElement-r16

RTD-InfoElement-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 subframeOffset-r16 INTEGER (0..1966079),

 rtd-Quality-r16 NR-TimingQuality-r16,

 ...,

 [[

 integrityRTD-InfoBounds-r18 IntegrityRTD-InfoBounds-r18 OPTIONAL -- Need OR

 ]]

}

IntegrityRTD-InfoBounds-r18 ::= SEQUENCE {

 meanRTD-r18 INTEGER (0..255),

 stdDevRTD-r18 StdDevRTD-r18,

 ...

}

StdDevRTD-r18 ::= SEQUENCE {

 value-r18 INTEGER (0..31),

 resolution-r18 ENUMERATED {mdot1, m1, m10, m30, ...}

}

-- ASN1STOP

| *NR-RTD-Info* field descriptions |
| --- |
| ***referenceTRP-RTD-Info***This field defines the reference TRP for the RTD and comprises the following sub-fields:- ***dl-PRS-ID-Ref***: This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource, and is associated to the reference TRP.- ***nr-PhysCellId-Ref***: This field specifies the physical cell identity of the reference TRP.- ***nr-CellGlobalId-Ref***: This field specifies the NCGI, the globally unique identity of a cell in NR, of the reference TRP.- ***nr-ARFCN-Ref***: This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*.- ***refTime***: This field specifies the reference time at which the *rtd-InfoList* is valid. The *systemFrameNumber* choice refers to the SFN of the reference TRP.- ***rtd-RefQuality***: This field specifies the quality of the timing of reference TRP, used to determine the RTD values provided in *rtd-InfoList*. |
| ***dl-PRS-ID***This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource. This ID can be associated with multiple DL-PRS Resource Sets associated with a single TRP for which the *RTD-InfoElement* is applicable. |
| ***nr-PhysCellID***This field specifies the physical cell identity of the associated TRP for which the *RTD-InfoElement* is applicable, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP for which the *RTD-InfoElement* is applicable, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by *nr-PhysCellID*. |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID* for which the *RTD-InfoElement* is applicable. |
| ***subframeOffset***This field specifies the subframe boundary offset at the TRP antenna location between the reference TRP and this neighbour TRP in time units  where $Δf\_{max}=480∙10^{3}$ Hz and  (TS 38.211 [41]).The offset is counted from the beginning of a subframe #0 of the reference TRP to the beginning of the closest subsequent subframe of this neighbour TRP.Scale factor 1 Tc. |
| ***rtd-Quality***This field specifies the quality of the RTD. |
| ***IntegrityRTD-InfoBounds***This field specifies an overbounding model that bounds the inter-TRP synchronization error between reference TRP and this TRP. This field comprises the following sub-fields:- ***meanRTD***: This field specifies the mean value of the inter-TRP synchronization error bound of the overbounding model. The bound is *meanRTD* + K \* *stdDevRTD* and shall be so that the probability of it to be exceeded shall be lower than IRallocation for ir-Minimum < IRallocation < ir-Maximum, where K = normInv(IRallocation / 2) and ir-Minimum, ir-Maximum as provided in IE *NR-IntegrityServiceParameters*.This IRallocation is a fraction of the Target Integrity Risk that represents the integrity risk budget available. Default value is 0 if absent.- ***stdDevRTD***: This field specifies the standard deviation of the inter-TRP synchronization error bound of the overbounding model. The value field used in the *stdDevRTD* is provided in units of metres. The resolution is used in the value field of *stdDevRTD*. The enumerated values mdot1, m1, m10, m30 correspond to 0.1, 1, 10, 30 metres, respectively. |

*NEXT CHANGE*

#### *– NR-TimeStamp*

The IE *NR-TimeStamp* defines the UE measurement associated time stamp.

-- ASN1START

NR-TimeStamp-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 nr-SFN-r16 INTEGER (0..1023),

 nr-Slot-r16 CHOICE {

 scs15-r16 INTEGER (0..9),

 scs30-r16 INTEGER (0..19),

 scs60-r16 INTEGER (0..39),

 scs120-r16 INTEGER (0..79)

 },

 ...,

 [[

 nr-Symbol-r18 INTEGER (0..13) OPTIONAL -- Need OR

 ]]

}

-- ASN1STOP

| *NR-TimeStamp* field descriptions |
| --- |
| ***dl-PRS-ID***This field specifies the DL-PRS ID of the TRP for which the *nr-SFN* is applicable. |
| ***nr-PhysCellID***This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35].  |
| ***nr-ARFCN***This field specifies the ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID* associated with the *dl-PRS-ID*. |
| ***nr-SFN***This field specifies the NR system frame number for the time stamp. |
| ***nr-Slot***This field specifies the NR slot number within the NR system frame number indicated by *nr-SFN* for the time stamp. |
| ***nr-Symbol***This field specifies the NR symbol index within the NR slot number indicated by *nr-Slot* for the time stamp for RSCP/RSCPD measurement. |

*NEXT CHANGE*

#### – *NR-TRP-BeamAntennaInfo*

The IE *NR-TRP-BeamAntennaInfo* is used by the location server to provide beam antenna information of the TRP together with integrity information.

-- ASN1START

NR-TRP-BeamAntennaInfo-r17 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-TRP-BeamAntennaInfoPerFreqLayer-r17

NR-TRP-BeamAntennaInfoPerFreqLayer-r17 ::= SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 NR-TRP-BeamAntennaInfoPerTRP-r17

NR-TRP-BeamAntennaInfoPerTRP-r17 ::= SEQUENCE {

 dl-PRS-ID-r17 INTEGER (0..255),

 nr-PhysCellID-r17 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r17 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r17 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 associated-DL-PRS-ID-r17 INTEGER (0..255) OPTIONAL, -- Need OP

 lcs-GCS-TranslationParameter-r17 LCS-GCS-TranslationParameter-r16 OPTIONAL, -- Need OP

 nr-TRP-BeamAntennaAngles-r17 NR-TRP-BeamAntennaAngles-r17 OPTIONAL, -- Need OP

 ...

}

NR-TRP-BeamAntennaAngles-r17 ::= SEQUENCE (SIZE(1..3600)) OF

 NR-TRP-BeamAntennaInfoAzimuthElevation-r17

NR-TRP-BeamAntennaInfoAzimuthElevation-r17 ::= SEQUENCE {

 azimuth-r17 INTEGER (0..359) OPTIONAL, -- Cond Az

 azimuth-fine-r17 INTEGER (0..9) OPTIONAL, -- Cond AzOpt

 elevationList-r17 SEQUENCE (SIZE(1..1801)) OF ElevationElement-R17,

 ...

}

ElevationElement-R17 ::= SEQUENCE {

 elevation-r17 INTEGER (0..180) OPTIONAL, -- Cond El

 elevation-fine-r17 INTEGER (0..9) OPTIONAL, -- Cond ElOpt

 beamPowerList-r17 SEQUENCE (SIZE (2..maxNumResourcesPerAngle-r17)) OF

 BeamPowerElement-r17,

 ...

}

BeamPowerElement-r17 ::= SEQUENCE {

 nr-dl-prs-ResourceSetID-r17 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, -- Need OP

 nr-dl-prs-ResourceID-r17 NR-DL-PRS-ResourceID-r16,

 nr-dl-prs-RelativePower-r17 INTEGER (0..30),

 nr-dl-prs-RelativePowerFine-r17 INTEGER (0..9) OPTIONAL, -- Need ON

 ...,

 [[

 integrityBeamPowerBounds-r18 IntegrityBeamPowerBounds-r18 OPTIONAL -- Need OP

 ]]

}

IntegrityBeamPowerBounds-r18 ::= SEQUENCE {

 meanBeamPower-r18 INTEGER (0..128),

 stdDevBeamPower-r18 INTEGER (0..128),

 ...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *Az* | The field is mandatory present if the field *elevation* is absent; otherwise it is optionally present, need ON. |
| *AzOpt* | The field is optionally present, need ON, when *azimuth* is present; otherwise it is not present. |
| *El* | The field is mandatory present if the field *azimuth* is absent; otherwise it is optionally present, need ON. |
| *ElOpt* | The field is optionally present, need ON, when *elevation* is present; otherwise it is not present. |

| *NR-TRP-BeamAntennaInfo* field descriptions |
| --- |
| ***dl-PRS-ID***This field specifies the DL-PRS ID of the TRP for which the Beam Antenna Information is provided. |
| ***nr-PhysCellID***This field specifies the physical Cell-ID of the TRP for which the Beam Antenna Information is provided, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the TRP for which the Beam Antenna Information is provided, as defined in TS 38.331 [35].  |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*. |
| ***associated-DL-PRS-ID***This field specifies the *dl-PRS-ID* of the associated TRP from which the beam antenna information is obtained. See the field descriptions for *nr-TRP-BeamAntennaAngles* and *lcs-GCS-TranslationParameter*. |
| ***lcs-GCS-TranslationParameter***This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [44]. If this field and the *associated-DL-PRS-ID* field are both absent, the *azimuth* and *elevation* are provided in a GCS. If this field is absent and the *associated-DL-PRS-ID* field is present, then the *lcs-GCS-TranslationParameter* for this TRP is obtained from the *lcs-GCS-TranslationParameter* of the associated TRP. |
| ***nr-TRP-BeamAntennaAngles***This field provides the relative power between DL-PRS Resources per angle per TRP. If this field is absent and the field *associated-DL-PRS-ID* is present, the *nr-TRP-BeamAntennaAngles* for this TRP are obtained from the *nr-TRP-BeamAntennaAngles* of the associated TRP. |
| ***Azimuth***This field specifies the azimuth angle for which the relative power between DL-PRS Resources is provided.For a Global Coordinate System (GCS), the azimuth angle is measured counter-clockwise from geographical North.For a Local Coordinate System (LCS), the azimuth angle is measured counter-clockwise from the x-axis of the LCS.Scale factor 1 degree; range 0 to 359 degrees. |
| ***azimuth-fine***This field provides finer granularity for the *azimuth*.The total azimuth angle is given by *azimuth* + *azimuth-fine.*Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***Elevation***This field specifies the elevation angle for which the relative power between DL-PRS Resources is provided for the given *azimuth*.For a Global Coordinate System (GCS), the elevation angle is measured relative to zenith and positive to the horizontal direction (elevation 0 deg. points to zenith, 90 deg to the horizon).For a Local Coordinate System (LCS), the elevation angle is measured relative to the z-axis of the LCS (elevation 0 deg. points to the z-axis, 90 deg to the x-y plane).Scale factor 1 degree; range 0 to 180 degrees. |
| ***elevation-fine***This field provides finer granularity for the *elevation*.The total elevation angle is given by *elevation* + *elevation-fine.*Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***beamPowerList***This field provides the relative power between DL-PRS Resources for the angle given by *azimuth* and *elevation*.The first *BeamPowerElement* in this list provides the peak power for this angle and is defined as 0dB power; i.e., the first value is set to '0' by the location server. All the remaining *BeamPowerElement*'s in this list provide the relative DL-PRS Resource power relative to this first element in the list. |
| ***nr-dl-prs-ResourceSetID***This field specifies the DL-PRS Resource Set ID of the DL-PRS Resource for which the *nr-dl-prs-RelativePower* is provided. If this field is absent, the DL-PRS Resource Set ID for this instance of the *beamPowerList* is the same as the DL-PRS Resource Set ID of the previous instance in the *beamPowerList*. This field shall be included at least in the first instance of the *beamPowerList*. |
| ***nr-dl-prs-ResourceID***This field specifies the DL-PRS Resource for which the *nr-dl-prs-RelativePower* is provided. |
| ***nr-dl-prs-RelativePower***Except for the first element in *beamPowerList*, this field provides the relative power of the DL-PRS Resource, relative to the first element in the *beamPowerList*.For the first element in *beamPowerList*, this field provides the peak power for this angle normalised to 0 dB.Scale factor 1 dB; range 0..30 dB. |
| ***nr-dl-prs-RelativePowerFine***This field provides finer granularity for the *nr-dl-prs-RelativePower*.The total relative power of the DL-PRS Resource is given by *nr-dl-prs-RelativePower* + *nr-dl-prs-RelativePowerFine.*Scale factor 0.1 dB; range 0 to 0.9 dB.NOTE: For the first element in *beamPowerList*, this field is not needed. |
| ***integrityBeamPowerBounds***This field specifies the mean and the Standard Deviation beam power error bound for an overbounding model that bounds the beam power error. If this field is absent, the *integrityBeamInfoBounds* for this instance of the *beamPowerList* is the same as *integrityBeamInfoBounds* of the previous instance in the *beamPowerList*. If integrity bounds are provided, this field shall be included at least in the first instance of the *beamPowerList*. |
| ***meanBeamPower***This field specifies the Mean Beam Power Error bound which is the mean value for an overbounding model that bounds the beam power error of the DL-PRS Resources.The bound is *meanBeamPower* + K \* *stdDevBeamPower* and shall be so that the probability of it to be exceeded shall be lower than IRallocation for *ir-Minimum* < IRallocation < *ir-Maximum*, where K = normInv(IRallocation / 2) and *ir-Minimum*, *irMaximum* as provided in IE *NR-Integrity-ServiceParameters*.This IRallocation is a fraction of the Target Integrity Risk that represents the integrity risk budget available.Scale factor 0.1 dB; range 0-12.8 dB. |
| ***stdDevBeamPower***This field specifies the Standard Deviation Beam Power Error bound which is the standard deviation for an overbounding model that bounds the beam power error of the DL-PRS Resources.Scale factor 0.1 degrees; range 0-12.8 dB. |

*NEXT CHANGE*

#### *–* *NR-TRP-LocationInfo*

The IE *NR-TRP-LocationInfo* is used by the location server to provide the coordinates of the antenna reference points for a set of TRPs. For each TRP, the ARP location can be provided for each associated PRS Resource ID per PRS Resource Set.

-- ASN1START

NR-TRP-LocationInfo-r16 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-TRP-LocationInfoPerFreqLayer-r16

NR-TRP-LocationInfoPerFreqLayer-r16 ::= SEQUENCE {

 referencePoint-r16 ReferencePoint-r16 OPTIONAL, -- Cond NotSameAsPrev

 trp-LocationInfoList-r16 SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 TRP-LocationInfoElement-r16,

 ...

}

TRP-LocationInfoElement-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 associated-DL-PRS-ID-r16 INTEGER (0..255) OPTIONAL, -- Need OP

 trp-Location-r16 RelativeLocation-r16 OPTIONAL, -- Need OP

 trp-DL-PRS-ResourceSets-r16 SEQUENCE (SIZE(1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF

 DL-PRS-ResourceSets-TRP-Element-r16 OPTIONAL, -- Need OP

 ...,

 [[

 integrityTRP-LocationBounds-r18 IntegrityLocationBounds-r18 OPTIONAL -- Need OR

 ]]

}

DL-PRS-ResourceSets-TRP-Element-r16 ::= SEQUENCE {

 dl-PRS-ResourceSetARP-r16 RelativeLocation-r16 OPTIONAL, -- Need OP

 dl-PRS-Resource-ARP-List-r16 SEQUENCE (SIZE(1..nrMaxResourcesPerSet-r16)) OF

 DL-PRS-Resource-ARP-Element-r16 OPTIONAL, -- Need OP

 ...,

 [[

 integrityDL-PRS-ResourceSetARP-LocationBounds-r18

 IntegrityLocationBounds-r18 OPTIONAL -- Need OR

 ]]

}

DL-PRS-Resource-ARP-Element-r16 ::= SEQUENCE {

 dl-PRS-Resource-ARP-location-r16 RelativeLocation-r16 OPTIONAL, -- Need OP

 ...,

 [[

 integrityDL-PRS-ResourceARP-LocationBounds-r18

 IntegrityLocationBounds-r18 OPTIONAL -- Need OR

 ]]

}

IntegrityLocationBounds-r18 ::= SEQUENCE {

 meanLatitude-r18 INTEGER (0..255),

 meanLongitude-r18 INTEGER (0..255),

 meanheight-r18 INTEGER (0..255),

 stdDevLatitude-r18 INTEGER (0..255),

 stdDevLongitude-r18 INTEGER (0..255),

 stdDevheight-r18 INTEGER (0..255),

 ...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *NotSameAsPrev* | The field is mandatory present in the first entry of the *NR-TRP-LocationInfoPerFreqLayer* list; otherwise it is optionally present, need OP. |

| *NR-TRP-LocationInfo* field descriptions |
| --- |
| ***referencePoint***This field specifies the reference point used to define the TRP location in the *trp-LocationInfoList*. If this field is absent, the reference point is the same as in the previous entry of the *NR-TRP-LocationInfoPerFreqLayer* list. |
| ***trp-LocationInfoList***This field provides the antenna reference point locations of the DL-PRS Resources for the TRPs and comprises the following sub-fields:- ***dl-PRS-ID***: This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource, and is associated to a single TRP.- ***nr-PhysCellID***: This field specifies the physical cell identity of the associated TRP.- ***nr-CellGlobalID***: This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP.- ***nr-ARFCN***: This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*.- ***associated-DL-PRS-ID***: This field, if present, specifies the *dl-PRS-ID* of the associated TRP from which the *trp-location* information is adopted. If the field is present, the field *trp-Location* shall be absent.- ***trp-Location***: This field provides the location of the TRP relative to the *referencePoint* location. If this field is absent the TRP location coincides with the *referencePoint* location, unless the field *associated-dl-PRS-ID*is present, in which case the *trp-Location* is adopted from the associated TRP indicated by *associated-dl-PRS-ID*.- ***trp-DL-PRS-ResourceSets***: This field provides the antenna reference point location(s) of the DL-PRS Resource Set(s) associated with this TRP. If this field is absent, the antenna reference point location(s) of the DL-PRS Resource Set(s) coincides with the *trp-Location* location. This field comprises the following sub-fields:- ***dl-PRS-ResourceSetARP***: This field provides the antenna reference point location of the DL-PRS Resource Set relative to the *trp-Location* location. If this field is absent, the antenna reference point location of this DL-PRS Resource Set coincides with the *trp-Location* location.- ***integrityDL-PRS-ResourceSetARP-LocationBounds***: This field specifies the mean and the Standard Deviation location error bound for an overbounding model that bounds the antenna reference point location error of the DL-PRS Resource Set.- ***dl-PRS-Resource-ARP-List***: This field provides the antenna reference point location(s) of the DL-PRS Resource(s) associated with this Resource Set of the TRP. If this field is absent, the antenna reference point location(s) of the DL-PRS Resources coincides with the *dl-PRS-ResourceSetARP* location. This field comprises the following sub-fields:- ***dl-PRS-Resource-ARP-location***: This field provides the antenna reference point location of the DL-PRS Resource associated with the DL-PRS Resource Set of the TRP relative to the *dl-PRS-ResourceSetARP* location. If this field is absent, the antenna reference point location of this DL-PRS Resource coincides with the *dl-PRS-ResourceSetARP* location.- ***integrityDL-PRS-ResourceARP-LocationBounds***: This field specifies the mean and the Standard Deviation location error bound for an overbounding model that bounds the antenna reference point location error of the DL-PRS Resource associated with the DL-PRS Resource Set of the TRP. - ***integrityTRP-LocationBounds***: This field specifies the mean and the Standard Deviation TRP location error bound for an overbounding model that bounds the TRP location error. |
| ***IntegrityLocationBounds***This field specifies the mean and the standard deviation of the location error bound of the overbounding model that bounds the location error, and comprises the following sub-fields:***- meanLatitude, meanLongitude, meanheight***: This field specifies the location error bound in Latitude, Longitude, height, which are the mean value for an overbounding model that bounds the corresponding Latitude, Longitude, height error of the referece point locaiton. The bound is mean + K \* stdDev and shall be so that the probability of it to be exceeded shall be lower than IRallocation for *ir-Minimum* < IRallocation < *ir-Maximum*, where K = normInv(IRallocation / 2) and *ir-Minimum*, *ir-Maximum* as provided in IE *NR-Integrity-ServiceParameters*.This IRallocation is a fraction of the Target Integrity Risk that represents the integrity risk budget available. Scale factor 0.1 degrees; range 0-25.5 degrees.***- stdDevLatitude, stdDevLongitude, stdDevheight***:This field specifies the Standard Deviation Location Error bound in Latitude, Longitude, height, which are the standard deviation values for the overbounding model that bounds the location of the reference point error in Latitude, Longitude, height. Scale factor 0.1 degrees; range 0-25.5 degrees.If integrity bounds are provided, the field shall be present at least in the first entry of the *NR-TRP-LocationInfoPerFreqLayer* list. |

*NEXT CHANGE*

#### *– NR-UL-SRS-Capability*

The IE *NR-UL-SRS-Capability* defines the UE uplink SRS capability.

-- ASN1START

NR-UL-SRS-Capability-r16 ::= SEQUENCE {

 srs-CapabilityBandList-r16 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

 SRS-CapabilityPerBand-r16,

 srs-PosResourceConfigCA-BandList-r16 SEQUENCE (SIZE (1..nrMaxConfiguredBands-r16)) OF

 SRS-PosResourcesPerBand-r16 OPTIONAL,

 maxNumberSRS-PosPathLossEstimateAllServingCells-r16

 ENUMERATED {n1, n4, n8, n16} OPTIONAL,

 maxNumberSRS-PosSpatialRelationsAllServingCells-r16

 ENUMERATED {n0, n1, n2, n4, n8, n16} OPTIONAL,

 ...

}

SRS-CapabilityPerBand-r16 ::= SEQUENCE {

 freqBandIndicatorNR-r16 FreqBandIndicatorNR-r16,

 olpc-SRS-Pos-r16 OLPC-SRS-Pos-r16 OPTIONAL,

 spatialRelationsSRS-Pos-r16 SpatialRelationsSRS-Pos-r16 OPTIONAL,

 ...,

 [[

 posSRS-RRC-Inactive-InInitialUL-BWP-r17 PosSRS-RRC-Inactive-InInitialUL-BWP-r17 OPTIONAL,

 posSRS-RRC-Inactive-OutsideInitialUL-BWP-r17

 PosSRS-RRC-Inactive-OutsideInitialUL-BWP-r17

 OPTIONAL,

 olpc-SRS-PosRRC-Inactive-r17 OLPC-SRS-Pos-r16 OPTIONAL,

 spatialRelationsSRS-PosRRC-Inactive-r17 SpatialRelationsSRS-Pos-r16 OPTIONAL

 ]],

 [[

 posSRS-SP-RRC-Inactive-InInitialUL-BWP-r17 PosSRS-SP-RRC-Inactive-InInitialUL-BWP-r17

 OPTIONAL

 ]],

 [[

 posSRS-RRC-InactiveInitialUL-BWP-r18 ENUMERATED {supported} OPTIONAL,

 posSRS-RRC-InactiveOutsideInitialUL-BWP-r18 ENUMERATED {supported} OPTIONAL

 ]]

}

OLPC-SRS-Pos-r16 ::= SEQUENCE {

 olpc-SRS-PosBasedOnPRS-Serving-r16 ENUMERATED {supported} OPTIONAL,

 olpc-SRS-PosBasedOnSSB-Neigh-r16 ENUMERATED {supported} OPTIONAL,

 olpc-SRS-PosBasedOnPRS-Neigh-r16 ENUMERATED {supported} OPTIONAL,

 maxNumberPathLossEstimatePerServing-r16 ENUMERATED {n1, n4, n8, n16} OPTIONAL,

 ...

}

SpatialRelationsSRS-Pos-r16 ::= SEQUENCE {

 spatialRelation-SRS-PosBasedOnSSB-Serving-r16 ENUMERATED {supported} OPTIONAL,

 spatialRelation-SRS-PosBasedOnCSI-RS-Serving-r16 ENUMERATED {supported} OPTIONAL,

 spatialRelation-SRS-PosBasedOnPRS-Serving-r16 ENUMERATED {supported} OPTIONAL,

 spatialRelation-SRS-PosBasedOnSRS-r16 ENUMERATED {supported} OPTIONAL,

 spatialRelation-SRS-PosBasedOnSSB-Neigh-r16 ENUMERATED {supported} OPTIONAL,

 spatialRelation-SRS-PosBasedOnPRS-Neigh-r16 ENUMERATED {supported} OPTIONAL,

 ...

}

SRS-PosResourcesPerBand-r16 ::= SEQUENCE {

 freqBandIndicatorNR-r16 FreqBandIndicatorNR-r16,

 maxNumberSRS-PosResourceSetsPerBWP-r16 ENUMERATED {n1, n2, n4, n8, n12, n16},

 maxNumberSRS-PosResourcesPerBWP-r16 ENUMERATED {n1, n2, n4, n8, n16, n32, n64},

 maxNumberPeriodicSRS-PosResourcesPerBWP-r16 ENUMERATED {n1, n2, n4, n8, n16, n32, n64},

 maxNumberAP-SRS-PosResourcesPerBWP-r16 ENUMERATED {n1, n2, n4, n8, n16, n32, n64}

 OPTIONAL,

 maxNumberSP-SRS-PosResourcesPerBWP-r16 ENUMERATED {n1, n2, n4, n8, n16, n32, n64}

 OPTIONAL,

 ...

}

PosSRS-RRC-Inactive-InInitialUL-BWP-r17 ::= SEQUENCE {

 maxNumOfSRSposResourceSets-r17 ENUMERATED {n1, n2, n4, n8, n12, n16 } OPTIONAL,

 maxNumOfPeriodicAndSemiPersistentSRSposResources-r17

 ENUMERATED {n1, n2, n4, n8, n16, n32, n64 }

 OPTIONAL,

 maxNumOfPeriodicAndSemiPersistentSRSposResourcesPerSlot-r17

 ENUMERATED {n1, n2, n3, n4, n5, n6, n8, n10, n12, n14}

 OPTIONAL,

 maxNumOfPeriodicSRSposResources-r17

 ENUMERATED {n1, n2, n4, n8, n16, n32, n64 }

 OPTIONAL,

 maxNumOfPeriodicSRSposResourcesPerSlot-r17

 ENUMERATED {n1, n2, n3, n4, n5, n6, n8, n10, n12, n14}

 OPTIONAL,

 dummy1 ENUMERATED {n1, n2, n4, n8, n16, n32, n64} OPTIONAL,

 dummy2 ENUMERATED { n1, n2, n3, n4, n5, n6, n8, n10, n12, n14 }

 OPTIONAL,

 ...

}

PosSRS-RRC-Inactive-OutsideInitialUL-BWP-r17 ::= SEQUENCE {

 maxSRSposBandwidthForEachSCS-withinCC-FR1-r17

 ENUMERATED { mhz5, mhz10, mhz15, mhz20, mhz25, mhz30,
 mhz35, mhz40, mhz45, mhz50, mhz60, mhz70,

 mhz80, mhz90, mhz100 } OPTIONAL,

 maxSRSposBandwidthForEachSCS-withinCC-FR2-r17

 ENUMERATED {mhz50, mhz100, mhz200, mhz400} OPTIONAL,

 maxNumOfSRSposResourceSets-r17 ENUMERATED { n1, n2, n4, n8, n12, n16 } OPTIONAL,

 maxNumOfPeriodicSRSposResources-r17 ENUMERATED { n1, n2, n4, n8, n16, n32, n64 }

 OPTIONAL,

 maxNumOfPeriodicSRSposResourcesPerSlot-r17

 ENUMERATED { n1, n2, n3, n4, n5, n6, n8, n10, n12, n14 }

 OPTIONAL,

 differentNumerologyBetweenSRSposAndInitialBWP-r17

 ENUMERATED { supported } OPTIONAL,

 srsPosWithoutRestrictionOnBWP-r17

 ENUMERATED { supported } OPTIONAL,

 maxNumOfPeriodicAndSemiPersistentSRSposResources-r17

 ENUMERATED {n1, n2, n4, n8, n16, n32, n64} OPTIONAL,

 maxNumOfPeriodicAndSemiPersistentSRSposResourcesPerSlot-r17

 ENUMERATED { n1, n2, n3, n4, n5, n6, n8, n10,

 n12, n14 } OPTIONAL,

 differentCenterFreqBetweenSRSposAndInitialBWP-r17

 ENUMERATED { supported } OPTIONAL,

 maxNumOfSemiPersistentSRSposResources-r17

 ENUMERATED { n1, n2, n4, n8, n16, n32, n64 }

 OPTIONAL,

 maxNumOfSemiPersistentSRSposResourcesPerSlot-r17

 ENUMERATED { n1, n2, n3, n4, n5, n6, n8, n10,

 n12, n14 } OPTIONAL,

 switchingTimeSRS-TX-OtherTX-r17 ENUMERATED { us100, us140, us200, us300, us500 }

 OPTIONAL,

 ...

}

PosSRS-SP-RRC-Inactive-InInitialUL-BWP-r17 ::= SEQUENCE {

 maxNumOfSemiPersistentSRSposResources-r17

 ENUMERATED {n1, n2, n4, n8, n16, n32, n64} OPTIONAL,

 maxNumOfSemiPersistentSRSposResourcesPerSlot-r17

 ENUMERATED {n1, n2, n3, n4, n5, n6, n8, n10, n12, n14}

 OPTIONAL,

 ...

}

-- ASN1STOP

|  |
| --- |
| *NR-UL-SRS-Capability* field descriptions |
| ***srs-PosResourceConfigCA-BandList***This field indicates the number of SRS for positioning resources supported by the target device. The target device includes this field for each band which belongs to the *srs-CapabilityBandList* for the current configured CA band combination. The capability signalling comprises the following parameters:- ***freqBandIndicatorNR***indicates the current configured NR band of the target device.- ***maxNumberSRS-PosResourceSetsPerBWP***indicates the maximum number of SRS Resource Sets for positioning supported by the target device per BWP. Enumerated values *n1*, *n2*, *n4*, *n8*, *n12*, *n16* correspond to 1, 2, 4, 8, 12, 16 SRS Resource Sets for positioning, respectively.- ***maxNumberSRS-PosResourcesPerBWP***indicates the maximum number of periodic, semi-persistent, and aperiodic SRS Resources for positioning supported by the target device per BWP. Enumerated values *n1, n2, n4, n8, n16, n32, n64* correspond to 1, 2, 4, 8, 16, 32, 64 SRS Resources for positioning, respectively.- ***maxNumberPeriodicSRS-PosResourcesPerBWP***indicates the maximum number of periodic SRS Resources for positioning supported by the target device per BWP. Enumerated values *n1, n2, n4, n8, n16, n32, n64* correspond to 1, 2, 4, 8, 16, 32, 64 periodic SRS Resources for positioning, respectively.- ***maxNumberAP-SRS-PosResourcesPerBWP***indicates the maximum number of aperiodic SRS Resources for positioning supported by the target device per BWP. Enumerated values *n1, n2, n4, n8, n16, n32, n64* correspond to 1, 2, 4, 8, 16, 32, 64 aperiodic SRS Resources for positioning, respectively.- ***maxNumberSP-SRS-PosResourcesPerBWP***indicates the maximum number of semi-persistent SRS Resources for positioning supported by the target device per BWP. Enumerated values *n1, n2, n4, n8, n16, n32, n64* correspond to 1, 2, 4, 8, 16, 32, 64 semi-persistent SRS Resources for positioning, respectively. |
| ***maxNumberSRS-PosPathLossEstimateAllServingCells***Indicates the maximum number of pathloss estimates that the UE can simultaneously maintain for all the SRS resource sets for positioning across all cells in addition to the up to four pathloss estimates that the UE maintains per serving cell for the PUSCH/PUCCH/SRS transmissions. The UE shall include this field if the UE supports any of *olpc-SRS-PosBasedOnPRS-Serving, olpc-SRS-PosBasedOnSSB-Neigh* and *olpc-SRS-PosBasedOnPRS-Neigh.* Otherwise, the UE does not include this field. |
| ***maxNumberSRS-PosSpatialRelationsAllServingCells***indicates the maximum number of maintained spatial relations for all the SRS resource sets for positioning across all serving cells in addition to the spatial relations maintained spatial relations per serving cell for the PUSCH/PUCCH/SRS transmissions. It is only applied for FR2. The UE can include this field only if the UE supports any of *spatialRelation-SRS-PosBasedOnSSB-Serving*, *spatialRelation-SRS-PosBasedOnCSI-RS-Serving*, *spatialRelation-SRS-PosBasedOnPRS-Serving*, *spatialRelation-SRS-PosBasedOnSSB-Neigh* or *spatialRelation-SRS-PosBasedOnPRS-Neigh*. Otherwise, the UE does not include this field. |
| ***olpc-SRS-Pos***Indicates whether the UE supports open-loop power control for SRS for positioning. The capability signalling comprises the following parameters:- ***olpc-SRS-PosBasedOnPRS-Serving***indicates whether the UE supports OLPC for SRS for positioning based on PRS from the serving cell in the same band. The UE can include this field only if the UE supports NR-DL-*PRS-ProcessingCapability* and *srs-PosResources* TS38.331 [35] Otherwise, the UE does not include this field.- ***olpc-SRS-PosBasedOnSSB-Neigh***indicates whether the UE supports OLPC for SRS for positioning based on SSB from the neighbouring cell in the same band. The UE can include this field only if the UE supports *srs-PosResources* TS 38.331 [35]. Otherwise, the UE does not include this field.- ***olpc-SRS-PosBasedOnPRS-Neigh***indicates whether the UE supports OLPC for SRS for positioning based on PRS from the neighbouring cell in the same band. The UE can include this field only if the UE supports *olpc-SRS-PosBasedOnPRS-Serving*. Otherwise, the UE does not include this field.Note: A PRS from a PRS-only TP is treated as PRS from a non-serving cell.- ***maxNumberPathLossEstimatePerServing***indicates the maximum number of pathloss estimates that the UE can simultaneously maintain for all the SRS resource sets for positioning per serving cell in addition to the up to four pathloss estimates that the UE maintains per serving cell for the PUSCH/PUCCH/SRS transmissions. The UE shall include this field if the UE supports any of *olpc-SRS-PosBasedOnPRS-Serving, olpc-SRS-PosBasedOnSSB-Neigh* and *olpc-SRS-PosBasedOnPRS-Neigh.* Otherwise, the UE does not include this field. |
| ***spatialRelationsSRS-Pos***Indicates whether the UE supports spatial relations for SRS for positioning. It is only applicable for FR2. The capability signalling comprises the following parameters:- ***spatialRelation-SRS-PosBasedOnSSB-Serving*** indicates whether the UE supports spatial relation for SRS for positioning based on SSB from the serving cell in the same band. The UE can include this field only if the UE supports *srs-PosResources* TS 38.331 [35]. Otherwise, the UE does not include this field.- ***spatialRelation-SRS-PosBasedOnCSI-RS-Serving*** indicates whether the UE supports spatial relation for SRS for positioning based on CSI-RS from the serving cell in the same band. The UE can include this field only if the UE supports *spatialRelation-SRS-PosBasedOnSSB-Serving*. Otherwise, the UE does not include this field.- ***spatialRelation-SRS-PosBasedOnPRS-Serving***indicates whether the UE supports spatial relation for SRS for positioning based on PRS from the serving cell in the same band. The UE can include this field only if the UE supports any of DL-PRS Resources for DL-AoD, DL-PRS Resources for DL-TDOA or DL-PRS Resources for Multi-RTT, or *srs-PosResources* TS 38.331 [35]. Otherwise, the UE does not include this field.- ***spatialRelation-SRS-PosBasedOnSRS***indicates whether the UE supports spatial relation for SRS for positioning based on SRS in the same band. The UE can include this field only if the UE supports *srs-PosResources* TS 38.331 [35]. Otherwise, the UE does not include this field.- ***spatialRelation-SRS-PosBasedOnSSB-Neig****h* indicates whether the UE supports spatial relation for SRS for positioning based on SSB from the neighbouring cell in the same band. The UE can include this field only if the UE supports *spatialRelation-SRS-PosBasedOnSSB-Serving*. Otherwise, the UE does not include this field.- ***spatialRelation-SRS-PosBasedOnPRS-Neigh***indicates whether the UE supports spatial relation for SRS for positioning based on PRS from the neighbouring cell in the same band. The UE can include this field only if the UE supports *spatialRelation-SRS-PosBasedOnPRS-Serving*. Otherwise, the UE does not include this field.Note: A PRS from a PRS-only TP is treated as PRS from a non-serving cell. |
| ***posSRS-RRC-Inactive-InInitialUL-BWP***Indicates whether the UE supports positioning SRS transmission in RRC\_INACTIVE state for initial UL BWP. The capability signalling comprises the following parameters:- ***maxNumOfSRSposResourceSets*** indicates the maximum number of SRS Resource Sets for positioning supported by the UE.- ***maxNumOfPeriodicAndSemiPersistentSRSposResources*** indicates the maximum number of periodic and semi-persistent SRS Resources for positioning supported by the UE.- ***maxNumOfPeriodicAndSemiPersistentSRSposResourcesPerSlot***indicates the maximum number of periodic and semi-persistent SRS Resources for positioning per slot supported by the UE.- ***maxNumOfPeriodicSRSposResources***indicates the maximum number of periodic SRS Resources for positioning supported by the UE.- ***maxNumOfPeriodicSRSposResourcesPerSlot***indicates the maximum number of periodic SRS Resources for positioning per slot supported by the UE.- ***dummy1, dummy2***are not used in the specification. If received they shall be ignored by the receiver. |
| ***posSRS-RRC-Inactive-OutsideInitialUL-BWP***Indicates whether the UE supports positioning SRS transmission in RRC\_INACTIVE state outside initial UL BWP. The UE can include this field only if the UE supports *posSRS-RRC-Inactive-InInitialUL-BWP*. Otherwise, the UE does not include this field. The capability signalling comprises the following parameters:- ***maxSRSposBandwidthForEachSCS-withinCC-FR1*** indicates the maximum SRS bandwidth in MHz supported for each SCS that UE supports within a single CC for FR1.- ***maxSRSposBandwidthForEachSCS-withinCC-FR2*** indicates the maximum SRS bandwidth in MHz supported for each SCS that UE supports within a single CC for FR2.- ***maxNumOfSRSposResourceSets*** indicates the maximum number of SRS Resource Sets for positioning supported by the UE.- ***maxNumOfPeriodicSRSposResources***indicates the maximum number of periodic SRS Resources for positioning supported by the UE.- ***maxNumOfPeriodicSRSposResourcesPerSlot***indicates the maximum number of periodic SRS Resources for positioning per slot supported by the UE.- ***differentNumerologyBetweenSRSposAndInitialBWP***indicates whether different numerology between the SRS and the initial UL BWP is supported by the UE. If the field is absent, the UE only supports same numerology between the SRS and the initial UL BWP.- ***srsPosWithoutRestrictionOnBWP*** indicates whether SRS operation without restriction on the BW is supported by the UE; BW of the SRS may not include BW of the CORESET#0 and SSB. If the field is absent, the UE supports only SRS BW that includes the BW of the CORESET #0 and SSB.- ***maxNumOfPeriodicAndSemiPersistentSRSposResources*** indicates the maximum number of periodic and semi-persistent SRS Resources for positioning supported by the UE.- ***maxNumOfPeriodicAndSemiPersistentSRSposResourcesPerSlot*** indicates the maximum number of periodic and semi-persistent SRS Resources for positioning per slot supported by the UE.- ***differentCenterFreqBetweenSRSposAndInitialBWP*** indicates whether different center frequency between the SRS for positioning and the initial UL BWP is supported by the UE. If the field is absent, the UE only supports same center frequency between the SRS for positioning and initial UL BWP.- ***maxNumOfSemiPersistentSRSposResources***indicates the maximum number of semi-persistent SRS Resources for positioning supported by the UE. The UE can include this field only if the UE supports *posSRS-RRC-Inactive-InInitialUL-BWP*. Otherwise, the UE does not include this field.- ***maxNumOfSemiPersistentSRSposResourcesPerSlot***indicates the maximum number of semi-persistent SRS Resources for positioning per slot supported by the UE. The UE can include this field only if the UE supports *posSRS-RRC-Inactive-InInitialUL-BWP*. Otherwise, the UE does not include this field.- ***switchingTimeSRS-TX-OtherTX*** indicates the switching time between SRS Tx and other Tx in initial UL BWP or Rx in initial DL BWP. |
| ***olpc-SRS-PosRRC-Inactive***Indicates whether the UE supports open-loop power control for SRS for positioning in RRC\_INACTIVE state. The UE can include this field only if the UE supports *posSRS-RRC-Inactive-InInitialUL-BWP*. Otherwise, the UE does not include this field. |
| ***spatialRelationsSRS-PosRRC-Inactive***Indicates whether the UE supports spatial relations for SRS for positioning in RRC\_INACTIVE state on FR2. The UE can include this field only if the UE supports *posSRS-RRC-Inactive-InInitialUL-BWP*. Otherwise, the UE does not include this field. |
| ***posSRS-SP-RRC-Inactive-InInitialUL-BWP***Indicates whether the UE supports positioning SRS transmission in RRC\_INACTIVE state for initial UL BWP with semi-persistent SRS. The UE can include this field only if the UE supports *posSRS-RRC-Inactive-InInitialUL-BWP*. Otherwise, the UE does not include this field. The capability signalling comprises the following parameters:- ***maxNumOfSemiPersistentSRSposResources*** indicates the maximum number of semi-persistent SRS Resources for positioning supported by the UE.- ***maxNumOfSemiPersistentSRSposResourcesPerSlot*** indicates the maximum number of semi-persistent SRS Resources for positioning per slot supported by the UE. |
| ***posSRS-RRC-InactiveInitialUL-BWP***Indicates whether UE supports of preconfigured SRS with validity area in RRC\_INACTIVE for initial BWP. The UE can include this field only if the UE supports of SRS for positioning configuration in multiple cells for UEs in RRC\_INACTIVE state for initial UL BWP.Otherwise, the UE does not include this field. |
| ***posSRS-RRC-InactiveOutsideInitialUL-BWP***Indicates whether UE supports of preconfigured SRS with validity area in RRC\_INACTIVE outside initial BWP. The UE can include this field only if the UE support of SRS for positioning configuration in multiple cells for UEs in RRC\_INACTIVE state configured outside initial UL BWP. Otherwise, the UE does not include this field. |

*NEXT CHANGE*

#### *– NR-PhaseQuality*

The IE *NR-PhaseQuality* defines the quality of the RSCP/RSCPD measurement.

-- ASN1START

NR-PhaseQuality-r18 ::= SEQUENCE {

 phaseQualityValue-r18 INTEGER (0..179),

 phaseQualityResolution-r18 ENUMERATED {mdot1, m1,...},

 ...

}

-- ASN1STOP

| *NR-PhaseQuality* field descriptions |
| --- |
| ***phaseQualityValue***This field provides an estimate of uncertainty of the phase value for which the IE *NR-PhaseQuality* is provided in units of degrees. |
| ***phaseQualityResolution***This field provides the resolution used in the *phaseQualityValue* field. Enumerated values *mdot1* and *m1* correspond to 0.1 and 1 degrees respectively. |

*NEXT CHANGE*

## 6.5 Positioning Method IEs

### 6.5.10 NR DL-TDOA Positioning

This clause defines the information elements for NR downlink TDOA positioning (TS 38.305 [40]).

#### 6.5.10.1 NR DL-TDOA Assistance Data

#### – *NR-DL-TDOA-ProvideAssistanceData*

The IE *NR-DL-TDOA-ProvideAssistanceData* is used by the location server to provide assistance data to enable UE‑assisted and UE-based NR DL-TDOA. It may also be used to provide NR DL-TDOA positioning specific error reason.

-- ASN1START

NR-DL-TDOA-ProvideAssistanceData-r16 ::= SEQUENCE {

 nr-DL-PRS-AssistanceData-r16 NR-DL-PRS-AssistanceData-r16 OPTIONAL, -- Need ON

 nr-SelectedDL-PRS-IndexList-r16 NR-SelectedDL-PRS-IndexList-r16 OPTIONAL, -- Need ON

 nr-PositionCalculationAssistance-r16

 NR-PositionCalculationAssistance-r16

 OPTIONAL, -- Cond UEB

 nr-DL-TDOA-Error-r16 NR-DL-TDOA-Error-r16 OPTIONAL, -- Need ON

 ...,

 [[

 nr-On-Demand-DL-PRS-Configurations-r17

 NR-On-Demand-DL-PRS-Configurations-r17

 OPTIONAL, -- Need ON

 nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17

 NR-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 OPTIONAL, -- Need ON

 assistanceDataValidityArea-r17 AreaID-CellList-r17 OPTIONAL -- Need ON

 ]],

 [[

 nr-PeriodicAssistData-r18 NR-PeriodicAssistData-r18 OPTIONAL -- Cond CtrTrans

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *UEB* | The field is optionally present, need ON, for UE based NR DL-TDOA; otherwise it is not present. |
| *CtrTrans* | The field is mandatory present in the control transaction of a periodic assistance data delivery session as described in clauses 5.2.1a and 5.2.2a, for UE based NR DL-TDOA. Otherwise it is not present. |

|  |
| --- |
| *NR-DL-TDOA-ProvideAssistanceData* field descriptions |
| ***nr-DL-PRS-AssistanceData***This field specifies the assistance data reference and neighbour TRPs and provides the DL-PRS configuration for the TRPs.Note, if this field is absent but the *nr-SelectedDL-PRS-IndexList* field is present, the *nr-DL-PRS-AssistanceData* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-AoD-ProvideAssistanceData*. |
| ***nr-SelectedDL-PRS-IndexList***This field specifies the DL-PRS Resources which are applicable for this *NR-DL-TDOA-ProvideAssistanceData* message.  |
| ***nr-PositionCalculationAssistance***This field provides position calculation assistance data for UE-based mode. |
| ***nr-DL-TDOA-Error***This field provides DL-TDOA error reasons. |
| ***nr-On-Demand-DL-PRS-Configurations***This field provides a set of available DL-PRS configurations which can be requested by the target device on-demand.NOTE 1: VoidNOTE 2: If this field is absent but the *nr-On-Demand-DL-PRS-Configurations-Selected-IndexList* is present, the *nr-On-Demand-DL-PRS-Configurations* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-AoD-ProvideAssistanceData*. |
| ***nr-On-Demand-DL-PRS-Configurations-Selected-IndexList***This field specifies the selected available on-demand DL-PRS configurations which are applicable for this *NR-DL-TDOA-ProvideAssistanceData message*. |
| ***assistanceDataValidityArea***This field specifies the network area for which this *NR-DL-TDOA-ProvideAssistanceData* is valid. |
| ***nr-PeriodicAssistData***This field specifies the periodic assistance data for UE‑based carrier phase positioning. |

#### 6.5.10.2 NR DL-TDOA Assistance Data Request

#### – *NR-DL-TDOA-RequestAssistanceData*

The IE *NR-DL-TDOA-RequestAssistanceData* is used by the target device to request assistance data from a location server.

-- ASN1START

NR-DL-TDOA-RequestAssistanceData-r16 ::= SEQUENCE {

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL,

 nr-AdType-r16 BIT STRING { dl-prs (0),

 posCalc (1) } (SIZE (1..8)),

 ...,

 [[

 nr-PosCalcAssistanceRequest-r17 BIT STRING { trpLoc (0),

 beamInfo (1),

 rtdInfo (2),

 losNlosInfo (3),

 trpTEG-Info (4),

 integrityParameters-r18 (5),

 pruInfo-r18 (6)

 } (SIZE (1..8)) OPTIONAL,

 nr-on-demand-DL-PRS-Request-r17 NR-On-Demand-DL-PRS-Request-r17 OPTIONAL,

 nr-DL-PRS-ExpectedAoD-or-AoA-Request-r17

 ENUMERATED { eAoD, eAoA } OPTIONAL,

 pre-configured-AssistanceDataRequest-r17

 ENUMERATED { true } OPTIONAL

 ]],

 [[

 nr-PeriodicAssistDataReq-r18 NR-PeriodicAssistDataReq-r18 OPTIONAL -- Cond PerADReq

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *PerADReq* | This field is mandatory present if the target device requests periodic NR assistance data delivery. This field may only be included if '*pruInfo*' bit in*nr-PosCalcAssistanceRequest* is set to '1'. |

|  |
| --- |
| *NR-DL-TDOA-RequestAssistanceData* field descriptions |
| ***nr-PhysCellID***This field specifies the NR physical cell identity of the current primary cell of the target device. |
| ***nr-AdType***This field indicates the requested assistance data. *dl-prs* means requested assistance data is *nr-DL-PRS-AssistanceData*, *posCalc* means requested assistance data is *nr-PositionCalculationAssistance* for UE based positioning. |
| ***nr-PosCalcAssistanceRequest***This field indicates the Position Calculation Assistance Data requested. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is requested; a zero‑value means not requested.- bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 3 indicates whether the field *nr-DL-PRS-Expected-LOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 4 indicates whether the field *nr-DL-PRS-TRP-TEG-Info* in IE *NR-PositionCalculationAssistance* is requested or not.- bit 5 indicates whether integrity parameters, the service parameters for integrity, and bounds parameters for inter-TRP synchronization error, TRP/ARP location error and beam-related error is requested.- bit 6 indicates whether the field *nr-PRU-DL-Info* in IE *NR-PositionCalculationAssistance* is requested or not.This field may only be present if the '*posCalc*' bit in *nr-AdType* is set to value '1'. |
| ***nr-on-demand-DL-PRS-Request***This field indicates the on-demand DL-PRS requested for DL-TDOA. This field may be included when the *dl-prs* bit in *nr-AdType* is set to value '1'. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Request***This field, if present, indicates that the IE *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData* is requested. Enumerated value '*eAoD*' indicates that expected AoD information is requested; value '*eAoA*' indicates that expected AoA information is requested.This field may only be present if the '*dl-prs*' bit in *nr-AdType* is set to value '1'. |
| ***pre-configured-AssistanceDataRequest***This field, if present, indicates that the target device requests pre-configured assistance data with area validity. |
| ***nr-PeriodicAssistDataReq*** This field indicates the Periodic Position Calculation Assistance Data requested. |

*NEXT CHANGE*

6.5.10.4 NR DL-TDOA Location Information Elements

– *NR-DL-TDOA-SignalMeasurementInformation*

The IE *NR-DL-TDOA-SignalMeasurementInformation* is used by the target device to provide NR DL-TDOA measurements to the location server.

NOTE 1: The *dl-PRS-ReferenceInfo* defines the "RSTD reference" TRP. The *nr-RSTD's* and *nr-RSTD-ResultDiff*'s in *nr-DL-TDOA-MeasList* are provided relative to the "RSTD reference" TRP.

NOTE 2: The "RSTD reference" TRP may or may not be the same as the "assistance data reference" TRP provided by *nr-DL-PRS-ReferenceInfo* in IE *NR-DL-PRS-AssistanceData.*

NOTE 3: The target device includes a value of zero for the *nr-RSTD* and *nr-RSTD-ResultDiff* of the "RSTD reference" TRP in *nr-DL-TDOA-MeasList*.

-- ASN1START

NR-DL-TDOA-SignalMeasurementInformation-r16 ::= SEQUENCE {

 dl-PRS-ReferenceInfo-r16 DL-PRS-ID-Info-r16,

 nr-DL-TDOA-MeasList-r16 NR-DL-TDOA-MeasList-r16,

 ...,

 [[

 nr-UE-RxTEG-TimingErrorMargin-r17 TEG-TimingErrorMargin-r17 OPTIONAL -- Cond UERxTEG

 ]]

}

NR-DL-TDOA-MeasList-r16 ::= SEQUENCE (SIZE(1..nrMaxTRPs-r16)) OF NR-DL-TDOA-MeasElement-r16

NR-DL-TDOA-MeasElement-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL,

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL,

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL,

 nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 nr-RSTD-r16 CHOICE {

 k0-r16 INTEGER (0..1970049),

 k1-r16 INTEGER (0..985025),

 k2-r16 INTEGER (0..492513),

 k3-r16 INTEGER (0..246257),

 k4-r16 INTEGER (0..123129),

 k5-r16 INTEGER (0..61565),

 ...,

 kMinus1-r18 INTEGER (0..3940097),

 kMinus2-r18 INTEGER (0..7880193)

 },

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 nr-TimingQuality-r16 NR-TimingQuality-r16,

 nr-DL-PRS-RSRP-Result-r16 INTEGER (0..126) OPTIONAL,

 nr-DL-TDOA-AdditionalMeasurements-r16

 NR-DL-TDOA-AdditionalMeasurements-r16 OPTIONAL,

 ...,

 [[

 nr-UE-Rx-TEG-ID-r17 INTEGER (0..maxNumOfRxTEGs-1-r17) OPTIONAL,

 nr-DL-PRS-FirstPathRSRP-Result-r17 INTEGER (0..126) OPTIONAL,

 nr-los-nlos-Indicator-r17 CHOICE {

 perTRP-r17 LOS-NLOS-Indicator-r17,

 perResource-r17 LOS-NLOS-Indicator-r17

 } OPTIONAL,

 nr-AdditionalPathListExt-r17 NR-AdditionalPathListExt-r17 OPTIONAL,

 nr-DL-TDOA-AdditionalMeasurementsExt-r17

 NR-DL-TDOA-AdditionalMeasurementsExt-r17 OPTIONAL

 ]],

 [[

 nr-RSTD-BasedOnAggregatedResources-r18 ENUMERATED {true} OPTIONAL,

 nr-AggregatedDL-PRS-ResourceSetID-List-r18 SEQUENCE (SIZE (2.. 3)) OF

 NR-AggregatedDL-PRS-ResourceSetID-Element-r18 OPTIONAL,

 nr-RSCPD-r18 INTEGER (0..61565) OPTIONAL,

 nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL,

 nr-RSCPD-AddSampleMeasurements-r18 SEQUENCE (SIZE (1..nrNumOfSamples-1-r18 )) OF

 NR-RSCPD-AdditionalMeasurementElement-r18 OPTIONAL, nr-ReportDL-PRS-MeasBasedOnSingleOrMultiHopRx-r18

 ENUMERATED { singleHop, multipleHop } OPTIONAL

 ]]

}

NR-DL-TDOA-AdditionalMeasurements-r16 ::= SEQUENCE (SIZE (1..3)) OF

 NR-DL-TDOA-AdditionalMeasurementElement-r16

NR-DL-TDOA-AdditionalMeasurementsExt-r17 ::= SEQUENCE (SIZE (1..maxAddMeasTDOA-r17)) OF

 NR-DL-TDOA-AdditionalMeasurementElement-r16

NR-DL-TDOA-AdditionalMeasurementElement-r16 ::= SEQUENCE {

 nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 nr-RSTD-ResultDiff-r16 CHOICE {

 k0-r16 INTEGER (0..8191),

 k1-r16 INTEGER (0..4095),

 k2-r16 INTEGER (0..2047),

 k3-r16 INTEGER (0..1023),

 k4-r16 INTEGER (0..511),

 k5-r16 INTEGER (0..255),

 ...,

 kMinus1-r18 INTEGER (0..16382),

 kMinus2-r18 INTEGER (0..32764)

 },

 nr-TimingQuality-r16 NR-TimingQuality-r16,

 nr-DL-PRS-RSRP-ResultDiff-r16 INTEGER (0..61) OPTIONAL,

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 ...,

 [[

 nr-UE-Rx-TEG-ID-r17 INTEGER (0..maxNumOfRxTEGs-1-r17) OPTIONAL,

 nr-DL-PRS-FirstPathRSRP-ResultDiff-r17

 INTEGER (0..61) OPTIONAL,

 nr-los-nlos-IndicatorPerResource-r17

 LOS-NLOS-Indicator-r17 OPTIONAL,

 nr-AdditionalPathListExt-r17 NR-AdditionalPathListExt-r17 OPTIONAL

 ]],

 [[

 nr-RSTD-BasedOnAggregatedResources-r18 ENUMERATED {true} OPTIONAL,

 nr-AggregatedDL-PRS-ResourceSetID-List-r18 SEQUENCE (SIZE (2.. 3)) OF

 NR-AggregatedDL-PRS-ResourceSetID-Element-r18 OPTIONAL,

 nr-RSCPD-r18 INTEGER (0..61565) OPTIONAL,

 nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL,

 nr-RSCPD-AdditionalMeasurementsAddSample-r18 SEQUENCE (SIZE (1..nrNumOfSamples-1-r18 )) OF NR-RSCPD-AdditionalMeasurementElement-r18 OPTIONAL,

 nr-ReportDL-PRS-MeasBasedOnSingleOrMultiHopRx-r18

 ENUMERATED { singleHop, multipleHop } OPTIONAL

 ]]

}

NR-RSCPD-AdditionalMeasurementElement-r18 ::= SEQUENCE {

 nr-RSCPD-Result-r18 INTEGER (0..61565) OPTIONAL,

 nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL,

 nr-TimeStamp-r18 NR-TimeStamp-r16 OPTIONAL,

 ...

}

-- ASN1STOP

| **Conditional presence** | **Explanation** |
| --- | --- |
| *UERxTEG* | The field is optionally present, need OP, if the field *nr-UE-Rx-TEG-ID* is present; otherwise it is not present. |

|  |
| --- |
| ***NR-DL-TDOA-SignalMeasurementInformation* field descriptions** |
| ***nr-UE-RxTEG-TimingErrorMargin***This field specifies the UE Rx TEG timing error margin value for all the UE Rx TEGs within one *NR-DL-TDOA-SignalMeasurementInformation*. If the *nr-UE-Rx-TEG-ID* is present and this field is absent, the receiver should consider the UE Rx TEG timing error margin value to be the maximum applicable value as defined in TS 38.133 [46]. |
| ***dl-PRS-ID***This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource. This ID can be associated with multiple DL-PRS Resource Sets associated with a single TRP.Each TRP should only be associated with one such ID. |
| ***nr-PhysCellID***This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*. |
| ***nr-TimeStamp***This field specifies the time instance at which the TOA, RSCP (if included) and DL PRS-RSRP/RSRPP (if included) measurement is performed. The *nr-SFN*, *nr-Slo*t and *nr-Symbol* (if inlcuded) in IE *NR-TimeStamp* correspond to the TRP provided in *dl-PRS-ReferenceInfo* as specified in TS 38.214 [45]. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*. |
| ***nr-RSTD***This field specifies the relative timing difference between this neighbour TRP and the PRS reference TRP, as defined in TS 38.215 [36]. Mapping of the measured quantity is defined as in TS 38.133 [46]. |
| ***nr-AdditionalPathList***This field specifies one or more additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-RSTD* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. If this field is present, the field *nr-AdditionalPathListExt* shall be absent. |
| ***nr-TimingQuality***This field specifies the target device′s best estimate of the quality of the TOA measurement. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*. |
| ***nr-DL-PRS-RSRP-Result***This field specifies the NR DL-PRS reference signal received power (DL PRS-RSRP) measurement, as defined in TS 38.215 [36]. The mapping of the quantity is defined as in TS 38.133 [46]. |
| ***nr-DL-TDOA-AdditionalMeasurements***This field provides up to 3 additional RSTD measurements per pair of TRPs, with each measurement between a different pair of DL-PRS Resources or DL-PRS Resource Sets of the DL-PRS for those TRPs [45].If this field is present, the field *nr-DL-TDOA-AdditionalMeasurementsExt* shall be absent. |
| ***nr-UE-Rx-TEG-ID***This field provides the ID of the UE Rx TEG associated with the TOA measurement. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*. When different UE Rx TEGs for RSTD measurements are requested, the maximum number of reported RSTD measurements associated with different DL-PRS Resources per UE Rx TEG per target TRP is 4. |
| ***nr-DL-PRS-FirstPathRSRP-Result***This field specifies the NR DL-PRS reference signal received path power (DL PRS-RSRPP) of the first detected path in time, as defined in TS 38.215 [36]. The mapping of the measured quantity is defined as in TS 38.133 [46]. |
| ***nr-los-nlos-Indicator***This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the TRP or resource. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*.This field also applies to specify the target device's best estimate of the LOS or NLOS of the RSCP measurement for the TRP or resource. Note, the RSCP measurement refers to the RSCP of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSCPD or nr-RSCPD-ResultDiff*.NOTE: If the requested type or granularity in *nr-los-nlos-IndicatorRequest* is not possible, the target device may provide a different type and granularity for the estimated *LOS-NLOS-Indicator.* |
| ***nr-AdditionalPathListExt***This field provides up to 8 additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-RSTD* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. If this field is present, the field *nr-AdditionalPathList* shall be absent. |
| ***nr-DL-TDOA-AdditionalMeasurementsExt***This field, in addition to the measurements provided in *NR-DL-TDOA-MeasElement*, provides TOA measurements of up to 4 DL-PRS Resources of a TRP with different UE Rx TEGs. For a certain DL-PRS Resource, there can be up to 8 TOA measurement results with respect to different Rx TEGs.If this field is present, the field *nr-DL-TDOA-AdditionalMeasurements* shall be absent. |
| ***nr-RSTD-BasedOnAggregatedResources***This field indicates whether the measurement is based on aggregation across PFLs for DL-TDOA. |
| ***nr-AggregatedDL-PRS-ResourceSetID-List***This field provides the PRS resource set IDs and the PRS resource IDs for the aggregated measurement which are used for timing measurement results. If the field is present, the field nr-DL-PRS-ResourceID and nr-DL-PRS-ResourceSetID should not be included.  |
| ***nr-RSCPD***This field specifies the NR DL reference signal carrier phase difference measurement, as defined in TS 38.215 [36]. Mapping of the measured quantity is defined as in TS 38.133 [46]. The target and the reference TRP are in the same PFL. |
| ***nr-PhaseQuality***This field specifies the target device′s best estimate of the quality of the RSCPD measurement. |
| ***nr-RSCPD-AddSampleMeasurements***This field, in addition to the measurements provided in *NR-DL-TDOA-MeasElement*, provides up to 3 RSCPD measurements associated with the *nr-RSTD* in *NR-DL-TDOA-MeasElement*.  |
| ***nr-ReportDL-PRS-MeasBasedOnSingleOrMultiHopRx***This field indicates that the reported measurement is based on receiving single or multiple hops of DL PRS. |
| ***nr-RSTD-ResultDiff***This field provides the additional DL RSTD measurement result relative to *nr-RSTD.* The RSTD value of this measurement is obtained by adding the value of this field to the value of the *nr-RSTD* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-DL-PRS-RSRP-ResultDiff***This field provides the additional DL-PRS RSRP measurement result relative to *nr-DL-PRS-RSRP-Result.* The DL-PRS RSRP value of this measurement is obtained by adding the value of this field to the value of the *nr-DL-PRS-RSRP-Result* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-DL-PRS-FirstPathRSRP-ResultDiff***This field specifies the additional NR DL PRS reference signal received path power (DL PRS-RSRPP) of the first detected path in time relative to *nr-DL-PRS-FirstPathRSRP-Result*. The DL-PRS RSRPP of first path value of this measurement is obtained by adding the value of this field to the value of the *nr-DL-PRS-FirstPathRSRP-Result* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-los-nlos-IndicatorPerResource***This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the resource. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*.This field may only be present if the field *nr-LOS-NLOS-Indicator* choice indicates *perResource*. |
| ***nr-RSCPD-AdditionalMeasurements***This field, provides up to 4 RSCPD measurements associated with the TOA measurement in *NR-DL-TDOA-AdditionalMeasurementElement.* |
| ***nr-RSCPD-ResultDiff***This field provides the additional RSCPD measurement result relative to *nr-RSCPD.* The RSCPD value of this measurement is obtained by adding the value of this field to the value of the *nr-RSCPD* field. |

*NEXT CHANGE*

6.5.10.5 NR DL-TDOA Location Information Request

– *NR-DL-TDOA-RequestLocationInformation*

The IE *NR-DL-TDOA-RequestLocationInformation* is used by the location server to request NR DL-TDOA location measurements from a target device.

-- ASN1START

NR-DL-TDOA-RequestLocationInformation-r16 ::= SEQUENCE {

 nr-DL-PRS-RstdMeasurementInfoRequest-r16 ENUMERATED { true } OPTIONAL,-- Need ON

 nr-RequestedMeasurements-r16 BIT STRING { prsrsrpReq (0),

 firstPathRsrpReq-r17 (1),

 jointMeasurementsReq-r18 (2)

 } (SIZE(1..8)),

 nr-AssistanceAvailability-r16 BOOLEAN,

 nr-DL-TDOA-ReportConfig-r16 NR-DL-TDOA-ReportConfig-r16 OPTIONAL, -- Need ON

 additionalPaths-r16 ENUMERATED { requested } OPTIONAL, -- Need ON

 ...,

 [[

 nr-UE-RxTEG-Request-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 nr-los-nlos-IndicatorRequest-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType1-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity1-r17,

 ...

 } OPTIONAL, -- Need ON

 additionalPathsExt-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 additionalPathsDL-PRS-RSRP-Request-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 multiMeasInSameReport-r17 ENUMERATED { requested } OPTIONAL -- Need ON

 ]],

 [[

 nr-DL-PRS-JointMeasurementRequested-r18 SEQUENCE (SIZE (2..3)) OF

 INTEGER (0..nrMaxFreqLayers-1-r16) OPTIONAL, -- Need ON

 nr-DL-PRS-RxHoppingRequest-r18 ENUMERATED { requested } OPTIONAL, -- Need ON

 nr-DL-PRS-RxHoppingTotalBandwidth-r18 CHOICE {

 fr1 ENUMERATED {mhz40, mhz50, mhz80, mhz100},

 fr2 ENUMERATED {mhz100, mhz200, mhz400}

 } OPTIONAL, -- Need ON

 nr-DL-PRS-RSCPD-Request-r18 ENUMERATED { requested } OPTIONAL -- Need ON

 ]]

}

NR-DL-TDOA-ReportConfig-r16 ::= SEQUENCE {

 maxDL-PRS-RSTD-MeasurementsPerTRP-Pair-r16 INTEGER (1..4) OPTIONAL, -- Need ON

 timingReportingGranularityFactor-r16 INTEGER (0..5) OPTIONAL, -- Need ON

 ...,

 [[

 measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17

 ENUMERATED { n0, n2, n3, n4, n6, n8, ... }

 OPTIONAL, -- Need ON

 reducedDL-PRS-ProcessingSamples-r17 ENUMERATED { requested, ... } OPTIONAL, -- Need ON

 lowerRxBeamSweepingFactor-FR2-r17 ENUMERATED { requested } OPTIONAL -- Need ON

 ]],

 [[

 timingReportingGranularityFactorExt-r18 INTEGER (6..7) OPTIONAL, -- Need ON

 nr-DL-PRS-MeasurementTimeWindowsConfig-r18

 NR-DL-PRS-MeasurementTimeWindowsConfig-r18 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

|  |
| --- |
| ***NR-DL-TDOA-RequestLocationInformation* field descriptions** |
| ***nr-DL-PRS-RstdMeasurementInfoRequest***This field indicates whether the target device is requested to report DL-PRS Resource ID(s) or DL-PRS Resource Set ID(s) used for determining the timing of each TRP in RSTD measurements. The *jointMeasurementsReq* means that the target device is requested to perform joint measurement across aggregated PFLs for DL-TDOA. |
| ***nr-RequestedMeasurements***This field specifies the NR DL-TDOA measurements requested. This is represented by a bit string, with a one‑value at the bit position means the particular measurement is requested; a zero‑value means not requested.  |
| ***nr-AssistanceAvailability***This field indicates whether the target device may request additional PRS assistance data from the server. TRUE means allowed and FALSE means not allowed. |
| ***additionalPaths***This field, if present, indicates that the target device is requested to provide the *nr-AdditionalPathList* in IE *NR-DL-TDOA-SignalMeasurementInformation*. If this field is present, the field *additionalPathsExt* shall be absent. |
| ***nr-UE-RxTEG-Request***This field, if present, indicates that the target device is requested to provide the *nr-UE-Rx-TEG-ID* in IE *NR-DL-TDOA-SignalMeasurementInformation.* |
| ***nr-los-nlos-IndicatorRequest***This field, if present, indicates that the target device is requested to provide the indicated type and granularity of the estimated *LOS-NLOS-Indicator* in the *NR-DL-TDOA-SignalMeasurementInformation*. |
| ***additionalPathsExt***This field, if present, indicates that the target device is requested to provide the *nr-AdditionalPathListExt* in IE *NR-DL-TDOA-SignalMeasurementInformation*. If this field is present, the field *additionalPaths* shall be absent. |
| ***additionalPathsDL-PRS-RSRP-Request***This field, if present, indicates that the target device is requested to provide the *nr-DL-PRS-RSRPP* for the additional paths in fields *nr-AdditionalPathList* or *nr-AdditionalPathListExt*. |
| ***multiMeasInSameReport***This field, if present, indicates that the target device is requested to provide multiple measurement instances in a single measurement report; i.e., include the *nr-DL-TDOA-SignalMeasurementInstances* (in the case of UE-assisted mode is requested) or *nr-DL-TDOA-LocationInformationInstances* (in the case of UE-based mode is requested) in IE *NR-DL-TDOA-ProvideLocationInformation.* |
| ***nr-DL-PRS-JointMeasurementRequested***This field, if present, indicates the target device is requested to perform joint measurements on the indicated two or three PFLs. The field can be present if *jointMeasurementsReq* in *nr-RequestedMeasurements* is set to one-value. Otherwise, it is absent. Value 0 corresponds to the first frequency layer provided in *nr-DL-PRS-AssistanceDataList*, value 1 to the second frequency layer in *nr-DL-PRS-AssistanceDataList*, and so on. |
| ***nr-DL-PRS-RxHoppingRequest***This field, if present, indicates that the target device is requested to perform DL PRS Rx hopping measurements and reporting. |
| ***nr-DL-PRS-RxHoppingTotalBandwidth***This field, if present, indicates the total bandwidth of all hops in MHz. |
| ***nr-DL-PRS-RSCPD-Request***This field, if present, indicates that the target device is requested to provide theRSCPD measurement together with DL-PRS RSTD measurement. |
| ***maxDL-PRS-RSTD-MeasurementsPerTRP-Pair***This field specifies the maximum number of DL-PRS RSTD measurements per pair of TRPs. The maximum number is defined across all Positioning Frequency Layers. When requested for aggregated measurements by the location server, this field specifies the maximum number of aggregated DL-PRS RSTD measurements per pair of TRPs. The maximum number is defined across all Positioning Frequency Layers. |
| ***timingReportingGranularityFactor, timingReportingGranularityFactorExt***This field specifies the recommended reporting granularity for the DL RSTD measurements. Value (0..5) corresponds to (*k0*..*k5*) and value (6..7) corresponds to (kMinus1..kMinus2)used for *nr-RSTD* and *nr-RSTD-ResultDiff* in *NR-DL-TDOA-MeasElement*. The UE may select a different granularity value for *nr-RSTD* and *nr-RSTD-ResultDiff*. The *timingReportingGranularityFactorExt* should not be included by the location server and shall be ignored by the target device if *timingReportingGranularityFactor* is included.The *timingReportingGranularityFactor* should not be included by the location server and shall be ignored by the target device if *timingReportingGranularityFactorExt* is included. |
| ***measureSameDL-PRS-ResourceWithDifferentRxTEGs***This field, if present, indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with *N* different UE Rx TEGs. Enumerated value '*n0*' indicates that the number *N* of different UE Rx TEGs to measure the same DL PRS Resource can be determined by the target device, value '*n2*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 2 different UE Rx TEGs, value '*n3*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 3 different UE Rx TEGs, and so on.If this field is present, the field *nr-UE-RxTEG-Request* should also be present. When the location server requests aggregated measurements, target device is request to measure the same aggregated DL-PRS Resources of a TRP with N different UE Rx TEGs. |
| ***reducedDL-PRS-ProcessingSamples***This field, if present and set to '*requested*', indicates that the target device is requested to perform the requested measurements with reduced number of samples (M=1 or M=2) as specified in TS 38.133 [46]. When requested for aggregated measurements by the location server, this field indicates processing of reduced number of samples for the aggregated measurements. |
| ***lowerRxBeamSweepingFactor-FR2***This field, if present, indicates that the target device is requested to use a lower Rx beam sweeping factor than 8 for FR2 according to UE's capability. When requested for aggregated measurements by the location server, this field indicates that the target device is requested to use a lower Rx beam sweeping factor than 8 for FR2 according to UE's capability for the aggregated measurements. |
| ***NR-DL-PRS-MeasurementTimeWindowsConfig***This field indicates DL-PRS resource set(s) occurring within time window(s) for performing measurements where the time window is indicated by a start time, periodicity, offset and duration. |

*NEXT CHANGE*

#### 6.5.10.6 NR DL-TDOA Capability Information

#### – *NR-DL-TDOA-ProvideCapabilities*

The IE *NR-DL-TDOA-ProvideCapabilities* is used by the target device to indicate its capability to support NR DL-TDOA and to provide its NR DL-TDOA positioning capabilities to the location server.

-- ASN1START

NR-DL-TDOA-ProvideCapabilities-r16 ::= SEQUENCE {

 nr-DL-TDOA-Mode-r16 PositioningModes,

 nr-DL-TDOA-PRS-Capability-r16 NR-DL-PRS-ResourcesCapability-r16,

 nr-DL-TDOA-MeasurementCapability-r16 NR-DL-TDOA-MeasurementCapability-r16,

 nr-DL-PRS-QCL-ProcessingCapability-r16 NR-DL-PRS-QCL-ProcessingCapability-r16,

 nr-DL-PRS-ProcessingCapability-r16 NR-DL-PRS-ProcessingCapability-r16,

 additionalPathsReport-r16 ENUMERATED { supported } OPTIONAL,

 periodicalReporting-r16 PositioningModes OPTIONAL,

 ...,

 [[

 ten-ms-unit-ResponseTime-r17 PositioningModes OPTIONAL,

 nr-PosCalcAssistanceSupport-r17 BIT STRING { trpLocSup (0),

 beamInfoSup (1),

 rtdInfoSup (2),

 trpTEG-InfoSup (3),

 integritySup-r18 (4),

 pruInfoSup-r18 (5)

 } (SIZE (1..8)) OPTIONAL,

 nr-los-nlos-AssistanceDataSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

 nr-DL-PRS-ExpectedAoD-or-AoA-Sup-r17 BIT STRING { eAoD (0),

 eAoA (1)

 } (SIZE (1..8)) OPTIONAL,

 nr-DL-TDOA-On-Demand-DL-PRS-Support-r17 NR-On-Demand-DL-PRS-Support-r17 OPTIONAL,

 nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

 additionalPathsExtSupport-r17 ENUMERATED { n4, n6, n8 } OPTIONAL,

 scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17 OPTIONAL,

 nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

 area-validity-r17 INTEGER (1..maxNrOfAreas-r17) OPTIONAL, ...

 } OPTIONAL,

 multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

 mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 posMeasGapSupport-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 symbolTimeStampSupport-r18 ENUMERATED { supported } OPTIONAL,

 periodicAssistanceData-r18 BIT STRING { solicited (0),

 unsolicited (1) } (SIZE (1..8)) OPTIONAL,

 nr-DL-TDOA-PosIntegritySupport-r18 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-TDOA-ProvideCapabilities* field descriptions |
| ***nr-DL-TDOA-Mode***This field specifies the NR DL-TDOA mode(s) supported by the target device. |
| ***periodicalReporting***This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***ten-ms-unit-ResponseTime***This field, if present, specifies the positioning modes for which the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one‑value at the bit position means '*ten-milli-seconds'* response time unit for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support '*ten-milli-seconds'* response time unitin *CommonIEsRequestLocationInformation*. |
| ***nr-PosCalcAssistanceSupport***This field indicates the Position Calculation Assistance Data supported by the target device for UE-based DL-TDOA. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is supported; a zero‑value means not supported.- bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is supported or not;- bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is supported or not;- bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is supported or not;- bit 3 indicates whether the field *nr-DL-PRS-TRP-TEG-Info* in IE *NR-PositionCalculationAssistance* is supported or not. The UE can indicate this bit only if the UE supports *prs-ProcessingCapabilityBandList* and any of *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer*, *maxNrOfTRP-AcrossFreqs*, *maxNrOfPosLayer*, *maxNrOfDL-PRS-ResourcesPerResourceSet* and *maxNrOfDL-PRS-ResourcesPerPositioningFrequencylayer*. Otherwise, the UE does not include this field.- bit 4 indicates whether the target service supports the range of integrity risk (IR) for which the integrity assistance data are valid.- bit 5 indicates whether the field *nr-PRU-DL-Info* in IE *NR-PositionCalculationAssistance* is supported or not. |
| ***nr-los-nlos-AssistanceDataSupport***This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance*:- *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in *LOS-NLOS-Indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance*.- *granularity* indicates whether the target device supports *nr-los-nlos-indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* '*per-trp*', '*per-resource*', or both.The UE can include this field only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1*, *maxDL-PRS-RSRP-MeasurementFR2*, *dl-RSTD-MeasurementPerPairOfTRP-FR1*, *dl-RSTD-MeasurementPerPairOfTRP-FR*2, *maxNrOfRx-TX-MeasFR1*, *maxNrOfRx-TX-MeasFR2*, *supportOfRSRP-MeasFR1* and *supportOfRSRP-MeasFR2*. Otherwise, the UE does not include this field. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Sup***This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData.* |
| ***nr-DL-TDOA-On-Demand-DL-PRS-Support***This field, if present, indicates that the target device supports on-demand DL-PRS requests.  |
| ***nr-los-nlos-IndicatorSupport***This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-DL-TDOA-SignalMeasurementInformation*.- *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in IE *LOS-NLOS-Indicator.*- *granularity* indicates whether the target device supports *LOS-NLOS-Indicator* reporting per TRP, per DL-PRS Resource, or both.NOTE: A single value is reported when both Multi-RTT and DL-TDOA are supported. |
| ***additionalPathsExtSupport***This field, if present, indicates that the target device supports the *nr-AdditionalPathListExt* reporting in IE *NR-DL-TDOA-SignalMeasurementInformation*. The enumerated value indicates the number of additional paths supported by the target device.NOTE: The *supportOfDL-PRS-FirstPathRSRP* in IE *NR-DL-TDOA-MeasurementCapability* also applies to the additional paths. |
| ***scheduledLocationRequestSupported***This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***nr-dl-prs-AssistanceDataValidity***This field, if present, indicates that the target device supports validity conditions for pre-configured assistance data and comprises the following subfields:- ***area-validity*** indicates that the target device supports pre-configured assistance data with area validity. The integer number indicates the maximum number of areas the target device supports*.* |
| ***multiMeasInSameMeasReport***This field, if present, indicates that the target device supports multiple measurement instances in a single measurement report. |
| ***mg-ActivationRequest***This field, if present, indicates that the target device supports UL MAC CE for positioning measurement gap activation/deactivation request for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationRequestPRS-Meas* and *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***posMeasGapSupport***This field, if present, indicates that the target device supports pre-configured positioning measurement gap for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***symbolTimeStampSupport***This field, if present, indicates that the target device supports reporting timestamp in terms of radio frame timing down to OFDM symbol level. |
| ***periodicAssistanceData***This field identifies the periodic NR assistance data delivery procedures supported by the target device. This is represented by a bit string, with a one value at the bit position means the periodic NR assistance data delivery procedure is supported; a zero value means not supported. Bit 0 (solicited) represents the procedure according to clause 5.2.1a; bit (1) (unsolicited) represents the procedure according to clause 5.2.2a. |
| ***nr-DL-TDOA-PosIntegritySupport*** This field, if present, indicates that the target device supports the RAT-dependent positioning integrity for DL-TDOA. |

*NEXT CHANGE*

#### 6.5.10.6a NR DL-TDOA Capability Information Elements

#### *– NR-DL-TDOA-MeasurementCapability*

The IE *NR-DL-TDOA-MeasurementCapability* defines the DL-TDOA measurement capability. The UE can include this IE only if the UE supports *NR-DL-PRS-ResourcesCapability* for DL-TDOA. Otherwise, the UE does not include this IE.

-- ASN1START

NR-DL-TDOA-MeasurementCapability-r16 ::= SEQUENCE {

 dl-RSTD-MeasurementPerPairOfTRP-FR1-r16 INTEGER (1..4),

 dl-RSTD-MeasurementPerPairOfTRP-FR2-r16 INTEGER (1..4),

 supportOfDL-PRS-RSRP-MeasFR1-r16 ENUMERATED { supported} OPTIONAL,

 supportOfDL-PRS-RSRP-MeasFR2-r16 ENUMERATED { supported} OPTIONAL,

 ...,

 [[

 nr-UE-TEG-Capability-r17 NR-UE-TEG-Capability-r17 OPTIONAL,

 dl-tdoa-MeasCapabilityBandList-r17 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

 DL-TDOA-MeasCapabilityPerBand-r17 OPTIONAL

 ]]

}

DL-TDOA-MeasCapabilityPerBand-r17 ::= SEQUENCE {

 freqBandIndicatorNR-r17 FreqBandIndicatorNR-r16,

 supportOfDL-PRS-FirstPathRSRP-r17 ENUMERATED { supported } OPTIONAL,

 dl-PRS-MeasRRC-Inactive-r17 ENUMERATED { supported } OPTIONAL,

 ...,

 [[

 supportOfDL-PRS-BWA-RRC-Connected-r18 ENUMERATED { supported } OPTIONAL,

 supportOfDL-PRS-BWA-RRC-Inactive-r18 ENUMERATED { supported } OPTIONAL,

 supportOfDL-PRS-BWA-RRC-Idle-r18 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-TDOA-MeasurementCapability* field descriptions |
| ***dl-RSTD-MeasurementPerPairOfTRP-FR1***Indicates number of DL RSTD measurements per pair of TRPs on FR1. |
| ***dl-RSTD-MeasurementPerPairOfTRP-FR2***Indicates number of DL RSTD measurements per pair of TRPs on FR2. |
| ***supportOfDL-PRS-RSRP-MeasFR1***Indicates whether the UE supports DL-PRS RSRP measurement for DL-TDOA on FR1. |
| ***supportOfDL-PRS-RSRP-MeasFR2***Indicates whether the UE supports DL-PRS RSRP measurement for DL-TDOA on FR2. |
| ***nr-UE-TEG-Capability***Indicates the UE TEG capability. |
| ***supportOfDL-PRS-FirstPathRSRP***Indicates whether the target device supports DL-PRS RSRPP of first path measurement for DL-TDOA. The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field. The UE supporting *additionalPathsReport* and *supportOfDL-PRS-FirstPathRSRP* shall support RSRPP reporting for K=1 or 2 additional paths. |
| ***dl-PRS-MeasRRC-Inactive***This field, if present, indicates that the target device supports DL-PRS measurement in RRC\_INACTIVE state. The UE can include this field only if the UE supports *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer, maxNrOfTRP-AcrossFreqs, maxNrOfPosLayer* and *dl-PRS-BufferType-RRC-Inactive*. Otherwise, the UE does not include this field.NOTE 1: This capability is applicable to both, UE-assisted and UE-based DL-TDOA.NOTE 2: The capabilities *NR-DL-PRS-ResourcesCapability, dl-RSTD-MeasurementPerPairOfTRP-FR1, dl-RSTD-MeasurementPerPairOfTRP-FR2, supportOfDL-PRS-RSRP-MeasFR1, supportOfDL-PRS-RSRP-MeasFR2, simul-NR-DL-AoD-DL-TDOA* are the same in RRC\_INACTIVE state. |
| ***supportOfDL-PRS-BWA-RRC-Connected*** Indicates whether the target device supports PRS bandwidth aggregation in RRC\_CONNECTED for DL-TDOA.The UE can include this field only if the UE supports *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer, maxNrOfTRP-AcrossFreqs, maxNrOfPosLayer* and *prs-BWA-TwoContiguousIntrabandInMG-RRC-Connected*. Otherwise, the UE does not include this field. |
| ***supportOfDL-PRS-BWA-RRC-Inactive***Indicates whether the target device supports PRS bandwidth aggregation in RRC\_INACTIVE for DL-TDOA.The UE can include this field only if the UE supports *dl-PRS-MeasRRC-Inactive* and *prs-BWA-TwoContiguousIntrabandInMG-RRC-IdleAndInactive*. Otherwise, the UE does not include this field. |
| ***supportOfDL-PRS-BWA-RRC-Idle***Indicates the target device whether supports PRS bandwidth aggregation in RRC\_IDLE for DL-TDOA.The UE can include this field only if the UE supports of PRS measurement in RRC\_IDLE and *prs-BWA-TwoContiguousIntrabandInMG-RRC-IdleAndInactive*. Otherwise, the UE does not include this field. |

*NEXT CHANGE*

### 6.5.11 NR DL-AoD Positioning

This clause defines the information elements for NR downlink AoD positioning (TS 38.305 [40]).

#### 6.5.11.1 NR DL-AoD Assistance Data

#### – *NR-DL-AoD-ProvideAssistanceData*

The IE *NR-DL-AoD-ProvideAssistanceData* is used by the location server to provide assistance data to enable UE‑assisted and UE-based NR DL-AoD. It may also be used to provide NR DL-AoD positioning specific error reason.

-- ASN1START

NR-DL-AoD-ProvideAssistanceData-r16 ::= SEQUENCE {

 nr-DL-PRS-AssistanceData-r16 NR-DL-PRS-AssistanceData-r16 OPTIONAL, -- Need ON

 nr-SelectedDL-PRS-IndexList-r16 NR-SelectedDL-PRS-IndexList-r16 OPTIONAL, -- Need ON

 nr-PositionCalculationAssistance-r16

 NR-PositionCalculationAssistance-r16

 OPTIONAL, -- Cond UEB

 nr-DL-AoD-Error-r16 NR-DL-AoD-Error-r16 OPTIONAL, -- Need ON

 ...,

 [[

 nr-DL-PRS-BeamInfo-r17 NR-DL-PRS-BeamInfo-r16 OPTIONAL, -- Cond UEA

 nr-On-Demand-DL-PRS-Configurations-r17

 NR-On-Demand-DL-PRS-Configurations-r17

 OPTIONAL, -- Need ON

 nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17

 NR-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17

 OPTIONAL, -- Need ON

 assistanceDataValidityArea-r17 AreaID-CellList-r17 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *UEB* | The field is optionally present, need ON, for UE based NR DL-AoD; otherwise it is not present. |
| *UEA* | The field is optionally present, need ON, for UE-assisted NR DL-AoD; otherwise it is not present. |

|  |
| --- |
| *NR-DL-AoD-ProvideAssistanceData* field descriptions |
| ***nr-DL-PRS-AssistanceData***This field specifies the assistance data reference and neighbour TRPs and provides the DL-PRS configuration for the TRPs.Note, if this field is absent but the *nr-SelectedDL-PRS-IndexList* field is present, the *nr-DL-PRS-AssistanceData* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-TDOA-ProvideAssistanceData*. |
| ***nr-SelectedDL-PRS-IndexList***This field specifies the DL-PRS Resources which are applicable for this *NR-DL-AoD-ProvideAssistanceData* message. |
| ***nr-PositionCalculationAssistance***This field provides position calculation assistance data for UE-based mode. |
| ***nr-DL-AoD-Error***This field provides DL-AoD error reasons. |
| ***nr-DL-PRS-BeamInfo***This field provides spatial direction information of the DL-PRS Resources included in *nr-DL-PRS-AssistanceData* or indicated by *nr-SelectedDL-PRS-IndexList.* |
| ***nr-On-Demand-DL-PRS-Configurations***This field provides a set of available DL-PRS configurations which can be requested by the target device on-demand.NOTE 1: Void.NOTE 2: If this field is absent but the *nr-On-Demand-DL-PRS-Configurations-Selected-IndexList* is present, the *nr-On-Demand-DL-PRS-Configurations* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-TDOA-ProvideAssistanceData*. |
| ***nr-On-Demand-DL-PRS-Configurations-Selected-IndexList***This field specifies the selected available on-demand DL-PRS configurations which are applicable for this *NR-DL-AoD-ProvideAssistanceData message*. |
| ***assistanceDataValidityArea***This field specifies the network area for which this *NR-DL-AoD-ProvideAssistanceData* is valid. |

#### 6.5.11.2 NR DL-AoD Assistance Data Request

#### – *NR-DL-AoD-RequestAssistanceData*

The IE *NR-DL-AoD-RequestAssistanceData* is used by the target device to request assistance data from a location server.

-- ASN1START

NR-DL-AoD-RequestAssistanceData-r16 ::= SEQUENCE {

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL,

 nr-AdType-r16 BIT STRING { dl-prs (0),

 posCalc (1) } (SIZE (1..8)),

 ...,

 [[

 nr-PosCalcAssistanceRequest-r17 BIT STRING { trpLoc (0),

 beamInfo (1),

 rtdInfo (2),

 beamAntInfo (3),

 losNlosInfo (4),

 integrityParameters-r18 (5)

 } (SIZE (1..8)) OPTIONAL,

 nr-DL-PRS-ExpectedAoD-or-AoA-Request-r17 ENUMERATED { eAoD, eAoA } OPTIONAL,

 nr-DL-PRS-BeamInfoRequest-r17 ENUMERATED { requested } OPTIONAL,

 nr-on-demand-DL-PRS-Request-r17 NR-On-Demand-DL-PRS-Request-r17 OPTIONAL,

 pre-configured-AssistanceDataRequest-r17 ENUMERATED { true } OPTIONAL

 ]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-AoD-RequestAssistanceData* field descriptions |
| ***nr-PhysCellID***This field specifies the NR physical cell identity of the current primary cell of the target device. |
| ***nr-AdType***This field indicates the requested assistance data. *dl-prs* means requested assistance data is *nr-DL-PRS-AssistanceData*, *posCalc* means requested assistance data is *nr-PositionCalculationAssistance* for UE based positioning. |
| ***nr-PosCalcAssistanceRequest***This field indicates the Position Calculation Assistance Data requested. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is requested; a zero‑value means not requested.- bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 3 indicates whether the field *nr-TRP-BeamAntennaInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 4 indicates whether the field *nr-DL-PRS-Expected-LOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance* is requested or not.- bit 5 indicates the integrity parameters, the service parameters for integrity, the TRP/ARP location error and beam-related error is requested.This field may only be present if the '*posCalc*' bit in *nr-AdType* is set to value '1'. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Request***This field, if present, indicates that the IE *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData* is requested. Enumerated value '*eAoD*' indicates that expected AoD information is requested; value 'eAoA' indicates that expected AoA information is requested.This field may only be present if the '*dl-prs*' bit in *nr-AdType* is set to value '1'. |
| ***nr-DL-PRS-BeamInfoRequest***This field, if present, indicates that the IE *NR-DL-PRS-BeamInfo* is requested. |
| ***nr-on-demand-DL-PRS-Request***This field indicates the on-demand DL-PRS requested for DL-AoD. This field may be included when the *dl-prs* bit in *nr-AdType* is set to value '1'. |
| ***pre-configured-AssistanceDataRequest***This field, if present, indicates that the target device requests pre-configured assistance data with area validity. |

*NEXT CHANGE*

#### 6.5.11.5 NR DL-AoD Location Information Request

#### – *NR-DL-AoD-RequestLocationInformation*

The IE *NR-DL-AoD-RequestLocationInformation* is used by the location server to request NR DL-AoD location measurements from a target device.

-- ASN1START

NR-DL-AoD-RequestLocationInformation-r16 ::= SEQUENCE {

 nr-AssistanceAvailability-r16 BOOLEAN,

 nr-DL-AoD-ReportConfig-r16 NR-DL-AoD-ReportConfig-r16,

 ...,

 [[

 multiMeasInSameReport-r17 ENUMERATED { requested } OPTIONAL -- Need ON

 ]],

 [[

 nr-DL-PRS-RxHoppingRequest-r18 ENUMERATED { requested } OPTIONAL, -- Need ON

 nr-DL-PRS-RxHoppingTotalBandwidth-r18 CHOICE {

 fr1 ENUMERATED {mhz40, mhz50, mhz80, mhz100},

 fr2 ENUMERATED {mhz100, mhz200, mhz400}

 } OPTIONAL -- Need ON

 ]]

}

NR-DL-AoD-ReportConfig-r16 ::= SEQUENCE {

 maxDL-PRS-RSRP-MeasurementsPerTRP-r16 INTEGER (1..8) OPTIONAL, -- Need ON

 ...,

 [[

 maxDL-PRS-RSRP-MeasurementsPerTRP-r17 INTEGER (9..24) OPTIONAL, -- Need ON

 maxDL-PRS-RSRPP-MeasurementsPerTRP-r17 INTEGER (1..24) OPTIONAL, -- Need ON

 nr-los-nlos-IndicatorRequest-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType1-r17,

 granularity-r17

 LOS-NLOS-IndicatorGranularity1-r17,

 ...

 } OPTIONAL, -- Need ON

 reducedDL-PRS-ProcessingSamples-r17 ENUMERATED { requested, ... }

 OPTIONAL, -- Need ON

 lowerRxBeamSweepingFactor-FR2-r17 ENUMERATED { requested } OPTIONAL -- Need ON

 ]],

 [[

 nr-DL-PRS-MeasurementTimeWindowsConfig-r18

 NR-DL-PRS-MeasurementTimeWindowsConfig-r18 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

| *NR-DL-AoD-RequestLocationInformation* field descriptions |
| --- |
| ***nr-AssistanceAvailability***This field indicates whether the target device may request additional PRS assistance data from the server. TRUE means allowed and FALSE means not allowed. |
| ***multiMeasInSameReport***This field, if present, indicates that the target device is requested to provide multiple measurement instances in a single measurement report; i.e., include the *nr-DL-AoD-SignalMeasurementInstances* (in the case of UE-assisted mode is requested) or *nr-DL-AoD-LocationInformationInstances* (in the case of UE-based mode is requested) in IE *NR-DL-AoD-ProvideLocationInformation.* |
| ***nr-DL-PRS-RxHoppingRequest***This field, if present, indicates that the target device is requested to perform DL PRS Rx hopping measurements and reporting. |
| ***nr-DL-PRS-RxHoppingTotalBandwidth***This field, if present, indicates the total bandwidth of all hops in MHz. |
| ***maxDL-PRS-RSRP-MeasurementsPerTRP***This field specifies the maximum number of DL-PRS RSRP measurements on different DL-PRS Resources from the same TRP. If this field with -r17 suffix is present, the field with -r16 suffix should not be present. |
| ***maxDL-PRS-RSRPP-MeasurementsPerTRP***This field specifies the maximum number of DL-PRS RSRPP measurements on different DL-PRS Resources from the same TRP. |
| ***nr-los-nlos-IndicatorRequest***This field, if present, indicates that the target device is requested to provide the indicated type and granularity of the estimated *LOS-NLOS-Indicator* in the *NR-DL-AoD-SignalMeasurementInformation*. |
| ***reducedDL-PRS-ProcessingSamples***This field, if present and set to '*requested*', indicates that the target device is requested to perform the requested measurements with reduced number of samples (M=1 or M=2) as specified in TS 38.133 [46]. |
| ***lowerRxBeamSweepingFactor-FR2***This field, if present, indicates that the target device is requested to use a lower Rx beam sweeping factor than 8 for FR2 according to UE's capability. |
| ***NR-DL-PRS-MeasurementTimeWindowsConfig*** This field indicates DL-PRS resource set(s) occurring within time window(s) for performing measurements where the time window is indicated by a start time, periodicity, offset and duration. |

*NEXT CHANGE*

#### 6.5.11.6 NR DL-AoD Capability Information

#### – *NR-DL-AoD-ProvideCapabilities*

The IE *NR-DL-AoD-ProvideCapabilities* is used by the target device to indicate its capability to support NR DL-AoD and to provide its NR DL-AoD positioning capabilities to the location server.

-- ASN1START

NR-DL-AoD-ProvideCapabilities-r16 ::= SEQUENCE {

 nr-DL-AoD-Mode-r16 PositioningModes,

 nr-DL-AoD-PRS-Capability-r16 NR-DL-PRS-ResourcesCapability-r16,

 nr-DL-AoD-MeasurementCapability-r16 NR-DL-AoD-MeasurementCapability-r16,

 nr-DL-PRS-QCL-ProcessingCapability-r16 NR-DL-PRS-QCL-ProcessingCapability-r16,

 nr-DL-PRS-ProcessingCapability-r16 NR-DL-PRS-ProcessingCapability-r16,

 periodicalReporting-r16 PositioningModes OPTIONAL,

 ...,

 [[

 ten-ms-unit-ResponseTime-r17 PositioningModes OPTIONAL,

 nr-PosCalcAssistanceSupport-r17 BIT STRING { trpLocSup (0),

 beamInfoSup (1),

 rtdInfoSup (2),

 beamAntInfoSup (3),

 integritySup-r18 (4)

 } (SIZE (1..8)) OPTIONAL,

 nr-los-nlos-AssistanceDataSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

 nr-DL-PRS-ExpectedAoD-or-AoA-Sup-r17 BIT STRING { eAoD (0),

 eAoA (1)

 } (SIZE (1..8)) OPTIONAL,

 dl-PRS-ResourcePrioritySubset-Sup-r17 ENUMERATED { sameSet, differentSet, sameOrDifferentSet }

 OPTIONAL,

 nr-DL-PRS-BeamInfoSup-r17 ENUMERATED { supported } OPTIONAL,

 nr-DL-AoD-On-Demand-DL-PRS-Support-r17 NR-On-Demand-DL-PRS-Support-r17 OPTIONAL,

 nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

 scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17

 OPTIONAL,

 nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

 area-validity-r17 INTEGER (1..maxNrOfAreas-r17) OPTIONAL,

 ...

 } OPTIONAL,

 multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

 mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 posMeasGapSupport-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 nr-DL-AoD-PosIntegritySupport-r18 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-AoD-ProvideCapabilities* field descriptions |
| ***nr-DL-AoD-Mode***This field specifies the NR DL-AoD mode(s) supported by the target device. |
| ***periodicalReporting***This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***ten-ms-unit-ResponseTime***This field, if present, specifies the positioning modes for which the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one‑value at the bit position means '*ten-milli-seconds'* response time unit for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support '*ten-milli-seconds'* response time unitin *CommonIEsRequestLocationInformation*. |
| ***nr-PosCalcAssistanceSupport***This field indicates the Position Calculation Assistance Data supported by the target device for UE-based DL-AoD. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is supported; a zero‑value means not supported.- bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is supported or not;- bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is supported or not;- bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is supported or not. The UE can indicate this bit only if the UE supports *prs-ProcessingCapabilityBandList* and any of *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer*, *maxNrOfTRP-AcrossFreqs*, *maxNrOfPosLayer*, *maxNrOfDL-PRS-ResourcesPerResourceSet* and *maxNrOfDL-PRS-ResourcesPerPositioningFrequencylayer*. Otherwise, the UE does not include this field;- bit 3 indicates whether the field *nr-TRP-BeamAntennaInfo* in IE *NR-PositionCalculationAssistance* is supported or not.- bit 4 indicates whether the target service supports the range of integrity risk (IR) for which the integrity assistance data are valid. |
| ***nr-los-nlos-AssistanceDataSupport***This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance*:- *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in *LOS-NLOS-Indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance*.- *granularity* indicates whether the target device supports *nr-los-nlos-indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistanc*e 'per-trp', '*per-resource*', or both.The UE can include this field only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1*, *maxDL-PRS-RSRP-MeasurementFR2,dl-RSTD-MeasurementPerPairOfTRP-FR1, dl-RSTD-MeasurementPerPairOfTRP-FR2, maxNrOfRx-TX-MeasFR1, maxNrOfRx-TX-MeasFR2, supportOfRSRP-MeasFR1* and *supportOfRSRP-MeasFR2* . Otherwise, the UE does not include this field. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Sup***This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData.*  |
| ***dl-PRS-ResourcePrioritySubset-Sup***This field, if present, indicates that the target device supports the *DL-PRS-ResourcePrioritySubset* in IE *NR-DL-PRS-Info.* Enumerated value indicates the supported resource set relationship for the target DL-PRS Resource and the associated subset. |
| ***nr-DL-PRS-BeamInfoSup***This field, if present, indicates that the target device supports the *NR-DL-PRS-BeamInfo* in IE *NR-DL-AoD-ProvideAssistanceData.* |
| ***nr-DL-AoD-On-Demand-DL-PRS-Support***This field, if present, indicates that the target device supports on-demand DL-PRS requests. |
| ***nr-los-nlos-IndicatorSupport***This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-DL-AoD-SignalMeasurementInformation*.- *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in IE *LOS-NLOS-Indicator.*- *granularit*y indicates whether the target device supports *LOS-NLOS-Indicator* reporting per TRP, per DL-PRS Resource, or both. |
| ***scheduledLocationRequestSupported***This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***nr-dl-prs-AssistanceDataValidity***This field, if present, indicates that the target device supports validity conditions for pre-configured assistance data and comprises the following subfields:- ***area-validity*** indicates that the target device supports pre-configured assistance data with area validity. The integer number indicates the maximum number of areas the target device supports. |
| ***multiMeasInSameMeasReport***This field, if present, indicates that the target device supports multiple measurement instances in a single measurement report. |
| ***mg-ActivationRequest***This field, if present, indicates that the target device supports UL MAC CE for positioning measurement gap activation/deactivation request for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationRequestPRS-Meas* and *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***posMeasGapSupport***This field, if present, indicates that the target device supports pre-configured positioning measurement gap for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***nr-DL-AoD-PosIntegritySupport***This field, if present, indicates that the target device supports the RAT-dependent positioning integrity for DL-AoD. |

*NEXT CHANGE*

### 6.5.12 NR Multi-RTT Positioning

This clause defines the information elements for NR Multi-RTT positioning (TS 38.305 [40]).

\*\*\*\*\*\*\*\*\*\*skip the unchanged part\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#### 6.5.12.4 NR Multi-RTT Location Information Elements

#### – *NR-Multi-RTT-SignalMeasurementInformation*

The IE *NR-Multi-RTT-SignalMeasurementInformation* is used by the target device to provide NR Multi-RTT measurements to the location server.

-- ASN1START

NR-Multi-RTT-SignalMeasurementInformation-r16 ::= SEQUENCE {

 nr-Multi-RTT-MeasList-r16 NR-Multi-RTT-MeasList-r16,

 nr-NTA-Offset-r16 ENUMERATED { nTA1, nTA2, nTA3, nTA4, ... } OPTIONAL,

 ...,

 [[

 nr-SRS-TxTEG-Set-r17 SEQUENCE (SIZE(1..maxTxTEG-Sets-r17)) OF

 NR-SRS-TxTEG-Element-r17 OPTIONAL

 -- Cond Case2-3

 ]],

 [[

 nr-UE-RxTEG-TimingErrorMargin-r17 TEG-TimingErrorMargin-r17 OPTIONAL,-- Cond TEGCase3

 nr-UE-TxTEG-TimingErrorMargin-r17 TEG-TimingErrorMargin-r17 OPTIONAL,-- Cond TEGCase2-3

 nr-UE-RxTxTEG-TimingErrorMargin-r17 RxTxTEG-TimingErrorMargin-r17 OPTIONAL -- Cond TEGCase1-2

 ]]

}

NR-Multi-RTT-MeasList-r16 ::= SEQUENCE (SIZE(1..nrMaxTRPs-r16)) OF NR-Multi-RTT-MeasElement-r16

NR-Multi-RTT-MeasElement-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL,

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL,

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL,

 nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,

 nr-UE-RxTxTimeDiff-r16 CHOICE {

 k0-r16 INTEGER (0..1970049),

 k1-r16 INTEGER (0..985025),

 k2-r16 INTEGER (0..492513),

 k3-r16 INTEGER (0..246257),

 k4-r16 INTEGER (0..123129),

 k5-r16 INTEGER (0..61565),

 ...,

 kMinus1-r18 INTEGER (0..3940097),

 kMinus2-r18 INTEGER (0..7880193)

 },

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 nr-TimingQuality-r16 NR-TimingQuality-r16,

 nr-DL-PRS-RSRP-Result-r16 INTEGER (0..126) OPTIONAL,

 nr-Multi-RTT-AdditionalMeasurements-r16

 NR-Multi-RTT-AdditionalMeasurements-r16 OPTIONAL,

 ...,

 [[

 nr-UE-RxTx-TEG-Info-r17 NR-UE-RxTx-TEG-Info-r17 OPTIONAL,

 nr-DL-PRS-FirstPathRSRP-Result-r17 INTEGER (0..126) OPTIONAL,

 nr-los-nlos-Indicator-r17 CHOICE {

 perTRP-r17 LOS-NLOS-Indicator-r17,

 perResource-r17 LOS-NLOS-Indicator-r17

 } OPTIONAL,

 nr-AdditionalPathListExt-r17 NR-AdditionalPathListExt-r17 OPTIONAL,

 nr-Multi-RTT-AdditionalMeasurementsExt-r17

 NR-Multi-RTT-AdditionalMeasurementsExt-r17 OPTIONAL

 ]],

 [[

 nr-UE-RxTxTimeDiffBasedOnAggregatedResources-r18 ENUMERATED {true} OPTIONAL,

 nr-AggregatedDL-PRS-ResourceSetID-List-r18 SEQUENCE (SIZE (2.. 3)) OF

 NR-AggregatedDL-PRS-ResourceSetID-Element-r18 OPTIONAL,

 nr-RSCP-r18 INTEGER (0..3600) OPTIONAL,

 nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL,

 nr-RSCP-AddSampleMeasurements-r18

 SEQUENCE (SIZE (1..nrNumOfSamples-1-r18 )) OF NR-RSCP-AdditionalMeasurements-r18

 OPTIONAL,

 nr-ReportDL-PRS-MeasBasedOnSingleOrMultiHopRx-r18

 ENUMERATED { singleHop, multipleHop } OPTIONAL

 ]]

}

NR-Multi-RTT-AdditionalMeasurements-r16 ::= SEQUENCE (SIZE (1..3)) OF

 NR-Multi-RTT-AdditionalMeasurementElement-r16

NR-Multi-RTT-AdditionalMeasurementsExt-r17 ::= SEQUENCE (SIZE (1..maxAddMeasRTT-r17)) OF

 NR-Multi-RTT-AdditionalMeasurementElement-r16

NR-Multi-RTT-AdditionalMeasurementElement-r16 ::= SEQUENCE {

 nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,

 nr-DL-PRS-RSRP-ResultDiff-r16 INTEGER (0..61) OPTIONAL,

 nr-UE-RxTxTimeDiffAdditional-r16 CHOICE {

 k0-r16 INTEGER (0..8191),

 k1-r16 INTEGER (0..4095),

 k2-r16 INTEGER (0..2047),

 k3-r16 INTEGER (0..1023),

 k4-r16 INTEGER (0..511),

 k5-r16 INTEGER (0..255),

 ...,

 kMinus1-r18 INTEGER (0..16382),

 kMinus2-r18 INTEGER (0..32764)

 },

 nr-TimingQuality-r16 NR-TimingQuality-r16,

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 ...,

 [[

 nr-UE-RxTx-TEG-Info-r17 NR-UE-RxTx-TEG-Info-r17 OPTIONAL,

 nr-DL-PRS-FirstPathRSRP-ResultDiff-r17 INTEGER (0..61) OPTIONAL,

 nr-los-nlos-IndicatorPerResource-r17 LOS-NLOS-Indicator-r17 OPTIONAL,

 nr-AdditionalPathListExt-r17 NR-AdditionalPathListExt-r17 OPTIONAL

 ]],

 [[

 nr-UE-RxTxTimeDiffBasedOnAggregatedResources-r18 ENUMERATED {true} OPTIONAL,

 nr-AggregatedDL-PRS-ResourceSetID-List-r18 SEQUENCE (SIZE (2.. 3)) OF

 NR-AggregatedDL-PRS-ResourceSetID-Element-r18 OPTIONAL,

 nr-RSCP-r18 INTEGER (0..3600) OPTIONAL,

 nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL,

 nr-RSCP-AdditionalMeasurementsAddSample-r18

 SEQUENCE (SIZE (1..nrNumOfSamples-1-r18 )) OF NR-RSCP-AdditionalMeasurements-r18

 OPTIONAL,

 nr-ReportDL-PRS-MeasBasedOnSingleOrMultiHopRx-r18

 ENUMERATED { singleHop, multipleHop } OPTIONAL

 ]]

}

NR-SRS-TxTEG-Element-r17 ::= SEQUENCE {

 nr-TimeStamp-r17 NR-TimeStamp-r16 OPTIONAL, -- Need OP

 nr-UE-Tx-TEG-ID-r17 INTEGER (0..maxNumOfTxTEGs-1-r17),

 carrierFreq-r17 SEQUENCE {

 absoluteFrequencyPointA-r17 ARFCN-ValueNR-r15,

 offsetToPointA-r17 INTEGER (0..2199)

 } OPTIONAL,

 srs-PosResourceList-r17 SEQUENCE (SIZE (1..maxNumOfSRS-PosResources-r17)) OF

 INTEGER (0..maxNumOfSRS-PosResources-1-r17),

 ...

}

NR-UE-RxTx-TEG-Info-r17 ::= CHOICE {

 case1-r17 SEQUENCE {

 nr-UE-RxTx-TEG-ID-r17 INTEGER (0..maxNumOfRxTxTEGs-1-r17)

 },

 case2-r17 SEQUENCE {

 nr-UE-RxTx-TEG-ID-r17 INTEGER (0..maxNumOfRxTxTEGs-1-r17),

 nr-UE-Tx-TEG-Index-r17 INTEGER (1..maxTxTEG-Sets-r17)

 },

 case3-r17 SEQUENCE {

 nr-UE-Rx-TEG-ID-r17 INTEGER (0..maxNumOfRxTEGs-1-r17),

 nr-UE-Tx-TEG-Index-r17 INTEGER (1..maxTxTEG-Sets-r17)

 },

 ...

}

NR-RSCP-AdditionalMeasurements-r18 ::= SEQUENCE {

 nr-RSCP-ResultDiff-r18 INTEGER (0..3600) OPTIONAL,

 nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL,

 nr-TimeStamp-r18 NR-TimeStamp-r16 OPTIONAL,

 ...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *Case2-3* | The field is mandatory present if the IE *NR-UE-RxTx-TEG-Info* is provided for choice's *case2* and *case3*. Otherwise it is not present. |
| *TEGCase3* | The field is optionally present, need OP, if the IE *NR-UE-RxTx-TEG-Info* is provided for choice *case3*. Otherwise it is not present. |
| *TEGCase2-3* | The field is optionally present, need OP, if the IE *NR-UE-RxTx-TEG-Info* is provided for choice's *case2* and *case3*. Otherwise it is not present. |
| *TEGCase1-2* | The field is optionally present, need OP, if the IE *NR-UE-RxTx-TEG-Info* is provided for choice's *case1* and *case2*. Otherwise it is not present. |

|  |
| --- |
| *NR-Multi-RTT-SignalMeasurementInformation* field descriptions |
| ***nr-NTA-Offset***This field provides the *NTAoffset* used by the target device as specified in TS 38.133 [46], Table 7.1.2-2. Enumerated values nTA1, nTA2, nTA3, and nTA4 correspond to *NTAoffset* of 25600 Tc, 0 Tc, 39936 Tc, and 13792 Tc, respectively. |
| ***nr-SRS-TxTEG-Set***This field provides the SRS for Positioning Resources associated with a particular UE Tx TEG and comprises the following subfields:- ***nr-TimeStamp*** specifies the start time for which the *NR-SRS-TxTEG-Element* is valid. If this field is absent, the *nr-TimeStamp* of this instance of the *NR-SRS-TxTEG-Element* of the *nr-SRS-TxTEG-Set* is the same as the *nr-TimeStamp* of the previous instance of the *NR-SRS-TxTEG-Element*. If this field is also absent in the first *NR-SRS-TxTEG-Element* of the *nr-SRS-TxTEG-Set*, all *NR-SRS-TxTEG-Element*'s provided are valid for the measurement period of the *NR-Multi-RTT-SignalMeasurementInformation.*- ***nr-UE-Tx-TEG-ID*** specifies the ID of this UE Tx TEG.- ***carrierFreq*** specifies the frequency of the SRS for positioning resources.- ***srs-PosResourceList*** specifies the SRS for Positioning Resources belonging to this UE Tx TEG.For each UE Tx TEG, there may be up to 8 changes (different *nr-TimeStamp*) of the TEG-SRS association information provided in *nr-SRS-TxTEG-Set*, i.e., the maximum value for *maxTxTEG-Sets* is 64. |
| ***nr-UE-RxTEG-TimingErrorMargin***This field specifies the UE Rx TEG timing error margin value for all the UE Rx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case3* and this field is absent, the receiver should consider the UE Rx TEG timing error margin value to be the maximum value available in IE *TEG-TimingErrorMargin*. |
| ***nr-UE-TxTEG-TimingErrorMargin***This field specifies the UE Tx TEG timing error margin value for all the UE Tx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case2* or *case3* and this field is absent, the receiver should consider the UE Tx TEG timing error margin value to be the maximum value available in IE *TEG-TimingErrorMargin*. |
| ***nr-UE-RxTxTEG-TimingErrorMargin***This field specifies the UE RxTx TEG timing error margin value for all the UE RxTx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case1* or *case2* and this field is absent, the receiver should consider the UE RxTx TEG timing error margin value to be the maximum applicable value as defined in TS 38.133 [46]. |
| ***dl-PRS-ID***This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource. This ID can be associated with multiple DL-PRS Resource Sets associated with a single TRP.Each TRP should only be associated with one such ID. |
| ***nr-PhysCellID***This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*. |
| ***nr-UE-RxTxTimeDiff***This field specifies the UE Rx–Tx time difference measurement, as defined in TS 38.215 [36].  |
| ***nr-AdditionalPathList***This field specifies one or more additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-UE-RxTxTimeDiff* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. If this field is present, the field *nr-AdditionalPathListExt* shall be absent. |
| ***nr-TimeStamp***This field specifies the time instance for which the measurement is performed. If RSCP measurement is present, the timestamp applies to both RSCP and UE Rx–Tx time difference measurement. |
| ***nr-TimingQuality***This field specifies the target device′s best estimate of the quality of the measurement. |
| ***nr-DL-PRS-RSRP-Result***This field specifies the NR DL-PRS reference signal received power (DL PRS-RSRP) measurement, as defined in TS 38.215 [36]. The mapping of the quantity is defined as in TS 38.133 [46]. |
| ***nr-Multi-RTT-AdditionalMeasurements***This field provides up to 3 additional UE Rx-Tx time difference measurements corresponding to a single configured SRS Resource or Resource Set for positioning. Each measurement corresponds to a single received DL-PRS Resource or DL-PRS Resource Set [45].If this field is present, the field *nr-Multi-RTT-AdditionalMeasurementsExt* shall be absent. |
| ***nr-UE-RxTx-TEG-Info***This field provides the ID(s) of the UE TEG associated with the *nr-UE-RxTxTimeDiff* or*nr-UE-RxTxTimeDiffAdditional* measurement. One of the following combinations of TEG IDs can be provided:- ***case1*** provides the UE RxTx TEG ID;- ***case2*** provides the UE RxTx TEG ID together with the UE Tx TEG ID. The *nr-UE-Tx-TEG-Index* provides the index to the *nr-SRS-TxTEG-Set* field for the applicable UE Tx TEG ID, where value '1' indicates the first *NR-SRS-TxTEG-Element* in *nr-SRS-TxTEG-Set*, value '2' indicates the second *NR-SRS-TxTEG-Element* in *nr-SRS-TxTEG-Set*, and so on;- ***case3*** provides the UE Rx TEG ID together with the UE Tx TEG ID. The *nr-UE-Tx-TEG-Index* provides the index to the *nr-SRS-TxTEG-Set* field for the applicable UE Tx TEG ID, where value '1' indicates the first *NR-SRS-TxTEG-Element* in *nr-SRS-TxTEG-Set*, value '2' indicates the second *NR-SRS-TxTEG-Element* in *nr-SRS-TxTEG-Set*, and so on. |
| ***nr-DL-PRS-FirstPathRSRP-Result***This field specifies the NR DL PRS reference signal received path power (DL PRS-RSRPP) of the first detected path in time, as defined in TS 38.215 [36]. The mapping of the measured quantity is defined as in TS 38.133 [46]. |
| ***nr-los-nlos-Indicator***This field specifies the target device's best estimate of the LOS or NLOS of the UE Rx-Tx Time Difference, RSRP or RSRPP of first path measurement for the TRP or resource.NOTE: If the requested type or granularity in *nr-los-nlos-IndicatorRequest* is not possible, the target device may provide a different type and granularity for the estimated *LOS-NLOS-Indicator.* |
| ***nr-AdditionalPathListExt***This field provides up to 8 additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-UE-RxTxTimeDiff* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. If this field is present, the field *nr-AdditionalPathList* shall be absent. |
| ***nr-Multi-RTT-AdditionalMeasurementsExt***This field, in addition to the measurements provided in *NR-Multi-RTT-MeasElement*, provides UE Rx-Tx time difference measurements of up to 4 DL-PRS Resources of a TRP with different UE RxTx or UE Rx TEGs. For a certain DL-PRS Resource, there can be up to 8 measurement results with respect to different UE RxTx or UE Rx TEGs. If this field is present, the field *nr-Multi-RTT-AdditionalMeasurements* shall be absent. |
| ***nr-UE-RxTxTimeDiffBasedOnAggregatedResources***This field indicates whether the measurement is based on aggregation across PFLs for Multi-RTT. |
| ***nr-AggregatedDL-PRS-ResourceSetID-List***This field provides the PRS resource set IDs and the PRS resource IDs for the aggregated measurement which are used for RSRP/RSRPP and/or timing measurement results. If the field is present, the field nr-DL-PRS-ResourceID and nr-DL-PRS-ResourceSetID should not be included. |
| ***nr-RSCP***This field specifies the NR DL reference signal carrier phase measurement, as defined in TS 38.215 [36]. sMapping of the measured quantity is defined as in TS 38.133 [46]. |
| ***nr-PhaseQuality***This field specifies the target device′s best estimate of the quality of the RSCP measurement. |
| ***nr-RSCP-AddSampleMeasurements***This field, in addition to the measurements provided in *NR-Multi-RTT-MeasElement*, provides up to 3 RSCP measurements associated with the *nr-UE-RxTxTimeDiff* in *NR-Multi-RTT-MeasElement*. |
| ***nr-ReportDL-PRS-MeasBasedOnSingleOrMultiHopRx***This field indicates that the reported measurement is based on receiving single or multiple hops of DL PRS. |
| ***nr-DL-PRS-RSRP-ResultDiff***This field provides the additional DL-PRS RSRP measurement result relative to *nr-DL-PRS-RSRP-Result.* The DL-PRS RSRP value of this measurement is obtained by adding the value of this field to the value of the *nr-DL-PRS-RSRP-Result*. The mapping of this field is defined as in TS 38.133 [46]. |
| ***nr-UE-RxTxTimeDiffAdditional***This field provides the additional UE Rx-Tx Difference measurement result relative to *nr-UE-RxTxTimeDiff.* The UE Rx-Tx Difference value of this measurement is obtained by adding the value of this field to the value of the *nr-UE-RxTxTimeDiff* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-DL-PRS-FirstPathRSRP-ResultDiff***This field specifies the additional NR DL-PRS reference signal received path power (DL PRS-RSRPP) of the first detected path in time relative to *nr-DL-PRS-FirstPathRSRP-Result*. The DL-PRS RSRPP of first path value of this measurement is obtained by adding the value of this field to the value of the *nr-DL-PRS-FirstPathRSRP-Result* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-los-nlos-IndicatorPerResource***This field specifies the target device's best estimate of the LOS or NLOS of the UE Rx-Tx Time Difference, RSRP or RSRPP of first path measurement for the resource.This field may only be present if the field *nr-LOS-NLOS-Indicator* choice indicates *perResource*. |
| ***nr-RSCP-AdditionalMeasurements***This field, provides up to 4 RSCP measurements associated with the UE Rx-Tx Time Difference measurement in *NR-Multi-RTT-MeasElement.* |
| ***nr-RSCP-ResultDiff***This field provides the additional RSCP measurement result relative to *nr-RSCP.* The RSCP value of this measurement is obtained by adding the value of this field to the value of the *nr-RSCP* field. |

*NEXT CHANGE*

6.5.12.5 NR Multi-RTT Location Information Request

– *NR-Multi-RTT-RequestLocationInformation*

The IE *NR-Multi-RTT-RequestLocationInformation* is used by the location server to request NR Multi-RTT location measurements from a target device.

-- ASN1START

NR-Multi-RTT-RequestLocationInformation-r16 ::= SEQUENCE {

 nr-UE-RxTxTimeDiffMeasurementInfoRequest-r16

 ENUMERATED { true } OPTIONAL, -- Need ON

 nr-RequestedMeasurements-r16 BIT STRING { prsrsrpReq (0),

 firstPathRsrpReq-r17 (1),

 jointMeasurementsReq-r18 (2)} (SIZE(1..8)),

 nr-AssistanceAvailability-r16 BOOLEAN,

 nr-Multi-RTT-ReportConfig-r16 NR-Multi-RTT-ReportConfig-r16,

 additionalPaths-r16 ENUMERATED { requested } OPTIONAL, -- Need ON

 ...,

 [[

 nr-UE-RxTxTEG-Request-r17 ENUMERATED { case1, case2, case3, ... }

 OPTIONAL, -- Need ON

 measureSameDL-PRS-ResourceWithDifferentRxTxTEGs-r17

 ENUMERATED { n0, n2, n3, n4, n6, n8, ... }

 OPTIONAL, -- Need ON

 measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17

 ENUMERATED { n0, n2, n3, n4, n6, n8, ... }

 OPTIONAL, -- Need ON

 reducedDL-PRS-ProcessingSamples-r17

 ENUMERATED { requested, ... } OPTIONAL, -- Need ON

 nr-los-nlos-IndicatorRequest-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType1-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity1-r17,

 ...

 } OPTIONAL, -- Need ON

 additionalPathsExt-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 additionalPathsDL-PRS-RSRP-Request-r17

 ENUMERATED { requested } OPTIONAL, -- Need ON

 multiMeasInSameReport-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 lowerRxBeamSweepingFactor-FR2-r17 ENUMERATED { requested } OPTIONAL -- Need ON

 ]],

 [[

 nr-DL-PRS-RxHoppingRequest-r18 ENUMERATED { requested } OPTIONAL, -- Need ON

 nr-DL-PRS-RxHoppingTotalBandwidth-r18 CHOICE {

 fr1 ENUMERATED {mhz40, mhz50, mhz80, mhz100},

 fr2 ENUMERATED {mhz100, mhz200, mhz400}

 } OPTIONAL, -- Need ON

 timingReportingGranularityFactorExt-r18 INTEGER (6..7) OPTIONAL, -- Need ON

 nr-DL-PRS-JointMeasurementRequested-r18 SEQUENCE (SIZE (2..3)) OF

 INTEGER (0..nrMaxFreqLayers-1-r16) OPTIONAL, -- Need ON

 nr-UE-RSCP-Request-r18 ENUMERATED { requested } OPTIONAL, -- Need ON

 nr-DL-PRS-MeasurementTimeWindowsConfig-r18

 NR-DL-PRS-MeasurementTimeWindowsConfig-r18 OPTIONAL -- Need ON

 ]]

}

NR-Multi-RTT-ReportConfig-r16 ::= SEQUENCE {

 maxDL-PRS-RxTxTimeDiffMeasPerTRP-r16 INTEGER (1..4) OPTIONAL, -- Need ON

 timingReportingGranularityFactor-r16 INTEGER (0..5) OPTIONAL -- Need ON

}

-- ASN1STOP

|  |
| --- |
| ***NR-Multi-RTT-RequestLocationInformation* field descriptions** |
| ***nr-UE-RxTxTimeDiffMeasurementInfoRequest***This field, if present, indicates that the target device is requested to report the DL-PRS Resource ID(s) or DL-PRS Resource Set ID(s) associated with the DL-PRS Resources(s) or the DL-PRS Resource Set(s) which are used in determining the UE Rx-Tx time difference measurements. |
| ***nr-AssistanceAvailability***This field indicates whether the target device may request additional PRS assistance data from the server. TRUE means allowed and FALSE means not allowed. |
| ***maxDL-PRS-RxTxTimeDiffMeasPerTRP***This field specifies the maximum number of UE-Rx-Tx time difference measurements for different DL-PRS Resources or DL-PRS Resource Sets per TRP.  |
| ***timingReportingGranularityFactor, timingReportingGranularityFactorExt***This field specifies the recommended reporting granularity for the UE Rx-Tx time difference measurements. Value (0..5) corresponds to (*k0*..*k5*) and value (6..7) corresponds to (*kMinus1*..*kMinus2*) used for *nr-UE-RxTxTimeDiff* and *nr-UE-RxTxTimeDiffAdditional* in *NR-Multi-RTT-MeasElement*. The UE may select a different granularity value for *nr-UE-RxTxTimeDiff* and *nr-UE-RxTxTimeDiffAdditional*. The *timingReportingGranularityFactorExt* should not be included by the location server and shall be ignored by the target device if *timingReportingGranularityFactor* is included.The *timingReportingGranularityFactor* should not be included by the location server and shall be ignored by the target device if *timingReportingGranularityFactorExt* is included. |
| ***additionalPaths***This field, if present, indicates that the target device is requested to provide the *nr-AdditionalPathList* in IE *NR-Multi-RTT-SignalMeasurementInformation*. If this field is present, the field *additionalPathsExt* shall be absent. |
| ***nr-UE-RxTxTEG-Request***This field, if present, indicates that the target device is requested to provide the *NR-UE-RxTx-TEG-Info* in IE *NR-Multi-RTT-SignalMeasurementInformation.* Enumerated value '*case1*' indicates that the target device is requested to provide the *case1* choice in *NR-UE-RxTx-TEG-Info*, enumerated value '*case2*' indicates that the target device is requested to provide the *case2* choice in *NR-UE-RxTx-TEG-Info*, and so on. |
| ***measureSameDL-PRS-ResourceWithDifferentRxTxTEGs***This field, if present, indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with *N* different UE RxTx TEGs and with the same UE Tx TEG. Enumerated value '*n0*' indicates that the number *N* of different UE RxTx TEGs to measure the same DL PRS Resource can be determined by the target device, value '*n2*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 2 different UE RxTx TEGs, value '*n3*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 3 different UE RxTx TEGs, and so on. When the location server requests aggregated measurements, a request for configuring the target device to measure the same aggregated DL-PRS Resources of a TRP with N different UE RxTx TEGs.If this field is present, the field *nr-UE-RxTxTEG-Request* should also be present.If this field is present, the field *measureSameDL-PRS-ResourceWithDifferentRxTEGs* should not be present. |
| ***measureSameDL-PRS-ResourceWithDifferentRxTEGs***This field, if present, indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with *N* different UE Rx TEGs. Enumerated value '*n0*' indicates that the number *N* of different UE Rx TEGs to measure the same DL PRS Resource can be determined by the target device, value '*n2*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 2 different UE Rx TEGs, value '*n3*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 3 different UE Rx TEGs, and so on. When the location server requests aggregated measurements, a request for configuring the UE to measure the same aggregated DL-PRS Resources of a TRP with N different UE Rx TEGs.If this field is present, the field *nr-UE-RxTxTEG-Request* should also be present.If this field is present, the field *measureSameDL-PRS-ResourceWithDifferentRxTxTEGs* should not be present. |
| ***reducedDL-PRS-ProcessingSamples***This field, if present and set to '*requested*', indicates that the target device is requested to perform the requested measurements with reduced number of samples (M=1 or M=2) as specified in TS 38.133 [46]. When requested for aggregated measurements by the location server, this field indicates processing of reduced number of samples for the aggregated measurements. |
| ***nr-los-nlos-IndicatorRequest***This field, if present, indicates that the target device is requested to provide the indicated type and granularity of the estimated *LOS-NLOS-Indicator* in the *NR-Multi-RTT-SignalMeasurementInformation*.  |
| ***additionalPathsExt***This field, if present, indicates that the target device is requested to provide the *nr-AdditionalPathListExt* in IE *NR-Multi-RTT-SignalMeasurementInformation*. If this field is present, the field *additionalPaths* shall be absent. |
| ***additionalPathsDL-PRS-RSRP-Request***This field, if present, indicates that the target device is requested to provide the *nr-DL-PRS-RSRPP* for the additional paths in the field *nr-AdditionalPathList* or *nr-AdditionalPathListExt*.  |
| ***multiMeasInSameReport***This field, if present, indicates that the target device is requested to provide multiple measurement instances in a single measurement report; i.e., include the *nr-Multi-RTT-SignalMeasurementInstances* in IE *NR-Multi-RTT-ProvideLocationInformation.* |
| ***lowerRxBeamSweepingFactor-FR2***This field, if present, indicates that the target device is requested to use a lower Rx beam sweeping factor than 8 for FR2 according to UE's capability. When requested for aggregated measurements by the LMF, this field indicates that the target device is requested to use a lower Rx beam sweeping factor than 8 for FR2 according to UE's capability for the aggregated measurements. |
| ***nr-DL-PRS-RxHoppingRequest***This field, if present, indicates that the target device is requested to perform DL PRS Rx hopping measurements and reporting. |
| ***nr-DL-PRS-RxHoppingTotalBandwidth***This field, if present, indicates the total bandwidth of all hops in MHz. |
| ***nr-DL-PRS-JointMeasurementRequested***This field, if present, indicates that the target device is requested to perform joint measurements on the indicated two or three PFLs that are linked for DL PRS BW aggregation. The field can be present if *jointMeasurementsReq* in *nr-RequestedMeasurements* is set to one-value. Otherwise, it is absent. Value 0 corresponds to the first frequency layer provided in nr-DL-PRS-AssistanceDataList, value 1 to the second frequency layer in *nr-DL-PRS-AssistanceDataList*, and so on. |
| ***nr-UE-RSCP-Request***This field, if present, indicates that the device is requested to provide the DL RSCP measurement in IE *NR-Multi-RTT-SignalMeasurementInformation* together with *nr-UE-RxTxTimeDiff.* |
| ***NR-DL-PRS-MeasurementTimeWindowsConfig*** This field indicates DL-PRS resource set(s) occurring within time window(s) for performing measurements where the time window is indicated by a start time, periodicity, offset and duration. |

#### 6.5.12.6 NR Multi-RTT Capability Information

#### – *NR-Multi-RTT-ProvideCapabilities*

The IE *NR-Multi-RTT-ProvideCapabilities* is used by the target device to indicate its capability to support NR Multi-RTT and to provide its NR Multi-RTT positioning capabilities to the location server.

-- ASN1START

NR-Multi-RTT-ProvideCapabilities-r16 ::= SEQUENCE {

 nr-Multi-RTT-PRS-Capability-r16 NR-DL-PRS-ResourcesCapability-r16,

 nr-Multi-RTT-MeasurementCapability-r16 NR-Multi-RTT-MeasurementCapability-r16,

 nr-DL-PRS-QCL-ProcessingCapability-r16 NR-DL-PRS-QCL-ProcessingCapability-r16,

 nr-DL-PRS-ProcessingCapability-r16 NR-DL-PRS-ProcessingCapability-r16,

 nr-UL-SRS-Capability-r16 NR-UL-SRS-Capability-r16,

 additionalPathsReport-r16 ENUMERATED { supported } OPTIONAL,

 periodicalReporting-r16 ENUMERATED { supported } OPTIONAL,

 ...,

 [[

 ten-ms-unit-ResponseTime-r17 ENUMERATED { supported } OPTIONAL,

 nr-DL-PRS-ExpectedAoD-or-AoA-Sup-r17 BIT STRING { eAoD (0),

 eAoA (1)

 } (SIZE (1..8)) OPTIONAL, nr-Multi-RTT-On-Demand-DL-PRS-Support-r17

 NR-On-Demand-DL-PRS-Support-r17 OPTIONAL,

 nr-UE-RxTx-TEG-ID-ReportingSupport-r17 BIT STRING { case1 (0),

 case2 (1),

 case3 (2)

 } (SIZE (1..8)) OPTIONAL,

 nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

 additionalPathsExtSupport-r17 ENUMERATED { n4, n6, n8 } OPTIONAL,

 scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupport-r17 OPTIONAL,

 nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

 area-validity-r17 INTEGER (1..maxNrOfAreas-r17) OPTIONAL,

 ...

 } OPTIONAL,

 multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

 mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 posMeasGapSupport-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 symbolTimeStampSupport-r18 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

| *NR-Multi-RTT-ProvideCapabilities* field descriptions |
| --- |
| ***ten-ms-unit-ResponseTime***This field, if present, indicates that the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Sup***This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData.* |
| ***nr-Multi-RTT-On-Demand-DL-PRS-Support***This field, if present, indicates that the target device supports on-demand DL-PRS requests. |
| ***nr-UE-RxTx-TEG-ID-ReportingSupport***This field, if present, indicates that the target device supports *nr-UE-RxTx-TEG-Info* reporting in IE *NR-Multi-RTT-SignalMeasurementInformation.* This is represented by a bit string, with a one‑value at the bit position means the particular case is supported; a zero‑value means not supported:- bit 0indicates that the target device supports the '*case1*' choice in *NR-UE-RxTx-TEG-Info*.- bit 1 indicates that the target device supports the '*case2*' choice in *NR-UE-RxTx-TEG-Info*.- bit 2 indicates that the target device supports the '*case3*' choice in *NR-UE-RxTx-TEG-Info*.  |
| ***nr-los-nlos-IndicatorSupport***This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-Multi-RTT-SignalMeasurementInformation*.- *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in IE *LOS-NLOS-Indicator.*- *granularity* indicates whether the target device supports *LOS-NLOS-Indicator* reporting per TRP, per DL-PRS Resource, or both.NOTE: A single value is reported when both Multi-RTT and DL-TDOA are supported. |
| ***additionalPathsExtSupport***This field, if present, indicates that the target device supports the *nr-AdditionalPathListExt* reporting in IE *NR-Multi-RTT-SignalMeasurementInformation*. The enumerated value indicates the number of additional paths supported by the target device.NOTE: The *supportOfDL-PRS-FirstPathRSRP* in IE *NR-Multi-RTT-MeasurementCapability* also applies to the additional paths. |
| ***scheduledLocationRequestSupported***This field, if present, indicates that the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time. |
| ***nr-dl-prs-AssistanceDataValidity***This field, if present, indicates that the target device supports validity conditions for pre-configured assistance data and comprises the following subfields:- ***area-validity*** indicates that the target device supports pre-configured assistance data with area validity. The integer number indicates the maximum number of areas the target device supports*.* |
| ***multiMeasInSameMeasReport***This field, if present, indicates that the target device supports multiple measurement instances in a single measurement report. |
| ***mg-ActivationRequest***This field, if present, indicates that the target device supports UL MAC CE for positioning measurement gap activation/deactivation request for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationRequestPRS-Meas* and *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***posMeasGapSupport***This field, if present, indicates that the target device supports pre-configured positioning measurement gap for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***symbolTimeStampSupport***This field, if present, indicates that the target device supports reporting timestamp in terms of radio frame timing down to OFDM symbol level. |

*NEXT CHANGE*

#### 6.5.12.6a NR Multi-RTT Capability Information Elements

#### *– NR-Multi-RTT-MeasurementCapability*

The IE *NR-Multi-RTT-MeasurementCapability* defines the Multi-RTT measurement capability. The UE can include this IE only if the UE supports *NR-DL-PRS-ResourcesCapability* for Multi-RTT. Otherwise, the UE does not include this IE;

-- ASN1START

NR-Multi-RTT-MeasurementCapability-r16 ::= SEQUENCE {

 maxNrOfRx-TX-MeasFR1-r16 INTEGER (1..4) OPTIONAL,

 maxNrOfRx-TX-MeasFR2-r16 INTEGER (1..4) OPTIONAL,

 supportOfRSRP-MeasFR1-r16 ENUMERATED { supported } OPTIONAL,

 supportOfRSRP-MeasFR2-r16 ENUMERATED { supported } OPTIONAL,

 srs-AssocPRS-MultiLayersFR1-r16 ENUMERATED { supported } OPTIONAL,

 srs-AssocPRS-MultiLayersFR2-r16 ENUMERATED { supported } OPTIONAL,

 ...,

 [[

 nr-UE-TEG-Capability-r17 NR-UE-TEG-Capability-r17 OPTIONAL,

 multi-RTT-MeasCapabilityBandList-r17 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

 Multi-RTT-MeasCapabilityPerBand-r17

 OPTIONAL

 ]]

}

Multi-RTT-MeasCapabilityPerBand-r17 ::= SEQUENCE {

 freqBandIndicatorNR-r17 FreqBandIndicatorNR-r16,

 supportOfDL-PRS-FirstPathRSRP-r17 ENUMERATED { supported } OPTIONAL,

 dl-PRS-MeasRRC-Inactive-r17 ENUMERATED { supported } OPTIONAL,

 ...,

 [[

 supportOfDL-PRS-BWA-RRC-Connected-r18 ENUMERATED { supported } OPTIONAL,

 supportOfDL-PRS-BWA-RRC-Inactive-r18 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

|  |
| --- |
| *NR-Multi-RTT-MeasurementCapability* field descriptions |
| ***maxNrOfRx-TX-MeasFR1***Indicates the maximum number of UE Rx–Tx time difference measurements corresponding to a single SRS resource/resource set for positioning with each measurement corresponding to a single DL-PRS resource/resource set on FR1. |
| ***maxNrOfRx-TX-MeasFR2***Indicates the maximum number of UE Rx–Tx time difference measurements corresponding to a single SRS resource/resource set for positioning with each measurement corresponding to a single DL-PRS resource/resource set on FR2. |
| ***srs-AssocPRS-MultiLayersFR1***Indicates whether the UE supports measurements derived on one or more DL-PRS resource/resource sets which may be in different positioning frequency layers for SRS transmitted in a single CC. PRS and SRS may be on different bands. This is for FR1 only. |
| ***srs-AssocPRS-MultiLayersFR2***Indicates whether the UE supports measurements derived on one or more DL-PRS resource/resource sets which may be in different positioning frequency layers for SRS transmitted in a single CC. PRS and SRS may be on different bands. This is for FR2 only. |
| ***supportOfRSRP-MeasFR1***Indicates whether the UE supports RSRP measurement for Multi-RTT on FR1. |
| ***supportOfRSRP-MeasFR2***Indicates whether the UE supports RSRP measurement for Multi-RTT on FR2. |
| ***nr-UE-TEG-Capability***Indicates the UE TEG capability. |
| ***supportOfDL-PRS-FirstPathRSRP***Indicates whether the target device supports DL-PRS RSRPP of first path measurement for Multi-RTT. The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field. The UE supporting *additionalPathsReport* and *supportOfDL-PRS-FirstPathRSRP* shall support RSRPP reporting for K=1 or 2 additional paths. |
| ***dl-PRS-MeasRRC-Inactive***This field, if present, indicates that the target device supports DL-PRS measurement in RRC\_INACTIVE state. The UE can include this field only if the UE supports *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer, maxNrOfTRP-AcrossFreqs, maxNrOfPosLayer* and *dl-PRS-BufferType-RRC-Inactive*. Otherwise, the UE does not include this field.NOTE: The capabilities *NR-DL-PRS-ResourcesCapability, maxNrOfRx-TX-MeasFR1, maxNrOfRx-TX-MeasFR2, supportOfRSRP-MeasFR1, supportOfRSRP-MeasFR2, srs-AssocPRS-MultiLayersFR1, srs-AssocPRS-MultiLayersFR2, simul-NR-DL-AoD-Multi-RTT* are the same in RRC\_INACTIVE state. |
| ***supportOfDL-PRS-BWA-RRC-Connected***Indicates whether the target device supports PRS bandwidth aggregation in RRC\_CONNECTED for Multi-RTT. The target device can include this field only if the target device supports *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer*, *maxNrOfTRP-AcrossFreqs*, *maxNrOfPosLayer* and *prs-BWA-TwoContiguousIntrabandInMG-RRC-Connected*. Otherwise, the UE does not include this field. |
| ***supportOfDL-PRS-BWA-RRC-Inactive***Indicates whether the target device supports PRS bandwidth aggregation in RRC\_INACTIVE for Multi-RTT. The target device can include this field only if the target device supports *dl-PRS-MeasRRC-Inactive* and *prs-BWA-TwoContiguousIntrabandInMG-RRC-IdleandInactive*. Otherwise, the target device does not include this field. |

*NEXT CHANGE*

## 6.6 Multiplicity and type constraint values

#### *– Multiplicity and type constraint definitions*

-- ASN1START

maxEARFCN INTEGER ::= 65535 -- Maximum value of EUTRA carrier frequency

maxEARFCN-Plus1 INTEGER ::= 65536 -- Lowest value extended EARFCN range

maxEARFCN2 INTEGER ::= 262143 -- Highest value extended EARFCN range

maxMBS-r14 INTEGER ::= 64

maxWLAN-AP-r13 INTEGER ::= 64

maxKnownAPs-r14 INTEGER ::= 2048

maxVisibleAPs-r14 INTEGER ::= 32

maxWLAN-AP-r14 INTEGER ::= 128

maxWLAN-DataSets-r14 INTEGER ::= 8

maxBT-Beacon-r13 INTEGER ::= 32

nrMaxBands-r16 INTEGER ::= 1024 -- Maximum number of supported bands in

 -- UE capability.

nrMaxFreqLayers-r16 INTEGER ::= 4 -- Max freq layers

nrMaxFreqLayers-1-r16 INTEGER ::= 3

nrMaxNumDL-PRS-ResourcesPerSet-1-r16 INTEGER ::= 63

nrMaxNumDL-PRS-ResourceSetsPerTRP-1-r16 INTEGER ::= 7

nrMaxResourceIDs-r16 INTEGER ::= 64 -- Max Resource IDs

nrMaxResourceOffsetValue-1-r16 INTEGER ::= 511

nrMaxResourcesPerSet-r16 INTEGER ::= 64 -- Maximum resources for one set

nrMaxSetsPerTrpPerFreqLayer-r16 INTEGER ::= 2 -- Maximum resource sets for one TRP

nrMaxSetsPerTrpPerFreqLayer-1-r16 INTEGER ::= 1

nrMaxTRPs-r16 INTEGER ::= 256 -- Max TRPs per UE

nrMaxTRPsPerFreq-r16 INTEGER ::= 64 -- Max TRPs per freq layers

nrMaxTRPsPerFreq-1-r16 INTEGER ::= 63

maxSimultaneousBands-r16 INTEGER ::= 4 -- Maximum number of simultaneously

 -- measured bands

maxBandComb-r16 INTEGER ::= 1024

nrMaxConfiguredBands-r16 INTEGER ::= 16

maxNumOfRxTEGs-r17 INTEGER ::= 32

maxNumOfRxTEGs-1-r17 INTEGER ::= 31

maxNumOfTxTEGs-1-r17 INTEGER ::= 7

maxTxTEG-Sets-r17 INTEGER ::= 256 -- Maximum applicable number is 64

maxNumOfRxTxTEGs-1-r17 INTEGER ::= 255

maxNumOfTRP-TxTEGs-1-r17 INTEGER ::= 7

maxNumOfSRS-PosResources-r17 INTEGER ::= 64

maxNumOfSRS-PosResources-1-r17 INTEGER ::= 63

maxNumResourcesPerAngle-r17 INTEGER ::= 24

maxNumPrioResources-r17 INTEGER ::= 24

maxAddMeasTDOA-r17 INTEGER ::= 31

maxAddMeasAoD-r17 INTEGER ::= 23

maxAddMeasRTT-r17 INTEGER ::= 31

maxOD-DL-PRS-Configs-r17 INTEGER ::= 8

maxCellIDsPerArea-r17 INTEGER ::= 256

maxNrOfAreas-r17 INTEGER ::= 16

maxMeasInstances-r17 INTEGER ::= 32

nrMaxNumPRS-BandWidthAggregation-r18 INTEGER ::= 256 -- Max number of PRS bandwidth

 -- aggregation configurations that

 -- LMF can provide to the UE

nrNumOfSamples-r18 INTEGER ::= 4 -- NSample of RSCP/RSCPD

nrNumOfSamples-1-r18 INTEGER ::= 3

-- ASN1STOP

*NEXT CHANGE*

# 7 Broadcast of assistance data

## 7.2 Mapping of *posSibType* to assistance data element

The supported *posSibType*'s are specified in Table 7.2-1. The GNSS Common and Generic Assistance Data IEs are defined in clause 6.5.2.2. The OTDOA Assistance Data IEs and NR DL-TDOA/DL-AoD Assistance Data IEs are defined in clause 7.4.2. The Barometric Assistance Data IEs are defined in clause 6.5.5.8. The TBS (based on MBS signals) Assistance Data IEs are defined in clause 6.5.4.8.

Table 7.2-1: Mapping of posSibType to assistanceDataElement

|  |  |  |
| --- | --- | --- |
|  | *posSibType* | *assistanceDataElement* |
| GNSS Common Assistance Data (clause 6.5.2.2) | *posSibType1-1* | *GNSS-ReferenceTime* |
| *posSibType1-2* | *GNSS-ReferenceLocation* |
| *posSibType1-3* | *GNSS-IonosphericModel* |
| *posSibType1-4* | *GNSS-EarthOrientationParameters* |
| *posSibType1-5* | *GNSS-RTK-ReferenceStationInfo* |
| *posSibType1-6* | *GNSS-RTK-CommonObservationInfo* |
| *posSibType1-7* | *GNSS-RTK-AuxiliaryStationData* |
| *posSibType1-8* | *GNSS-SSR-CorrectionPoints* |
| *posSibType1-9* | *GNSS-Integrity-ServiceParameters* |
| *posSibType1-10* | *GNSS-Integrity-ServiceAlert* |
| GNSS Generic Assistance Data (clause 6.5.2.2) | *posSibType2-1* | *GNSS-TimeModelList* |
| *posSibType2-2* | *GNSS-DifferentialCorrections* |
| *posSibType2-3* | *GNSS-NavigationModel* |
| *posSibType2-4* | *GNSS-RealTimeIntegrity* |
| *posSibType2-5* | *GNSS-DataBitAssistance* |
| *posSibType2-6* | *GNSS-AcquisitionAssistance* |
| *posSibType2-7* | *GNSS-Almanac* |
| *posSibType2-8* | *GNSS-UTC-Model* |
| *posSibType2-9* | *GNSS-AuxiliaryInformation* |
| *posSibType2-10* | *BDS-DifferentialCorrections* |
| *posSibType2-11* | *BDS-GridModelParameter* |
| *posSibType2-12* | *GNSS-RTK-Observations* |
| *posSibType2-13* | *GLO-RTK-BiasInformation* |
| *posSibType2-14* | *GNSS-RTK-MAC-CorrectionDifferences* |
| *posSibType2-15* | *GNSS-RTK-Residuals* |
| *posSibType2-16* | *GNSS-RTK-FKP-Gradients* |
| *posSibType2-17* | *GNSS-SSR-OrbitCorrections* |
| *posSibType2-18* | *GNSS-SSR-ClockCorrections* |
| *posSibType2-19* | *GNSS-SSR-CodeBias* |
| *posSibType2-20* | *GNSS-SSR-URA* |
| *posSibType2-21* | *GNSS-SSR-PhaseBias* |
| *posSibType2-22* | *GNSS-SSR-STEC-Correction* |
| *posSibType2-23* | *GNSS-SSR-GriddedCorrection* |
| *posSibType2-24* | *NavIC-DifferentialCorrections* |
| *posSibType2-25* | *NavIC-GridModelParameter* |
| OTDOA Assistance Data (clause 7.4.2) | *posSibType3-1* | *OTDOA-UE-Assisted* |
| Barometric Assistance Data(clause 6.5.5.8) | *posSibType4-1* | *Sensor-AssistanceDataList* |
| TBS Assistance Data(clause 6.5.4.8) | *posSibType5-1* | *TBS-AssistanceDataList* |
| NR DL-TDOA/DL-AoD Assistance Data (clauses 6.4.3, 7.4.2) | *posSibType6-1* | *NR-DL-PRS-AssistanceData* |
| *posSibType6-2* | *NR-UEB-TRP-LocationData* |
| *posSibType6-3* | *NR-UEB-TRP-RTD-Info* |
| *posSibType6-4* | *NR-TRP-BeamAntennaInfo* |
| *posSibType6-5* | *NR-DL-PRS-TRP-TEG-Info* |
| *posSibType6-x* | *NR-PRU-DL-Info* |
| On-demand DL-PRS Configurations (clause 6.4.3) | *posSibType6-6* | *NR-On-Demand-DL-PRS-Configurations* |
| Integrity Assistance Data for NR Positioning Methods(clause 6.4.3)  | *posSibType7-x* | *NR-IntegrityRiskParameters* |
| *posSibType7-y* | *NR-IntegrityServiceParameters* |
| *posSibType7-z* | *NR-IntegrityServiceAlert* |
| *posSibType7-z1* | *NR-IntegrityParameters* |

*NEXT CHANGE*

### 7.4.2 Element definitions

#### – *AssistanceDataSIBelement*

The IE *AssistanceDataSIBelement* is used in the IE *SystemInformationBlockPos* as specified in TS 36.331 [12] andIE *SIBpos* as specified in TS 38.331 [35].

-- ASN1START

AssistanceDataSIBelement-r15 ::= SEQUENCE {

 valueTag-r15 INTEGER (0..63) OPTIONAL, -- Need OP

 expirationTime-r15 UTCTime OPTIONAL, -- Need OP

 cipheringKeyData-r15 CipheringKeyData-r15 OPTIONAL, -- Need OP

 segmentationInfo-r15 SegmentationInfo-r15 OPTIONAL, -- Need OP

 assistanceDataElement-r15 OCTET STRING,

 ...

}

CipheringKeyData-r15 ::= SEQUENCE {

 cipherSetID-r15 INTEGER (0..65535),

 d0-r15 BIT STRING (SIZE (1..128)),

 ...

}

SegmentationInfo-r15 ::= SEQUENCE {

 segmentationOption-r15 ENUMERATED {pseudo-seg, octet-string-seg},

 assistanceDataSegmentType-r15 ENUMERATED {notLastSegment, lastSegment},

 assistanceDataSegmentNumber-r15 INTEGER (0..63),

 ...

}

-- ASN1STOP

| *AssistanceDataSIBelement* field descriptions |
| --- |
| ***valueTag***This field is used to indicate to the target device any changes in the broadcast assistance data content. The *valueTag* is incremented by one, by the location server, every time a modified assistance data content is provided. This field is not included if the broadcast assistance data changes too frequently. If *valueTag* and *expirationTime* are absent, the UE assumes that the broadcast assistance data content changes at every broadcast interval. |
| ***expirationTime***This field indicates how long the broadcast assistance data content is valid. It is specified as UTC time and indicates when the broadcast assistance data content will expire. |
| ***cipheringKeyData***If present, indicates that the *assistanceDataElement* octet string is ciphered. |
| ***segmentationInfo***If present, indicates that the *assistanceDataElement* is one of many segments. |
| ***assistanceDataElement***The *assistanceDataElement* OCTET STRING depends on the *posSibType* and is specified in Table 7.2-1. NOTE. |
| ***cipherSetID***This field identifies a cipher set comprising a cipher key value and the first component C0 of the initial counter C1. |
| ***d0***This field provides the second component for the initial ciphering counter C1. This field is defined as a bit string with a length of 1 to 128 bits. A target device first pads out the bit string if less than 128 bits with zeroes in least significant bit positions to achieve 128 bits. C1 is then obtained from D0 and C0 (defined by the *cipherSetID*) as:C1 = (D0 + C0) mod 2128 (with all values treated as non-negative integers). |
| ***segmentationOption***Indicates the used segmentation option.  |
| ***assistanceDataSegmentType***Indicates whether the included *assistanceDataElement* segment is the last segment or not. |
| ***assistanceDataSegmentNumber***Segment number of the *assistanceDataElement* segment. A segment number of zero corresponds to the first segment, one corresponds to the second segment, and so on. Segments numbers wraparound should there be more than 64 segments |

NOTE: For example, if the *posSibType* in IE *PosSIB-Type* defined in TS 36.331 [12] and TS 38.331 [35] indicates '*posSibType1-7*', the *assistanceDataElement* OCTET STRING includes the LPP IE *GNSS‑RTK‑AuxiliaryStationData*.

#### – *OTDOA-UE-Assisted*

The IE *OTDOA-UE-Assisted* is used in the *assistanceDataElement* if the *posSibType* in IE *PosSIB-Type* defined in TS 36.331 [12] indicates '*posSibType3-1*'.

-- ASN1START

OTDOA-UE-Assisted-r15 ::= SEQUENCE {

 otdoa-ReferenceCellInfo-r15 OTDOA-ReferenceCellInfo,

 otdoa-NeighbourCellInfo-r15 OTDOA-NeighbourCellInfoList,

 ...

}

-- ASN1STOP

| *OTDOA-UE-Assisted* field descriptions |
| --- |
| ***otdoa-ReferenceCellInfo***LPP IE *OTDOA-ReferenceCellInfo* as defined in clause 6.5.1.2. |
| ***otdoa-NeighbourCellInfo***LPP IE *OTDOA-NeighbourCellInfoList* as defined in clause 6.5.1.2. |

#### – *NR-IntegrityParameters*

The IE *NR-IntegrityParameters* is used in the *assistanceDataElement* if the *posSibType* in IE *PosSIB-Type* defined in TS 38.331 [35] indicates '*posSibType7-z*'.

-- ASN1START

NR-IntegrityParameters-r18 ::= SEQUENCE {

 nr-IntegrityParametersTRP-LocationInfo-r18

 NR-IntegrityParametersTRP-LocationInfo-r18 OPTIONAL, -- Need OR

 nr-IntegrityParametersDL-PRS-BeamInfo-r18

 NR-IntegrityParametersDL-PRS-BeamInfo-r18 OPTIONAL, -- Need OR

 nr-IntegrityParametersRTD-Info-r18

 NR-IntegrityParametersRTD-Info-r18 OPTIONAL, -- Need OR

 nr-IntegrityParametersTRP-BeamAntennaInfo-r18

 NR-IntegrityParametersTRP-BeamAntennaInfo-r18 OPTIONAL, -- Need OR

 ...

}

-- ASN1STOP

| *NR-IntegrityParameters* field descriptions |
| --- |
| ***NR-IntegrityParametersTRP-LocationInfo***LPP IE *NR-IntegrityParametersTRP-LocationInfo* as defined in IE *NR-PositionCalculationAssistance* in clause 6.4.3. |
| ***nr-IntegrityParametersDL-PRS-BeamInfo***LPP IE *NR-IntegrityParametersDL-PRS-BeamInfo* as defined in IE *NR-PositionCalculationAssistance* in clause 6.4.3. |
| ***NR-IntegrityParametersRTD-Info***LPP IE *NR-IntegrityParametersRTD-Info* as defined in IE *NR-PositionCalculationAssistance* in clause 6.4.3. |
| ***nr-IntegrityParametersTRP-BeamAntennaInfo***LPP IE *NR-IntegrityParametersTRP-BeamAntennaInfo* as defined in IE *NR-PositionCalculationAssistance* in clause 6.4.3. |

#### – *NR-UEB-TRP-LocationData*

The IE *NR-UEB-TRP-LocationData* is used in the *assistanceDataElement* if the *posSibType* in IE *PosSIB-Type* defined in TS 38.331 [35] indicates '*posSibType6-2*'.

-- ASN1START

NR-UEB-TRP-LocationData-r16 ::= SEQUENCE {

 nr-trp-LocationInfo-r16 NR-TRP-LocationInfo-r16,

 nr-dl-prs-BeamInfo-r16 NR-DL-PRS-BeamInfo-r16 OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

| *NR-UEB-TRP-LocationData* field descriptions |
| --- |
| ***nr-trp-LocationInfo***LPP IE *NR-TRP-LocationInfo* as defined in clause 6.4.2.1. |
| ***nr-dl-prs-BeamInfo***LPP IE *NR-DL-PRS-Beam-Info* as defined in clause 6.4.2.1. |

#### – *NR-UEB-TRP-RTD-Info*

The IE *NR-UEB-TRP-RTD-Info* is used in the *assistanceDataElement* if the *posSibType* in IE *PosSIB-Type* defined in TS 38.331 [35] indicates '*posSibType6-3*'.

-- ASN1START

NR-UEB-TRP-RTD-Info-r16 ::= SEQUENCE {

 nr-rtd-Info-r16 NR-RTD-Info-r16,

 ...

}

-- ASN1STOP

| *NR-UEB-TRP-RTD-Info* field descriptions |
| --- |
| ***nr-rtd-Info***LPP IE *NR-RTD-Info* as defined in clause 6.4.2.1. |

#### *– End of LPP-Broadcast-Definitions*

-- ASN1START

END

-- ASN1STOP

*END OF CHANGE*