**3GPP TSG-RAN RAN2 #121 R2-230xxxx**

**Athens, Greece, 27th Feb – 3rd Mar, 2023**

**Agenda Item:**  **LPHAP**

**Source: Apple (rapporteur)**

**Title:** **Summary of 7.2.4 LPHAP**

**Document for: Discussion and Decision**

# 1 Introduction

This report summarizes the proposals from the contributions submitted to agenda item 7.2.4.

The summarized proposals (for discussion online) are provided in section 3.

The input papers are listed in section 4.

# 2 Discussion

## 2.1 Issues, views, and moderator’s suggestions

### 2.2.1 Extending eDRX cycle

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| **Company** | **Proposals** |
| R2-2302505, CATT | For the objective of extend eDRX cycle beyond 10.24s in RRC\_INACTIVE state, RAN2 can wait for the progress of eRedCap WI. |
| R2-2302742, Intel | Proposal 1: Send LS to RAN1, ask them to provide positioning specific value for eDRX cycle beyond 10.24s in RRC\_INACTIVE. |
| R2-2303434, Xiaomi | Proposal 8: UE sends request on eDRX cycle beyond 10.24s to LMF and LMF requests gNB to configure the eDRX cycle beyond 10.24s. |
| R2-2303697, QCOM | Proposal 1: Support eDRX for RRC\_INACTIVE state with max. value of eDRX cycle up to 10485.76 seconds (1024 hyper-frames), if considered feasible in eRedCap WI. The eDRX design for eRedCap is also applicable for LPHAP. |
| R2-2303494, ZTE | Proposal 9: Support to extend the PRS periodicity larger than 10240ms to suit the eDRX cycle value for eDRX paging cycle in RRC\_INACTIVE and/or RRC\_IDLE.  Proposal 10: Support to wait for RedCap’s decision on RAN initiated PTW in RRC\_INACTIVE when designing the PRS/eDRX alignment. |

3 out of 5 companies which provided proposals for this issue suggest to leave it for eRedCap WI. Hence the proposal:

**Proposal 1: to discuss whether the objective of extend eDRX cycle beyond 10.24s in RRC\_INACTIVE is expected to be addressed in the eRedCap WI.**

### 2.2.2 SRS configuration enhancements based on validity area for UEs in RRC\_INACTIVE

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| **Company** | **Proposals** |
| R2-2302505, CATT | Proposal 2: The valid area in format of cell list is configured to UE together with the SRS configuration.  Proposal 3: To recover the UL resource timely and improve the flexibility of network resource allocation, a valid time can be configured together with the SRS configuration.  Proposal 4: The SRS can be pre-configured to UE via dedicate signalling and posSIB.  Proposal 5: Wait for RAN1’s final conclusion on which parameters can be commonly configured within the validity area to design the SRS configuration structure.  Proposal 6: When the pre-configured SRS is UE-specific, a dedicate preamble for POS can be used by UE to trigger the network to start detecting and performing measurement on the SRS.  Proposal 7: When the SRSs are pre-configured via posSIB, UE request the SRS allocation via RACH-based procedure. FFS via Msg1 or Msg3. |
| R2-2302580, Huawei | Proposal1: At the initiation of UL positioning procedure when event is detected, the UE should send RRC message for SRS configuration request and resume the pre-configured SRS configuration from the inactive UE context after response from the network.  Proposal2: Adopt the following unified solution as baseline for SRS configuration update when UE moves out of positioning area and at the initiation of UL positioning procedure.  Proposal3: Reuse the legacy non-UE associated NRPPa message TRP INFORMATION EXCHANGE for coordination of multiple SRS configurations between gNBs and LMF.    Proposal4: Take the following procedures as the baseline for the efficient provision of SRS configuration with positioning area by system information or dedicated signaling. |
| R2-2302589, Fraunhofer | Proposal 1: A UE shall be provided multiple TA values applicable within a validity area. The applicable TA shall be selected by the UE based on DL-measurement (which may be part of cell-reselection).  Proposal 2: A UE shall be provided multiple configuration instances, a particular configuration shall be selected based on camped cell and (optionally) measurements.  Proposal 3: A SRS configuration shall be mapped to a downlink reference signal, the measurement on the DL reference signal indicates to the UE whether some other UE in the network is currently using the uplink SRS configuration or not.  Proposal 4: The SRS configuration shall be divided into common and UE-specific for RRC\_INACTIVE. The common configuration shall be coordinated among multiple cells.  Proposal 5: The UE-specific part / complementary parameter (sequences or cyclic shift) may be derived by the UE based on UE identifiers or identifier of the last visited cell or using MT-SDT.  Proposal 6: The positioning SRS in RRC\_INACTIVE mode shall be triggered to stop if the RSRP on an associated DL-RS (SSB or PRS), – reference resource, falls below a certain threshold or rises above a certain threshold configured by the network.  Proposal 7: The UE may signal its capability of the size of BWP for data and BWP for positioning separately.  Proposal 8: SL-PRS allocation rules shall be defined to restrict conflict configurations between communication and positioning. In particular, the transmission of PUSCH and PUCCH shall be restricted to a portion of bandwidth part, depending on UE capability.  Proposal 5: The UE-specific part / complementary parameter (sequences or cyclic shift) may be derived by the UE based on UE identifiers or identifier of the last visited cell or signaled by the cell (MT-SDT). |
| R2-2302742, Intel | Proposal 2: For SRS for positioning activation/request procedure(s), if allowed by the network, UE sends Msg-3 based RRC-resume-request to trigger SRS configuration/activation request when cell reselection occurs outside of validity area.  Proposal 3: For SRS for positioning activation/request procedure(s), serving gNB forwards updated SRS configuration to the LMF via NRPPa message when receiving the request from the UE, and the LMF forwards the updated SRS configuration to measured gNBs. The details to be discussed in RAN3.  Proposal 4: Issues related to TA, interference issues, pathloss, spatial relation, and common parameters across multiple cells should be discussed in RAN1 first.  Proposal 5: The measured gNB should be aware of which SRS configuration should be used for the positioning measurement.    Proposal 6: For preconfigured multiple SRS configurations, if allowed by the network, UE sends Msg-3 based RRC-resume-request to indicate the change of SRS configuration when different SRS configuration is selected due to cell reselection.  Proposal 7: For preconfigured multiple SRS configurations, serving gNB forwards updated SRS configuration to the LMF via NRPPa message when receiving the change indication from the UE, and the LMF forwards the updated SRS configuration to measured gNBs. The details to be discussed in RAN3. |
| R2-2302960, vivo | Proposal 1: The SRS positioning validity area is determined by LMF.  Proposal 2: LMF may send an indication to the serving cell when requesting the serving cell to configure SRS configuration. After receiving the indication, the serving cell should wait for the validity area before releasing the target UE to the RRC\_INACTIVE state.  Proposal 3: The LMF should forward the SRS configuration received from the serving cell to neighbor cells belonging to the expected validity area and request neighbor cells to reserve radio resources for SRS transmission. And LMF can decide the final validity area based on the feedback from the neighbor cells.  Proposal 4: The LMF should send the validity area to the serving cell so that the serving cell can forward it to the target UE via RRCRelease with SuspendConfig.  Proposal 5: LS to RAN3 to take RAN2’s solution into consideration when RAN2 reaches a consensus on the solution of validity area for SRS configuration.  Proposal 6: RAN2 to discuss how to send the RRC message to the network for SRS configuration request when there is no ongoing SDT,  - Option 1: UE may trigger MO-SDT to send the RRC message.  - Option 2: UE sends the RRC message after entering the RRC\_CONNECTED state.  Proposal 7: RAN2 to discuss whether to reuse existing RRC message (e.g., UE Assistance Information) or introduce a new message to send the SRS configuration request.  Proposal 8: The last serving cell should include the indication received from LMF in the UE context. With it, the new cell will wait for the validity area from LMF before releasing the target UE to the RRC\_INACTIVE state.    Proposal 9: The discussion on the pre-configuration of one or multiple SRS for positioning configurations can be de-deprioritized in Rel-18. |
| R2-2303079, Sony | Proposal 1: Support multiple UL SRS configuration supporting several gNBs for positioning of the UE to operate UL and DL+UL positioning in RRC\_INACTIVE state.  Proposal 2: Multiple UL SRS configuration can be provided to the UE via dedicated RRC (e.g., when the UE is in connected mode) or system information (SI).  Proposal 3: Support network to trigger UL SRS transmission via downlink signal when the UE is in RRC\_INACTIVE mode.  Proposal 4: Both alternatives, configuration triggered via MT-SDT or configured via RRC release should be considered.  Proposal 5: Introduce new parameter “positioning trigger indication”, in relation to the MT-SDT procedure to initiate/trigger the positioning procedure/measurements. |
| R2-2303185, OPPO | Proposal 5: RAN2 to agree that UE should not transmitt the SRS configuration update request msg if the UE has been configured with the SRS configuration but leaved the SRS configuration area.  Proposal 6: RAN2 to agree that UE should not transmit the SRS configuration update request msg if a location event is detected at the UE. |
| R2-2303231, Lenovo | Proposal 1: The SRS validity area information is delivered with SRS configuration to RRC\_INACTIVE UE by RRCRelease message or by SI broadcast signalling.  Proposal 2: In case of multiple SRS configurations associated with multiple SRS positioning validity areas are pre-configured for UE in RRC\_INACTIVE, an explicit SRS configuration and associated validity area are suggested to be provided to the UE in response to a request or in unsolicited manner.  Proposal 3: LMF indicates the serving gNB to provide cell-specific or validity area specific SRS configuration for UEs in RRC\_INACTIVE.  Proposal 4: UE may transmit RRCResume request message to gNB to update SRS configuration and validity area, gNB may provide updated SRS configuration and validity area information by RRCRelease message.  Proposal 5: Paging is initiated by the gNB to page the target UE within the configured validity area for the SRS activation/deactivation.  Proposal 6: RAN2 is suggested to discuss the TA maintenance issues within the SRS validity area according to RAN1’s conclusions. |
| R2-2303434, Xiaomi | Proposal 1: The PCI list is used for the SRS positioning validity area and it was configured by RRC release message when gNB configures the SRS for RRC inactive UE.  Proposal 2: When UE moves out of the cell which configures the SRS with the validity area for the UE, the SRS transmission from the UE will lead to inference to other UE in serving cell, and the inference should be avoid.  Proposal 3: If SRS with validity area is configured, all gNBs in the validity area should reserve the SRS in advance.  Proposal 4: The SRS positioning validity area is determined by LMF.  Proposal 5: UE indicates the SRS status to LMF in event report when the SRS positioning validity area is configured and LMF don’t trigger gNB to configure the SRS if the SRS configuration is still valid.  Proposal 6: If UE requests gNB to provide the SRS validity area, gNB may request the SRS validity area from LMF if the SRS validity area is determined by LMF.  Proposal 7: UE may send the activation/deactivation request for semi-persistent or aperiodic SRS to gNB. |
| R2-2303494, ZTE | Proposal 1: For UE is within the SRS validity area, support UE keeps on transmitting SRS without notifying the camping gNB. LMF schedules all gNBs/TRPs in the validity area to monitor the SRS.  Proposal 2: Support RAN2 to wait for RAN3’s final decision on the procedure when UE reselects out of SRS validity area.  Proposal 3: Support pre-configured multiple SRS configurations for multiple cells, each pre-configured SRS configuration is associated with a cell.  Proposal 4: Support option 2 or option 3 for pre-configured multiple SRS configurations.  Proposal 5:For positioning SRS (pre-)configured across multiple cells, support to (pre-)configure both periodic SRS and semi-persistent SRS.  Proposal 6: Support to reuse the Rel-17 TA timer start/restart conditions for Rel-18 TA timer across multiple cells.  Proposal 7: Support the new TA timer to reuse the Rel-17 TA timer behaviour on stop action(except for cell-reselection case), i.e., if RRCSetup or RRCResume is received, UE stops the SRS TA timer.  Proposal 8: Support a unified ASN.1 design of SRS within validity area and pre-configure SRS for multiple cells. Support to configure the Rel-18 SRS in RRC Release with Suspend Config and take the example configuration in Annex as baseline. |
| R2-2303539, CMCC | Proposal 1: RAN2 is kindly asked to support the broadcast of SRS configuration.  Proposal 2: TAT and RSRP-threshold for Rel-17 RRC\_INACTIVE positioning could be re-used for LPHAP.  Proposal 3: RAN2 is kindly asked to study how to maintain an area-specific TA for SRS validity area. |
| R2-2303570, Spreadtrum | Proposal 2: To determine the SRS configuration with validity area mechanism, a dedicated SRS configuration can associate with a cell.  Proposal 3： Send LS to RAN3 regarding SRS validity area mechanism, considering dedicated SRS configuration associating with a cell. |
| R2-2303697, QCOM | Proposal 2: The "SRS validity area" for pre-configured SRS for positioning is defined as a list of Cell-IDs where an SRS for positioning configuration is valid. If the UE reselects to a cell included in the validity area cell list the UE is permitted to continue the (associated) positioning SRS transmission in the new cell after cell reselection.  Proposal 3: A UE preconfigured with SRS for positioning may send an RRC message to the network for SRS for positioning activation request. This RRC 'SRS for positioning Activation Request' message can be sent by the UE to the serving gNB along with an RRC Resume Request and includes an identifier of the SRS for positioning configuration requested to be activated (possibly a list in preferred order).  Proposal 4: To activate a pre-configured SRS for positioning in the target device, the gNB sends a RRC message for SRS for positioning Activation. This 'RRC SRS for positioning Activation' message can be sent by the serving gNB along with an RRC Release. The 'RRC SRS for positioning Activation' message includes an identifier of the SRS for positioning configuration together with SRS for positioning configuration parameter which were not pre-configured, or which overwrite pre-configured SRS for positioning parameter.  Proposal 5: The target device starts transmitting the (pre-configured) SRS for positioning once the 'RRC SRS for positioning Activation' message has been received.  Proposal 6: The serving gNB of the target device sends a NRPPa message to the LMF once the SRS for positioning has been activated in the target device. This NRPPa message carries information on the activated SRS for positioning and the current serving cell ID to enable the LMF to request UL measurements from TRPs.  Proposal 7: Define a NRPPa message which allows an LMF to request SRS for positioning deactivation from the target device's serving gNB.  Proposal 8: Define a UE triggered RRC message which allows the UE to request SRS for positioning deactivation from the serving gNB. This 'SRS for positioning deactivation request' message can be sent by the UE to the serving gNB along with an RRC Resume Request using SDT.  Proposal 9: Define a gNB triggered 'SRS for positioning deactivation' RRC message. The target device stops transmitting the indicated SRS for positioning when the message has been received. |
| R2-2303704, E/// | Proposal 5 RAN2 to no longer pursue below  a. Pre-configuration of one or multiple SRS for positioning configurations  b. SRS for positioning activation/request procedure(s  Proposal 6 UE establishes TA validity based upon positioning time of arrival estimation.  Proposal 7 Cell resources and Sequence ID co-ordination is done for UL-SRS Tx among cells which are part of the validity area.  Proposal 8 The solution should not require the gNB to monitor multiple SRS configuration simultaneously for a UE  Proposal 9 Send LS to RAN3/RAN1 requesting to analyse if over provisioning of RPs are required to support this feature. |
| R2-2303886, Samsung | Proposal 1: RAN2 to discuss whether spatial relation information and pathloss reference in the SRS configuration can be configured differently for each cell within validity area (i.e., whether receiving TRPs can be changed according to UE’s serving cell within validity area).  Proposal 2: RAN2 to discuss which entity (e.g., LMF, gNB) can decide the validity area of the SRS configuration.  Proposal 3: UE needs to update TA value for SRS transmission upon cell re-selection within the validity area. RA procedure can be used for TA update with a new serving cell.  Proposal 4: RAN2 to discuss whether the SRS configuration request via RRC message can be also used for the case without validity area.  Proposal 4: RAN2 to exclude pre-configuration of SRS via (pos)SIB for LPHAP.  Proposal 5: RAN2 to discuss how to activate a specific SRS configuration among multiple pre-configured SRS configurations considering the two options below.  - Option 1. The UE requests the gNB to activate a specific SRS configuration.  - Option 2. The UE just requests the activation of SRS and the gNB select a specific SRS configuration to activate. |
| R2-2303985, LGE | Proposal 2. RAN2 to consider at least “SRS validity area” for SRS validation. |
| R2-2303995, IDC | Proposal 1: Study potential values for area specific TA timer |
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Validity area definition

Multiple companies suggest using cell list and validity time. Hence the proposal:

**Proposal 2a: SRS validity area configuration contains list of cells in which it is valid and validity time.**

SRS (pre)configuration

Two options of SRS (pre)configuration are proposed by multiple companies: dedicated signalling and posSIB. Regarding posSIB, some companies insist on the importance of this options whereas some companies propose to exclude it. Virtually all the companies agree that dedicated signalling is needed and out of those who provided details, everybody agree to use RRCRelease. Hence the proposal:s

**Proposal 2b: RRCRelease is used to provide SRS (pre)configuration.**

**Proposal 2c: to discuss whether SRS (pre)configuration can also be provided via posSIB.**

SRS configuration request by UE

There are multiple proposals from different companies regarding SRS configuration update and activation request via RRC. However, two companies thinks this should not be pursued. Hence the proposal:

**Proposal 2d: to discuss whether to introduce SRS configuration update request via RRC and SRS configuration activation request via RRC.**

Multiple SRS (configurations

Similarly, a number of companies propose to support multiple SRS configurations, wheras one company thinks it is not needed. Hence the proposal:

**Proposal 2e: to discuss whether to support multiple SRS configurations.**

Finally, another issue brought up by many companies is about which node (gNB or LMF) determines SRS validity area. Hence the proposal:

**Proposal 2f: to discuss which node (gNB or LMF) determines SRS validity area.**

### 2.2.3 DL-PRS measurements in RRC\_IDLE and reporting in RRC\_CONNECTED

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| **Company** | **Proposals** |
| R2-2302505, CATT | Proposal 10: Postpone the measurement performed in RRC\_IDLE and report in RRC\_CONNECTED until there is a clear confirmation of power saving benefits from RAN1. |
| R2-2302580, Huawei | Proposal19: UE can perform the DL PRS measurements in RRC\_IDLE state and report them in RRC\_CONNECTED state to the LMF with the current SA2 stage2 procedure in Clause 6.3.1 in TS 23.273. Send a LS to SA2 to confirm the understanding. |
| R2-2302742, Intel | Proposal 8: RAN2 to send LS to SA2, to inform them that RAN has agreed to support “DL PRS measurements for a UE in RRC\_IDLE state and reporting of the measurements in RRC\_CONNECTED state” and would like to check whether the CN can handle the measurement reports from the UE in RRC\_CONNECTED, while the positioning was performed in RRC\_IDLE for MO-LR, MT-LR and NI-LR. |
| R2-2302960, vivo | Proposal 16: UE positioning measurements in RRC\_IDLE state in NB-IoT can be used as a baseline for R18 positioning in RRC\_IDLE. |
| R2-2303185, OPPO | Proposal 2: RAN2 to agree that the DL-PRS configuration to be applied in the RRC\_Idle state could be sent towards the UE in the LPP msg when the UE is still in the RRC\_Connected state and the LMF indicates to the UE that DL positioning will be used for subsequent location reporting events when the UE in RRC\_IDLE state.  Proposal 3: RAN2 to agree that the DL-PRS configuration to be applied in the RRC\_Idle state could be valid in a large area, i.e., list of cells, to keep the continuity of the positioning service in the RRC\_Idle state.  Proposal 4: RAN2 to agree to let UE be enabled for the cipheration and integrity protection before transmission of the DL-PRS measurement results. |
| R2-2303231, Lenovo | Proposal 9: For DL measurement reporting in RRC\_IDLE state, RAN2 to consider request RAN1 to evaluate the power saving benefit for alternative 1 and SA2/SA3 to provide feedback on potential AS context/security issues for alternative 2. |
| R2-2303494, ZTE | Proposal 16: Support UE to utilize the positioning assistance data through posSIB or pre-configured assistance data in RRC\_CONNECTED when UE is to perform positioning in RRC\_IDLE. |
| R2-2303570, Spreadtrum | Proposal 4: RAN2 to send LS to SA2 to check how CN can handle the the measurement reports from the UE in RRC\_CONNECTED, while the positioning was performed in RRC\_IDLE for MO-LR, MT-LR and NI-LR. |
| R2-2303697, QCOM | Proposal 10: The 'Low Power Periodic and Triggered 5GC-MT-LR Procedures' in RRC\_INACTIVE state defined in clause 6.7 of TS 23.273 are also applicable to DL-PRS measurements in RRC\_IDLE state and reporting of the measurements in RRC\_CONNECTED state, but without using SDT for event/measurement reporting. Instead of using SDT for event/measurement reporting, a UE triggered service request would be used which moves the UE to connected state for event/measurement reporting. It is up to SA2 to decide whether this should be captured in TS 23.273 or not.  Proposal 11: Performing DL-PRS measurements (or any other positioning measurements) for a UE in RRC\_IDLE state and reporting of the measurements in RRC\_CONNECTED state can already be supported with existing signalling. If considered useful, a clarification can be added to Stage 2 38.305. |
| R2-2303704, E/// | Proposal 3 The idle mode measurement is sent in RRC Connected mode after the security mode procedure. |
| R2-2303995, IDC | Proposal 3: Study when the UE can transition to RRC\_CONNECTED to send the measurement report that contains measurements made during RRC\_IDLE |

At least 2 companies think this can already be supported by the existing procedures as captured in TS 23.273. At least 3 companies would like to send an LS to SA2 to confirm that it is actually correct. At least 2 companies would like to confirm with RAN1 that there are power saving gains in this.

Considering the above, the only suggestion the moderator can provide is to indeed send the LS to SA2 to confirm the existing procedures can support DL-PRS measurements in RRC\_IDLE and reporting in RRC\_CONNECTED.

**Proposal 3a: to discuss whether to send the LS to SA2 to confirm the existing procedures can support DL-PRS measurements in RRC\_IDLE and reporting in RRC\_CONNECTED.**

### 2.2.4 Alignment between eDRX and PRS configurations

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| **Company** | **Proposals** |
| R2-2302505, CATT | Proposal 8: Support PRS alignment with fixed DRX. The fixed DRX refer to the potential PF and PO of the cell, which can be determined by the cell level parameters, e.g. PF\_offset, N and minimum DRX cycle.  Proposal 9: There are some impacts on RAN3 to support alignment between DRX and PRS. Send RAN2 agreement to RAN3 to trigger the discussion. |
| R2-2302580, Huawei | Proposal5: For the PRS alignment with fixed DRX, the legacy UE-based on-demand PRS procedure can be sent in RRC\_CONNECTED and RRC\_INACTIVE with SDT with no stage-3 impacts.  Proposal6: For DRX alignment with fixed PRS, focus on changing the DRX configuration delivered by NAS message and RRCRelease message  Proposal7: For the alignment of AMF-generated DRX configuration with fixed PRS, the existing NAS message REGISTRATION REQUEST/RESPONSE can be reused/enhanced.  Proposal8: For the alignment of gNB-generated DRX configuration with fixed PRS   For UE-based approach, RRC message can be used for the UE to request the DRX configuration;   For LMF-based approach, NRPPa message MEASUREMENT PRECONFIG |
| R2-2302742, Intel | Proposal 9: Confirm SA2 conclusion that during the positioning procedure, AMF provides the LPHAP indication to the LMF, and the LMF also sends LPHAP indication to RAN in the NRPPa message (stage 2 and RAN3 impact).  Proposal 10: For DRX alignment with fixed PRS configurations, it is up to RAN to align DRX configuration with fixed PRS based on LPHAP indication obtained from the LMF and available PRS configuration in RAN.  Proposal 11: For PRS alignment with fixed DRX configurations, it can be archived by on-demand PRS request without stage 3 impact. If the UE wants to change PRS configuration to align with DRX configuration, the UE can send on-Demand PRS request to the LMF with suitable recommended PRS configuration. |
| R2-2302960, vivo | Proposal 10: LMF should be informed about the eDRX, DRX and default paging configuration in advance, and then it may take the information into account when setting the periodicity and/or response time of deferred MT-LR.  Proposal 11: To align the PRS configuration with fixed eDRX, the following solution can be considered:  - LMF should negotiate PRS configuration with selected TRP(s) to ensure there is valid PRS around PO within PTW. (in RAN3 scope)  - UE should perform PRS measurement around PO within PTW. (RAN1/RAN4 related)  Proposal 12: LS to RAN1/RAN3/RAN4 to trigger the discussion on aligning PRS configuration with fixed eDRX when RAN2 reaches a consensus on the solution.  Proposal 13: Considering the following aspects, the discussion on aligning eDRX with fixed PRS can be de-deprioritized in Rel-18.  - It is not feasible to align the eDRX of multiple target UEs with fixed PRS considering that different UEs have different PO.  - The DRX cycle can be set depending on the data delay tolerance and power-saving requirements. In this sense, the eDRX cannot be adjusted significantly for positioning purposes.  Proposal 14: RAN2 to consider aligning SRS configuration with fixed eDRX (especially for the eDRX cycle beyond 10.24s). The solution can be:  - LMF acquires the eDRX configuration and takes it into account when setting the periodicity of the requested SRS.  - LMF indicates the serving gNB to configure the SRS close to the paging occasion.  Proposal 15: LS to RAN1/RAN3 to trigger further discussion on aligning SRS configuration with fixed eDRX when RAN2 reaches a consensus on the requirements and initial solutions. |
| R2-2303079, Sony | Proposal 6: Support aligning the DRX on duration and UL SRS transmission for positioning  Proposal 7: In case of aperiodic/event triggered PRS transmission let the LMF align the PRS transmission to the UE DRX cycle/PO,  Proposal 8: In case of periodic PRS transmission let the AMF (or gNB) align the UE DRX/PO to the Periodic PRS transmissions by adding an Offset to the UE-ID for PO calculation, similar to the solution in LTE for MuSIM as specified in 36.304 and 23.502 used for avoiding paging collision. |
| R2-2303185, OPPO | Proposal 1: RAN2 to agree to align the DL-PRS timing pattern with the fixed DRX. |
| R2-2303231, Lenovo | Proposal 7: In the case of LMF performs the alignment, e-DRX configurations depending on the UE’s RRC state should be shared with the LMF from the NG-RAN node or from the UE.  Proposal 8: In the case of gNB performs the alignment, gNB should be indicated to perform the alignment between e-DRX and PRS configuration explicitly or implicitly. |
| R2-2303367, Apple | Proposal 2: to agree on the general solution direction: PRS alignment to fixed DRX, DRX alignment to fixed PRS, or both.  Proposal 3: if RAN2 is to standardize both solutions (alignment of PRS to fixed DRX and alignment of DRX to fixed PRS), these should be separate features with separate UE capabilities. |
| R2-2303434, Xiaomi | Proposal 9: PRS is aligned with eDRX for alignment between eDRX and PRS.  Proposal 10: UE requests LMF to align PRS with eDRX by LPP request assistance information and UE may provide the eDRX parameters to LMF.  Proposal 11: LMF requests gNB to align PRS with eDRX by NRPPa message and LMF may acquire the eDRX parameters of UE from UE or serving cell and send it to gNB. |
| R2-2303494, ZTE | Proposal 11: Support to use UE-initiated on-demand PRS procedure for PRS to align with fixed DRX.  Proposal 12: In LPP on-demand PRS request message, support UE to request the PRS time offset associated with each requested PRS periodicity to better align the actual paging location.  Proposal 13: In LPP on-demand PRS request message, support UE to request separate PRS periodicities in order to align with the paging cycle inside-PTW and outside-PTW, respectively.  Proposal 14: In LPP on-demand PRS request message, support UE to use dl-prs-StartTime-and-Duration to request the PRS reception within the PTW(if existed).  Proposal 15: Support LMF to include UE’s requested PRS periodicities or PRS time offsets in the NRPPa PRS CONFIGURATION REQUEST message. |
| R2-2303570, Spreadtrum | Proposal 1: PRS alignment with fixed DRX is preferred by reusing on demand PRS procedure. |
| R2-2303697, Qualcomm | Proposal 12: For the (e)DRX alignment with configured DL-PRS, support adding the UE configured LCS reporting activity and configured DL-PRS information (e.g., DL-PRS periodicity) to the IE 'Core Network Assistance Information for RRC INACTIVE' (TS 38.413). Inform RAN3 and SA2 on RAN2's decision.  Proposal 13: For the DL-PRS alignment with configured (e)DRX, the LPP Request Assistance Data for on-demand DL-PRS is used. The UE may set the dl-prs-ResourceSetPeriodicityReq according to the configured LCS reporting activity and (e)DRX configuration. FFS whether additional parameter are needed (e.g., DL-PRS slot offset). |
| R2-2303704, E/// | Proposal 4 Send LS to RAN3 to request for NRPPa/OAM signaling support for cell/UE specific DRX/eDRX configurations. |
| R2-2303985, LGE | Proposal 1. RAN2 to consider “DRX alignment with fixed PRS” for DRX/PRS alignment, if different DRX periodicities are preferred (or configured) on gNBs. |
| R2-2303995, IDC | Proposal 2: Down-select the alignment options a) and b) after knowing the PRS measurement requirements in RRC\_INACTIVE/RRC\_IDLE. |
| R2-2304059, Nokia | Proposal 1: The option (a) where PRS is aligned with fixed (e)DRX should be considered as the solution to align PRS and (e)DRX configuration for power saving of LPHAP UE.  Proposal 2: The LMF shall acquire the (e)DRX configuration for support of option (a). Details FFS.  Proposal 3: The LMF can indicate to LPHAP UE to selectively measure PRS or transmit SRS so as to align (e)DRX configuration for UE power consumption. |

There are 3 different views on the high level solution direction:

* Align PRS to fixed DRX
* Align DRX to fixed PRS
* Both

9 companies prefer to align PRS to fixed DRX, 1 company would like to align DRX to fixed PRS and 5 companies suggest standardizing both variants. Hence the proposal:

**Proposal 4a: to standardize a mechanism to align PRS to fixed DRX. If not greeble, standardize two mechanisms: to align PRS to fixed DRX and to align DRX to fixed PRS.**

Regarding solution details to align PRS to fixed DRX, there are two different views:

* Re-use legacy on-demand PRS signalling
* Ask RAN3 define NRPPa signalling to convey DRX information to LMF

5 companies prefer the first option, 3 companies support the second option. Hence the proposal:

**Proposal 4b: for aligning PRS to fixed DRX, discuss whether to re-use the legacy UE-initiated on-demand PRS signalling or task RAN3 to define new NRPPa signalling.**

Regarding solution details to align PRS to fixed DRX, Huawei in R2-2302580 provide the most detailed description, which can be used for online discussion. Hence the proposal:

**Proposal 4c: For the alignment of AMF-generated DRX configuration with fixed PRS, the existing NAS message REGISTRATION REQUEST/RESPONSE can be reused/enhanced. For the alignment of gNB-generated DRX configuration with fixed PRS:**

* **For UE-based approach, RRC message can be used for the UE to request the DRX configuration,**
* **For LMF-based approach, NRPPa message MEASUREMENT PRECONFIG can be used,**
* **For gNB-based approach, LPHAP indication obtained from the LMF and available PRS configuration in RAN**

Furthermore, 3 companies propose to discuss SRS alignment with DRX. This is a new proposal not entirely in the scope of the WID.

**Proposal 4d: to discuss whether to align SRS with DRX.**

### 2.2.5 SA2 LS on WI scope

|  |  |
| --- | --- |
| **Company** | **Proposals** |
| **R2-2302505, CATT** | **Proposal 11: Send a reply LS to SA2 to indicate that from the perspective of RAN2, “low power or high accuracy” positioning is out of the release 18 RAN working scope** |
| **R2-2302742, Intel** | **Proposal 12: RAN2 confirm only ‘low power’ or only ‘high accuracy positioning’ is OUT of the release 18 RAN working scope.** |
| **R2-2303704, E///** | **Proposal 1 RAN2 to Reply to SA2 that the RAN WI scope is Low Power and High Accuracy.** |

All 3 companies that provided inputs on this issue seem to be in agreement the SA2 request is outside of the current WI scope. Hence the proposal:

**Proposal 5: Send a reply LS to SA2 to indicate that from the perspective of RAN2, “low power or high accuracy” positioning is out of the Rel-18 WI scope.**

# 3 Conclusion

# 3 References

R2-2302505 Discussion on LPHAP CATT discussion Rel-18 NR\_pos\_enh2

R2-2302580 Discussion on LPHAP Huawei, HiSilicon discussion Rel-18 NR\_pos\_enh2

R2-2302589 Enhancements for supporting LPHAP Fraunhofer IIS, Fraunhofer HHI discussion

R2-2302742 Further considerations on LPHAP Intel Corporation discussion Rel-18 NR\_pos\_enh2

R2-2302960 Discussion on solution of LPHAP vivo discussion Rel-18 FS\_NR\_pos\_enh2

R2-2303079 Considerations on Low Power High Accuracy Positioning Sony discussion Rel-18 FS\_NR\_pos\_enh2

R2-2303185 Discussion on LPHAP OPPO discussion Rel-18 NR\_pos\_enh2

R2-2303231 Discussion on low power high accuracy positioning Lenovo discussion Rel-18

R2-2303367 Alignment between DRX and PRS Apple discussion Rel-18 NR\_pos\_enh2

R2-2303434 Discussion on LPHA positioning Xiaomi discussion

R2-2303494 Discussion on LPHAP ZTE Corporation discussion Rel-18 NR\_pos\_enh2

R2-2303539 Considerations on LPHAP CMCC discussion Rel-18 NR\_pos\_enh2

R2-2303570 Discussion on LPHAP Spreadtrum Communications discussion Rel-18

R2-2303697 Enhancements for LPHAP Qualcomm Incorporated discussion

R2-2303704 Discussion on Low Power High Accuracy Positioning Ericsson discussion Rel-18

R2-2303886 Discussion on SRS configuration in RRC\_INACTIVE Samsung discussion Rel-18 FS\_NR\_pos\_enh2

R2-2303985 Discussion on LPHAP LG Electronics Inc. discussion Rel-18

R2-2303995 Discussion on LPHAP InterDigital Communications discussion Rel-18

R2-2304059 PRS and DRX configuration alignment Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_pos\_enh2-Core R2-2301752

# 4 Agreements from previous meetings (for information)

## 4.1 RAN2#121

Agreements:

When configured with SRS configuration along with SRS validity area, if the UE reselects to another cell within the SRS validity area during SRS transmission, the UE continues the SRS transmission, subject to validation for SRS transmission.

Wait for RAN1 progress for the validation of SRS transmission with issues such as interference, timing advance and spatial relation information, etc.

Agreements:

RAN2 assume when the UE reselects out of the positioning validity area during SRS transmission, the UE may send an RRC message to the network for SRS configuration request.

LS to RAN3 to confirm this.