**3GPP TSG-RAN WG2 Meeting #124 *R2-231xxxx***

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

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Introduction of Expanded and improved NR positioning | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CATT | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh2 | | | | |  | ***Date:*** | | | 2023-11-21 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-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. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Not support Rel-18 positioning enhancements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.1, 3.2, 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 38.305 CR 0150  TS 38.331 CR 4454  TS 38.321 CR 1700  TS 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 which have common configured parameters.

**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*

# 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-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 *Should be*  *NR-linkedDL-PRS-ResourceSetID-ListPRS-Aggregation* are 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 ON

]]

}

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 first 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 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..nrMaxSetsPerTrpPerFreqLayer-r16)) 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-ResourceSetIndexList***  This field specifies the associated DL-PRS Resource Sets of *nr-DL-PRS-AssistanceDataList* with the time window. |
| ***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-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.This field specifies the onset probability that the residual range or range rate 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 constellation fault occurs.  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 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 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

]]

}

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,

...

}

-- Editor’s note: Possible enhancements are needed to support alignment of the PRS configuration to the fixed (e)DRX configuration.

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  slots, where 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

| *GNSS-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:  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:  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:  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:  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 legacy measurement reported by a PRU, 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 (0..nrNumOfSamples-1-r18 )) OF

NR-PRU-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-AdditionalMeasurements-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 legacy DL-TDOA measurement information tmeasured by the PRU. |
| ***nr-PRU-DL-AoD-MeasInfo***  This field specifies the list of legacy DL-AoD measurement information tmeasured 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) OPTIONAL, -- Need OR

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 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. |

*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 first 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,

...,

[[

integrityReferencePointLocationBounds-r18

IntegrityLocationBounds-r18 OPTIONAL -- Need OP

]]

}

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 OP

]]

}

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 OP

]]

}

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

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

...,

[[

integrityDL-PRS-ResourceSetARP-LocationBounds-r18

IntegrityLocationBounds-r18 OPTIONAL -- Need OP

]]

}

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. If this field is absent, the bounds of the antenna reference point location of this DL-PRS Resource Set coincides with the *integrityTRP-LocationBounds*.  - ***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. If this field is absent, the bounds of the antenna reference point location(s) of this DL-PRS Resources coincides with the *integrityDL-PRS-ResourceSetARP-LocationBounds*.  - *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. If this field is absent the bounds of TRP location coincides with the *integrityReferencePointLocationBounds*, unless the field *associated-dl-PRS-ID*is present, in which case the *integrityTRP-LocationBounds* is adopted from the associated TRP indicated by *associated-dl-PRS-ID*. |
| ***integrityReferencePointLocationBounds***  This field specifies the mean and the standard deviation of the reference point location error bound of the overbounding model that bounds the reference point 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.  ***- 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.  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.

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

#### *– 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. 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: 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-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. |

|  |
| --- |
| *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-DL-PRS-ResourceSetID-r16 OPTIONAL,

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

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

nr-RSCPD-AddSampleMeasurements-r18 SEQUENCE (SIZE (0..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-DL-PRS-ResourceSetID-r16 OPTIONAL,

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

NR-RSCPD-AdditionalMeasurementElement-r18 OPTIONAL,

nr-ReportDL-PRS-MeasBasedOnSingleOrMultiHopRx-r18

ENUMERATED { singleHop, multipleHop } OPTIONAL

]]

}

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

nr-RSCPD-ResultDiff-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 for the aggregated measurement which are used for timing measurement results. |
| ***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-r18* means that the LMF request the UE 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 indicates Request from the LMF to the UE indicating which two or three PFLs to be used for performing joint measurement. The field can be present if *jointMeasurementsReq*-r18 in *nr-RequestedMeasurements-r16* 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 LMF, 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*. If the IE *timingReportingGranularityFactorExt is present, NW shall not configure the IE timingReportingGranularityFactor.* |
| ***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 LMF 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. |
| ***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 LMF, 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 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-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

]]

}

-- 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. |

*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

]]

}

-- 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]. |

*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-DL-PRS-ResourceSetID-r16 OPTIONAL,

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

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

nr-RSCP-AddSampleMeasurements-r18

SEQUENCE (SIZE (0..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-DL-PRS-ResourceSetID-r16 OPTIONAL,

nr-RSCP-AdditionalMeasurements-r18 SEQUENCE (SIZE (1..nrNumOfSamples-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. |
| ***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 for the aggregated measurement which are used for RSRP/RSRPP and/or timing measurement results. |
| ***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*. If the IE *timingReportingGranularityFactorExt is present, UE shall ignore the IE timingReportingGranularityFactor.* |
| ***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 LMF requests aggregated measurements, a request for configuring the UE 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 LMF 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 LMF, 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 indicates which two or three PFLs and the DL PRS resource sets in the two or three DL PFLs that are linked for DL PRS BW aggregation for the joint measurements. The field can be present if *jointMeasurementsReq-r18* in *nr-RequestedMeasurements-r16* 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*

## 6.6 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*

# **Annex – Agreements on Rel-18 POS enhancements (NR\_pos\_enh2)**

## **RAN2#121**

Sidelink positioning

Agreement:

RAN2 does not intend to make spec changes to support NTN operation as a PRU in Rel-18.

Agreement:

Use “SLPP” (without hyphen) as the name of the new protocol.

Agreements:

Regarding the structure of SLPP, e.g. general part, procedure part , Information Element Abstract Syntax Definition, the structure of LPP (TS 37.355) can be used as baseline for further discussion. The content of each section will be added in accordance with future agreements, not based on LPP legacy directly. FFS on procedure description in the field description as LPP.

Regarding the ASN.1 part of SLPP, follow NR RRC approach, e.g.

- FFS on Need code (e.g. how to support no UL/DL), support of delta signalling

- Define ASN.1 elements for common UE capabilities in a dedicated section (i.e. “UE capability information elements”); FFS whether any positioning method specific capability IEs should be grouped by positioning method.

- Common section for constraints

- “nonCriticalExtension” at message level

- Fields in the field description are sorted based on alphabetical order

- FFS on whether setup release structure should be introduced in SLPP

Agreement:

PC5-U is used for transport of SLPP.

Agreement:

With respect to the overall signaling procedure for PC5-only positioning (including at least IC and OOC; FFS if there are differences for PC), it is proposed to agree that the sidelink positioning procedure comprises the following series of steps as a baseline, between the LMF/positioning server UE/NG-RAN/candidate Anchor UE(s) and Target UE(s):

1. Triggering event
2. Sidelink positioning capability exchange

3. Sidelink positioning assistance data transfer

4. SL Positioning Request Location Information

5. Measurement of SL-PRS

6. Location calculation

7. SL Positioning Provide Location Information

Some steps may have dependencies on SA2 and can be revisited in this light. The order is subject to further discussion. FFS if discovery and selection of anchor UEs and/or server UE are part of the positioning layer in RAN2 scope.

LS to SA2 to ask for confirmation and guidance on the SA2 aspects.

Agreement:

RAN2 do not intend to discuss assistant UE functionality in Rel-18.

To be indicated in the LS to SA2 in discussion [409].

Direct ranging between two UEs with the server providing assistance to both sides is not precluded.

Agreement:

RAN2 confirm that for cases without LMF involvement, besides method determination, assistant data distribution and anchor UE selection (agreed in RAN2), the SL positioning server UE may perform SL-PRS configuration coordination and location calculation.

RAT-dependent integrity

Agreements:

RAN2 anticipate that the error sources are overbounded by a Gaussian distribution.

LS to RAN1 to check this view and ask about the parameters for the overbound distributions.

Agreements:

TRP related error source bounds can be provided to UE via dedicated LPP providing assistance message or posSIB.

Any interaction between the LMF and NG-RAN to support determination of error sources is in RAN3 scope. Other aspects of determining the TRP error sources are left to deployment and implementation.

For UE-based RAT-dependent integrity, the PL and/or its corresponding TIR are provided to LMF as legacy, using the existing common LPP signalling from Rel-17.

LPHAP

Agreements:

When configured with SRS configuration along with SRS validity area, if the UE reselects to another cell within the SRS validity area during SRS transmission, the UE continues the SRS transmission, subject to validation for SRS transmission.

Wait for RAN1 progress for the validation of SRS transmission with issues such as interference, timing advance and spatial relation information, etc.

Agreements:

RAN2 assume when the UE reselects out of the positioning validity area during SRS transmission, the UE may send an RRC message to the network for SRS configuration request.

LS to RAN3 to confirm this.

## **RAN2#121bis-e**

Sidelink positioning

Agreements:

LS on group positioning is postponed for a reply from next meeting.

WA: RAN2 understand that group positioning is to acquire location estimates of multiple target UEs (absolute positioning) or multiple UE pairs (Ranging/relative positioning) per LCS request, in line with the guidance already received from SA2.

WA: At least part of the group management for group positioning is performed at upper/application layer.

Agreements:

Sidelink Positioning Architecture in Figure 1-4 on R2-2304301 is taken as baseline in TS 38.305 for further discussion.

RAN2 understanding is that there is no impact to LTE specs from this objective.

Agreement:

Anchor UE and target UE roles can be shown in the sidelink positioning procedures in stage 2. Server UE can be further discussed at least for the case that the server UE is separate from the target and anchor.

Agreement:

Discovery procedure is included in the sidelink positioning procedure at least for out of coverage scenario.

Agreement:

Anchor UE selection can be included in the sidelink positioning procedures at least for out of coverage scenario.

Agreements:

RAN2 confirms that discovery messages will be used to carry information for targeted discovery and candidate selection of SL positioning UEs, including at least the indication of anchor UE, target UE. and server UE roles. FFS how much information is indicated about anchor UEs (e.g., knowledge of location).

The UE role information is indicated in the discovery SLPP metafield. FFS if this applies to both discovery modes and which messages.

Agreements:

R2 agree that for session-based SLPP, a SLPP session is used among UEs in PC5-only case in order to obtain location related measurements/location estimates, to transfer assistance data, or to exchange of capabilities.

RAN2 agree that for session-based SLPP, a single SLPP session is created to support a single location request at least in case of a single target UE; FFS how sessions work if there are multiple target UEs in a single location request.

TP in R2-2304005 is postponed.

RAN2 agree that, for session-based SLPP, SLPP transactions are indicated at the SLPP protocol level with a transaction ID in order to associate messages with one another (e.g., request and response)”

RAN2 agree that for session-based SLPP, messages within a transaction are linked by a common transaction identifier.

RAT-dependent integrity

Agreement:

LS to RAN1 to include a request for confirmation that the beam-related information (Beam Bore-Sight Direction and Beam Antenna Information) are error sources for DL-AoD positioning.

Agreement:

LS to RAN1 to include the question of whether RAN1 identify a need for a DNU flag for measurements.

Agreement:

For RAT-dependent integrity, the PL calculation is performed by the entity which also performs the position calculation for a location process.

Agreements:

For UE-based integrity, the integrity parameters of error sources for RAT-dependent integrity are included in assistance data.

LPP Request/Provide Assistance Data are reused for retrieving the integrity parameters to the UE from the LMF. The request is per positioning method (as in legacy operation) and the provided integrity parameters are as appropriate for the selected positioning method.

Use of posSIBs for integrity parameters is not excluded.

Working assumption:

For LMF-based integrity, no integrity KPI (TTA, TIR, and AL) and integrity results transfer in LPP message.

Working assumption:

It is left to LMF implementation to decide the measurement error source bound distribution based on the measurement results from UE and/or NG-RAN.

Agreement:

Indicate the WA above in the LS to RAN1 to allow them to register any concern.

Agreement:

Capture the stage 2 impact for RAT-dependent integrity in section 7 of 38.305. Initial running CR to be seen at next meeting, using R2-2302504 and R2-2303682 as baseline.

Agreements:

Q1: no addition over the version in R2-2304460

Q2: omit the condition on the WA

Q2: omit the sentence on the use case

LS approved with these changes.

LPHAP

Agreement:

Wait for RedCap progress on extending eDRX cycle (from RAN2 perspective).

Agreement:

The SRS validity area configuration contains a list of cells in which it is valid. FFS validity timer or if we would depend only on explicit release by the network.

Agreements:

RRCRelease can be used to provide SRS configuration with validity area for use in RRC\_INACTIVE.

Agreement:

SRS configuration request can be indicated via Msg3/MsgA transmission. FFS if the request is in the RRC message or an accompanying MAC CE.

Agreement:

Send a reply LS to SA2 to indicate that from the perspective of RAN2, “low power or high accuracy” positioning is out of the Rel-18 WI scope.

## **RAN2#122**

Sidelink positioning

Agreement:

WA: The SLPP ASN.1 design should allow "selective ASN.1 compilation", i.e. The overall SLPP functionality is divided into "groups", where each group is defined as a separate ASN.1 module.

Agreements:

SLPP over PC5-U/Uu will support reliable transport for at least unicast. FFS groupcast.

Inform SA2 about our agreements on sidelink positioning, with “take into account” action.

SLPP carried over NAS is used between UE and LMF. FFS on how to manage the session/transaction.

Agreements:

Anchor UE selection is supported by information about the candidate anchor UEs. At least the following list can be discussed for use in anchor UE selection:

1. UE roles

2. Supported positioning method

3. In coverage or not

4. RSRP

5. LOS/NLOS

6. Location

7. PLMN

A normative requirement on which anchor UEs to select (e.g., ranking) will not be specified.

RAN2 impact of this information to be determined.

FFS which information would be determined statically/dynamically.

Agreements:

SLPP can support multiple target UEs in the same session when LCS requests.

RAN2 will not specify group management for multiple target UEs. RAN2 assumption is that a group ID will be provided from upper layers.

FFS how session IDs are managed between multiple UEs.

RAT-dependent integrity

Agreement:

For stage2 description of RAT-dependent integrity, move the section of “Integrity Principle of Operation” to a generic section that is not specific to positioning methods.

Agreements:

Represent the TRP and ARP location errors by a Gaussian paired over-bounding.

Represent the RTD errors by a Gaussian paired over-bounding.

LPHAP

Agreements:

Define an SRS for positioning validity-area specific TA timer (e.g., with larger values) for a UE in RRC\_INACTIVE state.

- The UE starts/restarts the area-specific TA timer when it receives the TA command.

- The UE stops the SRS transmission when the area-specific TA timer expires.

- The UE stops the area-specific TA timer when it reselects to a cell out of the SRS validity area.

- Other stop/restart conditions can be discussed.

Agreements:

RAN2 consider that the LMF should determine the area-specific SRS configuration. Details are up to RAN3.

LS to RAN3 to indicate this conclusion, including RAN1 to prompt them for parameters. To be included in the LS from [AT122][415].

Agreement:

RAN2 will introduce an activation indication and/or request for preconfigured SRS using at least Msg3/MsgA; FFS if Msg1 would be supported also. FFS RRC signalling or MAC CE for the Msg3/MsgA case, as for the configuration request. This agreement does not imply that the UE will be allowed to transmit autonomously.

## **RAN2#123**

Sidelink positioning

Agreement:

Tell SA2 that like anchor UEs, a normative requirement on which server UE to select (e.g., ranking) will not be specified, and RAN2 do not intend to specify when the selection takes place; we leave it to SA2 to determine whether to specify anything.

Agreement:

RAN2 will follow RAN1 agreement to support relative velocity in Rel-18.

Agreements:

Reply to SA2 that LMF can provide assistance information to UE in SLPP, which is not exposed to SA2.

Agreements:

Endorse the TS 38.355 v0.0.4 in R2-2307663

SLPP reliable transport includes duplicate detection, acknowledgement and retransmission functions.

Text proposal of reliable transport (Alt 1) in clause 6 is used as baseline for reliable transport.

Text proposal of message header in clause 7 is used as baseline for reliable transport.

Confirm the WA “i.e. The overall SLPP functionality is divided into "groups", where each group is defined as a separate ASN.1 module.” and use text proposal in clause 8 as baseline.

Reuse the LPP transaction mechanism to SLPP.

Agreements:

RRC/38.306 capabilities are captured separately and merged into the mega CRs as usual (both RAN1/RAN4 and RAN2 capabilities).

RAN1/4 feature groups related to LPP/SLPP should be captured in LPP/SLPP running CR directly.

RAN2 determined UE capabilities can be captured in LPP/SLPP running CR directly. Feature list will be captured and maintained as usual.

CR rapporteurs are asked to check for consistency where capabilities overlap between RRC and LPP/SLPP.

Agreements:

For LMF involved SL based positioning, follow SA2 on how to handle LMF involved SL based positioning between UE (who has connection with network), LMF and AMF. FFS on how to handle session for UEs involved in the same LMF involved SL based positioning and the relationship between routing ID/correlation ID and session ID.

At least for UE-only operation, introduce explicit field “sessionID” in SLPP, and put it under message header of SLPP message. FFS how session ID is defined.

At least for UE-only operation, the UE who receives the LCS request at least needs to:

- Initiate the first SLPP procedure;

- Assign the sessionID, and include it in the SLPP messages (Rx side should use the received sessionID for messages in the same positioning session).

FFS within what scope the session ID is unique.

At least for UE-only operation, if the UE who receives the LCS request can act as the SL Positioning Server UE, then the UE shall trigger following procedures with each of UEs (UE2-UEn in the figure) in the SLPP session:

- SL Positioning Capability Transfer procedure,

- SL Location Information Transfer (FFS on who decide positioning method) and

- SL Positioning Assistance Data exchange (depends on RAN1 discussion on how to select the SL-PRS resources)

In stage 3 specification, use "Endpoint A" and "Endpoint B” to describe the procedure instead of target UE, anchor UE and server UE concept, e.g. [figure omitted]

Agreement:

RAN2 to apply terms of “UE-only Operation” and “Network-based Operation” defined in TS 23.586 by SA2 for SLPP procedures.

Agreements:

Delivery by an IC UE to the LMF via SLPP of information received from an OOC UE via SLPP (UE2 => UE1 => LMF), and the reverse operation LMF => UE1 => UE2, are needed at least for partial coverage scenarios.

FFS if this involves single or separate SLPP sessions (LMF ⬄ UE1 and UE1 ⬄ UE2).

FFS if the same functionality is needed for IC scenarios (depending on whether the LMF communicates with each UE or always through the target).

RAN2 see risk to completion of sidelink positioning with the current scope.

Agreement:

FFS which (if any) additional parameters can be included (as optional or mandatory) in the metadata in the discovery message for anchor and server UE selection; it should be based on technical requirements for the fields and how they will be used.

Agreements:

Define 8 priority levels for SL-PRS priority, same as the number of priority levels for SL-SCH. Send a LS to RAN1 and SA2 on RAN2 agreement with the understanding that the SL-PRS priority levels are mapped from sidelink positioning/ranging QoS. (14/14)

The SL-PRS priority can be provided by the UE’s own high layer when it triggers the SL-PRS transmission. (14/14) The following issues are open and can be raised in the LS for RAN1 input:

 Whether the UE’s higher layer can provide SL-PRS priority for the SL-PRS triggered by peer UE

 Whether the peer UE triggers the SL-PRS transmission can provide the SL-PRS priority

When aperiodic/one-shot SL-PRS transmission is triggered for UE configured with Scheme 1 SL-PRS resource allocation, at least for the case when LMF is not involved in giving the grant, design a new MAC CE for the UE to send to the gNB for SL-PRS resource request. (12/14) FFS when LMF is involved.

At least when periodic SL-PRS transmission is triggered for UE configured with Scheme 1 SL-PRS resource allocation, at least for the case when LMF is not involved in giving the grant, the UE sends an RRC message to the gNB for providing the assistance information for CG configuration. (13/14) FFS when the LMF is involved.

Support CBR measurement on both shared and dedicated resource pool for SL-PRS transmission. (14/14)

RAT-dependent integrity

Agreements:

The DNU flags are provided per TRP and per error contribution (e.g., TRP location, RTD, beam information, etc.) in a new IE NR-Integrity-ServiceAlert.

DNU flags for TRP/UE positioning measurements are not needed.

The 'Integrity Correlation Times', defining the minimum time interval beyond which two sets of assistance data parameters for a given error can be considered to be independent from one another, can optionally be provided for the integrity assistance data.

It is left to LMF implementation to decide the measurement error source bound distribution based on the measurement results provided to the LMF from UE and/or NG-RAN.

The beam related information (Beam Bore-Sight Direction/Beam Antenna Information) are error sources for DL-AoD positioning. FFS if RAN2 support signalling this information.

Agreement:

For LMF-based integrity, no integrity KPI (TTA, TIR, and AL) and integrity results transfer in LPP message.

LPHAP

Agreements:

When the UE reselects out of the positioning validity area during SRS transmission, the UE may send an RRC message to the network for SRS configuration request. The SRS configuration request is sent in the RRC message RRCResumeRequest (18/18).

WA: A new resume cause is introduced for the above use case.

Periodic SRS is supported to be configured with validity area. This agreement does not affect preconfigured SRS.

Activation/deactivation is not required for periodic SRS. This agreement does not affect preconfigured SRS.

Aperiodic SRS is not supported to be configured with validity area.

RAN2 do not further consider providing pre-configured SRS via system information in Rel-18.

For the activation indication and/or request for preconfigured SRSs, RRCResumeRequest message is used, and 1-bit indication in the RRCResumeRequest is introduced for this use.

WA: The resume cause introduced for the SRS configuration request can be reused for the activation indication of the pre-configuration SRS.

Sending the activation indication and/or requesting for preconfigured SRS using Msg1 is not supported.

Agreement:

Semi-persistent SRS is supported to be configured with validity area, and RAN2 agree to reuse legacy mechanism to deactivate the SP SRS

Agreements:

At least alignment of PRS to fixed (e)DRX is supported.

At least UE-initiated on-demand PRS request procedure is supported for the alignment of the PRS configuration to the fixed (e)DRX configuration.

UE may utilize the positioning assistance data through posSIB or assistance data received in RRC\_CONNECTED when UE is to perform positioning in RRC\_IDLE. No stage 3 impact is foreseen.

The following criterion needs to be defined for the start/re-start of the area-specific TA timer:

 Reception of RRCRelease message containing the SRS configuration (excluding pre-configured SRS)

The following criteria need to be defined for the stop of the area-specific TA timer (FFS other conditions):

 Reception of RRCResume message

 Reception of RRCSetup message

 Reception of RRCRelease message without SRS configuration

RedCap positioning, carrier phase positioning, and bandwidth aggregation for positioning

Agreements:

For DL PRS bandwidth aggregation across PFLs, RAN2 to consider following signalling enhancements (subject to the details of the RAN1 parameter list):

− Include the joint measurement indication and the aggregated PRSs resource PRS sets IDs across PFLs in LPP RequestLocationInformation and ProvideAssistanceData messages.

− Include the PFL aggregation indication and the aggregated measurement results with PRS resource sets ID in LPP ProvideLocationInformation message.

For activation/deactivation of aggregated SRS across two or three carriers, a single MAC CE is used. FFS if it can be a legacy MAC CE or a new one is needed.

## **RAN2#123bis-e**

Sidelink positioning

Agreements:

Introduce the UE capability on supporting positioning mode(i.e. UE based, UE assisted) per positioning method in SLPP.

Introduce the UE capability on supporting periodical reporting per positioning method in SLPP.

Introduce the UE capability on supporting lower value of response time (e.g. 10ms) per positioning method in SLPP.

Agreements:

The configuration of SL-PRS resource pool to the UE shall follow the same principle as SL communication, i.e. rely on NW/gNB for in coverage and pre-configuration for out of coverage case.

The SL-PRS sequence ID can be provided to the TX UE by the LMF/Server UE (via SLPP signalling). If the Tx UE does not receive a sequence ID via SLPP message from the server, the Tx UE is expected to select one by itself. FFS exact SLPP signalling.

For absolute sidelink positioning, the locations of the anchor UEs are provided to the entity that does the location calculation.

Agreements:

Support the following at least the following contents within the MAC CE for SL-PRS resource request: FFS whether both of them can be items with a list

 Destination ID (indicated by an index rather than the complete destination ID)

 Priority

When UL-SCH resource cannot accommodate SL-PRS resource request MAC CE plus its subheader, the UE should send SR to the gNB, either by SR-PUCCH or SR-PRACH.

SL-PRS resource request MAC CE is cancelled when the MAC CE is transmitted. FFS the other conditions to cancel the MAC CE.

SR triggered by the SL-PRS resource request MAC CE is cancelled when the MAC CE is transmitted. FFS the other conditions to cancel the SR.

Do not support activation/deactivation of the CG type2 by the UE sending a MAC CE.

CG confirmation MAC CE is needed when the DCI for CG type 2 activation/deactivation command is successfully received.

Decide on the issue of whether to reuse the legacy Sidelink Configured Grant Confirmation MAC CE when the CG configurations are provided by RAN1.

Confirm that dedicated/shared RP can be configured at the same time.

Leave the resource pool selection to UE implementation among resource pools allowing SL-PRS transmission when resource selection is triggered for SL-PRS transmission.

Legacy conditions for resource selection/reselection check can be reused when the shared pool is selected.

Legacy conditions for resource selection/reselection can be the baseline when the dedicated pool is selected.

The following two conditions are not applicable for the conditions for resource selection/reselection for dedicated resource pool.

 if PSCCH duration(s) and 2nd stage SCI on PSSCH for all transmissions of a MAC PDU of any selected sidelink grant(s) are not in SL DRX Active time as specified in clause 5.28.3 of the destination that has data to be sent.

 if the selected sidelink grant cannot accommodate a RLC SDU by using the maximum allowed MCS configured by RRC in sl-MaxMCS-PSSCH associated with the selected MCS table and the UE selects not to segment the RLC SDU

If the transmission with the selected grant cannot fulfill the remaining SL-PRS delay budget, resource selection/reselection is performed.

The following legacy parameters are selected/reselected when the TX resource (re-)selection is triggered in the shared resource pool.

(a) Resource reservation interval, when the transmission of periodic SL-PRS

(b) COUNTER value, when the transmission of periodic SL-PRS

(c) Number of HARQ retransmissions

(d) frequency resources within the range

The following parameters are selected/reselected when the TX resource (re-)selection is triggered in the dedicated resource pool. [15/15] FFS the number of retransmissions.

(a) resource reservation interval, when the transmission of periodic SL-PRS

(b) COUNTER value, when the transmission of periodic SL-PRS

When resource selection is triggered for the transmission of both data and SL-PRS on shared resource pool, the priority is determined by MAC as the higher priority of the two for the usage of both MAC and PHY. Send a reply LS to RAN1

The priority of the data should follow the priority of PRS when there is only SL-PRS pending for transmission on shared resource pool.

For a SL grant in dedicated resource pool, MAC layer selects the destination that has the highest priority of the SL PRS for transmission. FFS the other criteria for destination selection in shared resource pool

For a SL Grant in shared resource pool, MAC layer selects the destination with the highest priority of the SL-PRS and SL-SCH data. FFS the other criteria for destination selection in shared resource pool

When the destination of the shared resource pool is already selected when there are both SL-PRS and data pending for transmission, SL PRS is transmitted when there is remaining resources for SL-PRS after the SL-SCH with higher priority has already been allocated; if there is no higher priority data, SL-PRS can be transmitted.

If a SL PRS is transmitted in the SL grant in the shared pool, legacy LCP rules can be performed to construct MAC PDU associated with the SL grant after TBS is provided from PHY.

If the selected destination only has pending SL PRS, the MAC entity should generate MAC PDU containing only padding MAC subPDU for the transmission along with SL-PRS.

DRX and dedicated resource pool for PRS transmission should not be applied together. This does not preclude the NW configuration for dedicated RP to be configured together with DRX.

Collision handling between SL/UU for SL-PRS is based on the L1 priority.

SL-PRS is prioritized over PUSCH/PUCCH when

 The value of the priority of PUSCH/PUCCH is higher than a threshold, as in legacy

 The value of the priority of SL-PRS is lower than a threshold

Send an LS to RAN1 about the agreement on collision handling.

Agreement:

When resource selection is triggered for SL-LCH data transmission, dedicated pool should not be selected.

Agreements:

Not support SLPP segmentation in Rel-18.

6 octets length session ID

Not to support initiator ID unless companies identify the use case for it.

FFS to introduce endSession Boolean value in the message header with/without the messageBody. When set to FALSE, endSession indicates an active SLPP session. When set to TRUE, endSession indicates the SLPP session has concluded. When set to TRUE, the message should always request an acknowledgement

Introduce an additional SLPP PDU (e.g., SLPP-PDU-Common-SL-PRS-Methods-Contents), which specifies common content for SL-PRS methods only. We still keep positioning specific PDU for future proof.

Working assumption: Add Range and Direction as one choice in the LocationCoordinates IE. We may revise it if RAN1 have different view.

Introduce the following SLPP position methods:

- SL-RTT,

- SL-AoA,

- SL-TDOA,

- SL-TOA.

The capability exchange can be performed between two peer UEs

Keep the EN - Editor’s note FFS if any UEs can request the capabilities from the peer UE., FFS on Endpoint A can also be the server UE

Same as proposal in 401, the provide assistance data message contains multiple SL-PRS configurations.

Reuse the Request/Provide Assistance Data messages for server to get the assistance data from Anchor UEs. FFS on how to capture.

The agreements for SLPP can be applied for LMF involved case unless the issue is identified. FFS on session ID handling since it is also related to forwarding case.

The server (LMF or UE) is expected to downselect based on which anchors are useful (considering anchor UE capabilities, geometry, QoS requirements, etc.), no stage 3 impact to our work. But related to SA2 work. Rely on companies’ internal coordination.

Not to discuss in RAN2 on Server UE Selection Indication procedure, rely on internal coordination with SA2 colleagues.

Not to introduce providing discovery information procedure.

RAT-dependent integrity

Introduce a single UE capability on supporting RAT-dependent positioning integrity for DL-TDOA and DL-AoD respectively. Additional finer-grained capabilities are not excluded if a need is found.

Agreement:

The identified signalling used for integrity information transmission can be reused for the beam related error source for DL-AOD positioning. Details can be discussed in CR drafting.

LPHAP

Agreement:

Send an LS to RAN4, Cc: RAN1, offering the two alternatives of “SSB for the currently camped cell” and “same as stored RSRP”, and ask them for a preference, requesting a timely response.

Introduce the UE capability on UE supporting preconfigured SRS, in both RRC and LPP.

Don’t introduce the UE capability on supporting activation indication/request of the pre-configuration SRS preconfigured SRS, it can be a component for the capability on supporting pre-configured SRS.

Working assumption:

Don’t introduce the UE capability on supporting alignment of PRS to fixed (e)DRX.

Agreements:

Introduce an autonomous TA adjustment enabler in the area-specific SRS configuration. If configured by the network, subject to UE capability, UE autonomously adjusts the stored RSRP when cell-reselection happens.

Maintain the WA that a new resume cause is introduced for SRS configuration request. Implement the running CR accordingly and finalise the decision at next meeting when all WIs conclude.

There is only one SRS configuration per validity area.

Rely on network explicit release as a baseline for release of the SRS configuration in Rel-18. FFS if any other solution is needed. This agreement does not revert the existing agreement about stopping the area-specific TA timer when the UE reselects out of the validity area.

RedCap positioning, carrier phase positioning, and bandwidth aggregation for positioning

Agreement:

Capture as a NOTE in the running LPP CR for bandwidth aggregation that the resources aggregated across PFLs should be from the same TRP. Wording of the NOTE to be resolved in CR email discussion.

Agreements:

TP from R2-2310854 can be migrated into the LPP running CR.

FFS exact IE structure of the request for location+measurements.

A Note for clarification can be added to address concern that the location is based on the measurement:

Note: For PRU, if PRU is requested to return both location estimate and measurements, the location information is determined independently of the reported measurements.

Agreements:

For Multi-RTT positioning, if requested by LMF, the UE reports the RSCP measurement along with the UE Rx-Tx time difference measurement. Extend NR-Multi-RTT-SignalMeasurementInformation IE and add DL RSCP measurement as an optional measurement quantity to be reported along with nr-UE-RxTxTimeDiff measurement.

Extend NR-Multi-RTT-SignalMeasurementInformation IE to include a timestamp associated with the reported DL RSCP measurement and a quality indication for the reported RSCP measurement.

For DL-TDOA positioning, if requested by LMF, the UE reports RSCPD measurement along with the RSTD measurement. Extend NR-DL-TDOA-SignalMeasurementInformation IE and add DL RSCPD measurement as an optional measurement quantity to be reported along with nr-RSTD measurement.

Extend NR-DL-TDOA-SignalMeasurementInformation IE to include a timestamp associated with the reported DL RSCPD measurement and a quality indication for the reported RSCPD.

Update the field description for nr-los-nlos-Indicator in NR-DL-TDOA-SignalMeasurementInformation IE to clarify that the indication applies also to the RSCPD measurement associated with the RSTD measurement in the reported DL-TDOA measurement.

Update the field description for nr-los-nlos-Indicator in NR-Multi-RTT-SignalMeasurementInformation IE to clarify that the indication applies also to the RSCP measurement associated with the UE Rx-Tx time difference measurement in the reported Multi-RTT measurement.

For UE-assisted DL-TDOA positioning, to support Simultaneous measurement by target UE and PRU, extend the NR-DL-TDOA-RequestLocationInformation IE to be able to request RSCPD measurement.

For UE-assisted Multi-RTT positioning, to support Simultaneous measurement by target UE and PRU, extend the NR-Multi-RTT-RequestLocationInformation IE to be able to request RSCP measurement.

FFS impact of supporting simultaneous measurements for the legacy measurements that are already there in the RequestLocationInformation IEs. Capture in the reply LS on PRUs to RAN1 the question of what the impact for these measurements is.

Extend the NR-DL-TDOA-RequestLocationInformation IE and NR-Multi-RTT-RequestLocationInformation IE to include time window(s) configuration and DL PRS resource sets occurring within the indicated time window(s).

Each time window configuration in Request Location Information IE contains the following: Start of time window, Duration of time window, Periodicity of time window (Optional). The number of time windows is configurable and signalled as part of the time window configuration.

For UE-based DL-TDOA positioning, extend the NR-DL-TDOA-ProvideAssistanceData IE to include the following PRU related information: reference RSCPD measurement reported by PRU, timestamp associated with the reference RSCPD measurement, and PRU location information.

Enhance the PRS configuration assistance data provided in NR-DL-PRS-AssistanceData IE in the Provide Assistance Data message for DL-TDOA and multi-RTT positioning as follows:

- indicate the DL PRS resource sets IDs from two or three different PFLs that are linked for DL PRS BW aggregation that UE needs to use for the joint measurement (FFS if multiple combinations of linked PFLs can be indicated, e.g., 2+2 and others).

- extend the NR-DL-TDOA-ReportConfig IE and add a new timingReportingGranularityFactor-Ext-r18 field with values {-1, -2}. Other values FFS.

- introduce a new NR-Multi-RTT-ReportConfig-Ext-r18 IE add a new timingReportingGranularityFactor-Ext-r18 field with values {-1, -2}. Other values FFS.

Extend the NR-DL-TDOA-SignalMeasurementInformation IE and add a new field to indicate whether the reported RSTD/RSRP/RSRPP measurement is a joint measurement or not.

Extend the NR-Multi-RTT-SignalMeasurementInformation IE and add a new field to indicate whether the reported UE Rx-Tx time difference/RSRP/RSRPP measurement is a joint measurement or not.

LS to RAN1 to ask about the additional FFS points from tables 1/2/3 of R2-2310998. Also including FFS point on whether the PRU measurements in assistance data also include legacy measurements, and confirm whether one TRP can have multiple pairs of aggregated PFLs.

## **RAN2#124**

Sidelink positioning

Agreements:

Revisit the formula for determining CG occasion when the RRC configuration is fully determined

There can be zero or one SR configuration for SL-PRS resource request MAC CE

At most one PUCCH resource for SR is configured for SL-PRS resource request MAC CE.

Come back to this issue of determining the number of SL-PRS retransmission when the signaling details, i.e, the RRC configurations and L1 parameters are completed

At SCI reception, the source ID in SCI for SL-PRS dedicated resource pool when configured as 12 bit is the 12 LSB of the destination ID of the peer UE.

The number of bits for destination ID is 5 bits, the same as in legacy SL-BSR and the number of bits for priority is 3 bits.

eLCID is adopted for SL-PRS request MAC CE.

SL-PRS’s priority is on the same level as data from STCH and lower than SCI reporting MAC CE, Sidelink Inter-UE Coordination Request MAC CE and Sidelink Inter-UE Coordination Information MAC CE, Sidelink DRX Command MAC CE and data from SCCH.

Agreement:

If the CR to TS 37.340 is agreed, the rapporteurs will add the TS to the WID for RAN#102.

Agreements:

The carrier supporting ranging/sidelink positioning should be prioritized if the UE is configured by the upper layer to perform sidelink positioning.

For ranging/sidelink positioning, the UE may perform measurements on the non-serving frequencies that support ranging/sidelink positioning or the frequencies that may provide inter-carrier configurations for that frequencies for cell selection/reselection.

For ranging/sidelink positioning, the UE considers itself to be out of coverage if on a certain frequency, it cannot find any cell that satisfy the S criterion.

It needs to be captured in TS 37.340 that “Sidelink positioning cannot be configured in MR-DC in this release”.

Agreements:

SL-PRS-related capabilities are grouped according to the table in R2-2312762.

Positioning method specific capabilities are included in the positioning method specific capability IE.

RAN2 to agree that periodical reporting capability is indicated per positioning mode per positioning method.

10ms granularity response time is indicated per positioning mode per positioning method.

Agreements:

Agree the following proposals from R2-2312020 Report of [Post123bis][412][POS]

- 1 Close the open issue 19, remove the “Editor's note FFS With regards to duplicate detection: the applicability of the 10min inactivity rule. With regards to retransmission: the applicability of the timeout period of 250ms”.

- 2 Close open issue 26 and 30, Reuse the Request/Provide Assistance Data messages for server to get anchor UE’s location, and the ENs for issue 26 and 30 can be removed.

- 3 Close the open issue 25 for stage 3, and remove the corresponding ENs.

- 4 Close open issue 41, sequenceID is included in Provide Assistance Data message.

- 5 Request of sequenceID is included in CommonSL-PRS-MethodsIEsRequestAssistanceData, the value should be boolean and optional.

Check the changes on latest RAN1 parameters in R2-2312023, Draft TS 38.355 v1.3.0 via postmeeting email discussion.

Close the open issue 5 and 6 on Session handling for LMF involved case:

- session ID is OPTIONAL in the SLPP message for the communication between target UE and the LMF;

- Session ID is assigned by target UE and used for communications between UEs.

Close the open issue 9, endSessionFlag is not introduced in Rel-18

Close the open issue 24, 28, 31 on UE role. RAN2 will not capture the description of UE role for procedures.

Close the open issue 31 on Need code, delta signalling is not supported and Need code is not supported unless companies identify the real need.

Open issue 50 on relative location/velocity can be checked in maintenance phase.

Close the open issue 52, application layer ID is used in the SLPP specification.

Close the open issue 53 on QoS for AoA, capture the TP from R2-2312724 in SLPP specification.

Close the open issue 49, scheduled location between UE and the LMF is supported in the SLPP specification. E-CID like trigger event is not supported in the SLPP specification.

Proposal 2 from R2-2312127 is not pursued;

Update the TS 38.355 based on the proposal 3 from R2-2312127 on the periodical reporting;

Proposal 4 from R2-2312127 to change the max value for SL-RTT-AdditionalPathList and SL-TDOA-AdditionalPathList to 8 has been covered by latest RAN1 parameters “the maximum number of additional paths for SL-RSTD, SL-RTOA and SL Rx – Tx time difference to be equal to 8. The maximum number of additional paths for SL-AoA is equal to 2”, Will update the TS 38.355 accordingly;

Note: RAN1 has agreed

Define the maximum number of additional paths for SL-RSTD, SL-RTOA and SL Rx – Tx time difference to be equal to 8. The maximum number of additional paths for SL-AoA is equal to 2.

Update the TS 38.355 based on the proposal 10 from R2-2312807

- Clarify that RangeResult field under the LocationCoordinates IE of the CommonIEsProvideLocationInformation IE is in metric units of meters and update the value range to INTEGER (0..999).

- Clarify that the AzimuthResult and ElevationResult field under the LocationCoordinates IE of the CommonIEsProvideLocationInformation IE is in metric units of degrees and update the ElevationResult value rage to INTEGER (0..89).

Proposal 2 from R2-2313329 on the TP for section 4.2 of SLPP is not pursued;

Proposal 3 from R2-2312724 on the TP Reference direction can be discussed in maintenance phase;

RAN2 confirm that the support of SLPP is fully optional for the UE, i.e. there is no prerequisite for a SL positioning capable UE to support LPP. No specification impact;

RAN2 confirm that adopt the LPP approach (i.e. left to UE implementation) for SLPP on the support of multiple parallel SL positioning sessions. No specification impact.

RAN2 confirm that Separate LPP (for Uu positioning) and SLPP(for SL positioning) is used as the baseline for hybrid positioning..

Proposal 6 from R2-2313329 on sessionType is not pursued;

Proposal 7 from R2-2313329 on common time reference has been covered by RAN1 new parameters sl-Timestamp, tx-Time-Info. Will update the TS 38.355 accordingly.

Proposal 5 and 6 from R2-2312254 on SA2 issues are not pursued; Companies can discuss this in SA2 directly.

Agreement:

SLPP forwarding functionality is not specified in SLPP spec. RAN2 will provide support to other groups on this aspect as needed.

Agreements:

To distinguish the Reference UE/Anchor UE from Located UE, the UE announced as anchor UE in the RSPP metafield should also indicate the availability of known location (1-bit indication).

Multiple UE roles can be indicated in the RSPP metafield.

To be discussed offline whether this information is captured as an SLPP IE, a parameter list in SLPP spec, or a parameter list sent to SA2/CT1 in an LS.

Agreements:

Specify the RSPP metadata in SLPP specification as an SLPP IE/separate module (in a separate section and is not expected to be included in any SLPP message).

LS to SA2 on the agreements on the RSPP metadata.

No need to include the following parameters in RSPP metadata:

- metadata type (i.e., announced, required, satisfied);

- SLPP support;

- serving PLMN;

- positioning methods of anchor UE.

Agreements:

Uplink transmission can be considered as prioritized when uplink cannot be transmitted together with sidelink and none of the V2X sidelink communications or NR sidelink communications or sidelink PRS transmissions are prioritized.

The prioritization between SR triggered by UL-SCH and SL-PRS shall follow the same principle as that between UL-SCH and SL-SCH, i.e. based on configured UL/SL prioritization thresholds.

The prioritization between SR triggered by SL-SCH and SL-PRS shall be based on direct comparison between the SL priority for SL-PRS and the SL logical channel that triggered the SR.

Reuse the legacy threshold for SL communications for SL-PRS prioritization.

SL-PRS resource request MAC CE:

 May be cancelled when SL grant can accommodate all the pending SL-PRS transmission.

 Shall be cancelled when a MAC PDU is transmitted and this MAC PDU contains SL-PRS resource request MAC CE that indicates all the pending SL-PRS to be transmitted since the last event the MAC CE is triggered.

Triggered SR shall be cancelled

 when SL grant can accommodate all the pending SL-PRS transmission.

 when a MAC PDU is transmitted and this MAC PDU contains SL-PRS resource request MAC CE that indicates all the pending SL-PRS to be transmitted since the last event the MAC CE is triggered.

Reuse the legacy counter mechanism for SL-PRS transmission, i.e., the counter is maintained per SL process. This applies for both shared and dedicated pool.

SL-PRS resource request MAC CE includes at least a list of (destination, priority).

Implement support for retransmission on dedicated resource pool.

When there are both SL-PRS and SL-SCH data pending for transmission at resource selection, the resource selection should be within the smaller one of the SL-PRS delay budget of the pending SL-PRSs and PDB of the logical channels.

Agreements:

UE should perform connection setup/resume request with the following conditions:

(a) SL-PRS transmission is triggered; and

(b) the carrier for SL-PRS transmission is included in the frequency list in the system information; and

(c) the system information does not have resource pool configuration for Scheme2 selection.

Transmission of SidelinkUEInformationNR for SL-PRS is needed for the UE to let gNB know the UE’s interest in SL-PRS transmission or the UE’s no longer interested.

The UE uses UAI to request CG configuration when periodic SL-PRS transmissions are needed.

Conditions for UE to perform sidelink positioning, including SL-PRS transmission, are aligned with legacy sidelink communication conditions.

If the UE is in RRC\_CONNECTED, when the UE is configured with SL-PRS resource allocation scheme 1 or scheme 2 configurations, conditions for transmitting SL-PRS follow the corresponding legacy sidelink communication conditions.

For cell-reselection triggered for SL-PRS transmission, UE follows legacy behaviour for sidelink communication.

Agreements:

Introduce a new SIB for sidelink positioning parameters.

Introduce new preconfigurations for sidelink positioning.

Agreements:

Ask RAN1 for the maximum number of parallel processes that a Tx UE can use for dedicated SL-PRS transmission in dedicated/shared pool. Can be included in a general LS with questions to RAN1.

Ask RAN1 about retransmission of SL-PRS in shared pool when accompanying data have been acknowledged.

RAT-dependent integrity

Agreements:

Introduce error bounds for all levels at which location can be provided, as optional fields. Conditions for inclusion can be worked on in CR implementation.

No separate error bound is introduced for the reference point as distinct from the location bound; the error bound for the location includes any error bound associated with the reference point. Can be clarified in field description.

The Probability of Onset of TRP fault and Mean TRP fault duration work for all error sources, with ranges following A-GNSS parameters (0..255 and 1..3600 respectively). To be checked in CR review.

LPHAP

Agreements:

Do not restart the TAT when the UE autonomously adjusts the TA.

Can be discussed in CR implementation if there is a need to capture inter-layer interaction for autonomous TA adjustment.

Agreement:

For preconfigured SRS, the configuration is released only when the network releases it explicitly.

Agreement:

Implement the already agreed network explicit release in the running CR. Additional behaviour can be discussed in maintenance.

Agreement:

Access category 8 is used for the RRC resume procedure for SRS configuration/activation request.

Agreements:

For SRS for positioning activation/request procedure(s), confirm the WA, i.e. when the UE reselects out of the positioning validity area during SRS transmission, the UE may send an RRC message to the network for SRS configuration request. The SRS configuration request is sent in the RRC message RRCResumeRequest via a new resume cause.

For preconfigured multiple SRS configurations, confirm the WA, i.e. UE sends a new ResumeCause of RRCResumeRequest message to indicate the change or activations of SRS configuration when different SRS configuration is selected due to change of validity area, or when a new SRS configuration is selected where none was previously in use.

The same new resume cause is used for both cases.

Agreement:

Confirm the WA not to introduce the UE capability on supporting alignment of PRS to fixed (e)DRX.

RedCap positioning, carrier phase positioning, and bandwidth aggregation for positioning

Agreements:

RAN2 will align with RAN1 guidance on the granularity of the time window.

RAN2 will align with RAN1 guidance on the inclusion of RSCP in the PRU info (also any legacy measurements).

Support changes of location in PRU Info using the Cond NotSameAsPrev for relative location in NR-TRP-LocationInfo when PRU location is signalled from the LMF in assistance data.

Agreements:

nrMaxNumPRS-BandWidthAggregation-r18 (Max number of linkage information) is 256. Equivalent number for SRS can be discussed in CR finalisation.

The available on-demand DL-PRS configurations supporting DL-PRS bandwidth aggregation are indicated via a group of 2 or 3 DL-PRS-Configuration-ID's in IE NR-On-Demand-DL-PRS-Configurations. Up to 8 such groups can be indicated in IE NR-On-Demand-DL-PRS-Configurations.

The IE NR-On-Demand-DL-PRS-Request can include a list of preferred aggregated DL-PRS configurations in the order of preference, where each aggregated DL-PRS configuration is addressed by its SEQUENCE-index in the IE NR-On-Demand-DL-PRS-Configurations.

The requested aggregated PFLs can be indicated by its SEQUENCE-index in the IE NR-On-Demand-DL-PRS-Information in IE NR-On-Demand-DL-PRS-Request. The UE can include a list of preferred aggregated DL-PRS configurations in the order of preference.

Agreement:

The question of whether to use a new MAC CE for semi-persistent SRS activation with bandwidth aggregation can be discussed in maintenance.