**3GPP TSG-RAN2 Meeting #116bis-e *R2-2200431***

**Online, 17th – 25th Jan, 2022**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.321** | **CR** | DraftCR | **rev** | **-** | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Running draft MAC CR for R17 positioning | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | RAN2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh-Core | | | | |  | ***Date:*** | | | 2022-01-17 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In R17 discussion two new features have been discussed and agreed with major MAC spec impacts: (a) positioning SRS transmission in RRC\_INACTIVE; (b) MG and PPW pre-configuration for positioning latency reduction  ***Positioning SRS transmission in RRC\_INACTIVE***  Related R2 agreements have been captured under annex  ***MG and PPW pre-configuration for positioning latency reduction***  Related R2 agreements have been captured under annex  During the previous R1 meeting, R1 has made the following agreements for PPW that the UE should not receive any downlink channel or physical signal for the affected symbols within the PPW on the affected UE/band/cc. Specifically, R1 has agreed that  **Agreement**  For capability 1A as per working assumption made in RAN1#106-e, the DL signalings/channels in a per UE fashion (i.e. both across NR & LTE) inside the PRS processing window are dropped if the DL PRS is determined to be higher priority.  For capability 1B as per working assumption made in RAN1#106-e, only the DL signalings/channels from a certain band inside the PRS processing window are dropped if the DL PRS is determined to be higher priority.   |  | | --- | | Working assumption:  Subject to UE capability, support PRS measurement outside the MG, within a PRS processing window, and UE measurement inside the active DL BWP with PRS having the same numerology as the active DL BWP.   * Inside the PRS processing window, subject to the UE determining that DL PRS to be higher priority, support the following UE capabilities:   + Capability 1: PRS prioritization over all other DL signals/channels in all symbols inside the window.     - Cap. 1A: The DL signals/channels from all DL CCs (per UE) are affected.     - Cap. 1B: Only the DL signals/channels from a certain band/CC are affected.       * FFS: band or CC   + Capability 2: PRS prioritization over other DL signals/channels only in the PRS symbols inside the window   + A UE shall be able to declare a PRS processing capability outside MG.     - FFS: Details of capability signalling (e.g., per UE or per band, etc.) |   In the meantime, the running R1 spec has defined the conditions to apply the PPW and the priority between PRS and other DL channels/signals in RP-212970. Thus, on these aspects, MAC spec only needs cite the R1 spec TS 38.214 for reference.   |  | | --- | | The UE is expected to measure the DL PRS outside the measurement gap, subject to UE capability, if the DL PRS is inside the active DL BWP and has the same numerology as the active DL BWP and is within the DL PRS processing window indicated by higher layer parameter [*PRSProcessingWindow*]. For receiving the DL PRS outside the measurement gap and within the DL PRS processing window, if the UE determines the DL PRS priority is higher than [other DL signals or channels except SSB] as indicated by higher layer parameter [*PRS-priority-indicator*] or as implied by UE capability, the UE is expected to measure the DL PRS; otherwise, the UE is not expected to measure the DL PRS and expected to receive [other DL signals and channels], subject to UE capabilities. When the UE is expected to measure the DL PRS outside the measurement gap if it is supporting [capability 1A] and if the DL PRS is determined to be higher priority than the DL signals and channels inside the PRS processing window, those DL signals and channels are not expected to be measured by the UE. When the UE is expected to measure the DL PRS outside the measurement gap if it is supporting [capability 1B] and if the DL PRS is determined to be higher priority than the DL signals and channels inside the PRS processing window, those DL signals and channels in the same band as the DL PRS are not expected to be measured by the UE. When the UE is expected to measure the DL PRS outside the measurement gap if it is supporting [capability 2] and if the DL PRS is determined to be higher priority than the DL signals and channels inside the PRS processing window, those DL signals and channels are not expected to be measured by the UE on the overlapped symbols with the DL PRS. |   R1 has also made the following agreements for MG/PPW pre-configuration and its activation/deactivation.  Agreement:  Support using UL MAC CE for MG activation request by UE (Option 2) for the purpose of positioning.  Agreement:  Support the following option (from the agreement made in RAN1#106-e) for a new MG activation procedure to be performed by the gNB for the purpose of positioning.   * Option 2: DL MAC CE * FFS: Deactivation process   **Agreement**  Preconfiguration of MG(s) in RRC is supported from RAN1 perspective.   * Each MG in the preconfiguration is associated with an ID * The information in the UL MAC CE for MG activation request by the UE can be one ID associated with the preconfiguration of the MG * Send an LS to RAN2 and RAN3   Based on the above agreements, introduction of R17 positioning enhancement into the MAC spec is captured in this CR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Revised the note for whether SRS in the procedural text includes positioning SRS 2. Added definition for MG, PPW and PRS 3. Revised on the procedure for measurement gap that only when it is activated, the procedure applies 4. Revised uplink time alignment for TA for positioning SRS 5. Add two new clauses for DL MAC CE for MG/PPW activation/deactivation command, respectively 6. Add a new clause for handling PRS processing window in MAC spec 7. Add a new clause for UL MAC CE for MG activation/deactivation request 8. Add a new clause | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | R17 positioning enhancement will not be supported in the MAC spec | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.1, 3.2, 5.14, 5.2, 5.18.x, 5.18.y, 5.X, 5.Y, 5.Z, 6.1.3.x, 6.1.3.y, 6.1.3.z, 6.2.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 38.331, 38.305, 37.355, 38.304 | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Ver0: submitted to R2#116bis-e as R2-2200431. | | | | | | | | |

=====================================START OF CHANGES===============================

## 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].

**Dormant BWP:** The dormant BWP is one of downlink BWPs configured by the network via dedicated RRC signaling. In the dormant BWP, the UE stop monitoring PDCCH on/for the SCell, but continues performing CSI measurements, Automatic Gain Control (AGC) and beam management, if configured.

**DRX group:** A group of Serving Cells that is configured by RRC and that have the same DRX Active Time.

**HARQ information:** HARQ information for DL-SCH, for UL-SCH, or for SL-SCH transmissions consists of New Data Indicator (NDI), Transport Block size (TBS), Redundancy Version (RV), and HARQ process ID.

**IAB-donor:** gNB that provides network access to UEs via a network of backhaul and access links.

**IAB-node:** RAN node that supports NR access links to UEs and NR backhaul links to parent nodes and child nodes.

**Listen Before Talk**: A procedure according to which transmissions are not performed if the channel is identified as being occupied, see TS 37.213 [18].

**Msg3**: Message transmitted on UL-SCH containing a C-RNTI MAC CE or CCCH SDU, submitted from upper layer and associated with the UE Contention Resolution Identity, as part of a Random Access procedure.

**NR backhaul link:** NR link used for backhauling between an IAB-node and an IAB-donor, and between IAB-nodes in case of a multi-hop backhauling.

**NR sidelink communication**: AS functionality enabling at least V2X Communication as defined in TS 23.287 [19], between two or more nearby UEs, using NR technology but not traversing any network node.

**PDCCH occasion**: A time duration (i.e. one or a consecutive number of symbols) during which the MAC entity is configured to monitor the PDCCH.

**PRS Processing Window**: A time window during which UE may perform PRS measurement inside the active DL BWP with the same numerology as the active DL BWP without measurement gap.

**Serving Cell:** A PCell, a PSCell, or an SCell in TS 38.331 [5].

**Sidelink transmission information:** Sidelink transmission information included in a SCI for a SL-SCH transmission as specified in clause 8.3 and 8.4 of TS 38.212 [9] consists of Sidelink HARQ information including NDI, RV, Sidelink process ID, HARQ feedback enabled/disabled indicator, Sidelink identification information including cast type indicator, Source Layer-1 ID and Destination Layer-1 ID, and Sidelink other information including CSI request, a priority, a communication range requirement and Zone ID.

**Special Cell:** For Dual Connectivity operation the term Special Cell refers to the PCell of the MCG or the PSCell of the SCG depending on if the MAC entity is associated to the MCG or the SCG, respectively. Otherwise the term Special Cell refers to the PCell. A Special Cell supports PUCCH transmission and contention-based Random Access, and is always activated.

**Timing Advance Group:** A group of Serving Cells that is configured by RRC and that, for the cells with a UL configured, using the same timing reference cell and the same Timing Advance value. A Timing Advance Group containing the SpCell of a MAC entity is referred to as Primary Timing Advance Group (PTAG), whereas the term Secondary Timing Advance Group (STAG) refers to other TAGs.

**V2X sidelink communication**: AS functionality enabling V2X Communication as defined in TS 23.285 [20], between nearby UEs, using E-UTRA technology but not traversing any network node.

NOTE 1: A timer is running once it is started, until it is stopped or until it expires; otherwise it is not running. A timer can be started if it is not running or restarted if it is running. A Timer is always started or restarted from its initial value. The duration of a timer is not updated until it is stopped or expires (e.g. due to BWP switching). When the MAC entity applies zero value for a timer, the timer shall be started and immediately expire unless explicitly stated otherwise.

NOTE 2: In this version of the specification, the SRS in the procedural description includes Positioning SRS except for the Positioning SRS for RRC\_INACTIVE transmission as in clause 5.Z. Positioning SRS is treated the same as SRS by the UE unless explicitly stated otherwise.

==================================NEXT CHANGE=====================================

## 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].

AP Aperiodic

BFR Beam Failure Recovery

BSR Buffer Status Report

BWP Bandwidth Part

CE Control Element

CG Cell Group

CI-RNTI Cancellation Indication RNTI

CSI Channel State Information

CSI-IM CSI Interference Measurement

CSI-RS CSI Reference Signal

CS-RNTI Configured Scheduling RNTI

DAPS Dual Active Protocol Stack

DCP DCI with CRC scrambled by PS-RNTI

DL-PRS DownLink-Positioning Reference Signal

IAB Integrated Access and Backhaul

INT-RNTI Interruption RNTI

LBT Listen Before Talk

LCG Logical Channel Group

LCP Logical Channel Prioritization

MCG Master Cell Group

MPE Maximum Permissible Exposure

NUL Normal Uplink

NZP CSI-RS Non-Zero Power CSI-RS

PDB Packet Delay Budget

PHR Power Headroom Report

PS-RNTI Power Saving RNTI

PTAG Primary Timing Advance Group

QCL Quasi-colocation

PPW PRS Processing Window

PRS Positioning Reference Signal

RS Reference Signal

SCG Secondary Cell Group

SFI-RNTI Slot Format Indication RNTI

SI System Information

SL-RNTI Sidelink RNTI

SLCS-RNTI Sidelink Configured Scheduling RNTI

SpCell Special Cell

SP Semi-Persistent

SP-CSI-RNTI Semi-Persistent CSI RNTI

SPS Semi-Persistent Scheduling

SR Scheduling Request

SS Synchronization Signals

SSB Synchronization Signal Block

STAG Secondary Timing Advance Group

SUL Supplementary Uplink

TAG Timing Advance Group

TCI Transmission Configuration Indicator

TPC-SRS-RNTI Transmit Power Control-Sounding Reference Signal-RNTI

UCI Uplink Control Information

V2X Vehicle-to-Everything

ZP CSI-RS Zero Power CSI-RS

==================================NEXT CHANGE=====================================

## 5.2 Maintenance of Uplink Time Alignment

RRC configures the following parameters for the maintenance of UL time alignment:

- *timeAlignmentTimer* (per TAG) which controls how long the MAC entity considers the Serving Cells belonging to the associated TAG to be uplink time aligned;

- *inactivePosSRS-TimeAlignmentTimer* which controls how long the MAC entity considers the Positioning SRS transmission in RRC\_INACTIVE in clause 5.Z to be uplink time aligned.

The MAC entity shall:

1> when a Timing Advance Command MAC CE is received, and if an NTA (as defined in TS 38.211 [8]) has been maintained with the indicated TAG:

2> apply the Timing Advance Command for the indicated TAG;

2> start or restart the *timeAlignmentTimer* associated with the indicated TAG.

1> when a Timing Advance Command is received in a Random Access Response message for a Serving Cell belonging to a TAG or in a MSGB for an SpCell:

2> if the Random Access Preamble was not selected by the MAC entity among the contention-based Random Access Preamble:

3> apply the Timing Advance Command for this TAG;

3> start or restart the *timeAlignmentTimer* associated with this TAG.

2> else if the *timeAlignmentTimer* associated with this TAG is not running:

3> apply the Timing Advance Command for this TAG;

3> start the *timeAlignmentTimer* associated with this TAG;

3> when the Contention Resolution is considered not successful as described in clause 5.1.5; or

3> when the Contention Resolution is considered successful for SI request as described in clause 5.1.5, after transmitting HARQ feedback for MAC PDU including UE Contention Resolution Identity MAC CE:

4> stop *timeAlignmentTimer* associated with this TAG.

2> else:

3> ignore the received Timing Advance Command.

1> when an Absolute Timing Advance Command is received in response to a MSGA transmission including C-RNTI MAC CE as specified in clause 5.1.4a:

2> apply the Timing Advance Command for PTAG;

2> start or restart the *timeAlignmentTimer* associated with PTAG.

1> when the configuration for *inactivePosSRS-TimeAlignmentTimer* is received:

2> start or restart the *inactivePosSRS-TimeAlignmentTimer*.

1> when a *timeAlignmentTimer* expires:

2> if the *timeAlignmentTimer* is associated with the PTAG:

3> flush all HARQ buffers for all Serving Cells;

3> notify RRC to release PUCCH for all Serving Cells, if configured;

3> notify RRC to release SRS for all Serving Cells, if configured;

3> clear any configured downlink assignments and configured uplink grants;

3> clear any PUSCH resource for semi-persistent CSI reporting;

3> consider all running *timeAlignmentTimer*s as expired;

3> maintain NTA (defined in TS 38.211 [8]) of all TAGs.

2> else if the *timeAlignmentTimer* is associated with an STAG, then for all Serving Cells belonging to this TAG:

3> flush all HARQ buffers;

3> notify RRC to release PUCCH, if configured;

3> notify RRC to release SRS, if configured;

3> clear any configured downlink assignments and configured uplink grants;

3> clear any PUSCH resource for semi-persistent CSI reporting;

3> maintain NTA (defined in TS 38.211 [8]) of this TAG.

1> when the *inactivePosSRS-TimeAlignmentTimer* expires:

2> notify RRC to release Positioning SRS configuration(s) for RRC\_INACTIVE.

When the MAC entity stops uplink transmissions for an SCell due to the fact that the maximum uplink transmission timing difference between TAGs of the MAC entity or the maximum uplink transmission timing difference between TAGs of any MAC entity of the UE is exceeded, the MAC entity considers the *timeAlignmentTimer* associated with the SCell as expired.

The MAC entity shall not perform any uplink transmission on a Serving Cell except the Random Access Preamble and MSGA transmission when the *timeAlignmentTimer* associated with the TAG to which this Serving Cell belongs is not running. Furthermore, when the *timeAlignmentTimer* associated with the PTAG is not running, the MAC entity shall not perform any uplink transmission on any Serving Cell except the Random Access Preamble and MSGA transmission on the SpCell.

==================================NEXT CHANGE=====================================

## 5.14 Handling of measurement gaps

During an activated measurement gap, the MAC entity shall, on the Serving Cell(s) in the corresponding frequency range of the measurement gap configured by *measGapConfig* as specified in TS 38.331 [5]:

1> not perform the transmission of HARQ feedback, SR, and CSI;

1> not report SRS;

1> not transmit on UL-SCH except for Msg3 or the MSGA payload as specified in clause 5.4.2.2;

1> if the *ra-ResponseWindow* or the *ra-ContentionResolutionTimer* or the *msgB-ResponseWindow* is running:

2> monitor the PDCCH as specified in clauses 5.1.4 and 5.1.5.

1> else:

2> not monitor the PDCCH;

2> not receive on DL-SCH.

==================================NEXT CHANGE=====================================

### 5.18.x Positioning Measurement Gap Activation/Deactivation Command

If the UE is configured with pre-configured measurement gaps, the network may send DL MAC CE for Positioning Measurement Gap Activation/Deactivation Command to the UE as in clause 6.1.3.y. For the activated measurement gap, the UE shall follow the specified UE behaviour in clause 5.14 for measurement gap.

Upon the reception of the MAC CE for Positioning Measurement Gap Activation/Deactivation command, the MAC entity shall:

- if the Measurement Gap Activation/Deactivation Command MAC CE indicates the deactivation of a pre-configured positioning measurement gap:

- deactivate the positioning measurement gap.

- else if the Positioning Measurement Gap Activation/Deactivation Command MAC CE indicates the activation of a configured measurement gap:

- activate the positioning measurement gap according to the procedure specified in clause 5.14.

==================================NEXT CHANGE=====================================

### 5.18.y PPW Activation/Deactivation Command

If the UE is configured with pre-configured PPW, the network may send DL MAC CE for PPW Activation/Deactivation Command to the UE as in clause 6.1.3.z. For the activated PPW, the UE shall follow the specified UE behaviour in clause 5.x for PPW.

Upon the reception of the MAC CE for PPW Activation/Deactivation Command, the MAC entity shall:

- if the DL MAC CE for PPW Activation/Deactivation Command indicates the deactivation of a pre-configured PPW:

- deactivate the PPW.

- else if the DL MAC CE for PPW Activation/Deactivation Command indicates the activation of a configured PPW:

- activate the PPW according to the procedure specified in clause 5.14.Editor’s NOTE: FFS whether multiple PPW can be activated at the same time

==================================NEXT CHANGE=====================================

## 5.X Handling of PRS Positioning Window

When PPW is activated and PRS has higher priority than DL channel and signals, for the affected symbols within the PPW according to clause 5.1.6.5 in TS 38.214 [7], the MAC entity shall:

1> not receive DL-SCH;

1> not receive PDCCH.

Editor’s NOTE: FFS UE behaviour during RAR window and contention resolution window

==================================NEXT CHANGE=====================================

## 5.Y Positioning Measurement Gap Activation/Deactivation Request

If the UE is configured with pre-configured measurement gap, the UE may request the network to activate or deactivate the Positioning measurement gap with UL MAC CE for Positioning Measurement Gap Activation/Deactivation Request in clause 6.1.3.x.

The MAC entity shall,

1>if Positioning Measurement Gap Activation/Deactivation Request MAC CE has been triggered, and not cancelled:

2> if UL-SCH resources are available for a new transmission and these UL-SCH resources can accommodate the Positioning Measurement Gap Activation/Deactivation Request MAC CE plus its subheader as a result of logical channel prioritization:

3> instruct the Multiplexing and Assembly procedure to generate the Positioning Measurement Gap Activation/Deactivation Request MAC CE.

2> else:

3> trigger a Scheduling Request for Positioning Measurement Gap Activation/Deactivation Request MAC CE.

Editor’s NOTE: FFS triggering/cancellation of the MAC CE

Editor’s NOTE: FFS whether PPW Activation/Deactivation can be requested with UL MAC CE

==================================NEXT CHANGE=====================================

## 5.Z Positioning SRS transmission in RRC\_INACTIVE

Periodic and semi-persistent Positioning SRS can be configured for Positioning SRS transmission in RRC\_INACTIVE. RRC configures the following parameters for TA validation of the Positioning SRS transmission in RRC\_INACTIVE:

* *inactivePosSRS-RSRP-ChangeThreshold*: RSRP threshold for the increase/decrease of RSRP for time alignment validation;

The MAC entity shall consider the positioning SRS resource to be valid for TA when the following conditions are fulfilled:

1> compared to the stored downlink pathloss reference RSRP value at the UE’s last uplink transmission, the RSRP has not increased/decreased by more than *inactivePosSRS-RSRP-ChangeThreshold*, if configured.

Editor’s NOTE: FFS whether to follow CG-SDT for (a) RSRP derivation for positioning SRS TA validation, (b) definition of stored downlink pathloss reference RSRP value at the very first positioning SRS transmission

==================================NEXT CHANGE=====================================

#### 6.1.3.x Positioning Measurement Gap Activation/Deactivation Request MAC CE

The Positioning Measurement Gap Activation/deactivation request MAC CE is identified by MAC subheader with LCID/eLCID as specified in Table 6.2.1-2.

Editor’s NOTE: FFS the format of the MAC CE and the fields within the MAC CE.

==================================NEXT CHANGE=====================================

#### 6.1.3.y Positioning Measurement Gap Activation/Deactivation Command MAC CE

The Positioning Measurement Gap Activation/Deactivation Command MAC CE is identified by MAC subheader with LCID/eLCID as specified in Table 6.2.1-1.

Editor’s NOTE: FFS the format of the MAC CE and the fields within the MAC CE.

==================================NEXT CHANGE=====================================

#### 6.1.3.z PPW Activation/Deactivation Command MAC CE

The PPW Activation/Deactivation Command MAC CE is identified by MAC subheader with LCID/eLCID as specified in Table 6.2.1-1.

Editor’s NOTE: FFS the format of the MAC CE and the fields within the MAC CE.

==================================NEXT CHANGE=====================================

### 6.2.1 MAC subheader for DL-SCH and UL-SCH

The MAC subheader consists of the following fields:

- LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE or padding as described in Tables 6.2.1-1 and 6.2.1-2 for the DL-SCH and UL-SCH respectively. There is one LCID field per MAC subheader. The size of the LCID field is 6 bits. If the LCID field is set to 34, one additional octet is present in the MAC subheader containing the eLCID field and follow the octet containing LCID field. If the LCID field is set to 33, two additional octets are present in the MAC subheader containing the eLCID field and these two additional octets follow the octet containing LCID field;

- eLCID: The extended Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE as described in tables 6.2.1-1a, 6.2.1-1b, 6.2.1-2a and 6.2.1-2b for the DL-SCH and UL-SCH respectively. The size of the eLCID field is either 8 bits or 16 bits.

NOTE: The extended Logical Channel ID space using two-octet eLCID and the relevant MAC subheader format is used, only when configured, on the NR backhaul links between IAB nodes or between IAB node and IAB Donor.

- L: The Length field indicates the length of the corresponding MAC SDU or variable-sized MAC CE in bytes. There is one L field per MAC subheader except for subheaders corresponding to fixed-sized MAC CEs, padding, and MAC SDUs containing UL CCCH. The size of the L field is indicated by the F field;

- F: The Format field indicates the size of the Length field. There is one F field per MAC subheader except for subheaders corresponding to fixed-sized MAC CEs, padding, and MAC SDUs containing UL CCCH. The size of the F field is 1 bit. The value 0 indicates 8 bits of the Length field. The value 1 indicates 16 bits of the Length field;

- R: Reserved bit, set to 0.

The MAC subheader is octet aligned.

Table 6.2.1-1 Values of LCID for DL-SCH

|  |  |
| --- | --- |
| Codepoint/Index | LCID values |
| 0 | CCCH |
| 1–32 | Identity of the logical channel |
| 33 | Extended logical channel ID field (two-octet eLCID field) |
| 34 | Extended logical channel ID field (one-octet eLCID field) |
| 35–46 | Reserved |
| 47 | Recommended bit rate |
| 48 | SP ZP CSI-RS Resource Set Activation/Deactivation |
| 49 | PUCCH spatial relation Activation/Deactivation |
| 50 | SP SRS Activation/Deactivation |
| 51 | SP CSI reporting on PUCCH Activation/Deactivation |
| 52 | TCI State Indication for UE-specific PDCCH |
| 53 | TCI States Activation/Deactivation for UE-specific PDSCH |
| 54 | Aperiodic CSI Trigger State Subselection |
| 55 | SP CSI-RS/CSI-IM Resource Set Activation/Deactivation |
| 56 | Duplication Activation/Deactivation |
| 57 | SCell Activation/Deactivation (four octets) |
| 58 | SCell Activation/Deactivation (one octet) |
| 59 | Long DRX Command |
| 60 | DRX Command |
| 61 | Timing Advance Command |
| 62 | UE Contention Resolution Identity |
| 63 | Padding |

Table 6.2.1-1a Values of two-octet eLCID for DL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to (216 – 1) | 320 to (216 + 319) | Identity of the logical channel |

Table 6.2.1-1b Values of one-octet eLCID for DL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to 244 | 64 to 308 | Reserved |
| 245 | 309 | Serving Cell Set based SRS Spatial Relation Indication |
| 246 | 310 | PUSCH Pathloss Reference RS Update |
| 247 | 311 | SRS Pathloss Reference RS Update |
| 248 | 312 | Enhanced SP/AP SRS Spatial Relation Indication |
| 249 | 313 | Enhanced PUCCH Spatial Relation Activation/Deactivation |
| 250 | 314 | Enhanced TCI States Activation/Deactivation for UE-specific PDSCH |
| 251 | 315 | Duplication RLC Activation/Deactivation |
| 252 | 316 | Absolute Timing Advance Command |
| 253 | 317 | SP Positioning SRS Activation/Deactivation |
| 254 | 318 | Provided Guard Symbols |
| 255 | 319 | Timing Delta |

Table 6.2.1-2 Values of LCID for UL-SCH

|  |  |
| --- | --- |
| Codepoint/Index | LCID values |
| 0 | CCCH of size 64 bits (referred to as "CCCH1" in TS 38.331 [5]) |
| 1–32 | Identity of the logical channel |
| 33 | Extended logical channel ID field (two-octet eLCID field) |
| 34 | Extended logical channel ID field (one-octet eLCID field) |
| 35–44 | Reserved |
| 45 | Truncated Sidelink BSR |
| 46 | Sidelink BSR |
| 47 | Reserved |
| 48 | LBT failure (four octets) |
| 49 | LBT failure (one octet) |
| 50 | BFR (one octet Ci) |
| 51 | Truncated BFR (one octet Ci) |
| 52 | CCCH of size 48 bits (referred to as "CCCH" in TS 38.331 [5]) |
| 53 | Recommended bit rate query |
| 54 | Multiple Entry PHR (four octets Ci) |
| 55 | Configured Grant Confirmation |
| 56 | Multiple Entry PHR (one octet Ci) |
| 57 | Single Entry PHR |
| 58 | C-RNTI |
| 59 | Short Truncated BSR |
| 60 | Long Truncated BSR |
| 61 | Short BSR |
| 62 | Long BSR |
| 63 | Padding |

Table 6.2.1-2a Values of two-octet eLCID for UL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to (216 – 1) | 320 to (216 + 319) | Identity of the logical channel |

Table 6.2.1-2b Values of one-octet eLCID for UL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to 249 | 64 to 313 | Reserved |
| 250 | 314 | BFR (four octets Ci) |
| 251 | 315 | Truncated BFR (four octets Ci) |
| 252 | 316 | Multiple Entry Configured Grant Confirmation |
| 253 | 317 | Sidelink Configured Grant Confirmation |
| 254 | 318 | Desired Guard Symbols |
| 255 | 319 | Pre-emptive BSR |

Editor’s NOTE: FFS whether to use LCID or eLCID for MAC CE for Positioning Measurement Gap Activation/Deactivation Request and MAC CE for Positioning Measurement Gap/PPW Activation/Deactivation Command.

==================================END OF CHANGES====================================

# Annex: Related R2 agreements

## Agreement to RRC\_INACTIVE positioning

### R2#115

Agreements:

LPP PDU and LCS message transfer:

Proposal 1: The LPP PDU Transfer Procedure in Annex A is used as baseline for further work.

NOTE 1: Some details may depend on further progress of the SDT work item.

NOTE 2: Whether such a procedure needs to be captured in Stage 2 specification or not can be decided later when the procedure has been fully developed/agreed. That is, the procedure can be considered as "running baseline".

Proposal 2: The LCS Message Transfer Procedure in Annex B is used as baseline for further work.

NOTE 1: Some details may depend on further progress of the SDT work item.

NOTE 2: Whether such a procedure needs to be captured in Stage 2 specification or not can be decided later when the procedure has been fully developed/agreed. That is, the procedure can be considered as "running baseline".

Proposal 3: UL LPP message segmentation can also be used by the UE in RRC\_INACTIVE state; i.e., a LPP message body can be sent in several shorter LPP messages instead of one long LPP message by using the SDT "Subsequent Data Transmission" phase. FFS spec impact.

DL and RAT-independent positioning:

Proposal 4: The Deferred 5GC-MT-LR Procedure with SDT for DL-only and RAT-independent positioning in Annex C is used as baseline for further work.

NOTE 1: Some details may depend on further progress of SDT work item.

NOTE 2: Whether such a procedure needs to be captured in Stage 2 specification or not can be decided later when the procedure has been fully developed/agreed. That is, the procedure can be considered as "running baseline".

NOTE 3: Once the procedure is stable from RAN2 perspective, send an LS to SA2 including the baseline procedure.

Agreement:

(High priority)Proposal 1: Support all the RAT independent positioning methods in RRC\_INACTIVE state.

Agreement:

gNB can configure the UE with periodic SRS (assuming periodic SRS is supported in RRC\_INACTIVE) by RRCRelease with suspendConfig at least when periodic event is configured for deferred MT-LR. Other cases can be further discussed.

### R2#116

Agreement:

Proposal 1 (modified): The PRS configuration from LMF to UE is independent of the RRC state. That is, no impact on PRS configuration for RRC\_INACTIVE (13/15) from RAN2 perspective.

Agreement:

Proposal 4 (modified): For positioning in RRC\_INACTIVE state, the positioning assistance data can be delivered to UE through the following ways:

- positioning system information, i.e. posSIB;(12/13)

- pre-configure assistance data when UE in RRC\_CONNECTED state;(11/13)

- send to UE in RRC\_INACTIVE during ongoing SDT procedure. (9/13)

Agreement:

Proposal 6: SRS for positioning in RRC\_INACTIVE state can be configured through the following ways:

- RRCRelease with SuspendConfig (13/13)

- SDT DL RRC message, i.e. Msg B / Msg 4 of RA-SDT (9/13)

- WA: pre-configure positioning SRS in RRC\_CONNECTED (9/13)

FFS detailed signalling for these approaches.

Proposal 8: Support SP SRSp for positioning in RRC\_INACTIVE state. (12/13)

Proposal 9: SP Positioning SRS Activation/Deactivation MAC CE is reused for triggering SRSp transmission in RRC\_INACTIVE. (12/12)

Proposal 10: AP SRSp is not supported for positioning in RRC\_INACTIVE state. (11/13)

### R2#116bis

Agreements:

Proposal 1 (modified) To support UL positioning in RRC\_INACTIVE, reuse SDT TA timer mechanism (with a separate timer with similar function) for TA validation.

Proposal 2 To support UL positioning in RRC\_INACTIVE, reuse RSRP change based solution for TA validation

Proposal 3 The SRSp configuration is considered as invalid if TA is not valid.

Proposal 4 When cell reselection is performed and UE initiates RRC resume procedure to the cell which is different from the cell in which the SRSp is configured, the TA timer configuration for SRS should be released.

Proposal 5 (modified) The SRSp configuration is released when the UE sends RRCResumeRequest to a cell other than the cell where it is released to RRC\_INACTIVE state.

Proposal 6 BWP info together with the SRS-PosResourceSet IE is included in RRCRelease message for SRS configuration in RRC\_INACTIVE.

Proposal 7 RAN2 confirms RAN1 agreement that UE may be configured to transmit UL SRS for Positioning where the following parameters are additionally configured for the transmission of the SRS for Positioning during the RRC\_INACTIVE state: frequency location and bandwidth, SCS, CP length.

Proposal 8 Add the restriction on AP SRS in the field description of resourceType “The aperiodic is not applicable for the UE in RRC\_INACTIVE.”.

FFS if the TA timer configuration is invalidated upon any cell reselection.

Agreement:

RAN2 will not make additional effort to make the gNB aware of when to transit the UE to RRC\_INACTIVE (left to gNB implementation and RAN3 solution).

Agreements:

Proposal 3 The agreement with WA: pre-configure positioning SRS in RRC\_CONNECTED is removed.

Proposal 12 (modified) No indication is added in Rel-17 from NW to UE for the continuity of UL SRS Tx when transiting from one mode to other.

## Agreements to PPW and MG

### R2#116bis

Agreements:

Proposal 5a: A new UL MAC CE for positioning measurement gap activation and deactivation request is introduced.

Proposal 5b: The new UL MAC CE for positioning measurement gap activation and deactivation request includes at least the ID of the pre-configured positioning measurement gap configuration for which the activation/deactivation is requested. Other parameter are FFS.

Proposal 5c (modified): A new DL MAC CE for positioning measurement gap activation and deactivation command is introduced for positioning latency reduction. LS to RAN1/4 indicating our conclusion, and confirming that DL MAC CE can also be used for positioning measurement gap deactivation as well as activation (to be drafted by email).

Proposal 5d: The new DL MAC CE for positioning measurement gap activation and deactivation command includes at least the ID of the pre-configured positioning measurement gap configuration which has been configured/activated by the gNB. Other parameter are FFS.

Proposal 5e: The Scheduling Request should be triggered when there is no PUSCH and UL MAC CE for positioning measurement gap activation/deactivation request is triggered.

Agreements:

Proposal 4: The pre-configured Measurement Gap Configurations for Positioning are provided via RRCReconfiguration message. The pre-configured Measurement Gap Configurations for Positioning are included in IE MeasGapConfig.

Proposal 5: The content of the pre-configured Measurement Gap Configurations for Positioning includes at least the existing measurement gap parameters together with an ID identifying each Measurement Gap Configuration for Positioning.

Proposal 6: The existing RRC LocationMeasurementIndication procedure to request the positioning measurement gaps can still be used by a UE, even when pre-configured measurement gaps are provided to the UE.

Agreements:

Proposal 7: The PRS processing window configuration is provided via RRCReconfiguration message. Whether PRS processing window configuration is provided per BWP or not is up to RAN1 to decide.

Proposal 8: A new DL MAC CE for PRS Processing Window activation and deactivation command is introduced.

Proposal 9: The new DL MAC CE for PRS Processing Window activation and deactivation command includes at least the ID of the pre-configured PRS Processing Window configuration, at least in the case when multiple PRS Processing Windows can be configured.

Proposal 10: The UE behaviour related to the PRS Processing Window feature is captured in the MAC specification.