**3GPP TSG-RAN WG2 Meeting #117e R2-2203160**

**Electronic, February, 2022**

**Agenda Item: 9.2.3.1**

**Source: OPPO**

**Title: Report of [AT117-e][011][IoT-NTN] User Plane (OPPO) – round 1**

**Document for: Discussion and Decision**

# Introduction

This document is to collect companies’ views for the following offline discussion.

* [AT117-e][011][IoT-NTN] User Plane (OPPO)

 Scope: Based on R2-2203160 and related on-line discussion + based on R2-2203721 issue on cfg of event triggered TA report and issue Whether SR is triggered if no available/sufficient UL-SCH resources for the triggered TA reporting.

 - For items that are dependent on NR NTN, kick off the relevant discussion points once NR NTN decision has been taken. For items with no dependency, discussion can be kicked off immediately, and result should be ready for first CB occasion.

 - Determine agreeable parts, Aim to agree less controversial points offline (with no CB). Identify CB points. Controversial points and/or very late points (with no time for offline decision) can CB on-line.

 Intended outcome: Report

 Deadline: In time for first on-line CB W2 Tuesday, later CB TBD.

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| Company | Delegate contact |
| COMPANY\_NAME | NAME (email@address.com) |
| MediaTek | Abhishek Roy (Abhishek.Roy@mediatek.com) |
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# Round-1 Discussion

For companies’ easy track, RAN2 agreements related to IoT NTN’s UP impact are copied below.

RAN2#115e:

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| * Start of ra-ResponseWindow is delayed by an offset. Postpone discussion on the offset value until further agreements regarding RACH are made in RAN1.
* If the start of the RA Response window is accurately compensated by UE-eNB RTT and no extension of repetition is required, there is no need to extend the ra-ResponseWindowSize for IoT NTN.
* Start of mac-ContentionResolutionTimer is delayed by an offset, (assumed equal to UE-eNB RTT). This can be revisited if RAN1 decides something that requires to change this.
* If the start of mac-ContentionResolutionTimer is accurately compensated by UE-eNB RTT and no extension of repetition is required, there is no need to extend the mac-ContentionResolutionTimer for IoT NTN.
* From RAN2 perspective, for UE with UE-specific pre-compensation as a baseline it is up to eNB implementation to ensure sufficient time on UE side for the Msg3 transmission for IoT NTN.
* RAN2 assumes that TA information (FFS what) reporting by the UE on network enabling will be needed in IoT NTN. Expect RAN1 need to progress on this, and can maybe reuse NR NTN progress. FFS in which message this is provided.
* UE-eNB RTT is taken into account when calculating the (UL) HARQ RTT timer.
* RAN2 assumes that sr-ProhibitTimer need to be extended. Postpone treatment of sr-ProhibitTimer values until the NR NTN details have been decided.
* From RAN2’s perspective, delayed start of pur-ResponseWindowTimer with UE-eNB RTT can be supported. This can be revised if RAN1 finds issues to support PUR that are not small.
* pur-ResponseWindowSize is not extended for IoT NTN.
* SPS is supported without modification for IoT NTN.
* RAN2 confirm the SI agreement that the value range of the RLC t-Reordering timer will be extended to support IoT NTN.
* Do not extend the PDCP discardTimer for NB-IoT over NTN.
* FFS whether to extend the PDCP discardTimer for eMTC over NTN.
* Do not extend PDCP t-Reordering for IoT NTN.
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RAN2#116e:

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| * The estimate of UE-eNB RTT is equal to the sum of UE’s TA and K\_mac, where the UE’s TA is given by $T\_{TA}=\left(N\_{TA}+N\_{TA,UE-specific}+N\_{TA,common}+N\_{TA,offset}\right)×T\_{s}$, and K\_mac value is broadcasted by network.
* RAN2 confirm that the start of mac-ContentionResolutionTimer is delayed by UE-eNB RTT in IoT NTN.
* Any enhancements on (N)PRACH resource selection in IoT NTN will not be pursued in Rel-17.
* An offset equal to UE-eNB RTT is added to the formula used for calculating the (UL) HARQ RTT timer in IoT NTN.
* Support UE-specific TA reporting using MAC CE in Msg3/Msg5 for IoT NTN.
* For IoT NTN, UE specific TA reporting during RACH procedure (MSG3/MSG5) in RRC IDLE is enabled/disabled by SI, similar with NR NTN.
* Support TA reporting in RRC connected mode in IoT NTN.
* UE-specific TA report uses MAC CE.
* Support event-triggered for TA reporting in connected mode. Wait for NR NTN agreements for other triggers.
* On how to extend RLC t-Reordering in IoT NTN, wait for NR NTN agreements and see if they can be reused.
* Don’t change the L2 buffer requirement for IoT NTN (assume the network may need to limit the bit rate in order to not exceed L2 buffer).
* The PDCP discardTimer should be extended to support eMTC over NTN.
* If PDCP discardTimer is agreed to be extended to support eMTC over NTN, how to extend the timer value can wait for the conclusion for RLC t-reordering timer.
* The ra window start offset is defined as sum (current offset, UE-eNB RTT) and current offset is defined in TS36.321 (FFS if applicable to NB-IoT 41ms offset)
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RAN2#116bis-e:

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| * Do not mandate Msg3 or Msg5 to include TA report MAC CE, and whether it can be included depends on the TB size of Msg3 or Msg5.
* Reuse NR NTN’s TA reporting trigger event in IoT NTN, i.e., a TA offset threshold between current TA and the last successfully reported TA is used for event-triggered TA reporting. FFS for location used for TA reporting purpose.
* Introduce a new MAC CE for provision of UE specific K\_offset and the size is fixed to 1 byte. FFS on the MAC CE’s name.
* (Following NR NTN) Neither of the following options are supported “TA information requested by network”, “Periodical reporting of TA information”
* (Following NR NTN) Upon reception of configuration or reconfiguration of TA reporting trigger event, if UE has not reported TA before, the UE triggers a TA reporting. FFS whether we need different behaviour for different re-configurations e.g. Handover.
* On the RAR window’s start offset for the case of NB-IoT 41ms offset: The RA window start offset defined as sum (current offset, UE-eNB RTT) is applied to the case of NB-IoT 41ms offset.
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These are the recommended proposals based on pre-discussions.

*Proposal for agreements:*

Proposal 1: (16/17) Align with NR NTN and use the name of “Differential UE-Specific K\_Offset MAC CE”. (IoT NTN/NR NTN common)

Proposal 2: (15/16) Align with NR NTN and capture the contents of Differential UE-Specific K\_Offset MAC CE as “Differential UE-Specific K\_Offset: This field contains the differential UE-specific K\_Offset. The length of the field is 8 bits”. FFS on whether to change “8 bits” to “6 bits” for both 36.321 and 38.321. (IoT NTN/NR NTN common)

Proposal 3: (15/17) A reserved LCID is used for the Differential UE-Specific K\_Offset MAC CE.

Proposal 4: (14/16) Align with NR NTN and use the name of “UE-specific TA MAC CE”. (IoT NTN/NR NTN common)

Proposal 5: (15/16) Align with NR NTN and capture the contents of UE-specific TA MAC CE as “UE-specific TA: This field contains the UE estimate of the full UE-specific TA (i.e., T\_TA as defined in the UE’s TA formula). The length of the field is 16 bits”. (IoT NTN/NR NTN common)

Proposal 6: (15/17) A reserved LCID is used for the UE-specific TA MAC CE.

Proposal 7: (17/17) On logical channel priority, put the UE-specific TA report MAC CE between “MAC control element for AUL confirmation” and “MAC control element for BSR, with exception of BSR included for padding”.

Proposal 8: (17/17) During RA procedure for RRC re-establishment procedure, the UE should trigger TA report if an indication is broadcasted by the target cell’s SI. (IoT NTN/NR NTN common)

Proposal 9: (17/17) During RA procedure for handover, the UE should trigger TA report if the target cell indicates this in the handover command. (IoT NTN/NR NTN common)

Proposal 10: (16/17) Other than re-establishment and handover procedure, TA reporting in connected mode is not controlled by enabling/disabling indication in SI. (IoT NTN/NR NTN common)

Proposal 11a: RAN2 to clarify the previous agreement as: Upon reception of configuration or reconfiguration of TA reporting trigger event, if UE has not reported TA to current serving cell before, the UE triggers a TA reporting. (IoT NTN/NR NTN common)

Proposal 12: (17/17) Threshold-based TA-Trigger will align with NR-NTN.

*Proposal for discussion:*

Proposal 11b: RAN2 to further discuss below open issues. (IoT NTN/NR NTN common)

1. Whether the TA reporting event configuration in reconfiguration message uses NEED OR or NEED ON?
2. Whether target cell can use delta configuration for the TA reporting event configuration in handover command?
3. If TA reporting event configuration is absent in handover command which supports delta configuration and if target cell’s SI disables TA reporting during RACH, how should the UE trigger TA reporting after handover?

Proposal 13: (13/17) Regarding how to extend sr-ProhibitTimer in IoT NTN, follow NR NTN and add more extended values (in number of SR periods).

Proposal 14: RAN2 to further discuss whether the offset is fixed or configured by the network, if RAN2 agrees to add an offset to the legacy value of sr-ProhibitTimer.

Proposal 15: (9/17) On extending RLC t-Reordering timer for IoT NTN, RAN2 to add values ms2200 and ms3200. RAN2 can further discuss if to add any other values between ms200 and ms1600.

Proposal 16: (13/17) RAN2 to introduce a new discardTimer value ms2000 for eMTC over NTN.

For proposal 1/2/4/5, it was agreed in Monday’s session to align naming and field description with NR NTN. Discussion points will be kicked off once NR NTN decision has been taken.

## 2.1 MAC

### 2.1.1 K\_Offset MAC CE

*MAC CE’s LCID:*

Regarding the LCID for the MAC CE corresponding K\_Offset, 15 out of 17 companies supported using a reserved LCID during pre-discussion. Ericsson commented that eLCID can be used.

For company’s easy check, below is the copy of TS 36.321 on LCIDs for DL-SCH.

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| Table 6.2.1-1 Values of LCID for DL-SCH

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| Codepoint/Index | LCID values |
| 00000 | CCCH |
| 00001-01010 | Identity of the logical channel |
| 01011-01111 | Reserved |
| 10000 | Extended logical channel ID field |
| 10001 | DCQR Command |
| 10010 | Activation/Deactivation of PDCP Duplication |
| 10011 | Hibernation (1 octet) |
| 10100 | Hibernation (4 octets) |
| 10101 | Activation/Deactivation of CSI-RS |
| 10110 | Recommended bit rate |
| 10111 | SC-PTM Stop Indication |
| 11000 | Activation/Deactivation (4 octets) |
| 11001 | SC-MCCH, SC-MTCH (see note) |
| 11010 | Long DRX Command |
| 11011 | Activation/Deactivation (1 octet) |
| 11100 | UE Contention Resolution Identity |
| 11101 | Timing Advance Command |
| 11110 | DRX Command |
| 11111 | Padding |
| NOTE: Both SC-MCCH and SC-MTCH cannot be multiplexed with other logical channels in the same MAC PDU except for Padding and SC-PTM Stop Indication |

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

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| Codepoint | Index | LCID values |
| 000000-000110 | 32-38 | Identity of the logical channel |
| 000111-111111 | 39-95 | Reserved |

For NB-IoT only the following LCID values for DL-SCH are applicable: CCCH, Identity of the logical channel, DCQR Command, SC-PTM Stop Indication, SC-MCCH/SC-MTCH, UE Contention Resolution Identity, Timing Advance Command, DRX Command and Padding. |

**Question 1: Which option do companies prefer for the LCID used for the MAC CE corresponding K\_Offset?**

* **Option 1: use a reserved LCID**
* **Option 2: repurpose an existing LCID (and which one?)**
* **Option 3: eLCID??**

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| **Company** | **Option for eMTC,****Option for NB-IoT** | **Additional comments****(suggest an existing LCID if you prefer option 2)** |
| MediaTek | Option 1 | Option 1 is simple. |
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### 2.1.2 TA reporting MAC CE

*MAC CE’s LCID:*

Regarding the LCID for the TA reporting MAC CE, 15 out of 17 companies supported using a reserved LCID during pre-discussion.

For company’s easy check, below is the copy of TS 36.321 on LCIDs for UL-SCH.

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| Table 6.2.1-2 Values of LCID for UL-SCH

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| Codepoint/Index | LCID values |
| 00000 | CCCH |
| 00001-01010 | Identity of the logical channel |
| 01011 | CCCH |
| 01100 | CCCH |
| 01101 | CCCH and Extended Power Headroom Report |
| 01110-01111 | Reserved |
| 10000 | Extended logical channel ID field |
| 10001 | DCQR and AS RAI |
| 10010 | AUL confirmation (4 octets) |
| 10011 | AUL confirmation (1 octet) |
| 10100 | Recommended bit rate query |
| 10101 | SPS confirmation |
| 10110 | Truncated Sidelink BSR |
| 10111 | Sidelink BSR |
| 11000 | Dual Connectivity Power Headroom Report |
| 11001 | Extended Power Headroom Report |
| 11010 | Power Headroom Report |
| 11011 | C-RNTI |
| 11100 | Truncated BSR |
| 11101 | Short BSR |
| 11110 | Long BSR |
| 11111 | Padding |

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

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| Codepoint | Index | LCID values |
| 000000-000110 | 32-38 | Identity of the logical channel |
| 000111-111111 | 39-95 | Reserved |

For NB-IoT only the following LCID values for UL-SCH are applicable: CCCH (LCID "00000"), Identity of the logical channel, CCCH and Extended Power Headroom Report, DCQR and AS RAI, SPS confirmation, C-RNTI, Short BSR and Padding. |

**Question 2: Which option do companies prefer for the LCID used for the TA reporting MAC CE?**

* **Option 1: use a reserved LCID**
* **Option 2: repurpose an existing LCID (and which one?)**
* **Option 3: eLCID??**

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| **Company** | **Option for eMTC,****Option for NB-IoT** | **Additional comments****(suggest an existing LCID if you prefer option 2)** |
| MediaTek | Option 1 for NB-IoTOption 3: eMTC |  |
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*MAC CE’s logical channel priority:*

For the logical channel priority of the UE-Specific TA Report MAC CE, all companies during pre-discussion agreed to the below order.

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| **Proposal 7: (17/17) On logical channel priority, put the UE-specific TA report MAC CE between “MAC control element for AUL confirmation” and “MAC control element for BSR, with exception of BSR included for padding”.** |

Example for MAC spec is shown here.

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| - MAC control element for C-RNTI or data from UL-CCCH;- MAC control element for DPR;- MAC control element for SPS confirmation;- MAC control element for AUL confirmation;- MAC CE for UE-Specific TA Report;- MAC control element for BSR, with exception of BSR included for padding;- MAC control element for PHR, Extended PHR, or Dual Connectivity PHR;- MAC control element for Sidelink BSR, with exception of Sidelink BSR included for padding;- MAC control element for DCQR and AS RAI, with exception of when DCQR is to be included in Msg3;- data from any Logical Channel, except data from UL-CCCH;- MAC control element for DCQR and AS RAI, when DCQR is to be included in Msg3;- MAC control element for Recommended bit rate query;- MAC control element for BSR included for padding;- MAC control element for Sidelink BSR included for padding. |

**Question 3: Do companies agree to P7 above?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| MediaTek | Agree |  |
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### 2.1.3 Enable/disable indication applied for TA reporting in connected mode?

Regarding TA reporting during RACH for RRC re-establishment or handover, all companies during pre-discussions agreed to the below proposals.

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| **Proposal 8: (17/17) During RA procedure for RRC re-establishment procedure, the UE should trigger TA report if an indication is broadcasted by the target cell’s SI. (IoT NTN/NR NTN common)****Proposal 9: (17/17) During RA procedure for handover, the UE should trigger TA report if the target cell indicates this in the handover command. (IoT NTN/NR NTN common)** |

This is to check whether companies have changed their mind.

**Question 4: Do companies agree to p8 and p9 above?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| MediaTek | Agree |  |
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Other than re-establishment and handover procedure, there seems no value to have extra control of TA reporting by checking enable/disable indication since network can have UE-specific TA reporting event configuration to control TA reporting in connected mode. 16 out of 17 companies supported this views during pre-discussions.

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| **Proposal 10: (16/17) Other than re-establishment and handover procedure, TA reporting in connected mode is not controlled by enabling/disabling indication in SI. (IoT NTN/NR NTN common)** |

**Question 5: Do companies agree to P10 above?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| MediaTek | Agree |  |
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### 2.1.4 TA reporting upon configuration/reconfiguration

RAN2#116bis-e made the following agreement.

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| * (Following NR NTN) Upon reception of configuration or reconfiguration of TA reporting trigger event, if UE has not reported TA before, the UE triggers a TA reporting. FFS whether we need different behaviour for different re-configurations e.g. Handover.
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The issue is that UE may change cell during handover. Even if UE has reported TA to the source cell, the source cell TA may not be suitable to be compared to when evaluating the triggering condition in the target cell as it may lead to too late TA reporting. Before that late reporting, the target cell cannot know UE’s TA and thus cannot configure UE-specific K\_Offset properly.

The above issue also applies to re-establishment as for cell change case, the source cell TA is not suitable to be used as reference value for later comparison. It is worth clarifying the previous agreement means that if UE has not reported TA to the current serving cell, upon configuration/reconfiguration of TA reporting trigger event, UE triggers a TA reporting.

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| **Proposal 11a: RAN2 to clarify the previous agreement as: Upon reception of configuration or reconfiguration of TA reporting trigger event, if UE has not reported TA to current serving cell before, the UE triggers a TA reporting.** |

**Question 6: Do companies agree to P11a above?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| MediaTek | Agree |  |
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The next question is: how should the UE trigger TA during handover, when handover command uses delta configuration. Some open issues are like:

1. Whether the event configuration in reconfiguration message uses NEED OR or NEED ON?
2. Whether target cell can use delta configuration for the event configuration in handover command?
3. If event configuration is absent in handover command which supports delta configuration and if target cell’s SI disables TA reporting during RACH, how should the UE trigger TA reporting after handover? Should it directly triggered TA reporting?

**Question 7: companies can provide input for the following open issues.**

1. **Whether the event configuration in reconfiguration message uses NEED OR or NEED ON?**
2. **Whether target cell can use delta configuration for the event configuration in handover command?**
3. **If event configuration is absent in handover command which supports delta configuration and if target cell’s SI disables TA reporting during RACH, should the UE trigger TA reporting after handover?**

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| **Company** | 1. **NEED OR or NEED ON?**
2. **Yes or No?**
3. **Yes or No? if no, how should UE trigger TA reporting?**
 | **Additional comments** |
| MediaTek | 1. OR
2. No
3. Yes
 | We think Question (3) should be the baseline.  |
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### 2.1.5 TA reporting aligned with NR NTN?

In pre-discussions, all companies agree that threshold-based TA-Trigger will align with NR-NTN. In Monday’s session, some company wanted to clarify this only applies to TA value reporting.

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| **Proposal 12: (17/17) Threshold-based TA-Trigger for TA value reporting will align with NR-NTN.** |

**Question 8: Do companies agree to P12 above?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| MediaTek | Agree |  |
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*Configuration of TA report triggering event*

It is summarized in R2-2203721 that all the 4 contributions (R2-2203002, R2-2203052, R2-2203080 and R2-2203483) on configuration of event triggered TA report have suggested using of an offset threshold for event triggered TA report configuration.

This is also discussed in NR-NTN offline: “**[****Pre117-e][NTN][101] RRC open issues**”, with report available in R2-2203154.Based on all the Tdoc contributions and progress in NR-NTN, following proposal is suggested by the AI summary’s rapporteur.

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| **Proposal 4a: Configuration of event triggered TA report will include TA offset threshold between current TA and the last successfully reported TA (similar to NR-NTN). FFS: The value of the TA offset threshold (consider possible to align with NR-NTN values).** |

**Question 9: Do companies agree to P4a above?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| MediaTek | Agree |  |
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*Triggering SR?*

There is a left open issue in User Plane on “***whether SR can be triggered if there is no available or sufficient UL-SCH resources for the triggered TA reporting***”. It is common with NR NTN and also under discussion in “[Pre117-e][NTN][103] MAC open issues (InterDigital). Discussion points will be kicked off once NR NTN decision has been taken.

### 2.1.6 Extension of *sr-ProhibitTimer*

How to extend *sr-ProhibitTimer* was discussed in [6]. It states that in NR, sr-ProhibitTimer is signalled as a value in the unit of ms so it is straightforward to extend the value range to take into account the RTT in NTN. In NB-IoT and eMTC, sr-ProhibitTimer is signalled as a value in number of SR period(s). The length of a SR period can take very different values depending on the configuration, i.e. 1ms, 2ms, 5ms, 10ms, 20ms, 40ms and 80ms for eMTC and 40ms, 80ms, 160ms, 240ms, 320ms, 640ms, 1280ms, 2560 ms, 5120 ms for NB-IoT. Thus it seems better to add an offset to the signalled value of the timer length.

During pre-discussions, 13 out of 17 companies preferred to follow NR NTN and add more extended values (in number of SR periods).

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| **Proposal 13: (13/17)** **Regarding how to extend sr-ProhibitTimer in IoT NTN, follow NR NTN and add more extended values (in number of SR periods).** |

**Question 10: Do companies agree to P13 above? If you agree, please suggest the added values.**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| MediaTek | Agree |  |
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## RLC t-Reordering timer extension

NR NTN has agreed to extend t-Reassembly timer: {ms210, ms220, ms340, ms350, ms550, ms1100, ms1650, ms2200}. During pre-dicussions, slight majority companies preferred to add ms2200 and ms3200, and there is clear majority view on whether to add any other values between 200 ms and 1600 ms.

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| **Proposal 15: (9/17) On extending RLC t-Reordering timer for IoT NTN, RAN2 to add values ms2200 and ms3200. RAN2 can further discuss if to add any other values between ms200 and ms1600.** |

**Question 11: Do companies agree to extend RLC t-Reordering timer by adding values {ms2200, ms3200}?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| MediaTek | Agree |  |
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**Question 12: Any other values between ms200 and ms1600 are needed for extending RLC t-Reordering timer?**

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| **Company** | **Yes or No** | **Additional comments (any suggested values if Yes?)** |
| MediaTek | No |  |
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## 2.3 PDCP discardTimer extension

NR NTN has agreed to introduce a new discardTimerExt-r17 IE with a new value ms2000. During pre-discussion, 13 out of 17 companies prefer to introduce a new discardTimer value ms2000 for eMTC over NTN. Regarding the concerns on larger value than t-Reordering timer (if ms2200 or ms3200 is configured for t-Reordering timer), rapporteur assumes that network can configure discardTimer as “infinite” in such case.

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| **Proposal 16: (13/17) RAN2 to introduce a new discardTimer value ms2000 for eMTC over NTN.** |

**Question 13: Do companies agree to P16 above?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
| MediaTek | Agree |  |
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# 3. Round-1 summary

*To be updated…*

# 4. References

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2. R2-2200692, Discussion on TA information reporting for IoT NTN, CATT
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