**3GPP TSG-RAN2 Meeting #123bis R2-2311563**

**Xiamen, China, 9th – 13th October, 2023**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.321** | **CR** | DraftCR | **rev** | **-** | **Current version:** | 17.5.0 |  |
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| *For* [***HELP***](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:*** | Draft running MAC CR for the introduction of LPHAP | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | RAN2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh2 | | | | |  | ***Date:*** | | | 2023-10-09 |
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| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | * **Issue1**: The following agreements have been made during RAN2#122 regarding area-specific TAT  |  | | --- | | Agreements:  Define an SRS for positioning validity-area specific TA timer (e.g., with larger values) for a UE in RRC\_INACTIVE state.  - The UE starts/restarts the area-specific TA timer when it receives the TA command.  - The UE stops the SRS transmission when the area-specific TA timer expires.  - The UE stops the area-specific TA timer when it reselects to a cell out of the SRS validity area.  - Other stop/restart conditions can be discussed. |  * **Issue2**: The following has been agreed during RAN2#123  |  | | --- | | Agreements:  The following criterion needs to be defined for the start/re-start of the area-specific TA timer:   * Reception of RRCRelease message containing the SRS configuration (excluding pre-configured SRS) |   ==================UPDATE AFTER R2#123bis==================   * **Issue3**: During RAN2#123bis, the following has been agreed regarding the stored RSRP update at cell reselection.  |  | | --- | | Agreements:  Introduce an autonomous TA adjustment enabler in the area-specific SRS configuration. If configured by the network, subject to UE capability, UE autonomously adjusts the stored RSRP when cell-reselection happens. | | | | | | | | | |
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| ***Summary of change:*** | | The following changes have been applied in the current CR   * Change1: Introduce an area-specific time alignment timer * Change1a: For the section maintenance of uplink time alignment, the UE starts the area-specific TAT when TA command is received when validity area is configured for SRS * Change1b: When transmitting SRS with validity area, validity condition has to be satisfied and the validity condition includes running area-specific TAT * Change1c: when cell selection/reselection happens out of a validity area, the RRC layer should indicate to MAC to stop the area-specific TAT * Change2: the condition for the UE to start/re-start the area-specific TAT is added * Change3: add how stored RSRP is updated when validity area is configured | | | | | | | | |
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| ***Consequences if not approved:*** | | The new feature LPHAP can not be well supported by the MAC spec | | | | | | | | |
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| ***Clauses affected:*** | | 5.2, 5.26 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Ver0 in RAN2#123: R2-2307214  Ver1 in RAN2#123bis:R2-2309632  Ver2 in RAN2#123bis: R2-2311563  Ver3 after RAN2#123bis: R2-231 | | | | | | | | |

====================================CHAGNE BEGIN====================================

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 5.26 to be uplink time aligned;

- *srs-ValidityAreaTimeAlignmentTimer* which controls how long the MAC entity considers Positioning SRS transmission in RRC\_INACTIVE in clause 5.26 to be uplink time aligned when SRS positioning validity area is configured;

- *cg-SDT-TimeAlignmentTimer* which controls how long the MAC entity considers the uplink transmission for CG-SDT 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 there is ongoing Positioning SRS Transmission in RRC\_INACTIVE as in clause 5.26:

3> if SRS positioning validity area is configured:

4> start or restart the *srs-ValidityAreaTimeAlignmentTimer* associated with the indicated TAG.

3> else:

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

2> if CG-SDT procedure triggered as in clause 5.27 is ongoing:

3> start or restart the *cg-SDT-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.

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

4> if CG-SDT procedure triggered as in clause 5.27 is ongoing:

5> set the NTA value to the value before applying the received Timing Advance Command as in TS 38.211 [8].

3> when the Contention Resolution is considered successful for Random Access procedure while the CG-SDT procedure is ongoing:

4> stop *timeAlignmentTimer* associated with this TAG;

4> start or restart the *cg-SDT-TimeAlignmentTimer* associated with this TAG.

3> when the Contention Resolution is considered successful for Random Access procedure while SRS transmission in RRC\_INACTIVE is ongoing:

4> if SRS positioning validity area is configured:

5> start or restart the *srs-ValidityAreaTimeAlignmentTimer* associated with the indicated TAG.

4> else:

5> start or restart the *inactivePosSRS-TimeAlignmentTimer* associated with this TAG.

2> else:

3> ignore the received Timing Advance Command.

Editor's NOTE: FFS whether when the UE autonomously adjust the TA when cell reselection happens, the TAT is restarted.

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> if there is ongoing Positioning SRS Transmission in RRC\_INACTIVE as in clause 5.26:

3> if SRS positioning validity area is configured:

4> start or restart the *srs-ValidityAreaTimeAlignmentTimer* associated with the indicated TAG.

3> else:

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

2> if CG-SDT procedure is ongoing:

3> start or restart the *cg-SDT-TimeAlignmentTimer* associated with PTAG.

2> else:

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

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

2> stop the *inactivePosSRS-TimeAlignmentTimer*.1> when the indication is received from upper layer for starting the *inactivePosSRS-TimeAlignmentTimer*:

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

1> when instruction from the upper layer has been received for starting the *cg-SDT-TimeAlignmentTimer*:

2> start the *cg-SDT-TimeAlignmentTimer*.

1> when instruction from the upper layer has been received for stopping the *cg-SDT-TimeAlignmentTimer*:

2> consider the *cg-SDT-TimeAlignmentTimer* as expired.

1> when the indication is received from upper layer for starting the *srs-ValidityArea-TimerAlignmentTimer*:

2> start or restart the *srs-ValidityArea-TimerAlignmentTimer*.

1> when the indication is received from upper layer for stopping the *srs-ValidityArea-TimerAlignmentTimer*:

2> stop the *srs-ValidityArea-TimerAlignmentTimer*.

1> when instruction from the upper layer has been received for starting the *TimeAlignmentTimer* associated with PTAG:

2> start the *TimeAlignmentTimer* associated with PTAG.

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).

1> when the *cg-SDT-TimeAlignmentTimer* expires:

2> clear any configured uplink grants;

2> if a PDCCH addressed to the MAC entity's C-RNTI after initial transmission for the CG-SDT with CCCH message has not been received:

3> consider ongoing CG-SDT procedure as terminated;

3> indicate the expiry of *cg-SDT-TimeAlignmentTimer* to the upper layer.

2> flush all HARQ buffers;

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

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, CG-SDT procedure is not ongoing and SRS transmission in RRC\_INACTIVE as in clause 5.26 is not on-going. Furthermore, when the *timeAlignmentTimer* associated with the PTAG is not running, CG-SDT procedure is not ongoing and SRS transmission in RRC\_INACTIVE as in clause 5.26 is not ongoing, the MAC entity shall not perform any uplink transmission on any Serving Cell except the Random Access Preamble and MSGA transmission on the SpCell. The MAC entity shall not perform any uplink transmission except the Random Access Preamble and MSGA transmission when the *cg-SDT-TimeAlignmentTimer* is not running during the ongoing CG-SDT procedure as triggered in clause 5.27 and the *inactivePosSRS-TimeAlignmentTimer* or *srs-ValidityAreaTimeAlignmentTimer* is not running.

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

5.26 Positioning SRS transmission in RRC\_INACTIVE

5.26.1 General

Periodic and semi-persistent Positioning SRS can be configured for Positioning SRS transmission in RRC\_INACTIVE.

The MAC entity shall, if the TA of the configured Positioning SRS is valid according to clause 5.26.2, and the conditions for positioning SRS transmission in clause 7.3.1 of TS 38.213 [6] and clause 6.2.1.4 of TS 38.214 [7] are satisfied:

- instruct to the lower layer according to TS 38.214 [7] to transmit Positioning Periodic SRS or Semi-Persistent SRS that is activated according to clause 5.18.17.

5.26.2 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.

The MAC entity shall:

1> if the UE receives configuration for SRS transmission in RRC\_INACTIVE:

2> store the RSRP of the downlink pathloss reference with the current RSRP value of the downlink pathloss reference as in TS 38.331 [5].

1> else if the UE is configured with SRS transmission in RRC\_INACTIVE:

2> if Timing Advance Command MAC CE is received as in clause 5.2, or;

2> if Timing Advance Command or Absolute Timing Advance Command is received for Random Access procedure that is successfully completed:

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

2> if the UE is configured with SRS with validity area and the upper layer indicates the MAC to update the stored RSRP:

3> store the RSRP of the downlink pathloss reference with the current RSRP value of the downlink pathloss reference of the camped cell as in TS 38.331

The MAC entity shall consider the TA to be valid when the following conditions are 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; and

1> *inactivePosSRS-TimeAlignmentTimer* is running or *srs-ValidityArea-TimerAlignmentTimer* is running when positioning validity area is configured.

Editor’s NOTE: FFS the pathloss reference threshold condition for positioning SRS transmission when validity area is configured.

Editor's NOTE: FFS the definition of the current RSRP for TA validation.

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