3GPP RAN WG2 Meeting #118-e R2-2206194

eMeeting May 9th – May 20th, 2022

Agenda Item: 6.10.2.1

Source: InterDigital

Title: [DRAFT] Report of [AT118-e][104][NTN] UP corrections: Phase 1

Document for: Discussion, Decision

# Introduction

This document is intended to address general corrections and summarize proposals from selected papers in AI 6.10.2.1, focusing on the main issues identified in RAN2#117e as per the following discussion guidelines:

**[AT118-e][104][NTN] UP corrections (InterDigital)**

* **Initial scope: based on contributions in 6.10.2, discuss corrections for TA reporting, msg3 retx, Contention Resolution timer, validity timer expiry, HARQ RTT timer extension and other general UP corrections**
* **Initial intended outcome: Summary of the offline discussion with e.g.:**
	+ **List of proposals for agreement (if any)**
	+ **List of proposals that require online discussions**
	+ **List of proposals that should not be pursued (if any)**

Please note the following deadlines:

* Initial deadline (for companies' feedback): **Monday 2022-05-09 2000 UTC**
* Initial deadline (for rapporteur's summary in R2-2206194): Monday 2022-05-09 2200 UTC

# General corrections and clarifications

**Correction 1**: Unclear description on Active Time triggered by SR transmission

The following *condition* is introduced for the DRX Active Time triggered by SR transmission, as an enhancement to NTN:

* a Scheduling Request is sent on PUCCH and is pending (as described in clause 5.4.4 or 5.22.15). *If this Serving Cell is part of a non-terrestrial network, the Active Time is started after the first Scheduling Request transmission plus the UE-gNB RTT*; or

However, the term “first scheduling request transmission” used in 5.7 for DRX procedure is not clearly defined in the current MAC Spec, making the UE unable to judge what such “first SR transmission” actually refers to and unable to determine what the intended UE behaviour should be. For the DRX Active Time triggered by SR transmission in NTN, [15] notes the intention of the related agreement is to consider only the first SR transmission which is performed from the moment the first SR is triggered when there is no other pending SR, until all pending SR(s) are later cancelled.

Considering that there is the following text in 5.4.4 to describe the first SR triggered when there is no pending SR for a given SR configuration (e.g. after previous SR cancellation or for the very first SR triggering), such “first SR transmission” can be interpreted as “the SR transmission that is performed when the *SR\_COUNTER* of all the SR configurations with pending SR(s) is zero”.

*“If an SR is triggered and there are no other SRs pending corresponding to the same SR configuration, the MAC entity shall set the SR\_COUNTER of the corresponding SR configuration to 0.”*

Therefore, [15] proposes to change “the first SR transmission” to **i**n 5.7 DRX procedure to “the SR transmission that is performed when the SR\_COUNTER is 0 for all the SR configurations with pending SR(s)”.A corresponding text proposal for TS 38.321 is provided below:

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| 5.7 Discontinuous Reception (DRX)…When DRX is configured, the Active Time for Serving Cells in a DRX group includes the time while:- *drx-onDurationTimer* or *drx-InactivityTimer* configured for the DRX group is running; or- *drx-RetransmissionTimerDL*, *drx-RetransmissionTimerUL* or *drx-RetransmissionTimerSL* is running on any Serving Cell in the DRX group; or- *ra-ContentionResolutionTimer* (as described in clause 5.1.5) or *msgB-ResponseWindow* (as described in clause 5.1.4a) is running; or- a Scheduling Request is sent on PUCCH and is pending (as described in clause 5.4.4 or 5.22.15). If this Serving Cell is part of a non-terrestrial network, the Active Time is started after the Scheduling Request transmission that is performed when the *SR\_COUNTER* is 0 for all the SR configurations with pending SR(s) plus the UE-gNB RTT; or- a PDCCH indicating a new transmission addressed to the C-RNTI of the MAC entity has not been received after successful reception of a Random Access Response for the Random Access Preamble not selected by the MAC entity among the contention-based Random Access Preamble (as described in clauses 5.1.4 and 5.1.4a). |

**Correction 2:** Clarification on TA reporting when multiple TARs are triggered and pending at once

In the subclause “5.4.8 Timing Advance Reporting”, there could be more than one TAR triggered and pending at a given time. Based on the following procedural text, a MAC PDU shall contain at most one Timing Advance Report MAC CE:

*“A MAC PDU shall contain at most one Timing Advance Report MAC CE, even when multiple events have triggered a Timing Advance report.”*

In this case, the UE needs to generate TAR MAC CE based on the latest UE-gNB RTT value available. [15] proposes that this can be clarified via a NOTE in the TAR reporting procedure, similar to the NOTE that is captured already for the DRX procedure as follows in subclause 5.7. A corresponding text proposal for TS 38.321 is provided below:

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| 5.4.8 Timing Advance Reporting…NOTE: UL-SCH resources are considered available if the MAC entity has been configured with, receives, or determines an uplink grant. If the MAC entity has determined at a given point in time that UL-SCH resources are available, this need not imply that UL-SCH resources are available for use at that point in time.NOTE X: The TAR MAC CE is generated based on the latest UE-gNB RTT available. |

**Correction 3:** Clarification on Timing Advance report triggering

In subclause “5.4.8 Timing Advance Reporting”, the following text is captured to describe TAR triggering:

*“A Timing Advance report (TAR) may be triggered if any of the following events occur:”*

As noted in [16] and [17], The procedural text for TA report triggering in MAC spec is a required behaviour. Therefore, it is proposed in both [16] and [17] that the description: “A Timing Advance report (TAR) may be triggered if any of the following events occur” shall be updated to “A Timing Advance report (TAR) shall be triggered if any of the following events occur” A corresponding text proposal for TS 38.321 is provided below:

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| 5.4.8 Timing Advance Reporting…A Timing Advance report (TAR) shall be triggered if any of the following events occur:- if *ta-Report* is configured with value enabled, upon initiation of Random Access procedure due to initial access from RRC\_IDLE, RRC Connection Resume procedure from RRC\_INACTIVE, or RRC Connection Re-establishment procedure (see TS 38.331 [5]); |

**Correction 4:** Inclusion of UE-gNB RTT definition in RRC specification

The UE-gNB RTT is a widely used variable in MAC specification which can be reused in RRC specification to help setting the value of RTT timer. [14] therefore proposes that UE-gNB be added in the definition part of TS 38.331. A corresponding text proposal for TS 38.331 is provided below:

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| 3.1 Definitions…**Uu Relay RLC channel**: An RLC channel between L2 U2N Relay UE and gNB, which is used to transport packets over Uu for L2 UE-to-Network relay**.****UE-gNB RTT:** For non-terrestrial networks, the sum of the UE's Timing Advance value (see TS 38.211 [16] clause 4.3.1) and *kmac* provided in *NTN-Config*.**UE Inactive AS Context**: UE Inactive AS Context is stored when the connection is suspended and restored when the connection is resumed. It includes information as defined in clause 5.3.8.3. |

**Correction 5:** Reconfiguration of *offsetThresholdTA* to disable TA reporting

In subclause “5.4.8 Timing Advance Reporting”, the following TAR triggering condition is captured:

*- upon configuration or reconfiguration of offsetThresholdTA by upper layers, if the UE has not previously reported Timing Advance value to current Serving Cell;*

Like PHR, it is possible for NW to reconfigure UE to release the event triggered TA report. In such case there is no need to trigger TA report, so [18] proposes to capture that UE doesn’t trigger TA report if reconfigured to disable the TA report function (i.e., to release the *offsetThresholdTA*). A corresponding text proposal for TS 38.321 is provided below:

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| 5.4.8 Timing Advance Reporting…A Timing Advance report (TAR) may be triggered if any of the following events occur:- if *ta-Report* is configured with value enabled, upon initiation of Random Access procedure due to initial access from RRC\_IDLE, RRC Connection Resume procedure from RRC\_INACTIVE, or RRC Connection Re-establishment procedure (see TS 38.331 [5]);- if *ta-Report* with value enabled is indicated in the handover command, upon initiation of Random Access procedure due to reconfiguration with sync;- upon configuration or reconfiguration of *offsetThresholdTA* by upper layers which is not used to disable the TA report function, if the UE has not previously reported Timing Advance value to current Serving Cell during this connection;- if the variation between current information about Timing Advance and the last successfully reported information about Timing Advance is equal to or larger than *offsetThresholdTA*, if configured. |

**Correction 6:** Clarification of reference to RAN1 specifications in TAR triggering

In subclause “5.4.8 Timing Advance Reporting”, the following text is captured to describe TA reporting:

*The Timing Advance reporting procedure is used in a non-terrestrial network to provide the gNB with an estimate of the UE's Timing Advance value (i.e., T\_TA as defined in the UE's TA formula, see TS 38.211 [8] clause 4.3.1).*

There is no need to use the L1 spec notation in the MAC spec, it is sufficient to write out Timing Advance and have the reference. [8] therefore proposes the to remove “*T\_TA as defined in the UE's TA formula*” from the above description. A corresponding text proposal for TS 38.321 is provided below:

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| 5.4.8 Timing Advance ReportingThe Timing Advance reporting procedure is used in a non-terrestrial network to provide the gNB with an estimate of the UE's Timing Advance value (see TS 38.211 [8] clause 4.3.1). |

**Correction 7:** Alignment of MAC and RRC on use of HARQ mode

There are several instanced where usage of “HARQ mode” in MAC spec is not consistent with other RRC fields. It is proposed in [19] that in several instances, the value shall be in italics to indicate it is a value of a RRC field. A corresponding text proposal for TS 38.321 is provided below:

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| 5.4.3.1 Logical Channel Prioritization…- *allowedHARQ-mode* which sets the allowed *uplinkHARQ-mode* for transmission.…2> *allowedHARQ-mode*, if configured, includes the *uplinkHARQ-mode* for the HARQ process associated to the UL grant. |

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| 5.7 Discontinuous Reception (DRX)…- *uplinkHARQ-Mode* (optional): the configuration to set *HARQmodeA* or *HARQmodeB* per UL HARQ process.…1> if a MAC PDU is transmitted in a configured uplink grant and LBT failure indication is not received from lower layers:2> if this Serving Cell is not configured with *uplinkHARQ-Mode*; or2> if the corresponding HARQ process in this Serving Cell is configured with *uplinkHARQ-Mode* equal to *HARQmodeA*:…2> if the PDCCH indicates a UL transmission:3> if this Serving Cell is not configured with *uplinkHARQ-Mode*; or3> if the corresponding HARQ process in this Serving Cell is configured with *uplinkHARQ-Mode* equal to *HARQmodeA*: |

**Correction 8:** Modelling of UE-gNB RTT

There is an inconsistent use of “UE-gNB RTT” in the spec, the usage has two different forms: 1) “the UE estimate of UE-gNB RTT”; and “the UE-gNB RTT”. As 3.1 has the exact definition of UE-gNB RTT, the usage “the UE estimate of UE-gNB RTT” is unnecessary. [19] therefore proposes that in 5.1.5, the two occurrences of “UE estimate of” are removed. A corresponding text proposal for TS 38.321 is provided below:

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| 5.1.5 Contention ResolutionOnce Msg3 is transmitted the MAC entity shall:1> if Msg3 is transmitted on a non-terrestrial network:2> start the *ra-ContentionResolutionTimer* and restart the *ra-ContentionResolutionTimer* at each HARQ retransmission in the first symbol after the end of the Msg3 transmission plus the UE-gNB RTT.…1> if *ra-ContentionResolutionTimer* expires:2> if Msg3 is transmitted on a non-terrestrial network and *ra-ContentionResolutionTimer* expires prior to the first symbol after the end of a Msg3 retransmission plus the UE-gNB RTT:3> do not consider the Contention Resolution unsuccessful.2> else:3> discard the *TEMPORARY\_C-RNTI*;3> consider the Contention Resolution not successful. |

**Question 1) If you object to one or more of the above text proposal(s), please: 1) Indicate which text proposal(s) is unacceptable; 2) Provide technical justification why the text proposal is unacceptable; and 3) Suggest an alternative acceptable wording (if available).**

**Note: If a company does not comment on a proposal, it is assumed to be agreeable.**

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| **Company** | **Comments**  |
| ASUSTeK | For correction 2, the TAR MAC CE could be generated based on the latest “Timing Advance value” as the field description of the TAR MAC CE in subclause 6.1.3.56. The UE-gNB RTT is the sum of UE's TA and K\_mac. As mentioned in [15], the NOTE 1b in subclause 5.7 is for RTT compensation, but not for TA calculation. |
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# Issues from RAN2#117e: Potentially agreeable aspects

## Configuration for Blind Msg3 retransmission

In RAN2#117e, it was agreed to support blind MSG3 retransmissions in NTN via procedural text, although details are still FFS. A main point from past offline discussion is whether explicit configuration is needed to support blind MSG3 retransmission.

*Support for configuration* [5]:

[5] states that under the current implementation, no matter whether blind Msg3 retransmission is used or not by network, UE shall keep PDCCH monitoring once *ra-ContentionResolutionTimer* is (re)started until the timer expires. This would lead to unnecessary UE power consumption if blind MSG3 retransmission is not used by the network. Introducing a configuration would allow for differentiate behaviour on whether blind scheduling for Msg3 retransmission is used by network.

*Do not support configuration* [6, 7]

Alternatively, [6] noted that blind MSG3 retransmission should always be possible for UE, and there is no extra benefit in making the solution over complex by introducing two configurable sub-solutions. This opinion is shared by [7], where it is stated that a configuration-based solution is over-optimized and would require additional specification effort to support.

**Question 2) Do you agree to introduce an explicit configuration to support blind Msg3 retransmission in NTN?**

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| **Company** | **Agree/Disagree** | **Additional comments**  |
| ASUSTeK | Disagree | For simplification, we can follow current text style in spec. |
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## MSG3 repetition

In [8] it is noted that another Rel-17 WI has introduced support for MSG3 repetitions, captured in TS 38.321, section 5.1.5 as follows:

1> if Msg3 is transmitted on a non-terrestrial network:

2> start the *ra-ContentionResolutionTimer* and restart the *ra-ContentionResolutionTimer* at each HARQ retransmission in the first symbol after the end of the Msg3 transmission plus the UE estimate of UE-gNB RTT.

1> else if the Msg3 transmission (i.e. initial transmission or HARQ retransmission) is scheduled with Type A PUSCH repetition:

2> start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of all repetitions of the Msg3 transmission.

1> else:

2> start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of the Msg3 transmission.

Considering coverage can also be an issue in non-terrestrial networks, [8] proposes that this functionality also be supported for NTN UEs, as well as an accompanying TP to update the NTN part of the CRT handling in section 5.1.5 to support MSG3 repetition.

**Question 3) Do you agree the Msg3 repetition functionality introduced in Rel-17 shall also be supported in NTN?**

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| **Company** | **Agree/Disagree** | **Additional comments**  |
| ASUSTeK | See comment | We are fine to support Msg3 repetition in NTN. However, regarding the TP, the UE behavior should be inherited from Msg3 repetition and modified based on agreement from NTN (i.e. an offset to the start of the ra-ContentionResolutionTimer is introduced), such as below:Once Msg3 is transmitted the MAC entity shall:~~1> if Msg3 is transmitted on a non-terrestrial network:~~~~2> start the~~ *~~ra-ContentionResolutionTimer~~* ~~and restart the~~ *~~ra-ContentionResolutionTimer~~* ~~at each HARQ retransmission in the first symbol after the end of the Msg3 transmission plus the UE estimate of UE-gNB RTT.~~1> ~~else~~ if the Msg3 transmission (i.e. initial transmission or HARQ retransmission) is scheduled with Type A PUSCH repetition:2> if Msg3 is transmitted on a non-terrestrial network:3> start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of all repetitions of the Msg3 transmission plus the UE estimate of UE-gNB RTT.2> else3> ~~2>~~start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of all repetitions of the Msg3 transmission.1> else:2> if Msg3 is transmitted on a non-terrestrial network:3> start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of the Msg3 transmission plus the UE estimate of UE-gNB RTT.2> else3> ~~2>~~ start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of the Msg3 transmission. |
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## UE behaviour upon validity timer expiry

The validity timer *ntn-UlSyncValidityDuration* is introduced in Rel-17 to support uplink synchronization in non-terrestrial networks. *ntn-UlSyncValidityDuration* is configured by the network, and indicates the maximum time during which the UE can apply satellite assistance information (i.e. Serving satellite ephemeris and Common TA parameters) without having acquired new assistance information. In NR, satellite assistance information is carried in SIB19. Current UE behaviour upon validity timer expiry is captured as a working assumption: “*Upon validity timer expiry, UE shall suspend uplink transmission and re-acquire SI, flushing HARQ buffers”*.

*Support for confirmation of working assumption* [9, 10, 12]

A main point of disagreement is whether to support flushing of HARQ buffers. As noted in [9, 10, 12] this is useful to avoid HARQ state mismatch, and a similar agreement has already been made in IoT NTN. Another concern is that the network doesn’t know whether UE’s validity timer is expired or not. However, [12] states if epoch time is explicitly provided network knows that the validity timer at UE side may expire at (epoch + validity duration). The network can confirm this assumption if a missing UL data transmission or UL HARQ feedback for DL data is detected close to validity timer expiry.

**Question 4) Do you agree to confirm the following RAN2 working assumption from RAN2#117e:**

***“Upon validity timer expiry, UE shall suspend uplink transmission and re-acquire SI, flushing HARQ buffers”***

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| **Company** | **Agree/Disagree** | **Additional comments**  |
| ASUSTeK | Agree |  |
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## Validity timer location and MAC/RRC interaction

Current RRC implementation in NR implies that *ntn-UlSyncValidityDuration* is maintained in MAC layer. However, *ntn-UlSyncValidityDuration* is controlled (e.g., started/restarted) by reception of SIB19, and upon expiry triggers re-acquisition of SIB. Furthermore, in RAN2#117e it has been agreed that UE behaviour upon validity timer expiry is covered in RRC. [10] notes the above would suggest the validity timer is better maintained at the RRC layer (as in IoT NTN) and proposes a new T3XX timer should be introduced and maintained in the NR RRC specification. A similar procedure is also proposed in [12].

**Question 5a) Do you agree a new T3XX timer is introduced in RRC specification with duration *ntn-UlSyncValidityDuration*. T3XX is started/restarted upon acquisition of SIB19. Upon T3XX expiry, the UE re-acquires SIB19.**

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| **Company** | **Agree/Disagree** | **Additional comments**  |
| ASUSTeK | Agree |  |
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As noted in [10] if the current WA is agreed, the suspension of UL transmission and flushing HARQ buffers upon validity timer expiry requires MAC-RRC interaction. It is proposed that (as in IoT case) RRC should inform lower layers (i.e., MAC) that UL synchronization is lost. Once SIB19 has been re-acquired, RRC should indicate to lower layers that UL synchronisation is restored.

**Question 5b) If ‘Agree’ to previous question, do you agree that upon T3XX expiry: 1) RRC indicates to lower layers that the UL synchronisation is lost; and 2) once SIB19 has been re-acquired RRC indicates to lower layers that the UL synchronisation is restored?**

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| **Company** | **Agree/Disagree** | **Additional comments**  |
| ASUSTeK | Agree |  |
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## HARQ RTT Timer extension

As described in [14], to accommodate increased propagation delay in NTN RAN2 has agreed to extend *drx-HARQ-RTT-TimerDL/UL* by UE-gNB RTT when HARQ feedback is enabled/UL-HARQ-mode A is used. There has been some discussion on how to specify this behaviour, and in RAN2#117e it was agreed to capture the setting of corresponding DRX timer length in RRC specs with possible interaction in MAC specs.

[14] describes two options on how the HARQ RTT Timer extension may be implemented in TS 38.331:

*Option 1: Introduce procedural text*

Whether HARQ RTT timers apply legacy value or are extended by UE-gNB RTT depends on configuration of *downlinkHARQ-FeedbackDisabled* and *uplinkHARQ-Mode*. Procedural text capturing this behaviour was discussed in [Post117-e][101] and received wide support.

*Option 2: Change field description of drx-HARQ-RTT-TimerDL/UL*

Alternatively, [14] notes that considering the *drx-HARQ-RTT-TimerDL/UL* is configured in *DRX-Config*, a simple implementation is to clarify in the field description that UE set the value of *drx-HARQ-RTT-TimerDL/UL* to the value configured plus UE-gNB RTT. This would avoid discussing which subclause is a better place for HARQ RTT timer extension implementation.

**Question 6a) Please indicate your preferred option to capture HARQ RTT Timer extension in RRC specification:**

* **Option 1: Introduce procedural text**
* **Option 2: Change field description of *drx-HARQ-RTT-TimerDL/UL***
* **Option 3: Other, please describe**

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| **Company** | **Supported Option(s)** | **Additional comments**  |
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In [Post117-e][101], the procedural text proposal was captured in subclause “5.3.5.5.5 MAC entity configuration” and received wide support. Although, another option raised in discussion is to instead capture this text in “5.3.5.5.7 SpCell Configuration”.

**Question 6b) If you selected ‘Option 1’ in the previous question, please indicate the preferred subclause for procedural text:**

* **Option 1: 5.3.5.5.5 MAC entity configuration**
* **Option 2: 5.3.5.5.7 SpCell Configuration**
* **Option 3: Other, please describe**

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| **Company** | **Supported Option(s)** | **Additional comments**  |
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# Summary

<To be generated pending company input>

# Conclusions

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# References

1. [R2-2204556](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204556.zip): Corrections on the TAR triggers based on RRC procedures in NR NTN – vivo
2. [R2-2205720](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205720.zip): Discussion on user plane known issues for NR NTN – Nokia, Nokia Shanghai Bell
3. [R2-2205231](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205231.zip): The Modification of TA Reporting Triggering Condition – CATT
4. [R2-2205478](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205478.zip): Further consideration on TA report MAC CE – Huawei, HiSilicon
5. [R2-2204733](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204733.zip):  Discussion on ra-ContentionResolutionTimer in NTN – OPPO
6. [R2-2205477](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205477.zip):  Discussion on Contention Resolution timer expiry – Huawei, HiSilicon
7. [R2-2205694](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205694.zip):  Discussion on MAC open issues – Samsung Research America
8. [R2-2205994](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205994.zip):  Known NR NTN user plane issues – Ericsson
9. [R2-2204735](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204735.zip):  Further discussion on validity timer impacts in NTN – OPPO
10. [R2-2205956](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205956.zip):  UE behaviour upon validity timer expiry – InterDigital
11. [R2-2205240](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205240.zip):  Discussion on remaining issues – LG Electronics Inc.
12. [R2-2205403](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205403.zip):  Remaining issues related to NTN validity timer – Xiaomi
13. [R2-2204748](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204748.zip):  MAC operations about the validity timer expiry – Spreadtrum Communications
14. [R2-2205359](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205359.zip): Consideration on RTT timer extension implementation – ZTE Corporation, Sanechips
15. [R2-2204558](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204558.zip): On corrections to DRX procedure and TA reporting procedure in TS 38.321 – vivo
16. [R2-2205134](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205134.zip): Corrections for TA report – ASUSTeK
17. [R2-2204559](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204559.zip): Miscellaneous corrections on TS 38.321 for NR NTN – vivo
18. [R2-2205596](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205596.zip): Further consideration on TA report – ZTE Corporation, Sanechips
19. [R2-2205995](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205995.zip): Other NR NTN user plane issues – Ericsson

# Annex: Issues from RAN2#117e postponed to Phase 2

## Timing Advance: Reporting during Random Access and SR

Topic 1: Clarification of trigger conditions in MAC specification [1, 3, 4]

From TS 38.321, a Timing Advance report (TAR) may be triggered if any of the following events occur:

*- if ta-Report is configured with value enabled, upon initiation of Random Access procedure due to initial access from RRC\_IDLE, RRC Connection Resume procedure from RRC\_INACTIVE, or RRC Connection Re-establishment procedure (see TS 38.331 [5]);*

*- if ta-Report with value enabled is indicated in the handover command, upon initiation of Random Access procedure due to reconfiguration with sync;*

*- upon configuration or reconfiguration of offsetThresholdTA by upper layers, if the UE has not previously reported Timing Advance value to current Serving Cell;*

*- if the variation between current information about Timing Advance and the last successfully reported information about Timing Advance is equal to or larger than offsetThresholdTA, if configured.*

[1] addresses the first two triggering conditions, noting it is usually assumed the specific RRC procedure which triggers RACH is invisible to the MAC entity. It is proposed that reference to specific RRC-based procedures be removed from MAC and instead specified in RRC. If the corresponding RRC procedures are initiated (e.g. initial access, connection resume), RRC indicates to MAC to trigger TAR procedure based on the *ta-Report* indicator in SIB/dedicated signalling.

[3] addresses the third triggering condition, noting that there will be some cases where the UE has no pre-reported TA value available for TA report triggering. For example, if the *offsetThresholdTA* is released by RRC after a previous (re)configuration and the UE releases the last reported TA value, upon subsequent configuration of *offsetThresholdTA* a TAR will not be triggered because the UE has already reported Timing Advance value to current Serving Cell. As a result, the UE will have no pre-reported TA value to use for TA triggering comparison, and TA reporting effectively disabled in RRC\_CONNECTED (as illustrated in Figure 2 from [3]). To resolve this issue, it is proposed that the third triggering condition be revised to “upon configuration or reconfiguration of *offsetThresholdTA* by upper layers, if the UE *has no available Timing Advance value previously reported* to current Serving Cell”.

[4] addresses the fourth triggering condition, noting that based on current description, UE should compare current TA with “last successfully reported TA”. However, the meaning of “last successfully reported information about Timing Advance” is ambiguous as UE may not be able to know whether a TA reporting is successful or not (especially when the TA report MAC CE is transmitted on a HARQ process configured with HARQ mode B). It is proposed that RAN2 clarify the meaning of “successfully reported information about Timing Advance” to avoid ambiguity and specifically how UE can determine a TA reporting is successful.

Topic 2: Clarification of SR configuration for TA report MAC CE reporting [2]

In RAN2#117e, it was agreed that the network may configure UE to trigger an SR if a Timing Advance report (TAR) is triggered and there are no available UL-SCH resources to accommodate the TA report MAC CE. Based on current implementation in TS 38.321, this is controlled by RRC via configuration of *timingAdvanceSR*:

However, it is noted in [2] that RAN2 has so far not discussed which SR configuration should be used by TA report MAC CE. If the UE is configured to trigger SR to report TA MAC CE to NW, UE should report TA to NW in time to avoid UL data transmission failure (and UL scheduling failure). To ensure this is the case, [2] proposes the following options (with a preference for Option 2 considering the late phase of Rel-17 and less specification impact):

***Option 1:*** *Explicit SR configuration for TAR MAC CE :*

* TA report MAC CE is mapped to one SR configuration.
* If the SR configuration is absent, UE should not trigger SR and RACH to report TA MAC CE.
* SR configuration presence/absence can be used by NW to configure UE to trigger an SR, hence parameter *timingAdvanceSR* is not needed.

***Option 2:*** *Implicit SR configuration for TAR MAC CE:*

* Reuse the parameter *timingAdvanceSR* to control whether UE should trigger SR for TA MAC CE
* SR configuration for LCH can be reused for TA MAC CE (e.g. the SR configuration of the highest priority LCH is used to transmit the SR triggered by TA MAC CE to make sure NW can schedule the UE in time for TA reporting).

## Contention Resolution Timer and MSG3 retransmission

The following modifications to *ra-ContentionResolutionTimer* operation in NTN are suggested in the selected contributions. Companies are encouraged to refer to the referenced contribution for exemplary text proposals.

[5] proposes that CRT operation be based on configuration, which is beneficial from a power-saving perspective if blind retransmission is not used. The following UE behaviour is proposed:

If blind Msg3 retransmission is not configured, UE stops *ra-ContentionResolutionTimer* upon receiving PDCCH indicating Msg3 retransmission and then starts *ra-ContentionResolutionTimer* after the end of the Msg3 retransmission plus UE-gNB RTT.

* If blind Msg3 retransmission is configured, if *ra-ContentionResolutionTimer* expires after receiving PDCCH indicating Msg3 retransmission, the UE does not consider the Contention Resolution unsuccessful.
1. [6] proposes that instead of procedural text, there should instead be a NOTE that if *ra-ContentionResolutionTimer* expires during the UE-gNB RTT after Msg3 retransmission, the UE does not consider the Contention Resolution unsuccessful. This is because there is no extra benefit in making the solution over complex by introducing two configurable sub-solutions, and that according to previous agreement a solution not based on configuration should be captured as a NOTE in specs (which is not currently the case).
2. [7] notes that to support blind Msg3 retransmission, the *ra-ContentionResolutionTimer* should not be stopped upon receiving PDCCH indicating Msg3 retransmission since the UE is not able to monitor PDCCH for blind Msg3 retransmission. Instead, *ra-ContentionResolutionTimer* should run longer for the UE to monitor PDCCH. It is proposed that this be captured as follows:
* the *ra-ContentionResolutionTimer* is started or restarted after the end of the Msg3 retransmission plus UE-gNB RTT.
* When the *ra-ContentionResolutionTimer* expires, the UE does not consider the contention resolution not successful if the *ra-ContentionResolutionTimer* has been scheduled to be started/restarted after the *ra-ContentionResolutionTimer* expires.
1. [8] proposes two modifications to current text in 5.1.5 to enable blind MSG3 retransmissions:
* In the part on (re)starting CRT in NTN, the UE must start the CRT also for the first transmission of MSG3.
* In the part about CRT expiry, it states to not consider the Contention Resolution as unsuccessful if CRT expires before “the first symbol after the end of a Msg3 retransmission plus the UE-gNB RTT” because in that case, the CRT will be restarted later (it will be restarted “in the first symbol after the end of the Msg3 transmission plus the UE estimate of UE-gNB RTT”). However, it says after a MSG3 retransmission, and with the change above, CRT is started also for the first MSG3 transmission It is proposed this be changed to apply for all MSG3 transmissions.

## Validity timer

Topic 1: Additional behaviour upon validity timer expiry

*Triggering of RACH procedure* [10, 13]

Another contentious issue is whether UE triggers RACH upon validity timer expiry (which was ultimately not included in WA). Justification for triggering RACH is that it informs network that the UE has regained UL synchronization and allows refinement of the UE-estimated UE-gNB RTT (via RAR). However, [10] mentions that validity timer expiry should be rare in NR, and a complex solution avoided. Similarly, [13] mentions that unless there is uplink data arrival, it is not necessary for UE to trigger RA procedure.

*Do not specify anything* [11]

Alternatively, [11] notes that RAN2 has concluded UE will re-acquire the NTN assistance information before validity timer expiry, so there would be no case that the validity timer expires except if UE does not receive the SIB before expiry of the validity timer due to the bad radio conditions. Since this case may already be handled by the radio link failure procedure, [11] proposes RAN2 do not need to specify any UE behaviour regarding validity timer expiry.

Topic 2: Other issues regarding SIB19 acquisition [9, 12, 13]

*Search space configuration for SIB-19 acquisition* [9]

RAN2 has agreed that upon validity timer expiry UE shall re-acquire serving satellite ephemeris data and common TA parameters from SIB19. However, in NR a UE may not be configured with *searchSpaceSIB1* or *searchSpaceOtherSystemInformation* on the active BWP. In this case [9] proposes UE switch to *initialDownlinkBWP* to re-acquire SIB19 and then return to the previous active BWP.

[9] also mentions RAN2 should discuss the case when UE is not configured with *searchSpaceSIB1* or *searchSpaceOtherSystemInformation* on the active BWP and attempts SIB19 acquisition prior to validity timer expiry. If a BWP switch to re-acquire SIB19 is allowed the consequence would be the same as that when UE re-acquires SIB19 after validity timer expiry (i.e. in both cases, UE would be unreachable since the UE switches to *initialDownlinkBWP* until it returns back, which is unknown to network).

*Stop vs. Suspending validity timer if UE acquires SIB19 prior to timer expiry* [12]

As mentioned in [12], it is unclear whether UE stops or suspends UL validity timer if UE acquires the new SIB19 before timer expiry. [12] notes that based on RAN1 discussion, the epoch time can be indicated to a future time. In this case, if UE acquires the new SIB19 and does not restart the validity timer, it will expire before UE can apply the new SIB19. There will be a gap between the expiry of the timer and the epoch time in the new SIB19, which result in UL interruption during the gap.

If epoch time is implicitly indicated, epoch time will be started at the end of SI window, which means that there will be maximum *si-WindowLength* time gap between the reception of SIB19 and the start of epoch time. If validity timer is expired during *si-WindowLength*, there will be UL interruption. It is therefore proposed in [12] to stop the validity timer upon reception of SIB19.

*Application time of updated parameters* [12, 13]

[12] also notes it also unclear whether UE applies the parameter immediately or until epoch time. It is proposed that if epoch time indicates a past time, UE applies it immediately; if epoch time indicates a future time, since the gap between UE receiving SIB19 and the epoch time might be long, early application of parameters may result in inaccurate TA pre-compensation. It is noted however that this is common understanding, no spec change is needed. A similar issue is raised in [13], where it is proposed that whether the UE shall apply the content of newly acquired SIB19 or use the former (still valid) parameters is up to UE implementation.