3GPP TSG RAN WG1 #117 R1- 24xxxx

Fukuoka, Japan, 20 – 24 May, 2024

**Agenda item: 8.1**

**Source: Moderator (Nokia)**

**Title: Moderator Summary on LS reply on DL-AoD Assistance Information**

**WI code: NR\_pos\_enh2-Core**

**Release: Rel-18**

**Document for: Discussion and Decision**

# Introduction

RAN2 has sent an LS to RAN1 with the following requested action [1]:

**ACTION:** RAN2 respectfully asks RAN1 to confirm whether LMF should forward the NR DL-AoD measurements (*NR-DL-AoD-SignalMeasurementInformation-r16* IE) of the PRU to the target UE and clarify the use case for forwarding the NR DL-AoD measurements of PRU to target UE.

In RAN1#113, the following agreement was made regarding support of positioning assistance data for UE-based carrier phase positioning [2]:

**Agreement**

For UE-based carrier phase positioning, support enabling LMF to forward the DL carrier phase measurement reported by a PRU, with additional information of the same PRU to a target UE for UE-based carrier phase positioning in the positioning assistance data.

* Note: Whether the forwarded DL carrier phase measurement is DL RSCP and/or DL RSCPD depends at least on which of them is (are) supported by UE capability.
* additional information of the same PRU includes at least PRU location.
  + FFS: additional PRU information, e.g. the AoD of PRU to each TRP, etc.

No further agreement was reached regarding additional PRU DL-AoD measurements as additional PRU information.

# Discussion

For this issue, 9 companies provided their views in [3-12]. Based on those references, company views are split. InterDigital [3], CATT [4,5], ZTE [8,9] and Qualcomm [10] support providing *NR-DL-AoD-SignalMeasurementInformation-r16 IE* of the PRU to the target UE, and OPPO [6], Intel [7], Ericsson [11], Huawei, HiSilicon [12], and Nokia [1] suggested to not provide it.

* + - Support: 4 companies
    - Do not support: 6 companies

Supporting companies provided justification on why such information should be provided. The following is a summary: [3] mentioned it would be useful for the target UE to determine whether the forwarded RSCPD measurements can be used for double differential measurement considering the potential measurement impact of the orientation of the PRU. [4] mentioned the current provided information of the PRU already could include DL PRS-RSRP and/or DL PRS-RSRPP, so the PRU DL-AoD measurements could be provided. [8] suggested that the target UE may be able to use the information to calibrate initial phase error. [10] provided a view that target UE can determine LoS condition of the PRU.

However, RAN1 have not agreed to provide DL-AoD positioning measurements of PRU(s) to the target UE, and it is a part was FFS as part of a previous agreement. The moderator’s understanding is that [6], [7], [11], [12], and [1] share a similar view. When RAN1 discussed this issue, it was targeting UE-based carrier phase positioning.

Based on the agreement made in RAN1#113, the moderator’s suggestion is to indicate LMF does not forward NR DL-AoD measurements made by a PRU to a target UE. The following proposal is provided for further discussion. Companies are invited to share their comments.

**FL Proposal 1:**

**RAN1 confirms that LMF does not forward NR DL-AoD measurements (NR-DL-AoD-SignalMeasurementInformation-r16 IE) of the PRU to the target UE as assistance data.**

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| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| Intel | Agree | We agree with the Moderator’s analysis of the prior discussion and do not prefer to reopen the earlier discussion on this issue. The reasons to forward such information are entirely speculative (“could be useful”) and lacks clarity on how effective information on DL PRS-RSRP/RSRPP would be for a target UE to estimate the orientation information about the PRU. |
| Qualcomm | Disagree | We prefer to keep it as it was analyzed in the papers. There is no additional effort that is needed; the specification already includes it. |
| Huawei, HiSilicon | Agree | Based on our understanding, forwarding DL-AoD measurement is not well justified, which also includes e.g. Rx beam index information.  If there is usefulness on forwarding DL-AoD for PCO compensation, we think directly providing the angle itself (instead of measurement) would be sufficient. |
| ZTE | Disagree | As we analyzed in the discussion paper, forwarding DL-AOD is beneficial for improving the performance of UE-based positioning. And also as mentioned by Qualcomm. DL-AOD measurement exists in RAN2’s specification. If it’s hard to reach an agreement, we can make a conclusion saying that:  **RAN1 does not have consensus on whether support LMF forward the NR DL-AoD measurements of PRU to the target UE.** |
| CATT |  | Given that RAN1 has not explicitly discussed whether to forward NR DL-AoD measurements of PRU in the previous discussion, and the diverged views from the companies on this issue in this meeting, we also suggest, as ZTE did, to inform RAN2 that RAN1 does not have the consensus on this issue, and no further discussion within R18 frame.  **RAN1 does not have consensus on whether support LMF forward the NR DL-AoD measurements of PRU to the target UE, and currently does not plan to have a further discussion on the issue** |
| InterDigital | Disagree | As we discussed in our contribution, forwarding AoD measurements is beneficial. As a compromise, we are also ok with the proposal from ZTE, informing RAN2 that RAN1 does not have consensus. We can let RAN2 decide whether AoD measurements should be included or not. |

## Moderator Summary

Based on company views there does not seem to be consensus on whether LMF forwards NR DL-AoD measurements (NR-DL-AoD-SignalMeasurementInformation-r16 IE) of the PRU to the target UE as assistance data. In moderator’s view, there should be no RAN1 spec impact associated with deciding either way. As this is the case, it seems the only way forward is to indicate to RAN2 that there is no RAN1 consensus.

**Moderator Conclusion 1:**

**There is no RAN1 specification impact regardless of whether LMF forwards NR DL-AoD measurements (NR-DL-AoD-SignalMeasurementInformation-r16 IE) of the PRU to the target UE as assistance data or not.**

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| **Company** | **Agree/Disagree** | **Comments** |
| Qualcomm | OK | RAN1 can always capture more information from what it is included as assistance data, but the specifications could work without updating further RAN1. |
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**Moderator Proposal 1:**

**RAN1 sends an LS to RAN2 confirming that there is no consensus on whether LMF does not forward NR DL-AoD measurements (NR-DL-AoD-SignalMeasurementInformation-r16 IE) of the PRU to the target UE as assistance data.**

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| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| InterDigital | Agree | Making the agreement for Moderator Proposal 1 is sufficient. There is no need to make an agreement the Moderator Conclusion 1 as agreed Moderator Proposal 1 will stop the discussion in RAN1. |
| Qualcomm |  | We think a more fair starting point is to say:  **RAN1 sends an LS to RAN2 informing them that some companies in RAN1 consider it useful for the LMF to forward NR DL-AoD measurements (NR-DL-AoD-SignalMeasurementInformation-r16 IE) of the PRU to the target UE as assistance data, whereas others do not agree with that statement.** |

# Conclusion

# References

1. R1-2404198 LS on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE RAN2, Nokia
2. R1-2306352 Report of RAN1#113 meeting ETSI MCC
3. R1-2404649 Discussion on LS reply on DL-AoD measurements in NR-PRU-DL-Info InterDigital, Inc.
4. R1-2404727 Discussion on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE CATT
5. R1-2404728 Draft reply LS on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE CATT
6. R1-2404827 Discussion on RAN2 LS on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE OPPO
7. R1-2404969 Draft LS reply on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE Intel Corporation
8. R1-2404984 Draft reply LS on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE ZTE
9. R1-2404985 Discussion on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE ZTE
10. R1-2405135 Draft Reply to LS on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE Qualcomm Incorporated
11. R1-2405285 Discussion on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE Ericsson
12. R1-2405329 Discussion on RAN2 LS on DL-AoD measurements in NR-PRU-DL-Info forwarded to target UE Huawei, HiSilicon