**3GPP TSG RAN WG2 Meeting#117-e R2-22xxxxx  
Electronic Meeting, 21 February 2022 - 03 March 2022**

**Agenda item:** 8.11.2.3

**Source:** Lenovo, Motorola Mobility

**Title:** Report of [Pre117-e][608][POS] Open issues on on-demand PRS

**Document for:**Discussion and Decision

Introduction

This pre-meeting report collects companies’ inputs and provides a summary of proposals to address the remaining open-issues for the on-demand PRS feature.

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| * [Pre117-e][608][POS] Open issues on on-demand PRS (Lenovo)   This offline discussion will report the following:   * Proposals related to Stage 2 and 3 running CRs * Proposals addressing the remaining issues identified by the open issue list. |

As per the Chair’s guidance the following discussion timeline is noted:

* **Start of Pre-discussions that collects structured company input:-** 
  + **Start Date: 9th February 2022**

The Rapporteur would like to divide this Pre-meeting discussion into 2 phases for easier collection, review and update of proposals**:**

* **Phase 1-Initial collection of companies inputs/views (Pre-meeting discussion Stop):** 
  + **Phase 1 deadline: 14th February 2022, 23:00 UTC**
* **Phase 2- Review and Feedback on Rapporteur’s Proposals:**
  + **Phase 2 deadline: 17th February 2022, 10:00 UTC**

## Contact Information

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## Background

During the RAN2#116bis-e Post-meeting discussion in [1, [R2-2202005](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_116bis-e/Docs/R2-2202005.zip)], the following list of open issues were identified for the completion of the on-demand PRS feature (the Rapporteur has also enumerated the open issues with the corresponding question(s) for easier mapping to the relevant Sections of this Pre-meeting discussion):

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| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** | **Open Issue# - Associated Question** |
| **Stage 2** | Stage 2 text | ? | **Status**: draft in stage 2, check the status of stage 2 email discussion 116bis-629 | **1 – Q1** |
| **Stage 3** | Trigger criterion/pre-condition for UE initiated On-Demand PRS | Yes | **Status**: check the status of LPP email discussion 116bis-628  RAN2#116bis:  If the LMF indicates predefined configurations, the UE can request them via LPP RequestAssistanceData. | **2 – Q2, Q3** |
| The content of On-Demand PRS request, e.g. explicit indication, parameter/value;  FFS: whether UE can request only the explicit parameters that NW indicates and their value range is within the value range that NW supports. | Yes | **Status**: check the status of LPP email discussion 116bis-628  RAN2#116bis:  LPP signaling supports index-based and explicit request of DL-PRS parameters from the UE. The UE is not required to implement requesting explicit parameters and the LMF is not required to grant them if the UE does request. | **3 – Q4, Q5, Q6, Q7** |
| PosSI as response for On-Demand PRS request | Yes | **Status**: discussion see R2-2200047  Suggest to approve the proposal 6 based on majority;  **14 companies have responded. It is clear majority (13 Vs 1) that For On-Demand PRS, posSI cannot be the response for On-Demand PRS request .**  **Proposal 6 For On-Demand PRS, posSI cannot be the response for On-Demand PRS request.** | **4 – Q8** |
| Content of MO-LR, e.g. NR ECID | Yes | **Status**: discussion see R2-2200047  Suggest to approve the proposal 4 based on majority;  14 companies have responded. Only two companies support that proactive signaling to provide NR ECID measurements in MO-LR message while requesting for DL-PRS AD (as in legacy Rel-16 without on demand PRS) is supported.  **Proposal 4 UE does not need to include NR ECID (RRM measurements) in MO-LR message while requesting for DL-PRS AD .** | **5 – Q9** |
| RAN1 parameters on On-Demand PRS  FFS on the response of UE initiated on-demand PRS  FFS on the configuration of configured available PRS, i.e., how much set of contribution can be provided, what are included within the pre-configured available PRS. | Yes | **Status**: check the status of LPP email discussion 116bis-628 | **6 – Q10, Q11, Q12, Q13, Q14, Q15** |
| We have not discussed if UE should provide the reason as why UE prefers to request a new PRS characteristics. A generic reason may help NW understand what is lacking. | No | **Rapporteur considers this as optimization, we could have it only if there is consensus.** | **3 (related to content of OD-PRS request) – Q7** |
| **UE capability** | UE capability on On-Demand PRS  FFS on per positioning method | Yes | **Status**: check the status of LPP email discussion 116bis-628~~, and the status of RAN1 feature list;~~  RAN2#116bis:  **Proposal 3.2.3-1: [Easy agreements] [10/10] For On-Demand PRS, introduce LPP capability on UE-initiated On-Demand PRS Request;**  ~~Should be decided in RAN2 although RAN1 mentioned it in their feature list R1-2200767~~  RAN1 has deleted 27-5-1 [UE-initiated] on-demand PRS from their list, and rely on RAN2 | **7 - Q16, Q17** |
| **NRPPa** | NRPPa change | Yes | **Status: RAN3 to decide;** | **Not treated, under RAN3 scope** |

This report will use the above remaining issues as baseline to gather companies’ views.

# Open Issue#1: Stage 2 issues

## Question 1

In order to stabilize the Stage 2 text on On-demand PRS, companies are kindly invited to review and provide any comments/feedback (if any) to the latest version of the running CR in [2, [R2-2201815](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201815.zip)], which is based on the outcome of the [Post116bis-e][629][POS] running CR discussion and used as baseline for gathering companies’ views on this aspect.

**Companies are encouraged to provide their feedback/comments on the latest version of the Stage 2 text of the TS38.305 running CR in [2,** [**R2-2201815**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201815.zip)**]**:

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| **Section** | **Company** | **Identified issues & Suggested Changes** |
| 7.x.1 | Nokia | In 7.x.1, saying “LMF to request” is not correct. LMF does not request UE or any other entity. We propose the following text:  On-Demand PRS transmission procedure allows to control whether PRS is transmitted or not and to change the characteristics of an ongoing PRS transmission. The on-demand PRS transmission procedure can be initiated either by the UE or LMF. |
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| 7.x.2 | Nokia | In 7.x.2:  Step 1 and 2a both covers UE-initiated ODPRS. So, the figure needs to be updated to put both steps under one dotted box for UE-initiated ODPRS.  Step 2a: The last sentence about sending in MO-LR should be a NOTE as it is a caveat addressing a different procedure covered in LCS specification.  Step 2b: In the figure, it is shown as LMF-initiated ODPRS but it is not mentioned in the description of step 2b. Also, what is “available PRS configuration” mentioned in step 2b? How does that relate to step 1? Add “In case of LMF-initiated On-Demand PRS to step 2b and remove the text “or to provide available On-Demand PRS configurations to the UE”  Step 3: Change “or change to PRS transmission characteristics” to “or change to the transmission characteristics of an ongoing PRS transmission”  Step 7 does not fit in this 38.305 call flow. The treatment of ODPRS request for assistance data via MO-LR and reference to SA2 specification can be put under a NOTE.  Editor’s Note with FFS to step 6 can be removed as I believe we concluded the response to a ODPRS request cannot be a posSIB. |
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| Other Identified Changes |  |  |
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### Rapporteur’s Summary:

Only one company (Nokia) has responded with inputs for consideration in relation to Clauses 7.x.1 and 7.x.2 of the Stage 2 text. For Section 7.x.1, the Rapporteur’s understanding is that the usage of “LMF to request” relates to the LMF request of the change of PRS parameters for LMF-initiated on-demand PRS to the gNB/TRP. On the Editor’s note for the FFS related to step 6 this is to be finalized by Proposal 8 of this Pre-meeting discussion.

Due to the limited company input with respect to the raised Stage 2 issues in 7.x.1 and 7.x.2, it is recommended that the following be used as further direct input for the Stage 2 running CR discussions.

Stage 2 issues to be noted:

Under 7.x.1

* Revise introductory text to: “On-Demand PRS transmission procedure allows to control whether PRS is transmitted or not and to change the characteristics of an ongoing PRS transmission. The on-demand PRS transmission procedure can be initiated either by the UE or LMF”.

Under 7.x.2:

* Step 1 and 2a both covers UE-initiated ODPRS. Figure 7.x.2-1 requires update to consolidate both steps under one dotted box for UE-initiated ODPRS.
* Step 2a: The last sentence: “The LPP Request Assistance Data message for On-Demand PRS may also be sent in an MO-LR location service request message” should be a NOTE as it is a caveat addressing a different procedure covered in LCS specification.
* Step 2b: In Figure 7.x.2-1, it is shown as LMF-initiated ODPRS but it is not mentioned in the description of step 2b. Also, what is “available PRS configuration” mentioned in step 2b? How does that relate to step 1? Add “In case of LMF-initiated On-Demand PRS to step 2b and remove the text “or to provide available On-Demand PRS configurations to the UE”
* Step 3: Change “or change to PRS transmission characteristics” to “or change to the transmission characteristics of an ongoing PRS transmission”
* Step 7 does not fit in this 38.305 call flow. The treatment of ODPRS request for assistance data via MO-LR and reference to SA2 specification can be put under a NOTE.
* Editor’s Note with FFS to step 6 can be removed as I believe we concluded the response to a ODPRS request cannot be a posSIB.

Stage 3 Remaining Issues

This Section discusses the remaining identified Stage 3 open issues.

## Open Issue#2: Trigger criterion/pre-condition for UE initiated On-Demand PRS

The trigger criterion for UE-initiated on-demand PRS was extensively discussed during the past meetings but not yet finalized. It has already been agreed during the RAN2#116bis-e meeting, that the UE may request for the indicated pre-defined PRS configurations from the LMF via the LPP *RequestAssistanceData* message. In addition, during the Post116-e email discussion [601][3, [R2-2200047](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200047.zip)], the pre-requisite conditions for on-demand PRS request were also discussed.

On one hand, a blind request of the requested on-demand PRS parameters by the UE, may allow the network to efficiently meet the UE’s on-demand PRS request via the already agreed explicit request. From the UE perspective, this may seem more reasonable than the UE indicating its preferred pre-defined on-demand PRS configuration from the index of received pre-defined on-demand PRS configurations, which may or may not meets its positioning requirements. In this case, the network is not mandated to fulfil the UE’s on-demand PRS request as per the agreements made during the RAN2#115-e meeting.

However, the currently agreed network aware UE-initiated on-demand PRS request is firstly contingent on the LMF indication of the pre-defined on-demand PRS configurations. This may imply that if the LMF does not indicate any pre-defined configurations to the UE and the UE is capable of supporting the UE-initiated on-demand PRS feature then this may result in the UE never transmitting an on-demand PRS request in the first place, unless provided by the network. As discussed in the previous meeting and noted by the Chair, this may be resolved according to one of the following methods:

* Based on the network awareness of the UE supporting UE-initiated on-demand PRS (via capability signalling), such that the network may be first aware on whether to initially provide the pre-defined on-demand PRS configurations to the UE based on the capability signalling.
* The UE may indicate its need for requesting a set of pre-defined on-demand PRS configurations e.g., via LPP *RequestAssistanceData*.

### Blind Request of UE-initiated on-demand PRS

#### Question 2

**Companies are invited to provide their input on whether a blind UE-initiated on-demand PRS request should be supported. In addition, please also indicate if the LMF response to the blind request should be best effort, i.e., it is up to the LMF to respond to the UE’s on-demand PRS blind request.**

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| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | We need to first clarify that here the discussion is only for parameter-based PRS request. For configuredID-based PRS request, agreement has already been made that UE can only make the request after PRS request configuration has been delivered to the UE.  Then, for parameter-based PRS request, we think no blind request should be allowed that the UE should be allowed to make the request only after the PRS request configuration, same as configuration-based PRS request. The reason is that in order for the UE to make the request, the UE would need to perform some measurements on the PRS such that informed decisions can be made. SO anyway, the UE already has the AD when UE makes the request |
| Xiaomi | No | When network don’t support on-demand PRS, blind request don’t have any benefit and will lead additional positioning latency. |
| Qualcomm | Yes | The feature can be supported with the existing LPP transactions and produres and no changes are needed. The UE cannot make any PRS measurements if there is no PRS, and the UE is also not required to make PRS measurements without PRS assistance data.  Any LPP Request Assistance Data is usually a "blind" request. |
| CATT | No | Blind request should be avoided, since it is probably rejected by LMF. |
| Apple | No | What would be the point in that? |
| ZTE | Yes | For index based request we agree with HW. For parameter based, according to the agreement of last meeting: ‘The UE is not required to implement requesting explicit parameters and the LMF is not required to grant them if the UE does request.’ That means even if UE’s request is within NW’s capability, NW may also reject the request, so we think blind request is also feasible. |
| Ericsson |  | If QC implies that this is supported based upon an already existing LPP transactions; .ie not part of the very 1st MO-LR message (i.e not part of embedded LPP MO-LR); then we are fine.  To provide view on ZTE; the NW can also reject the index-based request from the UE.  It is just that not every deployment will have the possibility to pre-define the configuration. It may happen that only one or two parameters can be changed dynamically and hence to pre-define configuration is meaningless. Rather simply indicating that these parameters and value ranges are supported is sufficient; and hence UE can request explicitly what is needed. Similar to how UE request structure is provided; the structure from NW side can also be provided saying these are the parameters that can be changed. We do not need to in such case worry about maximum on-demand PRS pre-defined configurations. |
| Intel | No | As we discussed in the previous meetings as well, if LMF supports indication of predefined configurations, the UE can request via LPP RequestAssistanceData. We don’t think anything new needs to be defined. |
| Samsung | No | Allowing this makes too various combination of DL PRS and this is also not guaranteed that LMF can meet the request. Since the LMF only can handle the final configuration of DL PRS, we think UE’s request should be under this LMF’s configuration which is available at the network. |
| OPPO | No | PRS configuration is not a UE specific config, introduce such blind request will increase the load of LMF and the request may not be accepted with a large probability. |
| InterDigital | Yes | We share same understanding with QC that the UE should be able to send the blind request in scenarios when there is no preconfigured DL-PRS assistance data. Regarding the response to blind request, it can be up to LMF on whether to respond with pre-defined one-demand PRS configurations/parameters or reject the request. |
| vivo | No | Blind request may increase the unnecessary signaling overhead. UE’s behavior should be under the network’s control. |
| Nokia | No | We do not support blind request from UE for ODPRS.  Discussion under 3.1 is not coherent and is very confusing. What a blind request is, is not well defined. We understand blind request refers to UE explicitly requesting certain PRS parameters a) without having prior knowledge of NW supported PRS configuration or b) without NW providing pre-defined PRS configurations. We agree with Huawei that this discussion seems to focus on UE initiated ODPRS for the case where UE can explicitly request PRS parameters. Even for UE initiated ODPRS with explicit signaling of PRS parameters, the UE must have some idea of what configurations the network supports. |
| Lenovo, Motorola Mobility | Yes, but | We share the view that no new additional signalling needs to be introduced and the existing existing LPP RequestAssistanceData message may reused. |
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##### Rapporteur’s Summary:

Fourteen (14) companies have responded to this issue with [5/14] proponents and [9/14] companies not supporting blind requests for UE-initiated on-demand PRS. The key arguments are summarized as follows:

Support for UE-initiated Blind on-demand PRS Requests:

* There are no changes to the LPP spec. required for supporting blind on-demand PRS requests.
* Blind requests are feasible to support parameter-based requests by the UE and the NW may still reject the request based on previous RAN2#116bis-e agreements.
* Not every deployment may have an index of pre-defined configurations, and may only require one or two parameters to be modified
* Blind requests may be used in scenarios where the pre-defined PRS configurations may have not been provided to the UE.

Arguments against UE-initiated Blind on-demand PRS Requests:

* The on-demand PRS request is dependent on already performed PRS measurements based on previously received AD
* Unnecessary signalling overhead, high probability of rejection by the LMF and additional latency incurred.
* Complexity of multiple combination of on-demand PRS parameters with no guarantee/proability the blind request is met.
* Increase of signalling load at the LMF.

The Rapporteur would like to highlight that a blind request may refer to a UE explicitly requesting certain OD-PRS parameters that may or may not be supported by the network in order to address following issues 1) UE may not always received an index of pre-defined configurations 2) UE is not aware of the supported OD-PRS parameters for particular NW deployment.

However, due to the lack of clear consensus on the UE-initiated on-demand PRS blind request issue, it is recommended to use the following as a basis for further discussion:

**Proposal 1: RAN2 to further discuss the need for blind on-demand PRS request support for UE-initiated on-demand PRS**.

### Network-aware request of UE-initiated on-demand PRS

#### Question 3

**Companies are invited to provide their input on whether the following pre-condition options may be supported for the LMF to provide/not provide an index of pre-defined on-demand PRS configurations to the UE:**

* **Option 1: The LMF is implicitly aware of UE-initiated on-demand PRS support via capability information signalling, e.g., using LPP ProvideCapabilityInformation.**
* **Option 2: UE explicitly indicates its need for on-demand PRS to the LMF, e.g., using LPP RequestAssistanceData**
* **Option 3: No extra/other pre-conditions are necessary for the LMF to provide pre-defined on-demand PRS configuration(s).**

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| Company | Options 1/2/3 | Comments |
| Huawei, HiSilicon | 1 | There is no need for explicit request from the UE for the AD. If the UE does not want the configuration, the UE does not need to report the capability for on-demand PRS request in the first place, even if the UE may support on-demand PRS.  No strong view for Option2, we should not spend too much time on this anymore. |
| Xiaomi | 1 |  |
| Qualcomm | 2 | Option 2 seems the only agreement we have so far and which is sufficient:  "UE-initiated on-demand PRS request is enabled by enhancing LPP RequestAssistanceData." |
| CATT | 1 |  |
| Apple | 1 |  |
| ZTE | 1 | Whether UE can send on-demand PRS request or not should be know by LMF |
| Ericsson | 1 | Yes, agree with comment from ZTE. |
| Intel | 1 | Our understanding is that option 1 can be easily supported (and indeed needs to be supported anyway as the agreement that “For On-Demand PRS, introduce LPP capability on UE-initiated On-Demand PRS Request”). Then, the need for explicit indication via LPP does not seem essential. |
| Samsung | 1 | Same view with Huawei. |
| OPPO | 1 |  |
| InterDigital | 1 or 2 |  |
| vivo | 1 with comment | The “implicitly” in Option 1 should be removed as LMF can explicitly know the support via capability information. We assume the question just aims to dedicate LPP scenario. The LMF can provide pre-defined on-demand PRS configurations to the UE who support on-demand PRS via LPP and no initial request from UE is needed. |
| Nokia | 1 | Question is confusing! It looks like the intent of the question is to find out whether LMF can unconditionally provide pre-defined PRS configurations or if it should be conditioned on knowing the UE capability (for support of UE-initiated ODPRS) or only when the LMF receives a request for assistance data from UE.  The LMF must know the UE capability for support of UE-initiated ODPRS before it can use dedicated LPP signaling (i.e., pushed by LMF using ProvideAssistanceData) to provide pre-defined PRS configurations. So, in that sense Option 1 must be supported. There is also the capability already for UE to request assistance data and hence Option 2 is already supported.  For broadcast of pre-defined PRS configurations, only UEs capable of UE-initiated on-demand PRS receives the pre-defined PRS configuration sent in posSI. |
| Lenovo, Motorola Mobility | Option 2 | Prefer option 2 since the UE can provide more detailed information regarding the UE-initiated on-demand PRS as request in terms of duration, etc. Option 1 is also fine, however with signalling only the capability information, the network may know over which time interval the UE may require the OD-PRS index of configurations. If the UE requests for normal AD (legacy procedure), the UE may also further indicate that it needs OD-PRS in addition to normal AD-PRS. |
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##### Rapporteur’s Summary:

Fourteen (14) companies have responded to this issue with the majority of companies in support of Option 1 [11/14], [2/14] companies in support for Option 2, and [1/14] company supporting either Option 1 or 2.

The Rapporteur notes that concluding on either Option 1 or Option 2 will enable the NW to make an informed decision on whether to provide an index of on-demand PRS configurations to the UE. Since the provision of UE-initiated on-demand PRS has already been agreed to during the RAN2#116bis-e meeting, Option 1 has no specification impact and may be simply noted.

Proposal to be noted based on existing RAN2#116bis-e agreement on UE-initiated on-demand PRS capability

**Proposal 2: The network is aware of UE-initiated on-demand PRS support via the previous RAN2#116bis-e agreement on introducing LPP capability for UE-initiated On-Demand PRS Request.**

## Open Issue#3: On-demand PRS Request Content

Based on the previous RAN2#116bis-e meeting agreement, the following request options are supported:

1. Explicit request of on-demand PRS parameters
2. Index-based request of on-demand PRS parameters

In the case of the explicit on-demand PRS request, an open issue remains on whether the UE may freely request a specific set of explicit (individual) on-demand PRS parameters, as already provided by RAN1, e.g., PRS bandwidth, periodicity, etc. based on its own positioning requirements or whether the explicit request by the UE may only depend on the parameters provided by the network. It is assumed that the network will provide a list of supported parameters via separate prior signalling, e.g., an index of pre-defined on-demand PRS configurations. It also noteworthy to mention that the network may still attempt to fulfill the UE’s request in a best effort manner and in cases where the requested PRS parameter(s) and value ranges are not supported, may not fulfil the UE’s explicit on-demand PRS request at all.

### Question 4

**In the case of an explicit request of on-demand PRS parameters, companies are invited to provide their preference on the following options:**

* **Option 1: UE may request any of the explicit parameters from the RAN1 agreed parameter list.**
* **Option 2: UE may only explicitly request the parameters that were indicated by the network via prior signalling, e.g., based on an index of pre-defined PRS configurations.**
* **Option 3: Other, please specify**

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| Company | Option 1/2/3 | Comments |
| Huawei, HiSIlicon |  | This question is duplicated with Question2 on blind request? |
| Xiaomi | 1 | Option 1 is more flexible, and there is no issue if LMF don’t support parameters requested by UE since the final decision is made by LMF and LMF can attempt to fulfill the UE’s request in a best effort way. |
| Qualcomm | 1 | What would be the purpose/use case for specifying the RAN1 parameter in LPP, but only a subset is allowed at the end? |
| CATT |  | See the comment of Question 2. |
| Apple | 3 | In general, we think only the index based request is needed. If we are to support explicit parameters request in the end, then there is no need to make this even more complex by introducing restrictions – that is, we do not support option 2. |
| ZTE | 1 | Whether UE can send on-demand PRS request or not should be know by LMF |
| Ericsson | 1, however | Instead of pre-define an explicit indication from NW is needed. It is anyways complicated on how to define the maximum number of pre-defined configuration etc.  To make it simple; LMF may provide the parameters and value range of each parameters that NW supports instead of putting it in any index. |
| Intel | 3 (see comment) | We assume that this relates to the NW-aware request case as discussed in section 3.1.  In any case, the UE should only be able to explicitly request parameters indicated by the NW via prior signaling, i.e. UE cannot request parameters or values not allowed by the network |
| Samsung | 1 | Whether LMF can support the requested DL PRS is just the manner of best effort. We don’t think need to have additional LPP procedure to give the hint of the parameters. |
| OPPO | Option 1, but | We think UE may request any of the explicit parameters that are pre-defined by network.  As we mentioned in Q2, no blind request is preferred. |
| InterDigital | 1 | We do not see the need for any conditions for the UE to send the request for any explicit parameters |
| vivo | 3 | Agree with Intel.  The LMF may provide the available on-demand configuration based on the RAN1 agreed parameter list in two formats:  1. pre-defined on-demand PRS configuration sets and each associated with an index  2. pre-defined explicit parameters associated with a value range, and the range of values can be indicated by a maximum or minimum value. |
| Nokia | 1 and 2 | Combination of Option 1 and Option 2  Option 1 is the baseline. The UE can only request those parameters that were agreed by RAN1 as ODPRS parameters.  Option 2 is related to blind request and is specifically saying it is not allowed and that UE request should be based on prior signaling from NW, which can either be pre-defined PRS configuration (as mentioned in Option 2) or other some new signaling to indicate the allowed PRS configurations (which indicate the parameters allowed and the values supported). |
| Lenovo, Motorola Mobility | 1,2 | Option 1 can enable the blind parameter request of OD-PRS, while Option 2 may complement the index-based OD-PRS solution. |
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#### Rapporteur’s Summary:

Fourteen (14) companies have responded to this issue of explicit parameter-based request of on-demand PRS with the majority of companies in support of Option 1 [9/14], [2/14] companies in support for Option 2, and [2/14] companies supporting Option 3. The [2/14] companies supporting Option 3, have a similar understanding to the way forward provided by Option 2, while the remaining company supporting Option 3 does not favour of increasing complexity by introducing further restrictions on the explicit parameter request. The intention of the question was to gather companies views on the scope and conditions of the explicit on-demand PRS parameters to be requested by the UE. The Rapporteur notes that this issue has a dependency on both blind and network aware UE-initiated on-demand PRS. Based on the majority, the following is proposed:

**Proposal 3: UE may explicitly request one or more the of the on-demand PRS parameters as provided in the RAN1 parameter list**.

### Question 5

Another related remaining open issue is to understand the types of supported value ranges associated to an explicit request of on-demand PRS parameters, which may or may not go beyond the value range supported by the network. From the Rapporteur perspective, it seems relatively straight-forward to re-use the value ranges of the PRS parameters supported in Rel-16.

**In the case of an explicit UE request of on-demand PRS parameters, do companies confirm that the already defined value ranges in Rel-16 are applicable to the agreed RAN1 on-demand PRS parameters? If the answer is No, companies are encouraged specify in the comments, which on-demand PRS parameter(s) may require different value ranges.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSIlicon | Yes |  |
| Xiaomi | Yes |  |
| Qualcomm | Yes | This seems according to RAN1 parameter list. |
| CATT | Yes |  |
| Apple |  | If we are to support this in the end, then of course there is no need to define new value ranges. |
| ZTE | Yes | If UE requests explicit parameters based on R16 value range, then no available PRS configurations for parameter-based request is needed |
| Ericsson | Yes |  |
| Intel | Yes |  |
| Samsung | Yes |  |
| OPPO | Yes |  |
| InterDigital | Yes |  |
| vivo | Yes | Note that the requested value should be in the range of network allowance. |
| Nokia | Yes | Not sure why this is even an issue for discussion. As long as RAN1 decides which parameters are ODPRS parameters, the value ranges for those parameters are also decided by RAN1. For existing parameters, the value range is already known and for new parameters, RAN1 should tell us what it is. |
| Lenovo, Motorola Mobility | Yes |  |
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|  |  |  |

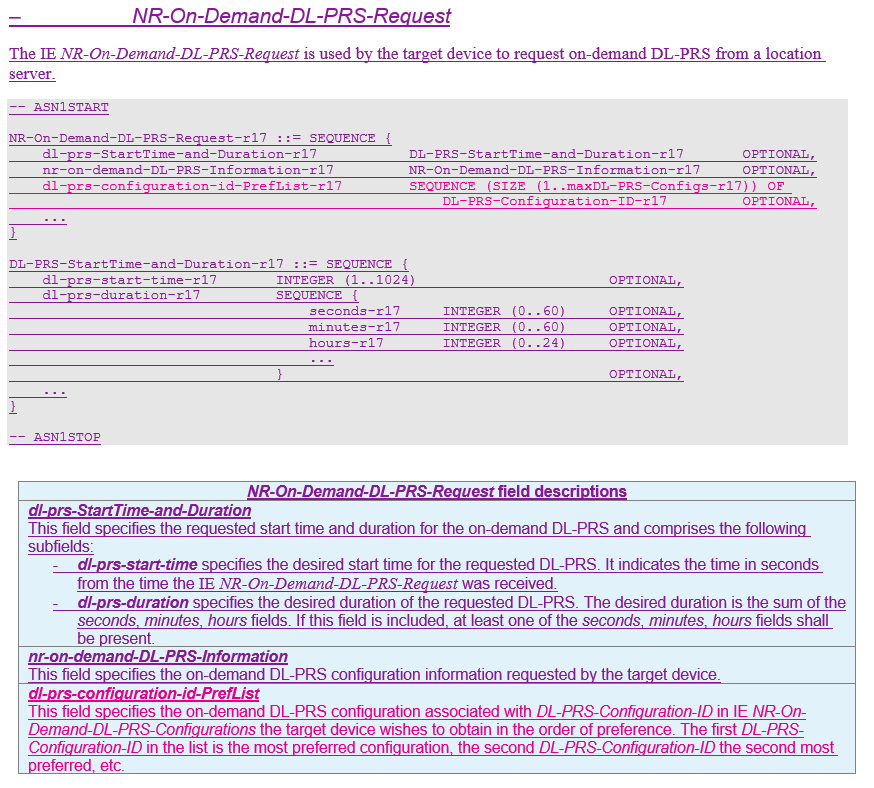
#### Rapporteur’s Summary:

Fourteen (14) companies have responded to this issue related to the supported value ranges for explicit parameter-based request of on-demand PRS with all companies in agreement [14/14], that the value ranges associated with the explicit on-demand PRS may re-use the currently supported Rel-16 value ranges.

**Proposal 4: UE may explicitly request on-demand PRS parameters based on the Rel-16 value ranges**.

### Question 6

Based on the latest version of the TS37.355 draft running-CR discussion under Clause 6.4.3 [4, [R2-2201723](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201723.zip)] (See Figure 1), the index-based request may consist of the UE indicating its preferred pre-defined on-demand DL-PRS configuration(s) in decreasing order of appearance.



**Figure 1**: **Extract of On-demand PRS Request from latest TS 37.355 Running CR [4]**

**In the case of an index-based on-demand PRS request, are companies in agreement that the UE may indicate its preferred on-demand PRS pre-defined configuration(s) via one or more PRS configuration IDs requested in decreasing order of preference (i.e., from most preferred to least preferred on-demand PRS configuration)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes |  |
| Xiaomi | Yes |  |
| Qualcomm | Yes | Even if a NW indicates multiple on-demand configurations, not all may be possible/available at the desired time. |
| CATT | No | We understand this is to avoid the issue that UE always request the best configuration, even a less better configuration can already satisfy the positioning QoS requirement.  But we think this is not an essential issue, even UE always request the best configuration, anyway LMF is aware of the positioning QoS, and it is LMF to make the final decision on whether to accept the request of UE.  Or if majority think this issue is essential, instead of the solution proposed in the running CR, we can add an restriction that UE always request the lowest configuration that can satisfy the positioning QoS requirement. |
| Apple | Yes |  |
| ZTE | Yes | It saves time since any one of the list can be indicated by LMF |
| Ericsson | No | There is no need to do over optimization. One request which UE can decide is best is enough. We are also supportive of CATT proposal that the UE always request the lowest configuration that can satisfy the positioning QoS requirement. |
| Intel | Yes |  |
| Samsung | Yes |  |
| OPPO | No | Agree with CATT and Ericsson. One configuration index is sufficient. |
| InterDigital | Yes |  |
| vivo | No | Agree with CATT that the UE shall request the lowest configuration that can satisfy the positioning QoS requirement. In other words, if the lowest configuration in the preferred list can satisfy the QoS, why does the UE request other higher configurations? |
| Nokia | Yes | In fact, the LMF should also provide the pre-defined PRS configuration in NW preference order to the UE. These preferences indicated by NW and UE are not to prevent the UE from always requesting the best configuration as CATT commented but only to find a compromise in the configuration from both UE and NW perspective. This increases the probability of UE and LMF agreeing to a middle ground configuration rather than LMF just rejecting the request from UE. |
| Lenovo, Motorola Mobility | Yes | We think this solution offers best flexibility since as already stated, from network perspective not all configurations may be available and from UE perspective not all configurations may exactly match its own internal positioning requirements. |
|  |  |  |
|  |  |  |

#### Rapporteur’s Summary:

Fourteen (14) companies have responded to this issue with [10/14] companies in agreement that the UE may indicate its preferred on-demand PRS pre-defined configuration(s) via a preferred list, while [4/14] companies support the request of a single configuration index as part of the UE’s on-demand PRS request message. One of the companies further mentions that the UE may request the lowest PRS configuration that meets the UE’s positioning requirements (QoS). The Rapporteur notes that defining “the lowest PRS configuration” may be challenging given the number of on-demand PRS parameters and various combination of value ranges for each of the on-demand PRS parameters that may constitute a “low” on-demand PRS configuration. Furthermore, according to Rapporteur’s understanding the UE’s most preferred on-demand PRS configuration is the configuration that best aligns with the UE’s positioning QoS, the second on-demand PRS configuration on the list is the second-best configuration that aligns with the UE’s positioning QoS, and so on. A key argument for the proponents of the preferred list is that it offers a middle ground or compromise as to what the network may offer (in terms of available on-demand PRS configurations) and what the UE may require depending on its positioning QoS. The Rapporteur would like to recommend the following:

**Proposal 5: The UE may indicate its preferred on-demand PRS pre-defined configuration via a list in decreasing order of preference (i.e., sorted from the UE’s most preferred to least preferred on-demand PRS configuration).**

### Question 7

Another issue noted in [1, [R2-2202005](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_116bis-e/Docs/R2-2202005.zip)] was the provision of a reason cause to the network as to why the UE would want to request a new on-demand PRS configuration. The Rapporteur’s view is that since the standard LPP procedure for the UE to request assistance data does not explicitly require such a reason cause, there is no substantial motivation to introduce it for the UE’s request for on-demand PRS. It has also been noted in [1, [R2-2202005](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_116bis-e/Docs/R2-2202005.zip)], that this issue may not be critical to the completion of the on-demand PRS feature. However, further company inputs are encouraged to determine the need for the UE to transmit a reason indication to the network as to why a UE prefers to request for a new on-demand PRS configuration (new PRS characteristics).

**Do companies agree that an explicit UE reason may not be required to be signalled to the network when the UE requests an on-demand PRS configuration?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | There is no need for cause for on-demand PRS request |
| Xiaomi | Yes | The explicit UE reason is not needed, and the requested parameters can reflect the cause. |
| Qualcomm | Yes | There is no need for a cause for any assistance data request. Per definition/specification, the UE sends a LPP Request Assistance Data when the available assistance data are not sufficient. |
| CATT | No | Seems within SON/MDT scope, but not POS enhancement. |
| Apple | Yes | Note: looks like companies that answered “no” actually meant “yes” |
| ZTE | Yes | UE’s reason will not affect LMF’s decision when LMF configuring on-demand PRS response |
| Ericsson | No | As PRS is shared resource; it is good if LMF can have a common view; hence additional assistance information from UE is needed especially if UE happens to request a new AD soon after requesting a previous one; i.e the time lag between two requests is very short. Otherwise, it is very difficult to realize this feature in field if every UE simply request one after another UE preferred AD.  NW will simply have to disable the feature. |
| Intel | No need for an explicit UE reason/cause | In our view, this does not seem to be an essential issue to consider at this stage |
| Samsung | No | There is no need for LMF to know the cause for assigning DL PRS. |
| OPPO | Yes | We see no need for the explicit UE reason. |
| InterDigital | Yes | Is this related to the previous discussion on conditions that trigger the on-demand PRS request? |
| vivo | Yes | The LMF may deduce the potential reason from the requested configuration/parameters. The explicit reason is unnecessary. |
| Nokia | No, reason/cause may be useful | Knowing the reason for the request may help LMF to factor in the reason for the request in the LMF decision making. |
| Lenovo, Motorola Mobility | Yes |  |
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#### Rapporteur’s Summary:

Fourteen (14) companies have responded to this issue with [12/14] companies in agreement that the UE does not need to indicate a reason/cause for its request for an on-demand PRS configuration, while [2/14] companies support a reason/cause. The Rapporteur further notes that Huawei, CATT and Samsung do not support the reason/cause, although indicated otherwise under the Yes/No column. The following proposal is therefore recommended:

**Proposal 6: A UE reason/cause for an on-demand PRS request is not supported.**

## Open Issue#4: Response to On-demand PRS Request

During the Post116-e email discussion [3, [R2-2200047](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200047.zip)], the issue related to the response signalling of a UE-initiated on-demand PRS response was discussed but not finalized. In addition, companies were of the view that since LPP *RequestAssistanceData* is initiated to request the preferred on-demand PRS configuration parameters, the appropriate network response via the LPP *ProvideAssistanceData* message is deemed necessary as a response to the on-demand PRS request. Furthermore, according to the Rapporteur’s understanding, the on-demand SIB/posSIB functionality discussed in [3, [R2-2200047](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200047.zip)] is considered to be a separate aspect. Therefore based on the consensus in [3, [R2-2200047](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200047.zip)], the following question is provided to re-check companies understanding on the type of response signalling to an on-demand PRS request:

### Question 8

**Do companies agree that for On-Demand PRS, the posSI message cannot be the response for On-Demand PRS request?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | posSIB cannot be the response | LPP response is needed after request. |
| Xiaomi | Yes | On-demand PRS configuration may be UE specific. |
| Qualcomm | Yes |  |
| CATT | No | Only LPP response is allowed for LPP request. |
| Apple | Yes |  |
| ZTE | Yes | On-demand PRS request is UE specific so it is hard to broadcast the response |
| Ericsson | Yes, posSI can be the response | If NW happens to decide to change the broadcast when UE sent a request; NW may simply release the LPP session. UE can obtain the new content via posSI. |
| Intel | Yes | Agree with Huawei. Note that this issue was discussed previously and there was a large majority that posSI cannot be the response for On-Demand PRS request. So, we assume this can be agreed and closed. |
| Samsung | No | The response need to be specific to the explicit request. |
| OPPO | Yes |  |
| InterDigital | Yes |  |
| vivo | Yes | Only LPP response is needed. |
| Nokia | posSI cannot be the response | Yes, agree that for On-Demand PRS, the posSI message cannot be the response for On-Demand PRS request. |
| Lenovo, Motorola Mobility | Yes |  |
|  |  |  |
|  |  |  |
|  |  |  |

#### Rapporteur’s Summary:

Fourteen (14) companies have responded to this on-demand PRS issue with [13/14] companies in agreement that the network does not need to respond on-demand PRS request via a posSI message, while [1/14] company supports. The Rapporteur further notes that CATT and Samsung share the view with the majority, although indicated otherwise under the Yes/No column. The Rapporteur proposes the following:

**Proposal 7: The posSI message cannot be the response for a UE’s On-Demand PRS request.**

## Open Issue#5: RRM measurements in MO-LR LCS message

An open issue, which was extensively discussed over the past meetings was the provision of RRM measurements to the network in order to aid the LMF in determining the appropriate DL-PRS configurations within the initial on-demand PRS configuration attempt via the MO-LR LCS message, which has been highlighted by a few companies to be beneficial for UE-initiated on-demand PRS. The RRM measurements, will enable the LMF to determine the rough coarse location of the UE in order to provision the optimal on-demand PRS configuration, e.g., the LMF may only configure TRPs within the vicinity of the UE’s rough location based on the RRM measurements.

On the other hand, many companies support the view that the RRM measurements may not have any specification impact since the LMF may utilize existing signalling mechanisms, e.g., *NR-ECID-RequestLocationInformation* IE to allow the UE to provide any available RRM measurements, which can be used to enhance the on-demand PRS configuration. The Rapporteur notes that this mechanism may already be supported for an ongoing LPP session based on the aforementioned request. The following question is provided to re-check companies understanding of transmitting RRM measurements as part of the MO-LR LCS message:

### Question 9

**Do companies agree on transmitting RRM Measurements as part of the MO-LR LCS message?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSIlicon | NO | MO-LR can send E-CID measurements as in legacy  Why are we discussing these issues at all? |
| Xiaomi |  | There is no need to introduce any optimization for LMF determining on-demand PRS configuration. |
| Qualcomm |  | No change compared to Rel-9 is needed. Any UE triggered LCS message can include up to 3 LPP PDUs. |
| CATT | No | Not clear what it is the issue, this already be supported in current specification, i.e., the MO-LR can include up to three LPP message, within which LPP ProvideLocationIInformation message can be included to indicate the E-CID measurements. |
| Apple | No | No new functionality is needed |
| ZTE | No | No additional auxiliary information (reason for request, ECID measurement, RRM measurement) to demonstrate necessity of on-demand PRS request is needed. |
| Ericsson | Yes | To save latency; it is beneficial if sending ECID report is mandated as part of MO-LR procedure. |
| Intel |  | We share the view with Huawei that this does not seem like a critical feature to consider considering the time for this WI. Not that it seems this issue was discussed in the last meeting and 12/14 companies did not want to support any new enhancement, so we suggest to follow majority view on this, i.e. UE does not need to include NR ECID (RRM measurements) in MO-LR message while requesting for DL-PRS AD , and the issue can be closed. |
| Samsung | No | Same view with Huawei. |
| OPPO | No |  |
| InterDigital | No | Since legacy reporting of E-CID measurements are supported with MO-LR, there is no need for introducing any additional reporting. |
| vivo |  | No need to further discuss as there seems no extra spec impact. |
| Nokia |  | Agree with Huawei, Qualcomm and CATT. The capability to include LPP PDU in a UE triggered LCS message already exists. So, the MO-LR LCS message can already include a LPP PDU for reporting measurements to the LMF. |
| Lenovo, Motorola Mobility | No | Fine to use existing mechanisms to report E-CID measurements. |
|  |  |  |
|  |  |  |
|  |  |  |

#### Rapporteur’s Summary:

Fourteen (14) companies have responded to this on-demand PRS issue with [13/14] companies in agreement that existing mechanism may be used to report RRM measurements in a MO-LR message, while [1/14] believes that the RRM measurements must be mandated as part of the MO-LR message. Therefore, the Rapportuer recommends the following proposal:

**Proposal 8: RRM measurements do not need to be transmitted as part of the LCS MO-LR message.**

## Open Issue#6: On-demand PRS Configuration

According to the latest version of the TS37.355 draft running-CR discussion [4, [R2-2201723](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201723.zip)], a number of FFS points were raised with regard to the content of (pre-defined) On-demand PRS configuration message provided by the LMF. The list of questions below aim to gather companies’ views on the following:

* Response of UE-initiated on-demand PRS request
* Content of the pre-defined on-demand PRS configuration, number of pre-defined configurations in a set, variable/fixed number of parameters within a set
* Configuration ID association

### UE-initiated on-demand PRS response

The degree of network control over a UE-initiated on-demand PRS request has also been discussed over the past few meetings [3, [R2-2200047](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200047.zip)] [5, [R2-2111256](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2111256.zip)]. The discussed options carried over from the previous RAN2#116bis-e meeting include the following [3, [R2-2200047](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200047.zip)]:

* Option A: UE can only request on-demand PRS based on prior reception of on-demand PRS configuration
* Option B: Configuration of a prohibit timer
* Option C: Reattempt timer
* Option D: Stop or Error or Abort message indication from the LMF
* Option E: None

Option A represents the pre-condition, allowing the UE to only perform UE-initiated on-demand PRS requests based on prior reception of the sets of pre-defined on-demand PRS configurations. Options B and C represent timer-based solutions either to prevent the UE from transmitting subsequent requests or enable the UE to transmit an on-demand PRS request after a certain duration has elapsed. The timer configurations may also be signalled along with pre-defined on-demand PRS configurations to control the number on-demand PRS requests transmitted upon reception of the on-demand PRS configuration. In addition, the Rapporteur notes that one of the reasons that a UE may transmit subsequent on-demand PRS requests is if the received pre-defined list of on-demand PRS configurations do not meet the UE’s positioning requirements (as required by the internal LCS client). Furthermore, since the LMF may ignore the request as per the earlier RAN2#115-e agreements, this may result in the UE transmitting multiple requests in succession, provided that the requests are continually ignored by the network. If the request is rejected by the LMF, then Option D may be considered as a viable rejection response to UE’s on-demand PRS request.

#### Question 10

The aforementioned options are therefore consolidated as follows:

* **Option 1: UE can only request on-demand PRS based on prior reception of on-demand PRS configuration**
* **Option 2: To limit the number of UE on-demand PRS requests after reception of an on-demand PRS configuration, a timer may be configured (e.g., prohibit timer, reattempt timer)**
* **Option 3: To reject a UE’s request for further on-demand PRS configurations, Stop/Error/Abort message indication from the LMF is signalled to the UE.**
* **Option 4: No mechanism to control the UE’s on-demand PRS request(s) needs to be specified in Rel-17.**
* **Option 5: No mechanism to reject a UE’s on-demand PRS request(s) or respond to a partially/completely unfulfilled request(s) needs to be specified in Rel-17.**

**Companies are encouraged to provide their preference on the above options. Note that since Options 1-3 are not mutually exclusive, companies may also indicate their support for more than one option accordingly.**

|  |  |  |
| --- | --- | --- |
| Company | Option 1/2/3/4/5 | Comments |
| Huawei, HiSIlicon | Option3 | Is option1 duplicated with the discussion above?  Option3, on rejecting UE’s request, this is already supported by the current LPP running CR. The LMF can send on-demand-dl-prs-supportedButCurrentlyNotAvailableByServer to the UE |
| Xiaomi | Option 1 and  Option 3 |  |
| Qualcomm | None | No new agreement is needed. The feature can be supported with the existing LPP transactions and procedures and the current set of agreements. E.g.,  - If the LMF indicates predefined configurations, the UE can request them via LPP RequestAssistanceData.  - LPP signalling supports index-based and explicit request of DL-PRS parameters from the UE.  -The UE is not required to implement requesting explicit parameters and the LMF is not required to grant them if the UE does request.  Therefore, the introduction of additional location server error causes is sufficient. |
| CATT | Option 2, but no strong view |  |
| Apple | Option 1 and 4 |  |
| ZTE | Option 3 | Agree with HW |
| Ericsson | None | Agree with QC. We think Option 3 is already supported. As LMF can send abort message. |
| Intel |  | Option 1 seems duplicated with previous discussion.  Option 2 may be useful but not essential to support  Agree with Huawei that Option 3 already seems to be supported |
| Samsung | Option 2 | We wonder if UE received No msg, then it cannot request again on the same configuration. We think the situation of DL PRS currently turned on can be changed in time. So UE should be able to request again after some time. And this can be realized by option 2. |
| OPPO | Option 1 and 2 |  |
| InterDigital | Option 2 and Option 3 |  |
| vivo | Option 2 and 3 with comments | Option 3 is not clear, in understanding, the new cause indication is not used to reject a UE’s request for further on-demand PRS configurations but to inform the UE that the previous request is rejected. Does it mean the UE cannot request on-demand PRS anymore once a previous request fails?  We think a prohibit timer or reattempt timer is essential to make the mechanism complete. |
| Nokia | Option 1 | Option 1 is required anyway to avoid blind request from UE. The other options either delay the request from UE or take action only after the fact there is a flood of requests from UEs. A better way to control UL signaling congestion is to define additional standardized conditions/trigger criteria as to when the UE can send the request. Along with Option 1, we suggest defining radio conditions as additional criteria to trigger the UE request for on-demand PRS. The PRS configuration sent to UE as pre-configuration or pre-defined configuration can also be associated with positioning QoS to control which configurations the UE can request under certain conditions (please also see our comment for Question 18). |
| Lenovo, Motorola Mobility | Options 2 and 3 | We support a timer-based mechanism to manage the UE-initiated on-demand PRS requests to the UE , while providing a NACK message to the UE via the existing error causes in the latest running version of the CR. |
|  |  |  |

##### Rapporteur’s Summary:

Fourteen (14) companies have responded to this on-demand PRS issue with [4/14] companies in favour of Option 1, [6/14] companies favour of Option 2, [6/14] companies in favour of Option 3, [1/14] company in favour of Option 4, while [2/14] companies are in favour of none of the provided Options. Since Option 1 is already part of the past agreements on network aware UE-initiated on-demand PRS no further proposal is needed as a pre-condition. Option 2 and 3 seem agreeable to most companies given that:

* Option 2 limits the request for a certain a period of time to prevent any potential surge in the number of UE-initiated on-demand PRS requests;
* Option 3 may be fulfilled as part of the existing LPP transaction behaviour and may be fulfilled using the *on-demand-dl-prs-supportedButCurrentlyNotAvailableByServer* error cause.

Based on the above discussion, the following proposals are recommended:

**Proposal 9-1: To respond to an unfulfilled UE-initiated on-demand PRS request, an error cause may be provided to the UE.**

**Proposal 9-2: To control the number of UE-initiated on-demand PRS requests, a timer may be configured (e.g., prohibit timer, reattempt timer).**

### Content of on-demand PRS configuration

The on-demand PRS configuration may consist of a set of on-demand PRS parameters agreed by RAN1. The following agreements were already made with respect to both LMF-initiated and UE-initiated on-demand PRS during RAN1#107-e [6, [R1-2112792](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_107-e/Docs/R1-2112792.zip)]:

|  |
| --- |
| **Agreement**   * From RAN1 perspective, for LMF-initiated request of on-demand DL PRS, the following group of on-demand DL PRS parameters is defined and signaled   + per resource set per positioning frequency layer per FR  1. DL PRS Periodicity 2. DL PRS Resource Bandwidth 3. DL PRS Resource Repetition Factor 4. Number of DL PRS Resource Symbols per DL PRS Resource 5. DL-PRS CombSizeN   Two options for indication of DL PRS QCL-Info, either   * + Option 1: per resource set per positioning frequency layer per FR * LMF recommends a list of QCL sources   + Option 2: per resource set per positioning frequency layer per FR     - LMF requests to provide the QCL information in the assistance data in NRPPa   + per FR     - Number of DL PRS frequency layers   + either per resource set per positioning frequency layer or per UE     - Start/end time of DL PRS transmission   + either per resource, or per resource set, or per UE     - ON/OFF indicator (for LMF initiated request only)   **Agreement**   * From RAN1 perspective, for UE-initiated request of on-demand DL PRS, the following group of on-demand DL PRS parameters is defined and signalled   + per positioning frequency layer per FR  1. DL PRS Periodicity 2. DL PRS Resource Bandwidth 3. DL PRS Resource Repetition Factor 4. Number of DL PRS Resource Symbols per DL PRS Resource 5. DL-PRS CombSizeN    * per FR 6. Number of DL PRS frequency layers    * per UE 7. Start/end time of DL PRS transmission   Two options for indication of DL PRS QCL-Info, either   * + Option 1: ~~per resource~~ per resource set per positioning frequency layer per FR     - UE recommends a list of QCL sources   + Option 2: per resource set per positioning frequency layer per FR   UE requests to provide the QCL information in the assistance data |

The number of on-demand PRS parameters in an on-demand PRS configuration can be summarized as follows:

**Table 1: Summary of parameters contained within an on-demand PRS configuration**

|  |  |  |
| --- | --- | --- |
| **No.** | **On-demand PRS Parameter** | **Resource Granularity** |
| 1 | DL PRS Periodicity | per positioning frequency layer per FR |
| 2 | DL PRS Resource Bandwidth | per positioning frequency layer per FR |
| 3 | DL PRS Resource Repetition Factor | per positioning frequency layer per FR |
| 4 | Number of DL PRS Resource Symbols per DL PRS Resource | per positioning frequency layer per FR |
| 5 | DL-PRS CombSizeN | per positioning frequency layer per FR |
| 6 | Number of DL PRS frequency layers | Per FR |
| 7 | Start/end time of DL PRS transmission | Per UE |
| 8 | DL PRS QCL-Info | per resource set per positioning frequency layer per FR |
| 9 | ON/OFF indicator (LMF-initiated on-demand PRS only) | either per resource, or per resource set, or per UE |

#### Question 11

The following question is intended to address the content of the on-demand PRS configuration and not any on-demand PRS request signalling.

**Do companies agree that the content of a single (pre-defined) on-demand PRS configuration for:**

1. **LMF-initiated on-demand PRS may comprise the PRS parameters No. 1-9 listed in Table 1 above;**
2. **UE-initiated on-demand PRS may comprise the PRS parameters No. 1-8 listed in Table 1 above.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | No need for discussion in LMF-initaited in R2 | For UE-initiated on-demand PRS, the agreement has been quite clear and no need for discussion in R2 |
|  |  |  |
| Xiaomi | Yes |  |
| Qualcomm | Yes | This should follow the RAN1 parameter list. |
| CATT | No need to discuss LMF initiated in RAN2 | Same view of HW. |
| Apple |  | If we are discussing the content of the pre-defined configuration, why do we need to differentiate between LMF-initiated and UE-initiated? |
| ZTE | Yes |  |
| Ericsson | No need to discuss LMF initiated in RAN2 | For UE-Initiated; follow RAN1 parameter list |
| Intel | Yes |  |
| Samsung | Yes |  |
| OPPO | Yes | We should follow RAN1 agreements. |
| InterDigital | Yes |  |
| vivo | Yes |  |
| Nokia | Yes | Don’t understand the reason for this question or why LMF-initiated case should not be discussed. If RAN1 agreed these parameters, then we have to adopt them and implement them. |
| Lenovo, Motorola Mobility | Yes |  |
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##### Rapporteur’s Summary:

Fourteen (14) companies have responded to this question with [14/14] companies in agreement that a single pre-defined on-demand PRS configuration may comprise of the all the parameters provided by RAN1. Since there is a common understanding on this aspect and by taking into account all parameters provided by RAN1 into the definition of an on-demand PRS configuration, no additional Stage 3 impact is foreseen. Therefore, the common understanding may be simply noted.

**No proposal required based on established common understanding of the RAN1 parameters to be supported.**

#### Question 12

The number of on-demand PRS parameters (pre-defined) on-demand PRS configuration may be fixed or variable, i.e. when the number is fixed, the LMF may decide to always signal the parameters listed in Table 1 as part of a (pre-defined) on-demand PRS configuration. When the number is variable, the LMF may decide to only signal a subset of the parameters in Table 1 and this subset number of parameters is up to the LMF implementation/network deployment.

**Companies are invited to provide their views on the following options related to the number of on-demand PRS parameters that can be signalled within a single (pre-defined) on-demand PRS configuration?**

* **Option 1: The number of on-demand PRS parameters may be fixed to 9 parameters for LMF-initiated on-demand PRS and 8 parameters for UE-initiated on-demand PRS as indicated in Table 1.**
* **Option 2: The number of on-demand PRS parameters to be signalled is up to network implementation/deployment for both LMF-initiated and UE-initiated on-demand PRS.**
* **Option 3: Other, please specify alternative.**

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| --- | --- | --- |
| Company | Option 1/2/3 | Comments |
| Huawei, HiSIlicon | Option1 | No need for discussion about LMF-initiated PRS request in R2 |
| Xiaomi | Option 1 |  |
| Qualcomm | None | Why should the number of on-demand PRS parameters be specified? This number is nowhere used…? The number of parameters can always be extended after the ASN.1 ellipsis "…". |
| CATT | Option3 | We support that a single on-demand PRS configuration include a complete set of PRS configurations, including frequency layer/TRPs/PRS resource set/PRS resources, and naturally these 8 parameters can be implicitly included within the set of PRS configurations. |
| Apple |  | The question is not clear. Why are we discussing the number of parameters? |
| ZTE | Option 1 |  |
| Ericsson | None | Agree with QC. |
| Intel | Option 1 | We assume there can be updates/changes during ASN.1 as needed |
| Samsung | Option 1 |  |
| OPPO | Option 1 |  |
| InterDigital | Option 1 | Under option 1, is there a possibility that for some pre-defined parameters the value  indicated is blank, e.g., Periodicity = {1ms 5ms 10ms}, Repetition factor = {}, etc.,?  Is there a scenario where the network does not want the UE to make a request for certain  parameters? |
| vivo | None | Agree with QC. |
| Nokia | None | Don’t see the relevancy of discussing the total number of parameters and whether this number is fixed or variable. What is the advantage to limiting the ODPRS parameters to a subset of the parameters agreed in RAN1? |
| Lenovo, Motorola Mobility | Option 1 |  |
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##### Rapporteur’s Summary:

Fourteen (14) companies have responded to this question with [8/14] companies in agreement that a single pre-defined on-demand PRS configuration may comprise of the all the parameters provided by RAN1, [1/14] companies support Option 3 a single on-demand PRS configuration includes a complete set of PRS configurations, while [4/14] do not see the relevancy of discussing the number parameters in an on-demand PRS config. as there is no Stage 3 impact. The intention of the question was to gain a common understanding on whether a network may provide a partial configuration consisting of only a subset of parameters or as Interdigital noted, whether a particular on-demand PRS parameter may be provided as an empty/blank field. Based on the discussion above, the following is proposed to be noted:

**Proposal 10: The provision of a partial on-demand PRS configuration is up to network deployment/implementation.**

#### Question 13

Another remaining open issue involves the number of on-demand PRS configurations that may be signalled to the UE as part of an index/set, which depends on the network deployment and possible UE capability (e.g., number of on-demands PRS configurations that may be stored by the UE (See Sec. 3.6, Q17)). An on-demand PRS index/set may comprise one or more on-demand PRS configurations, where each on-demand PRS configuration consists of the parameters listed in Table 1 together with an associated configuration ID. The number of on-demand PRS configurations within an index/set is yet to be finalized.

**Companies are invited to provide their views on the following options related to the number of on-demand PRS configurations that may be signalled as part of an index/set?**

* **Option 1: The number of on-demand PRS configurations within an index may be fixed to a maximum value of *N,* where *N* is to be specified.**
* **Option 2: The number of on-demand PRS configurations within an index is up to network implementation.**
* **Option 3: Other, please specify**

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| --- | --- | --- |
| Company | Option 1/2/3 | Comments |
| Huawei, HiSilicon | Option1 |  |
| Xiaomi | Option 1 |  |
| Qualcomm | None | With the current agreements, there is only one configuration per index. I.e., we may have N pre-defined configurations, and each configuration is associated with an ID. Why should there be multiple pre-defined configurations "within an index"? |
| CATT | Option 1 |  |
| Apple | None | Agree with QC, there is only one configuration per index. |
| ZTE | Option 1 | We understand option 1 like QC’s view. Is that a typo? |
| Ericsson | None | There is no storage here. It is not pre-configured, but it is instantaneous. Also agree with QC |
| Intel | Option 1 | We assume this is basically asking about max number of on-demand PRS configurations to be supported. We think N=4 or 8 can be supported. |
| Samsung | Option 1 | As rapporteur commented, UE will have the capability to store the configurations. There should be a specific max number on the configurations so that network can consider that. |
| OPPO | Option1 | The number of pre-defined PRS configurations should be specified. |
| InterDigital | Option 1 | What are examples of “number of on-demand PRS configurations within an index”? For example, can index 1 contain a set of parameters such as “periodicity = 10ms, repetition factor =4”?, index 2 contains the same parameters but with different values? |
| vivo | Option 1 with clarification | Agree with QC. The question is not clear.  Our preference is that the maximum number of on-demand PRS configurations is to be specified. |
| Nokia | None | Agree with Qualcomm. There is a 1:1 mapping between an index (configuration ID) and a pre-defined configuration. Not sure why we are discussing multiple pre-defined configurations that are referenced by one index/configuration ID. |
| Lenovo, Motorola Mobility | Option 1, see comments | It depends if multiple on-demand PRS configurations need to be nested under an index. If not, we fine with QC, Apple and Nokia’s understanding that there is 1:1 mapping between a configuration ID and index. |
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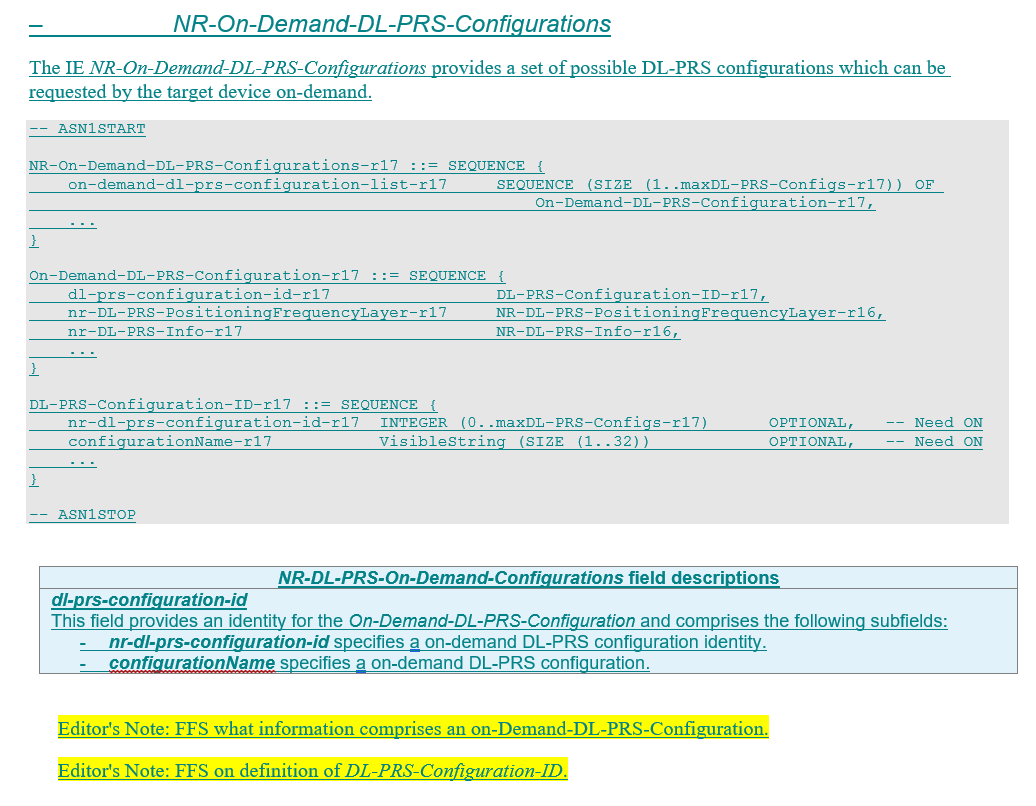
##### Rapporteur’s Summary:

Fourteen (14) companies have responded to this question with [10/14] companies in agreement that a maximum number of on-demand PRS configurations has to be specified, [4/14] companies further indicate that there is a 1:1 mapping between an on-demand PRS configuration (configuration ID) and an index. Based on this 1:1 mapping of on-demands PRS configuration to index, the Rapporteur would like to further clarify that the maximum value of N corresponds to the *maxDL-PRS-Configs-r17* (as indicated in the latest Running CR [4]) that may be signalled to the UE. There is also a related dependency on the UE capability in Q17. Therefore, the following is proposed:

**Proposal 11: The maximum number of on-demand PRS configurations, i.e., *maxDL-PRS-Configs-r17* signalled to the UE is to be specified. RAN2 to further discuss the value of *maxDL-PRS-Configs-r17*.**

#### Question 14

The definition of the PRS configuration ID was also identified as an open issue in the TS37.355 running CR [4, [R2-2201723](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201723.zip)]. The function of such an ID may be to uniquely distinguish the multiple pre-defined configurations provided by the network. According to the latest version of the TS37.355 draft running-CR discussion [4, [R2-2201723](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201723.zip)], the configuration ID is defined by an ID number and configuration name (See Figure 2). Although the need for a configuration name associated with the ID number is still to be determined.



**Figure 2**: **Extract of On-demand PRS Config. IE from latest TS 37.355 Running CR [4]**

**Do companies agree that the configuration ID includes an ID number and configuration name as illustrated in the extract from Figure 2?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | Not sure why configuration name is useful |
| Xiaomi | No | Configuration ID is sufficient. |
| Qualcomm | Yes | Configuration Name can disambiguate the ID (e.g., could be a PLMN ID, LMF ID, etc. as desired by a deployment). The UE may receive the pre-defined configurations from different sources/LMFs (LPP, posSIB, MO-LR). |
| CATT | No | ID is enough. |
| Apple | No | ID is sufficient |
| ZTE | No |  |
| Ericsson | No | ID is more than enough. It is rather instantaneous and is applicable at that moment; UE does not need to store such configs. It is different that pre-configured. ID is sufficient. |
| Intel | No | Having a name seems redundant if an ID is included |
| Samsung | No |  |
| OPPO | No | Configuration ID is enough. |
| ZTE | No |  |
| vivo | No | The intention of the configuration name is unclear. |
| Nokia | No | A unique ID is sufficient to uniquely point to a pre-defined PRS configuration. Currently, the LMF is the only source of pre-defined PRS configuration. We have not discussed the requirement for identifying different sources of configuration or identifying the different instances of LMF as a source. Handling the configuration received via LPP vs posSIB does not require identifying the different modes of signaling the configuration. We can discuss a UE behavior whether dedicated signaling overrides the broadcast signaled configuration or not. |
| Lenovo, Motorola Mobility | No | No sufficient/clear motivation to introduce a configuration name. |
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##### Rapporteur’s Summary:

Fourteen (14) companies have responded to this question with [13/14] companies in agreement that a configuration ID is sufficient and that a configuration name is not necessary, while [1/14] company indicates that a configuration name is to further differentiate among PLMN IDs, LMF IDs, etc. Considering the majority support, the following proposal is recommended:

**Proposal 12: The DL-PRS-Configuration ID is only defined by an identifier (ID).**

#### Question 15

Another issue relates to the provision of a single on-demand PRS configuration, in the case that multiple LPP *ProvideAssistanceData* messages have been received by the UE corresponding to different positioning methods, e.g., Multi-RTT, DL-TDOA, and DL-AoD. From the Rapporteur’s perspective, the provision of on-demand PRS assistance data per positioning is a natural extension to the UE’s request of on-demand PRS per positioning method (via *RequestAssistanceData*) as agreed upon in RAN2#116-e. An issue, however, could be related with any impacts on signalling overhead.

**Do companies agree that the on-demand PRS configuration(s) can be provided to the UE on a per positioning method basis?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSIlicon | Yes | Since PRS configuration can be different for different positioning methods, on-demand PRS configuration can also be different for different positioning methods. |
| Xiaomi | Yes |  |
| Qualcomm | Yes | This follows general LPP logic. |
| CATT | Maybe | In general we are ok with implementation of the current running CR, but in case of hybrid positioning, further enhancement may be required to avoid repeated on-demand PRS configurations. And we will further discuss this issue in our tdoc. |
| Apple | Yes |  |
| ZTE | No | We think there is no issue if on-demand PRS configuration is provided commonly, and UE request uniquely for different positioning methods. It is somewhat like the mechanism of nr-DL-PRS-AssistanceData-r16 and nr-SelectedDL-PRS-IndexList-r16 in current spec |
| Ericsson | No | Agree with ZTE. |
| Intel | Yes |  |
| Samsung | Yes |  |
| OPPO | Yes |  |
| InterDigital | Yes |  |
| vivo | Yes with comment | The on-demand PRS configuration shall be per positioning method. Besides, agree with ZTE to introduce a similar mechanism to the nr-SelectedDL-PRS-IndexList-r16, which can reduce signaling overhead. |
| Nokia | Yes |  |
| Lenovo, Motorola Mobility | Yes |  |
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##### Rapporteur’s Summary:

Fourteen (14) companies have responded to this question with [11/14] companies in agreement that on-demand PRS configuration is provided per positioning method, while [2/14] companies support a common configuration as per the definition of the Rel-16 IEs *DL-PRS-AssistanceData-r16* and *nr-SelectedDL-PRS-IndexList-r16*. [1/14] company is also of the view that both per positioning method and common configuration may be supported. The common configuration may be further discussed, if companies are strongly in favour of this additional signalling option. Therefore, the following proposal is recommended based on majority support:

**Proposal 13: On-demand PRS configuration is at least provided per positioning method.**

## Open Issue#7: UE-capability for on-demand PRS

### Question 16

It has already been agreed during the Ran#116bis-e meeting that there is a need for a separate UE-initiated on-demand PRS capability. A follow-up open issue is to collect company views on whether the UE-initiated on-demand PRS may be requested per positioning method. Since the on-demand PRS is request is per positioning method (based on earlier RAN2#116-e agreement), it is of the Rapporteur’s view that the UE-initiated on-demand PRS Capability exchange between LMF and UE may also be similarly structured in terms of requested positioning method.

**Do companies agree that the LMF may request UE-initiated on-demand PRS capability per positioning method, while the UE may similarly respond on its UE-initiated on-demand PRS capability per positioning method?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSIlicon | No | Not sure why a UE can request PRS for one positioning method but cannot request for another method. |
| Xiaomi | No strong view | Both On-demand PRS capability per positioning method or only reporting its on-demand PRS regardless of positioning method are OK. |
| Qualcomm | Yes | This follows general LPP logic. The LMF requests the capability based on what the LMF needs in a particular situation and depends on which positioning methods a LMF supports. |
| CATT | Yes | Yes that the on-demand PRS capability is signaled per positioning method. |
| Apple | Yes |  |
| ZTE | No | Agree with HW |
| Ericsson | No | Agree with HW |
| Intel | Yes | We can put on-demand PRS capability under each positioning method. |
| Samsung | No | Same view with Huawei |
| OPPO | Yes |  |
| InterDigital | Yes |  |
| vivo | Yes | Similar with the existing ‘*NR-DL-PRS-QCL-ProcessingCapability’* which is a common IE but included in different DL positioning methods. |
| Nokia | Yes | We have the same view as Huawei but since LPP specification allows independent ProvideCapabilities signaling for each positioning method, we can accept having a per method positioning capability. However, we assume that a UE which supports UE-initiated ODPRS for one ‘PRS measurement-based’ method can also support the same for an another ‘PRS measurement-based’ method also. |
| Lenovo, Motorola Mobility | Yes | Fine to support that UE may request OD-PRS per positioning method. We also understand that the LMF may request for OD-PRS capabilities for one or more positioning methods. |
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#### Rapporteur’s Summary:

Fourteen (14) companies have responded to this question with [9/14] companies in agreement that on-demand PRS capability is requested and provided per positioning method, [1/14] company has no strong view, while the remaining [4/14] companies have a concern on only limiting the capability request for a single positioning method. The Rapporteur would like to also clarify that the capabilities corresponding to multiple positioning methods may be requested and received by the LMF and there is no limitation on the capability request applying to only a single positioning method. The following is proposed to address the key concern from companies:

**Proposal 14: UE-initiated on-demand PRS capability information is independently requested per positioning method. More than one capability per positioning method may be provided to the LMF based on the applicable request.**

### Question 17

In addition, it has already been agreed that the UE may receive an index with multiple pre-defined on-demand PRS configurations, where the UE may store these configurations until it is overridden by a new index containing a pre-defined on-demand PRS configurations. This may affect the number of pre-defined on-demand PRS configurations to be stored in the UE depending on the UE’s capabilities, which may vary accordingly.

**Companies are invited to provide their views on the following UE behaviour related to the reception of the on-demand PRS configuration index and whether it has an impact on the UE-initiated on-demand PRS capability:**

1. **The UE may store a number of pre-defined on-demand PRS configurations until it is overridden by a new index of on-demand PRS configurations.**
2. **The number of pre-defined on-demand PRS configurations that a UE may store has an impact on the UE’s capability.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| Huawei, HiSilicon |  | The question is not clear |
| Xiaomi |  | We think this question relates the question 13. The max number of on-demand PRS configuration stored by UE is N, which N is based on UE capability. |
| Qualcomm |  | Not clear what new agreement is needed. |
| CATT |  | Not clear the intention of this question. |
| Apple |  | The question is not clear |
| ZTE |  | We are not sure in different LPP sessions can UE use the same on-demand PRS configuration like pre-configured AD in latency reduction. |
| Ericsson |  | There is no storage here. |
| Intel | See comment | We are not sure if option 1 seems to imply that there is no capability related impact related to the storage of pre-defined PRS configurations? Assuming this is the case, we think the UE should be able to store at least the *maxDL-PRS-Configs-r17* and if the configuration exceed maxDL-PRS-Configs-r17, the UE will consider this as Error, and up to UE implementation on how to handle it |
| Samsung | Disagree | We don’t think the storage capability of the UE can play a any role on LMF’s decision of preconfiguration of DL PRS. |
| InterDigital |  | Is this question related to validity conditions of predefined on-demand PRS configurations? |
| vivo |  | The question is not clear.  In our understanding, the pre-defined on-demand PRS is different from pre-configuration and shall be released when the location session ends or be overwritten by new pre-defined on-demand PRS. Whether modification of pre-defined on-demand PRS can be supported may follow the decision for pre-configuration. |
| Nokia |  | Agree with others. The question is not clear. Are we asking if any UE capability signaling is needed as to how many pre-defined PRS configurations is the UE capable of storing? |
| Lenovo, Motorola Mobility | Agree | As Xiaomi and Intel have mentioned, this relates to Q13 on *maxDL-PRS-Configs-r17* that can be supported as a function of UE capability and this depends on the UE behavior of either storing or discarding the received pre-defined configurations. In one scenario, if the received pre-defined configurations by the UE are discarded after the UE indicates its preferred on-demand PRS configurations, there we see no impacts to the UE capability. However, if the UE has to store the pre-defined configurations after sending its response then there may be impacts to the UE capability. Also, if the network signals more pre-defined configurations than the UE can handle, this could be handled by UE implementation or error causes as Intel have mentioned. |
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#### Rapporteur’s Summary:

The Rapporteur notes that majority of the companies could not converge on an answer due to the lack of clarity of the question. The intention of the question was to clarify the UE behaviour upon receiving the on-demand PRS configuration indices. It is assumed that the UE capability may/may not be impacted depending on the whether the UE stores or discards the received pre-defined configuration. [4/14] companies agree that there is some sort of (temporary) storage of the pre-defined configurations. Furthermore, vivo further elaborates that the received pre-defined on-demand PRS configurations is stored until the LPP session is released or is overridden by a new set of on-demand PRS configurations. Intel also indicates that if the network signals a number of on-demand PRS configurations greater than *maxDL-PRS-Configs-r17*, then the UE may indicate an error to the LMF, while it is UE implementation on how to handle this scenario. The Rapporteur further understands that if *maxDL-PRS-Configs-r17* is signalled as part of the UE’s capability, this information may be used to align with network, such that the network strives to never provide a set of on-demand PRS configurations that exceeds *maxDL-PRS-Configs-r17*. Additionally, the timescale of storing pre-defined on-demand PRS configurations is meant to be temporary and is not to be confused with pre-configured PRS AD, which has longer storage time with associated validity conditions.

The following is proposed as a basis for further discussion.

**Proposal 15-1: RAN2 to further discuss the following UE behaviour options upon receiving the pre-defined configurations from the network:**

* **Option A: UE discards the pre-defined on-demand PRS configuration, after sending its preferred configuration(s).**
* **Option B: UE stores the pre-defined on-demand PRS configuration(s) until the LPP session ends or is overridden by a new set of on-demand PRS configuration(s)**

**Proposal 15-2: The *maxDL-PRS-Configs-r17*****defines the number of pre-defined on-demand PRS configurations that may be stored based on the UE’s capability.**

**Proposal 15-3: If the network provides a set of on-demand PRS configurations that exceed the *maxDL-PRS-Configs-r17*, a UE error is sent to the LMF and it is up to UE implementation on how to handle it.**

# Other Identified Issues

### Question 18

**Companies are invited to indicate any other unresolved issues not covered in the above discussion.**

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| Company | Comments |
| Nokia | We think RAN2 should specify some standard pre-defined PRS configurations for different positioning QoS in the specification. |
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#### Rapporteur’s Summary:

Nokia has identified a further issue to be resolved, which include the mapping of pre-defined PRS configurations to positioning QoS, which has to be specified. The Rapporteur understands that there may be multiple mapping combinations of pre-defined on-demand PRS configurations to different types of positioning QoS, which require further discussions to converge on by the group. Due to the limited time left for the completion of Rel-17 and lack of additional company input on this aspect, the Rapporteur recommends that the association of pre-defined on-demand PRS configuration(s) to different positioning QoS be studied in future releases since it is not critical to the completion of the basic functionality of on-demand PRS.

**Proposal 16: Association of pre-defined PRS configurations to positioning QoS is not considered in Rel-17.**

# Conclusions

## Easy Agreements (Clear Majority)

**Proposal 4: UE may explicitly request on-demand PRS parameters based on the Rel-16 value ranges**. **[14/14]**

**Proposal 6: A UE reason/cause for an on-demand PRS request is not supported. [12/14]**

**Proposal 7: The posSI message cannot be the response for a UE’s On-Demand PRS request. [13/14]**

**Proposal 8: RRM measurements do not need to be transmitted as part of the LCS MO-LR message. [13/14]**

**Proposal 12: The DL-PRS-Configuration ID is only defined by an identifier (ID). [13/14]**

**Proposal 13: On-demand PRS configuration is at least provided per positioning method. [12/14]**

## Reasonable support (Potential to be agreed)

**On-demand PRS Request:**

**Proposal 5: The UE may indicate its preferred on-demand PRS pre-defined configuration via a list in decreasing order of preference (i.e., sorted from the UE’s most preferred to least preferred on-demand PRS configuration). [10/14]**

**Proposal 3: UE may explicitly request one or more the of the on-demand PRS parameters as provided in the RAN1 parameter list**. **[9/14]**

**Capability:**

**Proposal 14: UE-initiated on-demand PRS capability information is independently requested per positioning method. More than one capability per positioning method may be provided to the LMF based on the applicable request. [9/14]**

**UE-initiated On-demand PRS Request Management and Control:**

**Proposal 9-1: To respond to an unfulfilled UE-initiated on-demand PRS request, an error cause may be provided to the UE. [6/14]**

**Proposal 9-2: To control the number of UE-initiated on-demand PRS requests, a timer may be configured (e.g., prohibit timer, reattempt timer). [6/14]**

## Requires Further Discussion

**On-demand PRS Request:**

**Proposal 1: RAN2 to further discuss the need for blind on-demand PRS request support for UE-initiated on-demand PRS**.

**Maximum number of On-demand PRS Configurations and Capability:**

**Proposal 11: The maximum number of on-demand PRS configurations, i.e., *maxDL-PRS-Configs-r17* signalled to the UE is to be specified.** **RAN2 to further discuss the value of *maxDL-PRS-Configs-r17*.**

**Proposal 15-1: RAN2 to further discuss the following UE behavioural options upon receiving pre-defined configurations from the network:**

* **Option A: UE discards the pre-defined on-demand PRS configuration, after sending its preferred configuration(s).**
* **Option B: UE stores the pre-defined on-demand PRS configuration(s) until the LPP session ends or is overridden by a new set of on-demand PRS configuration(s)**

**Proposal 15-2: The *maxDL-PRS-Configs-r17*****defines the number of pre-defined on-demand PRS configurations that may be stored based on the UE’s capability.**

**Proposal 15-3: If the network provides a set of on-demand PRS configurations that exceed the *maxDL-PRS-Configs-r17*, a UE error is sent to the LMF and it is up to UE implementation on how to handle it.**

## Proposals to be noted

**Proposal 2: The network is aware of UE-initiated on-demand PRS support via the previous RAN2#116bis-e agreement on introducing LPP capability for UE-initiated On-Demand PRS Request.**

**Proposal 10: The provision of a partial on-demand PRS configuration is up to network deployment/implementation.**

**Proposal 16: Association of pre-defined PRS configurations to positioning QoS is not considered in Rel-17.**

References

1. R2-2202005, “Report of email discussion [Post116bis-e][634][POS] Positioning open issues list (Intel)”, Intel, Jan. 2022.
2. R2-2201815, “Running 38.305 CR for Positioning WI on RAT dependent positioning methods”, Intel, v16.7.0, Jan. 2022.
3. R2-2200047, “Report on Procedures and signalling for on-demand PRS”, Ericsson, Jan. 2022.
4. R2-2201723, “Running LPP CR for NR positioning enhancements”, Qualcomm Inc., Jan. 2022.
5. R2-2111256, “Summary of Agenda Item 8.11.4: On-demand PRS”, Lenovo, Motorola Mobility, Nov. 2021.
6. R1-2112792, “Session notes for 8.5 (NR Positioning Enhancements)”, RAN1#107-e, Huawei (Session Chair), November 2021.
7. R2-2201767, “Report of offline discussion [AT116bis-e][610][POS] Positioning UE capabilities (Intel)”, Jan. 2022.

# Annex A: Previous Agreements on On-demand PRS

**RAN2#113bis-e (April 2021) (R2-2104305)**:

Agreements:

UE-initiated on-demand PRS request is enabled by enhancing LPP RequestAssistanceData. FFS how much control the network has over the UE request.

The UE-initiated mechanism is enabled by the UE request triggering a request from the LMF, and the actual PRS changes are requested by the LMF irrespective of whether the procedure is UE- or LMF-initiated.

Put the stage 2 description for UE-initiated and LMF-initiated PRS request under the same framework.

**RAN2#114-e (May 2021) (R2-2106475)**:

Agreements:

The network can signal predefined PRS configurations to the UE and the UE can select one to request. FFS if the UE can request a configuration with different parameters and exactly which parameters are flexible.

Agreements:

Proposal 2:Define a new LPP assistance data IE which can contain a set of possible on-demand DL-PRS configurations, where each on-demand DL-PRS configuration has an associated identifier.

Proposal 3 (modified): The new LPP assistance data IE from Proposal 2 can be included in an LPP Provide Assistance Data message and/or a new posSIB.

Agreements:

Proposal 4 (modified): The procedure(s) for on-demand DL-PRS should support at least the following functionality (up to RAN3 what is in NRPPa vs. OAM, etc.):

-Providing the requested on-demand DL-PRS configuration information from an LMF to the gNB (e.g., explicit parameter or identifier of a predefined DL-PRS configuration), and confirmation of the request by the gNB

-Provision of (possible/allowed) on-demand DL-PRS configurations that the gNB can support from a gNB to an LMF

-TRP capability transfer (e.g., whether the RAN node supports the reconfiguration of DL-PRS, etc.)

**RAN2#115-e (August 2021) (R2-2108835)**

Agreements (R2-2108400 Report on [Post114-e][603][POS] Procedures and signalling for on-demand PRS (Ericsson) Ericsson):

Before providing available DL-PRS configuration to the UE, the LMF may obtain configuration information on what DL-PRS can be supported from one or more TRPs via NRPPa.

Capture the steps provided above as a baseline, along with a note indicating it remains FFS if the UE can send the MO-LR to request on-demand PRS.

FFS if we indicate to SA2 that MO-LR can be used to trigger on-demand PRS procedure.

It is up to Network (LMF) implementation on the steps to follow (accept/reject/ignore) on receiving request from UE for changing the DL-PRS configurations.

**RAN2#116-e (November 2021) (R2-2111295)**

Agreements:

Proposal 1: RAN2 to agree to support the UE originated request of on-demand PRS via MO-LR for autonomous self location. (11/14)

Proposal 3: RAN2 to agree that UE can send an MO-LR Request message included in an UL NAS TRANSPORT message to the serving AMF including an LPP Request Assistance Data message which is used for on-demand DL-PRS transmission, and the MOLR-Type of this MO-LR Request message is “assistanceData”. (12/14)

Proposal 4: RAN2 to agree the following general stage 2 procedure as baseline for UE initiated on-demand PRS via MO-LR. (13/14) [Figure 2 of R2-2109483, with the associated list of steps as given in section 5 of R2-2109483.] To be discussed in development of the running stage 2 CR (post-meeting) how much of this detail we need to capture in 38.305

Agreements:

Proposal 1.1: The UE may initiate an on-demand PRS request per positioning method including DL-TDoA, DL-AoD and Multi-RTT, via the existing LPP RequestAssistanceData message.

Proposal 1.2: There is no need for introducing a new LPP message to carry the on-demand PRS request.

**RAN2#116bis-e (January 2022) (R2-2201665)**

Agreements:

If the LMF indicates predefined configurations, the UE can request them via LPP RequestAssistanceData.

Agreement:

LPP signalling supports index-based and explicit request of DL-PRS parameters from the UE. The UE is not required to implement requesting explicit parameters and the LMF is not required to grant them if the UE does request.

Agreements:

Proposal 3.2.1.2-1: [Easy agreements] [8/9] For storing LPP capability in the AMF, do not introduce “variability indicator ” in LPP capability.

Proposal 3.2.1.3-1 (modified): [Easy agreements] [10/10] Include the capability to support validity area in each method ProvideCapabilities message, where “method” can be any of the LPP positioning methods that rely on DL-PRS. FFS on other validity criteria.

Proposal 3.2.3-1: [Easy agreements] [10/10] For On-Demand PRS, introduce LPP capability on UE-initiated On-Demand PRS Request;