**3GPP TSG-RAN WG4 Meeting #108bis [Draft] R4-2316906**

**Xiamen, China, October 09 – October 13, 2023**

**Title:** WF on NR NTN Co-existence

**Agenda Item:** 8.26.2

**Source:** Samsung

**Document for:** Approval

# Topic #1: Simulation assumptions

**Issue 1-1: NTN Antenna Pattern**

[Tentative] Agreement:

* Circular aperture antenna model for SAN and NTN UE is used in the co-existence study for Rel-18 NTN. Use of phased array antenna model needs further discussion.
* Remove the angle range limitation of ± 90° for NTN UE antenna.
* Equivalent satellite antenna aperture values for co-existence study:

|  |  |  |
| --- | --- | --- |
| **GEO** | **LEO-1200** | **LEO-600** |
| 5.9/3.66m (DL/UL) | 0.6/0.36 m (DL/UL) | 0.6/0.36 m (DL/UL) |

**Issue 1-2: VSAT Antenna height**

[Tentative] Agreement: Simulation of VSAT with 1.5m height can be covered by ESIM cases taking into account the agreement of Issue 1-1.

**Issue 1-3: Atmospheric losses and the scintillation losses**

* Proposals
  + Option 1: A total of 2dB of atmospheric losses and the scintillation losses to be assumed in the co-existence study.
* Recommended WF
  + [1/1.5/2] dB

**Issue 1-4: Polarization isolation**

* Proposals
  + Option 1: Do not consider the polarization isolation to simplify the Ka-band NTN coexistence study.

[Tentative] Agreement: Option 1 has already been agreed in previous meeting

**Issue 1-5: TN cellular diameter**

* Proposals
  + Option 1: Consider a cellular Terrestrial Network (TN) not larger than 50 km diameter.
* Recommended WF
  + Stick with TN 20% active ratio rather than changing the TN cell diameter

**Issue 1-6: Scaling Factor of TN to NTN**

* Proposals
  + Option 1: Companies to use same scaling factor values for lower NTN SAN elevation angle (e.g. 25°) and 90° NTN SAN elevation angle.

|  |  |  |
| --- | --- | --- |
| **Orbit** | **90°** | **25°** |
| LEO600 | **13.8 dB** | **13.8 dB** |
| LEO1200 | **19.6 dB** | **19.6 dB** |
| GEO | **29.1 dB** | **29.1 dB** |

* Recommended WF
  + Stick with TN 20% active ratio rather than changing the TN cell diameter

**Issue 1-7: SAN Elevation Angle**

* Proposals
  + Option 1: Companies to focus on 90° elevation angle. If a second value is still required, companies are encouraged to decide use e.g. 45° elevation angle.
  + Option 2: To further simulate lower elevation angles i.e., 25 degrees in order to have more accurate conclusions for all the scenarios as this is the worst-case scenario.
* Recommended WF
  + No issues on 90° so keep moving on this and further evaluate 25° cases.

**Issue 1-8: Isolation distance and frequency offset**

* Proposals
  + Option 1: To test different isolation distances and investigate frequency offset for scenario 5 between the TN BS and the NTN VSAT to have better coexistence.
* Recommended WF
  + FFS

**Issue 1-9: TN ACLR & ACS @ 17GHz**

* Proposals
  + Option 1: To increase hypothetical TN requirements (which are not currently specified by any TN specification since such TN deployment does not exist) at least with 3 more dBs:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Frequency band | BS | | UE | | ACIR | |
| ACLR | ACS | ACLR | ACS | BS ACLR  UE ACS | UE ACLR  BS ACS |
| 17 GHz | [30] + 3dB | [26] + 3dB | [19] + 3dB | [25] + 3dB | [23.8] +3dB | [18.2] +3dB |
| 27 GHz | 28 | 24 | 17 | 23 | 21.8 | 16.2 |

* + Option 2: If Option 1 is not sufficient, the values should be increased more.
  + Option 3: Other alternatives could be considered, including
    - Increasing the guardband of NTN CBW;
    - Considering a different ACLR model from the fixed one;
    - Other options

[Tentative] Agreement: Do not discuss on the change of TN ACLR & ACS values @ 17GHz at this stage and as the normal approach, ACIR values will be achieved first and ACLR and ACS values of NTN will be derived based on those ACIR when TN values @17GHz may be discussed and referred to.

**Issue 1-10: ACIR modelling**

* Proposals
  + Option 1: Reuse the ACIR 3-steps model for TN and NTN in UL. And for NTN, the ACIR 3-steps model will be used according the following:
    - 3 UEs will transmit in ACIR region 1;
    - 3 UEs will transmit in ACIR region 2;
    - 4 UEs will transmit in ACIR region 3.

[Tentative] Agreement: Use the flat ACIR model for both NTN & TN. 10 NTN UEs in UL and 1 TN UE in UL.

**Issue 1-11: NTN UL TxP**

* Proposals
  + Option 1: RAN4 may also consider the NTN UL TxP increase as a potential way forward to improve LEO orbits in scenario 4.
* Recommended WF
  + Not considered at this stage.

**Issue 1-12: Simulation assumption summary**

* Proposals
  + Option 1: Update simulation assumption document with latest agreements
* Recommended WF
  + Agree on Option 1.

# Topic #2: Calibration

**Issue 2-1: Deviation of TN UL**

* Proposals
  + Option 1: While running the NTN-TN coexistence simulations, RAN4 should continue investigating why the TN UL results are so diverging (especially for 27GHz)
* Recommended WF
  + Agree on Option 1.

**Issue 2-2: Shadowing correlation**

* Proposals
  + Option 1: Assume shadowing correlation between beams of the same satellite as 1.
* Recommended WF
  + Agree on Option 1.

**Issue 2-3: Intermediate results**

* Proposals
  + Option 1: Companies to share exact uplink Tx power control value used for calibration.
  + Option 2: to share UL TxP statistics and UL CLx-tile actual values between companies to align UL SINR

- Single beam UL SINR (no interference) should be 15 dB for all users in LEO! Moreover, some GEO users may be power limited.

* Recommended WF
  + Agree on Option 1 and 2.

# Topic #3: Co-existence study

[Tentative] Agreement:

* Update and use the table in Attachment 2 of R4-2316265 to collect results of the co-existence study of NTN in above 10GHz bands.
* Further discuss considerations on Scenario 5 taking into account related Issues in Topic 1.