**3GPP TSG-RAN2 Meeting #117-e *R2-220***

**Online, 21st Feb– 3rd Mar, 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **38.321** | **CR** | 1197 | **rev** | **2** | **Current version:** | **16.7.0** |  |
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| *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 | **X** | Radio Access Network | **X** | Core Network |  |

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|  |
| ***Title:***  | Introduction of R17 positioningEnh for MAC spec |
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| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | RAN2 |
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| ***Work item code:*** | NR\_pos\_enh-Core |  | ***Date:*** | 2022-02-21 |
|  |  |  |  |  |
| ***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 canbe 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 annexDuring 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.

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| 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.

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| 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. During R2#117e, the following agreement has been made regarding PPW in R1:**Agreement*** The PRS processing window is configured per DL BWP.
* Processing type, to be selected from 1A, 1B and 2, will be provided associated with the PRS processing window if and only if multiple processing types per band in the UE capability signaling is supported.
* No need to provide band ID and CC ID associated with the PRS processing window.
* A single priority indicator is provided for a PRS processing window, which applies to all PRS within the PRS processing window for the corresponding DL BWP.
* The maximum number of activated PRS processing windows per DL BWP is 1.
* The maximum number of activated PRS processing windows across all active DL BWPs is 4.
	+ The maximum number of activated PRS processing windows overlapping in time across all active DL BWPs is 1

Thus, the format for DL MAC CE for PPW activation/deactivation command has been provided. |
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| ***Summary of change:*** | 1. Revised the note for whether SRS in the procedural text includes positioning SRS
2. Added definition for PPW and abbreviations of 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 measurement gap/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 measurement gap activation/deactivation request
8. Add a new clause for DL MAC CE for measurement gap activation/deactivation command
9. Add a new clause for DL MAC CE for PPW activation/deactivation command
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| ***Consequences if not approved:*** | R17 positioning enhancement will not be supported in the MAC spec |
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| ***Clauses affected:*** | 3.1, 3.2, 5.12, 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.Ver1: submitted to postR2#116bis-e as R2-2202011Ver2: CatB CR submitted to R2#117e as R2-2202605Ver3: Rev1 of CatB CR submitred to R2#117-e as R2-2203616Ver4: rev2 of CatB CR submitted to R2 as  |

=====================================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 transmission in RRC\_INACTIVE as in clause 5.Z. Positioning SRS except for the Positioning SRS for transmission in RRC\_INACTIVE 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> if *inactivePosSRS-TimeAlignmentTimer* is configured and there is ongoing Positioning SRS Transmission in RRC\_INACTIVE as in clause 5.Y:

3> start or restart the *inactivePosSRS-TimeAlignmentTimer* associated with the indicated TAG.

2> else:

3> 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 indication is received from upper layer for stoping the *inactivePosSRS-TimeAlignmentTimer*:

2> stop the *inactivePosSRS-TimeAlignmentTimer*.

1> when the indication is received from upper layer for stariting the *inactivePosSRS-TimeAlignmentTimer*:

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 for RRC\_INACTIVE configuration(s).

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=====================================

5.12 MAC Reset

If a reset of the MAC entity is requested by upper layers, the MAC entity shall:

1> initialize *Bj* for each logical channel to zero;

1> initialize *SBj* for each logical channel to zero if Sidelink resource allocation mode 1 is configured by RRC;

1> stop (if running) all timers;

1> consider all *timeAlignmentTimer*s and *inactivePosSRS-TimeAlignmentTimer* as expired and perform the corresponding actions in clause 5.2;

1> set the NDIs for all uplink HARQ processes to the value 0;

1> sets the NDIs for all HARQ process IDs to the value 0 for monitoring PDCCH in Sidelink resource allocation mode 1;

1> stop, if any, ongoing Random Access procedure;

1> discard explicitly signalled contention-free Random Access Resources for 4-step RA type and 2-step RA type, if any;

1> flush Msg3 buffer;

1> flush MSGA buffer;

1> cancel, if any, triggered Scheduling Request procedure;

1> cancel, if any, triggered Buffer Status Reporting procedure;

1> cancel, if any, triggered Power Headroom Reporting procedure;

1> cancel, if any, triggered consistent LBT failure;

1> cancel, if any, triggered BFR;

1> cancel, if any, triggered Sidelink Buffer Status Reporting procedure;

1> cancel, if any, triggered Pre-emptive Buffer Status Reporting procedure;

1> cancel, if any, triggered Recommended bit rate query procedure;

1> cancel, if any, triggered Configured uplink grant confirmation;

1> cancel, if any, triggered configured sidelink grant confirmation;

1> cancel, if any, triggered Desired Guard Symbol query;

1> cancel, if any, triggered Positioning Measurement Gap Activation/Deactivation Request procedure;

1> flush the soft buffers for all DL HARQ processes;

1> for each DL HARQ process, consider the next received transmission for a TB as the very first transmission;

1> release, if any, Temporary C-RNTI;

1> reset all *BFI\_COUNTER*s;

1> reset all *LBT\_COUNTERs*.

If a Sidelink specific reset of the MAC entity is requested for a PC5-RRC connection by upper layers, the MAC entity shall:

1> flush the soft buffers for all Sidelink processes for all TB(s) associated to the PC5-RRC connection;

1> consider all Sidelink processes for all TB(s) associated to the PC5-RRC connection as unoccupied;

1> cancel, if any, triggered Scheduling Request procedure only associated to the PC5-RRC connection;

1> cancel, if any, triggered Sidelink Buffer Status Reporting procedure only associated to the PC5-RRC connection;

1> cancel, if any, triggered Sidelink CSI Reporting procedure associated to the PC5-RRC connection;

1> stop (if running) all timers associated to the PC5-RRC connection;

1> reset the *numConsecutiveDTX* associated to the PC5-RRC connection;

1> initialize *SBj* for each logical channel associated to the PC5-RRC connection to zero.

================================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.

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 and perform 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.

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 pre-configured PPW:

- activate the PPW according to the procedure specified in clause 5.X

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

## 5.X Handling of PRS Processing 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> 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 receive DL-SCH;

2> not receive PDCCH.

==================================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, when triggered by the upper layer to send Positioning Measurement Gap Activation/Deactivation Request, cancel the triggered Positioning Measurement Gap Activation/Deactivation Request, if there is, and trigger another Positioning Measurement Gap Activation/Deactivation Request according to the upper layer’s request.

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 according to the upper layer’s request;

3> cancel triggered Positioning Measurement Gap Activation/Deactivation Request MAC CE.

2> else:

3> trigger a Scheduling Request for Positioning Measurement Gap Activation/Deactivation Request 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, if the TA is of the configured Positioning SRS is valid according to clause 5.Z.1:

- transmit Positioning Periodic SRS or Semi-Persistent SRS defined in TS 38.214 [7]

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

### 5.Z.1 TA validation for SRS transmission in RRC\_INACTIVE

RRC configures the following parameters for validation for SRS transmission in RRC\_INACTIVE:

* *inactivePosSRS-RSRP-ChangeThreshold*: RSRP threshold for the increase/decrease of RSRP for time alignment validation;
* *inactivePosSRS-NrOfSS-BlocksToAverage*: number of SSBs with highest RSRPs for derivation of downlink pathloss reference for TA validation;
* *inactivePosSRS-AbsThreshSS-BlocksConsolidation*: absolute RSRP threshold for determining the set of SSBs for derivation of downlink pathloss reference for TA validation.

The MAC entity shall:

1> if *inactivePosSRS-NrOfSS-BlocksToAverage* is not configured; or

1> if *inactivePosSRS-AbsThreshSS-BlocksConsolidation* is not configured or the highest beam measurement quantity value is below or equal to *inactivePosSRS-AbsThreshSS-BlockConsolidation*, if configured:

2> derive the downlink pathloss reference RSRP for TA validation for SRS transmission in RRC\_INACTIVE as the highest beam measurement quantity value, where each beam measurement quantity is described in TS 38.215 [24].

1> else:

2> derive the downlink pathloss reference RSRP for TA validation for SRS transmission in RRC\_INACTIVE as the linear average of the power values of up to *inactivePosSRS -NrOfSS-BlocksToAverage* of the highest beam measurement quantity values above *inactivePosSRS -AbsThreshSS-BlocksConsolidation*, where each beam measurement quantity is described in TS 38.215 [24].

The MAC entity shall:

1> if the UE is configured with *measObject* for the serving cell where the UE receives configuration for SRS transmission in RRC\_INACTIVE:

2> store the RSRP of the downlink pathloss reference derived based on the *measObject* configured for the serving cell as in TS 38.331.

1> else if Timing Advance Command MAC CE is received for *inactivePosSRS -TimeAlignmentTimer* as in clause 5.2:

2> update the stored downlink pathloss reference with the current RSRP value of the downlink pathloss reference.

The MAC entity shall consider the TA to be valid when the following condition is fulfilled:

1> compared to the stored downlink pathloss reference RSRP value, the current RSRP value of the downlink pathloss reference has not increased/decreased by more than *inactivePosSRS-RSRP-ChangeThreshold*, if configured.

==================================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 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 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 eLCID as specified in Table 6.2.1-1.

It has variable size and consists of a single octet defined as follows (Figure 6.1.3.z-1):

- numEntry: This field indicates the number of entries N-1 in the MAC CE. 00 indicates that N equals to 1; 01 indicates that N equals to 2 and so on. The length of the field is 2 bits;

- Serving Cell ID: This field indicates the identity of the Serving Cell for which the MAC CE applies. The length of the field is 5 bits;- PPW ID: This field indicates the PPW configured on active DL BWP of the serving cell identified by the above Serving Cell ID. The length of the field is 2 bits;

- A/D: This field indicates the activation or deactivation of the PPW. The field is set to 1 to indicate activation, otherwise it indicates deactivation. The length of the field is 1 bit.

- R: Reserverd bit, set to 0.



Figure 6.1.3.z-1: PPW Activation/Deactivation Command 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 242 | 64 to 306 | Reserved |
| xx2 | yy2 | Positioning Measurement Gap Activation/Deactivation Command |
| xx1 | yy1 | PPW Activation/Deactivation Command |
| 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 248 | 64 to 312 | Reserved |
| xx3 | yy3 | Positioning Measurement Gap Activation/Deactivation Request |
| 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 |

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