**3GPP TSG-RAN WG3 Meeting #128 *R3-253977***

**Malta, MT, 19th – 23rd May 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.305** | **CR** | **-** | **rev** | **-** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](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 |  | Radio Access Network | **X** | Core Network | **X** |

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|  | | | | | | | | | | |
| ***Title:*** | Introduction of AIML air | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CATT, Ericsson, Nokia, Huawei, Xiaomi, ZTE, CMCC, Samsung, CEWiT, Jio Platforms | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_AIML\_air-Core | | | | |  | ***Date:*** | | | 2025-04-15 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In Rel-19, AI/ML assisted positioning with gNB side model is supported. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Specify the stage 2 description for Positioning Data Collection Procedure. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No stage 2 description for the for Positioning Data Collection Procedure. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.4.2, 5.4.4, 6.3.1, 7.x(new), 7.x.1 (new), 7.x.2 (new), 8.10.1, 8.10.2.3, 8.10.3.0, 8.13.1, 8.13.2.2, 8.13.2.3, 8.13.3.0 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 38.455 CR 0190  TS 38.473 CR 1575  TS 38.413 CR 1285  TS 38.401 CR 0477  TS 38.300 Draft 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:*** | | Capture the agreed TP: R3-252486.  Implement the agreed TP: R3-253963. | | | | | | | | |

**START OF CHANGES**

## 5.4 Functional Description of Elements Related to UE Positioning in NG-RAN

[…]

### 5.4.2 gNB

The gNB is a network element of NG-RAN that may provide measurement information for a target UE and communicates this information to an LMF.

To support NR RAT-Dependent positioning, the gNB may make measurements of radio signals for a target UE, and provide measurement results for position estimation. A gNB may serve several TRPs, including for example remote radio heads, and UL-SRS only RPs and DL-PRS-only TPs. For NTN, a TRP may be located on board the satellite.

A gNB may host AI/ML models to infer the measurements from radio signals transmitted by a target UE. The AI/ML model that is used for measurement inference by the gNB may have been trained by the gNB.

A gNB may broadcast assistance data information, received from an LMF, in positioning System Information messages.

### 5.4.3 ng-eNB

The ng-eNB is a network element of NG-RAN that may provide measurement results for position estimation and makes measurements of radio signals for a target UE and communicates these measurements to an LMF.

The ng-eNB makes its measurements in response to requests from the LMF (on demand or periodically).

An ng-eNB may serve several TPs, including for example remote radio heads and PRS-only TPs for PRS-based TBS positioning for E-UTRA.

An ng-eNB may broadcast assistance data information, received from an LMF, in positioning System Information messages.

### 5.4.4 Location Management Function (LMF)

The LMF manages the support of different location services for target UEs, including positioning of UEs and delivery of assistance data to UEs. The LMF may interact with the serving gNB or serving ng-eNB for a target UE in order to obtain position measurements for the UE, including uplink measurements made by an NG-RAN and downlink measurements made by the UE that were provided to an NG-RAN as part of other functions such as for support of handover.

The LMF may interact with a target UE in order to deliver assistance data if requested for a particular location service, or to obtain a location estimate if that was requested.

The LMF may interact with multiple NG-RAN nodes to provide assistance data information for broadcasting. The assistance data information for broadcast may optionally be segmented and/or ciphered by the LMF. The LMF may also interact with AMFs to provide ciphering key data information to the AMF as described in greater detail in TS 23.273 [35].

For positioning of a target UE, the LMF decides on the position methods to be used, based on factors that may include the LCS Client type, the required QoS, UE positioning capabilities, gNB positioning capabilities and ng-eNB positioning capabilities. The LMF then invokes these positioning methods in the UE, serving gNB and/or serving ng‑eNB. The positioning methods may yield a location estimate for UE-based position methods and/or positioning measurements for UE-assisted and network-based position methods. The LMF may combine all the received results and determine a single location estimate for the target UE (hybrid positioning). Additional information like accuracy of the location estimate and velocity may also be determined.

The LMF may interact with the AMF to provide (updated) UE Positioning Capability to AMF and to receive stored UE Positioning Capability from AMF as described in TS 23.273 [35].

For NTN, the LMF is configured by the OAM with satellite related information (described in TS 38.300 [52]), as well as the association between TRP(s) and satellite(s), the association between gNB and TRP(s).

A LMF may host AI/ML models to infer the target UE location from measurement information received from gNBs. The AI/ML model that is used for UE location inference by the LMF may have been trained by the LMF.

### 5.4.5 Positioning Reference Unit (PRU)

A Positioning Reference Unit (PRU) at a known location can perform positioning measurements (e.g., RSTD, RSRP, UE Rx-Tx Time Difference measurements, DL-RSCPD, DL-RSCP, etc.) and report these measurements to a location server. In addition, the PRU can transmit SRS to enable TRPs to measure and report UL positioning measurements (e.g., RTOA, UL-AoA, gNB Rx-Tx Time Difference, UL-RSCP, etc.) from PRU at a known location. The PRU measurements can be compared by a location server with the measurements expected at the known PRU location to determine correction terms for other nearby target devices. The DL- and/or UL location measurements for other target devices can then be corrected based on the previously determined correction terms.

PRU measurements may also be provided to the target device in the assistance data as described in clause 8.12.

From a location server perspective, the PRU functionality is realized by a UE with known location.

**Next Change**

## 6.3 NG-RAN Node terminated protocols

### 6.3.1 NR Positioning Protocol A (NRPPa)

The NR Positioning Protocol A (NRPPa) carries information between the NG-RAN Node and the LMF. It is used to support the following positioning functions:

- E-CID for E-UTRA where measurements are transferred from the ng-eNB to the LMF.

- Data collection from ng-eNB's and gNB's for support of OTDOA positioning for E-UTRA.

- Cell-ID and Cell Portion ID retrieval from gNB's for support of NR Cell ID positioning method.

- Exchange of information between LMF and NG-RAN node for the purpose of assistance data broadcasting.

- NR E-CID where measurements are transferred from the gNB to the LMF.

- NR Multi-RTT where measurements are transferred from the gNB to the LMF.

- NR UL-AoA where measurements are transferred from the gNB to the LMF.

- NR UL-TDOA where measurements are transferred from the gNB to the LMF.

- Data collection from gNBs for support of DL-TDOA, DL-AoD, Multi-RTT, UL-TDOA, UL-AoA.

- Measurement Preconfiguration Information Transfer which allows the LMF to request the NG-RAN node to pre-configure and activate/deactivate measurement gap and/or PRS processing window.

- Area-specific SRS Information Transfer which allows the LMF to notify the NG-RAN node about area-specific SRS configuration information.

- Transfer of data collection information from LMF to gNB to facilitate AI/ML model training and performance monitoring at the gNB.

The NRPPa protocol is transparent to the AMF. The AMF routes the NRPPa PDUs transparently based on a Routing ID corresponding to the involved LMF over NG-C interface without knowledge of the involved NRPPa transaction. It carries the NRPPa PDUs over NG-C interface either in UE associated mode or non-UE associated mode.

In case of a split gNB architecture, the NRPPa protocol is terminated at the gNB-CU.

**Next Change**

## 7.x AI/ML assisted positioning with gNB side model

### 7.x.1 General

NG-RAN support for AI/ML positioning requires inputs of ground truth and related data from LMF and measurements by the gNB for the purpose of management of the corresponding gNB side AI/ML model.

### 7.x.2 Positioning Data Collection Procedure

Figure 7.x.2-1 shows the Positioning Data Collection procedure used to retrieve positioning information for a UE that is undergoing a positioning process.

Figure 7.x.2-1: Positioning Data Collection Procedure

1. The LMF sends the NRPPa MEASUREMENT REQUEST message to one or more gNBs according to UL related positioning procedures described in Clause 8.

2. The gNB(s) determines that data collection is needed for the UE being positioned.

3. The gNB(s) sends the NRPPa MEASUREMENT RESPONSE message to the LMF and indicates that data collection is needed for the UE being positioned.

Note: Steps 1 to 3 may occur while the LMF performs one or more of the positioning procedures described in clause 8.

4. The LMF sends a NRPPa POSITIONING DATA COLLECTION REPORT message to the gNB(s) which indicated in step 3 that positioning data collection is needed. The message includes information related to UE location and correlation information that enables the gNB to correlate the information related to UE location with information related to UL measurements (e.g., LMF Measurement ID and RAN Measurement ID).

Editor’s Note: The texts above could be further refined, if needed.

Editor’s Note: FFS on details of the signallings and IEs.

**Next Change**

## 8.10 Multi-RTT positioning

### 8.10.1 General

In the Multi-RTT positioning method, the UE position is estimated based on measurements performed at both, UE and TRPs. The measurements performed at the UE and TRPs are UE/gNB Rx-Tx time difference measurements (and optionally DL-PRS-RSRP, DL-PRS-RSRPP, UL-SRS-RSRP, UL-SRS-RSRPP, and/or DL-RSCP/UL-RSCP) of DL-PRS and UL-SRS, which are used by an LMF to determine the RTTs.

The gNB Rx-Tx time difference measurements may also be inferred by using a trained AI/ML model hosted by the NG-RAN node.

For network verification of UE location in NTN, the measurements can be performed at a single TRP at different time instances. The additional measurements performed at UE are the UE Rx – Tx time difference subframe offset in unit of subframe and the DL timing drift due to Doppler in service link between UE and satellite as defined in TS 38.215 [37].

The UE may require measurement gaps to perform the Multi-RTT measurements from NR TRPs. The UE may request measurement gaps from a gNB using the procedure described in clause 7.4.1.1. The UE may also request to activate pre-configured measurement gaps as described in clause 7.7.2.

NOTE: Multi-RTT positioning with aperiodic or semi-persistent SRS is not supported for a U2N Remote UE.

[…]

#### 8.10.2.3 Information that may be transferred from the gNB to LMF

[…]

The measurement results that may be signalled from gNBs to the LMF is listed in Table 8.10.2.3-3.

Table 8.10.2.3-3: Measurement results that may be transferred from gNBs to the LMF

|  |
| --- |
| Measurement results |
| NCGI and TRP ID of the measurement |
| gNB Rx-Tx time difference measurement NOTE 2 |
| UL-SRS-RSRP |
| UL-SRS-RSRPP |
| UL-RSCP measurement |
| UL Angle of Arrival (azimuth and/or elevation) NOTE 1 |
| Multiple UL Angle of Arrival (azimuth and/or elevation) NOTE 1 |
| SRS Resource Type |
| Time stamp of the measurement |
| Quality for each measurement |
| Beam Information of the measurement |
| LoS/NLoS information for each measurement NOTE 2 (FFS) |
| ARP ID of the measurement |
| Mobile TRP Location Information |
| Measured frequency hops |
| Aggregated positioning SRS resource ID list |
| Measurement based on aggregated resources indication |
| NOTE 1: When used with UL-AoA for hybrid positioning.  NOTE 2: These measurements may also be inferred by using a trained AI/ML model hosted by the NG-RAN node, |

[…]

### 8.10.3 Multi-RTT Positioning Procedures

#### 8.10.3.0 General

The procedures described in this clause support Multi-RTT positioning measurements obtained by the UE and TRPs/gNB.

The procedures for data collection to support AI/ML model training and performance monitoring at the NG-RAN node for Multi-RTT positioning measurement inference are described in Clause 7.x.

[…]

**Next Change**

## 8.13 UL-TDOA positioning

### 8.13.1 General

In the UL-TDOA positioning method, the UE position is estimated based on UL-RTOA (and optionally UL-SRS-RSRP and/or UL-SRS-RSRPP and/or UL-RSCP) measurements taken at different TRPs of uplink radio signals from UE, along with other configuration information.

The UL-RTOA measurements taken at different TRPs of uplink radio signals from UE may also be inferred by using a trained AI/ML model hosted by the NG-RAN node.

The LMF may also use a trained AI/ML model hosted by the LMF to infer directly the UE location using the TRP measurements.

The specifics of any UL-TDOA positioning methods or techniques used to estimate the UE's location from these measurements are beyond the scope of this specification.

In order to obtain uplink measurements, the TRPs need to know the characteristics of the SRS signal transmitted by the UE for the time period required to perform uplink measurement. These characteristics should be static over the periodic transmission of SRS during the uplink measurements. Hence, the LMF will indicate to the serving gNB the need to direct the UE to transmit SRS signals for uplink positioning. It is up to the serving gNB to make the final decision on resources to be assigned and to communicate this SRS configuration information back to the LMF so that LMF can forward the SRS configuration to the TRPs. The gNB may decide (e.g., in case no resources are available) to configure no resources for the UE and report the empty resource configuration to the LMF.

NOTE: UL-TDOA positioning with aperiodic or semi-persistent SRS is not supported for a U2N Remote UE.

[…]

### 8.13.2 Information to be transferred between NG-RAN/5GC Elements

This clause defines the information that may be transferred between LMF and gNB/TRPs.

[…]

#### 8.13.2.2 Location Information that may be transferred from the gNBs to LMF

The information that may be transferred from gNBs to the LMF include measurement results listed in Table 8.13.2.2-1. The individual measurements are defined in TS 38.215 [37].

Table 8.13.2.2-1: Measurement results that may be transferred from gNBs to the LMF

|  |
| --- |
| Measurement results |
| NCGI and TRP ID of the measurement |
| UL-RTOA NOTE 2 |
| UL-SRS-RSRP |
| UL-SRS-RSRPP |
| UL-RSCP measurement |
| UL Angle of Arrival (azimuth and/or elevation) NOTE 1 |
| Multiple UL Angle of Arrival (azimuth and/or elevation) NOTE 1 |
| SRS Resource Type |
| Time stamp of the measurement |
| Quality for each measurement |
| Beam Information for each measurement |
| LoS/NLoS information for each measurement NOTE 2 (FFS) |
| ARP ID of the measurement |
| Mobile TRP Location Information |
| Measured frequency hops |
| Aggregated positioning SRS resource ID list |
| Measurement based on aggregated resources indication |
| Time domain channel measurements (FFS)NOTE 3 |
| NOTE 1: When used with UL-AoA for hybrid positioning.  NOTE 2: These measurements may also be inferred by using a trained AI/ML model hosted by the NG-RAN node.  NOTE 3: These measurements may also be used by an LMF to directly infer the UE location using a trained AI/ML model hosted by the LMF. |

#### 8.13.2.3 Information that may be transferred from the LMF to gNBs

The requested UL-SRS transmission characteristics information that may be signalled from the LMF to the gNB is listed in Table 8.13.2.3-1.

Table 8.13.2.3-1: Requested UL-SRS transmission characteristics information that may be transferred from LMF to gNB.

|  |
| --- |
| Information |
| Number Of Transmissions/duration for which the UL-SRS is requested |
| Bandwidth |
| Resource type (periodic, semi-persistent, aperiodic) |
| Pathloss reference:  - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs)  - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |
| Spatial relation info  - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs)  - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID  - NZP CSI-RS Resource ID  - SRS Resource ID  - Positioning SRS Resource ID |
| SSB Information |
| Periodicity of the SRS for each SRS resource set |
| Carrier frequency of SRS transmission bandwidth |
| Bandwidth aggregation request indication |
| Positioning validity area cell list |
| Validity area specific SRS information |

The TRP measurement request information that may be signalled from the LMF to the gNB is listed in table 8.13.2.3-2.

Table 8.13.2.3-2: TRP Measurement request information that may be transferred from LMF to gNB.

|  |
| --- |
| Information |
| TRP ID, cell ID of the TRP to receive UL-SRS |
| UE-SRS configuration |
| UL timing information together with timing uncertainty, for reception of SRS by candidate TRPs |
| Report characteristics for the measurements |
| Measurement Quantities |
| Measurement periodicity and amount |
| Measurement beam information request |
| Search window information |
| Expected UL AoA/ZoA and uncertainty range |
| Number of TRP Rx TEGs |
| Response time |
| Measurement characteristics request indicator |
| Measurement time occasions for a measurement instance |
| Time window information for measurements |
| Information on time window size and number of channel response samples for channel measurements |

The Positioning Activation/Deactivation request information that may be signalled from the LMF to the gNB is listed in Table 8.13.2.3-3.

Table 8.13.2.3-3: Requested positioning activation/deactivation information that may be transferred from LMF to gNB.

|  |
| --- |
| Information |
| SP UL-SRS:  - Activation or Deactivation request  - Positioning SRS Resource Set ID which is to be activated/deactivated  - Spatial relation for Resource IDi  - Activation Time |
| Aperiodic UL-SRS:  - Aperiodic SRS Resource Trigger List  - Activation time |
| UL-SRS:  - Release all |

### 8.13.3 UL-TDOA Positioning Procedures

#### 8.13.3.0 General

The procedures described in this clause support UL-TDOA positioning measurements obtained by the gNB and provided to the LMF using NRPPa.

The procedures for data collection to support AI/ML model training and performance monitoring at the NG-RAN node for UL-TDOA measurement inference are described in Clause 7.x.

The procedures for data collection to support AI/ML model training and performance monitoring at the LMF for direct UE location inference are described in TS 23.273 [35].

[…]

**END OF CHANGES**