**3GPP TSG- Meeting # *R3-25xxxx***

**, , -**

**Agenda item: 20.2**

**Source: Xiaomi, Ericsson, CATT, Nokia, Samsung, ZTE, CEWIT, Huawei, Qualcomm Incorporated**

**Title: (TP to BL CR TS 38.473) Addition of UL SRS time domain channel measurement**

**Document for: other**

# 1 Introduction

In TS 38.215 V19.0.0 [1], we can see that RAN1 has concluded on defining new measurements:

• UL SRS time domain channel timing (UL SRS-TDCT) – see section 5.2.9

• UL SRS time domain channel power (UL SRS-TDCP) – see section 5.2.10

This contribution provides a TP to align with RAN1 specification.

# 2 Reference

[1]3GPP TS 38.215, Physical layer measurements, Release 19

# 3 TP to BL CR 38.473 (support of case 3b)

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## 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

A2X Aircraft-to-Everything

AMF Access and Mobility Management Function

ARP Antenna Reference Point

ARPI Additional RRM Policy Index

BH Backhaul

CAG Closed Access Group

CG Cell Group

CG-SDT Configured Grant-Small Data Transmission

CGI Cell Global Identifier

CHO Conditional Handover

CN Core Network

CP Control Plane

CPA Conditional PSCell Addition

CPAC Conditional PSCell Addition or Change

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

eRedCap Enhanced Reduced Capability

FSA ID MBS Frequency Selection Area (FSA) ID

GPSI Generic Public Subscription Identifier

IAB Integrated Access and Backhaul

IMEISV International Mobile station Equipment Identity and Software Version number

LMF Location Management Function

LTM L1/L2 Triggered Mobility

MBS Multicast/Broadcast Service

MP Multi-path

MT-SDT Mobile Terminated Small Data Transmission

N3C Non-3GPP Connection

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

PNI-NPN Public Network Integrated NPN

posSIB Positioning SIB

PSI PDU Set Importance

PTM Point to Multipoint

PTP Point to Point

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

RSPP Ranging/Sidelink Positioning Protocol

RSRP Reference Signal Received Power

S-CPAC Subsequent Conditional PSCell Addition or Change

S-NSSAI Single Network Slice Selection Assistance Information

SDT Small Data Transmission

SNPN Stand-alone Non-Public Network

SUL Supplementary Uplink

TAC Tracking Area Code

TAG Timing Advance Group

TAI Tracking Area Identity

TEG Timing Error Group

TRP Transmission-Reception Point

TSS Timing Synchronisation Status

U2N UE-to-Network

U2U UE-to-UE

UL-AoA Uplink Angle of Arrival

UL-RSCP UL Reference Signal Carrier Phase

UL-RTOA Uplink Relative Time of Arrival

UL-SRS Uplink Sounding Reference Signal

UL SRS-TDCT UL SRS Time Domain Channel Timing

UL-SRS-TDCP UL SRS Time Domain Channel Power

V2X Vehicle-to-Everything

Z-AoA Zenith Angles of Arrival

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#### 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, UL SRS-TDCT)  | The UL-RSCP measurement is applicable only when the UL-RTOA and/or gNB-RxTxTimeDiff measurement(s) is also requested. | - |  |
| >>Timing Reporting Granularity Factor | O |  | INTEGER (0..5) | TS 38.133 [38]This IE is ignored when the *Timing Reporting Granularity Factor Extended* IE is included. | - |  |
| >>Timing Reporting Granularity Factor Extended | O |  | INTEGER (-6..-1, …) | Value -6 corresponds to kminus6, value -5 corresponds to kminus5, and so on, seeTS 38.133 [38]. | YES | ignore |
| >>Channel Response Information | O |  | 9.3.1.x1 | Applicable to ULSRS-TDCT only. | Yes  | ignore |
| 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 Measurement List | O |  | 9.3.1.334 |  | YES | ignore |

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#### 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* |  |  |  |  | YES | reject |
| >>>Zenith Angle of Arrival Information | M |  | 9.3.1.239 |  | - |  |
| *>>Multiple UL AoA* |  |  |  |  | YES | reject |
| >>>Multiple UL AoA | M |  | 9.3.1.245 |  | - |  |
| *>>UL SRS-RSRPP* |  |  |  |  | YES | reject |
| >>>UL SRS-RSRPP | M |  | 9.3.1.246 |  | - |  |
| *>>UL RSCP*  |  |  |  |  | YES | reject |
| >>>UL RSCP | M |  | 9.3.1.335 |  | - |  |
| *>>UL SRS-TDCT* |  |  |  |  | YES | reject |
| >>>UL SRS-TDCT | M |  | 9.3.1.x2 |  | - |  |
| >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 |
| >Mobile TRP Location Information | O |  | 9.3.1.304 |  | YES | ignore |
| >Measured Frequency Hops | O |  | ENUMERATED (singleHop, multiHop, …) |  | YES | ignore |
| **>Aggregated Positioning SRS Resource ID List** |  | *0..1* |  | Indicates the used Positioning SRS resources across aggregated carriers. | YES | ignore |
| **>>Aggregated Positioning SRS Resource ID Item** |  | *2..<maxnoaggregatedSRS-Resources>* |  |  | - |  |
| >>>Positioning SRS Resource ID | M |  | INTEGER (0..63) |  | - |  |
| >>>Point A | M |  | INTEGER (0..3279165) |  | YES | ignore |
| **>>>SCS Specific Carrier** |  | *1* |  |  | YES | ignore |
| >>>>Offset ToCarrier | M |  | INTEGER(0..2199,…) |  | - |  |
| >>>>Subcarrier Spacing | M |  | ENUMERATED(kHz15, kHz30, kHz60, kHz120,…, kHz480, kHz960) |  | - |  |
| >>>>Carrier Bandwidth | M |  | INTEGER (1..275,…) |  | - |  |
| >>>PCI | O |  | INTEGER (0..1007) |  | YES | ignore |
| >Measurement Based On Aggregated Resources | O |  | ENUMERATED(true, …) |  | YES | ignore |

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#### 9.3.1.254 Measurement Characteristics Request Indicator

This IE contains the measurement characteristic information requested by the gNB-CU.

| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| --- | --- | --- | --- | --- |
| Measurement characteristic request indicator | M |  | BIT STRING (SIZE(16)) | Each position in the bitmap represents a requested measurement characteristic:first bit: Measurement Beam InformationSecond bit: Extended Additional Path List Third bit: Additional Path Power Fourth Bit: Multiple UL AoA of Additional Path Fifth bit: LoS/NLoS Information Sixth bit: TRP Rx TEG association for UL-TDOASeventh bit: TRP RxTxTEG-ID information for DL+UL positioning.Eighth bit: SRS Resource Type Ninth bit: Multiple Measurement InstancesTenth bit: Mobile TRP location informationEleventh bit: SRS bandwidth aggregation used for joint UL positioning measurement.Twelfth bit: Aggregated Positioning SRS resources IDs used for joint UL positioning measurement.Thirteenth bit: UL SRS-TDCP in UL SRS-TDCT.Other bits reserved for future use. Value ‘1’ indicates ‘requested measurement characteristic’, Value ‘0’ indicates ‘not requested’. |

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#### 9.3.1.x1 Channel Response Information

This IE contains information about the requested UL SRS-TDCT measurement.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **IE/Group Name** | **Presence** | **Range** | **IE Type and Reference** | **Semantics Description** |
| Channel Response Window Size | M |  | ENUMERATED (32, 64, 128, …) | Represents the window size over which channel response values are selected.  |
| Channel Response Number | M |  | ENUMERATED (8, 16, 24, …) | Represents the number of channel responses selected over the channel response window size. |

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#### 9.3.1.x2 UL SRS-TDCT

This information element contains the UL SRS time domain channel timing.

| **IE/Group Name** | **Presence** | **Range** | **IE Type and Reference** | **Semantics Description** |
| --- | --- | --- | --- | --- |
| **UL SRS-TDCT List** |  |  |  |  |
| **>UL SRS-TDCT Item** |  | *1..<maxnoofChannelRes>* |  |  |
| *>>*CHOICE *Timing Information* | M |  |  |  |
| *>>>k0* |  |  |  |  |
| *>>>>k0* | M |  | INTEGER (0.. 1970049) | TS 38.133 [38] |
| *>>>k1* |  |  |  |  |
| >>>>k1 | M |  | INTEGER (0.. 985025) | TS 38.133 [38] |
| *>>>k2* |  |  |  |  |
| >>>>k2 | M |  | INTEGER (0.. 492513) | TS 38.133 [38] |
| *>>>k3* |  |  |  |  |
| >>>>k3 | M |  | INTEGER (0.. 246257) | TS 38.133 [38] |
| *>>>k4* |  |  |  |  |
| >>>>k4 | M |  | INTEGER (0.. 123129) | TS 38.133 [38] |
| *>>>k5* |  |  |  |  |
| >>>>k5 | M |  | INTEGER (0.. 61565) | TS 38.133 [38] |
| >> Power Information | O |  | UL SRS-TDCP Item9.3.1.x3 |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofChannelRes | Maximum no of channel response. Value is 24 |

#### 9.3.1.x3 UL SRS-TDCP Item

This IE contains an item of the UL SRS time domain channel power for a given channel response.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| UL SRS-TDCP Item | M |  | INTEGER (0..126) | TS 38.133 [16] |

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### 9.4.5 Information Element Definitions

-- ASN1START

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

--

-- Information Element Definitions

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-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

F1AP-IEs {

itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)

ngran-access (22) modules (3) f1ap (3) version1 (1) f1ap-IEs (2) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS

 id-gNB-CUSystemInformation,

 id-HandoverPreparationInformation,

 id-TAISliceSupportList,

 id-RANAC,

//Omitted text unchanged//

 id-ChannelResponseInformation,

 id-UL-SRS-TDCT,

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ChannelResponseInformation ::= SEQUENCE {

 channelResponseWindowSize ENUMERATED {ws32, ws64, ws128, ...},

 channelResponseNumber ENUMERATED {n8, n16, n24, ...},

 iE-Extension ProtocolExtensionContainer { { ChannelResponseInformation-ExtIEs} } OPTIONAL,

 ...

}

ChannelResponseInformation-ExtIEs F1AP-PROTOCOL-EXTENSION ::= {

 ...

}

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<next change>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

MeasuredResultsValue-ExtIEs F1AP-PROTOCOL-IES ::= {

 { ID id-ZoAInformation CRITICALITY reject TYPE ZoAInformation PRESENCE mandatory}|

 { ID id-MultipleULAoA CRITICALITY reject TYPE MultipleULAoA PRESENCE mandatory}|

 { ID id-UL-SRS-RSRPP CRITICALITY reject TYPE UL-SRS-RSRPP PRESENCE mandatory}|

 { ID id-UL-RSCP CRITICALITY reject TYPE UL-RSCP PRESENCE mandatory}|

 { ID id-UL-SRS-TDCT CRITICALITY reject TYPE UL-SRS-TDCT PRESENCE mandatory},

 ...

}

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PosMeasurementType ::= ENUMERATED {

 gnb-rx-tx,

 ul-srs-rsrp,

 ul-aoa,

 ul-rtoa,

 ... ,

 multiple-ul-aoa,

 ul-srs-rsrpp,

 ul-rscp,

 UL-SRS-TDCT

}

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UL-SRS-TDCT ::= SEQUENCE {

 UL-SRS-TDCT-List UL-SRS-TDCT-List,

 iE-Extensions ProtocolExtensionContainer { { UL-SRS-TDCT-ExtIEs } } OPTIONAL,

 ...

}

UL-SRS-TDCT-ExtIEs F1AP-PROTOCOL-EXTENSION ::= {

 ...

}

UL-SRS-TDCT-List::= SEQUENCE (SIZE(1..maxnoofChannelRes)) OF UL-SRS-TDCT-Item

UL-SRS-TDCT-Item ::=SEQUENCE {

 timingInformation TimingInformation,

 powerInformation UL-SRS-TDCP-Item OPTIONAL,

 iE-Extensions ProtocolExtensionContainer { { UL-SRS-TDCT-Item-ExtIEs } } OPTIONAL,

 ...

}

UL-SRS-TDCT-Item-ExtIEs F1AP-PROTOCOL-EXTENSION ::= {

 ...

}

UL-SRS-TDCP-Item ::= INTEGER (0..126)

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### 9.4.7 Constant Definitions

-- ASN1START

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

--

-- Constant definitions

--

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

F1AP-Constants {

itu-t (0) identified-organization (4) etsi (0) mobileDomain (0)

ngran-access (22) modules (3) f1ap (3) version1 (1) f1ap-Constants (4) }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

--

-- IE parameter types from other modules.

--

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

IMPORTS

 ProcedureCode,

 ProtocolIE-ID

FROM F1AP-CommonDataTypes;

-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

--

-- Elementary Procedures

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-- \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

id-Reset ProcedureCode ::= 0

//Omitted text unchanged//

id-ChannelResponseInformation ProtocolIE-ID ::= xx1

id-UL-SRS-TDCT ProtocolIE-ID ::= xx2

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