**3GPP TSG-RAN WG4 Meeting #** **109 [R4-2321974](http://10.10.10.10/ftp/RAN/RAN4/Inbox/R4-2321974.zip)**

**Chicago, USA, Nov 13 – Nov 17, 2023**

**Agenda item:** 8.26.9

**Source:** ZTE Corporation, Samsung

**Title:** WF on NTN UE RF requirements

**Document for:** Approval

# Online agreement: NTN UE RF requirement

**Issue 1-1 NTN UE power class/types definition**

**Agreement:**

* **Define the requirements based on the following UE types**

|  |  |  |
| --- | --- | --- |
| **UE class** | **UE type** | Type description |
| Fixed VSAT | 1 | Fixed VSAT supporting GSO and LEO with mechanical steering antenna. |
| 2 | Fixed VSAT supporting GSO and LEO with electronical steering antenna. |
| 3 | Fixed VSAT supporting LEO only with electronical steering antenna. |
| Mobile VSAT | 4 | Mobile VSAT supporting GSO with mechanical steering antenna. |
| 5 | Mobile VSAT supporting GSO with electronical steering antenna. |
| Note: Assuming that UE has single beam towards one single satellite at a given time. | | |

* UE capabilities for Rel-18 NTN UE
  + The following new UE capabilities will be specified
    - Capability signalling to distinguish electronic or mechanical steering antenna
    - Capability signalling to distinguish fixed or mobile VSAT
  + Reuse the capability of NTN\_ScenearioSuppot\_R17 to distinguish LEO, GSO or both

**Issue 1-2: Mapping between NF and NTN UE power class/types**

Agreement:

Fixed VSAT:

                             Electronic steering

                                             Class 1: 2.5 dB NF  (LEO and GSO)

                                             Class 2: 6 dB NF  (LEO only)

Mechanical steering

                                             Class 1: 2.5 dB NF  (LEO and GSO)

    Mobile VSAT:

                              electronic steering

                                             Class 1: 2.5 dB NF  (GSO)

                              mechanical steering

                                             Class 1: 2.5 dB NF  (GSO)

**Issue 1-3: the necessity of introduction of NTN UE capable of both electronic steering and mechanical steering and how reflect in the above UE types.**

**Agreement:**

* For the hybrid beam steering capable NTN UE, one clarification note is suggested to be added in 38.133 and 38.101-5 that the requirement could follow either electronic or mechanical beam steering requirements depending on the declared UE types.

**Issue 1-4: network signalling for barring certain VAST access**

Agreement: Specify a network IE to signal that network supports either a mobile VSAT UE, a fixed VSAT UE or both in Ka band.

### Sub-topic 2 Tx requirement

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 2-1: How to define the on-axis EIRP limit**

**Agreement:**

* maximum EIRP limit is 76.2dBm.
* The maximum TRP limit for NTN UE follows the regulatory requirements, including both ECC and FCC requirements.

**Issue 2-2: Transmit power assumption for each UE types**

**Agreement:**

* for each UE type, single value for minimum EIRP limit for certain elevation angle and FFS for the exact value;
* If UE is capable of communicating with both GSO and LEO, to follow the minimum EIRP for worse case.

**Issue 2-3: MPR and A-MPR requirement for VSAT**

**Agreement:**

* Not to introduce MPR and A-MPR requirement for NTN VSAT
* To use NS value approach to indicate the regional requirement if necessary

**Issue 2-4: freq error requirement for NTN VSAT**

Agreement: Reuse the existing FR1 NTN UE freq error requirement [+/-0.1ppm with 1ms]

**Issue 2-5: EVM requirement for NTN VSAT**

Agreement: postpone the support of Pi/2 BPSK for NTN VSAT in Rel-18 into future release

**Issue 2-6: Other transmitter signal quality requirement for NTN VSAT**

Agreement:

* Do not define the following requirements
  + carrier leakage requirement for NTN VSAT
  + legacy TN UE in-band emission for NTN VSAT
  + EVM equalizer spectrum flatness requirement for NTN VSAT

**Issue 2-7: Transmitter dynamic range requirement for NTN VSAT**

Agreement: The following requirements need be specified.

* The minimum output power
* The OFF output power
* The transition period requirement
* Power control requirement,

**Issue 2-8 OBW**

**Agreement:** follow the existing requirement of TS 38.101-2

# Offline agreement: NTN UE RF requirement

**Issue 2-9 SEM requirement**

Agreement:

Option 1:

* Proposal 1:
* for the out-of-band emission requirement, propose to use the ITU-R SM.1541-6, Annex 5 OoB domain emission limits for space services (earth and space stations) as starting point and further discuss any modification if necessary (e.g. to keep consistency with other regional out-of-band emission requirement). [ZTE,R4-2320332]

Option 2:

**Table 9.5.2.2-1: General NR spectrum emission mask for FR2-NTN.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Spectrum emission limit (dBm) / Channel bandwidth** | | | | |
| **ΔfOOB**  **(MHz)** | **50**  **MHz** | **100**  **MHz** | **200**  **MHz** | **400**  **MHz** | **Measurement bandwidth** |
| ± 0-5 | -5 | -5 | -5 | -5 | 1 MHz |
| ± 5-10 | -13 | -5 | -5 | -5 | 1 MHz |
| ± 10-20 | -13 | -13 | -5 | -5 | 1 MHz |
| ± 20-40 | -13 | -13 | -13 | -5 | 1 MHz |
| ± 40-80 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 80-100 | -13 | -13 | -13 | -13 | 1 MHz |
| ± 100-160 |  | -13 | -13 | -13 | 1 MHz |
| ± 160-200 |  | -13 | -13 | -13 | 1 MHz |
| ± 200-400 |  |  | -13 | -13 | 1 MHz |
| ± 400-800 |  |  |  | -13 | 1 MHz |
| ± 800-1600 |  |  |  |  | 1 MHz |
| ± 1600-3200 |  |  |  |  | 1 MHz |
| ± 3200-4000 |  |  |  |  | 1 MHz |
| NOTE 1: Void | | | | | |

Option 3: other options are not precluded.

**Issue 2-10 transmitter spurious emission requirement**

Agreement:

Option 1:

* The following regulatory requirement should be taken into account.
* for the general transmitter spurious emission requirement, propose to follow the ITU-R SM.39 recommendation.[ZTE,R4-2320332]

TABLE 2 [ITU-R SM.329]

|  |  |
| --- | --- |
| Space services (mobile earth stations)(3), (4) | 43  10 log *P*, or 60 dBc, whichever is less stringent |
| Space services (fixed earth stations)(3), (4) | 43  10 log *P*, or 60 dBc, whichever is less stringent |

* CEPT ERC 74.01
* FCC 25.202(f)(4)

**Issue 2-11 Phase continuity requirement for DMRS bundling.**

Agreement:

* NOT applicable for FR2-NTN VSAT

### Sub-topic 3 Rx requirement

*Sub-topic description:*

*Open issues and candidate options before e-meeting:.*

**Issue 3-1 REFSENS requirements**

Agreement for polarization assumption:

* For polarization assumption for VSAT receiver requirement, the default assumption is single polarization
* If VSAT is capable of both polarization reception at the same time, the delta\_R [TBD] for diversity gain could be added;

Agreement for REFSENS:

For UE type 3 supporting with LEO only:

* Link budget is based on the LEO600KM at [90] degree elevation angle and NF as 6dB;

For UE types supporting with both GEO and LEO:

* Link budget is based on GEO assumption with [25] degree elevation angle and NF as 2.5dB;

**Issue 3-2 FRC and FDD pattern in Annex.**

Agreement:

* Reuse the existing DL FRC defined in TS38.101-2 with update TDD pattern configuration for FDD. FFS for UL FRC/ PRB configuration.

**Issue 3-3: Maximum input power for NTN VSAT**

Agreement :

For UE type 3 supporting with LEO only:

* Link budget is based on the LEO400KM at [90] degree elevation;

For UE types supporting with both GEO and LEO:

* Link budget is based on LEO600KM at [90] degree elevation;

**Issue 3-4: In-band blocking requirement for**

Agreement :

for in-band blocking requirement for VSAT, propose to specify the power level of IBB to the same as power level of interfering signal of ACS requirement and reuse the freq offset of FR2 TN UE in-band blocking requirement

**Issue 3-5: Receiver spurious emission requirement for NTN VSAT.**

Agreement :

* Option 1: not needed since this is FDD band and OTA conformance testing.

# Offline agreement for PUSCH DMRS bundling

**Issue 4-2: applicability of DMRS bundling for GSO and NGSO**

Agreement:

For GSO:

* *To reuse maxDurationDMRS-Bundling-r17 for Rel-18 NTN UE DMRS bundling*
* reuse the same requirement from Rel-17 TN coverage enhancement requirement (DMRS bundling )for Rel-18 NTN UE DMRS bundling requirement;
* . The requirement is verified under [0.17ppm] Doppler and constant delay test conditions. The delay condition is a constant and derived from the ephemeris information (SIB-19) and UE location associated with the Doppler value under test.

For NGSO:

* To define new capability for Rel-18 NTN UE DMRS bundling for Rel-18 NTN UE DMRS bundling;
* RAN4 will not introduce the requirement in Rel-18;
* There are no conformance testing with emulated varying channel model under NGSO up to Rel-18, whether to enable the DMRS bundling feature in NGSO, it’s up to the network decision;
* RAN4 recommend to specify side condition for NGSO under the varying Doppler and time delay in the future release.