**3GPP TSG RAN WG1 #122 R1-250XXXX**

**Bengaluru, India, Aug 25th – 29th, 2025**

Agenda Item: 10.6

Source: Ad-Hoc Chair (Ericsson)

Title: Session notes for 10.6 Non-Terrestrial Network (NTN) for NR Phase 4

Document for: Discussion, Decision

## Non-Terrestrial Networks (NTN) for NR Phase 4

*Please refer to* [*RP-251863*](https://www.3gpp.org/ftp/TSG_RAN/TSG_RAN/TSGR_106/Docs/RP-243300.zip) *for detailed scope of the SI for NR-NTN Phase 4.*

[122-R20-NR-NTN] Email discussion on Rel-20 NR-NTN – xxx

* To be used for sharing updates on online/offline schedule, details on what is to be discussed in online/offline sessions, tdoc number of the moderator summary for online session, etc

R1-2505153 Discussion on Rel-20 GNSS resilient NR NTN operation FUTUREWEI

**R1-2505361** Work plan for NR NTN Phase 4 THALES

Late submission

R1-2506115 Discussion on GNSS resilient NR-NTN operation Sony

### NR-NTN GNSS resilience

**R1-2505859** Considerations for the study of NR-NTN GNSS resilience Eutelsat Group

**R1-2506048** Initial views on GNSS resilient operation for NR over NTN Nokia

R1-2505124 Discussion on NR-NTN GNSS resilience SageRAN

R1-2505142 On GNSS-resilient operation for NR-NTN Ericsson

R1-2505169 Discussion on NR NTN GNSS resilience Spreadtrum, UNISOC

R1-2505223 GNSS resilience for NR-NTN Huawei, HiSilicon

R1-2505307 Discussion on NR-NTN GNSS resilience CATT

R1-2505359 Considerations on NR-NTN Resilience to GNSS Unavailability and Degradation THALES

R1-2505413 Discussion on NR-NTN GNSS resilience vivo

R1-2505460 Discussion on NR-NTN GNSS resilience Xiaomi

R1-2505508 Discussion on NR-NTN GNSS resilience ZTE Corporation, Sanechips

R1-2505581 Discussion on NR-NTN GNSS resilience Samsung

R1-2505590 Discussion on NR-NTN GNSS resilience Fraunhofer IIS, Fraunhofer HHI

R1-2505632 GNSS Resilient NR-NTN Operation in 5G Adv Tejas Network Limited

R1-2505672 Discussion on NR-NTN GNSS resilience Ofinno

R1-2505695 Random access for NR NTN GNSS resilient operation Sharp

R1-2505754 Discussion on NR-NTN GNSS resilience OPPO

R1-2505779 Discussion on NR-NTN GNSS resilience China Telecom

R1-2505910 Considerations of NR-NTN GNSS Resilient Operations Apple

R1-2505937 Discussion on NR-NTN GNSS resilience NEC

R1-2505940 Discussion on the GNSS resilient NR-NTN operation TCL

R1-2505949 Discussion on GNSS resilient NR-NTN operation LG Electronics

R1-2505977 Discussion on GNSS resilient NR-NTN Panasonic

R1-2506001 Discussion on NR-NTN GNSS resilience HONOR

R1-2506040 GNSS resilient operations in NR NTN MediaTek Inc.

R1-2506062 Discussion on NR-NTN GNSS resilient operations ETRI

R1-2506094 Discussion on NR-NTN GNSS resilience CMCC

R1-2506132 Discussion on NR-NTN GNSS Resilient Operations Lenovo

R1-2506154 Considerations for GNSS resilient NR-NTN operation ST Engineering iDirect

R1-2506155 NR-NTN GNSS resilience InterDigital, Inc.

R1-2506165 Discussion on GNSS resilient NR-NTN operation TOYOTA Info Technology Center

R1-2506215 NR-NTN GNSS resilience Qualcomm Incorporated

R1-2506264 Discussion of NR-NTN GNSS Resilience Johns Hopkins University APL

R1-2506302 Study on NR-NTN GNSS resilience NTT DOCOMO, INC.

R1-2506334 Discussion on GNSS resilience for NR-NTN CSCN

R1-2506343 Discussion on NR-NTN GNSS resilience Google

R1-2506357 Discussion on GNSS Resilient Operation for NR NTN CEWiT

R1-2506385 Discussion on NR-NTN GNSS resilience ViaSat Satellite Holdings Ltd, Inmarsat, Terrestar, Ligado, Space42, Thuraya

**R1-2506446**

**R1-2506447**

**Agreement**

For the study on GNSS resilient operation, scenarios should be considered where:

* Scenario 1: The UE cannot rely on its GNSS for timing and frequency compensation on the service link.
* Scenario 2: There is a previously acquired GNSS based position
  + UE has not received GNSS information for time duration T from the last acquired GNSS position and hence, the GNSS accuracy is degraded
    - FFS: value of T
    - FFS: GNSS based UE location validity duration
    - FFS: GNSS accuracy
* Note: Two scenarios above belong to description as in SID.

**R1-2506448**

**Proposal 2-3-v2**

For the study on GNSS resilient operation, the following scenarios are considered for evaluation purposes:

|  |  |  |  |
| --- | --- | --- | --- |
| **Satellite orbit** | GSO | LEO-1200 | LEO-600 |
| **Satellite altitude** | 35786 km | 1200 km | 600 km |
| **Satellite scenario parameters** | At least Table 6.1.1.1-1 in TR 38.821, Parameters in Table 6.1.1.1-2 in TR 38.821could be considered. | | |
| **Beam size (note 3)** | At least values captured in Table 6.1.1.1-1/2 are considered, | | |
| **Minimum elevation angle** | 30° (LEO), 12.5° (GSO) | | |
| **Frequency ranges/bands** | FR1 NTN (2GHz/Ku: 14 GHz) and FR2 NTN (30 GHz) | | |
| **UE type** | Handheld (L/S band), VSAT (Ku/Ka) | | |
| **UE speed (note 1)** | L/S band: 3 km/h, 120km/h, 1500 km/h, Ku/Ka: 3 km/h , 120 km/h, 1500 km/h, (note 2) | | |
| **Beam/cell type (note 4)** | (Quasi)-Earth-fixed beams/cells and Earth-moving | | |
| Note 1: UE altitude is considered  Note 2: 10 km altitude in case of aircraft scenario. 1500 km/h is for aircraft scenario.  Note 3: Same values can be reused for other elevation angle than nadir. Beam size of the edge beam can be reported by companies.  Note 4: Footprint of the beam could be: case 1: within the orbital plane, case 2: at 90° with respect to orbital plane. Companies to report the elevation angle of the beam.  Note 5: Other parameters can be reported by companies. | | | |

**Note: The cyan highlighted parameters are prioritized for evaluation purposes.**

**R1-2506612**

**Agreement:**

For PRACH performance evaluation for existing PRACH formats, adopt the following methods:

* Baseline: Analytical characterization of performance based on e.g. properties of ZC sequences and values of differential Delay / Doppler.
* Optional: Link level evaluations
  + The following table is proposed for LLS parameters

|  |  |  |
| --- | --- | --- |
| Configurations | S/L-band | Ka/Ku-band |
| Carrier Frequency | 2 GHz | For Ka: UL 30GHz, for Ku: UL 14 GHz |
| Channel Model | Baseline NTN TDL-C rural model in TR38.811 | |
| Antenna Configuration at the TRP (satellite) | 1 Rx | 1 Rx |
| Antenna Configuration at the UE | A single omni-directional antenna element | VSAT with 60 cm equivalent aperture diameter |
| PRACH format | To be reported by companies. | To be reported by companies |
| PRACH configuration | To be reported by companies. | |
| Metric | PRACH detection rate, FAR (Based on the preamble pool size is not less than 64), CDF of estimation error for frequency/timing | |
| Receiver | Companies to report the receiver for PRACH detection. | |

**Agreement:**

For evaluation regarding GNSS-resilient operation, based on GNSS information or the lack of it, it is assumed that the UE has a horizontal location uncertainty within an area

* Case a: the location uncertainty area is the area served by the cell or beam.
* Case b: the location uncertainty area is a circle of radius X km
  + X to be reported

UE altitude error should be taken into account.

* UE altitude error to be reported.

For both Case a and Case b above, RAN1 to evaluate at least:

* Differential delay values
* Differential frequency offset/Doppler values