**3GPP TSG RAN WG1 Meeting #113 R1-230xxxx**

Incheon, Korea, May 22nd – May 26th, 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: **June 7th, UTC 12.00**!

# 2 Discussion – first round

The comments in this section are based on version 0 of the the draft CR available in the **Post RAN1#113 discussion.**

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| Company | Comments | Editor reply/Notes |
| CATT | Comment 1: **Agreement**Introduce DL reference carrier phase (DL RSCP) and NR DL reference carrier phase difference (DL RSCPD) as DL carrier phase measurements.* Note: It is up to RAN4 to decide whether and how to define the requirements for DL RSCP and/or DL RSCPD. No LS needed to RAN4 for this note.
* DL RSCP can be reported together with UE Rx – Tx time difference measurement
* DL RSCPD can be reported together with RSTD measurement
* …

Based on above agreement, we need to switch RSCPD and RSCP in the following paragraph: *In 5.1.6.5 PRS reception procedure**….**For DL UE positioning measurement reporting in higher layer parameter NR-DL-TDOA-SignalMeasurementInformation,* the UE may be configured to report the DL Reference Signal Carrier Phase Difference (RSCPD) [7, TS 38.215] measurement along with the DL RSTD. When the UE reports RSCPD measurements the reference is the same as the one configured, or reported, for the RSTD measurements. For DL UE positioning measurement reporting in higher layer parameter *NR-Multi-RTT-SignalMeasurementInformation* the UE may be configured to report the DL Reference Signal Carrier Phase (RSCP) measurement [7, TS 38,215] along with the UE Rx-Tx time difference.Comment 2: **Agreement**If a UE reports RSCPD measurements together with RSTD measurements in a measurement report element, the reference TRP for RSCPD is the same as the reference TRP reported for RSTD.* The target and the reference TRP are in the same PFL

Based on above agreement, suggest making the following change to the reference of the RSCPD: *In 5.1.6.5 PRS reception procedure**….**For DL UE positioning measurement reporting in higher layer parameter NR-DL-TDOA-SignalMeasurementInformation,* the UE may be configured to report the DL Reference Signal Carrier Phase (RSCP) [7, TS 38.215] measurement along with the DL RSTD. When the UE reports RSCPD measurements, the reference TRP is the same as the one reported for the RSTD measurements. For DL UE positioning measurement reporting in higher layer parameter *NR-Multi-RTT-SignalMeasurementInformation* the UE may be configured to report the DL Reference Signal Carrier Phase Difference (RSCPD) measurement [7, TS 38,215] along with the UE Rx-Tx time difference. |  |
| Qualcomm | 1)On the following: For DL UE positioning measurement reporting in higher layer parameter NR-DL-TDOA-SignalMeasurementInformation, the UE may be configured to report the DL Reference Signal Carrier Phase (RSCP) [7, TS 38.215] measurement along with the DL RSTDThe agreement says RSCPD: * DL RSCPD can be reported together with RSTD measurement

And similarly, for Rx-Tx is the RSCP:* DL RSCP can be reported together with UE Rx – Tx time difference measurement

But the draft CR says: For DL UE positioning measurement reporting in higher layer parameter NR-Multi-RTT-SignalMeasurementInformation the UE may be configured to report the DL Reference Signal Carrier Phase Difference (RSCPD) measurement2) On PRS aggregation, and with regards to the following text: 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 sets across DL PRS positioning frequency layers associated with a *dl-PRS-ID*The linked PRS resource sets will be associated with a different dl-PRS-ID. Observ that we have 256 PRS-IDs because it is up to 8 sets (2 sets per PFL), for up to 64 TRPs. So total 64\*8=256. Therefore, the sets that belong on different PFL will actually have a different dl-PRS-ID. R-DL-PRS-AssistanceDataPerTRP-r16 ::= SEQUENCE {    dl-PRS-ID-r16                 INTEGER (0..255),    nr-PhysCellID-r16              NR-PhysCellID-r16          OPTIONAL,   -- Need ON    nr-CellGlobalID-r16            NCGI-r15                  OPTIONAL,   -- Need ON    nr-ARFCN-r16                  ARFCN-ValueNR-r15          OPTIONAL,   -- Need ON    nr-DL-PRS-SFN0-Offset-r16      NR-DL-PRS-SFN0-Offset-r16,    nr-DL-PRS-ExpectedRSTD-r16     INTEGER (-3841..3841),    nr-DL-PRS-ExpectedRSTD-Uncertainty-r16                                 INTEGER (0..246),    nr-DL-PRS-Info-r16             NR-DL-PRS-Info-r16,NR-DL-PRS-Info-r16 ::= SEQUENCE {    nr-DL-PRS-ResourceSetList-r16      SEQUENCE (SIZE (1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF                                                              NR-DL-PRS-ResourceSet-r16,    ...}nrMaxSetsPerTrpPerFreqLayer-r16        INTEGER ::= 2      -- Maximum resource sets for one TRPTherefore, our suggestion is to keep the agreement wording for now: “per TRP”: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 on a per TRP basis, via higher layer parameter [*linkage*], between DL PRS resource sets across DL PRS positioning frequency layers ~~associated with a~~ *~~dl-PRS-ID~~* 3) We think the following sentence from the agreement needs to be captured and it may related to the last part of the paragraph below. ***It is assumed that the PRS resources across the linked PRS resource sets are linked if the conditions are satisfied. For the non-linked PRS resource sets, no aggregation is assumed*** Our understanding of the agreement and proposal is as follows: For the linked PRS resource sets, the UE is expected to be configured with the same values of QCL, *dl-PRS-Periodicity-and-ResourceSetSlotOffset, dl-PRS-NumSymbols*,*dl-PRS-ResourceTimeGap, dl-PRS-ResourceSymbolOffset,* *dl-prs-MutingBitRepetitionFactor,* CP, comb size, power per subcarrier, *NR-MutingPattern*, and *NR-DL-PRS-SFN0-Offset,* and the UE is expected to be configured with PRS resources that maintain uniformly spaced PRS RE pattern within a symbol across aggregated DL PRS positioning frequency layers. The UE may assume that PRS resources across the linked PRS resource sets which satisfy the above conditions are linked for PRS bandwidth aggregation, otherwise, the UE does not assume that PRS resources from the linked DL PRS resource sets are linked. Note: More comments will be added later from our side. Thanks! |  |

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| Qualcomm2 | 3) With regards to the following:When an SRS resource configured in a CC without PUSCH or PUCCH is linked for bandwidth aggregation with an SRS resource configured in an active UL BWP of another [UL data transmission] CC, a [guard period] is provided during which the UE is not expected to transmit or receive other signals or channels.* 1. We think it should clearly say that it is “SRS resource configured with *SRS-PosResource*” since this is only for SRS for Positioning.
	2. There is another sentence in the same section of 38.214 saying:

The UE does not expect to be configured with *SRS-PosResource* on a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission.* 1. The [UL data transmission] CC could just be: “CC configured for PUSCH/PUCCH transmission”

Based on the above, our **proposal** is to merge these 2 sentences (one existing and a new one as follows) using the following paragraphs:The UE does not expect to be configured with *SRS-PosResource* on a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission, unless, subject to UE capability, this *SRS-PosResource* is linked for bandwidth aggregation with an SRS resource configured with *SRS-PosResource* in an active UL BWP of another CC configured for PUSCH/PUCCH transmission. When an SRS resource configured with *SRS-PosResource* in a CC without PUSCH or PUCCH is linked for bandwidth aggregation with an SRS resource configured with *SRS-PosResource* in an active UL BWP of another CC configured for PUSCH/PUCCH transmission, a [guard period] is provided during which the UE is not expected to transmit or receive other signals or channels.4) With regards to this part of the agreement on SRS BW aggregation:It is assumed that the SRS resources across the linked SRS resource sets are linked if the conditions are satisfied. For the non-linked SRS resource sets, no aggregation is assumed even if the conditions are satisfied. We believe it is needed to be captured, otherwise the UE doesn’t now which SRS resource is linked with which one. Note that, at least with regards to the “startPosition” it is in an SRS resource level, so there cannot be that the sets are configured with the same value. Our **proposal** is shown below: 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. SRS resources across the linked SRS resource sets are linked for bandwidth aggregation when the the same values of *startPosition, nrofSymbols,* *periodicityAndOffset, slotOffset, alpha, p0,* subcarrier spacing, CP, and comb size are configured, otherwise, the UE does not assume that the SRS resources from the linked SRS resource sets are linked.  ~~aggregated measurement across CCs from the transmission of the linked SRS resource sets.~~5) We believe this agreement needs to be captured in 38.214:**Agreement**When the UE receives a request to perform aggregated measurements, * TRP(s) that include PRS aggregation have higher priority than the TRPs that do not include PRS aggregation
	+ If 2 or more TRPs include linked resources, then their priority follows the legacy priority, i.e., sorted in the configuration according to priority
* If a PRS resource set is linked for aggregation, then it has higher priority compared to the PRS resource set not linked for aggregation.
	+ If both sets in a PFL are linked for aggregation, then their priority follows the legacy priority, i.e., sorted in the configuration according to priority

And it is related to the following existing *paragraph in the same section*: *Within a positioning frequency layer, the DL PRS resources are sorted in the decreasing order of priority for measurement to be performed by the UE, with the reference indicated by nr-DL-PRS-ReferenceInfo being the highest priority for measurement, and the following priority is assumed:**- Up to 64 NR-SelectedDL-PRS-IndexPerTRP of the DL PRS positioning frequency layer are sorted according to priority if nr-SelectedDL-PRS-IndexListPerFreq is provided, or up to 64 NR-DL-PRS-AssistanceDataPerTRP of the frequency layer are sorted according to priority otherwise;**- Up to 2 DL-SelectedPRS-ResourceSetIndex per dl-PRS-ID of the DL PRS positioning frequency layer are sorted according to priority if dl-SelectedPRS-ResourceSetIndexList is provided, or up to 2 NR-DL-PRS-ResourceSet per dl-PRS-ID of the DL PRS positioning frequency layer are sorted according to priority otherwise.*We make a **proposal** with changes in the existing paragraph as follows: *Within a positioning frequency layer, the DL PRS resources are sorted in the decreasing order of priority for measurement to be performed by the UE, with the reference indicated by nr-DL-PRS-ReferenceInfo being the highest priority for measurement, and the following priority is assumed:**- Up to 64 NR-SelectedDL-PRS-IndexPerTRP of the DL PRS positioning frequency layer are sorted according to priority if nr-SelectedDL-PRS-IndexListPerFreq is provided, or up to 64 NR-DL-PRS-AssistanceDataPerTRP of the frequency layer are sorted according to priority otherwise; unless** *A TRP includes DL PRS bandwidth aggregation linkage, in which case it has higher priority than a TRP(s) without DL PRS bandwidth aggregation linkage. If multiple TRP(s) in the nr-SelectedDL-PRS-IndexListPerFreq, if provided, or NR-DL-PRS-AssistanceDataPerTRP, otherwise, include DL PRS bandwidth aggregation linkage, then they are sorted according to priority.*

*- Up to 2 DL-SelectedPRS-ResourceSetIndex per dl-PRS-ID of the DL PRS positioning frequency layer are sorted according to priority if dl-SelectedPRS-ResourceSetIndexList is provided, or up to 2 NR-DL-PRS-ResourceSet per dl-PRS-ID of the DL PRS positioning frequency layer are sorted according to priority otherwise, unless** *A DL PRS resource set associated with a dl-PRS-ID includes a DL PRS bandwidth aggregation linkage, in which case it has higher priority than a DL PRS resource set associated with the same dl-PRS-ID without a DL PRS bandwidth aggregation linkage. If multiple DL PRS resource sets associated with a dl-PRS-ID include PRS bandwidth aggregation linkage, then they are sorted according to priority.*
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| OPPO | Comment 1: It was agreed that report RSCPD + RSTD and RSCP + UE Rx-Tx time difference. The current text has typo. Suggest the following change:

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| For DL UE positioning measurement reporting in higher layer parameter NR-DL-TDOA-SignalMeasurementInformation, the UE may be configured to report the DL Reference Signal Carrier Phase Difference (RSCPD) [7, TS 38.215] measurement along with the DL RSTD. When the UE reports RSCPD measurements the reference is the same as the one configured, or reported, for the RSTD measurements. For DL UE positioning measurement reporting in higher layer parameter NR-Multi-RTT-SignalMeasurementInformation the UE may be configured to report the DL Reference Signal Carrier Phase (RSCP) measurement [7, TS 38,215] along with the UE Rx-Tx time difference. |

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| Intel | **Comment 1*** For DL PRS bandwidth aggregation, subcarrier spacing (dl-PRS-SubcarrierSpacing), and phase continuity need to be included to enable bandwidth aggregation based on the following agreement. Suggest to change CP as dl-PRS-CyclicPrefix.

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| **Agreement**To enable PRS bandwidth aggregation between PRS in two or three different PFLs, the following conditions should be satisfied for the aggregated PRS resources from a TRP across the aggregated PFLs: * In the same slot, in same symbols, by the same TRP associated with the same ARP, from the same RF chain (i.e. the same antenna), this implies
	+ FFS: The same gNB Tx TEG and the same UE Rx TEG, the maximum TX timing error margin
	+ The same QCL
* The same number of symbols, symbol location within one slot, repetition factor,
* FFS: the same periodicity and slot offset
* FFS muting pattern
* The same numerology, i.e. the same CP and SCS
* The same or different bandwidths
* The same comb size
* FFS: The same number of PRS resource sets and resources for a TRP
* The same power per subcarrier
* FFS: the same *NR-DL-PRS-SFN0-Offset*
* Aggregated PFLs are configured on the same aligned numerology grid
* FFS: How to maintain contiguous PRS pattern across aggregated bandwidths even in the presence of guard tones (e.g, PFLs with different RE-offset configurations, PFLs with different point A)
* Phase continuity between aggregated PFLs
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**Comment 2*** For SRS bandwidth aggregation, phase continuity needs to be included to enable bandwidth aggregation based on the following agreement.

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| **Agreement**To enable SRS bandwidth aggregation between SRS in two or three carriers, the following conditions should be satisfied for the aggregated SRS resources across the aggregated carriers* In the same slot, in same symbols, from the same antenna, this implies
	+ FFS: The same gNB Rx TEG and the same UE Tx TEG
	+ The same spatial relation
* The same *startPosition, nrofSymbols*
* FFS: *periodicityAndOffset,* and *slotOffset*
* The same numerology, i.e. the same CP and SCS
* The same or different bandwidths
* The same comb size
* FFS: The same number of SRS resource sets and resources
* The same Tx PSD (power per subcarrier)
	+ FFS whether to need the same pathloss RS, Po and alpha
	+ Note: the Tx PSD is not captured in RAN1 specifications
* FFS: SRS with RE-offset configuration which maintains contiguous SRS pattern across aggregated bandwidths even in the presence of guard tones
* Phase continuity between aggregated SRS in different carriers
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**Comment 3*** For the following text, it may be good to mention that the hopping bandwidth may be larger than the maximum bandwidth that is supported by RedCap UEs. Suggest the following update:

“The reduced capability UE transmit frequency hopping is performed within one SRS resource for positioning that may be configured with a bandwidth larger than the maximum bandwidth supported by the reduced capability UE”

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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. The reduced capability UE transmit frequency hopping is performed within one SRS resource for positioning.  |

**Comment 4*** For the following text, the agreement below is intended to emphasize that the support of additional comb sizes is not implied for SL PRS in the shared resource pool in the context of the quoted agreement and not as a condition. Thus, it would be good to remove the condition as currently implied in the CR, or at least put “For comb sizes of 1, 2, 4” in brackets.

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| For a shared resource pool, the UE transmits the SL PRS in resources indicated for PSSCH according to clause 8.1.2.1, with the following restrictions:- the UE shall not transmit SL PRS in symbols used for PSCCH- the UE shall not transmit SL PRS and PSSCH DMRS in the same symbol.- For comb sizes of 1, 2, 4, the UE shall not transmit PSSCH and SL PRS in the same symbol. |

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| **Agreement**In a shared resource pool, SL-PRS, associated PSCCH and PSSCH scheduled by the PSCCH are included in the same slot:* With regards to PSSCH and SL-PRS multiplexing, only TDMing is supported for the already agreed comb sizes 1, 2, 4
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**Comment 5*** For the following text, as per agreement, the UE may be configured to report the DL Reference Signal Carrier Phase Difference (RSCPD) with DL RSTD and DL RSCP~~D~~ with UE Rx-Tx time difference. Thus, the references to RSCP and RSCPD need to be swapped. Further, it may be better to first describe reporting of RSCP with UE Rx-Tx time difference and then reporting of RSCPD with DL RSTD.

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| For DL UE positioning measurement reporting in higher layer parameter *NR-DL-TDOA-SignalMeasurementInformation,* the UE may be configured to report the DL Reference Signal Carrier Phase (RSCP) [7, TS 38.215] measurement along with the DL RSTD. When the UE reports RSCPD measurements the reference is the same as the one configured, or reported, for the RSTD measurements. For DL UE positioning measurement reporting in higher layer parameter *NR-Multi-RTT-SignalMeasurementInformation* the UE may be configured to report the DL Reference Signal Carrier Phase Difference (RSCPD) measurement [7, TS 38,215] along with the UE Rx-Tx time difference. |

**Comment 6*** For the following text, there was no agreement that configuration of overlapping and non-overlapping frequency hopping is subject to UE capability. Suggest to remove this.

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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. The reduced capability UE transmit frequency hopping is performed within one SRS resource for positioning. The reduced capability UE transmit frequency hopping, subject to UE capability, may be configured with overlapping or non-overlapping frequency hops in the frequency domain. |

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| **Agreement**For UL SRS Tx hopping, the frequency hopping pattern is configured with overlapping or non-overlapping hops.* FFS: exact patterns to be supported
* FFS: whether the overlapping hops may or may not be adjacent in the time domain
* Note: RAN1 assumes that no additional UE requirements shall be specified for the case of Tx hopping with non-overlapping hops compared to the case of Tx hopping with overlapping hops, e.g., a UE is not responsible for keeping phase continuity across the hops in either case of overlapping or non-overlapping hops.
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| Sharp | * **Comment#1, on clause 8.2.4:**

The title of section 8.2.4 is supposed to come with revision marks.* **Comment#2, on clause 8.2.4:**

On the use of the name “shared resource pool”, we think this is a too generic name and may cause problems in the future e.g. when some other signals/channels are introduced for sidelink and (similarly to SL PRS) can also share a resource pool with legacy signals/channels. We propose to use “resource pool common for sidelink communication and sidelink positioning”.And on the use of the name for “dedicated resource pool”, this is not even aligned within the draft CR itself (“*dedicated SL PRS resource pool*”, “*dedicated pool for SL positioning*”). We propose to use “resource pool dedicated for sidelink positioning”.* **Comment#3, on clause 8.2.4:**

Similarly to the legacy spec text for DL PRS, it should be made clear that the symbols for SL PRS are within a slot.

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| [Starting symbol and the number of SL PRS symbols] indicates the starting symbol index within a slot and the number of symbols of the SL PRS resource. |

* **Comment#4, on clause 8.2.4:**

On frequency domain allocation, at least for a shared resource pool, it is chosen by gNB or the TX UE and indicated in SCI rather than “configured”.

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| [SL PRS frequency domain allocation] indicates the frequency location and the number of resource blocks ~~configured~~ for SL PRS transmission |

* **Comment#5, on clause 8.2.4:**

“in the same slot” in the sentence below is not necessary, or else it just repeats the first sentence of clause 8.2.4.1.1 (“*The UE shall transmit the SL PRS in the same slot as the associated PSCCH*”). Note that the same structure (except PSSCH -> SL PRS) was used for legacy PSSCH in clause 8.1 (without “in the same slot”) and clause 8.1.2.1 (with “in the same slot”).

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| Each SL PRS transmission is associated with an PSCCH transmission ~~in the same slot~~. |

* **Comment#6, on clause 8.2.4.1:**

Our understanding is that any of DG, CG type 1 and CG type 2 can be configured, hence it should be “or” rather than “and”.

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| For SL PRS transmission, a UE may be configured with dynamic grant, configured grant type 1, ~~and~~ or configured grant type 2 |

* **Comment#7, on clause 8.2.4.1.1:**

Firstly, we think the use of the word “resources” below is confusing, because in clause 8.1.5, all REs allocated for a PSCCH/PSSCH transmission correspond to a single “resource”. Since this is time domain resource allocation, we think it suffices to say “symbols”. The word “indicated” is not necessary as there is no symbol-level indication in SCI.

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| For a ~~shared~~ resource pool common for sidelink communication and sidelink positioning, the UE transmits the SL PRS in ~~resources~~ symbols ~~indicated~~ for PSSCH according to clause 8.1.2.1, with the following restrictions: |

* **Comment#8, on clause 8.2.4.1.2:**

For a share resource pool, the frequency domain resource for a SL-PRS is same as indicated in SCI 1-A, i.e. it is NOT “configured” as stated by the first sentence of this clause. We propose to use a similar wording as used in clause 8.2.4.1.1 in the draft CR.For a dedicated resource pool, the sentence in the draft CR reads like a separate parameter should be used for SL PRS bandwidth just for the purpose of configuring a same value as the resource pool bandwidth, but we don’t think this should be the case (i.e. no such parameter is necessary for separately configuring the SL PRS bandwidth).We propose the following changes:

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| ~~The UE is not expected to be configured with a different bandwidth of an SL PRS resource in a shared resource pool than the bandwidth indicated for PSSCH. The UE is not expected to be configured with a different bandwidth of an SL PRS resource in a dedicated resource pool than the bandwidth of the resource pool.~~For a resource pool common for sidelink communication and sidelink positioning, the subchannel assignment is same as that for PSSCH according to clause 8.1.2.2.For a resource pool dedicated for sidelink positioning, the [resource blocks] assigned for a SL PRS resource are same as those configured for the resource pool. |

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| ZTE | **Comment 1:** According to the agreement regarding RedCap UE positioning, both UE reporting a single measurement based on receiving multiple hops and the UE reporting one measurement based one received hop are supported.**Agreement**The previous agreement is updated as follows:**Agreement**For DL Rx hopping or UL Tx hopping, support the UE or gNB to report the following:* A single measurement based on receiving multiple hops of the DL PRS or UL SRS for positioning
* One measurement where a measurement is associated with one received hop
* FFS: indication of how many received hops / which received hops where used in the measurement report.
* Note: no new measurement definition is introduced in RAN1
* FFS: conditions when the above measurements are reported, and whether the above measurements can be reported together

The current text in draft CR only including one measurement based on one hop, therefore, we have the following suggestion:

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| 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 within a configured measurement gap. The reduced capability UE may be configured to perform receiver frequency hopping within one DL PRS resource. 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 and/or one measurement based on receiving multiple hops of the DL PRS. 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.  |

**Comment 2:** For the RSCPD/RSCP measurement report together with RSTD/RTT, we share the same view as mentioned by CATT, Qualcomm, OPPO and Intel.Comment 3: For RSCP/RSCP measurement within indicated time windows, we suggest updating the description, since the agreements mentioned that *the measurements on indicated DL PRS resource sets occurring within indicated time window(s).* The current CR implies that the UE can only perform RSCP/RSCPD measurement on ONE time window, but the agreement indicate that the measurement behavior can be performed in one or more time windows(s). Therefore, we have the following suggestion:

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| 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*]. |

**Comment 3:** For the TA adjustment part, as far as we know, it has been reflected in 38.213 as follows:

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| Draft CR of TS 38.213If a UE transmits SRS based on a configuration by *SRS-PosResourceSet* in *SRS-PosRRC-InactiveConfig-ValidityArea* in RRC\_INACTIVE state, the UE can autonomously update $N\_{TA}$ at cell reselection if the UE is provided *SRS-autonomousTAupdate*; else, the UE maintains the $N\_{TA}$ of a last serving cell prior to the release of a dedicated RRC connection.  |

Our suggestions is removing the description in the current draft CR for TS 38.214:

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| Draft CR of TS 38.214 |

**Comment 4:** The yellow part of the following agreement seems not reflected in the current draft CR.**Agreement**For PRS bandwidth aggregation, with regards to the signaling in the location information request message, introduce the following:* A request to indicate UE which two or three PFLs to be used for performing joint measurement
* A new ReportingGranularityfactor smaller than 0 which can be applicable at least when the LMF requests aggregated measurements
	+ Support at least the values of k={-1,-2}
		- FFS other values e.g. -3, -4, -5, -6
	+ Send RAN4 an LS to confirm the feasibility

In addition, in the measurement report, the report PRS resource set IDs should be the ones across the PFLs. Here is our suggestion:

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| The UE may report via higher layer parameter [*positioning frequency layer aggregation information*] which indicates if bandwidth aggregation is performed and which two or three DL PRS positioning frequency layers to be used for the joint DL RSTD measurement(s) and the joint UE Rx-Tx time difference measurement(s). In a measurement report, the UE may report PRS resource set IDs across the two or three DL PRS positioning frequency layers used to perform the joint DL RSTD measurement or the joint UE Rx-Tx time difference measurement |

**Comment 5:** We agree with Intel’s comment 3 that it is better to mention that the hopping bandwidth may be larger than the maximum bandwidth that is supported by RedCap UEs. Here is our suggestion:

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| The reduced capability UE transmit frequency hopping is performed within one SRS resource for positioning that may be configured with a bandwidth larger than the maximum bandwidth supported by the reduced capability UE. |

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| LGE | **Comment 1:**For a share resource pool, the frequency domain granularity of SL PRS resource is subchannel as same as PSSCH. But for a dedicated resource pool, we don’t have agreement on the frequency domain granularity of SL PRS resource, which can be RB or subchannel. So we suggest to delete the yellow part in the following sub-bullet in Section 8.2.4.- [*SL PRS frequency domain allocation*] indicates the frequency location ~~and the number of resource blocks configured for SL PRS transmission.~~**Agreement*** A SL PRS resource refers to a time-frequency resource within a slot of a dedicated SL PRS resource pool that is used for SL PRS transmission.
	+ FFS: for a shared resource pool
* Characteristics associated with a SL PRS resource include at least:
	+ SL PRS resource ID,
	+ SL PRS comb offset and associated SL PRS comb size (N),
	+ SL PRS starting symbol and number of SL PRS symbols (M),
	+ SL PRS frequency domain allocation,
	+ Note: Additional parameters can be included as/when identified.
	+ FFS: other time domain aspects, if any
* A SL PRS resource is identified by a SL PRS resource ID that is unique within a slot of a dedicated SL PRS resource pool.

NOTE 1: The above does not imply need for signalling/(pre-)configuration of all these parameters**Agreement**For a shared resource pool* A SL PRS resource refers to a time-frequency resource within a slot that is used for SL PRS transmission.
* Characteristics associated with a SL PRS resource in a slot of a shared resource pool include at least:
	+ SL PRS resource ID,
	+ SL PRS comb offset and associated SL PRS comb size (N),
	+ SL PRS starting symbol and number of SL PRS symbols (M),
	+ SL PRS frequency domain allocation
		- SL PRS freq domain allocation is not used to identify a unique SL PRS resource ID
* A SL PRS resource is identified by a combination of SL PRS resource ID and a SL PRS frequency domain allocation. This combination is unique within a slot of a shared resource pool.

NOTE 1: The above does not imply need for signalling/(pre-)configuration of all these parameters**Comment 2:**According to the agreement, SFN and slot number shall be included in a time stamp if SFN is used for timing, and DFN and slot number if DFN is used. In addition, nr-PhysCellID, nr-ARFCN, nr-CellGlobalID fields are optional. We suggest the following clarification (yellow part) in Section 8.4.4.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*]. The timestamp ~~can~~ includes ~~one or more of~~ the SFN, slot number, and optionally *nr-PhysCellID*, *nr-ARFCN*, *nr-CellGlobalID*, or the time stamp include DFN and slot number.**Agreement**A time stamp associated to each SL positioning measurement within the report includes at least the followings:* SFN, slot number, and optionally including nr-PhysCellID, nr-ARFCN, nr-CellGlobalID
	+ FFS if at least one of nr-PhysCellID, nr-ARFCN, nr-CellGlobalID is always included
* Or DFN and slot number
	+ FFS: sidelink synchronization identity

FFS: SL-PRS resource ID is included within the measurement reportFFS: symbol number**Comment 3:**For SL TDOA, it was agreed to exchange the sync information between UEs or between UE and LMF. So we suggest the following clarification in yellow in Section 8.4.4.For the SL RSTD, SL RTOA measurements, the UE may report synchronization information to a UE or to network [on synchronization source, relative time difference, and/or synchronization quality] via [*higher layer parameter(s)*]. For the SL RSTD measurement, the UE may report a reference UE information.**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
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| Huawei, HiSilicon | Please find our comments in the first round on non-SL positioning related parts.**#1:** clause 5.1.6.5 on frequency hopping, we have the following comments and the revised text suggestion.* There is no need to restrict the feature to RedCap UEs at least UE type is not known by the LMF that requested the measurement.
* The single measurement associated with multiple hops are not explicitly mentioned.
* The sentences can be merged.

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| A 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 within a single instance of a measurement gap. The UE performing receiver frequency hopping may be configured to report via [*higher layer parameter*] one measurement associated with one received frequency hop or multiple received frequency hops.  |

**#2:** clause 5.1.6.5 on PRS bandwidth aggregation, we wonder whether the first two paragraphs are duplicated from the last one.

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| The UE may be configured to measure and report, subject to UE capability, [up to XX] joint DL RSTD measurement(s) per pair of *dl-PRS-ID,* from aggregated DL PRS resources across two or three DL PRS positioning frequency layers*.* The UE may be configured to measure and report, subject to UE capability, [up to YY] joint UE Rx-Tx time difference measurement(s) from aggregated DL PRS resources across two or three DL PRS positioning frequency layers.The UE may be requested via higher layer parameter [*positioning frequency layer aggregation indication*] to perform the joint DL RSTD measurement(s) or the joint UE Rx-Tx time difference measurement(s) across two or three DL PRS positioning frequency layers. |

**#3:** clause 6.2.1.4 on SRS spatial relation in RRC\_INACTIVE, we do not think the change is needed. Note that cited agreement applies to area-specific SRS configuration, while Rel-17 already supports regular SRS transmission in RRC\_INACTIVE state.

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| If the UE is not configured with the higher layer parameter *spatialRelationInfoPos* the UE in RRC\_CONNECTED mode or RRC\_INACTIVE mode may use a fixed spatial domain transmission filter for transmissions of the SRS configured by the higher layer parameter *SRS-PosResource* across multiple SRS resources or it may use a different spatial domain transmission filter across multiple SRS resources.  |

**#4:** clause 6.2.1.4 on SRS frequency hopping, we have the following comments and revised text suggestion.* There is no need to restrict the feature to RedCap UE.
* The sentences can be merged.

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| A UE may be configured via [*higher layer parameter*], subject to UE capability, to perform transmit frequency hopping within one SRS resource for positioning separate from the UL BWP configuration in RRC\_CONNECTED or RRC\_INACTIVE mode. The UE transmit frequency hopping, subject to UE capability, may be configured with overlapping or non-overlapping frequency hops in the frequency domain. When the 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. A UE may be configured, via [higher layer parameter], with an UL time window where the UE is not expected to [receive] or transmit other signals/channels and is only expected to transmit the SRS for positioning using frequency hopping.  |

**#5:** clause 6.2.1.4 on SRS BW aggregation, the measurement across multiple CCs does not seem a valid assumption at the UE. The suggested text is as below.

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| The UE is expected to be configured with linkage information [*linkage*] on SRS resource sets 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. |

**#6:** clause 6.2.1.4 on SRS BW aggregation, we support the change from QC to merge the legacy one with regards to SRS transmission on carrier not configured with PUSCH/PUCCH.**#7:** clause 6.2.1.4 on SRS positioning validity area, the wording “UE is expected to be configured” is a bit strange. It is anyway subject to UE capability. The suggested text is as below. The autonomous UL timing adjustment is already captured in TS 38.213, so there is no need to say it again in 214. Different from ZTE’s comment, we prefer to keep the first sentence instead of removing both.

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| Subject to UE capability, a UE may be configured with SRS, via [*SRS-PosRRC-InactiveConfig-ValidityArea*], valid in multiple cells within a validity area for RRC\_INACTIVE mode.  |

Regarding comments from CATT on the same reference TRP for DL RSTD and DL RSCPD, we prefer not to use the terminology TRP, which has been avoided in TS 38.214.Regarding comments from QC on different dl-PRS-IDs for linked PRS resource sets, we have a different view, and believe that they should be the same dl-PRS-ID as currently written by the editor. The reason is that we designed up to 8 PRS resource set IDs within a TRP, and if the same TRP on different positioning frequency layers is associated with different dl-PRS-ID, we only need 2 PRS resource set IDs. By the way, 64\*8=512. |  |
| OPPO2 | 1. We propose to replace “In sidelink resource allocation mode 1” with “In Scheme 1 SL-PRS resource allocation” such as to distinct from mode 1 for SL communication.
2. It would be better to say “the UE shall not transmit SL PRS in symbols where the associated PSCCH is transmitted PSCCH”, as “symbols used for PSCCH” is not clearly defined in specifications.
3. “For a dedicated resource pool, UE shall not transmit SL PRS and associated PSCCH in the same symbol.”, such as to align with the agreement.
4. “The bandwidth of an SL PRS resource in a shared resource pool is same as the bandwidth indicated for PSSCH. The bandwidth of an SL PRS resource in a dedicated resource pool is same as the bandwidth of the resource pool.”, as the original wording reads like a dedicated configuration would be introduced for frequency domain allocation in shared/dedicated resource pool.
5. “for the first detected path and/or additional detected paths.”, as measuring additional path is optional.

**Agreement**Support SL-based RSTD, Rx-Tx time difference, RToA, AoA, RSRPP measurement and report for the first path and optionally additional path.* No specification impact for how to set the additional path measurements
* From RAN1 perspective, no performance requirements are expected to be defined for the additional-path measurements in Rel-18.
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| Huawei, HiSilicon2 | Please find our comments in the first round on SL positioning related parts.#1: A general suggestion is to split SL-PRS related procedure from section 8 since it does not fit in the general PSSCH related procedure. TS 38.214 already set a good example to have a dedicated clause 9 for RTT based PDC, and such a practice can be followed at least for SL positioning. Another approach can be considered is to have shared RP in clause 8, and dedicated RP in a new clause (e.g. clause 10).#2: In general, the definition for shared pool and dedicated pool seems necessary and it is better to be captured in 214 before expanding the procedures for each. #3: At least for dedicated resource pool, we should have SL-PRS transmission procedure (separate procedure from PSSCH transmission), including SL-PRS resource allocation, SL-PRS resource reported to higher layer for scheme 2, SL-PRS congestion control for scheme 2, SL-PRS receiving procedure, procedure for reporting positioning measurement (as counterpart to CSI).#4: clause 8.4.4, we do not have SL PRS-RSRP for each path. UE reporting ARP ID location information should not be captured in RAN1 specification but rather the agreement implies such parameter will be needed. A suggested text is as follows.

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| The UE may be configured, via [*higher layer parameter(s)*], to measure and report one or more of 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 ARP ID associated with the reported measurements.  |

#5: clause 8.4.4, we do not think the LoS/NLoS indicator should be associated with each measurement. For example, we do not need per-path LoS/NLoS indicator. The suggested text is as follows.

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| The UE may report, LoS/NLoS indicator(s) via [*nr-los-nlos-Indicator*] associated with the SL RSTD, SL Rx-Tx time difference, SL RTOA, SL AoA, SL PRS-RSRP, and SL PRS-RSRPP measurements. |

#6: On synchronization information, we prefer the following change given that the UE providing the synchronization information could be the anchor UE, while the UE performing SL RSTD measurement should be the target UE. On the reference for SL RSTD measurement, the reference reporting can be a separate paragraph. The suggested text is as follows.

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| A UE may report synchronization information [on synchronization source, relative time difference, and/or synchronization quality] via [*higher layer parameter(s)*]. For the SL RSTD measurement, a UE may report a reference UE information. |

#7: For SL RTOA measurement, we prefer to rewrite the following sentence.

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| For SL RTOA measurement, a UE may be provided with the SFN or DFN initialization time. |

#8: For assistance data of UE based positioning, in general it should not appear in RAN1 specification. For UE based positioning reporting to network, it should also not appear in RAN1 specification. The following paragraph can be removed.

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| vivo | **Comment #1:** clause 5.1.6.5 on frequency hopping, we have some concerns about performing FH within a DL PRS resource is configured.

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| 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 within a configured measurement gap.. 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 multiple received frequency hops. 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.  |

**Comment #2: minor modification**

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| For DL UE positioning measurement reporting in higher layer parameter *NR-DL-TDOA-SignalMeasurementInformation,* the UE may be configured to report the DL Reference Signal Carrier Phase difference (RSCPD) [7, TS 38.215] measurement along with the DL RSTD measurement. When the UE reports RSCPD measurements the reference is the same as the the reference for the RSTD measurement . For DL UE positioning measurement reporting in higher layer parameter *NR-Multi-RTT-SignalMeasurementInformation* the UE may be configured to report the DL Reference Signal Carrier Phase (RSCP) measurement [7, TS 38,215] along with the UE Rx-Tx time difference measurement. |

**Comment #3**: LOS indicator for carrier phaseThe following part can be removed since it is reused the existing parameter

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**Comment #4**: we would like to confirm majority whether the “stop” in the specification is equal to “suspend” in the agreement. That is, if is suspend, whether UE will transmit the SRS again after accurately measuring spatial RS

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| If the UE in RRC\_INACTIVE mode determines that the UE is not able to accurately measure the configured DL RS in *SRS-SpatialRelationInfoPos* for a SRS resource for positioning where the DL RS is semi-persistent or periodic, the UE **stops** transmission of the SRS resource for positioning. |

**Comment #5 : remove “ subject to UE capability” since no related agreement**

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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. The reduced capability UE transmit frequency hopping is performed within one SRS resource for positioning. 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. The reduced capability UE may be configured to perform transmit frequency hopping in RRC\_CONNECTED or RRC\_INACTIVE mode |

**Comment #6:** the following agreement needs to be captured **Agreement**To support intra-band contiguous SRS bandwidth aggregation for UE in RRC\_INACTIVE state, frequency information (e.g. point A, offset to carrier) of one or two additional carriers with respective SRS configurations should be provided to the UE, where the newly introduced carrier(s) and the carrier of the initial BWP should be intra-band contiguous carriers.**Comment#7(8.2.4)**: The granularity is PRB or subchannel needs to be further discussed, So, we prefer putting resource blocks in the bracket

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

**Comment#8(8.2.4.1.2)**: for mode 2, we don’t think the frequency domain information(including bandwidth) is configured. So we prefer to reuse the similar description in the agreement

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| ~~The UE is not expected to be configured with a different bandwidth of an SL PRS resource in a shared resource pool than the bandwidth indicated for PSSCH. The UE is not expected to be configured with a different bandwidth of an SL PRS resource in a dedicated resource pool than the bandwidth of the resource pool.~~For a shared resource pool, SL PRS frequency domain allocation is same as associated PSSCH For a dedicated resource pool, SL PRS frequency domain allocation is same as the resource pool. |

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| Qualcomm3 | With regards to our comment 2, and the response from HW/HiSilicon:* Indeed, what i meant to write is: 64 (#TRPs) \* 4 (# PFLs) = 256, and that is why there are 256 PRS-ID. But this doesn’t change the overall discussion and the point we are trying to make.

In short, assistance data configuration (starting from Rel-16) allows to configure the UE with assistance data in either one of the following ways: * AD construction Approach 1: Same PRS-ID for all the 4 PFLs for each TRP. In which case, if there are 8 sets, there can be 8 set IDs that are “globally” defined within the PRS-ID.
	+ This is HW’s approach of how the AD should be constructed
* AD construction Approach 2: Different PRS-ID for each of the of the 4 PFLs for each TRP.
	+ This is the alternative approach that is already allowed in the specification from rel-16. More specific:
	+ This means, that the same TRP, could have 4 PRS-IDs, each one for a different PFL. See that, each PRS-ID in a given PFL is associated with a NR-DL-PRS-Info-r16, which contains up 2 sets only since nrMaxSetsPerTrpPerFreqLayer-r16 =2.

R-DL-PRS-AssistanceDataPerTRP-r16 ::= SEQUENCE {    dl-PRS-ID-r16                 INTEGER (0..255),    nr-PhysCellID-r16              NR-PhysCellID-r16          OPTIONAL,   -- Need ON    nr-CellGlobalID-r16            NCGI-r15                  OPTIONAL,   -- Need ON    nr-ARFCN-r16                  ARFCN-ValueNR-r15          OPTIONAL,   -- Need ON    nr-DL-PRS-SFN0-Offset-r16      NR-DL-PRS-SFN0-Offset-r16,    nr-DL-PRS-ExpectedRSTD-r16     INTEGER (-3841..3841),    nr-DL-PRS-ExpectedRSTD-Uncertainty-r16                                 INTEGER (0..246),    nr-DL-PRS-Info-r16             NR-DL-PRS-Info-r16,NR-DL-PRS-Info-r16 ::= SEQUENCE {    nr-DL-PRS-ResourceSetList-r16      SEQUENCE (SIZE (1..nrMaxSets**PerTrpPerFreqLayer**-r16)) OF                                                              NR-DL-PRS-ResourceSet-r16,    ...}nrMaxSetsPerTrpPerFreqLayer-r16        INTEGER ::= 2      -- Maximum resource sets for one TRPnrMaxTRPsPerFreq-r16                  INTEGER ::= 64     -- Max TRPs per freq layersBased on the above, without an explicit agreement, we don’t see a need to specify BW Aggregation assuming only one way of AD construction, especially when the other is also possible, and up to network deployment. **Therefore, we still think that “same DL-PRS-ID” should not be included and it should be left up to the network/LMF implementation to construct the AD in either way they see fit.** |  |