3GPP RAN WG2 Meeting #116bis-e R2-2201900

eMeeting January 17th – 25th, 2022

Agenda Item: 8.10.1

Source: InterDigital

Title: MAC open issues in NTN

Document for: Discussion, Decision

# Introduction

This document is intended to gather a list of open issues as per the following email discussion:

**[Post116bis-e][109][NTN] MAC running CR and list of open issues (InterDigital)**

* Scope: Update the MAC running CR and define the list of MAC open issues
* Intended outcome: Endorsed MAC running CR and list of open issue

Please note the following deadlines:

* Deadline (for companies' feedback): **Friday 2022-01-28 0800 UTC**
* Deadline (for updated running CR in R2-2201899 and list of open issues in R2-2201900): Friday 2022-01-28 1600 UTC

As per chairman guidelines, this discussion shall propose the pre-discussions for next meeting.

* **Each open issue** should be associated with **suggested treatment/handling**.
  1. **Company input into Pre117-e-offline (i.e. no company tdocs)**
  2. Company tdocs invited.
  3. CR rapporteur handled issue (CR rapporteur will propose resolution as input to next meeting).
  4. Other, e.g. immature area, reference to dependency, unclear status etc.

# Open Issues

## TA reporting and RACH aspects

**Open Issue 1:** Enable/disable TA reporting during RACH in connected mode:

RAN2 to confirm whether enable/disable indication in SI also applies for RACH in connected mode.

**Open Issue 2:** TA reporting triggered and no UL-SCH resources:

RAN2 to confirm whether an SR can be triggered if there is a TA report triggered and no UL-SCH resources for TA reporting.

**Open Issue 3:** UE location information vs. UE-specific TA information for TA reporting purposes:

RAN2 to confirm support of UE location information for purposes of TA reporting, including the following aspects:

* Whether both UE location and/or UE specific TA information are needed in parallel for the purposes of TA reporting;
* Definition of event trigger for location reporting (e.g. if it re-uses the same event trigger or different trigger)
* connected mode UE failing to acquire an accurate UE location to be used in the calculation of the full TA.

**Open Issue 4:** Event triggering for UE-specific TA reporting

RAN2 to finalize details regarding event-triggered TA reporting for UE in RRC Connected in RRC specification, with update to MAC as needed (e.g. parameter name of offset threshold). NOTE: This is not to define new behaviour, but to update MAC specification based on RRC.

**Open Issue 5:** Details of UE-specific K\_Offset and TA reporting MAC CEs

RAN2 to confirm the structure of both MAC CEs and additional details of K\_Offset MAC CE, as needed.

**Open Issue 6:** Extension of *ra-ReponseWindow* and *msgB-ResponseWindow*

RAN2 to confirm that *ra-ResponseWindow* and *msgB-ReponseWindow* extension is not necessary.

**Open Issue 7:** Remaining details of ra-ContentionResolutionTimer

RAN2 to confirm if 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.

## DRX/LCP/Timers

**Open Issue 8:** Parameter names for DRX and LCP

RAN2 to revise naming/descriptions of *allowedHARQ-DRX-LCP,* *uplinkHARQ-DRX-LCP-Mode* and HARQ DRX-LCP modes for further clarity in the specification.

**Open Issue 9:** Configured HARQ mode for the case of a PUSCH transmission scheduled by RAR.

RAN2 to confirm applicability/needed specification impact of HARQ mode/new LCP restriction for PUSCH transmission scheduled by RAR.

**Open Issue 10:** Extension of the *configuredGrantTimer*.

RAN2 to confirm details of how to extend the configuredGrantTimer (i.e. IE value range extension or extension of timer by UE-gNB RTT).

**Open Issue 11:** Details of SR-Prohibit Timer extension.

RAN2 to confirm values included in new *sr-ProhibitTimerExt-r17* IE, and any possible spec impact to MAC.

## Other Issues

**Open Issue 12:** Identification of non-terrestrial network cells

RAN2 to confirm how UE detects cell originates from a non-terrestrial network, and whether there is specification impact.

**Open Issue 13:** drx-HARQ-RTT-TimerDL/UL behaviour for HARQ feedback enabled and UL HARQ state A

RAN2 to discuss UE DRX behaviour when PDCCH indicates a UL/DL transmission doesn’t consider the case where drx-HARQ-RTT-TimerUL/DL for the corresponding HARQ process has already been running. (Companies are referred to [R2-2201739](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Inbox/R2-2201739.zip), Section 5.2 for additional details).

**Open Issue 14:** Repetition transmission based HARQ retransmission

RAN2 to discuss whether repetition transmission based HARQ retransmission is always allowed and is explicitly indicated via DCI or semi-statically with RRC signalling (as in legacy). (Companies are referred to [R2-2201739](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Inbox/R2-2201739.zip), Section 5.2 for additional details).

**Open Issue 15:** details of DRX behaviour after sending SR and msg3 for CFRA

RAN2 to discuss whether:

* for DRX in NTN, in the case that a UE sends an SR, the UE enters Active time to monitor for a response after an offset time has elapsed.
* In the case that a UE sends msg3 as response to a RAR message during CFRA, the UE enters Active time when an offset time has elapsed.

(Companies are referred to [R2-2201739](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Inbox/R2-2201739.zip), Section 5.2 for additional details).

# Company Input

## Current list of open issues

Companies are invited to comment on the captured list of open issues.

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| **Company** | **Issue** | **Comments** |
| Xiaomi | **Open Issue 3:** | Whether location based TA report details(signalling design and trigger condition design, e.g. event/periodical/network request) are discussed in control plane session, i.e. in 8.10.3.1 together with LCS? From our understanding, location report for TA and LCS purpose should share the same signalling structure and trigger event design. No need to differentiate purpose when gNB configures to include location information. |
| Nokia |  | For Option issue 3, we don’t think the trigger event for location reporting is same in Control plane (e.g. for cell id mapping) and in User plane (e.g. for TA reporting purpose). For example, in user plane, we need to define a TA change offset as the threshold no matter CP trigger UE location update or not.  We think below issue should be discussed further:  Open Issue xx: how to handle UL synchronization failure due to the validity timer expiry (discussed in R2-2201755 but no conclusion) |
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## Additional Open Issues

Companies are invited to describe any additional issues they feel are critical to completion of the MAC specification and/or NTN work item.

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| **Company** | **Additional Issues identified** |
| Qualcomm | We think we should discuss if we need to capture the DL MAC CE execution delay by K\_MAC agreed by RAN1. There are some DL MAC CEs that cannot be actiavted immediately as per RAN1 agreement. For example, the UE should not be applying long/short DRX cycle immediately (like this) upon reception of the DRX command MAC CE (this is not processing delay only, it is K\_MAC delay).  1> if a DRX Command MAC CE is received:  2> if the Short DRX cycle is configured:  3> start or restart *drx-ShortCycleTimer* for each DRX group in the first symbol after the end of DRX Command MAC CE reception;  3> use the Short DRX cycle for each DRX group.  2> else:  3> use the Long DRX cycle for each DRX group. |
| Samsung | UE behaviour when UL synchronization is lost due to validity timer expiry |
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# Conclusions

<To be generated pending company input>

# Annex: MAC Agreements

The following RAN2 user plane agreements have been capture in NTN so far [1] [2] [5] [8] [14] [15] [18]:

## RAN2#116bis-e Agreements

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| Do not support allocating dedicated RA preamble for the RACH procedure triggered by TA reporting.  UE does not start or restart the timeAlignmentTimer after the UE reports its TA.  NTN specific parameters, e.g. ephemeris, K\_mac, common TA, cell-specific Koffset, network enable/disable TA report, etc., are provided in the new NTN-specific SIB.  The MAC CE for differential UE-specific K\_offset has a fixed size of a single octet.  Use an eLCID for the MAC CE for differential UE-specific K\_offset  priority of the TA report MAC CE is lower than LBT failure MAC CE and higher than MAC CE for SL-BSR prioritized.  UE triggers a TA reporting upon reception of configuration or reconfiguration of TA reporting trigger event if the UE has not reported TA before.  Other than event-triggered TA reporting, no more triggers are introduced for TA reporting in connected mode.  For the TA report triggering event which uses the offset threshold between current information about UE specific TA and the last successfully reported information about UE specific TA, no hysteresis or time to trigger is needed.  UE reports Full TA (i.e., T\_TA as defined in the UE’s TA formula). The size of the TA report MAC CE is fixed to two octets.  If SA3 will confirm that NTN-specific user consent will the available in Rel-17, the network could at least ask the UE to report its UE location for any reason at any time. FFS if we define an event-triggered reporting of UE location for TA reporting purposes.  uplinkHARQ-DRX-Mode-r17 controls the DRX behaviour of HARQ processes in the same way for configured grants as for dynamic grants.  It is up to network implementation to ensure proper configuration of HARQ feedback (i.e. enabled or disabled) for HARQ processes used by an SPS configuration (no Stage 3 specification impact). FFS if a note in Stage 2 is needed  It is up to network implementation to ensure proper configuration of HARQ mode for HARQ processes used by a CG configuration (no Stage 3 specification impact). FFS if a note in Stage 2 is needed  For HARQ process(es) configured with HARQ Mode B, blind retransmission relies on UE being in DRX Active Time via other means (i.e. drx-RetransmissionTimerUL is not started).  For HARQ process(es) configured with disabled HARQ feedback, blind retransmission relies on UE being in DRX Active Time via other means (i.e. drx-RetransmissionTimerDL is not started).  RAN2 understanding:  RAN2 understanding is that: in general, all HARQ processes used by an SPS configuration are configured with the same HARQ feedback enabled/disabled state. No specification impact.  RAN2 understanding is that: in general, all HARQ processes used by a CG configuration are configured with the same HARQ state (e.g. A or B). No specification impact  AllowedHARQ-DRX-LCP also applies to CG  Working Assumption: It is up to NW implementation to properly configure allowedHARQ-DRX-LCP or allowedCG-List for a LCH (e.g. to avoid conflicting configuration) (Comeback if we find a problem in the implementation in the spec) |

## RAN2#116e Agreements

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| Enhancements for RA type selection in NTN will not be pursued in Rel-17. FFS for BSR  Do not mandate Msg3/MsgA or Msg5 to include TA report MAC CE, and whether it can be included depends on the TB size of Msg3/MsgA or Msg5. No spec change is needed for this  Reserved LCID is used for the TA report MAC CE.  Postpone the discussion on the size of the TA report MAC CE until RAN2 concludes on the content of TA report.  RAN2 do not pursue any enhancements to allow inclusion of TA information without extending Msg3 size.  Logical channel priority of the TA report MAC CE should be lower than that of “C-RNTI MAC CE or data from UL-CCCH” and higher than that of “data from any Logical Channel, except data from UL-CCCH”.  Do not introduce additional enhancement on BSR over 2-step RACH in Rel-17.  RAN2 further discuss the exact priority of the TA report MAC CE between “C-RNTI MAC CE or data from UL-CCCH” and “MAC CE for BSR, with exception of BSR included for padding  If the reported content of information about UE specific TA is TA pre-compensation value in connected mode, MAC CE is used to report  In case UE location information can be reported to network, dedicated signaling is used to configure UE to report the UE location and/or the UE specific TA information for the purpose of TA reporting in connected mode. FFS if both mechanisms are needed in parallel  The extended values for sr-ProhibitTimer in NTN can include values less than UE-gNB RTT (as in legacy). FFS on the actual values and how this is extended  RRC parameter “allowedHARQ-DRX-LCP” is included in LogicalChannelConfig (FFS on the actual name of the parameter)  configuredGrantTimer can be extended in NTN. FFS details of when extension is applicable and method of extention.  The ConfiguredGrantConfiguration shall allow for up to 32 in nrofHARQ-Processes, and up to 31 in harq-ProcID-Offset and harq-ProcID-Offset2.  The SPS-Config shall allow up to 32 for nrofHARQ-Processes, and up to 31 in harq-ProcID-Offset.  HARQ feedback shall always be sent for SPS deactivation (i.e. regardless of HARQ feedback enabled/disabled).  For HARQ process(es) not configured with DL HARQ feedback enabled/disabled, drx-HARQ-RTT-TimerDL behaves as per legacy.  Introduce a new sr-ProhibitTimerExt-r17 IE. Values FFS  If uplinkHARQ-DRX-LCP-Mode-r17 is configured, a HARQ process may be mapped to either ‘HARQ mode A’ or ‘HARQ mode B’.  uplinkHARQ-DRX-Mode shall be included in PUSCH-ServingCellConfig.  For at least dynamic grants, if uplinkHARQ-DRX-LCP-Mode-r17 is configured, the following LCH to HARQ process mapping rules are supported:  1) LCH is mapped only to a HARQ process configured with HARQ mode A;  2) LCH is mapped only to a HARQ process configured with HARQ mode B;  3) If an LCH is not configured with a mapping rule, it may be mapped to any HARQ process (HARQ mode A or B).  downlinkHARQ-FeedbackDisabled shall be included in PDSCH-ServingCellConfig. |

## RAN2#115e Agreements

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| UE specific TA reporting during RACH procedure is enabled/disabled by SI (FFS for RACH in connected mode)  In the MAC specification section 5.1.5, delay the start of ra-ContentionResolutionTimer by the UE-gNB RTT (i.e. sum of UE's TA and K\_mac)  The content of UE specific TA pre-compensation reported in RA procedure using MAC CE is UE specific TA (this can be revisited after receiving RAN1 response).  Reporting on the information about UE specific TA in connected mode is supported, FFS via RRC signalling or MAC CE  Event-triggers for reporting on the information about UE specific TA in connected mode is supported. FFS on the details. Confirmation by RAN1 is also needed  If configured, the UE shall report information of the UE specific TA pre-compensation to the target cell during the random access. FFS if a new indication in RRC reconfiguration with sync is needed or not (besides the SIB indication carried in HO command on whether TA report is enabled/disabled in the target cell).  Information about UE specific TA pre-compensation is not reported in RA procedures triggered due to “Request for Other SI”  The event-triggers for reporting information about UE specific TA are based on TA values (confirmation from RAN1 is needed)  A TA offset threshold can be used for event-triggered reporting, at least the offset threshold can be between current information about UE specific TA and the last successfully reported information about UE specific TA  The event-triggers for reporting information about UE specific TA based on time threshold is not supported in NTN.  No new indication in RRC reconfiguration with sync is needed to configure the UE to report information about UE specific TA in handover procedure (besides the SIB indication carried in HO command on whether TA report is enabled/disabled in the target cell).  Under the work assumption "the UE location information cannot be reported in connected mode", the content of UE specific TA reported in connected mode is UE specific TA pre-compensation(for the details of the TA value, confirmation from RAN1 is needed).  If the reported content of information about UE specific TA is UE location information in connected mode, RRC signalling is used to report.  Under the work assumption "the UE location information can be reported in connected mode", for TA reporting purposes in connected mode, the network can configure the UE to send either the UE specific TA pre-compensation (for the details of the TA value, confirmation from RAN1 is needed) or the UE location information  Working Assumption: If the reported content of information about UE specific TA is TA pre-compensation value in connected mode, MAC CE is used to report  Confirm the RAN2 working assumption that offset to drx-HARQ-RTT-TimerUL length is equal to UE-gNB RTT (i.e. sum on UE's TA and K\_mac).  Confirm the RAN2 working assumption that for HARQ processes with DL HARQ feedback enabled, the drx-HARQ-RTT-TimerDL length is increased by an offset equal to UE-gNB RTT (i.e. sum on UE's TA and K\_mac).  No new LCP restrictions are introduced for exisiting UL MAC CEs (if new MAC CEs will be introduced we can revisit this)  For dynamic grants, each LCH can optionally be semi statically configured (by RRC) to be mapped to one or more HARQ processes (FFS if it's possible to map to more than one HARQ process/ process type. FFS on mapping method). If there is no RRC configuration for this, this mapping has no effect (legacy behaviour applies).  For at least dynamic grants, the network may optionally configure an UL HARQ retransmission state per HARQ process. Two UL HARQ retransmission states are defined in NTN: HARQ state A and HARQ state B (FFS whether "HARQ state A" and "HARQ state B" should be renamed)  HARQ state A/B are defined as follows:   * HARQ state A: length of drx-HARQ-RTT-TimerUL is extended by UE-gNB RTT (i.e. UE PDCCH monitoring is optimized to support UL retransmission grant based on UL decoding result). * HARQ state B: drx-HARQ-RTT-TimerUL is not started.   Configuration of UL HARQ retransmission state is semi-static, signalled via RRC, and the decision and criteria to configure UL HARQ retransmission state is under network control.  For dynamic grants, each LCH can be optionally mapped to an UL HARQ retransmission state via semi-static RRC configuration. If there is no configuration, the mapping has no effect (legacy behaviour applies).  If HARQ process has not been configured with an UL HARQ retransmission state, new LCH mapping rule has no effect (i.e. UE applies legacy behaviour).  The following behaviours are supported for drx-HARQ-RTT-TimerUL in NTN per HARQ process: 1) Timer length is extended by offset; 2) Timer disabled (i.e. not started)  UE determines drx-HARQ-RTT-TimerUL behaviour per HARQ process based on configured UL HARQ retransmission state.  For HARQ process(es) not configured with an UL HARQ retransmission state, drx-HARQ-RTT-TimerUL and drx-RetransmissionTimerUL behave as per legacy.  An UL HARQ retransmission state is configured per HARQ process to support new LCH mapping restriction and proper configuration of drx-HARQ-RTT-TimerUL behaviour.  The network may consider delay and reliability characteristics of ongoing services when choosing to configure an UL HARQ retransmission state.  Alternative naming for HARQ state A/B can be further considered during stage 3, however UE behaviour in each state should be defined in specification.  RAN2 understanding is that UE behaviour in HARQ state A (i.e. extending the drx-HARQ-RTT-TimerUL by UE-gNB RTT) best supports reception of UL retransmission grant based on UL decoding result. (No RAN2 specification impact)  RAN2 understanding is that UE behaviour in HARQ state B (i.e. not starting drx-HARQ-RTT-TimerUL) best supports no UL retransmission and/or blind UL retransmission. (No RAN2 specification impact)  For HARQ state B, FFS to run drx-RetransmissionTimerUL for blind UL retransmission  UE configured with an UL HARQ retransmission state (i.e. A or B) will always act as indicated in a grant/assignment provided during a valid occasion (i.e. subject to legacy restrictions in e.g. MAC and RAN1 specifications). (No RAN2 specification impact) |

## RAN2#114e Agreements

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| If enabled by the network, the UE reports information about UE specific TA pre-compensation at the random access procedure (MSGA/MSG3 or MSG5) using a MAC CE. Actual content is FFS and also depends on further RAN1 input (we can revise this whole agreement if RAN1 come to a different conclusion in terms of what needs to be conveyed to the NW)  The following options are supported for drx-HARQ-RTT-TimerUL in NTN per HARQ process: 1) Timer length is extended by offset; 2) Timer set to zero and/or 3) Timer disabled (i.e. not started). FFS if this is based on explicit configuration or not. We can also come back to see whether both 2 and 3 are needed.  RAN2 working assumption: Offset for drx-HARQ-RTT-TimerUL is equal to UE-gNB RTT (if RAN1 decides something that requires to change this we can revisit it). drx-RetransmissionTimerDL timer length is not extended in NTN  The drx-HARQ-RTT-TimerUL behaviour applied for each HARQ process is up to the network (e.g. to support NW scheduling strategy to avoid HARQ stalling).  RAN2 Working Assumption: No new CG-specific LCP restriction is introduced for NTN. If a new LCP restriction is agreed for dynamic grant, the proposal does not preclude future discussion on whether it may also apply to configured grant  Repetition transmission based HARQ retransmission is always allowed and is explicitly indicated per HARQ process via DCI (as in legacy).  At least the following options for LCP in NTN are further studied: 1) allowedPHY-PriorityIndex is re-used; and 2) A new LCP restriction is introduced to map LCH to one or more HARQ process(es). FFS if HARQ processes can be classified as having retransmission “enabled” or “disabled” in this case. |

## RAN2#113bis-e Agreements

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| Legacy mechanism for RA type selection based on RSRP threshold is the baseline for NTN. Optimizations can still be suggested, showing the gain (in any case, any method needs to be combined with RSRP based approach)  Reuse legacy RA type switching mechanism  Extend the timer length of sr-ProhibitTimer (FFS on the details)  RAN2 wait for RAN1’s feedback on UE obtaining UE-gNB RTT.  RAN2 wait for RAN1’s progress and postpone the discussion on how to broadcast parameters, if any, for TA pre-compensation.  RAN2 send an LS to RAN1, focusing on below aspects:   * Ask RAN1 to prioritize the TA pre-compensation work on whether and/or what parameters to broadcast for TA pre-compensation, and when broadcasted, how often the broadcasted parameters are expected to change over time; * RAN2 has agreed to use UE-gNB RTT as the offset to start some UP timers (e.g. drx-HARQ-RTT-TimerDL). Ask RAN1 to provide inputs on (i) how UE acquires UE-gNB RTT and (ii) what additional information needs to be broadcasted other than that for TA pre-compensation, if any.   At least for uplink scheduling adaptations, the UE may report information about the UE specific TA pre-compensation. The exact information and frequency of reports depend on RAN1 outcome. FFS on when/how to report.  It is FFS whether the UE reports the UE specific TA pre-compensation at the RACH procedure (MSG3 or MSG5) using a MAC CE. Actual content is FFS and also depends on further RAN1 input. Configurability is FFS  It is NW scheduling strategy to avoid NTN UE in HARQ stalling state. From RAN2 perspective, the NW can continuously schedule the UE using one or a combination of scheduling strategies, such as without HARQ retransmissions, or with blind retransmissions, or with HARQ retransmissions based on DL HARQ feedback (or UL decoding result).  RAN2 confirms that in NTN if the UE is in DRX Active Time for any reason, the UE should monitor the PDCCH regardless of whether drx-HARQ-RTT-TimerUL or drx-HARQ-RTT-TimerDL is running or not. No specification change is needed.  RAN2 confirms that in NTN using the value= “zero” for drx-HARQ-RTT-TimerUL and drx-RetransmissionTimerUL is possible. No specification change is needed.  In NTN, The drx-HARQ-RTT-TimerUL is configured per UE DRX group and the behaviour can be configured per HARQ process. FFS the different behaviours and how to indicate the behaviour to the UE and the number of behaviours (e.g., two or more behaviours).  LCP restrictions should be further considered for an UL HARQ process in NTN. FFS if no further LCP restrictions are needed, or if (R16) existing LCP restrictions can be re-used or if new LCP restriction shall be defined for this purpose. |

## RAN2#113-e Agreements

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| Both Type 1 and Type 2 configured grant are feasible in NTN.  From RAN2’s perspective, no need to modify parameter periodicity of IE ConfiguredGrantConfig to support NTN.  No need to modify maxNrofConfiguredGrantConfig-r16 and maxNrofConfiguredGrantConfigMAC-r16 to support NTN.  UE in NTN can have both 2-step RACH and configured grant configurations at the same time.  For HARQ processes with DL HARQ feedback disabled, drx-HARQ-RTT-TimerDL is not started.  FFS: method(s) to support blind retransmission for HARQ processes with HARQ feedback disabled.  From RAN2 perspective, for HARQ processes where gNB can sends UL grant without waiting for decoding result of previous PUSCH transmission, no new network scheduling restrictions are introduced to schedule subsequent grants (i.e. up to network implementation. (Can come back if we don't find an agreement on p8)  For HARQ processes with DL HARQ feedback enabled, drx-HARQ-RTT-TimerDL length is increased by offset (i.e. existing values within value range increased by offset). RAN2 working assumption: offset is equal to UE-gNB RTT (if RAN1 decides something that requires to change this we can revisit it) |

## RAN2#112-e Agreements

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| RAN2 working assumption (for RRC idle. FFS for Inactive/Connected): Rel-17 UE with pre-compensation capability obtains UE specific UE-gNB RTT based on its GNSS in LEO/GEO. FFS how this is calculated and what/if anything needs to be broadcasted for the different pre-compensation methods (e.g. common TA) to help the UE to obtain the full UE-gNB RTT.  If the UE-gNB RTT is pre-compensated, preamble ambiguity is not an issue in Rel-17 NTN (i.e. no enhancements are necessary). FFS how and by whom the possibly multiple components of UE-gNB RTT are pre-compensated  From RAN2 perspective, for UE with UE-specific pre-compensation as a baseline it is up to gNB implementation to ensure sufficient time on UE side for the Msg3 transmission.  For UE with pre-compensation capability (at least for the HARQ-feedback enabled case. FFS for HARQ-feedback disabled, if supported), drx-HARQ-RTT-TimerDL is offset by UE-specific RTT (UE-gNB delay) in LEO/GEO. FFS if offset is applied to: 1) the start of the timers or 2) the timer value range (i.e. existing values within value range increased by offset)  From RAN2 perspective, for dynamic grant, one possibility for "enabling"/"disabling" HARQ uplink retransmission at UE transmitter is without introducing an additional mechanism (i.e. gNB can send grant with NDI not toggled/toggled without waiting for decoding result of previous PUSCH transmission). FFS on the handling of RTT timers. Other solutions for enabling/disabling HARQ UL reTX are not precluded  If the start of the ra-ResponseWindow and msgB-ResponseWindow is accurately compensated by UE-gNB RTT, ra-ResponseWindow and msgB-ResponseWindow are not extended in LEO/GEO.  At least the following are FFS in Rel-17 NTN:   * Report UE-calculated TA in e.g. msg3/msg5/msgA * Enhancements to RSRP-based selection mechanism of 2-step vs. 4-step RACH * LCP impact caused by disabling HARQ UL retransmission   RAN2 decision on starting ra-ContentionResolutionTimer, ra-ResponseWindow and msgB-ResponseWindow is postponed until further progress in RAN1 regarding UE pre-compensation method and TA estimation accuracy. |

## RAN2#111-e Agreements

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| From RAN2 perspective, an offset is applied to the start of ra-ResponseWindow in NTN for both LEO and GEO scenarios.  An offset to the start of the ra-ContentionResolutionTimer is introduced for both LEO and GEO scenarios.  Modification of drx-LongCycleStartOffset, drx-StartOffset, drx-ShortCycle, drx-ShortCycleTimer, drx-onDurationTimer, drx-SlotOffset and drx-InactivityTimer is not needed in Rel-17 NTN.  From a RAN2 perspective, for DL, HARQ feedback can be enabled/disabled in Rel-17 NTN, but HARQ processes remain configured. The criteria and decision to enable/disable HARQ feedback is under network control and is signalled to the UE via RRC in a semi-static manner. FFS for UL  At least the following methods to enhance UL scheduling are further studied in NTN: configured grant and BSR over 2-step RACH. (other solutions to enhance UL scheduling are not precluded)  Both 2-step and 4-step RACH are supported in Rel-17 NTN. FFS enhancements to RACH to accommodate the NTN environment. |