3GPP TSG-RAN WG3 Meeting #112-e R3-212693

Online, 17 – 27 May 2021

**Agenda item: 19.2.3**

**Source: Nokia (moderator)**

**Title: Summary of offline: #53\_Pos\_OnDemandPRS**

**Document for: Discussion and Decision**

# 1 Introduction

This paper summarizes the following email discussion:

**CB: # 53\_Pos\_OnDemandPRS**

**- (CATT)**

**wait for further discussion of RAN1/2 to decide which parameters need to be introduced into NRPPa specification.**

**wait for further discussion of RAN2 to determine whether the triggering condition of on-demand PRS request should be reflected in NRPPa specification.**

**Further discussion is needed on how to transmit the on-demand PRS request/response, reuse existing NRPPa procedures or use new defined NRPPa procedure.**

**Further discussion is needed on how to provide a selected set of PRS configurations to LMF, via NRPPa or OAM.**

**- (HW)**

**Introduce new procedure for the support of on-demand PRS transmissions.**

**Take supplied TP as the BL CR for NRPPa and F1AP for on-demand PRS.**

**wait for RAN2 and RAN1 to determine the detail parameters for supporting the on-demand PRS transmission.**

**- (E///)**

**focus on LMF (network)-initiated request of on-demand DL PRS transmission. The scope of the UE-initiated is not clear.**

**discuss and agree on a solution for providing PRS beam utilization in NRPPa and F1AP to reduce PRS overhead.**

**discuss and note the possible signaling solutions for providing PRS beam utilization over NRPPa/F1AP. gNB-controlled triggering is preferred.**

**PRS Activity Report can include:**

**- The list of PRS resources set that can be configured by the TRPs hosted in the NG-RAN node.**

**- The resource ID for each resource set**

**- For each PRS resource ID:**

**i. The number of UEs (or the specific UE) that have detected RSRP values with good quality**

**ii. Their average RSRP/RSRQ**

**iii. Other metrics FFS**

**- (Nok)**

**Enhance NRPPa to enable LMF to request new PRS configuration, and NG-RAN node to respond if the recommended PRS configuration has been followed**

**- Chair: suggest to focus on network-initiated; detailed parameters probably need to wait for RAN1/RAN2; suggest to start discussing existing NRPPa procedure vs. new one (RAN-initiated vs. LMF-initiated) and info to be signaled; attempt st3 BL CR**

(Nok - moderator)

Summary of offline disc [R3-212693](file:///D:\NEXT\TSG3_112\Meeting\Docs\Drafts\CB%20%23%2053_Pos_OnDemandPRS\Inbox\R3-212693.zip)

# 2 For the Chairman’s Notes

Proposed agreements (to be discussed and confirmed online):

Introduce a new non-UE associated NRPPa procedure (class 1) to support on-demand PRS.

The new NRPPa procedure enables LMF to request gNB to (re)configure PRS transmission, and gNB to indicate the updated PRS configuration to LMF.

Details regarding information (e.g. parameters, PRS utilization, measurements in general, etc.) to be exchanged by the procedure is pending RAN1/RAN2.

# 3 Discussion (Phase 1)

Please provide your Phase 1 views by 18:00 UTC Friday May 21st

Early comments can be taken into account during the Wednesday May 19th online session

It is proposed to focus this email discussion on **LMF (network)-initiated** request of on-demand DL PRS transmission, and particularly the **NRPPa impacts**. The F1AP impacts can be evaluated at a later stage.

**Question 1: Do you have any comments regarding the proposed scope of this email discussion?**

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| **Company** | **Comments** |
| Ericsson | Ok |
| Qualcomm | In our understanding this scope statement is not relevant for RAN3, i.e. it does not matter which entity triggered the request. So it should not be used as a conclusion, or somehow framing the discussion. |
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## 3.1 Option 0

*Moderator Note: Options in this SoO are numbered in a way to avoid confusion with respect to how options are numbered in tdocs.*

A similar framework appears to be proposed in [1][2][4], where the LMF determines PRS configuration(s) and requests the gNB to (re)configure PRS transmission. The basic steps are as follows:

- LMF determines to trigger on-demand PRS (details pending RAN1/RAN2)

- LMF sends REQUEST via NRPPa to gNB, to (re)configure PRS transmission.

- gNB determines what action to take and sends RESPONSE via NRPPa to LMF, to indicate the updated PRS configuration.

**Question 2: Please provide your views on the above (Option 0) framework for LMF (network)-initiated request of on-demand DL PRS transmission.**

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| **Company** | **Comments** |
| Huawei | Option 0 is aligned with our understanding on LMF initiates the on-demand DL PRS.  Please note that: Option 0 does not exclude the cases the fact that the LMF receives UE measurements via LPP and then determines the on-demand PRS. The measurements (RRM or PRS measurements) via LPP should be determined by RAN2. |
| Nokia | We agree with Option 0 as a baseline framework for on-demand DL PRS. |
| CATT | We agree with option 0 as a baseline for on-demand DL PRS |
| Ericsson | Generally, it is too early for RAN3 to agree on any framework, since there are no agreements on what the framework should support. |
| Qualcomm | We agree with option 0 as a baseline. |
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For the REQUEST / RESPONSE, there are several options on how to support in NRPPa:

- Option A: Reuse the TRP Information Exchange procedure (non-UE associated)

- Option B: Reuse the Positioning Information Exchange procedure (UE-associated)

- Option C: Introduce a new LMF-initiated procedure, e.g. PRS Transmission procedure (see [2]).

**Question 3: If RAN3 agrees to support the Option 0 framework, what NRPPa procedure should be used (Option A, B, or C) and why?**

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| **Company** | **Comments** |
| Huawei | We have preference for option C  We also would like to clarify that the procedure could not be UE associated (Option B) for various reason like neighbouring configuration, PRS is a cell level broadcast signal etc ..  In [2] we develop a list of observations which makes difficult to reuse an existing procedure (option A) |
| Nokia | We prefer to reuse existing non-UE associated NRPPa procedure if feasible (i.e. Option A) but are open to new NRPPa procedure (i.e. Option C). |
| CATT | Both A and C are fine with us, PRS is a cell level information, so the UE associated procedure is not preferred. |
| Ericsson | For us it is too early to decide. Although at this stage, we are ok to define a new procedure. |
| Qualcomm | This can be decided once the functionality and message content is clear. But first impression is that (1) it should be non-UE associated, since it affects a group of TRPs (serving and non-serving), so B is not suitable and (2) it may be easier to do this with a new set of procedures i..e. C; basically we should investigate A vs C, but likely we need C. |
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## 3.2 Options 1, 2 and 3

*Moderator Note: It is not entirely clear whether Options 1-3 are to be viewed as alternatives to Option 0, i.e. whether Option 0 and Options 1-3 address the same use case or different use cases. This should be clarified in the email discussion.*

In [3][5], the gNB reconfigures PRS transmission based on PRS beam utilization information (PRS Activity Report) provided by the LMF. For Option 1, the basic steps are as follows:

- LMF gathers PRS beam utilization information from UE measurements received via LPP.

- LMF sends REQUEST via NRPPa to gNB, to provide the PRS beam utilization known by the LMF.

- gNB takes the received information into account when configuring PRS transmissions for the UE and sends RESPONSE via NRPPa to LMF, to indicate the updated PRS configuration for the UE.

**Question 4: Please provide your views on the above (Option 1) framework where gNB determines PRS configuration based on PRS beam utilization information provided by LMF.**

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| **Company** | **Comments** |
| Huawei | Well as explain above question 3, and where we express doubt on this version is the part underline, the PRS to us is not UE related configuration.  Whether LMF gather measurements from UE for on-demand PRS and what measurements can be gathered via LPP should be discussed in RAN2. The solution in [3][5] use UE associated procedure, which is not appropriate |
| Nokia | We are not convinced that a solution based on “PRS beam utilization” fits with on-demand DL PRS. The solution seems more oriented towards energy savings (turn off DL-PRS if under-utilized) but how to (re)activate transmission of DL PRS on-demand is not clear from the solution description. |
| CATT | From our understanding for contribution [3][5], it seems that the Option 1 corresponds to the Option B of Option 0, but we prefer a non-UE-related procedure as explained above. |
| Ericsson | We had presented this quite open (FFS on UE/non-UE). To clarify, the PRS activity report can be used for cell specific signalling, which would be the best way to have an on-demand solution that scales well in terms of signalling. Our proposal can be seen, indeed, as a power saving measure, but it can also be a latency saver if the gNB spends time and processing power receiving only useful PRS. |
| Qualcomm | The DL-PRS parameter which can be changed on-demand are supposed to come from RAN1. We also expect that no new UE measurement information is required to support on-demand PRS (e.g., no "PRS beam utilization report" need to be introduced, etc.), but in any case, measurements appear to be a RAN1 issue. |
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It is further described in [3][5] that the LMF can construct a PRS activity report based on UE-reported LPP measurements. The gNB can use the PRS activity report to assist it in identifying which beams to select for PRS transmission. Information that can be included in a PRS activity report are listed in Proposal 4 of [3].

The gNB can obtain the PRS activity report from the LMF using new NRPPa procedures [3][5]:

- **LMF-initiated** (Option 2): LMF sends the PRS activity report to the gNB in a PRS Configuration Request (class 1), either periodically or at pre-configured time instances. The gNB replies with the PRS Configuration Acknowledge (class 1).

- **gNB-initiated** (Option 3): gNB requests the PRS activity report from the LMF by sending the PRS Activity Report Request. The LMF replies with the PRS Activity Report Response including the PRS activity report.

It is the moderator’s understanding that these are different variants of Option 1, i.e. gNB reconfigures PRS transmission based on PRS activity report / PRS beam utilization information. Therefore, company views may be highly dependent on their response to Question 4.

**Question 5: Please provide your views on the above (Option 2 and Option 3), particularly any feedback that may not be evident from your response to Question 4.**

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| **Company** | **Comments** |
| Huawei | Does it mean in option 2 – 3 the gNB initiate the on-demand PRS? Is it possible??? |
| CATT | From our understanding for contribution [3][5], it seems that the Option 2 corresponds to the Option C of Option 0, as stated above, we do not have a strong view on the reusing or new definition procedure, whereas Option 3 appears to be a new option in which on-demand PRS is initiated by gNB and we are not sure if this option can solve new issues. But the Option 1/2 seems to cover all the issues for on demand PRS. |
| Ericsson | Yes, Option2 corresponds to Option C of Option 0.  For Option3, it can be combined with option 2, where gNB - once it received a first message from LMF with the suggested beam reconfiguration - triggers a gNB-initiated message requesting PRS beam utilization information, if available at LMF. Every time gNB sees it has some wiggle room for PRS optimization, it would ask LMF for the report. This would reduce the risk of failure and make this PRS configuration network-controlled. |
| Qualcomm | See our comments to Q4 (e.g. “The DL-PRS parameter which can be changed on-demand are supposed to come from RAN1), and in addition for now there is no gNB-initiated request in scope of the WI. |
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# 4 Conclusions, Recommendations

There seems to be strong support for Option 0 as a baseline for LMF (network)-initiated request of on-demand DL PRS transmission:

- LMF sends REQUEST via NRPPa to gNB, to (re)configure PRS transmission.

- gNB determines what action to take and sends RESPONSE via NRPPa to LMF, to indicate the updated PRS configuration.

Companies appear to agree that the procedure used for on-demand DL PRS should be non-UE associated, and a new procedure seems preferable over re-using an existing one (e.g. TRP Information Exchange).

Several companies indicated that information to be exchanged (e.g. parameters, PRS utilization, measurements in general, etc.) is RAN1/RAN2 scope.

At least one company believes that gNB-initiated requests (Option 3) is out-of-scope of the WID.

Based on the above, the following is proposed to be captured in the Chair Minutes:

Introduce a new non-UE associated NRPPa procedure (class 1) to support on-demand PRS.

The new NRPPa procedure enables LMF to request gNB to (re)configure PRS transmission, and gNB to indicate the updated PRS configuration to LMF.

Details regarding information (e.g. parameters, PRS utilization, measurements in general, etc.) to be exchanged by the procedure is pending RAN1/RAN2.

# References

1. R3-211822, *Consideration on On-Demand PRS Transmission and Reception*, CATT
2. R3-212241, *Discussion on on-demand PRS (with TP)*, Huawei
3. R3-212351, *Discussion on first aspects to support On-Demand PRS transmission*, Ericsson
4. R3-212395, *On-demand PRS*, Nokia, Nokia Shanghai Bell
5. R3-212352, *Support of NRPPa NR Positioning enhancements*, Ericsson