3GPP TSG-RAN WG2 #113e R2-21xxxxx

Electronic meeting, January 25th – Feb 5th, 2021

Agenda Item: 8.11.2

Source: Ericsson

Title: Report on [Post112-e][608][POS] Support of on-demand PRS

Document for: Discussion, Decision

# 1 Introduction

This document addresses the following email discussion:

* [Post112-e][608][POS] Support of on-demand PRS (Ericsson)

Scope: Discuss potential solutions for on-demand PRS: signalling aspects, which node requests the PRS, which node the request is directed to. Rapporteur is asked to provide update on RAN1 agreements.

Intended outcome: Report to next meeting

Deadline: Long

Section 2 provides information on RAN1 agreements.

Section 3 contains the questionnaire on various aspects of “On demand PRS”. The purpose is to collect the views and identify the commonalties and differences in order to provide proposals for way forward.

# 2 RAN1 Agreements

Agreement:

Capture the following in the TR [1]:

From a physical layer perspective, on-demand transmission and reception of DL PRS, which includes at least the following is recommended

* + UE-initiated request of on-demand DL PRS transmission
  + LMF (network)-initiated request of on-demand DL PRS transmission
* Above enhancements are recommended for both DL and DL+UL positioning methods and both UE-based and UE-assisted positioning solutions.

# 3 On Demand PRS

## 3.1 Objective

The SID [1] has different objectives such as RS overhead reduction, latency reduction etc.

1. Study enhancements and solutions necessary to support the high accuracy (horizontal and vertical), low latency, network efficiency (scalability, RS overhead, etc.), and device efficiency (power consumption, complexity, etc.) requirements for commercial uses cases (incl. general commercial use cases and specifically (I)IoT use cases as exemplified in section 3 above (Justification)):
   1. Identify and evaluate positioning techniques, DL/UL positioning reference signals, signalling and procedures for improved accuracy, reduced latency, network efficiency, and device efficiency.  
      Enhancements to Rel-16 positioning techniques, if they meet the requirements, will be prioritized, and new techniques will not be considered in this case. [RAN1, RAN2]

Please describe what would be the objective that “on Demand PRS” should aim to fulfil (*from your perspective*). Please also explain in brief (Abstract) as how this can be achieved from the solution/signalling that is envisioned (*by you*).

**Companies are invited to provide their view**

**Please explain the objective and solution/signalling abstract**

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| Company | Objective | Abstract of Solution/Signalling |
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## 3.2 UE-initiated request for on-demand DL PRS

From RAN1 physical layer perspective, one of the agreements is as below

* + UE-initiated request of on-demand DL PRS transmission

RAN2 need to further evaluate and decide whether it is feasible in terms of signalling.

When it comes to UE-initiated request for on-demand PRS; there can be two different interpretations:

1. UE-initiated Request from Idle/Inactive similar to SI Request
2. UE-initiated Request during active LPP session

According to interpretation a), the UE-initiated request for on-demand PRS is similar to on demand SI. Based upon this, serving gNB should inform to LMF and LMF should then identify neighbor gNBs/TRPs and request for PRS transmission. An example of UE-initiated request according to interpretation a) is given in Figure 1.



Figure 1: An example of UE initiated Request for On demand PRS using SI request Analogy

According to interpretation b), the UE in connected mode may request to modify the existing PRS configuration. For instance, the UE may request for denser PRS configuration or more repetitions, shorter periodicity, different frequency region etc. An example of UE-initiated request according to interpretation b) is given in Figure 2.



Figure 2: An example of On demand PRS Based upon UE Request

**Companies are invited to provide their view**

**Please explain the objective to support UE-Initiated Request i.e what would it map to the above SID objective.**

**Please provide also your opinion on which version should be supported: either a or b, both or none.**

**For Option b) Please also provide the desired list for the PRS configuration parameters those can be changed via on demand procedure. For example: number of symbols, bandwidth, Frequency region, muting pattern, resource sets, resources, resource power etc.**

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| Company | Options (a, b, both, none) | Objectives |
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## 3.3 LMF (network)-initiated request

From RAN1 physical layer perspective, one of the agreements is

* LMF (network)-initiated request of on-demand DL PRS transmission

RAN2 need to further evaluate and decide whether it is feasible in terms of signalling.

When it comes to LMF initiated request for on-demand PRS; there can be two different interpretations:

1. LMF dynamically varying PRS config
2. LMF recommending turning on/off beams to gNB

According to interpretation a) LMF may dynamically vary certain aspects of PRS configuration such as request for denser PRS configuration or more repetitions, shorter periodicity, different frequency region etc. depending upon UE measurements and location accuracy. An example of LMF-initiated request according to interpretation a) is given in Figure 3.



Figure 3: An example of LMF-initiated request for on demand PRS

According to interpretation b) LMF may identify that certain beams are not contributing to positioning measurements or certain beams (based upon ECID, QCL-D info) which are currently disabled and should be enabled for PRS transmission; LMF may recommend the gNBs accordingly to switch on/off PRS beams. An example of LMF-initiated request according to interpretation b) is given in Figure 4.



Figure 4: An example Signalling of LMF for PRS Overhead Reduction

**Companies are invited to provide their view**

**Please explain the objective to support LMF-Initiated Request i.e what would it map to the above SID objective.**

**Please provide also your opinion on which version should be supported: either a or b, both or none.**

**For Option a) Please also provide the desired list for the PRS configuration parameters those can be changed via on demand procedure. For example: number of symbols, bandwidth, Frequency region, muting pattern, resource sets, resources, resource power etc.**

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## 3.4 gNB based

**Companies are invited to provide their view on whether gNB based On demand PRS be considered. In such case UE may have to provide measurement results (RSRP) to gNB and gNBs may need to co-ordinate over XnAP interface.**

**Please provide also your opinion on such mechanism.**

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| Company | Options Yes/No (Yes: support, No: do not support) | Comments |
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## 3.5 PRS Overhead reduction for UE Based Idle/Inactive Mode Positioning

LMF is involved when the LCS client is external; but when the LCS client is internal within UE and when AD is provided via broadcast/OnDemand, there is no involvement of LMF (also captured in end to end delay latency).

There are two questions raised

1) In such case, how would LMF authorize which mode the UE should operate in?

2) For PRS overhead reduction, as discussed above, UE measurement report is needed. How shall UE measurement be obtained when UE happens to be operating in UE based mode.

**Companies are invited to provide their views on these questions**

**1) How should the Positioning mode be decided for scenario where there may not be LMF involvement?**

**2) How is the SID objective “PRS overhead reduction” possible for scenario where majority of UE operates in UE based mode; i.e without measurement report/feedback?**

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## 3.6 Other

**Companies are invited to provide their view if any aspects missed to be discussed**

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| Company | Comments |
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# Conclusion

To be provide later

# References

1. R1-2009842, TR 38.857 Study on NR Positioning Enhancements