**3GPP TSG RAN meeting #94-e RP-213349**

**Electronic Meeting, December 6 - 17, 2021**

## Status Report to TSG

**Agenda item:** 10.4.3 NB-IoT/eMTC support for Non-Terrestrial Networks (NTN)

|  |  |
| --- | --- |
| **WI / SI Name** |  |
| included in this status report | Study Item: No | Core part: Yes | Performance part:No | Testing part:- |
| **Acronym** | LTE\_NBIOT\_eMTC\_NTN |
| **Unique ID** |  |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-211601 |
| **Target Completion Date****(indicate if changed)** | Study Item:  | Core part:  | Performance part:  | Testing part: - |
| **Overall Completion level** | Study Item:  | Core part: Overall: 75%For informationRAN1: 100% RAN2: 70%RAN3: 0% | Performance Part:  | Testing part: - |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

|  |  |
| --- | --- |
| **Leading WG** | RAN1 |
| **Rapporteur** | **Name** | Gilles Charbit |
| **Company** | MediaTek |
| **Email** | Gilles.charbit@mediatek.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.
 One time unit (TU) corresponds to ~ 2 hours in the meeting.
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

 NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### 2.1.1 Agreements

* **RAN1#107-e, 11th November – 19th November 2021, e-meeting**

**Agreements on “8.15.1 Enhancements to time and frequency synchronization”**

GNSS validity:

**Agreement**

The UE autonomously determines its GNSS validity duration X and reports information associated with this valid duration to the network via RRC signalling.

* X = {10s, 20s, 30s, 40s, 50s, 60s, 5 min, 10 min, 15 min, 20 min, 25 min, 30 min, 60 min, 90 min, 120 min, infinity}

**Agreement**

Send LS to RAN2 to take the following RAN1 agreements into consideration to specify the aspects related to GNSS position validity:

* For sporadic short transmission, UE in RRC\_CONNECTED should go back to idle mode and re-acquire a GNSS position fix if GNSS becomes outdated
* The UE autonomously determines its GNSS validity duration X and reports information associated with this valid duration to the network via RRC signalling.
	+ X = {10s, 20s, 30s, 40s, 50s, 60s, 5 min, 10 min, 15 min, 20 min, 25 min, 30 min, 60 min, 90 min, 120 min, infinity}
* Note: The duration of the short transmission is not longer than the “validity timer for UL synchronization” referred to in the WID objective (but which still needs further discussion for specifying further details)

R1-2112847 –DRAFT LS to RAN2 on GNSS validity duration for IoT NTN

* Final LS in R1-2112848

Validity timer for UL Synchronization:

**Agreement**

The serving satellite ephemeris and common TA related parameters are signalled in the same SIB message and have the same epoch time.

**Agreement**

A single validity duration for both serving satellite ephemeris and common TA related parameters is broadcast on the SIB.

**Agreement**

Validity timer for UL synchronization should be started/restarted with configured timer validity duration at the epoch time of the assistance information.

 **Agreement**

Validity timer duration is configured per cell and indicated to the UE in X bits with:

·       Value range {5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 120, 180, 240}

·       Unit is second

·       FFS Additional values for GEO

For NPUSCH for NB-IoT and PUSCH/PUCCH for eMTC:

**Agreement**

For eMTC PUCCH/PUSCH with frequency hopping enabled, the UE can adjust the uplink transmit timing when hopping to a new narrowband if the frequency hopping interval is less than or equal to the configured transmission segment duration.

**Agreement**

For eMTC PUCCH, a 3-bit field to indicate K=7 values for the uplink transmission segment duration:

·         2 4 8 16 32 64 128 subframes

**Agreement**

For eMTC PUCCH/PUSCH with frequency hopping enabled, the UE can adjust the uplink transmit timing and transmit frequency when hopping to a new narrowband if the frequency hopping interval is less than or equal to the configured transmission segment duration.

**Agreement**

UE pre-compensation per segment of NPUSCH for NB-IoT and PUSCH/PUCCH for eMTC is applied from one segment to the next segment by using one or more of the following methods if supported by UE implementation

 1. UE may drop / Insert samples / Puncture OFDM symbols

 2. UE may blank subframes / slots where UE skip a slot or a subframe

The total transmission time is not changed

UE autonomously Drop / insert samples / Puncture OFDM symbols or Blank subframes / slots where UE drops a subframe / slot

The method used for the UE pre-compensation is known to the eNB by a single UE capability

* UE Blank subframes / slots where UE skip a slot or a subframe (slot is based on Sub Carrier Spacing)

FFS Details of method(s) to drop / insert samples, blanking subframes / slots (slot is based on Sub Carrier Spacing)

For NPRACH for NB-IoT and PRACH for eMTC:

**Agreement**

For NB-IoT, UE pre-compensation per segment of NPRACH is applied from one segment to the next segment by using one or more of the following methods if supported by UE implementation

* UE may drop / Insert samples
* UE may blank subframe / repetition unit where UE drops a subframe / repetition unit

The total transmission time is not changed

FFS Details of method(s) to drop / insert samples / blank subframe / repetition unit

FFS Specification impact

**Agreement**

For eMTC, UE pre-compensation per segment of PRACH is applied from one segment to the next segment by drop / insert samples in Guard Period of PRACH preamble.

* The total transmission time is not changed
* FFS Details of method(s) to drop / insert samples

UL segmented transmission configuration:

**Agreement**

UL transmission segment duration with one value X per NPUSCH for NB-IoT and PUSCH/PUCCH for eMTC may be indicated on SIB.

* For NB-IoT/eMTC, X is one of K candidate values for the UL transmission segment duration of NPUSCH/PUSCH/PUCCH
* The value X for eMTC PUSCH applies for full-PRB allocation and should be divided by 2, 4 and 8 for sub-PRB allocation of 6, 3 and 2-out-of-3 tones allocation, respectively.

**Agreement**

At least UL transmission segment duration with one value X for NPRACH for NB-IoT and PRACH for eMTC may be indicated on SIB

* For NB-IoT/eMTC, X is one of K candidate values for the UL transmission segment duration of NPRACH/PRACH
* FFS One value X, one or more values Xi

**Agreement**

UL Segmented transmission NPRACH/NPUSCH for NB-IoT is not supported in GEO based on UE feature

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**Agreement**

For NB-IoT NTN, the network configures one of K values for the UL transmission segment duration of each PRACH preamble format in a k-bit field, where the size of the k-bit field and the number of K candidate values depend on the preamble format.

* Format 0 and format 1: 3-bit field, K=6 candidate values 2.4.(TCP+TSEQ), 4.4.(TCP+TSEQ), 8.4.(TCP+TSEQ), 16.4.(TCP+TSEQ), 32.4.(TCP+TSEQ), 64.4.(TCP+TSEQ)
* Format 2:  3-bit field, K=5 candidate values 1.6.(TCP+TSEQ), 2.6.(TCP+TSEQ), 4.6.(TCP+TSEQ), 8.6.(TCP+TSEQ), 16.6.(TCP+TSEQ)

**Agreement**

Support network re-configuration of UL transmission segment by dedicated RRC Signalling

DL Synchronization enhancements:

**Agreement**

For DL synchronization enhancements:

* Signal Part-of ARFCN indication on MIB for bands where RAN4 cannot introduce a 200 kHz channel raster and the legacy 100 kHz raster is used, otherwise for bands where RAN4 can introduce a 200 kHz channel raster there is no signalling of the part-of ARFCN indication on MIB.

**Agreement**

For IoT NTN, indicate two LSBs of the ARFCN in the MIB.

R1-2112689 –DRAFT LS to RAN4 on DL synchronization enhancements for IoT NTN

* Final LS in R1-2112768

Synchronization aspects common to IoT NTN and NR NTN:

**Agreement**

The following agreements from NR NTN are re-used for IoT NTN

The granularity of Common TA is set to be 1.Ts

**Conclusion**

The following conclusion from NR NTN is re-used for IoT NTN

Conclusion: Do not define a TA margin.

Working assumption:

Higher-layer parameters TACommon, TACommonDrift, TACommonDriftVariation are indicated with the following range, granularity and bits allocation:

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter name** | **Value range** | **Granularity** | **Bits allocation** |
| **TACommon** | **0 ...8316827****(i.e: 0… 270.73 ms)** | **32.55208 ×10-3μs** | **23 bits** |
| **TACommonDrift** | **- 261935… + 261935****(i.e: -53.33   μs/s… +53.33 μs/s)** | **0.2×10-3μs/s** | **19 bits** |
| **TACommonDriftVariation** | **0…29470****(0…0.60 μs/s2)** | **0.2×10-4μs/s2** | **15 bits** |
| -        **Value ranges are given in unit of corresponding granularity** |   |   |   |

**Agreement**

Confirm the working assumption made at RAN1#106-bis-e on serving satellite ephemeris bit allocations for LEO/MEO/GEO based non-terrestrial access network:

* Support serving satellite ephemeris format bit allocations for LEO/MEO/GEO based non-terrestrial access network:
	+ Position and velocity state vector ephemeris format is 17 bytes payload.
		- The field size for position (m) is 78 bits
			* Position range is driven by GEO : +/- 42 200 km
			* The quantization step is 1.3m for position
		- The field size for velocity (m/s) is 54 bits
			* Velocity range is driven by LEO@600 km: +/- 8000 m/s
			* The quantization step is 0.06 m/s for Velocity
	+ Orbital parameter ephemeris format 18 byte payload
		- Semi-major axis α (m) is 33 bits
			* Range: [6500, 43000]km
		- Eccentricity e is 19 bits
			* Range: ≤ 0.015
		- Argument of periapsis ω (rad) is 24 bits
			* Range: [0, 2π]
		- Longitude of ascending node (Ω rad) is 21 bits
			* Range: [0, 2π]
		- Inclination i (rad) is 20 bits
			* Range: [- π/2 , + π/2]
		- Mean anomaly M (rad) at epoch time to is 24 bits
			* Range: [0, 2π]

**Agreement**

Using indicated Higher-layer Common TA parameters, if configured, the UE can determine the one-way propagation time ( $Delay\_{common})$ used for $N\_{TA, common}$  calculation as follows:

$$Delay\_{common}\left(t\right)= D\_{Common }\left(t\_{epoch}\right)+ DCommonDrift× \left(t-t\_{epoch}\right)+DCommonDriftVariation× \left(t-t\_{epoch}\right)^{2} $$

Where:

* $D\_{Common }=\frac{ TA\_{Common }}{2}$, $DCommonDrift=\frac{TACommonDrift}{2}$ and $DCommonDriftVariation=\frac{TACommonDriftVariation}{2}$
* TACommon, TACommonDrift and TACommonDriftVariation are Common TA parameter defined in RAN1 Meeting #106-bis-e
* $Delay\_{common}\left(t\right) $is the distance between the satellite and the uplink time synchronization reference point divided by the speed of light. DL and UL are frame aligned at the reference point with an offset given by $N\_{TA,offset}$**.**
* $N\_{TA, common}$ is derived by the UE based on $Delay\_{common}\left(t\right)$ to pre-compensate the two-way transmission delay between the uplink time reference point and the satellite.

**Agreements on “8.15.2 Timing relationship enhancements”**

**Agreement**

For IoT NTN, signalling one value for cell-specific K\_offset in system information is supported.

**Agreement**

For IoT NTN, the unit of K\_offset is subframe based on a 15kHz subcarrier spacing (i.e. 1 ms).

* Further discuss the case where UL is using 3.75 kHz SCS

**Agreement**

For IoT NTN, the UE specific K\_offset is provided and updated by the network using MAC CE.

**Agreement**

For IoT NTN, the information of K\_mac is carried in system information.

**Agreement**

For IoT NTN, the unit of K\_mac is subframe based on a 15kHz subcarrier spacing (i.e. 1 ms).

* Further discuss the case where UL is using 3.75 kHz SCS

**Agreement**

Modification of the designation of subframes with NPDCCH monitoring restrictions is needed for at least Cases 1 to 6.

**Agreement**

Whether/how the “indicated value” of K\_offset is translated into number of slots for different numerologies (i.e., 15 kHz and 3.75 kHz) is left to the spec-editor.

* This resolves the bullet from previous agreement: Further discuss the case where UL is using 3.75 kHz SCS

**Agreement**

For IoT NTN, adopt the NR NTN agreement without modification for FR1: (a) the value range (i.e. 1 ms), (b) the quantity signalled (e.g. a differential UE specific K\_offset) for the UE specific K\_offset.

**Agreement**

For IoT NTN, adopt the NR NTN agreement without modification for FR1 for the value range of Kmac.

Leave it to spec editor to formulate in the specs the NPDCCH monitoring restrictions for Cases 1 to 6.

Explanatory Note for editor

When the UE changes from receiving on the DL to transmitting on the UL (or vice versa), immediately before/after the DL/UL switch the UE is not required to monitor an NPDCCH candidate in some DL subframes. The designation of these subframes in the spec needs to take the “effect” of the TA into consideration. There may be multiple ways to capture this in the specifications for (at least) Cases 1 to 6. Two options (in principle) are described below, to guide the spec editor to capture this as best he/she sees it. Examples of where the changes may apply for cases 1 to 6 can be found as examples in appendix A in R1-2112554**.**

**Option 1**: The DL subframes during which the UE is not required to monitor an NPDCCH candidate are described in terms of downlink subframe timing. This would typically involve inserting a “-TA” term in their indexing.

**Option 2**: The DL subframes during which the UE is not required to monitor an NPDCCH candidate are described in terms of uplink subframe timing using the indexing of the UL subframes that coincide in time with the DL subframes in question.

**Agreement**

Network can configure UE-specific TA reporting either a TA or UE location for connected mode UE

* In case a TA is configured, NR NTN solutions are a baseline for the following UE-specific TA handling issues,
	+ Signaling – quantity (full or delta), range, number of bits
	+ Granularity of report
	+ Frequency of reporting
	+ Means of reporting
	+ NOTE: Any changes needed for IoT NTN can be made.
* In case the UE location is configured, RAN2 will design solutions for the UE location information, and it is left to RAN2 to decide whether to support UE location reporting
* **RAN1#106bis-e, 11th October – 19th October 2021, e-meeting**

**Agreements on “8.15.1 Enhancements to time and frequency synchronization”**

Agreement:

The validity timer for UL synchronization is started/restarted with configured timer validity duration at the epoch time of the assistance information (i.e. serving satellite ephemeris data).

* FFS: Precise definition of epoch time taking into account SIB repetitions

Agreement:

A single validity duration for both serving satellite ephemeris and common TA related parameters is defined at least if serving satellite ephemeris and common TA parameters are signalled in the same SIB message.

Agreement:

Configuration of UL transmission segment is indicated on SIB at least for initial access

* FFS via UE-specific RRC signalling in RRC\_CONNECTED.

Agreement:

For eMTC PUSCH, a 3-bit field to indicate K=8 values for the uplink transmission segment duration:

* Full-PRB allocation (unit: subframes): 2 4 8 16 32 64 128 256
* Sub-PRB allocation (unit: resource units): 1 2 4 8 16 32 64 128

Agreement:

For eMTC, a 3-bit field is defined in the SIB to indicate the following K=8 values for the uplink transmission segment duration of PRACH:

(TCP+TSEQ+TGP), 2\*(TCP+TSEQ+TGP), 4\*(TCP+TSEQ+TGP), 8\*(TCP+TSEQ+TGP), 16\*(TCP+TSEQ+TGP), 32\*(TCP+TSEQ+TGP), 64\*(TCP+TSEQ+TGP), 128\*(TCP+TSEQ+TGP)

Agreement:

For eMTC, the same value is used for segment durations for all PRACH preambles

Agreement:

For NB-IOT, the same value is used for segment durations for all NPRACH preambles for a particular NPRACH format

Agreement:

In eMTC/NB-IoT, NTA update based on TA Command field in msg2 and MAC CE TA command is used for UL timing alignment correction as follows:

* No extension on TAC 11-bit field in Random Access Response
* When TAC (TA) in Msg2 is received, UE first adjustment and NTA is adjusted as follows: NTA,new = TA ×16, where TA is the timing advance command in msg2.
* When TACs ($T\_{A})$ provided within the MAC CE is received, $N\_{TA}$ is updated as follows:
	+ $N\_{TA\\_new}=N\_{TA\\_old}+\left(T\_{A}-31\right).16$ ,
* Where TA is the TAC field received in MAC CE command.

Agreement:

RAN1 has discussed the following aspects and leaves it up to RAN2 to specify UE behaviour related to expiry of UL synchronization validity timer and determine which of the following aspects are to be specified:

* Mechanisms for UE to declare loss of UL synchronization including mechanisms for UL synchronization recovery procedure when UL synchronization is lost if UL synchronization validity timer expires in RRC\_CONNECTED
	+ It is up to RAN2 to specify this new behaviour for connected UE within RLF set of procedures or a new procedure for re-acquiring satellite ephemeris
	+ Mechanism for UL synchronization includes re-acquiring the satellite ephemeris and common TA parameters if indicated on SIB
	+ A new clause of RLF for loss of UL synchronization if validity timer for UL synchronization expires assuming a new re-interpretation of RLF set of procedures is specified for recovery of UL synchronization with re-acquisition of satellite ephemeris and common TA parameters if indicated
	+ Potential additional RACH after re-acquisition of satellite ephemeris and common TA parameters if indicated for the UL synchronization recovery procedure in case of potential residual TA error.
* If validity timer for UL synchronization expires and no UL synchronization recovery mechanisms specified as above, UE behaviour shall declare RLF and go into idle mode autonomously to re-acquire ephemeris SIB. UE will then need to re-access the cell via Random Access procedure.
* UE signalling to indicate the validity timer for UL synchronization is about to expire

R1-2110652 Draft LS on Validity Timer for UL Synchronization Moderator (MediaTek)

Final LS approved in R1-2110673

**Agreements on “8.15.2 Timing relationship enhancements”**

Agreement:

In IoT NTN, for a random access procedure initiated by a N/MPDCCH order, the UE shall delay the transmission of the random access preamble by *Koffset* as compared to the current specification.

Agreement:

For IoT NTN, with respect to the granularity, configuration, indication and update of K\_Offset, the mechanisms concluded in NR-NTN shall be taken as baseline.

Agreement:

For eMTC in IoT NTN, if the UE determines that a preamble retransmission is necessary, the choice of a suitable preamble retransmission subframe shall be delayed by Koffset as compared to current specifications.

Agreement:

For NB-IoT, if the UE has initiated an NPUSCH transmission using pre-configured uplink resources ending in subframe n, the UE shall start or restart to monitor the NPDCCH from DL subframe n+4+K\_mac (where K\_mac is defined as in NR-NTN).

Agreement:

For eMTC, if the UE has initiated an PUSCH transmission using pre-configured uplink resources ending in subframe n, the UE shall start or restart to monitor the MPDCCH from DL subframe n+4+K\_mac (where K\_mac is defined as in NR-NTN).

Agreement:

Support PUR at least for GEO-based IoT NTN in Rel-17

FFS: for NGSO-based IoT NTN.

Agreement:

NPDCCH monitoring restrictions have been identified for further checking to see if changes for NB-IoT need to be made for the following cases:

* case 1: MTBG NPUSCH
* case 2: 2 NPUSCH HARQ processes scheduled
* case 3: long single NPUSCH when MTBG or 2HARQ configured
* case 4: single NPUSCH scheduled by DCI format N0 or RAR
* case 5: NPUSCH format 2 in response to DCI format N1
* case 6: NPRACH in response to PDCCH order
* case 7: NPUSCH with same HARQ process when 2 HARQ configured
* case 8: subframes after NPUSCH processing
* case 9: subframes after NPUSCH carrying Msg3
* case 10: NPRACH for SR for long NPRACH transmissions
* case 11: NPRACH for SR for short NPRACH transmissions
* FFS: the changes in each case
* FFS: additional cases

#### Remaining Open issues

All issues in 8.15.1 Enhancements to time and frequency synchronization and 8.15.2 Timing relationship enhancements were closed. RAN1 has specified designs that are sufficient for generating RRC parameters, UE feature definitions, and specifications. RAN1 will enter maintenance phase and resolve the outstanding FFS (see below).

There are 4 FFS on the methods of drop/insert/blank agreed for UL transmission for PUSCH and PRACH captured in the agreements, with details to write the agreements in the specs in maintenance phase as discussed in GTW

* Agreement on NPUSCH for NB-IoT and PUSCH/PUCCH for eMTC
	+ FFS Details of method(s) to drop / insert samples, blanking subframes / slots (slot is based on Sub Carrier Spacing)
* Agreement on NPRACH for NB-IoT
	+ FFS Details of method(s) to drop / insert samples / blank subframe / repetition unit
	+ FFS Specification impact
* Agreement on PRACH for eMTC
	+ FFS Details of method(s) to drop / insert samples

There is one FFS on configuration value of long UL transmission of RACH captured in the agreement, which can be discussed in maintenance phase as discussed in GTW.

* Agreement on NPRACH for NB-IoT
	+ FFS One value X, one or more values Xi

There is one FFS for configuration values in RRC parameters to discuss in maintenance phase as discussed in GTW

* Agreement on validity duration
	+ FFS Additional values for GEO

There were NR NTN agreements on Epoch time made on the last day of the meeting Nov-19. The NR NTN agreements on Epoch time will be re-used for IoT NTN in RRC parameters for RAN2 as part of email discussion for RRC parameter or should be directly reusable for eMTC and NB-IoT according to the WID in maintenance phase.

There are FFS in NR NTN to be discussed in maintenance phase of NR NTN. These can also be discussed for IoT NTN during maintenance phase when NR NTN has agreements on these FFS.

## 2.2 RAN2

#### 2.2.1 Agreements

* **RAN2#116-e, 1st November – 12th November 2021, e-meeting**

Agreements from AI 9.2.1: Organizational

Agreements from AI 9.2.2: Support of Non continuous coverage

Satellite Ephemeris Parameters (not same as for L1 pre-compensation, for the constellation, not just single satellite) is needed for the UE for predicting coverage discontinuity. Other info, e.g. beam info, elevation angle, reference location or corresponding is FFS.

Providing the start-time of (incoming) satellite’s coverage and end-time of serving satellite’s coverage is needed for Quasi-Earth Fixed satellites.

From RAN2 point of view, the existing power saving mechanisms e.g. DRX, PSM, eDRX, relaxed monitoring, and WUS can be reused in IoT-NTN. Minor enhancements in existing power saving mechanisms to support discontinuous coverage is FFS.

Agreements from AI 9.2.3: User Plane Impact

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)

Agreements from AI 9.2.4: Control Plane Impact

The AS layer indicates to NAS layer all of the received TACs for the selected PLMN.

For quasi-earth fixed cell, UE should start measurements on neighbour cells before the broadcast stop time of the serving cell, i.e the time when the serving cell stops covering the current area, and the exact time to start measurements (inter and intra-frequency) is up to UE implementation. FFS to what extent this need to be covered in the TS.

Location-assisted cell reselection (e.g. as for NR NTN) is not supported for IoT NTN in rel 17.

The use of hard TAC or soft TAC is up to network implementation in earth-fixed and earth-moving cells.

Relaxed monitoring further enhancements are not considered for IoT NTN in rel-17.

The serving cell ephemeris information (used for L1 pre-compensation) is signalled in a new SIB, which is NTN specific.

Update to serving cell ephemeris information does not affect the system information value tag and does not trigger System information modification procedure. How to trigger re-read of this information is FFS. FFS if the UE shall reacquire the new SIB when SI update is triggered.

Updates to serving cell ephemeris information are not bound to the BCCH modification period.

The timing information on when a serving cell is going to stop serving the area is broadcast in the same SIB as the ephemeris information.

Broadcast of the timing information on when a serving cell is going to stop serving the area is only applicable to quasi earth fixed cell (not to moving cell).

No enhancement to R16 RLF and RRC connection Re-establishment procedures are introduced in R17. (this does not include handling of UL synchronisation loss which is FFS and does not include non continuous coverage).

No extension to timers and constants is required for RLF and RRC connection Re-establishment.

No need to extend the 10 s delay for actions upon reception of RRCConnectionRelease in NB-IoT.

It is feasible to use the legacy barring bit to block legacy UEs, and it is possible to have a new bit that assumes the functionality of the old bit. It is FFS if it is needed to use the barring bit or whether other mechanism can be assumed (new band etc).

No enhancement to R16 CHO are introduced in R17.

Idle mode related

Other

Further optimization

#### 2.2.2 Remaining Open issues

- User Plane aspects:

- Enhancements to HARQ RTT timer, UL HARQ RTT timer, sr-ProhibitTimer;

- Enhancements to RLC t-Reordering timer; PDCP discardTimer (for eMTC over NTN).

- Control Plane / others:

- Provisioning of ephemeris and common Timing Advance (TA) parameters by the network; ***[In progress]***

- Support of UE specific TA reporting to the network. ***[In progress]***

- Mobility and Tracking Area management:

- Enhancements to tracking area management where the network may broadcast more than one Tracking Area Code per PLMN; ***[In progress]***

- Cell selection/reselection: adjustments to existing mechanisms, such as the provision of timing or other assistance information to adapt functionality to NTN. ***[In progress]***.

- Support for discontinuous coverage:

- Support of discontinuous coverage without excessive UE power consumption and without excessive failures / recovery actions. If found needed, minor enhancements to the existing power saving mechanisms e.g. DRX, PSM, eDRX, relaxed monitoring, and (G)WUS;

- Provisioning of assistance information.

## 2.3 RAN3

#### 2.3.1 Agreements:

**RAN3#113-e, 16th August – 26th August 2021, e-meeting**

* IoT NTN WI has not been discussed in RAN3 until now, which will be treated in 2022 Q1 RAN3 meetings.

#### 2.3.2 Remaining Open issues:

NB-IoT and eMTC NTN support for E-UTRAN (i.e. including S1 interface) will be specified by re-using NR NTN functionality as a baseline, e.g.

- Support for cell identity and TA corresponding to Earth-fixed area in relevant network interfaces (taking Rel-17 NR NTN as baseline where appropriate)

- Support for country-specific CN routing (taking Rel-17 NR NTN as baseline where appropriate)

- Support for identification and restriction of satellite access (following Rel-17 NR NTN, and if confirmed by SA2)

- OAM requirements (taking Rel-17 NR NTN as baseline where appropriate).

Where needed, adjustments will be considered for IoT NTN specific alignments in line with functionality defined in other WGs.

## 2.4 RAN4

#### 2.4.1 Agreements: N/A (RAN4 is not involved in the SI)

#### 2.4.2 Remaining Open issues: N/A

## 4. References

NOTE: This can be e.g. a list of all related Tdocs in the affected WGs since last TSG, references to LSs, produced TRs/TSs, the work/study item description or status reports of previous TSGs.

## 4.1 RAN1

**RAN1#107-e, 11th November – 19th November 2021, 2021**

Submitted to AI 8.15: NB-IoT/eMTC support for Non-Terrestrial Network

* R1-2111376 Summary of [107-e-R17-RRC-IoT-NTN] IoT over NTN Moderator (MediaTek Inc.)
* R1-2111377 List of IoT over NTN Rel-17 RRC parameters Moderator (MediaTek Inc.)

Submitted to AI 8.15.1 Enhancements to time and frequency synchronization

* [R1-2110808](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2110808.zip) Discussion on time and frequency synchronization enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2111048](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111048.zip) Remaining issues on time and frequency synchronization enhancements for NB-IoT/eMTC over NTN vivo
* [R1-2111117](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111117.zip) Discussion on enhancements to time and frequency synchronization for IOT NTN Spreadtrum Communications
* [R1-2111172](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111172.zip) Enhancements to time and frequency synchronization Mavenir
* [R1-2111182](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111182.zip) Enhancements to time and frequency synchronization for IoT NTN NEC
* [R1-2111236](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111236.zip) Time and frequency synchronization enhancement for IoT over NTN CATT
* [R1-2111276](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111276.zip) Enhancement to time and frequency synchronization for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2111319](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111319.zip) Discussion on enhancements to time and frequency synchronization OPPO
* [R1-2111373](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111373.zip) Enhancements to time and frequency synchronization for IoT NTN MediaTek Inc.
* [R1-2111410](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111410.zip) Remaining issues on time and frequency synchronisation for IoT-NTN Sony
* [R1-2111420](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111420.zip) On time and frequency synchronization enhancements for IoT NTN Ericsson
* [R1-2111451](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111451.zip) Enhancements to time and frequency synchronization Qualcomm Incorporated
* [R1-2111523](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111523.zip) Remaining issues on synchronization for IoT NTN Intel Corporation
* [R1-2111557](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111557.zip) Discussion on time and frequency synchronization for IoT NTN Xiaomi
* [R1-2111633](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111633.zip) Enhancements on time and frequency synchronization for IoT NTN CMCC
* [R1-2111662](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111662.zip) Discussion on synchronization for IoT-NTN ZTE
* [R1-2111767](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111767.zip) On enhancements to time and frequency synchronization Samsung
* [R1-2111904](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111904.zip) Time and Frequency Synchronization in IoT NTN Apple
* [R1-2112002](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2112002.zip) Time and frequency synchronization for IoT NTN Lenovo, Motorola Mobility
* [R1-2112329](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2112329.zip) Enhancements to time and frequency synchronization Nordic Semiconductor ASA
* **R1-2111375** "Summary #1 of AI 8.15.1 Enhancements to time and frequency synchronization for IoT NTN" Moderator (MediaTek Inc.)
* R1-2108558 "Summary #6 of AI 8.15.1 Enhancements to time and frequency synchronization for IoT NTN" MediaTek Inc.
* **R1-2112615** Summary #2 of AI 8.15.1 Enhancements to time and frequency synchronization for IoT NTN Moderator (MediaTek Inc.)
* R1-2112679 Summary #3 of AI 8.15.1 Enhancements to time and frequency synchronization for IoT NTN Moderator (MediaTek Inc.)
* R1-2112803, Moderator (MediaTek), Summary #4 of AI 8.15.2 Enhancements to time and frequency synchronization, RAN1#107-e, November 2021
* R1-2112847 –DRAFT LS to RAN2 on GNSS validity duration for IoT NTN
* R1-2112848- LS to RAN2 on GNSS validity duration for IoT NTN
* R1-2112689 –DRAFT LS to RAN4 on DL synchronization enhancements for IoT NTN
* R1-2112768- LS to RAN4 on DL synchronization enhancements for IoT NTN

Submitted TDocs to 8.15.2: Timing relationship enhancements

* [R1-2110809](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2110809.zip) Discussion on timing relationship enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2111049](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111049.zip) Remaining issues on timing relationship enhancements for NB-IoT/eMTC over NTN vivo
* [R1-2111118](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111118.zip) Discussion on timing relationship enhancements for IOT NTN Spreadtrum Communications
* [R1-2111173](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111173.zip) Timing relationship enhancements Mavenir
* [R1-2111183](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111183.zip) Timing relationship enhancements for IoT NTN NEC
* [R1-2111237](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111237.zip) Timing relationship enhancement for IoT over NTN CATT
* [R1-2111277](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111277.zip) Timing relationship enhancements for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2111320](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111320.zip) Discussion on timing relationship enhancements OPPO
* [R1-2111374](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111374.zip) Timing relationship enhancements for IoT NTN MediaTek Inc.
* [R1-2111411](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111411.zip) Remaining issues on timing relationship enhancements for IoT-NTN Sony
* [R1-2111421](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111421.zip) On timing relationship enhancements for IoT NTN Ericsson
* [R1-2111452](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111452.zip) Timing relationship enhancements Qualcomm Incorporated
* [R1-2111524](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111524.zip) Remaining issues on timing relationships for IoT NTN Intel Corporation
* [R1-2111558](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111558.zip) Discussion on the timing relationship enhancement for IoT NTN Xiaomi
* [R1-2111634](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111634.zip) Discussion on timing relationship enhancements for IoT NTN CMCC
* [R1-2111663](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111663.zip) Discussion on timing relationship for IoT-NTN ZTE
* [R1-2111768](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111768.zip) Timing relationship enhancements Samsung
* [R1-2111905](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111905.zip) Timing Relationship Enhancements in IoT NTN Apple
* [R1-2112003](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2112003.zip) Timing Relationship for IoT NTN Lenovo, Motorola Mobility
* [R1-2112331](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2112331.zip) Timing relationship enhancements Nordic Semiconductor ASA

Submitted TDocs to AI 8.15.3: Others

* [R1-2111278](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111278.zip) Discussion on other aspects for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2111422](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111422.zip) Mobile IoT in the 5G future – NB-IoT and eMTC for NTN Ericsson
* [R1-2111559](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111559.zip) Discussion on the other design aspects for IoT NTN Xiaomi
* [R1-2111664](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111664.zip) Discussion on additional enhancement for IoT-NTN ZTE
* [R1-2111925](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23107-e%5CDocs%5CR1-2111925.zip) Other aspects to support IoT in NTN Huawei, HiSilicon

**RAN1#106-bis-e, 11th October – 19th October 2021, 2021**

* R1-2110628 Summary of [106bis-e-R17-RRC-IoT-NTN] IoT over NTN Moderator (MediaTek)
* R1-2110629 List of IoT over NTN Rel-17 RRC parameters Moderator (MediaTek)

Submitted to AI 8.15: NB-IoT/eMTC support for Non-Terrestrial Network

* [R1-2108750](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2108750.zip) Discussion on time and frequency synchronization enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2108931](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2108931.zip) Discussion on enhancements to time and frequency synchronization for IOT NTN Spreadtrum Communications
* [R1-2109011](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109011.zip) Discussion on time and frequency synchronization enhancements for NB-IoT/eMTC over NTN vivo
* [R1-2109080](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109080.zip) Discussion on enhancements to time and frequency synchronization OPPO
* [R1-2109115](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109115.zip) Enhancements to time and frequency synchronization Mavenir
* [R1-2109171](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109171.zip) Enhancements to time and frequency synchronization for IoT NTN MediaTek Inc.
* R1-2109173 Summary #1 of AI 8.15.1 Enhancements to time and frequency
* synchronization for IoT NTN Moderator (MediaTek Inc.)
* [R1-2109176](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109176.zip) Enhancements to time and frequency synchronization Qualcomm Incorporated
* [R1-2109201](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109201.zip) Time and frequency synchronization enhancement for IoT over NTN CATT
* [R1-2109265](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109265.zip) Enhancement to time and frequency synchronization for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2109308](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109308.zip) Enhancements on time and frequency synchronization for IoT NTN CMCC
* [R1-2109321](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109321.zip) Time and frequency synchronization for IoT NTN Lenovo, Motorola Mobility
* [R1-2109362](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109362.zip) Enhancements to time and frequency synchronization NEC
* [R1-2109396](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109396.zip) Discussion on time and frequency synchronization for IoT NTN Xiaomi
* [R1-2109522](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109522.zip) On enhancements to time and frequency synchronization Samsung
* [R1-2109640](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109640.zip) On synchronization for NB-IoT and eMTC NTN Intel Corporation
* [R1-2109804](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109804.zip) Enhancement to time synchronisation for IoT-NTN Sony
* [R1-2109829](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109829.zip) Enhancements to time and frequency synchronization to NB-IoT NTN FGI, Asia Pacific Telecom, III, ITRI
* [R1-2109847](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109847.zip) Discussion on synchronization for IoT-NTN ZTE
* [R1-2109956](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109956.zip) On time and frequency synchronization enhancements for IoT NTN Ericsson
* [R1-2110063](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2110063.zip) Discussion on Time and Frequency Synchronization in IoT NTN Apple
* [R1-2110260](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2110260.zip) Enhancements to time and frequency synchronization Nordic Semiconductor ASA
* **R1-2109173** Summary #1 of AI 8.15.1 Enhancements to time and frequency synchronization for IoT NTN Moderator (MediaTek Inc.)
* **R1-2110508** Summary#2 of AI 8.15.1 Enhancements to time and frequency synchronization Moderator (MediaTek)
* **R1-2110536** Summary#3 of AI 8.15.1 Enhancements to time and frequency synchronization Moderator (MediaTek)
* **R1-2110550** Summary#4 of AI 8.15.1 Enhancements to time and frequency synchronization Moderator (MediaTek)
* R1-2110645Summary#5 of AI 8.15.1 Enhancements to time and frequency synchronization Moderator (MediaTek)

Submitted TDocs to 8.15.2: Timing relationship enhancements

* [R1-2108751](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2108751.zip) Discussion on timing relationship enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2108932](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2108932.zip) Discussion on timing relationship enhancements for IOT NTN Spreadtrum Communications
* [R1-2109012](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109012.zip) Discussion on timing relationship enhancements for NB-IoT/eMTC over NTN vivo
* [R1-2109081](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109081.zip) Discussion on timing relationship enhancements OPPO
* [R1-2109116](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109116.zip) Timing relationship enhancements Mavenir
* [R1-2109172](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109172.zip) Timing relationship enhancements for IoT NTN MediaTek Inc.
* [R1-2109177](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109177.zip) Timing relationship enhancements Qualcomm Incorporated
* [R1-2109202](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109202.zip) Timing relationship enhancement for IoT over NTN CATT
* [R1-2109266](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109266.zip) Timing relationship enhancements for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2109309](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109309.zip) Discussion on timing relationship enhancements for IoT NTN CMCC
* [R1-2109322](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109322.zip) Timing Relationship for IoT NTN Lenovo, Motorola Mobility
* [R1-2109397](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109397.zip) Discussion on the timing relationship enhancement for IoT NTN Xiaomi
* [R1-2109523](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109523.zip) Timing relationship enhancements Samsung
* [R1-2109641](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109641.zip) On timing relationship for NB-IoT and eMTC NTN Intel Corporation
* [R1-2109805](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109805.zip) Timing relationships enhancement for IoT- NTN Sony
* [R1-2109830](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109830.zip) Timing relationship enhancements to NB-IoT NTN FGI, Asia Pacific Telecom, III, ITRI
* [R1-2109848](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109848.zip) Discussion on timing relationship for IoT-NTN ZTE
* [R1-2109957](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109957.zip) On timing relationship enhancements for IoT NTN Ericsson
* [R1-2110064](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2110064.zip) Discussion on Timing Relationship Enhancements in IoT NTN Apple
* [R1-2110262](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2110262.zip) Timing relationship enhancements Nordic Semiconductor ASA
* **R1-2110461** FL summary 1 of AI 8.15.2 Timing relationship for IoT-NTN Moderator (Sony)
* **R1-2110462** FL summary 2 of AI 8.15.2 Timing relationship for IoT-NTN Moderator (Sony)
* **R1-2110533** FL summary 3 of AI 8.15.2 Timing relationship for IoT-NTN Moderator (Sony)
* **R1-2110534** FL summary 4 of AI 8.15.2 Timing relationship for IoT-NTN Moderator (Sony)

Submitted TDocs to AI 8.15.3: Others

* [R1-2109267](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109267.zip) Discussion on other aspects for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2109398](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109398.zip) Discussion on the other design aspects for IoT NTN Xiaomi
* [R1-2109750](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109750.zip) Other aspects to support IoT in NTN Huawei, HiSilicon
* [R1-2109849](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109849.zip) Discussion on additional enhancement for IoT-NTN ZTE
* [R1-2109958](file:///C%3A%5CUsers%5Cmtk06374%5CDocuments%5C3GPP%20RAN1%5CRAN1%23106e-bis%5CDocs%5CR1-2109958.zip) Mobile IoT in the 5G future – NB-IoT and eMTC for NTN Ericsson

## 4.2 RAN2

**RAN2#115-e, 9th August – 27th August 2021**

Submitted TDocs to AI 9.2.1: Organizational

* [R2-2111212](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111212.zip) LS on Validity Timer for UL Synchronization (R1-2110673; contact: MediaTek)
* [R2-2111245](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111245.zip) Reply LS on EPS support for IoT NTN in Rel-17 (S2-2108176; contact: MediaTek)
* [R2-2110478](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110478.zip) Running CR - Support of Non-Terrestrial Network in NB-IoT and eMTC Huawei

Submitted TDocs to AI 9.2.2: Support of Non continuous coverage

* [R2-2111479](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111479.zip) Summary of 9.2.2 Non continuous coverage MediaTek Inc.
* [R2-2109504](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109504.zip) Discussion on discontinuous coverage for IoT over NTN OPPO
* [R2-2109640](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109640.zip) Discussion on remaining issues on non-continuous coverage, Intel Corporation
* [R2-2109702](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109702.zip) Discussion on the support of discontinuous coverage for IoT NTN, CATT
* [R2-2109821](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109821.zip) Contents and delivery options for Satellite Assistance Information for NTN, Gatehouse, Sateliot discussion
* [R2-2109965](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109965.zip) Satellite visit time for non-continuous coverage, Qualcomm Incorporated
* [R2-2110071](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110071.zip) Support of discontinuous coverage, Apple
* [R2-2110114](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110114.zip) Remaining FFSs on discontinuous coverage in IoT NTN ZTE Corporation, Sanechips
* [R2-2110130](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110130.zip) Discussion on the issue of non-continuous coverage, Spreadtrum Communications
* [R2-2110262](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110262.zip) Discussion on support of Non continuous coverage CMCC, discussion
* [R2-2110313](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110313.zip) Assistance information for NTN discontinuous coverage, Lenovo, Motorola Mobility, discussion
* [R2-2110314](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110314.zip) Enhancement for idle UE power saving in discontinuous coverage, Lenovo, Motorola Mobility
* [R2-2110315](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110315.zip) RRC connection handling for discontinuous coverage in IoT NTN, Lenovo, Motorola Mobility
* [R2-2110544](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110544.zip) Power Saving in Discontinuous Coverage for NB IoT NTN, Rakuten Mobile, Inc, discussion
* [R2-2110549](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110549.zip) Support of Discontinuous Coverage for IoT-NTN Interdigital, Inc., discussion
* [R2-2110705](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110705.zip) On aspects of discontinuous coverage in IoT NTN Nokia, Nokia Shanghai Bell discussion
* [R2-2110834](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110834.zip) Discontinuous coverage in IoT NTN, Ericsson
* [R2-2110922](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110922.zip) On Discontinuous coverage in IoT-NTN, MediaTek Inc.
* [R2-2110977](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110977.zip) Discussion on non continuous coverage, Huawei, HiSilicon
* [R2-2111112](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111112.zip) Discussion on discontinuous coverage , Xiaomi

Submitted TDocs to AI 9.2.3: User Plane Impact

* [R2-2111477](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111477.zip) Report of [AT116-e][028][IoT-NTN] User Plane Impact (OPPO)
* [R2-2109505](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109505.zip) Discussion on UP impact for IoT over NTN, OPPO
* [R2-2110550](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110550.zip) IoT-NTN UP impacts, Interdigital, Inc.
* [R2-2109701](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109701.zip) Discussion on TA information reporting for IoT NTN, CATT
* [R2-2110919](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110919.zip) Validity Timer Expiry and Synchronization Loss in IoT-NTN MediaTek Inc.
* [R2-2109966](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109966.zip) UL synchronization validity timer in RRC\_CONNECTED Qualcomm Incorporated
* [R2-2110115](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110115.zip) Remaining FFSs on UP in IoT NTN, ZTE Corporation, Sanechips
* [R2-2110268](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110268.zip) Discussion on UP aspects for IoT-NTN, CMCC
* [R2-2110479](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110479.zip) User plane for IOT NTN, Huawei, HiSilicon
* [R2-2110706](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110706.zip) On User Plane aspects for IoT NTN, Nokia, Nokia Shanghai Bell
* [R2-2110953](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110953.zip) User plane aspects of NB-IoT and LTE-M in NTNs, Ericsson

Submitted TDocs to AI 9.2.4: Control Plane Impact

* [R2-2111516](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111516.zip) Report of [Offline-029][IoT-NTN] Idle mode mobility and TA handling, Ericsson
* [R2-2111475](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111475.zip) [AT116-e][030][IoT-NTN] CP Other (Huawei) Huawei

Idle mode related

* [R2-2109633](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109633.zip) On Soft-switch based Tracking Area Updates in IoT-NTN MediaTek Inc.
* [R2-2110146](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110146.zip) Further discussion on TA switching and Idle mode procedures for IoT-NTN Nokia, Nokia Shanghai Bells
* [R2-2110551](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110551.zip) IoT-NTN cell change Interdigital, Inc.
* [R2-2109923](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109923.zip) On Cell Re-selection in IoT-NTN MediaTek Inc.
* [R2-2110113](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110113.zip) Remaining FFSs on CP in IoT NTN ZTE Corporation, Sanechips

Other

* [R2-2109967](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109967.zip) GNSS fix and Paging response delay Qualcomm Incorporated
* [R2-2109506](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109506.zip) Discussion on CP impact for IoT over NTN, OPPO
* [R2-2110020](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110020.zip) Consideration on RRC release for IOT NTN Beijing Xiaomi Mobile Software
* [R2-2110480](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110480.zip) Control plane for IOT NTN, Huawei, HiSilicon
* [R2-2110072](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110072.zip) Provision of ephemeris, Apple
* [R2-2110770](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110770.zip) Analysis on Mobility Aspects for IoT NTN, NEC Telecom MODUS Ltd.
* [R2-2110835](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110835.zip) Control plane aspects of IoT NTN, Ericsson
* [R2-2111030](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111030.zip) Discussion on control plane issues for IoT NTN, Xiaomi

Further Optimization

* [R2-2111045](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2111045.zip) Discussion on CP Impact for IoT over NTN, CMCC
* [R2-2109703](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2109703.zip) Discussion on the mobility issues of IoT NTN, CATT
* [R2-2110561](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110561.zip) PRACH Congestion mitigation in NTN IoT, Rakuten Mobile, Inc

## 4.3 RAN3

**RAN3#113-e, 16th August – 26th August 2021, e-meeting**

# 5 Others

Corresponding Rel-17 work in SA and CT WGs is progressing.

- SA:

- SA#93e/Sep 2021 plenary approved a corresponding SA2 WID in [SP-211124](https://www.3gpp.org/ftp/tsg_sa/TSG_SA/TSGS_93E_Electronic_2021_09/Docs/SP-211124.zip) where WUS and Discontinuous coverage were not planned to be supported.

- SA2#148e/Nov 2021 agreed an update of the SA2 WID in [S2-2109198](https://www.3gpp.org/ftp/tsg_sa/WG2_Arch/TSGS2_148E_Electronic_2021-11/Docs/S2-2109198.zip), submitted to SA#94e/Dec 2021 for approval to support WUS and Discontinuous coverage, resulting from discussions triggered by the LS from RAN#93e in RP‑212617. Two LSs from SA2 inform about the decision to support WUS and Discontinuous coverage: S2-2108176, S2-2109344.

- A number of CRs are agreed by SA2, submitted to SA#94e/Dec 2021 for approval. The latest WI status from SA2 (SA2#148e/Nov 2021) is available in S2-2109382, reporting 95% completion of the work.

- CT

- A CT WID is submitted to CT#94e/Dec 2021 for approval, following CT1 agreement and CT3/CT4/CT6 endorsement (CT1 TDoc#: C1-217214)

- Some initial CRs were agreed by CT1#133e/Nov 2021, submitted to CT#94e/Dec 2021 for approval.

***END***