3GPP TSG-RAN WG3 Meeting #121 R3-234603

Toulouse, France, 21 - 25 August 2023

**Agenda item: 23.2.3**

**Source: Huawei, Nokia, Nokia Shanghai Bell, Ericsson**

**Title: (TP for TS 38.473 BL CR) UL Carrier phase positioning**

**Document for: Other**

#  Text Proposal for TS 38.473

*Start of modifications*

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply.
An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

5GC 5G Core Network

5QI 5G QoS Identifier

AMF Access and Mobility Management Function

ARP Antenna Reference Point

ARPI Additional RRM Policy Index

BH Backhaul

CAG Closed Access Group

CN Core Network

CG Cell Group

CG-SDT Configured Grant-Small Data Transmission

CGI Cell Global Identifier

CHO Conditional Handover

CP Control Plane

CPA Conditional PSCell Addition

CPC Conditional PSCell Change

DAPS Dual Active Protocol Stack

DL Downlink

DL-PRS Downlink Positioning Reference Signal

EN-DC E-UTRA-NR Dual Connectivity

EPC Evolved Packet Core

FSA ID MBS Frequency Selection Area (FSA) ID

IAB Integrated Access and Backhaul

IMEISV International Mobile station Equipment Identity and Software Version number

LMF Location Management Function

MBS Multicast/Broadcast Service

NID Network Identifier

NPN Non-Public Network

NSAG Network Slice AS Group

NSSAI Network Slice Selection Assistance Information

PDC Propagation Delay Compensation

PEIPS Paging Early Indication with Paging Subgrouping

posSIB Positioning SIB

PNI-NPN Public Network Integrated NPN

PTP Point to Point

PTM Point to Multipoint

QMC QoE Measurement Collection

QoE Quality of Experience

RANAC RAN Area Code

RedCap Reduced Capability

RIM Remote Interference Management

RIM-RS RIM Reference Signal

RRC Radio Resource Control

RSRP Reference Signal Received Power

SDT Small Data Transmission

SNPN Stand-alone Non-Public Network

S-NSSAI Single Network Slice Selection Assistance Information

SUL Supplementary Uplink

TAC Tracking Area Code

TAI Tracking Area Identity

TEG Timing Error Group

TRP Transmission-Reception Point

U2N UE-to-Network

UL-AoA Uplink Angle of Arrival

UL-RTOA Uplink Relative Time of Arrival

UL-SRS Uplink Sounding Reference Signal

UL-RSCP UL Reference Signal Carrier Phase

Z-AoA Zenith Angles of Arrival

*next modification*

### 8.13.9 Positioning Information Exchange

#### 8.13.9.1 General

The Positioning Information Exchange procedure is initiated by the gNB-CU to indicate to the gNB-DU the need to configure the UE to transmit SRS signals and to retrieve the SRS configuration from the gNB-DU. The procedure uses UE-associated signalling.

#### 8.13.9.2 Successful Operation



Figure 8.13.9.2-1: Positioning Information Exchange procedure, successful operation

The gNB-CU initiates the procedure by sending a POSITIONING INFORMATION REQUEST message to the gNB-DU.

If the *Requested SRS Transmission Characteristics* IE is included in the POSITIONING INFORMATION REQUEST message, the gNB-DU may take this information into account when configuring SRS transmissions for the UE, and it shall include the *SRS Configuration* IE and the *SFN Initialisation Time* IE in the POSITIONING INFORMATION RESPONSE message. If the *SRS Positioning INACTIVE Query Indication* IE is also included in the POSITIONING INFORMATION REQUEST message and set to ‘true’, the gNB-DU shall, if supported, include the *SRS-PosRRC-InactiveConfig* IE in the POSITIONING INFORMATION RESPONSE message.

If the *Spatial Relation Information per SRS Resource* IE and the *Periodicity List* IE are both included in the *Requested SRS Transmission Characteristics* IE, the gNB-DU shall consider that the *Spatial Relation per SRS Resource Item* IE and the *Periodicity List Item* IE have one-to-one mapping relation.

If the *UE Reporting Information* IE is included in the POSITIONING INFORMATION REQUEST message, the gNB-DU may take this information into account for allocating proper CG-SDT resources when positioning a UE.

If the *Time Window Information for SRS* IE is included in the POSITIONING INFORMATION REQUEST message, the gNB-DU shall, if supported, configure the UE to start transmitting its UL SRS transmission at the indicated time instance.

**Interaction with the UE Context Modification Required (gNB-DU initiated) procedure:**

The UE Context Modification Required (gNB-DU initiated) procedure may be performed before the POSITIONING INFORMATION RESPONSE message.

*next modification*

#### 9.2.12.13 POSITIONING INFORMATION REQUEST

This message is sent by the gNB-CU to indicate to the gNB-DU the need to configure the UE to transmit SRS signals for uplink positioning measurement and also to retrieve the SRS configuration from the gNB-DU.

Direction: gNB-CU → gNB-DU.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| Message Type | M |  | 9.3.1.1 |  | YES | reject |
| gNB-CU UE F1AP ID | M  |  | 9.3.1.4 |  | YES | reject |
| gNB-DU UE F1AP ID  | M |  | 9.3.1.5 |  | YES | reject |
| Requested SRS Transmission Characteristics | O |  | 9.3.1.175 |  | YES | ignore |
| UE Reporting Information | O |  | 9.3.1.255 |  | YES | ignore |
| SRS Positioning INACTIVE Query Indication | O |  | ENUMERATED (true, ...) | Applicable only if the *Requested SRS Transmission Characteristics* IE is present | YES | ignore |
| Time Window Information for SRS (FFS) | O |  | 9.3.1.x1 |  | YES | Reject |

*next modification*

####  9.2.12.3 POSITIONING MEASUREMENT REQUEST

This message is sent by the gNB-CU to request the gNB-DU to configure a positioning measurement.

Direction: gNB-CU → gNB-DU.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| --- | --- | --- | --- | --- | --- | --- |
| Message Type | M |  | 9.3.1.1 |  | YES | reject |
| Transaction ID | M |  | 9.3.1.23 |  | YES | reject |
| LMF Measurement ID | M |  | INTEGER (1..65536, …) |  | YES | reject |
| RAN Measurement ID | M |  | INTEGER (1..65536, …) |  | YES | reject |
| **TRP Measurement Request List** |  | 1 |  |  | YES | reject |
| >TRP Measurement Request Item |  | 1..<maxnoofMeasTRPs> |  |  |  |  |
| >>TRP ID | M |  | 9.3.1.197 |  |  |  |
| >>Search Window Information | O |  | 9.3.1.204 |  |  |  |
| >>NR CGI | O |  | 9.3.1.12 | The Cell ID of the TRP identified by the *TRP ID* IE. | YES | ignore |
| >>AoA Search Window Information | O |  | UL-AoA Assistance Information 9.3.1.238 |  | YES | ignore |
| >>Number of TRP Rx TEGs | O |  | ENUMERATED (2, 3, 4, 6, 8, …) |  | YES | ignore |
| >>Number of TRP RxTx TEGs | O |  | ENUMERATED (2, 3, 4, 6, 8, …) |  | YES | ignore |
| Positioning Report Characteristics | M |  | ENUMERATED (OnDemand, Periodic, …) |  | YES | reject |
| Positioning Measurement Periodicity | C-ifReportCharacteristicsPeriodic |  | ENUMERATED (120ms, 240ms, 480ms, 640ms, 1024ms, 2048ms, 5120ms, 10240ms, 1min, 6min, 12min, 30min, …, 20480ms, 40960ms, extended) | The codepoint 120ms, 240ms, 480ms, 1024ms, 2048ms, 1min, 6min, 12min, and 30min are not applicable. | YES | reject |
| **Positioning Measurement Quantities** |  | *1* |  |  | YES | reject |
| **>Positioning Measurement Quantities Item** |  | *1..<maxnoofPosMeas>* |  |  | EACH |  |
| >>Positioning Measurement Type | M |  | ENUMERATED (gNB RX-TX, UL-SRS-RSRP, UL AoA, UL RTOA, …, Multiple UL AoA, UL SRS-RSRPP, UL-RSCP)  |  |  | - |
| >>Timing Reporting Granularity Factor | O |  | INTEGER (0..5) | TS 38.133 [38] |  |  |
| SFN Initialisation Time | O |  | Relative Time 19009.3.1.183 | If this IE is not present, the TRP may assume that the value is same as its own SFN initialisation time. | YES | ignore |
| SRS Configuration | O |  | 9.3.1.192 |  | YES | ignore |
| Measurement Beam Information Request | O |  | ENUMERATED (true, ...) | This IE is ignored when the Measurement characteristics Request Indicator IE is included. | YES | ignore |
| System Frame Number | O  |  | INTEGER(0..1023) |  | YES | ignore |
| Slot Number | O |  | INTEGER(0..79) |  | YES | ignore |
| Measurement Periodicity Extended | C-ifMeasPerExt |  | ENUMERATED (160ms, 320ms, 1280ms, 2560ms, 61440ms,81920ms, 368640ms, 737280ms, 1843200ms, …) |  | YES | reject |
| Response Time | O |  | 9.3.1.242 | This IE is ignored when the *Positioning* *Report Characteristics* IE is set to “Periodic”. | YES | ignore |
| Measurement Characteristics Request Indicator | O |  | 9.3.1.254 |  | YES | ignore |
| Measurement Time Occasion | O |  | ENUMERATED (o1, o4,…) |  | YES | ignore |
| Positioning Measurement Amount | O |  | ENUMERATED (0, 1, 2, 4, 8, 16, 32, 64) | This IE is ignored if the *Positioning Report Characteristics* IE is set to ‘OnDemand’. Value 0 represents an infinite number of periodic reporting. | YES | ignore |
| Time Window Information for Measurement (FFS) | O |  | 9.3.1.x2 |  | YES | ignore |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofPosMeas | Maximum no. of measured quantities that can be configured and reported with one message. Value is 16384. |
| maxnoofMeasTRPs | Maximum no. of TRPs that can be included within one measurement message. Value is 64. |

|  |  |
| --- | --- |
| Condition | Explanation |
| ifReportCharacteristicsPeriodic | This IE shall be present if the *Positioning Report Characteristics* IE is set to the value "Periodic". |
| ifMeasPerExt | This IE shall be present if the *Positioning Measurement Periodicity* IE is set to the value "extended". |

Editor’s Note: It is FFS if a Time Window Information for Measurement is needed, or if the existing SFN Initialisation Time (System Frame Number and Slot Number) can be re-used.

*next modification*

####  9.3.1.166 Positioning Measurement Result

The purpose of this information element is to provide the measurement result(s).

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description | Criticality | Assigned Criticality |
| --- | --- | --- | --- | --- | --- | --- |
| Positioning Measured Result Item |  | 1 .. <maxnoofPosMeas> |  |  | - |  |
| >CHOICE *Measured Results Value* | M |  |  |  | - |  |
| *>>UL Angle of Arrival* |  |  |  |  |  |  |
| >>>UL Angle of Arrival | M |  | 9.3.1.167 |  | - |  |
| *>>UL SRS-RSRP* |  |  |  |  |  |  |
| >>>UL SRS-RSRP | M |  | INTEGER (0..126) |  | - |  |
| *>>UL RTOA* |  |  |  |  |  |  |
| >>>UL RTOA | M |  | UL RTOA Measurement9.3.1.168 |  | - |  |
| *>>gNB Rx-Tx Time Difference* |  |  |  |  |  |  |
| >>>gNB Rx-Tx Time Difference | M |  | 9.3.1.170 |  | - |  |
| *>>Zenith Angle of Arrival Information* |  |  |  |  |  |  |
| >>>Zenith Angle of Arrival Information | M |  | 9.3.1.239 |  | YES | reject |
| *>>Multiple UL AoA* |  |  |  |  |  |  |
| >>>Multiple UL AoA | M |  | 9.3.1.245 |  | YES | reject |
| *>>UL SRS-RSRPP* |  |  |  |  |  |  |
| >>>UL SRS-RSRPP | M |  | 9.3.1.246 |  | YES | reject |
| *>>*UL RSCP |  | FFS |  |  |  |  |
| >>>UL RSCP | M |  | 9.3.1.x3 |  | YES | reject |
| >Time Stamp | M |  | 9.3.1.171 |  | - |  |
| >Measurement Quality | O |  | TRP Measurement Quality9.3.1.172 |  | - |  |
| >Measurement Beam Information | O |  | 9.3.1.173 |  | - |  |
| >ARP ID | O |  | 9.3.1.244 |  | YES | ignore |
| >SRS Resource type | O |  | 9.3.1.247 |  | YES | ignore |
| >LoS/NLoS Information | O |  | 9.3.1.249 |  | Yes | ignore |

| Range bound | Explanation |
| --- | --- |
| maxnoofPosMeas | Maximum no. of measured quantities that can be configured and reported with one message. Value is 16384. |

*next modification*

###  9.3.1.x1 Time Window Information of SRS (FFS)

This IE contains the time window(s) when UL SRS transmission is requested.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| [FFS] |  |  |  |  |

### 9.3.1.x2 Time Window Information of Measurement (FFS)

This IE contains the time window(s) when UL SRS measurement is requested.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| [FFS] |  |  |  |  |

### 9.3.1.x3 UL RSCP(FFS)

This IE contains the UL Reference Signal Carrier Phase (RSCP) measurement.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| [FFS] |  |  |  |  |

*End of modifications*