3GPP TSG-RAN WG2 #110e *DRAFT* R2-2005904

Online, June 01 – 12, 2020

Agenda Item: 6.8.2.3

Source: Ericsson

Title: [AT110-e][612][POS] Report on TRP-ID continuation email discussion (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

This document provides discussion templates and reports the following email discussion:

* [AT110-e][612][POS] TRP-ID continuation (Ericsson)

Scope: Continue discussion of the open issues from R2-2004704 and converge where possible. Open issues identified:

* Name of the integer identifier for a TRP
* Unique identification of a DL-PRS resource between the UE and the LMF
* Need for an additional identifier in the measurement information
* Need for a cell identifier in DL-PRS assistance data
* Need for a cell identifier in UE-based assistance data

Intended outcome: Report of discussion, in R2-2005894 – updated report in R2-2005904

Deadline: Thursday 2020-06-04 1800 UTC – extended to Wednesday 2020-06-10 1000 UTC

The online discussion during RAN2#110-e led to the following agreements:

Agreements:

The TRP-ID IE is replaced by separate IEs signalled in the separate cases where previously the TRP-ID was used.

The existing dl-PRS-Id field retains its range as INTEGER (0..255) and is broken out as a separate IE.

The included identifiers of the NR E-CID Signal Measurement Information per cell are the NR physical cell identity, NR cell global identity (shall be provided if the device was able to determine the NCGI of the measured cell at the time of measurement) and NRARFCN.

The NR-SSB-Config IE includes NR physical cell identity and NR ARFCN but no (0..255) TRP ID.

Some issues are however still open:

1. Any optional cell identifiers per TRP associated to TRPs in the DL-PRS and UEB AD, as well as UEA measurements
2. Any optional cell identifiers of the NR-DL-PRS-AssistanceDataPerTRP IE
3. Any optional cell identifiers associated to each TRP of the \*-measResult IEs
4. Any optional cell identifiers associated to each TRP of the NR-TRP-LocationInfo, NR-DL-PRS-BeamInfo, ReferenceTRP-RTD-Info, RTD-InfoElement IEs
5. The optional cell identifiers of the NR-TimeStamp IE

# 2 Discussion

The following subsections addresses the open issues, first with the input provided from companies in [1] in section 2.x.1, and then the discussion template in 2.x.2, where applicable.

## 2.1 Any optional cell identifiers per TRP associated to TRPs in the DL-PRS and UEB AD, as well as UEA measurements

The DL-PRS-ID IE enables the device to associate the NR DL-PRS assistance data with measurements and UEB assistance data within an LPP session. However, there are also scenarios where NR DL-PRS AD and/or parts or all UEB AD are provided via a mix of unicast and broadcast and/or the UEA measurements per TRP are provided via unicast, which means that there is a need to cross-identify the information per TRP via these different resources. Therefore, there is a need for additional cell identifiers.

Since the optional cell identifiers associated with a TRP as part of the DL-PRS AD, UEB AD and UEA measurements are inter-related, we gather all these aspects in a common discussion about optional cell identifiers per TRP in these contexts. Hopefully, it is enough to address this issue in common and there is no need for the discussion under sections 2.2, 2.3 and 2.4.

Companies are asked to provide their view regarding any optional cell identifier information in the IE per TRP by an ‘x’ in the corresponding column together with motivations and comments.

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| Issue 1 The optional cell identifiers of the IE associated to TRPs in the DL-PRS and UEB AD, as well as UEA measurements | | | |
| Company | PCI+NR-ARFCN | NCGI | Motivation/comment |
| Qualcomm | x | x | See our comments to the previous 3 (?) email discussions on the same topic. |
| Nokia | x | x | Given that LMF signals DL PRS config for UEB AD and UEA measurements for a pool of 256 TRPs, which is a subset of the total deployed in the network, indicating the associated cell and frequency layer information is useful for UE to store and use TRP information. |
| OPPO | X | X | We also agree that broadcast-based AD provisioning cause the main reason for globally unique ID, e.g., PCI+ARFCN / NCGI. |
| CATT | x | x | PCI+NR-ARFCN/NCGI is required in DL-PRS AD because UE needs to get the sfn of reference TRP.  PCI+NR-ARFCN/NCGI is required in UEA measurements so the LMF can identify the measurement. Because the TRP which is relative to this report may not belong to the TRP list which were sent in this LPP session. |
| Spreadtrum |  |  | DL-PRS-ID is enough for DL-PRS AD and UEA measurement which is under a session. PCI+NR-ARFCN or NCGI is OK for DL-PRS AD and UEB AD for UEB positioning.  A little confusion on the mix mode of unicast and broadcast. Does this mean that DL-PRS-ID is referenced in UEB AD for the scenario DL-PRS AD are provided by unicast while UEB AD such as NR-UEB-TRP-LocationData-r16 are provided via broadcast? If the answer is yes, I guess there will be problems because the DL-PRS-ID is per session per UE while NR-UEB-TRP-LocationData-r16 is for all UEs. |
| Huawei, HiSilicon |  |  | For the case of broadcast AD, UE should report the cell id though which the UE obtains the broadcast AD for measurement report. But not to add cell identifies within the measurement report for DL PRS.  For DL-PRS and UE-based AD, there is no need to contain cell identity. |
| Ericsson | (x) | x | There is a need for a possibility to tie the TRP to some global ID to allow matching between unicast and broadcast. |
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Summary: Five companies in favor of adding NCGI, PCI, NR-ARFCN, one company conditionally in favor in case different parts of the AD can be distributed via broadcast and unicast (it is the case). One company not in favor of cell IDs for DL-PRS and UE-based AD.

Based on a majority vote, the following proposal can be agreeable:

1. Add NCGI, PCI and NR-ARFCN as optional cell identifiers of the IE associated to TRPs in the DL-PRS and UEB AD, as well as UEA measurements.

## 2.2 Any optional cell identifiers of the NR-DL-PRS-AssistanceDataPerTRP IE

The *NR-DL-PRS-AssistanceDataPerTRP* IE is part of the IE *NR-DL-PRS-AssistanceData*.

### 2.2.1 Input from [1]

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| Table 2.7 Need for additional TRP identifiers in *NR-DL-PRS-AssistanceDataPerTRP-r16* | |
| Company | Comments |
| Huawei/HiSilicon | *dl-PRS-ID*, *nr-PhysCellId*, *nr-CellGlobalId*  Considering broadcast and positioning SIB may be different for different cell, Cell ID should be included, and optional.  No need for ARFCN, as *dl-PRS-PointA* is already provided in *NR-DL–PRS-PositioningFrequencyLayer* |
| Qualcomm | *dl-PRS-ID*, *nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId*  I understand the *nr-ARFCN* can disambiguate the *nr-PhysCellId* in some cases. I.e., this is the same as in Rel-15 LPP where PCI/ARFCN can be provided as pair. If this is not applicable to NR (and we made a mistake in Rel-15), then I agree with Huawei and *nr-ARFCN* is not needed (note, I understand this *nr-ARFCN* is not supposed to be the *dl-PRS-PointA*).  As mentioned in the comment above (RAN1 agreement), the *dl-PRS-ID* identifies a DL-PRS Resource of a TRP, but not necessarily the TRP. Therefore, the possible identifiers of a TRP (*nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId)* need to be provided in some cases to uniquely identify a TRP and associated measurement. E.g., when the assistance data are not provided from the same source or the same LPP session.  In general, we cannot see anything wrong with the current LPP (apart from the somewhat misleading name of the *TRP-ID* IE). All fields are optional present in the IE and can be provided when needed/appropriate. |
| OPPO | *dl-PRS-ID +* Either *nr-PhysCellId/nr-ARFCN* Or *nr-CellGlobalId*  PRS ID only is not enough since it is unique within a TRP but not across TRPs. So to uniquely identify a TRP, either the combination of *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId* can work, by assuming no local PCI confusion at a same local area for a same frequency. May be the latter one, i.e., *nr-CellGlobalId*, is safer. This applies to both UL and DL.  So we fail to see the need to include both the combination of *nr-PhysCellId/nr-ARFCN* and *nr-CellGlobalId* in DL PRS info here. |
| Ericsson | As explained above, there is a *nr-CellGlobalId* presented together with the DL-PRS in the broadcast, and a *nr-CellGlobalId* in the AD request in case of unicast, so an additional cell ID is not needed. |
| CATT | As explained above, slightly prefer dl-PRS-ID + Either nr-PhysCellId/nr-ARFCN Or nr-CellGlobalId. But wonder nr-ARFCN needs to be configured for each TRP as TRPs within a frequency layer sharing the same nr-ARFCN. |
| Intel | For the AD from LMF via LPP, and corresponding measurement reports, ID 0-255 is sufficient.  The only question is whether it is allowed to provide more than 255 TRPs in broadcast AD? If yes, ID defined in RAN1 is not sufficient. Additional ID, e.g. PCI/ARFCN or CGI is needed. |
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### 2.2.2 Discussion template

Companies are asked to provide their view regarding any optional cell identifier information in the *NR-DL-PRS-AssistanceDataPerTRP* IE by an ‘x’ in the corresponding column together with motivations and comments.

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| Issue 2 Any optional cell identifiers of the NR-DL-PRS-AssistanceDataPerTRP IE | | | |
| Company | PCI+NR-ARFCN | NCGI | Motivation/comment |
| Qualcomm | x | x | See our comments to the previous 3 (?) email discussions on the same topic. |
| Nokia | x | x | Given that LMF signals DL PRS config for UEB AD and UEA measurements for a pool of 256 TRPs, which is a subset of the total deployed in the network, indicating the associated cell and frequency layer information is useful for UE to store and use TRP information. |
| OPPO | X | X | We also agree that broadcast-based AD provisioning cause the main reason for globally unique ID, e.g., PCI+ARFCN / NCGI. |
| CATT | x | x | PCI+NR-ARFCN/NCGI is required in *NR-DL-PRS-AssistanceDataPerTRP* because UE needs to get the sfn of reference TRP. |
| Spreadtrum | x | x | PCI+NR-AFRCN or NCGI. In some cases, ARFCN can be omitted if it can be deferred as described by companies above. |
| Huawei/HiSilicon |  |  | We update our view that PCI/NR ARFCN/NGCI are not needed even in case of broadcast AD, because they cannot be used with PRS\_ID to identify a TRP.  We suggest UE to report the serving cell ID in the measurement report through which it accesses the broadcast AD. |
| Ericsson | (X) | X |  |
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Summary: Six companies in favor of adding NCGI, PCI, NR-ARFCN, one company thinks that it is enough to only use serving cell NCGI.

## 2.3 Any optional cell identifiers associated to each TRP of the \*-measResult IEs

The *NR-Multi-RTT-MeasElement* IE is part of the IE *NR-Multi-RTT-SignalMeasurementInformation*, the *NR-DL-AoD-MeasElement* IE is part of the IE *NR-DL-AoD-SignalMeasurementInformation*, and the *NR-DL-TDOA-MeasElement* IE is part of the IE *NR-DL-TDOA-SignalMeasurementInformation*

### 2.3.1 Input from [1]

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| Table 2.1 Need for additional TRP identifiers in *NR-Multi-RTT-MeasElement-r16* | |
| Company | Comments |
| Huawei/HiSilicon | *dl-PRS-ID*, *nr-PhysCellId*, *nr-CellGlobalId*  Considering broadcast and positioning SIB may be different for different cell, Cell ID should be included, and optional.  No need for ARFCN, as *dl-PRS-PointA* is already provided in *NR-DL–PRS-PositioningFrequencyLayer* |
| Qulcomm | *dl-PRS-ID*, *nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId*  I understand the *nr-ARFCN* can disambiguate the *nr-PhysCellId* in some cases. I.e., this is the same as in Rel-15 LPP where PCI/ARFCN can be provided as pair. If this is not applicable to NR (and we made a mistake in Rel-15), then I agree with Huawei and *nr-ARFCN* is not needed (note, I understand this *nr-ARFCN* is not supposed to be the *dl-PRS-PointA*).  As mentioned in the comment above (RAN1 agreement), the *dl-PRS-ID* identifies a DL-PRS Resource of a TRP, but not necessarily the TRP. Therefore, the possible identifiers of a TRP (*nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId)* need to be provided in some cases to uniquely identify a TRP and associated measurements. E.g., when the assistance data are not provided from the same source or the same LPP session.  In general, we cannot see anything wrong with the current LPP (apart from the somewhat misleading name of the *TRP-ID* IE). All fields are optional present in this IE and can be provided when needed/appropriate. |
| OPPO | *dl-PRS-ID +* Either *nr-PhysCellId/nr-ARFCN* Or *nr-CellGlobalId*  PRS ID only is not enough since it is unique within a TRP but not across TRPs. So to uniquely identify a TRP, either the combination of *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId* can work, by assuming no local PCI confusion at a same local area for a same frequency. May be the latter one, i.e., *nr-CellGlobalId*, is safer. This applies to both UL and DL.  So we fail to see the need to include both the combination of *nr-PhysCellId/nr-ARFCN* and *nr-CellGlobalId* in UL report here for multi-RTT. |
| Ericsson | We read the RAN1 agreement differently. The TRP ID is like the country code of a telephone number that together with an area code and a local number identifies the number identity. Same here, where the DL PRS resource is identified by a TRP-ID, a DL-PRS resource set ID and a DL PRS resource ID.  Therefore, to name the “country code” a “local number identifier” would be strange, and to name the identify of the TRP a DL-PRS ID would also be confusing.  It is important to consider the context here.  A UE requesting DL-PRS assistance data is including the nr-CellGlobalId to the LMF and in return obtains a DL-PRS resources in a hierarchy based on TRPs per frequency layers. A UE retrieving assistance data via system information broadcast from a cell also obtains the nr-CellGlobalId of that cell. Therefore, there is already nr-CellGlobalId + TRP ID provided to the UE to ensure that the UE can handle information from different sources for UEB.  Therefore, it is enough to provide a TRP ID 0..255 to the UE. When the UE provides measurements to the LMF, the corresponding measurement is tied to a TRP with a TRP ID, and since the UE can be configured with up to 4\*64=256 TRPs, the TRP ID 0..255 is enough to identify the measurement as part of UEA.  With a globally unique cell identifier in the unicast AD request and in the broadcast SIB1, and a list of TRPs, each with a TRP ID, how can there be a need for something in addition to that? We do not see any technical motivation for additional identifiers. |
| CATT | *dl-PRS-ID +* either *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId.*  From a UE perspective, we agree with Ericsson it is enough to identify a TRP with 256 value. But LMF serves a large area. LMF needs *dl-PRS-ID +* either *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId* to identify a TRP when receiving measurement info from a UE. In order to avoid the LMF storing the mapping for a UE between *dl-PRS-ID +* either *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId* and a TRP id for the UE, we slighly prefer to introduce *dl-PRS-ID +* either *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId.* |
| Intel | For the AD from LMF via LPP, and corresponding measurement reports, ID 0-255 is sufficient.  The only question is whether it is allowed to provide more than 255 TRPs in broadcast AD? If yes, ID defined in RAN1 is not sufficient. Additional ID, e.g. PCI/ARFCN or CGI is needed. |
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| Table 2.2 Need for additional TRP identifiers in *NR-DL-AoD-MeasElement-r16* | |
| Company | Comments |
| Huawei/HiSilicon | *dl-PRS-ID*, *nr-PhysCellId*, *nr-CellGlobalId*  Considering broadcast and positioning SIB may be different for different cell, Cell ID should be included, and optional.  No need for ARFCN, as *dl-PRS-PointA* is already provided in *NR-DL–PRS-PositioningFrequencyLayer* |
| Qualcomm | *dl-PRS-ID*, *nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId*  I understand the *nr-ARFCN* can disambiguate the *nr-PhysCellId* in some cases. I.e., this is the same as in Rel-15 LPP where PCI/ARFCN can be provided as pair. If this is not applicable to NR (and we made a mistake in Rel-15), then I agree with Huawei and *nr-ARFCN* is not needed (note, I understand this *nr-ARFCN* is not supposed to be the *dl-PRS-PointA*).  As mentioned in the comment above (RAN1 agreement), the *dl-PRS-ID* identifies a DL-PRS Resource of a TRP, but not necessarily the TRP. Therefore, the possible identifiers of a TRP (*nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId)* need to be provided in some cases to uniquely identify a TRP and associated measurements. E.g., when the assistance data are not provided from the same source or the same LPP session.  In general, we cannot see anything wrong with the current LPP (apart from the somewhat misleading name of the *TRP-ID* IE). All fields are optional present in this IE and can be provided when needed/appropriate. |
| OPPO | *dl-PRS-ID +* Either *nr-PhysCellId/nr-ARFCN* Or *nr-CellGlobalId*  PRS ID only is not enough since it is unique within a TRP but not across TRPs. So to uniquely identify a TRP, either the combination of *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId* can work, by assuming no local PCI confusion at a same local area for a same frequency. May be the latter one, i.e., *nr-CellGlobalId*, is safer. This applies to both UL and DL.  So we fail to see the need to include both the combination of *nr-PhysCellId/nr-ARFCN* and *nr-CellGlobalId* in UL report here for DL-AoD. |
| Ericsson | We read the RAN1 agreement differently. The TRP ID is like the country code of a telephone number that together with an area code and a local number identifies the number identity. Same here, where the DL PRS resource is identified by a TRP-ID, a DL-PRS resource set ID and a DL PRS resource ID.  Therefore, to name the “country code” a “local number identifier” would be strange, and to name the identify of the TRP a DL-PRS ID would also be confusing.  It is important to consider the context here.  A UE requesting DL-PRS assistance data is including the nr-CellGlobalId to the LMF and in return obtains a DL-PRS resources in a hierarchy based on TRPs per frequency layers. A UE retrieving assistance data via system information broadcast from a cell also obtains the nr-CellGlobalId of that cell. Therefore, there is already nr-CellGlobalId + TRP ID provided to the UE to ensure that the UE can handle information from different sources for UEB.  Therefore, it is enough to provide a TRP ID 0..255 to the UE. When the UE provides measurements to the LMF, the corresponding measurement is tied to a TRP with a TRP ID, and since the UE can be configured with up to 4\*64=256 TRPs, the TRP ID 0..255 is enough to identify the measurement as part of UEA.  With a globally unique cell identifier in the unicast AD request and in the broadcast SIB1, and a list of TRPs, each with a TRP ID, how can there be a need for something in addition to that? We do not see any technical motivation for additional identifiers. |
| CATT | As explained above, slightly prefer dl-PRS-ID + Either nr-PhysCellId/nr-ARFCN Or nr-CellGlobalId. |
| Intel | Same as above. |
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| Table 2.3 Need for additional TRP identifiers in *NR-DL-TDOA-MeasElement-r16* | |
| Company | Comments |
| Huawei/HiSilicon | *dl-PRS-ID*, *nr-PhysCellId*, *nr-CellGlobalId*  Considering broadcast and positioning SIB may be different for different cell, Cell ID should be included, and optional.  No need for ARFCN, as *dl-PRS-PointA* is already provided in *NR-DL–PRS-PositioningFrequencyLayer* |
| Qualcomm | *dl-PRS-ID*, *nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId*  I understand the *nr-ARFCN* can disambiguate the *nr-PhysCellId* in some cases. I.e., this is the same as in Rel-15 LPP where PCI/ARFCN can be provided as pair. If this is not applicable to NR (and we made a mistake in Rel-15), then I agree with Huawei and *nr-ARFCN* is not needed (note, I understand this *nr-ARFCN* is not supposed to be the *dl-PRS-PointA*).  As mentioned in the comment above (RAN1 agreement), the *dl-PRS-ID* identifies a DL-PRS Resource of a TRP, but not necessarily the TRP. Therefore, the possible identifiers of a TRP (*nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId)* need to be provided in some cases to uniquely identify a TRP and associated measurements. E.g., when the assistance data are not provided from the same source or the same LPP session.  In general, we cannot see anything wrong with the current LPP (apart from the somewhat misleading name of the *TRP-ID* IE). All fields are optional present in this IE and can be provided when needed/appropriate. |
| OPPO | *dl-PRS-ID +* Either *nr-PhysCellId/nr-ARFCN* Or *nr-CellGlobalId*  PRS ID only is not enough since it is unique within a TRP but not across TRPs. So to uniquely identify a TRP, either the combination of *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId* can work, by assuming no local PCI confusion at a same local area for a same frequency. May be the latter one, i.e., *nr-CellGlobalId*, is safer. This applies to both UL and DL.  So we fail to see the need to include both the combination of *nr-PhysCellId/nr-ARFCN* and *nr-CellGlobalId* in UL report here for DL-TDOA. |
| Ericsson | We read the RAN1 agreement differently. The TRP ID is like the country code of a telephone number that together with an area code and a local number identifies the number identity. Same here, where the DL PRS resource is identified by a TRP-ID, a DL-PRS resource set ID and a DL PRS resource ID.  Therefore, to name the “country code” a “local number identifier” would be strange, and to name the identify of the TRP a DL-PRS ID would also be confusing.  It is important to consider the context here.  A UE requesting DL-PRS assistance data is including the nr-CellGlobalId to the LMF and in return obtains a DL-PRS resources in a hierarchy based on TRPs per frequency layers. A UE retrieving assistance data via system information broadcast from a cell also obtains the nr-CellGlobalId of that cell. Therefore, there is already nr-CellGlobalId + TRP ID provided to the UE to ensure that the UE can handle information from different sources for UEB.  Therefore, it is enough to provide a TRP ID 0..255 to the UE. When the UE provides measurements to the LMF, the corresponding measurement is tied to a TRP with a TRP ID, and since the UE can be configured with up to 4\*64=256 TRPs, the TRP ID 0..255 is enough to identify the measurement as part of UEA.  With a globally unique cell identifier in the unicast AD request and in the broadcast SIB1, and a list of TRPs, each with a TRP ID, how can there be a need for something in addition to that? We do not see any technical motivation for additional identifiers. |
| CATT | As explained above, slightly prefer dl-PRS-ID + Either nr-PhysCellId/nr-ARFCN Or nr-CellGlobalId. |
| Intel | Same as above. |
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### 2.3.2 Discussion template

Companies are asked to provide their view regarding any optional cell identifier information in the \*-measResult IE by an ‘x’ in the corresponding column together with motivations and comments.

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| Issue 3 3. Any optional cell identifiers associated to each TRP of the \*-measResult IEs | | | |
| Company | PCI+NR-ARFCN | NCGI | Motivation/comment |
| Qualcomm | x | x | See our comments to the previous 3 (?) email discussions on the same topic. |
| Nokia | x | x | Same reasoning as for signaling in downlink. Helps LMF to know which cells the TRP are associated with for any look up operation or associative operation. |
| OPPO | X | X | We also agree that broadcast-based AD provisioning cause the main reason for globally unique ID, e.g., PCI+ARFCN / NCGI. |
| Spreadtrum |  |  | No one is needed for a unique TRP can be addressed by the LMF with a DL-PRS-ID in the session for the UE. |
| Huawei/HiSlicon |  |  | We update our view that PCI/NR ARFCN/NGCI are not needed even in case of broadcast AD, because they cannot be used with PRS\_ID to identify a TRP.  We suggest UE to report the serving cell ID in the measurement report through which it accesses the broadcast AD in the message body of provideLocationInforamtion. |
| Ericsson | (X) | X |  |
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Summary: Five companies in favor of adding NCGI, PCI, NR-ARFCN, one company not in favor

## 2.4 Any optional cell identifiers associated to each TRP of the NR-TRP-LocationInfo, NR-DL-PRS-BeamInfo, ReferenceTRP-RTD-Info, RTD-InfoElement IEs

The IEs The IEs *NR-TRP-LocationInfo, NR-DL-PRS-BeamInfo,* *ReferenceTRP-RTD-Info* and *RTD-InfoElement* are part of the UEB AD.

### 2.4.1 Input from [1]

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| Table 2.9 Need for additional TRP identifiers in *ReferenceTRP-RTD-Info-r16* and *RTD-InfoElement-r16* | |
| Company | Comments |
| Huawei/HiSilicon | We think only *dl-PRS-ID* is needed. |
| Qualcomm | *dl-PRS-ID*, *nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId*  As mentioned in the comment above (RAN1 agreement), the *dl-PRS-ID* identifies a DL-PRS Resource of a TRP, but not necessarily the TRP. Therefore, the possible identifiers of a TRP (*nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId)* need to be provided in some cases to uniquely identify a TRP and associated measurement. E.g., when the assistance data are not provided from the same source or the same LPP session.  Also, e.g. RTD and TRP location info can be provided in different posSIBs, and a UE may get the posSIBs from different cells. A UE need to be able to uniquely associate the assistance data to the correct TRP, even when provided from different sources (e.g., different cells/posSIBs, different LPP messages of the same or different LPP session, MO-LR, etc.).  In general, we cannot see anything wrong with the current LPP (apart from the somewhat misleading name of the *TRP-ID* IE). All fields are optional present in the *TRP-ID* IE and can be provided when needed/appropriate. |
| OPPO | *dl-PRS-ID +* Either *nr-PhysCellId/nr-ARFCN* Or *nr-CellGlobalId*  PRS ID only is not enough since it is unique within a TRP but not across TRPs. So to uniquely identify a TRP, either the combination of *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId* can work, by assuming no local PCI confusion at a same local area for a same frequency. May be the latter one, i.e., *nr-CellGlobalId*, is safer. This applies to both UL and DL.  So we fail to see the need to include both the combination of *nr-PhysCellId/nr-ARFCN* and *nr-CellGlobalId* in RTD info here. |
| Ericsson | It is important to consider the context here.  A UE requesting DL-PRS assistance data is including the nr-CellGlobalId to the LMF and in return obtains a DL-PRS resources in a hierarchy based on TRPs per frequency layers. A UE retrieving assistance data via system information broadcast from a cell also obtains the nr-CellGlobalId of that cell. Therefore, there is already nr-CellGlobalId + TRP ID provided to the UE to ensure that the UE can handle information from different sources for UEB.  Therefore, it is enough to provide a TRP ID 0..255 to the UE. |
| CATT | As explained above, slightly prefer dl-PRS-ID + Either nr-PhysCellId/nr-ARFCN Or nr-CellGlobalId. But wonder nr-ARFCN needs to be configured for each TRP as TRPs within a frequency layer share the same nr-ARFCN. |
| Intel | For the AD from LMF via LPP, and corresponding measurement reports, ID 0-255 is sufficient.  The only question is whether it is allowed to provide more than 255 TRPs in broadcast AD? If yes, ID defined in RAN1 is not sufficient. Additional ID, e.g. PCI/ARFCN or CGI is needed. |
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|  |  |
| --- | --- |
| Table 2.10 Need for additional TRP identifiers in *NR-TRP-LocationInfo-r16 and NR-DL-PRS-BeamInfo-r16* | |
| Company | Comments |
| Huawei/HiSilicon | We think only *dl-PRS-ID* is needed. |
| Qualcomm | *dl-PRS-ID*, *nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId*  As mentioned in the comment above (RAN1 agreement), the *dl-PRS-ID* identifies a DL-PRS Resource of a TRP, but not necessarily the TRP. Therefore, the possible identifiers of a TRP (*nr-PhysCellId/nr-ARFCN*, *nr-CellGlobalId)* need to be provided in some cases to uniquely identify a TRP and associated measurement. E.g., when the assistance data are not provided from the same source or the same LPP session.  Also, e.g. RTD and TRP location info can be provided in different posSIBs, and a UE may get the posSIBs from different cells. A UE need to be able to uniquely associate the assistance data to the correct TRP, even when provided from different sources (e.g., different cells/posSIBs, different LPP messages of the same or different LPP session, MO-LR, etc.).  In general, we cannot see anything wrong with the current LPP (apart from the somewhat misleading name of the *TRP-ID* IE). All fields are optional present in the *TRP-ID* IE and can be provided when needed/appropriate. |
| OPPO | *dl-PRS-ID +* Either *nr-PhysCellId/nr-ARFCN* Or *nr-CellGlobalId*  PRS ID only is not enough since it is unique within a TRP but not across TRPs. So to uniquely identify a TRP, either the combination of *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId* can work, by assuming no local PCI confusion at a same local area for a same frequency. May be the latter one, i.e., *nr-CellGlobalId*, is safer. This applies to both UL and DL.  So we fail to see the need to include both the combination of *nr-PhysCellId/nr-ARFCN* and *nr-CellGlobalId* in TRP location and beam info here. |
| Ericsson | It is important to consider the context here.  A UE requesting DL-PRS assistance data is including the nr-CellGlobalId to the LMF and in return obtains a DL-PRS resources in a hierarchy based on TRPs per frequency layers. A UE retrieving assistance data via system information broadcast from a cell also obtains the nr-CellGlobalId of that cell. Therefore, there is already nr-CellGlobalId + TRP ID provided to the UE to ensure that the UE can handle information from different sources for UEB.  Therefore, it is enough to provide a TRP ID 0..255 to the UE. |
| CATT | As explained above, slightly prefer dl-PRS-ID + Either nr-PhysCellId/nr-ARFCN Or nr-CellGlobalId. But wonder nr-ARFCN needs to be configured for each TRP as TRPs within a frequency layer share the same nr-ARFCN. |
| Intel | For the AD from LMF via LPP, and corresponding measurement reports, ID 0-255 is sufficient.  The only question is whether it is allowed to provide more than 255 TRPs in broadcast AD? If yes, ID defined in RAN1 is not sufficient. Additional ID, e.g. PCI/ARFCN or CGI is needed. |
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### 2.4.2 Discussion template

|  |  |  |  |
| --- | --- | --- | --- |
| Issue 4 4. Any optional cell identifiers associated to each TRP of the NR-TRP-LocationInfo, NR-DL-PRS-BeamInfo, ReferenceTRP-RTD-Info, RTD-InfoElement IEs | | | |
| Company | PCI+NR-ARFCN | NCGI | Motivation/comment |
| Qualcomm | x | x | See our comments to the previous 3 (?) email discussions on the same topic. |
| Nokia | x | x | See comments in 2.2.2 and 2.3.2 |
| OPPO | X | X | We also agree that broadcast-based AD provisioning cause the main reason for globally unique ID, e.g., PCI+ARFCN / NCGI. |
| Spreadtrum | X | x | PCI+NR-ARFCN or NCGI. |
| Huawei/HiSilicon |  |  | No need.  Cell ID should only be used with TRP ID (defined by RAN3) to identify a TRP; by no means can it be used with PRS ID for that purpose. |
| Ericsson | (X) | X |  |
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|  |  |  |  |
|  |  |  |  |

Summary: Five companies in favor of adding NCGI, PCI, NR-ARFCN, one company not in favor.

## 2.5 The optional cell identifiers of the NR-TimeStamp IE

The NR time stamp is provided as SFN and slot number, which needs to be associated to a cell identifier of the cell the SFN has been retrieved from. Companies have commented that there is a RAN1 agreement stating that the assistance data reference is used to identify the time stamp timing. However, companies have also commented that the assistance data reference is not always present. In the case when the target device is configured with UE-based positioning and to provide a location estimate to the location server, no assistance data reference is present.

Therefore, an optional cell identifier (PCI+NR-ARFCN and/or NCGI) needs to be conditionally present in the NR-TimeStamp IE.

### 2.5.1 Input from [1]

Companies are asked to identify additional TRP identifiers that are considered needed as to provide a solid technical motivation.

|  |  |
| --- | --- |
| Table 2.5 Need for additional TRP identifiers in *NR-TimeStamp-r16* | |
| Company | Comments |
| Huawei/HiSilicon | No need to include TRP ID or PCI, as it was agreed in RAN1 and captured in RAN1 specification, that the assistance data reference is used to identify the time stamp timing.  Agreement (RAN1#99):  Modify the previous agreement on the definition of the time stamp as follows:  A UE measurement can be associated with a time stamp. For UE RSTD, DL PRS RSRP and UE Rx-Tx time difference measurement report, the time stamp can include the SFN, as well as the slot number for a subcarrier spacing. These values correspond to the reference provided by the DL-PRS-RstdReferenceInfo.  TS 38.214  For the DL RSTD, DL PRS-RSRP, and UE Rx-Tx time difference measurements the UE can report an associated higher layer parameter *Timestamp*. The *Timestamp* can include the SFN and the slot number for a subcarrier spacing. These values correspond to the reference which is provided by *DL-PRS-RSTDReferenceInfo*. |
| Qualcomm | The proposed *NR-PhysCellId-r16* in the ASN.1 above is included in IE *TRP-ID-r16*, so no change is needed.  The *NR-TimeStamp-r16* can also provide the time stamp for the location estimate (UE-based); e.g., IE *NR-DL-TDOA-LocationInformation,* for which the RAN1 agreement cited by Huawei above seems not applicable (i.e., the *TRP-ID* is optional present). |
| OPPO | We are not sure about the necessity of PCI/Arfcn/CGI information here in timestamp.  If take DL TDOA as an example:   1. For the time stamp included in *NR-DL-AoD-MeasElement-r16,* we assume the agreement cited by Huawei is applicable, so no need for additional information at all (not even PCI); 2. For the time stamp included in *NR-DL-TDOA-LocationInformation*, if Qualcomm comment is correct, and thus cell information is needed, we wonder if PCI is enough, considering the possible PCI confusion issue. As commented above, So to uniquely identify a TRP, either the combination of *nr-PhysCellId/nr-ARFCN* or *nr-CellGlobalId* can work, by assuming no local PCI confusion at a same local area for a same frequency. May be the latter one, i.e., *nr-CellGlobalId*, is safer. This applies to both UL and DL. |
| Ericsson | In response to the QC comment about this already being present in a complex IE:  The clear majority of companies from the RAN2#109bis email discussion were in favor of splitting the TRP ID of the baseline into separate fields, so TRP ID (or another name) in this context is 0..255 and not including PCI.  We agree with QC on the necessity to ensure that SFN is well-defined in all cases. |
| CATT | Agree with Qualcomm. |
| Intel | Agree with Huawei view, i.e. TRP-ID, PCI are not needed since it is based on reference cell. |
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### 2.5.2 Discussion template

Companies are asked to provide their view regarding any optional cell identifier information in the *NR-TimeStamp* IE by an ‘x’ in the corresponding column together with motivations and comments.

|  |  |  |  |
| --- | --- | --- | --- |
| Issue 5 The optional cell identifiers of the NR-TimeStamp IE | | | |
| Company | PCI+NR-ARFCN | NCGI | Motivation/comment |
| Qualcomm | x | x | See our comments to the previous 3 (?) email discussions on the same topic. |
| Nokia | x | x | The NR-TimeStamp is seen per measurement element inside the xxx-SignalMeasurementInformation IE but also at a higher level in the xxx-LocationInformation IE. For the per-measurementElement time stamp, there is already a TRP ID. We need to add cell identifiers along with TRP ID in this case but the TRP ID inside NR-TimeStamp IE is not needed. For the time stamp in LocationInformation (included in ProvideLocationInformation) the time stamp is associated with the signal measurement information as a whole. Not sure if this time stamp in xxx-LocationInformation IE (i.e. measurementReferenceTime-r16) is needed. Need to take to close look at the level at time information is added and then decide where to add the cell identifiers. |
| OPPO | X | X | We also agree that broadcast-based AD provisioning cause the main reason for globally unique ID, e.g., PCI+ARFCN / NCGI. |
| Spreadtrum |  |  | We think DL-PRS-ID is enough for UEA. For UEB cases, would QC like to provide examples? |
| Huawei/HiSilicon |  |  | No need.  It should always be the assistance data reference, regardless of broadcast or unicast.  In case of broadcast AD, UE should report the serving cell ID through which it accesses the broadcast AD. |
| Ericsson | X | (X) |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Summary: Five companies in favor of adding NCGI, PCI, NR-ARFCN one company not in favor

Therefore, the following proposal could be agreeable, based on majority vote:

1. Add NCGI, PCI and NR-ARFCN as optional cell identifiers of the NR-TimeStamp IE.

## 2.6 Any remaining open issues concerning cell identifiers associated to TRPs

|  |  |
| --- | --- |
| Company | Comment |
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With full consensus behind the propopsals, the text proposal in Annex 1 seems agreeable:

1. RAN2 to agree to the text proposal in Annex A1.

# Conclusion

Based on the email discussion summary in the previous sections we propose the following:

[Proposal 1 Add NCGI, PCI and NR-ARFCN as optional cell identifiers of the IE associated to TRPs in the DL-PRS and UEB AD, as well as UEA measurements.](#_Toc42685078)

[Proposal 2 Add NCGI, PCI and NR-ARFCN as optional cell identifiers of the NR-TimeStamp IE.](#_Toc42685079)

[Proposal 3 RAN2 to agree to the text proposal in Annex A1.](#_Toc42685080)

# References

[1] R2-2004701, Report on TRP-ID structure (Email discussion 947) (Ericsson).

[2] R2-2004704, Summary and Text Proposal on TRP-ID structure (Email discussion 947) (Ericsson).

[3] R2-2005894, Report on TRP-ID continuation, Ericsson

# Annex 1, Text proposal to 3GPP TS 37.355 for TRP-agreements

*[…]*

#### 6.4.3.1 Common NR assistance data Information Elements

*[…]*







|  |
| --- |
| ***nr-PhysCellId***  This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalId***  This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by *nr-PhysCellId*. |
| ***nrARFCNRef***  This field specifies the NRARFCN of the TRP. |
| ***dl-PRS-ID***  This field is used along with a DL PRS Resource Set ID and a DL PRS Resources ID to uniquely identify a DL PRS Resource. This ID can be associated with multiple DL PRS Resource Sets associated with a single TRP.  Each TRP should only be associated with one such ID. |

*[…]*

*–* *NR-TRP-LocationInfo*

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

-- ASN1START

NR-TRP-LocationInfo-r16 ::= SEQUENCE (SIZE (1..4)) OF NR-TRP-LocationInfoPerFreqLayer-r16

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

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

trp-LocationInfoList-r16 SEQUENCE (SIZE (1..64)) OF TRP-LocationInfoElement-r16,

...

}

TRP-LocationInfoElement-r16 ::= SEQUENCE {

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

nr-PhysCellId-r16 NR-PhysCellId-r16 OPTIONAL,

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

nrARFCNRef-r16 ARFCN-ValueNR-r15 OPTIONAL -- Cond NotSameAsRefServ0

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

trp-DL-PRS-ResourceSets-r16 SEQUENCE (SIZE(1..2)) OF

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

...

}

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

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

dl-PRS-Resource-ARP-List-r16 SEQUENCE (SIZE(1..64)) OF

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

...

}

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

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

...

}

-- ASN1STOP

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

| ***NR-TRP-LocationInfo* field descriptions** |
| --- |
| ***referencePoint***  This field specifies the reference point used to define the TRP location in the *trp-LocationInfoList*. If this field is absent, the reference point is the same as in the previous entry of the *NR-TRP-LocationInfoPerFreqLayer* list. |
| ***trp-LocationInfoList***  This field provides the antenna reference point locations of the DL-PRS Resources for the TRPs and comprises the following sub-fields:  - **dl-PRS-ID**: This field is used along with a DL PRS Resource Set ID and a DL PRS Resources ID to uniquely identify a DL PRS Resource, and is associated to a single TRP-  - **nr-PhysCellId**: This field specifies the physical cell identity of the associated TRP.  - **nr-CellGlobalId**: This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP.  - **nrARFCNRef**: This field specifies the NRARFCN of the TRP.- ***trp-Location***: This field provides the location of the TRP relative to the *referencePoint* location. If this field is absent the TRP location coincides with the *referencePoint* location.  - ***trp-DL-PRS-ResourceSets***: This field provides the antenna reference point location(s) of the DL-PRS Resource Set(s) associated with this TRP. If this field is absent, the antenna reference point location(s) of the DL-PRS Resource Set(s) coincides with the *trp-Location* location. This field comprises the following sub-fields:  - ***dl-PRS-ResourceSetARP***: This field provides the antenna reference point location of the DL-PRS Resource Set relative to the *trp-Location* location. If this field is absent, the antenna reference point location of this DL-PRS Resource Set coincides with the *trp-Location* location.  - ***dl-PRS-Resource-ARP-List***: This field provides the antenna reference point location(s) of the DL-PRS Resource(s) associated with this resource set of the TRP. If this field is absent, the antenna reference point location(s) of the DL-PRS Resources coincides with the *dl-PRS-ResourceSetARP* location. This field comprises the following sub-fields:  - ***dl-PRS-Resource-ARP-location***: This field provides the antenna reference point location of the DL-PRS Resource associated with the DL-PRS Resource Set of the TRP relative to the *dl-PRS-ResourceSetARP* location. If this field is absent, the antenna reference point location of this DL-PRS Resource coincides with the *dl-PRS-ResourceSetARP* location. |

– *ReferencePoint*

The IE *ReferencePoint* provides a well defined location relative to which other locations may be defined.

-- ASN1START

ReferencePoint-r16 ::= SEQUENCE {

referencePointGeographicLocation-r16 CHOICE {

location3D-r16 EllipsoidPointWithAltitudeAndUncertaintyEllipsoid,

ha-location3D-r16 HighAccuracyEllipsoidPointWithAltitudeAndUncertaintyEllipsoid-r15,

...

},

...

}

-- ASN1STOP

| ***ReferencePoint* field descriptions** |
| --- |
| ***referencePointGeographicLocation***  This field provides the geodetic location of the reference point. |

– *RelativeLocation*

The IE *RelativeLocation* provides a location relative to some known reference location.

-- ASN1START

RelativeLocation-r16 ::= SEQUENCE {

milli-arc-second-units-r16 ENUMERATED { mas0-03, mas0-3, mas3, mas30, ...},

height-units-r16 ENUMERATED {mm, cm, m, ...},

delta-latitude-r16 Delta-Latitude-r16,

delta-longitude-r16 Delta-Longitude-r16,

delta-height-r16 Delta-Height-r16,

locationUNC-r16 LocationUncertainty-r16 OPTIONAL, -- Need OP

...

}

Delta-Latitude-r16 ::= SEQUENCE {

delta-Latitude-r16 INTEGER (-1024..1023),

coarse-delta-Latitude-r16 INTEGER (0..4095) OPTIONAL, -- Need OP

...

}

Delta-Longitude-r16 ::= SEQUENCE {

delta-Longitude-r16 INTEGER (-1024..1023),

coarse-delta-Longitude-r16 INTEGER (0..4095) OPTIONAL, -- Need OP

...

}

Delta-Height-r16 ::= SEQUENCE {

delta-Height-r16 INTEGER (-1024..1023),

coarse-delta-Height-r16 INTEGER (0..4095) OPTIONAL, -- Need OP

...

}

LocationUncertainty-r16 ::= SEQUENCE {

horizontalUncertainty-r15 INTEGER (0..255),

horizontalConfidence-r15 INTEGER (0..100),

verticalUncertainty-r15 INTEGER (0..255),

verticalConfidence-r15 INTEGER (0..100)

}

-- ASN1STOP

| ***RelativeLocation* field descriptions** |
| --- |
| ***milli-arc-second-units***  This field provides the units and scale factor for the *delta-latitude* and *delta-longitude* fields. Enumerated values *mas0-03*, *mas0-3*, *mas3*, and *mas30*, correspond to 0.03, 0.3, 3, and 30 milliarcseconds, respectively. |
| ***height-units***  This field provides the units and scale factor for the *delta-height* field. Enumerated values *mm*, *cm*, and *m* correspond to 10-3 metre, 10-2 meter, and 1 meters, respectively. |
| ***delta-latitude***  This field specifies the delta value in latitude of the desired location, defined as "desired location" minus "reference point location" and comprises the following sub-fields:  - ***delta-Latitude*** specifies the delta value in latitude in the unit provided in *milli-arc-second-units* field.  - ***coarse-delta-Latitude*** specifies the delta value in latitude in 1024 times the size of the unit provided in *milli-arc‑second‑units* field and with the same sign as in the *delta-Latitude* field. If this field is absent, the value for *coarse-delta-Latitude*is zero.  I.e., the full *delta-latitude* is given by:  (*delta-Latitude* × *milli-arc-second-units*)±(*coarse-delta-Latitude* × 1024 × *milli-arc-second-units*) [milli-arc-seconds] |
| ***delta-longitude***  This field specifies the delta value in longitude of the desired location, defined as "desired location" minus "reference point location" and comprises the following sub-fields:  - ***delta-Longitude*** specifies the delta value in longitude in the unit provided in *milli-arc-second-units* field.  - ***coarse-delta-Longitude*** specifies the delta value in longitude in 1024 times the size of the unit provided in *milli-arc‑second‑units* field and with the same sign as in the *delta-Longitude* field. If this field is absent, the value for *coarse-delta-Longitude*is zero.  I.e., the full *delta-longitude* is given by:  (*delta-Longitude* × *milli-arc-second-units*)±(*coarse-delta-Latitude* × 1024 × *milli-arc-second-units*) [milli-arc-seconds] |
| ***delta-height***  This field specifies the delta value in ellipsoidal height of the desired location, defined as "desired location" minus "reference point location" and comprises the following sub-fields:  - ***delta-Height*** specifies the delta value in ellipsoidal height in the unit provided in *height-units* field.  - ***coarse-delta-Height*** specifies the delta value in ellipsoidal height in 1024 times the size of the unit provided in *height-units* field and with the same sign as in the *delta-Height* field. If this field is absent, the value for *coarse-delta-Height*is zero.  I.e., the full *delta-height* is given by:  (*delta-Height* × *height-units*) *±* (*coarse-delta-Height* × 1024 × *height-units*) [meters] |
| ***locationUNC***  This field specifies the uncertainty of the location coordinates and comprises the following sub-fields:  - ***horizontalUncertainty*** indicates the horizontal uncertainty of the ARP latitude/longitude. The ′*horizontalUncertainty*′ corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and ′*horizontalConfidence*′ corresponds to confidence as defined in TS 23.032 [15].  - ***verticalUncertainty*** indicates the vertical uncertainty of the ARP altitude. The '*verticalUncertainty*' corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and '*verticalConfidence*' corresponds to confidence as defined in TS 23.032 [15].  If this field is absent, the uncertainty is the same as for the associated reference point location. |

– *NR-DL-PRS-BeamInfo*

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

-- ASN1START

NR-DL-PRS-BeamInfo-r16 ::= SEQUENCE (SIZE (1..4)) OF NR-DL-PRS-BeamInfoPerFreqLayer-r16

NR-DL-PRS-BeamInfoPerFreqLayer-r16 ::= SEQUENCE (SIZE (1..64)) OF NR-DL-PRS-BeamInfo-r16

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

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

nr-PhysCellId-r16 NR-PhysCellId-r16 OPTIONAL,

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

nrARFCNRef-r16 ARFCN-ValueNR-r15 OPTIONAL -- Cond NotSameAsRefServ0

lcs-gcs-translation-parameter-r16 LCS-GCS-Translation-Parameter-r16 OPTIONAL, -- Need OP

dl-prs-BeamInfoSet-r16 DL-PRS-BeamInfoSet-r16,

...

}

DL-PRS-BeamInfoSet-r16 ::= SEQUENCE (SIZE(1..2)) OF DL-PRS-BeamInfoResourceSet-r16

DL-PRS-BeamInfoResourceSet-r16 ::= SEQUENCE (SIZE(1..64)) OF DL-PRS-BeamInfoElement-r16

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

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

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

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

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

...

}

LCS-GCS-Translation-Parameter-r16 ::= SEQUENCE {

alpha-r16 INTEGER (0..359),

alpha-fine-r16 INTEGER (0..9), OPTIONAL, -- Cond AzElFine

beta-r16 INTEGER (0..359),

beta-fine-r16 INTEGER (0..9) OPTIONAL, -- Cond AzElFine

gamma-r16 INTEGER (0..359),

gamma-fine-r16 INTEGER (0..9) OPTIONAL, -- Cond AzElFine

...

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *AzElFine* | The field is mandatory present if *dl-PRS-Azimuth-fine* or *dl-PRS-Elevation-fine* are present; otherwise it is not present. |

| ***NR-DL-PRS-Beam-Info* field descriptions** |
| --- |
| ***nr-PhysCellId***  This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalId***  This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by *nr-PhysCellId*. |
| ***nrARFCNRef***  This field specifies the NRARFCN of the TRP. |
| ***dl-PRS-ID***  This field is used along with a DL PRS Resource Set ID and a DL PRS Resources ID to uniquely identify a DL PRS Resource. This ID can be associated with multiple DL PRS Resource Sets associated with a single TRP.  Each TRP should only be associated with one such ID. |
| ***lcs-gcs-translation-parameter***  This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [44]. If this field is absent, the *dl-PRS-Azimuth* and *dl-PRS-Elevation* are provided in a GCS. |
| ***dl-prs-BeamInfoSet***  This field provides the DL-PRS beam information for each DL-PRS Resource of the DL-PRS Resource Set associated with this TRP. |
| ***dl-PRS-Azimuth***  This field specifies the azimuth angle of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.  For a Global Coordinate System (GCS), the azimuth angle is measured counter-clockwise from geographical North.  For a Local Coordinate System (LCS), the azimuth angle is measured measured counter-clockwise from the x-axis of the LCS.  Scale factor 1 degrees; range 0 to 359 degrees. |
| ***dl-PRS-Azimuth-fine***  This field provides finer granularity for the *dl-PRS-Azimuth*.  The total azimuth angle of the boresight direction is given by *dl-PRS-Azimuth* + *dl-PRS-Azimuth-fine.*  Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***dl-PRS-Elevation***  This field specifies the elevation angle of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.  For a Global Coordinate System (GCS), the elevation angle is measured relative to zenith and positive to the horizontal direction (elevation 0 deg. points to zenith, 90 deg to the horizon).  For a Local Coordinate System (LCS), the elevation angle is measured relative to the z-axis of the LCS (elevation 0 deg. points to the z-axis, 90 deg to the x-y plane).  Scale factor 1 degrees; range 0 to 180 degrees. |
| ***dl-PRS-Elevation-fine***  This field provides finer granularity for the *dl-PRS-Elevation*.  The total elevation angle of the boresight direction is given by *dl-PRS-Elevation* + *dl-PRS-Elevation-fine.*  Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***alpha***  This field specifies the bearing angle α for the translation of the LCS to a GCS as defined in TR 38.901 [44].  Scale factor 1 degrees; range 0 to 359 degrees. |
| ***alpha-fine***  This field provides finer granularity for the *alpha*.  The total bearing angle α is given by *alpha* + *alpha-fine.*  Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***beta***  This field specifies the downtilts angle β for the translation of the LCS to a GCS as defined in TR 38.901 [44].  Scale factor 1 degrees; range 0 to 359 degrees. |
| ***beta-fine***  This field provides finer granularity for the *beta*.  The total downtilt angle β is given by *beta* + *beta-fine.*  Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***gamma***  This field specifies the slant angle γ for the translation of the LCS to a GCS as defined in TR 38.901 [44].  Scale factor 1 degrees; range 0 to 359 degrees. |
| ***gamma-fine***  This field provides finer granularity for the *gamma*.  The total slant angle γ is given by *gamma* + *gamma-fine.*  Scale factor 0.1 degrees; range 0 to 0.9 degrees. |

– *NR-RTD-Info*

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

-- ASN1START

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

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

rtd-InfoList-r16 RTD-InfoList-r16,

...

}

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

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

nr-PhysCellId-r16 NR-PhysCellId-r16 OPTIONAL,

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

nrARFCNRef-r16 ARFCN-ValueNR-r15 OPTIONAL -- Cond NotSameAsRefServ0

refTime-r16 CHOICE {

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

utc-r16 UTCTime,

...

},

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

...

}

RTD-InfoList-r16 ::= SEQUENCE (SIZE (1..4)) OF RTD-InfoListPerFreqLayer-r16

RTD-InfoListPerFreqLayer-r16 ::= SEQUENCE (SIZE(1..63)) OF RTD-InfoElement-r16

RTD-InfoElement-r16 ::= SEQUENCE {

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

nr-PhysCellId-r16 NR-PhysCellId-r16 OPTIONAL,

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

nrARFCNRef-r16 ARFCN-ValueNR-r15 OPTIONAL -- Cond NotSameAsRefServ0

subframeOffset-r16 INTEGER (0..1966079),

rtd-Quality-r16 NR-TimingMeasQuality-r16,

...

}

-- ASN1STOP

| ***NR-RTD-Info* field descriptions** |
| --- |
| ***referenceTRP-RTD-Info***  This field defines the reference TRP for the RTD and comprises the following sub-fields:  - **dl-PRS-ID**: This field is used along with a DL PRS Resource Set ID and a DL PRS Resources ID to uniquely identify a DL PRS Resource, and is associated to the reference TRP  - **nr-PhysCellId**: This field specifies the physical cell identity of the reference TRP.  - **nr-CellGlobalId**: This field specifies the NCGI, the globally unique identity of a cell in NR, of the reference TRP.  - **nrARFCNRef**: This field specifies the NRARFCN of the TRP.  - ***refTime***: This field specifies the reference time at which the *rtd-InfoList* is valid. The *systemFrameNumber* choice refers to the SFN of the reference TRP.  - ***rtd-RefQuality***: This field specifies the quality of the timing of reference TRP, used to determine the RTD values provided in *rtd-InfoList*. |
| ***nr-PhysCellId***  This field specifies the physical cell identity of the associated TRP for which the *RTD-InfoElement* is applicable, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalId***  This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP for which the *RTD-InfoElement* is applicable, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by *nr-PhysCellId*. |
| ***nrARFCNRef***  This field specifies the NRARFCN of the TRP for which the *RTD-InfoElement* is applicable. |
| ***dl-PRS-ID***  This field is used along with a DL PRS Resource Set ID and a DL PRS Resources ID to uniquely identify a DL PRS Resource. This ID can be associated with multiple DL PRS Resource Sets associated with a single TRP for which the *RTD-InfoElement* is applicable. |
| ***subframeOffset***  This field specifies the subframe boundary offset at the TRP antenna location between the reference TRP and this neighbour TRP in time units  where Hz and  (TS 38.211 [41]).  The offset is counted from the beginning of a subframe #0 of the reference TRP to the beginning of the closest subsequent subframe of this neighbour TRP.  Scale factor 1 Tc. |
| ***rtd-Quality***  This field specifies the quality of the RTD. |

– *NR-DL-PRS-AssistanceData*

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

-- ASN1START

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

nr-DL-PRS-ReferenceInfo-r16 DL-PRS-IdInfo-r16 OPTIONAL, -- Need ON

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

nr-SSB-Config-r16 SEQUENCE (SIZE (0..255)) OF NR-SSB-Config-r16,

...

}

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

nr-DL-PRS-AssistanceDataPerFreq (SIZE (1..nrMaxTRPsPerFreq)) OF NR-DL-PRS-AssistanceDataPerTRP-r16,

nr-DL–PRS-PositioningFrequencyLayer-r16 NR-DL–PRS-PositioningFrequencyLayer-r16 OPTIONAL, --Need ON

...

}

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

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

nr-DL-PRS-expectedRSTD-uncerainty-r16 INTEGER (-246..246),

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

nr-PhysCellId-r16 NR-PhysCellId-r16 OPTIONAL,

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

nrARFCNRef-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Cond NotSameAsRefServ0

nr-DL-PRS-Config-r16 NR-DL-PRS-Config-r16,

...

}

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

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

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

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

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

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

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

...

}

nrMaxFreqLayers INTEGER ::= 4 -- Max freq layers

nrMaxTRPsPerFreq INTEGER ::= 64 -- Max TRPs per freq layers

nrMaxResourceIDs INTEGER ::= 64 -- Max ResourceIDs

-- ASN1STOP

| ***NR-DL-PRS-AssistanceData* field descriptions** |
| --- |
| ***nr-DL-PRS-Config***  This field specifies the PRS configuration of the TRP. |
| ***nr-DL-PRS-ReferenceInfo***  This field indicates the IDs of the reference TRP. |
| ***nr-DL-PRS-ResourceID-List***  The list of nr-DL PRS resource ID. Only a single nr-DL-PRS-ResourceId is included if the field is used in measurement reporting. |

#### – *DL-PRS-IdInfo*

The IE *DL-PRS-IdInfo* provides the IDs of the reference and neighbour TRPs' DL-PRS Resources.

-- ASN1START

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

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

nr-DL-PRS-ResourceID-List-r16 (SIZE (1..nrMaxResourceIDs)) OF NR-DL-PRS-ResourceId-r16 OPTIONAL,

nr-DL-PRS-ResourceSetId-r16 NR-DL-PRS-ResourceSetId-r16 OPTIONAL

}

-- ASN1STOP

*[…]*

6.4.3.2 Common NR report Information Elements

*– NR-TimingMeasQuality*

The IE *NR-TimingMeasQuality* defines the target device′s best estimate of the quality of measurements.

-- ASN1START

NR-TimingMeasQuality-r16 ::= SEQUENCE {

timingMeasQualityValue-r16 INTEGER (0..31),

timingMeasQualityResolution-r16 ENUMERATED {mdot1, m1, m10, m30, ...},

...

}

-- ASN1STOP

| ***NR-TimingMeasQuality* field descriptions** |
| --- |
| ***timingMeasQualityValue***  This parameter provides the best estimate of the uncertainty of the measurement. |
| ***timingMeasQualityResolution***  This parameter provides the resolution levels used in the Value field. |

*– NR-TimeStamp*

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

-- ASN1START

NR-TimeStamp-r16 ::= SEQUENCE {

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

nr-PhysCellId-r16 NR-PhysCellId-r16 OPTIONAL,

nr-CellGlobalId-r16 NCGI-r15 OPTIONAL,

nrARFCNRef-r16 ARFCN-ValueNR-r15 OPTIONAL,

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

nr-Slot-r16 CHOICE {

scs15 INTEGER (0..9),

scs30 INTEGER (0..19),

scs60 INTEGER (0..39),

scs120 INTEGER (0..79)

},

...

}

-- ASN1STOP

| **Conditional presence** | **Explanation** |
| --- | --- |
| *NotSameAsRefServ0* | The field is mandatory present if the SFN is not from the reference TRP; otherwise it is not present. |

*[…]*

#### 6.5.10.4 NR-DL-TDOA Location Information Elements

#### – *NR-DL-TDOA-SignalMeasurementInformation*

The IE *NR-DL-TDOA-SignalMeasurementInformation* is used by the target device to provide NR-DL TDOA measurements to the location server. The measurements are provided as a list of TRPs, where the first TRP in the list is used as reference TRP in case RSTD measurements are reported. The first TRP in the list may or may not be the reference TRP indicated in the *NR-DL-PRS-AssistanceData*. Furthermore, the target device selects a reference resource per TRP, and compiles the measurements per TRP based on the selected reference resource.

-- ASN1START

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

dl-PRS-ReferenceInfo-r16 DL-PRS-IdInfo-r16,

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

...

}

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

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

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

nr-PhysCellId-r16 NR-PhysCellId-r16 OPTIONAL,

nr-CellGlobalId-r16 NCGI-r15 OPTIONAL,

nrARFCNRef-r16 ARFCN-ValueNR-r15 OPTIONAL,

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

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

nr-TimeStamp-r16 NR-TimeStamp-r16,

nr-RSTD-r16 INTEGER (0..ffs), -- FFS on the value range

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

nr-TimingMeasQuality-r16 NR-TimingMeasQuality-r16,

nr-PRS-RSRP-Result-r16 INTEGER (FFS) OPTIONAL, -- FFS, value range to be decided in RAN4.

nr-DL-TDOA-AdditionalMeasurements-r16 NR-DL-TDOA-AdditionalMeasurements-r16,

...

}

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

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

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

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

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

nr-TimeStamp-r16 NR-TimeStamp-r16,

nr-RSTD-ResultDiff-r16 INTEGER (0..ffs), -- FFS on the value range to be decided in RAN4

dl-PRS-RSRP-ResultDiff-r16 INTEGER (FFS) OPTIONAL, -- FFS on the value range to be decided in RAN4

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

...

}

nrMaxTRPs INTEGER ::= 256 -- Max TRPs per UE

-- ASN1STOP

| *NR-DL-TDOA-SignalMeasurementInformation* field descriptions |
| --- |
| ***nr-PRS-RSRP-Result***  This field specifies the reference signal received power (RSRP) measurement, as defined in TS 38.331 [35]. |
| ***nr-AdditionalPathList***  This field specifies one or more additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-RSTD* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. |
| ***nr-RSTD***  This field specifies the relative timing difference between this neighbour TRP and the PRS reference TRP, as defined in FFS. Mapping of the measured quantity is defined as in FSS. |
| ***nr-TimingMeasQuality***  This field specifies the target device′s best estimate of the quality of the measurement. |
| ***nr-PhysCellId***  This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalId***  This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by nr-PhysCellId. |
| ***nrARFCNRef***  This field specifies the NRARFCN of the TRP. |
| ***dl-PRS-ID***  This field is used along with a DL PRS Resource Set ID and a DL PRS Resources ID to uniquely identify a DL PRS Resource. This ID can be associated with multiple DL PRS Resource Sets associated with a single TRP.  Each TRP should only be associated with one such ID. |

#### *– NR-DL-TDOA-LocationInformation*

The IE *NR-DL-TDOA-LocationInformation* is included by the target device when location information derived using NR-DL-TDOA is provided to the location server.

-- ASN1START

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

measurementReferenceTime-r16 CHOICE {

systemFrameNumber-r16 NR-TimeStamp-r16,

utc-time-r16 UTCTime,

...

} OPTIONAL,

...

}

-- ASN1STOP

| *NR-DL-TDOA-LocationInformation* field descriptions |
| --- |
| ***measurementReferenceTime***  This field specifies the time for which the location estimate is valid. |

*[…]*

#### 6.5.11.4 NR-DL-AoD Location Information Elements

#### – *NR-DL-AoD-SignalMeasurementInformation*

The IE *NR-DL-AoD-SignalMeasurementInformation* is used by the target device to provide NR DL AoD measurements to the location server. The measurements are provided as a list of TRPs, where the first TRP in the list is used as reference TRP.

-- ASN1START

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

nr-DL-AoD-MeasList-r16 NR-DL-AoD-MeasList-r16,

...

}

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

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

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

nr-PhysCellId-r16 NR-PhysCellId-r16 OPTIONAL,

nr-CellGlobalId-r16 NCGI-r15 OPTIONAL,

nrARFCNRef-r16 ARFCN-ValueNR-r15 OPTIONAL,

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

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

nr-TimeStamp-r16 NR-TimeStamp-r16,

nr-PRS-RSRP-Result-r16 INTEGER (FFS) OPTIONAL, -- Need RAN4 inputs on value range

nr-DL-PRS-RxBeamIndex-r16 INTEGER (1..8),

nr-TimingMeasQuality-r16 NR-TimingMeasQuality-r16,

nr-DL-Aod-AdditionalMeasurements-r16 NR-DL-AoD-AdditionalMeasurements-r16,

...

}

NR-DL-AoD-AdditionalMeasurements-r16 ::= SEQUENCE (SIZE (1..7)) OF NR-DL-AoD-AdditionalMeasurementElement-r16

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

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

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

nr-TimeStamp-r16 NR-TimeStamp-r16,

nr-PRS-RSRP-ResultDiff-r16 INTEGER (FFS) OPTIONAL, -- Need RAN4 inputs on value range

nr-DL-PRS-RxBeamIndex-r16 INTEGER (1..8),

...

}

nrMaxTRPs INTEGER ::= 256 -- Max TRPs

-- ASN1STOP

| *NR-DL-AoD-SignalMeasurementInformation* field descriptions |
| --- |
| ***nr-PRS-RSRP-Result***  This field specifies the reference signal received power (RSRP) measurement, as defined in TS 38.331 [35]. |
| ***nr-PhysCellId***  This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalId***  This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by nr-PhysCellId. |
| ***nrARFCNRef***  This field specifies the NRARFCN of the TRP. |
| ***dl-PRS-ID***  This field is used along with a DL PRS Resource Set ID and a DL PRS Resources ID to uniquely identify a DL PRS Resource. This ID can be associated with multiple DL PRS Resource Sets associated with a single TRP.  Each TRP should only be associated with one such ID. |

#### – *NR-DL-AoD-LocationInformation*

The IE *NR-DL-AoD-LocationInformation* is included by the target device when location information derived using NR-DL-AoD is provided to the location server.

-- ASN1START

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

measurementReferenceTime-r16 CHOICE {

sfn-time-r16 NR-TimeStamp-r16,

utc-time-r16 UTCTime,

...

} OPTIONAL,

...

}

-- ASN1STOP

| *NR-DL-AoD-LocationInformation* field descriptions |
| --- |
| ***measurementReferenceTime***  This field specifies the time for which the location estimate is valid. |

*[…]*

6.5.12.4 NR-Multi-RTT Location Information Elements

– *NR-Multi-RTT-SignalMeasurementInformation*

The IE *NR-Multi-RTT-SignalMeasurementInformation* is used by the target device to provide NR Multi-RTT measurements to the location server. The measurements are provided as a list of TRPs, where the first TRP in the list is used as reference TRP.

-- ASN1START

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

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

...

}

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

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

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

nr-PhysCellId-r16 NR-PhysCellId-r16 OPTIONAL,

nr-CellGlobalId-r16 NCGI-r15 OPTIONAL,

nrARFCNRef-r16 ARFCN-ValueNR-r15 OPTIONAL,

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

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

nr-UE-RxTxTimeDiff-r16 INTEGER (0..ffs) OPTIONAL, -- FFS on the value range to be decided in RAN4

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

nr-TimeStamp-r16 NR-TimeStamp-r16,

nr-TimingMeasQuality-r16 NR-TimingMeasQuality-r16,

nr-PRS-RSRP-Result-r16 INTEGER (FFS) OPTIONAL, -- FFS, value range to be decided in RAN4.

nr-Multi-RTT-AdditionalMeasurements-r16 NR-Multi-RTT-AdditionalMeasurements-r16,

...

}

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

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

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

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

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

nr-PRS-RSRP-ResultDiff-r16 INTEGER (FFS) OPTIONAL, -- FFS, value range to be decided in RAN4.

nr-UE-RxTxTimeDiffAdditional-r16 INTEGER (0..ffs) OPTIONAL, -- FFS on the value range

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

nr-TimeStamp-r16 NR-TimeStamp-r16,

...

}

nrMaxTRPs INTEGER ::= 256 -- Max TRPs

-- ASN1STOP

| ***NR-Multi-RTT-SignalMeasurementInformation* field descriptions** |
| --- |
| ***nr-PRS-RSRP-Result***  This field specifies the reference signal received power (RSRP) measurement, as defined in TS 38.331 [35]. |
| ***nr-UE-RxTxTimeDiff***  This field specifies the UE Rx–Tx time difference measurement, as defined in FFS. |
| ***nr-AdditionalPathList***  This field specifies one or more additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-UE-RxTxTimeDiff* value or the *nr-UE-RxTxTimeDiffAdditional* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. |
| ***nr-PhysCellId***  This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalId***  This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by nr-PhysCellId. |
| ***nrARFCNRef***  This field specifies the NRARFCN of the TRP. |
| ***dl-PRS-ID***  This field is used along with a DL PRS Resource Set ID and a DL PRS Resources ID to uniquely identify a DL PRS Resource. This ID can be associated with multiple DL PRS Resource Sets associated with a single TRP.  Each TRP should only be associated with one such ID. |