**3GPP TSG-RAN WG2 Meeting #116bis-e** **R2-220xxxx**

**E-Meeting, Jan 17th – Jan 25th, 2022**

**Agenda item:** 8.11.1

**Source:** Intel Corporation

**Title:** Report of email discussion [Post116bis-e][634][POS] Positioning open issues list (Intel)

**Document for:**  Discussion and decision

# Introduction

This is the report of following offline discussion:

* [Post116bis-e][634][POS] Positioning open issues list (Intel)

      Scope: Develop a list of open issues to be used to prepare for RAN2#117-e.

      Intended outcome: Endorsed open issue list

      Deadline:  Friday 2022-01-28 0800 UTC

Rapporteur would like to set an early deadline for companies to provide initial comments in order to reserve time for further updates/discussion.

Deadline for initial comments (from companies): Thursday 2022-01-27 0800 UTC;

In addition, the issue lists may be updated based on the status of running CR (stage 2, RRC, MAC, LPP) discussion.

# Annex: companies’ point of contact

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| --- | --- | --- |
| **Company** | **Point of contact** | **Email address** |
| Intel Corporation | Yi Guo | Yi.guo@intel.com |
| vivo | Xiang Pan | panxiang@vivo.com |
| Huawei, HiSIlicon | YinghaoGuo | yinghaoguo@huawei.com |
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# Discussion

As indicated by Johan: "Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues." Rapporteur considered following issues need to be closed for capability discussion:

## Latency reduction

**Table 3.1: open issue lists for Latency reduction**

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| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **Scheduled location time** | Stage 2 Text | ? | **Status**: draft in stage 2, check the status of stage 2 email discussion 116bis-629 |
| whether scheduled location time needs to be transmitted to UE and NG-RAN; | Yes | **Status**: Resolved; be transmitted to UE, transparent to NG-RAN;  RAN2#116bis:  Include a "Scheduled Location Time" with measurement time information in LPP CommonIEsRequestLocationInformation, defining the desired time when the location measurements or location estimate is to be obtained/valid.  Include the capability to support scheduled location in each method-ProvideCapabilities message, where 'method' can be any of the LPP positioning methods. The capability should indicate the time base(s) supported for scheduling location measurements. |
| Stage 3 details- FFS if the "Scheduled Location Time" is an absolute time or a window. | Yes | **Statue:** draft in LPP running CR, check the status of LPP email discussion 116bis-628 |
| UE capability | Yes | **Status**: draft in LPP running CR, check the status of LPP email discussion 116bis-628  RAN2#116bis:  Include the capability to support scheduled location in each method-ProvideCapabilities message, where 'method' can be any of the LPP positioning methods. The capability should indicate the time base(s) supported for scheduling location measurements. |
| **Storing positioning capability in AMF** | Stage 2 text | ? | **Status**: draft in stage 2, check the status of stage 2 email discussion 116bis-629 |
|  | FFS on RAN stage 3 impact (wait for SA2 inputs); | Yes | **Status**: Resolved; No stage 3 impact  RAN2#116bis:  Proposal 3.2.1.2-1: [Easy agreements] [8/9] For storing LPP capability in the AMF, do not introduce “variability indicator ” in LPP capability. |
| **Pre-configured assistance data** | Validity condition for pre-configured assistance data-area ID  FFS on details and whether it would be included in RRC broadcast.  FFS if there would be signalling for multiple area IDs in the same instance. Signalling details can be discussed in the LPP running CR discussion.  FFS on the meaning/ value range of area ID | Yes | **Status**: check the status of LPP email discussion 116bis-628  check the status of RRC email discussion 116bis-631  RAN2#116bis:  Proposal 3a (modified): Pre-configured DL-PRS assistance data can be associated with a "validity area" at least in LPP. FFS on details and whether it would be included in RRC broadcast.  Pre-configured DL-PRS assistance data can consist of multiple instances, where each instance is applicable to a different area within the network. FFS on additional specification impacts and whether this can already be supported with the agreement made that pre-configured DL-PRS assistance data can be associated with a "validity area". Single instance of AD is not excluded; FFS if there would be signalling for multiple area IDs in the same instance. Signalling details can be discussed in the LPP running CR discussion. |
| UE capability/configuration limitation  FFS the maximum number of preconfigured assistance data instances; | Yes | **Status**: check the status of LPP email discussion 116bis-628  RAN2#116bis:  Proposal 3.2.1.3-1 (modified): [Easy agreements] [10/10] Include the capability to support validity area in each method ProvideCapabilities message, where “method” can be any of the LPP positioning methods that rely on DL-PRS. FFS on other validity criteria. |
| Validity Conditions for DL-PRS Assistance Data  Proposal 1: RAN2 to discuss further whether pre-configured assistance data should be associated with a "validity time" or not.  Proposal 2: RAN2 to discuss further whether pre-configured assistance data could be explicitly modified or released. | ? | **Status**: No majority see R2-2201875  **P1: (9:6)**  **P2: (8:4 and 2 neutral).**  **Suggestion:** stop the discussion on them considering RAN2 has discussed this issue several meeting. |
| **RAN1 led item-MG enhancements** | Stage 2 text | ? | **Status**: draft in stage 2, check the status of stage 2 email discussion 116bis-629  **Note: need to be updated based on the details of RRC/MAC and NRPPa;** |
| Pre-configuration of MG(s) in RRC (Each MG in the pre-configuration is associated with an ID) | Yes | **Status**: check the status of RRC email discussion 116bis-631  RAN2#116bis:  Proposal 4: The pre-configured Measurement Gap Configurations for Positioning are provided via RRCReconfiguration message. The pre-configured Measurement Gap Configurations for Positioning are included in IE MeasGapConfig.  Proposal 5: The content of the pre-configured Measurement Gap Configurations for Positioning includes at least the existing measurement gap parameters together with an ID identifying each Measurement Gap Configuration for Positioning.  Proposal 6: The existing RRC LocationMeasurementIndication procedure to request the positioning measurement gaps can still be used by a UE, even when pre-configured measurement gaps are provided to the UE. |
| UL MAC CE for MG activation request  Other parameter are FFS. | Yes | **Status**: check the status of MAC email discussion 116bis-632  RAN2#116bis:  Proposal 5a: A new UL MAC CE for positioning measurement gap activation and deactivation request is introduced.  Proposal 5b: The new UL MAC CE for positioning measurement gap activation and deactivation request includes at least the ID of the pre-configured positioning measurement gap configuration for which the activation/deactivation is requested.  Proposal 5e: The Scheduling Request should be triggered when there is no PUSCH and UL MAC CE for positioning measurement gap activation/deactivation request is triggered. |
| DL MAC CE for MG activation/deactivation  Other parameter are FFS. | Yes | **Status**: check the status of MAC email discussion 116bis-632  RAN2#116bis:  Proposal 5c (modified): A new DL MAC CE for positioning measurement gap activation and deactivation command is introduced for positioning latency reduction. LS to RAN1/4 indicating our conclusion, and confirming that DL MAC CE can also be used for positioning measurement gap deactivation as well as activation (to be drafted by email).  Proposal 5d: The new DL MAC CE for positioning measurement gap activation and deactivation command includes at least the ID of the pre-configured positioning measurement gap configuration which has been configured/activated by the gNB. |
| UE capabilities for MG enhancements | Yes | **Status**: check the status of RAN1 feature list  RAN2 also needs to discuss how to capture UE capability based on RAN1 feature list R1-2111810  27-10, 27-11 |
| NRPPa change | Yes | **Status: RAN3 to decide;** |
| **RAN1 led item-Priority handling of PRS when PRS measurement is outside MG** | Stage 2 text | ? | **Status**: draft in stage 2, check the status of stage 2 email discussion 116bis-629  **Note: need to be updated based on the details of RRC/MAC and NRPPa;** |
| Pre-configuration of PPW  FFS:Whether PRS processing window configuration is provided per BWP or not is up to RAN1 to decide. | Yes | **Status**: check the status of RRC email discussion 116bis-631  RAN2#116bis:  Proposal 7: The PRS processing window configuration is provided via RRCReconfiguration message. Whether PRS processing window configuration is provided per BWP or not is up to RAN1 to decide. |
| UL MAC CE for PPW activation request  Whether UL MAC CE can also be used for PRS processing window activation/deactivation should be decided by RAN1. | ~~?~~ | **Status**: unrelated to RAN2; |
| DL MAC CE for MG activation/deactivation | Yes | **Status**: check the status of MAC email discussion 116bis-632  RAN2#116bis:  Proposal 8: A new DL MAC CE for PRS Processing Window activation and deactivation command is introduced.  Proposal 9: The new DL MAC CE for PRS Processing Window activation and deactivation command includes at least the ID of the pre-configured PRS Processing Window configuration, at least in the case when multiple PRS Processing Windows can be configured.  Proposal 10: The UE behaviour related to the PRS Processing Window feature is captured in the MAC specification. |
| UE capabilities for MG enhancements | Yes | **Status**: check the status of RAN1 feature list  RAN2 also needs to discuss how to capture UE capability based on RAN1 feature list R1-2111810  27-3-2, 27-3-3, |
| NRPPa change | Yes | **Status: RAN3 to decide;** |

**Discussion point 3.1-1: Companies are invited to provide view on open issue lists summarized in table 3.1 ? e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

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| **Company’s name** | **Comments, if any** |
| vivo | **Pre-configured assistance data,**  As to the ‘Validity Conditions for DL-PRS Assistance Data’, fine with the intention to converge the discussion. But we already agreed that pre-configured assistance data can be independent of any LPP positioning session. Therefore, there should be a mechanism to release the pre-configured assistance data. Besides, we suppose it is a little bit related to the completion of WI since the feature is not completed without a release mechanism. If we cannot reach a consensus on the two optimizations, one compromise is to clarify that the pre-configured assistance data will be overwritten by any new configured AD, including the normal AD.  **RAN1 led item-MG enhancements**  As to ‘UL MAC CE for MG activation request’, should be activation/deactivation.  **RAN1 led item-Priority handling of PRS when PRS measurement is outside MG**  As to ‘DL MAC CE for MG activation/deactivation’, add an FFS: Whether UE can be configured with multiple PRS processing windows should be decided by RAN1. |
| Huawei, HiSilicon | 1/ On R1-let work item for MG/PPW enhancement, we think the following issues remain   * Exact format of the UL MAC CE for MG activation/deactivation request and DL MAC CE for MG/PPW activation/deactivation command, e.g., fields, LCIDs, etc (R2 to resolve) * How to trigger the UL MAC CE for MG activation/deactivation request (R2 to resolve) * PPW and MG configuration (R2 and R1 to resolve) * Remaining issues for PPW (R2 to resolve)   + PDCCH monitoring during RAR window and contention resolution timer |
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## On-Demand PRS

**Table 3.2: open issue lists for On-Demand PRS**

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| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **Stage 2** | Stage 2 text | ? | **Status**: draft in stage 2, check the status of stage 2 email discussion 116bis-629 |
| **Stage 3** | Trigger criterion/pre-condition for UE initiated On-Demand PRS | Yes | **Status**: check the status of LPP email discussion 116bis-628  RAN2#116bis:  If the LMF indicates predefined configurations, the UE can request them via LPP RequestAssistanceData. |
| The content of On-Demand PRS request, e.g. explicit indication, parameter/value; | Yes | **Status**: check the status of LPP email discussion 116bis-628  RAN2#116bis:  LPP signalling supports index-based and explicit request of DL-PRS parameters from the UE. The UE is not required to implement requesting explicit parameters and the LMF is not required to grant them if the UE does request. |
| PosSI as response for On-Demand PRS request | Yes | **Status**: discussion see R2-2200047  Suggest to approve the proposal 6 based on majority;  **14 companies have responded. It is clear majority (13 Vs 1) that For On-Demand PRS, posSI cannot be the response for On-Demand PRS request .**  **Proposal 6 For On-Demand PRS, posSI cannot be the response for On-Demand PRS request.** |
| Content of MO-LR, e.g. NR ECID | Yes | **Status**: discussion see R2-2200047  Suggest to approve the proposal 4 based on majority;  14 companies have responded. Only two companies support that proactive signaling to provide NR ECID measurements in MO-LR message while requesting for DL-PRS AD (as in legacy Rel-16 without on demand PRS) is supported.  **Proposal 4 UE does not need to include NR ECID (RRM measurements) in MO-LR message while requesting for DL-PRS AD .** |
| RAN1 parameters on On-Demand PRS | Yes | **Status**: check the status of LPP email discussion 116bis-628 |
| **UE capability** | UE capability on On-Demand PRS  FFS on per positioning method | Yes | **Status**: check the status of LPP email discussion 116bis-628, and the status of RAN1 feature list;  RAN2#116bis:  **Proposal 3.2.3-1: [Easy agreements] [10/10] For On-Demand PRS, introduce LPP capability on UE-initiated On-Demand PRS Request;**  Should be decided in RAN2 although RAN1 mentioned it in their feature list R1-2111810,  27-5-1 [UE-initiated] on-demand PRS |
| **NRPPa** | NRPPa change | Yes | **Status: RAN3 to decide;** |

**Discussion point 3.2-1: Companies are invited to provide view on open issue lists summarized in table 3.2 ?e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

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| **Company’s name** | **Comments, if any** |
| vivo | As to ‘Trigger criterion/pre-condition for UE initiated On-Demand PRS’, the explicit parameter has not been concluded. Therefore, suggest adding an FFS: whether UE can request only the explicit parameters that NW indicates and their value range is within the value range that NW supports. |
| Huawei, HiSilicon | 1/ On-demand PRS, downselect from the two modeling captured by the chair  Chair understands we have two proposed models: (1) MO-LR indicates the blind request and the LMF may or may not reply with a configuration, or (2) MO-LR indicates the capability or need for on-demand PRS, and the LMF replies with what configurations are available. |
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## Positioning in RRC\_INACTIVE

**Table 3.3: open issue lists for positioning in RRC\_INACTIVE**

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| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **Stage 2** | Stage 2: what should be captured in the stage 2 specification | ? | **Status**: Discussion see R2-2201772;   1. **It is not necessary to introduce the new positioning procedures in stage 2 specification for RRC inactive UE positioning [8]** 2. **Send LS to SA2 to let SA2 decide the spec impacts [12, 3]. Use [R2-2200961] as baseline** 3. **Capture in TS 38.305 [12]**   Suggest to down prioritize the discussion considering companies have different view on what should be capture.  RAN2 should prioritize the discussion stage 3; |
| All LCS service types are allowed to use SDT | ? | **Status**: Discussion see R2-2201772;  Suggest, stop the discussion since no majority and original agreements is sufficient, i.e. any LPP/LCS messages can be transmitted in RRC\_INACTIVE using SDT;  *6 companies prefer that only deferred MT-LR is in the scope whereas 7 companies prefer that all the procedures are in scope. There is also general view that previous agreement made by RAN2 that any LCS message can be transmitted using SDT still holds even when the procedure is described limited to deferred MT-LR Procedure. One of the companies expresses the view that it adds more complexity if we limit it to only deferred MT-LR. It may so happen that there is no time to discuss further other service types etc; and the use case is only for deferred MT-LR; there is no problem so far described as why for other service type it may not work and as there is already RAN2 agreement to support LCS msg transfer for all messages in RRC Inactive; it is proposed that.*  ***Proposal 10 All LCS service types are allowed to use SDT.*** |
| **UL positioning related issues** | UL positioning related issues:  1 How to introduce SRS configuration in RRCRelease message, e.g. which IE should be contained, srs-Config, BWP-Uplink or UplinkConfig | Yes | **Status**: check the status of RRC email discussion 116bis-631  RAN2#116bis:  Proposal 6 BWP info together with the SRS-PosResourceSet IE is included in RRCRelease message for SRS configuration in RRC\_INACTIVE.  Proposal 7 RAN2 confirms RAN1 agreement that UE may be configured to transmit UL SRS for Positioning where the following parameters are additionally configured for the transmission of the SRS for Positioning during the RRC\_INACTIVE state: frequency location and bandwidth, SCS, CP length. |
| UL positioning related issues:  2 How to send SP-SRS activation/deactivation MAC CE? | Yes | **Status**: check SDT discussion, Coordination with SDT WI is needed |
| 3 The validity of SRS configuration, e.g. upon change of cell? TA timer expires? | Yes | **Status**: check the status of MAC email discussion 116bis-632  check the status of RRC email discussion 116bis-631  RAN2#116bis:  Proposal 1 (modified) To support UL positioning in RRC\_INACTIVE, reuse SDT TA timer mechanism (with a separate timer with similar function) for TA validation.  Proposal 2 To support UL positioning in RRC\_INACTIVE, reuse RSRP change based solution for TA validation  Proposal 3 The SRSp configuration is considered as invalid if TA is not valid.  Proposal 4 When cell reselection is performed and UE initiates RRC resume procedure to the cell which is different from the cell in which the SRSp is configured, the TA timer configuration for SRS should be released.  Proposal 5 (modified) The SRSp configuration is released when the UE sends RRCResumeRequest to a cell other than the cell where it is released to RRC\_INACTIVE state. |
| 4 How to maintain the TA for SRS transmission;?  4.1 The details of TA timer configuration;  4.2 Where to configure TA timer configuration;  4.3 Validity of TA, e.g. additional RSRP based validation;  4.4 Validity of TA timer configuration, same as SRS configuration?  FFS if the TA timer configuration is invalidated upon any cell reselection. | Yes | **Status**: check the status of MAC email discussion 116bis-632  check the status of RRC email discussion 116bis-631  RAN2#116bis:  Proposal 1 (modified) To support UL positioning in RRC\_INACTIVE, reuse SDT TA timer mechanism (with a separate timer with similar function) for TA validation.  Proposal 2 To support UL positioning in RRC\_INACTIVE, reuse RSRP change based solution for TA validation  Proposal 3 The SRSp configuration is considered as invalid if TA is not valid.  Proposal 4 When cell reselection is performed and UE initiates RRC resume procedure to the cell which is different from the cell in which the SRSp is configured, the TA timer configuration for SRS should be released.  Proposal 5 (modified) The SRSp configuration is released when the UE sends RRCResumeRequest to a cell other than the cell where it is released to RRC\_INACTIVE state. |
| 5 Need to clarify AP SRS cannot be configured for the UE in RRC\_INACTIVE; | Yes | **Status**: resolved. check the status of RRC email discussion 116bis-631  RAN2#116bis:  Proposal 8 Add the restriction on AP SRS in the field description of resourceType “The aperiodic is not applicable for the UE in RRC\_INACTIVE**.”.** |
| **UE capability** | UE capabilities on positioning in RRC\_INACTIVE in RAN1 feature lists  27-6 DL PRS processing capabilities in RRC inactive state  27-15 Support of positioning SRS transmission in RRC\_INACTIVE state [for initial BWP]  27-16 OLPC for positioning SRS in RRC\_INACTIVE state  27-17 Support of [PRS measurement in RRC\_INACTIVE]  27-18a Support of PRS measurement in RRC\_INACTIVE state for DL-TDOA  27-18b Support of PRS measurement in RRC\_INACTIVE state for DL-AoD  27-18c Support of PRS measurement in RRC\_INACTIVE state for Multi-RTT  27-19 Spatial relation for positioning SRS in RRC\_INACTIVE state | Yes | **Status:** check the status of RAN1 feature list and the discussion in R2-2201767;  Follow RAN2 agreements “RRC state is transparent to LMF and no different handling on PRS for different RRC state”, RAN2 should avoid to optimize these aspects even if RAN1 agrees to introduce RRC\_INACTIVE specific LPP capabilities (27-6, 27-16, 27-17, 27-18a, 27-18b, 27-18c, 27-19). |
| UL capability  Wait for RAN1 decision on whether UL related RRC\_INACTIVE specific capabilities (27-15, 27-16, 27-19) should be captured in RRC or LPP. | Yes | **Status:** check the status of RAN1 feature list and the discussion in R2-2201767; |
| **gNB awareness** | Assistance data in gNB | ? | **Status: no further discussion in RAN2.**  RAN2#116bis  RAN2 will not make additional effort to make the gNB aware of when to transit the UE to RRC\_INACTIVE (left to gNB implementation and RAN3 solution). |

**Discussion point 3.3-1: Companies are invited to provide view on open issue lists summarized in table 3.3 ?e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

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| **Company’s name** | **Comments, if any** |
| vivo | As to ‘Stage 2: what should be captured in the stage 2 specification’, although controversial, some essential description shall be added at least.  As to ‘**UE capability’**, my RAN1 colleague said they did not make the decision on whether UL-related RRC\_INACTIVE specific capabilities should be informed to LMF in RAN1 #107b-e. Thus, RAN2 may further discuss and make the decision. |
| Huawei, HiSilicon | We think for INACTIVE positioning, we have the following issues to address  1/ which option to adopt for stage2 baseline for deferred MT-LR,  2/ how to resolve the following issue for the unalignment between agreement and endorsed stage2 baseline for DL inactive positioning  Agreement:  Proposal 4 (modified): For positioning in RRC\_INACTIVE state, the positioning assistance data can be delivered to UE through the following ways:  - positioning system information, i.e. posSIB;(12/13)  - pre-configure assistance data when UE in RRC\_CONNECTED state;(11/13)  - send to UE in RRC\_INACTIVE during ongoing SDT procedure. (9/13)  **R2 considers to down select from the following two options regarding positioning assistance data delivery：**   * **Option1: Revert the previous agreement: positioning assistance data cannot be delivered to the UE in RRC\_INATIVE during SDT procedure** * **Option2: Add the positioning assistance data delivery during SDT procedure to the stage2 procedure**   3/ if the other LCS type is also supported, e.g., MO-LR, the stage2 procedure for the MO-LR, for UL/DL/UL+DL |
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## GNSS integrity

**Table 3.4: open issue lists for GNSS Integrity**

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| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **Stage 2** | Stage 2 text | ? | **Status**: draft in stage 2, check the status of stage 2 email discussion 116bis-627  RAN2#116bis  Proposal 1: RAN2 agrees to add the Integrity Principle of Operation (Clause 8.1.1a) text from Appendix A (R2-2201761) into TS 36.305 and TS 38.305.  Proposal 2: Agree to add the descriptions from Appendix A (R2-2201761) for the SSR Code Bias (8.1.2.1.23), SSR Phase Bias (8.1.2.1.24), SSR STEC Corrections (8.1.2.1.25) and SSR Gridded Corrections (8.1.2.1.26) as baseline. Final wording is subject to the outcomes of Stage 3 and depends on which integrity IEs and associated fields are included in LPP.  Proposal 3: Agree to add the Integrity Service Parameters (8.1.2.1.29) and Integrity Alerts (8.1.2.1.30) descriptions from Appendix A (R2-2201761) into TS 36.305 and TS 38.305.  Proposal 4: RAN2 agrees to include the description for the Orbit Clock Error Bounds, as per Appendix A (R2-2201761), but the final description is FFS subject to the Stage 3 discussions on whether option (b), (c) or (d) is preferred (or another alternative):  (b) Duplicate within the SSR Orbit and Clock IEs (NW determines which to include).  (c) Add orbit and clock integrity bounds (mean, sigma) to the existing Orbit and Clock IEs (but without the full covariance).  (d) Define a separate message as a new IE (i.e. a combined message for the Orbit Clock Error Bounds).  Proposal 5: RAN2 agrees to include the Integrity Residual Risk Parameters into their existing corresponding GNSS IEs (as per Appendix A (R2-2201761). This discussion is also subject to the Stage 3 outcomes regarding which IEs and associated fields to define for integrity.  Proposal 6: Agree to add Section 8.1.2.1b-1 and Table 8.1.2.1b-1 (as per Appendix A (R2-2201761)) into TS 36.305 and TS 38.305. The field names in Table 8.1.2.1b-1 are subject to the outcomes of Stage 3 regarding which integrity IEs and associated fields to include in LPP. |
| **Stage 3 details** | Stage 3 details on how to introduce KPIs, assistance data (e.g. where to add the Integrity Orbit Clock Error Bounds, the Integrity Residual Risk Parameters, etc) | Yes | **Status:** check the status of LPP email discussion 116bis-628  RAN2#116bis  Proposal 1: Agree to add a new IE for the Integrity Service Parameters which contains the irMinimum and irMaximum fields. The IE will be included under GNSS-CommonAssistData.  Proposal 2: Agree to add a new IE for Integrity Service Alerts under GNSS-CommonAssistData which contains the Ionosphere DNU and Troposphere DNU.  FFS on whether to also include the Service DNU.  Proposal 4: Agree to add the Mean and Standard Deviation parameters for the Integrity Bounds within the existing SSR-Code-Bias, SSR-Phase-Bias, SSR-STEC-Correction and SSR-GriddedCorrection IEs in LPP, as per Table 3.2-1 in R2-2201765.  Proposal 6: RAN2 agrees to update Stage 2 with a description of the Mean Fault Duration parameters. The following changes are proposed in addition to the Stage 2 text updates that were agreed in R2-2201765, for inclusion into the running Stage 2 CR:  [Chair’s note: See R2-2201765 for the properly formatted and change-marked version of this agreement]  8.1.2.1.31 Integrity Residual Risk Parameters  Integrity Residual Risk Parameters are used to provide the residual risk parameters related to the satellite, constellation, ionosphere and troposphere residual risk probabilities. These parameters include a Probability of Onset which is defined per unit of time and represents the probability that the feared event begins. The Mean Duration represents the expected mean duration of the corresponding feared event and is used to convert the Probability of Onset to a probability that the feared event is present at any given time, i.e.  P(Feared Event is Present)= Mean Duration\*Probability of Onset of Feared Event  Proposal 8: Agree to include the Integrity Correlation Times parameters from Table 3.2-3 (R2-2201765) within the SSR-STEC-Correction and SSR-GriddedCorrection IEs in LPP, with updated field names as follows:  tCorrelationIonosphere changed to ionoRangeErrorCorrelationTime  tCorrelationIonosphereRate changed to ionoRangeRateErrorCorrelationTime  tCorrelationTroposphere changed to tropoRangeRateErrorCorrelationTime  tCorrelationTroposphereRate changed to tropoRangeRateErrorCorrelationTime |
| Stage 3 details on the support of broadcast assistance data;  FFS: The detailed IE should depend on stage 3 details; | Yes | **Status:** check the status of LPP email discussion 116bis-628  check the status of RRC email discussion 116bis-631  RAN2#116bis  Introduce a new posSIB for the new assistance data added for integrity. |
| Proposal 3 (Open Issue): RAN2 to discuss whether to modify the existing GNSS-RealTimeIntegrity IE or create a new IE to accommodate the Alerts for the satellite/constellation specific DNUs under GNSS-GenericAssistData.  Discuss whether a Constellation DNU and per-signal DNU should be included in addition to the SV DNU. | Yes | **Status:** Discussion in R2-2201765. check the status of LPP email discussion 116bis-628 |
| Proposal 5 (Open Issue): RAN2 to discuss whether or not the cross-covariance should be included for the Orbit and Clock integrity bounds and whether these bounds should be included as a new IE or within the existing SSR Orbit and Clock IEs. | Yes | **Status:** Discussion in R2-2201765. check the status of LPP email discussion 116bis-628 |
| Proposal 7 (Open Issue): RAN2 to discuss whether the Residual Risk parameters proposed in Table 3.2-2 (R2-2201765) should be integrated into their corresponding SSR correction IEs or within a separate standalone IE. | Yes | **Status:** Discussion in R2-2201765. check the status of LPP email discussion 116bis-628 |
| Proposal 9 (Open Issue): RAN2 to discuss whether a validity period needs to be defined for each of the bounds and what value ranges are appropriate if so. | Yes | **Status:** Discussion in R2-2201765. check the status of LPP email discussion 116bis-628 |
| Proposal 10 (Open Issue): RAN2 to discuss which of the assistance data should be sent as periodic assistance data. | Yes | **Status:** Discussion in R2-2201765. check the status of LPP email discussion 116bis-628 |
| FFS whether Mode 2 and the TIR, AL, TTA that were used in the integrity calculation will also be reported in the integrity results. | No | **Status**: no discussion  Not essential for the completion of the WI, RAN2 can provide the minimum set in Rel-17. |
| FFS alignment with the assistance data for OSR in RTCM (also FFS alignment with SSR, if RTCM produce something in that direction in the Rel-17 time frame). | No | **Status**: no discussion  Not essential for the completion of the WI, RAN2 can provide the minimum set in Rel-17, and then try to align with RTCM via TEI or Rel-18; |
| Pursue LMF-based integrity on a best-effort basis in Rel-17 | No | **Status**: no discussion  Not essential for the completion of the WI, RAN2 can provide the minimum set in Rel-17. |
| The minimum set of assistance data: | Yes | **Status: resolved, there is consensus on what should be captured.** |
| **Capability** | GNSS Integrity capability | Yes | **Status**: see the discussion in R2-2201767  **Companies would like to wait for the outcome from GNSS integrity discussion.** |

**Discussion point 3.4-1: Companies are invited to provide view on open issue lists summarized in table 3.4 ?e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

|  |  |
| --- | --- |
| **Company’s name** | **Comments, if any** |
| vivo | As to ‘Stage 3 details on the support of broadcast assistance data’, the RRC email discussion 116bis-631 does not handle it. We are wondering whether the content of 631 shall align with 634 as there are a lot of issues are marked as ‘check the status of RRC email discussion 116bis-631’ while 631 only covers the UL positioning in RRC\_INACTIVE. |
| Huawei, HiSilicon | We think the following issues remain,  Detailed UE capability discussion  **The capability information for GNSS positioning integrity should include:**   * **The capability to support GNSS positioning integrity (e.g., pair-error bounding)** * **Difference types of error boundings for GNSS Integrity (e.g., Orbit, Clock, Code Bias, Phase Bias, Ionospherre, Troposphere)** * **Integrity results reporting capability (e.g., Mode 1)** |
|  |  |

## A-GNSS positioning enhancements

**Table 3.5: open issue lists for A-GNSS positioning enhancements**

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **BDS** | Support of BDS B2a/BDS B3I | Yes | CRs have been endorsed. May still need the further checking on the endorsed CRs; |
| **NavIC** | Support of NavIC | Yes | CRs have been endorsed. May still need the further checking on the endorsed CRs; |

**Discussion point 3.5-1: Companies are invited to provide view on open issue lists summarized in table 3.5 ?e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

|  |  |
| --- | --- |
| **Company’s name** | **Comments, if any** |
|  |  |
|  |  |
|  |  |

## RAN1 led item-Accuracy

### Accuracy improvements-PRU

**Table 3.6.1: open issue lists for Accuracy improvements-PRU**

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **Stage 2** | Stage 2 Text? | ? | **Status**: Hold on, wait for RAN1  Draft in stage 2, check the status of stage 2 email discussion 116bis-629  Suggest to keep it for now, may delete all PRU related information if RAN1 cannot provide further guidance.  RAN2#116bis  RAN2 will not discuss PRUs further without further guidance from RAN1 (LS or feature list). |
| **Stage 3** | Support of PRU in Rel-17?  What solution should be adopted if support PRU in Rel-17, MT-LR, MO-LR, etc | Yes | **Status**: Hold on, wait for RAN1 |
| What additional information should be introduced in ProvideLocationInformation (known location information and antenna orientation information) and ProvideAssistanceData (correction information); | Yes | **Status**: Hold on, wait for RAN1 |
| **UE capability** | ? | ? | **Status**: Hold on, wait for RAN1 |

**Discussion point 3.6.1-1: Companies are invited to provide view on open issue lists summarized in table 3.6.1 ?e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

|  |  |
| --- | --- |
| **Company’s name** | **Comments, if any** |
|  |  |
|  |  |
|  |  |

### Enhancements of information reporting from UE and gNB for multipath/NLOS mitigation (max 8 additional paths)

**Table 3.6.2: open issue lists for Enhancements of information reporting from UE and gNB for multipath/NLOS mitigation**

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **Stage 2** | Stage 2 Text? | ? | **Status**: draft in stage 2 (based on R2-2201870), check the status of stage 2 email discussion 116bis-629 |
| **Stage 3** | Max 8 additional paths (request/report and UE capability ) | Yes | **Status**: Discussion see R2-2201768. draft in LPP running CR, check the status of LPP email discussion 116bis-628  Check RAN1 feature list R1-2111810 and RAN1 parameter list  RAN2#116bis  Proposal 2.2-5: introduce support for an LMF to request and UE to report first path PRS RSRP for DL-AoD.  Proposal 2.2-6: introduce support for extended additional paths beyond 2.  Proposal 2.2-7: introduce support a LoS/NLoS indication per RSTD, RSRP and UE RxTx measurements. |
| Los/NLos indicators (request/report and UE capability) | Yes |
| **Capability** | UE capability | Yes | **Status**: check the status of LPP email discussion 116bis-628, check the status of RAN1 feature list.  Check RAN1 feature list R1-2111810 |
| **NRPPa impact** | NRPPa change | Yes | **Status: RAN3 to decide;** |

**Discussion point 3.6.2-1: Companies are invited to provide view on open issue lists summarized in table 3.6.2 ? e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

|  |  |
| --- | --- |
| **Company’s name** | **Comments, if any** |
|  |  |
|  |  |
|  |  |

### Accuracy improvements by mitigating UE Rx/Tx and/or gNB Rx/Tx timing delays

**Table 3.6.3: open issue lists for Accuracy improvements by mitigating UE Rx/Tx and/or gNB Rx/Tx timing delays**

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **Stage 2** | Stage 2 Text? | ? | **Status**: draft in stage 2 (based on R2-2201870), check the status of stage 2 email discussion 116bis-629 |
| **Stage 3** | Support of RSTD measurements from different DL PRS resources per UE Rx TEG | Yes | **Status**: Discussion see R2-2201768. draft in LPP running CR, check the status of LPP email discussion 116bis-628, check the status of RRC email discussion 116bis-631  Check RAN1 feature list R1-2111810 and RAN1 parameter list  RAN2#116bis  Proposal 2.1-2: enhance LPP assistance data signalling to allow LMF to provide the association information of DL PRS resources with TRP Tx TEG ID.  Proposal 2.2-1: introduce in LPP RequestLocationInformation: request for UE Rx TEG ID, maximum number of Rx TEGs for the same PRS resource, request for UE Tx TEG ID, maximum number of RxTx TEGs for the same PRS resource, request for UE RxTx TEGD ID.  Proposal 2.2-2: introduce in LPP ProvideLocationInformation: UE Rx TEG IDs, UE Tx TEG IDs, and UE RxTx TEG IDs.  Proposal 2.2-3: introduce in LPP ProvideLocationInformation: multiple UE Rx-Tx time difference measurements (for N different UE Rx TEGs), and multiple UE Rx-Tx time difference measurements (for N different UE RxTx TEGs with the same UE Tx TEG).  Proposal 2.1-5: include in the LPP assistance data the the boresight direction information.  For UL-TDOA, RRC signalling is used to convey the information about signalling for association of UL SRS resources with UE Tx TEGs ID to the gNB. For multi-RTT, LPP is used. FFS which RRC message(s) are used. |
| Support of RTOA measurements obtained from different UL SRS resources for positioning per TRP Rx TEG | Yes |
| Support of UEE Rx-Tx time difference measurements obtained from different DL PRS resources per UE Rx TEG | Yes |
| Support of gNB Rx-Tx time difference measurements obtained from different UL SRS resources per TRP Rx TEG | Yes |
| Support of UE Rx-Tx time difference measurements obtained from different DL PRS resources per UE RxTx TEG | Yes |
| Support of gNB Rx-Tx time difference measurements obtained from different UL SRS resources per TRP RxTx TEG | Yes |
| Support of broadcast signalling;  FFS whether existing posSIB or new posSIB should be used | Yes | **Status**: Discussion see R2-2201768. check the status of LPP email discussion 116bis-628, check the status of RRC email discussion 116bis-631 |
| For UL-TDOA, RRC signalling is used to convey the information about signalling for association of UL SRS resources with UE Tx TEGs ID to the gNB. For multi-RTT, LPP is used. FFS which RRC message(s) are used. | Yes | **Status**: Discussion see R2-2201768. Check the status of RRC email discussion 116bis-631 |
| **Capability** | UE capability | Yes | **Status**: Discussion see R2-2201768. check the status of LPP email discussion 116bis-628, check the status of RRC email discussion 116bis-631  Check the status of RAN1 feature list.  Check RAN1 feature list R1-2111810 |
| **NRPPa impact** | NRPPa change | Yes | **Status: RAN3 to decide;** |

**Discussion point 3.6.3-1: Companies are invited to provide view on open issue lists summarized in table 3.6.3 ? e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

|  |  |
| --- | --- |
| **Company’s name** | **Comments, if any** |
| Huawei, HiSIlicon | For UL-TDOA, which RRC message should be used for reporting TEG association, for periodic/ per NW request and un-solicited scenarios |
|  |  |
|  |  |

### Accuracy improvements for UL-AoA positioning solutions

**Table 3.6.4: open issue lists for Accuracy improvements for UL-AoA positioning solutions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **Stage 2** | Stage 2 Text? | ? | **Status**: No, expect input from RAN3; |
| **Stage 3** | Stage 3 impact, UL SRS RSRPP, ARP association with UL measurements (AoA), etc. |  | **Status**: RAN3 to decide. |

**Discussion point 3.6.4-1: Companies are invited to provide view on open issue lists summarized in table 3.6.4 ?e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

|  |  |
| --- | --- |
| **Company’s name** | **Comments, if any** |
|  |  |
|  |  |
|  |  |

### Accuracy improvements for DL-AoD positioning solutions

**Table 3.6.5: open issue lists for Accuracy improvements for DL-AoD positioning solutions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **Stage 2** | Stage 2 Text? | ? | **Status**: draft in stage 2 (based on R2-2201870), check the status of stage 2 email discussion 116bis-629 |
| **Stage 3** | The LMF provides TRP beam/antenna information to the UE for UE based DL-AoD; | Yes | **Status**: Discussion see R2-2201768. draft in LPP running CR, check the status of LPP email discussion 116bis-628;  Check RAN1 feature list R1-2111810 and RAN1 parameter list  RAN2#116bis  Proposal 2.1-1: enhance LPP assistance data signalling to allow UE to request and LMF to provide TRP beam/antenna information.  Proposal 2.1-6: enhance LPP assistance data signalling to allow UE to request and LMF to provide the expected angle value and uncertainty.  Proposal 2.1-4: include in the LPP assistance data the information about subset of PRS resources for the purpose of prioritization of DL-AOD reporting. |
| For UE-A DL-AoD:  DL PRS RSRPP M  DL PRS RSRP (N values) | Yes |
| For both UE-B and UE-A DL-AoD, introduce expected angle value and uncertainty; | Yes |
| For UE-assisted DL-AOD positioning method, to enhance the signaling to the UE for the purpose of PRS resource(s) reporting, the LMF may indicate in the assistance data (AD), the prioritization information; | Yes |
| FFS Support of broadcast signalling; | Yes | **Status**: need to be discussed. |
| **Capability** | UE capability | Yes | **Status**: Discussion see R2-2201768. check the status of LPP email discussion 116bis-628;  Check the status of RAN1 feature list.  Check RAN1 feature list R1-2111810 |
| **NRPPa impact** | NRPPa change | Yes | **Status: RAN3 to decide;** |

**Discussion point 3.6.5-1: Companies are invited to provide view on open issue lists summarized in table 3.6.5 ?e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

|  |  |
| --- | --- |
| **Company’s name** | **Comments, if any** |
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|  |  |
|  |  |

## UE positioning capability

The open issues on capability have been added under each topic, therefore Rapporteur did not capture open issues here.

**Table 3.7: open issue lists for UE positioning capability**

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark** |
| **See UE capability issues in each topics in previous sections** |  |  |  |
|  |  |  |  |

**Discussion point 3.7-1: Companies are invited to provide view on open issue lists summarized in table 3.7 ? e.g. is any issue missing?**

**Note: only essential issues need to be listed;**

**Note: Companies can still provide general comments if any.**

|  |  |
| --- | --- |
| **Company’s name** | **Comments, if any** |
|  |  |
|  |  |
|  |  |

# Summary report and proposals

# Reference

[1] RP-210903 WID\_ePOS

[2] R1-2112902 Rel17 RAN1 UE feature List

[3] R2-2200285 Open issue lists on Rel-17 positioning WI

[4] R2-2201875 [AT116bis-e][616][POS] Remaining proposals on latency reduction (Qualcomm)

[5] [AT116bis-e][617][POS] Remaining issues on positioning in RRC\_INACTIVE (Ericsson)

[6] R2-2200438 [AT116bis-e][614][POS] PRUs (Huawei)

[7] R2-2201775 [AT116bis-e][613][POS] BDS and NavIC CRs (CATT)

[8] R2-2201768 [AT116bis-e][612][POS] Positioning accuracy enhancements (Apple)

[9] R2-2201765 [AT116bis-e][611][POS] GNSS integrity (Swift)

[10] R2-2201767 [AT116bis-e][610][POS] Positioning UE capabilities (Intel)