**3GPP TSG RAN meeting #92-e RP-211454**

**Electronic Meeting, June 14 - 18, 2021**

## Status Report to TSG

**Agenda item:** 10.5.1 Study on NB-IoT/eMTC support for Non-Terrestrial Networks (NTN) [RAN1 SI: FS\_LTE\_NBIOT\_eMTC\_NTN]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **WI / SI Name** |  | | | | |
| included in this status report | Study Item:  Yes | Core part:  No | Performance part:  No | | Testing part:  - |
| **Acronym** |  | | | | |
| **Unique ID** |  | | | | |
| **TSG Tdoc of latest approved WI/SI description (if any)** |  | | | | |
| **Target Completion Date**  **(indicate if changed)** | Study Item:  12/2021 | Core part: | Performance part: | Testing part: - | |
| **Overall Completion level** | Study Item:  Overall: 100% | Core part: | 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#105-e, 10th May – 27th May 2021, e-meeting**

**Agreements on “Scenarios applicable to NB-IoT/eMTC”**

* Include the following Table for Set 5 – MEO in TR 36.763
* Include MEO case 11 in calibration spreadsheet.

***Set 5***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Cases*** | ***EIRP Density*** | ***EIRP per spot*** | ***DL C/N*** | ***G/T*** | ***UL C/N***  ***1080 kHz / 360 kHz / 180 kHz / 90 kHz / 45 kHz / 30 kHz / 15 kHz / 3.75 kHz*** |
| ***11*** | ***45.4 dBW/MHz*** | ***68 dBm*** | ***-4.5 dB*** | ***3.8 dB/K*** | ***-25.0 dB / -19.8 dB / -16.8 dB / -13.8 dB / -10.8 dB / -9.0 dB / -6.0 dB / -0.0 dB*** |

Add other losses as follows for MEO in Table 6.2-1: Other losses in TR 36.763

***Table 6.2-1: Satellite losses***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Other Losses*** | ***GEO (35786 km)*** | ***LEO (1200 km)*** | ***LEO (600 km)*** | ***MEO (10000 km)*** |
| ***Scintillation losses*** | ***2.2 dB*** | ***2.2 dB*** | ***2.2 dB*** | ***2.2 dB*** |
| ***Atmospheric losses*** | ***0.2 dB*** | ***0.1 dB*** | ***0.1 dB*** | ***0.04 dB*** |
| Polarization loss | 3 dB | 3 dB | 3 dB | 3 dB |
| Shadow margin | 3 dB | 3 dB | 3 dB | 3 dB |

*NOTE 1: With PC3 (23 dBm) there is a 3dB gain compared to the PC5 (20 dBm) assumption on UL.*

*NOTE 2: With NF=7 dB, there is a 2 dB improvement compare to NF=9 dB on DL.*

*NOTE 3: Link budgets with other link budget parameters are not excluded from being captured in the TR.*

*NOTE 4: These parameters are only for the purpose of link budget calculations.*

*NOTE 5: Atmospheric losses are a function of elevation angle.*

Prioritize standalone deployment for NB-IoT / eMTC for support in Rel-17 timeframe

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

A specification change is needed for UL transmission with repetitions R>1.

For segmented UE pre-compensation how the following is handled can be further discussed

* Phase discontinuity at subframe boundary when applying new pre-compensation
* Coherence time limitation due to delay/frequency drift rate during segment
* Signal overlapping between different TA segments

FFS: Need for more frequent new UL gaps during long transmission

FFS: Whether sampling frequency adjustment to avoid new UL gaps can be achieved by implementation

FFS: Value of N for the number of time units and what is the time unit for the segmented UE pre-compensation

A validity timer for UL synchronization (e.g., for satellite ephemeris and potentially other aspects) configured by the network is recommended.

* Details e.g. when to set/reset the timer, timer duration and UE behaviour upon timer expiry can be discussed in the normative phase

For sporadic short transmission:

* The idle UE wakes up from idle DRX / PSM, access the network, perform uplink and/or downlink communications for a short duration of time and go back to idle.
* Before accessing the network, the UE acquires GNSS position fix and does not need to re-acquire a GNSS position fix for the transmission of the packets.

Details of the duration of the short transmission, acquisition of the GNSS position and validity of the GNSS position can be discussed in normative phase.

Capture in Section 8 in TR 36.763 the recommendations for NB-IoT and eMTC NTN Time and frequency synchronization enhancements in Release 17 timeframe can follow NTN NR agreements as baseline for the following:

* UE Pre-compensation including Ephemeris Format (orbital / Position -Velocity)
* Timing Advance TTA formula (granularity of the timing advance may be different)
* FFS: UE pre-compensation for UL synchronization in RRC\_IDLE and RRC\_INACTIVE and RRC\_CONNECTED states based at least on its GNSS-acquired position and the serving satellite ephemeris
* Combination of Open (i.e. UE autonomous TA estimation, and common TA estimation) and Closed TA (i.e., received TA commands) control loops in RRC\_CONNECTED state

NOTE 1: The above is up to the decision in NR-NTN WI

NOTE 2: The NR NTN WI enhancements for UE pre-compensation do not include IoT NTN specific aspects for long transmission on PUSCH and PRACH.

Capture in Section 8 in TR 36.763 the recommendations for NB-IoT and eMTC NTN Time and frequency synchronization enhancements in Release 17 timeframe can follow NTN NR agreements as baseline for the following:

* UE pre-compensation for UL synchronization in RRC\_IDLE and RRC\_INACTIVE and RRC\_CONNECTED states based at least on its GNSS-acquired position and the serving satellite ephemeris

NOTE 3: The NR NTN WI enhancements for UE pre-compensation do not include:

* Restriction on the use of GNSS module, where simultaneous GNSS and NTN NB-IoT/eMTC operation is not assumed.
* IoT NTN aspects of validity timer for UL synchronization and GNSS measurement for sporadic short transmission.

NR NTN have different requirements than IoT NTN for cost, complexity, power consumption, and IoT-specific scenarios.

NOTE 4: It is assumed baseline functions in NB-IoT/eMTC terrestrial work without enhancement unless certain issue is found, that will require essential enhancements

With a GNSS position fix that can be assumed to be valid for some period of time X, the following apply for UE in RRC\_CONNECTED

* TA error due to UE velocity satisfies the requirements defined in RAN4
* Doppler shift error due to UE velocity satisfies the requirement defined in RAN4

FFS: Validity of a GNSS position fix and details of acquiring a GNSS position fix, value of X, in RRC CONNECTED mode

FFS: Potential impact on the existing closed loop TA maintenance mechanism

NOTE: The detailed requirement will be defined in RAN4 during normative work.

Conclusion:

The potential issue of RACH congestion is not to be studied further within Release-17 timeframe.

**Agreements on “Timing relationship enhancements”**

Make a TP to correct error in TR to:

------ TP -------------

The following eMTC timing relationships need enhancing for **essential minimum functionality of** IoT NTN:

* MPDCCH to PUSCH
* RAR grant to PUSCH
* MPDCCH to scheduled uplink SPS
* PDSCH to HARQ-ACK on PUCCH
* CSI reference resource timing
* MPDCCH to aperiodic SRS
* Timing advance command activation
* FFS: MPDCCH order to PRACH
* FFS:Other eMTC timing relationships

------ End TP ------------

Conclusion:

The description of timing relationships for eMTC and NB-IoT in Rel-16 do not take the TA into account in general.

* Note: Exceptions to this may be identified as work on eMTC and NB-IoT over NTN progresses further.

The RAR window offset value for NR NTN, the parameters used for its calculation and how these are configured or signalled together form a starting point for IoT NTN.

Capture the following in the TR:

Signalling aspects involved in UE-specific TA maintenance and reporting in Rel-17 IoT and techniques to reduce the signalling load have been discussed. Mechanisms to report the UE-specific TA and other means of determining the UE-specific TA have been discussed. Decisions on these aspects can be made during a subsequent normative phase.

Capture the following in the TR:

Whether UE-specific K-Offsets are needed or not in Rel17 IoT NTN from a physical layer point of view was discussed but without arriving at a consensus. This issue can be further discussed during a future normative phase.

**Agreements on HARQ enhancements:**

Conclusion:

For NB-IoT and eMTC in NTN, RAN1 has not reached consensus to recommend enhancements to the Rel-16 procedure for the monitoring of a PDCCH which indicates an ACK/NACK after transmission of a PUSCH.

Capture the following in the TR:

* RAN1 discussed that if there are a large number of repetitions in NTN IoT, an UL/DL transmission may potentially have a duration larger than the time interval needed by the UE for cell reselection or handover. This may potentially be an issue especially for LEO satellite due to high mobility. Some repetitions may not be able to be transmitted before a cell change happens and this will cause a waste of resources. Combining repetitions from different cells is a potential solution.
* RAN1 has not reached consensus to recommend solutions in Rel-17.

Capture the following in the TR:

* RAN1 discussed to enable PDCCH monitoring during the time period between receiving NPDSCH and transmitting HARQ ACK in NB-IoT to enhance throughput.
* RAN1 has not reached consensus to recommend solutions to enhance throughput in Rel-17.

Conclusion:

From a physical layer perspective, there is no consensus on disabling HARQ feedback for NTN IoT in Rel-17.

Capture the following in the TR:

RAN1 discussed the monitoring of a PDCCH which indicates an ACK/NACK after transmission of a PUSCH. The reason for not monitoring PDCCH for a time period after transmission of the PUSCH is UE power saving.

* When a UE is configured with one HARQ process, it was discussed whether the UE can stop PDCCH monitoring after a PUSCH transmission as a new grant would not be received until after one RTT, or the UE cannot stop PDCCH monitoring because a new grant can be received before one RTT has passed and/or the UE may need to monitor DCI for other scheduling assignments e.g. paging, system information, etc.
* When a UE is configured with two (or more) HARQ processes, whether to stop monitoring PDCCH for a time period after transmission of the PUSCH needs also to consider the relative timing of the two HARQ processes.

RAN1 noted that reduced monitoring of PDCCH is closely related to DRX and should therefore be discussed in RAN1 and RAN2.

Conclusion:

For NB-IoT and eMTC in NTN, RAN1 concluded that enhancement~~s~~ to the Rel-16 procedure for the monitoring of a PDCCH which indicates an ACK/NACK after transmission of a PUSCH is not an essential feature for NTN IoT in Rel-17.

Capture the following in the TR:

RAN1 discussed reporting of additional information by a UE (such as timing information to inform the network that a sufficient number of repetitions has been transmitted, requested number of repetition, BLER-based triggering or bundling of feedback, buffer status, enabling/disabling HARQ feedback, etc.)

Conclusion:

RAN1 concluded that reporting of additional feedback is not an essential feature for NTN IoT in Rel-17.

* **RAN1#104bis-e, 12th April – 20th April 2021, e-meeting**

**Agreements on “Scenarios applicable to NB-IoT/eMTC”**

Capture in TR 36.763 the summary of link budget results from contributing companies in Appendix 1, Section 6.1.1

NOTE 1: The summary in Appendix 1, Section 6.1.1 can be further checked and revised during the drafting of Text Proposal as necessary.

NOTE 2: The summary of link budget results will be captured with alignment between contributing companies

Capture the detailed link budget results from contributing companies in a separate spreadsheet

Capture parameters associated with Set 4 for maximum beam diameter of 1700 km in a separate table in TR 36.763:

NOTE: There is no impact on Table 6.1-1 : IoT NTN reference scenario parameters in TR 36.763

|  |  |  |  |
| --- | --- | --- | --- |
| 3GPP TR 36.763 V0.1.0 Table 6.1-1 parameters that could be impacted by the beam size revision: | Current values in TR 36.763 V0.1.0 for LEO 600 km | Assumed and computed values under the consideration of a beam of 1700 km in diameter pointed at Nadir: | Comment |
| Min Elevation angle for both sat-gateway and C-IoT device | 10° for service link and 10° for feeder link | 30° for service link and 10° for feeder link | Assumed value for service link is higher than value in Table 6.1-1 in TR 36.763. No revision needed. |
| Max distance between satellite and C-IoT device at min elevation angle | 1,932 km | 1075.8 km  (Computed for a terminal located at the beam edge, corresponding to an elevation angle of 30 degrees) | Computed value is lower than current value in Table 6.1-1 in TR 36.763. No revision needed. |
| Max Round Trip Delay (propagation delay only) | 25.77 ms (service and feeder links) | 20.05 ms  (Computed for a terminal located at the beam edge, corresponding to an elevation angle of 30 degrees. Feeder link elevation angle kept at 10º) | Computed value is lower than current value in Table 6.1-1 in TR 36.763. No revision needed. |
| Max differential delay within a cell | 3.12 ms | 1.58 ms  (Computed as the maximum differential delay between a device at beam edge and one at beam center) | Computed value is lower than current value in Table 6.1-1 in TR 36.763. No revision needed. |
| Max Doppler shift variation (earth fixed user equipment) (NOTE 6)” | 24 ppm | 19,95 ppm  (Computed for a terminal at beam edge, corresponding to an elevation angle of 30 degrees) | Computed value is lower than current value in Table 6.1-1 in TR 36.763. No revision needed. |

Include the following in TR36.763

Add MEO scenario D in Table 4.2-1 in TR 36.763.

Table 4.2-1: IoT NTN reference scenarios (TR 36.763)

|  |  |
| --- | --- |
| **NTN Configurations** | **Transparent satellite** |
| GEO based non-terrestrial access network | Scenario A |
| LEO based non-terrestrial access network generating steerable beams (altitude 1200 km and 600km) | Scenario B |
| LEO based non-terrestrial access network generating fixed beams whose footprints move with the satellite (altitude 1200 km and 600km) | Scenario C |
| MEO based non-terrestrial access network generating fixed beams whose footprints move with the satellite (altitude 10000 km) | Scenario D |

Add MEO IoT NTN reference scenario parameters in Table 6.1-1 in TR 36.763:

Table 6.1-1: IoT NTN reference scenario parameters (TR 36.763)

|  |  |  |  |
| --- | --- | --- | --- |
| Scenarios | **GEO based non-terrestrial access network - scenario A** | **LEO based non-terrestrial access network -Scenario B & C** | **MEO based non-terrestrial access network -Scenario D** |
| Orbit type | station keeping a nominally fixed position in terms of elevation/azimuth with respect to a given earth point | circular orbiting at low altitude around the earth | circular orbiting at medium altitude around the earth |
| Altitude | 35,786 km | 600 km  1,200 km | 10,000 km |
| Frequency Range | < 6 GHz (e.g. 2 GHz in S band) | | |
| Device channel Bandwidth (service link) (NOTE 7) | -                  NB-IoT 180 kHz (DL), Up to 180 kHz with all permissible smaller resource allocations 12\*15 kHz, 6\*15 kHz, 3\*15 kHz, 1\*15 kHz, 1\*3.75 kHz (UL)  -                  eMTC: 1080 kHz (DL), Up to 1080 kHz with all permissible smaller resource allocations, including 2\*180 kHz, 180 kHz, 2\*15 kHz or 3\*15 kHz or 6\*15 kHz (UL) | | |
| Payload | Transparent type | Transparent Type | Transparent type |
| Earth-fixed beams | Yes | Scenario B:  Yes (steerable beams), see NOTE 1  Scenario C: No (the beams move with the satellite) | Scenario D: The beams move with the satellite |
| Max beam footprint size (edge to edge) regardless of the elevation angle | 3500 km (NOTE 3) | 1000 km (NOTE 2) | 4018 km |
| Min Elevation angle for both sat-gateway and C-IoT device | 10° for service link and 10° for feeder link | 10° for service link and 10° for feeder link | 10° for service link and 10° for feeder link |
| Max distance between satellite and C-IoT device at min elevation angle | 40,581 km | 1,932 km (600 km altitude)   3,131 km (1,200 km altitude) | 14018 km |
| Max Round Trip Delay (propagation delay only) | 541.46ms (service and feeder links) | 25.77 ms (600km) (service and feeder links)  41.77 ms (1200km) (service and feeder links) | 95.19 ms  (service and feeder links) |
| Max differential delay within a cell | 10.3 ms | 3.12 ms and 3.18 ms for respectively 600km and 1200km | 13.4 ms |
| Max Doppler shift (earth fixed user equipment) (NOTE 6) | 0.93 ppm | 24 ppm (600km)   21ppm(1200km) | 7.5 ppm |
| Max Doppler shift variation (earth fixed user equipment) (NOTE 6) | 0.000 045 ppm/s | 0.27 ppm/s (600km)    0.13 ppm/s (1200km) | 0.003 ppm/s |
| C-IoT device motion on the earth | Min 0 km/s (stationary device), max 120 km/h | Min 0 km/s (stationary device), max 120 km/h | Min 0 km/s (stationary device), max 120 km/h |
| C-IoT device antenna types | Omnidirectional antenna with 0 dBi TX antenna gain and 0 dBi RX antenna gain (NOTE 4) | | |
| C-IoT device max Tx power | UE power class 3 with up to 200 mW (23dBm), UE power class 5 with up to 100 mW (20 dBm) | | |
| C-IoT device Noise Figure | Omnidirectional antenna: 7 dB or 9 dB (NOTE 5) | | |
| Service link | 3GPP defined Narrow Band IoT and eMTC | | |
| NOTE 1:      Each satellite has the capability to steer beams towards fixed points on earth using beamforming techniques. This is applicable for a period of time corresponding to the visibility time of the satellite.  NOTE 2:      This beam size refers to the Nadir pointing of the satellite.  NOTE 3:      The Maximum beam footprint size for GEO is based on current state of the art GEO High Throughput systems, assuming either spot beams at the edge of coverage (low elevation) or a single wide-beam.  NOTE 4:      The use of a Circular polarized antenna is optional.  NOTE 5:      Same Noise Figure of 7 dB as in Release 16 TR 38.821 or 9 dB as in Release 12 TR 36.888 for device can be assumed for link budget. The noise figure is device vendor implementation specific.  NOTE 6:      Max Doppler shift and Max Doppler shift variation in the absence of any device pre-compensation of satellite Doppler shift on the service link.  NOTE 7:      System bandwidth is FFS | | | |

Include MEO Set-5 parameters for link budget analysis in a new Table 6.2-8 in TR 36.763, as a representative characterization of NTN-IoT scenarios with MEO altitude and characteristics:

Table 6.2-8: Sets of satellite parameters for link budget and system level evaluations

|  |  |
| --- | --- |
|  | **Proposed MEO Scenarios (Set 5)** |
| Satellite orbit | MEO |
| Satellite altitude | 10,000 km |
| Payload characteristics for DL transmission | |
| Frequency band | S-band (i.e. 2 GHz) |
| Equivalent satellite antenna aperture (NOTE1) | 1.5 m |
| Satellite EIRP density | 45.4 dBW/MHz |
| Satellite Tx max Gain | 28.1 dBi |
| 3dB beamwidth | 6.5 degrees |
| Satellite beam diameter (at nadir pointing) | 1140 km |
| Payload characteristics for UL reception | |
| Frequency band | S-band (i.e. 2 GHz) |
| Equivalent satellite antenna aperture (NOTE1) | 1.5 m |
| G/T | 3.8 dB/K |
| Satellite Rx max Gain | 28.1 dBi |
| NOTE 1: This value is equivalent to the antenna diameter for the parabolic reflector modelled in Sec. 6.4.1 of TR 38.811. Other antenna models can be considered. | |

Add MEO Set-5 satellite parameters for system level simulator calibration   in a new Table 6.2-9 in TR 36.763:

Table 6.2-9: Set-5 parameters for link budget analysis

|  |  |
| --- | --- |
| **Set 5** | **MEO** |
| 3 dB Beam width (HPBW) | 6.5 degrees |
| Central beam center elevation | 90 degrees |
| Central beam edge elevation | 81.6 degrees |
| Central beam edge satellite-UE distance | 10042 km |

Add observation in TR 36.763:

The doppler shift/variation and the delay variation for MEO are smaller than for LEO. The maximum delay for MEO is smaller than for GEO. The IoT-NTN enhancements for LEO and GEO should be sufficient to support MEO.

NOTE: The parameter set for MEO is only for information/reference and evaluation/enhancements are mainly considered for GEO and LEO. These enhancements can be applicable for MEO.

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

Capture in TR 36.763, moderator’s summary of GNSS Position fix impact on UE power consumption based on Appendix A Section 5.1

Capture in TR 36.763, individual companies battery life analysis in Appendix A

UE pre-compensation done per N time units for long PUSCH is the baseline solution.

* The pre-compensation does not vary within a block of N time units
* FFS: the definition and value of N

UE pre-compensation done per N time units for long PRACH is the baseline solution.

* The pre-compensation does not vary within a block of N time units
* FFS: the definition and value of N

For DL synchronization in the Rel-17 timeframe, the following should be considered

* New Channel raster with a step size increased to be greater than 100 kHz
* (part of) ARFCN-indication-in-MIB

Capture the following in the TR:

The required power consumption to read SIB containing satellite ephemeris information for the short sporadic connections use case is not significant.

* Note: For this conclusion, it is assumed that the UE need not read broadcast SIB for the purpose of obtaining satellite ephemeris information in CONNECTED mode.

**Agreements on “Timing relationship enhancements”**

The following NB-IoT timing relationships need enhancing for essential minimum functionality of IoT NTN:

* NPDCCH to NPUSCH format 1
* RAR grant to NPUSCH format 1
* NPDSCH to HARQ-ACK on NPUSCH format 2
* Timing advance command activation
* FFS: NPDCCH order to NPRACH
* FFS: Other NB-IoT timing relationships

The enhancement based on extending the timing relationship, by e.g. Koffset, adopted in NR NTN should be the starting point for enhancement of NB-IoT timing relationships in IoT NTN. Details can be further discussed considering IoT NTN.

The following eMTC timing relationships need enhancing for **essential minimum functionality of** IoT NTN:

* MPDCCH to PUSCH
* RAR grant to PUSCH
* MPDCCH to scheduled uplink SPS
* PUSCH to HARQ-ACK on PUCCH
* CSI reference resource timing
* MPDCCH to aperiodic SRS
* Timing advance command activation
* FFS: MPDCCH order to PRACH
* FFS: Other eMTC timing relationships

The enhancement based on extending the timing relationship, by e.g. Koffset, adopted in NR NTN should be the starting point for enhancement of eMTC timing relationships in IoT NTN. Details can be further discussed considering IoT NTN.

For NB-IoT over NTN, the following timing relationship needs to be studied to check whether enhancement is necessary and beneficial:

* PRACH preamble retransmission

For eMTC over NTN, the following timing relationship needs to be studied to check whether enhancement is necessary and beneficial:

* PRACH preamble retransmission

Capture the following in the TR:

The UE-specific TA and/or K\_offset can be used by the eNB in its scheduling to avoid UL-DL collisions in FDD-HD.

The following aspects of Koffset are not to be studied further and can at least rely on decisions made in the NR NTN WI:

* Explicit or implicit indication in system information
* Support UE-specific Koffset after initial access

**Agreements on HARQ enhancements:**

Increasing the number of HARQ processes for NB-IoT and for eMTC in NTN is recommended not to be supported in Rel-17.

#### Remaining Open issues

## 2.2 RAN2

#### 2.2.1 Agreements

* **RAN1#114-e, 10th May – 27th May 2021, e-meeting**

Agreements from AI 9.2.1: Organizational and scenarios

**Essential Functionality:**

**Disabling of HARQ feedback is not essential**

Agreements from email discussion [AT114-e][032][IoT NTN] TR Essential Features:

2: No need has been identified in RAN2 for further R17 IoT NTN enhancement regarding eMTC and NB-IoT Coverage Enhancement features. They are assumed applicable to IoT NTN. L1 issues if any, and the potential related need for further enhancement, are assumed addressed by RAN1.

3: Enhancement to PDCP discard timer is not essential, but can be considered in the WI as TS impact is very small.

4: No additional agreements on “earth-moving cell” are needed in The SI for Tracking Area Handling, as this is included in the already made agreements.

5: Referring to a previous agreement: “The NR-NTN agreements, where the network may broadcast more than one TACs per PLMN in a cell is considered for IoT NTN (other options not excluded for now)”, Remove the text “*(other options not excluded for now)”* from previous agreement.

6: Referring to a previous agreement, “[035] 15: RAN2 should wait until agreements regarding TAU are made in the NR-NTN WI, and use those for eMTC/NB-IoT over NTN, if applicable. “. TAU details based on agreements regarding TAU made in the NR-NTN WI is handled in the IoT NTN WI as a part of using the earth-fixed TA concept.

13: Enhancements for SON and channel quality reporting for NTN have not been found to be essential

8: Support of legacy (R16) cell selection/reselection mechanisms without major enhancements is considered essential. Minor adjustments to existing mobility mechanisms, such as a new parameter values, change to timing etc. can be considered to adapt functionality to NTN.

9:  From RAN2 point of view, the existing power saving mechanisms e.g. DRX, PSM, eDRX, relaxed monitoring, and WUS can be reused without enhancement. Can consider enhancements if found needed, to support discontinuous coverage.

10: Support of discontinuous coverage without excessive UE power consumption and without excessive failures / recovery actions, is essential, Expectation that this need to be taken into account at least for Idle mode, and that this is applicable for all reference scenarios (GEO, MEO and LEO).

12: Enhancements for power saving in connected mode power are not essential. Minor adaptations to enable support in NTN deployment of existing features e.g. EDT, PUR for GEO may be considered in WI phase. (no major changes for adaptation is assumed).

15: Support for EPC is essential. RAN2 believes that support for 5GC is not essential, however the impact in RAN2 to additionally support 5GC is small and is feasible.

16: The SI can be closed from RAN2 perspective.

11: Support of legacy (R16) Handover and RLF/reestablishment mechanisms without major enhancements is considered essential. For eMTC, Rel-16 LTE CHO procedure can be considered without major enhancements. Minor adjustments to existing mobility mechanisms, such as a new parameter values, change to timing etc. can be considered to adapt functionality to NTN.

Agreements from AI 9.2.2: Open issues not covered by NR NTN

**The details of MAC (36.321) specification changes and other signalling aspects of HARQ can be discussed in Work Item phase (non technical agreement).**

**For PUR, offset is suggested to be added to the start of pur-ResponseWindowTimer. If the start of the pur-ResponseWindowTimer is accurately compensated by UE-gNB RTT, there is no need to extend pur-ResponseWindowTimer value range.**

**For a UE, it shall be possible to predict discontinuous coverage based on the satellite assistance information. To the extent possible/reasonable: The UE is expected to save power by not attempting to camp or connect when coverage is not there. To the extent possible/reasonable: The network is expected not try to reach UEs that are out of coverage. Note that it is still an expected requirement that UE and Network are synchronized w.r.t. when the UE is awake and reachable (e.g. for paging].**

**For some IoT UEs it is expected that SI enhancements based on same SI provided in multiple cells can bring power consumption benefits.**

Agreements from AI 9.2.2: Other Open issues

**On paging capacity, should capture in the main part of the TR how to calculate, then capture in an annex some examples (and it should be clear that this is examples).**

**Include reference to company tdocs in TR 36.373 on examples of Connection density, and RACH capacity.**

**For the TA handling, the details are expected to be settled in the WI, e.g. the requirements for UE to update/reread SI.**

**RAN2 assumes that the existing Qoffset(s) can be used for cell re-selection between TN and NTN.**

* **RAN1#113bis-e, 12th April – 20th April 2021, e-meeting**

Agreements on AI 9.2.1: Organizational and scenarios

The following points are endorsed

* Enhancements to ra-ResponseWindow and mac-ContentionResolutionTimer are essential. R2 assume that design can follow NR NTN agreements as baseline.
* Enhancements to HARQ-RTT-Timer and UL-HARQ-RTT-Timer are essential. R2 assume that design can follow NR NTN agreements as baseline.
* Enhancements to sr-ProhibitTimer are essential. R2 assume that design can follow NR NTN agreements as baseline.
* Enhancements to RLC SN and PDCP SN are not essential.
* Enhancements to tracking area management are essential.
* Provisioning of ephemeris is essential. NR NTN agreements can be used as the baseline.

There is significant interest for Power saving in idle mode for NTN IOT devices, e.g. there is significant interest for enhancements to eDRX/PSM (discontinuous coverage) and to relaxed monitoring, SI acquisition and WUS.

The following points are endorsed

* Enhancements to UL scheduling for latency reduction are not essential.
* Enhancements to PUR are not essential (19/23). Enhancement to pur-ResponseTimer is needed and feasibility of PUR in GEO and LEO scenarios needs to be checked by RAN1.
* Enhancements to RLC t-Reordering timer are essential. There is no need for further study as design can follow NR NTN agreements.

Chair: Most companies think Enhancements for power saving in connected mode are not essential for NTN IOT devices.

Agreements on AI 9.2.2: User Plane

Agreements on AI 9.2.3: Mobility and Tracking Area

R2 has (so far) not identified any issue in order to support CHO for Cat-M UEs with EPC.

For handling of coverage holes or discountinous satellite coverage in a power efficient way R2 assumes that Sattelite assistance information, e.g. ephemeris info, can be used.

The NR-NTN agreements, where the network may broadcast more than one TACs per PLMN in a cell is considered for IoT NTN (other options not excluded for now)

For enhancements to CHO, e.g. location and time based triggering events related to CHO in eMTC-based NTN should follow NR-NTN.

For Connected mode, for both NB-IoT and eMTC, Legacy RLF and reestablishment procedures can be used (minor enhancement can be considered).

Agreements on AI 9.2.4: Other

Invite for input to the TR on paging evalutation for next meeting, use assumptions from this paper when applicable.

#### 2.2.2 Remaining Open issues

## 2.3 RAN3

#### 2.3.1 Agreements: N/A (RAN3 is not involved in the SI)

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

## 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#105-e, 10th May – 27th May 2021, 2021**

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

* R1-210XXXX Session notes for 8.15 (Study on NB-IoT/eMTC support for Non-Terrestrial Network) Ad-Hoc Chair (Ericsson)
* [R1-2104573](file:///C:\Users\Docs\R1-2104573.zip) Link budget result calibration Spreadsheet for IoT NTN MediaTek Inc.
* [R1-2105815](file:///C:\Users\Docs\R1-2105815.zip) Study on Narrow-Band Internet of Things (NB-IoT) / enhanced Machine Type Communication (eMTC) support for Non-Terrestrial Networks (NTN) (Release 17) Rapporteur (MediaTek)
* **R1-2105815** 3GPP TR 36.763 V0.3.0, R1-2105815 is endorsed

Submitted to AI 8.15.1: Scenarios applicable to NB-IoT/eMTC

* [R1-2104258](file:///C:\Users\Docs\R1-2104258.zip) Application scenarios of IoT in NTN Huawei, HiSilicon
* [R1-2104403](file:///C:\Users\Docs\R1-2104403.zip) Discussion on eMTC enabling High Value NTN IoT use-cases Omnispace
* [R1-2104503](file:///C:\Users\Docs\R1-2104503.zip) Applicable scenarios to NB-IoT/eMTC CATT
* [R1-2104567](file:///C:\Users\Docs\R1-2104567.zip) Scenarios applicable to IoT NTN MediaTek Inc.
* [R1-2104636](file:///C:\Users\Docs\R1-2104636.zip) Discussion on scenarios applicable to NB-IoT/eMTC CMCC
* [R1-2104777](file:///C:\Users\Docs\R1-2104777.zip) Discussion on scenarios applicable to NB-IoT/eMTC OPPO
* [R1-2104814](file:///C:\Users\Docs\R1-2104814.zip) On scenarios and evaluations for NB-IoT and eMTC based NTN Ericsson
* [R1-2104822](file:///C:\Users\Docs\R1-2104822.zip) Scenarios applicable to NB-IoT/eMTC Qualcomm Incorporated
* [R1-2105138](file:///C:\Users\Docs\R1-2105138.zip) On Link Budget Analysis of IoT NTN Apple
* [R1-2105182](file:///C:\Users\Docs\R1-2105182.zip) IoT-NTN Link Budgets Sony
* [R1-2105193](file:///C:\Users\Docs\R1-2105193.zip) Discussion on the remaining issues of scenarios and assumption for IoT-NTN ZTE
* [R1-2105345](file:///C:\Users\Docs\R1-2105345.zip) Initial link budget evaluation for NB-IoT/eMTC Samsung
* [R1-2105404](file:///C:\Users\Docs\R1-2105404.zip) Link budget evaluations and deployment for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2105946](file:///C:\Users\Docs\R1-2105946.zip) Discussion on eMTC enabling High Value NTN IoT use-cases Omnispace
* R1-2104571 Summary #1 of AI 8.15.1 Scenarios applicable to NB-IoT/eMTC NTN MediaTek Inc.
* R1-2106190 Summary #2 of AI 8.15.1 Scenarios applicable to NB-IoT/eMTC NTN MediaTek Inc.

Submitted to AI 8.15.2 Enhancements to time and frequency synchronization

* [R1-2104259](../../../../../../Docs/R1-2104259.zip) Discussion on time and frequency synchronization enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2104399](../../../../../../Docs/R1-2104399.zip) Discussion on enhancements to time and frequency synchronization on NB-IoT\_eMTC for NTN vivo
* [R1-2104448](../../../../../../Docs/R1-2104448.zip) Consideration on enhancements to time and frequency synchronization for IoT NTN Spreadtrum Communications
* [R1-2104504](../../../../../../Docs/R1-2104504.zip) Time and frequency synchronization for NB-IoT/eMTC CATT
* [R1-2104568](../../../../../../Docs/R1-2104568.zip) Enhancements to time and frequency synchronization for IoT NTN MediaTek Inc.
* [R1-2104637](../../../../../../Docs/R1-2104637.zip) Enhancements to time and frequency synchronization for IoT NTN CMCC
* [R1-2104778](../../../../../../Docs/R1-2104778.zip) Discussion on enhancements to time and frequency synchronization OPPO
* [R1-2104815](../../../../../../Docs/R1-2104815.zip) On time and frequency synchronization enhancements for IoT NTN Ericsson
* [R1-2104823](../../../../../../Docs/R1-2104823.zip) Enhancements to time and frequency synchronization Qualcomm Incorporated
* [R1-2104937](../../../../../../Docs/R1-2104937.zip) On synchronization for NB-IoT and eMTC NTN Intel Corporation
* [R1-2105139](../../../../../../Docs/R1-2105139.zip) Time and Frequency Synchronization in IoT NTN Apple
* [R1-2105183](../../../../../../Docs/R1-2105183.zip) Enhancements to time and frequency synchronisation for IoT-NTN Sony
* [R1-2105194](../../../../../../Docs/R1-2105194.zip) Discussion on the synchronization for IoT-NTN ZTE
* [R1-2105346](../../../../../../Docs/R1-2105346.zip) On enhancements to time and frequency synchronization Samsung
* [R1-2105405](../../../../../../Docs/R1-2105405.zip) Enhancement to time and frequency synchronization for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2105551](../../../../../../Docs/R1-2105551.zip) Discussion on time and frequency synchronization for IoT NTN Xiaomi
* [R1-2105624](../../../../../../Docs/R1-2105624.zip) Time and frequency synchronization for IoT NTN Lenovo, Motorola Mobility
* [R1-2105676](../../../../../../Docs/R1-2105676.zip) Time/Frequency Synchronization for IoT NTN InterDigital, Inc.
* [R1-2105825](../../../../../../Docs/R1-2105825.zip) Time and Frequency Synchronization to NB-IoT in NTN Asia Pacific Telecom, FGI
* R1-2104572 "Summary #1 of AI 8.15.2 Enhancements to time and frequency synchronization for IoT NTN" MediaTek Inc.
* **R1-2104572** Summary #1 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)
* **R1-2106095** Summary #2 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)
* **R1-2106191** Summary #3 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)

Submitted TDocs to 8.15.3: Timing relationship enhancements

* [R1-2104260](file:///C:\Users\Docs\R1-2104260.zip) Discussion on timing relationship enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2104449](file:///C:\Users\Docs\R1-2104449.zip) Consideration on timing relationship enhancements for IoT NTN Spreadtrum Communications
* [R1-2104505](file:///C:\Users\Docs\R1-2104505.zip) Timing relationship enhancement for NB-IoT/eMTC CATT
* [R1-2104569](file:///C:\Users\Docs\R1-2104569.zip) Timing relationship enhancements for IoT NTN MediaTek Inc.
* [R1-2104638](file:///C:\Users\Docs\R1-2104638.zip) Timing relationship enhancements for IoT NTN CMCC
* [R1-2104779](file:///C:\Users\Docs\R1-2104779.zip) Discussion on timing relationship enhancements OPPO
* [R1-2104816](file:///C:\Users\Docs\R1-2104816.zip) On timing relationship enhancements for IoT NTN Ericsson
* [R1-2104824](file:///C:\Users\Docs\R1-2104824.zip) Timing relationship enhancements Qualcomm Incorporated
* [R1-2104938](file:///C:\Users\Docs\R1-2104938.zip) On timing relationship for NB-IoT and eMTC NTN Intel Corporation
* [R1-2105140](file:///C:\Users\Docs\R1-2105140.zip) Timing Relationship Enhancement in IoT NTN Apple
* [R1-2105184](file:///C:\Users\Docs\R1-2105184.zip) Timing relationship enhancements for IoT-NTN Sony
* [R1-2105195](file:///C:\Users\Docs\R1-2105195.zip) Discussion on timing relationship for IoT-NTN ZTE
* [R1-2105347](file:///C:\Users\Docs\R1-2105347.zip) Timing relationship enhancements Samsung
* [R1-2105406](file:///C:\Users\Docs\R1-2105406.zip) Timing relationship enhancements for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2105503](file:///C:\Users\Docs\R1-2105503.zip) RAR Window Offset Fraunhofer IIS / Fraunhofer HHI
* [R1-2105552](file:///C:\Users\Docs\R1-2105552.zip) Discussion on the timing relationship enhancement for IoT NTN Xiaomi
* [R1-2105677](file:///C:\Users\Docs\R1-2105677.zip) Timing relationship enhancement for IoT NTN InterDigital, Inc.
* [R1-2105826](file:///C:\Users\Docs\R1-2105826.zip) Timing relationship enhancements to NB-IoT in NTN Asia Pacific Telecom, FGI
* **R1-2106080** FL summary #1 of AI 8.15.3: Timing relationships for IoT-NTN Moderator (Sony)
* **R1-2106189** FL summary #2 of AI 8.15.3: Timing relationships for IoT-NTN Moderator (Sony)
* **R1-2106310** FL summary #2 of AI 8.15.3: Timing relationships for IoT-NTN Moderator (Sony)

Submitted TDocs to AI 8.15.4: Enhancements on HARQ

* [R1-2104261](file:///C:\Users\Docs\R1-2104261.zip) Discussion on HARQ enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2104400](file:///C:\Users\Docs\R1-2104400.zip) Discussion on HARQ enhancements on NB-IoT\_eMTC for NTN vivo
* [R1-2104450](file:///C:\Users\Docs\R1-2104450.zip) Consideration on enhancements on HARQ for IoT NTN Spreadtrum Communications
* [R1-2104506](file:///C:\Users\Docs\R1-2104506.zip) HARQ operation enhancement for NB-IoT/eMTC CATT
* [R1-2104570](file:///C:\Users\Docs\R1-2104570.zip) Enhancements on HARQ for IoT NTN MediaTek Inc.
* [R1-2104639](file:///C:\Users\Docs\R1-2104639.zip) Enhancements on HARQ for IoT NTN CMCC
* [R1-2104780](file:///C:\Users\Docs\R1-2104780.zip) Discussion on HARQ enhancements OPPO
* [R1-2104817](file:///C:\Users\Docs\R1-2104817.zip) On HARQ enhancements for IoT NTN Ericsson
* [R1-2104825](file:///C:\Users\Docs\R1-2104825.zip) Enhancements on HARQ Qualcomm Incorporated
* [R1-2105141](file:///C:\Users\Docs\R1-2105141.zip) HARQ Enhancement in IoT NTN Apple
* [R1-2105185](file:///C:\Users\Docs\R1-2105185.zip) HARQ enhancements for IoT-NTN Sony
* [R1-2105196](file:///C:\Users\Docs\R1-2105196.zip) Discussion on HARQ for IoT-NTN ZTE
* [R1-2105348](file:///C:\Users\Docs\R1-2105348.zip) On enhancements on HARQ Samsung
* [R1-2105407](file:///C:\Users\Docs\R1-2105407.zip) HARQ for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2105553](file:///C:\Users\Docs\R1-2105553.zip) Discussion on the HARQ enhancement for IoT NTN Xiaomi
* [R1-2105621](file:///C:\Users\Docs\R1-2105621.zip) HARQ enhancement for IoT NTN Lenovo, Motorola Mobility
* [R1-2105678](file:///C:\Users\Docs\R1-2105678.zip) HARQ enhancement for IoT NTN InterDigital, Inc.
* [R1-2105827](file:///C:\Users\Docs\R1-2105827.zip) Enhancements on HARQ to NB-IoT in NTN Asia Pacific Telecom, FGI
* **R1-2106060** Summary#1 of enhancements on HARQ Moderator (Samsung)
* **R1-2106061** Summary#2 of enhancements on HARQ Moderator (Samsung)
* **R1-2106271** Summary#3 of enhancements on HARQ Moderator (Samsung)

Submitted TDocs to AI 8.15.5: Others

* [R1-2104451](file:///C:\Users\Docs\R1-2104451.zip) Consideration on other design aspects for IoT NTN Spreadtrum Communications
* [R1-2104781](file:///C:\Users\Docs\R1-2104781.zip) Discussion on other aspects OPPO
* [R1-2104820](file:///C:\Users\Docs\R1-2104820.zip) On evaluation assumptions for NB-IoT and eMTC based NTN Ericsson
* [R1-2104826](file:///C:\Users\Docs\R1-2104826.zip) Other aspects for NTN IOT Qualcomm Incorporated
* [R1-2105197](file:///C:\Users\Docs\R1-2105197.zip) Discussion on additional enhancement for IoT-NTN ZTE
* [R1-2105408](file:///C:\Users\Docs\R1-2105408.zip) Applicability of NB-IoT/eMTC features for NTN Nokia, Nokia Shanghai Bell
* [R1-2105530](file:///C:\Users\Docs\R1-2105530.zip) Other aspects to support IoT in NTN Huawei, HiSilicon
* [R1-2105554](file:///C:\Users\Docs\R1-2105554.zip) Discussion on the other design aspects for IoT NTN Xiaomi

**RAN1#104bis-e, 12th April – 20th April 2021, e-meeting**

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

* [R1-2102753](file:///C:\Users\Docs\R1-2102753.zip) FS\_LTE\_NBIOT\_eMTC\_NTN work plan MediaTek Inc.

Submitted to AI 8.15.1: Scenarios applicable to NB-IoT/eMTC

* [R1-2102343](file:///C:\Users\Docs\R1-2102343.zip) Application scenarios of IoT in NTN Huawei, HiSilicon
* [R1-2102422](file:///C:\Users\Docs\R1-2102422.zip) Discussion on scenarios applicable to NB-IoT/eMTC OPPO
* [R1-2102550](file:///C:\Users\Docs\R1-2102550.zip) Discussion on scenarios applicable to NB-IoT\_eMTC for NTN vivo
* [R1-2102617](file:///C:\Users\Docs\R1-2102617.zip) Applicable scenario and initial evaluation result to NB-IoT/eMTC CATT
* [R1-2102750](file:///C:\Users\Docs\R1-2102750.zip) Discussion on NTN-IoT scenario with MEO Hughes/EchoStar
* [R1-2102754](file:///C:\Users\Docs\R1-2102754.zip) Scenarios applicable to IoT NTN MediaTek Inc.
* [R1-2102831](file:///C:\Users\Docs\R1-2102831.zip) Link budget evaluations for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2102905](file:///C:\Users\Docs\R1-2102905.zip) Discussion on scenarios applicable to NB-IoT/eMTC CMCC
* [R1-2102916](file:///C:\Users\Docs\R1-2102916.zip) Discussion on the scenarios and assumption for IoT-NTN ZTE
* [R1-2102972](file:///C:\Users\Docs\R1-2102972.zip) Discussion on the link budget of NBIoT and eMTC over NTN Xiaomi
* [R1-2103060](file:///C:\Users\Docs\R1-2103060.zip) On scenarios and evaluations for NB-IoT and eMTC based NTN Ericsson
* [R1-2103070](file:///C:\Users\Docs\R1-2103070.zip) Scenarios applicable to NB-IoT/eMTC Qualcomm Incorporated
* [R1-2103132](file:///C:\Users\Docs\R1-2103132.zip) Link Budget Analysis of IoT NTN Apple
* [R1-2103266](file:///C:\Users\Docs\R1-2103266.zip) Initial link budget evaluation for NB-IoT/eMTC Samsung
* [R1-2103318](file:///C:\Users\Docs\R1-2103318.zip) Scenarios for IoT-NTN Sony
* [R1-2103716](file:///C:\Users\Docs\R1-2103716.zip) Link budget analysis for Set-4 Sateliot, Gatehouse, Thales
* **R1-2103826** Summary #1 of AI 8.15.1 Scenarios applicable to NB-IoT/eMTC Document for: Discussion and Decision Moderator (MediaTek)

Submitted to AI 8.15.2 Enhancements to time and frequency synchronization

* [R1-2102344](../../../../../../Docs/R1-2102344.zip) Discussion on time and frequency synchronization enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2102423](../../../../../../Docs/R1-2102423.zip) Discussion on enhancements to time and frequency synchronization OPPO
* [R1-2102473](../../../../../../Docs/R1-2102473.zip) Consideration on enhancements to time and frequency synchronization Spreadtrum Communications
* [R1-2102618](../../../../../../Docs/R1-2102618.zip) Time and frequency synchronization for NB-IoT/eMTC CATT
* [R1-2102736](../../../../../../Docs/R1-2102736.zip) Enhancements to time and frequency synchronization Asia Pacific Telecom, FGI, ITRI, III
* [R1-2102755](../../../../../../Docs/R1-2102755.zip) Enhancements to time and frequency synchronization for IoT NTN MediaTek Inc.
* [R1-2102832](../../../../../../Docs/R1-2102832.zip) Enhancement to time and frequency synchronization for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2102906](../../../../../../Docs/R1-2102906.zip) Enhancements to time and frequency synchronization for IoT NTN CMCC
* [R1-2102917](../../../../../../Docs/R1-2102917.zip) Discussion on the synchronization for IoT-NTN ZTE
* [R1-2102973](../../../../../../Docs/R1-2102973.zip) Discussion on time and frequency synchronization for IoT NTN Xiaomi
* [R1-2103056](../../../../../../Docs/R1-2103056.zip) On synchronization for NB-IoT and eMTC NTN Intel Corporation
* [R1-2103061](../../../../../../Docs/R1-2103061.zip) On time and frequency synchronization enhancements for IoT NTN Ericsson
* [R1-2103071](../../../../../../Docs/R1-2103071.zip) Enhancements to time and frequency synchronization Qualcomm Incorporated
* [R1-2103133](../../../../../../Docs/R1-2103133.zip) On Time and Frequency Synchronization in IoT NTN Apple
* [R1-2103267](../../../../../../Docs/R1-2103267.zip) On enhancements to time and frequency synchronization Samsung
* [R1-2103273](../../../../../../Docs/R1-2103273.zip) Time/Frequency Synchronization for IoT NTN InterDigital, Inc.
* [R1-2103319](../../../../../../Docs/R1-2103319.zip) Time and frequency synchronisation enhancements for IoT-NTN Sony
* [R1-2103528](../../../../../../Docs/R1-2103528.zip) Time and frequency synchronization for IoT NTN Lenovo, Motorola Mobility
* **R1-2102758** Summary #1 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)
* **R1-2103908** Summary #2 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)
* **R1-2103950** Summary #3 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)

Submitted TDocs to 8.15.3: Timing relationship enhancements

* [R1-2102345](file:///C:\Users\Docs\R1-2102345.zip) Discussion on timing relationship enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2102424](file:///C:\Users\Docs\R1-2102424.zip) Discussion on timing relationship enhancements OPPO
* [R1-2102474](file:///C:\Users\Docs\R1-2102474.zip) Consideration on timing relationship enhancements Spreadtrum Communications
* [R1-2102619](file:///C:\Users\Docs\R1-2102619.zip) Timing relationship enhancement for NB-IoT/eMTC CATT
* [R1-2102737](file:///C:\Users\Docs\R1-2102737.zip) Timing relationship enhancements Asia Pacific Telecom, FGI, ITRI, III
* [R1-2102756](file:///C:\Users\Docs\R1-2102756.zip) Timing relationship enhancements for IoT NTN MediaTek Inc.
* [R1-2102800](file:///C:\Users\Docs\R1-2102800.zip) Timing relationship enhancements to support NB-IoT eMTC in Non-Terrestrial Network Zhejiang Lab
* [R1-2102833](file:///C:\Users\Docs\R1-2102833.zip) Timing relationship enhancements for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2102907](file:///C:\Users\Docs\R1-2102907.zip) Timing relationship enhancements for IoT NTN CMCC
* [R1-2102918](file:///C:\Users\Docs\R1-2102918.zip) Discussion on timing relationship for IoT-NTN ZTE
* [R1-2102974](file:///C:\Users\Docs\R1-2102974.zip) Discussion on the timing relationship enhancement for IoT NTN Xiaomi
* [R1-2103057](file:///C:\Users\Docs\R1-2103057.zip) On timing relationship for NB-IoT and eMTC NTN Intel Corporation
* [R1-2103062](file:///C:\Users\Docs\R1-2103062.zip) On timing relationship enhancements for IoT NTN Ericsson
* [R1-2103072](file:///C:\Users\Docs\R1-2103072.zip) Timing relationship enhancements Qualcomm Incorporated
* [R1-2103134](file:///C:\Users\Docs\R1-2103134.zip) On Timing Relationship Enhancement in IoT NTN Apple
* [R1-2103268](file:///C:\Users\Docs\R1-2103268.zip) Timing relationship enhancements Samsung
* [R1-2103274](file:///C:\Users\Docs\R1-2103274.zip) Timing relationship enhancement for IoT NTN InterDigital, Inc.
* [R1-2103320](file:///C:\Users\Docs\R1-2103320.zip) Timing relationships for IoT-NTN Sony
* [R1-2103529](file:///C:\Users\Docs\R1-2103529.zip) Timing relationship enhancements for IoT NTN Lenovo, Motorola Mobility
* R1-2104083 FL summary #4 of AI 8.15.3: Timing relationship for IoT-NTN, Moderator (Sony)

Submitted TDocs to AI 8.15.4: Enhancements on HARQ

* [R1-2102346](file:///C:\Users\Docs\R1-2102346.zip) Discussion on HARQ enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2102425](file:///C:\Users\Docs\R1-2102425.zip) Discussion on HARQ enhancements OPPO
* [R1-2102475](file:///C:\Users\Docs\R1-2102475.zip) Consideration on enhancements on HARQ Spreadtrum Communications
* [R1-2102551](file:///C:\Users\Docs\R1-2102551.zip) Discussion on HARQ enhancements on NB-IoT/eMTC for NTN vivo
* [R1-2102620](file:///C:\Users\Docs\R1-2102620.zip) HARQ operation enhancement for NB-IoT/eMTC CATT
* [R1-2102738](file:///C:\Users\Docs\R1-2102738.zip) Enhancements on HARQ Asia Pacific Telecom, FGI, ITRI, III
* [R1-2102757](file:///C:\Users\Docs\R1-2102757.zip) Enhancements on HARQ for IoT NTN MediaTek Inc.
* [R1-2102834](file:///C:\Users\Docs\R1-2102834.zip) HARQ for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2102908](file:///C:\Users\Docs\R1-2102908.zip) Enhancements on HARQ for IoT NTN CMCC
* [R1-2102919](file:///C:\Users\Docs\R1-2102919.zip) Discussion on HARQ for IoT-NTN ZTE
* [R1-2102975](file:///C:\Users\Docs\R1-2102975.zip) Discussion on the HARQ enhancement for IoT NTN Xiaomi
* [R1-2103063](file:///C:\Users\Docs\R1-2103063.zip) On HARQ enhancements for IoT NTN Ericsson
* [R1-2103073](file:///C:\Users\Docs\R1-2103073.zip) Enhancements on HARQ Qualcomm Incorporated
* [R1-2103135](file:///C:\Users\Docs\R1-2103135.zip) On HARQ Enhancement in IoT NTN Apple
* [R1-2103269](file:///C:\Users\Docs\R1-2103269.zip) On enhancements on HARQ Samsung
* [R1-2103275](file:///C:\Users\Docs\R1-2103275.zip) HARQ enhancement for IoT NTN InterDigital, Inc.
* [R1-2103321](file:///C:\Users\Docs\R1-2103321.zip) HARQ issues for IoT-NTN Sony
* [R1-2103530](file:///C:\Users\Docs\R1-2103530.zip) HARQ enhancement for IoT NTN Lenovo, Motorola Mobility
* **R1-2103803** Summary#1 of enhancements on HARQ Moderator (Samsung)
* **R1-2103804** Summary#2 of enhancements on HARQ Moderator (Samsung)
* **R1-2103805** Summary#3 of enhancements on HARQ Moderator (Samsung)

Submitted TDocs to AI 8.15.5: Others

* [R1-2102426](file:///C:\Users\Docs\R1-2102426.zip) Discussion on other aspects OPPO
* [R1-2102476](file:///C:\Users\Docs\R1-2102476.zip) Consideration on other design aspects for IOT NTN Spreadtrum Communications
* [R1-2102835](file:///C:\Users\Docs\R1-2102835.zip) Applicability of NB-IoT/eMTC features for NTN Nokia, Nokia Shanghai Bell
* [R1-2102920](file:///C:\Users\Docs\R1-2102920.zip) Discussion on additional enhancement for IoT-NTN ZTE
* [R1-2102976](file:///C:\Users\Docs\R1-2102976.zip) Discussion on the other design aspects for IoT NTN Xiaomi
* [R1-2103064](file:///C:\Users\Docs\R1-2103064.zip) On evaluation assumptions for NB-IoT and eMTC based NTN Ericsson
* [R1-2103074](file:///C:\Users\Docs\R1-2103074.zip) Other aspects for NTN IOT Qualcomm Incorporated
* [R1-2103396](file:///C:\Users\Docs\R1-2103396.zip) Other aspects to support IoT in NTN Huawei, HiSilicon

## 4.2 RAN2

**RAN2#114-e, 17th May – 27th May 2021**

Submitted TDocs to AI 9.2.1: Organizational and scenarios

[R2-2106745](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106745.zip) TP for TR 36.763 capturing RAN2 #114e agreements Eutelsat, MediaTek

[Post114-e][061][IoT NTN] Final TP for TR 36.763 (Eutelsat) Endorsed in R2-2106784

[R2-2106677](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106677.zip) [AT114-e][032][IoT NTN] TR Essential Features Chairman (MediaTek)

[R2-2106468](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106468.zip) [Pre114-e][004][IoT NTN] Summary of 9.2.1 Essential Parts Huawei

[R2-2104817](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2104817.zip) Discussion on essential features of IoT over NTN OPPO discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2104855](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2104855.zip) Further Consideration on PSM for IoT NTN CATT discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105364](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105364.zip) Further discussion on essential parts of IoT NTN ZTE Corporation discussion FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105415](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105415.zip) Further discussion on essential parts for IoT-NTN functionality for Rel-17 Nokia, Nokia Shanghai Bell discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105428](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105428.zip) Essential features for SI TR Qualcomm Incorporated discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105664](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105664.zip) Discussion on essential parts for IOT NTN Huawei, HiSilicon discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2106168](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106168.zip) Essential functionality in IoT NTN Ericsson discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2106359](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106359.zip) Essential Functionality related to power saving & mobility Beijing Xiaomi Mobile Software discussion Rel-17

Submitted TDocs to AI 9.2.2: Open issues not covered by NR NTN

[R2-2106479](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106479.zip) Summary 9.2.2 Open Issues not Covered by NR-NTN MediaTek Inc.

[R2-2104818](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2104818.zip) Discussion on impact of repetition transmission for IoT over NTN OPPO discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2104819](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2104819.zip) Discussion on other open issues for IoT over NTN OPPO discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105369](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105369.zip) Specific issues of IoT NTN ZTE Corporation, Sanechips discussion FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105416](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105416.zip) Discussion on open issues not covered by NR NTN Nokia, Nokia Shanghai Bell discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105429](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105429.zip) Recovery of synchronization in RRC\_CONNECTED Qualcomm Incorporated discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105559](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105559.zip) Discussion on open issues and essential enhancements for IoT-NTN XIaomi discussion

[R2-2105663](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105663.zip) Discussion on mobility enhancement for IoT NTN Huawei, HiSilicon discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105821](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105821.zip) Considerations on power saving for idle mode in discontinuous coverage Lenovo, Motorola Mobility discussion Rel-17

[R2-2105822](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105822.zip) Considerations on RLF and re-establishment for IoT NTN Lenovo, Motorola Mobility discussion Rel-17

[R2-2105908](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105908.zip) On satellite pass predictions for UE wake-up management under discontinuous coverage Sateliot, Gatehouse, ESA discussion [R2-2104863](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2104863.zip)

[R2-2106420](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106420.zip) Mobile-Termination with non-continuous coverage in NTN Gatehouse, Sateliot, Thales, ESA discussion [R2-2105860](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105860.zip)

R2-2106211 Discontinuous coverage, SIB acquisition during cell reselection and extended DRX cycles in IoT NTN Ericsson discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

Submitted TDocs to AI 9.2.3: Other Open issues

[R2-2106486](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106486.zip) [Pre114-e][006][IoT NTN] Summary of 9.2.3 Other Open Issues Ericsson

[R2-2104856](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2104856.zip) Discussion on RLF mechanism of IOT over NTN CATT discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105223](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105223.zip) On Paging Capacity Evaluation for IoT-NTN Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2105254](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105254.zip) On Discontinuous coverage in IoT-NTN MediaTek Inc. discussion

[R2-2105371](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105371.zip) Paging capacity evaluation for IoT NTN ZTE Corporation, Sanechips discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105430](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105430.zip) Enhancement to SIB acquisition Qualcomm Incorporated discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN R2-2103052

[R2-2105461](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105461.zip) Connected mode related issues in IoT NTN Xiaomi Communications discussion

[R2-2105545](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105545.zip) Discussion on the issue of mobility for IoT over NTN Spreadtrum Communications discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2105662](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105662.zip) Paging evaluation for NTN IOT Huawei, HiSilicon discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2106169](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106169.zip) Connection density evaluation for IoT NTN devices Ericsson discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2106247](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106247.zip) RLF-based NB-IoT mobility in IoT-NTN CMCC discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2106250](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106250.zip) Discussion on TA Update for IoT-NTN CMCC discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

**RAN2#113bis-e, 12th April – 20th April 2021**

Submitted TDocs to AI 9.2.1: Organizational, scenarios and scope

**LS in**

[R2-2102602](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102602.zip) LS on extraterritorial use of MCC for satellite access (C1-210439; contact: Qualcomm) CT1 LS in Rel-17 5GSAT\_ARCH-CT To:SA1 Cc:SA2, RAN2, SA3

[R2-2102655](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102655.zip) Reply LS on timer for periodic network selection attempts in satellite access (S1-210357; contact: OPPO) SA1 LS in Rel-17 5GSAT\_ARCH-CT To:CT1 Cc:RAN2, CT6

[R2-2102656](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102656.zip) Reply LS on extraterritorial use of MCC for satellite access (S1-210358; contact: Qualcomm) SA1 LS in Rel-17 5GSAT\_ARCH-CT To:CT1 Cc:SA2, RAN2, SA3

[R2-2102663](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102663.zip) Reply LS on IoT-NTN basic architecture (S2-2101663; contact: MediaTek) SA2 LS in Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN To:RAN2, RAN3 Cc:RAN, CT1

**Work Plan**

[R2-2103800](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103800.zip) FS\_LTE\_NBIOT\_eMTC\_NTN work plan Eutelsat S.A., MediaTek Work Plan Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

**TP/TR**

[Post113bis-e][056][IoT-NTN] Capture agreements (Eutelsat), Endorsed in [R2-2104648](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104648.zip)

**Essential Parts**

[R2-2104552](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104552.zip) [Offline-027] IOT NTN essential parts (Huawei)

[R2-2102743](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102743.zip) Discussion on scope of IoT over NTN OPPO discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2102828](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102828.zip) Identifying Essential Topics in IoT-NTN MediaTek Inc. discussion

[R2-2102956](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102956.zip) Determination of essential parts for IoT NTN CATT discussion

[R2-2102961](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102961.zip) Essential adaptations for discontinuous coverage in IoT-NTN Gatehouse Satcom A/S, Sateliot discussion

[R2-2103177](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103177.zip) Essential functionality for IOT NTN Beijing Xiaomi Mobile Software discussion Rel-17

[R2-2103189](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103189.zip) Analysis on essential parts for IoT-NTN functionality for Rel-17 Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2103509](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103509.zip) Discussion on essential functionalities for IOT NTN Huawei, HiSilicon discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2104016](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104016.zip) Discussion on essential functionality in IoT NTN - scenarios and scope Ericsson discussion FS\_LTE\_NBIOT\_eMTC\_NTN

Submitted TDocs to AI 9.2.2: User Plane

[R2-2103843](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103843.zip) On Preamble Ambiguity in Non Terrestrial Networks Apple

Submitted TDocs to AI 9.2.3: Mobility and Tracking Area

[R2-2104551](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104551.zip) [028] Summary for Control Plane Procedures in IoT-NTN MediaTek inc

[R2-2102744](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102744.zip) Discussion on control plane for IoT over NTN OPPO discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2102829](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102829.zip) On Cell-Reselection in NR-NTN MediaTek Inc. discussion [R2-2100264](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2100264.zip)

[R2-2102957](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102957.zip) Discussion on the mobility of IoT over NTN CATT discussion

[R2-2103051](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103051.zip) Connected mode and idle mode mobility Qualcomm Incorporated discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2103136](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103136.zip) Discussion on RRC Idle mobility for IoT NTN Xiaomi discussion

[R2-2103183](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103183.zip) Discussion on connected mode mobility in NB-IoT and eMTC NTN Xiaomi Communications discussion

[R2-2103190](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103190.zip) On the mobility aspects of IoT-NTN Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2103243](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103243.zip) Discussion on the issue of mobility for IoT over NTN Spreadtrum Communications discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2103342](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103342.zip) Control plane aspects of IoT over NTN ZTE Corporation, Sanechips discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2103411](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103411.zip) Potential issues in IoT NTN with discontinuous coverage Lenovo, Motorola Mobility discussion Rel-17

[R2-2103412](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103412.zip) Further considerations on RLF-based mobility for NB-IoT in NTN Lenovo, Motorola Mobility discussion Rel-17

[R2-2103510](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103510.zip) Discussion on Mobility for NTN NB-IoT Huawei, HiSilicon discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2103511](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103511.zip) Discussion on discontinuous coverage for NTN NB-IoT Huawei, HiSilicon discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2103727](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103727.zip) RLF-based NB-IoT mobility in NTN CMCC discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2104298](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104298.zip) Discussion on TA Update for IoT-NTN CMCC discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2104017](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104017.zip) Mobility for NB-IoT and LTE-M in NTN Ericsson discussion FS\_LTE\_NBIOT\_eMTC\_NTN

Submitted TDocs to AI 9.2.4: Other

**Performance**

[R2-2104033](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104033.zip) Summary of [Post113-e][055][IoT NTN] Performance evaluation Ericsson

[R2-2104020](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104020.zip) Connection density evaluation for IoT NTN devices Ericsson

**Features and Enhancements**

[R2-2102745](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102745.zip) Discussion on system information enhancement for IoT over NTN OPPO discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2103052](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103052.zip) Enhancement to SIB acquisition Qualcomm Incorporated discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2103233](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103233.zip) On system information enhancement and IoT features applicability for NTN Nokia, Nokia Shanghai Bell discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2103357](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103357.zip) SIB and IoT features applicability for IoT over NTN ZTE Corporation, Sanechips discussion FS\_LTE\_NBIOT\_eMTC\_NTN

[R2-2102830](http://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102830.zip) On Providing Ephemeris Information in IoT-NTN MediaTek Inc. discussion

***END***