**3GPP TSG RAN meeting #94-e RP-212803**

**Electronic Meeting, Dec 6 - 17th, 2021** *rev from**RP-211774*

## Status Report to TSG

**Agenda item:** 9.3.2.2 - Solutions for NR to support NTN [RAN2 WI: NR\_NTN\_solutions]

|  |  |
| --- | --- |
| **WI / SI Name** | Solutions for NR to support non-terrestrial networks (NTN) |
| included in this status report | Study Item: No | Core part: Yes | Performance part:Yes | Testing part:- |
| **Acronym** | NR\_NTN\_solutions |
| **Unique ID** | 860046 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-211784 |
| **Target Completion Date****(indicate if changed)** | Study Item: - | Core part: 03/2022 | Performance part: 09/2022 | Testing part: - |
| **Overall Completion level** | Study Item: - | Core part: Overall: 75% RAN1: 100%RAN2: 75%RAN3: 95% RAN4: 65% | Performance Part: Overall: 0% RAN1: 0%RAN2: 0%RAN3: 0% RAN4: 0% | 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** | RAN2 |
| **Rapporteur** | **Name** | Nicolas Chuberre |
| **Company** | Thales |
| **Email** | nicolas.chuberre@thalesaleniaspace.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#106-bis-e, 11th– 20th October 2021, e-meeting**

[General]

Agreements on “Timing relationship enhancements”:

Agreement:

Signalling one value for cell-specific K\_offset is supported.

Agreement:

* For the reference subcarrier spacing value for the unit of K\_offset in FR1, a value of 15 kHz is used.
* FFS: FR2

Agreement:

The granularity of the reported TA is slot.

* FFS how to round TA value to slot level granularity

Agreement:

For the reference subcarrier spacing value for the unit of K\_mac in FR1, a value of 15 kHz is used.

* FFS: FR2

Agreement:

For defining value range(s) of K\_offset, down-select one option from below:

|  |  |  |
| --- | --- | --- |
| Option | Value range | Step size |
| Option 1: One value range of K\_offset covering all scenarios. | [0] – [542] ms | Same as the unit of K\_offset |
| Option 2: Different value ranges of K\_offset for different scenarios. | LEO: [0] – [49] msMEO: [93] – [395] msGEO: [477] – [542] msFFS: ATG and HAPSFFS: How to determine the scenarios | Same as the unit of K\_offset |
| Note: If deemed necessary, numbers in bracket can be further updated at RAN1#107-e. |

Agreement:

For defining value range(s) of K\_mac, down-select one option from below:

|  |  |  |
| --- | --- | --- |
| Option | Value range | Step size |
| Option 1: One value range of K\_mac covering all scenarios. | [1] – [271] ms | Same as the unit of K\_mac |
| Option 2: Different value ranges of K\_mac for different scenarios. | LEO: [1] – [25] msMEO: [1] – [198] msGEO: [1] – [271] msFFS: ATG and HAPSFFS: How to determine the scenarios | Same as the unit of K\_mac |
| Note 1: If deemed necessary, numbers in bracket can be further updated at RAN1#107-e.Note 2: Note that it was agreed already that when UE is not provided by network with a K\_mac value, UE assumes K\_mac = 0. |

Agreement:

RAN1 to conclude the following as a basis to reply to RAN2:

* RAN1 definition of UE’s TA is given by the following agreement:

Agreement:

The Timing Advance applied by an NR NTN UE in RRC\_IDLE/INACTIVE and RRC\_CONNECTED is given by:

$$T\_{TA}=\left(N\_{TA}+N\_{TA, UE-specific}+N\_{TA,common}+N\_{TA,offset}\right)×T\_{c}$$

Where:

* $N\_{TA}$ is defined as 0 for PRACH and updated based on TA Command field in msg2/msgB and MAC CE TA command.
	+ FFS: details of NTA update/accumulation.
* $N\_{TA, UE-specific}$  is UE self-estimated TA to pre-compensate for the service link delay.
* $N\_{TA,common}$ is network-controlled common TA, and may include any timing offset considered necessary by the network.
* $N\_{TA,common}$ with value of 0 is supported.
	+ FFS:  details of signaling including granularity.
* $N\_{TA,offset}$ is a fixed offset used to calculate the timing advance.
* In addition, RAN1 has agreed the following for UE TA reporting:

Agreement:

The granularity of the reported TA is slot.

* FFS how to round TA value to slot level granularity

It is up to RAN2 to decide which component or what combination of the components in the UE’s TA formula to use in TA reporting.

Agreements on “UL time and frequency synchronization”

Agreement:

Confirm the working assumption:

Common TA may include parameter(s) indicating timing drift.

* The UE will apply common TA according to the parameters provided by the network (if any). No offset between the common TA according to the parameters provided by the network and the actual feeder link RTT is considered when defining UE UL timing error requirements.

Agreement:

Common TA Epoch time is implicitly known as a reference time defined by the starting time of a DL slot and/or frame.

* FFS: Whether this starting time is given by predefined rule or it is indicated by the Network
	+ Note: “implicitly known” means that UTC is not provided to define the Common TA epoch time.

Agreement:

The UE assumes that it has lost uplink synchronization if new or additional assistance information (i.e. serving satellite ephemeris data or Common TA parameters) is not available within the associated validity duration.

* FFS: details on how to acquire new or additional assistance information

Agreement:

NTN ephemeris validity timer should be started/restarted with configured timer validity duration at the epoch time of the assistance information (i.e. serving satellite ephemeris data)

Agreement:

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

Agreement:

In NTN, the Network may optionally indicate one or more of the following parameters:

* Common TA , Common TA drift rate and Common TA drift rate variation.
* FFS: Common TA third order derivative.
* FFS: Details of combination of Common TA parameters

Agreement:

* The granularity of Common TA is set to be ${64}/{2^{μ}}∙T\_{c}$
* μ is the highest allowed numerology supported for data, for the given Frequency Range

Working assumption:

* Support serving satellite ephemeris format bit allocations for LEO/MEO/GEO based non-terrestrial access network.:
	+ Position and velocity state vector ephemeris format [17 bytes payload].
		- The field size for position [m]  is [78 bits]
			* Position range is driven by GEO : +/- 42 200 km
			* The quantization step is [1.3m] for position
		- The field size for velocity [m/s] is [54 bits]
			* Velocity range is driven by LEO@600 km: +/- 8000 m/s
			* The quantization step is [0.06 m/s] for Velocity
	+ Orbital parameter ephemeris format [18 byte payload]
		- Semi-major axis α [m] is [33 bits]
			* Range: [6500, 43000]km
		- Eccentricity e is [19 bits]
			* Range: ≤ 0.015
		- Argument of periapsis ω [rad] is [24 bits]
			* Range: [0, 2π]
		- Longitude of ascending node Ω [rad] is [21 bits]
			* Range: [-180o , +180o]
		- Inclination i [rad] is [20 bits]
			* Range: [-90o  , +90o ]
		- Mean anomaly M [rad] at epoch time to is [24 bits]
			* Range: [0, 2π]
* FFS: Additional enhancement to optimize the signalling overhead.
* FFS: Ephemeris format bit allocations for HAPS

Agreements on “Enhancements on HARQ”

Agreement: For DCI indicating SPS PDSCH release, HARQ-ACK report is as in Rel-16.

Conclusion: For DCI 0-0/1-0, no enhancement to support indication of more than 16 HARQ processes is considered in Rel-17.

Agreements on “Others”

Agreement: Support polarization signalling for target serving cell in handover command message.

Agreement: Support polarization signalling for non-serving cell in RRM measurement configuration.

Agreed LS out

* R1-2110663 LS on UE TA reporting RAN1, Ericsson
* R1-2110604 LS on Combination of open and closed loop TA control in NTN RAN1, Thales
* **RAN1#107-e, 11th– 19th November 2021, e-meeting**

[General]

Agreements on “Timing relationship enhancements”:

**Agreement**

For defining value range(s) of K\_offset, specify one value range of K\_offset covering all scenarios

**Agreement**

For defining value range(s) of K\_mac, specify one value range of K\_mac covering all scenarios.

**Agreement**

For determining UE specific K\_offset

* Option 2: MAC CE provides a differential UE specific K\_offset value. The full UE specific K\_offset value equals the cell specific K\_offset value minus the differential UE specific K\_offset value.
	+ FFS: whether/how to resolve ambiguity of which cell-specific K\_offset value to use during the SIB modification period

**Agreement**

15 kHz is used as the reference subcarrier spacing value for the unit of TA reported in FR1.

**Agreement**

The reported TA is the least integer number of slots greater than or equal to the corresponding TA value.

Proposal 3-A is endorsed as a basis to reply to RAN2 LS on TA pre-compensation (R1-2104230).

**Proposal 3-A:**

RAN1 to conclude the following as a basis to reply to RAN2:

RAN1 inputs for the following RAN2 agreements (*in italic*) are given below:

* *Event-triggers for reporting on the information about UE specific TA in connected mode is supported. FFS on the details. Confirmation by RAN1 is also needed*

[RAN1]: RAN1 confirms that event-triggers for reporting on the information about UE specific TA in connected mode can be supported.

* *The event-triggers for reporting information about UE specific TA are based on TA values (confirmation from RAN1 is needed)*

[RAN1]: RAN1 confirms that the event-triggers for reporting information about UE specific TA can be based on TA values.

* *Under the work assumption "the UE location information cannot be reported in connected mode", the content of UE specific TA reported in connected mode is UE specific TA pre-compensation(for the details of the TA value, confirmation from RAN1 is needed).*

*Under the work assumption "the UE location information can be reported in connected mode", for TA reporting purposes in connected mode, the network can configure the UE to send either the UE specific TA pre-compensation (for the details of the TA value, confirmation from RAN1 is needed) or the UE location information*

[RAN1]: RAN1 made the following further agreements for the details of the TA value:

**Agreement**

15 kHz is used as the reference subcarrier spacing value for the unit of TA reported in FR1.

**Agreement**

The reported TA is the least integer number of slots greater than or equal to the corresponding TA value.

**Agreement**

The value range of cell specific K\_offset is 0 – 1023 ms.

**Agreement**

The value range of K\_mac is 1 – 512 ms.

**Agreement**

The value range of the differential UE specific K\_offset provided in MAC CE is 0 – 63 ms.

**Agreement**

The K\_offset value signaled in system information is always used for PDCCH ordered PRACH timing relationship.

**Agreement**

Adopt the following TP (38.213, 8.1):

For a PRACH transmission triggered by a PDCCH order, the PRACH mask index field [5, TS 38.212], if the value of the random access preamble index field is not zero, indicates the PRACH occasion for the PRACH transmission where the PRACH occasions are associated with the SS/PBCH block index indicated by the SS/PBCH block index field of the PDCCH order. If UE is provided with *Koffset*$K\_{offset}$, for a PDCCH order received in downlink slot *n*, the available PRACH occasion is after uplink slot *n*+*Koffset*$n+K\_{offset}$.

Note: Editor can make further adjustment as appropriate.

**Agreement**

On beam failure recovery procedure, for PRACH transmission in uplink slot n, UE monitors the corresponding PDCCH starting from downlink slot “n + K\_mac + 4” within a corresponding RAR window.

Agreements on “UL time and frequency synchronization”

**Agreement**

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

**Agreement**

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

**Working assumption**

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

| **Parameter name**  | **Value range** | **Granularity** | **Bits allocation** |
| --- | --- | --- | --- |
| $$TA\_{Common }$$ | 0 ...66485757 (i.e: 0… 270.73 ms)  | $$4.07×10^{-3} μs$$ | **26 bits** |
| **TACommonDrift** |  - 261935… + 261935**(i.e: --53.33** ${μs}/{s}$**… +-53.33** ${μs}/{s}$**)**  | $$0.2×10^{-3}{μs}/{s}$$ | **19 bits** |
| **TACommonDriftVariation** | 0…29470**(0…0.60** ${μs}/{s^{2}}$**)** | $$0.2×10^{-4}{μs}/{s^{2}}$$ | **15 bits** |
| **[TACommonThirdOrder]** | -4912…+4912(-0.015 ${μs}/{s^{3}}$…+0.015 ${μs}/{s^{3}}$) | $$0.3×10^{-5}{μs}/{s^{3}}$$ | **14 bits** |
| * **Value ranges are given in unit of corresponding granularity**
 |

**Agreement**

NTN validity duration is configured per cell and indicated to the UE in X bits with:

* Value range { 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 120, 180, 240~~, Infinity~~}
* Unit is second
* FFS (to be resolved in current meeting): Additional values for GEO

**Agreement**

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

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

**Agreement**

The reference point of the epoch time for assistance information (i.e. Serving satellite ephemeris and Common TA parameters) should be known by UE.

* FFS: the definition of the reference point

**Conclusion**

  $N\_{TA,UE-specific} $is UE self-estimated TA to pre-compensate for the service link delay, which is calculated using the UE position and the serving satellite ephemeris.

* How the UE calculates/updates NTA, UE-specific is left to UE implementation.

**Agreement**

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

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

Where:

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

**Agreement**

Confirm the Working assumption on granularity and bits allocation for Common TA parameters: Value range, granularity and bits allocation of Higher-layer parameters TACommon, TACommonDrift, TACommonDriftVariation are as follows:

| **Parameter name**  | **Value range** | **Granularity** | **Bits allocation** |
| --- | --- | --- | --- |
|  | 0 ...66485757 (i.e: 0… 270.73 ms)  |  | 26 bits |
| TACommonDrift | - 261935… + 261935(i.e: --53.33   … +-53.33 )  |  | 19 bits |
| TACommonDriftVariation | 0…29470(0…0.60 ) |  | 15 bits |
| * Value ranges are given in unit of corresponding granularity
 |

**Agreement**

* When explicitly provided through SIB, Epoch time of assistance information (i.e. Serving satellite ephemeris and Common TA parameters) is the starting time of a DL sub-frame, indicated by a SFN and a sub-frame number signaled together with the assistance information.
* Otherwise, when indicated in SIB (other than SIB1), epoch time of assistance information (i.e. Serving satellite ephemeris and Common TA parameters) is implicitly known as the end of the SI window during which the SI message is transmitted.
* When provided through dedicated signaling, epoch time of assistance information (i.e. Serving satellite ephemeris and Common TA parameters) is the starting time of a DL sub-frame, indicated by a SFN and a sub-frame number.

**Agreement**

The reference point for epoch time of the serving satellite ephemeris and Common TA parameters is the uplink time synchronization reference point.

Working assumption:

When TAC ($T\_{A}$) in msg2/msgB is received, UE receives the first adjustment and $N\_{TA}$ is updated as:

* Option 1: $N\_{TA}=T\_{A}⋅16⋅\frac{64}{2^{μ}}$.

Where, $T\_{A}$ is the TAC field in msg2/msgB

**Conclusion**

DL frequency compensation by gNB for the service link Doppler is not supported in Release 17.

Agreements on “Enhancements on HARQ”

**Agreement**

The bit-fields related to the HARQ-ACK feedback (i.e., PRI, PUSCH-to-HARQ\_feedback timing, DAI) are unchanged for the DCI of PDSCH with feedback-disabled HARQ process in Rel-17 with the same interpretation from UE as for feedback-enabled HARQ process

* Note: The interpretation regarding the DAI for Type-2 codebook is up to the progress of codebook design.

**Agreement**

For Type-1 HARQ codebook, the UE will consistently report NACK-only for the feedback-disabled HARQ process regardless of decoding results of corresponding PDSCH.

**Agreement**

For Type-3 HARQ codebook in NTN, the UE should skip the codebook feedback for a feedback-disabled HARQ processes

Note: The Type-3 codebook size is reduced by excluding the bit positions of disabled HARQ processes

**Agreement**

HARQ feedback for SPS activation may be additionally enabled by the network by RRC configuration.

* If enabled, UE reports ACK/NACK for the first SPS PDSCH after activation, regardless of whether HARQ feedback is enabled or disabled corresponding to the first SPS PDSCH after activation
* Otherwise, UE follows configuration of HARQ feedback enabled/disabled corresponding to the first SPS PDSCH after activation,
	+ FFS between Alt1 and Alt2
		- [Alt-1: UE follows the per-process configuration of HARQ feedback enabled/disabled for the associated HARQ process
		- Alt-2: UE follows the feedback-enabled/disabled configuration of the SPS PDSCH]

Agreements on “Others”

**Conclusion**

No consensus on the enhancement to support gNB dominant BWP switching based on prediction in NTN-NR R17.

**Conclusion**

Handling inter-service link interference is not considered in NTN-NR R17.

**Conclusion**

Handling inter-feeder link interference is not considered in NTN-NR R17.

**Conclusion**

It is up to gNB implementation to handle BWP\_inactivityTimer function, no enhancement is considered in NTN-NR R17.

**Conclusion:**

No further enhancement is considered for polarization signaling in NTN-NR R17.

No consensus on UE reporting polarization capability.

No consensus on UE behavior for selecting polarization mode for DL reception and UL transmission.

Agreed LS out

* R1-2112652 [DRAFT] LS reply on TA pre-compensation Moderator (Ericsson)
* Final LS endorsed in R1-2112766.

Other agreements

* R1-2111809 “107-e-R17-UE-features-NR-NTN”: agreements listed in Section 6 are endorsed

 [Essential corrections]

None

#### 2.1.2 Remaining Open issues

At RAN1, NR NTN WI was declared completed, at the GTW session held on 19 Nov. 21

Issue on combination of open and closed loop TA control: The following conclusion was extensively discussed during RAN1#107e

**Conclusion:**

**The solution to resolve the issue on combination of open and closed loop TA control is up to the UE implementation to meet the RAN4 gradual timing adjustment requirement.**

Many companies were supportive of this conclusion. Few companies prefer not to conclude for now. The issue is within the hands of RAN4. RAN1 to come back on this issue during maintenance phase of release 17.

## 2.2 RAN2

#### 2.2.1 Agreements

[General]

The RAN2 work plan described in R2-2107146 is considered as a basis for work.

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

Agreements on ”User plane”

*RACH aspects*

1. Enhancements for RA type selection in NTN will not be pursued in Rel-17. FFS for BSR

1. Do not mandate Msg3/MsgA or Msg5 to include TA report MAC CE, and whether it can be included depends on the TB size of Msg3/MsgA or Msg5. No spec change is needed for this

2. Reserved LCID is used for the TA report MAC CE.

3. Postpone the discussion on the size of the TA report MAC CE until RAN2 concludes on the content of TA report.

4. RAN2 do not pursue any enhancements to allow inclusion of TA information without extending Msg3 size.

5. Logical channel priority of the TA report MAC CE should be lower than that of “C-RNTI MAC CE or data from UL-CCCH” and higher than that of “data from any Logical Channel, except data from UL-CCCH”.

1. Do not introduce additional enhancement on BSR over 2-step RACH in Rel-17.

1. RAN2 further discuss the exact priority of the TA report MAC CE between “C-RNTI MAC CE or data from UL-CCCH” and “MAC CE for BSR, with exception of BSR included for padding

2. If the reported content of information about UE specific TA is TA pre-compensation value in connected mode, MAC CE is used to report

3. In case UE location information can be reported to network, dedicated signaling is used to configure UE to report the UE location and/or the UE specific TA information for the purpose of TA reporting in connected mode. FFS if both mechanisms are needed in parallel

*Other MAC aspects*

1. The extended values for sr-ProhibitTimer in NTN can include values less than UE-gNB RTT (as in legacy). FFS on the actual values and how this is extended

2. RRC parameter “allowedHARQ-DRX-LCP” is included in LogicalChannelConfig (FFS on the actual name of the parameter)

3. configuredGrantTimer can be extended in NTN. FFS details of when extension is applicable and method of extention.

4. The ConfiguredGrantConfiguration shall allow for up to 32 in nrofHARQ-Processes, and up to 31 in harq-ProcID-Offset and harq-ProcID-Offset2.

5. The SPS-Config shall allow up to 32 for nrofHARQ-Processes, and up to 31 in harq-ProcID-Offset.

6. HARQ feedback shall always be sent for SPS deactivation (i.e. regardless of HARQ feedback enabled/disabled).

1. For HARQ process(es) not configured with DL HARQ feedback enabled/disabled, drx-HARQ-RTT-TimerDL behaves as per legacy.

2. Introduce a new sr-ProhibitTimerExt-r17 IE. Values FFS

3. If uplinkHARQ-DRX-LCP-Mode-r17 is configured, a HARQ process may be mapped to either ‘HARQ mode A’ or ‘HARQ mode B’.

4. uplinkHARQ-DRX-Mode shall be included in PUSCH-ServingCellConfig.

1. If uplinkHARQ-DRX-LCP-Mode-r17 is configured, the following LCH to HARQ process mapping rules are supported:

 1) LCH is mapped only to a HARQ process configured with HARQ mode A;

 2) LCH is mapped only to a HARQ process configured with HARQ mode B;

 3) If an LCH is not configured with a mapping rule, it may be mapped to any HARQ process (HARQ mode A or B).

2. downlinkHARQ-FeedbackDisabled shall be included in PDSCH-ServingCellConfig.

Agreements on “Control plane”

1. There will be max 12 TACs per NR NTN cell, including same or different PLMNs.

1. Location assisted cell reselection, with the distance between UE and the reference location of the cell (serving cell and/or neighbor cell) taken into account, is supported for quasi-earth fixed cell. FFS on how UE performs location acquisition.

1. When UE uses location based cell reselection enhancements, it's up to UE implementation to guarantee that a valid location information is available

2. For quasi-earth fixed cell, same as legacy, UE shall perform neighbour cell measurements of “higher priority NR inter-frequency or inter-RAT frequencies” regardless of the distance between UE and serving cell reference location.

1. For quasi-earth fixed cell, UE should start measurements on neighbour cells before the serving cell stops covering the current area, regardless of (the distance between UE and serving cell reference location) or (if legacy Srxlev/Squal condition is met, i.e., serving cell’s Srxlev/Squal is better than a threshold).

1. Distance based cell reselection criteria for quasi-earth fixed cell is supported

2. For quasi-earth fixed cell, the cell stop time of neighbour cell(s) is NOT broadcast

1. We don't introduce new mechanisms (e.g. based on MAC CE) to activate/deactivate SMTCs for NTN neighbour measurements. Which SMTCs the UE will consider is only based on RRC configuration (UE based solutions are not excluded by this)

1. RAN2 will decide which option to choose for NTN assistance information for SMTC/MG once SA3 feedback on user consent is received.

2. If propagation delay based UE assistance information for NTN SMTC is agreed, it is defined in the form of propagation delay difference.

3. RAN2 assumes FL delay is known to and compensated by the network. RAN2 also assumes the UE needs to have neighbour cell ephemeris for the propagation delay estimation.

4. In NW-based SMTC solution the UE is not allowed to apply shifts to configured SMTCs.

5. Measurement gap related aspects for Rel-17 NTN will be addressed in Rel-17 NTN WI. Coordination and avoiding overlap with other WIs and WGs is recommended.

6. RAN2 will reuse at least the SMTC agreements made for UE assistance information reporting also in the area of measurement gaps for NTN

1. UE assistance information for NTN SMTC adjustments is event-triggered. Details of the triggering event are FFS (pending the decision on supported assistance information type).

2. RAN2 aims to minimize the number of configurable measurement gaps required for monitoring configured SMTCs in NTN. At least gap length and UE capabilities impact the number of required measurement gaps.

3. UE-based solution for SMTC adjustments in NTN is supported for IDLE/INACTIVE UEs. FFS how does the UE perform the necessary shifts in SMTC.

1. In NW-based solution, the network can configure up to 2 SMTCs in parallel and the UE uses all of them, i.e. there is no switching between or activation/deactivation of configured SMTCs. FFS whether this (UE support for 2 SMTCs) requires a UE capability. A UE can optionally indicate support for 4 SMTCs (in this case the NW can configure up to 4 SMTCs in parallel)

Endorsed draft Running CR

* R2-2111336 Stage 2 running CR (Thales)
* R2-2110466 Stage-3 running 304 CR for NTN ZTE corporation, Sanechips
* R2-2110864 Stage 3 NTN running CR for 38.321 - RAN2#116e InterDigital

Agreed LS out:

* R2-2111612 Reply LS on extended NAS supervision timers at satellite access (contact: Ericsson) LS out Rel-17
* R2-2111547 Reply on UE location aspects in NTN (contact: Qualcomm) LS out Rel-17

Off line Email discussions during the meeting

* R2-2111354 [AT116-e][101][NTN] Other MAC aspects (Interdigital)
* R2-2111352 [AT116-e][102][NTN] Idle mode aspects (Intel)
* R2-2111353 [AT116-e][103][NTN] SMTC and gaps (Nokia)
* R2-2111351 [AT116-e][106][NTN] RACH aspects (Oppo)
* R2-2111xxx [AT116-e][107][NTN] Stage 2 running CR (Thales)
* R2-2111358 [AT116-e][108][NRN] Extended NAS timers (Ericsson)
* R2-2111357 [AT116-e][109][NTN] Reply LS to SA2 on the number of TACs (Qualcomm)

Post email discussions (short)

* R2-2111613 [post116-e][101][NTN] Stage 2 running CR (Thales)
* R2-2111614 [post116-e][102][NTN] RRC running CR (Ericsson)
* R2-2111615 [post116-e][103][NTN] MAC running CR (Interdigital)
* R2-2111616 [post116-e][104][NTN] 38.304 running CR (ZTE)
* R2-2111617 and R2-2111618 [post116-e][105][NTN] RLC and PDCP running CRs (Mediatek)

Post email discussions (long)

* R2-21xxxxx [post116-e][111][NTN] UE capabilities (Intel)

[Essential corrections]

None

#### 2.2.2 Remaining Open issues

User plane aspects:

* Details about TA information reporting in idle and connected mode
* Details about HARQ

Control plane aspects:

* Further discuss UE location in NTN
* Details about cell (re) selection in idle mode (including NTN-TN mobility)
* Details about mobility procedures in connected mode (including NTN-TN mobility)
* Details about measurements

Other aspects

* NTN UE capabilities

## 2.3 RAN3

#### 2.3.1 Agreements

* **RAN3#114-e, 1st – 11th November 2021, e-meeting**

[General]

Agreements

* No need to reply to the RAN2 LS (R3-214698), RAN2 status is consistent with existing RAN3 assumptions.
* It is unnecessary for the geographic area represented by the CGI at initial access to be comparable to a TN cell coverage area (based on SA2 input).
* In NTN the legacy location reporting procedure over NGAP is reused. Enhancements to the location reporting procedure over NGAP are not needed.
* So far, no impacts on Xn from CHO have been identified in Rel-17.
* Enhancement of Xn to support feeder link switch-over is not needed in Rel-17.
* New procedure of Xn for feeder link switch-over is not needed in Rel-17.
* Enhancement of NG to support feeder link switch-over is not needed in Rel-17.

BL CRs endorsed:

* R3-214614 Clarification of NAS Node Selection Function for NTN nodes providing access over multiple countries (Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, Huawei)
* R3-214615 Support of NTN RAT identification and NTN RAT restrictions (Qualcomm Incorporated, Huawei, Thales, Ericsson, Nokia, Nokia Shanghai Bell, CATT)
* R3-214663 Support Non-Terrestrial Networks (Huawei, Thales, Ericsson, ZTE, Qualcomm Incorporated)
* R3-214664 Support of NTN RAT identification and NTN RAT restrictions (Qualcomm Incorporated, Huawei, Thales, Ericsson, Nokia, Nokia Shanghai Bell, CATT)

TP agreed

* R3-216036 (TP for BL CR TS 38.300) NTN Stage 2 Update (Huawei)
* R3-216093 (TP for BL CR for TS 38.300) On country policy handling (CATT)

Summary of email discussions

* R3-215880 CB # 2001\_NTN\_General (Thales – moderator)
* R3-215881 CB # 2002\_NTN\_NW-ID (Qualcomm - moderator)
* R3-215882 CB # 2003\_NTN\_Cell\_Rel (ZTE – moderator)
* R3-215883 CB # 2004\_NTN\_Feeder\_Link (CMCC – moderator)
* R3-216092 CB # 2005\_NTN\_Country\_Routing (CATT – moderator)

LS out agreed

* R3-216067 Reply LS on UE Location Aspects in NTN (Ericsson LM)

[Essential corrections]

None

#### 2.3.2 Remaining Open issues

Handling of incoming LSs from SA2, SA3 and RAN2 with possible impact related to Multiple TAC and UE location aspects.

It’s FFS whether it is needed to introduce a new cause value for UE Context Release Request.

## 2.4 RAN4

#### 2.4.1 Agreements

[General]

The RAN4 work plan described in R4-2104879 should be considered as a basis for work.

* **RAN4#101-e, 1st – 12th November 2021, e-meeting**

**[GTW Agreements on BSRF Test Demod aspects (2nd of Nov)]**

NTN Satellite Band PrefixAgreement:

Using ‘n’ as prefix, companies are continued the effort on the “note” and table for introduction of NTN satellite bands.

**NTN Satellite gNB Class/Type** Agreement:

non-AAS architecture (1-C) is confirmed as being out of scope of the Rel-17 NTN work.

Satellite NTN BS Type 1-O Agreement:

Further check the progress on BS type 1-O in Jan. 2022 RAN4 meeting and decide if BS type 1-O to be further considered in Rel-17.

For Jan 2022 meeting, RAN4 can consider to have dedicated AIs for BS Type 1-O requirements.

No need to consider BS 1-O and 1-H as package from RAN4 requirements introduction perspective.

Satellite NTN gNB Class Agreement:

It’s FFS whether separate NTN gNB classes needed or not for Rel-17 which pending on further check on the RF requirements.

* If no difference observed from RAN4 RF requirements perspective, then only single NTN BS class will be introduced as wide area BS.
* All NTN BS classes can be potentially considered equivalent as to Wide Area BS (e.g. if all classes have the same requirements).
* At least introduce NTN BS class with wide coverage

The Classes intended to be used for differentiate the RF requirements.

Below candidate NTN gNB class can be considered as starting point:

* GEO, LEO@600, LEO@1200
* FFS whether need to LEO@600, LEO@1200 can be merged as single class

**NTN TR and TS Titles** Agreement: “Satellite Access Node” agreed to use for RAN4 requirements and spec title for the box of **Satellite** payload + feeder link + GW + Non-NTN infrastructure gNB.

**Base station output power** Agreement:

The power limitation on “satellite access node” are manufacture declaration basis, no limitation in RAN4 specification.

Some background information from regulatory can be considered to be included in the TR for information.

**RE power dynamic range** Agreement:

Further discuss the necessity of introducing of RE power dynamic range requirement

The current RE power dynamic range can be reused for Satellite Access Node if introduced

**Total power dynamic range** Agreement:

The current total power dynamic range requirement can be reused.

* If the co-existence simulations indicate that there is no need to change the ACLR, SU can be reused from NR.

**Frequency error** Agreements: The current requirement for WA BS can be reused, i.e. 0.05ppm.

**Modulation quality (EVM)** Agreements:

For Satellite Access Node DL transmission:

* The current requirement can be reused for QPSK and 16 QAM
* FFS whether 64QAM can be supported in FR1
* 256QAM is not supported by Satellite Access node in Rel-17.

**Time alignment error** Agreement:

CA is out of Rel-17 NTN WI scope for RAN4 requirements

FFS whether MIMO cases supported in Rel-17 NTN WI scope.

**Rx requirements for Satellite BS** Agreement: taking option 1 as starting point.

* Option 1: The FRCs specified in TS 38.104 shall be re-used to specify the satellite node Rx requirements. Specifically the following FRCs and DMRS pattern is re-used.

|  |  |  |  |
| --- | --- | --- | --- |
|  | BS Channel BW | Subcarrier spacing | Number of PRBS |
| G-FR1-A1-1 | 5 MHz | 15 kHz | 25 |
| G-FR1-A1-2 | 5 MHz | 30 kHz | 11 |
| G-FR1-A1-3 | 10 MHz | 60 kHz | 11 |
| G-FR1-A1-4 | 20 MHz | 15 kHz | 106 |
| G-FR1-A1-5 | 20 MHz | 30 kHz | 51 |
| G-FR1-A1-6 | 20 MHz | 60 kHz | 24 |



**Noise figure** Agreements: Option 1

* Option 1: Consider the satellite access node’s noise figure as a whole and use the following as starting point.

|  |  |  |  |
| --- | --- | --- | --- |
| **Satellite** | **GEO** | **LEO 600** | **LEO 1200** |
| **G/T (dB K-1)** | 19 | 1.1 | 1.1 |
| **G\_Rx (dBi)** | 51 | 30 | 30 |
| **NF (dB)** | **7.4** | **4.3** | **4.3** |

**[GTW Agreements on BSRF Test Demod aspects (12th of Nov)]**

NTN UE ACS and ACLR **Agreement:**

**The baseline assumption (GTW 12/11/2021):** RAN4 follow the assumption that NTN handheld User Equipment has both TN and NTN functionalities for FR1 in Rel-17 NTN WI from RAN4 requirements perspective.

Protection of GNSS **Agreement:**

Protection of GNSS shall be ensured in conformance with regional regulations, including when n255 is deployed.

HAPS technical specifications **Agreement:**

Introduce HAPS specific technical requirements to **TS 38.104** under suffix section where requirements are **different from** normal NR operation.

Coexistence aspects **Agreement:** **RAN4 agreed no further effort on NTN to NTN (satellite to satellite) co-existence scenarios in Rel-17 NTN WI.**

Documents approved:

* R4-2120774 Way Forward on NTN\_solutions\_Part1 THALES Approved
* R4-2120759 draft TP to TR 38.863: Operating bands and channel arrangements ZTE Corporation Approved pCR on TR 38.863
* R4-2120760 TP for 38.863 on system parameters on satellite bands Huawei Approved pCR on TR 38.863
* R4-2120761 TP to TR 38.863 - Regulatory aspects Ericsson Approved pCR on TR 38.863
* R4-2120762 TP to TR 38.863: node class, RF RX (6.2) Huawei Approved pCR on TR 38.863
* R4-2120763 TP for 38.863 on NTN UE transmission characteristics Huawei Approved pCR on TR 38.863
* R4-2120670 WF on [310] NTN\_Solutions\_Part2 Samsung Approved
* R4-2120671 Simulation assumptions for NTN co-existence Samsung, CATT Approved
* R4-2120672 Simulation assumptions for HAPS co-existence Nokia Approved
* R4-2120749 Summary of NTN co-existence study Samsung Approved
* R4-2120750 Summary of HAPS co-existence study Nokia Approved
* R4-2120772 Draft text proposal to update TR 38.863 NTN related RF and co-existence aspects Samsung Approved
* R4-21120674 WF on Tx RF requirements for satellite access node CATT Approved
* R4-21120675 WF on Rx RF requirements for satellite access node Ericsson Approved
* R4-21120676 WF on NTN UE RF requirements Huawei Approved

[Other documents]

Email discussion summaries:

* R4-2120740 Email discussion summary for [101-e][309] NTN\_Solutions\_Part1, THALES
* R4-2120741 Email discussion summary for [101-e][310] NTN\_Solutions\_Part2, Samsung
* R4-2120742 Email discussion summary for [101-e][311] NTN\_Solutions\_Part3, CATT

**[GTW Agreements on RRM aspects – 5th of November 2021]**

The maximum number of SMTCs per Frequency layer: The maximum number of SMTCs configured per measurement object for the same ssbFrequency is 4.

* FFS on the assumptions on the number of configured parallel SMTCs to be used for requirements definition
* FFS if different UE capabilities to support measurements for multiple configured SMTCs are needed

If valid neighbour/target cell’s timing information in terms of validity or accuracy is not provided to UE - 1st round summary WF

* If valid neighbour/target cell’s timing information in terms of validity or accuracy is not provided to UE, clarify in spec that additional delay is expected for the corresponding requirement, e.g. SIB reading time.
* RAN4 send LS to RAN1/2 with the following contents (details can be discussed in the second round):
	+ Clarify whether and how those parameters to be used for deriving timing relation between UE and non-serving cell(s) for measurement and/or handover are provided by serving cell.
	+ What is UE behaviour if the information is not provided by serving cell.

Requirement of initial transmit timing error (Te\_NTN) - Agreement

|  |  |  |
| --- | --- | --- |
| SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | Te\_NTN |
| 15 | 15 | [26\*64\*Tc] |
| 30 | 24\*64\*Tc |
| 60 | FFS |
| 30 | 15 | [24\*64\*Tc] |
| 30 | 22\*64\*Tc |
| 60 | FFS |

**[GTW Agreements on RRM aspects – 12th of November 2021]**

Requirement of initial transmit timing error (Te\_NTN) - Candidate agreement

|  |  |  |
| --- | --- | --- |
| SCS of SSB signals (kHz) | SCS of uplink signals (kHz) | Te\_NTN |
| 15 | 15 | [29\*64\*Tc] |
| 30 | 24\*64\*Tc |
| 60 |  |
| 30 | 15 | [24\*64\*Tc] |
| 30 | 22\*64\*Tc |
| 60 |  |

R4-2120312 Reply LS on combination of open and closed loop TA control in NTN

Documents approved:

* R4-2120307 WF on NR NTN RRM requirements Qualcomm Approved
* R4-2120308 Reply LS on Multiple SMTCs for NR NTN Qualcomm Approved
* R4-2120309 LS on NR NTN Neighbor Cell and Satellite Information Qualcomm Approved
* R4-2120310 WF on GNSS-related and timing requirements for NR NTN Xiaomi Approved
* R4-2120311 Reply LS on NTN UL time and frequency synchronization requirements Xiaomi Approved
* R4-2120312 Reply LS on combination of open and closed loop TA control in NTN Qualcomm Return to Treat in GTW

[Other documents]

Email discussion summaries:

* R4-2120366 Email discussion summary for [101-e][224] NR\_NTN\_solutions\_RRM\_1, Qualcomm
* R4-2120367 Email discussion summary for [101-e][225] NR\_NTN\_solutions\_RRM\_2, Xiaomi

Agreed LS outs

* R4-2120417 Reply LS on combination of open and closed loop TA control in NTN (Qualcomm)

[Essential corrections]

None

#### 2.4.2 Remaining Open issues

In general, follow WF agreements. Companies decided to improve Phase 1 coexistence simulations by January meeting. Some extra calibration of simulations might be required. Since the NTN parameter list becomes more stable, TS contents to be further discussed. Companies are also encouraged to provide pCRs to TR 38.863.

For the RRM part, it has been discussed if NTN UE RRM requirements can be considered in separate sections of 38.133, if needed. No decisions will be made in RAN4 on whether separate specification will be used for NTN RRM. The decision is planned to be made in RAN #94e (December 2021). To facilitate progress and better understanding companies can share views on NTN RRM specification structure under assumption of separate or same specifications.

With respect to RRM further System level Simulation, if simulations are used to derive conclusions, then common simulation assumptions are encouraged.

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

## 3.1 SAx/CTs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Work Area |  WIDs/SIDs | Rapporteurs | RAN WIDs | Rapporteurs |
| 5G Satellite Aspects | SA2 led WI 5GSAT\_ARCH | jean-yves.fine@thalesgroup.com | RAN2 led WI NR\_NTN\_solutions | nicolas.chuberre@thalesaleniaspace.com |
| 5G Satellite Aspects | CT1 led SI 5GSAT\_ARCH-CT | amerc@qti.qualcomm.com | RAN2 led WI NR\_NTN\_solutions | nicolas.chuberre@thalesaleniaspace.com |

#### 3.1.1 Agreements with cross-TSG impacts

a Cell ID as used in the User Location Information on the NG/N2 interface corresponds to a fixed geographical area, and the Tracking Area is coupled with geographical area.

Note: NTN WID includes “identification of potential issues associated to the use of the existing Location Services (LCS) application protocols to locate UE in the context of NTN and specify adaptations if any [RAN2/3]”. This could be used to determine the UE location with sufficient level of accuracy if needed.

#### 3.1.2 Remaining Open issues with cross-TSG impacts

NOTE: This section should also flag any critical dependencies that need TSG attention.

* UE location aspects
* Multiple TAC reporting

## 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#106-bis-e, 11th – 20th October 2021, e-meeting**

Submitted TDOCs:

* R1-2110374 Updated NR\_NTN\_solutions work plan Thales
* R1-2110685 3GPP TSG-RAN WG1 Agreements under 8.4 up to eMeeting RAN1#106-bis-e WI rapporteur (Thales)
* R1-2110613 Session notes for 8.4 (Solutions for NR to support non-terrestrial networks (NTN)) Ad-Hoc Chair (Ericsson)
* R1-2110624 Summary of [106bis-e-R17-RRC-NR-NTN] Email discussion on Rel-17 RRC parameters for NR to support NTN Moderator (Thales)
* R1-2110541 Feature lead summary#4 on timing relationship enhancements Moderator (Ericsson)
* R1-2110577 Feature lead summary#5 on timing relationship enhancements Moderator (Ericsson)
* R1-2110487 Feature lead summary#2 on timing relationship enhancements Moderator (Ericsson)
* R1-2110641 Feature lead summary#6 on timing relationship enhancements Moderator (Ericsson)
* R1-2110663 LS on UE TA reporting RAN1, Ericsson
* R1-2110505 Feature lead summary#3 on timing relationship enhancements Moderator (Ericsson)
* R1-2110387 Feature lead summary#1 on timing relationship enhancements Moderator (Ericsson)
* R1-2109763 Discussion on timing relationship enhancement for NTN Baicells
* R1-2109786 Calculation and application of timing relationship offsets Sony
* R1-2110290 Discussion on Timing Relationship Enhancements for NTN Fraunhofer IIS - Fraunhofer HHI
* R1-2109927 On timing relationship enhancements for NTN Ericsson
* R1-2110031 Discussion on Timing Relationship Enhancements for NR NTN Apple
* R1-2110183 Enhancements for Timing Relationship for NTN Qualcomm Incorporated
* R1-2110084 Discussions on timing relationship enhancements in NTN LG Electronics
* R1-2109932 Timing relationship enhancements for NTN ITL
* R1-2109609 On timing relationship enhancements for NTN Intel Corporation
* R1-2109675 Discussion on timing relationship enhancements for NTN NTT DOCOMO, INC.
* R1-2109220 Further discussion on timing relationship enhancements for NTN CATT
* R1-2109323 Discussion on NTN timing relationship Lenovo, Motorola Mobility
* R1-2109279 Discussion on timing relationship enhancements for NTN CMCC
* R1-2109343 Timing relationship enhancements to support NTN CAICT
* R1-2109357 Discussion on timing relationship enhancements for NTN NEC
* R1-2109825 Timing relationship enhancements in NTN FGI, Asia Pacific Telecom, III
* R1-2109843 Discussion on timing relationship for NR-NTN ZTE
* R1-2109865 Timing relationship for NTN Panasonic Corporation
* R1-2109878 Timing relationship enhancement for NTN InterDigital, Inc.
* R1-2109486 Timing relationship enhancements for NTN Samsung
* R1-2109409 Discussion on the timing relationship enhancement for NTN Xiaomi
* R1-2109164 Further discussion on timing relation aspects for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2109168 Timing relationship enhancements for NR-NTN MediaTek Inc.
* R1-2109076 Discussion on timing relationship enhancement OPPO
* R1-2109025 Timing relationship enhancements for NTN Zhejiang Lab
* R1-2108747 Discussion on timing relationship enhancements for NTN Huawei, HiSilicon
* R1-2108971 Discussion on timing relationship enhancements for NR-NTN vivo
* R1-2108909 Discussion on timing relationship enhancements for NTN Spreadtrum Communications
* R1-2110085 Discussions on UL time and frequency synchronization enhancements in NTN LG Electronics
* R1-2110184 UL time and frequency synchronization for NTN Qualcomm Incorporated
* R1-2110032 Discussion on Uplink Time and Frequency Synchronization for NR NTN Apple
* R1-2109928 On UL time and frequency synchronization enhancements for NTN Ericsson
* R1-2110292 Discussion on UL Time Synchronization for NTN Fraunhofer IIS - Fraunhofer HHI
* R1-2109787 Considerations on UL time synchronisation Sony
* R1-2109764 Discussion on UL time and frequency synchronization enhancement for NTN Baicells
* R1-2110604 LS on Combination of open and closed loop TA control in NTN RAN1, Thales
* R1-2110602 FL Summary #6 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2110603 Draft LS on Combination of open and closed loop TA control in NTN Moderator (Thales)
* R1-2108910 Discussion on enhancements on UL time and frequency synchronization for NTN Spreadtrum Communications
* R1-2108972 Discussion on UL time and frequency synchronization enhancements for NR-NTN vivo
* R1-2108748 Discussion on UL time and frequency synchronization enhancement for NTN Huawei, HiSilicon
* R1-2108780 FL Summary #4 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2108781 FL Summary #5 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2108720 Considerations on UL timing and frequency synchronization in NTN THALES
* R1-2108721 FL Summary #1 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2108722 FL Summary #2 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2108779 FL Summary #3 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2109077 Discussion on UL time and frequency synchronization OPPO
* R1-2109169 Enhancements on UL Time and Frequency Synchronisation for NR-NTN MediaTek Inc.
* R1-2109165 Further discussion on synchronization aspects for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2109410 Discussion on UL time and frequency synchronization for NTN Xiaomi
* R1-2109487 Enhancements on UL time and frequency synchronization for NTN Samsung
* R1-2109879 UL time/frequency synchronization for NTN InterDigital, Inc.
* R1-2109858 Enhancements on UL time and frequency synchronization PANASONIC R&D Center Germany
* R1-2109844 Discussion on UL synchronization for NR-NTN ZTE
* R1-2109826 UL time and frequency synchronization in NTN FGI, Asia Pacific Telecom, III, ITRI
* R1-2109358 Discussion on UL time synchronization for NR NTN NEC
* R1-2109280 Enhancements on UL time and frequency synchronization for NTN CMCC
* R1-2109324 Discussion on NTN uplink time synchronization Lenovo, Motorola Mobility
* R1-2109221 Further discussion on UL time and frequency synchronization enhancement for NTN CATT
* R1-2109676 Discussion on UL time and frequency synchronization enhancements for NTN NTT DOCOMO, INC.
* R1-2109610 On UL synchronization for NTN Intel Corporation
* R1-2110546 Summary#3 of AI 8.4.3 for HARQ in NTN Moderator (ZTE)
* R1-2110471 Summary#1 of AI 8.4.3 for HARQ in NTN Moderator (ZTE)
* R1-2110532 Summary#2 of AI 8.4.3 for HARQ in NTN Moderator (ZTE)
* R1-2109812 Discussion on HARQ Enhancements for NTN ETRI
* R1-2109765 Discussion on HARQ enhancement for NTN Baicells
* R1-2109788 Enhancements on HARQ for NTN Sony
* R1-2109929 On HARQ enhancements for NTN Ericsson
* R1-2110033 Discussion on HARQ Enhancements for NR NTN Apple
* R1-2110185 Enhancements for HARQ for NTN Qualcomm Incorporated
* R1-2110086 Discussions on HARQ enhancements in NTN LG Electronics
* R1-2109933 Discussion on HARQ enhancements for NTN ITL
* R1-2109677 Discussion on HARQ enhancements for NR NTN NTT DOCOMO, INC.
* R1-2109222 Further discussion on HARQ operation enhancement for NTN CATT
* R1-2109281 Enhancements on HARQ for NTN CMCC
* R1-2109359 Discussion on HARQ enhancements for NR NTN NEC
* R1-2109827 Enhancements on HARQ in NTN FGI, Asia Pacific Telecom, III
* R1-2109344 Enhancements on HARQ to support NTN CAICT
* R1-2109845 Discussion on HARQ for NR-NTN ZTE
* R1-2109868 HARQ enhancement for NTN Panasonic Corporation
* R1-2109880 HARQ enhancement for NTN InterDigital, Inc.
* R1-2109488 Enhancements on HARQ for NTN Samsung
* R1-2109411 Discussion on the HARQ enhancement for NTN Xiaomi
* R1-2109166 Further discussion of aspects related to HARQ for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2109170 Enhancements on HARQ for NR NTN MediaTek Inc.
* R1-2109078 Discussion on HARQ enhancements OPPO
* R1-2108749 Discussion on HARQ enhancement for NTN Huawei, HiSilicon
* R1-2108973 Discussion on HARQ enhancements for NR-NTN vivo
* R1-2108911 Discussion on enhancements on HARQ for NTN Spreadtrum Communications
* R1-2110087 Discussions on other aspects of NTN LG Electronics
* R1-2110186 BWP operation and other issues for NTN Qualcomm Incorporated
* R1-2110034 Discussion on Other Aspects of NR NTN Apple
* R1-2109930 On other enhancements for NTN Ericsson
* R1-2109789 Discussion on beam management and polarization for NTN Sony
* R1-2109766 Discussion on beam management and other consideration for NTN Baicells
* R1-2109749 Discussion on other design aspects for NTN Huawei, HiSilicon
* R1-2110259 Beam management and polarization signaling for NTN Panasonic
* R1-2110489 Summary of the discussions on other enhancements Moderator (OPPO)
* R1-2110570 Summary#2 of the discussions on other enhancements Moderator (OPPO)
* R1-2108912 Discussion on beam management and other aspects for NTN Spreadtrum Communications
* R1-2108974 Discussion on other aspects for NR-NTN vivo
* R1-2109079 Discussion on beam management OPPO
* R1-2109167 Further discussion on remaining aspects for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2109412 Discussion on other design aspects for NTN Xiaomi
* R1-2109489 Remaining issues for NTN Samsung
* R1-2109881 On beam management for NTN InterDigital, Inc.
* R1-2109877 Network Verified UE Location in Non-Terrestrial Networks Fraunhofer IIS, Fraunhofer HHI, Thales
* R1-2109892 Considerations on NTN with Transparent Payload III
* R1-2109846 Discussion on additional enhancement for NR-NTN ZTE
* R1-2109828 Other aspects of NR-NTN FGI, Asia Pacific Telecom, III, ITRI
* R1-2109360 Remaining issues for NR NTN NEC
* R1-2109282 Other Aspects for NTN CMCC
* R1-2109325 Discussion on other aspects for NTN Lenovo, Motorola Mobility
* R1-2109223 Beam management and other aspects for NTN CATT
* R1-2109678 Discussion on other aspects for NR NTN NTT DOCOMO, INC.
* **RAN1#107-e, 11th – 19th November 2021, e-meeting**

Submitted TDOCs:

* R1-2112486 Introduction of solutions for NR to support non-terrestrial networks (NTN) Nokia
* R1-2112473 Introduction of NR non-terrestrial networks (NTN) Huawei
* R1-2112447 Introduction of non-terrestrial network operation in NR Samsung
* R1-2112432 Introduction of NTN Ericsson
* R1-2111493 Remaining issues on timing relationships for NTN Intel Corporation
* R1-2111445 Discussions on timing relationship enhancements in NTN SK Telecom, ETRI
* R1-2111441 Discussion on timing relationship enhancement for NTN Baicells
* R1-2111413 On timing relationship enhancements for NTN Ericsson
* R1-2111734 Timing relationship enhancements for NTN Samsung
* R1-2111570 Discussion on the remaining issues on the timing relationship enhancement for NTN Xiaomi
* R1-2111605 Discussion on timing relationship enhancements for NTN CMCC
* R1-2111820 Remaining issues on timing relationship enhancement for NTN InterDigital, Inc.
* R1-2111652 Timing relationship enhancements to support NTN CAICT
* R1-2111646 Timing relationship for NTN Panasonic Corporation
* R1-2111658 Discussion on timing relationship for NR-NTN ZTE
* R1-2111870 Timing Relationship Enhancements for NR NTN Apple
* R1-2111009 Remaining issues on timing relationship enhancements for NR-NTN vivo
* R1-2110899 Remaining timing relation aspects for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2110804 Discussion on timing relationship enhancements for NTN Huawei, HiSilicon
* R1-2111252 Further discussion on timing relationship enhancements for NTN CATT
* R1-2111177 Discussion on timing relationship enhancements for NTN NEC
* R1-2111097 Discussion on timing relationship enhancements for NTN Spreadtrum Communications
* R1-2111353 Remaining issues for timing relationship enhancements in NTN Zhejiang Lab
* R1-2111370 Timing relationship enhancements for NR-NTN MediaTek Inc.
* R1-2111393 Calculation and application of timing relationship offsets Sony
* R1-2111314 Discusson on timing relationship enhancement OPPO
* R1-2112507 Feature lead summary#1 on timing relationship enhancements Moderator (Ericsson)
* R1-2112004 Discussion on NTN timing relationship Lenovo, Motorola Mobility
* R1-2112533 Feature lead summary#2 on timing relationship enhancements Moderator (Ericsson)
* R1-2111968 Discussions on timing relationship enhancements in NTN LG Electronics
* R1-2112104 Discussion on timing relationship enhancements for NTN NTT DOCOMO, INC.
* R1-2112213 Enhancements on Timing Relationship for NTN Qualcomm Incorporated
* R1-2112169 Timing relationship enhancements for NTN ITL
* R1-2111315 Discussion on UL time and frequency synchronization OPPO
* R1-2111394 Considerations on UL time synchronisation Sony
* R1-2111371 Enhancements on UL Time and Frequency Synchronisation for NR-NTN MediaTek Inc.
* R1-2111355 Enhancements on UL time and frequency synchronization PANASONIC R&D Center Germany
* R1-2111098 Discussion on enhancements on UL time and frequency synchronization for NTN Spreadtrum Communications
* R1-2111122 Considerations on UL timing and frequency synchronization in NTN THALES
* R1-2111123 FL Summary #1 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2111124 FL Summary #2 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2111125 FL Summary #3 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2111126 FL Summary #4 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2111127 FL Summary #5 on enhancements on UL time and frequency synchronization for NR NTN Moderator (Thales)
* R1-2111178 Discussion on UL time synchronization for NR NTN NEC
* R1-2111253 Further discussion on UL time and frequency synchronization enhancement for NTN CATT
* R1-2110805 Discussion on UL time and frequency synchronization enhancement for NTN Huawei, HiSilicon
* R1-2110900 Remaining time and frequency synchronization aspects for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2111010 Remaining issues on UL time and frequency synchronization enhancements for NR-NTN vivo
* R1-2111871 Uplink Time and Frequency Synchronization for NR NTN Apple
* R1-2111659 Discussion on UL synchronization for NR-NTN ZTE
* R1-2111821 Remaining issues on UL time/frequency synchronization for NTN InterDigital, Inc.
* R1-2111790 Discussion on UL Time Synchronization for NTN Fraunhofer IIS - Fraunhofer HHI
* R1-2111606 Enhancements on UL time and frequency synchronization for NTN CMCC
* R1-2111571 Discussion on UL time and frequency synchronization for NTN Xiaomi
* R1-2111735 Enhancements on UL time and frequency synchronization for NTN Samsung
* R1-2111414 On UL time and frequency synchronization enhancements for NTN Ericsson
* R1-2111412 Frequency Synchronization Considerations Lockheed Martin
* R1-2111442 Discussion on UL time and frequency synchronization enhancement for NTN Baicells
* R1-2111494 Remaining issues on synchronization for NTN Intel Corporation
* R1-2112214 UL time and frequency synchronization for NTN Qualcomm Incorporated
* R1-2112105 Discussion on UL time and frequency synchronization enhancements for NTN NTT DOCOMO, INC.
* R1-2111969 Discussions on UL time and frequency synchronization enhancements in NTN LG Electronics
* R1-2112005 Discussion on NTN uplink time synchronization Lenovo, Motorola Mobility
* R1-2111443 Discussion on HARQ enhancement for NTN Baicells
* R1-2111415 On HARQ enhancements for NTN Ericsson
* R1-2111736 Enhancements on HARQ for NTN Samsung
* R1-2111572 Discussion on the HARQ enhancement for NTN Xiaomi
* R1-2111607 Enhancements on HARQ for NTN CMCC
* R1-2111822 Remaining issues on HARQ enhancement for NTN InterDigital, Inc.
* R1-2111660 Discussion on HARQ for NR-NTN ZTE
* R1-2111647 HARQ enhancement for NTN Panasonic Corporation
* R1-2111653 Enhancements on HARQ to support NTN CAICT
* R1-2111872 HARQ Enhancements for NR NTN Apple
* R1-2111011 Remaining issues on HARQ enhancements for NR-NTN vivo
* R1-2110901 Remaining aspects related to HARQ for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2110806 Discussion on HARQ enhancement for NTN Huawei, HiSilicon
* R1-2111254 HARQ operation enhancement for NTN CATT
* R1-2111179 Discussion on HARQ enhancements for NR NTN NEC
* R1-2111099 Discussion on enhancements on HARQ for NTN Spreadtrum Communications
* R1-2111372 Enhancements on HARQ for NR NTN MediaTek Inc.
* R1-2111395 Enhancements on HARQ for NTN Sony
* R1-2111316 Discussion on HARQ enhancements OPPO
* R1-2112555 Summary#1 of AI 8.4.3 for HARQ in NTN Moderator (ZTE)
* R1-2112335 Discussion on HARQ enhancements for NTN ITL
* R1-2111970 Discussions on HARQ enhancements in NTN LG Electronics
* R1-2112106 Discussion on HARQ enhancements for NR NTN NTT DOCOMO, INC.
* R1-2112215 Enhancements on HARQ for NTN Qualcomm Incorporated
* R1-2111991 Discussion on HARQ Enhancements for NTN ETRI
* R1-2111317 Discussion on beam management OPPO
* R1-2111396 Discussion on beam management and polarization for NTN Sony
* R1-2111100 Discussion on beam management and other aspects for NTN Spreadtrum Communications
* R1-2111180 Remaining issues for NR NTN NEC
* R1-2111255 Other aspects for NTN CATT
* R1-2110902 Remaining other aspects for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2110903 Discussion on other aspects for NR-NTN BUPT
* R1-2111012 Remaining issues on other aspects for NR-NTN vivo
* R1-2111873 Other Aspects of NR NTN Apple
* R1-2111661 Discussion on additional enhancement for NR-NTN ZTE
* R1-2111706 Beam management and polarization signaling for NTN Panasonic
* R1-2111823 Remaining issues on beam management for NTN InterDigital, Inc.
* R1-2111608 Other Aspects for NTN CMCC
* R1-2111573 Discussion on other design aspects for NTN Xiaomi
* R1-2111737 Remaining issues for NTN Samsung
* R1-2111416 On other enhancements for NTN Ericsson
* R1-2111444 Discussion on beam management and other consideration for NTN Baicells
* R1-2112216 BWP operation and other issues for NTN Qualcomm Incorporated
* R1-2112270 Issues on NTN with Transparent Payload III
* R1-2112107 Discussion on other aspects for NR NTN NTT DOCOMO, INC.
* R1-2111971 Discussions on other aspects of NTN LG Electronics
* R1-2111924 Discussion on other design aspects for NTN Huawei, HiSilicon
* R1-2112532 Summary#1 of the discussions on other enhancements Moderator (OPPO)

## 4.2 RAN2

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

Submitted TDOCs:

* R2-2109815 Reply LS on UE location aspects in NTN (C1-216250; contact: Nokia) CT1
* R2-2109586 [Post115-e][101][NTN] Stage 2 running CR (Thales) THALES
* R2-2109373 LS Response to Reply LS on UE location aspects in NTN (S2-2106651; contact: Qualcomm) SA2
* R2-2109307 LS on extended NAS supervision timers at satellite access (C1-215074; contact: Ericsson) CT1
* R2-2109312 Reply LS on TA pre-compensation (R1-2108410; contact: OPPO) RAN1
* R2-2110710 Stage-3 running RRC CR for NTN Rel-17 Ericsson
* R2-2110466 Stage-3 running 304 CR for NTN ZTE corporation, Sanechips
* R2-2110863 MAC open issues in NTN - RAN2#116e InterDigital
* R2-2110864 Stage 3 NTN running CR for 38.321 - RAN2#116e InterDigital
* R2-2111221 LS on UE TA reporting (R1-2110663; contact: Ericsson) RAN1
* R2-2109498 Discussion on RACH and TA report in NTN OPPO
* R2-2109551 Discussion on UE-specific TA information reporting in NTN CATT
* R2-2109660 Further consideration on TA reporting Huawei, HiSilicon
* R2-2110125 TA report procedure Spreadtrum Communications
* R2-2110019 RACH Type selection and TA report Xiaomi
* R2-2110044 UE Reported UE Specific TA Pre-Compensation Apple
* R2-2111207 Discussion on UE-specific TA information reporting in NTN CATT
* R2-2110774 Further considerations on TA report Samsung Research America
* R2-2110703 Reporting information about UE specific TA and RA Type Selection Nokia, Nokia Shanghai Bell
* R2-2111005 Discussion on LCH-based RA type selection ASUSTeK
* R2-2111006 Discussion on issue of restarting contention resolution timer ASUSTeK
* R2-2110941 Additional criterion for RA type selection Samsung Research America
* R2-2110765 TA reporting Remaining issues NEC Telecom MODUS Ltd.
* R2-2110733 Remaining issues on TA report ZTE Corporation, Sanechips
* R2-2111140 Discussion on RACH and TA report aspects LG Electronics Inc.
* R2-2110952 Reporting information about UE specific TA pre-compensation in NTNs Ericsson
* R2-2110045 NTN HARQ Management Apple
* R2-2109968 HARQ process for SPS and CG Qualcomm Incorporated
* R2-2110126 Discussion on HARQ and LCP remaining issues Spreadtrum Communications
* R2-2110017 Remaining issues related to HARQ retransmission state Xiaomi
* R2-2110354 CG enhancements in NTN Sony
* R2-2110308 Remaining UP issues for NR NTN Lenovo, Motorola Mobility
* R2-2109661 Further consideration on LCP and HARQ Huawei, HiSilicon
* R2-2109631 Remaining issue on disabling uplink HARQ retransmission MediaTek Inc.
* R2-2109632 Round trip delay offset for configured grant timers MediaTek Inc.
* R2-2109552 Co-existence issue of BSR over CG and BSR over 2-step RA CATT
* R2-2109499 Discussion on HARQ related aspects in NTN OPPO
* R2-2110926 Updating SR-Prohibit Timer MediaTek Inc.
* R2-2111154 HARQ State A/B for CG aspects ITL
* R2-2110951 On configured scheduling, DRX, LCP, HARQ and SR/BSR in NTNs Ericsson
* R2-2111151 Retransmission timer for HARQ state B ITL
* R2-2111139 Discussion on other MAC aspects LG Electronics Inc.
* R2-2110734 Remaining issues on HARQ aspects ZTE Corporation, Sanechips
* R2-2111044 Remaining Issue on LCP Restrictions and CG Impact in NTN CMCC
* R2-2110704 Discussion on UL scheduling, DRX and other MAC aspects Nokia, Nokia Shanghai Bell
* R2-2110859 Remaining MAC open issues in NTN InterDigital
* R2-2111267 Remaining issue on disabling uplink HARQ retransmission MediaTek Inc.
* R2-2110548 Consequences of long propagation delays on RLC Interdigital, Inc.
* R2-2110925 On RLC t-Reassembly for NTN Sequans Communications
* R2-2110766 RLC t-Reassembly timer NEC Telecom MODUS Ltd.
* R2-2110950 On RLC and PDCP for NTNs Ericsson
* R2-2110528 Further considerations on TAC selection in NTN Samsung R&D Institute UK
* R2-2110386 DRAFT Reply LS on extended NAS supervision timers at satellite access Ericsson
* R2-2110388 Discussion on reply LS to CT1 on extended NAs supervision timers at satellite access Ericsson
* R2-2110309 Considerations on ephemeris provision for NTN Lenovo, Motorola Mobility
* R2-2110355 Event triggered location reporting in NTN Sony
* R2-2110127 Discussion on stop serving time of NTN cell Spreadtrum Communications
* R2-2110136 Discussion on TAC update in NTN Spreadtrum Communications
* R2-2109969 Coarse UE location report in RRC\_CONNECTED Qualcomm Incorporated
* R2-2110043 NTN Ephemeris definition and signaling Apple
* R2-2109973 Discussion on UE reporting of selected TAI vivo, Nokia, Nokia Shanghai Bell, Ericsson
* R2-2109974 Discussion on UE capability for Rel-17 NR NTN vivo
* R2-2109975 Discussion on the remaining issue on TAC update vivo
* R2-2109500 Discussion on T300’s extension in NTN OPPO
* R2-2109553 Discussion on UE coarse location information report in NTN CATT
* R2-2109587 Validity timer of a broadcasted TAC THALES, Ericsson
* R2-2109636 Consideration on RAN2-determined NTN UE capabilities Intel Corporation
* R2-2111110 Discussion on UE location reporting in NTN Xiaomi
* R2-2111043 Discussion on UE Coarse Location Information Report in NTN CMCC
* R2-2111007 Discussion on event triggered based UE location report ASUSTeK
* R2-2110614 Final views on location aspects for Rel-17 NTN Nokia, Nokia Shanghai Bell
* R2-2110467 UE location report and TAC in NTN ZTE corporation, Sanechips
* R2-2109637 Discussion on enhancements to cell reselection Intel Corporation
* R2-2109639 Discussion on TN prioritization over NTN for idle mode Intel Corporation
* R2-2109765 Cell selection and reselection enhancements for NTN China Telecom
* R2-2109554 Further Discussion on the Leftover Issues of IDLE/INACTIVE CATT
* R2-2109501 Discussion on idle/inactive mode procedures in NTN OPPO
* R2-2109976 Remaining issues on cell reselection for NTN vivo
* R2-2110046 NTN Cell Selection and Cell Reselection Apple
* R2-2109970 Enhancement to cell selection and reselection Qualcomm Incorporated
* R2-2110211 NTN-TN Mobility Enhancement in IDLE and INACTIVE State FGI, Asia Pacific Telecom
* R2-2110356 Idle mode enhancement in NTN Sony
* R2-2110228 Remaining issues in NTN idle mode LG Electronics Inc.
* R2-2110265 Discussion on cell reselection CMCC
* R2-2110275 Discussion on cell reselection Huawei, HiSilicon
* R2-2110375 Idle mode aspects for NTN Ericsson
* R2-2110468 Consideration on the system information and idle mode mobility for intra-NTN and TN-NTN case ZTE corporation, Sanechips
* R2-2110862 Cell reselection for earth moving cells InterDigital
* R2-2110768 NTN to TN mobility in Idle or Inactive mode NEC Telecom MODUS Ltd.
* R2-2110769 Time and Location-assisted cell reselection NEC Telecom MODUS Ltd.
* R2-2110943 Further considerations on idle/inactive behaviours Samsung Research America
* R2-2111111 Cell selection and reselection enhancements for NTN Xiaomi
* R2-2110384 SMTC and measurement gap enhancements LG Electronics Inc.
* R2-2110276 Discussion on CHO in NTN Huawei, HiSilicon
* R2-2110277 Discussion on SMTC and measurement gap configuration Huawei, HiSilicon
* R2-2110283 Discussion on signaling and data transmission issues of NTN CHO ITRI
* R2-2110266 Further discussion on intra-NTN mobility CMCC
* R2-2110267 Further discussion on SMTC and measurement Gap configuration for NTN CMCC
* R2-2110229 Remaining issues in NTN CHO LG Electronics Inc.
* R2-2110310 UE assistance for measurement gap and SMTC configuration in NTN Lenovo, Motorola Mobility
* R2-2110311 Connected mobility for NTN/TN continuity Lenovo, Motorola Mobility
* R2-2110312 Remaining issues for CHO in NTN Lenovo, Motorola Mobility
* R2-2109972 SMTC and MG enhancements Qualcomm Incorporated
* R2-2110340 Connected mode aspects for NTN Ericsson
* R2-2109971 Open issues in CHO Qualcomm Incorporated
* R2-2109977 Remaining issues on connected mode mobility for NTN vivo
* R2-2109502 Discussion on mobility management for connected mode UE in NTN OPPO
* R2-2109555 Futher discussion on NTN mobility aspect CATT
* R2-2109634 Efficient Configuration of SMTC and Measurement Gaps in NR-NTN MediaTek Inc.
* R2-2109635 Mobility for NTN-TN scenarios MediaTek Inc.
* R2-2109638 Discussion on remaining issues on SMTC Intel Corporation
* R2-2111166 Remaining Issues on SMTC and measurement Gap configuration for NTN Rakuten Mobile, Inc
* R2-2111028 Discussion on connected mode aspects for NTN Xiaomi Communications
* R2-2110815 Measurements and handover Samsung Research America
* R2-2110860 UE location reporting in NTN InterDigital
* R2-2110861 UE-specific TA reporting in connected mode InterDigital
* R2-2110469 Consideration on CHO and measurements ZTE corporation, Sanechips
* R2-2110612 More thoughts on mobility in Rel-17 NTN Nokia, Nokia Shanghai Bell
* R2-2110358 Signaling storm during HOs Sony
* R2-2110357 SMTC enhancement in NTN Sony
* R2-2110613 Final views on SMTC and measurement gaps for Rel-17 NTN Nokia, Nokia Shanghai Bell

## 4.3 RAN3

* **RAN3#114-e, 1st– 11th November 2021, e-meeting**

Submitted TDOCs:

* R3-215462 Multi TAC handling and reporting THALES
* R3-215099 (TP for BL CR TS 38.300) NTN Stage 2 Update Huawei
* R3-215100 (TP for BL CR TS 38.413) stage 3 TP for mapped CGIs Huawei
* R3-214663 Support Non-Terrestrial Networks Huawei, Thales, Ericsson, ZTE, Qualcomm Incorporated
* R3-214664 Support of NTN RAT identification and NTN RAT restrictions Qualcomm Incorporated, Huawei, Thales, , Ericsson, Nokia, Nokia Shanghai Bell, CATT
* R3-214614 Clarification of NAS Node Selection Function for NTN nodes providing access over multiple countries Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, Huawei
* R3-214615 Support of NTN RAT identification and NTN RAT restrictions Qualcomm Incorporated, Huawei, Thales, , Ericsson, Nokia, Nokia Shanghai Bell, CATT
* R3-214900 Further discussion on aspects related to TAC/CGI reporting in ULI Qualcomm Incorporated
* R3-214901 (TP for BL CR for 38.413) Verification of ULI Qualcomm Incorporated
* R3-215592 (TP for BL CR for TS 38.300) On CGI mapping CATT
* R3-215349 Discussion on indication in the ULI how the mapped cell ID was obtained Nokia, Nokia Shanghai Bell
* R3-215350 (TP for BL CR for TS 38.300) Discussion on the support for multiple TAC Nokia, Nokia Shanghai Bell
* R3-215740 Further Discussion on Cell Relation for NTN ZTE
* R3-215101 no support of Xn interface Huawei
* R3-215741 Further Discussion on Feeder Link Switch-over for LEO ZTE
* R3-215678 Discussion on feeder link switch for NTN CMCC
* R3-215593 Discussion on feederlink switch CATT
* R3-215351 Discussion on enhancement on Xn interface for Feeder link switch over Nokia, Nokia Shanghai Bell
* R3-215594 (TP for BL CR for TS 38.300) On country policy handling CATT
* R3-215742 Further Discussion on Country-specific Routing for NTN ZTE
* R3-214902 (TP for BL CR for 38.300) Final aspects of country border crossing Qualcomm Incorporated
* R3-214836 Country specific routing issue China Telecommunication
* R3-215102 Location Report Trigger Conditions Huawei
* R3-215103 [DRAFT] LS on location report trigger condition Huawei
* R3-215743 Initial Consideration on NB-IoT and eMTC Support for NTN ZTE
* R3-214682 Response LS on Multiple TACs per PLMN RAN2
* R3-214693 LS on NTN specific user consent RAN2
* R3-214698 Reply LS on UE location aspects in NTN RAN2
* R3-214699 Reply LS on UE location aspects in NTN RAN2
* R3-214706 LS Response to Reply LS on UE location aspects in NTN SA2
* R3-214868 Reply LS on UE location aspects in NTN CT1
* R3-215096 Discussion on UE Location Aspects in NTN Huawei
* R3-215097 [DRAFT] Reply LS on UE location aspects in NTN Huawei
* R3-215098 [DRAFT] Reply LS on UE location aspects and Multiple TACs per PLMN Huawei
* R3-215591 [Draft] LS Response on UE location aspects in NTN CATT
* R3-215257 UE Location Aspects in NTN Ericsson LM
* R3-215258 [DRAFT] Reply LS on UE Location Aspects in NTN Ericsson LM
* R3-215767 Discussion on UE location aspects in NTN ZTE
* R3-215768 [Draft] Reply LS on UE location aspects in NTN ZTE

## 4.1 RAN4

* **RAN4#101-e, 1st– 12th November 2021, e-meeting**

Submitted TDOCs:

* R4-2119200 Further discussion on system parameters for NTN ZTE Corporation
* R4-2119204 draft TP to TR 38.863:Operating bands and channel arrangements ZTE Corporation
* R4-2118716 TP for 38.863 on system parameters on satellite bands Huawei, HiSilicon
* R4-2118613 On NTN System parameters Nokia, Nokia Shanghai Bell
* R4-2117377 On open issue for NTN system parameters CATT
* R4-2118147 Discussion on NTN system parameters Qualcomm Incorporated
* R4-2118159 NTN - System parameters Ericsson
* R4-2117730 NTN gNB Class CMCC
* R4-2117378 Furhter discussion on NTN BS class/type CATT
* R4-2118614 On NTN gNB ClassType Nokia, Nokia Shanghai Bell
* R4-2119201 Further discussion on NTN gNB class and type ZTE Corporation
* R4-2119141 Further discussion on the NTN gNB Class/Type Huawei
* R4-2119592 On the Definition of NTN gNB Classes THALES
* R4-2118157 NTN - Regulatory information - TP to TR 38.863 Ericsson
* R4-2118156 NTN - General Ericsson
* R4-2117379 Furhter discussion on NTN specificaiton CATT
* R4-2117380 draft LS on NTN architecture CATT
* R4-2119553 NTN NR UE Technical Specification Discussion THALES
* R4-2119299 NTN MEO Scenarios Hughes/EchoStar
* R4-2118162 NTN - LS to RAN2 on NTN UE assumptions for TN-NTN coexistence studies Ericsson
* R4-2117778 Draft text proposal to update TR 38.863 NTN related RF and co-existence aspects Samsung
* R4-2119294 On the S-band NTN-NTN Coexistence Hughes/EchoStar
* R4-2117745 Simulation result for coexistence study on NR to support non-terrestrial networks Xiaomi
* R4-2117777 NR-NTN co-ex assumption and ACIR results Samsung
* R4-2118158 NTN - Simulation first results Ericsson
* R4-2118145 Coexistence simulation assumptions and results for NTN Qualcomm Incorporated
* R4-2117383 Further discussion on NTN co-existence simulation CATT
* R4-2117384 Co-existence simulation results for NTN <--> TN scenarios CATT
* R4-2119202 Further discussion on simulation assumptions for NTN ZTE Corporation
* R4-2119203 Set 1 Simulation results for NTN coexistence study ZTE Corporation
* R4-2118715 Initial NTN simulation Results and discussion on ACLR and ACS Huawei, HiSilicon
* R4-2119300 NTN-NR MEO Scenarios and Characteristics Hughes/EchoStar
* R4-2119554 On NTN-NTN Coexistence Analysis THALES
* R4-2119552 NTN coexistence simulation results MediaTek (Chengdu) Inc.
* R4-2119546 Correction of some Simulation Parameters for NTN Coexistence Scenarios THALES
* R4-2119557 TN-NTN Coexistence Results for Phase 1 THALES, Magister Solutions Ltd
* R4-2118714 Discussion on HAPS simulation assumptions Huawei, HiSilicon
* R4-2118615 HAPS simulation assumptions and results for coexistence study Nokia, Nokia Shanghai Bell
* R4-2118146 Coexistence simulation assumptions and results for HAPS Qualcomm Incorporated
* R4-2119556 On the Variation of NTN ACLR and NTN ACS Parameters THALES
* R4-2118160 NTN - Satellite Node - Tx requirements Ericsson
* R4-2117381 Further discussion on Tx requirements for NTN BS CATT
* R4-2119205 Discussion on Tx requirements of satellite gNB ZTE Corporation
* R4-2119142 TP to TR 38.863: node class, RF RX (6.2) Huawei
* R4-2117382 Further discussion on Rx requirements for NTN BS CATT
* R4-2118161 NTN - Satellite Node - Rx requirements Ericsson
* R4-2119206 Discussion on Rx requirements of satellite gNB ZTE Corporation
* R4-2117746 Discussion on UE RF requirements for NR to support non-terrestrial networks Xiaomi
* R4-2117332 Further discussion on UE Tx RF requirements for NTN CATT
* R4-2118718 TP for 38.863 on NTN UE transmission characteristics Huawei, HiSilicon
* R4-2118717 Discussion on UE RF requirements for satellite access Huawei, HiSilicon
* R4-2117333 Further discussion on UE Rx RF requirements for NTN CATT
* R4-2117334 Initial simulation results for RRM requirement for NTN CATT
* R4-2117335 Further discussion on RRM requirements for NTN CATT
* R4-2118035 Discussion on general aspects for NTN UE RRM requirements Intel Corporation
* R4-2118347 General RRM for NTN Ericsson
* R4-2118268 Reply LS to RAN1: LS on NTN UL time and frequency synchronization requirements (Timing) Ericsson
* R4-2118330 Discussion on general RRM requirements in NTN MediaTek inc.
* R4-2119124 On the SMTC windows Nokia, Nokia Shanghai Bell
* R4-2119125 Dynamic system level assumptions and results for NTN moving cells mobility Nokia, Nokia Shanghai Bell
* R4-2119352 Discussion on general issues for NTN RRM Huawei, Hisilicon
* R4-2119353 Simulation results for system level analysis for NTN RRM Huawei, Hisilicon
* R4-2119586 General and RRM requirements impacts Qualcomm Incorporated
* R4-2119507 NTN NR UE RRM Specification Discussion THALES
* R4-2118269 UE positioing and timing requirements Ericsson
* R4-2118348 Mobility requirements for NTN Ericsson
* R4-2117336 Further Discussion on GNSS-related requirements CATT
* R4-2117337 Discussion on mobility requirements for NTN CATT
* R4-2117454 Discussion on mobility for NR NTN Apple
* R4-2118038 Discussion on mobility aspects for NTN UE RRM requirements Intel Corporation
* R4-2117710 Discussion on NTN mobility requirements CMCC
* R4-2117825 Further discussion on mobility requirements for NR NTN Xiaomi
* R4-2117840 Discussion on mobility related requirements for NR NTN LG Electronics Inc.
* R4-2118349 Measurement requirements for NTN Ericsson
* R4-2118811 Discussion on mobility requirements in NTN Huawei, Hisilicon
* R4-2119587 Mobility requirements Qualcomm Incorporated
* R4-2118834 Discussion on NTN timing related requirements Huawei, Hisilicon
* R4-2118389 Discussion on timing requirements for NR NTN OPPO
* R4-2118331 Discussion on timing requirements in NTN MediaTek inc.
* R4-2118267 Timing requirements Ericsson
* R4-2118429 Further discussion on timing requirements for NTN ZTE Corporation
* R4-2117841 Discussion on timing requirements for NR NTN LG Electronics Inc.
* R4-2117826 Further discussion on timing requirements for NR NTN Xiaomi
* R4-2117742 Discussion on NTN timing requirements CMCC
* R4-2118036 Discussion on timing requirements for NTN UE Intel Corporation
* R4-2117455 Discussion on timing requirements for NR NTN Apple
* R4-2117338 Further discussion on timing requirements for NTN CATT
* R4-2119588 Timing requirements Qualcomm Incorporated
* R4-2119505 On the NTN UL Timing Accuracy THALES
* R4-2117339 Discussion on measurement procedure requirements for NTN CATT
* R4-2117456 Discussion on measurement procedure requirements for NTN Apple
* R4-2118037 Discussion on measurements for NTN UE RRM requirements Intel Corporation
* R4-2117827 Further discussion on measurement requirements for NR NTN Xiaomi
* R4-2118246 Discussion on measurement requirement for NR NTN LG Electronics UK
* R4-2118390 Discussion on measurement procedure requirements for NR NTN OPPO
* R4-2119354 Discussion on measurement requirements for NTN Huawei, Hisilicon
* R4-2119589 Measurement procedure requirements Qualcomm Incorporated

***END***