**3GPP TSG-RAN WG1 Meeting #118** **R1- 24NNNNN**

Maastricht, Netherlands, August 19th – August 24th, 2024

Agenda Item: 8.1

Source: Moderator (Ericsson)

Title: LS discussion summary for LS on synchronization source change at the transmitting anchor UE in SL positioning

Document for: Discussion, Decision

# LS discussion

### Background

In the RAN4 LS reply “LS on synchronization source change at the transmitting anchor UE in SL positioning”[1] RAN4 asks the following to RAN1:

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| *LS from R1-2405788*1. **Overall Description:**

During the discussion on RRM core requirements for SL positioning, RAN4 reached the following agreement. * Agreement
	+ It is a RAN4 understanding that UE performing measurements may not be aware on the synchronization source change at the Tx UE.
	+ For synchronization reference source change occurring at Tx side, measurement accuracy requirements do not apply and no specific UE behaviour is defined.
		- Note: the agreement can be revisited if a RAN1/2 solution is introduced to inform the UE performing measurements on the synchronization source change at the Tx UE.

RAN4 would like to check whether RAN1 and RAN2 have introduced or are working on any solutions to inform a UE performing an SL positioning measurement (e.g., SL RSTD, SL Rx-Tx, and SL RTOA) about synchronization reference source change at a UE which is transmitting SL-PRS for the measurement.**2. Actions:****To RAN1, RAN2:****ACTION:** RAN4 kindly requests RAN1 and RAN2 to clarify whether they have introduced or are working on any solutions to inform an SL UE performing an SL positioning measurement (e.g., SL RSTD, SL Rx-Tx, and SL RTOA) about synchronization reference source change at a UE which is transmitting SL-PRS for the measurement. |

The following contribution discuss the issue:

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| **Tdoc#** | **Proposal** |
|  x7167 |  Proposal 1 Confirm RAN4 understanding that to not impact a timing measurement, the transmitting UE's sync source should not change while another UE is performing a measurement based on its transmission, otherwise the measurement needs to be restarted. Proposal 2 RAN1 should not plan further enhancements for notification of a change in sync ref source from a tx UE to another measuring UE. |
| x6998 | Proposed LS response:

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| RAN1 thanks RAN4 for the LS.RAN1 has discussed this matter, and confirms that RAN1 has not introduced and is not working on any solutions to inform an SL UE performing an SL positioning measurement (e.g., SL RSTD, SL Rx-Tx, and SL RTOA) about synchronization reference source change at a UE which is transmitting SL-PRS for the measurement. It is RAN1 understanding that such a solution is not necessary. |

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| x6952 | Proposed LS response:RAN1 discussed the synchronization error issues, and agreed the Tx anchor UE’s **synchronization source type** can be informed to an LMF or another UE for SL-TDOA or SL-TOA. Moreover, for SL-RTT a Tx UE’s synchronization source type can be informed in a Tx time stamp of a measurement report. From RAN1’s perspective, RAN1 will NOT specify additional solutions for Tx UE’s synchronization source change. The related agreements are marked in yellow in the following RAN1 agreements. |
| x6675 | Proposal 1: Support an indication from one UE to another UE or LMF on time reference change for Tx time (i.e., SyncRef change).Proposal 2: If RAN1 agrees to support a SyncRef change indication, then reply to RAN4 accordingly. |
| x6617 | Proposed LS response:RAN1 has discussed this issue, and concluded that* It is up to RAN2 to decide whether to introduce/introduced any solutions to inform an SL UE performing an SL positioning measurement about synchronization reference source change at a UE which is transmitting SL-PRS for the measurement.
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| x6532 | Proposed LS response:While synchronization source information can be provided to a UE performing measurements on SL PRS as assistance information from a server via ***sl-RTD-Info***, the server may not always be aware of changes to synchronization source for a transmitting anchor UE. Accordingly, as observed in the quoted RAN4 agreement, a measuring UE may not always be aware of synchronization source change for a transmitting anchor UE. Beyond the methods currently available, RAN1 does not intend to introduce any specific solutions for Rel-18 to inform a measuring UE of changes to synchronization source for a transmitting anchor UE and would like to confirm that RAN4’s agreement is reasonable from RAN1’s perspective. |
| x6322 | Proposed LS responseProposal 1: Regarding the question related to synchronization source change at the transmitting anchor UE in SL positioning in the RAN4 LS R1-2405788(R4-2410352), suggest providing the following response:• RAN1 had introduced solutions to inform an SL UE performing an SL positioning measurement (e.g., SL RSTD, SL Rx-Tx, and SL RTOA) about synchronization reference source change at a UE which is transmitting SL-PRS for the measurement as follows, The UE, which transmits SL PRS, may report synchronization source type via syncSourceType and/or relative time difference with the associated quality metric, via sl-RTD-Info. If reported syncSourceType is gNB-eNB, the UE may report cell identity information.  The UE, which performs an SL positioning measurement, may be provided with synchronization source type of the UE that transmits SL-PRS and/or the relative time difference with the associated quality metric, via syncSourceType and sl-RTD-Info, respectively. |
| x6150 | RAN1 confirms the following mechanisms are supported to mitigate the impact of synchronization errors for SL positioning (i.e., exchange the synchronization information of transmiting UE and RTD between transmitting anchor UE ).

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| **Agreement**Support at least the following mechanism to mitigate the impact of synchronization errors between anchor UEs for SL-TDoA based measurement* Exchange of synchronization information of anchor UEs between a UE and LMF or another UE.
* FFS detailed synchronization information. E.g: synchronization source, relative time difference (RTD), synchronization quality information
* FFS other mechanisms

AgreementSupport to include the following in the exchanged synchronization information of anchor UEs between a UE and LMF or another UE:The synchronization source type (GNSS, gNB/eNB, and UE) of anchor UEs, AgreementUpdate previous agreement on synchronization information exchange with the following modification:

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| To mitigate the impact of synchronization errors between anchor UEs for SL-PRS based measurement, the exchanged synchronization information of anchor UEs between a UE and LMF or another UE includes the following:* The synchronization source type (GNSS, gNB/eNB, and UE) of anchor UEs,
	+ ~~[If the synchronization source of an anchor UE is SyncRef UE, the anchor UE can optionally indicate the coverage status and synchronization connection status (whether the SyncRef UE is directly or indirectly synchronized to GNSS/gNB, or other SyncRef UE) of the SyncRef UE]~~
	+ If the synchronization source of an anchor UE is gNB/eNB, the anchor UE can further provide cell identity information
* ~~[Synchronization quality/accuracy information]~~
* The RTD between anchor UEs
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RAN1 confirms the following mechanisms are supported to mitigate the impact of synchronization errors for SL positioning (i.e., exchange the synchronization information of transmiting UE and RTD between transmitting anchor UE ).In addition, for SL Rx-Tx measurement, the following agreement is achieved so that the UE can provide the Tx time for SL Rx-Tx measurement which can align the Tx time between transmitting UE and reception UE.

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| **Agreement**For definition of SL-PRS based Rx-Tx measurement, the actual SL-PRS transmission time is used for the definition of SL-PRS based Rx-Tx time difference measurement if the UE optionally reports the Tx time information, otherwise use the Rel-16/17 definition for gNB Rx-Tx time difference/UE Rx-Tx time difference in Uu.* FFS: details of the Tx time information
* FFS: whether additionally the network or LMF can request the UE to report the Tx time information
* Note: the value of Rx-Tx measurement is within [-0.5 0.5] ms
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The majority of contribution agrees with RAN4 view, and want to confirm that RAN1 will not plan to work on a solution to inform a Rx UE of syncref change in the tx UE. For 1 company, RAN2 could handle the issue.

Below is a draft response based on the received comments. Please provide feedback on whether including the RAN1 agreements to the LS response is necessary, as well as further wording revision:

RAN1 thanks RAN4 for the LS. RAN1 has discussed this matter, and has the following response:

* RAN1 has not introduced and is not working on any solutions to inform an SL UE performing an SL positioning measurement (e.g., SL RSTD, SL Rx-Tx, and SL RTOA) about synchronization reference source change at a UE which is transmitting SL-PRS for the measurement.
* Beyond the methods currently available, RAN1 does not intend to introduce any specific solutions for Rel-18 to inform a measuring UE of changes to synchronization source for a transmitting anchor UE and would like to confirm that RAN4’s agreement is reasonable from RAN1’s perspective.
* This does not preclude other RAN group to introduce such signalling.

In addition, RAN1 thinks the following RAN1 agreements are relevant to the discussion:

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| **Agreement**Support at least the following mechanism to mitigate the impact of synchronization errors between anchor UEs for SL-TDoA based measurement* Exchange of synchronization information of anchor UEs between a UE and LMF or another UE.
* FFS detailed synchronization information. E.g: synchronization source, relative time difference (RTD), synchronization quality information
* FFS other mechanisms

AgreementSupport to include the following in the exchanged synchronization information of anchor UEs between a UE and LMF or another UE:The synchronization source type (GNSS, gNB/eNB, and UE) of anchor UEs, AgreementUpdate previous agreement on synchronization information exchange with the following modification:

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| To mitigate the impact of synchronization errors between anchor UEs for SL-PRS based measurement, the exchanged synchronization information of anchor UEs between a UE and LMF or another UE includes the following:* The synchronization source type (GNSS, gNB/eNB, and UE) of anchor UEs,
	+ ~~[If the synchronization source of an anchor UE is SyncRef UE, the anchor UE can optionally indicate the coverage status and synchronization connection status (whether the SyncRef UE is directly or indirectly synchronized to GNSS/gNB, or other SyncRef UE) of the SyncRef UE]~~
	+ If the synchronization source of an anchor UE is gNB/eNB, the anchor UE can further provide cell identity information
* ~~[Synchronization quality/accuracy information]~~
* The RTD between anchor UEs
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**Agreement**For definition of SL-PRS based Rx-Tx measurement, the actual SL-PRS transmission time is used for the definition of SL-PRS based Rx-Tx time difference measurement if the UE optionally reports the Tx time information, otherwise use the Rel-16/17 definition for gNB Rx-Tx time difference/UE Rx-Tx time difference in Uu.* FFS: details of the Tx time information
* FFS: whether additionally the network or LMF can request the UE to report the Tx time information

Note: the value of Rx-Tx measurement is within [-0.5 0.5] msAgreementFor SL-PRS based Rx-Tx measurement, the Tx time information in the measurement report is the associated SL-PRS transmission timestamp.AgreementRegarding the time stamp information in measurement report, support the following:* For the timestamp of SFN and slot number, at least one of nr-PhysCellID, nr-ARFCN, nr-CellGlobalID is included.
* For the timestamp of DFN and slot number, the synchronization reference source indication ‘GNSS or UE’ can be optionally included.

Note: The number of SL-PRS symbols is not signalled in the SL positioning measurement report. |

### First round

Please provide feedback on whether including the RAN1 agreements to the LS response is necessary, as well as further wording revision:

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| **Company** | **Comment** |
| Huawei, HiSilicon | Regarding the response, can we just delete the first sub-bullet? The reason is it might cause confusion since providing sync source as the currently available mechanism can also be used to reflect the change by reporting the sync source again once changed. RAN1 thanks RAN4 for the LS. RAN1 has discussed this matter, and has the following response:* ~~RAN1 has not introduced and is not working on any solutions to inform an SL UE performing an SL positioning measurement (e.g., SL RSTD, SL Rx-Tx, and SL RTOA) about synchronization reference source change at a UE which is transmitting SL-PRS for the measurement.~~
* Beyond the methods currently available, RAN1 does not intend to introduce any specific solutions for Rel-18 to inform a measuring UE of changes to synchronization source for a transmitting anchor UE and would like to confirm that RAN4’s agreement is reasonable from RAN1’s perspective.
* This does not preclude other RAN group to introduce such signalling.

RAN1’s agreement can be attached for RAN2’s reference. |
| Qualcomm | We support the FL proposal, without the statement, „Beyond the methods currently available“. With regards to HW’s comment, RAN4 is asking directly whether we have introduced a solution for the problem at hand. Yes indeed, a Rx UE can get the sync-source info from a Tx UE, and if it gets that information multiple times back-to-back, then maybe the Rx UE might be able to compare the consecutive messages and determine whether there is a change or not. However, this is not a specification solution/mechanism that has been introduced for this purpose, nor has been discussed, or evaluated whether it works.  |

# Conclusion