3GPP TSG-RAN WG2 Meeting #131

Bengaluru, India, August 25-29, 2025

**Agenda item:** 8.1.2.3

**Source:** Qualcomm Incorporated (Rapporteur)

**Title:** Unofficial offline - LPP-21: "Associated ID" for TRP Location Coordinates

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Per Chairnotes:

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| *LPP-21: "Associated ID" for TRP Location Coordinates (IE TRP-ImplicitLocationInfo-r19)* [Unofficial offline – lead by Qualcomm]  [R2-2505765](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_131\Docs\R2-2505765.zip) Remaining LPP open issues for "AI/ML Positioning Case 1" Qualcomm Incorporated discussion NR\_AIML\_air-Core  Proposal 4a (LPP-21): The new IE for the implicit TRP location information (NR-TRP-LocationInfo-Implicit-r19) has the same structure as the existing IE NR-TRP-LocationInfo-r16, but with the location coordinate information being replaced by an "Associated ID" at each level (TRP, ARPs level).  Proposal 4b (LPP-21): In all NR AI/ML assistance data IEs where Cell IDs (NCGIs, PCIs) can optionally be included for a TRP, the Cell IDs (NCGIs, PCIs) are always present in the IEs if the TRP is associated to a cell.  Proposal 4c (LPP-21): If Proposals 4a/4b are agreeable, the "Associated ID" can be defined with 8-bits.  Proposal 4d (LPP-21): Whether the IEs NR-TRP-LocationInfo-r16 and NR-TRP-LocationInfo-Implicit-r19 can be both provided together or not is left to implementation/deployment and does not need to be specified.  Proposal 4e (LPP-21): If a UE supports explicit TRP location info (NR-TRP-LocationInfo-r16) a UE must not mandatorily support also implicit location info (NR-TRP-LocationInfo-Implicit-r19) (and vice versa).  [R2-2505908](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_131\Docs\R2-2505908.zip) RAN1 Agreements impacting RAN2 and Addressing Open Issues Ericsson discussion Rel-19 NR\_AIML\_air-Core  Proposal 5: (LPP-21) Associate ID for PRS only TP is not considered in Rel-20. The scope of Associate ID (to what granular level the associate ID needs to be updated) is left to NW implementation. Associate ID value range is 0 to 255. Explicit and Implicit TRP coordinates are mutually inclusive. In terms of UE capability, the UE supporting case1 AI/ML must support implicit location info. |

Per Open Issues List:

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| **Open issue LPP-21 (new): "Associated ID" for TRP Location Coordinates (IE TRP-ImplicitLocationInfo-r19)**   1. Must the "Associated ID" for the TRP coordinates be associated with a "cell" (e.g., NCGI)? If so, how should PRS-only TPs (which are not associated with a cell) being handled? And how to implement RAN1 agreement that UE does not expect to receive different values of associated ID for TRPs belonging to the same cell? 2. Is the "Associated ID" only for the TRP location coordinates, or also for the associated DL-PRS Resource Set/DL-PRS Resource ARPs? 3. Is the value range of 0..255 for the "Associated ID" sufficient? In particular if the "Associated ID" should be "configured per cell"? 4. Are the explicit TRP coordinates (NR-TRP-LocationInfo-r16) and implicit TRP coordinates (NR-TRP-ImplicitLocationInfo-r19) mutually exclusive, or can a deployment provide both? 5. If a UE supports explicit TRP location info (NR-TRP-LocationInfo-r16), must a UE support also implicit location info (NR-TRP-ImplicitLocationInfo-r19) (and vice versa)? |

Currently, only the following RAN1 agreement from RAN1#121 is available:

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| Agreement  For AI/ML based positioning Case 1, regarding Info #7 in the assistance information from legacy UE-based DL-TDOA,   * If implicitly provided, the implicit indication of Info #7 is via associated ID.   + For given TRP(s), same associated ID implies that geographical coordinates of the TRP(s) can be understood as consistent by the UE.   + The associated ID is not expected to provide the real value of Info #7 (i.e., geographical coordinates of the TRP(s) are not disclosed).   + an associated ID is configured per-cell (e.g., NCGI-r15)     - UE does not expect to receive different values of associated ID for TRPs belonging to the same NCGI-r15   + Associated ID can be realized by an identifier of N bits (e.g., 8 bits) |

Per RAN1 agreement above, "an associated ID is configured per-cell (e.g., NCGI-r15)". For NR positioning, PRS-only TPs are also supported. Since a PRS-only TP has no NCGI, the "associated ID" would need to be indicated for a DL-PRS ID (i.e., TRP ID). Ericsson proposes above that "Associate ID for PRS only TP is not considered in Rel-20" (I assume this should be Rel-19).

**Question 1:** Should the *NR-TRP-LocationInfo-Implicit-r19* assistance data support PRS-only TPs?

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| Company | Yes/No | Comments (if any) |
| Nokia |  | We need to get guidance from RAN1. RAN1 should have provided a complete solution for the consistency problem and considered all possible scenarios. |
| Ericsson | No | Associated ID for PRS only TP is not considered in Rel-19 since RAN1 has not considered this. We can add support later. |
| vivo | Yes | There is no restriction on the type of TP transmitting PRS for AI/ML positioning based on RAN1 progress, therefore PRS-only TPs should support *NR-TRP-LocationInfo-Implicit-r19* assistance data in case this type of TP takes part in AI/ML positioning and need to provide it to the network. |
| ZTE | No |  |
| LG | Wait RAN1 input (Yes) | We think RAN2 should wait for further RAN1 input. RAN2 can send LS to RAN1 if needed.  Below is our technical view from RAN2 point of view:  From RAN2 point of view, our answer is Yes.  According to current specifications, DL-PRS-only TP is already supported for PRS-based TBS, so PRS-only TPs should also be supported in NR-TRP-LocationInfo-Implicit.  Since NCGI is not applicable for such PRS-only TPs, relying on DL-PRS ID or PCI alone may lead to ambiguity because DL-PRS ID and PCI values are reused across the network. To avoid this, a combination of DL-PRS ID, PCI, and ARFCN should be used for identification of DL-PRS-only TP.  Within the scope of a single PLMN/LMF domain, this combination may be sufficient to ensure training–inference consistency for AI/ML positioning, even though it does not provide global uniqueness. Where available, PLMN ID can also be included to fully disambiguate across networks. |
| Samsung | YEs | PRS-only TP can be used for AI-POS as like other NR RAT-dependent method. Then, for the consistency between training and inference, the associated ID should be supported also for PRS only TP. |
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Per RAN1 agreement above, the "implicit indication of Info #7 is via associated ID". Info #7 refers to the following row in Table 8.12.2.1.0-1 of 38.305:

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| Geographical coordinates of the TRPs served by the gNB (include a transmission reference location for each DL-PRS Resource ID, reference location for the transmitting antenna of the reference TRP, relative locations for transmitting antennas of other TRPs) |

According to the above, "Info#7" includes "transmission reference location for each DL-PRS Resource ID".

Per Ericsson Proposal above, "The scope of Associate ID (to what granular level the associate ID needs to be updated) is left to NW implementation.". However, a UE need to be aware of the scope of the Associated ID in order to make proper use of the assistance data.

**Question 2a:** Do you agree that the "Associated ID" for indicating the implicit TRP location coordinates in IE *NR-TRP-LocationInfo-Implicit-r19* is also indicating the implicit DL-PRS Resource Set/DL-PRS Resource ARP coordinates?

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| Company | Yes/No | Comments (if any) |
| Nokia |  | Again, RAN1 guidance is needed as even their agreements are inconsistent in that they refer to both “location coordinates” and “Info#7” in their agreements i.e. sometimes they broadly mention use of associated ID for consistency of training and inference but other times they specifically refer to use of associated ID for consistency of TRP locations. However, my interpretation is, associated ID refers to more than TRP location coordinates since it is used to address the consistency of training vs inference, not just consistency of the TRP location coordinates. |
| Ericsson | No as in Not Necessary | it should be NW implementation to decide what change would impact the accuracy of UE positioning and thus NW should update the associatedID; accordingly, we do not think we need to mandate it to ARP level granularity etc. especially when RAN1 has not mentioned.  That is if associatedID has been updated then UE should assume that there is inconsistency. |
| vivo | Yes, but | We do think *NR-TRP-LocationInfo-Implicit-r19* can be used to represent the son IE under TRP location coordinates, but no need to add additional explanation for it in the field description as the representing relationship is on the parent IE level. |
| ZTE | Yes | I assume the RAN1 agreement implies the associate ID represents the change status of the whole *NR-TRP-LocationInfo-r16*, which contains the TRP location and ARP location with respective to the corresponding TRP location: *NR-TRP-LocationInfo* The IE *NR-TRP-LocationInfo* is used by the location server to provide the coordinates of TRPs and coordinates of the antenna reference points for a set of TRPs together with integrity information. For each TRP, the ARP location can be provided for each associated DL-PRS Resource ID per DL-PRS Resource Set. |
| LG | Wait RAN1 input (Yes) | We think RAN2 should wait for further RAN1 input. RAN2 can send LS to RAN1 if needed.  Below is our technical view from RAN2 point of view:  From RAN2 point of view, our answer is Yes.  Associated ID should not be limited to TRP coordinates only. To ensure consistency between training and inference phases, it should also cover DL-PRS Resource Set and ARP level coordinates. This aligns with current specifications (TS 38.305, TS 37.355), where both TRP coordinates and DL-PRS/ARP transmission reference positions are part of the assistance data. Restricting Associated ID to TRP level alone would prevent UEs from correctly aligning the PRS resources used during model training and inference. |
| Samsung | Yes | To guarantee the consistency between training and inference, the associated ID should apply to both TRP location and ARP location. Even with the same TRP location, if ARP location of DL-PRS Resource(Set) changes, we can not guarantee the consistency. |
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**Question 2b:**

If your answer to question 2a is "yes", should it be possible to (optionally) indicate separate "Associated IDs" for the TRP and ARP coordinates (Qualcomm Proposal above), or should there be a single "Associated ID" for all ARPs under each TRP?

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| Company | Single ID/Separate ID | Comments (if any) |
| Nokia |  | Depends on the requirements from RAN1. We need to conclude on Question 2a first. |
| Ericsson |  | Associated ID is still on per cell level. |
| vivo | Single ID | We should stick to what RAN1 agreement is and endorse it in LPP specification, with no extra interpretation. |
| ZTE | Single ID | As mentioned in Q2a, there is no need to reflect the change status for TRP location and ARP location separately. |
| LG | Wait RAN1 input (Separate) | We think RAN2 should wait for further RAN1 input. RAN2 can send LS to RAN1 if needed.  Below is our technical view from RAN2 point of view:  From RAN2 point of view, our answer is to separate "Associated IDs" for the TRP and ARP coordinates.  Associated ID should be assignable at both TRP and ARP levels, rather than relying only on a single TRP-level ID. A TRP-level ID ensures stability of the TRP’s geographical coordinates. Separate ARP-level IDs allow finer granularity when PRS resources or antenna reference points change (e.g., beam panel reconfiguration), while maintaining the association to the parent TRP.  This two-level approach is consistent with TS 38.305 and 37.355, which define both TRP and ARP transmission reference positions, and avoids forcing all updates to be signaled at the TRP level when only ARP configurations change |
| Samsung | Single ID | Single ID configured per TRP can imply the consistency of ARP of DL-PRS Resoruce(set) from the TRP. |
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In all NR positioning assistance data, a TRP is identified by the DL-PRS ID. However, given that there is usually some time elapsed between training and inference phases, the DL-PRS ID only may be ambiguous. To resolve this potential ambiguity, a cell-ID can be provided in addition. There is the following common structure in all existing NR positioning assistance data elements:

dl-PRS-ID-r16 INTEGER (0..255),

nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL,

nr-CellGlobalID-r16 NCGI-r15 OPTIONAL,

nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL,

For example, in the assistance data used for training, a particular value for the DL-PRS ID may be the same as in the assistance data for inference but may indicate different physical TRPs. A DL-PRS ID would be unambiguous only within the same LPP session, but there is no guarantee that a DL-PRS ID is unambiguous across different LPP sessions (and across different LMFs).

Therefore, Qualcomm proposed above that for DL AI/ML positioning, whenever assistance data are provided, a LMF must always include the Cell-IDs in all NR assistance data elements when the TRP is associated to a cell (in LPP, this could for example be implemented via a NOTE in *NR-DL-AIML-ProvideAssistanceData*).

**Question 3a:** Do you agree that for DL AI/ML positioning, when NR AI/ML assistance data are provided, the Cell IDs (NCGIs, PCIs) must always be included in the assistance data IEs when the TRP is associated to a cell?

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| Company | Yes/No | Comments (if any) |
| Nokia |  | We agree about the ambiguity in identifying the TRPs but let us get more guidance on associated ID usage from RAN1 first. |
| Ericsson | Yes | We agree that ASN.1 should not change and Note should be sufficient. |
| vivo | Yes |  |
| ZTE |  | Whether the TRPs in a certain cell can be allocated with different DL-PRS ID in different time? If so, the cell ID + DL-PRS ID cannot guarantee the one physical TRP |
| LG | Wait RAN1 input (Yes) | We think RAN2 should wait for further RAN1 input. RAN2 can send LS to RAN1 if needed.  Below is our technical view from RAN2 point of view:  From RAN2 point of view, our answer is Yes.  When a TRP is associated with a cell, the Cell ID (NCGI/PCI) should always be included in NR-TRP-LocationInfo-Implicit to avoid ambiguity. This approach is consistent with current specifications, where TRP identification uses the combination of NCGI/PCI, ARFCN and DL-PRS ID.  But, a note is fine. Deleting OPTIONAL is not supported. NCGI should be included whenever available, since PCI alone is reused and not globally unique. NCGI provides global uniqueness and ensures that the TRP can be unambiguously identified across sessions and PLMNs/LMFs, but providing PCI or NCGI depends on whether PRS-only TP or not, respectively. |
| Samsung | Yes | For ZTE’s comment, we think cell ID + DL-PRS ID + associated ID can guarantee the one physical TRP. |
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**Question 3b:** Is the value range of 0..255 for the "Associated ID" considered being sufficient?

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| Company | Yes/No | Comments (if any) |
| Nokia |  | Depends on further guidance from RAN1. |
| Ericsson | Yes | We see this same as valueTag for SIBs. 255 should be more than adequate. |
| vivo | Yes |  |
| ZTE | Yes |  |
| LG | Wait RAN1 input (Yes, but) | We think RAN2 should wait for further RAN1 input. RAN2 can send LS to RAN1 if needed.  Below is our technical view from RAN2 point of view:  From RAN2 point of view, our answer is Yes, but…  Yes, 0..255 range for Associated ID appears sufficient under the assumption that IDs are allocated per cell, since a single cell is unlikely to host more than 256 PRS TRPs.  But, in very dense deployments or future extensions, this limit may become restrictive, e.g., 256 PRS IDs are used in single ARFCN and multiple ARFCNs are used as well. So we therefore recommend keeping 8-bit (0..255) as the baseline, but defining the field with an extension marker (e.g., INTEGER (0..maxNrOfTRPs)) to allow future expansion beyond 256 if needed. |
| Samsung | Yes |  |
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Currently, all assistance data for all positioning methods are optional (i.e., for each defined assistance data element there is also a separate UE capability indication). Ericsson proposes above that a UE supporting Case 1 must also support the *NR-TRP-LocationInfo-Implicit-r19* assistance data.

**Question 4a:** Must the support for *NR-TRP-LocationInfo-Implicit-r19* assistance data be mandatory for a UE supporting Case 1?

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| Company | Yes/No | Comments (if any) |
| Nokia |  | Depends on the RAN1 guidance and what they decide in terms of UE features list. |
| Ericsson | Yes | As per RAN1 agreement; NW may only provide Assistance data#7 implictly; thus UE supporting the case1 must support this implicit Location.  UE supporting this implicit location capability shall also support explicit TRP location info (NR-TRP-LocationInfo-r16). But the UE supporting explicit TRP location info is NOT mandated to support implicit TRP location info |
| vivo | No | As per RAN1 agreement, TRP location information can be indicated either explicitly or implicitly, therefore UE is not required to mandatorily support the implicit way. |
| ZTE | No | Explicit TRP location exposure and implicit TRP location exposure are both supported for case 1. There is no need to have such restriction |
| LG | Wait RAN1 input (No) | We think RAN2 should wait for further RAN1 input. RAN2 can send LS to RAN1 if needed.  Below is our technical view from RAN2 point of view:  From RAN2 point of view, our answer is No.  We understand that the purpose of NR-TRP-LocationInfo-Implicit is to reduce signaling overhead by referring to TRP/ARP coordinates through an Associated ID, thereby ensuring consistency between training and inference phases. However, such consistency can only be guaranteed if the UE already knows the mapping between the Associated ID and the explicit coordinate set.  Therefore, during the training phase, it is essential that the LMF provides both the explicit TRP/ARP coordinates and the corresponding Associated ID. This allows the UE to establish a clear mapping. Then, during the inference phase, the LMF can signal only the Associated ID, and the UE can reliably interpret it based on the stored mapping.  Without this explicit-to-implicit initialization step, the UE cannot ensure that the ID received at inference actually corresponds to the same TRP set used in training, which may break training–inference consistency.  This aligns with the general LPP framework where all assistance data elements are optional and controlled by UE capability signaling and network configuration. |
| Samsung | No | There can be the UE supporting Case 1 with only explicit location. |
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**Question 4b:** If a UE supports both, explicit TRP coordinates (*NR-TRP-LocationInfo-r16*) and implicit TRP coordinates (*NR-TRP-LocationInfo-Implicit-r19*) (independent of Question 4a) can a LMF provide both to a UE (when supported by an LMF and e.g., requested by a UE)?

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| Company | Yes/No | Comments (if any) |
| Nokia | No | Need RAN1 guidance. Need to know whether RAN1 motivation is to use associated ID for not revealing the TRP location or as a signalling optimization to refer to a group of TRPs. |
| Ericsson | Up to NW implementation | The answer is both yes and no and up to NW. |
| vivo | See comment | This two IEs should be viewed as two independent assistance data. The UE can support receiving both; however, only when it requests both, there exists a possibility to provide both. However, we do not think UE might request the same information in different forms at the same time. In this sense, we should depend on UE implementation to solve this issue. |
| ZTE | Yes | It depends on NW implementation on how to set the both fields, or choose only to set one of them. |
| LG | Wait RAN1 input (Yes) | We think RAN2 should wait for further RAN1 input. RAN2 can send LS to RAN1 if needed.  Below is our technical view from RAN2 point of view:  From RAN2 point of view, our answer is Yes.  We do not see strong reasons that LMF provide both explicit and implicit (i.e. Association ID) TRP coordinates at the same time, but that can be useful in some cases, e.g., due to big time gaps, to check consistency of information between training phase and inference phase, especially for debugging, verification, or migration scenarios. |
| Samsung | Yes | We think that the implicit coordinate can be used to indicate the consistency of the explicit coordinate. For that case, LMF can provide both of them together in the first assistance data message. Anyway how to configure them can be up to NW implementation. |
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