**3GPP TSG RAN WG1 Meeting #114 R1-230xxxx**

Toulouse, France, August 21 – 25, 2023

**Agenda item: 9.17**

**Source: Nokia, Nokia Shanghai Bell**

**Title: Summary on email discussion on** **NR Enhanced Positioning**

**Document for: Discussion and Decision**

# 1 Introduction

This thread will discuss the draft CR to 38.214 for the NR Enhanced Positioning.

First checkpoint for this discussion: **September 5, 6:00 UTC**!

# 2 Discussion – first round

The comments in this section are based on version 0 of the the draft CR available in the **Post RAN1#114 discussion.**

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| Company | Comments | Editor reply/Notes |
| Intel | * **Comment #1**

In subclause 5.1.6.5, the RSCP and RSCPD need to be swapped as indicated below:

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| When the UE reports DL RSCPD measurement(s) along with DL RSTD measurement(s) or DL RSCP measurement(s) along with UE Rx-Tx time difference measurement(s), the DL RSCPD and/or DL RSCP measurement(s) should be measured from a single DL PRS positioning frequency layer.  |

* **Comment #2**

In subclause 5.1.6.5, suggest that the following sentence be removed – as discussed as part of review of draft CR for 38.215, it can be captured in RAN4 specs.

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| The UE is not expected to obtain more than 1 DL RSCP or DL RSCPD measurement sample in a single measurement instance. |

* **Comment #3**

In subclause 5.1.6.5, for the following sentence, suggest to add “subject to UE capability” as per the agreement

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| When the UE reports a timestamp associated with a DL RSCP measurement or a DL RSCPD measurement, subject to UE capability, it may include a symbol index in the timestamp. |

* **Comment #4**

In subclause 6.2.1.4, For the following suggest couple of updates indicated below for improved readability.

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| The reduced capability UE transmit frequency hopping is configured within one SRS resource for positioning that may be configured with a bandwidth larger than the maximum bandwidth of the reduced capability UE, in RRC\_CONNECTED or RRC\_INACTIVE mode. The reduced capability UE transmit frequency hopping may be configured with overlapping or non-overlapping frequency hops in the frequency domain. When the reduced capability UE is configured to perform transmit frequency hopping it expects to be configured via [higher layer parameter] with the starting PRB of the first frequency hop. |

* **Comment #5**

Option 1 in the following agreement needs to be captured in Clause 6.2.1.4. **Agreement**With regard to aperiodic positioning SRS for bandwidth aggregation for UEs in RRC\_CONNECTED state, support both Option 2 and Option1.* Option 2: Support to use a DCI format 0\_3 or 1\_3 for multi-cell PDSCH/PUSCH scheduling to trigger SRS resources for bandwidth aggregation in multiple CCs.
* Option 1: Support a Rel-17 single DCI scheduling positioning SRS resource sets across the linked carriers, as a separate UE capability.
	+ Reuse Rel-17 DCI framework without modification.
	+ If a single DCI indicates transmission of an aperiodic positioning SRS resource set, UE transmits aperiodic positioning SRS resource sets across all linked carriers for bandwidth aggregation.
* **Comment #6**

Based on the agreement, if SRS in one of aggregated carriers is dropped in a symbol, UE will drop SRS transmission in other CCs. The following highlighted text may need to be updated as “if an SRS transmission in one of the CC is dropped” as it is not always the case that UE will drop SRS transmission (e.g., for A-SRS transmission for positioning) if SRS collides with other signals/channels.

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| For the linked SRS resource sets for bandwidth aggregation across CCs, if an SRS configured by the higher layer parameter SRS-PosResource collides with other signals or channels on a symbol, SRS transmission of the linked SRS resource sets across all CCs is dropped on that symbol. |

* **Comment #7**

In subclause 8.2.4.1.1, we suggest to remove “For comb sizes of 1, 2, 4” in the last bullet as there is no such restriction for TDM’ed multiplexing between PSSCH and SL PRS. Adding it would be redundant since only comb sizes of 1, 2, 4 are supported for SL PRS in shared resource pool. In addition, based on the following working assumption, SL PRS is transmitted in the last M consecutive symbols considering all other restrictions including PSFCH. Lastly, we also suggest to add a placeholder after “in parameter” in the first bullet similar to what is currently captured for dedicated resource pool.

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| - the UE shall transmit SL PRS only after the last symbol with second stage SCI .- For a given value of ‘M’, SL PRS resource is mapped to the last consecutive ‘M’ SL symbols in the slot that meet the other restrictions- For comb sizes of 1, 2, 4, the UE shall not transmit PSSCH and SL PRS in the same symbol.]For a shared resource pool, the UE shall not transmit SL PRS in symbols where PSFCH is transmitted. |

We suggest to update the above text as follows:

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| - the number of contiguous symbols for SL PRS transmission, ‘M’, shall correspond to one of the SL PRS resources in parameter [TODO]~~.~~- the UE shall not transmit SL PRS in symbols where associated PSCCH is transmitted- the UE shall not transmit SL PRS and PSSCH DMRS in the same symbol~~.~~- the UE shall transmit SL PRS only after the last symbol with second stage SCI~~.~~- the UE shall not transmit SL PRS in symbols where PSFCH is transmitted-~~- For comb sizes of 1, 2, 4,~~ the UE shall not transmit PSSCH and SL PRS in the same symbol- ~~F~~for a given value of ‘M’, SL PRS resource is mapped to the last consecutive ‘M’ SL symbols in the slot that meet the other restrictions.~~- - For comb sizes of 1, 2, 4, the UE shall not transmit PSSCH and SL PRS in the same symbol.]~~~~For a shared resource pool, the UE shall not transmit SL PRS in symbols where PSFCH is transmitted.~~ |

**Working assumption**For a shared resource pool,* Explicit (pre-)configuration of SL PRS resources in a slot, applicable for an indicated frequency domain allocation, includes:
	+ SL PRS Resource ID, (M, N) pattern, comb offset.
* For a given value of ‘M’, SL PRS resource is mapped to the last consecutive ‘M’ SL symbols in the slot that can be used for SL PRS, i.e., taking into consideration multiplexing with PSSCH DMRS, PT-RS, CSI-RS, PSFCH, gap symbols, AGC symbols, PSCCH in the slot
* The maximum number of SL PRS resources in a slot of a shared resource pool that can be (pre-)configured is FFS.
* **Comment #8**

It is not clear the meaning of “within parameter”. We suggest to add a placeholder for the higher layer parameter as done elsewhere “that is provided by [*higher-layer-parameter*]”.

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| The first SL PRS resource is determined according to the sub-channel used for the PSCCH transmission containing the associated SCI format 1-B: The index of the sub-channel in the resource pool is identical to the index of the SL PRS resource ~~within parameter~~ that is provided by [*higher-layer-parameter*]. |

* **Comment #9**

It appears that the following agreements are not captured in 211 or 214 and we think 214 would be the right place for these.

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| **Agreement**At least for dedicated SL PRS resource pools, in addition to already-agreed (M, N) = (2, 2), (4, 4), fully staggered pattern with (M, N) = (6, 6) is supported. * FFS: Other values of (M, N).
* FFS: Applicability to shared resource pools.

AgreementFor a dedicated resource pool, the maximum number of TDM groups for TDM-based multiplexing of SL PRS within a slot is 4.* Maximum number 4 only applies to the case of comb-2

AgreementFor SL PRS in a dedicated or shared resource pool, for a given valid comb size ‘N’, partially staggered SL PRS patterns (M, N) are supported for all integer values of ‘M’ such that (M, N) = (1, 2) or (2, 4). |

* **Comment #10**

In section 8.2.4.1.1, suggest the following modification, otherwise it looks inaccurate:* A UE does not transmit on multiple SL PRS resources in the same slot
* **Comment #11**

In section 8.2.4.1.1, there is a typo “asubject” -> “subject” which is visible when markups are switched off:* For a dedicated resource pool, UE shall transmit SL PRS ~~a~~subject to the following restrictions:
* **Comment #12**

In section 8.2.4.1.2, the second sentence is not completely accurate since there is no definition of FDRA of a resource pool. Suggest the following modification:For a dedicated resource pool, the frequency domain resource assignment of a SL PRS resource is same as frequency resources of a resource pool ~~the same as the resource pool~~ | #1: Implemented#2: Adding square brackets for now, and let’s hear more views!#3: OK#4: Implemented#5: waiting for more views.#6: Ok.#7: it was captured based on the agreement. It is a part of square bracket, so I would suggest waiting for more views.#ok#9 suggesting to implement this in 38.211#10 implemented#11 implemented#12 OK |
| ZTE | **Comment 1: for RedCap**For RedCap, PRS Rx hopping in RRC\_INACTIVE and RRC\_IDLE have been supported. The measurement gap is only applicable for RRC\_CONNECTED state.

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| AgreementPRS Rx frequency hopping for RRC\_INACTIVE state and for RRC\_IDLE state is supported for a RedCap UE. |

Here is our suggestion:---------------------------The reduced capability UE may be configured to measure and report, subject to UE capability, via [higher layer parameter] the DL RSTD, DL PRS-RSRP, DL PRS-RSRPP, or UE Rx-Tx time difference using receiver frequency hopping for a DL PRS resource, with bandwidth that may be greater than the maximum reduced capability UE bandwidth. The reduced capability UE performing receiver frequency hopping may be configured to report via [*higher layer parameter*] one measurement associated with one received frequency hop or one measurement based on multiple hops of the DL PRS. In RRC\_CONNECTED state, the reduced capability UE is expected to use a single instance of a configured measurement gap to receive all hops of the DL PRS using receiver frequency hopping. **Comment2: for CPP**RSCPD should be reported along with RSTD. Also, it should be either one of RSCP and RSCPD, rather than both of them.Here is our suggestion:---------------------------When the UE reports DL RSCPD measurement(s) along with DL RSTD measurement(s) or DL RSCP measurement(s) along with UE Rx-Tx time difference measurement(s), the DL RSCP or DL RSCPD measurement(s) should be measured from a single DL PRS positioning frequency layer.**Comment 3: for CPP**In Rel-17 specification, Nsample can be 1 or 2 as shown in 38.214 as follows.

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| Rel-17 38.214The UE may be requested, subject to UE capability, to measure and report one or more of the DL RSTD, DL PRS-RSRP, DL PRS-RSRPP, or UE Rx-Tx time difference measurements with either or 4 samples, where  = 1 or 2 is as defined in [11, TS 38.133], via higher layer parameter *reducedDL-PRS-ProcessingSamples* [17, TS 37.355] which applies for all DL PRS positioning frequency layers. |

For CPP in Rel-18, Nsample can only be 1 as shown in the following agreement.

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| AgreementEach DL RSCP/RSCPD measurement instance is obtained with sample only. |

We think the similar wording should be used. Here is our suggestion:---------------------------The UE, subject to UE capability, may be requested via [higher layer parameter] to perform DL RSCP or DL RSCPD measurements on indicated DL PRS resource sets occurring within one or more time window(s) indicated by [*higher layer parameter*]. The UE is expected to obtain DL RSCP or DL RSCPD measurement with = 1 as defined in [11, TS 38.133].**Comment 4: for BW aggregation**The following description is not aligned with the agreement. When positioning SRS collides with other signal which has low priority, the SRS is not dropped. The agreement is for the case when positioning SRS in one CC has lower priority than other signals and dropped.Here is our suggestion:-------------------------------For the linked SRS resource sets for bandwidth aggregation across CCs, if an SRS configured by the higher layer parameter *SRS-PosResource* collides with other signals or channels on a symbol and is the SRS in that symbol is dropped, SRS transmission of the linked SRS resource sets across all CCs is dropped on that symbol**Comment 5: for BW aggregation**As Intel commented, Option 1 in the following agreement needs to be captured in Clause 6.2.1.4.

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| Option 1 in the following agreement needs to be captured in Clause 6.2.1.4. **Agreement**With regard to aperiodic positioning SRS for bandwidth aggregation for UEs in RRC\_CONNECTED state, support both Option 2 and Option1.* Option 2: Support to use a DCI format 0\_3 or 1\_3 for multi-cell PDSCH/PUSCH scheduling to trigger SRS resources for bandwidth aggregation in multiple CCs.
* Option 1: Support a Rel-17 single DCI scheduling positioning SRS resource sets across the linked carriers, as a separate UE capability.
	+ Reuse Rel-17 DCI framework without modification.
	+ If a single DCI indicates transmission of an aperiodic positioning SRS resource set, UE transmits aperiodic positioning SRS resource sets across all linked carriers for bandwidth aggregation.
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**Comment 6: for SL**With regard to the following agreement, the report should be for all already transmitted SL PRS resources. The wording can refer to the description for SRS Tx TEG ID reporting

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| **Agreement(RAN1#114)**For location calculation, the ARP ID of SL PRS transmission can be informed to another UE or LMF by Tx UE informing the association between ARP ID and the already transmitted SL PRS resource(s) as assistance data.38.214 Rel-17 SRS Tx TEG ID: the UE shall report the association information of the already transmitted SRS resources configured by the higher layer parameter *SRS-PosResource* with the UE Tx TEG ID |

Here is our suggestion:-------------------------------The UE may report the association information of the already transmitted SL PRS resources with UE Tx ARP ID as assistance data.**Comment 7: for SL**There is no agreement that DCI format 3\_0 is reused for shared pool. We think it is still FFS whether DCI 3\_0 or DCI 3\_2 should be used. Hence, we suggest put the following sentence in bracket.----------------[In sidelink resource allocation mode 1 for a shared resource pool, the time domain behaviour for sidelink dynamic grants and sidelink configured grants for SL PRS follows the behaviour in clause 8.1.2.1.]**Comment 8: for SL**Both Rx and Tx timestamp may be reported based on the agreement in which Tx timestamp may be optional. ------------------For the SL RSTD, SL Rx-Tx time difference, SL RTOA, SL AoA, SL PRS-RSRP, and SL PRS-RSRPP measurements, the UE may report an associated timestamp via higher layer parameter [*sl-prs-time-stamp*], where the timestamp can be associated with a SL PRS reception time and may optionally further be assoicated with a SL PRS transmission time. The timestamp includes the SFN, slot number, and optionally *nr-PhysCellID*, *nr-ARFCN*, *nr-CellGlobalID*, or the timestamp includes DFN and slot number.  | #1 implemented#2 implemented#3: partially implanted considering comment#2 from Intel.#4 implemented#5 waiting for more views!#6: partially implemented. (without “assistance data”#7: partially implemented.#8: please see response to vivo (comment 7-2). |
| Sharp | * **Comment #1, on 8.2.4.1.1:**

On the first bullet for shared RP, we suggest the following editorial changes (there is no need to mention the parameter(s)),

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| - the number of contiguous symbols for SL PRS transmission, ‘M’, shall correspond to one of the SL PRS resources configured in the slot. |

* **Comment #2, on 8.2.4.1.1:**

On the third bullet for shared RP, it is more accurate to use the same wording as the previous (i.e. 2nd) bullet, which makes it clear that PSSCH DMRS is first mapped, and SL PRS should avoid mapping to symbols already used by PSSCH DMRS,

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| - the UE shall not transmit SL PRS in symbols where PSSCH DMRS is transmitted. |

* **Comment #3, on 8.2.4.1.1:**

On shared RP, the RAN1 working assumption also mentions PT-RS, SL CSI-RS, AGC and GAP. It is unclear why these were not captured by the Editor.* **Comment #4, on 8.2.4.1.1:**

On the last bullet for shared RP,

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| - For comb sizes of 1, 2, 4, the UE shall not transmit PSSCH and SL PRS in the same symbol. |

Since the UE shall determine symbols for SL PRS prior to determining symbols for PSSCH, this bullet should actually be moved to 8.1.2.1 (i.e. for determining symbols for PSSCH, symbols for SL PRS shall be excluded; it is NOT feasible to do it the other way around, i.e. “exclude symbols for PSSCH when determining symbols for SL PRS”).(And agree with Intel that there is no need to mention “comb sizes of 1, 2, 4” because those are all the comb sizes supported for a shared RP)* **Comment #5, on 8.2.4.1.1:**

On the second bullet for dedicated RP, same suggestion as in Comment #1.

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| - the number of contiguous symbols and the starting symbol for SL PRS transmission shall correspond to one of the SL PRS resources configured in the slot. |

* **Comment #6, on 8.2.4.1.1:**

On the last two paragraphs, there has not been any RAN1 agreement on the actual DCI format(s) for scheduling SL PRS. At least the sentence ““DCI format 3\_0” is replaced by “DCI format 3\_2”” should be removed, and the two paragraphs should be put around brackets.* **Comment #7, on 8.2.4.2:**

On “SL PRS/PSCCH transmission”, unlike in SL communications where a reported “resource” is really used for both PSSCH and PSCCH transmissions (hence the term “PSSCH/PSCCH” in legacy spec being reasonable), in a dedicated RP, the UE reports a subset of SL PRS resources, each corresponding to a SL PRS transmission (see the definition of a candidate single-slot resource in the draft CR), so “SL PRS transmission” should instead be used.* **Comment #8, on 8.2.4.X:**

On the first sentence, the following change is proposed (because each SL PRS resource correspond to a SL PRS transmission)

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| The set of slots and SL PRS resources for SL PRS transmissions is determined by the resource used for the PSCCH transmission containing the associated SCI format 1-B |

 | #1. Not acceptable. Suggest to keep the current text. Once the parameter name is known it'll be inserted here, which will result in a more usable spec than just saying "configured" without reference to the parameter used for configuring it.2. Don’t see the necessity to change for now.#3. Suggest waiting for a more clear agreement to draft relevant text.#4: Implemented#5 Not acceptable. Suggest to keep the current text. Once the parameter name is known it'll be inserted here, which will result in a more usable spec than just saying "configured" without reference to the parameter used for configuring it.#6: A square bracket is added now.#7. Added square bracket for now.#8 ok. |
| xiaomi | **Comment 1: In all the section 8.**The terminologies for SL PRS resource allocation is “Scheme 1” and “Scheme 2”, which are not “mode 1” and “mode 2” in SL communication, so whether we need to differentiate the terminology for these two cases may need to be clarified.**Comment 2: In section 8.1**The last two bullets of the below working assumption may need to be reflected.

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| Working assumptionThe number of bits in the embedded SCI format field of SCI format 2-D is 2 bits* If the “Embedded SCI format” field is set to 00, the SCI 2-A fields are included with necessary padding
* If the “Embedded SCI format” field is set to 01, the SCI 2-B fields are included
* If the “Embedded SCI format” field is set to 10, “size of SCI 2-B” number of reserved bits are included
* If the “Embedded SCI format” field is set to 11, “size of SCI 2-B” number of reserved bits are included
* Note: the size of SCI format 2-D is the same regardless of the value of the embedded SCI format field
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**Comment 3: In section 8.2.4**“SL PRS frequency domain allocation” is only need for a shared resource pool.

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| - [*SL PRS frequency domain allocation*] indicates the frequency location [and the number of resource blocks for SL PRS transmission in a shared resource pool.] |

**Comment 4, on 8.2.4.1.1:**On the first bullet for shared RP, we agree with Sharp’s view that “in parameter” is confusing and no need to mention the parameter and propose an “at least”. Besides, The description for DMRS symbols should align with the description for PSFCH symbols, and it is better to put them in the same level.

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| For a shared resource pool, the UE transmits the SL PRS in PSSCH symbols according to clause 8.1.2.1, [with the following restrictions:- the number of contiguous symbols for SL PRS transmission, ‘M’, shall correspond to at least one of the SL PRS resources configured in the slot.- the UE shall not transmit SL PRS in symbols where associated PSCCH is transmitted- The UE shall not transmit SL PRS in symbols where PSSCH DMRS is transmitted.- the UE shall not transmit SL PRS in symbols where PSFCH is transmitted.- the UE shall transmit SL PRS only after the last symbol with second stage SCI.- For a given value of ‘M’, SL PRS resource is mapped to the last consecutive ‘M’ SL symbols in the slot that meet the other restrictions- For comb sizes of 1, 2, 4, the UE shall not transmit PSSCH and SL PRS in the same symbol.] |

And also, a brackets should be added for DCI format 3\_2 because RAN1 needs to further decide whether a new DCI format should be introduced or reuse the legacy one.

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| * [“DCI format 3\_0” is replaced by “DCI format 3\_2”.]
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**Comment 5, on 8.2.4.1.2:**

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| For a shared resource pool, the frequency domain resource assignment of a SL PRS resource is the same as PSSCH transmission by the same UE in the same slot. |

**Comment 6, on 8.2.4.2:**We proposal the following modification to make the description clearer:

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| The UE shall perform this procedure according to clause 8.1.4, with the following modifications:* Partial sensing is not applicable in a dedicated SL PRS resource pool;
* A candidate single-slot resource for transmission is defined as the SL PRS resource with index ,which shall belong to the Set of SL-PRS resource ID(s) provided by the higher layer and in slot
* “SCI format 1-A” is replaced by “SCI format 1-B”,
* In step 5 TODO
* In condition b of step 6, the RSRP measurement is the PSCCH DMRS-RSRP;
* In condition c of step 6 “determines according to clause 8.1.5 the set of resource blocks and slots” is replaced by “determines according to clause 8.2.4.X the set of slots and SL PRS resources”;
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**Comment 7, on 8.2.4.X:**For clarification, we propose the following modifications:

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| If [*sl-MaxNumPerReserve]* is 2 then the index of the SLPRS resource in the second scheduling SL slot is indicated by the field [Resource ID indication].[ If [*sl-MaxNumPerReserve]* is3 then the index of the SL PRS resource in the second/third scheduling SL slot is indicated by the field [ Resource ID indication].] |

 | #1. Not acceptable.Mode 1/scheme1, and mode 2/scheme 2 are so similar that there seems no point in using separate terminology. Moreover "scheme 1/scheme 2" may create confusion with IUC schemes.#2. Wait for more views on this.#3. Implemented#4. The second part is implemented.#5: not ok#6: partially implemented. #7: not ok. The current text is still clear. |
| LGE | Comment 1:We suggest to remove “in PSSCH symbols” in the following sentence in Section 8.2.4.1.1, because it is contradictory to the other sentence highlighted below.8.2.4.1.1 Resource allocation in time domainFor a shared resource pool, the UE transmits the SL PRS ~~in PSSCH symbols~~ according to clause 8.1.2.1, [with the following restrictions:* For comb sizes of 1, 2, 4, the UE shall not transmit PSSCH and SL PRS in the same symbol.]

Comment 2:We suggest to capture the following agreements.**Agreement**Multiple (M,N) pairs within a slot in a dedicated resource pool is supported only when the different (M, N) pairs are always multiplexed via TDM to different sets of symbols in a slot. Only a single (M,N) value can be mapped within one TDM duration (i.e. one set of symbols).Recommended text is as follows.In a dedicated resource pool, only a single {M, N} value can be mapped within one TDM duration in a slot, where M is the number of SL PRS symbols and N is the comb size. Different {M, N} values across different TDM duration can be mapped.Comment 3:We suggest the following clarification on the current text in Section 8.2.4.1.2, according to the following conclusion.For a dedicated resource pool, the ~~frequency domain resource assignment~~ bandwidth of a SL PRS resource is the same as that of the resource pool.**Conclusion**For a dedicated resource pool, only the case where SL PRS bandwidth is the same as resource pool bandwidth is supported in Rel-18.Comment 4:SL PRS resource can be only a part of a slot. To make the sentence clear in that point, we suggest the following clarification in the current text in Section 8.2.4.2.A candidate single-slot resource for transmission is ~~defined as~~ replaced by the SL PRS resource with index within the Set of SL-PRS resource ID(s) provided by the higher layer and in slot  | Comment #1/#2/#3/#4#2 not captured for now.#3. It would be better to keep the "frequency domain resource assignment" terminology, for consistency with shared resource pool.The wording proposed here would allow SL PRS to be shifted in frequency relative to the pool as long as the bandwidth is the same. See comment #12 from Intel.#4. the rationale is unclear for this change. The wording "single-slot resource" does not imply that the resource must span the whole slot, it just implies that it is confined to a single slot. |
| vivo | **Comment #0: 5.1.6.5**1. For the single sample measurement of CPP, we prefer ZTE’s modification

**Comment #1: 6.2.1.4**1. Typo:” BPW”->”BWP”

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| The reduced capability UE may be configured via [*higher layer parameter*], subject to UE capability, to perform transmit frequency hopping separate from the UL BWP configuration and outside of the UL BPW. |

**Comment 2: 8.1** The following agreement seems missing, do we need to add it in 8.1?

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| AgreementIn a shared resource pool, when PSSCH and SL-PRS are multiplexed in the same slot, they share the same source ID, destination ID, cast type fields |

**Comment #3: 8.2.4*** 1. The configuration of SL PRS resources as the following agreement is missed, and it may be needed to add in section 8.2.4

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| AgreementFor a dedicated resource pool, explicit (pre-)configuration of SL PRS resources in a slot includes:* SL PRS Resource ID, (M, N) pattern, starting symbol, comb offset.
* FFS: constraints to the (pre-)configuration to address potential AGC issues

Working assumptionFor a shared resource pool,* Explicit (pre-)configuration of SL PRS resources in a slot, applicable for an indicated frequency domain allocation, includes:
	+ SL PRS Resource ID, (M, N) pattern, comb offset.
* For a given value of ‘M’, SL PRS resource is mapped to the last consecutive ‘M’ SL symbols in the slot that can be used for SL PRS, i.e., taking into consideration multiplexing with PSSCH DMRS, PT-RS, CSI-RS, PSFCH, gap symbols, AGC symbols, PSCCH in the slot

The maximum number of SL PRS resources in a slot of a shared resource pool that can be (pre-)configured is FFS. |

* 1. Based on the agreement and considering an ARP ID can associated with multiple SL PRS resources and timestamp, we prefer to change “an SL PRS transmission of an SL PRS resource” to “the already transmitted SL PRS resource(s) “to align agreement

**Comment #4: 8.2.4.1.1*** 1. We prefer adding the following blue highlighted part as a restriction based on the agreement
* the UE shall not transmit SL PRS and PSSCH DMRS in the same symbol. And the SL PRS can be mapped to contiguous M symbols either before, between (as a working assumption), or after PSSCH DMRS symbols, and is not mapped before the first PSSCH DMRS symbol.

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| AgreementUpdate the following agreement as:* In a shared resource pool:
	+ Opt. B: SL PRS is mapped to contiguous symbols either before, between (as a working assumption), or after PSSCH DMRS symbols
		- SL PRS is not mapped before the first PSSCH DMRS symbol
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* 1. Remove blue highlighted part since no other combsize are agreed
* ~~For comb sizes of 1, 2, 4,~~ the UE shall not transmit PSSCH and SL PRS in the same symbol
	1. Based on the following agreement, we think the wording about the multiplexing with PSFCH can be changed as follows blue highlighted part.
* ~~For a shared resource pool, the UE shall not transmit SL PRS in symbols where PSFCH is transmitted~~ A SL-PRS resource and PSFCH (including the preceding gap symbol) are not mapped on the same symbols

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| AgreementSupport the following for SL-PRS multiplexing/collision with the following channels:* A SL-PRS resource and PSFCH (including the preceding gap symbol) are not mapped on the same symbols
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* 1. Add the following blue highlighted part as a restriction based on the agreement, and put the second restriction in the bracket since it is unclear.

- the UE shall not transmit SL PRS and associated PSCCH in the same symbol;- [the number of contiguous symbols and the starting symbol for SL PRS transmission shall correspond to one of the SL PRS resources in parameter [TODO]].* Only a single (M,N) value can be mapped if Multiple (M,N) pairs within a slot is not supported one TDM duration
* If Multiple (M,N) pairs within a slot is supported in a dedicated resource pool, Only a single (M,N) value can be mapped within one TDM duration, and different (M, N) pairs are always multiplexed via TDM to different sets of symbols in a slot

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| **Agreement**Multiple (M,N) pairs within a slot in a dedicated resource pool is supported only when the different (M, N) pairs are always multiplexed via TDM to different sets of symbols in a slot. Only a single (M,N) value can be mapped within one TDM duration (i.e. one set of symbols). |

* 1. For sidelink resource allocation mode 1 for a dedicated resource pool, the PSSCH in 8.1.2.1 should be changed to SL PRS by adding new bullets as following
* “PSSCH” is replaced by “SL PRS”

**Comment# 5 8.2.4.1.2 resource allocation in frequency domain*** 1. In section 8.1.2.2, the section also specifies how to determine the frequency information and PSCCH, so we propose adding the blue highlighted part.

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| For a shared resource pool, the frequency domain resource assignment of a SL PRS resource is the same as PSSCH in the same slot and is determined using the "Frequency resource assignment" field in the associated SCI.For a dedicated resource pool, the frequency domain resource assignment of a SL PRS resource is the same as the resource pool and is determined by the [high layer parameter].  |

**Comment #6 8.2.4.X**For the parameter “” , we would like to confirm with the majority whether the parameter needs to be reused and its benefit. **Comment#7 8.4.4**1. Refer to section 8.3, we prefer to add the following highlighted part in 8.4.4

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| For sidelink resource allocation scheme 1 and scheme 2, a UE upon detection of SCI format 1-A on PSCCH can decode PSSCH and measure SL PRS according to the detected SCI formats 2-D, and associated PSSCH resource and SL PRS resource configuration configured by higher layers. The UE is not required to decode more than one PSCCH at each PSCCH resource candidate.For sidelink resource allocation scheme 1 and scheme 2, a UE upon detection of SCI format 1-B on PSCCH can measure associated SL PRS resource according to the detected SCI format 1-B, and associated SL PRS resource configuration configured by higher layers. The UE is not required to decode more than one PSCCH at each PSCCH resource candidate. |

1. For the Tx time stamp, it can only be associated with Rx-Tx measurement, and a separate description is needed. In addition, considering that the timestamp of SL PRS reception is mandatory, the use of ‘may’ should be deleted. So, we prefer

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| For the SL RSTD, SL Rx-Tx time difference, SL RTOA, SL AoA, SL PRS-RSRP, and SL PRS-RSRPP measurements, the UE ~~may~~ reports an associated SL PRS reception timestamp via higher layer parameter [*sl-prs-time-stamp*]. For SL Rx-Tx time difference, the UE may report an associated SL PRS transimission timestamp via higher layer parameter [*sl-prs-time-stamp*]. The timestamp includes the SFN, slot number, and optionally *nr-PhysCellID*, *nr-ARFCN*, *nr-CellGlobalID*, or the timestamp includes DFN and slot number.  |

 | #0: implemented.#1: implemented#2 : Wait for more comments. it is unclear if TS 38.214 needs capture this for now.1. Not captured for now, we can wait to get the WA confirmed.

#3.2: implemented.#4.1: would suggest drafting until the WA is confirmed.4.2: OK4.3 OK4.4 Suggest further clarification on the suggestion. 4.5 okay but I am not 100% sure which clause you intended. Please give further clarification. 5.1 not acceptable. The additional part looks redundant. For the first one, existing spec already explains how to determine the PSSCH f-allocation.For the second one, the spec already explains how to determine the frequency domain aspects of a resource pool.6. Suggest more views on this. If we don't reuse C\_resel then more work will be required.7.1 Wait for further views for now. In 8.3, we may need to add SCI format 2-D. But for the SL PRS measurement aspects, I think they would fit better under clause 8.4 (UE procedure for receiving reference signals), since, especially in dedicated pool, there is no PSSCH at all, so putting this into a clause titled "UE procedure for receiving the physical SL shared Channel" seems confusing.#7-2: implemented. |
| OPPO | 1. Seems placeholders are missing

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| - the number of contiguous symbols for SL PRS transmission, ‘M’, shall correspond to one of the SL PRS resources in parameter [TODO]. |

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| The first SL PRS resource is determined according to the sub-channel used for the PSCCH transmission containing the associated SCI format 1-B: The index of the sub-channel in the resource pool is identical to the index of the SL PRS resource within parameter [TODO]. |

2. propose to add “all” for clarity.

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| For a given value of ‘M’, SL PRS resource is mapped to the last consecutive ‘M’ SL symbols in the slot that meet all the other restrictions. |

3. A typo:

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| *- [sl-TxPercentageLis]~~t~~*: internal parameter for a given is defined as *sl-TxPercentageList ()* converted from percentage to ratio |

4. There is no agreement to change legacy step 5 for SL PRS resource selection.

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| The UE shall perform this procedure according to clause 8.1.4, with the following modifications:* Partial sensing is not applicable in a dedicated SL PRS resource pool;
* A candidate single-slot resource for transmission is defined as the SL PRS resource with index within the Set of SL-PRS resource ID(s) provided by the higher layer and in slot
* “SCI format 1-A” is replaced by “SCI format 1-B”,
* In condition b of step 6, the RSRP measurement is the PSCCH-RSRP;
* In condition c of step 6 “determines according to clause 8.1.5 the set of resource blocks and slots” is replaced by “determines according to clause 8.2.4.X the set of slots and SL PRS resources”;
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5. Share similar view as vivo, the following agreement should be captured:AgreementIn a shared resource pool, when PSSCH and SL-PRS are multiplexed in the same slot, they share the same source ID, destination ID, cast type fields. | #1 if you refer to [TODO] indeed, these are some placeholder for a future iteration, delated for nwo to avoid confusion but let [].#2 ok#3 fixed#4 ok#5 will happen in a future iteration |
| CMCC | **Comment 1: On 5.1.6.5 CPP**For the single sample measurement, we share similar views as ZTE that it should be kept in 38.214.**Comment 2: On 5.1.6.5 CPP**The agreement is to support LMF forwarding carrier phase measurement reported by a PRU and its associated location information:

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| **Agreement**For UE-based carrier phase positioning, support enabling LMF to forward the DL carrier phase measurement reported by a PRU, with additional information of the same PRU to a target UE for UE-based carrier phase positioning in the positioning assistance data.* Note: Whether the forwarded DL carrier phase measurement is DL RSCP and/or DL RSCPD depends at least on which of them is (are) supported by UE capability.
* additional information of the same PRU includes at least PRU location.
	+ FFS: additional PRU information, e.g. the AoD of PRU to each TRP, etc.
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We think that “may be provided” is more appropriate than “may be configured”:The UE may be provided~~configured~~ with [higher layer parameter] which contains DL carrier phase measurements performed by a positioning reference unit (PRU) [20, TS 38.305] along with the location information of the PRU.**Comment 3: On 6.2.1.4 RedCap UE POS**We think that the sub-bullet of this agreement should also be captured in the spec:

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| Agreement(RAN1#114)SRS for positioning with Tx hopping can be configured outside of the active UL BWP* The configuration may include SCS, CP size and bandwidth (position and size), which can use a SCS, CP size and bandwidth different from the UL active BWP
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Suggested changes:The reduced capability UE may be configured via [*higher layer parameter*], subject to UE capability, to perform transmit frequency hopping separate from the UL BWP configuration and outside of the UL BWP, where the UE may be configured with subcarrier spacing, CP and bandwidth that are different from the UL active BWP.**Comment 4: On 6.2.1.4 BW aggregation**The agreement says that in RRC\_CONNECTED mode, when SRS in one of the aggregated CCs is dropped, then stop SRS transmission in all aggregated CCs in the same symbol.

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| AgreementIn RRC\_CONNECTED state, for positioning SRS aggregation across CCs, if SRS in one of aggregated carriers is dropped in a symbol, stop SRS transmission in all aggregated carriers in the same symbol |

Based on the current spec in 214, SRS collides with other signals/channels does not equal to the operation of dropping SRS, at last when AP-SRS collides with PUCCH carrying P/SP CSI reports or P/SP L1-RSRP/L1-SINR reports only:“For PUCCH and SRS on the same carrier, a UE shall not transmit SRS when semi-persistent or periodic SRS is configured in the same symbol(s) with PUCCH carrying only CSI report(s), or only L1-RSRP report(s), or only L1-SINR report(s). A UE shall not transmit SRS when semi-persistent or periodic SRS is configured or aperiodic SRS is triggered to be transmitted in the same symbol(s) with PUCCH carrying HARQ-ACK, link recovery request (as defined in clause 9.2.4 of [6, 38.213]) and/or SR. In the case that SRS is not transmitted due to overlap with PUCCH, only the SRS symbol(s) that overlap with PUCCH symbol(s) are dropped. PUCCH shall not be transmitted when aperiodic SRS is triggered to be transmitted to overlap in the same symbol with PUCCH carrying semi-persistent/periodic CSI report(s) or semi-persistent/periodic L1-RSRP report(s) only, or only L1-SINR report(s). ”In addition, we also have agreed the following prioritization rule for linked SRS in RRC\_INACTIVE state:

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| **Agreement**For positioning SRS aggregation transmission in RRC\_INACTIVE state, reuse Rel-17 prioritization rule of SRS outside initial BWP, i.e. SRS is dropped in the symbol(s) of all aggregated carriers where collision occurs. |

Therefore, we suggest the following changes:For the linked SRS resource sets for bandwidth aggregation across CCs, in RRC\_CONNECTED mode, if an SRS configured by the higher layer parameter *SRS-PosResource* in one CC is dropped on a symbol, SRS transmission of the linked SRS resource sets across all CCs is dropped on that symbol. In RRC\_INACTIVE mode, SRS transmission of the linked SRS resource sets across all CCs is dropped in the symbol(s) where the collision occurs. | #1. Ok#2 not something to worry for now, kept configured for now.#3 can be captured in a future round especially that it seems we have no RRC parameter in place either. #4 some edits exist in the area. |
| Huawei, HiSilicon | **Comment 1:**The measurement window is no longer limited to RSCP/RSCPD only, which can be applicable to other measurements as well.We suggest the following text change in 5.1.6.5.The UE is not expected to obtain more than 1 DL RSCP or DL RSCPD measurement sample in a single measurement instance.The UE, subject to UE capability, may be requested via [higher layer parameter] to perform DL PRS measurements on indicated DL PRS resource sets occurring within one or more time window(s) indicated by [*higher layer parameter*].**Comment 2:**According to the discussion during higher layer parameter, we think that either a Boolean indicator or the PRS resource set IDs can be used to indicate joint processing.We suggest the following text change in 5.1.6.5.The UE may report via higher layer parameter [*positioning frequency layer aggregation information*], which indicates if bandwidth aggregation is performed or via PRS resource set IDs, which indicates which two or three DL PRS positioning frequency layers are used for the joint DL RSTD measurement(s) and the joint UE Rx-Tx time difference measurement(s). **Comment 3:**For the dropping of SRS in BW aggregation, the guard period should be considered, which is similar to the SRS carrier switching case.We suggest the following text change in 6.2.1.4.The UE is expected to be configured with linkage information [*linkage*] on SRS resource sets for positioning across two or three CCs which are linked for bandwidth aggregation. For the linked SRS resource sets, the UE is expected to be configured with the same values of *startPosition, nrofSymbols,* *periodicityAndOffset, slotOffset, alpha, p0,* subcarrier spacing, CP, and comb size, and the UE is expected to maintain phase continuity for the SRS transmission. The UE may assume that SRS resources across the linked SRS resource sets which satisfy the above conditions are linked for bandwidth aggregation, otherwise, the UE does not assume that SRS resources of the linked SRS resource sets are linked for bandwidth aggregation. For the linked SRS resource sets for bandwidth aggregation across CCs, if an SRS configured by the higher layer parameter *SRS-PosResource*, along with the [switching period] when applicable,collides with other signals or channels on a symbol, SRS transmission of the linked SRS resource sets across all CCs is dropped on that symbol.A UE in RRC\_INACTIVE mode is expected to be configured with [frequency information] on additional component carrier(s) with respective SRS configuration(s) for bandwidth aggregation.When an SRS resource configured in a CC without PUSCH or PUCCH is linked for bandwidth aggregation with an SRS resource configured in another [UL data transmission] CC for RRC\_CONNECTED mode and RRC\_INACTIVE mode, subject to UE capability, there is a [switching period] during which the UE is not expected to transmit or receive other signals or channels.**Comment 4:**The following agreement should be captured in the spec.**Agreement**In Scheme 2, with regards to the triggering of SL-PRS,* Support SL-PRS transmission triggering at the physical layer by the UE’s own higher layers
* Working assumption: Support UE-A to request UE-B to transmit SL-PRS via lower layer signaling sent by UE-A.
	+ Up to UE-B’s own higher layers to transmit SL-PRS in response to the lower layer request from UE-A
	+ FFS: Lower layer signaling corresponds to SCI, MAC-CE, or SL-PRS

For example, the corresponding UE procedure can be added to clause 8.4.4, where the UE physical layer could provide the information received from another UE to its own higher layers. | #1 I think something similar is said now but in a negated form. #2 I would not touch this text which is agreed in the previous meeting. #3 some partial implementation. As for the above, I would not change text agreed in the previous round. #4 will be reflected in a future update but I prefer to see the WA confirmed also so that we are not wasting implementation effort. |
| Qualcomm | **Comment 1:** With regards to the “associated with a dl-PRS-ID in the following: * *When the UE is expected to perform joint measurements for bandwidth aggregation across DL PRS positioning frequency layers, the UE expects to be configured with linkage information, via higher layer parameter [linkage], between DL PRS resource setss across DL PRS positioning frequency layers [associated with a dl-PRS-ID].*

We discussed this during the meeting, and the following agreement was made:AgreementSend an LS to RAN2 with the following contentWith regards to higher layer parameter *dl-PRS-ID*, RAN1 understands that the current RAN2 specification support two interpretations:* Interpretation 1: PRS resource sets in different PFLs of a TRP are configured with the same dl-PRS-ID
* Interpretation 2: PRS resource sets in different PFLs of a TRP can be configured with different dl-PRS-ID

For PRS bandwidth aggregation, RAN1’s agreement is that the linked PRS resource sets from two or three PFLs should be from the same TRP. RAN1 kindly requests RAN2 to capture the condition of the same TRP in RAN2 specifications for PRS bandwidth aggregation.AgreementEndorse the draft LS in R1-2308645 with the following modification to the action:**ACTION:** RAN1 respectfully ask RAN2 to take the above information into consideration for their future work, and asks RAN2 to capture the condition of the same TRP in RAN2 specifications for PRS bandwidth aggregation.Final LS in R1-2308646.Our understanding was that the issue is closed and that the expression “associated with a dl-PRS-ID” is not needed any more, and that RAN2 will capture the “same TRP” constraint in their specification. **Proposal 1: Update the following sentence as follows:*** *When the UE is expected to perform joint measurements for bandwidth aggregation across DL PRS positioning frequency layers, the UE expects to be configured with linkage information, via higher layer parameter [linkage], between DL PRS resource setss across DL PRS positioning frequency layers ~~[associated with a dl-PRS-ID]~~.*

**From the comments added above from other companies, we specifically want to point out the following:** **Comment 2:** We agree with Comment 1 from Huawei, HiSilicon, as shown in the LS below:AgreementEndorse the following RAN1 reply on PRU procedures**…****…***Furthermore, it is RAN1’s understanding that the simultaneous measurements/transmissions for multiple UEs, including a target UE and a PRU,* ***is applicable to RAN1’s on-going work related to NR carrier phase positioning, and is also applicable to the remaining uplink and downlink positioning measurements and methods.*** *Therefore, RAN1’s agreements related to the NR carrier phase positioning are provided in Section 4 in this LS for information.***…****…**Final LS in R1-2308644.**Comment 3:** We agree with Comment 3 from Huawei, HiSilicon and we think it will be useful to add the suggested text.**Comment 4:** We agree with Comment 3 from ZTE related to the single sample processing and we prefer their suggestion on TP.  | To be addressed in next round, your answers came way after the deadline! |

# 3 Discussion – second round

The comments in this section are based on version 1 of the draft CR available in the **Post RAN1#114 discussion.**

Second checkpoint for this discussion:  **is September 6, 9.00 am UTC!**

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| Company | Comments | Editor reply/Notes |
| Qualcomm | Subclause 8.2.4.1.1: Could you add the following to the list of restrictions? It is from the RAN1 #114 agreement (below) and helps clarify that neither DMRS nor SL-PRS is punctured:* The UE shall transmit SL PRS on contiguous symbols either in between or after symbols where PSSCH DMRS is transmitted.

AgreementUpdate the following agreement as:* In a shared resource pool:
	+ Opt. B: SL PRS is mapped to contiguous symbols either before, between (as a working assumption), or after PSSCH DMRS symbols
		- SL PRS is not mapped before the first PSSCH DMRS symbol

Subclause 8.2.4.1.1: We prefer the wording used for the shared pool vs. the one used for the dedicated resource pool:For a dedicated resource pool, the UE ~~shall transmit~~ transmits SL PRS subject to the following restrictions:Subclause 8.4.4: While the main target of synchronization quality report is TDoA as in the original agreement text, the reporting portion in the latest agreement is not limited to this TDoA only. Separately, the agreement has reporting of the synchronization source type, not the synchronization source itself. Lastly, as in Uu (ReferenceTRP-RTD-Info), RTD measurement should also include a quality metric.~~For the SL RSTD, SL RTOA measurements,~~ the UE may report synchronization information [~~on~~ synchronization source type and/or relative time difference with the associated quality metric, via [*higher layer parameter(s)*]. For the SL RSTD measurement, the UE may report a reference UE information |  |
| Huawei, HiSilicon | **Comment 1: (in response to comment 1 in the previous round)**

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| **Comment 1:**The measurement window is no longer limited to RSCP/RSCPD only, which can be applicable to other measurements as well.We suggest the following text change in 5.1.6.5.The UE is not expected to obtain more than 1 DL RSCP or DL RSCPD measurement sample in a single measurement instance.The UE, subject to UE capability, may be requested via [higher layer parameter] to perform DL PRS measurements on indicated DL PRS resource sets occurring within one or more time window(s) indicated by [*higher layer parameter*].**Editor comment:**#1 I think something similar is said now but in a negated form.  |

We agree with QC’s explanation, and the key change is to remove restriction on RSCP/RSCPD measurement within the window, which is based on new progress and consensus in this meeting, which is cited by QC.So the essential change here should be to replace “DL RSCP or DL RSCPD measurements” with “DL PRS measurements”.The UE, subject to UE capability, may be requested via [higher layer parameter] to perform DL PRS measurements on indicated DL PRS resource sets occurring within one or more time window(s) indicated by [*higher layer parameter*]. The UE is expected to obtain 1 DL RSCP or DL RSCPD measurement with as defined in [11, TS 38.133.**Comment 2: (in response to comment 4 in the previous round)**

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| **Comment 4:**The following agreement should be captured in the spec.**Agreement**In Scheme 2, with regards to the triggering of SL-PRS,* Support SL-PRS transmission triggering at the physical layer by the UE’s own higher layers
* Working assumption: Support UE-A to request UE-B to transmit SL-PRS via lower layer signaling sent by UE-A.
	+ Up to UE-B’s own higher layers to transmit SL-PRS in response to the lower layer request from UE-A
	+ FFS: Lower layer signaling corresponds to SCI, MAC-CE, or SL-PRS

For example, the corresponding UE procedure can be added to clause 8.4.4, where the UE physical layer could provide the information received from another UE to its own higher layers.**Editor comment:**#4 will be reflected in a future update but I prefer to see the WA confirmed also so that we are not wasting implementation effort. |

This working assumption is already confirmed. We do not see any waste in the implementation effort.**Agreement**In Scheme 2, with regards to the triggering of SL-PRS, confirm the related WA for shared and dedicated resource pools.* With regards to the lower-layer signalling, support SCI associated with SL-PRS transmission
	+ FFS: whether this is enabled by (pre)configuration
* FFS: to support also SL-PRS

**Comment 3:**We think it should be useful to include “ARP – antenna reference point” definition in clause 3.3. |  |
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