

[91E][36][Positioning_scope] - Version 0.0.3
RAN

3GPP TSG-RAN Meeting #91-e

RP-210819

Electronic Meeting, 22-26 March 2021

Agenda Item: 9.7.25

Source: Email discussion moderator (Intel)

Title: Report from Email Discussion [91E][36][Positioning_scope]

Document for: Discussion and decision

1 Introduction

This documents reports on the following email discussion during RAN#901e:

[91E][36][Positioning_scope]

Input contributions covered: RP-210248, RP-210260, RP-210267, RP-210734, RP-210318, RP-210628, RP-210343, RP-210467, RP-210489, RP-210565, RP-210568, RP-210586, RP-210600, RP-210688, RP-210242.

The rapporteur's proposal for the revised WID is contained in RP-210628. The discussion below is structured to collect company opinion on the new objectives proposed by the rapporteur. Finally, there is an opportunity to give opinion on other objectives that were not proposed to be included by the rapporteur, and also an opportunity to provide any other comments on the proposed WID. In providing feedback companies should keep mind what is a reasonable amount of work to include in the WI given the time that will be available in the WGs.

2 RAN2 centric objectives

2.1 Positioning latency improvements

The rapporteur's proposal for the revised WID contains the following new objectives [Sorry for the slightly messed up formatting of the objectives - the NWM tool doesn't seem to allow use of bullets]:

- Specify the enhancements of signalling, and procedures for improving positioning latency of the Rel-16 NR positioning methods, for DL and DL+UL positioning methods, including:
 - o [1] Latency reduction related to the reporting and request of positioning assistance data (e.g., via location scheduling in advance of the time of when the location is needed); [RAN2, RAN1, RAN3]
 - o [2] Latency reduction related to the reporting and request of the measurement (e.g., via

RRC signaling, MAC-CE and/or physical layer procedure, and/or priority rules); [RAN1, RAN2, RAN4]

- o [3] Latency reduction related to the time needed to perform UE measurements; [RAN4, RAN1]
- o [4] Latency reduction related to the measurement gap; [RAN4, RAN1, RAN2]
- [Study and, if supported, the enhancements of signalling, and procedures for improving positioning latency of the Rel-16 NR positioning methods, for DL and DL+UL positioning methods, including:
 - o [5] Latency reduction related to the request and response of positioning assistance data (e.g., via RRC signaling, MAC-CE and/or physical layer procedure); [RAN1, RAN2, RAN3]
 - o [6] Latency reduction related to the reporting of the measurements (CG-based transmission); [RAN2, RAN3, RAN4]
 - o [7] Latency reduction related to the request and response of UE positioning capabilities (e.g., via storing UE capabilities in the network); [RAN2, RAN3]
 - o [8] Latency reduction related to the reception of DL PRS (e.g., priority rules for the reception of DL PRS); [RAN1,RAN4]

Numbering has been added to these objectives to make it easier for companies to reference them in their response.

2.1.1 Initial Round

Companies are invited to give feedback related to above objectives. Specifically, companies should indicate which of the sub-objectives (numbered 1-8) they support or do not support to be addressed by the WID. Additional comments and explanation may also be provided.

Feedback Form 1: Initial round feedback on positioning latency improvements

| Item | Company | Comments |
|------|------------------|--|
| 1 | Nokia Denmark | <p>Nokia Supports the following items:</p> <p>[1] [2] [3] [4]</p> <p>We do suggest to remove the e.g. as this indicate a solution already. Nokia suggest to limit the scope of the WID by removing the following objectives:</p> <p>[5] [6] [7] [8]</p> |

| Item | Company | Comments |
|------|--------------------------------|--|
| 2 | CATT | CATT's support including [1], [2], [3] and [4] for reducing the positioning latency. To limit the WI scope, CATT suggest excluding [5], [6], [7] and [8] |
| 3 | InterDigital Communications | InterDigital support [1], [3], [4], [6], [7], [8] |
| 4 | Qualcomm CDMA Technologies | <p>Qualcomm supports: [1] [2] with modification [3] [4]</p> <p>On [2], since no architecture enhancements have been agreed, we think the "e.g., via RRC signalling, MAC-CE and/or physical layer procedure" should be removed.</p> <p>[1] and [2] could then be combined, since both are related to LPP configuration signalling (providing assistance data and requesting location information), and seem generally independent of the positioning method (e.g., could equally apply to RAT-independent methods).</p> |
| 5 | Beijing Xiaomi Mobile Software | Xiaomi supports 1, 2, 3, 4, 7 and not support 5, 6, and 8 for REL17 |
| 6 | vivo Mobile Communication Co., | <p>vivo supports: [1] [2] [3] [4] with modification</p> <p>On [4], in RAN1 discussion, it includes two solution, one is perform PRS measurement without MG, another is MG enhancement, we think RAN4 can not lead the item especially when PRS measurement without MG</p> |
| 7 | vivo Mobile Communication Co., | <p>One additional comment: the following reporting should be changed to response.</p> <p>[1] Latency reduction related to the reporting and request of positioning assistance data (e.g., via location scheduling in advance of the time of when the location is needed); [RAN2, RAN1, RAN3]</p> |
| 8 | Guangdong OPPO Mobile Telecom. | OPPO supports [1] and [4]. |
| 9 | Motorola Mobility Germany GmbH | <p>Lenovo, Motorola Mobility supports objectives [1], [2], [3], [4], and [8]. Objectives [5] and [6] are redundant without the examples, while [7] can be deprioritized.</p> <p>Furthermore, for the supported objectives, the examples associated to the objectives may also be removed.</p> |

| Item | Company | Comments |
|------|------------------------------|--|
| 10 | Samsung Electronics Co., Ltd | We support [1], [2], [3], [4], [5], and [6]. |
| 11 | ZTE Corporation | [ZTE] We prefer to support [1], [2], [4] and [8] (similar to SP-SRS and AP-SRS for positioning defined in Rel-16) and remove the objectives in [3], [5], [6] and [7]. |
| 12 | Intel Corporation (UK) Ltd | We support [1], [2], [3], [4] |
| 13 | Ericsson Inc. | We think a single objective for latency is enough, potentially merging sub-objectives from the two objectives in the draft WID. We support including: [1] Latency reduction related to the reporting and request of positioning assistance data (e.g., via location scheduling in advance of the time of when the location is needed); [RAN2, RAN1, RAN3] [3] Latency reduction related to the time needed to perform UE measurements; [RAN4, RAN1] [4] Latency reduction related to the measurement gap; [RAN4, RAN1, RAN2] [6] Latency reduction related to the reporting of the measurements (CG-based transmission); [RAN2, RAN3, RAN4] [7] Latency reduction related to the request and response of UE positioning capabilities (e.g., via storing UE capabilities in the network); [RAN2, RAN3] |
| 14 | HUAWEI TECHNOLOGIES Co. Ltd. | [Huawei, HiSilicon] Support [1] and [4]. [8] can also be added for further study on PRS-PRS priority and PRS-data/RS priority for the case without measurement gap configuration. |
| 15 | MediaTek Inc. | We would like to give priority to accuracy related enhancements as opposed to latency enhancements, so should only cover these if there is remaining time with current TU allocation. |

2.1.2 Summary from Initial Round

There was wide support for objectives 1 - 4. Regarding the objectives 5 - 8 that all included a study element there was relatively little support (Objective [5] with only 1 supporter, [6] and [7] with 3 supporters each and [8] with 4 supporters). Also considering time availability, there does not seem to be sufficient support to include any of objectives 5 - 8 in the WI.

In addition the comments on support of objectives, there were a number of comments about the wording of the objectives. It is proposed that these should be considered by the rapporteur in an update to the revised WID.

Moderator's proposal from Initial Round

1 - Include objectives 1 - 4 in the WI

2 - Do not include the objectives 5 - 8

2.1.3 Intermediate Round

Feedback Form 2: Feedback on the moderator’s proposal from the Initial Round

| Item | Company | Comments |
|------|--|---|
| 1 | CATT | Support moderator’s proposal to include the objectives 1 - 4 in the WI. |
| 2 | Apple France | We support moderator’s proposal with removing objective 2. For 2, given that CG-based transmission is already an available solution, as mentioned in 6, and no agreements on the required signaling to move related procedure to NG-RAN was made within SI phase (which is needed under RRC/MAC-CE/PHY layer signaling), we think objective 2 can be dropped. |
| 3 | Qualcomm CDMA Technolo- gies | We support the moderator’s proposal in principle. On the details, we would have the following main comments: For [2], the reporting ”via RRC signalling, MAC-CE and/or physical layer procedures” should be removed, given that there is no location server functionality in the gNB/RAN agreed. [1] and [2] could then be combined and should be [RAN2, RAN3]-only objectives. For [3] and [4], we think RAN1 should look at these items first; i.e., impacting WGs should be [RAN1, RAN4]. The measurement capabilities were discussed in RAN1; also measuring without the need of measurement gaps was discussed in RAN1 first during Rel-16. |
| 4 | vivo Mobile Communi- cation Co., | Ok in principle. Two minor comment: Regarding [1], ”reporting” should be reworded to ”response”. Regarding [4], it is more appropriate to have RAN1 as the leading WG. |
| 5 | InterDigital Communi- cations | Ok with moderator’s proposal for progress |
| 6 | Beijing Xiaomi Mobile Software | We support the inclusion of objectives 1 – 4. For Objective 7 we feel this is required to reduce latency and will not take much time to conclude, and could be considered for inclusion as a lower priority and handled time permitting. |
| 7 | Samsung Electron- ics Co., Ltd | We are fine with the proposal from the Moderator. |
| 8 | Nokia Denmark | Nokia is fine with the proposal |

| Item | Company | Comments |
|------|---|--|
| 9 | Guangdong OPPO Mobile Telecom. | We support the proposal except for [2], same comment as Qualcomm since there is no local LMF function in gNB (ruled out by RAN2 already), the RRC/MAC/PHY solution is not feasible at all, so this bullet does not bring benefit for latency reduction in our view. For [3], some clarification on the specific work is needed before we add this bullet to the WID. Is it intended to relax the measurement requirement or something else? |
| 10 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility] - Support Rapporteur's Option 1 of including Objectives [1]-[4] as it stands. |
| 11 | Sony Europe B.V. | We support to include 1-4, but also have sympathy for 8. |
| 12 | HUAWEI TECHNOLOGIES Co. Ltd. | [Huawei, HiSilicon] From the evaluation of low latency techniques in the TR, objective 4 seems the only one that deserves the normative work in terms of low latency benefits, but we are ok to support objectives 1 and 4 for compromise. We don't see the correlation between the objective 1 of requesting/reporting measurements via LPP in scheduled time from client and objective 2 of request/reporting measurements with L1/L2 signaling, so it does not seem a good idea to us to merge objective 2 into objective 1. |
| 13 | ZTE Corporation | We are okay to include [1]-[4] in the scope for latency reduction. We think [8] can be included in addition with minimal spec impact, e.g., AP or SP PRS following a similar approach as AP SRS and SP SRS supported in Rel-16. |
| 14 | MediaTek Inc. | We are ok with the proposal, but it could possibly be further reduced in scope. |
| 15 | Ericsson Inc. | we support to include objectives 1,3 and 4 (with some clarifications). we also think that objectives 6 and 7 could be included. regarding [2], we think that it is too broad as it is written now. for example, what is the RS considered for RRC signalling (is CSI-RS considered? only PRS?). For aperiodic RS, we have already discussed the impact of supporting them in neighbour cells on signalling overhead and latency. regarding [4] there was several solutions discussed during the SI. we should clearly state what solution should be specified: (1) MG-less operation, (2) semi-persistent/aperiodic MGs, (3) Avoiding or minimizing latency associated with MGs, and (4) Fast activation of MGs. Hence, this sub-objective is also too broad in its current form. |

2.2 Positioning in Inactive state

The rapporteur's proposal for the revised WID contains the following new objectives:

- Specify the enhancements for RAT-dependent and RAT-independent positioning for UEs in RRC_INACTIVE state, for DL, UL and DL+UL positioning methods and UE-based and

UE-assisted positioning solutions, including:

- o Signalling and procedures for supporting the assistance data delivery and measurement reporting; [RAN2, RAN1, RAN3,RAN4]

- o Reporting of DL-PRS measurement and/or location estimate performed in RRC_INACTIVE when the UE is in RRC_INACTIVE: [RAN2, RAN1, RAN3, RAN4]

The reporting of DL-PRS measurement and/or location estimate performed in RRC_INACTIVE when the UE is in RRC_INACTIVE is enabled by enhancing small data transmission in RRC_INACTIVE. (Details of the use of SDT to be studied in the WI phase)

- o UE and gNB positioning measurements, UL reference signals for UL measurements, and configuration of the DL-PRS and UL reference signals; [RAN1,RAN4]

2.2.1 Initial Round

Companies are invited to give feedback related to above objective. Specifically, companies should indicate whether they support the addition of positioning in RRC_INACTIVE, and provide additional comments regarding the details of the scope (e.g. DL and/or UL based positioning).

Feedback Form 3: Initial round feedback on Positioning in Inactive state

| Item | Company | Comments |
|------|-----------------------------|---|
| 1 | Nokia Denmark | Nokia supports the addition of positioning in RRC_INACTIVE in DL only. RAN2 agreement was to focus on DL positioning methods only - this is supported by Nokia and thus we do not support UL RRC_INACTIVE positioning in Rel. 17 WID |
| 2 | CATT | CATT supports "the enhancements for RAT-dependent and RAT-independent positioning for UEs in RRC_INACTIVE state, for DL, UL and DL+UL positioning methods and UE-based and UE-assisted positioning solutions" as recommended by the SI and suggested by the Rapporteur. |
| 3 | InterDigital Communications | Support INACTIVE mode positioning for DL, UL and DL+UL positioning methods. If there's not enough TU, we are ok to focus on DL only |
| 4 | Qualcomm CDMA Technologies | Qualcomm supports positioning of UEs in RRC_INACTIVE for all defined positioning methods (i.e., DL-only, UL-only, UL+DL, RAT-Independent). A location estimate is often derived based on multiple methods ("hybrid"). |
| 5 | CEWiT | We support the proposal to enhance RAT-dependent and RAT-independent positioning for UEs in RRC_INACTIVE state, for DL, UL and DL+UL positioning methods and UE-based and UE-assisted positioning solutions. |

| Item | Company | Comments |
|------|--|---|
| 6 | Beijing Xiaomi Mobile Software | Xiaomi see REL17 positioning enhancements for RRC_INACTIVE UEs as important for latency reduction as well as power consumption reduction. RAN2 identified for DL positioning that SDT could be used to transmit the DL-PRS measurement report and/or the location estimate. We therefore support DL positioning for RRC_INACTIVE UEs. UL positioning for UEs in RRC_INACTIVE was inconclusive. If included it should only be done with a second priority, i.e. should time allow. |
| 7 | vivo Mobile Communi- cation Co., | Vivo supports the enhancements for RAT-dependent and RAT-independent positioning for UEs in RRC_INACTIVE state, for DL, UL and DL+UL positioning methods and UE-based and UE-assisted positioning solutions Vivo supports positioning measurements in RRC_IDLE and reporting in RRC_INACTIVE state and RRC_connected state |
| 8 | Guangdong OPPO Mobile Telecom. | Support inactive mode positioning for DL, for which on the other hand, we can rely on the SDT WID revision to cover it, i.e., the other bullets above are not necessary to be included in the NR positioning WID. For UL, we are neutral. |
| 9 | Motorola Mobility Germany GmbH | Lenovo, Motorola Mobility generally supports the Rapporteur's proposal with respect to DL-only positioning methods as a starting point for the WID. Therefore, the last bullet regarding the study of UL-only and DL+UL positioning methods in RRC_INACTIVE state can be deprioritised for future releases. |
| 10 | Deutsche Telekom AG | Deutsche Telekom supports all methods also being applicable in RRC_INACTIVE |
| 11 | Samsung Electron- ics Co., Ltd | We also support the addition of positioning in RRC_INACTIVE in DL only, as agreed in RAN2. |
| 12 | ZTE Cor- poration | [ZTE] We only prefer to support DL positioning for INACTIVE positioning in Rel-17. There is not enough time for RAN2 to study on how to support UL related positioning in SI phase. Thus, the content in TR 38.857 which is used to describe the UL related positioning in INACTIVE is not as mature as DL positioning. Currently, considering the limited time budget in WI, and to complete all topics successfully in WI, we prefer to only support DL INACTIVE positioning. The DL INACTIVE positioning should reuse SDT as transport mechanism as agreed in RAN2. |
| 13 | Samsung Electron- ics Co., Ltd | In addition, support of <u>reporting</u> positioning in RRC_INACTIVE using SDT should be discussed in the other thread: [91E][31][SDT_scope], and should not be specified here. |
| 14 | Intel Cor- poration (UK) Ltd | We support the positioning in RRC_INACTIVE for DL/UL/UL+DL as recommended by both RAN1 and RAN2 |
| 15 | Rakuten Mobile, Inc | We support the Positioning in RRC_INACTIVE Mode. We also, agree with Samsung's comment. |

| Item | Company | Comments |
|------|------------------------------|--|
| 16 | Ericsson Inc. | We do not support this objective. Our view is that the priority for rel17 should be enhancing latency and accuracy. Therefore, power saving objective can be down prioritised, considering the already large scope. |
| 17 | HUAWEI TECHNOLOGIES Co. Ltd. | [Huawei, HiSilicon] Support DL, UL, and DL+UL. Regarding adding UL and DL+UL, we think any deployed positioning method in Rel-16 deserve the enhancements for INACTIVE state, which means that to enable INACTIVE state positioning enhancement, operators does not have to switch positioning method. For SRS transmission in INACTIVE state, CG-PUSCH transmission can be the baseline, and the specification impact can be managed. |
| 18 | MediaTek Inc. | We are supportive of the RRC_INACTIVE scope as recommended by the WGs. |

Furthermore, although not included in the proposal for the revised WID from the rapporteur, a number of the submitted contributions also commented on the support of positioning in RRC_IDLE. Companies are invited to provide their views on the support of positioning in RRC_IDLE.

Feedback Form 4: Initial round feedback on Positioning in Idle

| Item | Company | Comments |
|------|--------------------------------|---|
| 1 | Nokia Denmark | Nokia do not support positioning in RRC_IDLE to keep the scope manageable |
| 2 | InterDigital Communications | Same view with Nokia |
| 3 | Qualcomm CDMA Technologies | Qualcomm supports positioning measurements in RRC_IDLE (with reporting the location information in RRC_CONNECTED) for DL-only and RAT-Independent methods. We think this can in principle already be supported in Rel-16 and require only small changes; mainly TS 38.215 (applicability of measurements), and probably some Stage 2 (TS 38.305) clarifications. |
| 4 | CEWiT | We support positioning in RRC_IDLE at least in DL only positioning for both RAT dependent and RAT independent methods. |
| 5 | Beijing Xiaomi Mobile Software | Xiaomi – RAN2 concluded that DL IDLE positioning can be supported and measurements or location estimates can be transmitted in INACTIVE or CONNECTED. We see no need to include IDLE positioning in REL17. |
| 6 | vivo Mobile Communication Co., | Vivo supports positioning measurements in RRC_IDLE |
| 7 | Guangdong OPPO Mobile Telecom. | Same view as above, the only exception is RAN4 work to include measurement in IDLE state. |

| Item | Company | Comments |
|------|--------------------------------|--|
| 8 | Motorola Mobility Germany GmbH | Lenovo, Motorola Mobility shares the view that there is only minimal work required to enable measurements of positioning measurements in RRC IDLE state and thus can be added to WID. The reporting of RRC IDLE measurements can take place in RRC CONNECTED state. |
| 9 | Deutsche Telekom AG | Deutsche Telekom has a not so strong view of adding any method also for IDLE mode (DL would be focus), but RAT-independent shall be supported in IDLE mode |
| 10 | Samsung Electronics Co., Ltd | We share the view with Nokia: we do not support the positioning in RRC_IDLE. |
| 11 | ZTE Corporation | [ZTE] We don't prefer to introduce new mechanisms for supporting IDLE positioning in Rel-17. From our point of view, UE has already supported performing DL positioning measurement in RRC_IDLE based on Rel-16 mechanism. However, unlike the INACTIVE state, there is no means to transmit the positioning information to the network without moving to connected mode. Due to the time shortage in WI, we think the IDLE positioning should be down prioritized. And we should not spend too much time budget on discussing new mechanisms for this feature. The study on the IDLE positioning can be postponed to Rel-18. |
| 12 | Intel Corporation (UK) Ltd | The majority view in RAN2 was that IDLE can be supported based on existing mechanisms, and no new changes are needed. Therefore we think it can be deprioritized |
| 13 | Intel Corporation (UK) Ltd | We support on demand DL PRS for both DL and DL+UL positioning for UE based and UE assisted positioning methods |
| 14 | Rakuten Mobile, Inc | We support adding positioning in RRC_IDLE. |
| 15 | Ericsson Inc. | our view is that this objective can be de-prioritised, |
| 16 | HUAWEI TECHNOLOGIES Co. Ltd. | [Huawei, HiSilicon] we can accept to exclude IDLE given the others opinions. |
| 17 | MediaTek Inc. | UE performing positioning measurements in IDLE seems fine, but we currently do not see it as a priority to define measurement reporting directly from IDLE mode. |

2.2.2 Summary from Initial Round

There was wide support for positioning in inactive, with only one company not supporting the objective. With regards to whether the objective should cover all all cases of DL, UL and DL+UL, there were some different views on whether the UL cases should in included. The main concerns

regarding UL cases were that the RAN2 study had not been able to conclude on UL and the limited amount of time for the WI to complete all the objectives.

For the support of positioning in RRC_IDLE views were split as to whether this should be included in the WI. In addition there were views that performing positioning measurements in RRC_IDLE is possible even in Rel-16, with the measurements reported in CONNECTED. There seems to be insufficient support for RRC_IDLE to include an objective at this meeting.

Moderator’s proposal from Initial Round:

- 1 - Include the objective for RRC_INACTIVE for DL positioning methods
- 2 - Continue to discuss RRC_INACTIVE for UL positioning methods with particular consideration to whether the WI has time to complete this work.
- 3 - Do not include an objective for RRC_IDLE

2.2.3 Intermediate Round

Feedback Form 5: Feedback on the moderator’s proposal from the Initial Round

| Item | Company | Comments |
|------|------------------------|--|
| 1 | CATT | 1. CATT supports Moderator’s proposal to include the objective for RRC_INACTIVE for DL positioning methods; 2. CATT also supports RRC_INACTIVE for UL positioning methods based on the conclusion from the SI. We consider the support of RRC_INACTIVE for UL positioning should have the same priority as RRC_INACTIVE for DL positioning methods; 3. CATT is fine with Moderator’s proposal of not including an objective for RRC_IDLE. |
| 2 | Futurewei Technologies | We support 1. Wrt to 2, as applicable to other enhancements that we have included in the WID, they are applicable to DL, UL and DL+UL positioning methods, and UE-based and UE-assisted positioning solutions. It applies to this enhancement as well for Inactive positioning. So, we think down scoping proposed in 2 is not necessary and UL Inactive positioning should be done as part of the overall feature for Inactive. We support proposal in 3. |
| 3 | Apple France | We support 1 and 3. We do not support UL positioning in RRC_INACTIVE. |

| Item | Company | Comments |
|------|--|--|
| 4 | Qualcomm CDMA Technolo- gies | <p>We support the moderator's proposal in principle, with the following comments:</p> <p>On 1 – If DL-only in RRC_INACTIVE is supported, it can equally be supported for RAT-Independent (e.g., GNSS), since the same principle/mechanism. I.e., a UE performs and reports "DL" measurements or location estimate. It does not make a difference for the signalling and procedures whether the DL measurements are from gNBs or e.g. satellites. In particular for UE-based, the UE reports a location estimate and it should not matter whether this has been derived from DL-PRS measurements or from e.g. GNSS measurements, or from both, etc.</p> <p>On 2 - Given the opinions from all the companies, we suggest making RRC_INACTIVE for UL a 2nd priority objective. E.g., in the case there is time available for this in the WGs.</p> |
| 5 | InterDigital Communi- cations | We support the moderator's proposals 1/2/3 |
| 6 | vivo Mobile Commu- nication Co., | <p>We are supportive of proposal 1 for DL positioning in inactive.</p> <p>We are supportive of UL positioning in inactive. There are explicit recommendation from WG discussion.</p> <p>For the measurement in idle mode, we are open. The intended specification impact is quite simple.</p> |
| 7 | China Mo- bile Com. Corpora- tion | We support RRC INACTIVE for UL positioning. We see the benefit, and since both RAN1 and RAN2 have agreed on the recommendation for UL positioning in RRC INACTIVE, we prefer to stick on that. |
| 8 | Beijing Xiaomi Mobile Software | Xiaomi supports the moderator proposals 1 and 3 to include the RRC_INACTIVE for DL positioning and to not include positioning for IDLE in REL17. Regarding RRC_INACTIVE we feel this was not clearly concluded in the study phase and could be deprioritised within the WID, and handled if time allows. |
| 9 | Samsung Electron- ics Co., Ltd | We support the proposals 1 and 3 from the Moderator, and regarding Proposal 2, we do not support UL positioning in RRC_INACTIVE considering the limited TUs, as commented previously. Even if majority wants to have it, it should be a low priority objective. |
| 10 | Nokia Denmark | Nokia is ok to compromise on the inclusion of UL positioning methods but keeping this as the secondary option. |
| 11 | CEWiT | We support the proposal 1. For the proposal 2, we support RRC INACTIVE for UL positioning methods. |
| 12 | Guangdong OPPO Mobile Telecom. | We support 1/3. For 2, we are neutral |
| 13 | Sony Eu- rope B.V. | We support the moderators proposal |

| Item | Company | Comments |
|------|--|--|
| 14 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility] - We maintain support of Option 1 as main priority for DL-only methods and Option 3 has minimal spec effort (if any) and can also be included. Option 2 of UL-only methods in RRC INACTIVE can be deprioritized based on available WI time. |
| 15 | Deutsche Telekom AG | We agree on 1) as priority, but only want to exclude 2 & 3 if there are not enough TUs (based on a realistic unbiased counting) available. 2 & 3 would then be candidates for Rel-18 evolution. |
| 16 | China Telecom- munications | we support to include RRC <i>INACTIVE</i> for <i>UL positioning in the scope to get the full (UL+DL) positioning functionality in RRC INACTIVE</i> . |
| 17 | China Unicom | [China Unicom] As RAN1 and RAN2 have agreed on the recommendation for UL positioning in RRC INACTIVE in SI, we support UL positioning in RRC INACTIVE. Moreover, both DL and UL positioning in RRC_INACTIVE should be specified in R17. |
| 18 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] RAN2 also studied UL (and DL+UL) methods in INACTIVE state in the last RAN2 meeting and made the confirmation with respect to RAN1 recommendation of UL measurement for INACTIVE UEs. The normative work for UL transmission can be carried out in the WI. Agreements: Proposal 1a: RAN2 confirms on the following recommendation of TSG RAN (17/17) Positioning in RRC_INACTIVE DL, UL and DL+UL positioning methods UE-based and UE-assisted positioning solutions Support of UE positioning measurements for UEs in RRC_INACTIVE state Options that can be considered include DL-PRS or DL-PRS and SSB Support of gNB positioning measurements for UEs in RRC_INACTIVE state Splitting DL and UL positioning in inactive state in Rel-17 by specifying one but not the other would enforce operator to replace the deployed UL positioning with DL positioning or vice versa, which should be avoided. Therefore, Rel-17 should support both DL and UL positioning for inactive. We are fine with Moderator's proposal in 3. We initially wanted to have also IDLE positioning, but we compromise on this objective. |

| Item | Company | Comments |
|------|-----------------|---|
| 19 | ZTE Corporation | 1 - We are supportive to include DL positioning in RRC inactive state. 2 - We are okay to follow the majority view on whether to include UL based positioning in inactive state in the scope. As noted in our tdoc RP-210600, it can be included as the second priority to manage the time, and it would also be useful to have a clear scope/solution clarified in the WID for UL based positioning to be able to converge on a quick solution 3 - We support not to include positioning for RRC idle. |
| 20 | MediaTek Inc. | Moderator proposal seems reasonable. |
| 21 | Ericsson Inc. | for (1), we are ok with defining measurements for inactive state. for reporting, we have a concern that SDT will not manage to carry positioning reports which can be larger than what SDT allows. therefore we think reporting can be excluded. we are ok with the moderator's view on (2) and (3). we see (2) as low priority. |

2.3 On demand transmission/reception of DL PRS

The rapporteur's proposal for the revised WID contains the following new objectives:

- Specify on-demand transmission and reception of DL PRS for DL and DL+UL positioning for UE-based and UE-assisted positioning solutions, including: [RAN2, RAN1]
 - o UE-initiated request of on-demand DL PRS transmission;
 - o LMF (network)-initiated request of on-demand DL PRS transmission;

2.3.1 Initial Round

Companies are invited to give feedback related to above objective. Specifically, companies should indicate whether they support on demand transmission/reception of DL PRS, and provide additional comments regarding the details of the scope.

Feedback Form 6: Initial round feedback on "On demand transmission/reception of DL PRS"

| Item | Company | Comments |
|------|---------------|---|
| 1 | Nokia Denmark | Nokia do support on-demand transmission and reception of DL PRS for both LMF and UE initiated solutions |
| 2 | CATT | CATT supports on-demand transmission and reception of DL PRS for DL and DL+UL positioning and suggest higher priority for LMF (network)-initiated than UE-initiated on-demand DL PRS. |

| Item | Company | Comments |
|------|--------------------------------|--|
| 3 | InterDigital Communications | Support on-demand DL PRS for DL and DL+UL positioning for UE-based and UE-assisted positioning solutions |
| 4 | Qualcomm CDMA Technologies | Qualcomm supports the objective. Both, UE- and LMF-initiated are required, depending on the location of the LCS Client (UE or network) and positioning mode (UE-assisted or UE-based). |
| 5 | CEWiT | We support the proposal and we think that UE and LMF initiated solutions are equally important. |
| 6 | Beijing Xiaomi Mobile Software | Xiaomi supports both UE-initiated request of on-demand DL-PRS transmission and LMF initiated on-demand control of DL-PRS transmission should be included in WID scope |
| 7 | vivo Mobile Communication Co., | Vivo supports UE-initiated and LMF- initiated on-demand PRS reception for DL and DL+UL positioning for UE-based and UE-assisted positioning solutions |
| 8 | Guangdong OPPO Mobile Telecom. | OPPO support on-demand transmission and reception of DL PRS for both LMF and UE initiated solution |
| 9 | Motorola Mobility Germany GmbH | Lenovo, Motorola Mobility is supportive of the both objectives in the Rapporteur's proposal pertaining to the On-demand transmission/reception of DL-PRS. |
| 10 | Deutsche Telekom AG | Deutsche Telekom: What else than "On Demand" would be a solution ? Obviously we support it. |
| 11 | ZTE Corporation | [ZTE] We prefer UE-initiated on-demand DL PRS. We should down prioritize the LMF(NW)-initiated on-demand PRS since it's quite related to network implementation. |
| 12 | Samsung Electronics Co., Ltd | We are fine with the proposal from the rapporteur. |
| 13 | Intel Corporation (UK) Ltd | We support on demand DL PRS for both DL and DL+UL positioning for UE based and UE assisted positioning methods |
| 14 | Rakuten Mobile, Inc | Support |
| 15 | Ericsson Inc. | considering the workload, we think this objective should be downprioritized. |

| Item | Company | Comments |
|------|--|--|
| 16 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] Support |
| 17 | MediaTek Inc. | We would support inclusion of this objective, but should limit this to RAN2 scope. |

2.3.2 Summary from Initial Round

There was wide support for this objective, with only 2 companies not supporting or thinking that the objective can be down prioritised.

Moderator's proposal from Initial Round:

1 - Include the objective for On demand transmission/reception of DL PRS

2.3.3 Intermediate Round

Feedback Form 7: Feedback on the moderator's proposal from the Initial Round

| Item | Company | Comments |
|------|--|--|
| 1 | CATT | CATT supports the Moderator's proposal to include the objective for On demand transmission/reception of DL PRS |
| 2 | Futurewei Technolo- gies | Support |
| 3 | Apple France | We supports the Moderator's proposal |
| 4 | Qualcomm CDMA Technolo- gies | We support the Moderator's proposal. |
| 5 | InterDigital Communi- cations | Support moderator's proposal |
| 6 | vivo Mobile Commu- nication Co., | Support the proposal. |
| 7 | Samsung Electron- ics Co., Ltd | We are fine with the proposal from the Moderator. |
| 8 | Nokia Denmark | Nokia supports the proposal |

| Item | Company | Comments |
|------|--|---|
| 9 | CEWiT | We support the proposal |
| 10 | Sony Europe B.V. | We support the proposal |
| 11 | Guangdong OPPO Mobile Telecom. | Support |
| 12 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility] - Support |
| 13 | Deutsche Telekom AG | Support |
| 14 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] Support |
| 15 | ZTE Cor- poration | Okay with moderator's proposal. We can accept both UE and LMF initiated DL PRS if this is majority view. |
| 16 | MediaTek Inc. | ok in principle, but we made the comment before that we assume no RAN1 time is needed. Would like to hear other views on whether this is has RAN1 impact. |
| 17 | Ericsson Inc. | For on demand PRS, we think that both UE initiated and LMF initiated solutions will take too much time. as a compromise, we propose to consolidate the solution into an LMF-initiated request of on-demand DL PRS transmission based on UE feedback (e.g. measurement). |

2.4 GNSS positioning integrity

The rapporteur's proposal for the revised WID contains the following new objectives:

- Specify the signalling, and procedures to support GNSS positioning integrity determination, including [RAN2, RAN3]:
 - o The assistance information that will be used to support integrity determination
 - o The information that will be used to provide the positioning integrity KPIs and integrity results
 - o Support of integrity for UE-based and UE-assisted A-GNSS positioning.

2.4.1 Initial Round

Companies are invited to give feedback related to above objective. Specifically, companies should indicate whether they support GNSS positioning integrity, and provide additional comments regarding the details of the scope.

Feedback Form 8: Initial round feedback on "GNSS positioning integrity"

| Item | Company | Comments |
|-------------|--|--|
| 1 | Nokia Denmark | Nokia support GNSS positioning integrity |
| 2 | CATT | CATT supports the above objective for GNSS positioning integrity. |
| 3 | InterDigital Communi- cations | Support GNSS positioning integrity |
| 4 | Swift Nav- igation | Swift Navigation supports the objectives for GNSS positioning integrity |
| 5 | T-Mobile USA Inc. | <p>T-Mobile doesn't support Positioning Integrity in its current form. TR states "For example, a Target Integrity Risk (TIR) of 10-7/hr translates to a 99.99999% probability that no hazardously misleading outputs occurred in a given hour of operation. The TIR sets the target for determining which feared events need to be monitored in order to meet the specified Alert Limit (AL) at this level of probability."</p> <p>This puts the operator/vendors in the position of determining when a UE is operating in a manner that is hazardous. This leads to a feature that can't be deployed for business reasons.</p> <p>T-Mobile's feared event is addressed if an objective is added that states "Specification shall not reference hazardous operation or feared events nor require the network or the network operator to determine that the UE is operating out of tolerance"</p> |
| 6 | Qualcomm CDMA Technolo- gies | Qualcomm supports the objective for NR and LTE. The "NR" may need to be removed in the WI title. |
| 7 | Beijing Xiaomi Mobile Software | Xiaomi supports integrity for UE-Based and UE-Assisted A-GNSS positioning should be included in the WID scope. |
| 8 | vivo Mobile Communi- cation Co., | Support GNSS positioning integrity |
| 9 | Guangdong OPPO Mobile Telecom. | OPPO support positioning integrity |
| 10 | ESA | ESA supports adding this objective to the WID |

| Item | Company | Comments |
|------|---|--|
| 11 | Motorola Mobility Germany GmbH | Lenovo, Motorola Mobility supports the Rapporteur's proposal on GNSS positioning integrity. |
| 12 | Samsung Electronics Co., Ltd | We support GNSS positioning integrity. |
| 13 | Deutsche Telekom AG | Deutsche Telekom supports GNSS positioning integrity (as already from the beginning of the SI). We think that mobile network can play a vital role in enhancing the GNSS value. |
| 14 | ZTE Corporation | [ZTE] We are fine with the scope mentioned above. |
| 15 | Rakuten Mobile, Inc | We agree with the above defined scope. |
| 16 | Intel Corporation (UK) Ltd | We support the GNSS positioning integrity in the scope. |
| 17 | Ericsson Inc. | Support. GNSS Integrity Solution is provided to enable a complete offering for GNSS based solutions to the end user |
| 18 | HUAWEI TECHNOLOGIES Co. Ltd. | [Huawei, HiSilicon] Support |
| 19 | MediaTek Inc. | We would support adding this. |

2.4.2 Summary from Initial Round

There was widespread support for the addition of the objective on Positioning Integrity, with only one company not supporting the objective in its current form.

Moderator's proposal from initial round

1 - Include the objective for GNSS positioning integrity

2.4.3 Intermediate Round

Feedback Form 9: Feedback on the moderator's proposal from the Initial Round

| Item | Company | Comments |
|-------------|--------------------------------|--|
| 1 | CATT | CATT supports the Moderator's proposal to include the objective for GNSS positioning integrity |
| 2 | Futurewei Technologies | Support |
| 3 | Apple France | We supports the Moderator's proposal |
| 4 | Qualcomm CDMA Technologies | We support the moderator's proposal. |
| 5 | InterDigital Communications | Support moderator's proposal |
| 6 | vivo Mobile Communication Co., | Support |
| 7 | Beijing Xiaomi Mobile Software | Xiaomi supports the moderator's proposal |
| 8 | Samsung Electronics Co., Ltd | We are fine with the proposal from the Moderator. |
| 9 | Nokia Denmark | Nokia supports the proposal |
| 10 | CEWiT | Support the proposal |
| 11 | Sony Europe B.V. | Support the proposal |
| 12 | Swift Navigation | Swift Navigation supports the Moderator's proposal |
| 13 | Guangdong OPPO Mobile Telecom. | Support |
| 14 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility] - Support |
| 15 | Deutsche Telekom AG | Support |

| Item | Company | Comments |
|------|--|--|
| 16 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] Support |
| 17 | ZTE Cor- poration | Okay with moderator's proposal. |
| 18 | MediaTek Inc. | We are fine with the moderator proposal. |
| 19 | Ericsson Inc. | support. |

2.5 A-GNSS positioning enhancements

The rapporteur's proposal for the revised WID contains the following new objectives:

- Support the following enhancements of A-GNSS positioning [RAN2]
 - o Specify support for BDS B2a signal
 - o Specify support for BDS B3I signal
 - o Specify support for NavIC to NR

2.5.1 Initial Round

Companies are invited to give feedback related to above objective. Specifically, companies should indicate whether they support of these A-GNSS technologies. In addition, several documents submitted to this meeting describe that various different approaches may be taken with regard to the WI in which the work is performed, so companies are invited to provide their view on how this work should be performed (e.g. within this WID, within a separate new WI, or within TEI17).

Feedback Form 10: Initial round feedback on "A-GNSS positioning enhancements"

| Item | Company | Comments |
|------|------------------|---|
| 1 | Nokia Denmark | Nokia's preference is to not add this due to Rel-17 positioning WID is already quite full with many enhancement areas |
| 2 | CATT | CATT supports including the enhancements of A-GNSS positioning of BDS B2a, BDS B3I and NavIC. For Nokia's concern on the impact on WID scope, our understanding is that including the above enhancements has minimum impact on the workload. Based on the previous experience of introducing BDS B1C signal, only stage 2 specs and TS 37.355 are impacted. We would need, most likely, one email discussion for companies to review and approve the new parameters for B2a and B3I signals without the need for online discussion. In addition, TEI17 or a very small LTE WI can be used to introduce B2a and B3I signals to LTE. |

| Item | Company | Comments |
|------|--------------------------------|---|
| 3 | Swift Navigation | Swift Navigation supports the objectives and the comments from CATT |
| 4 | Qualcomm CDMA Technologies | Qualcomm supports the objectives; and it seems sensible to include them in this WID. However, since the BDS enhancements should also be applicable to LTE, the WID scope should be clarified. In addition to RAN2, there are also RAN4 impacts (and probably small RAN3 impacts; e.g., in the case of additional posSIBs are required). |
| 5 | Beijing Xiaomi Mobile Software | Xiaomi – We support the inclusion of these enhancements for AGNSS positioning in REL17. We believe that completion of the work will be minimal within the WG TU allocation, with most work able to be completed via email. |
| 6 | CEWiT | We support the proposal to add NavIC into present work item. Further as mentioned in our joint contribution RP-210734, there is small RAN 4 impact we expect therefore we suggest to add RAN 4 in responsible WG list for this particular proposal. |
| 7 | Reliance Jio | Reliance Jio supports the proposal of extending the A-GNSS support for NavIC to NR IRel-17 under NR_pos_enh WI. We would however suggest broadening the scope to include impact on RAN2, RAN3 & RAN4 as detailed in RP-210734. |
| 8 | Guangdong OPPO Mobile Telecom. | OPPO supports the objectives and the comments from CATT |
| 9 | ISRO | ISRO is supportive of extending NAVIC A-GNSS support to NR Rel-17 under NR_posenh WI The work should address RAN2, RAN3 & RAN4 impacts as per RP-210734. |
| 10 | Deutsche Telekom AG | Deutsche Telekom supports this. |
| 11 | ZTE Corporation | From RAN2 perspective, we can support this proposal. We are fine to discuss this in either WI (this WI or separate WI) or TEI. The comments from CATT need to be taken into account. |
| 12 | Intel Corporation (UK) Ltd | Same view as CATT, the required work is to review the changes based on email discussion, and therefore it can be added in the scope |
| 13 | Rakuten Mobile, Inc | We support this proposal |
| 14 | Ericsson Inc. | Support. |
| 15 | HUAWEI TECHNOLOGIES Co. Ltd. | [Huawei, HiSilicon] Support. Note that this was intended to be included in the WI in Dec. 2019, which later was turned into an SI. For introducing the enhancement in the LTE part, an LTE TEI can be used. |

| Item | Company | Comments |
|------|---------------|--|
| 16 | MediaTek Inc. | We should include all GNSS technologies in the scope of Rel-17 enhancements. |

2.5.2 Summary from Initial Round

There was wide support to include these new A-GNSS technologies, with only one company expressing concerns on this objective due to workload considerations. Companies also seem to be open to doing the work within the current NR positioning enhancements WI, noting that the scope will need to be clarified to also include LTE.

Moderator's proposal from Initial Round

1 - Include the objective on A-GNSS positioning enhancements

2.5.3 Intermediate Round

Feedback Form 11: Feedback on the moderator's proposal from the Initial Round

| Item | Company | Comments |
|------|--------------------------------|---|
| 1 | CATT | CATT supports the Moderator's proposal to include the objective on A-GNSS positioning enhancements. |
| 2 | Qualcomm CDMA Technologies | We support the moderator's proposal. |
| 3 | vivo Mobile Communication Co., | Support |
| 4 | Beijing Xiaomi Mobile Software | Xiaomi supports this proposal to include these new A-GNSS technologies within the WID. |
| 5 | Samsung Electronics Co., Ltd | We are fine with the proposal from the Moderator. |
| 6 | Nokia Denmark | Nokia supports the proposal - however concerned related to the workload. |
| 7 | CEWiT | We support this proposal but assume that the detailed sub agendas will be included during WID drafting. |
| 8 | Swift Navigation | Swift Navigation supports the Moderator's proposal |

| Item | Company | Comments |
|------|--|--|
| 9 | Guangdong OPPO Mobile Telecom. | Support |
| 10 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility] - Support Rapporteur's proposal |
| 11 | Deutsche Telekom AG | support |
| 12 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] Support |
| 13 | ZTE Cor- poration | Okay with moderator's proposal. |
| 14 | MediaTek Inc. | We support the moderator proposal. |
| 15 | Ericsson Inc. | support |
| 16 | Reliance Jio | Reliance Jio supports the proposal with an understanding that WID would be revised to include RAN2, RAN3, & RAN4 impact for NAVIC support as suggested in RP-210734. |

3 RAN1 centric objectives

3.1 Multipath/NLOS mitigation

The rapporteur's proposal for the revised WID contains the following new objectives:

- [Study and specify, if supported, the enhancements of information reporting from UE and gNB for multipath/NLOS mitigation [RAN1, RAN2, RAN3]]

3.1.1 Initial Round

This objective was discussed at RAN2#90e but there was not sufficient support to include it at that time. Companies should indicate whether they support the addition of multipath/NLOS mitigation, and provide any additional comments as appropriate.

Feedback Form 12: Initial round feedback on "Multipath/NLOS mitigation"

| Item | Company | Comments |
|-------------|--|--|
| 1 | Nokia Denmark | Multipath/NLOS mitigation is supported by Nokia. This solution is required to meet the positioning accuracy as agreed in Rel. 17. Any of the positioning accuracy enhancement that we specify in Rel. 17 will not enable the needed accuracy without taking the LoS/Non Los into account, thus this is the key enabled for the Rel. 17 accuracy enhancement. |
| 2 | InterDigital Communi- cations | Support the additional of multipath/NLOS mitigation study |
| 3 | Qualcomm CDMA Technolo- gies | We think all objectives which require further study should be postponed to the next Release. We believe the WGs are already (probably more than) fully loaded with the objectives recommended for normative work during the SID. |
| 4 | CEWiT | We support this proposal and firmly believe that this is necessary to achieve the Rel 17 positioning accuracy. |
| 5 | Beijing Xiaomi Mobile Software | Xiaomi supports the inclusion of the multipath/NLOS mitigation to the WID for REL17 |
| 6 | vivo Mobile Communi- cation Co., | Share the view that all items that need further study should be postponed. |
| 7 | Guangdong OPPO Mobile Telecom. | Not support 1. It was illustrated by some tdocs that implementation-based solution is sufficient. No specification is needed 2. This feature is NOT in the recommended list according to the output of SI. The current RAN1 scope is large enough and the workload is high. Let's take only timing error mitigation as an example, there have been 10 options, 4 options, 7 options, 6 options, for mitigating TRP Tx timing errors and/or UE Rx timing errors for DL TDOA, mitigating UE Tx and TRP Rx timing errors for UL TDOA, mitigating UE Rx/Tx timing errors in DL+UL positioning, mitigating gNB Rx/Tx timing errors in DL+UL positioning, respectively. A total numbers of 27 options for timing error mitigation in additional to the reference device based solution. |

| Item | Company | Comments |
|------|--------------------------------|---|
| 8 | Motorola Mobility Germany GmbH | Lenovo, Motorola Mobility supports the Rapporteur's proposal on Multipath/NLOS mitigation as part of the accuracy enhancements. It has already been proposed and discussed during the previous RAN#104-e in the context of the current WID objectives related to DL-AoD/UL-AoA enhancements and subject to further discussion during this RAN meeting. This accuracy enhancement objective should be therefore be recommended for normative work across all positioning methods under a common objective as suggested by the Rapporteur to avoid potential fragmentation of this solution for only certain positioning methods. |
| 9 | Deutsche Telekom AG | Deutsche Telekom support this objective |
| 10 | ZTE Corporation | [ZTE] Support. Stringent positioning accuracy requirements were defined in study item phase, in order to improve the performance under low LOS scenario, the multipath/NLOS mitigation is a critical technique to address the problem and fulfill the requirements. |
| 11 | NTT DOCOMO INC. | NTT DOCOMO support this objective. |
| 12 | Intel Corporation (UK) Ltd | Intel supports this objective |
| 13 | Rakuten Mobile, Inc | We Support this objective. |
| 14 | Ericsson Inc. | support this objective. since multipath reporting is already being discussed in RAN1 in existing agenda items, we propose to have RAN2 lead the topic and focus on extension additional path reporting. |
| 15 | HUAWEI TECHNOLOGIES Co. Ltd. | [Huawei, HiSilicon] Support. For NLOS mitigation, RAN1 already made progress on using a reference device to calibrate/cancel the gNB/UE Rx/Tx timing error, which cannot be replaced by implementation-based method (RAIM/RANSAC/etc.). |
| 16 | MediaTek Inc. | This relates to accuracy improvement, so should be high priority if study outcome is positive. We would support completion of the study by RAN4 and would support the follow-up specification work in Rel-17 if this can be done within the existing TU allocation. |

3.1.2 Summary from Initial Round

There was support from 13 companies to include this objective, with 3 companies not supporting mainly based on concerns that the WI is already fully loaded. Based on this feedback, it is proposed to include the objective in the WID.

Moderator's proposal from Initial Round

1 - Include the objective on Multipath/NLOS mitigation”

3.1.3 Intermediate Round

Feedback Form 13: Feedback on the moderator’s proposal from the Initial Round

| Item | Company | Comments |
|-------------|--------------------------------|---|
| 1 | CATT | CATT is supportive to include the further study of Multipath/NLOS mitigation in the WI objective |
| 2 | Futurewei Technologies | Support this inclusion in the WID. NLOS is a major source of error in the positioning accuracy. |
| 3 | Apple France | We share similar view as Qualcomm and vivo within the initial round, that items with need to further study can be postponed to the next release. |
| 4 | Qualcomm CDMA Technologies | Given the opinions from all the companies, we support the moderator’s proposal if this can be done within the existing TU allocation. It could have 2nd priority in the case there is time available in RAN1/2 for further study. |
| 5 | InterDigital Communications | Support moderator’s proposal |
| 6 | vivo Mobile Communication Co., | UL inactive positioning is with explicit WG recommendation while NLOS mitigation still require further study. Priority perspective, the item should not be treated with higher priority than UL inactive positioning. |
| 7 | Beijing Xiaomi Mobile Software | Xiaomi supports moderator’s proposal to include the multipath/NLOS mitigation in the WID |
| 8 | Nokia Denmark | Nokia supports the proposal |
| 9 | CEWiT | We support this proposal |
| 10 | Guangdong OPPO Mobile Telecom. | Not support. As many companies comment in the initial round, this topic is not with high priority based on the output of study phase. In fact, the performance/benefits of this feature have not been justified so far, which lead to the low priority as captured in TR. |
| 11 | Sony Europe B.V. | Support the moderators proposal |
| 12 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility] - Support Rapporteur’s proposal |
| 13 | Deutsche Telekom AG | Support (with lower priority than other parts of the WI) |

| Item | Company | Comments |
|------|--|---|
| 14 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] Support |
| 15 | ZTE Cor- poration | We are supportive to include NLOS mitigation in the WID. It is a key component to meet the positioning accuracy requirement for Rel-17. |
| 16 | MediaTek Inc. | We support the moderator proposal if it can be done within existing RAN1 TU allocation. |
| 17 | Ericsson Inc. | support the moderator's proposal. |

3.2 Aggregation of PRS

The rapporteur's proposal for the revised WID contains the following new objectives:

- [Study and specify, if supported, the enhancements to simultaneous transmission by the gNB and aggregated reception by the UE of DL PRS for positioning for one or more contiguous carriers in one or more contiguous PFLs [RAN1, RAN2, RAN3, RAN4]
- o The applicability and feasibility of this enhancement need to be further studied from both gNB and UE perspectives for different scenarios, configurations, particular bands and RF architectures.

3.2.1 Initial Round

This objective was discussed at RAN2#90e but there was not sufficient support to include it at that time. Companies should indicate whether they support the of Aggregation of PRS, and provide any additional comments as appropriate.

Feedback Form 14: Initial round feedback on "Aggregation of PRS"

| Item | Company | Comments |
|------|------------------|---|
| 1 | Nokia Denmark | Aggregation os PRS is supported by Nokia. The additional bandwidth required in a realistic operator frequency allocation will not enable the Rel. 17 accuracy without carrier aggregation of the positioning reference signals. |
| 2 | CATT | CATT is supportive to the objective. Aggregation of DL PRS may significantly improve the positioning accuracy. |

| Item | Company | Comments |
|------|--|--|
| 3 | Qualcomm CDMA Technolo- gies | We think all objectives which require further study should be postponed to the next Release. We believe the WGs are already (probably more than) fully loaded with the objectives recommended for normative work during the SID. |
| 4 | CEWiT | We support this proposal. |
| 5 | Beijing Xiaomi Mobile Software | Xiaomi does not support continuation of this objective at this time. |
| 6 | vivo Mobile Commu- nication Co., | Share the view that all items that need further study should be postponed. |
| 7 | Guangdong OPPO Mobile Telecom. | Not support 1. There were extensive discussions on the feature during the study phase. The feasibility and performance gain are not justified so far. 2. This feature is NOT in the recommended list according to the output of SI. The current RAN1 scope is large enough and the workload is high. Let's take only timing error mitigation as an example, there have been 10 options, 4 options, 7 options, 6 options, for mitigating TRP Tx timing errors and/or UE Rx timing errors for DL TDOA, mitigating UE Tx and TRP Rx timing errors for UL TDOA, mitigating UE Rx/Tx timing errors in DL+UL positioning, mitigating gNB Rx/Tx timing errors in DL+UL positioning, respectively. That is to say, there are a total number of 27 options for timing error mitigation in additional to the reference device based solution. |
| 8 | Motorola Mobility Germany GmbH | Lenovo, Motorola Mobility supports the Rapporteur's proposal in general on Aggregation of PRS PFLs for accuracy enhancement, however if the WG workload is too high then this objective can be deprioritized. |
| 9 | ZTE Cor- poration | [ZTE] Support. It's an important enhancement for improving timing resolution. Considering the workload in RAN1, we're fine to select one of the PRS aggregation and SRS aggregation in Rel-17. We consider PRS aggregation as a higher priority. |
| 10 | Intel Cor- poration (UK) Ltd | We are supportive to consider aggregation of PRS if time is allowed. In terms of priority, we think that NLOS/multipath mitigation has higher priority for Rel.17. |
| 11 | Ericsson Inc. | do not support. During the study, it was pointed out that a coherent signal with multiple PRSs across multiple carriers was complex to realize, and even very small time difference in their timing/phase would produce large losses in accuracy. |

| Item | Company | Comments |
|------|--|---|
| 12 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] Support both PRS and SRS frequency aggregation. It can be a RAN4-led objective. |
| 13 | MediaTek Inc. | This relates to accuracy improvement, so should be high priority if study outcome is positive. We would support completion of the study by RAN4 and would support the follow-up specification work in Rel-17 if this can be done within the existing TU allocation. |

3.2.2 Summary from Initial Round

7 companies expressed support for the proposal while 5 companies did not support and a further company indicated that it could be de-prioritised if WI time was limited. Based on this feedback, there does not appear to be sufficient support to include the objective in the WID.

Moderator's proposal from Initial Round

1 - Do not include the objective on Aggregation of PRS

3.2.3 Intermediate Round

Feedback Form 15: Feedback on the moderator's proposal from the Initial Round

| Item | Company | Comments |
|------|--|---|
| 1 | Apple France | We supports the Moderator's proposal |
| 2 | vivo Mobile Commu- nication Co., | Support the proposal. |
| 3 | Beijing Xiaomi Mobile Software | Xiaomi agrees with others and supports the moderator's proposal that due to time concerns there is insufficient time to include this within the REL17 WID |
| 4 | Nokia Denmark | Nokia supports the proposal |
| 5 | Guangdong OPPO Mobile Telecom. | We supports the Moderator's proposal |
| 6 | Deutsche Telekom AG | support |

| Item | Company | Comments |
|------|--|--|
| 7 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] Rel-17 SI studied high accuracy, low power, etc. with parity. Therefore, we should include some techniques for each aspect for fairness. Since companies can converge to support multipath/NLOS for high accuracy, we are ok to not include CA for PRS/SRS in this release for compromise. Further, the saved time should be allocated to support DL and UL inactive positioning for low power. |
| 8 | MediaTek Inc. | As the NLOS accuracy enhancing work is included, we can accept the proposal. |
| 9 | Ericsson Inc. | support |

3.3 Aggregation of SRS

The rapporteur's proposal for the revised WID contains the following new objectives:

- [Study and specify, if supported, the enhancements to simultaneous transmission by the UE and aggregated reception by the gNB of the SRS for positioning in multiple contiguous intra-band carriers [RAN1, RAN2, RAN3, RAN4]
- o The applicability and feasibility of this enhancement need to be further studied from both gNB and UE perspectives for different scenarios, configurations, particular bands and RF architectures.

3.3.1 Initial Round

This objective was discussed at RAN2#90e but there was not sufficient support to include it at that time. Companies should indicate whether they support the addition of Aggregation of SRS, and provide any additional comments as appropriate.

Feedback Form 16: Initial round feedback on "Aggregation of SRS"

| Item | Company | Comments |
|------|----------------------------------|---|
| 1 | Nokia Denmark | Aggregation of SRS is supported by Nokia. The additional bandwidth required in a realistic operator frequency allocation will not enable the Rel. 17 accuracy without carrier aggregation of the positioning reference signals. |
| 2 | CATT | CATT is supportive to the objective. Aggregation of UL SRS may significantly improve the positioning accuracy. |
| 3 | Qualcomm CDMA Technologies | We think all objectives which require further study should be postponed to the next Release. We believe the WGs are already (probably more than) fully loaded with the objectives recommended for normative work during the SID. |

| Item | Company | Comments |
|------|--|--|
| 4 | CEWiT | We support this proposal |
| 5 | Beijing Xiaomi Mobile Software | Xiaomi does not support continuation of this objective at this time. |
| 6 | vivo Mobile Commu- nication Co., | Share the view that all items that need further study should be postponed. |
| 7 | Guangdong OPPO Mobile Telecom. | Not support 1. There were extensive discussions on the feature during the study phase. The feasibility and performance gain are not justified so far. 2. This feature is NOT in the recommended list according to the output of SI. The current RAN1 scope is large enough and the workload is high. Let's take only timing error mitigation as an example, there have been 10 options, 4 options, 7 options, 6 options, for mitigating TRP Tx timing errors and/or UE Rx timing errors for DL TDOA, mitigating UE Tx and TRP Rx timing errors for UL TDOA, mitigating UE Rx/Tx timing errors in DL+UL positioning, mitigating gNB Rx/Tx timing errors in DL+UL positioning, respectively. A total number of 27 options for timing error mitigation in additional to the reference device based solution. |
| 8 | Motorola Mobility Germany GmbH | Lenovo, Motorola Mobility shares the view that this potential enhancement could be deprioritized for this release based on other higher priority objectives. |
| 9 | ZTE Cor- poration | [ZTE] Support. It's an important enhancement for improving timing resolution. Considering the workload in RAN1, we're fine to select one of the PRS aggregation and SRS aggregation in Rel-17. We consider PRS aggregation as a higher priority. |
| 10 | Intel Cor- poration (UK) Ltd | We are supportive to consider aggregation of SRS for positioning if time is allowed. In terms of priority, we think that NLOS/multipath mitigation has higher priority for Rel.17. |
| 11 | Ericsson Inc. | do not support. same comment as for DL PRS. |
| 12 | MediaTek Inc. | This relates to accuracy improvement, so should be high priority if study outcome is positive. We would support completion of the study by RAN4 and would support the follow-up specification work in Rel-17 if this can be done within the existing TU allocation. |
| 13 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] Support both PRS and SRS frequency aggregation. It can be a RAN4-led objective. |

3.3.2 Summary from Initial Round

For aggregation of SRS the feedback is very similar to that received for aggregation of PRS, but for this case a further company could prioritise the objective if time was limited. In summary ,6 companies expressed support for the proposal while 5 companies did not support and a 2 companies indicated that it could be de-prioritised if WI time was limited. Based on this feedback, there does not appear to be sufficient support to include the objective in the WID.

Moderator’s proposal from Initial Round:

1 - Do not include the objective on Aggregation of PRS

3.3.3 Intermediate Round

Feedback Form 17: Feedback on the moderator’s proposal from the Initial Round

| Item | Company | Comments |
|------|--|---|
| 1 | Apple France | We supports the Moderator’s proposal |
| 2 | vivo Mobile Commu- nication Co., | Support. |
| 3 | Beijing Xiaomi Mobile Software | Xiaomi agrees with others and supports the moderator’s proposal that due to time concerns there is insufficient time to include this within the REL17 WID |
| 4 | Nokia Denmark | Nokia supports the proposal |
| 5 | Guangdong OPPO Mobile Telecom. | Support |
| 6 | Deutsche Telekom AG | Note: the proposal should read ”SRS”, not PRS (that was 3.2). Support. |
| 7 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] Rel-17 SI studied high accuracy, low power, etc. with parity. Therefore, we should include some techniques for each aspect for fairness. Since companies can converge to support multipath/NLOS for high accuracy, we are ok to not include CA for PRS/SRS in this release for compromise. Further, the saved time should be allocated to support DL and UL inactive positioning for low power. |
| 8 | MediaTek Inc. | We can accept this. Same comment as for PRS aggregation moderator proposal. |
| 9 | Ericsson Inc. | support. |

4 Other aspects

4.1 Additional objectives

Companies are invited to provide comments on any objectives that do not fit into any of the aspects discussed above, noting that there will be an opportunity later in the email discussion to give detailed comments on the wording of the WID, etc.

Feedback Form 18: Comment on additional objectives

| Item | Company | Comments |
|------|-------------------------------------|--|
| 1 | Nokia Denmark | A LoS/non LoS solution is required to meet the positioning accuracy as agreed in Rel. 17. Any of the positioning accuracy enhancement that we specify in Rel. 17 will not enable the needed accuracy without taking the LoS/Non Los into account, thus this is the key enabled for the Rel. 17 accuracy enhancement. |
| 2 | InterDigital Communi- cations | Along with on-demand PRS, support of aperiodic/semi-persistent PRS will provide additional flexibility at LMF for the PRS transmission. Therefore, we support to study on aperiodic/semi-persistent PRS reception in this WI |

4.1.1 Summary from Initial Round

The comment from Nokia appear to be a duplication of the comment made to section 3.1

Regarding the comment from Interdigital, in the understanding of the moderator the aperiodic/semi-persistent PRS reception mentioned seems to be a specific RAN1 aspect of the overall solution for On demand DL PRS. Therefore this seems to be covered by the On demand DL PRS objective and can be discussed as a potential solution during the WI, and it does not need to be added as an independent objective.

Moderator's conclusion from Initial Round

1 - No additional objectives compared to those already discussed in sections 2 and 3 will be considered at this meeting.

4.1.2 Intermediate Round

Feedback Form 19: Feedback on the moderator's proposal from the Initial Round

| Item | Company | Comments |
|------|--------------------------------|--|
| 1 | CATT | Support the moderator's conclusion. |
| 2 | Futurewei Technolo- gies | Agree with the moderator's proposal |
| 3 | Apple France | We supports the Moderator's conclusion |

| Item | Company | Comments |
|------|--|---|
| 4 | Beijing Xiaomi Mobile Software | Xiaomi supports the moderator's assessment and proposal |
| 5 | Guangdong OPPO Mobile Telecom. | Support moderator's conclusion |
| 6 | Deutsche Telekom AG | ; -) |
| 7 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] OK |

4.2 Other comments on the WID

Companies are invited to provide comments on any other comments on the WID.

Feedback Form 20: Other comments on WID

| Item | Company | Comments |
|------|---------|----------|
|------|---------|----------|

5 Summary from Wednesday GTW discussion

The Wednesday GTW discussion discussed RP-210817. The discussion was predominately around the RRC_INACTIVE objective and the Multipath/NLOS objective. From that discussion the following set of new high level objectives was agreed:

1. Positioning latency improvements with the sub objectives 1-4 (sub objective 5-8 are not included)
2. positioning for UEs in RRC_INACTIVE including:
 - 2.1 RAT independent and DL methods
 - 2.2 UL (and UL+DL) methods as a 2nd priority
3. On demand tx/rx of DL PRS
4. GNSS positioning integrity
5. A-GNSS positioning enhancements
6. Multipath/NLOS mitigation starting with a study phase in RAN1

The next phase of discussion will now focus on fine tuning the wording of the objectives.

6 Fine tuning of objective text

The rapporteur will provide an updated draft of the WID based on the conclusion from the Wednesday GTW session. One section and corresponding feedback form is provided for each high level objective, plus a final one to collect comments on any other part of the draft WID. **First round of feedback should be provided by 12:00 UTC on Thursday 25th March** and after this time the rapporteur will provide another update to the WID.

For this phase careful consideration should be give to checking which WG is leading and which other WGs are involved with each objective/sub-objective. This is important to ensure that each WG has a clear understanding of what is expected in the ongoing work.

6.1 Positioning latency improvements with the sub objectives 1-4

Some detailed comments were already made in the earlier rounds of discussion and should also be considered in this phase of the discussion (at least Qualcomm, Vivo, OPPO, Huawei, Ericsson provided such detail comment)

Feedback Form 21: Please provide comments on the objective on positioning latency improvements objective

| Item | Company | Comments |
|------|--------------------------------|--|
| 1 | CATT | For 2nd objective, suggest the following changes: "Latency reduction related to the <u>request and response</u> of the measurement (e.g., <u>priority rules</u>); [RAN1, RAN2, RAN4] |
| 2 | InterDigital Communications | Regarding [4] (latency reduction related to the measurement gap), we agree with Qualcomm and vivo from the previous round that RAN1 should be the leading WG since its impact on accuracy, latency and efficiency, and potential specification impacts may need to be analyzed in RAN1. |
| 3 | Guangdong OPPO Mobile Telecom. | We hold our negative view on the necessity of objective-2, so suggest to remove it directly. On the other hand, we can accept the suggested change by CATT as above. |
| 4 | Apple GmbH | For objective 2, we share the same view with CATT that only priority rules need to be kept in the scope of the 2nd objective. Also, the order of this objective need to be changed to [RAN2,RAN1,RAN4]. RAN2 need lead this objective. For Objective 3, change the order to [RAN1,RAN4]. RAN1 should lead this objective. For objective 4, change the order to [RAN1,RAN4]. RAN1 should lead this objective. |

| Item | Company | Comments |
|------|---|--|
| 5 | Qualcomm CDMA Technologies | <p>We think [1] and [2] could be combined, since the same basic principle/mechanism (e.g., a Request/Response message pair). New signalling/protocols (e.g., RRC, MAC, etc.) should not be needed, given that the Rel-16 architecture is kept. There seem be no RAN1 and RAN4 impacts.</p> <p>For [3] and [4] RAN1 should look into this first, where this was already discussed during Rel-16.</p> <p>A potential revision is proposed as follows:</p> <p>Specify enhancements of signalling and procedures for reducing positioning latency for DL and DL+UL NR positioning methods, including:</p> <ul style="list-style-type: none"> • Latency reduction related to the request and response of location information and positioning assistance data (e.g., via location scheduling in advance of the time of when the location is needed) [RAN2, RAN3] • Latency reduction related to the measurement gaps [RAN1, RAN4, RAN2] • Latency reduction related to measurement time [RAN1, RAN4] <p>(alternatively, all "e.g." could be deleted)</p> |
| 6 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility] - We support CATT's updated wording to [2] and that it remains as a standalone sub-objective. Alternatively, if companies are concerned, we would also support that the related examples for both sub-objectives [1] and [2] are removed and it will be also consistent with the other sub-objectives in the WID where no particular examples are mentioned. |
| 7 | Sony Europe B.V. | For objective 3 and 4, we think RAN1 should be the lead group. |
| 8 | Sony Europe B.V. | For objective 3 and 4 we think RAN1 should be the lead group |
| 9 | ZTE Corporation | <p>[2] - We support to remove the examples of "<u>RRC signaling, MAC-CE and/or physical layer procedure</u>" in the brackets, as these examples are related with local LMF which has been ruled out by RAN2. Further, the only left example "<u>priority rules</u>" in the TR is about priority rules for measurement report in higher layer. Hence RAN2 should lead the discussion for this sub-objective.</p> <p>[3] - It should be a RAN1-led item. In Rel-16, the UE processing capabilities for measurement were defined by RAN1. RAN4 was involved in measurement requirements later.</p> |
| 10 | Beijing Xiaomi Mobile Software | Based on the draft WID submitted to this meeting in RP-210628 we support the inclusion of the items 1-4. We don't have a strong feeling towards the combining of the bullets 1 & 2 however the text proposed by Qualcomm looks reasonable. |

| Item | Company | Comments |
|------|------------------------------|--|
| 11 | Ericsson Inc. | <p>As mentioned previously, we think that [2] is too broad as it is written now. for example, what is the RS considered for RRC signalling (is CSI-RS considered? only PRS?). If aperiodic RS is considered, we have already discussed the impact of supporting them in neighbour cells on signalling overhead and latency.</p> <ul style="list-style-type: none"> • we are OK with qualcomm proposal to focus on latency reduction by advance scheduling. <p>- regarding [4] there was several solutions discussed during the SI. we should clearly state what solution should be specified: (1) MG-less operation, (2) semi-persistent/aperiodic MGs, (3) Avoiding or minimizing latency associated with MGs, and (4) Fast activation of MGs. Hence, this sub-objective is also too broad in its current form. do we aim at studying al these items first and select one or more to specify? given the TU allocation, we think it is more reasonable to focus on a single optimization. our preference is to take MG less operation.</p> |
| 12 | HUAWEI TECHNOLOGIES Co. Ltd. | <p>[Huawei, HiSilicon] We support Objective 1 and 4. Objective 1 can be RAN2 to lead. Our preference is not to have Objective 2. At least new signaling/protocols including RRC, MAC etc. shall not be listed here as Rel-16 architecture is kept unchanged. It would be even better to add a note to clarify that there is no architectural change in the WI description to avoid any misunderstanding. Our preference is not to include Objective 3. If it is included, it should be RAN4 lead, since the PRS measurement latency evaluation during the SI is based on RAN4 RRM requirement. We do not think RAN1 can take the lead. Objective 4 should be RAN4 lead with RAN1 as the secondary WG. Our understanding is that the enhancements with regard to measurement gap should be better handled by RAN4. This also includes potential joint with the existing measurement gap enhancement. We do not mind to clarify that the related work on Objective 4 that is overlapping with the existing MG enhancement is addressed not in the positioning work item.</p> |
| 13 | MediaTek Inc. | 1 and 2 should be RAN2 led in our view. |
| 14 | Intel Corporation (UK) Ltd | Moderator: The rapporteur provided an update to the revised WID (Thursday just after 12:00 UTC) attempting to address as many comments as possible. The moderator proposes that further comments to the text of the draft WID are handled via the email reflector. |

6.2 Positioning for UEs in RRC_INACTIVE

Feedback Form 22: Please provide comments on Positioning for UEs in RRC_INACTIVE objective

| Item | Company | Comments |
|------|---------|---|
| 1 | CATT | We are fine with the objective of UE positioning in RRC_INACTIVE provided in RP-210628 " Revised WID on NR Positioning Enhancements ". |

| Item | Company | Comments |
|------|--------------------------------|--|
| 2 | InterDigital Communications | We also support the objective of UE positioning in RRC_INACTIVE provided in RP-210628. For progress, if other companies have concerns on inclusion of UL positioning methods in the WID, we are also ok to make it the 2nd priority objective as Qualcomm suggested. |
| 3 | Guangdong OPPO Mobile Telecom. | For the first bullet of "Signalling and procedures for supporting the assistance data delivery and measurement reporting; [RAN2, RAN1, RAN3,RAN4]", the assistance data can be done via SI, and the report is to be covered by the DL related bullet, so there is no need for this bullet. For the second bullet for DL, we believe the main work is to be done within SDT revised WI, so no need for this whole bullet in positioning WID, since there is no delta part to be covered. For UL, put it into a 2nd priority would be a good way-out from our perspective |
| 4 | Apple GmbH | We support to put UL part as a second-priority objective |
| 5 | vivo Mobile Communication Co., | Supportive of the objective provided in RP-210628 |
| 6 | Samsung Electronics Co., Ltd | We also think that UL part can be handled as a low priority, as commented earlier. |
| 7 | Qualcomm CDMA Technologies | This objective needs to be revised according to the GTW discussion. A potential revision is proposed as follows: Specify methods, measurements, signalling and procedures to support positioning for UEs in RRC_INACTIVE state, including: [RAN2, RAN1, RAN3] <ul style="list-style-type: none"> • DL NR positioning methods • RAT-independent positioning methods • UE-based and UE-assisted positioning modes • Support of UE positioning measurements for UEs in RRC_INACTIVE state • Reporting of DL-PRS measurements or location estimate performed in RRC_INACTIVE when the UE is in RRC_INACTIVE state. • As 2nd priority: <ul style="list-style-type: none"> – UL and DL+UL NR positioning methods – Support of gNB positioning measurements for UEs in RRC_INACTIVE state |
| 8 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility]- We are ok to support Rapporteur's Option 2 where UL and (UL+DL) methods can be included in the WID with the understanding that it is a 2nd priority objective. |

| Item | Company | Comments |
|------|--------------------------------|--|
| 9 | Sony Europe B.V. | We support the proposed objectives in RP-210628. |
| 10 | ZTE Corporation | <p>The guideline from Wed. GTW session "UL (and UL+DL) methods as a 2nd priority" should be captured in the objective clearly. e.g., add a note clarifying "Note: the work on UL and DL+UL positioning methods for UE in INACTIVE state is of second priority and should be pursued only if time permits".</p> <p>In addition, for the following sub-objective "UE and gNB positioning measurements, UL reference signals for UL measurements, and configuration of the DL-PRS and UL reference signals; [RAN1,RAN4]", RAN2 should be involved as well, since there is clearly RAN2 work at least for "configuration of the DL-PRS and UL reference signals".</p> <p>Regarding the following sentence with round brackets "(Details of the use of SDT to be studied in the WI phase)", we prefer to remove it as it does not provide much additional information. On the other hand, it can be mis-interpreted as the use of SDT still needs to be studied, which conflicts with the description of supporting enhancement on SDT for DL positioning purpose. Hence it's better to remove such sentence to avoid ambiguity in our future work.</p> |
| 11 | Beijing Xiaomi Mobile Software | We support amendments to indicate that the UL part be handled but only as a 2nd priority. |
| 12 | Ericsson Inc. | <p>RRC_INACTIVE: we support downprioritizing UL. regarding the WID draft text we agree with Qualcomm that we should break it in a two stage (DL first, UL, UL+DL second prio). the wording suggested by qualcomm is ok with us.</p> |
| 13 | HUAWEI TECHNOLOGIES Co. Ltd. | [Huawei, HiSilicon] We prefer the objective of UE positioning in RRC_INACTIVE provided in RP-210628. The priorities are clear from the discussion this week and we do not need to reflect this in the WID, it can be handled via normal project management in the WGs. |
| 14 | MediaTek Inc. | Agree with ZTE that we could remove the text in brackets in the revised WID regarding SDT studies. General proposal is ok apart from that. |
| 15 | Intel Corporation (UK) Ltd | <p>Moderator: The rapporteur provided an update to the revised WID (Thursday just after 12:00 UTC) attempting to address as many comment as possible. The moderator proposes that further comments to the text of the draft WID are handled via the email reflector.</p> <p>Regarding the comment from Huawei that the 2nd prioritisation for UL, this was a clear decision from the Wednesday GTW and so I think it is reasonable to capture it in the WID so as not to lose this information.</p> |

6.3 On demand tx/rx of DL PRS

Some comments were already made in the earlier rounds of discussion and should also be considered in this phase of the discussion. Specifically it was questioned (by Ericsson) whether both UE and LMF initiated On demand should be included, and it was questioned (by MediaTek) whether this

objective can have RAN1 impact.

Feedback Form 23: Please provide comments on On demand tx/rx of DL PRS objective

| Item | Company | Comments |
|------|--------------------------------|---|
| 1 | CATT | Although we prefer having higher priority for LMF-initiated on-demand DL PRS, we can accept the same priority for LMF-initiated and UE-initiated on-demand DL PRS. The objective of on-demand DL PRS in RP-210628 is fine to us. |
| 2 | InterDigital Communications | We also support the objective of on-demand DL PRS provided in RP-210628. Both UE-initiated and LMF-initiated on-demand PRS should be incorporated in WID with the same priority as both have benefits to enhance efficiency. |
| 3 | Guangdong OPPO Mobile Telecom. | same view as interdigital. |
| 4 | Apple GmbH | For UE-initiated on-demand DL PRS, the leading group needs to be RAN1. For LMF-initiated on-demand DL-PRS, RAN2 can lead. |
| 5 | Qualcomm CDMA Technologies | <p>This looks in principle O.K., however, RAN3 impacts seem missing.</p> <p>A potential revision is proposed as follows (incl. the TR recommendation/conclusion text as NOTES):</p> <p>Specify signalling and procedures to support on-demand transmission and reception of DL-PRS, including: [RAN2, RAN1, RAN3]</p> <ul style="list-style-type: none"> • UE-initiated request of on-demand DL-PRS transmission • LMF-initiated on-demand control of DL-PRS transmission <p>NOTE: Above enhancements shall be applicable for both, DL and DL+UL positioning methods, and both, UE-based and UE-assisted positioning solutions.</p> <p>NOTE: The exact parameters that can be dynamically changed and necessary measurement and/or assistance information for LMF/UE initiated on demand DL-PRS shall be decided during WI phase.</p> |
| 6 | Sony Europe B.V. | We support the objectives in RP-210628 to cover both UE and LMF initiated On demand PRS request. |
| 7 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility]- Support both UE-initiated and LMF-initiated on-demand DL-PRS objectives with equal priority. Fine with Qualcomm's revised wording, although the 2nd note may not be needed since these aspects will be covered in any case during the WI phase. |
| 8 | ZTE Corporation | As we commented in the previous round, we can accept both UE-initiated and LMF-initiated. |

| Item | Company | Comments |
|------|--|--|
| 9 | CATT | The impact of RAN3 is missing here. Fine with Qualcomm's revised wording except the second Note. These aspects mentioned in Note 2 can be discussed in detail in WI. |
| 10 | Beijing Xiaomi Mobile Software | We support both UE initiated and LMF initiated being handled with the same priority, and the objective as written in RP-210628 is acceptable as is. |
| 11 | Ericsson Inc. | we need to clarify the meaning of what "initiated". in our view, the network is always in control of what is being transmitted. UE will not "speak" to the gnodeB, only to LMF, so LMF will be initiating a change request to gnodeB PRS config. Thus we propose to reword the objective as follow: Specify signalling and procedures to support on-demand transmission and reception of DL-PRS, including: [RAN2, RAN1, RAN3] * enhancements of UE reporting to the LMF to provide feedback on PRS configuration. * enhancements of PRS configuration messages and procedures between gnodeB and LMF. we are ok with the notes proposed by Qualcomm |
| 12 | HUAWEI TECH- NOLO- GIES Co. Ltd. | [Huawei, HiSilicon] We are OK to include both LMF-initiated and UE-initiated objectives with RAN2 as the leading WG. |
| 13 | MediaTek Inc. | ok to include both LMF and UE initiated requests for on-demand PRS configuration. Yes RAN2 should lead this. |
| 14 | Intel Cor- poration (UK) Ltd | Moderator: The rapporteur provided an update to the revised WID (Thursday just after 12:00 UTC) attempting to address as many comment as possible. The moderator proposes that further comments to the text of the draft WID are handled via the email reflector Based on comments received, it seems that all companies are OK for include both UE initiated and LMF initiated on demand RPS transmission. Furthermore, there is a clear majority with the view that this objective should be RAN2 led. |

6.4 GNSS positioning integrity

Some detailed comments were already made in the earlier rounds of discussion and should also be considered in this phase of the discussion (at least T-Mobile and Qualcomm, Vivo provided such comments)

**Feedback Form 24: Please provide comments on
GNSS positioning integrity objective**

| Item | Company | Comments |
|-------------|--|---|
| 1 | CATT | We support the objective of GNSS positioning integrity provided in RP-210628. |
| 2 | InterDigital Communi- cations | We also support the objective of GNSS positioning integrity provided in RP-210628 |
| 3 | Guangdong OPPO Mobile Telecom. | Support the objective in 628 |
| 4 | Apple GmbH | We support the objective provided in RP-210628 |
| 5 | Qualcomm CDMA Technolo- gies | The draft objective looks O.K. |
| 6 | Swift Nav- igation | We support the objective of GNSS positioning integrity provided in RP-210628. |
| 7 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility]- Support the draft wording as it is in RP-210628. |
| 8 | ZTE Cor- poration | We are supportive to the objective given in RP-210628. |
| 9 | Beijing Xiaomi Mobile Software | We support the objective as captured in RP-210628 |
| 10 | ESA | We support the GNSS positioning integrity objective as provided in RP-210628 |
| 11 | HUAWEI TECH- NOLO- GIES Co. Ltd. | <p>[Huawei, HiSilicon] OK with the draft objective in RP-210628. Regarding comments from QC to remove “NR” from the WI title, we do not see the necessity. Normally what can be done for RAT-independent methods is agnostic on the RAT. If the intention is extend to EPS and ng-eNB in 5GS, we can add the following notes to the objective.</p> <ul style="list-style-type: none"> • Specify the signalling, and procedures to support GNSS positioning integrity determination, including [RAN2, RAN3]: <ul style="list-style-type: none"> o The assistance information that will be used to support integrity determination o The information that will be used to provide the positioning integrity KPIs and integrity results o Support of integrity for UE-based and UE-assisted A-GNSS positioning. o Note: This objective is applicable to 5GS and EPS. |

6.5 A-GNSS positioning enhancements

Some detailed comments were already made in the earlier rounds of discussion and should also be considered in this phase of the discussion, Specifically it was commented that the WI scope would need to be expanded to include LTE.

Feedback Form 25: Please provide comments on A-GNSS positioning enhancements objective

| Item | Company | Comments |
|------|--|---|
| 1 | CATT | We support the objective of A-GNSS positioning enhancements given in RP-210628. |
| 2 | CATT | We support the objective of A-GNSS positioning enhancements as provided in RP-210628. |
| 3 | Guangdong OPPO Mobile Telecom. | Support the objective in 628 |
| 4 | Apple GmbH | We are fine with this objective |
| 5 | Qualcomm CDMA Technolo- gies | RAN4 impacts are missing; and in case of new posSIB's are required, RAN3 |
| 6 | Swift Nav- igation | We support the objective |
| 7 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility]- Support the wording as it stands in RP-210628. |
| 8 | ZTE Cor- poration | We are supportive to the objective given in RP-210628. |
| 9 | Beijing Xiaomi Mobile Software | We support the objective as captured in RP-210628 |
| 10 | HUAWEI TECH- NOLO- GIES Co. Ltd. | <p>[Huawei, HiSilicon] The objective can be adjusted to also include LTE similar to 6.4.</p> <ul style="list-style-type: none"> • Support the following enhancements of A-GNSS positioning [RAN2] <ul style="list-style-type: none"> – Specify support for BDS B2a signal – Specify support for BDS B3I signal – Specify support for NavIC to NR – Note: This objective is applicable to 5GS and EPS. |

| Item | Company | Comments |
|------|----------------------------|---|
| 11 | Intel Corporation (UK) Ltd | Moderator: The rapporteur provided an update to the revised WID (Thursday just after 12:00 UTC) attempting to address as many comment as possible. The moderator proposes that further comments to the text of the draft WID are handled via the email reflector |

6.6 Multipath/NLOS mitigation

Some detailed comments were already made in the earlier rounds of discussion and should also be considered in this phase of the discussion. Specifically Ericsson suggested that RAN2 could be the lead group on this object and MediaTek commented that RAN4 should be involved in the study part.

The moderator considers that it is important to make clear which group is leading and which other groups are to be involved in the study phase of this objective.

Feedback Form 26: Please provide comments on Multipath/NLOS mitigation objective

| Item | Company | Comments |
|------|--------------------------------|---|
| 1 | CATT | We support the objective of multipath/NLOS mitigation given in RP-210628 after removing the brackets. In addition, there were many proposals on potential solutions, and thus, we may need to narrow down the solution after further study. Thus, suggest adding a note " Note: RAN1 will study the candidate solutions and provide updates for this objective, with status to be reviewed in RAN#92e." |
| 2 | Guangdong OPPO Mobile Telecom. | Since the study output is not predicable at the current time point, we suggest the revision as "Study and if needed, specify the solutions for multipath/NLOS mitigation" |
| 3 | InterDigital Communications | We support the objective for multipath/NLOS mitigation and also fine with the note suggested by CATT. We are ok with the list of working groups (i.e., RAN1, 2, 3) in RP-210628 for Multipath/NLOS mitigation. RAN1 should lead since solutions may have impact on accuracy. |
| 4 | Apple GmbH | We support the CATT note and also the change suggested by OPPO that "Study and if needed, specify the solutions for multipath/NLOS mitigation". Also, we think the study needs to be done by RAN1. This shall not be led by RAN2. |
| 5 | Qualcomm CDMA Technologies | Agree with the Note proposed by CATT. |
| 6 | Sony Europe B.V. | We support the objective as in RP-210628 and fine with additional note from CATT. |

| Item | Company | Comments |
|------|--------------------------------|--|
| 7 | Motorola Mobility Germany GmbH | [Lenovo, Motorola Mobility]- Support the overall objective of Multipath/NLOS mitigation and the note proposed by CATT seems fine. It seems to be already RAN1-led, according to the draft wording of RP-210628. |
| 8 | ZTE Corporation | We are supportive for the description given in RP-210628 as "Study and specify, if supported, the enhancements of information reporting from UE and gNB for multipath/NLOS mitigation [RAN1, RAN2, RAN3]". This is RAN1-led item although the signaling is specified in RAN2. RAN2 does not have the expertise to down-select candidate solutions. We don't think it should be given lower priority as accuracy enhancement should be the first priority for Rel-17 from the beginning. The note proposed by CATT "Note: RAN1 will study the candidate solutions and provide updates for this objective, with status to be reviewed in RAN#92e." is okay to us. |
| 9 | Beijing Xiaomi Mobile Software | We support the inclusion of the enhancements of information reporting from the UE and gNB for multipath/NLOS mitigation. Regarding the note from CATT, we would like to confirm whether it is the understanding that this would not be opening RAN1 to new proposals? RAN1 should push on based on its current status to evaluate and down select? We note the TR capture the status as follows. <ul style="list-style-type: none"> Note: The details of the enhancements of reporting are left for further discussion in normative work, which may include, but are not limited to the following information associated with multi-path, e.g., LOS/NLOS identification, time of arrival of the multi-path components, signal power and/or relative power, power delay profile, angle, and/or polarization information, coherence bandwidth, etc. |
| 10 | Ericsson Inc. | OK with the objective. proposed notes are fine. |
| 11 | HUAWEI TECHNOLOGIES Co. Ltd. | [Huawei, HiSilicon] Support the objective with RAN1 as the leading WG. |
| 12 | MediaTek Inc. | Still fine with this. |
| 13 | Futurewei Technologies | Support |
| 14 | Intel Corporation (UK) Ltd | Moderator: The rapporteur provided an update to the revised WID (Thursday just after 12:00 UTC) attempting to address as many comment as possible. The moderator proposes that further comments to the text of the draft WID are handled via the email reflector |

6.7 Other comments on WID

Feedback Form 27: Please provide any other comments on the draft WID

| Item | Company | Comments |
|------|---|---|
| 1 | Beijing Xiaomi Mobile Software | <p>We support the inclusion of the enhancements of information reporting from the UE and gNB for multipath/NLOS mitigation. Regarding the note from CATT, we would like to confirm whether it is the understanding that this would not be opening RAN1 to new proposals? RAN1 should push on based on its current status to evaluate and down select?</p> <p>We note the TR capture the status as follows.</p> <ul style="list-style-type: none"> Note: The details of the enhancements of reporting are left for further discussion in normative work, which may include, but are not limited to the following information associated with multi-path, e.g., LOS/NLOS identification, time of arrival of the multi-path components, signal power and/or relative power, power delay profile, angle, and/or polarization information, coherence bandwidth, etc. |
| 2 | Beijing Xiaomi Mobile Software | [please ignore the above - placed in wrong feedback form] |
| 3 | Ericsson Inc. | the overall scope is still very large and we need to consider what can be fitted in the TU budget. |

7 Contacts

Please provide a company contact that the email discussion moderator can contact if required.

Feedback Form 28: Contacts

| Item | Company | Comments |
|------|---|-------------------------------------|
| 1 | Nokia Denmark | benny.vejlgaard@nokia-bell-labs.com |
| 2 | CATT | renda@catt.cn |
| 3 | InterDigital Communi- cations | moonil.lee@interdigital.com |
| 4 | Swift Nav- igation | grant@swiftnav.com |
| 5 | Qualcomm CDMA Technolo- gies | sfischer@qti.qualcomm.com |
| 6 | Beijing Xiaomi Mobile Software | gordonpetery@xiaomi.com |

| Item | Company | Comments |
|------|--|---|
| 7 | Guangdong OPPO Mobile Telecom. | qianxi.lu@oppo.com, szh@oppo.com |
| 8 | ISRO | akhileshwar@isro.gov.in |
| 9 | Motorola Mobility Germany GmbH | rthomas7@lenovo.com |
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| 11 | ESA | florin-catalin.grec@esa.int |
| 12 | HUAWEI TECH- NOLO- GIES Co. Ltd. | simone.provvedi@huawei.com |
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| 17 | Rakuten Mobile, Inc | awn.muhammad@rakuten.com |
| 18 | Apple GmbH | zhibin_wu@apple.com |
| 19 | Samsung Electron- ics Co., Ltd | jack.jang@samsung.com |
| 20 | Sony Eu- rope B.V. | Anders.Berggren@sony.com |
| 21 | MediaTek Inc. | tim.frost@mediatek.com |