**3GPP TSG RAN meeting #97-e RP-222019**

**e-meeting, Sept 12 - 16th, 2022** *revised RP-221746*

## Status Report to TSG

**Title: Status report for WI NR NTN (Non-Terrestrial Networks) enhancements; rapporteur: Thales**

**Agenda item:** 9.3.2.7

|  |  |
| --- | --- |
| **WI / SI Name** | Rel-18 NR NTN (Non-Terrestrial Networks) enhancements |
| included in this status report | Study Item: No | Core part: Yes | Performance part:Yes | Testing part:No |
| **Acronym** | NR-NTN-enh |
| **Unique ID** | 941006 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-221819 |
| **Target Completion Date****(indicate if changed)** | Study Item:  | Core part: 12/2023 | Performance part: 06/2024 | Testing part:  |
| **Overall Completion level** | Study Item:  | Core part: Overall: 10%RAN1: 20%RAN2: 10%RAN3: 10% RAN4: 0% | Performance Part: Overall: 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:**

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## 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#110, August 22 - 26th 2022, Toulouse/France**

[General]

1. “9.12.1 Coverage enhancement for NR NTN

**Conclusion**

For Rel-18 coverage enhancement in NTN, NLOS environment is deprioritized.

**Agreement**

For NR-NTN coverage enhancement, RAN1 concludes that coverage enhancements specifically for GEO and MEO are de-prioritized in Rel-18.

* Potential enhancements for LEO can also apply to GEO and MEO

**Agreement**

For NR-NTN coverage enhancement in Rel-18, link budget of parameter set-1 for LEO-1200 operating at LOS is considered as the target to evaluate whether each channel/signal with the existing specification needs to be enhanced or not. The targeted performances are used to evaluate the following services:

* VoIP using AMR 4.75 kbps.
* Low data rate of 3 kbps.
* Potential enhancements for deployments with parameter set-1 can also apply for deployments for parameter set-2

**Observation**

For PUCCH format 1 with parameter set-1 for LEO-1200 operating at LOS,

* Five sources observed that the existing specification can meet the performance requirement

**Conclusion**

RAN1 concluded that enhancement is unnecessary for PUCCH format 1 with parameter set-1 for LEO-1200 operating at LOS, assuming -5dBi UE antenna gain.

**Observation**

For PUCCH format 3 with parameter set-1 for LEO-1200 operating at LOS,

* Six sources observed that the existing specification can meet the performance requirement
* One source observed that the existing specification cannot meet the performance requirement with at least 0.6 dB gap

**Conclusion**

RAN1 concluded that enhancement is unnecessary for PUCCH format 3 with parameter set-1 for LEO-1200 operating at LOS, assuming -5dBi UE antenna gain.

**Observation**

For PUCCH for Msg4 HARQ-ACK with parameter set-1 for LEO-1200 operating at LOS,

* One source observed that the existing specification can meet the performance requirement
* Three sources observed that the existing specification cannot meet the performance requirement with a gap of 1.8 to 6 dB.

**Conclusion**

RAN1 concluded that PUCCH for Msg4 HARQ-ACK should be enhanced to meet the coverage requirements for parameter set-1 for LEO-1200 operating at LOS, assuming -5dBi UE antenna gain.

**Observation**

For PUSCH for low data rate of 3 kbps with parameter set-1 for LEO-1200 operating at LOS,

* Eight sources observed that the existing specification can meet the performance requirement

**Conclusion**

RAN1 concluded that enhancement is unnecessary for PUSCH for low data rate of 3 kbps with parameter set-1 for LEO-1200 operating at LOS, assuming -5dBi UE antenna gain.

**Observation**

For PRACH format 0 with parameter set-1 for LEO-1200 operating at LOS,

* One source observed that the existing specification can meet the performance requirement
* Eight sources observed that the existing specification cannot meet the performance requirement with a gap of 0.3 to 5.3 dB

For PRACH format 2 with parameter set-1 for LEO-1200 operating at LOS,

* Ten sources observed that the existing specification can meet the performance requirement
* Two sources observed that the existing specification cannot meet the performance requirement with a gap of 1.9 to 8.8 dB

For PRACH format B4 with parameter set-1 for LEO-1200 operating at LOS,

* Ten sources observed that the existing specification cannot meet the performance requirement with a gap of 1.2 to 11.9 dB

Note: for the observations above, some sources used 1 Rx antenna and some sources used 2 Rx antennas at the satellite.

**Observation**

For PUSCH for VoIP with parameter set-1 for LEO-1200 operating at LOS,

* Six sources observed that the existing specification can meet the performance requirement with a margin of 0 to 1.7 dB
	+ One company simulated by using 20 repetitions without DMRS bundling
	+ Four companies simulated by using 20 repetitions with DMRS bundling
	+ One company simulated by using 32 repetitions with DMRS bundling
		- Note: this is the only result using frame combining by application layer
* Nine sources observed that the existing specification cannot meet the performance requirement with a gap of 0.3 to 8.6 dB
	+ Eight companies simulated by using 20 repetitions without DMRS bundling
	+ Seven companies simulated without frequency hopping
	+ One company simulated by using 16 repetitions with DMRS bundling

Note: for the observations above, some sources used 1 Rx antenna and some sources used 2 Rx antennas at the satellite.

**Observation**

RAN1 concluded that enhancement for PUSCH for VoIP may be needed to meet the coverage requirements for parameter set-1 for LEO-1200 operating at LOS, assuming -5dBi UE antenna gain, when DMRS bundling is not applied.

**Observation**

For Msg3 PUSCH with parameter set-1 for LEO-1200 operating at LOS,

* Eight sources observed that the existing specification can meet the performance requirement
* One source observed that the existing specification cannot meet the performance requirement with a gap of 1.5 dB.

**Conclusion**

RAN1 concluded that enhancement is unnecessary for Msg3 PUSCH with parameter set-1 for LEO-1200 operating at LOS, assuming -5dBi UE antenna gain.

1. “Network verified UE location for NR NTN ”

**Agreement**

The following 3GPP defined RAT dependent positioning methods shall be considered as starting point for the study on Network verified UE location in case of NGSO based NTN deployment:

* Multi-RTT
* DL/UL-TDOA

Note-1: Other methods (e.g. AoA based) are not precluded

Note-2: RAT independent positioning methods are not under the scope of the study

**Agreement**

For evaluating positioning performance in NTN, the following metrics apply.

* Horizontal accuracy:
* Horizontal accuracy is the difference between a calculated horizontal position by the network and the actual horizontal position of a UE (for evaluation purposes)
* At least CDFs of horizontal positioning errors are used as a performance metrics in NR positioning evaluations
* At least the following percentiles of positioning error is analyzed 50%, 67%, 80%, 90%, 95%

Agreement:

**The following parameters are assumed for the evaluation of RAT dependent positioning methods study in NTN:**

|  |  |
| --- | --- |
| **Parameter** | **Description/Value** |
| **Scenarios**  | Rural, LOS |
| **Satellite Orbit** | 600km, optional: 1200km |
| **Satellite parameters** | Reuse Set-1satellite parameters as in table 6.1.1.1-1/2 of TR38.821  |
| **Channel model/ Delay spread** | Based on section 6.7.2 of TR 38.811 |
| **FR/Carrier frequency** | FR1: 2GHz, S-band (n256). Optional: FR2 |
| **BW** | To be reported by companies |
| **Subcarrier spacing, kHz** | 15 for FR1, optional: 120 kHz for FR2 |
| **Number of satellite in view** | 1 for single satellite case, |
| **Orbit inclination** | To be reported by companies |
| **UE type** | Handheld terminal, Optional: VSAT |
| **UE related parameters** | Handheld UE characteristics as in Table 6.1.1.1-3 of TR38.821 with update of polarization, Tx/Rx antenna gain, and antenna type and configuration as agreed under AI 9.12.1 |
| **Positioning signals (Note 1)** | To be reported |
| **Reference Signal Physical Structure and Resource Allocation (RE pattern)** | To be reported |
| **RS type of sequence/number of ports** | To be reported |
| **Number of symbols used per occasion** | To be reported |
| **number of occasions used per positioning estimate** | To be reported |
| **Time window for measurement collection** | To be reported |
| **Interference modelling (ideal muting, or other)** | To be reported  |
| **Reference Signal Transmission Bandwidth** | To be reported  |
| **Reference point for timing measurement** | Satellite |
| **Description of positioning technique / applied positioning algorithm**  | To be reported |
| **UE speed** | 3km/h |
| **Maximum timing measurement error** | To be reported |
| **Performance metrics** | Horizontal accuracy (UE 2D position accuracy) |
| **Additional notes, if any** | Note 1: Time-related measurements can be performed via other downlink and uplink signals than PRS and SRS Note 2: The corresponding link budget should also be reported and the verification procedure should be done within the restriction of minimum elevation angle for service, e.g., 30 degree for LEO |

Agreed LS out

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Documents agreed

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Email discussions

* R1-2208268 Summary #5 on 9.12.1 Coverage enhancement for NR NTN Moderator (NTT DOCOMO, INC.)
* R1-2207631 FL Summary #2: Network verified UE location for NR NTN THALES
* [Post-110-R18- NTN] Email discussion on evaluation methodology for network-verified UE location

#### 2.1.2 Remaining Open issues

Coverage enhancements

It is still open issue whether satellite transmission power reduction may be considered and thereby whether enhancement are needed for downlink channels and signals

Network verified UE location

* Study and evaluate, if needed, solutions for network to verify UE reported location information

## 2.2 RAN2

#### 2.2.1 Agreements

* **RAN2#119-e, August 17 - 26th 2022, e-meeting**

a) Coverage enhancements

Agreements:

1. RAN2 understands that, based on the WID, only solutions that address the NTN specific characteristics (e.g. related to propagation delays, coverage loss, satellite movement) should be considered. But the identified solutions could then also be applicable to other cases (TN networks). In any case this will be discussed case by case (this understanding is not meant to change the WID description)

b) Network verified UE location

Agreements:

1. The UE location information is considered verified if the reported GNSS position is consistent with the network based assessment to within 5-10 km (similar to terrestrial network macro cell size) (it is assumed that there is no RAN2 spec impact due to this)

2. RAN2 should consider, as starting point, the re-use of the LCS framework of the LMF network for the network verification procedure. Send an LS to SA2 indicating RAN2 assumption on this

3. The network verification of the UE reported location may combine one or several 3GPP defined RAT dependent positioning methods (e.g. Multi RTT, DL/UL-TDOA, DL-AoA, NR E-CID, etc.).

c) Mobility enhancements

Agreements:

1. RAN2 to work on a solution so that measurements for TN’s coverage are performed only when relevant (FFS what relevant means).

2. RAN2 to work on assistance information that can be provided to NTN UEs for the above.

3. Cell reselection enhancements (for both NTN-NTN and NTN-TN mobility) are considered for both Earth-moving and (quasi-)Earth-fixed scenarios, at least via the use of system information for broadcasting necessary parameters (dedicated signalling is not precluded). FFS whether the same or different solutions are used for Earth-moving and (quasi-)Earth-fixed scenarios

LS out

* R2-2208779 LS on LCS framework for NW verified UE location (Contact: THALES)

Email discussions

* [AT119-e][120][NR-NTN] LS to SA2 (Thales)
* [POST119-e][108][NR-NTN] NW verified UE location (Thales)

#### 2.2.2 Remaining Open issues

a) Coverage enhancements

* Evaluate the coverage performance and identify the candidate physical radio channels that have coverage issues specific to NTN with following target services taking into account the studies in TR38.830 where appropriate, as well as general coverage enhancement techniques specified in Rel-18
	+ VoIP and low-data rate services for commercial handset terminals

b) Network verified UE location

* Study and evaluate, if needed, solutions for network to verify UE reported location information

c) NTN-TN and NTN-NTN mobility and service continuity enhancements

* Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements

## 2.3 RAN3

#### 2.3.1 Agreements

* **RAN3#117-e, August 15 - 24th 2022, e-meeting**

Mobility enhancements

Agreements

* **In Rel-18, mobility enhancement based on NG and Xn can be discussed in WI based on technical issues to be solved**
* **Enhancements for the support of CHO over NG for NTN-NTN hand-over should be discussed in this WI.**
* **Time based CHO should be supported**
* **The target gNB is able to uniquely identify the target cell based on the target cell information received from the source gNB.**
* **Start time, duration are added in the signaling of time-based CHO.**
* **The exchange of NTN Cell Coverage Stop Time between gNBs may be further discussed in future RAN3 meetings.**

Documents agreed

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Email discussions

* R3-225076 NTN1\_Mobility (Thales)

Network verified UE location

Agreements

* **The verification is performed in the CN.**
* **If the reported UE location is not correct, the CN will take necessary action and Rel-17 behavior can be kept as baseline. FFS on new cause value.**
* **RAN3 wait for RAN1/2 progress on the specific position method to be used for verification.**

Documents agreed

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Email discussions

* R3-225024 NTN2\_UELocation (Nokia)

#### 2.3.2 Remaining Open issues

a) Network verified UE location

* Study and evaluate, if needed, solutions for network to verify UE reported location information

b) NTN-TN and NTN-NTN mobility and service continuity enhancements

* Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements

To be further discussed as part of mobility enhancements

* **Uu Cell ID can be used in NG and Xn hand-over procedures, the usage of this IE needs to be further clarified.**
* **Served Cell Information and Neighbour Information IEs in both XN Setup procedure and Configuration Update procedure shall allow multiple TACs for NTN cells.**
* **the details of Time based CHO are FFS**
* **Uu Cell ID in hand-over signaling and/or Rel-17 defined mapped cell ID configuration via OAM**
* **Signaling multiple TACs for NTN cells at Xn setup and configuration update: to be continued...**

## 2.4 RAN4

#### 2.4.1 Agreements

* **RAN4#104-e, August 15 - 26th 2022, e-meeting**

No activity

#### 2.4.2 Remaining Open issues

NR-NTN deployment in above 10 GHz

* Study and identify NTN example band: Analysis of regulations and adjacent channel co-existence scenarios.
* Specify Rx/Tx requirements for satellite access node and different VSAT UE class (not only 60 cm aperture) as appropriate for the identified example band
* Identify values for physical layer parameters chosen from the existing FR1 and FR2 sets.

Coverage enhancements

* Evaluate the coverage performance and identify the candidate physical radio channels that have coverage issues specific to NTN with following target services taking into account the studies in TR38.830 where appropriate, as well as general coverage enhancement techniques specified in Rel-18
	+ VoIP and low-data rate services for commercial handset terminals

NTN-TN and NTN-NTN mobility and service continuity enhancements

* Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements

## 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 SA2

#### 3.1.1 Agreements with cross-TSG impacts

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

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

Aspects related to Network verified UE location

## 4. References

## 4.1 RAN1

* **RAN1#110, August 22 - 26th 2022, Toulouse/France**

Submitted TDOCs:

* R1-2208150 other Session notes for 9.12 (NTN (Non-Terrestrial Networks) enhancements) Ad-Hoc Chair (Huawei)
* R1-2205829 Work Plan Work plan for NR NTN enhancements in Rel-18 THALES
* R1-2206418 discussion Discussion on UL time and frequency synchronization enhancement for NTN BUPT
* R1-2206223 discussion Discussion on UL time and frequency synchronization enhancement for NTN BUPT
* R1-2206236 discussion Discussion on coverage enhancements aspects for NR NTN NEC
* R1-2206423 discussion Evaluation results for NTN coverage enhancement Panasonic
* R1-2206310 discussion Discussion on coverage enhancement for NR NTN OPPO
* R1-2206386 discussion Discussion on coverage enhancement for NR NTN CATT
* R1-2205826 discussion Discussion on NR NTN coverage enhancement THALES
* R1-2205856 discussion Discussion on coverage enhancement for NR NTN Huawei, HiSilicon
* R1-2205832 discussion Coverage Enhancement for NTN Lockheed Martin
* R1-2206137 discussion Coverage enhancement for NR NTN MediaTek Inc.
* R1-2206063 discussion Discussions on coverage enhancement for NR NTN vivo
* R1-2206020 discussion Discussion on coverage enhancement for NTN ZTE
* R1-2206012 discussion Coverage enhancement for NR NTN NTPU
* R1-2206133 discussion Considerations on improving NR NTN Coverage Sony
* R1-2206630 discussion Discussion on coverage enhancement for NR-NTN Xiaomi
* R1-2206009 discussion Discussion on coverage enhancements for NTN Spreadtrum Communications
* R1-2206848 discussion On coverage enhancement for NR NTN Samsung
* R1-2206859 discussion On NTN coverage enhancement ITL
* R1-2208268 discussion Summary #5 on 9.12.1 Coverage enhancement for NR NTN Moderator (NTT DOCOMO, INC.)
* R1-2208269 discussion Summary #6 on 9.12.1 Coverage enhancement for NR NTN Moderator (NTT DOCOMO, INC.)
* R1-2207808 discussion Summary #1 on 9.12.1 Coverage enhancement for NR NTN Moderator (NTT DOCOMO, INC.)
* R1-2207809 discussion Summary #2 on 9.12.1 Coverage enhancement for NR NTN Moderator (NTT DOCOMO, INC.)
* R1-2207810 discussion Summary #3 on 9.12.1 Coverage enhancement for NR NTN Moderator (NTT DOCOMO, INC.)
* R1-2207811 discussion Summary #4 on 9.12.1 Coverage enhancement for NR NTN Moderator (NTT DOCOMO, INC.)
* R1-2207762 discussion On coverage enhancements for NR NTN Ericsson
* R1-2206961 discussion Coverage enhancement for NR NTN ETRI
* R1-2207556 discussion On coverage enhancements for NR NTN Ericsson
* R1-2207428 discussion Discussion on coverage enhancement for NR NTN NTT DOCOMO, INC.
* R1-2207358 discussion Discussion on coverage enhancement for NR NTN LG Electronics
* R1-2207294 discussion Discussion on coverage enhancement for NR NTN Lenovo
* R1-2207372 discussion Discussion on coverage enhancement for NR NTN Baicells
* R1-2207353 discussion Performance Evaluation on Coverage Enhancement for NR NTN Apple
* R1-2207140 discussion Evaluation of coverage enhancements for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2207255 discussion Coverage enhancements for NR NTN Qualcomm Incorporated
* R1-2207256 discussion Network verified UE location for NR NTN Qualcomm Incorporated
* R1-2207141 discussion Network verified UE positioning for NR over NTN Nokia, Nokia Shanghai Bell
* R1-2207354 discussion On Network Verified UE Location Apple
* R1-2207359 discussion Discussion on network verified UE location for NR NTN LG Electronics
* R1-2207429 discussion Discussion on Network verified UE location for NR NTN NTT DOCOMO, INC.
* R1-2207628 discussion FL Summary #1: Network verified UE location for NR NTN Moderator (THALES)
* R1-2207630 discussion FL Summary #3: Network verified UE location for NR NTN Moderator (THALES)
* R1-2207631 discussion FL Summary #4: Network verified UE location for NR NTN Moderator (THALES)
* R1-2207682 discussion On network verified UE location in NR NTN Ericsson
* R1-2206962 discussion Discussion on network verified UE location for NTN ETRI
* R1-2207629 discussion FL Summary #2: Network verified UE location for NR NTN Moderator (THALES)
* R1-2206849 discussion Network verified UE location for NR NTN Samsung
* R1-2206503 discussion On NTN NW verified UE location Lenovo
* R1-2206631 discussion Discussion on the network verified location for NTN Xiaomi
* R1-2206134 discussion Network verified UE location for NR NTN Sony
* R1-2206021 discussion Discussion on network verified UE location for NR NTN ZTE
* R1-2206064 discussion Discussions on Network verified UE location for NR NTN vivo
* R1-2206138 discussion Network verified UE location for NR NTN MediaTek Inc.
* R1-2205859 discussion Discussion on network-verified UE location for NR NTN Huawei, HiSilicon
* R1-2205827 discussion Discussion on network verified UE location in NR NTN THALES
* R1-2206387 discussion Considerations on network verified UE location for NR NTN CATT
* R1-2206311 discussion Discussion on network verified UE location for NR NTN OPPO
* R1-2206424 discussion Discussion on network verified UE location for NTN Panasonic
* **RAN2#119-e, August 17 - 26th 2022, e-meeting**

Submitted TDOCs:

* R2-2207096 Work Plan R18 WI NR-NTN-enh work plan at RAN1, 2 and 3 THALES
* R2-2207346 discussion Protocol overhead reduction for coverage enhancements Qualcomm Incorporated
* R2-2207713 discussion Potential issues for Msg3 repetition in NTN Lenovo
* R2-2207633 discussion Discussion on RAN overhead reduction for VoNR support in NR NTN vivo
* R2-2208567 discussion On Coverage Enhancements for NR NTN Nokia, Nokia Shanghai Bell
* R2-2208586 discussion Discussion on coverage enhancement for NR NTN Xiaomi
* R2-2208612 discussion Discussion on RAN protocol overhead reduction Huawei, HiSilicon
* R2-2208375 discussion Analysis on NTN Coverage Enhancement CATT
* R2-2208323 discussion Discussion on the coverage enhancement in NTN LG Electronics Inc.
* R2-2208276 discussion Blind Msg3 retransmission in Rel-18 NTN InterDigital
* R2-2208376 discussion Discussion on UE Location Verification CATT
* R2-2208328 discussion Discussion on Network Verified UE Location NTT DOCOMO INC.
* R2-2208444 discussion Consideration on UE Location Verification via Network CMCC
* R2-2208546 discussion Consideration on NW verified UE location ZTE Corporation, Sanechips
* R2-2208674 discussion R18 NR NTN Network verified UE location Ericsson
* R2-2207634 discussion Discussion on NW verification of UE location in Rel-18 NR NTN vivo
* R2-2207645 discussion Discussion of Network verified UE location in NTN China Telecom
* R2-2207675 discussion Discussion on UE location verify procedure Spreadtrum Communications
* R2-2207779 discussion Network Verified UE Location Samsung R&D Institute UK
* R2-2207482 discussion Discussion on the network verfied UE location Huawei, HiSilicon
* R2-2207444 discussion Consideration on NTN Network Verified UE Location Apple
* R2-2207866 discussion On NTN NW verified UE location aspects Lenovo
* R2-2207915 discussion Discussion on network verified UE location Xiaomi
* R2-2208022 discussion UE location verification in NTN Deutsche Telekom, Huawei, HiSilicon
* R2-2207326 discussion Considerations on NW-verified UE location Nokia, Nokia Shanghai Bell
* R2-2207302 discussion On Network Verified UE Location in NR-NTN MediaTek Inc.
* R2-2207296 discussion Assumptions on Network verified location NEC Telecom MODUS Ltd.
* R2-2207274 discussion Discussion on network verified UE location Intel Corporation
* R2-2207074 discussion Discussion on network verified UE location OPPO
* R2-2207098 discussion Network verified UE location aspects THALES
* R2-2207062 discussion Discussion on mobility enhancements for idle and inactive UEs OPPO
* R2-2207048 discussion Discussion on mobility enhancements in Rel-18 NTN New H3C Technologies Co., Ltd.
* R2-2207073 discussion Discussion on NTN handover enhancements OPPO
* R2-2207195 discussion Discussion on NTN-TN and NTN-NTN mobility NTT DOCOMO, INC.
* R2-2207022 discussion Discussion on assistance information of cell reselection for NTN-TN mobility ITRI
* R2-2207272 discussion Discussion on NTN handover enhancements Intel Corporation
* R2-2207273 discussion Discussion on NTN cell reselection enhancements Intel Corporation
* R2-2207244 discussion NTN mobility enhancements in connected mode Samsung Research America
* R2-2207245 discussion NTN cell reselection enhancements Samsung Research America
* R2-2207297 discussion NTN-NTN handover enhancement for RRC\_CONNECTED UEs NEC Telecom MODUS Ltd.
* R2-2207298 discussion Solutions to reduce UE power consumption for NTN to TN mobility in Idle or Inactive mode NEC Telecom MODUS Ltd.
* R2-2207303 discussion Improving Cell Reselection in NR-NTN MediaTek Inc.
* R2-2207304 discussion Handover Enhancement in LEO NTN with Earth-moving Cells MediaTek Inc.
* R2-2207327 discussion On NTN-NTN and TN-NTN mobility in Rel-18 Nokia, Nokia Shanghai Bell
* R2-2207347 discussion Signaling and congestion reduction in satellite switch Qualcomm Incorporated
* R2-2207348 discussion IDLE mode TN-NTN mobility enhancement Qualcomm Incorporated
* R2-2207986 discussion Discussion on target cell's timing for intra-satellite and inter-satellite handover under users of non-uniform spatio -temporal distribution BUPT
* R2-2207916 discussion Discussion on mobility and service continuity enhancements Xiaomi
* R2-2207894 discussion Network-driven NTN-NTN Mobility Considerations Lockheed Martin
* R2-2207892 discussion Discussion on handover for NTN BUPT
* R2-2208147 discussion Discussion on ephemeris usage for NR NTN TURKCELL
* R2-2207445 discussion NTN-NTN Mobility Enhancement Apple
* R2-2207446 discussion NTN-TN Mobility Enhancement Apple
* R2-2207499 discussion Discussion on NTN mobility enhancements Huawei, HiSilicon
* R2-2207834 discussion NTN-TN mobility enhancements Sony
* R2-2207835 discussion Signaling overhead reduction during NTN-NTN HOs Sony
* R2-2207676 discussion Some enhancements in NTN Handover Spreadtrum Communications
* R2-2207646 discussion Discussion of NTN-TN mobility China Telecom
* R2-2207650 discussion Discussion on NTN mobility and service continuity enhancements Transsion Holdings
* R2-2207635 discussion Discussion on mobility and service continuity enhancement vivo
* R2-2207714 discussion Issue analysis for service continuity in TN-NTN and NTN-NTN scenarios Lenovo
* R2-2207732 discussion Discussion on handover for NTN BUPT
* R2-2207767 discussion Discussion on NTN-TN mobility and NTN-NTN mobility ITL
* R2-2208670 discussion R18 NR NTN Mobility enhancements Ericsson
* R2-2208671 discussion R18 NR NTN Idle mode Mobility enhancements Ericsson
* R2-2208641 discussion Discussion on ephemeris usage for NR NTN TURKCELL
* R2-2208424 discussion Discussion on cell reselection enhancements CMCC
* R2-2208425 discussion Discussion on mobility enhancements for connected mode CMCC
* R2-2208377 discussion Discussion on NTN Mobility Enhancements CATT
* R2-2208277 discussion RRC Idle/Inactive measurement, mobility, and service continuity InterDigital
* R2-2208278 discussion RRC Connected measurement, mobility, and service continuity InterDigital
* R2-2208280 discussion Discussion on cell reselection enhancement for NTN LG Electronics France
* R2-2208282 discussion Reducing UE power consumption in idle inactive mode LG Electronics France
* R2-2208332 discussion Cell reselection enhancements in NTN-NTN and NTN-TN mobility ZTE corporation, Sanechips
* R2-2208333 discussion Discussion on NTN-NTN handover enhancement ZTE corporation, Sanechips
* **RAN3#117-e, August 15 - 24th 2022, e-meeting**

Submitted TDOCs:

* R3-224235 Work Plan R18 WI NR-NTN-enh work plan at RAN1, 2 and 3 THALES
* R3-224304 discussion XN Enhancements for NTN Mobility and Feeder Link Switch Over Qualcomm India Pvt Ltd
* R3-224305 discussion NTN Mobility Enhancements for Rel18 Qualcomm India Pvt Ltd
* R3-224383 discussion Discussion on the Mobility and Service Continuity Enhancements in NR NTN Nokia, Nokia Shanghai Bell
* R3-224440 discussion Xn interface enhancements in NTN InterDigital
* R3-224399 discussion Mobility and service continuity enhancement for NTN China Telecommunication
* R3-224863 discussion Discussion on enhancements for feeder link switch over Samsung
* R3-224587 CR Enhancement on mobility of NTN Huawei
* R3-224588 discussion Discussion on mobility of NTN Huawei
* R3-224579 other CHO for NTN Ericsson, Thales
* R3-224580 other CHO for NTN – XnAP Impacts Ericsson, Thales
* R3-224636 discussion Discussion on signalling based feeder link switch CATT
* R3-224637 CR Support of signalling based feeder link switch-over in XnAP CATT
* R3-224622 discussion Initial consideration on mobility issue for NR NTN ZTE
* R3-224623 discussion Initial consideration on Network verified UE location for NR NTN ZTE
* R3-224624 CR Cause value on Network verified UE location for NR NTN ZTE
* R3-224635 discussion Discussion on UE location verification for NR NTN CATT
* R3-224578 other Initial Observations on Network Verified UE Location Ericsson LM
* R3-224595 discussion UE location verification Huawei
* R3-224384 discussion Discussion on the network verified UE location Nokia, Nokia Shanghai Bell
* R3-224234 discussion Network verified UE location aspects THALES
* **RAN4#104-e, August 15 - 26th 2022, e-meeting**

Submitted TDOCs:

* R4-2211515 LS in LS on UE antenna gain for NR NTN coverage enhancement RAN1

***END***