**3GPP TSG-RAN WG2 Meeting #121 *R2-230xxxx***

**Athens, Greece, Feb 27 – Mar 03, 2023**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.305** | **CR** | **0119** | **rev** | **1** | **Current version:** | **17.3.0** |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **X** |

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| ***Title:*** | Miscellaneous corrections for Positioning Stage2 | | | | | | | | | |
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| ***Source to WG:*** | Intel Corporation, Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh-Core | | | | |  | ***Date:*** | | | 2023-02-16 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)*  *Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This CR is to capture changes from CRs submitted in RAN2#120  **R2-2212356**  1 Capture Aperidoic UL-SRS not supported” in section 7.9 as a Note.  **R2-2212688**  1currently multiple assistance data instances cannot be contained in the same LPP ProvideAssistanceData message.  **R2-2212929**  1 RAN2#119bis-e meeting discussed about the issue about the achievable TIR and came to the following agreements:   |  | | --- | | Agreements  Proposal 1: No need to provide AL to UE to optionally obtain the achievable TIR.  Proposal 2: When the achievable TIR does not equal the requested TIR, how UE sets the value of achievableTargetIntegrityRisk is up to the UE implementation, i.e., the value can be larger or smaller than that of the requested TIR.  Can be considered next meeting if some impact to stage 2 is needed to reflect these agreements. |   Note that there exists a statement in current specification as “For the PL to be considered valid, it must simply satisfy the inequality above”, which contradicts the agreeable understanding that PL is not strictly calculated in a one-to-one mapping manner with required TIR. The value of PL is decided by UE based on implementation. Besides, if the TIR achieved by PL is not equal to the required TIR, the achievable TIR should be provided along with PL as specified in TS 37.355. Otherwise, the description is inaccurate without a supplementary condition.  2 UE-based integrity is supported for GNSS positioning method. However, when listed the possible information from UE to LMF in Section 8.1.2.2, the integrity information is not included. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | **R2-2212356**  1 Capture Aperidoic UL-SRS not supported” in section 7.9 as a Note  **R2-2212688**  1in 8.10.3.1.2.1, 8.11.3.1.2 and 8.12.3.1.2, change “One or more assistance data instances may be provided in one or more LPP Assistance Data messages.” to “One or more assistance data instances may be provided. Each instance is provided in one LPP Assistance Data messages.”  **R2-2212929**  1 in 3.1 to add a Note, NOTE 2: the TIR may correspond to the achievable TIR in the case that the requested TIR cannot be satisfied.  2 in 8.1.2.2 add the integrity information to Table 8.1.2.2-1  **Impact Analysis**  Impacted 5G architecture options: NR SA  Impacted functionality:  - Rel-17 positioning enhancements  Inter-operability issues:  - No issue has been identified. | | | | | | | | |
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| ***Consequences if not approved:*** | | Missing functional behaviour description in stage 2. | | | | | | | | |
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| ***Clauses affected:*** | | 3.1, 7.7.2, 7.8.1, 7.9, 8.1.2.2, 8.10.3.1.2.1, 8.11.3.1.2, 8.12.3.1.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

START OF CHANGE

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

As used in this document, the suffixes "-based" and "-assisted" refer respectively to the node that is responsible for making the positioning calculation (and which may also provide measurements) and a node that provides measurements (but which does not make the positioning calculation). Thus, an operation in which measurements are provided by the UE to the LMF to be used in the computation of a position estimate is described as "UE-assisted" (and could also be called "LMF-based"), while one in which the UE computes its own position is described as "UE-based".

**Positioning integrity**: A measure of the trust in the accuracy of the position-related data and the ability to provide associated alerts.

**Pre-configured assistance data**: Refers to the DL-PRS assistance data (with associated validity criteria) that can be provided to the UE (before or during an ongoing LPP positioning session), to be then utilized for potential positioning measurements at a future time (e.g. for deferred MT-LR). Pre-configured DL-PRS assistance data may consist of multiple instances, where each instance is applicable to a different area within the network.

**Protection Level (PL):** A statistical upper-bound of the Positioning Error (PE) that ensures that, the probability per unit of time of the true error being greater than the AL and the PL being less than or equal to the AL, for longer than the TTA, is less than the required TIR, i.e., the PL satisfies the following inequality:   
 *Prob per unit of time* [((*PE>AL*) & (*PL<=AL*)) *for longer than TTA*] *< required TIR*  
When the PL bounds the positioning error in the horizontal plane or on the vertical axis then it is called Horizontal Protection Level (HPL) or Vertical Protection Level (VPL) respectively.  
A specific equation for the PL is not specified as this is implementation-defined. For the PL to be considered valid, it must simply satisfy the inequality above.

NOTE 1: the PL inequality is valid for all values of the AL.

NOTE 2: the TIR may correspond to the achievable TIR in the case that the requested TIR cannot be satisfied.

**PRS-only TP**: A TP which only transmits PRS, DL-PRS signals and is not associated with a cell.

**PRS Processing Window (PPW):** The PRS Processing Window is configured by the network to a UE for NR DL-PRS measurements without measurement gap.

**Reception Point (RP)**: A set of geographically co-located receive antennas (e.g. antenna array (with one or more antenna elements)) for one cell, part of one cell or one UL-SRS-only RP. Reception Points can include base station (ng-eNB or gNB) antennas, remote radio heads, a remote antenna of a base station, an antenna of a UL-SRS-only RP, etc. One cell can include one or multiple reception points. For a homogeneous deployment, each reception point may correspond to one cell.

**Rx Time Delay:** From a signal reception perspective, there will be a time delay from the time when the RF signal arrives at the Rx antenna to the time when the signal is digitized and time-stamped at the baseband.

**Rx Timing Error:** Result of Rx time delay involved in the reception of a signal before reporting measurements that are obtained from the signal. It is the uncalibrated Rx time delay, or the remaining delay after the UE/TRP internal calibration/compensation of the Rx time delay, involved in the reception of the DL-PRS/UL SRS signals. The calibration/compensation may also include the calibration/compensation of the relative time delay between different RF chains in the same UE/TRP and may also possibly consider the offset of the Rx antenna phase centre to the physical antenna centre.

**SRS-only RP**: An RP which only receives UL-SRS signals and is not associated with a cell.

**Transmission Point (TP)**: A set of geographically co-located transmit antennas (e.g. antenna array (with one or more antenna elements)) for one cell, part of one cell or one DL-PRS-only TP. Transmission Points can include base station (ng-eNB or gNB) antennas, remote radio heads, a remote antenna of a base station, an antenna of a DL-PRS-only TP, etc. One cell can include one or multiple transmission points. For a homogeneous deployment, each transmission point may correspond to one cell.

**Transmission-Reception Point (TRP)**: A set of geographically co-located antennas (e.g. antenna array (with one or more antenna elements)) supporting TP and/or RP functionality.

**TRP Rx 'Timing Error Group' (TRP Rx TEG):** Rx timing errors, associated with TRP reporting of one or more UL measurements, that are within a certain margin.

**TRP RxTx 'Timing Error Group' (TRP RxTx TEG):** Rx timing errors and Tx timing errors, associated with TRP reporting of one or more gNB Rx-Tx time difference measurements, which have the 'Rx timing errors+Tx timing errors' differences within a certain margin.

**TRP Tx 'Timing Error Troup' (TRP Tx TEG):** Tx timing errors, associated with TRP transmissions on one or more DL-PRS resources, that are within a certain margin.

**Tx Time Delay:** From a signal transmission perspective, the time delay from the time when the digital signal is generated at baseband to the time when the RF signal is transmitted from the Tx antenna.

**Tx Timing Error:** Result of Tx time delay involved in the transmission of a signal. It is the uncalibrated Tx time delay, or the remaining delay after the TRP/UE internal calibration/compensation of the Tx time delay, involved in the transmission of the DL-PRS/UL SRS signals. The calibration/compensation may also include the calibration/compensation of the relative time delay between different RF chains in the same TRP/UE and may also possibly consider the offset of the Tx antenna phase centre to the physical antenna centre.

**UE Rx 'Timing Error Group' (UE Rx TEG):** Rx timing errors, associated with UE reporting of one or more DL measurements (RSTD), that are within a certain margin.

**UE RxTx 'Timing Error Group' (UE RxTx TEG):** Rx timing errors and Tx timing errors, associated with UE reporting of one or more UE Rx-Tx time difference measurements, which have the 'Rx timing errors+Tx timing errors' differences within a certain margin.

**UE Tx 'Timing Error Group' (UE Tx TEG):** Tx timing errors, associated with UE transmissions on one or more UL SRS resources for positioning purpose, that are within a certain margin.

NEXT CHANGE

## 7.9 Positioning in RRC\_INACTIVE state

Positioning may be performed when a UE is in RRC\_INACTIVE state. Any uplink LCS or LPP message can be transported in RRC\_INACTIVE state. If the UE initiated data transmission using UL SDT, the network can send DL LCS, LPP, RRC Release message (e.g. to configure SRS for UL positioning, if it is supported) and MAC CE to the UE without the need of state transition.

Periodic and Semi-persistent UL-SRS transmission for positioning can be supported in RRC\_INACTIVE.

NOTE: Aperiodic UL-SRS transmission for positioning is not supported in RRC\_INACTIVE.

NEXT CHANGE

#### 8.1.2.2 Information that may be transferred from the UE to LMF

The information that may be signalled from UE to the LMF is listed in table 8.1.2.2-1.

Table 8.1.2.2-1: Information that may be transferred from UE to the LMF

|  |  |  |
| --- | --- | --- |
| Information | UE‑assisted | UE‑based/standalone |
| Latitude/Longitude/Altitude, together with uncertainty shape | No | Yes |
| Velocity, together with uncertainty shape | No | Yes |
| Reference Time, possibly together with GNSS to NG-RAN time association and uncertainty | Yes | Yes |
| Indication of used positioning methods in the fix | No | Yes |
| Code phase measurements, also called pseudorange | Yes | No |
| Doppler measurements | Yes | No |
| Carrier phase measurements, also called Accumulated Delta Range (ADR) | Yes | No |
| Carrier-to-noise ratio of the received signal | Yes | No |
| Measurement quality parameters for each measurement | Yes | No |
| Additional, non-GNSS related measurement information | Yes | No |
| Protection Level, optionally together with achievable Target Integrity Risk | No | Yes |

NEXT CHANGE

###### 8.10.3.1.2.1 Assistance Data Transfer between LMF and UE

The purpose of this procedure is to enable the LMF to provide assistance data to the UE (e.g., as part of a positioning procedure) and the UE to request assistance data from the LMF (e.g., as part of a positioning procedure). The LMF may provide the pre-configured DL-PRS assistance data (with associated validity criteria) to the UE (before or during an ongoing LPP positioning session), to be utilized for potential positioning measurements at a future time. Pre-configured DL-PRS assistance data may consist of multiple instances, where each instance is applicable to a different area within the network. One or more assistance data instances may be provided. Each instance is provided in one LPP Assistance Data messages.

If a UE receives assistance data for a TRP for which it has already stored assistance data, it overwrites the stored assistance data, whereas if a UE receives assistance data for a TRP for which it has not stored assistance data, it maintains its stored assistance data for other TRPs. The TRPs are uniquely identified using a combination of PRS-ID and Cell-ID. The number TRPs for which the UE can store Assistance Data is a UE capability and is indicated by the number of areas a UE can support.

NEXT CHANGE

##### 8.11.3.1.2 Assistance Data Transfer Procedure

The purpose of this procedure is to enable the LMF to provide assistance data to the UE (e.g., as part of a positioning procedure) and the UE to request assistance data from the LMF (e.g., as part of a positioning procedure). The LMF may provide the pre-configured DL-PRS assistance data (with associated validity criteria) to the UE (before or during an ongoing LPP positioning session), to be utilized for potential positioning measurements at a future time. Pre-configured DL-PRS assistance data may consist of multiple instances, where each instance is applicable to a different area within the network. One or more assistance data instances may be provided. Each instance is provided in one LPP Assistance Data messages.

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NEXT CHANGE

##### 8.12.3.1.2 Assistance Data Transfer Procedure

The purpose of this procedure is to enable the LMF to provide assistance data to the UE (e.g., as part of a positioning procedure) and the UE to request assistance data from the LMF (e.g., as part of a positioning procedure). The LMF may provide the pre-configured DL-PRS assistance data (with associated validity criteria) to the UE (before or during an ongoing LPP positioning session), to be utilized for potential positioning measurements at a future time. Pre-configured DL-PRS assistance data may consist of multiple instances, where each instance is applicable to a different area within the network. One or more assistance data instances may be provided. Each instance is provided in one LPP Assistance Data messages.

If a UE receives assistance data for a TRP for which it has already stored assistance data, it overwrites the stored assistance data, whereas if a UE receives assistance data for a TRP for which it has not stored assistance data, it maintains its stored assistance data for other TRPs. The TRPs are uniquely identified using a combination of PRS-ID and Cell-ID. The number TRPs for which the UE can store Assistance Data is a UE capability and is indicated by the number of areas a UE can support.

END OF CHANGE