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Technical Specification

**3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
NG-RAN;
NR Positioning Protocol A (NRPPa)
(Release 16)**



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Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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where:

- x the first digit:
 - 1 presented to TSG for information;
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 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the control plane radio network layer signalling procedures between a NG-RAN node and the LMF. NRPPa supports the concerned functions by signalling procedures defined in this document.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".
- [3] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description; Stage 2".
- [4] Void.
- [5] 3GPP TR 25.921 (version 7.0.0): "Guidelines and principles for protocol description and error handling".
- [6] ITU-T Recommendation X.691 (2002-07): "Information technology - ASN.1 encoding rules - Specification of Packed Encoding Rules (PER)".
- [7] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Base Station (BS) radio transmission and reception".
- [8] 3GPP TS 23.032: "Technical Specification Group Services and System Aspects; Universal Geographical Area Description (GAD)".
- [9] 3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".
- [10] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Physical Channels and Modulation".
- [11] IEEE Std 802.11™-2012, IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area network.
- [12] 3GPP TS 36.455: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol A (LPPa)".
- [13] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".
- [14] 3GPP TS 37.355: "Technical Specification Group Radio Access Network; LTE Positioning Protocol (LPP)".
- [15] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".
- [16] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".
- [17] 3GPP TS 36.214: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer (PHY); Measurements".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

NG-RAN node: as defined in TS 38.300 [3].

ng-eNB: as defined in TS 38.300 [3].

3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

| | |
|---------|--|
| ARP | Antenna Reference Point |
| BDS | BeiDou Navigation Satellite System |
| CID | Cell-ID (positioning method) |
| DL-PRS | Downlink Positioning Reference Signal |
| E-CID | Enhanced Cell-ID (positioning method) |
| EGNOS | European Geostationary Navigation Overlay Service |
| 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 |
| LMF | Location Management Function |
| LPP | LTE Positioning Protocol |
| MSAS | Multi-functional Satellite Augmentation System |
| NavIC | NAVigation with Indian Constellation |
| NRPPa | NR Positioning Protocol A |
| OTDOA | Observed Time Difference of Arrival |
| posSIB | Positioning SIB |
| PRS | Positioning Reference Signal (for E-UTRA) |
| QZSS | Quasi-Zenith Satellite System |
| RSRP | Reference Signal Received Power |
| RSSI | Received Signal Strength Indicator |
| RSTD | Reference Signal Time Difference |
| SBAS | Space Based Augmentation System |
| SRS | Sounding Reference Signal |
| TRP | Transmission-Reception Point |
| UE | User Equipment |
| UL-AoA | Uplink Angle of Arrival |
| UL-RTOA | Uplink Relative Time of Arrival |
| UL-SRS | Uplink Sounding Reference Signal |
| WAAS | Wide Area Augmentation System |
| Z-AoA | Zenith Angles of Arrival |

4 General

4.1 Procedure specification principles

The principle for specifying the procedure logic is to specify the functional behaviour of the terminating NG-RAN Node exactly and completely. Any rule that specifies the behaviour of the originating NG-RAN Node shall be possible to be verified with information that is visible within the system.

The following specification principles have been applied for the procedure text in clause 8:

- The procedure text discriminates between:

- 1) Functionality which "shall" be executed

The procedure text indicates that the receiving node "shall" perform a certain function Y under a certain condition. If the receiving node supports procedure X but cannot perform functionality Y requested in the initiating message of a Class 1 EP, the receiving node shall respond with the message used to report unsuccessful outcome for this procedure, containing an appropriate cause value.

- 2) Functionality which "shall, if supported" be executed

The procedure text indicates that the receiving node "shall, if supported," perform a certain function Y under a certain condition. If the receiving node supports procedure X, but does not support functionality Y, the receiving node shall proceed with the execution of the EP, possibly informing the requesting node about the not supported functionality.

- Any required inclusion of an optional IE in a response message is explicitly indicated in the procedure text. If the procedure text does not explicitly indicate that an optional IE shall be included in a response message, the optional IE shall not be included. For requirements on including *Criticality Diagnostics* IE, see section 10.

4.2 Forwards and backwards compatibility

The forwards and backwards compatibility of the protocol is assured by a mechanism where all current and future messages, and IEs or groups of related IEs, include ID and criticality fields that are coded in a standard format that will not be changed in the future. These parts can always be decoded regardless of the standard version.

4.3 Specification notations

For the purposes of the present document, the following notations apply:

| | |
|----------------|--|
| Procedure | When referring to an elementary procedure in the specification the Procedure Name is written with the first letters in each word in upper case characters followed by the word "procedure", e.g. Handover Preparation procedure. |
| Message | When referring to a message in the specification the MESSAGE NAME is written with all letters in upper case characters followed by the word "message", e.g. ERROR INDICATION message. |
| IE | When referring to an information element (IE) in the specification the <i>Information Element Name</i> is written with the first letters in each word in upper case characters and all letters in Italic font followed by the abbreviation "IE", e.g. <i>Cause</i> IE. |
| Value of an IE | When referring to the value of an information element (IE) in the specification the "Value" is written as it is specified in sub clause 9.2 enclosed by quotation marks, e.g. "Value". |

5 NRPPa services

The present clause describes the services an NG -RAN Node offers to the LMF.

5.1 NRPPa procedure modules

The procedures are divided into two modules as follows:

1. NRPPa Location Information Transfer Procedures;
2. NRPPa Management Procedures;

The NRPPa Location Information Transfer Procedures module contains procedures used to handle the transfer of positioning related information between NG-RAN Node and LMF.

The Management Procedures module contains procedures that are not related specifically to positioning, i.e. error handling.

5.2 Parallel transactions

Unless explicitly indicated in the procedure specification, at any instance in time one protocol peer may have more than one ongoing NRPPa procedure.

6 Services expected from lower layer

Within 5G RAN, NRPPa protocol uses the services provided by the NGAP protocol. An NRPPa message is carried inside an NGAP message.

NGAP signalling is described in TS 38.413 [2].

7 Functions of NRPPa

The NRPPa protocol provides the following functions:

- E-CID Location Information Transfer. This function allows the NG-RAN node to exchange location information with LMF for the purpose of E-CID positioning and NR E-CID positioning.
- OTDOA Information Transfer. This function allows the NG-RAN node to exchange information with the LMF for the purpose of OTDOA positioning.
- Reporting of General Error Situations. This function allows reporting of general error situations, for which function specific error messages have not been defined.
- Assistance Information Transfer. This function allows the LMF to exchange information with the NG-RAN node for the purpose of assistance information broadcasting.
- Positioning Information Transfer. This function allows the NG-RAN node to exchange positioning information with the LMF for the purpose of positioning.
- Measurement Information Transfer. This function allows the LMF to exchange measurement information with the NG-RAN node for the purpose of positioning.
- TRP Information Transfer. This function allows an LMF to obtain TRP related information from an NG-RAN node.

The mapping between the above functions and NRPPa EPs is shown in the table below.

Table 7-1: Mapping between NRPPa functions and NRPPa EPs

| Function | Elementary Procedure(s) |
|---------------------------------------|---|
| E-CID Location Information Transfer | a) E-CID Measurement Initiation b) E-CID Measurement Failure Indication c) E-CID Measurement Report d) E-CID Measurement Termination |
| OTDOA Information Transfer | OTDOA Information Exchange |
| Assistance Information Transfer | a) Assistance Information Control b) Assistance Information Feedback |
| Reporting of General Error Situations | Error Indication |
| Positioning Information Transfer | a) Positioning Information Exchange b) Positioning Information Update c) Positioning Activation d) Positioning Deactivation |
| TRP Information Transfer | TRP Information Exchange |
| Measurement Information Transfer | a) Measurement b) Measurement Update c) Measurement Report d) Measurement Abort e) Measurement Failure Indication |

8 NRPPa procedures

8.1 Elementary procedures

In the following tables, all EPs are divided into Class 1 and Class 2 EPs.

Table 8.1-1: Class 1 Elementary Procedures

| Elementary Procedure | Initiating Message | Successful Outcome | Unsuccessful Outcome |
|----------------------------------|--------------------------------------|---------------------------------------|--------------------------------------|
| | | Response message | Response message |
| E-CID Measurement Initiation | E-CID MEASUREMENT INITIATION REQUEST | E-CID MEASUREMENT INITIATION RESPONSE | E-CID MEASUREMENT INITIATION FAILURE |
| OTDOA Information Exchange | OTDOA INFORMATION REQUEST | OTDOA INFORMATION RESPONSE | OTDOA INFORMATION FAILURE |
| Positioning Information Exchange | POSITIONING INFORMATION REQUEST | POSITIONING INFORMATION RESPONSE | POSITIONING INFORMATION FAILURE |
| TRP Information Exchange | TRP INFORMATION REQUEST | TRP INFORMATION RESPONSE | TRP INFORMATION FAILURE |
| Measurement | MEASUREMENT REQUEST | MEASUREMENT RESPONSE | MEASUREMENT FAILURE |
| Positioning Activation | POSITIONING ACTIVATION REQUEST | POSITIONING ACTIVATION RESPONSE | POSITIONING ACTIVATION FAILURE |

Table 8.1-2: Class 2 Elementary Procedures

| Elementary Procedure | Initiating Message |
|--------------------------------------|---------------------------------------|
| E-CID Measurement Failure Indication | E-CID MEASUREMENT FAILURE INDICATION |
| E-CID Measurement Report | E-CID MEASUREMENT REPORT |
| E-CID Measurement Termination | E-CID MEASUREMENT TERMINATION COMMAND |
| Error Indication | ERROR INDICATION |
| Assistance Information Control | ASSISTANCE INFORMATION CONTROL |
| Assistance Information Feedback | ASSISTANCE INFORMATION FEEDBACK |
| Positioning Information Update | POSITIONING INFORMATION UPDATE |
| Measurement Report | MEASUREMENT REPORT |
| Measurement Update | MEASUREMENT UPDATE |
| Measurement Abort | MEASUREMENT ABORT |
| Measurement Failure Indication | MEASUREMENT FAILURE INDICATION |
| Positioning Deactivation | POSITIONING DEACTIVATION |

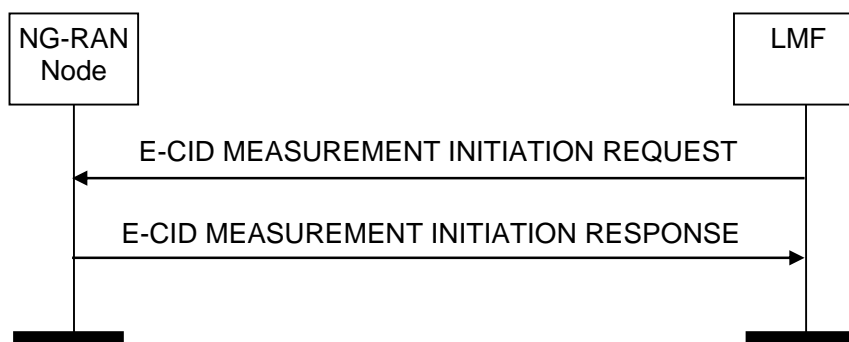
8.2 Location Information Transfer Procedures

8.2.1 E-CID Measurement Initiation

8.2.1.1 General

The purpose of E-CID Measurement Initiation procedure is to allow the LMF to request the NG-RAN node to report E-CID measurements used by LMF to compute the location of the UE.

8.2.1.2 Successful Operation

**Figure 8.2.1.2-1: E-CID Measurement Initiation procedure, successful operation**

The LMF initiates the procedure by sending an E-CID MEASUREMENT INITIATION REQUEST message. If the NG-RAN node is able to initiate the requested E-CID measurements, it shall reply with the E-CID MEASUREMENT INITIATION RESPONSE message.

The *Measured Results* IE shall be included in the *E-CID Measurement Result* IE of the E-CID MEASUREMENT INITIATION RESPONSE message when measurement results other than the "Cell-ID" have been requested.

If the *Report Characteristics* IE is set to "OnDemand", the NG-RAN node shall return the result of the measurement in the E-CID MEASUREMENT INITIATION RESPONSE message including, if available, the *NG-RAN Access Point Position* IE in the *E-CID Measurement Result* IE, and the LMF shall consider that the E-CID measurements for the UE has been terminated by the NG-RAN node. If available, the NG-RAN node shall include the *Cell Portion ID* IE in the E-CID MEASUREMENT INITIATION RESPONSE message. Upon reception of the *Cell Portion ID* IE, the LMF may use the value as the cell portion for the measurement. If the *Report Characteristics* IE is set to "OnDemand" and the

Inter-RAT Measurement Quantities IE is included in the E-CID MEASUREMENT INITIATION REQUEST message, the NG-RAN node shall, if supported, provide the corresponding measurements, if available in the NG-RAN node, in the *Inter-RAT Measurement Result* IE in E-CID MEASUREMENT INITIATION RESPONSE message. If the *Report Characteristics* IE is set to "OnDemand" and the *WLAN Measurement Quantities* IE is included in the E-CID MEASUREMENT INITIATION REQUEST message, the NG-RAN node shall, if supported, provide the corresponding measurements, if available in the NG-RAN node, in the *WLAN Measurement Result* IE in E-CID MEASUREMENT INITIATION RESPONSE message.

If the *Report Characteristics* IE is set to "Periodic", the NG-RAN node shall initiate the requested measurements and shall reply with the E-CID MEASUREMENT INITIATION RESPONSE message without including either the *E-CID Measurement Result* IE or the *Cell Portion ID* IE in this message. The NG-RAN node shall then periodically initiate the E-CID Measurement Report procedure for the measurements, with the requested reporting periodicity.

8.2.1.3 Unsuccessful Operation

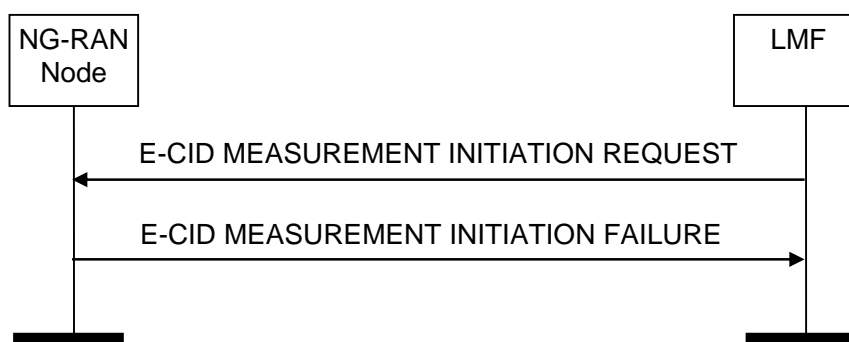


Figure 8.2.1.3-1: E-CID Measurement Initiation procedure, unsuccessful operation

If the NG-RAN node is not able to initiate at least one of the requested E-CID measurements, the NG-RAN node shall respond with an E-CID MEASUREMENT INITIATION FAILURE message.

8.2.2 E-CID Measurement Failure Indication

8.2.2.1 General

The purpose of the E-CID Measurement Failure Indication procedure is for the NG-RAN node to notify the LMF that the E-CID measurements previously requested with the E-CID Measurement Initiation procedure can no longer be reported.

8.2.2.2 Successful Operation

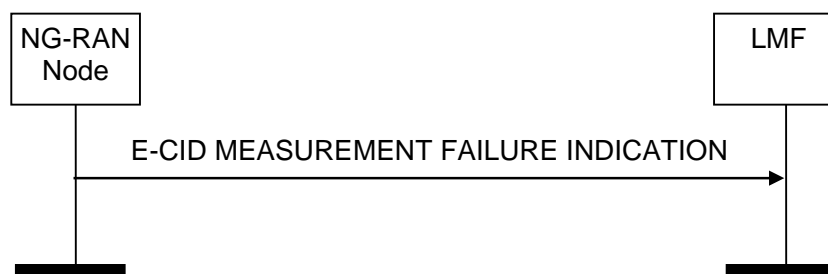


Figure 8.2.2.2-1: E-CID Measurement Failure Indication, successful operation

Upon reception of the E-CID MEASUREMENT FAILURE INDICATION message, the LMF shall consider that the E-CID measurements for the UE have been terminated by the NG-RAN node.

8.2.2.3 Unsuccessful Operation

Not applicable.

8.2.3 E-CID Measurement Report

8.2.3.1 General

The purpose of E-CID Measurement Report procedure is for the NG-RAN node to provide the E-CID measurements for the UE to the LMF.

8.2.3.2 Successful Operation



Figure 8.2.3.2-1: E-CID Measurement Report procedure, successful operation

The NG-RAN node initiates the procedure by sending an E-CID MEASUREMENT REPORT message. The E-CID MEASUREMENT REPORT message contains the E-CID measurement results according to the measurement configuration in the respective E-CID MEASUREMENT INITIATION REQUEST message.

The *Measured Results* IE shall be included in the *E-CID Measurement Result* IE of the E-CID MEASUREMENT REPORT message when measurement results other than the "Cell-ID" have been requested.

If available, the NG-RAN node shall include the *NG-RAN Access Point Position* IE or the *Geographical Coordinates* IE which is the configured estimated serving antenna position in the *E-CID Measurement Result* IE within the E-CID MEASUREMENT REPORT message. Upon reception of this *NG-RAN Access Point Position* IE, the LMF may use the value as the geographical position of the NG-RAN access point.

If available, the NG-RAN node shall include the *Cell Portion ID* IE in the E-CID MEASUREMENT REPORT message. Upon reception of the *Cell Portion ID* IE, the LMF may use the value as the cell portion for the measurement.

8.2.3.3 Unsuccessful Operation

Not applicable.

8.2.4 E-CID Measurement Termination

8.2.4.1 General

The purpose of E-CID Measurement Termination procedure is to terminate periodical E-CID measurements for the UE performed by the NG-RAN node.

8.2.4.2 Successful Operation



Figure 8.2.4.2-1: E-CID Measurement Termination procedure, successful operation

The LMF initiates the procedure by generating an E-CID MEASUREMENT TERMINATION COMMAND message.

8.2.4.3 Unsuccessful Operation

Not applicable.

8.2.5 OTDOA Information Exchange

8.2.5.1 General

The purpose of the OTDOA Information Exchange procedure is to allow the LMF to request the NG-RAN node to transfer OTDOA information to the LMF.

8.2.5.2 Successful Operation

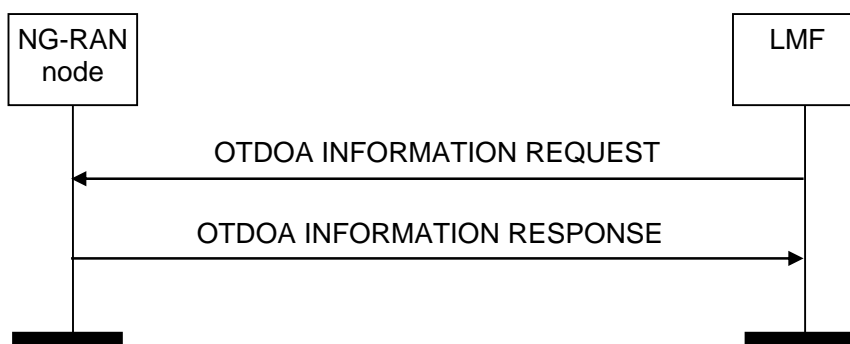


Figure 8.2.5.2-1: OTDOA Information Exchange procedure, successful operation

The LMF initiates the procedure by sending an OTDOA INFORMATION REQUEST message. The NG-RAN node responds with OTDOA INFORMATION RESPONSE message that contains the available OTDOA information applicable to the relevant cells/TPs.

8.2.5.3 Unsuccessful Operation

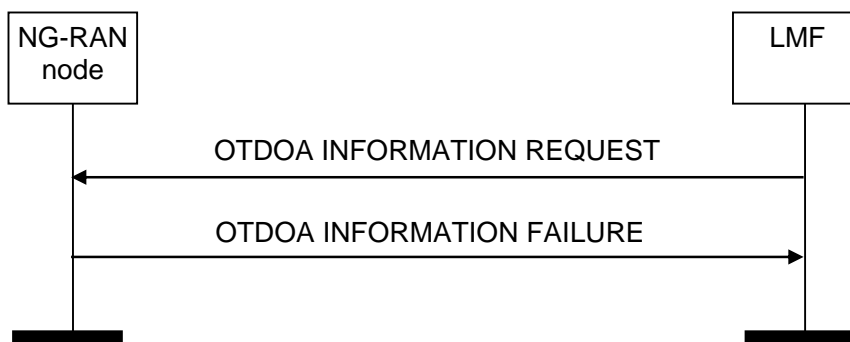


Figure 8.2.5.3-1: OTDOA Information Exchange procedure, unsuccessful operation

If the NG-RAN node does not have any OTDOA information to report, the NG-RAN node shall respond with an OTDOA INFORMATION FAILURE message.

8.2.6 Positioning Information Exchange

8.2.6.1 General

The Positioning Information Exchange procedure is initiated by the LMF to request to the NG-RAN node positioning information for the UE.

8.2.6.2 Successful Operation

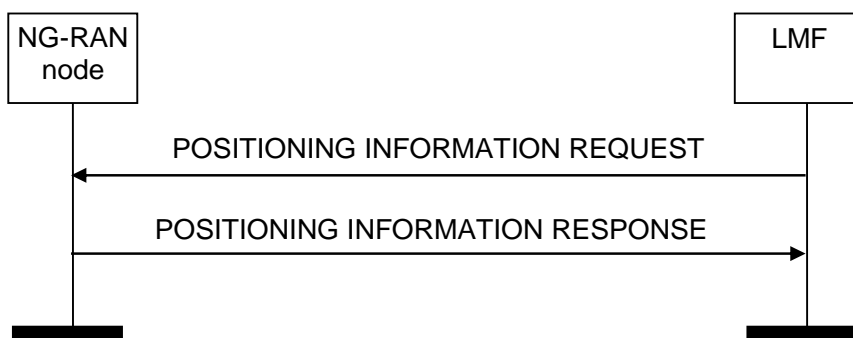


Figure 8.2.6.2-1: Positioning Information Exchange procedure, successful operation

The LMF initiates the procedure by sending a POSITIONING INFORMATION REQUEST message to the NG-RAN node.

If the *Requested SRS Transmission Characteristics* IE is included in the POSITIONING INFORMATION REQUEST message, the NG-RAN node may take this information into account when configuring SRS transmissions for the UE, and it shall include the *SRS Configuration* IE and the *SFN Initialisation Time* IE in the POSITIONING INFORMATION RESPONSE message.

8.2.6.3 Unsuccessful Operation

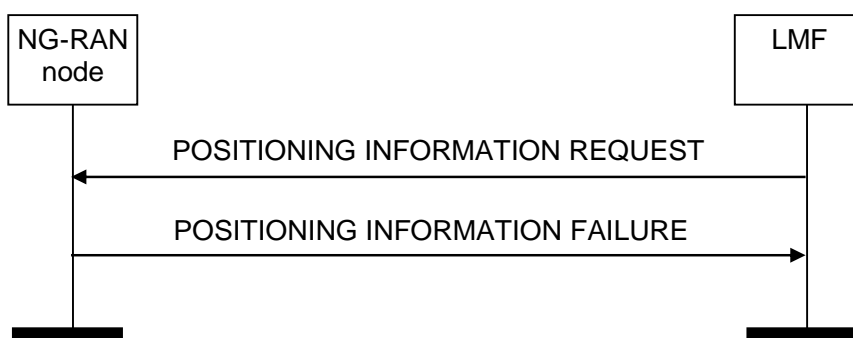


Figure 8.2.6.3-1: Positioning Information Exchange procedure, unsuccessful operation

If the *Requested SRS Transmission Characteristics* IE is included in the POSITIONING INFORMATION REQUEST message and the NG-RAN node is unable to configure any SRS transmissions for the UE, it shall respond with a POSITIONING INFORMATION FAILURE message. If a handover of the target UE has been triggered, the NG-RAN node shall send a POSITIONING INFORMATION FAILURE message with an appropriate cause value.

8.2.6.4 Abnormal Conditions

Void.

8.2.7 Positioning Information Update

8.2.7.1 General

The Positioning Information Update procedure is initiated by the NG-RAN node to indicate to the LMF that a change has occurred in the SRS configuration.

8.2.7.2 Successful Operation

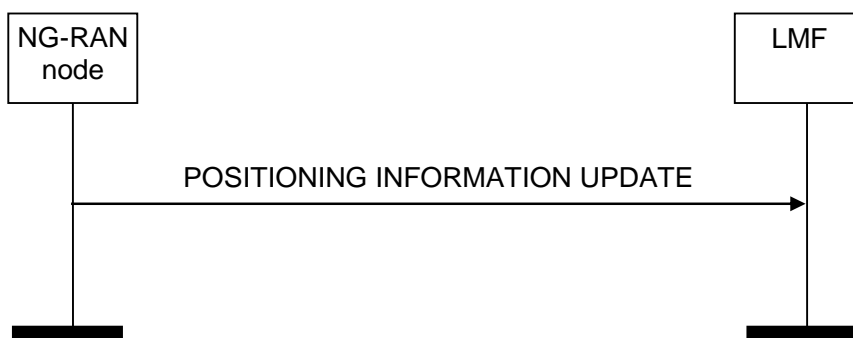


Figure 8.2.7.2-1: Positioning Information Update procedure, successful operation

The NG-RAN node initiates the procedure by sending a POSITIONING INFORMATION UPDATE message to the LMF. If the *SRS Configuration* IE is included in the POSITIONING INFORMATION UPDATE message, the LMF shall consider this information as the updated SRS Configuration for the UE. If the *SFN Initialisation Time* IE is included in the POSITIONING INFORMATION UPDATE message, the LMF shall consider this information as the SFN Initialisation Time associated to the SRS Configuration.

8.2.7.3 Unsuccessful Operation

Not Applicable.

8.2.7.4 Abnormal Conditions

Void.

8.2.8 TRP Information Exchange

8.2.8.1 General

The purpose of the TRP Information Exchange procedure is to allow the LMF to request the NG-RAN node to provide detailed information for TRPs hosted by the NG-RAN node.

8.2.8.2 Successful Operation

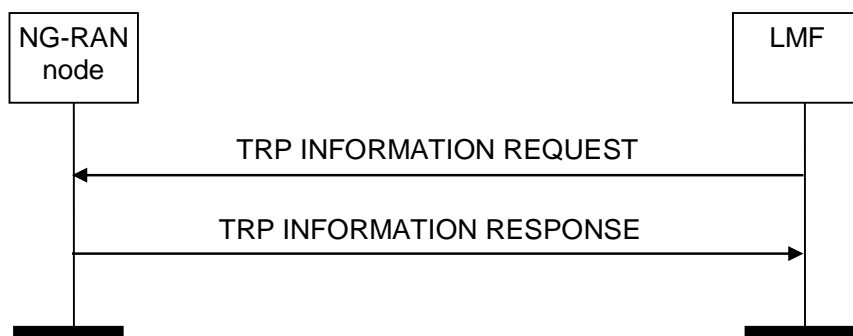


Figure 8.2.8.2-1: TRP Information Exchange procedure, successful operation

The LMF initiates the procedure by sending a TRP INFORMATION REQUEST message. The NG-RAN node responds with a TRP INFORMATION RESPONSE message that contains the requested TRP information.

If the *TRP List* IE is included in the TRP INFORMATION REQUEST message, the NG-RAN node should include in the TRP INFORMATION RESPONSE message, the requested information for all TRPs included in the *TRP List* IE.

If the *TRP List* IE is not included in the TRP INFORMATION REQUEST message, the NG-RAN node should include the requested information for all TRPs hosted by the NG-RAN node in the TRP INFORMATION RESPONSE message.

If the *PRS Muting* IE is included in the *PRS Configuration* IE in the TRP INFORMATION RESPONSE message, the LMF may take it into account as the muting information for the given PRS resource set.

If the *QCL Info* IE is included in the *PRS Configuration* IE in the TRP INFORMATION RESPONSE message, the LMF may take it into account for the given PRS resource list.

If the *DL-PRS Resource Coordinates* IE is included in the *Geographical Coordinates* IE in the *TRP Information* IE in the TRP INFORMATION RESPONSE message, the LMF may take it into account as the DL PRS Resource Coordinates relative to the TRP coordinate.

8.2.8.3 Unsuccessful Operation

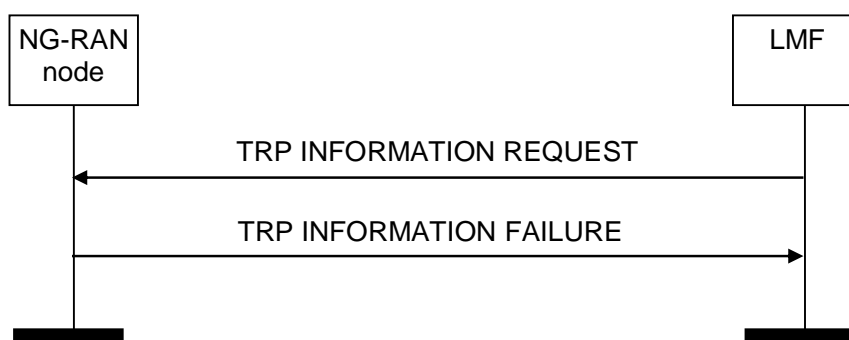


Figure 8.2.8.3-1: TRP Information Exchange procedure, unsuccessful operation

If the NG-RAN node cannot provide any of the requested information for any TRP, the NG-RAN node shall respond with a TRP INFORMATION FAILURE message.

8.2.9 Positioning Activation

8.2.9.1 General

The Positioning Activation procedure is initiated by the LMF to request the NG-RAN node to activate semi-persistent or trigger aperiodic UL SRS transmission by the UE.

8.2.9.2 Successful Operation

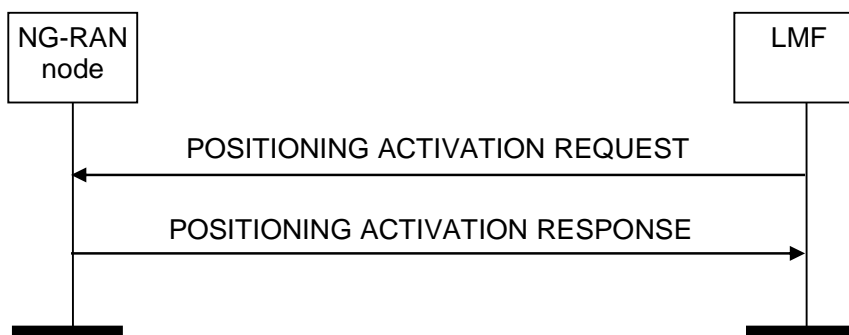


Figure 8.2.9.2-1: Positioning Activation procedure, successful operation

The LMF initiates the procedure by sending a POSITIONING ACTIVATION REQUEST message to the NG-RAN node.

For semi-persistent UL SRS, the POSITIONING ACTIVATION REQUEST message includes an indication of the UL SRS resource set to be activated and may include the spatial relation for the semi-persistent UL SRS resource to be activated. For aperiodic UL SRS, if the *SRS Resource Trigger* IE is included in the POSITIONING ACTIVATION REQUEST message, the NG-RAN node shall take the value of this IE into account when triggering aperiodic SRS transmission by the UE.

If the *Activation Time* IE is included in the POSITIONING ACTIVATION REQUEST message, the NG-RAN node shall take the indicated value as the LMF's requested time for activation of the UE's SRS transmission.

Following successful activation of UL SRS transmission in the UE, the NG-RAN node shall respond with a POSITIONING ACTIVATION RESPONSE message. If the POSITIONING ACTIVATION RESPONSE message includes the *System Frame Number* and/or the *Slot Number* IEs, the LMF shall consider that the respective information indicates the activation time of SRS transmission by the UE.

8.2.9.3 Unsuccessful Operation

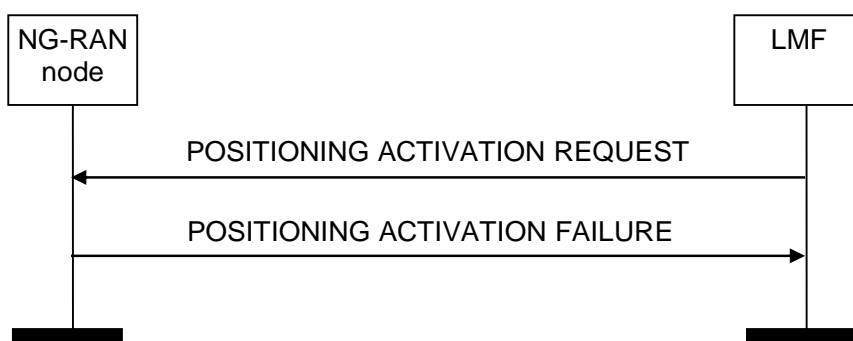


Figure 8.2.9.3-1: Positioning Activation procedure, unsuccessful operation

If the NG-RAN node is unable to activate UL SRS transmission in the UE, it shall respond with a POSITIONING ACTIVATION FAILURE message.

If the NG-RAN node is unable to trigger the aperiodic SRS transmission with the indicated *SRS Resource Trigger* IE, it shall respond with a POSITIONING ACTIVATION FAILURE message with an appropriate cause value.

8.2.9.4 Abnormal Conditions

Void.

8.2.10 Positioning Deactivation

8.2.10.1 General

The Positioning Deactivation procedure is initiated by the LMF to indicate to the NG-RAN node that UL SRS transmission should be deactivated in the UE.

8.2.10.2 Successful Operation



Figure 8.2.10.2-1: Positioning Deactivation procedure, successful operation

The LMF initiates the procedure by sending a POSITIONING DEACTIVATION message to the NG-RAN node. This message shall include an indication of the UL SRS resource set to be deactivated or release all the related resources.

8.2.10.3 Unsuccessful Operation

Not Applicable.

8.2.10.4 Abnormal Conditions

Void.

8.3 Management Procedures

8.3.1 Error Indication

8.3.1.1 General

The Error Indication procedure is initiated by a node to report detected errors in one incoming message, provided they cannot be reported by an appropriate failure message.

8.3.1.2 Successful Operation

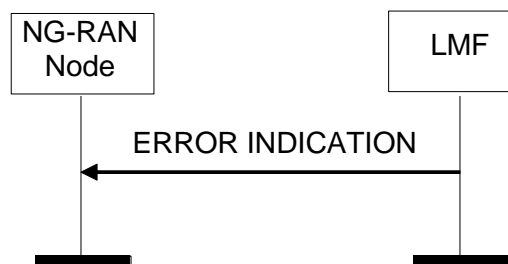


Figure 8.3.1.2-1: Error Indication procedure, LMF originated, successful operation

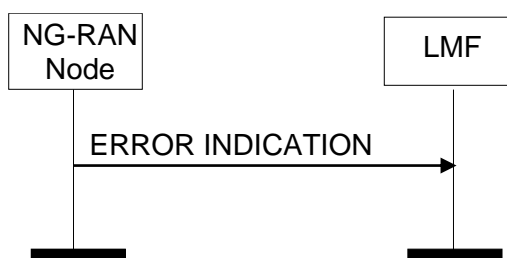


Figure 8.3.1.2-2: Error Indication procedure, NG-RAN node originated, successful operation

When the conditions defined in clause 10 are fulfilled, the Error Indication procedure is initiated by an ERROR INDICATION message sent from the receiving node.

The ERROR INDICATION message shall contain at least either the *Cause* IE or the *Criticality Diagnostics* IE.

8.3.1.3 Abnormal Conditions

Not applicable.

8.4 Assistance Information Transfer Procedures

8.4.1 Assistance Information Control

8.4.1.1 General

The purpose of the Assistance Information Control procedure is to allow the LMF to signal positioning assistance information to the NG-RAN Node for assistance information broadcasting.

8.4.1.2 Successful Operation



Figure 8.4.1.2-1: Assistance Information Control procedure

The LMF initiates the procedure by sending an ASSISTANCE INFORMATION CONTROL message.

If the *Assistance Information* IE is included in the ASSISTANCE INFORMATION CONTROL message, the NG-RAN Node shall, if supported, replace any previously stored assistance information and use the received information to configure assistance information broadcasting.

If the *Broadcast Priority* IE is included in the *Assistance Information* IE, the NG-RAN Node may take it into account when configuring broadcasting for the relevant information. Assistance information having the same Broadcast Priority value should receive the same treatment (i.e. broadcast by the NG-RAN Node or not broadcast).

If the *Broadcast* IE is included in the ASSISTANCE INFORMATION CONTROL message and set to "start", the NG-RAN Node may start broadcasting the assistance information. If the *Broadcast* IE is included in the ASSISTANCE INFORMATION CONTROL message and set to "stop", the NG-RAN Node may stop broadcasting the assistance information.

If the *Positioning Broadcast Cells* IE is included in the ASSISTANCE INFORMATION CONTROL message, the NG-RAN shall, if supported, consider that the received assistance information is applicable to the cells in this IE.

8.4.1.3 Abnormal Conditions

If the *Broadcast* IE is included in the ASSISTANCE INFORMATION CONTROL message and set to "start", and no assistance information is available, the NG-RAN Node shall consider the procedure as failed.

If neither the *Assistance Information* IE nor the *Broadcast* IE are included in the ASSISTANCE INFORMATION CONTROL message, the NG-RAN Node shall consider the procedure as failed.

8.4.2 Assistance Information Feedback

8.4.2.1 General

The purpose of the Assistance Information Feedback procedure is to allow the NG-RAN Node to give feedback to the LMF on assistance information broadcasting.

8.4.2.2 Successful Operation



Figure 8.4.2.2-1: Assistance Information Feedback procedure

If the *Assistance Information Failure List* IE is included in the ASSISTANCE INFORMATION FEEDBACK message, the LMF shall consider that assistance information broadcasting could not be configured for the relevant information.

If the *Positioning Broadcast Cells* IE is included in the ASSISTANCE INFORMATION FEEDBACK message, the LMF shall consider that the feedback provided is applicable to the cells in this IE.

8.4.2.3 Abnormal Conditions

Void.

8.5 Measurement Information Transfer

8.5.1 Measurement

8.5.1.1 General

The Measurement procedure allows the LMF to request one or more TRPs in the NG-RAN node to perform and report positioning measurements.

8.5.1.2 Successful Operation

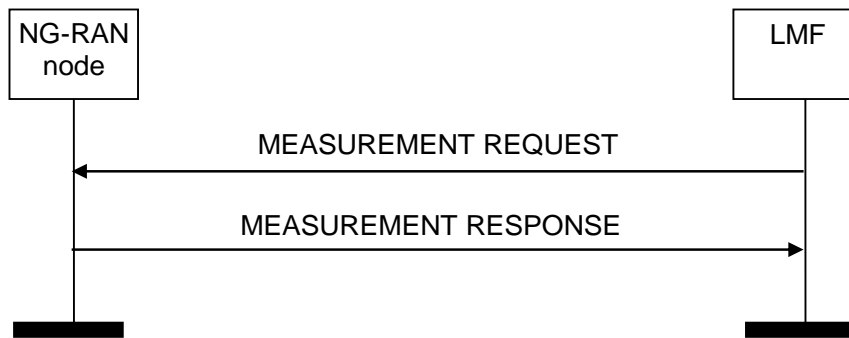


Figure 8.5.1.2.1: Measurement procedure. Successful operation.

The LMF initiates the procedure by sending a MEASUREMENT REQUEST message to the NG-RAN node, indicating in the *TRP Measurement Request List* IE the TRP(s) from which measurements are requested. The NG-RAN node shall use the included information to configure positioning measurements by the indicated TRP(s). If at least one of the requested measurements has been successful for at least one of the TRPs, the NG-RAN node shall reply with a MEASUREMENT RESPONSE message including the *TRP Measurement Response List* IE.

If the *Report Characteristics* IE is set to "OnDemand", the NG-RAN node shall return the corresponding measurement results in the MEASUREMENT RESPONSE message, and the LMF shall consider that this reporting has been terminated by the NG-RAN node. If the *Report Characteristics* IE is set to "Periodic", the NG-RAN node shall initiate the corresponding measurements, and it shall reply with the MEASUREMENT RESPONSE message without including any measurement results in the message. The NG-RAN node shall then periodically initiate the Measurement Report procedure for the corresponding measurements, with the requested reporting periodicity.

If the *Measurement Beam Information Request* IE is included in the MEASUREMENT REQUEST message, the NG-RAN node shall include the *Measurement Beam Information* IE in the *Measurement Result* IE of the MEASUREMENT RESPONSE message.

If the *Measurement Quality* IE is included in the *Measurement Result* IE in the MEASUREMENT RESPONSE message, the LMF may take it into account as the TRP estimate of the measurement quality. If the *Measurement Quality* IE includes the *Zenith Quality* IE, the LMF may take it into account within the angle measurement quality.

8.5.1.3 Unsuccessful Operation

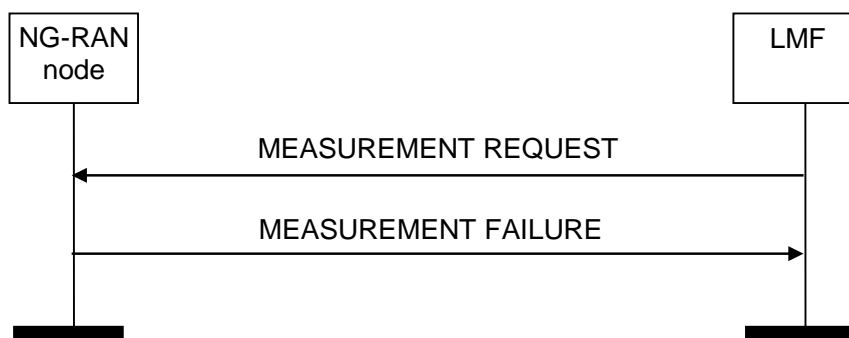


Figure 8.5.1.3.1: Measurement procedure. Unsuccessful operation.

If the NG-RAN node cannot configure any of the requested measurements for any of the TRPs in the *TRP Measurement Request List* IE of the MEASUREMENT REQUEST message, it shall respond with a MEASUREMENT FAILURE message with an appropriate cause value.

8.5.1.4 Abnormal Conditions

Not applicable.

8.5.2 Measurement Report

8.5.2.1 General

The Measurement Report procedure allows the NG-RAN node to report positioning measurements to the LMF.

8.5.2.2 Successful Operation



Figure 8.z.2.2.1: Measurement Report procedure. Successful operation.

The NG-RAN node initiates the procedure by sending a MEASUREMENT REPORT message to the LMF. The MEASUREMENT REPORT message contains the measurement results according to the associated measurement configuration.

8.5.3 Measurement Update

8.5.3.1 General

The Measurement Update Procedure allows the LMF to notify the NG-RAN node of a change in a previously configured measurement.

8.5.3.2 Successful Operation

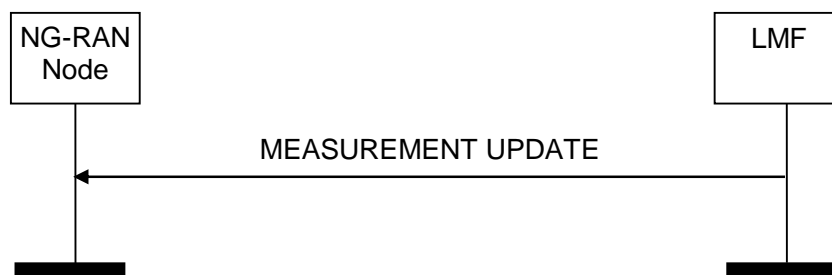


Figure 8.5.3.2.1: Measurement Update: Successful Operation.

The LMF initiates the procedure by sending a MEASUREMENT UPDATE message. Upon receiving the message, the NG-RAN node shall overwrite the previously received measurement configuration.

8.5.3.3 Unsuccessful Operation

Not applicable.

8.5.3.4 Abnormal Conditions

If the NG-RAN node cannot identify the previously requested measurement to be modified, it shall consider the procedure as failed and initiate local error handling.

8.5.4 Measurement Abort

8.5.4.1 General

The purpose of the Measurement Abort Procedure is to enable the LMF to abort an on-going measurement.

8.5.4.2 Successful Operation



Figure 8.5.4.2.1: Measurement Abort Procedure: Successful Operation.

The LMF initiates the procedure by sending a MEASUREMENT ABORT message.

Upon receiving this message, the NG-RAN node shall terminate the on-going measurement identified by the *LMF Measurement ID* IE and may release any resources previously allocated for the same measurement.

8.5.4.3 Unsuccessful Operation

Not applicable.

8.5.4.4 Abnormal Conditions

If the NG-RAN node cannot identify the previously requested measurement to be aborted, it shall ignore the MEASUREMENT ABORT message.

8.5.5 Measurement Failure Indication

8.5.5.1 General

The Measurement Failure Indication procedure allows the NG-RAN node to notify the LMF that the measurements previously requested with the Measurement procedure can no longer be reported.

8.5.5.2 Successful Operation



Figure 8.5.5.2.1: Measurement Report procedure. Successful operation.

Upon reception of the MEASUREMENT FAILURE INDICATION message, the LMF shall consider that the indicated measurements have been terminated by the NG-RAN node.

9 Elements for NRPPa Communication

9.0 General

Sub clauses 9.1 and 9.2 describe the structure of the messages and information elements required for the NRPPa protocol in tabular format. Sub clause 9.3 provides the corresponding ASN.1 definition.

The following attributes are used for the tabular description of the messages and information elements: Presence, Range Criticality and Assigned Criticality. Their definition and use can be found in TS 38.413 [2].

NOTE: The messages have been defined in accordance to the guidelines specified in TR 25.921 [5].

9.1 Message Functional Definition and Content

9.1.1 Messages for Location Information Transfer Procedures

9.1.1.1 E-CID MEASUREMENT INITIATION REQUEST

This message is sent by LMF to initiate E-CID measurements.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|---|---------------------|---|--|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF UE Measurement ID | M | | INTEGER (1..15 ,...,256) | | YES | reject |
| Report Characteristics | M | | ENUMERATED (OnDemand, Periodic,...) | | YES | reject |
| Measurement Periodicity | C- ifReportC haracterist icsPeriodi c | | ENUMERATED (120ms, 240ms, 480ms, 640ms, 1024ms, 2048ms, 5120ms, 10240ms, 1min, 6min, 12min, 30min, 60min,..., 20480ms, 40960ms) | The codepoint 60min applies only for ng-eNB. | YES | reject |
| Measurement Quantities | | 1 .. <maxnoMeas> | | | EACH | reject |
| >Measurement Quantities Item | M | | ENUMERATED (Cell-ID, Angle of Arrival, Timing Advance Type 1, Timing Advance Type 2, RSRP, RSRQ,..., SS-RSRP, SS-RSRQ, CSI-RSRP, CSI-RSRQ, NR Angle of Arrival) | | - | - |
| Other-RAT Measurement Quantities | | 0 .. <maxnoMeas> | | | EACH | ignore |
| >Other-RAT Measurement Quantities Item | M | | ENUMERATED (GERAN, UTRAN,..., NR, EUTRA) | | | |
| WLAN Measurement Quantities | | 0 .. <maxnoMeas> | | | EACH | ignore |
| >WLAN Measurement Quantities Item | M | | ENUMERATED (WLAN, ...) | | - | |

| Range bound | Explanation |
|-------------|---|
| maxnoMeas | Maximum no. of measured quantities that can be configured and reported with one message. Value is 64. |

| Condition | Explanation |
|---------------------------------|--|
| ifReportCharacteristicsPeriodic | This IE shall be present if the <i>Report Characteristics</i> IE is set to the value "Periodic". |

9.1.1.2 E-CID MEASUREMENT INITIATION RESPONSE

This message is sent by NG-RAN node to indicate that the requested E-CID measurement is successfully initiated.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------------|----------|-------|--------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF UE Measurement ID | M | | INTEGER (1..15,..., 256) | | YES | reject |
| RAN UE Measurement ID | M | | INTEGER (1..15,..., 256) | | YES | reject |
| E-CID Measurement Result | O | | 9.2.5 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |
| Cell Portion ID | O | | 9.2.12 | | YES | ignore |
| Other-RAT Measurement Result | O | | 9.2.13 | | YES | ignore |
| WLAN Measurement Result | O | | 9.2.14 | | YES | ignore |

9.1.1.3 E-CID MEASUREMENT INITIATION FAILURE

This message is sent by NG-RAN node to indicate that the requested E-CID measurement cannot be initiated.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|--------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF UE Measurement ID | M | | INTEGER (1..15,..., 256) | | YES | reject |
| Cause | M | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.4 E-CID MEASUREMENT FAILURE INDICATION

This message is sent by NG-RAN node to indicate that the previously requested E-CID measurement can no longer be reported.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------|----------|-------|--------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | ignore |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF UE Measurement ID | M | | INTEGER (1..15,..., 256) | | YES | reject |
| RAN UE Measurement ID | M | | INTEGER (1..15,..., 256) | | YES | reject |
| Cause | M | | 9.2.1 | | YES | ignore |

9.1.1.5 E-CID MEASUREMENT REPORT

This message is sent by NG-RAN node to report the results of the requested E-CID measurement.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------|----------|-------|--------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | ignore |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF UE Measurement ID | M | | INTEGER (1..15,..., 256) | | YES | reject |
| RAN UE Measurement ID | M | | INTEGER (1..15,..., 256) | | YES | reject |
| E-CID Measurement Result | M | | 9.2.5 | | YES | ignore |
| Cell Portion ID | O | | 9.2.12 | | YES | ignore |

9.1.1.6 E-CID MEASUREMENT TERMINATION COMMAND

This message is sent by the LMF to terminate the requested E-CID measurement.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------|----------|-------|--------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | ignore |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF UE Measurement ID | M | | INTEGER (1..15,..., 256) | | YES | reject |
| RAN UE Measurement ID | M | | INTEGER (1..15,..., 256) | | YES | reject |

9.1.1.7 OTDOA INFORMATION REQUEST

This message is sent by LMF to request OTDOA information.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------|----------|---------------------------|---|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| OTDOA Information Type | | 1 .. <maxnoOTDOAtypes> | | | EACH | reject |
| >OTDOA Information Item | M | | ENUMERATED (pci, cellid, tac, earfcn, prsBandwidth, prsConfigIndex, cpLength, noDIFrames, noAntennaPorts, sFNInitTime, nG-RANAccessPointPosition, prsmutingconfiguration, prsid, tpid, tpType, crsCPLength, dlBandwidth, multipleprsConfigurationsperCell, prsOccasionGroup, prsFrequencyHoppingConfiguration, ..., tddConfig) | | - | - |

| Range bound | Explanation |
|-----------------|--|
| maxnoOTDOAtypes | Maximum no. of OTDOA information types that can be requested and reported with one message. Value is 63. |

9.1.1.8 OTDOA INFORMATION RESPONSE

This message is sent by NG-RAN node to provide OTDOA information.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|----------------------------|-----------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| OTDOA Cells | | 1 .. <maxCellInRANnode> | | Served cells/TPs that broadcast PRS. May be used to signal multiple PRS configurations per cell/TPs (up to 3 are supported in this release). | GLOBAL | ignore |
| >OTDOA Cell Information | M | | 9.2.15 | | - | - |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

| Range bound | Explanation |
|-----------------|---|
| maxCellinRANode | Maximum no. cells that can be served by a RAN Node. Value is 16384. |

9.1.1.9 OTDOA INFORMATION FAILURE

This message is sent by NG-RAN node to indicate that the OTDOA information cannot be provided.

Direction: ng-eNB → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| Cause | M | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.10 POSITIONING INFORMATION REQUEST

This message is sent by LMF to request positioning information.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| Requested SRS Transmission Characteristics | O | | 9.2.27 | | YES | ignore |

9.1.1.11 POSITIONING INFORMATION RESPONSE

This message is sent by NG-RAN node to provide positioning information.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| SRS Configuration | O | | 9.2.28 | | YES | ignore |
| SFN Initialisation Time | O | | 9.2.36 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.12 POSITIONING INFORMATION FAILURE

This message is sent by NG-RAN node to indicate that the positioning information cannot be provided.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| Cause | M | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.13 POSITIONING INFORMATION UPDATE

This message is sent by NG-RAN node to indicate that a change in the SRS configuration has occurred.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | ignore |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| SRS Configuration | O | | 9.2.28 | | YES | ignore |
| SFN Initialisation Time | O | | 9.2.36 | | YES | ignore |

9.1.1.14 TRP INFORMATION REQUEST

This message is sent by an LMF to request information for TRPs hosted by an NG-RAN node.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------------|----------|----------------------------|---|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| TRP List | | 0..1 | | | YES | ignore |
| >TRP Item | | 1.. <maxnoTRPs> | | | EACH | ignore |
| >>TRP ID | M | | 9.2.24 | | - | |
| TRP Information Type List | | 1 | | | | |
| >TRP Information Type Item | | 1.. <maxnoTRPInfoTypes> | | | EACH | reject |
| >>TRP Information Type Item | M | | ENUMERATED (nr pci, ng-ran cgi, nr arfcn, prs config, ssb config, sfn init time, spatial direction info, geo-coordinates, ...) | | | |

| Range bound | Explanation |
|-------------------|---|
| maxnoTRPs | Maximum no. of TRPs in a NG-RAN node. Value is 65535 |
| maxnoTRPInfoTypes | Maximum no of TRP information types that can be requested and reported with one message. Value is 64. |

9.1.1.15 TRP INFORMATION RESPONSE

This message is sent by an NG-RAN node to convey TRP information to an LMF.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|---------------------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| TRP Information List | | 1 | | | YES | ignore |
| >TRP Information Item | M | 1 .. <maxnoTRPs> | | | EACH | ignore |
| >>TRP Information | M | | 9.2.25 | | - | |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

| Range bound | Explanation |
|-------------|---|
| maxnoTRPs | Maximum no. of TRPs in a NG-RAN node. Value is 65535. |

9.1.1.16 TRP INFORMATION FAILURE

This message is sent by an NG-RAN node to indicate that the requested TRP information cannot be provided to an LMF.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| Cause | M | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.17 POSITIONING ACTIVATION REQUEST

This message is sent by the LMF to cause the NG RAN node to activate/trigger UL SRS transmission by the UE.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|------------------------|----------|-------|--|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| CHOICE SRS type | M | | | | YES | reject |
| >Semi-persistent | | | | | | |
| >>SRS Resource Set ID | M | | 9.2.33 | | - | - |
| >>SRS Spatial Relation | O | | Spatial Relation Information 9.2.34 | | YES- | ignore- |
| >Aperiodic | | | | | | |
| >>Aperiodic | M | | ENUMERATED (true,...) | | - | - |
| >>SRS Resource Trigger | O | | 9.2.35 | | - | - |
| Activation Time | O | | SFN Initialisation Time 9.2.36 | indicates the start time when the SRS activation is requested | YES | ignore |

9.1.1.18 POSITIONING ACTIVATION RESPONSE

This message is sent by NG-RAN node to confirm successful UL SRS activation in the UE.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |
| System Frame Number | O | | INTEGER(0..1023) | | YES | ignore |
| Slot Number | O | | INTEGER(0..79) | | YES | ignore |

9.1.1.19 POSITIONING ACTIVATION FAILURE

This message is sent by NG-RAN node to indicate that activation of UL SRS transmission in the UE was unsuccessful.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| Cause | M | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.1.20 POSITIONING DEACTIVATION

This message is sent by the LMF to cause the NG RAN node to deactivate UL SRS transmission or release all the transmission by the UE.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------------------|----------|-------|-----------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | ignore |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| CHOICE <i>Abort Transmission</i> | M | | | | YES | Ignore |
| > <i>Deactivate SRS Resource Set</i> | | | | | | |
| >>SRS Resource Set ID | M | | 9.2.33 | | - | |
| > <i>Release ALL</i> | | | NULL | the NG-RAN node configures UE to stop transmitting SRS for the positioning purpose | | |

9.1.2 Messages for Management Procedures

9.1.2.1 ERROR INDICATION

This message is used to indicate that some error has been detected in the NG-RAN node or in the LMF.

Direction: LMF → NG-RAN node and NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-----------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | ignore |
| NRPPa Transaction ID | M | | 9.2.4 | | – | |
| Cause | O | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.3 Messages for Assistance Information Transfer Procedures

9.1.3.1 ASSISTANCE INFORMATION CONTROL

This message is sent by the LMF to transfer assistance information.

Direction: LMF → NG-RAN Node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-----------------------------|----------|-------|----------------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| Assistance Information | O | | 9.2.19 | | YES | reject |
| Broadcast | O | | ENUMERATED (start, stop, ...) | | YES | reject |
| Positioning Broadcast Cells | O | | 9.2.59 | The cell(s) that are requested to broadcast posSIB(s) according to the <i>Assistance Information</i> IE. | YES | reject |

9.1.3.2 ASSISTANCE INFORMATION FEEDBACK

This message is sent by the NG-RAN Node to give feedback on assistance information broadcasting.

Direction: NG-RAN Node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------------------|----------|-------|-----------------------|---|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| Assistance Information Failure List | O | | 9.2.23 | | YES | reject |
| Positioning Broadcast Cells | O | | 9.2.59 | The cells associated to the feedback provided in the <i>Assistance Information Failure List</i> IE. | YES | reject |
| Criticality Diagnostics | O | | 9.2.2 | | YES | ignore |

9.1.4 Messages for Measurement Information Transfer Procedures

9.1.4.1 MEASUREMENT REQUEST

This message is sent by the LMF to request the NG-RAN node to configure a positioning measurement.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|---------------------------------------|------------------------|---|--|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| TRP Measurement Request List | | 1 | | | YES | reject |
| >TRP Measurement Request Item | | 1..<maxno of MeasTRPs> | | | EACH | reject |
| >>TRP ID | M | | 9.2.24 | | - | |
| >>Search Window Information | O | | 9.2.26 | | - | |
| >>Cell ID | O | | NR CGI 9.2.9 | The Cell ID of the TRP identified by the <i>TRP ID</i> IE. | YES | ignore |
| Report Characteristics | M | | ENUMERATED (OnDemand, Periodic, ...) | | YES | reject |
| Measurement Periodicity | C- ifReportCharacteristicsPeriodic | | ENUMERATED (120ms, 240ms, 480ms, 640ms, 1024ms, 2048ms, 5120ms, 10240ms, 1min, 6min, 12min, 30min, 60min,..., 20480ms, 40960ms) | The codepoint 60min is not applicable | YES | reject |
| TRP Measurement Quantities | | 1 | | | YES | reject |
| >TRP Measurement Quantities Item | | 1 .. <maxnoPosMeas> | | | EACH | reject |
| >TRP Measurement Type | M | | ENUMERATED (gNB-RxTxTimeDiff, UL-SRS-RSRP, UL-AoA, UL-RTOA,...) | | - | |
| >Timing Reporting Granularity Factor | O | | INTEGER (0..5) | TS 38.133 [16] | - | |
| SFN initialisation Time | O | | 9.2.36 | If this IE is not present, the TRP may assume that the value is same as its own SFN initialisation time. | YES | ignore |
| SRS Configuration | O | | 9.2.28 | | YES | ignore |
| Measurement Beam Information Request | O | | ENUMERATED (true,...) | | YES | ignore |
| System Frame Number | O | | INTEGER(0..1023) | | YES | ignore |
| Slot Number | O | | INTEGER(0..79) | | YES | ignore |

| Condition | Explanation |
|---------------------------------|--|
| ifReportCharacteristicsPeriodic | This IE shall be present if the <i>Report Characteristics</i> IE is set to the value "Periodic". |

| Range bound | Explanation |
|-----------------|--|
| maxnoPosMeas | Maximum no. of measured quantities that can be configured and reported with one positioning measurement message. Value is 16384. |
| maxnoofMeasTRPs | Maximum no. of TRPs that can be included within one message. Value is 64. |

9.1.4.2 MEASUREMENT RESPONSE

This message is sent by the NG-RAN node to report positioning measurements for the target UE.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--------------------------------|----------|-----------------------|-------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| RAN Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| TRP Measurement Response List | | 0..1 | | | YES | reject |
| >TRP Measurement Response Item | | 1..<maxno ofMeasTRPs> | | | EACH | reject |
| >>TRP ID | M | | 9.2.24 | | - | |
| >> TRP Measurement Result | M | | 9.2.37 | | - | |
| >>Cell ID | O | | NR CGI 9.2.9 | The Cell ID of the TRP identified by the <i>TRP ID</i> IE. | YES | ignore |
| Criticality Diagnostics | O | | 9.2.11 | | YES | ignore |

| Range bound | Explanation |
|-----------------|---|
| maxnoofMeasTRPs | Maximum no. of TRPs that can be included within one message. Value is 64. |

9.1.4.3 MEASUREMENT FAILURE

This message is sent by the NG-RAN node to report measurement failure.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|-------------------------|----------|-------|-------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| Cause | M | | 9.2.1 | | YES | ignore |
| Criticality Diagnostics | O | | 9.2.11 | | YES | ignore |

9.1.4.4 MEASUREMENT REPORT

This message is sent by the NG-RAN node to report positioning measurements for the target UE.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|--|----------|------------------------|----------------------------|--|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| RAN Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| TRP Measurement Response List | | 1 | | | YES | reject |
| >TRP Measurement Response Item | | 1..<maxno of MeasTRPs> | | | EACH | reject |
| >>TRP ID | M | | 9.2.24 | | - | |
| >> TRP Measurement Result | M | | 9.2.37 | | - | |
| >>Cell ID | O | | NR CGI 9.2.9 | The Cell ID of the TRP identified by the <i>TRP ID</i> IE. | YES | ignore |

| Range bound | Explanation |
|-----------------|--|
| maxnoofMeasTRPs | Maximum no. of TRPs that can be included within one message. Value is 64. |

9.1.4.5 MEASUREMENT UPDATE

This message is sent by the LMF to update a previously configured measurement.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------------|----------|-------|----------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | ignore |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| RAN Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| SRS Configuration | O | | 9.2.28 | | YES | ignore |

9.1.4.6 MEASUREMENT ABORT

This message is sent by the LMF to request the NG-RAN node to abort a measurement.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------------|----------|-------|----------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| RAN Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |

9.1.4.7 MEASUREMENT FAILURE INDICATION

This message is sent by the NG-RAN node to indicate that the previously requested measurements can no longer be reported.

Direction: NG-RAN node → LMF.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
|----------------------|----------|-------|----------------------------|-----------------------|-------------|----------------------|
| Message Type | M | | 9.2.3 | | YES | reject |
| NRPPa Transaction ID | M | | 9.2.4 | | - | |
| LMF Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| RAN Measurement ID | M | | INTEGER (1..65536, ...) | | YES | reject |
| Cause | M | | 9.2.1 | | YES | ignore |

9.2 Information Element definitions

9.2.0 General

When specifying information elements which are to be represented by bit strings, if not otherwise specifically stated in the semantics description of the concerned IE or elsewhere, the following principle applies with regards to the ordering of bits:

- The first bit (leftmost bit) contains the most significant bit (MSB);
- The last bit (rightmost bit) contains the least significant bit (LSB);
- When importing bit strings from other specifications, the first bit of the bit string contains the first bit of the concerned information.

9.2.1 Cause

The purpose of the cause information element is to indicate the reason for a particular event for the whole protocol.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------------|----------|-------|---|-----------------------|
| CHOICE <i>Cause Group</i> | M | | | |
| > <i>Radio Network Layer</i> | | | | |
| >>Radio Network Layer Cause | M | | ENUMERATED (Unspecified, Requested Item not Supported, Requested Item Temporarily not Available, ...) | |
| > <i>Protocol</i> | | | | |
| >>Protocol Cause | M | | ENUMERATED (Transfer Syntax Error, Abstract Syntax Error (Reject), Abstract Syntax Error (Ignore and Notify), Message not Compatible with Receiver State, Semantic Error, Unspecified, Abstract Syntax Error (Falsely Constructed Message), ...) | |
| > <i>Misc</i> | | | | |
| >>Miscellaneous Cause | M | | ENUMERATED (Unspecified, ...) | |

The meaning of the different cause values is described in the following table. In general, "not supported" cause values indicate that the concerned capability is missing. On the other hand, "not available" cause values indicate that the concerned capability is present, but insufficient resources were available to perform the requested action.

| Radio Network Layer cause | Meaning |
|--|--|
| Unspecified | Sent when none of the above cause values applies but still the cause is Radio Network Layer related |
| Requested Item not Supported | The NG-RAN node does not support the requested measurement object, or cannot provide the requested information item. |
| Requested Item Temporarily not Available | The NG-RAN node can temporarily not provide the requested measurement object or information item. |

| Protocol cause | Meaning |
|---|--|
| Abstract Syntax Error (Reject) | The received message included an abstract syntax error and the concerned criticality indicated "reject" (see sub clause 10.3) |
| Abstract Syntax Error (Ignore and Notify) | The received message included an abstract syntax error and the concerned criticality indicated "ignore and notify" (see sub clause 10.3) |
| Abstract syntax error (falsely constructed message) | The received message contained IEs or IE groups in wrong order or with too many occurrences (see sub clause 10.3) |
| Message not Compatible with Receiver State | The received message was not compatible with the receiver state (see sub clause 10.4) |
| Semantic Error | The received message included a semantic error (see sub clause 10.4) |
| Transfer Syntax Error | The received message included a transfer syntax error (see sub clause 10.2) |
| Unspecified | Sent when none of the above cause values applies but still the cause is Protocol related |

| Miscellaneous cause | Meaning |
|---------------------|--|
| Unspecified | Sent when none of the above cause values applies and the cause is not related to any of the categories Radio Network Layer, Transport Network Layer or Protocol. |

9.2.2 Criticality Diagnostics

The *Criticality Diagnostics* IE is sent by the NG-RAN node or LMF when parts of a received message have not been comprehended or were missing, or if the message contained logical errors. When applicable, it contains information about which IEs were not comprehended or were missing. The conditions for inclusion of the *NRPPa Transaction ID* IE are described in clause 10.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--|----------|-----------------------|---|---|
| Procedure Code | O | | INTEGER (0..255) | Procedure Code is to be used if Criticality Diagnostics is part of Error Indication procedure, and not within the response message of the same procedure that caused the error. |
| Triggering Message | O | | ENUMERATED (initiating message, successful outcome, unsuccessful outcome) | The Triggering Message is used only if the Criticality Diagnostics is part of Error Indication procedure. |
| Procedure Criticality | O | | ENUMERATED (reject, ignore, notify) | This Procedure Criticality is used for reporting the Criticality of the Triggering message (Procedure). |
| NRPPa Transaction ID | O | | 9.2.4 | |
| Information Element Criticality Diagnostics | | 0 .. <maxNrOf Errors> | | |
| >IE Criticality | M | | ENUMERATED (reject, ignore, notify) | The IE Criticality is used for reporting the criticality of the triggering IE. The value "ignore" shall not be used. |
| >IE ID | M | | INTEGER (0..65535) | The IE ID of the not understood or missing IE. |
| >Type Of Error | M | | ENUMERATED (not understood, missing, ...) | |

| Range bound | Explanation |
|---------------|--|
| maxNrOfErrors | Maximum no. of IE errors allowed to be reported with a single message. The value for maxNrOfErrors is 256. |

9.2.3 Message Type

The *Message Type* IE uniquely identifies the message being sent. It is mandatory for all messages.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------|----------|-------|--|-----------------------|
| Procedure Code | M | | INTEGER (0..255) | |
| Type of Message | M | | CHOICE (Initiating Message, Successful Outcome, Unsuccessful Outcome, ...) | |

9.2.4 NRPPa Transaction ID

The *NRPPa Transaction ID* IE is used to associate all the messages belonging to the same procedure. Messages belonging to the same procedure shall use the same NRPPa Transaction ID.

The NRPPa Transaction ID is determined by the initiating peer of a procedure.

The NRPPa Transaction ID shall uniquely identify a procedure among all ongoing parallel procedures using the same procedure code, and initiated by the same protocol peer.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|----------------------|----------|-------|-----------------------|-----------------------|
| NRPPa Transaction ID | M | | INTEGER (0..32767) | |

9.2.5 E-CID Measurement Result

The purpose of the E-CID Measurement Result information element is to provide the E-CID measurement result.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description | Criticality | Assigned Criticality |
|---------------------------------------|----------|-------------------------|--------------------------|---|-------------|----------------------|
| Serving Cell ID | M | | NG-RAN CGI 9.2.6 | NG-RAN Cell Identifier of the serving cell | - | |
| Serving Cell TAC | M | | TAC 9.2.11 | Tracking Area Code of the serving cell | - | |
| NG-RAN Access Point Position | O | | 9.2.10 | The configured estimated geographical position of the antenna of the cell. If the <i>Geographical Coordinates</i> IE is used, the <i>NG-RAN Access Point Position</i> IE shall be ignored. | - | |
| Measured Results | | 0 .. <maxnoMeas> | | | - | |
| >CHOICE <i>Measured Results Value</i> | M | | | | - | |
| >>Value Angle of Arrival EUTRA | M | | INTEGER (0..719) | According to mapping in TS 36.133 [9] | - | |
| >>Value Timing Advance Type 1 EUTRA | M | | INTEGER (0..7690) | According to mapping in TS 36.214 [17] | - | |
| >>Value Timing Advance Type 2 EUTRA | M | | INTEGER (0..7690) | According to mapping in TS 36.214 [17] | - | |
| >>Result RSRP EUTRA | | 1 .. <maxCellReport> | | | - | |
| >>> PCI EUTRA | M | | INTEGER (0..503) | Physical Cell Identifier of the reported E-UTRA cell | - | |
| >>>EARFCN | M | | INTEGER (0..262143, ...) | Corresponds to ND/L for FDD and ND/L/UL for TDD in ref. TS 36.104 [7] | - | |
| >>> CGI EUTRA | O | | 9.2.7 | Cell Global Identifier of the reported E-UTRA cell | - | |
| >>>Value RSRP EUTRA | M | | INTEGER (0..97, ...) | | - | |
| >>Result RSRQ EUTRA | | 1 .. <maxCellReport> | | | - | |
| >>> PCI EUTRA | M | | INTEGER (0..503) | Physical Cell Identifier of the reported E-UTRA cell | - | |
| >>>EARFCN | M | | INTEGER (0..262143, ...) | Corresponds to ND/L for FDD and ND/L/UL for TDD in ref. TS 36.104 [7] | - | |
| >>> CGI EUTRA | O | | 9.2.7 | Cell Global Identifier of the reported E-UTRA cell | - | |
| >>>Value RSRQ | M | | INTEGER | | - | |

| | | | | | | |
|---|---|------------------------------------|-------------------------|--|-----|--------|
| EUTRA | | | (0..34, ...) | | | |
| >>Result SS-RSRP | | 1 .. <maxCell ReportNR > | | | YES | ignore |
| >>>NR PCI | M | | INTEGER (0..1007) | | - | |
| >>>NR ARFCN | M | | INTEGER (0..3279165) | | - | |
| >>>NR CGI | O | | 9.2.9 | | - | |
| >>>Value SS- RSRP Cell | O | | INTEGER (0..127) | SS-RSRP measurement aggregated at cell level | - | |
| >>>SS-RSRP per SSB Resource | | 0 .. <maxInde xesReport > | | | - | |
| >>>>SSB Index | M | | INTEGER (0..63) | | - | |
| >>>>Value SS- RSRP | M | | INTEGER (0..127) | SS-RSRP measurement per SSB resource | - | |
| >>Result SS-RSRQ | | 1 .. <maxCell ReportNR > | | | YES | ignore |
| >>>NR PCI | M | | INTEGER (0..1007) | | - | |
| >>>NR ARFCN | M | | INTEGER (0..3279165) | | - | |
| >>>NR CGI | O | | 9.2.9 | | - | |
| >>>Value SS- RSRQ Cell | O | | INTEGER (0..127) | SS-RSRQ measurement aggregated at cell level | - | |
| >>>SS-RSRQ per SSB Resource | | 0 .. <maxInde xesReport > | | | - | |
| >>>>SSB Index | M | | INTEGER (0..63) | | - | |
| >>>>Value SS- RSRQ | M | | INTEGER (0..127) | SS-RSRQ measurement per SSB resource | - | |
| >>Result CSI- RSRP | | 1 .. <maxCell ReportNR > | | | YES | ignore |
| >>>NR PCI | M | | INTEGER (0..1007) | | - | |
| >>>NR ARFCN | M | | INTEGER (0..3279165) | | - | |
| >>>NR CGI | O | | 9.2.9 | | - | |
| >>>Value CSI- RSRP Cell | O | | INTEGER (0..127) | CSI-RSRP measurement aggregated at cell level | - | |
| >>>CSI-RSRP per CSI-RS Resource | | 0 .. <maxInde xesReport > | | | - | |
| >>>>CSI-RS Index | M | | INTEGER (0..95) | | - | |
| >>>>Value CSI- RSRP | M | | INTEGER (0..127) | CSI-RSRP measurement per CSI-RS resource | - | |

| | | | | | | |
|---------------------------------|---|----------------------------|-------------------------------|---|-----|--------|
| >>Result CSI-RSRQ | | 1 .. <maxCellReportNR> | | | YES | ignore |
| >>>NR PCI | M | | INTEGER (0..1007) | | - | |
| >>>NR ARFCN | M | | INTEGER (0..3279165) | | - | |
| >>>NR CGI | O | | 9.2.9 | | - | |
| >>>Value CSI-RSRQ Cell | O | | INTEGER (0..127) | CSI-RSRQ measurement aggregated at cell level | - | |
| >>>CSI-RSRQ per CSI-RS Resource | | 0 .. <maxIndexesReport> | | | - | |
| >>>>CSI-RS Index | M | | INTEGER (0..95) | | - | |
| >>>>Value CSI-RSRQ | M | | INTEGER (0..127) | CSI-RSRQ measurement per CSI-RS resource | - | |
| >>Angle of Arrival NR | M | | UL Angle of Arrival 9.2.38 | | YES | ignore |
| Geographical Coordinates | O | | 9.2.46 | | YES | ignore |

| Range bound | Explanation |
|------------------|---|
| maxnoMeas | Maximum no. of measured quantities that can be configured and reported with one message. Value is 64. |
| maxCellReport | Maximum no. of cells that can be reported with one message. Value is 9. |
| maxCellReportNR | Maximum no. of NR cells that can be reported with one message. Value is 9. |
| maxIndexesReport | Maximum no. of beam level measurement results that can be reported with one message. Value is 64. |

9.2.6 NG-RAN CGI

The NG-RAN Cell Global Identifier (CGI) is used to globally identify a cell.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------|----------|-------|-----------------------|-----------------------|
| PLMN identity | M | | 9.2.8 | |
| CHOICE NG-RAN Cell | M | | | |
| >NR Cell | | | | |
| NR Cell Identifier | M | | BIT STRING (36) | |
| >E-UTRA Cell | | | | |
| E-UTRA Cell Identifier | M | | BIT STRING (28) | |

9.2.7 CGI EUTRA

The Cell Global Identifier EUTRA is used to globally identify an E-UTRA cell.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------|----------|-------|-----------------------|-----------------------|
| PLMN identity | M | | 9.2.8 | |
| E-UTRA Cell Identifier | M | | BIT STRING (28) | |

9.2.8 PLMN Identity

This IE indicates the PLMN Identity.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|---------------------------|---|
| PLMN Identity | M | | OCTET STRING (SIZE(3)) | <p>Digits 0 to 9 encoded 0000 to 1001, 1111 used as filler digit.</p> <p>Two digits per octet:</p> <ul style="list-style-type: none"> - bits 4 to 1 of octet n encoding digit 2n-1 - bits 8 to 5 of octet n encoding digit 2n <p>PLMN Identity consists of 3 digits from MCC followed by either:</p> <ul style="list-style-type: none"> - a filler digit plus 2 digits from MNC (in case of 2 digit MNC) or - 3 digits from MNC (in case of 3 digit MNC). |

9.2.9 NR CGI

The Cell Global Identifier NR is used to globally identify an NR cell.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------|----------|-------|-----------------------|-----------------------|
| PLMN Identity | M | | 9.2.8 | |
| NR Cell Identity | M | | BIT STRING (SIZE(36)) | |

9.2.10 NG-RAN Access Point Position

The *NG-RAN Access Point Position* IE is used to identify the geographical position of an NG-RAN Access Point. It is expressed as ellipsoid point with altitude and uncertainty ellipsoid according to TS 23.032 [8].

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------------------|----------|-------|---|--|
| Latitude Sign | M | | ENUMERATED (North, South) | |
| Degrees Of Latitude | M | | INTEGER (0..2 ²³ -1) | The IE value (N) is derived by this formula: $N \leq 2^{23} \times X / 90 < N+1$ X being the latitude in degrees (0°.. 90°). |
| Degrees Of Longitude | M | | INTEGER (-2 ²³ ..2 ²³ -1) | The IE value (N) is derived by this formula: $N \leq 2^{24} \times X / 360 < N+1$ X being the longitude in degrees (-180°..+180°). |
| Direction of Altitude | M | | ENUMERATED (Height, Depth) | |
| Altitude | M | | INTEGER (0..2 ¹⁵ -1) | The relation between the value (N) and the altitude (a) in meters it describes is $N \leq a < N+1$, except for $N=2^{15}-1$ for which the range is extended to include all greater values of (a). |
| Uncertainty semi-major | M | | INTEGER (0..127) | The uncertainty "r" is derived from the "uncertainty code" k by $r = 10 \times (1.1^k - 1)$. |
| Uncertainty semi-minor | M | | INTEGER (0..127) | The uncertainty "r" is derived from the "uncertainty code" k by $r = 10 \times (1.1^k - 1)$. |
| Orientation of major axis | M | | INTEGER (0..179) | |
| Uncertainty Altitude | M | | INTEGER (0..127) | The uncertainty altitude "h" expressed in metres is derived from the "uncertainty code" k, by: $h = 45 \times (1.025^k - 1)$. |
| Confidence | M | | INTEGER (0..100) | In percentage |

9.2.11 TAC

This information element is used to uniquely identify a Tracking Area Code.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|-------------------------|-----------------------|
| TAC | M | | OCTET STRING (SIZE (3)) | |

9.2.12 Cell Portion ID

This parameter gives the current Cell Portion associated with the target UE. The Cell Portion ID is the unique identifier for a cell portion within a cell.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-----------------|----------|-------|-----------------------|-----------------------|
| Cell Portion ID | M | | INTEGER (0..4095,...) | |

9.2.13 Other-RAT Measurement Result

The purpose of the Other-RAT Measurement Result information element is to provide the measurement results of RATs other than the serving RAT.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description | Criticality | Assigned Criticality |
|--|----------|-------------------------------|----------------------------|--|-------------|----------------------|
| Other-RAT Measured Results | | 1.. <maxnoMeas> | | | | |
| >CHOICE Other-RAT Measured Results Value | M | | | | | |
| >>Result GERAN | M | 1.. <maxGERANMeas> | | | | |
| >>>ARFCN of BCCH | M | | INTEGER (0..1023, ...) | | | |
| >>>Physical CellId GERAN | M | | INTEGER (0..63, ...) | | | |
| >>>RSSI | M | | INTEGER (0..63, ...) | | | |
| >>Result UTRAN | | 1.. <maxUTRANMeas> | | | | |
| >>>UARFCN | M | | INTEGER (0..16383, ...) | | | |
| >>>CHOICE Physical CellId UTRA | M | | | | | |
| >>>>Physical CellId UTRA FDD | M | | INTEGER (0..511, ...) | | | |
| >>>>Physical CellId UTRA TDD | M | | INTEGER (0..127, ...) | | | |
| >>>UTRA RSCP | O | | INTEGER (-5..91, ...) | | | |
| >>>UTRA EcNo | O | | INTEGER (0..49, ...) | This IE applies to FDD only. | | |
| >>Result NR | | 1.. <maxNRMeas> | | | YES | ignore |
| >>>NR PCI | M | | INTEGER (0..1007) | | - | |
| >>>NR ARFCN | M | | INTEGER (0..3279165) | | - | |
| >>>SS-RSRP Cell | O | | INTEGER (0..127) | SS-RSRP measurement aggregated at cell level | - | |
| >>>SS-RSRQ Cell | O | | INTEGER (0..127) | SS-RSRQ measurement aggregated at cell level | - | |
| >>>SS-RSRP per SSB Resource | | 0.. <maxnoIndexesToReport> | | | - | |
| >>>>SSB Index | M | | INTEGER (0..63) | | - | |
| >>>>Value SS-RSRP | M | | INTEGER (0..127) | SS-RSRP measurement per SSB resource | - | |
| >>>SS-RSRQ per SSB Resource | | 0.. <maxnoIndexesToReport> | | | - | |
| >>>>SSB Index | M | | INTEGER (0..63) | | - | |
| >>>>Value SS-RSRQ | M | | INTEGER (0..127) | SS-RSRQ measurement per SSB resource | - | |

| | | | | | | |
|----------------|---|------------------------------------|---------------------|--|-----|--------|
| >>>CGI NR | O | | 9.2.9 | Cell Global Identifier of the reported NR cell | - | |
| >>Result EUTRA | | <i>1..<maxEUTRAMeasures></i> | | | YES | ignore |
| >>>PCI EUTRA | M | | INTEGER (0..503) | | - | |
| >>>EARFCN | M | | INTEGER (0..262143) | | - | |
| >>>RSRP EUTRA | O | | INTEGER (0..97) | | - | |
| >>>RSRQ EUTRA | O | | INTEGER (0..34) | | - | |
| >>>CGI EUTRA | O | | 9.2.7 | Cell Global Identifier of the reported E-UTRA cell | - | |

| Range bound | Explanation |
|------------------|---|
| maxnoMeas | Maximum no. of measured quantities that can be configured and reported with one message. Value is 64. |
| maxGERANMeas | Maximum no. of GERAN cells that can be reported with one message. Value is 8. |
| maxUTRANMeas | Maximum no. of UTRAN cells that can be reported with one message. Value is 8. |
| maxNRMeas | Maximum no. of NR cells that can be reported with one message. Value is 8. |
| maxEUTRAMeas | Maximum no. of EUTRA cells that can be reported with one message. Value is 8. |
| maxIndexesReport | Maximum no. of beam level measurement results that can be reported with one message. Value is 64. |

9.2.14 WLAN Measurement Result

The WLAN Measurement Result information element provides the WLAN measurement results.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------------|----------|-----------------------------------|---|--|
| WLAN Measured Results | | <i>1..<maxnoMeas></i> | | |
| >WLAN RSSI | M | | INTEGER (0..141, ...) | |
| >SSID | O | | OCTET STRING (SIZE(1..32)) | Includes the SSID field as defined in subclause 8.4.2.2 of IEEE 802.11™ [11]. |
| >BSSID | M | | OCTET STRING (SIZE(6)) | Includes the BSSID field as defined in subclause 8.2.4.3.4 of IEEE 802.11™ [11]. |
| >HESSID | O | | OCTET STRING (SIZE(6)) | Includes the HESSID field as defined in subclause 8.4.2.94 of IEEE 802.11™ [11]. |
| >Operating Class | O | | INTEGER (0..255) | Indicates the WLAN Operating Class as defined in IEEE 802.11™ [11]. |
| >Country Code | | | ENUMERATED (unitedStates, europe, japan, global, ...) | Indicates the WLAN country code as defined in IEEE 802.11™ [11]. |
| >WLAN Channel List | | <i>0..1</i> | | |
| >>WLAN Channel List Item | | <i>1..<maxWLANchannels></i> | | |
| >>>WLAN Channel | | | INTEGER (0..255) | Indicates the WLAN channel number as defined in IEEE 802.11™ [11]. |
| >WLAN Band | O | | ENUMERATED (band2dot4, band5, ...) | Indicates the WLAN band as defined in IEEE 802.11™ [11]. |

| Range bound | Explanation |
|-----------------|---|
| maxnoMeas | Maximum no. of measured quantities that can be configured and reported with one message. Value is 63. |
| maxWLANchannels | Maximum no. of WLAN channels that can be reported within one list. Value is 16. |

9.2.15 OTDOA Cell Information

This IE contains OTDOA information of a cell/TP.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned criticality |
|--|----------|-----------------------------------|--|---|-------------|----------------------|
| OTDOA Cell Information | | 1 .. <maxnoO TDOAtype s> | | | | |
| >CHOICE OTDOA Cell Information Item | M | | | | | |
| >>PCI EUTRA | M | | INTEGER (0..503, ...) | Physical Cell ID of the reported E- UTRA cell. | | |
| >>CGI EUTRA | M | | 9.2.7 | Cell Global Identifier of the E- UTRA cell. | | |
| >>TAC | M | | 9.2.11 | Tracking Area Code | | |
| >>EARFCN | M | | INTEGER (0.. 262143, ...) | Corresponds to N _{DL} for FDD and N _{DL/UL} for TDD in ref. TS 36.104 [7]. | | |
| >>PRS Bandwidth EUTRA | M | | ENUMERATED (bw6, bw15, bw25, bw50, bw75, bw100, ...) | Transmission bandwidth of PRS | | |
| >>PRS Configuration Index EUTRA | M | | INTEGER (0..4095, ...) | PRS Configuration Index, ref TS 36.211 [10] | | |
| >>CP Length EUTRA | M | | ENUMERATED (Normal, Extended, ...) | Cyclic prefix length of the PRS | | |
| >>Number of DL Frames EUTRA | M | | ENUMERATED (sf1, sf2, sf4, sf6, ...) | Number of consecutive downlink subframes N _{PRS} with PRS, ref TS 36.211 [10] | | |
| >>Number of Antenna Ports EUTRA | M | | ENUMERATED (n1-or-n2, n4, ...) | Number of used antenna ports, where n1-or-n2 corresponds to 1 or 2 ports, n4 corresponds to 4 ports | | |
| >>SFN Initialisation Time EUTRA | M | | BIT STRING (64) | Time in seconds relative to 00:00:00 on 1 January 1900 (calculated as continuous time without leap seconds and traceable to a common time reference) where binary encoding of the integer part is in the first 32 bits and binary encoding of the fraction part in the last 32 bits. The fraction part is expressed with a granularity of 1 /2**32 second. | | |
| >>NG-RAN Access Point Position | M | | 9.2.10 | The configured estimated | | |

| | | | | | | |
|---|---|--|--|---|-----|--------|
| | | | | geographical position of the antenna of the cell/TP. | | |
| >>PRS Muting Configuration EUTRA | M | | 9.2.16 | The configuration of positioning reference signals muting pattern. | | |
| >>PRS-ID EUTRA | M | | INTEGER (0..4095, ...) | PRS ID, ref TS 36.211 [10]. | | |
| >>TP-ID EUTRA | M | | INTEGER (0..4095, ...) | Identity of the transmission point. This IE together with the <i>PCI</i> and/or <i>PRS-ID</i> may be used to identify the transmission point in case the same physical cell ID is shared by multiple transmission points. | | |
| >>TP Type EUTRA | M | | ENUMERATED (prs-only-tp, ...) | A TP which transmits PRS only. | | |
| >>Number of DL Frames-Extended EUTRA | M | | INTEGER (1..160, ...) | Number of consecutive downlink subframes N_{PRS} with PRS, ref TS 36.211 [10]. | | |
| >>CRS CP Length EUTRA | M | | ENUMERATED (Normal, Extended, ...) | Cyclic prefix length of the CRS. | | |
| >>DL Bandwidth EUTRA | M | | ENUMERATED (bw6, bw15, bw25, bw50, bw75, bw100, ...) | DL transmission bandwidth expressed in units of resource blocks N_{RB} , ref TS 36.104 [7]. | | |
| >>PRS Occasion Group EUTRA | M | | ENUMERATED (og2, og4, og8, og16, og32, og64, og128, ...) | PRS occasion group in a PRS period, ref TS 36.211 [10]. | | |
| >>PRS Frequency Hopping Configuration EUTRA | M | | 9.2.17 | PRS frequency hopping configuration. | | |
| >>TDD Configuration EUTRA | M | | 9.2.18 | TDD specific physical channel configuration. | YES | ignore |
| >>NR CGI | M | | 9.2.9 | Cell Global Identifier of the NR cell. | YES | ignore |
| >>SFN Initialisation Time NR | M | | BIT STRING (64) | Time in seconds relative to 00:00:00 on 1 January 1900 (calculated as continuous time without leap seconds and traceable to a common time reference) where binary encoding of | YES | ignore |

| | | | | | | |
|--|--|--|--|--|--|--|
| | | | | the integer part is in the first 32 bits and binary encoding of the fraction part in the last 32 bits. The fraction part is expressed with a granularity of $1/2^{**32}$ second. | | |
|--|--|--|--|--|--|--|

| Range bound | Explanation |
|-----------------|--|
| maxnoOTDOAtypes | Maximum no. of OTDOA information types that can be requested and reported with one message. Value is 63. |

9.2.16 PRS Muting Configuration EUTRA

The *PRS Muting Configuration EUTRA* IE is used to describe the configuration of PRS muting patterns for the concerned cell/TP, according to TS 36.211 [10] and TS 36.133 [9].

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--|----------|-------|-----------------------|---|
| CHOICE <i>PRS Muting Configuration</i> | M | | | |
| >Two | M | | BIT STRING (2) | If a bit is set to "0", it indicates that the PRS is muted in the corresponding PRS positioning occasion (numbering from any sub frame for which SFN=0) in a periodic cycle of length equal to the length of the bit string |
| >Four | M | | BIT STRING (4) | Same as above |
| >Eight | M | | BIT STRING (8) | Same as above |
| >Sixteen | M | | BIT STRING (16) | Same as above |
| >thirty-two | M | | BIT STRING (32) | Same as above |
| >sixty-four | M | | BIT STRING (64) | Same as above |
| >one-hundred-and-twenty-eight | M | | BIT STRING (128) | Same as above |
| >two-hundred-and-fifty-six | M | | BIT STRING (256) | Same as above |
| >five-hundred-and-twelve | M | | BIT STRING (512) | Same as above |
| >one-thousand-and-twenty-four | M | | BIT STRING (1024) | Same as above |

9.2.17 PRS Frequency Hopping Configuration EUTRA

The *PRS Frequency Hopping Configuration EUTRA* IE is used to describe the configuration of PRS frequency hopping for the concerned cell/TP, according to TS 36.211 [10].

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-----------------------------------|----------|--|---------------------------------------|--|
| Number of Frequency Hopping Bands | M | | ENUMERATED (twobands, fourbands, ...) | Number of bands for frequency hopping. |
| Band Positions | | 1.. <maxnoFreqHoppingBandsMinusOne,...> | | |
| >NarrowBand Index | M | | INTEGER (0..15, ...) | Narrowband Index |

| Range bound | Explanation |
|-------------------------------|---|
| maxnoFreqHoppingBandsMinusOne | Maximum no. of frequency hopping bands minus one. Value is 7. |

9.2.18 TDD Configuration EUTRA

The *TDD Configuration EUTRA* IE is used to specify the TDD specific physical channel configuration.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------------|----------|-------|---|--|
| Subframe Assignment | M | | ENUMERATED (sa0, sa1, sa2, sa3, sa4, sa5, sa6, ...) | sa0 points to Configuration 0, sa1 to Configuration 1 etc. as specified in TS 36.211 [6, table 4.2-2]. |

9.2.19 Assistance Information

This IE contains the assistance information.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|-------------------------------------|----------|---------------------------------------|---|---|
| Assistance Information | M | | | |
| > System Information | | <i>1..<maxNrOfPosSImessage></i> | | Corresponds to the number of SI messages with posSIBs to be scheduled |
| >>Broadcast Periodicity | M | | ENUMERATED (ms80, ms160, ms320, ms640, ms1280, ms2560, ms5120, ...) | Broadcast Periodicity for the Pos SIBs, see TS 38.331 [13] |
| >> Pos SIBs | | <i>1..<maxNrOfPosSIBs></i> | | Number of posSIBs in the System Information. |
| >>>PosSIB-Type | M | | 9.2.22 | |
| >>>PosSIB Segments | M | | 9.2.20 | |
| >>>Assistance Information Meta Data | O | | 9.2.21 | |
| >>>Broadcast Priority | O | | INTEGER (1..16, ...) | The priority of the assistance Information where 1 represents the highest priority and 16 the lowest priority |

| Range bound | Explanation |
|---------------------|---|
| maxNrOfPosSImessage | Maximum number of positioning system information messages. Value is 32. |
| maxNrOfPosSIBs | Maximum number of positioning system information blocks included in the message. Value is 32. |

9.2.20 PosSIB Segments

This IE provides one posSIB or two or more posSIB segments which must be scheduled in series in consecutive transmissions of the same SI message.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------------------|----------|-----------------------------------|-----------------------|-----------------------|
| PosSIB Segments | | <i>1..<maxNrOfSegments></i> | | |
| >Assistance Data SIB Element | M | | OCTET STRING | TS 37.355 [14] |

| Range bound | Explanation |
|-----------------|---|
| maxNrOfSegments | Maximum number of positioning SIB segments (in case of <i>Assistance Information Element</i> contains segmented data according to TS 37.355 [14]). Value is 64. |

9.2.21 Assistance Information Meta Data

This parameter contains meta data for an assistance information element.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|---------------|----------|-------|--|-----------------------|
| Encrypted | O | | ENUMERATED (true, ...) | |
| GNSS ID | O | | ENUMERATED (gps, sbas, qzss, galileo, glonass, bds, navic ...) | |
| SBAS ID | O | | ENUMERATED (waas, egnos, msas, gagan, ...) | |

9.2.22 Positioning SIB Type

This parameter defines a specific positioning SIB, as defined in TS 37.355 [14].

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|----------------------|----------|-------|---|-----------------------|
| Positioning SIB Type | M | | ENUMERATED (posSibType1-1, posSibType1-2, posSibType1-3, posSibType1-4, posSibType1-5, posSibType1-6, posSibType1-7, posSibType1-8, posSibType2-1, posSibType2-2, posSibType2-3, posSibType2-4, posSibType2-5, posSibType2-6, posSibType2-7, posSibType2-8, posSibType2-9, posSibType2-10, posSibType2-11, posSibType2-12, posSibType2-13, posSibType2-14, posSibType2-15, posSibType2-16, posSibType2-17, posSibType2-18, posSibType2-19, posSibType2-20, posSibType2-21, posSibType2-22, posSibType2-23, posSibType2-24, posSibType2-25, posSibType3-1, posSibType4-1, posSibType5-1, posSibType6-1, posSibType6-2, posSibType6-3, ...) | |

9.2.23 Assistance Information Failure List

This parameter identifies the assistance information for which the NG-RAN Node failed to configure broadcasting.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--|----------|--|--------------------------|-----------------------|
| Assistance Information Failure List | | <i>1..<maxno AssistInfo FailureList Items></i> | | |
| >PosSIB-Type | M | | 9.2.22 | |
| >Outcome | M | | ENUMERATED (failed, ...) | |

| Range bound | Explanation |
|---------------------------------|--|
| maxnoAssistInfoFailureListItems | Maximum no. of assistance information failure list items that can be signaled with one message. Value is 32. |

9.2.24 TRP ID

The *TRP ID* IE is used to identify a TRP uniquely within an NG-RAN node.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|----------------|----------|-------|------------------------|--|
| TRP Identifier | M | | INTEGER (1..65535,...) | Identifies a TRP within an NG-RAN node |

9.2.25 TRP Information

The *TRP Information* IE contains information for one TRP within an NG-RAN node.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------------------|----------|--|-----------------------|-----------------------|
| TRP ID | M | | 9.2.24 | |
| TRP Information Type | | <i>1 .. <maxno TRPInfoTypes></i> | | |
| >CHOICE <i>TRP Information Item</i> | M | | | |
| >>NR PCI | M | | INTEGER (0..1007) | NR Physical Cell ID |
| >>NR CGI | M | | 9.2.9 | |
| >>NR ARFCN | M | | INTEGER (0..3279165) | |
| >>PRS Configuration | M | | 9.2.44 | |
| >>SSB Information | M | | 9.2.54 | |
| >>SFN Initialisation Time | M | | 9.2.36 | |
| >>Spatial Direction Information | M | | 9.2.45 | |
| >>Geographical Coordinates | M | | 9.2.46 | |

| Range bound | Explanation |
|-------------------|---|
| maxnoTRPInfoTypes | Maximum no of TRP information types that can be requested and reported with one message. Value is 64. |

9.2.26 Search Window Information

This information element contains search window information for the TRP.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|----------------------------|----------|-------|------------------------------|---|
| Expected Propagation Delay | M | | INTEGER (-3841..3841,...) | Indicates when the SRS is expected to arrive in time at the TRP relative to the UL RTOA Reference Time. The UL RTOA Reference Time for a target SRS is defined as $T_0 + t_{\text{SRS}}$, where <ul style="list-style-type: none"> - T_0 is the SFN Initialisation Time - $t_{\text{SRS}} = (10n_f + n_{\text{sf}}) \times 10^{-3}$, where n_f and n_{sf} are the system frame number and the subframe number of the SRS, respectively. Granularity 4Ts, where $T_s = 1/(15 \cdot 10^3 \cdot 2048)$ seconds. Centre of the search window. |
| Delay Uncertainty | M | | INTEGER (1..246,...) | Indicates the uncertainty of the expected SRS arrival time at the TRP Granularity 4Ts, where $T_s = 1/(15 \cdot 10^3 \cdot 2048)$ seconds. Single-sided search window. |

9.2.27 Requested SRS Transmission Characteristics

This IE contains the requested SRS configuration for the UE.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-----------------------------------|--------------------------|---|---|---|
| Number Of Periodic Transmissions | C-ifResourceTypePeriodic | | INTEGER (0..500,...) | The number of periodic SRS transmissions requested. The value of '0' represents an infinite number of periodic SRS transmissions. |
| Resource Type | M | | ENUMERATED (periodic, semi-persistent, aperiodic, ...) | |
| CHOICE <i>Bandwidth</i> | M | | | |
| >FR1 | | | ENUMERATED (5mHz, 10mHz, 20mHz, 40mHz, 50mHz, 80mHz, 100mHz, ...) | |
| >FR2 | | | ENUMERATED (50mHz, 100mHz, 200mHz, 400mHz,...) | |
| SRS Resource Set List | | <i>0.. 1</i> | | |
| > SRS Resource Set Item | | <i>1..<maxnoSRS-ResourceSets></i> | | |
| >>Number of SRS Resources Per Set | O | | INTEGER (1..16,...) | The number of SRS Resources per resource set for SRS transmission. |
| >> Periodicity List | | <i>0.. 1</i> | | |
| >>> Periodicity List Item | | <i>1..<maxnoSRS-ResourcePerSet></i> | | |
| >>>>PeriodicitySRS | M | | ENUMERATED (0.125, 0.25, 0.5, 0.625, 1, 1.25, 2, 2.5, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120, 10240, ...) | Milli-seconds |
| >>Spatial Relation Information | O | | 9.2.34 | |
| >>Pathloss Reference Information | O | | 9.2.53 | |
| SSB Information | O | | 9.2.54 | |

| Condition | Explanation |
|------------------------|---|
| ifResourceTypePeriodic | This IE shall be present if the <i>Resource Type</i> IE is set to the value "Periodic". |

| Range bound | Explanation |
|-------------------------|--|
| maxnoSRS-ResourceSets | Maximum no of requested SRS Resource Sets for SRS transmission. Value is 16. |
| maxnoSRS-ResourcePerSet | Maximum no of SRS Resources per set. Value is 16. |

9.2.28 SRS Configuration

This information element contains the SRS configuration configured by the NG-RAN node for the UE.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--|----------|---|---|--|
| SRS Carrier List | | 1.. <i>maxno</i> SRS- Carriers> | | |
| >Point A | M | | INTEGER (0..3279165) | NR ARFCN |
| >Uplink Channel BW- PerSCS-List | | 1.. <i>maxno</i> SCSS> | | SCS-SpecificCarrier TS 38.331 [13] |
| >>Offset To Carrier | M | | INTEGER(0..2199,...) | First usable RB to Point A in the number of PRBs |
| >>Subcarrier Spacing | M | | ENUMERATED(kHz15, kHz30, kHz60, kHz120,...) | |
| >>Carrier Bandwidth | M | | INTEGER(1..275,...) | |
| >Active UL BWP | M | | | Only the configuration in the active UL BWP is needed. |
| >>Location And Bandwidth | M | | INTEGER(0..37949,...) | BWP TS 38.331 [13] |
| >>Subcarrier Spacing | M | | ENUMERATED(kHz15, kHz30, kHz60, kHz120,...) | |
| >>Cyclic Prefix | M | | ENUMERATED(Normal, Extended) | |
| >>Tx Direct Current Location | M | | INTEGER(0..3301,...) | |
| >>Shift7dot5kHz | O | | ENUMERATED(true,...) | |
| >>SRS Config | M | | | <i>SRS-Config</i> as defined in TS 38.331 [13] |
| >>>SRS Resource List | | 0.. <i>maxno</i> SRS- Resources > | | |
| >>>>SRS Resource | M | | 9.2.29 | <i>SRS-Resource</i> as defined in TS 38.331 [13] |
| >>>Positioning SRS Resource List | | 0.. <i>maxno</i> SRS- Resources > | | |
| >>>>Positioning SRS Resource | M | | 9.2.30 | <i>SRS-PosResource-r16</i> as defined in TS 38.331 [13] |
| >>>SRS Resource Set List | | 0.. <i>maxno</i> SRS- Resources > | | |
| >>>>SRS Resource Set | M | | 9.2.31 | <i>SRS-ResourceSet</i> as defined in TS 38.331 [13] |
| >>>Positioning SRS Resource Set List | | 0.. <i>maxno</i> SRS- Resources > | | |
| >>>>Positioning SRS Resource Set | M | | 9.2.32 | <i>SRS-PosResourceSet-r16</i> as defined in TS 38.331 [13] |
| >NR PCI | O | | INTEGER (0..1007) | Physical Cell ID of the cell that contains the SRS carrier |

| Range bound | Explanation |
|--------------------------|--|
| maxnoSRS-Carriers | Maximum no of carriers for SRS. Value is 32. |
| maxnoSCSS | Maximum no of SCS spacings for a carrier. Value is 5. |
| maxnoSRS-Resources | Maximum no of SRS resources per UL BWP. Value is 64. |
| maxnoSRS-PosResources | Maximum no of positioning SRS resources per UL BWP. Value is 64. |
| maxnoSRS-ResourceSets | Maximum no of SRS resource sets per UL BWP. Value is 16. |
| maxnoSRS-PosResourceSets | Maximum no of positioning SRS resource sets per UL BWP. Value is 16. |

9.2.29 SRS Resource

This information element contains the SRS resource.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------------------------|----------|-------|---|-----------------------|
| SRS Resource ID | M | | INTEGER(0..63) | |
| Number of Ports | M | | ENUMERATED(port1, ports2, ports4) | |
| CHOICE <i>Transmission Comb</i> | M | | | |
| > <i>Comb Two</i> | | | | |
| >>Comb Offset | M | | INTEGER(0..1) | |
| >>Cyclic Shift | M | | INTEGER(0..7) | |
| > <i>Comb Four</i> | | | | |
| >>Comb Offset | M | | INTEGER(0..3) | |
| >>Cyclic Shift | M | | INTEGER(0..11) | |
| Start Position | M | | INTEGER(0..13) | |
| Number of Symbols | M | | ENUMERATED(n1,n2,n4) | |
| Repetition Factor | M | | ENUMERATED(r1,r2,r4) | |
| Frequency Domain Position | M | | INTEGER(0..67) | |
| Frequency Domain Shift | M | | INTEGER(0..268) | |
| C-SRS | M | | INTEGER(0..63) | |
| B-SRS | M | | INTEGER(0..3) | |
| B-Hop | M | | INTEGER(0..3) | |
| Group or Sequence Hopping | M | | ENUMERATED(neither, groupHopping, sequenceHopping) | |
| CHOICE <i>Resource Type</i> | M | | | |
| > <i>Periodic</i> | | | | |
| >>Periodicity | M | | ENUMERATED(slot1, slot2, slot4, slot5, slot8, slot10, slot16, slot20, slot32, slot40, slot64, slot80, slot160, slot320, slot640, slot1280, slot2560, ...) | |
| >>Offset | M | | INTEGER(0..2559, ...) | |
| > <i>Semi-persistent</i> | | | | |
| >>Periodicity | M | | ENUMERATED(slot1, slot2, slot4, slot5, slot8, slot10, slot16, slot20, slot32, slot40, slot64, slot80, slot160, slot320, slot640, slot1280, slot2560, ...) | |
| >>Offset | M | | INTEGER(0..2559, ...) | |
| > <i>Aperiodic</i> | | | | |
| >>Aperiodic Resource Type | M | | ENUMERATED(true,...) | |
| Sequence ID | M | | INTEGER(0..1023) | |

9.2.30 Positioning SRS Resource

This information element contains the SRS resource for positioning.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--|----------|-------|---|-----------------------|
| Positioning SRS Resource ID | M | | INTEGER(0..63) | |
| CHOICE <i>Transmission Comb</i> | M | | | |
| > <i>Comb Two</i> | | | | |
| >>Comb Offset | M | | INTEGER(0..1) | |
| >>Cyclic Shift | M | | INTEGER(0..7) | |
| > <i>Comb Four</i> | | | | |
| >>Comb Offset | M | | INTEGER(0..3) | |
| >>Cyclic Shift | M | | INTEGER(0..11) | |
| > <i>Comb Eight</i> | | | | |
| >>Comb Offset | M | | INTEGER(0..7) | |
| >>Cyclic Shift | M | | INTEGER(0..5) | |
| Start Position | M | | INTEGER(0..13) | |
| Number of Symbols | M | | ENUMERATED(n1,n2,n4, n8, n12) | |
| Frequency Domain Shift | M | | INTEGER(0..268) | |
| C-SRS | M | | INTEGER(0..63) | |
| Group or Sequence Hopping | M | | ENUMERATED(Neither, groupHopping, sequenceHopping) | |
| CHOICE <i>Resource Type Positioning</i> | M | | | |
| > <i>periodic</i> | | | | |
| >>Periodicity | M | | ENUMERATED(slot1, slot2, slot4, slot5, slot8, slot10, slot16, slot20, slot32, slot40, slot64, slot80, slot160, slot320, slot640, slot1280, slot2560, slot5120, slot10240, slot40960, slot81920,...) | |
| >>Offset | M | | INTEGER(0..81919,...) | |
| > <i>semi-persistent</i> | | | | |
| >>Periodicity | M | | ENUMERATED(slot 1, slot 2, slot4, slot5, slot8, slot10, slot16, slot20, slot32, slot40, slot64, slot80, slot160, slot320, slot640, slot1280, slot2560, slot5120, slot10240, slot40960, slot81920,...) | |
| >>Offset | M | | INTEGER(0..81919,...) | |
| > <i>aperiodic</i> | | | | |
| >>slot offset | M | | INTEGER(0..32) | |
| Sequence ID | M | | INTEGER(0..65535) | |
| CHOICE <i>Spatial Relation Positioning</i> | O | | | |
| > <i>SSB</i> | | | | |
| >> NR PCI | M | | INTEGER (0..1007) | |
| >>SSB index | O | | INTEGER(0..63) | |
| > <i>PRS</i> | | | | |
| >>PRS ID | M | | INTEGER(0..255) | |
| >>PRS Resource Set ID | M | | INTEGER(0..7) | |
| >>PRS Resource ID | O | | INTEGER(0..63) | |

9.2.31 SRS Resource Set

This information element indicates an SRS resource set in the UE for UL SRS transmission.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------------------------|----------|--|-----------------------|---|
| SRS Resource Set ID | M | | INTEGER(0..15) | |
| SRS Resource ID List | | <i>1..<maxno SRS-ResourcePerSet></i> | | |
| >SRS Resource ID | M | | INTEGER(0..63) | |
| CHOICE <i>Resource Set Type</i> | M | | | |
| > <i>periodic</i> | | | | |
| >>periodicSet | M | | ENUMERATED(true,...) | |
| > <i>semi-persistent</i> | | | | |
| >>semi-persistentSet | M | | ENUMERATED(true,...) | |
| > <i>aperiodic</i> | | | | |
| >>SRS Resource Trigger | M | | INTEGER(1..3) | |
| >>Slot offset | M | | INTEGER(0..32) | Offset in number of slots, where value 0 indicates no offset. |

| Range bound | Explanation |
|-------------------------|--|
| maxnoSRS-ResourcePerSet | Maximum no of SRS resources per SRS resource set. Value is 16. |

9.2.32 Positioning SRS Resource Set

This information element indicates a positioning SRS resource set in the UE for UL SRS transmission.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---|----------|---|-----------------------|-----------------------|
| Positioning SRS Resource Set ID | M | | INTEGER(0..15) | |
| Positioning SRS Resource ID List | | <i>1..<maxno SRS-PosResourcePerSet></i> | | |
| >Positioning SRS Resource ID | M | | INTEGER(0..63) | |
| CHOICE <i>Resource Type</i> | M | | | |
| > <i>periodic</i> | | | | |
| >>PosperiodicSet | M | | ENUMERATED(true,...) | |
| > <i>semi-persistent</i> | | | | |
| >>Possemi-persistentSet | M | | ENUMERATED(true,...) | |
| > <i>aperiodic</i> | | | | |
| >>SRS Resource Trigger | M | | INTEGER(1..3) | |

| Range bound | Explanation |
|----------------------------|--|
| maxnoSRS-PosResourcePerSet | Maximum no of positioning SRS resources per positioning SRS resource set. Value is 16. |

9.2.33 SRS Resource Set ID

This information element indicates a resource set in the UE for UL SRS transmission.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------------|----------|-------|-----------------------|-----------------------------|
| SRS Resource Set ID | M | | INTEGER (0..15) | According to TS 38.331 [13] |

9.2.34 Spatial Relation Information

This information element indicates a spatial relation for transmission of UL SRS by a UE.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---|----------|--|-----------------------|--|
| Spatial Relation for Resource ID | | <i>1..<maxno SpatialRelations></i> | | According to TS 38.321 [15] and TS 38.331 [13] |
| CHOICE <i>Reference Signal</i> | M | | | |
| >NRP CSI-RS | | | | |
| >>NRP CSI-RS Resource ID | M | | INTEGER (0..191) | |
| >SSB | | | | |
| >> NR PCI | M | | INTEGER (0..1007) | |
| >>SSB Index | O | | INTEGER (0..63) | |
| >SRS | | | | |
| >>SRS Resource ID | M | | INTEGER (0..63) | |
| >Positioning SRS | | | | |
| >> Positioning SRS Resource ID | M | | INTEGER (0..63) | |
| >DL-PRS | | | | |
| >>DL-PRS ID | M | | INTEGER (0..255) | |
| >>DL-PRS Resource Set ID | M | | INTEGER (0..7) | |
| >>DL-PRS Resource ID | O | | INTEGER (0..63) | |

| Range bound | Explanation |
|-----------------------|---|
| maxnoSpatialRelations | Maximum no. of Spatial Relations that can be configured. Value is 64. |

9.2.35 SRS Resource Trigger

This information element indicates a DCI code point according to a SRS resource set configuration.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--|----------|---|-----------------------|-----------------------------|
| Aperiodic SRS Resource Trigger List | | <i>1..<maxno SRS-TriggerStates></i> | | According to TS 38.331 [13] |
| >Aperiodic SRS Resource Trigger | | | INTEGER (1..3) | |

| Range bound | Explanation |
|-----------------------|--|
| maxnoSRSTriggerStates | Maximum no. of SRS trigger states. Value is 3. |

9.2.36 SFN Initialisation Time

This information element indicates the SFN initialisation time.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------|----------|-------|-----------------------|---|
| SFN initialisation time | M | | BIT STRING (SIZE(64)) | Time in seconds relative to 00:00:00 on 1 January 1900 (calculated as continuous time without leap seconds and traceable to a common time reference) where binary encoding of the integer part is in the first 32 bits and binary encoding of the fraction part in the last 32 bits. The fraction part is expressed with a granularity of $1/2^{32}$ second |

9.2.37 TRP Measurement Result

This information element contains the measurement result.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------------------------------|----------|------------------------|-----------------------|-----------------------|
| Measured Result Item | | 1 .. <maxnoPosMeas> | | |
| >CHOICE <i>Measured Results Value</i> | M | | | |
| >>UL Angle of Arrival | M | | 9.2.38 | |
| >>UL SRS-RSRP | M | | INTEGER (0..126) | |
| >>UL RTOA | M | | 9.2.39 | |
| >>gNB Rx-Tx Time Difference | M | | 9.2.40 | |
| >Time Stamp | M | | 9.2.42 | |
| >Measurement Quality | O | | 9.2.43 | |
| >Measurement Beam Information | O | | 9.2.57 | |

| Range bound | Explanation |
|--------------|--|
| maxnoPosMeas | Maximum no. of measured quantities that can be configured and reported with one positioning measurement message. Value is 16384. |

9.2.38 UL Angle of Arrival

This information element contains the uplink Angle of Arrival measurement.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------------|----------|-------|-----------------------|--|
| Azimuth Angle of Arrival | M | | INTEGER(0..3599) | TS 38.133 [16] |
| Zenith Angle of Arrival | O | | INTEGER(0..1799) | TS 38.133 [16] |
| LCS to GCS Translation | | 0..1 | | If absent, the azimuth and zenith are provided in GCS. |
| >Alpha | M | | INTEGER (0..3599) | |
| >Beta | M | | INTEGER (0..3599) | |
| >Gamma | M | | INTEGER (0..3599) | |

9.2.39 UL RTOA Measurement

This information element contains the uplink RTOA measurement.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-----------------------------------|----------|-------|-----------------------|-----------------------|
| CHOICE <i>UL RTOA Measurement</i> | M | | | |
| >k0 | M | | INTEGER (0.. 1970049) | TS 38.133 [16] |
| >k1 | M | | INTEGER (0.. 985025) | TS 38.133 [16] |
| >k2 | M | | INTEGER (0.. 492513) | TS 38.133 [16] |
| >k3 | M | | INTEGER (0.. 246257) | TS 38.133 [16] |
| >k4 | M | | INTEGER (0.. 123129) | TS 38.133 [16] |
| >k5 | M | | INTEGER (0.. 61565) | TS 38.133 [16] |
| Additional Path List | O | | 9.2.41 | |

9.2.40 gNB Rx-Tx Time Difference

This information element contains the gNB Rx-Tx Time Difference measurement.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---|----------|-------|-----------------------|-----------------------|
| CHOICE <i>gNB Rx-Tx Time Difference Measurement</i> | M | | | |
| >k0 | M | | INTEGER (0.. 1970049) | TS 38.133 [16] |
| >k1 | M | | INTEGER (0.. 985025) | TS 38.133 [16] |
| >k2 | M | | INTEGER (0.. 492513) | TS 38.133 [16] |
| >k3 | M | | INTEGER (0.. 246257) | TS 38.133 [16] |
| >k4 | M | | INTEGER (0.. 123129) | TS 38.133 [16] |
| >k5 | M | | INTEGER (0.. 61565) | TS 38.133 [16] |
| Additional Path List | O | | 9.2.41 | |

9.2.41 Additional Path List

This information element contains the additional path results of time measurement.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------------------|----------|------------------------------|-------------------------------|-----------------------|
| Additional Path Item | | <i>1..<maxno path></i> | | |
| >CHOICE <i>Relative Path Delay</i> | M | | | |
| >>k0 | M | | INTEGER(0..16351) | |
| >>k1 | M | | INTEGER(0..8176) | |
| >>k2 | M | | INTEGER(0..4088) | |
| >>k3 | M | | INTEGER(0..2044) | |
| >>k4 | M | | INTEGER(0..1022) | |
| >>k5 | M | | INTEGER(0..511) | |
| >Path Quality | O | | Measurement Quality 9.2.43 | |

| Range bound | Explanation |
|-------------|---|
| maxnopath | Maximum no. of additional path measurement. Value is 2. |

9.2.42 Time Stamp

This information element contains the time stamp associated with the measurement.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--------------------------|----------|-------|-----------------------------------|-----------------------|
| System Frame Number | M | | INTEGER(0..1023) | |
| CHOICE <i>Slot Index</i> | M | | | |
| >SCS-15 | M | | INTEGER(0..9) | |
| >SCS-30 | M | | INTEGER(0..19) | |
| >SCS-60 | M | | INTEGER(0..39) | |
| >SCS-120 | M | | INTEGER(0..79) | |
| Measurement time | O | | SFN Initialisation Time 9.2.36 | |

9.2.43 Measurement Quality

This information element contains the TRP's best estimate of the quality of the measurement.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-----------------------------------|----------|-------|-------------------------------------|-----------------------|
| CHOICE <i>Measurement Quality</i> | M | | | |
| >Timing Measurement Quality | | | | |
| >>Measurement Quality | M | | INTEGER(0..31) | TS 37.355 [14] |
| >>Resolution | M | | ENUMERATED(0.1m, 1m, 10m, 30m, ...) | TS 37.355 [14] |
| >Angle Measurement Quality | | | | |
| >>Azimuth Quality | M | | INTEGER(0..255) | |
| >>Zenith Quality | O | | INTEGER(0..255) | |
| >>Resolution | M | | ENUMERATED (0.1deg, ...) | |

9.2.44 PRS Configuration

This information element contains the DL PRS configuration for the TRP.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------------------|----------|-------------------------------|---|---|
| PRS Resource Set List | | 1..<maxno of PRS resourceSet> | | |
| >PRS Resource Set ID | M | | INTEGER(0..7) | |
| >Subcarrier Spacing | M | | ENUMERATED(kHz15, kHz30, kHz60, kHz120, ...) | |
| >PRS bandwidth | M | | INTEGER(1..63) | 24,28,...,272 PRBs |
| >Start PRB | M | | INTEGER(0..2176) | Starting PRB to Point A |
| >Point A | M | | INTEGER (0..3279165) | NR ARFCN |
| >Comb Size | M | | ENUMERATED(2, 4, 6, 12, ...) | |
| >CP Type | M | | ENUMERATED(normal, extended, ...) | |
| >Resource Set Periodicity | M | | ENUMERATED(4,5,8,10,16,20,32,40,64,80,160,320,640,1280,2560,5120,10240,20480,40960,81920,...) | |
| >Resource Set Slot Offset | M | | INTEGER(0..81919,...) | |
| >Resource Repetition Factor | M | | ENUMERATED(rf1,rf2,rf4,rf6,rf8,rf16,rf32,...) | |
| >Resource Time Gap | M | | ENUMERATED(tg1,tg2,tg4,tg8,tg16,tg32,...) | |
| >Resource Number of Symbols | M | | ENUMERATED(n2,n4,n6,n12,...) | |
| >PRS Muting | O | | | |
| >>Option1 | O | | | |
| >>>Muting Pattern | M | | DL-PRS Muting Pattern 9.2.56 | Muting pattern option 1 is used to mute the whole PRS resource set (within a period) |
| >>>Muting Bit Repetition Factor | M | | ENUMERATED(1,2,4,8, ...) | |
| >>Option2 | O | | | |
| >>>Muting Pattern | M | | DL-PRS Muting Pattern 9.2.56 | Muting pattern option 2 is used to mute the selected repetition of the resource set (within the period) |
| >PRS Resource Transmit Power | M | | INTEGER(-60..50) | |
| >PRS Resource List | M | 1..<maxno of PRS resources> | | NR-DL-PRS-Resource-r16 as defined in TS 37.355 [14] |
| >>PRS Resource ID | M | | INTEGER(0..63) | |
| >>Sequence ID | M | | INTEGER(0..4095) | |
| >>RE Offset | M | | INTEGER(0..11,...) | |
| >>Resource Slot Offset | M | | INTEGER(0..511) | |
| >>Resource Symbol Offset | M | | INTEGER(0..12) | |
| >> CHOICE QCL Info | O | | | |
| >>>SSB | | | | |
| >>>>NR PCI | M | | INTEGER(0..1007) | |
| >>>>SSB Index | O | | INTEGER(0..63) | |
| >>>>DL-PRS | | | | |
| >>>>QCL Source PRS Resource Set ID | M | | INTEGER(0..7) | |
| >>>>QCL Source PRS Resource ID | O | | INTEGER(0..63) | If it is absent, the QCL source PRS resource ID is the same as the PRS resource ID |

| Range bound | Explanation |
|-----------------------|--|
| maxnoofPRSresourceSet | Maximum no of PRS resources set. Value is 8. |
| maxnoofPRSresource | Maximum no of PRS resources per PRS resource set. Value is 64. |

9.2.45 Spatial Direction Information

This information element contains the spatial direction information of the DL PRS resources for the TRP.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------|----------|-------|-----------------------|--|
| NR-PRS Beam Information | M | | 9.2.58 | The spatial directions of DL-PRS Resources for TRP |

9.2.46 Geographical Coordinates

This information element contains the geographical coordinates for the TRP.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|--|----------|-------|--|--|
| CHOICE <i>TRP Position Definition Type</i> | M | | | |
| > <i>Direct</i> | | | | |
| >>CHOICE <i>Accuracy</i> | M | | | |
| >>> <i>normal accuracy</i> | | | | |
| >>>>TRP Position | M | | NG-RAN Access Point Position 9.2.10 | The configured estimated geographical position of the antenna of the cell/TRP. |
| >>>> <i>high accuracy</i> | | | | |
| >>>>TRP High Accuracy Access Position | M | | NG-RAN High Accuracy Access Point Position 9.2.49 | The configured estimated geographical high accuracy position of the antenna of the cell/TRP. |
| > <i>Referenced</i> | | | | |
| >>Reference Point | M | | 9.2.51 | The reference point is used to derive the TRP position |
| >>CHOICE <i>Type</i> | M | | | |
| >>> <i>Geodetic</i> | | | | |
| >>>>TRP Position Relative Geodetic | M | | Relative Geodetic Location 9.2.48 | The configured estimated relative geodetic coordinate of the antenna of the cell/TRP |
| >>>> <i>Cartesian</i> | | | | |
| >>>>TRP Position Relative Cartesian | M | | Relative Cartesian Location 9.2.50 | The configured estimated relative Cartesian coordinate of the antenna of the cell/TRP |
| DL-PRS Resource Coordinates | O | | 9.2.47 | DL-PRS Resource Coordinates relative to the TRP coordinate |

9.2.47 DL-PRS Resource Coordinates

This information element contains the geographical coordinates of the antenna reference points (ARP) for the DL-PRS Resources of a TRP.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---|----------|-------------------------------------|------------------------------------|---|
| DL-PRS Resource Set ARP List | M | 1.. <i>maxP RS-Resource Sets</i> | | |
| >DL-PRS Resource Set ID | M | | INTEGER (0..7) | |
| >CHOICE <i>DL-PRS Resource Set ARP Location</i> | M | | | Relative to the geographical coordinates for the TRP. If this IE is absent, the Relative Location is zero for the indicated DL-PRS Resource Set ID. |
| >>Geodetic | | | | |
| >>>TRP Position Relative Geodetic | M | | Relative Geodetic Location 9.2.48 | |
| >>Cartesian | | | | |
| >>>TRP Position Relative Cartesian | M | | Relative Cartesian Location 9.2.50 | |
| >DL-PRS Resource ARP List | M | 1.. <i>maxP RS-Resources PerSet</i> | | |
| >>DL-PRS Resource ID | M | | INTEGER (0..63) | |
| >>CHOICE <i>DL-PRS Resource ARP Location</i> | M | | | Relative to the DL-PRS Resource Set ARP Location. If this IE is absent, the Relative Location is zero for the indicated DL-PRS Resource ID. |
| >>>Geodetic | | | | |
| >>>TRP Position Relative Geodetic | M | | Relative Geodetic Location 9.2.48 | |
| >>>Cartesian | | | | |
| >>>TRP Position Relative Cartesian | M | | Relative Cartesian Location 9.2.50 | |

| Range bound | Explanation |
|------------------------|--|
| maxPRS-ResourceSets | Maximum no of DL-PRS resource sets per TRP. Value is 2. |
| maxPRS-ResourcesPerSet | Maximum no of DL-PRS resources of the DL-PRS resource set of the TRP. Value is 64. |

9.2.48 Relative Geodetic Location

This information element provides a location relative to some known reference location in a relative geodetic coordinate system.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------|----------|-------|--------------------------------|--|
| Milli-Arc-Second Units | M | | ENUMERATED (0.03, 0.3, 3, ...) | Units and scale factor for the delta-latitude and delta-longitude fields. 0.03, 0.3, 3, milliarcseconds. TS 37.355 [14]. |
| Height Units | M | | ENUMERATED (mm, cm, m, ...) | Units and scale factor for the delta-height field. 10 ⁻³ metre, 10 ⁻² metre, TS 37.355 [14]. |
| Delta Latitude | M | | INTEGER (-1024..1023) | Delta value in latitude in the unit provided in Milli-Arc-Second Units. TS 37.355 [14]. |
| Delta Longitude | M | | INTEGER (-1024..1023) | Delta value in longitude in the unit provided in Milli-Arc-Second Units. TS 37.355 [14]. |
| Delta Height | M | | INTEGER (-1024..1023) | Delta value in ellipsoidal height in the unit provided in Height Units. TS 37.355 [14]. |
| Location uncertainty | M | | 9.2.52 | |

9.2.49 NG-RAN High Accuracy Access Point Position

The *NG-RAN High Accuracy Access Point Position* IE is used to identify the geographical position of an NG-RAN Access Point. It is expressed as High Accuracy Ellipsoid point with altitude and uncertainty ellipsoid according to TS 23.032 [8].

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------|----------|-------|----------------------------------|-----------------------|
| Degrees of Latitude | M | | INTEGER(-2147483648..2147483647) | |
| Degrees of Longitude | M | | INTEGER(-2147483648..2147483647) | |
| Altitude | M | | INTEGER(-64000..1280000) | |
| Uncertainty Semi Major | M | | INTEGER (0..255) | |
| Uncertainty Semi Minor | M | | INTEGER (0..255) | |
| Orientation Major Axis | M | | INTEGER (0..179) | |
| Horizontal Confidence | M | | INTEGER (0..100) | |
| Uncertainty Altitude | M | | INTEGER (0..255) | |
| Vertical Confidence | M | | INTEGER (0..100) | |

9.2.50 Relative Cartesian Location

This information element provides a location relative to some known reference location in a relative Cartesian coordinate system.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|----------------------|----------|-------|--|--|
| XYZ unit | M | | ENUMERATED (mm, cm, dm,...) | |
| X value | M | | INTEGER (-2 ¹⁶ .. 2 ¹⁶ -1) | Positive value represents northing from reference point, in units of <i>XYZ Unit</i> IE. |
| Y value | M | | INTEGER (-2 ¹⁶ .. 2 ¹⁶ -1) | Positive value represents easting from reference point in units of <i>XYZ Unit</i> IE. |
| Z value | M | | INTEGER (-2 ¹⁵ .. 2 ¹⁵ -1) | Positive value represents height above reference point in units of <i>XYZ Unit</i> IE. |
| Location uncertainty | M | | 9.2.52 | |

9.2.51 Reference Point

This information element provides a reference point information.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---|----------|-------|--|--|
| CHOICE <i>ReferencePoint</i> | M | | | Reference point to which relative location information is related to |
| >Coordinate ID | | | | |
| >>Coordinate ID | M | | INTEGER(0.. 2 ⁹ -1,..) | Referential ID mapped via OAM |
| >Reference Point Coordinates | | | | |
| >>Reference Point Position | M | | NG-RAN Access Point Position 9.2.10 | |
| >Reference Point Coordinates High Accuracy | | | | |
| >>Reference Point High Accuracy Access Point Position | M | | NG-RAN High Accuracy Access Point Position 9.2.49 | |

9.2.52 Location Uncertainty

This information element provides the location uncertainty information.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------|----------|-------|-----------------------|--|
| >Horizontal Uncertainty | M | | INTEGER (0..255) | Horizontal uncertainty of the ARP latitude/longitude. Corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [8] |
| >Horizontal Confidence | M | | INTEGER (0..100) | Corresponds to confidence as defined in TS 23.032 [8]. |
| >Vertical Uncertainty | M | | INTEGER (0..255) | Vertical uncertainty of the ARP altitude. Corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [8] |
| >Vertical Confidence | M | | INTEGER (0..100) | Corresponds to confidence as defined in TS 23.032 [8]. |

9.2.53 Pathloss Reference Information

This information element indicates a pathloss reference for transmission of UL SRS by a UE.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|----------------------------------|----------|-------|-----------------------|-----------------------|
| CHOICE Pathloss Reference Signal | M | | | |
| >SSB | | | | |
| >> NR PCI | M | | INTEGER (0..1007) | |
| >>SSB Index | O | | INTEGER (0..63) | |
| >DL-PRS | | | | |
| >>DL-PRS ID | M | | INTEGER (0..255) | |
| >>DL-PRS Resource Set ID | M | | INTEGER (0..7) | |
| >>DL PRS Resource ID | O | | INTEGER (0..63) | |

9.2.54 SSB Information

This information element contains the SSB time/frequency information for the TRPs.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|----------------------|----------|------------------------------|--|-----------------------|
| SSB Info List | | <i>1...<maxNoSSBs></i> | | |
| >SSB Configuration | M | | SSB Time/Frequency Configuration 9.2.55 | |
| > NR PCI | M | | INTEGER (0..1007) | |

| Range bound | Explanation |
|-------------|---|
| maxNoSSBs | Maximum no of SSBs for which the configuration can be provided. Value is 255. |

9.2.55 SSB Time/Frequency Configuration

This information element contains the time and frequency configuration of an SSB.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|------------------------------|----------|-------|---|-----------------------|
| SSB frequency | M | | INTEGER (0..3279165) | ARFCN |
| SSB subcarrier spacing | M | | ENUMERATED(15kHz, 30kHz, 60kHz, 120kHz, 240kHz,...) | |
| SSB Transmit power | M | | INTEGER (-60..50) | EPRE of SSS |
| SSB periodicity | M | | ENUMERATED(5ms, 10ms, 20ms, 40ms, 80ms, 160ms, ...) | |
| SSB half frame index | M | | INTEGER(0..1) | |
| SSB SFN offset | M | | INTEGER(0..15) | |
| CHOICE SSB Position in Burst | O | | | |
| >Short Bitmap | | | BIT STRING (SIZE(4)) | |
| >Medium Bitmap | | | BIT STRING (SIZE(8)) | |
| >Long Bitmap | | | BIT STRING (SIZE(64)) | |
| SFN initialisation time | O | | 9.2.36 | |

9.2.56 DL-PRS Muting Pattern

This information element contains the DL-PRS muting pattern.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|-------------------------------------|----------|-------|-----------------------|-----------------------|
| CHOICE DL-PRS Muting Pattern | M | | | |
| >Two | M | | BIT STRING (SIZE(2)) | |
| >Four | M | | BIT STRING (SIZE(4)) | |
| >Six | M | | BIT STRING (SIZE(6)) | |
| >Eight | M | | BIT STRING (SIZE(8)) | |
| >Sixteen | M | | BIT STRING (SIZE(16)) | |
| >Thirty-two | M | | BIT STRING (SIZE(32)) | |

9.2.57 Measurement Beam Information

This information element contains the receiving beam information when measuring UL signals.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
|---------------------|----------|-------|-----------------------|-----------------------|
| PRS Resource ID | O | | INTEGER(0..63) | |
| PRS Resource Set ID | O | | INTEGER(0..7) | |
| SSB Index | O | | INTEGER(0..63) | |

9.2.58 NR-PRS Beam Information

This IE contains spatial direction information of the DL-PRS Resources.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|--------------------------------|----------|---|-----------------------|--|
| NR-PRS Beam Information | | <i>1 .. < maxPRS-Resource Sets ></i> | | |
| >PRS Resource Set ID | M | | INTEGER (0..7) | The resource set in which the resources are associated with the angle. |
| >PRS Angle Item | | <i>1..< maxPRS-Resources PerSet ></i> | | |
| >>NR PRS Azimuth | M | | INTEGER (0..359) | |
| >>NR PRS Azimuth fine | O | | INTEGER (0..9) | Fine angles |
| >>NR PRS Elevation | O | | INTEGER (0..180) | |
| >>NR PRS Elevation fine | O | | INTEGER (0..9) | Fine angles |
| LCS to GCS Translation | | <i>0 .. <maxnolcs-gcs-translation ></i> | | If absent, the azimuth and elevation are provided in GCS. |
| >Alpha | M | | INTEGER (0..359) | |
| >Alpha-fine | O | | INTEGER (0..9) | Fine angles |
| >Beta | M | | INTEGER (0..359) | |
| >Beta-fine | O | | INTEGER (0..9) | Fine angles |
| >Gamma | M | | INTEGER (0..359) | |
| >Gamma-fine | O | | INTEGER (0..9) | Fine angles |

| Range bound | Explanation |
|--------------------------|---|
| maxPRS-ResourceSets | Maximum no of DL-PRS resource sets per TRP. Value is 2. |
| maxPRS-ResourcesPerSet | Maximum no of DL-PRS resources of the DL-PRS resource set of the TRP. Value is 64. |
| maxnolcs-gcs-translation | Maximum no. of LCS-GS-Translation-Parameters that can reported with one message. Value is 3. The current version of the specification supports 1. |

9.2.59 Positioning Broadcast Cells

This IE is used to indicate the cells that are requested to broadcast, or failed to broadcast, the associated posSIB(s).

| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
|------------------------------------|----------|--|-----------------------|-----------------------|
| Positioning Broadcast Cells | | <i>1 .. <maxnoBroadcastCell></i> | | |
| >NG-RAN-CGI | M | | 9.2.6 | |

| Range bound | Explanation |
|---------------------|--|
| maxnoBroadcastCells | Maximum no. of cells broadcasting a posSIB in a NG-RAN node. Value is 16384. |

9.3 Message and Information Element Abstract Syntax (with ASN.1)

9.3.1 General

Sub clause 9.3 presents the Abstract Syntax of the NRPPa protocol with ASN.1. In case there is contradiction between the ASN.1 definition in this sub clause and the tabular format in sub clause 9.1 and 9.2, the ASN.1 shall take precedence, except for the definition of conditions for the presence of conditional elements, in which the tabular format shall take precedence.

The ASN.1 definition specifies the structure and content of NRPPa messages. NRPPa messages can contain any IEs specified in the object set definitions for that message without the order or number of occurrence being restricted by ASN.1. However, for this version of the standard, a sending entity shall construct an NRPPa message according to the PDU definitions module and with the following additional rules (Note that in the following, "IE" means an IE in the object set with an explicit id. If one IE needs to appear more than once in one object set, then the different occurrences have different IE ids):

- IEs shall be ordered (in an IE container) in the order they appear in object set definitions.
- Object set definitions specify how many times IEs may appear. An IE shall appear exactly once if the presence field in an object has value "mandatory". An IE may appear at most once if the presence field in an object has value "optional" or "conditional". If in a tabular format there is multiplicity specified for an IE (i.e. an IE list) then in the corresponding ASN.1 definition the list definition is separated into two parts. The first part defines an IE container list in which the list elements reside. The second part defines list elements. The IE container list appears as an IE of its own. For this version of the standard an IE container list may contain only one kind of list elements.

If an NRPPa message that is not constructed as defined above is received, this shall be considered as Abstract Syntax Error, and the message shall be handled as defined for Abstract Syntax Error in clause 10.

9.3.2 Usage of Private Message Mechanism for Non-standard Use

The private message mechanism for non-standard use may be used:

- for special operator (and/or vendor) specific features considered not to be part of the basic functionality, i.e. the functionality required for a complete and high-quality specification in order to guarantee multivendor inter-operability.
- by vendors for research purposes, e.g. to implement and evaluate new algorithms/features before such features are proposed for standardisation.

The private message mechanism shall not be used for basic functionality. Such functionality shall be standardised.

9.3.3 Elementary Procedure Definitions

```
-- ASN1START
-- *****
--
-- Elementary Procedure definitions
--
```

```
-- *****

NRPPA-PDU-Descriptions {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-access (22) modules (3) nrppa (4) version1 (1) nrppa-PDU-Descriptions (0) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *****
--
-- IE parameter types from other modules.
--
-- *****

IMPORTS
    Criticality,
    ProcedureCode,
    NRPPATransactionID

FROM NRPPA-CommonDataTypes

    ErrorIndication,
    PrivateMessage,
    E-CIDMeasurementInitiationRequest,
    E-CIDMeasurementInitiationResponse,
    E-CIDMeasurementInitiationFailure,
    E-CIDMeasurementFailureIndication,
    E-CIDMeasurementReport,
    E-CIDMeasurementTerminationCommand,
    OTDOAInformationRequest,
    OTDOAInformationResponse,
    OTDOAInformationFailure,
    AssistanceInformationControl,
    AssistanceInformationFeedback,
    PositioningInformationRequest,
    PositioningInformationResponse,
    PositioningInformationFailure,
    PositioningInformationUpdate,
    MeasurementRequest,
    MeasurementResponse,
    MeasurementFailure,
    MeasurementReport,
    MeasurementUpdate,
    MeasurementAbort,
    MeasurementFailureIndication,
    TRPInformationRequest,
    TRPInformationResponse,
    TRPInformationFailure,
    PositioningActivationRequest,
    PositioningActivationResponse,
```

PositioningActivationFailure,
PositioningDeactivation

FROM NRPPA-PDU-Contents

id-errorIndication,
id-privateMessage,
id-e-CIDMeasurementInitiation,
id-e-CIDMeasurementFailureIndication,
id-e-CIDMeasurementReport,
id-e-CIDMeasurementTermination,
id-oTDOAInformationExchange,
id-assistanceInformationControl,
id-assistanceInformationFeedback,
id-positioningInformationExchange,
id-positioningInformationUpdate,
id-Measurement,
id-MeasurementReport,
id-MeasurementUpdate,
id-MeasurementAbort,
id-MeasurementFailureIndication,
id-tRPIInformationExchange,
id-positioningActivation,
id-positioningDeactivation

FROM NRPPA-Constants;

```
-- *****
--
-- Interface Elementary Procedure Class
--
-- *****
```

```
NRPPA-ELEMENTARY-PROCEDURE ::= CLASS {
    &InitiatingMessage          ,
    &SuccessfulOutcome           OPTIONAL,
    &UnsuccessfulOutcome         OPTIONAL,
    &procedureCode               ProcedureCode UNIQUE,
    &criticality                 Criticality DEFAULT ignore
}
```

```
WITH SYNTAX {
    INITIATING MESSAGE          &InitiatingMessage
    [SUCCESSFUL OUTCOME         &SuccessfulOutcome]
    [UNSUCCESSFUL OUTCOME       &UnsuccessfulOutcome]
    PROCEDURE CODE              &procedureCode
    [CRITICALITY                &criticality]
}
```

```
-- *****
--
```

```

-- Interface PDU Definition
--
-- *****

NRPPA-PDU ::= CHOICE {
    initiatingMessage      InitiatingMessage,
    successfulOutcome      SuccessfulOutcome,
    unsuccessfulOutcome    UnsuccessfulOutcome,
    ...
}

InitiatingMessage ::= SEQUENCE {
    procedureCode          NRPPA-ELEMENTARY-PROCEDURE.&procedureCode      ({NRPPA-ELEMENTARY-PROCEDURES}),
    criticality            NRPPA-ELEMENTARY-PROCEDURE.&criticality          ({NRPPA-ELEMENTARY-PROCEDURES}{@procedureCode}),
    nrppatransactionID     NRPPATransactionID,
    value                  NRPPA-ELEMENTARY-PROCEDURE.&InitiatingMessage    ({NRPPA-ELEMENTARY-PROCEDURES}{@procedureCode})
}

SuccessfulOutcome ::= SEQUENCE {
    procedureCode          NRPPA-ELEMENTARY-PROCEDURE.&procedureCode      ({NRPPA-ELEMENTARY-PROCEDURES}),
    criticality            NRPPA-ELEMENTARY-PROCEDURE.&criticality          ({NRPPA-ELEMENTARY-PROCEDURES}{@procedureCode}),
    nrppatransactionID     NRPPATransactionID,
    value                  NRPPA-ELEMENTARY-PROCEDURE.&SuccessfulOutcome    ({NRPPA-ELEMENTARY-PROCEDURES}{@procedureCode})
}

UnsuccessfulOutcome ::= SEQUENCE {
    procedureCode          NRPPA-ELEMENTARY-PROCEDURE.&procedureCode      ({NRPPA-ELEMENTARY-PROCEDURES}),
    criticality            NRPPA-ELEMENTARY-PROCEDURE.&criticality          ({NRPPA-ELEMENTARY-PROCEDURES}{@procedureCode}),
    nrppatransactionID     NRPPATransactionID,
    value                  NRPPA-ELEMENTARY-PROCEDURE.&UnsuccessfulOutcome  ({NRPPA-ELEMENTARY-PROCEDURES}{@procedureCode})
}

-- *****
--
-- Interface Elementary Procedure List
--
-- *****

NRPPA-ELEMENTARY-PROCEDURES NRPPA-ELEMENTARY-PROCEDURE ::= {
    NRPPA-ELEMENTARY-PROCEDURES-CLASS-1      |
    NRPPA-ELEMENTARY-PROCEDURES-CLASS-2      ,
    ...
}

NRPPA-ELEMENTARY-PROCEDURES-CLASS-1 NRPPA-ELEMENTARY-PROCEDURE ::= {
    e-CIDMeasurementInitiation |
    oTDOAInformationExchange   |
    positioningInformationExchange |
    measurement                |
    tRPInformationExchange     |
    positioningActivation,
    ...
}

```

```

}

NRPPA-ELEMENTARY-PROCEDURES-CLASS-2 NRPPA-ELEMENTARY-PROCEDURE ::= {
    e-CIDMeasurementFailureIndication      |
    e-CIDMeasurementReport                 |
    e-CIDMeasurementTermination             |
    errorIndication                        |
    privateMessage                         |
    assistanceInformationControl            |
    assistanceInformationFeedback           |
    positioningInformationUpdate            |
    measurementReport                      |
    measurementUpdate                      |
    measurementAbort                       |
    measurementFailureIndication           |
    positioningDeactivation,
    ...
}

-- *****
--
-- Interface Elementary Procedures
--
-- *****

e-CIDMeasurementInitiation NRPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      E-CIDMeasurementInitiationRequest
    SUCCESSFUL OUTCOME       E-CIDMeasurementInitiationResponse
    UNSUCCESSFUL OUTCOME    E-CIDMeasurementInitiationFailure
    PROCEDURE CODE          id-e-CIDMeasurementInitiation
    CRITICALITY              reject
}

e-CIDMeasurementFailureIndication NRPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      E-CIDMeasurementFailureIndication
    PROCEDURE CODE          id-e-CIDMeasurementFailureIndication
    CRITICALITY              ignore
}

e-CIDMeasurementReport NRPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      E-CIDMeasurementReport
    PROCEDURE CODE          id-e-CIDMeasurementReport
    CRITICALITY              ignore
}

e-CIDMeasurementTermination NRPPA-ELEMENTARY-PROCEDURE ::= {
    INITIATING MESSAGE      E-CIDMeasurementTerminationCommand
    PROCEDURE CODE          id-e-CIDMeasurementTermination
    CRITICALITY              reject
}

oTDOAInformationExchange NRPPA-ELEMENTARY-PROCEDURE ::= {

```

```
INITIATING MESSAGE      OTDOAInformationRequest
SUCCESSFUL OUTCOME      OTDOAInformationResponse
UNSUCCESSFUL OUTCOME    OTDOAInformationFailure
PROCEDURE CODE          id-otdoaInformationExchange
CRITICALITY             reject
}

assistanceInformationControl NRPPA-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      AssistanceInformationControl
  PROCEDURE CODE          id-assistanceInformationControl
  CRITICALITY             reject
}

assistanceInformationFeedback NRPPA-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      AssistanceInformationFeedback
  PROCEDURE CODE          id-assistanceInformationFeedback
  CRITICALITY             reject
}

errorIndication NRPPA-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      ErrorIndication
  PROCEDURE CODE          id-errorIndication
  CRITICALITY             ignore
}

privateMessage          NRPPA-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      PrivateMessage
  PROCEDURE CODE          id-privateMessage
  CRITICALITY             ignore
}

positioningInformationExchange NRPPA-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      PositioningInformationRequest
  SUCCESSFUL OUTCOME      PositioningInformationResponse
  UNSUCCESSFUL OUTCOME    PositioningInformationFailure
  PROCEDURE CODE          id-positioningInformationExchange
  CRITICALITY             reject
}

positioningInformationUpdate NRPPA-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      PositioningInformationUpdate
  PROCEDURE CODE          id-positioningInformationUpdate
  CRITICALITY             ignore
}

measurement NRPPA-ELEMENTARY-PROCEDURE ::= {
  INITIATING MESSAGE      MeasurementRequest
  SUCCESSFUL OUTCOME      MeasurementResponse
  UNSUCCESSFUL OUTCOME    MeasurementFailure
}
```



```
        PROCEDURE CODE      id-Measurement
        CRITICALITY         reject
    }

    measurementReport NRPPA-ELEMENTARY-PROCEDURE ::= {
        INITIATING MESSAGE   MeasurementReport
        PROCEDURE CODE       id-MeasurementReport
        CRITICALITY          ignore
    }

    measurementUpdate NRPPA-ELEMENTARY-PROCEDURE ::= {
        INITIATING MESSAGE   MeasurementUpdate
        PROCEDURE CODE       id-MeasurementUpdate
        CRITICALITY          ignore
    }

    measurementAbort NRPPA-ELEMENTARY-PROCEDURE ::= {
        INITIATING MESSAGE   MeasurementAbort
        PROCEDURE CODE       id-MeasurementAbort
        CRITICALITY          ignore
    }

    measurementFailureIndication NRPPA-ELEMENTARY-PROCEDURE ::= {
        INITIATING MESSAGE   MeasurementFailureIndication
        PROCEDURE CODE       id-MeasurementFailureIndication
        CRITICALITY          ignore
    }

    trpInformationExchange NRPPA-ELEMENTARY-PROCEDURE ::= {
        INITIATING MESSAGE   TRPInformationRequest
        SUCCESSFUL OUTCOME   TRPInformationResponse
        UNSUCCESSFUL OUTCOME TRPInformationFailure
        PROCEDURE CODE       id-trpInformationExchange
        CRITICALITY          reject
    }

    positioningActivation NRPPA-ELEMENTARY-PROCEDURE ::= {
        INITIATING MESSAGE   PositioningActivationRequest
        SUCCESSFUL OUTCOME   PositioningActivationResponse
        UNSUCCESSFUL OUTCOME PositioningActivationFailure
        PROCEDURE CODE       id-positioningActivation
        CRITICALITY          reject
    }

    positioningDeactivation NRPPA-ELEMENTARY-PROCEDURE ::= {
        INITIATING MESSAGE   PositioningDeactivation
        PROCEDURE CODE       id-positioningDeactivation
        CRITICALITY          ignore
    }

    END
    -- ASN1STOP
```

9.3.4 PDU Definitions

```
-- ASN1START
-- *****
--
-- PDU definitions for NRPPa
--
-- *****

NRPPA-PDU-Contents {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-access (22) modules (3) nrppa (4) version1 (1) nrppa-PDU-Contents (1) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *****
--
-- IE parameter types from other modules
--
-- *****

IMPORTS

    Cause,
    CriticalityDiagnostics,
    E-CID-MeasurementResult,
    OTDOACells,
    OTDOA-Information-Item,
    Measurement-ID,
    UE-Measurement-ID,
    MeasurementPeriodicity,
    MeasurementQuantities,
    ReportCharacteristics,
    RequestedSRSTransmissionCharacteristics,
    Cell-Portion-ID,
    OtherRATMeasurementQuantities,
    OtherRATMeasurementResult,
    WLANMeasurementQuantities,
    WLANMeasurementResult,
    Assistance-Information,
    Broadcast,
    AssistanceInformationFailureList,
    SRSTransmissionConfiguration,
    TRPMeasurementQuantities,
    TRPMeasurementResult,
    TRP-ID,
    TRPInformationTypeListTRPReq,
    TRPInformationListTRPResp,
```

TRP-MeasurementRequestList,
TRP-MeasurementResponseList,
MeasurementBeamInfoRequest,
PositioningBroadcastCells,
SRSResourceSetID,
SRSSpatialRelation,
SRSResourceTrigger,
TRPList,
AbortTransmission,
SystemFrameNumber,
SlotNumber,
SFNInitialisationTime

FROM NRPPA-IEs

PrivateIE-Container{},
ProtocolExtensionContainer{},
ProtocolIE-Container{},
ProtocolIE-ContainerList{},
ProtocolIE-Single-Container{},
NRPPA-PRIVATE-IES,
NRPPA-PROTOCOL-EXTENSION,
NRPPA-PROTOCOL-IES

FROM NRPPA-Containers

maxnoOTDOAtypes,
id-Cause,
id-CriticalityDiagnostics,
id-LMF-Measurement-ID,
id-LMF-UE-Measurement-ID,
id-OTDOACells,
id-OTDOA-Information-Type-Group,
id-OTDOA-Information-Type-Item,
id-ReportCharacteristics,
id-MeasurementPeriodicity,
id-MeasurementQuantities,
id-RAN-Measurement-ID,
id-RAN-UE-Measurement-ID,
id-E-CID-MeasurementResult,
id-RequestedSRSTransmissionCharacteristics,
id-Cell-Portion-ID,
id-OtherRATMeasurementQuantities,
id-OtherRATMeasurementResult,
id-WLANMeasurementQuantities,
id-WLANMeasurementResult,
id-Assistance-Information,
id-Broadcast,
id-AssistanceInformationFailureList,
id-SRSConfiguration,
id-TRPMeasurementQuantities,
id-MeasurementResult,

```

id-TRP-ID,
id-TRPInformationTypeListTRPReq,
id-TRPInformationListTRPResp,
id-TRP-MeasurementRequestList,
id-TRP-MeasurementResponseList,
id-TRP-MeasurementReportList,
id-MeasurementBeamInfoRequest,
id-PositioningBroadcastCells,
id-SRSType,
id-ActivationTime,
id-SRSResourceSetID,
id-TRPList,
id-SRSSpatialRelation,
id-AbortTransmission,
id-SystemFrameNumber,
id-SlotNumber,
id-SRSResourceTrigger,
id-SFNInitialisationTime

FROM NRPPA-Constants;

-- *****
--
-- E-CID MEASUREMENT INITIATION REQUEST
--
-- *****

E-CIDMeasurementInitiationRequest ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{E-CIDMeasurementInitiationRequest-IEs}},
    ...
}

E-CIDMeasurementInitiationRequest-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-LMF-UE-Measurement-ID          CRITICALITY reject TYPE UE-Measurement-ID          PRESENCE mandatory}|
    { ID id-ReportCharacteristics          CRITICALITY reject TYPE ReportCharacteristics      PRESENCE mandatory}|
    { ID id-MeasurementPeriodicity         CRITICALITY reject TYPE MeasurementPeriodicity    PRESENCE conditional}|
-- The IE shall be present if the Report Characteritics IE is set to "periodic" --
    { ID id-MeasurementQuantities          CRITICALITY reject TYPE MeasurementQuantities      PRESENCE mandatory}|
    { ID id-OtherRATMeasurementQuantities  CRITICALITY ignore TYPE OtherRATMeasurementQuantities  PRESENCE optional}|
    { ID id-WLANMeasurementQuantities      CRITICALITY ignore TYPE WLANMeasurementQuantities  PRESENCE optional},
    ...
}

-- *****
--
-- E-CID MEASUREMENT INITIATION RESPONSE
--
-- *****

E-CIDMeasurementInitiationResponse ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{E-CIDMeasurementInitiationResponse-IEs}},

```

```

    ...
}

E-CIDMeasurementInitiationResponse-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-LMF-UE-Measurement-ID      CRITICALITY reject TYPE UE-Measurement-ID      PRESENCE mandatory}|
    { ID id-RAN-UE-Measurement-ID      CRITICALITY reject TYPE UE-Measurement-ID      PRESENCE mandatory}|
    { ID id-E-CID-MeasurementResult    CRITICALITY ignore TYPE E-CID-MeasurementResult PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional}|
    { ID id-Cell-Portion-ID            CRITICALITY ignore TYPE Cell-Portion-ID        PRESENCE optional}|
    { ID id-OtherRATMeasurementResult  CRITICALITY ignore TYPE OtherRATMeasurementResult PRESENCE optional}|
    { ID id-WLANMeasurementResult      CRITICALITY ignore TYPE WLANMeasurementResult  PRESENCE optional},
    ...
}

-- *****
--
-- E-CID MEASUREMENT INITIATION FAILURE
--
-- *****

E-CIDMeasurementInitiationFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{E-CIDMeasurementInitiationFailure-IEs}},
    ...
}

E-CIDMeasurementInitiationFailure-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-LMF-UE-Measurement-ID      CRITICALITY reject TYPE UE-Measurement-ID      PRESENCE mandatory}|
    { ID id-Cause                      CRITICALITY ignore TYPE Cause                PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional},
    ...
}

-- *****
--
-- E-CID MEASUREMENT FAILURE INDICATION
--
-- *****

E-CIDMeasurementFailureIndication ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container    {{E-CIDMeasurementFailureIndication-IEs}},
    ...
}

E-CIDMeasurementFailureIndication-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-LMF-UE-Measurement-ID      CRITICALITY reject TYPE UE-Measurement-ID      PRESENCE mandatory}|
    { ID id-RAN-UE-Measurement-ID      CRITICALITY reject TYPE UE-Measurement-ID      PRESENCE mandatory}|
    { ID id-Cause                      CRITICALITY ignore TYPE Cause                PRESENCE mandatory},
    ...
}

-- *****

```

```

--
-- E-CID MEASUREMENT REPORT
--
-- *****

E-CIDMeasurementReport ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      {{E-CIDMeasurementReport-IEs}},
    ...
}

E-CIDMeasurementReport-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-LMF-UE-Measurement-ID          CRITICALITY reject TYPE UE-Measurement-ID          PRESENCE mandatory}|
    { ID id-RAN-UE-Measurement-ID          CRITICALITY reject TYPE UE-Measurement-ID          PRESENCE mandatory}|
    { ID id-E-CID-MeasurementResult        CRITICALITY ignore TYPE E-CID-MeasurementResult    PRESENCE mandatory}|
    { ID id-Cell-Portion-ID                CRITICALITY ignore TYPE Cell-Portion-ID          PRESENCE optional},
    ...
}

-- *****
--
-- E-CID MEASUREMENT TERMINATION
--
-- *****

E-CIDMeasurementTerminationCommand ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      {{E-CIDMeasurementTerminationCommand-IEs}},
    ...
}

E-CIDMeasurementTerminationCommand-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-LMF-UE-Measurement-ID          CRITICALITY reject TYPE UE-Measurement-ID          PRESENCE mandatory}|
    { ID id-RAN-UE-Measurement-ID          CRITICALITY reject TYPE UE-Measurement-ID          PRESENCE mandatory},
    ...
}

-- *****
--
-- OTDOA INFORMATION REQUEST
--
-- *****

OTDOAInformationRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      {{OTDOAInformationRequest-IEs}},
    ...
}

OTDOAInformationRequest-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-OTDOA-Information-Type-Group    CRITICALITY reject TYPE OTDOA-Information-Type    PRESENCE mandatory},
    ...
}

```

```

OTDOA-Information-Type ::= SEQUENCE (SIZE(1..maxnoOTDOAtypes)) OF ProtocolIE-Single-Container { { OTDOA-Information-
TypeIEs} }

OTDOA-Information-TypeIEs NRPPA-PROTOCOL-IES ::= {
  { ID id-OTDOA-Information-Type-Item      CRITICALITY reject  TYPE OTDOA-Information-Type-Item      PRESENCE mandatory},
  ...
}

OTDOA-Information-Type-Item ::= SEQUENCE {
  oTDOA-Information-Type-Item      OTDOA-Information-Item,
  iE-Extensions                    ProtocolExtensionContainer { { OTDOA-Information-Type-ItemExtIEs} } OPTIONAL,
  ...
}

OTDOA-Information-Type-ItemExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
  ...
}

-- *****
--
-- OTDOA INFORMATION RESPONSE
--
-- *****

OTDOAInformationResponse ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      {{OTDOAInformationResponse-IEs}},
  ...
}

OTDOAInformationResponse-IEs NRPPA-PROTOCOL-IES ::= {
  { ID id-OTDOACells      CRITICALITY ignore  TYPE OTDOACells      PRESENCE mandatory}|
  { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional},
  ...
}

-- *****
--
-- OTDOA INFORMATION FAILURE
--
-- *****

OTDOAInformationFailure ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      {{OTDOAInformationFailure-IEs}},
  ...
}

OTDOAInformationFailure-IEs NRPPA-PROTOCOL-IES ::= {
  { ID id-Cause      CRITICALITY ignore  TYPE Cause      PRESENCE mandatory}|
  { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional},
  ...
}

```

```

-- *****
--
-- ASSISTANCE INFORMATION CONTROL
--
-- *****

AssistanceInformationControl ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{AssistanceInformationControl-IEs}},
    ...
}

AssistanceInformationControl-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-Assistance-Information  CRITICALITY reject  TYPE Assistance-Information    PRESENCE optional}|
    { ID id-Broadcast               CRITICALITY reject  TYPE Broadcast                PRESENCE optional}|
    { ID id-PositioningBroadcastCells CRITICALITY reject  TYPE PositioningBroadcastCells PRESENCE optional},
    ...
}

-- *****
--
-- ASSISTANCE INFORMATION FEEDBACK
--
-- *****

AssistanceInformationFeedback ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{AssistanceInformationFeedback-IEs}},
    ...
}

AssistanceInformationFeedback-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-AssistanceInformationFailureList  CRITICALITY reject  TYPE AssistanceInformationFailureList  PRESENCE optional}|
    { ID id-PositioningBroadcastCells         CRITICALITY reject  TYPE PositioningBroadcastCells         PRESENCE optional}|
    { ID id-CriticalityDiagnostics            CRITICALITY ignore   TYPE CriticalityDiagnostics            PRESENCE optional},
    ...
}

-- *****
--
-- ERROR INDICATION
--
-- *****

ErrorIndication ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container    {{ErrorIndication-IEs}},
    ...
}

ErrorIndication-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-Cause                CRITICALITY ignore   TYPE Cause                PRESENCE optional}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore   TYPE CriticalityDiagnostics PRESENCE optional},
    ...
}

```



```

}

-- *****
--
-- PRIVATE MESSAGE
--
-- *****

PrivateMessage ::= SEQUENCE {
    privateIES      PrivateIE-Container {{PrivateMessage-IEs}},
    ...
}

PrivateMessage-IEs NRPPA-PRIVATE-IES ::= {
    ...
}

-- *****
--
-- POSITIONING INFORMATION REQUEST
--
-- *****

PositioningInformationRequest ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container {{PositioningInformationRequest-IEs}},
    ...
}

PositioningInformationRequest-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-RequestedSRSTransmissionCharacteristics CRITICALITY ignore TYPE RequestedSRSTransmissionCharacteristics PRESENCE optional},
    ...
}

-- *****
--
-- POSITIONING INFORMATION RESPONSE
--
-- *****

PositioningInformationResponse ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container {{PositioningInformationResponse-IEs}},
    ...
}

PositioningInformationResponse-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-SRSConfiguration CRITICALITY ignore TYPE SRSConfiguration PRESENCE optional}|
    { ID id-SFNInitialisationTime CRITICALITY ignore TYPE SFNInitialisationTime PRESENCE optional}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore TYPE CriticalityDiagnostics PRESENCE optional},
    ...
}

-- *****
--

```

```

-- POSITIONING INFORMATION FAILURE
--
-- *****

PositioningInformationFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      {{PositioningInformationFailure-IEs}},
    ...
}

PositioningInformationFailure-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-Cause          CRITICALITY ignore  TYPE Cause          PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional},
    ...
}

-- *****
--
-- POSITIONING INFORMATION UPDATE
--
-- *****

PositioningInformationUpdate ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      {{PositioningInformationUpdate-IEs}},
    ...
}

PositioningInformationUpdate-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-SRSConfiguration CRITICALITY ignore  TYPE SRSConfiguration PRESENCE optional}|
    { ID id-SFNInitialisationTime CRITICALITY ignore  TYPE SFNInitialisationTime PRESENCE optional},
    ...
}

-- *****
--
-- MEASUREMENT REQUEST
--
-- *****

MeasurementRequest ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      {{MeasurementRequest-IEs}},
    ...
}

MeasurementRequest-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-LMF-Measurement-ID CRITICALITY reject  TYPE Measurement-ID PRESENCE mandatory}|
    { ID id-TRP-MeasurementRequestList CRITICALITY reject  TYPE TRP-MeasurementRequestList PRESENCE mandatory}|
    { ID id-ReportCharacteristics CRITICALITY reject  TYPE ReportCharacteristics PRESENCE mandatory}|
    { ID id-MeasurementPeriodicity CRITICALITY reject  TYPE MeasurementPeriodicity PRESENCE conditional}|
-- The IE shall be present if the Report Characteristics IE is set to "periodic" -
    { ID id-TRPMeasurementQuantities CRITICALITY reject  TYPE TRPMeasurementQuantities PRESENCE mandatory}|
    { ID id-SFNInitialisationTime CRITICALITY ignore  TYPE SFNInitialisationTime PRESENCE optional}|
    { ID id-SRSConfiguration CRITICALITY ignore  TYPE SRSConfiguration PRESENCE optional}|
    { ID id-MeasurementBeamInfoRequest CRITICALITY ignore  TYPE MeasurementBeamInfoRequest PRESENCE optional}|
}

```

```

    { ID id-SystemFrameNumber          CRITICALITY ignore TYPE SystemFrameNumber          PRESENCE optional}|
    { ID id-SlotNumber                  CRITICALITY ignore TYPE SlotNumber                PRESENCE optional},
    ...
}

-- *****
--
-- MEASUREMENT RESPONSE
--
-- *****

MeasurementResponse ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container      {{MeasurementResponse-IEs}},
    ...
}

MeasurementResponse-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-LMF-Measurement-ID          CRITICALITY reject TYPE Measurement-ID          PRESENCE mandatory}|
    { ID id-RAN-Measurement-ID          CRITICALITY reject TYPE Measurement-ID          PRESENCE mandatory}|
    { ID id-TRP-MeasurementResponseList CRITICALITY reject TYPE TRP-MeasurementResponseList PRESENCE optional}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore TYPE CriticalityDiagnostics    PRESENCE optional},
    ...
}

-- *****
--
-- MEASUREMENT FAILURE
--
-- *****

MeasurementFailure ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container      {{MeasurementFailure-IEs}},
    ...
}

MeasurementFailure-IEs NRPPA-PROTOCOL-IES ::= {
    { ID id-LMF-Measurement-ID          CRITICALITY reject TYPE Measurement-ID          PRESENCE mandatory}|
    { ID id-Cause                      CRITICALITY ignore TYPE Cause                  PRESENCE mandatory}|
    { ID id-CriticalityDiagnostics      CRITICALITY ignore TYPE CriticalityDiagnostics    PRESENCE optional},
    ...
}

-- *****
--
-- MEASUREMENT REPORT
--
-- *****

MeasurementReport ::= SEQUENCE {
    protocolIEs      ProtocolIE-Container      {{MeasurementReport-IEs}},
    ...
}

```

```

MeasurementReport-IEs NRPPA-PROTOCOL-IES ::= {
  { ID id-LMF-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
  { ID id-RAN-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
  { ID id-TRP-MeasurementReportList CRITICALITY reject  TYPE TRP-MeasurementResponseList PRESENCE mandatory},
  ...
}

-- *****
--
-- MEASUREMENT UPDATE
--
-- *****

MeasurementUpdate ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      {{MeasurementUpdate-IEs}},
  ...
}

MeasurementUpdate-IEs NRPPA-PROTOCOL-IES ::= {
  { ID id-LMF-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
  { ID id-RAN-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
  { ID id-SRSConfiguration        CRITICALITY ignore  TYPE SRSConfiguration        PRESENCE optional},
  ...
}

-- *****
--
-- MEASUREMENT ABORT
--
-- *****

MeasurementAbort ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      {{MeasurementAbort-IEs}},
  ...
}

MeasurementAbort-IEs NRPPA-PROTOCOL-IES ::= {
  { ID id-LMF-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
  { ID id-RAN-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory},
  ...
}

-- *****
--
-- MEASUREMENT FAILURE INDICATION
--
-- *****

MeasurementFailureIndication ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container      {{MeasurementFailureIndication-IEs}},
  ...
}

```

```

}

MeasurementFailureIndication-IEs NRPPA-PROTOCOL-IES ::= {
  { ID id-LMF-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
  { ID id-RAN-Measurement-ID      CRITICALITY reject  TYPE Measurement-ID      PRESENCE mandatory}|
  { ID id-Cause                   CRITICALITY ignore   TYPE Cause                     PRESENCE mandatory},
  ...
}

-- *****
--
-- TRP INFORMATION REQUEST
--
-- *****

TRPInformationRequest ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container    {{TRPInformationRequest-IEs}},
  ...
}

TRPInformationRequest-IEs NRPPA-PROTOCOL-IES ::= {
  { ID id-TRPList                CRITICALITY ignore   TYPE TRPList                        PRESENCE optional}|
  { ID id-TRPInformationTypeListTRPReq  CRITICALITY reject  TYPE TRPInformationTypeListTRPReq  PRESENCE mandatory},
  ...
}

-- *****
--
-- TRP INFORMATION RESPONSE
--
-- *****

TRPInformationResponse ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container    {{TRPInformationResponse-IEs}},
  ...
}

TRPInformationResponse-IEs NRPPA-PROTOCOL-IES ::= {
  { ID id-TRPInformationListTRPResp      CRITICALITY ignore   TYPE TRPInformationListTRPResp      PRESENCE mandatory}|
  { ID id-CriticalityDiagnostics          CRITICALITY ignore   TYPE CriticalityDiagnostics         PRESENCE optional},
  ...
}

-- *****
--
-- TRP INFORMATION FAILURE
--
-- *****

TRPInformationFailure ::= SEQUENCE {
  protocolIEs      ProtocolIE-Container    {{TRPInformationFailure-IEs}},
  ...
}

```

```

TRPInformationFailure-IEs NRPPA-PROTOCOL-IES ::= {
  { ID id-Cause                CRITICALITY ignore  TYPE Cause                PRESENCE mandatory}|
  { ID id-CriticalityDiagnostics CRITICALITY ignore  TYPE CriticalityDiagnostics PRESENCE optional},
  ...
}

-- *****
--
-- POSITIONING ACTIVATION REQUEST
--
-- *****

PositioningActivationRequest ::= SEQUENCE {
  protocolIEs          ProtocolIE-Container      { { PositioningActivationRequestIEs} },
  ...
}

PositioningActivationRequestIEs NRPPA-PROTOCOL-IES ::= {
  { ID id-SRSType                CRITICALITY reject  TYPE SRSType                PRESENCE mandatory } |
  { ID id-ActivationTime          CRITICALITY ignore  TYPE SFNInitialisationTime          PRESENCE optional },
  ...
}

SRSType ::= CHOICE {
  semipersistentSRS                SemipersistentSRS,
  aperiodicSRS                    AperiodicSRS,
  SRSType-extension                ProtocolIE-Single-Container { { SRSType-ExtIEs} }
}

SRSType-ExtIEs NRPPA-PROTOCOL-IES ::= {
  ...
}

SemipersistentSRS ::= SEQUENCE {
  sRSResourceSetID                SRSResourceSetID,
  iE-Extensions                    ProtocolExtensionContainer { {SemipersistentSRS-ExtIEs} } OPTIONAL,
  ...
}

SemipersistentSRS-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
  { ID id-SRSSpatialRelation CRITICALITY ignore  EXTENSION SRSSpatialRelation PRESENCE optional},
  ...
}

AperiodicSRS ::= SEQUENCE {
  aperiodic                        ENUMERATED{true,...},
  sRSResourceTrigger                SRSResourceTrigger OPTIONAL,
  iE-Extensions                    ProtocolExtensionContainer { {AperiodicSRS-ExtIEs} } OPTIONAL,
  ...
}

```

```

AperiodicSRS-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

-- *****
--
-- POSITIONING ACTIVATION RESPONSE
--
-- *****

PositioningActivationResponse ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { { PositioningActivationResponseIEs} },
    ...
}

PositioningActivationResponseIEs NRPPA-PROTOCOL-IES ::= {
    { ID id-CriticalityDiagnostics      CRITICALITY ignore  TYPE CriticalityDiagnostics      PRESENCE optional }|
    { ID id-SystemFrameNumber          CRITICALITY ignore  TYPE SystemFrameNumber          PRESENCE optional }|
    { ID id-SlotNumber                 CRITICALITY ignore  TYPE SlotNumber                 PRESENCE optional },
    ...
}

-- *****
--
-- POSITIONING ACTIVATION FAILURE
--
-- *****

PositioningActivationFailure ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { { PositioningActivationFailureIEs} },
    ...
}

PositioningActivationFailureIEs NRPPA-PROTOCOL-IES ::= {
    { ID id-Cause                     CRITICALITY ignore  TYPE Cause                     PRESENCE mandatory }|
    { ID id-CriticalityDiagnostics     CRITICALITY ignore  TYPE CriticalityDiagnostics     PRESENCE optional },
    ...
}

-- *****
--
-- POSITIONING DEACTIVATION
--
-- *****

PositioningDeactivation ::= SEQUENCE {
    protocolIEs          ProtocolIE-Container      { { PositioningDeactivationIEs} },

```

```

    ...
}

PositioningDeactivationIES NRPPA-PROTOCOL-IES ::= {
    { ID id-AbortTransmission          CRITICALITY ignore   TYPE AbortTransmission      PRESENCE mandatory } ,
    ...
}

END
-- ASN1STOP

```

9.3.5 Information Element definitions

```

-- ASN1START
-- *****
--
-- Information Element Definitions
--
-- *****

NRPPA-IEs {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-access (22) modules (3) nrppa (4) version1 (1) nrppa-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

    id-MeasurementQuantities-Item,
    id-CGI-NR,
    id-SFNInitialisationTime-NR,
    id-GeographicalCoordinates,
    id-ResultSS-RSRP,
    id-ResultSS-RSRQ,
    id-ResultCSI-RSRP,
    id-ResultCSI-RSRQ,
    id-AngleOfArrivalNR,
    id-SRSSpatialRelation,
    id-ResultNR,
    id-ResultEUTRA,
    maxCellInRANnode,
    maxCellReport,
    maxNrOfErrors,
    maxNoMeas,
    maxnoOTDOAtypes,
    maxServCell,
    id-OtherRATMeasurementQuantities-Item,
    id-WLANMeasurementQuantities-Item,

```



```
maxGERANMeas,  
maxUTRANMeas,  
maxWLANchannels,  
maxnoFreqHoppingBandsMinusOne,  
id-TDD-Config-EUTRA-Item,  
maxNrOfPosSImessage,  
maxnoAssistInfoFailureListItems,  
maxNrOfSegments,  
maxNrOfPosSIBs,  
maxnoPosMeas,  
maxnoTRPs,  
maxnoTRPInfoTypes,  
maxNoOfMeasTRPs,  
maxNoPath,  
maxnoofAngleInfo,  
maxnolcs-gcs-translation,  
maxnoBcastCell,  
maxnoSRSTriggerStates,  
maxnoSpatialRelations,  
maxNRMeas,  
maxEUTRAMeas,  
maxIndexesReport,  
maxCellReportNR,  
maxnoSRS-Carriers,  
maxnoSCSs,  
maxnoSRS-Resources,  
maxnoSRS-PosResources,  
maxnoSRS-ResourceSets,  
maxnoSRS-ResourcePerSet,  
maxnoSRS-PosResourceSets,  
maxnoSRS-PosResourcePerSet,  
maxPRS-ResourceSets,  
maxPRS-ResourcesPerSet,  
maxNoSSBs,  
maxnoofPRSresourceSet,  
maxnoofPRSresource,  
id-Cell-ID,  
id-TRPInformationTypeItem
```

FROM NRPPA-Constants

```
Criticality,  
NRPPATransactionID,  
ProcedureCode,  
ProtocolIE-ID,  
TriggeringMessage
```

FROM NRPPA-CommonDataTypes

```
ProtocolExtensionContainer{},  
ProtocolIE-Single-Container{},
```

```

    NRPPA-PROTOCOL-EXTENSION,
    NRPPA-PROTOCOL-IES

FROM NRPPA-Containers;

-- A

AbortTransmission ::= CHOICE {
    deactivateSRSResourceSetID    SRSResourceSetID,
    releaseALL                     NULL,
    choice-extension               ProtocolIE-Single-Container { { AbortTransmission-ExtIEs } }
}

AbortTransmission-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

ActiveULBWP ::= SEQUENCE {
    locationAndBandwidth          INTEGER (0..37949,...),
    subcarrierSpacing             ENUMERATED {kHz15, kHz30, kHz60, kHz120,...},
    cyclicPrefix                  ENUMERATED {normal, extended},
    txDirectCurrentLocation       INTEGER (0..3301,...),
    shift7dot5kHz                 ENUMERATED {true, ...} OPTIONAL,
    sRSConfig                     SRSConfig,
    iE-Extensions                 ProtocolExtensionContainer { { ActiveULBWP-ExtIEs } } OPTIONAL,
    ...
}

ActiveULBWP-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

AdditionalPathList ::= SEQUENCE (SIZE (1.. maxNoPath)) OF AdditionalPathListItem

AdditionalPathListItem ::= SEQUENCE {
    relativeTimeOfPath            RelativePathDelay,
    pathQuality                   TrpMeasurementQuality OPTIONAL,
    iE-Extensions                 ProtocolExtensionContainer { { AdditionalPathListItem-ExtIEs } } OPTIONAL,
    ...
}

AdditionalPathListItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

AperiodicSRSResourceTriggerList ::= SEQUENCE (SIZE(1..maxnoSRSTriggerStates)) OF AperiodicSRSResourceTrigger

AperiodicSRSResourceTrigger ::= INTEGER (1..3)

```

```

Assistance-Information ::= SEQUENCE {
    systemInformation          SystemInformation,
    iE-Extensions              ProtocolExtensionContainer { { Assistance-Information-ExtIEs } } OPTIONAL,
    ...
}

Assistance-Information-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

AssistanceInformationFailureList ::= SEQUENCE (SIZE (1..maxnoAssistInfoFailureListItems)) OF SEQUENCE {
    possIB-Type                PosSIB-Type,
    outcome                    Outcome,
    iE-Extensions              ProtocolExtensionContainer { { AssistanceInformationFailureList-ExtIEs } } OPTIONAL,
    ...
}

AssistanceInformationFailureList-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

AssistanceInformationMetaData ::= SEQUENCE {
    encrypted                  ENUMERATED {true, ...} OPTIONAL,
    gNSSID                     ENUMERATED {gps, sbas, qzss, galileo, glonass, bds, navic, ...} OPTIONAL,
    sBASID                     ENUMERATED {waas, egnos, msas, gagan, ...} OPTIONAL,
    iE-Extensions              ProtocolExtensionContainer { { AssistanceInformationMetaData-ExtIEs } } OPTIONAL,
    ...
}

AssistanceInformationMetaData-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

-- B

BandwidthSRS ::= CHOICE {
    fR1      ENUMERATED {mHz5, mHz10, mHz20, mHz40, mHz50, mHz80, mHz100, ...},
    fR2      ENUMERATED {mHz50, mHz100, mHz200, mHz400, ...},
    choice-extension      ProtocolIE-Single-Container { { BandwidthSRS-ExtIEs } }
}

BandwidthSRS-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

BCCH ::= INTEGER (0..1023, ...)

Broadcast ::= ENUMERATED {
    start,
    stop,
    ...
}

```

```
}

BroadcastPeriodicity ::= ENUMERATED {
    ms80,
    ms160,
    ms320,
    ms640,
    ms1280,
    ms2560,
    ms5120,
    ...
}

PositioningBroadcastCells ::= SEQUENCE (SIZE (1..maxnoBcastCell)) OF NG-RAN-CGI

BSSID ::= OCTET STRING (SIZE(6))

-- C

Cause ::= CHOICE {
    radioNetwork      CauseRadioNetwork,
    protocol          CauseProtocol,
    misc              CauseMisc,
    cause-Extension   ProtocolIE-Single-Container {{ Cause-ExtensionIE }}
}

Cause-ExtensionIE NRPPA-PROTOCOL-IES ::= {
    ...
}

CauseMisc ::= ENUMERATED {
    unspecified,
    ...
}

CauseProtocol ::= ENUMERATED {
    transfer-syntax-error,
    abstract-syntax-error-reject,
    abstract-syntax-error-ignore-and-notify,
    message-not-compatible-with-receiver-state,
    semantic-error,
    unspecified,
    abstract-syntax-error-falsely-constructed-message,
    ...
}

CauseRadioNetwork ::= ENUMERATED {
    unspecified,
    requested-item-not-supported,
    requested-item-temporarily-not-available,
    ...
}
```

Cell-Portion-ID ::= INTEGER (0..4095,...)

```
CGI-EUTRA ::= SEQUENCE {
    plmn-Identity          PLMN-Identity,
    eutraCellIdentifier    EUTRACellIdentifier,
    ie-Extensions          ProtocolExtensionContainer { {CGI-EUTRA-ExtIEs} } OPTIONAL,
    ...
}
```

```
CGI-EUTRA-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
CGI-NR ::= SEQUENCE {
    plmn-Identity          PLMN-Identity,
    nrCellIdentifier       NRCellIdentifier,
    ie-Extensions          ProtocolExtensionContainer { {CGI-NR-ExtIEs} } OPTIONAL,
    ...
}
```

```
CGI-NR-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
CPLength-EUTRA ::= ENUMERATED {
    normal,
    extended,
    ...
}
```

```
CriticalityDiagnostics ::= SEQUENCE {
    procedureCode          ProcedureCode          OPTIONAL,
    triggeringMessage       TriggeringMessage      OPTIONAL,
    procedureCriticality    Criticality             OPTIONAL,
    nrppatransactionID      NRPPATransactionID     OPTIONAL,
    iEsCriticalityDiagnostics CriticalityDiagnostics-IE-List OPTIONAL,
    ie-Extensions          ProtocolExtensionContainer { {CriticalityDiagnostics-ExtIEs} } OPTIONAL,
    ...
}
```

```
CriticalityDiagnostics-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}
```

```
CriticalityDiagnostics-IE-List ::= SEQUENCE (SIZE (1..maxNrOfErrors)) OF
    SEQUENCE {
        iECriticality    Criticality,
        ie-ID            ProtocolIE-ID,
        typeOfError       TypeOfError,
```

```

        iE-Extensions          ProtocolExtensionContainer { {CriticalityDiagnostics-IE-List-ExtIEs} } OPTIONAL,
        ...
    }

CriticalityDiagnostics-IE-List-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

-- D

DL-Bandwidth-EUTRA ::= ENUMERATED {
    bw6,
    bw15,
    bw25,
    bw50,
    bw75,
    bw100,
    ...
}

DL-PRS ::= SEQUENCE {
    prsid                INTEGER (0..255),
    dl-PRSResourceSetID   PRS-Resource-Set-ID,
    dl-PRSResourceID      PRS-Resource-ID OPTIONAL,
    iE-Extensions         ProtocolExtensionContainer { {DL-PRS-ExtIEs} } OPTIONAL,
    ...
}

DL-PRS-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

DL-PRSMutingPattern ::= CHOICE {
    two                BIT STRING (SIZE(2)),
    four               BIT STRING (SIZE(4)),
    six                BIT STRING (SIZE(6)),
    eight              BIT STRING (SIZE(8)),
    sixteen             BIT STRING (SIZE(16)),
    thirty-two         BIT STRING (SIZE(32)),
    choice-extension    ProtocolIE-Single-Container { { DL-PRSMutingPattern-ExtIEs } }
}

DL-PRSMutingPattern-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

DLPRSResourceCoordinates ::= SEQUENCE {
    listofDL-PRSResourceSetARP SEQUENCE (SIZE(1.. maxPRS-ResourceSets)) OF DLPRSResourceSetARP,
    iE-Extensions              ProtocolExtensionContainer { { DLPRSResourceCoordinates-ExtIEs } } OPTIONAL,
    ...
}

```

```

DLPRSResourceCoordinates-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

DLPRSResourceSetARP ::= SEQUENCE {
    dl-PRSResourceSetID          PRS-Resource-Set-ID,
    dl-PRSResourceSetARPLocation DL-PRSResourceSetARPLocation,
    listOfDL-PRSResourceARP      SEQUENCE (SIZE(1.. maxPRS-ResourcesPerSet)) OF DLPRSResourceARP,
    iE-Extensions                ProtocolExtensionContainer { { DLPRSResourceSetARP-ExtIEs } } OPTIONAL,
    ...
}

DLPRSResourceSetARP-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

DL-PRSResourceSetARPLocation ::= CHOICE {
    relativeGeodeticLocation      RelativeGeodeticLocation,
    relativeCartesianLocation     RelativeCartesianLocation,
    choice-Extension              ProtocolIE-Single-Container { { DL-PRSResourceSetARPLocation-ExtIEs } }
}

DL-PRSResourceSetARPLocation-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

DLPRSResourceARP ::= SEQUENCE {
    dl-PRSResourceID             PRS-Resource-ID,
    dl-PRSResourceARPLocation    DL-PRSResourceARPLocation,
    iE-Extensions                ProtocolExtensionContainer { { DLPRSResourceARP-ExtIEs } } OPTIONAL,
    ...
}

DLPRSResourceARP-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

DL-PRSResourceARPLocation ::= CHOICE {
    relativeGeodeticLocation      RelativeGeodeticLocation,
    relativeCartesianLocation     RelativeCartesianLocation,
    choice-Extension              ProtocolIE-Single-Container { { DL-PRSResourceARPLocation-ExtIEs } }
}

DL-PRSResourceARPLocation-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

-- E

E-CID-MeasurementResult ::= SEQUENCE {
    servingCell-ID              NG-RAN-CGI,

```

```

    servingCellTAC          TAC,
    nG-RANAccessPointPosition  NG-RANAccessPointPosition  OPTIONAL,
    measuredResults          MeasuredResults              OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { { E-CID-MeasurementResult-ExtIEs} } OPTIONAL,
    ...
}

E-CID-MeasurementResult-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    { ID id-GeographicalCoordinates CRITICALITY ignore EXTENSION GeographicalCoordinates PRESENCE optional},
    ...
}

EUTRACellIdentifier ::= BIT STRING (SIZE (28))

EARFCN ::= INTEGER (0..262143, ...)

-- F

-- G

GeographicalCoordinates ::= SEQUENCE {
    trPPositionDefinitionType TRPPositionDefinitionType,
    dLPRSResourceCoordinates DLPRSResourceCoordinates OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { { GeographicalCoordinates-ExtIEs } } OPTIONAL,
    ...
}

GeographicalCoordinates-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

GNB-RxTxTimeDiff ::= SEQUENCE {

    rxTxTimeDiff          GNB-RxTxTimeDiffMeas,
    additionalPathList     AdditionalPathList OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { { GNB-RxTxTimeDiff-ExtIEs} } OPTIONAL,
    ...
}

GNB-RxTxTimeDiff-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {

    ...
}

GNBRxTxTimeDiffMeas ::= CHOICE {
    k0          INTEGER (0.. 1970049),
    k1          INTEGER (0.. 985025),
    k2          INTEGER (0.. 492513),
    k3          INTEGER (0.. 246257),
    k4          INTEGER (0.. 123129),
    k5          INTEGER (0.. 61565),

```



```

    choice-extension          ProtocolIE-Single-Container { { GNBRTxTimeDiffMeas-ExtIEs } }
}

GNBRTxTimeDiffMeas-ExtIEs    NRPPA-PROTOCOL-IES ::= {
    ...
}

-- H

HESSID ::= OCTET STRING (SIZE(6))

-- I

-- J

-- K

-- L

LCS-to-GCS-TranslationAoA ::= SEQUENCE {
    alpha                INTEGER (0..3599),
    beta                 INTEGER (0..3599),
    gamma                INTEGER (0..3599),
    iE-Extensions        ProtocolExtensionContainer { { LCS-to-GCS-TranslationAoA-ExtIEs } } OPTIONAL,
    ...
}

LCS-to-GCS-TranslationAoA-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

LCS-to-GCS-TranslationItem ::= SEQUENCE {
    alpha                INTEGER (0..359),
    alphaFine            INTEGER (0..9)          OPTIONAL,
    beta                 INTEGER (0..359),
    betaFine            INTEGER (0..9)          OPTIONAL,
    gamma                INTEGER (0..359),
    gammaFine           INTEGER (0..9)          OPTIONAL,
    iE-Extensions        ProtocolExtensionContainer { { LCS-to-GCS-TranslationItem-ExtIEs } } OPTIONAL,
    ...
}

LCS-to-GCS-TranslationItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

LocationUncertainty ::= SEQUENCE {
    horizontalUncertainty INTEGER (0..255),
    horizontalConfidence  INTEGER (0..100),
    verticalUncertainty   INTEGER (0..255),
    verticalConfidence    INTEGER (0..100),
    iE-Extensions        ProtocolExtensionContainer { { LocationUncertainty-ExtIEs } } OPTIONAL,
    ...
}

```

```

}

LocationUncertainty-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

-- M

Measurement-ID ::= INTEGER (1.. 65536, ...)

MeasurementBeamInfoRequest ::= ENUMERATED {true, ...}

MeasurementBeamInfo ::= SEQUENCE {
    pRS-Resource-ID          PRS-Resource-ID          OPTIONAL,
    pRS-Resource-Set-ID      PRS-Resource-Set-ID OPTIONAL,
    sSB-Index                SSB-Index                OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { { MeasurementBeamInfo-ExtIEs} } OPTIONAL,
    ...
}

MeasurementBeamInfo-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

MeasurementPeriodicity ::= ENUMERATED {
    ms120,
    ms240,
    ms480,
    ms640,
    ms1024,
    ms2048,
    ms5120,
    ms10240,
    min1,
    min6,
    min12,
    min30,
    min60,
    ...,
    ms20480,
    ms40960
}

MeasurementQuantities ::= SEQUENCE (SIZE (1.. maxNoMeas)) OF ProtocolIE-Single-Container { {MeasurementQuantities-ItemIEs} }

MeasurementQuantities-ItemIEs NRPPA-PROTOCOL-IES ::= {
    { ID id-MeasurementQuantities-Item CRITICALITY reject TYPE MeasurementQuantities-Item PRESENCE mandatory}
}

MeasurementQuantities-Item ::= SEQUENCE {
    measurementQuantitiesValue MeasurementQuantitiesValue,

```

```

    iE-Extensions                                ProtocolExtensionContainer { { MeasurementQuantitiesValue-ExtIEs } }
OPTIONAL,
    ...
}

MeasurementQuantitiesValue-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

MeasurementQuantitiesValue ::= ENUMERATED {
    cell-ID,
    angleOfArrival,
    timingAdvanceType1,
    timingAdvanceType2,
    rSRP,
    rSRQ,
    ... ,
    sS-RSRP,
    sS-RSRQ,
    cSI-RSRP,
    cSI-RSRQ,
    angleOfArrivalNR
}

MeasuredResults ::= SEQUENCE (SIZE (1.. maxNoMeas)) OF MeasuredResultsValue

MeasuredResultsValue ::= CHOICE {
    valueAngleOfArrival-EUTRA                INTEGER (0..719),
    valueTimingAdvanceType1-EUTRA            INTEGER (0..7690),
    valueTimingAdvanceType2-EUTRA            INTEGER (0..7690),
    resultRSRP-EUTRA                         ResultRSRP-EUTRA,
    resultRSRQ-EUTRA                         ResultRSRQ-EUTRA,
    measuredResultsValue-Extension            ProtocolIE-Single-Container {{ MeasurementResultsValue-ExtensionIE }}
}

MeasurementResultsValue-ExtensionIE NRPPA-PROTOCOL-IES ::= {
{ ID id-ResultSS-RSRP          CRITICALITY ignore  TYPE ResultSS-RSRP          PRESENCE mandatory }|
  { ID id-ResultSS-RSRQ        CRITICALITY ignore  TYPE ResultSS-RSRQ          PRESENCE mandatory }|
  { ID id-ResultCSI-RSRP       CRITICALITY ignore  TYPE ResultCSI-RSRP         PRESENCE mandatory }|
  { ID id-ResultCSI-RSRQ       CRITICALITY ignore  TYPE ResultCSI-RSRQ         PRESENCE mandatory }|
  { ID id-AngleOfArrivalNR     CRITICALITY ignore  TYPE UL-AoA                 PRESENCE mandatory },
    ...
}

-- N

NarrowBandIndex ::= INTEGER (0..15,...)

NG-RANAccessPointPosition ::= SEQUENCE {
    latitudeSign          ENUMERATED {north, south},
    latitude              INTEGER (0..8388607),
    longitude             INTEGER (-8388608..8388607),
    directionOfAltitude   ENUMERATED {height, depth},

```

```

    altitude                INTEGER (0..32767),
    uncertaintySemi-major    INTEGER (0..127),
    uncertaintySemi-minor    INTEGER (0..127),
    orientationOfMajorAxis   INTEGER (0..179),
    uncertaintyAltitude      INTEGER (0..127),
    confidence               INTEGER (0..100),
    iE-Extensions            ProtocolExtensionContainer { { NG-RANAccessPointPosition-ExtIEs} } OPTIONAL,
    ...
}

NG-RANAccessPointPosition-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

NGRANHighAccuracyAccessPointPosition ::= SEQUENCE {
    latitude                INTEGER (-2147483648.. 2147483647),
    longitude               INTEGER (-2147483648.. 2147483647),
    altitude                INTEGER (-64000..1280000),
    uncertaintySemi-major    INTEGER (0..255),
    uncertaintySemi-minor    INTEGER (0..255),
    orientationOfMajorAxis   INTEGER (0..179),
    horizontalConfidence     INTEGER (0..100),
    uncertaintyAltitude      INTEGER (0..255),
    verticalConfidence       INTEGER (0..100),
    iE-Extensions            ProtocolExtensionContainer { { NGRANHighAccuracyAccessPointPosition-ExtIEs} } OPTIONAL,
    ...
}

NGRANHighAccuracyAccessPointPosition-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

NG-RAN-CGI ::= SEQUENCE {
    pLMN-Identity            PLMN-Identity,
    nG-RANcell               NG-RANCell,
    iE-Extensions            ProtocolExtensionContainer { {NG-RAN-CGI-ExtIEs} } OPTIONAL,
    ...
}

NG-RAN-CGI-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

NG-RANCell ::= CHOICE {
    eUTRA-CellID             EUTRACellIdentifier,
    nR-CellID                NRCellIdentifier,
    nG-RANCell-Extension     ProtocolIE-Single-Container {{ NG-RANCell-ExtensionIE }}
}

NG-RANCell-ExtensionIE NRPPA-PROTOCOL-IES ::= {
    ...
}

```

```
NR-ARFCN ::= INTEGER (0..3279165)

NRCellIdentifier ::= BIT STRING (SIZE (36))

NR-PCI ::= INTEGER (0..1007)

NR-PRS-Beam-Information ::= SEQUENCE {
    nR-PRS-Beam-InformationList SEQUENCE (SIZE(1.. maxPRS-ResourceSets)) OF NR-PRS-Beam-InformationItem,
    lcs-to-GCS-TranslationList SEQUENCE (SIZE(1..maxnolcs-gcs-translation)) OF LCS-to-GCS-TranslationItem OPTIONAL,
    iE-Extensions ProtocolExtensionContainer { { NR-PRS-Beam-Information-IEs} } OPTIONAL,
    ...
}

NR-PRS-Beam-Information-IEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

NR-PRS-Beam-InformationItem ::= SEQUENCE {
    pRSresourceSetID PRS-Resource-Set-ID,
    pRSAngleItem SEQUENCE (SIZE(1..maxPRS-ResourcesPerSet)) OF PRSAngleItem,
    iE-Extensions ProtocolExtensionContainer { { NR-PRS-Beam-InformationItem-ExtIEs} } OPTIONAL,
    ...
}

NR-PRS-Beam-InformationItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

NumberOfAntennaPorts-EUTRA ::= ENUMERATED {
    n1-or-n2,
    n4,
    ...
}

NumberOfDlFrames-EUTRA ::= ENUMERATED {
    sf1,
    sf2,
    sf4,
    sf6,
    ...
}

NumberOfDlFrames-Extended-EUTRA ::= INTEGER (1..160,...)

NumberOfFrequencyHoppingBands ::= ENUMERATED {
    twobands,
    fourbands,
    ...
}

NZP-CSI-RS-ResourceID ::= INTEGER (0..191)

-- O
```

```

OTDOACells ::= SEQUENCE (SIZE (1.. maxCellinRANnode)) OF SEQUENCE {
    oTDOACellInfo          OTDOACell-Information,
    iE-Extensions          ProtocolExtensionContainer { {OTDOACells-ExtIEs} } OPTIONAL,
    ...
}

OTDOACells-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

OTDOACell-Information ::= SEQUENCE (SIZE (1..maxnoOTDOAtypes)) OF OTDOACell-Information-Item

OTDOACell-Information-Item ::= CHOICE {
    pci-EUTRA                PCI-EUTRA,
    cgi-EUTRA                CGI-EUTRA,
    tac                      TAC,
    earfcn                   EARFCN,
    prsBandwidth-EUTRA       PRS-Bandwidth-EUTRA,
    prsConfigurationIndex-EUTRA PRS-ConfigurationIndex-EUTRA,
    cpLength-EUTRA           CLength-EUTRA,
    numberOfDlFrames-EUTRA   NumberOfDlFrames-EUTRA,
    numberOfAntennaPorts-EUTRA NumberOfAntennaPorts-EUTRA,
    sfNInitialisationTime-EUTRA SFNInitialisationTime-EUTRA,
    ng-RANAccessPointPosition NG-RANAccessPointPosition,
    prsMutingConfiguration-EUTRA PRSMutingConfiguration-EUTRA,
    prsid-EUTRA              PRS-ID-EUTRA,
    tpid-EUTRA               TP-ID-EUTRA,
    tpType-EUTRA             TP-Type-EUTRA,
    numberOfDlFrames-Extended-EUTRA NumberOfDlFrames-Extended-EUTRA,
    crsCpLength-EUTRA        CLength-EUTRA,
    dl-Bandwidth-EUTRA       DL-Bandwidth-EUTRA,
    prsOccasionGroup-EUTRA   PRSOccasionGroup-EUTRA,
    prsFrequencyHoppingConfiguration-EUTRA PRSFrequencyHoppingConfiguration-EUTRA,
    oTDOACell-Information-Item-Extension ProtocolIE-Single-Container {{ OTDOACell-Information-Item-ExtensionIE }}
}

OTDOACell-Information-Item-ExtensionIE NRPPA-PROTOCOL-IES ::= {
    { ID id-TDD-Config-EUTRA-Item    CRITICALITY ignore TYPE TDD-Config-EUTRA-Item PRESENCE mandatory }|
    { ID id-CGI-NR                  CRITICALITY ignore TYPE CGI-NR PRESENCE mandatory }|
    { ID id-SFNInitialisationTime-NR CRITICALITY ignore TYPE SFNInitialisationTime-EUTRA PRESENCE mandatory },
    ...
}

OTDOA-Information-Item ::= ENUMERATED {
    pci,
    cgi,
    tac,
    earfcn,
    prsBandwidth,
    prsConfigIndex,
    cpLength,
    noDlFrames,

```

```

        noAntennaPorts,
        sFNInitTime,
        nG-RANAccessPointPosition,
        prsmutingconfiguration,
        prsid,
        tpid,
        tpType,
        crsCPLength,
        dlBandwidth,
        multipleprConfigurationsperCell,
        prsOccasionGroup,
        prsFrequencyHoppingConfiguration,
        ...,
        tddConfig
    }

OtherRATMeasurementQuantities ::= SEQUENCE (SIZE (0.. maxNoMeas)) OF ProtocolIE-Single-Container { {OtherRATMeasurementQuantities-ItemIEs} }

OtherRATMeasurementQuantities-ItemIEs NRPPA-PROTOCOL-IES ::= {
    { ID id-OtherRATMeasurementQuantities-Item CRITICALITY reject TYPE OtherRATMeasurementQuantities-Item PRESENCE mandatory}}

OtherRATMeasurementQuantities-Item ::= SEQUENCE {
    otherRATMeasurementQuantitiesValue OtherRATMeasurementQuantitiesValue,
    iE-Extensions ProtocolExtensionContainer { { OtherRATMeasurementQuantitiesValue-ExtIEs} } OPTIONAL,
    ...
}

OtherRATMeasurementQuantitiesValue-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

OtherRATMeasurementQuantitiesValue ::= ENUMERATED {
    geran,
    utran,
    ... ,
    nR,
    eUTRA
}

OtherRATMeasurementResult ::= SEQUENCE (SIZE (1.. maxNoMeas)) OF OtherRATMeasuredResultsValue

OtherRATMeasuredResultsValue ::= CHOICE {
    resultGERAN ResultGERAN,
    resultUTRAN ResultUTRAN,
    otherRATMeasuredResultsValue-Extension ProtocolIE-Single-Container {{ OtherRATMeasuredResultsValue-ExtensionIE }}
}

OtherRATMeasuredResultsValue-ExtensionIE NRPPA-PROTOCOL-IES ::= {
    { ID id-ResultNR CRITICALITY ignore TYPE ResultNR PRESENCE mandatory }|
    { ID id-ResultEUTRA CRITICALITY ignore TYPE ResultEUTRA PRESENCE mandatory },
    ...
}

```

```

Outcome ::= ENUMERATED {
    failed,
    ...
}

-- P

PathlossReferenceInformation ::= SEQUENCE {
    pathlossReferenceSignal          PathlossReferenceSignal,
    iE-Extensions                    ProtocolExtensionContainer { { PathlossReferenceInformation-ExtIEs } } OPTIONAL,
    ...
}

PathlossReferenceInformation-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PathlossReferenceSignal ::= CHOICE {
    sSB-Reference                    SSB,
    dL-PRS-Reference                 DL-PRS,
    choice-Extension                  ProtocolIE-Single-Container {{ PathlossReferenceSignal-ExtensionIE }}
}

PathlossReferenceSignal-ExtensionIE NRPPA-PROTOCOL-IES ::= {
    ...
}

PCI-EUTRA ::= INTEGER (0..503, ...)

PhysCellIDGERAN ::= INTEGER (0..63, ...)

PhysCellIDUTRA-FDD ::= INTEGER (0..511, ...)

PhysCellIDUTRA-TDD ::= INTEGER (0..127, ...)

PLMN-Identity ::= OCTET STRING (SIZE(3))

PeriodicityList ::= SEQUENCE (SIZE (1.. maxNoSRS-ResourcePerSet)) OF PeriodicityItem

PeriodicityItem ::= ENUMERATED {ms0dot125, ms0dot25, ms0dot5, ms0dot625, ms1, ms1dot25, ms2, ms2dot5, ms4dot, ms5, ms8, ms10, ms16, ms20, ms32,
ms40, ms64, ms80m, ms160, ms320, ms640m, ms1280, ms2560, ms5120, ms10240, ...}

PosSIBs ::= SEQUENCE (SIZE (1.. maxNrOfPosSIBs)) OF SEQUENCE {
    posSIB-Type                      PosSIB-Type,
    posSIB-Segments                  PosSIB-Segments,
    assistanceInformationMetaData    AssistanceInformationMetaData OPTIONAL,
    broadcastPriority                 INTEGER (1..16,...) OPTIONAL,
    iE-Extensions                    ProtocolExtensionContainer { { PosSIBs-ExtIEs } } OPTIONAL,

```



```
    ...
}

PosSIBs-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PosSIB-Segments ::= SEQUENCE (SIZE (1.. maxNrOfSegments)) OF SEQUENCE {
    assistanceDataSIBelement      OCTET STRING,
    iE-Extensions                  ProtocolExtensionContainer { { PosSIB-Segments-ExtIEs } } OPTIONAL,
    ...
}

PosSIB-Segments-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PosSIB-Type ::= ENUMERATED {
    posSibType1-1,
    posSibType1-2,
    posSibType1-3,
    posSibType1-4,
    posSibType1-5,
    posSibType1-6,
    posSibType1-7,
    posSibType1-8,
    posSibType2-1,
    posSibType2-2,
    posSibType2-3,
    posSibType2-4,
    posSibType2-5,
    posSibType2-6,
    posSibType2-7,
    posSibType2-8,
    posSibType2-9,
    posSibType2-10,
    posSibType2-11,
    posSibType2-12,
    posSibType2-13,
    posSibType2-14,
    posSibType2-15,
    posSibType2-16,
    posSibType2-17,
    posSibType2-18,
    posSibType2-19,
    posSibType2-20,
    posSibType2-21,
    posSibType2-22,
    posSibType2-23,
    posSibType2-24,
    posSibType2-25,
    posSibType3-1,
    posSibType4-1,
```

```

    posSibType5-1,
    posSibType6-1,
    posSibType6-2,
    posSibType6-3,
    ...
}

PosSRSResource-List ::= SEQUENCE (SIZE (1..maxnoSRS-PosResources)) OF PosSRSResource-Item

PosSRSResource-Item ::= SEQUENCE {
    srs-PosResourceID          SRSPosResourceID,
    transmissionCombPos        TransmissionCombPos,
    startPosition              INTEGER (0..13),
    nrofSymbols                ENUMERATED {n1, n2, n4, n8, n12},
    freqDomainShift            INTEGER (0..268),
    c-SRS                      INTEGER (0..63),
    groupOrSequenceHopping     ENUMERATED { neither, groupHopping, sequenceHopping },
    resourceTypePos            ResourceTypePos,
    sequenceId                 INTEGER (0.. 65535),
    spatialRelationPos         SpatialRelationPos OPTIONAL,
    iE-Extensions              ProtocolExtensionContainer { { PosSRSResource-Item-ExtIEs } } OPTIONAL,
    ...
}

PosSRSResource-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PosSRSResourceSet-List ::= SEQUENCE (SIZE (1..maxnoSRS-PosResourceSets)) OF PosSRSResourceSet-Item

PosSRSResourceID-List ::= SEQUENCE (SIZE (1..maxnoSRS-PosResourcePerSet)) OF SRSPosResourceID

PosSRSResourceSet-Item ::= SEQUENCE {
    possrsResourceSetID        INTEGER(0..15),
    possRSResourceID-List      PosSRSResourceID-List,
    posresourceSetType         PosResourceSetType,
    iE-Extensions              ProtocolExtensionContainer { { PosSRSResourceSet-Item-ExtIEs } } OPTIONAL,
    ...
}

PosSRSResourceSet-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PosResourceSetType ::= CHOICE {
    periodic                  PosResourceSetTypePeriodic,
    semi-persistent          PosResourceSetTypeSemi-persistent,
    aperiodic                 PosResourceSetTypeAperiodic,
    choice-extension          ProtocolIE-Single-Container {{ PosResourceSetType-ExtIEs }}
}

```

```

PosResourceSetType-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

PosResourceSetTypePeriodic ::= SEQUENCE {
    posperiodicSet      ENUMERATED{true, ...},
    iE-Extensions       ProtocolExtensionContainer { { PosResourceSetTypePeriodic-ExtIEs} } OPTIONAL,
    ...
}

PosResourceSetTypePeriodic-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PosResourceSetTypeSemi-persistent ::= SEQUENCE {
    possemi-persistentSet  ENUMERATED{true, ...},
    iE-Extensions          ProtocolExtensionContainer { { PosResourceSetTypeSemi-persistent-ExtIEs} } OPTIONAL,
    ...
}

PosResourceSetTypeSemi-persistent-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PosResourceSetTypeAperiodic ::= SEQUENCE {
    sRSResourceTrigger      INTEGER(1..3),
    iE-Extensions           ProtocolExtensionContainer { { PosResourceSetTypeAperiodic-ExtIEs} } OPTIONAL,
    ...
}

PosResourceSetTypeAperiodic-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRS-Bandwidth-EUTRA ::= ENUMERATED {
    bw6,
    bw15,
    bw25,
    bw50,
    bw75,
    bw100,
    ...
}

PRSAngleItem ::= SEQUENCE {
    nRPRSAzimuth      INTEGER (0..359),
    nRPRSAzimuthFine  INTEGER (0..9) OPTIONAL,
    nRPRSElevation    INTEGER (0..180) OPTIONAL,
    nRPRSElevationFine INTEGER (0..9) OPTIONAL,
    iE-Extensions      ProtocolExtensionContainer { { PRSAngleItem-ExtIEs} } OPTIONAL,
    ...
}

```

```

PRSAngleItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSGlobalPos ::= SEQUENCE {
    pRS-IDPos                INTEGER(0..255),
    pRS-Resource-Set-IDPos    INTEGER(0..7),
    pRS-Resource-IDPos        INTEGER(0..63) OPTIONAL,
    iE-Extensions             ProtocolExtensionContainer { { PRSGlobalPos-ExtIEs } } OPTIONAL,
    ...
}

PRSGlobalPos-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSGlobalConfiguration ::= SEQUENCE {
    pRSResourceSet-List       PRSGlobalResourceSet-List,
    iE-Extensions             ProtocolExtensionContainer { { PRSGlobalConfiguration-ExtIEs } } OPTIONAL,
    ...
}

PRSGlobalConfiguration-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSGlobalConfigurationIndex-EUTRA ::= INTEGER (0..4095, ...)

PRSGlobal-ID-EUTRA ::= INTEGER (0..4095, ...)

PRSGlobalMutingConfiguration-EUTRA ::= CHOICE {
    two                        BIT STRING (SIZE (2)),
    four                      BIT STRING (SIZE (4)),
    eight                    BIT STRING (SIZE (8)),
    sixteen                  BIT STRING (SIZE (16)),
    thirty-two              BIT STRING (SIZE (32)),
    sixty-four              BIT STRING (SIZE (64)),
    one-hundred-and-twenty-eight BIT STRING (SIZE (128)),
    two-hundred-and-fifty-six BIT STRING (SIZE (256)),
    five-hundred-and-twelve  BIT STRING (SIZE (512)),
    one-thousand-and-twenty-four BIT STRING (SIZE (1024)),
    pRSMutatingConfiguration-EUTRA-Extension ProtocolIE-Single-Container {{ PRSGlobalMutingConfiguration-EUTRA-ExtensionIE }}
}

PRSGlobalMutingConfiguration-EUTRA-ExtensionIE NRPPA-PROTOCOL-IES ::= {
    ...
}

PRSGlobalOccasionGroup-EUTRA ::= ENUMERATED {
    og2,
    og4,

```

```

    og8,
    og16,
    og32,
    og64,
    og128,
    ...
}

PRSFrequencyHoppingConfiguration-EUTRA ::= SEQUENCE {
    noOfFreqHoppingBands      NumberOfFrequencyHoppingBands,
    bandPositions             SEQUENCE(SIZE (1..maxnoFreqHoppingBandsMinusOne)) OF NarrowBandIndex,
    iE-Extensions             ProtocolExtensionContainer { { PRSFrequencyHoppingConfiguration-EUTRA-Item-IEs} } OPTIONAL,
    ...
}

PRSFrequencyHoppingConfiguration-EUTRA-Item-IEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSMuting ::= SEQUENCE {
    pRSMutingOption1          PRSMutingOption1,
    pRSMutingOption2          PRSMutingOption2,
    iE-Extensions             ProtocolExtensionContainer { { PRSMuting-ExtIEs} } OPTIONAL,
    ...
}

PRSMuting-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSMutingOption1 ::= SEQUENCE {
    mutingPattern              DL-PRSMutingPattern,
    mutingBitRepetitionFactor  ENUMERATED{n1,n2,n4,n8,...},
    iE-Extensions             ProtocolExtensionContainer { { PRSMutingOption1-ExtIEs} } OPTIONAL,
    ...
}

PRSMutingOption1-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSMutingOption2 ::= SEQUENCE {
    mutingPattern              DL-PRSMutingPattern,
    iE-Extensions             ProtocolExtensionContainer { { PRSMutingOption2-ExtIEs} } OPTIONAL,
    ...
}

PRSMutingOption2-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSResource-List ::= SEQUENCE (SIZE (1..maxnoofPRSresource)) OF PRSResource-Item

PRSResource-Item ::= SEQUENCE {
    PRSResourceID             PRS-Resource-ID,

```

```

sequenceID                INTEGER(0..4095),
rEOffset                  INTEGER(0..11,...),
resourceSlotOffset        INTEGER(0..511),
resourceSymbolOffset      INTEGER(0..12),
qCLInfo                   PRSResource-QCLInfo    OPTIONAL,
iE-Extensions             ProtocolExtensionContainer { { PRSResource-Item-ExtIEs } } OPTIONAL,
...
}
PRSResource-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSResource-QCLInfo ::= CHOICE {
    qCLSourceSSB          PRSResource-QCLSourceSSB,
    qCLSourcePRS          PRSResource-QCLSourcePRS,
    choice-Extension      ProtocolIE-Single-Container {{ PRSResource-QCLInfo-ExtIEs }}
}

PRSResource-QCLInfo-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

PRSResource-QCLSourceSSB ::= SEQUENCE {
    pCI-NR                INTEGER(0..1007),
    sSB-Index             SSB-Index    OPTIONAL,
    iE-Extensions         ProtocolExtensionContainer { { PRSResource-QCLSourceSSB-ExtIEs } } OPTIONAL,
    ...
}

PRSResource-QCLSourceSSB-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSResource-QCLSourcePRS ::= SEQUENCE {
    qCLSourcePRSResourceSetID PRS-Resource-Set-ID,
    qCLSourcePRSResourceID    PRS-Resource-ID OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { { PRSResource-QCLSourcePRS-ExtIEs } } OPTIONAL,
    ...
}

PRSResource-QCLSourcePRS-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRSResourceSet-List ::= SEQUENCE (SIZE (1..maxnoofPRSresourceSet)) OF PRSResourceSet-Item

PRSResourceSet-Item ::= SEQUENCE {
    pRSResourceSetID        PRS-Resource-Set-ID,
    subcarrierSpacing       ENUMERATED{kHz15, kHz30, kHz60, kHz120, ...},
    pRSbandwidth            INTEGER(1..63),
    startPRB               INTEGER(0..2176),
    pointA                 INTEGER (0..3279165),

```

```

    combSize          ENUMERATED{n2, n4, n6, n12, ...},
    cPType            ENUMERATED{normal, extended, ...},
    resourceSetPeriodicity
n81920,...},
    resourceSetSlotOffset
    INTEGER(0..81919,...),
    resourceRepetitionFactor
    ENUMERATED{rf1,rf2,rf4,rf6,rf8,rf16,rf32,...},
    resourceTimeGap
    ENUMERATED{tg1,tg2,tg4,tg8,tg16,tg32,...},
    resourceNumberOfSymbols
    ENUMERATED{n2,n4,n6,n12,...},
    pRSMuting          PRSMuting          OPTIONAL,
    pRSResourceTransmitPower
    INTEGER(-60..50),
    pRSResource-List
    PRSResource-List,
    iE-Extensions
    ProtocolExtensionContainer { { PRSResourceSet-Item-ExtIEs } } OPTIONAL,
    ...
}

PRSResourceSet-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

PRS-Resource-ID ::= INTEGER (0..63)

PRS-Resource-Set-ID ::= INTEGER(0..7)

PRS-ID ::= INTEGER(0..255)

-- Q

-- R

ReferenceSignal ::= CHOICE {
    nZP-CSI-RS          NZP-CSI-RS-ResourceID,
    sSB                 SSB,
    sRS                 SRSResourceID,
    positioningSRS      SRSPosResourceID,
    dL-PRS              DL-PRS,
    choice-Extension    ProtocolIE-Single-Container {{ReferenceSignal-ExtensionIE }}
}

ReferenceSignal-ExtensionIE NRPPA-PROTOCOL-IES ::= {
    ...
}

ReferencePoint ::= CHOICE {
    relativeCoordinateID      CoordinateID,
    referencePointCoordinate   NG-RANAccessPointPosition,
    referencePointCoordinateHA NGRANHighAccuracyAccessPointPosition,
    choice-Extension          ProtocolIE-Single-Container { { ReferencePoint-ExtIEs } }
}

ReferencePoint-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

```

```

CoordinateID ::= INTEGER (0..511, ...)
RelativeGeodeticLocation ::= SEQUENCE {
    milli-Arc-SecondUnits    ENUMERATED {zerodot03, zerodot3, three, ...},    heightUnits    ENUMERATED {mm, cm, m, ...},
    deltaLatitude            INTEGER (-1024.. 1023),
    deltaLongitude           INTEGER (-1024.. 1023),
    deltaHeight              INTEGER (-1024.. 1023),
    locationUncertainty      LocationUncertainty,
    iE-extensions            ProtocolExtensionContainer {{RelativeGeodeticLocation-ExtIEs }} OPTIONAL,
    ...
}

RelativeGeodeticLocation-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

RelativeCartesianLocation ::= SEQUENCE {
    xYzunit                 ENUMERATED {mm, cm, dm, ...},
    xvalue                  INTEGER (-65536..65535),
    yvalue                  INTEGER (-65536..65535),
    zvalue                  INTEGER (-32768..32767),
    locationUncertainty      LocationUncertainty,
    iE-Extensions           ProtocolExtensionContainer { { RelativeCartesianLocation-ExtIEs } } OPTIONAL,
    ...
}

RelativeCartesianLocation-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

RelativePathDelay ::= CHOICE {
    k0                      INTEGER(0..16351),
    k1                      INTEGER(0..8176),
    k2                      INTEGER(0..4088),
    k3                      INTEGER(0..2044),
    k4                      INTEGER(0..1022),
    k5                      INTEGER(0..511),
    choice-Extension        ProtocolIE-Single-Container { { RelativePathDelay-ExtIEs } }
}

RelativePathDelay-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

ReportCharacteristics ::= ENUMERATED {
    onDemand,
    periodic,
    ...
}

RequestedSRSTransmissionCharacteristics ::= SEQUENCE {
    numberOfTransmissions    INTEGER (0..500,...)    OPTIONAL,

```



```

-- The IE shall be present if the Resource Type IE is set to "periodic" --
resourceType      ENUMERATED {periodic, semi-persistent, aperiodic, ...},
bandwidth         BandwidthSRS,
listOfSRSResourceSet SEQUENCE (SIZE (1.. maxnoSRS-ResourceSets)) OF SRSResourceSet-Item OPTIONAL,
sSBInformation    SSBInfo      OPTIONAL,
iE-Extensions    ProtocolExtensionContainer { { RequestedSRSTransmissionCharacteristics-ExtIEs} } OPTIONAL,
...
}

RequestedSRSTransmissionCharacteristics-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SRSResourceSet-Item ::= SEQUENCE {
    numberOfSRSResourcePerSet INTEGER (1..16, ...) OPTIONAL,
    periodicityList           PeriodicityList      OPTIONAL,
    spatialRelationInformation SpatialRelationInfo OPTIONAL,
    pathlossReferenceInformation PathlossReferenceInformation OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { { SRSResourceSet-Item-ExtIEs} } OPTIONAL,
    ...
}

SRSResourceSet-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResourceSetType ::= CHOICE {
    periodic           ResourceSetTypePeriodic,
    semi-persistent   ResourceSetTypeSemi-persistent,
    aperiodic         ResourceSetTypeAperiodic,
    choice-extension   ProtocolIE-Single-Container {{ ResourceSetType-ExtIEs }}
}

ResourceSetType-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

ResourceSetTypePeriodic ::= SEQUENCE {
    periodicSet      ENUMERATED{true, ...},
    iE-Extensions    ProtocolExtensionContainer { { ResourceSetTypePeriodic-ExtIEs} } OPTIONAL,
    ...
}

ResourceSetTypePeriodic-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResourceSetTypeSemi-persistent ::= SEQUENCE {
    semi-persistentSet ENUMERATED{true, ...},
    iE-Extensions      ProtocolExtensionContainer { { ResourceSetTypeSemi-persistent-ExtIEs} } OPTIONAL,
    ...
}

```

```

ResourceSetTypeSemi-persistent-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResourceSetTypeAperiodic ::= SEQUENCE {
    sRSResourceTrigger      INTEGER(1..3),
    slotoffset              INTEGER(0..32),
    iE-Extensions           ProtocolExtensionContainer { { ResourceSetTypeAperiodic-ExtIEs } } OPTIONAL,
    ...
}

ResourceSetTypeAperiodic-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResourceType ::= CHOICE {
    periodic                ResourceTypePeriodic,
    semi-persistent         ResourceTypeSemi-persistent,
    aperiodic               ResourceTypeAperiodic,
    choice-extension        ProtocolIE-Single-Container {{ ResourceType-ExtIEs }}
}

ResourceType-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

ResourceTypePeriodic ::= SEQUENCE {
    periodicity             ENUMERATED{slot1, slot2, slot4, slot5, slot8, slot10, slot16, slot20, slot32, slot40, slot64, slot80, slot160,
slot320, slot640, slot1280, slot2560, ...},
    offset                  INTEGER(0..2559, ...),
    iE-Extensions           ProtocolExtensionContainer { { ResourceTypePeriodic-ExtIEs } } OPTIONAL,
    ...
}

ResourceTypePeriodic-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResourceTypeSemi-persistent ::= SEQUENCE {
    periodicity             ENUMERATED{slot1, slot2, slot4, slot5, slot8, slot10, slot16, slot20, slot32, slot40, slot64, slot80, slot160, slot320,
slot640, slot1280, slot2560, ...},
    offset                  INTEGER(0..2559, ...),
    iE-Extensions           ProtocolExtensionContainer { { ResourceTypeSemi-persistent-ExtIEs } } OPTIONAL,
    ...
}

ResourceTypeSemi-persistent-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResourceTypeAperiodic ::= SEQUENCE {

```

```

aperiodicResourceType      ENUMERATED{true, ...},
  iE-Extensions      ProtocolExtensionContainer { { ResourceTypeAperiodic-ExtIEs } } OPTIONAL,
  ...
}

ResourceTypeAperiodic-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
  ...
}

ResourceTypePos ::= CHOICE {
  periodic      ResourceTypePeriodicPos,
  semi-persistent      ResourceTypeSemi-persistentPos,
  aperiodic      ResourceTypeAperiodicPos,
  choice-extension      ProtocolIE-Single-Container {{ ResourceTypePos-ExtIEs }}
}

ResourceTypePos-ExtIEs NRPPA-PROTOCOL-IES ::= {
  ...
}

ResourceTypePeriodicPos ::= SEQUENCE {
  periodicity      ENUMERATED{slot1, slot2, slot4, slot5, slot8, slot10, slot16, slot20, slot32, slot40, slot64, slot80, slot160, slot320, slot640,
slot1280, slot2560, slot5120, slot10240, slot40960, slot81920, ...},
  offset      INTEGER(0..81919, ...),
  iE-Extensions      ProtocolExtensionContainer { { ResourceTypePeriodicPos-ExtIEs } } OPTIONAL,
  ...
}

ResourceTypePeriodicPos-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
  ...
}

ResourceTypeSemi-persistentPos ::= SEQUENCE {
  periodicity      ENUMERATED{slot1, slot2, slot4, slot5, slot8, slot10, slot16, slot20, slot32, slot40, slot64, slot80, slot160, slot320, slot640,
slot1280, slot2560, slot5120, slot10240, slot40960, slot81920, ...},
  offset      INTEGER(0..81919, ...),
  iE-Extensions      ProtocolExtensionContainer { { ResourceTypeSemi-persistentPos-ExtIEs } } OPTIONAL,
  ...
}

ResourceTypeSemi-persistentPos-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
  ...
}

ResourceTypeAperiodicPos ::= SEQUENCE {
  slotOffset      INTEGER (0..32),
  iE-Extensions      ProtocolExtensionContainer { { ResourceTypeAperiodicPos-ExtIEs } } OPTIONAL,
  ...
}

ResourceTypeAperiodicPos-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
  ...
}

```

```

}

ResultCSI-RSRP ::= SEQUENCE (SIZE (1.. maxCellReportNR)) OF ResultCSI-RSRP-Item

ResultCSI-RSRP-Item ::= SEQUENCE {
    nR-PCI                NR-PCI,
    nR-ARFCN              NR-ARFCN,
    CGI-NR                CGI-NR                                OPTIONAL,
    valueCSI-RSRP-Cell    ValueRSRP-NR                        OPTIONAL,
    cSI-RSRP-PerCSI-RS    ResultCSI-RSRP-PerCSI-RS            OPTIONAL,
    iE-Extensions         ProtocolExtensionContainer { { ResultCSI-RSRP-Item-ExtIEs} }  OPTIONAL,
    ...
}

ResultCSI-RSRP-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultCSI-RSRP-PerCSI-RS ::= SEQUENCE (SIZE (1.. maxIndexesReport)) OF ResultCSI-RSRP-PerCSI-RS-Item

ResultCSI-RSRP-PerCSI-RS-Item ::= SEQUENCE {
    cSI-RS-Index          INTEGER (0..95),
    valueCSI-RSRP         ValueRSRP-NR,
    iE-Extensions         ProtocolExtensionContainer { { ResultCSI-RSRP-PerCSI-RS-Item-ExtIEs} }  OPTIONAL,
    ...
}

ResultCSI-RSRP-PerCSI-RS-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultCSI-RSRQ ::= SEQUENCE (SIZE (1.. maxCellReportNR)) OF ResultCSI-RSRQ-Item

ResultCSI-RSRQ-Item ::= SEQUENCE {
    nR-PCI                NR-PCI,
    nR-ARFCN              NR-ARFCN,
    CGI-NR                CGI-NR                                OPTIONAL,
    valueCSI-RSRQ-Cell    ValueRSRQ-NR                        OPTIONAL,
    cSI-RSRQ-PerCSI-RS    ResultCSI-RSRQ-PerCSI-RS            OPTIONAL,
    iE-Extensions         ProtocolExtensionContainer { { ResultCSI-RSRQ-Item-ExtIEs} }  OPTIONAL,
    ...
}

ResultCSI-RSRQ-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultCSI-RSRQ-PerCSI-RS ::= SEQUENCE (SIZE (1.. maxIndexesReport)) OF ResultCSI-RSRQ-PerCSI-RS-Item

ResultCSI-RSRQ-PerCSI-RS-Item ::= SEQUENCE {
    cSI-RS-Index          INTEGER (0..95),
    valueCSI-RSRQ         ValueRSRQ-NR,
    iE-Extensions         ProtocolExtensionContainer { { ResultCSI-RSRQ-PerCSI-RS-Item-ExtIEs} }  OPTIONAL,

```

```

    ...
}

ResultCSI-RSRQ-PerCSI-RS-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultEUTRA ::= SEQUENCE (SIZE (1.. maxEUTRAMeas)) OF ResultEUTRA-Item

ResultEUTRA-Item ::= SEQUENCE {
    pCI-EUTRA          PCI-EUTRA,
    eARFCN             EARFCN,
    valueRSRP-EUTRA    ValueRSRP-EUTRA OPTIONAL,
    valueRSRQ-EUTRA    ValueRSRQ-EUTRA OPTIONAL,
    cGI-EUTRA          CGI-EUTRA OPTIONAL,
    iE-Extensions      ProtocolExtensionContainer { { ResultEUTRA-Item-ExtIEs } } OPTIONAL,
    ...
}

ResultEUTRA-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultRSRP-EUTRA ::= SEQUENCE (SIZE (1.. maxCellReport)) OF ResultRSRP-EUTRA-Item

ResultRSRP-EUTRA-Item ::= SEQUENCE {
    pCI-EUTRA          PCI-EUTRA,
    eARFCN             EARFCN,
    cGI-EUTRA          CGI-EUTRA OPTIONAL,
    valueRSRP-EUTRA    ValueRSRP-EUTRA,
    iE-Extensions      ProtocolExtensionContainer { { ResultRSRP-EUTRA-Item-ExtIEs } } OPTIONAL,
    ...
}

ResultRSRP-EUTRA-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultRSRQ-EUTRA ::= SEQUENCE (SIZE (1.. maxCellReport)) OF ResultRSRQ-EUTRA-Item

ResultRSRQ-EUTRA-Item ::= SEQUENCE {
    pCI-EUTRA          PCI-EUTRA,
    eARFCN             EARFCN,
    cGI-EUTRA          CGI-EUTRA OPTIONAL,
    valueRSRQ-EUTRA    ValueRSRQ-EUTRA,
    iE-Extensions      ProtocolExtensionContainer { { ResultRSRQ-EUTRA-Item-ExtIEs } } OPTIONAL,
    ...
}

ResultRSRQ-EUTRA-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

```

```

ResultSS-RSRP ::= SEQUENCE (SIZE (1.. maxCellReportNR)) OF ResultSS-RSRP-Item

ResultSS-RSRP-Item ::= SEQUENCE {
    nR-PCI          NR-PCI,
    nR-ARFCN        NR-ARFCN,
    CGI-NR          CGI-NR                                OPTIONAL,
    valueSS-RSRP-Cell ValueRSRP-NR                        OPTIONAL,
    sS-RSRP-PerSSB   ResultSS-RSRP-PerSSB                 OPTIONAL,
    iE-Extensions    ProtocolExtensionContainer { { ResultSS-RSRP-Item-ExtIEs} } OPTIONAL,
    ...
}

ResultSS-RSRP-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultSS-RSRP-PerSSB ::= SEQUENCE (SIZE (1.. maxIndexesReport)) OF ResultSS-RSRP-PerSSB-Item

ResultSS-RSRP-PerSSB-Item ::= SEQUENCE {
    sSB-Index       SSB-Index,
    valueSS-RSRP     ValueRSRP-NR,
    iE-Extensions    ProtocolExtensionContainer { { ResultSS-RSRP-PerSSB-Item-ExtIEs} } OPTIONAL,
    ...
}

ResultSS-RSRP-PerSSB-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultSS-RSRQ ::= SEQUENCE (SIZE (1.. maxCellReportNR)) OF ResultSS-RSRQ-Item

ResultSS-RSRQ-Item ::= SEQUENCE {
    nR-PCI          NR-PCI,
    nR-ARFCN        NR-ARFCN,
    CGI-NR          CGI-NR                                OPTIONAL,
    valueSS-RSRQ-Cell ValueRSRQ-NR                        OPTIONAL,
    sS-RSRQ-PerSSB   ResultSS-RSRQ-PerSSB                 OPTIONAL,
    iE-Extensions    ProtocolExtensionContainer { { ResultSS-RSRQ-Item-ExtIEs} } OPTIONAL,
    ...
}

ResultSS-RSRQ-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultSS-RSRQ-PerSSB ::= SEQUENCE (SIZE (1.. maxIndexesReport)) OF ResultSS-RSRQ-PerSSB-Item

ResultSS-RSRQ-PerSSB-Item ::= SEQUENCE {
    sSB-Index       SSB-Index,
    valueSS-RSRQ     ValueRSRQ-NR,
    iE-Extensions    ProtocolExtensionContainer { { ResultSS-RSRQ-PerSSB-Item-ExtIEs} } OPTIONAL,

```

```

    ...
}

ResultSS-RSRQ-PerSSB-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultGERAN ::= SEQUENCE (SIZE (1.. maxGERANMeas)) OF ResultGERAN-Item

ResultGERAN-Item ::= SEQUENCE {
    bCCH                BCCH,
    physCellIDGERAN     PhysCellIDGERAN,
    rSSI                RSSI,
    iE-Extensions       ProtocolExtensionContainer { { ResultGERAN-Item-ExtIEs} } OPTIONAL,
    ...
}

ResultGERAN-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultNR ::= SEQUENCE (SIZE (1.. maxNRMeas)) OF ResultNR-Item

ResultNR-Item ::= SEQUENCE {
    nR-PCI              NR-PCI,
    nR-ARFCN            NR-ARFCN,
    valueSS-RSRP-Cell   ValueRSRP-NR OPTIONAL,
    valueSS-RSRQ-Cell   ValueRSRQ-NR OPTIONAL,
    sS-RSRP-PerSSB      ResultSS-RSRP-PerSSB OPTIONAL,
    sS-RSRQ-PerSSB      ResultSS-RSRQ-PerSSB OPTIONAL,
    cGI-NR              CGI-NR OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { { ResultNR-Item-ExtIEs} } OPTIONAL,
    ...
}

ResultNR-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ResultUTRAN ::= SEQUENCE (SIZE (1.. maxUTRANMeas)) OF ResultUTRAN-Item

ResultUTRAN-Item ::= SEQUENCE {
    uARFCN              UARFCN,
    physCellIDUTRAN     CHOICE {
        physCellIDUTRA-FDD PhysCellIDUTRA-FDD,
        physCellIDUTRA-TDD PhysCellIDUTRA-TDD
    },
    uTRA-RSCP            UTRA-RSCP OPTIONAL,
    uTRA-EcN0            UTRA-EcN0 OPTIONAL,
    iE-Extensions       ProtocolExtensionContainer { { ResultUTRAN-Item-ExtIEs} } OPTIONAL,

```

```

    ...
}

ResultUTRAN-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

RSSI ::= INTEGER (0..63, ...)

-- S

SCS-SpecificCarrier ::= SEQUENCE {
    offsetToCarrier          INTEGER (0..2199,...),
    subcarrierSpacing        ENUMERATED {kHz15, kHz30, kHz60, kHz120,...},
    carrierBandwidth         INTEGER (1..275,...),
    iE-Extensions            ProtocolExtensionContainer { { SCS-SpecificCarrier-ExtIEs } } OPTIONAL,
    ...
}

SCS-SpecificCarrier-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

Search-window-information ::= SEQUENCE {
    expectedPropagationDelay  INTEGER (-3841..3841,...),
    delayUncertainty          INTEGER (1..246,...),
    iE-Extensions            ProtocolExtensionContainer { { Search-window-information-ExtIEs } } OPTIONAL,
    ...
}

Search-window-information-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SFNInitialisationTime ::= BIT STRING (SIZE (64))

SFNInitialisationTime-EUTRA ::= BIT STRING (SIZE (64))

SlotNumber ::= INTEGER (0..79)

SpatialDirectionInformation ::= SEQUENCE {
    nR-PRS-Beam-Information   NR-PRS-Beam-Information,
    iE-Extensions            ProtocolExtensionContainer { { SpatialDirectionInformation-ExtIEs } } OPTIONAL,
    ...
}

SpatialDirectionInformation-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

```



```

SpatialRelationInfo ::= SEQUENCE {
    spatialRelationforResourceID          SpatialRelationforResourceID,
    iE-Extensions          ProtocolExtensionContainer { {SpatialRelationInfo-ExtIEs} } OPTIONAL,
    ...
}

SpatialRelationInfo-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SpatialRelationforResourceID ::= SEQUENCE (SIZE(1..maxnoSpatialRelations)) OF SpatialRelationforResourceIDItem

SpatialRelationforResourceIDItem ::= SEQUENCE {
    referenceSignal          ReferenceSignal,
    iE-Extensions          ProtocolExtensionContainer { {SpatialRelationforResourceIDItem-ExtIEs} } OPTIONAL,
    ...
}

SpatialRelationforResourceIDItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SpatialRelationPos ::= CHOICE {
    sSBPos          SSB,
    pRSInformationPos          PRSInformationPos,
    choice-extension          ProtocolIE-Single-Container {{ SpatialInformationPos-ExtIEs }}
}

SpatialInformationPos-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

SRSConfig ::= SEQUENCE {
    sRSResource-List          SRSResource-List OPTIONAL,
    posSRSResource-List          PosSRSResource-List OPTIONAL,
    sRSResourceSet-List          SRSResourceSet-List OPTIONAL,
    posSRSResourceSet-List          PosSRSResourceSet-List OPTIONAL,
    iE-Extensions          ProtocolExtensionContainer { { SRSConfig-ExtIEs } } OPTIONAL,
    ...
}

SRSConfig-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SRSCarrier-List ::= SEQUENCE (SIZE(1.. maxnoSRS-Carriers)) OF SRSCarrier-List-Item

SRSCarrier-List-Item ::= SEQUENCE {

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    pointA                INTEGER (0..3279165),
    uplinkChannelBW-PerSCS-List  UplinkChannelBW-PerSCS-List,
    activeULBWP            ActiveULBWP,
    pCI-NR                INTEGER (0..1007)          OPTIONAL,
iE-Extensions            ProtocolExtensionContainer { { SRSCarrier-List-Item-ExtIEs } } OPTIONAL,
    ...
}

SRSCarrier-List-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SRSConfiguration ::= SEQUENCE {
    sRSCarrier-List      SRSCarrier-List,
    iE-Extensions        ProtocolExtensionContainer { { SRSConfiguration-ExtIEs } } OPTIONAL,
    ...
}

SRSConfiguration-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SRSPosResourceID ::= INTEGER (0..63)

SRSResource ::= SEQUENCE {
    sRSResourceID          SRSResourceID,
    nrofSRS-Ports          ENUMERATED {port1, ports2, ports4},
    transmissionComb        TransmissionComb,
    startPosition          INTEGER (0..13),
    nrofSymbols            ENUMERATED {n1, n2, n4},
    repetitionFactor        ENUMERATED {n1, n2, n4},
    freqDomainPosition      INTEGER (0..67),
    freqDomainShift         INTEGER (0..268),
    c-SRS                  INTEGER (0..63),
    b-SRS                  INTEGER (0..3),
    b-hop                  INTEGER (0..3),
    groupOrSequenceHopping  ENUMERATED { neither, groupHopping, sequenceHopping },
    resourceType            ResourceType,
    sequenceId             INTEGER (0..1023),
    iE-Extensions          ProtocolExtensionContainer { { SRSResource-ExtIEs } } OPTIONAL,
    ...
}

SRSResource-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SRSResourceID ::= INTEGER (0..63)

SRSResource-List ::= SEQUENCE (SIZE (1..maxnoSRS-Resources)) OF SRSResource

SRSResourceSet-List ::= SEQUENCE (SIZE (1..maxnoSRS-ResourceSets)) OF SRSResourceSet

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SRSResourceID-List ::= SEQUENCE (SIZE (1..maxNoSRS-ResourcePerSet)) OF SRSResourceID

SRSResourceSet ::= SEQUENCE {
    sRSResourceSetID          INTEGER(0..15),
    sRSResourceID-List        SRSResourceID-List,
    resourceSetType            ResourceSetType,
    iE-Extensions              ProtocolExtensionContainer { { SRSResourceSet-ExtIEs } } OPTIONAL,
    ...
}

SRSResourceSet-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SRSResourceSetID ::= INTEGER (0..15, ...)

SRSResourceTrigger ::= SEQUENCE {
    aperiodicSRSResourceTriggerList      AperiodicSRSResourceTriggerList,
    iE-Extensions              ProtocolExtensionContainer { {SRSResourceTrigger-ExtIEs} } OPTIONAL,
    ...
}

SRSResourceTrigger-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SRSSpatialRelation ::= SEQUENCE {
    spatialRelationforResourceID          SpatialRelationforResourceID,
    iE-Extensions              ProtocolExtensionContainer { {SRSSpatialRelation-ExtIEs} } OPTIONAL,
    ...
}

SRSSpatialRelation-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SSBInfo ::= SEQUENCE {
    listOfSSBInfo          SEQUENCE (SIZE (1..maxNoSSBs)) OF SSBInfoItem,
    iE-Extensions              ProtocolExtensionContainer { {SSBInfo-ExtIEs} } OPTIONAL,
    ...
}

SSBInfo-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SSBInfoItem ::= SEQUENCE {
    sSB-Configuration      TF-Configuration,
    pCI-NR                  INTEGER (0..1007),

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    iE-Extensions      ProtocolExtensionContainer { { SSBInfoItem-ExtIEs } }    OPTIONAL,
    ...
}

SSBInfoItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SSB ::= SEQUENCE {
    pCI-NR              INTEGER (0..1007),
    ssb-index           SSB-Index    OPTIONAL,
    iE-Extensions      ProtocolExtensionContainer { {SSB-ExtIEs} } OPTIONAL,
    ...
}

SSB-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

SSBBurstPosition ::= CHOICE {
    shortBitmap         BIT STRING (SIZE(4)),
    mediumBitmap        BIT STRING (SIZE(8)),
    longBitmap          BIT STRING (SIZE(64)),
    choice-extension    ProtocolIE-Single-Container { { SSBBurstPosition-ExtIEs } }
}

SSBBurstPosition-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

SSB-Index ::= INTEGER(0..63)

SSID ::= OCTET STRING (SIZE(1..32))

SystemFrameNumber ::= INTEGER (0..1023)

SystemInformation ::= SEQUENCE (SIZE (1.. maxNrOfPosSImessage)) OF SEQUENCE {
    broadcastPeriodicity BroadcastPeriodicity,
    posSIBs              PosSIBs,
    iE-Extensions        ProtocolExtensionContainer { { SystemInformation-ExtIEs } }    OPTIONAL,
    ...
}

SystemInformation-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

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TAC ::= OCTET STRING (SIZE(3))

TDD-Config-EUTRA-Item ::= SEQUENCE {
    subframeAssignment      ENUMERATED { sa0, sa1, sa2, sa3, sa4, sa5, sa6, ... },
    iE-Extensions            ProtocolExtensionContainer { { TDD-Config-EUTRA-Item-Item-ExtIEs } } OPTIONAL,
    ...
}

TDD-Config-EUTRA-Item-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TF-Configuration ::= SEQUENCE {
    sSB-frequency            INTEGER (0..3279165),
    sSB-subcarrier-spacing   ENUMERATED { kHz15, kHz30, kHz120, kHz240, ... },
    sSB-Transmit-power       INTEGER (-60..50),
    sSB-periodicity          ENUMERATED { ms5, ms10, ms20, ms40, ms80, ms160, ... },
    sSB-half-frame-offset    INTEGER(0..1),
    sSB-SFN-offset           INTEGER(0..15),
    sSB-BurstPosition        SSB-BurstPosition OPTIONAL,
    sFN-initialisation-time   SFNInitialisationTime OPTIONAL,
    iE-Extensions            ProtocolExtensionContainer { { TF-Configuration-ExtIEs } } OPTIONAL,
    ...
}

TF-Configuration-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TimeStamp ::= SEQUENCE {
    systemFrameNumber        SystemFrameNumber,
    slotIndex                TimeStampSlotIndex,
    measurementTime          SFNInitialisationTime OPTIONAL,
    iE-Extension              ProtocolExtensionContainer { { TimeStamp-ExtIEs } } OPTIONAL,
    ...
}

TimeStamp-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TimeStampSlotIndex ::= CHOICE {
    sCS-15                   INTEGER(0..9),
    sCS-30                   INTEGER(0..19),
    sCS-60                   INTEGER(0..39),
    sCS-120                  INTEGER(0..79),
    choice-extension          ProtocolIE-Single-Container { { TimeStampSlotIndex-ExtIEs } }
}

TimeStampSlotIndex-ExtIEs NRPPA-PROTOCOL-IES ::= {

```

```

    ...
}

TP-ID-EUTRA ::= INTEGER (0..4095, ...)

TP-Type-EUTRA ::= ENUMERATED { prs-only-tp, ... }

TransmissionComb ::= CHOICE {
    n2    SEQUENCE {
        combOffset-n2          INTEGER (0..1),
        cyclicShift-n2         INTEGER (0..7)
    },
    n4    SEQUENCE {
        combOffset-n4          INTEGER (0..3),
        cyclicShift-n4         INTEGER (0..11)
    },
    choice-extension            ProtocolIE-Single-Container { { TransmissionComb-ExtIEs } }
}
TransmissionComb-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

TransmissionCombPos ::= CHOICE {
    n2    SEQUENCE {
        combOffset-n2          INTEGER (0..1),
        cyclicShift-n2         INTEGER (0..7)
    },
    n4    SEQUENCE {
        combOffset-n4          INTEGER (0..3),
        cyclicShift-n4         INTEGER (0..11)
    },
    n8    SEQUENCE {
        combOffset-n8          INTEGER (0..7),
        cyclicShift-n8         INTEGER (0..5)
    },
    choice-extension            ProtocolIE-Single-Container { { TransmissionCombPos-ExtIEs } }
}
TransmissionCombPos-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

TRPMeasurementQuantities ::= SEQUENCE (SIZE (1..maxnoPosMeas)) OF TRPMeasurementQuantitiesList-Item

TRPMeasurementQuantitiesList-Item ::= SEQUENCE {
    trpMeasurementQuantities-Item    TRPMeasurementQuantities-Item,
    timingReportingGranularityFactor  INTEGER (0..5) OPTIONAL,
    iE-Extensions                    ProtocolExtensionContainer {{ TRPMeasurementQuantitiesList-Item-ExtIEs}}  OPTIONAL,
    ...
}

```

```

TRPMeasurementQuantitiesList-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TRPMeasurementQuantities-Item ::= ENUMERATED {
    gNB-RxTxTimeDiff,
    uL-SRS-RSRP,
    uL-AoA,
    uL-RTOA,
    ...
}

TrpMeasurementResult ::= SEQUENCE (SIZE (1.. maxnoPosMeas)) OF TrpMeasurementResultItem
TrpMeasurementResultItem ::= SEQUENCE {
    measuredResultsValue          TrpMeasuredResultsValue,
    timeStamp                     TimeStamp,
    measurementQuality            TrpMeasurementQuality OPTIONAL,
    measurementBeamInfo          MeasurementBeamInfo OPTIONAL,
    iE-Extensions                ProtocolExtensionContainer {{TrpMeasurementResultItem-ExtIEs}} OPTIONAL,
    ...
}

TrpMeasurementResultItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TrpMeasuredResultsValue ::= CHOICE {
    uL-AngleOfArrival    UL-AoA,
    uL-SRS-RSRP         UL-SRS-RSRP,
    uL-RTOA             UL-RTOAMeasurement,
    gNB-RxTxTimeDiff    GNB-RxTxTimeDiff,
    choice-extension     ProtocolIE-Single-Container { { TrpMeasuredResultsValue-ExtIEs } }
}

TrpMeasuredResultsValue-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

TrpMeasurementQuality ::= CHOICE {
    timingMeasQuality    TrpMeasurementTimingQuality,
    angleMeasQuality     TrpMeasurementAngleQuality,
    choice-Extension     ProtocolIE-Single-Container {{ TrpMeasurementQuality-ExtIEs}}
}

TrpMeasurementQuality-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

TrpMeasurementTimingQuality ::= SEQUENCE {
    measurementQuality    INTEGER (0..31),
    resolution            ENUMERATED {m0dot1, m1, m10, m30, ...},
    iE-extensions         ProtocolExtensionContainer { { TrpMeasurementTimingQuality-ExtIEs } } OPTIONAL,

```

```

    ...
}

TrpMeasurementTimingQuality-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TrpMeasurementAngleQuality ::= SEQUENCE {
    azimuthQuality      INTEGER (0..255),
    zenithQuality       INTEGER (0..255)    OPTIONAL,
    resolution          ENUMERATED {deg0dot1, ...},
    iE-extensions       ProtocolExtensionContainer { { TrpMeasurementAngleQuality-ExtIEs } } OPTIONAL,
    ...
}

TrpMeasurementAngleQuality-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TRP-MeasurementRequestList ::= SEQUENCE (SIZE (1..maxNoOfMeasTRPs)) OF TRP-MeasurementRequestItem

TRP-MeasurementRequestItem ::= SEQUENCE {
    trp-ID              TRP-ID,
    search-window-information Search-window-information    OPTIONAL,
    iE-extensions       ProtocolExtensionContainer { { TRP-MeasurementRequestItem-ExtIEs } } OPTIONAL,
    ...
}

TRP-MeasurementRequestItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    { ID id-Cell-ID      CRITICALITY ignore EXTENSION CGI-NR    PRESENCE optional },
    ...
}

TRP-MeasurementResponseList ::= SEQUENCE (SIZE (1..maxNoOfMeasTRPs)) OF TRP-MeasurementResponseItem

TRP-MeasurementResponseItem ::= SEQUENCE {
    trp-ID              TRP-ID,
    measurementResult   TrpMeasurementResult,
    iE-extensions       ProtocolExtensionContainer { { TRP-MeasurementResponseItem-ExtIEs } } OPTIONAL,
    ...
}

TRP-MeasurementResponseItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    { ID id-Cell-ID      CRITICALITY ignore EXTENSION CGI-NR    PRESENCE optional },
    ...
}

TRPInformationListTRPResp ::= SEQUENCE (SIZE (1.. maxnoTRPs)) OF SEQUENCE {
    trpInformation      TRPInformation,
    iE-Extensions       ProtocolExtensionContainer { {TRPInformationTRPResp-ExtIEs} } OPTIONAL,
    ...
}

```



```

TRPInformationTRPResp-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TRPInformation ::= SEQUENCE {
    tRP-ID                      TRP-ID,
    tRPInformationTypeResponseList TRPInformationTypeResponseList,
    iE-Extensions              ProtocolExtensionContainer { { TRPInformation-ExtIEs } } OPTIONAL,
    ...
}

TRPInformation-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TRPInformationTypeResponseList ::= SEQUENCE (SIZE (1..maxnoTRPInfoTypes)) OF TRPInformationTypeResponseItem

TRPInformationTypeResponseItem ::= CHOICE {
    pCI-NR                      INTEGER (0..1007),
    cGI-NR                      CGI-NR,
    aRFCN                      INTEGER (0..3279165),
    pRSConfiguration           PRSConfiguration,
    sSBInfo                    SSBInfo,
    sFNInitialisationTime      SFNInitialisationTime,
    spatialDirectionInformation SpatialDirectionInformation,
    geographicalCoordinates     GeographicalCoordinates,
    choice-extension            ProtocolIE-Single-Container { { TRPInformationTypeResponseItem-ExtIEs } }
}

TRPInformationTypeResponseItem-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

TRPInformationTypeListTRPReq ::= SEQUENCE (SIZE(1.. maxnoTRPInfoTypes)) OF ProtocolIE-Single-Container { {TRPInformationTypeItemTRPReq} }

TRPInformationTypeItemTRPReq NRPPA-PROTOCOL-IES ::= {
    { ID id-TRPInformationTypeItem CRITICALITY reject TYPE TRPInformationTypeItem PRESENCE mandatory },
    ...
}

TRPInformationTypeItem ::= ENUMERATED {
    nrPCI,
    nG-RAN-CGI,
    arfcn,
    pRSConfig,
    sSBInfo,
    sFNInitTime,
    spatialDirectInfo,
    geoCoord,
    ...
}

```

```

}

TRPList ::= SEQUENCE (SIZE(1.. maxnoTRPs)) OF TRPItem

TRPItem ::= SEQUENCE {
    tRP-ID      TRP-ID,
    iE-Extensions ProtocolExtensionContainer { {TRPItem-ExtIEs} } OPTIONAL,
    ...
}

TRPItem-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TRP-ID ::= INTEGER (1.. maxnoTRPs, ...)

TRPPositionDefinitionType ::= CHOICE {
    direct      TRPPositionDirect,
    referenced   TRPPositionReferenced,
    choice-extension
                                     ProtocolIE-Single-Container { { TRPPositionDefinitionType-ExtIEs } }
}

TRPPositionDefinitionType-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

TRPPositionDirect ::= SEQUENCE {
    accuracy      TRPPositionDirectAccuracy,
    iE-extensions ProtocolExtensionContainer { { TRPPositionDirect-ExtIEs } } OPTIONAL,
    ...
}

TRPPositionDirect-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TRPPositionDirectAccuracy ::= CHOICE {
    tRPPosition      NG-RANAccessPointPosition
    tRPPosition      NG-RANAccessPointPosition
    tRPHAPosition     NGRANHighAccuracyAccessPointPosition
    choice-extension  ProtocolIE-Single-Container { { TRPPositionDirectAccuracy-ExtIEs } }
}

TRPPositionDirectAccuracy-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

TRPPositionReferenced ::= SEQUENCE {
    referencePoint      ReferencePoint,
    referencePointType   TRPReferencePointType,
    iE-extensions        ProtocolExtensionContainer { { TRPPositionReferenced-ExtIEs } } OPTIONAL,

```

```

    ...
}

TRPPositionReferenced-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

TRPReferencePointType ::= CHOICE {
    trPPositionRelativeGeodetic      RelativeGeodeticLocation,
    trPPositionRelativeCartesian    RelativeCartesianLocation,
    choice-extension                 ProtocolIE-Single-Container { { TRPReferencePointType-ExtIEs } }
}

TRPReferencePointType-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

TypeOfError ::= ENUMERATED {
    not-understood,
    missing,
    ...
}

-- U

UARFCN ::= INTEGER (0..16383, ...)

UE-Measurement-ID ::= INTEGER (1..15, ..., 256)

UTRA-EcN0 ::= INTEGER (0..49, ...)

UTRA-RSCP ::= INTEGER (-5..91, ...)

UL-AoA ::= SEQUENCE {
    azimuthAoA          INTEGER (0..3599),
    zenithAoA           INTEGER (0..1799)      OPTIONAL,
    lCS-to-GCS-TranslationAoA  LCS-to-GCS-TranslationAoA  OPTIONAL,
    iE-extensions        ProtocolExtensionContainer { { UL-AoA-ExtIEs } }  OPTIONAL,
    ...
}

UL-AoA-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

UL-RTOAMeasurement ::= SEQUENCE {
    uLRTOameas          ULRTOameas,
    additionalPathList  AdditionalPathList  OPTIONAL,
    iE-extensions        ProtocolExtensionContainer { { UL-RTOAMeasurement-ExtIEs } }  OPTIONAL, ...
}

```

```

UL-RTOAMeasurement-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

ULRTOAMeas ::= CHOICE {
    k0      INTEGER (0.. 1970049),
    k1      INTEGER (0.. 985025),
    k2      INTEGER (0.. 492513),
    k3      INTEGER (0.. 246257),
    k4      INTEGER (0.. 123129),
    k5      INTEGER (0.. 61565),
    choice-extension      ProtocolIE-Single-Container { { ULRTOAMeas-ExtIEs } }
}
ULRTOAMeas-ExtIEs NRPPA-PROTOCOL-IES ::= {
    ...
}

UL-SRS-RSRP ::= INTEGER (0..126)

UplinkChannelBW-PerSCS-List ::= SEQUENCE (SIZE (1..maxnoSCSs)) OF SCS-SpecificCarrier

-- V

ValueRSRP-EUTRA ::= INTEGER (0..97, ...)

ValueRSRQ-EUTRA ::= INTEGER (0..34, ...)

ValueRSRP-NR ::= INTEGER (0..127)

ValueRSRQ-NR ::= INTEGER (0..127)

-- W

WLANMeasurementQuantities ::= SEQUENCE (SIZE (0.. maxNoMeas)) OF ProtocolIE-Single-Container { {WLANMeasurementQuantities-ItemIEs} }

WLANMeasurementQuantities-ItemIEs NRPPA-PROTOCOL-IES ::= {
    { ID id-WLANMeasurementQuantities-Item CRITICALITY reject TYPE WLANMeasurementQuantities-Item PRESENCE mandatory}}

WLANMeasurementQuantities-Item ::= SEQUENCE {
    wlanMeasurementQuantitiesValue      WLANMeasurementQuantitiesValue,
    iE-Extensions                        ProtocolExtensionContainer { { WLANMeasurementQuantitiesValue-ExtIEs} } OPTIONAL,
    ...
}

WLANMeasurementQuantitiesValue-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

WLANMeasurementQuantitiesValue ::= ENUMERATED {
    wlan,

```

```

    ...
}

WLANMeasurementResult ::= SEQUENCE (SIZE (1..maxNoMeas)) OF WLANMeasurementResult-Item

WLANMeasurementResult-Item ::= SEQUENCE {
    wlan-RSSI          WLAN-RSSI,
    ssid              SSID OPTIONAL,
    bssid             BSSID OPTIONAL,
    hessid            HESSID OPTIONAL,
    operatingClass     WLANOperatingClass OPTIONAL,
    countryCode       WLANCountryCode OPTIONAL,
    wlanChannelList    WLANChannelList OPTIONAL,
    wlanBand           WLANBand OPTIONAL,
    iE-Extensions      ProtocolExtensionContainer { { WLANMeasurementResult-Item-ExtIEs } } OPTIONAL,
    ...
}

WLANMeasurementResult-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {
    ...
}

WLAN-RSSI ::= INTEGER (0..141, ...)

WLANBand ::= ENUMERATED {band2dot4, band5, ...}

WLANChannelList ::= SEQUENCE (SIZE (1..maxWLANchannels)) OF WLANChannel

WLANChannel ::= INTEGER (0..255)

WLANCountryCode ::= ENUMERATED {
    unitedStates,
    europe,
    japan,
    global,
    ...
}

WLANOperatingClass ::= INTEGER (0..255)

-- X

-- Y

-- Z

END
-- ASN1STOP

```

9.3.6 Common definitions

```
-- ASN1START
-- *****
--
-- Common definitions
--
-- *****

NRPPA-CommonDataTypes {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-access (22) modules (3) nrppa (4) version1 (1) nrppa-CommonDataTypes (3)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *****
--
-- Extension constants
--
-- *****

maxPrivateIEs                INTEGER ::= 65535
maxProtocolExtensions        INTEGER ::= 65535
maxProtocolIEs               INTEGER ::= 65535

-- *****
--
-- Common Data Types
--
-- *****

Criticality      ::= ENUMERATED { reject, ignore, notify }

NRPPATransactionID      ::= INTEGER (0..32767)

Presence          ::= ENUMERATED { optional, conditional, mandatory }

PrivateIE-ID      ::= CHOICE {
    local          INTEGER (0.. maxPrivateIEs),
    global         OBJECT IDENTIFIER
}

ProcedureCode      ::= INTEGER (0..255)

ProtocolIE-ID      ::= INTEGER (0..maxProtocolIEs)

TriggeringMessage  ::= ENUMERATED { initiating-message, successful-outcome, unsuccessful-outcome}

END
```

```
-- ASN1STOP
```

9.3.7 Constant definitions

```
-- ASN1START
-- *****
--
-- Constant definitions
--
-- *****

NRPPA-Constants {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-access (22) modules (3) nrppa (4) version1 (1) nrppa-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

    ProcedureCode,
    ProtocolIE-ID
FROM NRPPA-CommonDataTypes;

-- *****
--
-- Elementary Procedures
--
-- *****

id-errorIndication                ProcedureCode ::= 0
id-privateMessage                 ProcedureCode ::= 1
id-e-CIDMeasurementInitiation     ProcedureCode ::= 2
id-e-CIDMeasurementFailureIndication ProcedureCode ::= 3
id-e-CIDMeasurementReport         ProcedureCode ::= 4
id-e-CIDMeasurementTermination    ProcedureCode ::= 5
id-oTDOAInformationExchange       ProcedureCode ::= 6
id-assistanceInformationControl    ProcedureCode ::= 7
id-assistanceInformationFeedback   ProcedureCode ::= 8
id-positioningInformationExchange  ProcedureCode ::= 9
id-positioningInformationUpdate    ProcedureCode ::= 10
id-Measurement                   ProcedureCode ::= 11
id-MeasurementReport              ProcedureCode ::= 12
id-MeasurementUpdate              ProcedureCode ::= 13
id-MeasurementAbort               ProcedureCode ::= 14
id-MeasurementFailureIndication   ProcedureCode ::= 15
id-tRPFInformationExchange        ProcedureCode ::= 16
id-positioningActivation           ProcedureCode ::= 17
id-positioningDeactivation         ProcedureCode ::= 18
```

```

-- *****
--
-- Lists
--
-- *****

maxNrOfErrors                INTEGER ::= 256
maxCellInRANnode             INTEGER ::= 3840
maxIndexesReport             INTEGER ::= 64
maxNoMeas                    INTEGER ::= 64
maxCellReport                INTEGER ::= 9
maxCellReportNR              INTEGER ::= 9
maxnoOTDOAtypes              INTEGER ::= 63
maxServCell                  INTEGER ::= 5
maxEUTRAMEas                 INTEGER ::= 8
maxGERANMeas                 INTEGER ::= 8
maxNRMeas                    INTEGER ::= 8
maxUTRANMeas                 INTEGER ::= 8
maxWLANchannels              INTEGER ::= 16
maxnoFreqHoppingBandsMinusOne INTEGER ::= 7
maxNoPath                     INTEGER ::= 2
maxNrOfPosSImessage           INTEGER ::= 32
maxnoAssistInfoFailureListItems INTEGER ::= 32
maxNrOfSegments              INTEGER ::= 64
maxNrOfPosSIBs                INTEGER ::= 32
maxNoOfMeasTRPs              INTEGER ::= 64
maxnoTRPs                     INTEGER ::= 65535
maxnoTRPInfoTypes            INTEGER ::= 64
maxnoofAngleInfo             INTEGER ::= 65535
maxnolcs-gcs-translation      INTEGER ::= 3
maxnoBcastCell                INTEGER ::= 16384
maxnoSRSTriggerStates         INTEGER ::= 3
maxnoSpatialRelations         INTEGER ::= 64
maxnoPosMeas                  INTEGER ::= 16384
maxnoSRS-Carriers             INTEGER ::= 32
maxnoSCSs                     INTEGER ::= 5
maxnoSRS-Resources            INTEGER ::= 64
maxnoSRS-PosResources         INTEGER ::= 64
maxnoSRS-ResourceSets         INTEGER ::= 16
maxnoSRS-ResourcePerSet       INTEGER ::= 16
maxnoSRS-PosResourceSets      INTEGER ::= 16
maxnoSRS-PosResourcePerSet    INTEGER ::= 16
maxPRS-ResourceSets           INTEGER ::= 2
maxPRS-ResourcesPerSet        INTEGER ::= 64
maxNoSSBs                     INTEGER ::= 255
maxnoofPRSresourceSet         INTEGER ::= 8
maxnoofPRSresource            INTEGER ::= 64

-- *****
--
-- IEs

```



```
--
-- *****

id-Cause                                         ProtocolIE-ID ::= 0
id-CriticalityDiagnostics                      ProtocolIE-ID ::= 1
id-LMF-UE-Measurement-ID                       ProtocolIE-ID ::= 2
id-ReportCharacteristics                       ProtocolIE-ID ::= 3
id-MeasurementPeriodicity                     ProtocolIE-ID ::= 4
id-MeasurementQuantities                      ProtocolIE-ID ::= 5
id-RAN-UE-Measurement-ID                      ProtocolIE-ID ::= 6
id-E-CID-MeasurementResult                    ProtocolIE-ID ::= 7
id-OTDOACells                                 ProtocolIE-ID ::= 8
id-OTDOA-Information-Type-Group                ProtocolIE-ID ::= 9
id-OTDOA-Information-Type-Item                ProtocolIE-ID ::= 10
id-MeasurementQuantities-Item                 ProtocolIE-ID ::= 11
id-RequestedSRSTransmissionCharacteristics     ProtocolIE-ID ::= 12
id-Cell-Portion-ID                           ProtocolIE-ID ::= 14
id-OtherRATMeasurementQuantities              ProtocolIE-ID ::= 15
id-OtherRATMeasurementQuantities-Item         ProtocolIE-ID ::= 16
id-OtherRATMeasurementResult                  ProtocolIE-ID ::= 17
id-WLANMeasurementQuantities                  ProtocolIE-ID ::= 19
id-WLANMeasurementQuantities-Item             ProtocolIE-ID ::= 20
id-WLANMeasurementResult                      ProtocolIE-ID ::= 21
id-TDD-Config-EUTRA-Item                     ProtocolIE-ID ::= 22
id-Assistance-Information                     ProtocolIE-ID ::= 23
id-Broadcast                                  ProtocolIE-ID ::= 24
id-AssistanceInformationFailureList            ProtocolIE-ID ::= 25
id-SRSConfiguration                           ProtocolIE-ID ::= 26
id-MeasurementResult                          ProtocolIE-ID ::= 27
id-TRP-ID                                    ProtocolIE-ID ::= 28
id-TRPInformationTypeListTRPReq               ProtocolIE-ID ::= 29
id-TRPInformationListTRPResp                  ProtocolIE-ID ::= 30
id-MeasurementBeamInfoRequest                  ProtocolIE-ID ::= 31
id-ResultSS-RSRP                              ProtocolIE-ID ::= 32
id-ResultSS-RSRQ                              ProtocolIE-ID ::= 33
id-ResultCSI-RSRP                             ProtocolIE-ID ::= 34
id-ResultCSI-RSRQ                             ProtocolIE-ID ::= 35
id-AngleOfArrivalNR                           ProtocolIE-ID ::= 36
id-GeographicalCoordinates                     ProtocolIE-ID ::= 37
id-PositioningBroadcastCells                   ProtocolIE-ID ::= 38
id-LMF-Measurement-ID                         ProtocolIE-ID ::= 39
id-RAN-Measurement-ID                         ProtocolIE-ID ::= 40
id-TRP-MeasurementRequestList                  ProtocolIE-ID ::= 41
id-TRP-MeasurementResponseList                 ProtocolIE-ID ::= 42
id-TRP-MeasurementReportList                   ProtocolIE-ID ::= 43
id-SRSType                                    ProtocolIE-ID ::= 44
id-ActivationTime                             ProtocolIE-ID ::= 45
id-SRSResourceSetID                           ProtocolIE-ID ::= 46
id-TRPList                                    ProtocolIE-ID ::= 47
id-SRSSpatialRelation                         ProtocolIE-ID ::= 48
id-SystemFrameNumber                          ProtocolIE-ID ::= 49
id-SlotNumber                                 ProtocolIE-ID ::= 50
id-SRSResourceTrigger                          ProtocolIE-ID ::= 51
```

| | |
|-----------------------------|----------------------|
| id-TRPMeasurementQuantities | ProtocolIE-ID ::= 52 |
| id-AbortTransmission | ProtocolIE-ID ::= 53 |
| id-SFNInitialisationTime | ProtocolIE-ID ::= 54 |
| id-ResultNR | ProtocolIE-ID ::= 55 |
| id-ResultEUTRA | ProtocolIE-ID ::= 56 |
| id-TRPInformationTypeItem | ProtocolIE-ID ::= 57 |
| id-CGI-NR | ProtocolIE-ID ::= 58 |
| id-SFNInitialisationTime-NR | ProtocolIE-ID ::= 59 |
| id-Cell-ID | ProtocolIE-ID ::= 60 |

END
-- ASN1STOP

9.3.8 Container definitions

```
-- ASN1START
-- *****
--
-- Container definitions
--
-- *****

NRPPA-Containers {
itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)
ngran-access (22) modules (3) nrppa (4) version1 (1) nrppa-Containers (5)}

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- *****
--
-- IE parameter types from other modules.
--
-- *****

IMPORTS
    maxPrivateIEs,
    maxProtocolExtensions,
    maxProtocolIEs,
    Criticality,
    Presence,
    PrivateIE-ID,
    ProtocolIE-ID
FROM NRPPA-CommonDataTypes;

-- *****
--
-- Class Definition for Protocol IEs
--
-- *****
```

```

NRPPA-PROTOCOL-IES ::= CLASS {
    &id                ProtocolIE-ID          UNIQUE,
    &criticality        Criticality,
    &Value,
    &presence           Presence
}
WITH SYNTAX {
    ID                &id
    CRITICALITY        &criticality
    TYPE              &Value
    PRESENCE           &presence
}

-- *****
--
-- Class Definition for Protocol Extensions
--
-- *****

NRPPA-PROTOCOL-EXTENSION ::= CLASS {
    &id                ProtocolIE-ID          UNIQUE,
    &criticality        Criticality,
    &Extension,
    &presence           Presence
}
WITH SYNTAX {
    ID                &id
    CRITICALITY        &criticality
    EXTENSION          &Extension
    PRESENCE           &presence
}

-- *****
--
-- Class Definition for Private IEs
--
-- *****

NRPPA-PRIVATE-IES ::= CLASS {
    &id                PrivateIE-ID,
    &criticality        Criticality,
    &Value,
    &presence           Presence
}
WITH SYNTAX {
    ID                &id
    CRITICALITY        &criticality
    TYPE              &Value
    PRESENCE           &presence
}

-- *****

```

```

--
-- Container for Protocol IEs
--
-- *****

ProtocolIE-Container { NRPPA-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (0..maxProtocolIEs)) OF
        ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Single-Container { NRPPA-PROTOCOL-IES : IEsSetParam} ::=
    ProtocolIE-Field {{IEsSetParam}}

ProtocolIE-Field { NRPPA-PROTOCOL-IES : IEsSetParam} ::= SEQUENCE {
    id                NRPPA-PROTOCOL-IES.&id                ({IEsSetParam}),
    criticality        NRPPA-PROTOCOL-IES.&criticality        ({IEsSetParam}{@id}),
    value              NRPPA-PROTOCOL-IES.&Value              ({IEsSetParam}{@id})
}

-- *****
--
-- Container Lists for Protocol IE Containers
--
-- *****

ProtocolIE-ContainerList {INTEGER : lowerBound, INTEGER : upperBound, NRPPA-PROTOCOL-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (lowerBound..upperBound)) OF
        ProtocolIE-Container {{IEsSetParam}}

-- *****
--
-- Container for Protocol Extensions
--
-- *****

ProtocolExtensionContainer { NRPPA-PROTOCOL-EXTENSION : ExtensionSetParam} ::=
    SEQUENCE (SIZE (1..maxProtocolExtensions)) OF
        ProtocolExtensionField {{ExtensionSetParam}}

ProtocolExtensionField { NRPPA-PROTOCOL-EXTENSION : ExtensionSetParam} ::= SEQUENCE {
    id                NRPPA-PROTOCOL-EXTENSION.&id                ({ExtensionSetParam}),
    criticality        NRPPA-PROTOCOL-EXTENSION.&criticality        ({ExtensionSetParam}{@id}),
    extensionValue      NRPPA-PROTOCOL-EXTENSION.&Extension        ({ExtensionSetParam}{@id})
}

-- *****
--
-- Container for Private IEs
--
-- *****

PrivateIE-Container { NRPPA-PRIVATE-IES : IEsSetParam} ::=
    SEQUENCE (SIZE (1..maxPrivateIEs)) OF
        PrivateIE-Field {{IEsSetParam}}

```

```
PrivateIE-Field { NRPPA-PRIVATE-IES : IEsSetParam} ::= SEQUENCE {  
    id          NRPPA-PRIVATE-IES.&id          ({IEsSetParam}),  
    criticality NRPPA-PRIVATE-IES.&criticality  ({IEsSetParam}{@id}),  
    value       NRPPA-PRIVATE-IES.&Value       ({IEsSetParam}{@id})  
}  
  
END  
-- ASN1STOP
```

9.4 Message transfer syntax

NRPPa shall use the ASN.1 Basic Packed Encoding Rules (BASIC-PER) Aligned Variant as transfer syntax, as specified in ref. ITU-T Rec. X.691 [6].

9.5 Timers

Void.

10 Handling of unknown, unforeseen and erroneous protocol data

Section 10 of TS 36.455 [12] is applicable for the purposes of the present document.

Annex A (informative): Change history

| Change history | | | | | | | |
|----------------|-----------------|-----------|------|-----|-----|--|-------------|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2017-08-23 | RAN3#97 | R3-173238 | | | | TS skeleton agreed | v0.0.0 |
| 2017-08-25 | RAN3#97 | R3-173374 | | | | TS 38.455 V0.1.0 | v0.1.0 |
| 2017-10-18 | RAN3#97bis | R3-173979 | | | | Implemented agreed pCR from R3#97bis | V0.2.0 |
| 2017-12-04 | RAN3#98 | R3-175064 | | | | Implemented agreed pCR from R3#98 | V0.3.0 |
| 2018-01-31 | RAN3 Adhoc 1801 | R3-180658 | | | | Implemented agreed pCR from R3 Adhoc_1801 | V0.5.0 |
| 2018-03-15 | RAN3#99 | R3-181595 | | | | Implemented agreed pCR's from R3#99 | V0.6.0 |
| 2018-05-29 | RAN3#100 | R3-183598 | | | | Implemented agreed pCR's from R3#100 | V0.7.0 |
| 2018-06 | RAN#80 | RP-181147 | | | | Submitted to RAN plenary for Approval | V1.0.0 |
| 2018-06 | RAN#80 | - | - | - | - | Specification approved at TSG-RAN and placed under change control | 15.0.0 |
| 2018-09 | RAN#81 | RP-181921 | 0002 | 1 | F | Rapporteur CR for TS 38.455 | 15.1.0 |
| 2018-12 | RAN#82 | RP-182446 | 0003 | 1 | F | Addition of TDD UL/DL configuration to OTDOA assistance data | 15.2.0 |
| 2019-01 | RAN#82 | | | | | Editorial Corrections: - 1 editorial correction to ASN.1 - adding "ASN1START" and "ASN1STOP" TAGs to the ASN.1 | 15.2.1 |
| 2020-07 | SA#88-e | - | - | - | - | Update to Rel-16 version (MCC) | 16.0.0 |
| 2020-09 | SA#89-e | RP-201849 | 0008 | 19 | B | Introduction of NR Positioning in NRPPa | 16.1.0 |
| 2020-12 | RAN#90-e | RP-202315 | 0014 | 2 | A | Support OTDOA assistance data for case of NR serving cell | 16.2.0 |
| 2020-12 | RAN#90-e | RP-202311 | 0015 | 2 | F | Corrections to tabular and asn.1 for NR positioning (NRPPa) | 16.2.0 |
| 2020-12 | RAN#90-e | RP-202311 | 0016 | - | F | Correction of NRPPa positioning procedures | 16.2.0 |
| 2020-12 | RAN#90-e | RP-202311 | 0021 | 1 | F | RRC alignment and various correction including ASN.1 | 16.2.0 |
| 2020-12 | RAN#90-e | RP-202311 | 0022 | 2 | F | Coupling TRP ID and Cell ID in Measurement procedures | 16.2.0 |