**3GPP TSG RAN meeting #91-e *Draft* RP-210644**

**Electronic Meeting, March 16th - 26th, 2021**

## Status Report to TSG

**Agenda item:** 10.6.1 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: 30%RAN1: 30%RAN2: 30% | 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#104-e, 25th January – 5th February 2021, e-meeting**

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

The following assumptions are agreed for a common set of link budget parameters:

* UE power class (PC5=20 dBm)
* UE Noise Figure (NF=9 dB)
* Channel Bandwidth for NB-IoT and eMTC as was included in IoT NTN reference scenario parameters agreed in RAN1#103e
	+ 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
	+ 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)
* Other losses

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

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.

Link budget analysis assumes 3 dB polarization loss for DL and 3 dB polarization loss on UL for satellite parameters Set 1, Set 2, Set 3, and Set 4

Include in TR 36.763, the 3 dB beam width (HPBW), central beam center elevation and central beam edge elevation in the satellite parameter set(s) to be used in link budget calculations – (Corresponding satellite parameter Set 3 and Set 4 are given in Section 9.4)

|  |  |  |  |
| --- | --- | --- | --- |
| SET 3 | GEO 35786 km | LEO-600 km | LEO-1200 km |
| 3 dB Beam width (HPBW) | 0.735 degree | 22.0631 degree | 22.0631 degree |
| Central beam center elevation  | 20.88 degree | 43.78 degree | 46.05 degree |
| Central beam edge elevation | 12.5 degree | 30 degree | 30 degree |
| Central beam edge satellite-UE distance | 40316 km | 1074 km | 1998 km |

|  |  |
| --- | --- |
| SET 4 | LEO-600 km |
| 3 dB Beam width (HPBW) | 104.7 degree |
| Central beam center  elevation | 90 degree |
| Central beam edge elevation | 30 degree |
| Central beam edge satellite-UE distance | 1076 km |

NOTE 1: The 3 dB beam width (HPBW)  is already included in satellite parameter set 1 and Set 2 in TR 38.821 Table 6.1.1.1-1 and Table 6.1.1.1-2  respectively. The central beam center elevation  for Set-1 and Set-2 is defined as the target elevation angle that is included in in TR 38.821 Table 6.1.3.2-1.   The central beam edge satellite-UE distance can be derived from the central beam edge elevation and does not need to be included.

NOTE 2: Central beam center elevation is the beam center elevation of the central beam in the beam layout.

NOTE 3: Central beam edge elevation is the minimum beam edge elevation of the central beam in the beam layout.

NOTE 4 In SLS evaluation with a multiple beam layout, the central beam is the serving beam for UEs. The outer beams have beam center elevation that is different from the central beam center elevation.  For the interference modelling, the interference due to the outer beams is determined by using their respective beam center elevations.

NOTE 5: For the multiple-beam satellite cell, the longest beam edge distance will correspond to the minimum beam edge elevation of the most outer beam as illustrated in figure below.

 Include the following tables in TR 36.763:

* Set 1 satellite parameters (based on TR 38.821, Table 6.1.1.1-1)
* Set 2 satellite parameters (based on TR 38.821, Table 6.1.1.1-2)
* Set 3 satellite parameters (Eutelsat [R1-2101146](file:///C%3A%5CUsers%5Cmtk06374%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101146.zip) with central beam edge elevation 12.5 degree for GEO, and 30 degree for LEO-600 km and 1200 km)

|  |  |  |  |
| --- | --- | --- | --- |
| Satellite orbit | GEO | LEO-1200 | LEO-600 |
| Satellite altitude | 35786 km | 1200 km | 600 km |
| Central beam edge elevation  | 12.5 degree | 30 degree | 30 degree |
| Central beam center elevation | 20.9 degree | 46.05 degree | 43.8 degree |
| Payload characteristics for DL transmissions |
| Equivalent satellite antenna aperture (NOTE 1) | S-band(i.e. 2 GHz) | 12 m | 0.4m | 0.4 m |
| Satellite EIRP density | 59.8 dBW/MHz | 33.7 dBW/MHz | 28.3 dBW/MHz |
| Satellite Tx max Gain | 45.7 dBi | 16.2 dBi | 16.2 dBi |
| 3dB beam width (HPBW) | 0.7353 degree | 22.1 degree | 22.1 degree |
| Satellite beam diameter (NOTE 2) | 459km | 470 km | 234 km |
| Payload characteristics for UL transmissions |
| Equivalent satellite antenna aperture (NOTE 1) | S-band (i.e. 2 GHz) | 12 m | 0.4 m | 0.4 m |
| G/T | 16.7dB K-1 | -12.8 dB K-1 | -12.8 dB K-1 |
| Satellite Rx max Gain | 45.7 dBi | 16.2 dBi | 16.2 dBi |

NOTE 1: This value is equivalent to the antenna diameter in Sec. 6.4.1 of TR 38.811

NOTE 2: Satellite beam diameter is at Nadir point

NOTE 3: Central beam center elevation is referred to as central beam elevation in TR 38.821

NOTE 4: Central beam edge elevation is the minimum beam edge elevation of the central beam in the beam layout.

* Set 4 satellite parameters (Thales, Sateliot, Gatehouse [R1-2101019](file:///C%3A%5CUsers%5Cmtk06374%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101019.zip))

|  |  |
| --- | --- |
| Satellite orbit | LEO-600 |
| Satellite altitude | 600 km |
| Central beam edge elevation | 30 degree |
| Central beam center elevation | 90 degree |
| Payload characteristics for DL transmissions |
| Equivalent satellite antenna aperture (NOTE 1) | S-band(i.e. 2 GHz) | 0.097 m |
| Satellite EIRP density | 21.45 dBW/MHz |
| Satellite Tx max Gain | 11 dBi |
| 3dB beam width (HPBW) | 104.7 degree |
| Satellite beam diameter (Note 2) | 1700 km |
| Payload characteristics for UL transmissions |
| Equivalent satellite antenna aperture (Note1) | S-band (i.e. 2 GHz) | 0.097 m |
| G/T | - 18.6 dB·K-1 |
| Satellite Rx max Gain | 11 dBi |

NOTE 1: This value is equivalent to the antenna diameter in Sec. 6.4.1 of TR 38.811

NOTE 2: Satellite beam diameter is at Nadir point

NOTE 3: Central beam center elevation is referred to as central beam elevation in TR 38.821

NOTE 4: Central beam edge elevation is the minimum beam edge elevation of the central beam in the beam layout.

Agreements on “Enhancements to time and frequency synchronization”

Study potential impact of GNSS Position fix on UE power consumption using battery life methodology in Rel-13 TR 45.820 (Section 5.4)

FFS: Details of the study

Discuss whether GNSS measurement window is needed and beneficial for initial access.

For the study of potential impact of GNSS Position fix on UE power consumption consider at least the following parameters

* GNSS power consumption value
* GNSS position Time To First Fix

Study potential impact of NTN SIB carrying the satellite ephemeris on

* UE power consumption in NB-IoT and eMTC
* Accuracy of satellite location tracking
* PRACH congestion

Study the UE pre-compensation of satellite delay during long UL transmission on (N)PUSCH in NB-IoT and eMTC.

Study the UE pre-compensation of satellite delay and Doppler during long UL transmission on PRACH in NB-IoT and eMTC.

Study the UE pre-compensation of satellite Doppler shift during long UL transmission on (N)PUSCH in NB-IoT and eMTC.

Agreements on “Timing relationship enhancements”

For NB-IoT over NTN, at least the following timing relationships need to be studied individually for checking whether enhancement is necessary and beneficial:

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

For eMTC over NTN, at least the following timing relationships can be studied individually for checking whether enhancement is necessary and beneficial:

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

Identify IoT-NTN configurations needing activation/de-activation via MAC CE and their timing relationships.

Study the impact of large RTD (which impacts TA) on HD-FDD UL-DL timing relationships and check whether enhancement is necessary and beneficial.

Study the impact on any timing relationships for IoT-NTN due to the need to perform GNSS measurements for time and frequency synchronization

Agreements on “Enhancements on HARQ”

Study further the potential benefits and/or drawbacks of increasing the number of HARQ processes on throughput, latency, power consumption and complexity

* For NTN, further study potential benefits and/or drawbacks of disabling HARQ feedback for NB-IoT.
* For NTN, further study potential benefits and/or drawbacks of disabling HARQ feedback for eMTC.

In relation to HARQ operation in NTN IoT, further study at least

* The necessity, potential benefits and drawbacks of any other potential HARQ feedback mechanisms
* The necessity, potential benefits and drawbacks of reduced PDCCH monitoring
* The necessity, potential benefits and drawbacks of coverage enhancements
* The necessity, potential benefits and drawbacks of uplink transmission gaps with multiple HARQ processes
* The necessity, potential benefits and drawbacks of maintaining HARQ process continuity in serving cell change
* The necessity, potential benefits and drawbacks of multiple Transport Blocks scheduling
* The necessity, potential benefits and drawbacks of throughput enhancements
	+ FFS: Whether target throughput in NTN will be the same as target throughput in terrestrial networks

The motivation for introducing HARQ enhancements in NR NTN needs further consideration for HARQ enhancements in NTN IoT. Capture the following in the TR:

* For NTN IoT, potential HARQ enhancements need to consider the main characteristics of an IoT device, which are low complexity, low cost, low power consumption and low throughput, and key requirements of IoT services which are extended coverage, delay-tolerant and infrequent data transmissions, and support of massive communications.
* The peak throughput of IoT UEs operating over NTN is not expected to be higher than the peak throughput of IoT UEs operating over TN.

Further study to identify whether HARQ stalling happens at least in the GEO satellite scenario.

Further discuss the potential benefits and/or drawbacks of increasing the number of HARQ processes in the UL for NB-IoT and eMTC, and for the analysis consider at least the following for the number of HARQ processes

* NB-IoT: 1,2,4
* eMTC: 2,4,8,14

And discuss at least power consumption and peak data rate as performance metrics

FFS: Whether to consider DL

Other values for number of HARQ processes below the maximum value can be discussed

Further discuss the potential benefits and/or drawbacks of disabling HARQ feedback for NB-IoT and eMTC, and consider at least the following number of HARQ processes for the analysis

* NB-IoT:
	+ Total: 2, disabled: {1,2}
* eMTC:
	+ Total: 2, disabled: {1,2}
	+ Total: 8, disabled: {1,2,7,8}

Other values for number of HARQ processes below the maximum value can be discussed

FFS: whether to consider separately LEO and GEO scenarios

FFS: whether to allow disabling of HARQ feedback in case of single HARQ process

FFS: whether to allow disabling of all HARQ feedback

FFS: other details for the evaluation/analysis

#### Remaining Open issues

* **First Objective**
* Link budget for identified scenarios applicable to NB-IoT/eMTC
* **Second Objective**

For the identified scenarios, study and recommend necessary changes to support NB-IoT and eMTC over satellite for the following, reusing as much as possible the conclusions of the studies performed for NR NTN in TR38.821:

* Aspects related to random access procedure/signals [RAN1, RAN2]
* Mechanisms for time/frequency adjustment including Timing Advance, and UL frequency compensation indication [RAN1, RAN2]
* Timing offset related to scheduling and HARQ-ACK feedback [RAN1, RAN2]
* Aspects related to HARQ operation [RAN2, RAN1]

## 2.2 RAN2

#### 2.2.1 Agreements

* **RAN2#113-e, 25th January – 5th February 2021, e-meeting**

Agreements from AI 9.2.1: Organizational and scenarios

**NTN IoT connected to 5GC is assumed, in addition to EPC (but there seems to be consensus that 5GC has lower urgency/priority)**

**From RAN2 point of view, support for NB-IoT multi-carrier and single-carrier operations are both assumed as a baseline.**

Agreements from AI 9.2.2 User Plane

**No of HARQ processes is R1 scope**

**Enable / disable HARQ feedback is R2 scope**

**Modify *sr-ProhibitTimer* for larger values to support IoT NTN. Alignment to NR NTN can be considered.**

**Extend the value range of *t-Reordering* to support IoT NTN.**

**From RAN2 point of view, assume that all IoT features up to R16 are supported, and can consider differently case by case when/if problems are found.**

Agreements from AI 9.2.3 Mobility and Tracking Area

**For eMTC in NTN**

**CHO can be used for both moving cell and fixed cell scenarios, and the CHO procedure and execution condition defined in Rel-16 is the baseline.**

**(i) The existing measurement framework for CHO (e.g. measurement configuration, execution) is the baseline.**

**(ii) The existing eMTC measurement criteria and event can be used in NTN. Support for new measurement would need justification, but is not precluded, e.g. for enh coverage.**

**(iii) Time or timer based and Location based CHO triggering event, in combination with the existing R16 CHO measurement based event, can be introduced for both moving cell and fixed cell scenarios. Support for new triggering events is not precluded.**

**(note that LTE CHO isn’t supported for 5GC, and same assumptions as LTE applies).**

**Rel-17 RLF enhancements in NB-IoT can be considered in NB-IOT NTN, if applicable. Further enhancements on RLF-based mobility can be considered, e.g. by using satellite assistance (ephemeris) information.**

**RAN2 will capture the options for signalling of Tracking Areas in the TR and wait for progress in NR-NTN for possible updates, if applicable to IoT NTN.**

**Paging capacity is evaluated using the same methodology captured in TR 38.821 as the baseline.**

**RAN2 will evaluate the paging capacity and the impact on the size of the Tracking Area considering the target IoT NTN device density captured in TR 36.763.**

**RAN2 will use cell selection/re-selection mechanism of NB-IoT/eMTC as ~~a~~ baseline. Enhancements introduced for cell selection/re-selection mechanism in NR NTN will be considered if applicable to IoT-NTN.**

**Cell selection/re-selection mechanism in IoT-NTN can be enhanced by using satellite assistance (e.g. ephemeris) information (similar to NR-NTN). RAN2 will wait for RAN1’s progress about the details of satellite ephemeris information.**

#### 2.2.2 Remaining Open issues

* Aspects related to HARQ operation
* Remaining aspects related to some timers (e.g. PDCP discard timer, etc.)
* Remaining RAN2 aspects related to idle mode and connected mode mobility considering the baseline agreements made at RAN2#113-e
* System information enhancements, provisioning of satellite ephemeris data
* Tracking area enhancements based on NR NTN updates
* Mechanisms for time/frequency adjustment including Timing Advance, and UL frequency compensation indication [RAN1, RAN2]
* Timing offset related to scheduling and HARQ-ACK feedback [RAN1, RAN2]
* Paging Capacity evaluation based on methodology captured in TR 38.821

## 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#104-e, 25th January – 5th February 2021, e-meeting**

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

* R1-2102199 Session notes for 8.15 (Study on NB-IoT/eMTC support for Non-Terrestrial Network) Ad-Hoc Chair (Ericsson)
* [R1-2100599](file:///C%3A%5CUsers%5Cmtk06374%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100599.zip) Rel-17 IoT NTN Work Plan MediaTek Inc.
* [R1-2100774](file:///C%3A%5CUsers%5Cmtk06374%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100774.zip) Market expectations for IoT over NTN NOVAMINT
* [R1-2101138](file:///C%3A%5CUsers%5Cmtk06374%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101138.zip) Skeleton TR 36.763 Study on NB-IoT / eMTC for NTN  (Release 17) MediaTek Inc.
* [R1-2101139](file:///C%3A%5CUsers%5Cmtk06374%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101139.zip) Text Proposal for TR 36.673 chapter related to RAN1 MediaTek Inc.

AI 8.15.1: Scenarios applicable to NB-IoT/eMTC

* [R1-2100160](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100160.zip) Discussion on scenarios applicable to NB-IoT/eMTC OPPO
* [R1-2100225](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100225.zip) Application scenarios of IoT in NTN Huawei, HiSilicon
* [R1-2100248](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100248.zip) Discussion on the scenarios and assumption for IoT-NTN ZTE
* [R1-2100365](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100365.zip) Applicable scenarios to NB-IoT/eMTC CATT
* [R1-2100480](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100480.zip) Discussion on scenarios applicable to NB-IoT/eMTC for NTN vivo
* [R1-2100494](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100494.zip) Scenarios applicable to NB-IoT/eMTC Zhejiang Lab
* [R1-2100521](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100521.zip) Discussion on NB-IoT NTN scenarios with small satellites / CubeSats Sateliot, Gatehouse, Thales, Kepler
* [R1-2100600](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100600.zip) IoT NTN scenarios MediaTek Inc.
* [R1-2100874](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100874.zip) Scenarios for IoT-NTN Sony
* [R1-2100930](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100930.zip) On scenarios and evaluations for NB-IoT and eMTC based NTN Ericsson
* [R1-2100975](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100975.zip) Scenarios applicable to NB-IoT in NTN Asia Pacific Telecom, FGI
* [R1-2101019](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101019.zip) Feasibility of the large, single-beam small sats / CubeSats scenario Thales, Sateliot, GateHouse
* [R1-2101027](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101027.zip) Scenarios and evalutions for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2101069](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101069.zip) Discussion on scenarios for IoT NTN CMCC
* [R1-2101146](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101146.zip) IoT NTN Link Budget Eutelsat S.A.
* [R1-2101242](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101242.zip) On Scenarios applicable to NB-IoT/eMTC Samsung
* [R1-2101368](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101368.zip) On Link Budget of IoT NTN Apple
* [R1-2101413](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101413.zip) Discussion on scenarios for NB-IoT and eMTC over NTN CAICT
* [R1-2101512](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101512.zip) Scenarios applicable to NB-IoT/eMTC Qualcomm Incorporated
* [R1-2101802](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101802.zip) Summary#1 of AI 8.15.1 Scenarios applicable to NB-IoT/eMTC Moderator (MediaTek)
* [R1-2101869](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101869.zip) Summary#2 of AI 8.15.1 Scenarios applicable to NB-IoT/eMTC Moderator (MediaTek)
* [R1-2101998](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101998.zip) Summary#3 of AI 8.15.1 Scenarios applicable to NB-IoT/eMTC Moderator (MediaTek)
* [R1-2102102](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2102102.zip) Summary#4 of AI 8.15.1 Scenarios applicable to NB-IoT/eMTC Moderator (MediaTek)
* [R1-2102265](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2102265.zip)Summary#5 of AI 8.15.1 Scenarios applicable to NB-IoT/eMTC Moderator (MediaTek)

AI 8.15.2 Enhancements to time and frequency synchronization

* [R1-2100161](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100161.zip) Discussion on enhancements to time and frequency synchronization OPPO
* [R1-2100234](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100234.zip) Discussion on time and frequency synchronization enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2100249](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100249.zip) Discussion on the synchronization for IoT-NTN ZTE
* [R1-2100366](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100366.zip) Time and frequency synchronization for NB-IoT/eMTC CATT
* [R1-2100481](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100481.zip) Discussion on time and frequency synchronization enhancements on NB-IoT/eMTC for NTN vivo
* [R1-2100601](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100601.zip) UE Time and frequency Synchronisation for IoT NTN MediaTek Inc.
* [R1-2100683](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100683.zip) On synchronization for NB-IoT and eMTC NTN Intel Corporation
* [R1-2100763](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100763.zip) Time and frequency synchronization for IoT NTN Lenovo, Motorola Mobility
* [R1-2100810](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100810.zip) Consideration on enhancements to time and frequency synchronization Spreadtrum Communications
* [R1-2100875](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100875.zip) Time and frequency synchronisation enhancements for IoT-NTN Sony
* [R1-2100931](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100931.zip) On time and frequency synchronization enhancements for IoT NTN Ericsson
* [R1-2100976](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100976.zip) Time and frequency synchronization to NB-IoT in NTN Asia Pacific Telecom, FGI
* [R1-2101028](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101028.zip) Enhancements to time and frequency synchronization for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2101070](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101070.zip) Discussion on enhancements for IoT NTN CMCC
* [R1-2101105](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101105.zip) Discussion on time and frequency synchronization for IoT NTN Xiaomi
* [R1-2101243](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101243.zip) On enhancements to time and frequency synchronization Samsung
* [R1-2101369](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101369.zip) Discussion on Time and Frequency Synchronization in IoT NTN Apple
* [R1-2101402](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101402.zip) Time/Frequency Synchronization for IoT NTN InterDigital, Inc.
* [R1-2101513](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101513.zip) Enhancements to time and frequency synchronization Qualcomm Incorporated
* [R1-2101692](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101692.zip) Discussion on enhancement of time and frequency synchronization for NB-IoT over satellite Fraunhofer IIS, Fraunhofer HHI
* [R1-2101803](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101803.zip) Summary#1 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)
* [R1-2101870](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101870.zip) Summary#2 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)
* [R1-2101999](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101999.zip) Summary#3 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)
* [R1-2102103](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2102103.zip) Summary#4 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)
* [R1-2102266](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2102266.zip) Summary#5 of AI 8.15.2 Enhancements to time and frequency synchronization Moderator (MediaTek)

Submitted TDocs to 8.15.3: Timing relationship enhancements

* [R1-2100162](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100162.zip) Discussion on timing relationship enhancements OPPO
* [R1-2100235](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100235.zip) Discussion on timing relationship enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2100250](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100250.zip) Discussion on timing relationship for IoT-NTN ZTE
* [R1-2100367](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100367.zip) Timing relationship enhancement for NB-IoT/eMTC CATT
* [R1-2100482](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100482.zip) Discussion on timing relationship enhancements on NB-IoT/eMTC for NTN vivo
* [R1-2100495](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100495.zip) Timing relationship enhancements to support NB-IoT/eMTC in Non-Terrestrial Network Zhejiang Lab
* [R1-2100602](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100602.zip) Timing relationship enhancements MediaTek Inc.
* [R1-2100684](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100684.zip) On timing relationship for NB-IoT and eMTC NTN Intel Corporation
* [R1-2100764](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100764.zip) Timing relationship enhancements for IoT NTN Lenovo, Motorola Mobility
* [R1-2100811](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100811.zip) Consideration on timing relationship enhancements Spreadtrum Communications
* [R1-2100876](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100876.zip) Timing relationship for IoT-NTN Sony
* [R1-2100932](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100932.zip) On timing relationship enhancements for IoT NTN Ericsson
* [R1-2100977](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100977.zip) Timing relationship enhancements to NB-IoT in NTN Asia Pacific Telecom, FGI
* [R1-2101029](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101029.zip) Timing relationship enhancements for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2101106](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101106.zip) Discussion on the timing relationship enhancement for IoT NTN Xiaomi
* [R1-2101244](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101244.zip) On timing relationship enhancements Samsung
* [R1-2101370](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101370.zip) Discussion on Timing Relationship Enhancement in IoT NTN Apple
* [R1-2101403](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101403.zip) On timing relationship enhancement for IoT NTN InterDigital, Inc.
* [R1-2101514](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101514.zip) Timing relationship enhancements Qualcomm Incorporated
* [**R1-2101844**](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101844.zip) FL summary of AI 8.15.3 Timing relationship for IoT-NTN Moderator (Sony)
* [**R1-2101949**](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101949.zip) FL summary of AI 8.15.3 Timing relationship for IoT-NTN Moderator (Sony)

Submitted TDocs to AI 8.15.4: Enhancements on HARQ

* [R1-2100163](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100163.zip) Discussion on HARQ enhancements OPPO
* [R1-2100236](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100236.zip) Discussion on HARQ enhancement for IoT in NTN Huawei, HiSilicon
* [R1-2100251](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100251.zip) Discussion on HARQ for IoT-NTN ZTE
* [R1-2100368](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100368.zip) HARQ operation enhancement for NB-IoT/eMTC CATT
* [R1-2100483](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100483.zip) Discussion on HARQ enhancements on NB-IoT/eMTC for NTN vivo
* [R1-2100603](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100603.zip) Enhancement on HRQ MediaTek Inc.
* [R1-2100685](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100685.zip) On HARQ enhancements for NB-IoT and eMTC NTN Intel Corporation
* [R1-2100765](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100765.zip) HARQ enhancement for IoT NTN Lenovo, Motorola Mobility
* [R1-2100812](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100812.zip) Consideration on enhancements on HARQ Spreadtrum Communications
* [R1-2100877](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100877.zip) HARQ issues for IoT-NTN Sony
* [R1-2100933](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100933.zip) On HARQ enhancements for IoT NTN Ericsson
* [R1-2100978](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100978.zip) Enhancements on HARQ to NB-IoT in NTN Asia Pacific Telecom, FGI
* [R1-2101030](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101030.zip) HARQ for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2101107](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101107.zip) Discussion on the HARQ enhancement for IoT NTN Xiaomi
* [R1-2101245](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101245.zip) On enhancements on HARQ Samsung
* [R1-2101323](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101323.zip) NTN IoT HARQ Considerations Sierra Wireless, S.A.
* [R1-2101371](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101371.zip) Discussion on HARQ Enhancement in IoT NTN Apple
* [R1-2101404](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101404.zip) HARQ enhancement for IoT NTN InterDigital, Inc.
* [R1-2101515](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101515.zip) Enhancements on HARQ Qualcomm Incorporated
* [**R1-2101822**](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101822.zip) Summary#1 for enhancements on HARQ Moderator (Samsung)
* [R1-2101957](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101957.zip) Summary#3 for enhancements on HARQ Moderator (Samsung)
* [R1-2102132](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2102132.zip) Summary#4 for enhancements on HARQ Moderator (Samsung)
* [R1-2101822](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101822.zip) Summary#1 for enhancements on HARQ Moderator (Samsung)
* [R1-2101957](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101957.zip) Summary#3 for enhancements on HARQ Moderator (Samsung)
* [R1-2102132](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2102132.zip) Summary#4 for enhancements on HARQ Moderator (Samsung)

Submitted TDocs to AI 8.15.5: Others

* [R1-2100164](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100164.zip) Discussion on other aspects OPPO
* [R1-2100252](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100252.zip) Discussion on additional enhancement for IoT-NTN ZTE
* [R1-2100604](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100604.zip) Others MediaTek Inc.
* [R1-2100813](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100813.zip) Consideration on other design aspects for IOT NTN Spreadtrum Communications
* [R1-2100878](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100878.zip) Power consumption of IoT-NTN Sony
* [R1-2100934](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100934.zip) On evaluation assumptions for NB-IoT and eMTC based NTN Ericsson
* [R1-2100979](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2100979.zip) NB-IoT modifications to support the NTN deployment Asia Pacific Telecom, FGI
* [R1-2101031](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101031.zip) Link budget analysis for UE power class 6 for NB-IoT/eMTC over NTN Nokia, Nokia Shanghai Bell
* [R1-2101108](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101108.zip) Discussion on the other design aspects for IoT NTN Xiaomi
* [R1-2101261](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101261.zip) Other aspects to support IoT in NTN Huawei, HiSilicon
* [R1-2101516](file:///C%3A%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104%5CDocs%5CR1-2101516.zip) Other aspects for NTN IOT Qualcomm Incorporated

## 4.2 RAN2

**RAN2#113-e, 25th January – 5th February 2021, e-meeting**

Submitted TDocs to AI 9.2.1: Organizational and scenarios

**LS in**

R2-2100002 Timer for periodic network selection attempts in satellite access (C1-207766; contact: OPPO) CT1 LS in

**Work Plan**

R2-2101409 FS\_LTE\_NBIOT\_eMTC\_NTN work plan Eutelsat S.A

**TPs for TR**

R2-2101455 Skeleton TR 36.763 Study NB-IoT / eMTC support for NTN MediaTek Inc

R2-2102492 Text proposal for TR 36.763 related to RAN2 Eutelsat S.A.

**[035] Endorsed (reflects progress up to R2 112-e)**

**Scenarios and Requirements**

R2-2101052 Discussion on scenarios for NTN NB-IoT Huawei, HiSilicon

R2-2102255 Market expectations for IoT over NTN NOVAMINT

R2-2101553 IoT NTN scenarios and architecture Ericsson

R2-2102258 IoT-NTN basic architecture Eutelsat S.A.

**LS out**

R2-2102420 LS on IoT-NTN basic architecture Eutelsat S.A LS out

Submitted TDocs to AI 9.2.2 User Plane

R2-2102251 Summary of AI 9.2.2 on user plane for IoT NTN OPPO

R2-2100165 Discussion on UP issues for IoT over NTN OPPO

R2-2100180 IOT NTN user plane related issues Beijing Xiaomi Mobile Software

R2-2100265 On Disabling HARQ Retransmissions in IoT-NTN MediaTek Inc.

R2-2100329 Consideration on user plane of IoT over NTN ZTE Corporation, Sanechips

R2-2100736 Enhancement to HARQ process Qualcomm Incorporated discussion

R2-2100737 Applicability of eMTC and NB-IoT feature in NTN Qualcomm Incorporated discussion

R2-2101053 Discussion on User Plane for NTN NB-IoT Huawei, HiSilicon

R2-2101064 Discussion on IoT over NTN HARQ enhancements Nokia, Nokia Shanghai Bell

R2-2101130 Considerations on PUR in IoT NTN Lenovo, Motorola Mobility

R2-2101554 HARQ operation and timers for IoT NTN Ericsson

Submitted TDocs to AI 9.2.3 Mobility and Tracking Area

R2-2102419 Summary for Control Plane Procedures in IoT-NTN MediaTek Inc. discussion

R2-2100166 Discussion on connected mode mobility for IoT over NTN OPPO

R2-2100167 Discussion on idle mode procedure for IoT over NTN OPPO

R2-2100257 IoT NTN Observations and Proposals Lockheed Martin

R2-2100263 Improving Tracking Area Updates in IoT-NTN MediaTek Inc.

R2-2100264 On Efficient Cell Re-selection in IoT-NTN MediaTek Inc.

R2-2100266 Connected Mode Mobility in IoT-NTN MediaTek Inc.

R2-2100338 Consideration on control plane of IoT over NTN ZTE Corporation, Sanechips

R2-2100510 Analysis of mobility aspects for IoT NTN Nokia, Nokia Shanghai Bell

R2-2100738 Connected mode and idle mode mobility Qualcomm Incorporated

R2-2100807 Discussion on connected mode mobility in NB-IoT and eMTC NTN Xiaomi

R2-2100808 Cell selection and reselection for IoT NTN Xiaomi

R2-2101054 Discussion on Mobility and TA for NTN NB-IoT Huawei, HiSilicon

R2-2101131 Discontinuous coverage for IoT NTN Lenovo, Motorola Mobility

R2-2101132 RLF-based mobility for NB-IoT in NTN Lenovo, Motorola Mobility

R2-2101248 Discussion on the service link discontinuity and affected procedures for NB-IoT NTN Gatehouse, Sateliot

R2-2101555 Idle and connected mode mobility for IoT NTN Ericsson

Submitted TDocs to AI 9.2.4 Other

**SI broadcast**

R2-2101055 Discussion on SI for NTN NB-IoT Huawei, HiSilicon

R2-2100739 Enhancement to SIB acquisition Qualcomm Incorporated

R2-2100168 Discussion on system information enhancement for IoT over NTN OPPO

**Functionality Scope**

R2-2100339 Consideration on other aspects of IoT over NTN ZTE Corporation, Sanechips

R2-2100511 Applicability terrestrial IoT Features for IoT-NTN study Nokia, Nokia Shanghai Bell

**System performance**

R2-2101556 Connection density evaluation for IoT NTN devices Ericsson

**Timing aspects**

R2-2101065 On timing and channel repetition impact in LEO Nokia, Nokia Shanghai Bell

***END***