**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 on [AT117-e][631][POS] Remaining OD-PRS issues (Lenovo)

**Document for:**Discussion and Decision

Introduction

This report summarizes the following AT-meeting discussion:

* [AT117-e][631][POS] Remaining OD-PRS issues (Lenovo)

Scope: Discuss P1/P3/P15-1 of R2-2202236 and attempt to converge on the OD-PRS request behaviour.

Intended outcome: Report to Monday CB session

Deadline: Friday 2022-02-25 1200 UTC

Please note the deadline for companies’ inputs/views: **Friday 2022-02-25 1200 UTC**

## Contact Information

Please kindly provide your contact information:

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Discussion

As per the Chair’s guidance the following discussion report aims to converge on the following Proposals reported in [1, R2-2202236].

* **Proposal 1: RAN2 to further discuss the need for blind on-demand PRS request support for UE-initiated on-demand PRS**.
* **Proposal 3: UE may explicitly request one or more the of the on-demand PRS parameters as provided in the RAN1 parameter list**.
* **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)**.

## Blind on-demand PRS Request

Based on the Pre-meeting discussion [1, R2-2202236], the following advantages and disadvantages for blind on-demand PRS request were summarized:

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/probability the blind request is met.
* Increase of signalling load at the LMF.

Based on the online GTW discussion regarding the support of blind on-demand PRS requests, the following arguments have been captured in the Chair notes.

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| Discussion:  Ericsson think from network perspective, it is better to have measurements than UE preferences. They see the explicit request as needed only when the network has not given pre-defined configurations.  Qualcomm think any AD request in LPP is “blind”, and the question is whether there is a need to depart from this principle for on-demand PRS. If we constrain when the UE can send the Request Assistance Data, it would be a behavioural change in LPP. |

The aim of Question 1 is to focus on Proposal 1 and the related concerns raised during the online GTW discussion, which are provided in Q1-1 and follow-up Q1-2.

### Question 1-1

**Do companies agree that there is a need for supporting blind on-demand PRS requests by the UE (e.g., if the network has not provided any pre-defined configurations)?**

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| Company | Yes/No | Comments |
| Ericsson | No, but pls see comments | We need to see how we see on-demand PRS feature. This feature is enhancement of Rel-16 DL-PRS transmission; which was static (DL-PRS Transmission) and now with on-demand in Rel-17 It is dynamic; the enhancement in Rel-17 is based upon Rel-16 DL-PRS baseline.  For Rel-17 on demand PRS; our view is that UE can still use the blind request using Rel-16 DL-PRS AD request in MO-LR message. We do not see why this requires enhancement as UE has the possibility to indicate DL-PRS AD. The other parameters such as positioning duration etc. are more additional assistance information to NW; which should not be viewed as type of assistance data  We agree that it is beneficial from NW perspective to obtain information such as duration of Positioning as it can help in planning the start/stop of DL-PRS transmission; however, these information are additional assistance info which NW may need or may not need; i.e it should be provided by UE only solicit; i.e based upon at least an indication that NW wants such information from UE; we do not see the need to blindly append additional information when indication of Rel-16 DL-PRS AD can already be used.  There is already agreement that there will be capability associated per method for on-demand request; hence NW based upon info on UE capability that it supports on-demand PRS request; can then request additional information from such UE to assist in identifying dynamic DL-PRS configuration.  We should not increase the Uu load unnecessarily and also minimize the risk of UE sending such request/preference to the NW as PRS is shared resource, it would be difficult to manage each and every UE preferred DL-PRS configuration.  We see the need of explicit indication in below cases:  a) When NW indicates UE can provide additional assistance information to aid in identifying suitable DL-PRS configuration especially the positioning duration. *Other info such as number of resources, BW can be identified by NW implicitly based upon required QoS info etc. However, no harm in getting detailed UE preference.*  b) After UE has performed the DL-PRS measurement; and finds the provided DL-PRS configuration is not suitable; it should be allowed to send detailed explicit request so NW can take that into account and learn and adapt.  In above cases; UE can send an explicit request of its preference. This is irrespective of whether pre-define configuration exist or does not exist. |
| CATT | No, but pls see comments | **If NW has provided the pre-defined on-demand PRS configurations to UE**:  The explicit parameters in the request from UE must be within the scope of the pre-defined available on-demand PRS configurations, or the index.  The reasons: network already indicates all the available PRS configurations to UE, the blind request which is out of scope of the pre-defined configurations doesn’t make sense to network and will bring large load to network considering LMF manages large numbers of UEs.  **If NW did not provide the pre-defined on-demand PRS configurations to UE**:  UE can send the explicit parameters in the request which is called blind request. |
| ZTE | Yes | Agree with CATT’s view that when UE send explicit parameters request without pre-defined on-demand PRS, then it is blind request. We think this case is necessary to bring this function flexibility. |
| Huawei, HiSilicon | No |  |
| Intel |  | In the interest of making progress, we are fine if the majority wants to support this, provided no further specification impact is foreseen in order to support this from Rel-16 |
| Nokia | No |  |
| OPPO | No |  |
| Xiaomi | No | In Rel-16, when UE is required to measure the PRS, the UE ensures the network support providing assistance information, so it can send LPP assistance information request even if there is no pre-defined assistance information, bur on-demand PRS is a new function which needs network to support it, so UE can’t assume the network always support on-demand PRS when UE is required to measure PRS. If the network has not provided any pre-defined PRS configurations, UE only can send LPP request assistance data message without including PRS related parameters. |
| vivo | No | If the NW does not support on-demand PRS, the blind request is just useless signalling. Even if the The NW does support on-demand PRS, the PRS resources are shared for many UEs. The LMF needs to consider the PRS resource configuration in an overall view, not just for one UE. We understand that the pre-defined on-demand PRS configuration is determined in the overall view. The probability of rejection for blind request without pre-defined AD may be very high, which causes unnecessary signalling overhead and additional latency. |
| Lenovo, Motorola Mobility | Yes | Blind request may offer the flexibility to solve the issue when the pre-defined OD-PRS has not been provided to the network as ZTE and CATT noted. Since we agreed that Rel-16 value ranges are reused, we see no additional spec. impact aside from the fact that the UE may blindly request any of the parameters from the RAN1 on-demand PRS list. |
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#### Question 1-1 Rapporteur’s Summary

[TBD]

### Question 1-2

**As a follow-up question, especially to the companies that answered ‘No’ to the above Question 1-1**, **do companies agree that there would be a UE behavioural change in LPP by constraining the *RequestAssistanceData* message to the UE first receiving the set of pre-defined on-demand PRS configurations? If the answer is ‘Yes’, please also indicate if the UE behavioural change in LPP is justified?**

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| Company | Yes/No | Comments |
| Ericsson | No | There is no behavioral change as UE can already request DL-PRS AD.  On demand PRS is just an extension of Rel-16 DL-PRS; moreover, the only addition is that PRS is dynamic in Rel-17 rather than static. Just because of this change, we do not see a need of completely new structure. The other parameters such as positioning duration etc. are more additional assistance information to NW; which should not be viewed as type of assistance data. The assistance data type is still DL-PRS AD. |
| CATT | Please see comments | **Perhaps a note or description is needed in the stage 2 specification.**  If NW has provided the available on-demand PRS configurations to UE, UE should take the pre-defined on-demand PRS configurations into consideration when initiating the on-demand PRS request irrespective ID or explicit parameters is requested, e.g., the on-demand PRS request must be within the scope of the pre-defined available on-demand PRS configurations. |
| ZTE |  | Agree with CATT that a note is needed. However, we think the note should illustrate: when receiving index-based ODPRS configuration, UE should **choose IDs** from it; if not receiving, UE can request explicit parameters based on its own requirement |
| Huawei, HiSilicon |  | Some simple clarifications in the LPP spec will be enough |
| Intel | No |  |
| Nokia | No | Typically, the request for assistance data is for some information that the UE uses e.g., for measurement purpose. In ODPRS case, the request for assistance data is for LMF to control (by interacting with gNBs) the PRS transmissions (ON/OFF or change PRS transmission characteristics). So, in ODPRS case since it impacts network transmission of PRS which may impact other UEs also, it is better to have some restrictions on what the UE can request. This behavior is restricted to request for ODPRS parameters only and should not impact the request for other assistance data. |
| OPPO | No |  |
| Xiaomi | Yes | In section 7.x.2 of the stage 2 running CR, the step 2a can be revised as: *In case of UE-initiated On-Demand PRS, the UE sends an On-Demand PRS request to the LMF via LPP Request Assistance Data message if the UE has pre-defined PRS configurations.* |
| vivo | No | Some description may be needed, e.g., if the UE would request on-demand PRS via requestAD message, the on-demand PRS request must be after receiving the pre-defined available on-demand PRS configurations and be within the scope of the pre-defined available on-demand PRS configurations. |
| Lenovo, Motorola Mobility | Yes | We see a slight behavioral change from the point of view of when the RequestAssistanceData message is triggered based on the received pre-defined OD-PRS configs. This is of course to be expected since OD-PRS is a new feature. Agree that a small Stage 2 description/note may also be added for better clarity on the procedure. |
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#### Question 1-2 Rapporteur’s Summary

[TBD]

### Question 2-1

This question tackles the related issue of supporting an explicit on-demand PRS parameter request by the UE based on the following RAN2#116bis-e agreement [2].

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| RAN2#116bis-e Agreement:  LPP signalling supports index-based and explicit request of on-demand 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. |

Some companies expressed views that the explicit request is only dependent on the support of blind requests, which is also based on the outcome of Question 1. However, in order to better understand how to support the UE explicit request for on-demand PRS parameters in the context of the above agreement, companies are encouraged to provide their views on how the UE may send an explicit request for the desired on-demand PRS parameters to the network. The question posed during the Pre-meeting discussion [1, R2-2202236] to derive Proposal 3 has been modified to obtain further companies views:

**To support explicit request of on-demand PRS parameters, companies are encouraged to provide their preference on the following option(s):**

* **Option 1: For blind on-demand PRS requests, UE may request any of the explicit parameters from the RAN1 agreed parameter list.**
* **Option 2: For pre-defined on-demand PRS configurations (index-based), UE may only further explicitly request the parameters that were indicated by the network via prior signalling.**
* **Option 3: Other behaviors for UE-initiated on-demand PRS explicit request, please specify.**

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| Company | Options 1/2/3 | Comments |
| Ericsson | Other, Option 3 | We see the need of explicit indication in below cases:  a) When NW indicates UE can provide additional assistance information to aid in identifying suitable DL-PRS configuration especially the positioning duration. *Other info such as number of resources, BW can be identified by NW implicitly based upon required QoS info etc. However, no harm in getting detailed UE preference.*  b) After UE has performed the DL-PRS measurement; and finds the provided DL-PRS configuration is not suitable; it should be allowed to send detailed explicit request so NW can take that into account and learn and adapt.  In above cases; UE can send an explicit request of its preference. This is irrespective of whether pre-define configuration exist or does not exist. |
| CATT | It depends | Option 2- if NW has provided the pre-defined on-demand PRS configurations to UE;  Option 1- if NW did not provide the pre-defined on-demand PRS configurations to UE |
| ZTE | Option 1 | A concern for option 2: why does UE needs to request explicit parameters within the index-based pre-defined on-demand PRS configurations? The PRS configurations are already packed up/combined well with indexes. NW may only support the combination when sending index-based ODPRS configuration |
| Huawei, HiSilicon | none |  |
| Intel | See comment | In case blind request is supported, this can happen regardless of/before pre-defined configuration has been provided to the UE.  If preconfigured AD has not been provided yet, the UE has no idea which parameters/values are supported by the NW, so Option 1 is the only choice.  In case the UE already has been provided with pre-configured AD, we think it makes logical sense for the UE to only explicitly request parameters included as part of the signaled AD (i.e. Option 2) |
| Nokia | 1, 2 |  |
| OPPO |  | Option 1 is preferred if blind request is supported.  For option2, we see no need to request explicit parameters as pre-defined on-demand PRS configurations (index-based) is provided. |
| Xiaomi | 2 |  |
| vivo | 3 | The pre-defined explicit parameters are configured to UE associated with a value range, and the range of values can be indicated by a maximum or minimum value. |
| Lenovo, Motorola Mobility | 1,2 | Supportive of both Options, which cover all cases. On Option 2, if the provided pre-defined OD-PRS configs. does not meet the UE’s desired Pos. QoS, the UE may only explicitly inform the network under the scope of the received parameters. |
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#### Question 2-1 Rapporteur’s Summary

[TBD]

### Question 2-2

For proponents of Option 2 in Q2-1, the prior signalling to be used for the explicit request may require some additional clarifications. Note that the prior signalling mentioned below is based on the signalling from the LMF to the UE.

**Companies are invited to provide their views on the “prior signalling” options in Q2-1 to be used as the basis for the explicit request:**

* **Option 1: Prior signalling is based on the on-demand PRS parameters received via the pre-defined configurations in a prior LPP *ProvideAssistanceData* message.**
* **Option 2: Prior signalling includes a separate list of supported on-demand PRS parameters provided by the LMF, i.e., not part of the pre-defined configurations as in Option 1.**
* **Option 3: Others, please specify.**

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| Company | Options 1/2/3 | Comments |
| Ericsson | Option 2, 3 | It can be Option 2 and/or simple indication that NW wants additional assistance info from UE or that UE is allowed to send explicitly UE preference. |
| CATT | Option 1 | Option 1 is enough, and the allowed explicit parameters already be included within the pre-defined on-demand PRS configurations. |
| ZTE | Option 3 | With the concern in Q2-1(index-based ODPRS configuration is only for index-based UE request), we assume no prior signalling is needed for UE’s explicit parameter request(blind request). |
| Intel | Option 1 | As discussed above, in case the UE has been provided with pre-defined PRS configuration, Option 1 should be sufficient |
| Nokia | Option 1 |  |
| OPPO | Option 1 |  |
| Xiaomi | Option 1 |  |
| vivo | Option 1 |  |
| Lenovo, Motorola Mobility | Option 1 |  |
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#### Q2-2 Rapporteur’s Summary

[TBD]

## UE behaviour for handling pre-defined On-demand PRS configurations

Another remaining open issue is to understand whether there is an impact to the UE capability depending on whether the UE stores or discards the received pre-defined on-demand PRS configurations from the network. Question 3 aims to gather companies views on this particular on-demand PRS UE behaviour by using proposal 15-1 as basis for the discussion. Please also note that the pre-configured Assistance Data UE behaviour is a separate discussion and not to be confused with the UE behaviour of handling pre-defined on-demand PRS configurations.

### Question 3

**Companies are invited to provide their views on which of the following options best describes the UE behaviour, upon receiving the pre-defined on-demand PRS configurations:**

* **Option 1: UE discards the pre-defined on-demand PRS configurations, after sending the list of preferred configurations.**
* **Option 2: UE stores the pre-defined on-demand PRS configuration(s) until the LPP session ends or is overridden by a new set of pre-defined on-demand PRS configuration(s).**
* **Option 3: Other behaviour, please specify.**

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| Company | Options 1/2/3 | Comments |
| Ericsson | 3 | We do not think anything is needed here to be specified. UE should simply check the posSIB and know the validity of such pre-defined configuration. If there is no posSIB; then similar to other LPP AD which is Need ON; UE considers it to be valid until reconfigured; i.e not new one is used. We do not need to explicitly say whether UE needs to store or discard etc.  *Need ON*  *Optionally present, No action*  *A field that is optional to signal. If the message is received by the target, and in case the field is absent, the target takes no action and where applicable shall continue to use the existing value (and/or the associated functionality).*  Anyways our view is that Pre-configured can be stored but pre-define should be instantaneous. If NW says 3 pre-define ODPRS; then UE can ask for one of them for that session. If for next session; UE needs to again check what is being broadcast or what is being communicated via LPP. |
| CATT | 3 | Same view as Ericsson. |
| ZTE | 3 | NEED ON code should be applied for pre-defined ODPRS configuration, and that is enough |
| Huawei,HiSilicon | Option2 | But in case of PRS preconfiguration, the configuration for on-demadn PRS can follow that for the other PRS configurations and be used across LPP sessions |
| Intel | 3 | Regarding the discarding aspect, we agree with Ericsson that we may not need to explicitly have any restriction if the UE needs to store or discard OD-PRS via LPP.  In addition, as we explained during the offline, we think there is no other impact regarding reception/storage of on-demand PRS except whether the UE should be able to store at least the *maxDL-PRS-Configs-r17* |
| Nokia | 2 |  |
| OPPO | Option2 |  |
| Xiaomi | 2 | We are also fine to only add Need ON code. |
| vivo | 3 | Agree with E/// for now and can revisit it when we conclude the mod/release mechanism of LPP configuration. |
| Lenovo, Motorola Mobility | 2 | Aligns with Need ON functionality |
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#### Q3 Rapporteur’s Summary:

[TBD]

# Conclusions

[TBD]

References

1. R2-2202236, “Report of [Pre117-e][608][POS] Open issues on on-demand PRS (Lenovo)”, RAN2#117-e, Feb.-Mar. 2022.
2. R2-2201665, “Report from session on positioning and sidelink relay”, RAN2#116bis-e, Jan. 2022.
3. ChairNotes, “Report from session on positioning and sidelink relay”, RAN2#117-e, Feb.-Mar. 2022.

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

**RAN2#117-e (Feb-March. 2022) [3]**

Agreements:

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 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]

Agreement:

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]

Agreement:

Proposal 14 (modified): UE-initiated on-demand PRS capability information is independently requested/indicated per positioning method.

Agreement:

Proposal 9-1 (modified): To respond to an unfulfilled UE-initiated on-demand PRS request, an error cause may be provided to the UE. To be discussed under running CR if the cause values are new or if we reuse existing values.

Agreement:

P11/P15-2/P15-3 to be discussed in the running CR discussion.