**3GPP TSG RAN meeting #93-e RP-211774**

**Electronic Meeting, Sept 13 - 17th, 2021** *rev from**RP-210986*

## Status Report to TSG

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

|  |  |
| --- | --- |
| **WI / SI Name** |  |
| included in this status report | Study Item: No | Core part: Yes | Performance part:Yes | Testing part:- |
| **Acronym** |  |
| **Unique ID** |  |
| **TSG Tdoc of latest approved WI/SI description (if any)** |  |
| **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: 65% RAN1: 80%RAN2: 65%RAN3: 90% RAN4: 35% | 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-e, 16th– 27th August 2021, e-meeting**

[General]

Agreements on “Timing relationship enhancements”:

Agreement:

* The UE-specific K\_offset can be provided and updated by network with MAC CE.
* FFS: UE can be provided and updated by network with a UE-specific K\_offset in RRC reconfiguration
	+ FFS: Details on whether and how the two solutions work together

Agreement:

For random access procedure initiated by a PDCCH order received in downlink slot , UE determines the next available PRACH occasion after uplink slot to transmit the ordered PRACH.

* Note: The UE’s TA is based on the RAN1#104bis-e agreement on Timing Advance applied by an NR NTN UE given by  , where is assumed for PDCCH ordered PRACH.
* FFS: Which value of should be applied
* FFS: Whether the timing relationship is impacted by UE behavior within or after the validity duration.

Agreement:

The unit of K\_offset is number of slots for a given subcarrier spacing.

* FFS: one subcarrier spacing value or different subcarrier spacing values for different scenarios.

Agreement:

The information of K\_mac is carried in system information.

Agreement:

The unit of K\_mac is number of slots for a given subcarrier spacing.

* FFS: one subcarrier spacing value or different subcarrier spacing values for different scenarios.

Agreement:

In the estimate of UE-gNB RTT, which is equal to the sum of UE’s TA and K\_mac, for delaying the starts of ra-ResponseWindow and msgB-ResponseWindow, the UE’s TA is equal to with .

Agreement:

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

* Option 1: One value range of K\_offset covering all scenarios.

Option 2: Different value ranges of K\_offset for different scenarios.

Agreements on “UL time and frequency synchronization”

Agreement:

* A validity duration configured by the network for satellite ephemeris data indicates the maximum time during which the UE can apply the satellite ephemeris without having acquired new satellite ephemeris.
	+ FFS: Associated UE behaviour if the UE does not read the ephemeris within the validity duration.
* FFS: Whether the same validity duration can be applied for Common TA.

Conclusion:

Indication of common post-compensation frequency offset for Uplink is not needed.

Agreement:

Confirm the working assumption on non-extension of TAC 12-bit field in msg2 (or msgB) and that the UE follows the requirements on UL time pre-compensation for Msg1/MsgA transmission as defined by RAN4.

Agreement:

Serving satellite ephemeris 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

Agreement:

In NTN, to avoid that the UE over pre-compensates its TA during RACH procedure, down-select one option from below:

* Option 1: PRACH transmission is delayed by
* Option 2: TA margin can be considered, and it is explicitly indicated to the UE
* Option 3: TA margin can be considered, and it is included within the Common TA
* Option 4: UE handles it via implementation

Agreement:

In NR NTN, NTA update based on TA Command field in msg2/msgB and MAC CE TA command is used for UL timing alignment correction as follows:

* When TAC ( in msg2/msgB is received, UE receives the first adjustment and is updated as follows:

 , FFS: the value of ,

* When TACs ( provided within the MAC CE is received, is updated as follows:

 ,

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.

Agreements on “Enhancements on HARQ”

Agreement:

For enhancement on the HARQ process indication, extend the HARQ process ID field up to 5 bits for DCI 0-1/1-1 when the maximum supported HARQ processes number is configured as 32.

Agreement:

* For Type-1 HARQ codebook, if DCIs carrying the feedback-disabled and feedback-enabled HARQ processes are detected by UE, one of following options should be supported:
	+ Option-1: The UE will report NACK only for the feedback-disabled HARQ process regardless of decoding results of corresponding PDSCH
	+ Option-2: The UE will report NACK/ACK for the feedback-disabled HARQ process depending on the decoding results of corresponding PDSCH
* FFS: Other cases, e.g., if only DCI carrying feedback-disabled HARQ process is detected by UE

Agreement:

For enhancement on the HARQ process indication, one of following options for DCI 0-0/1-0 can be considered:

* Option 2: Reusing one bit from other bit field
* Option 4: No enhancement

Agreement:

For Type-1 HARQ codebook, if only DCI carrying feedback-disabled HARQ process is detected by UE, one of following options should be supported:

* Option-1: The UE’s behavior is same as the case if DCIs carrying the feedback-disabled and feedback-enabled HARQ processes are detected by UE
* Option-2: The UE should skip the codebook feedback at least when the feedback is carried by PUCCH
	+ FFS: the case that feedback is carried by PUSCH.

Agreement:

The maximum number of supported aggregation factor (i.e., pdsch-AggregationFactor) for DL PDSCH is [X]

* FFS: X = 8, 16 or 32

Agreement:

For the DCI of PDSCH with feedback-disabled HARQ processes, only one of following is supported for Type-2 codebook:

* Option-1: The C-DAI and T-DAI are the count of feedback-enabled processes, despite they are not incremented, and are taken into account by the UE for type 2 codebook generation.
* Option-2: The C-DAI and T-DAI are ignored by the UE regardless of the value for Type 2 codebook generation.

Agreements on “Others”

Agreement:

When polarization signalling is present in SIB

* SIB indicates DL and/or UL polarization information using respective polarization type parameters to indicate: RHCP or LHCP or linear
* FFS: whether polarization signalling is per SSB

Agreed LS out

* **R1-2108410 DRAFT Reply LS on TA pre-compensation Moderator (Oppo)**

Post RAN1#106-e email discussions:

* **[Post-106-e-Rel17-RRC-04] NR NTN – to be moderated by Mohamed (THALES)**

The email discussions on RRC parameters start from September 1 until September 10. The purpose of these email discussions is to initiate RAN1 preparations to send the first LS to RAN2 on Rel-17 RRC parameters in October

 [Essential corrections]

None

#### 2.1.2 Remaining Open issues

UE-specific K\_offset: value range(s), RRC reconfiguration method

UE reporting of information about the UE specific TA pre-compensation

Common TA: parameters specification (indicating timing drift) that need to be indicated by the Network, Granularity and signalling

The update/maintenance of NTA,UE-specific and NTA,common

Details on the combination of open and closed loop TA control

Serving satellite ephemeris format bit allocations

HARQ: Enhancement on the process indication for DCI 0-0/1-0, codebook enhancements

SPS PDSCH related issue

PDSCH/PUSCH scheduling restriction

NR-NTN beam management issues

## 2.2 RAN2

#### 2.2.1 Agreements

[General]

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

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

Agreements on ”User plane”

1. UE specific TA reporting during RACH procedure is enabled/disabled by SI (FFS for RACH in connected mode)

1. In the MAC specification section 5.1.5, delay the start of ra-ContentionResolutionTimer by the UE-gNB RTT (i.e. sum of UE's TA and K\_mac)

1. The content of UE specific TA pre-compensation reported in RA procedure using MAC CE is UE specific TA (this can be revisited after receiving RAN1 response).

2. Reporting on the information about UE specific TA in connected mode is supported, FFS via RRC signalling or MAC CE

3. 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

4. If configured, the UE shall report information of the UE specific TA pre-compensation to the target cell during the random access. FFS if a new indication in RRC reconfiguration with sync is needed or not (besides the SIB indication carried in HO command on whether TA report is enabled/disabled in the target cell).

5. Information about UE specific TA pre-compensation is not reported in RA procedures triggered due to “Request for Other SI”

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

2. A TA offset threshold can be used for event-triggered reporting, at least the offset threshold can be between current information about UE specific TA and the last successfully reported information about UE specific TA

3. The event-triggers for reporting information about UE specific TA based on time threshold is not supported in NTN.

4. No new indication in RRC reconfiguration with sync is needed to configure the UE to report information about UE specific TA in handover procedure (besides the SIB indication carried in HO command on whether TA report is enabled/disabled in the target cell).

1. 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).

2. If the reported content of information about UE specific TA is UE location information in connected mode, RRC signalling is used to report.

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

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

1. Confirm the RAN2 working assumption that offset to drx-HARQ-RTT-TimerUL length is equal to UE-gNB RTT (i.e. sum on UE's TA and K\_mac).

2. Confirm the RAN2 working assumption that for HARQ processes with DL HARQ feedback enabled, the drx-HARQ-RTT-TimerDL length is increased by an offset equal to UE-gNB RTT (i.e. sum on UE's TA and K\_mac).

3. No new LCP restrictions are introduced for exisiting UL MAC CEs (if new MAC CEs will be introduced we can revisit this)

4. For dynamic grants, each LCH can optionally be semi statically configured (by RRC) to be mapped to one or more HARQ processes (FFS if it's possible to map to more than one HARQ process/ process type. FFS on mapping method). If there is no RRC configuration for this, this mapping has no effect (legacy behaviour applies).

1a. For at least dynamic grants, the network may optionally configure an UL HARQ retransmission state per HARQ process. Two UL HARQ retransmission states are defined in NTN: HARQ state A and HARQ state B (FFS whether "HARQ state A" and "HARQ state B" should be renamed)

1b. HARQ state A/B are defined as follows:

 - HARQ state A: length of drx-HARQ-RTT-TimerUL is extended by UE-gNB RTT (i.e. UE PDCCH monitoring is optimized to support UL retransmission grant based on UL decoding result).

 - HARQ state B: drx-HARQ-RTT-TimerUL is not started.

2. Configuration of UL HARQ retransmission state is semi-static, signalled via RRC, and the decision and criteria to configure UL HARQ retransmission state is under network control.

3. For dynamic grants, each LCH can be optionally mapped to an UL HARQ retransmission state via semi-static RRC configuration. If there is no configuration, the mapping has no effect (legacy behaviour applies).

4. If HARQ process has not been configured with an UL HARQ retransmission state, new LCH mapping rule has no effect (i.e. UE applies legacy behaviour).

5. The following behaviours are supported for drx-HARQ-RTT-TimerUL in NTN per HARQ process: 1) Timer length is extended by offset; 2) Timer disabled (i.e. not started)

6. UE determines drx-HARQ-RTT-TimerUL behaviour per HARQ process based on configured UL HARQ retransmission state.

7. For HARQ process(es) not configured with an UL HARQ retransmission state, drx-HARQ-RTT-TimerUL and drx-RetransmissionTimerUL behave as per legacy.

1. An UL HARQ retransmission state is configured per HARQ process to support new LCH mapping restriction and proper configuration of drx-HARQ-RTT-TimerUL behaviour.

2. The network may consider delay and reliability characteristics of ongoing services when choosing to configure an UL HARQ retransmission state.

3. Alternative naming for HARQ state A/B can be further considered during stage 3, however UE behaviour in each state should be defined in specification.

4. RAN2 understanding is that UE behaviour in HARQ state A (i.e. extending the drx-HARQ-RTT-TimerUL by UE-gNB RTT) best supports reception of UL retransmission grant based on UL decoding result. (No RAN2 specification impact)

5. RAN2 understanding is that UE behaviour in HARQ state B (i.e. not starting drx-HARQ-RTT-TimerUL) best supports no UL retransmission and/or blind UL retransmission. (No RAN2 specification impact)

1. For HARQ state B, FFS to run drx-RetransmissionTimerUL for blind UL retransmission

2. UE configured with an UL HARQ retransmission state (i.e. A or B) will always act as indicated in a grant/assignment provided during a valid occasion (i.e. subject to legacy restrictions in e.g. MAC and RAN1 specifications). (No RAN2 specification impact)

1. Introduce a new t-ReassemblyExt-r17 IE, which is optional present for NTN network scenario.

2. Introduce a new discardTimerExt-r17 IE with a new value ms2000 and several spare bits for future extension.

3. RAN2 consider not to extend PDCP t-Reordering timer or use several spare bits in legacy IE to add several greater values up to 4400ms.

Agreements on “Control plane”

1. RAN2 confirms AS indicates to NAS layer all received TACs per PLMN.

2. RAN2 responds to CT1 and SA2 with the confirmation that AS indicates to NAS layer all received TACs per PLMN. In addition it is stated that TACs in NTN are fixed to geographical location on Earth and UE’s location information can be used for TAI selection. Final decision on which criteria to apply (e.g. UE location information or other) is anyway up to CT1 and SA2 judgement

1. Broadcast of cell stop time in SIB is only applicable to quasi earth fixed cell (not to moving cell). No further work in this release to address any moving cell specific details on using the cell stop time to assist measurements or cell reselection

2. For quasi-earth fixed cell, the reference location of the cell (serving cell or the neighbor cells) is broadcast in system information

1. For quasi-earth fixed cell, UE should start measurements on neighbour cells before the serving cell stops covering the current area.

2. For quasi-earth fixed cell, the broadcast “timing information on when a cell is going to stop serving the area” refers to the time when a cell stops covering the current area.

3. For quasi-earth fixed cell, specify that UE should start measurements on neighbour cells before the broadcast stop time of the serving cell, i.e. the time when the serving cell stops covering the current area, and the exact time to start measurements is up to UE implementation.

Working Assumption: 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, if UE has valid location information, which means location acquisition will not be triggered at UE side only for location assisted cell reselection. FFS on the details.

Working Assumptions: Combination of serving and target cell reference location is supported for location report trigger event and for CHO location trigger

Working Assumptions: Specify that measurement reports can be configured to be piggybacked with location report when location based event triggers it

1. The following event is supported: condEvent L4: Distance between UE and the PCell’s reference location becomes larger than absolute threshold1 AND the distance between UE and the Conditional reconfiguration candidate becomes shorter than absolute threshold2.

 FFS other options

2. Specify hysteresis and time to trigger for the location event for RRM and CHO

3. Timing information from RRCReconfiguration message in RRC running CR is removed

4. UE is allowed to perform HO only during T1 to T2

5. Agree to limit to A or B and continue discussion between options A and B

 Option A: UTC time + duration/timer, e.g. 00:00:01 + 40s

 Option B: Two UTC time to indicate the start (T1) and end time (T2) of the candidate cell, e.g. 00:00:01 + 00:00:41

1. RAN2 adopts Option 1: UTC time + duration/timer, e.g. 00:00:01 + 40s for representing T1 and T2 for CHO time event.

2. RAN2 adopts options C: location and RRM and D: time and RRM to be configuration options for CHO

3. RAN2 down priorities further enhacnements for connected mode for Rel-17 for TN-NTN mobility

4. RAN2 continue discussing the exact solution for TN priorization over NTN for idle mode

1. The specific maximum number of SMTC configuration in one measurement object with the same ssbFrequency can be 4. And a LS will be sent to RAN4 to confirm the conclusion.

2. In NTN, NW-based solution is supported, i.e. the final SMTC/measurement gap configuration is generated and provided by NW in NTN to a given UE (based on the propagation delay difference between at least one target cell and the serving cell of a given UE). FFS whether UE-based solution is supported or not.

3. In NTN, it is necessary of the UE to report assistant information to the NW (which can be configured by NW or upon NW’s request) to assist NW calculating the offset for SMTC/GAP configurations. FFS the detailed information.

1. The UE can be configured with multiple SMTCs per carrier. FFS if the UE can use only a partial set or all of them in parallel, and in case FFS whether based on network configuration or UE implementation

1. If SA3 replies with concern on reporting UE location with any granularity during initial access, RAN2 will revisit agreement/solution for reporting UE location during initial access.

2. UE coarse location information refers to coarse GNSS coordinates (FFS on the details, e.g. X MSB bits out of 24 bits of longitude/latitude or GNSS coordinates with ~2km accuracy). FFS if any enhancements to validate the UE’s coarse location information is needed. FFS whether this is only used in initial access or also in connected

1. If SA3 has no concern reporting coarse location during initial access, the coarse location information is reported in Msg5, i.e., via RRCSetupComplete/RRCResumeComplete message.

2. For coarse UE location reporting during initial access, the location granularity is not indicated to UE via SIB

3. Enhancements to validate the UE ’s coarse location information is not needed from RAN2 perspective. Whether this is needed by the network is up to other WGs.

4. After AS security is established, gNB can obtain a GNSS-based location information from the UE using existing signalling method, i.e., by configuring includeCommonLocationInfo in the corresponding reportConfig. It is up to SA3 to decide whether User Consent is required before NW acquires location information from the UE in NTN. RAN2 discuss whether to send LS to SA3

5. Aperiodic location reporting (e.g., via DCI) is not supported.

Working assumption: Event triggered-based UE location reporting are configured by gNB to obtain UE location update of mobile UEs in RRC\_CONNECTED

1. Send new LS to SA3 for the need of NTN specific user consent for obtaining UE location by gNB."

1. If accepted by SA3, if the gNB has user consent to obtain UE location in NTN, reporting of finer location information/full GNSS coordinates in RRC\_CONNECTED can be supported after AS security is enabled

2. Periodic location reporting can also be configured by gNB to obtain UE location update of mobile UEs in RRC\_CONNECTED. RAN2 discuss whether it is part of existing periodic measurement report configuration or a new configuration for periodic reporting of UE location.

Agreed LS out:

* **R2-2109216 Reply LS on UE location aspects in NTN Qualcomm Incorporated To:RAN3 Cc:SA2, CT1**
* **R2-2108888 Response LS on Multiple TACs per PLMN Nokia, Nokia Shanghai Bell To:CT1, SA2, RAN3**
* **R2-2109199 LS on NTN specific user consent Qualcomm To:SA3**

Post email discussions

* [Post115-e][102][NTN] Reply LS on UE location aspects (Huawei)

 Scope: check whether we need to update the answer to Q1 in [R2-2108886](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2108886.zip) based on meeting agreements on the possible use of UE location information

 Intended outcome: reply LS to SA3 in R2-2109217

 Deadline: short

* [Post115-e][112][NTN] LS to RAN4 on SMTC (CMCC)

 Scope: Draft an LS to RAN4 to indicate RAN2 agreement on the maximum number of SMTC and ask for confirmation

 Intended outcome: LS to RAN4 in R2-2109219

 Deadline: short

* [Post115-e][101][NTN] Stage 2 running CR (Thales)

 Scope: update the Stage 2 (38.300) running CR based on meeting agreements

 Intended outcome: Endorsable 38.300 running CR

 Deadline: Long

* [Post115-e][103][NTN] RRC running CR (Ericsson)

 Scope: update the 38.331 running CR based on meeting agreements

 Intended outcome: Endorsable 38.331 running CR

 Deadline: Long

* [Post115-e][104][NTN] MAC running CR (Interdigital)

 Scope: update the 38.321 running CR based on meeting agreements

 Intended outcome: Endorsable 38.321 running CR

 Deadline: Long

* [Post115-e][105][NTN] 38.304 running CR (ZTE)

 Scope: update the 38.304 running CR based on meeting agreements

 Intended outcome: Endorsable 38.304 running CR

 Deadline: Long

[Essential corrections]

None

#### 2.2.2 Remaining Open issues

User plane aspects:

Further discuss UE reported info for TA pre compensation during connected mode

Control plane aspects:

Further discuss

* Location assisted cell reselection for quasi Earth fixed cell
* Enhancements to CHO
* UE location reporting information during initial access in coordination with SA3
* SMTC and gaps
* TN-NTN mobility aspects

## 2.3 RAN3

#### 2.3.1 Agreements

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

[General]

Agreements

**The two different sets of ephemeris format shall be supported:**

* **Set 1: Satellite position and velocity state vectors:**
	+ **position X,Y,Z in ECEF (m)**
	+ **velocity VX,VY,VZ in ECEF (m/s)**
* **Set 2: At least the following parameters in orbital parameter ephemeris format:**
	+ **Semi-major axis α [m]**
	+ **Eccentricity e**
	+ **Argument of periapsis ω [rad]**
	+ **Longitude of ascending node Ω [rad]**
	+ **Inclination i [rad]**
	+ **Mean anomaly M [rad] at epoch time to**

**The explicit epoch time associated to ephemeris data and the location of the NTN-Gateways, shall be provided by O&M to the gNB providing non-terrestrial NR access”**

**Mapped Cell ID: In NTN, it corresponds to a fixed geographical area**

**The Cell Identities used in the RAN Paging Area during Xn RAN paging (as defined in TS 38.423 [x]) allow the identification of the correct target cells for RAN paging.**

**Apart from RAN Paging, RRC\_INACTIVE is kept unspecified from a RAN3 perspective, i.e. no further RRC\_INACTIVE related specification text is added, neither on stage 2 nor stage 3 level.**

**To support Multiple TACs over the air interface, RAN3 wait for the progress in other WGs**

**Not to introduce the time window over NG/F1 in Rel-17**

**Mobility between NTN and TN over Xn has low priority in Rel-17.**

**The de-centralized coordination of switch-over should be taken as low priority in Rel-17.**

**So far, no impacts on F1 from NTN have been identified in Rel17. On the basis of that, NTN impacts of feeder link switch-over to F1 are out of the scope of Rel-17.**

**The UE location information reported from the UE (as specified by RAN2) is accurate enough for AMF (re-) selection.**

**NG-RAN is responsible for constructing the mapped cell ID based on the UE location info received from the UE. The mapping may be pre-configured (e.g., up to operator’s policy) or up to implementation.**

BL CRs endorsed:

* R3-213152 Clarification of NAS Node Selection Function for NTN nodes providing access over multiple countries (Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, Huawei) CR0029r4, TS 38.410 v16.3.0, Rel-17, Cat. C
* R3-213153 Support of NTN RAT identification and NTN RAT restrictions (Qualcomm Incorporated, Huawei, Thales, , Ericsson, Nokia, Nokia Shanghai Bell, CATT) CR0490r5, TS 38.413 v16.6.0, Rel-17, Cat. B
* R3-213154 Support of NTN RAT identification and NTN RAT restrictions (Qualcomm Incorporated, Huawei, Thales, , Ericsson, Nokia, Nokia Shanghai Bell, CATT) CR0488r5, TS 38.423 v16.6.0, Rel-17, Cat. B
* R3-213183 Support Non-Terrestrial Networks (Huawei, Thales, Ericsson, ZTE, Qualcomm Incorporated) DraftCR

TP agreed

* R3-214352 (TP for BL CR TS 38.300) NTN Stage 2 Update (Huawei)
* R3-214353 (TP for BL CR TS 38.300) NTN Stage 2 Update (Ericsson)
* R3-214354 (TP for BL CR for TS 38.300) add the correspondence for TAI and geographical area (Nokia)
* R3-214342 (TP for BL CR for TS 38.300) Discussion on feeder link switchover (Nokia, Nokia Shanghai Bell)
* R3-214438 (TP for BL CR for TS 38.300) Configuration for CGI mapping (CATT)
* R3-213539 (TP for BL CR for TS 38.413) Country Specific Routing for an RRC CONNECTED UE (Nokia, Nokia Shanghai Bell)

Summary of email discussions

* R3-214135 # 3\_NTNUELocation (CATT – Moderator)
* R3-214204 # 2001\_NTN\_General (Thales - moderator)
* R3-214205 # 2002\_NTN\_NW-ID (E/// - Moderator)
* R3-214206 # 2003\_NTN\_Reg\_Pag (Nok - moderator)
* R3-214207 # 2004\_NTN\_Cell\_Rel (CMCC – Moderator)
* R3-214363 # 2005\_NTN\_Feeder\_Link ( ZTE – Moderator)
* R3-214364 # 2006\_NTN\_Country\_Routing (CATT Moderator)
* R3-214365 # 2007\_NTN\_Others (HW – moderator)

LS out agreed

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[Essential corrections]

None

#### 2.3.2 Remaining Open issues

Further discuss

* the potential issue to map “~2km” UE location to “~2km” geographical fixed area, and coordinate with RAN2, SA2, SA3-LI if needed.
* the need for enhancement of feeder link switch-over for Xn and for new Xn procedure for feeder link switch-over.
* whether the NTN type of serving cells and neighbor cells should be exchanged when NTN gNB involves handover procedure.

## 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#100-e, 16th – 27th August 2021, e-meeting**

[GTW Agreements on BSRF Test Demod aspects (General)]

\* Satellite NTN gNB Type :BS Type 1-H and 1- O will be supported for NTN BS in Rel-17. The baseline assumption BS type 1-C is not supported in Rel-17 NTN pending on further checking till Nov 2021 Nov Meeting.

Further check the progress on BS type 1-O in Nov 2021 RAN4 meeting.

\* Satellite NTN gNB Class - general : Introducing NTN BS classes pending on the further checking whether there is difference among different classes from RAN4 RF requirements aspects. It’s not precluded to introduce a generic single BS class in Rel-17 timeframe. At least introduce NTN BS class with wide coverage.

The candidate criterias as following:

* Option 1: Define NTN BS class based (at least) on the considered satellite’s orbit.
	+ Note: Further discuss if, for each of those NTN BS classes, additional sub-classes should be considered.
* Option 2: Define NTN gNB classes characterized by requirements derived from different satellite types with certain satellite to ground altitude or altitude range.
	+ Note: NTN gNB could be classified by different altitudes or altitude ranges to differentiate RF requirements.
* Combined option 1 and option2 not excluded

\* MSS S-Band Range Clarification with respect to NTN RAN4 work : NO need to capture such information into TS. Such information can be included into TR as regulatory information.

\* MSS L-Band Range Clarification with respect to NTN RAN4 work : If no consensus on L band definition with frequency ranges can be reached by Nov 2021 RAN4 meeting, then L band work can be postponed after March 2022.

\* NTN Band Coding and Signalling Design: Introduce NTN band numbering respecting existing band coding and signalling design without changes on RAN2.

\* NTN Band Numbering : Starting from the largest band number in FR1 range for NTN bands which fully within FR1 frequency ranges, the number can be taken in a decreased order with first come, first service.

FFS with prefix as “n’ or “s”. A note can be included to clarify the usage of NTN bands.

\* SU discussion : Still following previous agreements Proposal 2-1-2-1 from R4-2108099: The common definition for channel bandwidth, transmission bandwidth configuration, minimum guard band, and RB alignment in 38.104 and 38.101-1 can be reused for NTN system.

RAN4 can further check the SU once ACLR, SEM, ACS requirements defined.

[GTW Agreements on BSRF Test Demod aspects (Coexistence)]

\* Calibration and alignment The updated summary of calibration results and assumptions will be captured in the new TR 38.863.

The calibration results indicate the consistency of most companies’ simulations. Therefore, calibration work has mostly been done for NTN coexistence. Companies can continue to contribute on calibration aspect over emails till Sep 30th.

For HAPS calibration, companies will continue the effort for calibration. It’s encouraged interested companies can provide results for HAPS, RAN4 will check the status till Nov 2021 RAN4 meeting.

RAN4 start to discuss the simulation assumption and co-existence results for phase 1 as agreed in previous work plan, RAN4 will check the status in Nov 2021 RAN4 meeting with the target to conclude phase 1 co-existence study by Nov 2021.

\* Central beam elevation angle: Baseline assumption for simulation: adding 45° for GEO and LEO; interested companies can bring analysis and results for other values.

\* NTN UE deployment : 9 UEs and 2RBs per UE for GEO and LEO. UEs are equally splitted inside the channel bandwidth into ACIR 3 regions

\* NTN UL TPC: Option 1

\* Propagation model between NTN and UE : Further discuss and include background information into RAN4 TR 38.863.

Way forward approved:

* R4-2115640 Way Forward on NTN\_solutions\_Part1 THALES
* R4-2115749 WF on [313] NTN\_Solutions\_Part2 Samsung
* R4-2115750 Simulation assumptions for NTN co-existence Samsung, CATT
* R4-2115751 Simulation assumptions for HAPS co-existence Nokia
* R4-2115641 WF on NTN BS requirements CATT
* R4-2115642 WF on NTN UE requirements Huawei

[Other documents]

Email discussion summaries:

* R4-2115784 Email discussion summary for [100-e][312] NTN\_Solutions\_Part1
* R4-2115785 Email discussion summary for [100-e][313] NTN\_Solutions\_Part2
* R4-2115786 Email discussion summary for [100-e][314] NTN\_Solutions\_Part3

 [GTW Agreements on RRM aspects]

\* MR-DC and CA: RAN4 does not consider MR-DC/CA for measurement and mobility in Rel-17

\* TN-NTN:

For RRC Idle/Inactive mode

* Define measurement/mobility requirements within NTN
* Define measurement/mobility requirements for TN-NTN
* Note: Inactive mode decision can be revisited in case the use case is deprioritized in other WGs

For RRC Connected

* Define measurement/mobility requirements within NTN
* FFS whether to define measurement/mobility requirements for TN-NTN

\* Initial transmit timing requirement in NTN (Te\_NTN)

* + Te\_NTN = Te + Te\_GNSS + Te\_SAT
		- Te is the legacy timing error
		- Te\_GNSS is the GNSS accuracy
			* Note: Te\_GNSS shall include the total RTT error
			* FFS how to derive Te\_GNSS from the GNSS positioning accuracy
		- Te\_SAT is the serving-satellite position estimation error
			* Note: Te\_SAT shall include the total RTT error
		- FFS if the equation shall be included into the specification or only Te\_NTN values shall be included

\* GNSS accuracy assumption for timing requirements

* + GNSS accuracy assumption for timing requirements
		- For UL SCS = 15 kHz and 30 kHz: 2-D position error is 50m
		- For UL SCS = 60kHz in FR1: FFS

Way forward approved:

* R4-2115345 WF on RRM requirements for NTN measurement and mobility
* R4-2115346 WF on timing requirements for NR NTN, Xiaomi

Agreed LS outs

* R4-2115347 Reply LS on NTN UL time and frequency synchronization requirements

[Other documents]

Email discussion summaries:

* R4-2115401 Email discussion summary: [100-e][226] NR\_NTN\_solutions\_RRM\_1
* R4-2115402 Email discussion summary: [100-e][227] NR\_NTN\_solutions\_RRM\_2

[Essential corrections]

None

#### 2.4.2 Remaining Open issues

Starting NTN FR2 study (coexistence) phase in March 2022 before the introduction to specification/normative phase

## 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.

## 4. References

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

## 4.1 RAN1

* **RAN1#105-e, 16th – 27th August 2021, e-meeting**

Submitted TDOCs:

* R1-2107076 Updated NR\_NTN\_solutions work plan THALES
* R1-2107064 Timing relationship enhancements for NR-NTN MediaTek Inc.
* R1-2107167 Timing relationship enhancements to support NTN CAICT
* R1-2107194 Discussion on timing relationship enhancements for NTN Hyundai Motors
* R1-2107287 Timing relationship enhancements in NTN FGI, Asia Pacific Telecom, III, ITRI
* R1-2107243 Discusson on timing relationship enhancement OPPO
* R1-2107538 Discussions on timing relationship enhancements in NTN LG Electronics
* R1-2107588 On timing relationship enhancements for NTN Intel Corporation
* R1-2107736 On Timing Relationship Enhancements for NR NTN Apple
* R1-2107341 Enhancements on Timing Relationship for NTN Qualcomm Incorporated
* R1-2107399 Discussion on timing relationship enhancements for NTN CMCC
* R1-2107636 On timing relationship enhancements for NTN Ericsson
* R1-2106884 Timing relationship enhancements for NTN Samsung
* R1-2106805 Calculation and application of timing relationship offsets Sony
* R1-2106723 Timing relationship enhancements for NTN Zhejiang Lab
* R1-2106754 Discussion on timing relationship enhancement for NTN Baicells
* R1-2106967 Further discussion on timing relationship enhancements for NTN CATT
* R1-2107014 Discussion on timing relationship enhancements for NTN NEC
* R1-2106701 Discussion on timing relationship enhancements for NTN Spreadtrum Communications
* R1-2106591 Discussion on timing relationship enhancements for NR-NTN vivo
* R1-2106482 Discussion on timing relationship enhancements for NTN Huawei, HiSilicon
* R1-2107468 Timing relationship for NTN Panasonic Corporation
* R1-2107855 Discussion on timing relationship enhancements for NTN NTT DOCOMO, INC.
* R1-2107775 Discussion on timing relationship for NR-NTN ZTE
* R1-2107918 Discussion on the timing relationship enhancement for NTN Xiaomi
* R1-2107944 Discussion on NTN timing relationship Lenovo, Motorola Mobility
* R1-2107992 Timing relationship enhancements for NTN ITL
* R1-2108031 Timing relationship enhancement for NTN InterDigital, Inc.
* R1-2108070 Discussion on Timing Relationship Enhancements for NTN Fraunhofer IIS, Fraunhofer HHI
* R1-2108090 Time relation aspects for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2108091 Time and frequency synchronization for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2108073 Discussion on UL Time Synchronization for NTN Fraunhofer IIS, Fraunhofer HHI
* R1-2108032 UL time/frequency synchronization for NTN InterDigital, Inc.
* R1-2107945 Discussion on NTN uplink time synchronization Lenovo, Motorola Mobility
* R1-2107919 Discussion on UL time and frequency synchronization for NTN Xiaomi
* R1-2107890 Considerations on Enhancements on UL Time Synchronization in NTN CAICT
* R1-2107776 Discussion on UL synchronization for NR-NTN ZTE
* R1-2107856 Discussion on UL time synchronization enhancements for NTN NTT DOCOMO, INC.
* R1-2106483 Discussion on UL time and frequency synchronization enhancement for NTN Huawei, HiSilicon
* R1-2106556 Considerations on UL timing and frequency synchronization in NTN THALES
* R1-2106592 Discussion on UL time and frequency synchronization enhancements for NR-NTN vivo
* R1-2106702 Discussion on enhancements on UL time and frequency synchronization for NTN Spreadtrum Communications
* R1-2107020 Enhancements on UL time and frequency synchronization PANASONIC R&D Center Germany
* R1-2106968 Enhancements on UL time and frequency synchronization for NTN CATT
* R1-2106781 Feature lead summary #1 on enhancements on UL timing and frequency synchronization THALES
* R1-2106782 Feature lead summary #2 on enhancements on UL timing and frequency synchronization THALES
* R1-2106783 Feature lead summary #3 on enhancements on UL timing and frequency synchronization THALES
* R1-2106784 Feature lead summary #4 on enhancements on UL timing and frequency synchronization THALES
* R1-2106785 Feature lead summary #5 on enhancements on UL timing and frequency synchronization THALES
* R1-2106755 Discussion on UL time and frequency synchronization enhancement for NTN Baicells
* R1-2106806 Considerations on UL time synchronisation Sony
* R1-2106885 Enhancements on UL time and frequency synchronization for NTN Samsung
* R1-2107637 On UL time and frequency synchronization enhancements for NTN Ericsson
* R1-2107400 Enhancements on UL time and frequency synchronization for NTN CMCC
* R1-2107342 UL time and frequency synchronization for NTN Qualcomm Incorporated
* R1-2107737 On Uplink Time and Frequency Synchronization for NR NTN Apple
* R1-2107589 On UL synchronization for NTN Intel Corporation
* R1-2107539 Discussions on UL time and frequency synchronization enhancements in NTN LG Electronics
* R1-2107244 Discussion on UL time and frequency synchronization OPPO
* R1-2107288 UL time and frequency synchronization in NTN FGI, Asia Pacific Telecom, III, ITRI
* R1-2107065 Enhancements on UL Time and Frequency Synchronisation for NR-NTN MediaTek Inc.
* R1-2107066 Enhancements on HARQ for NR NTN MediaTek Inc.
* R1-2107168 Enhancements on HARQ to support NTN CAICT
* R1-2107289 Enhancements on HARQ in NTN FGI, Asia Pacific Telecom, III, ITRI
* R1-2107245 Discussion on HARQ enhancements OPPO
* R1-2107540 Discussions on HARQ enhancements in NTN LG Electronics
* R1-2107738 HARQ Enhancements for NR NTN Apple
* R1-2107343 Enhancements on HARQ for NTN Qualcomm Incorporated
* R1-2107401 Enhancements on HARQ for NTN CMCC
* R1-2107638 On HARQ enhancements for NTN Ericsson
* R1-2106886 Enhancements on HARQ for NTN Samsung
* R1-2106807 Enhancements on HARQ for NTN Sony
* R1-2106756 Discussion on HARQ enhancement for NTN Baicells
* R1-2106969 HARQ operation enhancement for NTN CATT
* R1-2107015 Discussion on HARQ enhancements for NR NTN NEC
* R1-2106703 Discussion on enhancements on HARQ for NTN Spreadtrum Communications
* R1-2106593 Discussion on HARQ enhancements for NR-NTN vivo
* R1-2106484 Discussion on HARQ enhancement for NTN Huawei, HiSilicon
* R1-2107857 Discussion on HARQ enhancements for NR NTN NTT DOCOMO, INC.
* R1-2107777 Discussion on HARQ for NR-NTN ZTE
* R1-2107469 HARQ enhancement for NTN Panasonic Corporation
* R1-2107475 Discussion on HARQ Enhancements for NTN ETRI
* R1-2107920 Discussion on the HARQ enhancement for NTN Xiaomi
* R1-2107993 Discussion on HARQ enhancements for NTN ITL
* R1-2108033 HARQ enhancement for NTN InterDigital, Inc.
* R1-2108092 Remaining HARQ aspects of NR over NTN Nokia, Nokia Shanghai Bell
* R1-2108093 Further discussion of other aspects for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2108034 On beam management for NTN InterDigital, Inc.
* R1-2107946 Discussion on other aspects for NTN Lenovo, Motorola Mobility
* R1-2107921 Discussion on other design aspects for NTN Xiaomi
* R1-2107463 Beam management and polarization signaling for NTN Panasonic
* R1-2107381 Problems of Rel-17 NTN WI from HAPS point of view SoftBank Corp.
* R1-2107778 Discussion on additional enhancement for NR-NTN ZTE
* R1-2106557 Beam management and BWP operation in NTN THALES
* R1-2106530 Discussion on channel models for marine and inland river scenes GDCNI
* R1-2106594 Discussion on other aspects for NR-NTN vivo
* R1-2106704 Discussion on beam management and other aspects for NTN Spreadtrum Communications
* R1-2107016 Remaining issues for NR NTN NEC
* R1-2106970 Beam management and other aspects for NTN CATT
* R1-2106757 Discussion on beam management and other consideration for NTN Baicells
* R1-2106808 Discussion on beam management and polarization for NTN Sony
* R1-2106887 Remaining issues for NTN Samsung Samsung
* R1-2107675 Discussion on other design aspects for NTN Huawei, HiSilicon
* R1-2107644 On other enhancements for NTN Ericsson
* R1-2107402 Other Aspects for NTN CMCC
* R1-2107344 BWP operation and other issues for NTN Qualcomm Incorporated
* R1-2107739 On Other Aspects of NR NTN Apple
* R1-2107541 Discussions on other aspects of NTN LG Electronics
* R1-2107246 Discusson on beam management OPPO
* R1-2107290 Other aspects of NR-NTN FGI, Asia Pacific Telecom, III, ITRI
* R1-2106999 Discussion on channel models for marine and inland river scenes GDCNI

## 4.2 RAN2

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

Submitted TDOCs:

* R2-2107568 [Draft] Reply LS on UE location aspects in NTN Qualcomm Incorporated
* R2-2107732 Stage-3 running 304 CR for NTN ZTE corporation, Sanechips
* R2-2106976 Reply LS on UE location aspects in NTN (S3-212306; contact: Huawei) SA3
* R2-2106924 Reply LS on TA pre-compensation (R1-2106341; contact: OPPO) RAN1
* R2-2106922 Reply LS on PDB for new 5QI (R1-2106331; contact: Ericsson) RAN1
* R2-2106904 LS reply on multiple TACs per PLMN (C1-213965; contact: Nokia) CT1
* R2-2106940 Reply LS on SA WG2 assumptions from conclusion of study on architecture aspects for using satellite access in 5G (R3-212916; contact: Ericsson) RAN3
* R2-2106941 Reply LS on UE location aspects in NTN (R3-212917; contact: Qualcomm) RAN3
* R2-2107146 Updated NR-NTN-solutions work plan THALES
* R2-2107523 Draft Response LS on Multiple TACs per PLMN Nokia, Nokia Shanghai Bell
* R2-2108664 Stage 3 NTN running CR for 38.321 - RAN2#115 InterDigital
* R2-2108345 Stage-3 running RRC CR for NTN Rel-17 Ericsson
* R2-2108663 MAC open issues in NTN - RAN2#115 InterDigital
* R2-2107280 User Plane Issues and Enhancements for an NTN Samsung Research America
* R2-2107362 TA report in Random access procedure Spreadtrum Communications
* R2-2107314 Discussion on UE Specific TA Report CATT
* R2-2107075 Discussion on RACH in NTN OPPO
* R2-2108114 Further discussion on RACH issues for NR NTN Nokia, Nokia Shanghai Bell
* R2-2107972 RACH Type selection and TA report Beijing Xiaomi Mobile Software
* R2-2107908 Considerations on new criteria for RA type selection Lenovo, Motorola Mobility
* R2-2108609 Discussion on RACH and TA report aspects LG Electronics Inc.
* R2-2108453 Random Access timers and reporting information about UE specific TA pre-compensation in NTNs Ericsson
* R2-2108350 Considerations on RACH aspects ZTE Corporation, Sanechips
* R2-2108715 Discussion on LCH-based RA type selection ASUSTeK
* R2-2108318 On disabling uplink HARQ retransmission and associated LCP impacts MediaTek Inc.
* R2-2108351 Considerations on HARQ aspects ZTE Corporation, Sanechips
* R2-2107563 LCP restriction for an UL HARQ process Qualcomm Incorporated, Huawei, HiSilicon, Xiaomi, Samsung
* R2-2107790 Co-existence issue of BSR over CG and BSR over 2-step RACH PANASONIC R&D Center Germany
* R2-2108610 Consideration on LCP in NTN Huawei, HiSilicon
* R2-2108611 Discussion on TA report Huawei, HiSilicon
* R2-2108608 Discussion on other MAC aspects LG Electronics Inc.
* R2-2108319 Round trip delay offset for configured grant timer MediaTek Inc.
* R2-2108452 On DRX, LCP, HARQ, SR/BSR, and configured scheduling Ericsson
* R2-2108544 Discussion on LCP Restrictions and CG Impact in NTN CMCC
* R2-2108661 UL HARQ retransmission InterDigital
* R2-2108662 Impact of UE-gNB RTT determination on MAC InterDigital
* R2-2108716 Discussion on UL retransmission and DRX RTT timer ASUSTeK
* R2-2108768 HARQ Retransmission Enabling/Disabling for CG aspects ITL
* R2-2107909 BSR with configured 2-step RACH and CG Lenovo, Motorola Mobility
* R2-2107986 Consideration on HARQ aspects Beijing Xiaomi Mobile Software
* R2-2108115 Discussion on remaining MAC issues for NR NTN Nokia, Nokia Shanghai Bell
* R2-2107632 HARQ Management and LCP Restrictions in NTN Apple
* R2-2107076 Discussion on UL HARQ retransmission in NTN OPPO
* R2-2107315 Discussion on HARQ Aspects and UL Scheduling Enhancement in NTN CATT
* R2-2107449 Impact on DRX timers with UL/DL HARQ enhancement in NTN vivo
* R2-2107450 Impact on LCP with disabled UL HARQ retransmission in NTN vivo
* R2-2107361 Discussion on HARQ and LCP remaining issues Spreadtrum Communications
* R2-2108451 On RLC and PDCP for NTNs Ericsson
* R2-2108460 On RLC t-Reassembly for NTN Sequans Communications
* R2-2108317 RLC and PDCP timers extension NEC Telecom MODUS Ltd.
* R2-2107630 On NTN Ephemeris Definitions and Signaling Apple
* R2-2107284 Area Management in an NTN Samsung Research America, Thales, Rakuten Mobile, and Apple
* R2-2107567 Discussion on RAN3 LS reply on UE location Qualcomm Incorporated
* R2-2107729 Discussion on the remaining issue on TAC update vivo
* R2-2107564 Tracking area update timing Qualcomm Incorporated
* R2-2108100 Service continuity between NTN and TN Turkcell, Hughes/EchoStar, Network Systems, Thales, BT Plc, Vodafone, ESA, Inmarsat, Aselsan
* R2-2107359 Discussion on stop serving time of NTN cell Spreadtrum Communications
* R2-2107360 Discussion on TAC update in NTN Spreadtrum Communications
* R2-2107281 Remaining Beam Issues in an NTN: Tracking Area Management and Elliptical Beams Samsung Research America
* R2-2107343 Discussion on V2X-like zone ID Huawei, HiSilicon
* R2-2107345 Draft Reply LS on multiple TACs per PLMN Huawei, HiSilicon
* R2-2107346 Draft Reply LS on UE location aspects in NTN Huawei, HiSilicon
* R2-2107316 Further Discussion on LCS and TAC aspects in NTN CATT
* R2-2107520 On Tracking Area Code handling for NTN Nokia, Nokia Shanghai Bell
* R2-2107077 Discussion on UE location aspects in NTN OPPO
* R2-2107131 Signalling Solution for Feeder Link Switching of NTN VODAFONE Group Plc
* R2-2107150 Virtual cells for network verified UE position in NTN networks Fraunhofer IIS; Fraunhofer HHI; Thales
* R2-2108323 On Soft-switch based Tracking Area Updates in NR-NTN MediaTek Inc.
* R2-2108235 NTN Neighbour Cell information NEC Telecom MODUS Ltd.
* R2-2108606 TAC update and UE location report ZTE corporation, Sanechips
* R2-2108526 Discussion on location assisted cell reselection CMCC, Huawei, HiSilicon
* R2-2108779 NTN Idle/Inactive mode cell re-selection ITL
* R2-2108234 NTN to TN mobility in Idle/Inactive mode NEC Telecom MODUS Ltd.
* R2-2108281 Idle mode aspects for NTN Ericsson
* R2-2108412 NTN type and scenario indication Convida Wireless
* R2-2108413 NTN Cell (re)selection enhancements Convida Wireless
* R2-2108320 On Cell Re-selection in NR-NTN MediaTek Inc.
* R2-2107078 Discussion on idle/inactive mode procedures in NTN OPPO
* R2-2107317 Further Discussion on the Leftover Issues of IDLE/INACTIVE CATT
* R2-2107448 Remaining issues on cell reselection for NTN vivo
* R2-2107344 Discussion on cell reselection Huawei, HiSilicon
* R2-2107282 Cell Reselection, System Information, Paging Enhancements, and Power-Efficient Neighbor Cell Search for an NTN Samsung Research America
* R2-2108064 Idle mode enhancement in NTN Sony
* R2-2108170 Cell selection and reselection enhancements for NTN Xiaomi
* R2-2107853 Issues of cell reselection for prioritizing TN over NTN ITRI
* R2-2107910 Considerations on ephemeris provision for NTN Lenovo, Motorola Mobility
* R2-2107733 Further consideration on cell selection and reselection in NTN ZTE corporation, Sanechips
* R2-2107845 Remaining issues in NTN Idle mode LG Electronics Inc.
* R2-2107521 Further views on SMTC configurations for NTN Nokia, Nokia Shanghai Bell
* R2-2107634 Cell Selection and Cell Reselection Solutions for Non Terrestrial Networks Apple
* R2-2107631 On NTN Conditional Handovers Apple
* R2-2107283 Remaining Issues on Handover and Neighbor Search for an NTN Samsung Research America
* R2-2107846 Remaining issues for NTN connected mode mobility LG Electronics Inc.
* R2-2107878 Measurement window enhancements for NTN cell LG Electronics Inc.
* R2-2107704 Discussion on NTN-TN service continuity KT Corp.
* R2-2107911 UE assistance for measurement gap and SMTC configuration in NTN Lenovo, Motorola Mobility
* R2-2107912 Execution condition for CHO in NTN Lenovo, Motorola Mobility
* R2-2107987 Consideration on RRC release Beijing Xiaomi Mobile Software
* R2-2108065 Signaling storm during HOs and Timer based trigger details Sony
* R2-2108066 Cell coverage spillage over multiple countries issue in NTN Sony
* R2-2108067 SMTC enhancement in NTN Sony
* R2-2108017 Discussion on connected mode aspects for NTN Xiaomi Communications
* R2-2107447 Discussion on CHO related aspects for NTN vivo
* R2-2107318 Discussion on NTN CP left issues CATT
* R2-2107519 Further discussion on CHO in NTN Rakuten Mobile, Inc
* R2-2107522 Even further thoughts on mobility in NTN Nokia, Nokia Shanghai Bell
* R2-2107457 Consideration of location reporting in NTN CHO China Telecommunication
* R2-2107079 Discussion on mobility management for connected mode UE in NTN OPPO
* R2-2108329 Mobility for NTN-TN scenarios MediaTek Inc.
* R2-2108341 Connected mode aspects for NTN Ericsson
* R2-2108286 Remaining Issues on SMTC and measurement Gap configuration for NTN CMCC,Ericsson,ZTE Corporation,Huawei,CATT,Lenovo, Motorola Mobility
* R2-2107565 Open issues in CHO Qualcomm Incorporated
* R2-2107566 SMTC and MG enhancements Qualcomm Incorporated
* R2-2108198 Discussion on UE feedback based SMTC and GAPS measurement configuration Rakuten Mobile, Inc
* R2-2108717 Discussion on location-based measurement event triggering ASUSTeK
* R2-2108527 Signaling overhead reduction for connected mobility CMCC
* R2-2108528 Discussion on NTN-TN mobility CMCC
* R2-2108326 Efficient Configuration of SMTC and Measurement Gaps in NR-NTN MediaTek Inc.
* R2-2108607 Further consideration on CHO in NTN ZTE corporation, Sanechips
* R2-2108829 stg2 NR-NTN running Thales

## 4.3 RAN3

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

Submitted TDOCs:

* R3-213786 Considerations on the Current Status of NTN in Rel-17 Ericsson LM
* R3-213346 (TP for BL CR TS 38.300) NTN Stage 2 Update Huawei
* R3-213152 Clarification of NAS Node Selection Function for NTN nodes providing access over multiple countries Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, Huawei
* R3-213153 Support of NTN RAT identification and NTN RAT restrictions Qualcomm Incorporated, Huawei, Thales, , Ericsson, Nokia, Nokia Shanghai Bell, CATT
* R3-213154 Support of NTN RAT identification and NTN RAT restrictions Qualcomm Incorporated, Huawei, Thales, , Ericsson, Nokia, Nokia Shanghai Bell, CATT
* R3-213195 NTN ephemeris format and usage THALES, Ericsson
* R3-213183 Support Non-Terrestrial Networks Huawei, Thales, Ericsson, ZTE, Qualcomm Incorporated
* R3-213396 (TP for BL CR for 38.300) Cell ID handling in stage 2 Qualcomm Incorporated
* R3-213397 (TP for BL CR for 38.413) Verification of ULI Qualcomm Incorporated
* R3-213342 TAC in ULI Huawei
* R3-213343 Cell Identifier management Huawei
* R3-213310 Discussion on Network Identifier Handling China Telecommunication
* R3-213669 Discussion on CGI handling in RAN CATT
* R3-213588 On usage of cell identifiers for NTN Ericsson
* R3-213589 [TP for BL CR 38.300] On Cell Identifiers for NR NTN Ericsson
* R3-213536 (TP for BL CR for TS 38.300) Cell ID handling on NG/Xn interface Nokia, Nokia Shanghai Bell
* R3-214100 Discussion on Network Identifier Handling CMCC
* R3-214013 Cell ID Handling in Handover Samsung
* R3-213537 (TP for BL CR for TS 38.300) Discussion on TAI used in Registration Update and Paging Handling Nokia, Nokia Shanghai Bell
* R3-213670 On remaining issues regarding cell relation handling CATT
* R3-213341 Time Window management for signalling reduction Huawei
* R3-214099 Discussion on cell relation CMCC
* R3-214085 Further Discussion on Cell Relations for NTN ZTE
* R3-214086 Further Discussion on Feeder Link Switch-over for LEO ZTE
* R3-213311 Further discussion on Feeder Link Switchover China Telecommunication
* R3-213538 (TP for BL CR for TS 38.300) Discussion on feeder link switchover Nokia, Nokia Shanghai Bell
* R3-213539 (TP for BL CR for TS 38.413) Country Specific Routing for an RRC CONNECTED UE Nokia, Nokia Shanghai Bell
* R3-213671 Discussion on country-specific CN selection CATT
* R3-213344 Country-specific routing issues Huawei
* R3-214087 Discussion on Country-specific Routing for NTN ZTE
* R3-213345 NTN-NTN and NTN-TN mobility Huawei
* R3-213133 Reply LS on UE location aspects in NTN SA3
* R3-213126 LS Response to LS on multiple TACs per PLMN SA2
* R3-213116 New LS on UE location aspects in NTN RAN2
* R3-213113 Reply LS on PDB for new 5QI RAN2
* R3-213110 Reply LS on PDB for new 5QI RAN1
* R3-213105 LS reply on multiple TACs per PLMN CT1

## 4.1 RAN4

* **RAN4#100-e, 16th – 27th August 2021, e-meeting**

Submitted TDOCs:

* R4-2114469 MSS S-Band range (1980-2010 and 2170-2200 MHz) for NTN-FR1 and its adjacent bands Hughes/EchoStar, Inmarsat, Sateliot, Thales
* R4-2113745 NTN - System parameters Ericsson
* R4-2113689 On NTN System parameters Nokia, Nokia Shanghai Bell
* R4-2113183 system parameter for NTN network CMCC
* R4-2112390 NR NTN and Irregular Channel Bandwidths GLOBALSTAR Inc.
* R4-2111932 Further discussion on NTN System parameters CATT
* R4-2113928 Discussion on system parameters for NTN ZTE Corporation
* R4-2112145 Considerations on BS type and BS class SoftBank Corp., Deutsche Telekom
* R4-2112009 Discussion on NTN gNB type/class CATT
* R4-2113184 NTN gNB Class and Types CMCC
* R4-2113744 NTN - BS Class and Type Ericsson
* R4-2113929 Discussion on NTN gNB class and type ZTE Corporation
* R4-2113741 NTN - Regulatory information Ericsson
* R4-2114410 Ka band consideration for FR2 NTN Huawei
* R4-2113740 NTN - General Ericsson
* R4-2113430 General discussion on how to arrange the specifications for satellite communication system Huawei, HiSilicon
* R4-2113450 Discussion on NTN specification CATT
* R4-2113451 LS on NTN network architecture CATT
* R4-2114471 On the New NTN Specifications Titles and their Scope THALES
* R4-2114412 On the NTN bands numbering Huawei
* R4-2113394 Simulation assumptions and results for NTN co-existence calibration Fraunhofer HHI, Fraunhofer IIS
* R4-2112517 Skeleton of TR 38.863 for NTN related RF and co-existence aspects Samsung
* R4-2112716 NR-NTN calibration summary and observations Samsung
* R4-2112588 Proposed methodologies and assumptions for NTN co-ex study Samsung
* R4-2112012 Further consideration on simulation assumption CATT
* R4-2112248 Simulation assumptions for NTN co-existence Qualcomm Incorporated
* R4-2113427 Further discussion on NTN simulation assumptions Huawei, HiSilicon
* R4-2113311 Simulation assumptions for HAPS co-existence Qualcomm Incorporated
* R4-2113742 NTN - Simulation assumptions Ericsson
* R4-2113690 NTN simulation assumptions for coexistence study Nokia, Nokia Shanghai Bell
* R4-2114424 On the S-band NTN Scenarios and Parameters for Calibration and Coexistence Simulations THALES
* R4-2114425 On the NTN Propagation Model THALES
* R4-2114232 MSS S-Band range (1980-2010 and 2170-2200 MHz) for NTN-FR1 and its adjacent bands Hughes/EchoStar, Inmarsat, Sateliot, Thales
* R4-2113930 Further discussion on simulation assumptions for NTN ZTE Corporation
* R4-2113691 NTN adjacent channel coexistence simulation results Nokia, Nokia Shanghai Bell
* R4-2113743 NTN - Simulation results for alignment Ericsson
* R4-2113310 Simulation restuls for HAPS Qualcomm Incorporated
* R4-2113296 Coexistence study assumptions on NR to support non-terrestrial networks Xiaomi
* R4-2113428 Initial NTN simulation Results Huawei, HiSilicon
* R4-2112247 Coexistence simulation restuls for TN-NTN Qualcomm Incorporated
* R4-2112013 Simulation results for NTN CATT
* R4-2112715 Initial NR-NTN co-ex study ACIR results Samsung
* R4-2113931 Initial simulation results for NTN coexistence study ZTE Corporation
* R4-2114486 NTN co-existence calibration with THALES updated values THALES
* R4-2112010 Tx requirement for NTN gNB CATT
* R4-2113746 NTN - Satellite Node - Tx requirements Ericsson
* R4-2113932 Discussion on Tx requirements of satellite gNB ZTE Corporation
* R4-2113747 NTN - Satellite Node - Rx requirements Ericsson
* R4-2112011 Rx requirement for NTN gNB CATT
* R4-2113933 Discussion on Rx requirements of satellite gNB ZTE Corporation
* R4-2113297 Discussion on UE RF requirements for NR to support non-terrestrial networks Xiaomi
* R4-2113429 General discussion on NTN UE RF requirements. Huawei, HiSilicon
* R4-2111933 Discussion on UE Tx RF requirements for NTN CATT
* R4-2111934 Discussion on UE Rx RF requirements for NTN CATT
* R4-2111935 Further discussion on RRM requirements for NTN CATT
* R4-2112706 General and RRM requirements impacts Qualcomm Incorporated
* R4-2112485 Discussion on general RRM requirements in NTN MediaTek inc.
* R4-2113331 General and RRM requirements for NTN Ericsson
* R4-2113140 Discussion on the general and mobility requirements for NR NTN UE Intel Corporation
* R4-2114308 Discussion on general issues for NTN RRM Huawei, HiSilicon
* R4-2113523 UE positioing and timing requirements Ericsson
* R4-2112707 GNSS-related requirements Qualcomm Incorporated
* R4-2111936 Further Discussion on GNSS-related requirements CATT
* R4-2112205 Discussion on NTN GNSS related issues CMCC
* R4-2114309 Discussion on GNSS for NTN RRM Huawei, HiSilicon
* R4-2114416 NTN – GNSS requirements Nokia, Nokia Shanghai Bell
* R4-2111937 Discussion on mobility requirements for NTN CATT
* R4-2112127 Discussion on mobility for NR NTN Apple
* R4-2112708 Mobility requirements Qualcomm Incorporated
* R4-2112423 Further discussion on mobility requirements for NR NTN Xiaomi
* R4-2112680 Discussion on mobility related measurement for NR NTN LG Electronics Inc.
* R4-2113333 Mobility requirements for NTN Ericsson
* R4-2113281 Discussion on mobility requirements for NR NTN OPPO
* R4-2113842 Discussion on mobility requirements in NTN Huawei, HiSilicon
* R4-2113819 Discussion on NTN timing related requirements Huawei, HiSilicon
* R4-2113282 Discussion on timing requirements for NR NTN OPPO
* R4-2113203 Discussion on timing requirements for NTN ZTE Corporation
* R4-2113141 Discussion on the timing requirements for NR NTN UE Intel Corporation
* R4-2113521 Timing requirements Ericsson
* R4-2113522 Reply LS to RAN1: LS on NTN UL time and frequency synchronization requirements (Timing) Ericsson
* R4-2113453 Reply LS on NTN UL time and frequency synchronization requirements CATT
* R4-2112682 Discussion on timing requirements for NR NTN LG Electronics Inc.
* R4-2112424 Further discussion on timing requirements for NR NTN Xiaomi
* R4-2112486 Discussion on timing requirements in NTN MediaTek inc.
* R4-2112709 Timing requirements Qualcomm Incorporated
* R4-2112128 Discussion on timing requirements for NR NTN Apple
* R4-2111938 Further discussion on timing requirements for NTN CATT
* R4-2111740 Discussion on timing requirements for NR NTN FGI, Asia Pacific Telecom, III, ITRI
* R4-2112206 Discussion on NTN timing requirements CMCC
* R4-2114417 NTN - interaction between closed and open loop TA adjustments Nokia, Nokia Shanghai Bell
* R4-2114420 NTN UL Timing Accuracy THALES
* R4-2112189 Discussion on NTN RRM measurement requirements CMCC
* R4-2111939 Discussion on measurement procedure requirements for NTN CATT
* R4-2112710 Measurement procedure requirements Qualcomm Incorporated
* R4-2112894 Discussion on measurement procedure for NR NTN LG Electronics UK
* R4-2112487 Discussion on measurement requirements in NTN MediaTek inc.
* R4-2112425 Further discussion on measurement requirements for NR NTN Xiaomi
* R4-2113332 Measurement requirements for NTN Ericsson
* R4-2113843 Discussion on measurement requirements in NTN Huawei, HiSilicon

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