**3GPP TSG-RAN WG2 Meeting #118 electronic R2-2206058**

**e-Meeting, 9th – 20th May 2022**

Source: Huawei, HiSilicon

Title: Summary of AI 6.11.2.3 on on-demand PRS (Huawei)

Agenda Item: 6.11.2.3

Document for: Discussion and Decision

# Introduction

This document provides a summary of the following contributions submitted to AI 6.11.2.3 on on-demand PRS

R2-2205007 [H011] TRP config for on-demand PRS Huawei, HiSilicon CR Rel-17 37.355 17.0.0 0342 - F NR\_pos\_enh-Core

R2-2205011 [H057] Discussion on UE-initiated on-demand PRS Huawei, HiSilicon discussion Rel-17 NR\_pos\_enh-Core

R2-2205581 Discussion on the mismatch between the on-demand PRS procedure of RAN2 and RAN3 vivo discussion Rel-17 NR\_pos\_enh-Core

R2-2205805 On UE measurements to allow On-Demand PRS Ericsson, Nokia, Fraunhofer IIS, Fraunhofer HHI, Lenovo, Motorola Mobility CR Rel-17 38.305 17.0.0 0095 - F NR\_pos\_enh-Core

R2-2204988 [C012] Correction on the selected on-demand PRS configuration for hybrid positioning CATT CR Rel-17 37.355 17.0.0 0337 - F NR\_pos\_enh-Core

# Discussion

## R2-2205007 [H011] TRP config for on-demand PRS

In R2-2205007, it has been argued that since the PRS configuration can be directly indicated by the LMF using config id, without providing the complete configuration, the TRP configurations should be provided to the UE for the on-demand PRS configuration. The following text proposal has also been proposed:

-- ASN1START

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

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

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

...

}

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

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

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

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

...

}

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

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

...

}

-- ASN1STOP

***Proposal1*: TRP configuration should also be provided in on-demand PRS configuration for index-based on-demand PRS request.**

## R2-2205011 on-demand PRS configuration by explicit parameter

In R2-2205011, the following cases for on-demand PRS reqeust have been summarized:

* **Case 1: NW has provided the pre-defined On-Demand PRS configurations**
  + ***Option 1-1: Index-based request***

Request pre-defined PRS configuration ID within the pre-defined On-Demand PRS configurations

* ***Option 1-2: Explicit parameter request***

Request explicit DL-PRS parameters within the pre-defined On-Demand PRS configurations

* **Case 2: NW has NOT provided the pre-defined On-Demand PRS configurations**
* ***Option 2: Blind explicit parameter request***

Request On-Demand PRS parameters within the scope of the RAN1 allowed parameter list

For the current LPP spec, the following configuration has been specified:

|  |  |  |
| --- | --- | --- |
| *– NR-On-Demand-DL-PRS-Configurations* The IE *NR-On-Demand-DL-PRS-Configurations* provides a set of possible DL-PRS configurations which can be requested by the target device on-demand.  -- ASN1START  NR-On-Demand-DL-PRS-Configurations-r17 ::= SEQUENCE {  on-demand-dl-prs-configuration-list-r17 SEQUENCE (SIZE (1..maxDL-PRS-Configs-r17)) OF  On-Demand-DL-PRS-Configuration-r17,  ...  }  On-Demand-DL-PRS-Configuration-r17 ::= SEQUENCE {  dl-prs-configuration-id-r17 DL-PRS-Configuration-ID-r17,  nr-DL-PRS-PositioningFrequencyLayer-r17 NR-DL-PRS-PositioningFrequencyLayer-r16,  nr-DL-PRS-Info-r17 NR-DL-PRS-Info-r16,  ...  }  DL-PRS-Configuration-ID-r17 ::= SEQUENCE {  nr-dl-prs-configuration-id-r17 INTEGER (1..maxDL-PRS-Configs-r17),  ...  }  -- ASN1STOP   | *NR-DL-PRS-On-Demand-Configurations* field descriptions | | --- | | ***dl-prs-configuration-id***  This field provides an identity for the *On-Demand-DL-PRS-Configuration.* | |

Then, the following has been specified for the PRS request by the UE, which allows for both case1 and 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *NR-On-Demand-DL-PRS-Request*  The IE *NR-On-Demand-DL-PRS-Request* is used by the target device to request on-demand DL-PRS from a location server.  -- ASN1START  NR-On-Demand-DL-PRS-Request-r17 ::= SEQUENCE {  dl-prs-StartTime-and-Duration-r17 DL-PRS-StartTime-and-Duration-r17 OPTIONAL,  nr-on-demand-DL-PRS-Information-r17 NR-On-Demand-DL-PRS-Information-r17 OPTIONAL,  dl-prs-configuration-id-PrefList-r17 SEQUENCE (SIZE (1..maxDL-PRS-Configs-r17)) OF   DL-PRS-Configuration-ID-r17 OPTIONAL,  ...  }  DL-PRS-StartTime-and-Duration-r17 ::= SEQUENCE {  dl-prs-start-time-r17 INTEGER (1..1024) OPTIONAL,  dl-prs-duration-r17 SEQUENCE {  seconds-r17 INTEGER (0..59) OPTIONAL,  minutes-r17 INTEGER (0..59) OPTIONAL,  hours-r17 INTEGER (0..23) OPTIONAL,  ...  } OPTIONAL,  ...  }  -- ASN1STOP   |  | | --- | | *NR-On-Demand-DL-PRS-Request* field descriptions | | ***dl-prs-StartTime-and-Duration***  This field specifies the requested start time and duration for the on-demand DL-PRS and comprises the following subfields:  - ***dl-prs-start-time*** specifies the desired start time for the requested DL-PRS. It indicates the time in seconds from the time the IE *NR-On-Demand-DL-PRS-Request* was received.  - ***dl-prs-duration*** specifies the desired duration of the requested DL-PRS. The desired duration is the sum of the *seconds*, *minutes*, *hours* fields. If this field is included, at least one of the *seconds*, *minutes*, *hours* fields shall be present. | | ***nr-on-demand-DL-PRS-Information***  This field specifies the on-demand DL-PRS configuration information requested by the target device. | | ***dl-prs-configuration-id-PrefList***  This field specifies the on-demand DL-PRS configuration associated with *DL-PRS-Configuration-ID* in IE *NR-On-Demand-DL-PRS-Configurations* the target device wishes to obtain in the order of preference. The first *DL-PRS-Configuration-ID* in the list is the most preferred configuration, the second *DL-PRS-Configuration-ID* the second most preferred, etc. | |

It can be observed from the current LPP spec, that on-demand PRS configuration is only provided for the case of index-based PRS request, while not provided for the case of explicit paramter-based PRS request.

The understanding from R2-2205011 is that for request by explicit parameter, the UE still needs to request within the specified scope when the network provides such scope to the UE. However, UE-initiated on-demand PRS request with explicit parameters within the pre-defined On-Demand PRS configurations (i.e. Option 1-2) is missing in the current Stage 3 spec.

***Proposal2:* For UE-initiated on-demand PRS request by explicit parameter, allow the network to provide a list parameters to the UE that the UE should only request within the scope of the list, when such confifuration is provided.**

## R2-2205581 on-demand PRS configuration by index

In R2-2205581, discussion has been made on whether there is mismatch between R2 and R3 on the on-demand PRS procedure. The current stage2 procedure for on-demand PRS looks like follows:



**In step 0,** the possible On-Demand PRS configurations are provided in the *On-demand PRS TRP Information* of *TRP Information* IE as below:

* On-demand PRS Request Allowed
* Allowed Resource Set Periodicity Values
* Allowed PRS Bandwidth Values
* Allowed Resource Repetition Factor Values
* Allowed Resource Number of Symbols Values
* Allowed Comb Size Values

For the pre-defined on-demand PRS configuration from LMF to UE in **step 1**, each on-demand PRS configuration includes a complete PRS configuration:

|  |
| --- |
| On-Demand-DL-PRS-Configuration-r17 ::= SEQUENCE {  dl-prs-configuration-id-r17 DL-PRS-Configuration-ID-r17,  nr-DL-PRS-PositioningFrequencyLayer-r17 NR-DL-PRS-PositioningFrequencyLayer-r16,  nr-DL-PRS-Info-r17 NR-DL-PRS-Info-r16,  ...  } |

The complete PRS configuration includes two types of parameters:

* on-demand parameters which can be requested by the LMF or UE, e.g., Periodicity, PRS Bandwidth, Repetition Factor, Resource Number of Symbols.
* the other parameters which can not be requested by the LMF or UE, e.g., the time and frequency position of the resources.

**Observation 2: The pre-defined PRS configuration from LMF to UE includes a list of complete PRS configurations, which include some parameters that can not be requested by the UE.**

However, before step 1, the LMF only obtains the on-demand parameters which can be requested from the gNB. One issue is where the values of the other parameters which can not be requested by the UE come from. One possible method is that the LMF itself determined the values. In our understanding, it is undesirable that the LMF determines the radio resource in the Uu.

In step 2a, the UE requests the on-demand PRS via PRS configuration index associated with one of the pre-defined PRS configuration or explicit on-demand parameters:

|  |
| --- |
| NR-On-Demand-DL-PRS-Request-r17 ::= SEQUENCE {  dl-prs-StartTime-and-Duration-r17 DL-PRS-StartTime-and-Duration-r17 OPTIONAL,  nr-on-demand-DL-PRS-Information-r17 NR-On-Demand-DL-PRS-Information-r17 OPTIONAL,  dl-prs-configuration-id-PrefList-r17 SEQUENCE (SIZE (1..maxDL-PRS-Configs-r17)) OF DL-PRS-Configuration-ID-r17 OPTIONAL,  ...  } |

**In step 4**, the LMF requests the gNB to configure and activate the PRS transmission based on *Requested DL PRS Transmission Characteristics*, which include the possible On-Demand PRS configurations exchanged in step 1. The structure of *Requested DL PRS Transmission Characteristics* IE is as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| **Requested DL-PRS Resource Set List** |  | *1* |  |  |
| **>Requested DL-PRS Resource Set Item** |  | *1..<maxnoofPRSresourceSet>* |  |  |
| >>PRS bandwidth | O |  | INTEGER(1..63) | 24,28,…,272 PRBs |
| >>Comb Size | O |  | ENUMERATED(2, 4, 6, 12, …) |  |
| >>Resource Set Periodicity | O |  | ENUMERATED(4,5,8,10,16,20,32,40,64,80,160,320,640,1280,2560,5120,10240,20480,40960,81920,…) |  |
| >>Resource Repetition Factor | O |  | ENUMERATED(rf1,rf2,rf4,rf6,rf8,rf16,rf32,…) |  |
| >>Resource Number of Symbols | O |  | ENUMERATED(n2,n4,n6,n12,…) |  |
| >>Requested DL-PRS Resource List | O |  | 9.2.62 |  |
| >>Resource Set Start Time and Duration | O |  | Start Time and Duration  9.2.63 | This IE is ignored if the *Start Time and Duration* IE is present |
| Number of Frequency Layers | O |  | INTEGER(1..4) |  |
| Start Time and Duration | O |  | 9.2.63 |  |

**In step 5**, the gNB responses with the complete PRS configuration in PRS CONFIGURATION RESPONSE are as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 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 |  | - |  |
| **PRS Transmission TRP List** |  | *1* |  |  | YES | ignore |
| **>PRS Transmission TRP Item** |  | *1 .. <maxnoTRPs>* |  |  | EACH | ignore |
| >>TRP ID | M |  | 9.2.24 |  | - |  |
| >>PRS Configuration | M |  | 9.2.44 |  | - |  |

Based on the above observation, vivo wonders whether **how the LMF can derive the complete PRS configuration in step 1 based on the partial list of allowable parameters in step0?**

Based on the above discussion, vivo proposes two alternatives for the resolution of the issue, and R2 should think how we should resolve the issue and which solution to select

***Proposal3:* RAN2 to discuss and fix the mismatch issue of on-demand PRS between RAN2 and RAN3, the following alternatives can be considered:**

* **Alt 1: The pre-defined PRS configuration from LMF to UE includes a list of complete PRS configurations (maintaining the status quo), then the following changes are essential:**
* **In step 0, the possible On-Demand PRS configuration from gNB to LMF shall include a list of complete PRS configurations, each associated with a PRS configuration ID;**
* **In step 3, the PRS CONFIGURATION REQUEST from LMF to gNB shall include PRS configuration ID;**
* **In step 6, the on-demand PRS response from LMF to UE shall include the PRS configuration ID that is successfully activated.**
* **Alt 2: The pre-defined PRS configuration from LMF to UE only includes a list of allowed values for the parameters that can be requested by the UE**

## R2-2205805 On UE measurements to allow On-Demand PRS

Ericsson thinks that, Currently, the stage 2 description of On-Demand PRS only says, on high level, that UE measurements may be used. However, without some clarification on the type of UE measurements it is unclear as to how the feature would work.

On-Demand PRS allows NW to control whether PRS is transmitted or not. In order to identify which TRPs to send a request for DL-PRS transmission, SSB/CSI-RS RSRP measurements are needed. Further, when DL-PRS is being transmitted, in order to allow the NW to save energy the NW should have some information on PRS RSRP measurements to decide which beams are contributing to useful PRS transmissions and which are not, but are always ON. In previous version of On-Demand PRS stage 2 description below was mentioned.

2b. In case of LMF-initiated On-Demand PRS or UE-initiated On-Demand PRS, the LMF may obtain measurements from the UE using some existing positioning methods to assist step 3 e.g., the LMF may obtain SSB/CSI-RS RSRP measurements (NR-ECID) or DL-PRS RSRP measurements (DL-AoD).

However, it has been removed in current stage 2. The above information should be restored at least in the form of a Note to clarify how the feature works.

Hence, the following TP has been proposed:

|  |
| --- |
| 7.6.2 On-Demand PRS transmission procedures  Figure 7.6.2-1 shows the general positioning procedure for On-Demand PRS transmission.    **Figure 7.6.2-1: Procedures for On-Demand PRS request.**  0. The LMF may receive information on the possible On-Demand PRS configurations that the gNB can support during the TRP Information Exchange procedure.  1. In case of UE-initiated On-Demand PRS, the LMF may configure the UE with pre-defined PRS configurations via LPP Provide Assistance Data message or via posSI.  2a. In case of UE-initiated On-Demand PRS, the UE sends an On-Demand PRS request to the LMF via LPP Request Assistance Data message. The On-Demand PRS request can be the request for a defined PRS configuration with PRS configuration ID or explicit parameter for PRS configuration and may be a request for PRS transmission or change to the PRS transmission characteristics for positioning measurements.  NOTE 1: The LPP Request Assistance Data message for On-Demand PRS may also be sent in an MO-LR location service request message.  NOTE 2: If the NW has provided the pre-defined On-Demand PRS configurations to the UE, the UE is allowed to request On-Demand PRS parameters based on pre-defined PRS configuration ID (index-based request) or explicit parameter requests that is within the scope of the received pre-defined On-Demand PRS configurations. Otherwise, the UE may blindly request On-Demand PRS parameters via an explicit request within the scope of the allowed parameter list, as specified in TS37.355 [42].  2b. In case of LMF-initiated On-Demand PRS, the LMF and the UE may exchange LPP messages e.g., to obtain UE measurements or the DL-PRS positioning capabilities of the UE, etc.  3. The LMF determines the need for PRS transmission or change to the transmission characteristics of an ongoing PRS transmission.  NOTE 3: In case of LMF-initiated On-Demand PRS or UE-initiated On-Demand PRS, the LMF may obtain measurements from the UE using some existing positioning methods to assist step 3 e.g., the LMF may obtain SSB/CSI-RS RSRP measurements (NR-ECID) or DL-PRS RSRP measurements (DL-AoD).4. The LMF requests the serving and non-serving gNBs/TRPs for new PRS transmission or PRS transmission with changes to the PRS configuration via NRPPa PRS CONFIGURATION REQUEST message.  5. The gNBs/TRPs provide the PRS transmission update in the NRPPa PRS CONFIGURATION RESPONSE message accordingly.  6. LMF may provide the updated PRS configuration used for PRS transmission or error cause via LPP Provide Assistance Data message to the UE.  NOTE 4: If the LPP Request Assistance Data for On-Demand DL-PRS at Step 2a was sent in an MO-LR location service request message, the LMF provides a MO-LR response as described in clause 7.3.3.  NOTE 5: It is up to Network (LMF) implementation on the steps to follow (accept/reject/ignore) on receiving UE-initiated On-Demand PRS request.  NOTE 6: It is up to Network (TRP) implementation on the steps to follow (accept/reject/ignore) on receiving LMF-initiated On-Demand PRS requests. |

it is proposed that R2 should discuss on the following proposal:

***Proposal4*: Add a note for explaining measurements that is needed for the assistance of LMF/U-initiated on-demand PRS request.**

## R2-2204988 [C012] Correction on the selected on-demand PRS configuration

CATT thinks that RAN2 agreed to introduce a new IE, i.e., nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17, for RAT-dependedent DL positioning method, and multi-RTT positioning method to indicate the selected pre-defined on-demand PRS configurations in case of hybrid positioning, so as to avoid the repeated signnaling of pre-defined on-demand PRS configurations. However, the current implemention of the nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 is per-positioning method defined repeatedly, we think it is more clear to define the nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 as a common IE, and then be referred by RAT-dependedent DL and multi-RTT positioning method positioning mthod.

Thus the following text proposal has been given:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6.4.3 Common NR Positioning Information Elements – NR-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 The IE *NR-On-Demand-DL-PRS-Configurations-Selected-IndexList* is used by the location server to provide the selected pre-defined on-demand PRS configurations of *nr-On-Demand-DL-PRS-Configurations* to the target device.  In the case of assistance data for multiple NR positioning methods are provided, the IE *nr-On-Demand-DL-PRS-Configurations* shall be present in only one of *NR-Multi-RTT-ProvideAssistanceData*, *NR-DL-AoD-ProvideAssistanceData*, or *NR-DL-TDOA-ProvideAssistanceData*.  -- ASN1START  NR-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 ::= SEQUENCE (SIZE (1..maxDL-PRS-Configs-r17)) OF  DL-PRS-Configuration-ID-r17 OPTIONAL, -- Need ON  }  -- ASN1STOP  *NEXT CHANGE*  6.5.10.1 NR DL-TDOA Assistance Data  – *NR-DL-TDOA-ProvideAssistanceData*  The IE *NR-DL-TDOA-ProvideAssistanceData* is used by the location server to provide assistance data to enable UE‑assisted and UE-based NR DL-TDOA. It may also be used to provide NR DL-TDOA positioning specific error reason.  -- ASN1START  NR-DL-TDOA-ProvideAssistanceData-r16 ::= SEQUENCE {  nr-DL-PRS-AssistanceData-r16 NR-DL-PRS-AssistanceData-r16 OPTIONAL, -- Need ON  nr-SelectedDL-PRS-IndexList-r16 NR-SelectedDL-PRS-IndexList-r16 OPTIONAL, -- Need ON  nr-PositionCalculationAssistance-r16  NR-PositionCalculationAssistance-r16  OPTIONAL, -- Cond UEB  nr-DL-TDOA-Error-r16 NR-DL-TDOA-Error-r16 OPTIONAL, -- Need ON  ...,  [[ nr-On-Demand-DL-PRS-Configurations-r17  NR-On-Demand-DL-PRS-Configurations-r17  OPTIONAL, -- Need ON  nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17  NR-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 OPTIONAL, -- Need ON  area-ID-CellList-r17 Area-ID-CellList-r17 OPTIONAL -- Need ON  ]]  }  -- ASN1STOP   | **Conditional presence** | **Explanation** | | --- | --- | | *UEB* | The field is optionally present, need ON, for UE based NR DL-TDOA; otherwise it is not present. |  | ***NR-DL-TDOA-ProvideAssistanceData* field descriptions** | | --- | | ***nr-DL-PRS-AssistanceData***  This field specifies the assistance data reference and neighbour TRPs and provides the DL-PRS configuration for the TRPs.  Note, if this field is absent but the *nr-SelectedDL-PRS-IndexList* field is present, the *nr-DL-PRS-AssistanceData* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-AoD-ProvideAssistanceData*. | | ***nr-SelectedDL-PRS-IndexList***  This field specifies the DL-PRS Resources which are applicable for this *NR-DL-TDOA-ProvideAssistanceData* message. | | ***nr-PositionCalculationAssistance***  This field provides position calculation assistance data for UE-based mode. | | ***nr-DL-TDOA-Error***  This field provides DL-TDOA error reasons. | | ***nr-On-Demand-DL-PRS-Configurations***  This field provides a set of available DL-PRS configurations which can be requested by the target device on-demand.  NOTE 1: In the case of available on-demand DL-PRS configurations for multiple NR positioning methods are provided, the *nr-On-Demand-DL-PRS-Configurations* shall be present in only one of *NR-Multi-RTT-ProvideAssistanceData*, *NR-DL-AoD-ProvideAssistanceData*, or *NR-DL-TDOA-ProvideAssistanceData*.  NOTE 2: If this field is absent but the *nr-On-Demand-DL-PRS-Configurations-Selected-IndexList* is present, the *nr-On-Demand-DL-PRS-Configurations* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-AoD-ProvideAssistanceData*. | | ***nr-On-Demand-DL-PRS-Configurations-Selected-IndexList***  This field specifies the selected available on-demand DL-PRS configurations which are applicable for this *NR-DL-TDOA-ProvideAssistanceData message*. | | ***area-ID-CellList***  This field specifies the network area for which this *NR-DL-TDOA-ProvideAssistanceData* message is valid. |   *NEXT CHANGE*  6.5.11.1 NR DL-AoD Assistance Data  – *NR-DL-AoD-ProvideAssistanceData*  The IE *NR-DL-AoD-ProvideAssistanceData* is used by the location server to provide assistance data to enable UE‑assisted and UE-based NR DL-AoD. It may also be used to provide NR DL-AoD positioning specific error reason.  -- ASN1START  NR-DL-AoD-ProvideAssistanceData-r16 ::= SEQUENCE {  nr-DL-PRS-AssistanceData-r16 NR-DL-PRS-AssistanceData-r16 OPTIONAL, -- Need ON  nr-SelectedDL-PRS-IndexList-r16 NR-SelectedDL-PRS-IndexList-r16 OPTIONAL, -- Need ON  nr-PositionCalculationAssistance-r16  NR-PositionCalculationAssistance-r16  OPTIONAL, -- Cond UEB  nr-DL-AoD-Error-r16 NR-DL-AoD-Error-r16 OPTIONAL, -- Need ON  ...,  [[  nr-DL-PRS-BeamInfo-r17 NR-DL-PRS-BeamInfo-r16 OPTIONAL, -- Cond UEA  nr-On-Demand-DL-PRS-Configurations-r17  NR-On-Demand-DL-PRS-Configurations-r17  OPTIONAL, -- Need ON  nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17  NR-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 OPTIONAL, -- Need ON  area-ID-CellList-r17 Area-ID-CellList-r17 OPTIONAL -- Need ON  ]]  }  -- ASN1STOP   | **Conditional presence** | **Explanation** | | --- | --- | | *UEB* | The field is optionally present, need ON, for UE based NR DL-AoD; otherwise it is not present. | | *UEA* | The field is optionally present, need ON, for UE-assisted NR DL-AoD; otherwise it is not present. |  | ***NR-DL-AoD-ProvideAssistanceData* field descriptions** | | --- | | ***nr-DL-PRS-AssistanceData***  This field specifies the assistance data reference and neighbour TRPs and provides the DL-PRS configuration for the TRPs.  Note, if this field is absent but the *nr-SelectedDL-PRS-IndexList* field is present, the *nr-DL-PRS-AssistanceData* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-TDOA-ProvideAssistanceData*. | | ***nr-SelectedDL-PRS-IndexList***  This field specifies the DL-PRS Resources which are applicable for this *NR-DL-AoD-ProvideAssistanceData* message. | | ***nr-PositionCalculationAssistance***  This field provides position calculation assistance data for UE-based mode. | | ***nr-DL-AoD-Error***  This field provides DL-AoD error reasons. | | ***nr-DL-PRS-BeamInfo***  This field provides spatial direction information of the DL-PRS Resources included in *nr-DL-PRS-AssistanceData* or indicated by *nr-SelectedDL-PRS-IndexList.* | | ***nr-On-Demand-DL-PRS-Configurations***  This field provides a set of available DL-PRS configurations which can be requested by the target device on-demand.  NOTE 1: In the case of available on-demand DL-PRS configurations for multiple NR positioning methods are provided, the *nr-On-Demand-DL-PRS-Configurations* shall be present in only one of *NR-Multi-RTT-ProvideAssistanceData*, *NR-DL-AoD-ProvideAssistanceData*, or *NR-DL-TDOA-ProvideAssistanceData*.  NOTE 2: If this field is absent but the *nr-On-Demand-DL-PRS-Configurations-Selected-IndexList* is present, the *nr-On-Demand-DL-PRS-Configurations* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-TDOA-ProvideAssistanceData*. | | ***nr-On-Demand-DL-PRS-Configurations-Selected-IndexList***  This field specifies the selected available on-demand DL-PRS configurations which are applicable for this *NR-DL-AoD-ProvideAssistanceData message*. | | ***area-ID-CellList***  This field specifies the network area for which this *NR-DL-AoD-ProvideAssistanceData* message is valid. |   *NEXT CHANGE* 6.5.12.1 NR Multi-RTT Assistance Data – *NR-Multi-RTT-ProvideAssistanceData*  The IE *NR-Multi-RTT-ProvideAssistanceData* is used by the location server to provide assistance data to enable UE‑assisted NR Multi-RTT. It may also be used to provide NR Multi-RTT positioning specific error reason.  -- ASN1START  NR-Multi-RTT-ProvideAssistanceData-r16 ::= SEQUENCE {  nr-DL-PRS-AssistanceData-r16 NR-DL-PRS-AssistanceData-r16 OPTIONAL, -- Need ON  nr-SelectedDL-PRS-IndexList-r16 NR-SelectedDL-PRS-IndexList-r16 OPTIONAL, -- Need ON  nr-Multi-RTT-Error-r16 NR-Multi-RTT-Error-r16 OPTIONAL, -- Need ON  ...,  [[ nr-On-Demand-DL-PRS-Configurations-r17  NR-On-Demand-DL-PRS-Configurations-r17  OPTIONAL, -- Need ON  nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17  NR-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 OPTIONAL, -- Need ON  area-ID-CellList-r17 Area-ID-CellList-r17 OPTIONAL -- Need ON  ]]  }  -- ASN1STOP   | ***NR-Multi-RTT-ProvideAssistanceData* field descriptions** | | --- | | ***nr-DL-PRS-AssistanceData***  This field specifies the assistance data reference and neighbour TRPs and provides the DL-PRS configuration for the TRPs.  Note, if this field is absent but the *nr-SelectedDL-PRS-IndexList* field is present, the *nr-DL-PRS-AssistanceData* may be provided in IE *NR-DL-TDOA-ProvideAssistanceData* or *NR-DL-AoD-ProvideAssistanceData*. | | ***nr-SelectedDL-PRS-IndexList***  This field specifies the DL-PRS Resources which are applicable for this *NR-Multi-RTT-ProvideAssistanceData* message. | | ***nr-Multi-RTT-Error***  This field provides Multi-RTT error reasons. | | ***nr-On-Demand-DL-PRS-Configurations***  This field provides a set of available DL-PRS configurations which can be requested by the target device on-demand.  NOTE 1: In the case of available on-demand DL-PRS configurations for multiple NR positioning methods are provided, the *nr-On-Demand-DL-PRS-Configurations* shall be present in only one of *NR-Multi-RTT-ProvideAssistanceData*, *NR-DL-AoD-ProvideAssistanceData*, or *NR-DL-TDOA-ProvideAssistanceData*.  NOTE 2: If this field is absent but the *nr-On-Demand-DL-PRS-Configurations-Selected-IndexList* is present, the *nr-On-Demand-DL-PRS-Configurations* may be provided in *IE NR-DL-AoD-ProvideAssistanceData* or *NR-DL-TDOA-ProvideAssistanceData*. | | ***nr-On-Demand-DL-PRS-Configurations-Selected-IndexList***  This field specifies the selected available on-demand DL-PRS configurations which are applicable for this *NR-Multi-RTT-ProvideAssistanceData message*. | | ***area-ID-CellList***  This field specifies the network area for which this *NR-Multi-RTT-ProvideAssistanceData* message is valid. |   *END OF CHANGE* |

R2 should discuss on the following proposal:

***Proposal5:* Reomve the definition of the nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 within each DL and multi-RTT positioning method, and make it as a common IE, which is referred by DL and multi-RTT positioning method.**

# Conclusion

Based on the summary as above, we propose the following for dicsussion:

***Proposal1*: TRP configuration should also be provided in on-demand PRS configuration for index-based on-demand PRS request.**

***Proposal2:* For UE-initiated on-demand PRS request by explicit parameter, allow the network to provide a list parameters to the UE that the UE should only request within the scope of the list, when such confifuration is provided.**

***Proposal3:* RAN2 to discuss and fix the mismatch issue of on-demand PRS between RAN2 and RAN3, the following alternatives can be considered:**

* **Alt 1: The pre-defined PRS configuration from LMF to UE includes a list of complete PRS configurations (maintaining the status quo), then the following changes are essential:**
* **In step 0, the possible On-Demand PRS configuration from gNB to LMF shall include a list of complete PRS configurations, each associated with a PRS configuration ID;**
* **In step 3, the PRS CONFIGURATION REQUEST from LMF to gNB shall include PRS configuration ID;**
* **In step 6, the on-demand PRS response from LMF to UE shall include the PRS configuration ID that is successfully activated.**
* **Alt 2: The pre-defined PRS configuration from LMF to UE only includes a list of allowed values for the parameters that can be requested by the UE**

***Proposal4*: Add a note for explaining measurements that is needed for the assistance of LMF/U-initiated on-demand PRS request.**

***Proposal5:* Reomve the definition of the nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 within each DL and multi-RTT positioning method, and make it as a common IE, which is referred by DL and multi-RTT positioning method.**