**3GPP TSG-RAN WG4 Meeting #116 R4-25xxyyy**

**Bengaluru, India, 25thth to 29th August 2025**

Agenda Item: 7.7.3

Source: Ericsson

Title: NTN Ku band co-existence simulation assumptions (running document)

Document for: Approval

# 1 Introduction

This contribution captures the simulation assumption agreements until the 3GPP RAN4#116 meeting in Bengaluru. The participating companies are requested to use this document as reference for simulation

# 

# 6b Annex: Simulation assumptions

## 6b.1 Co-existence simulation scenario for 11/14GHz

Scenarios for the coexistence study for 11/14GHz are listed in Table 6b.1-1

Table 6a.1-1: Scenarios for NTN-NTN/TN co-existence

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 11/14GHz | | NTN | | |
| GEO | LEO 600km | LEO 1200km |
| NR | Rural | N/A | N/A | N/A |
| Urban macro | X | X | N/A |
| Dense Urban | N/A | N/A | N/A |
| Note: It was agreed to focus on Urban Macro for GEO and LEO600 as they represent the worst-case. | | | | |

The aggressor and victim combinations for 11/14GHz cases are listed in Table 6b.1-2.

Table 6b.1-2: Aggressor and victim

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **No** | **Combination** | **Aggressor** | **Victim** | **Frequency Band** | **Notes on the Ku Band** | **Scope of Coexistence Simulation** |
| 1 | TN with NTN | VSAT UL | UE UL | 14 GHz | Ku Band VSAT uplink interfering with gNodeB receiver. | The ACLR of the VSAT to be varied/defined.  The ACS of the gNodeB is fixed. |
| 2 | TN with NTN | UE UL | VSAT UL | 14 GHz | UE uplink interfering with Ku Band Satellite receiver. | The ACLR of the UE is fixed.  The ACS of the satellite to be varied/defined. |
| 3 | TN with NTN | VSAT UL | gNodeB DL | 14 GHz | Ku Band VSAT uplink interfering with UE receiver. | The ACLR of the VSAT to be varied/defined.  The ACS of the UE is fixed. |
| 4 | TN with NTN | gNodeB DL | VSAT UL | 14 GHz | gNodeB downlink interfering with Ku Band Satellite receiver. | The ACLR of the gNodeB is fixed.  The ACS of the Satellite to be varied/defined. |
| 5 | TN with NTN | gNodeB DL | Satellite DL | 11 GHz | gNodeB downlink interfering with Ku Band VSAT receiver. | The ACLR of the gNodeB is fixed.  The ACS of the VSAT to be varied/defined. |
| 6 | TN with NTN | Satellite DL | gNodeB DL | 11 GHz | Ku Band Satellite downlink interfering with UE receiver. | The ACLR of the Satellite to be varied/defined.  The ACS of the UE is fixed. |
| 7 | TN with NTN | Satellite DL | UE UL | 11 GHz | Ku Band Satellite downlink interfering with gNodeB receiver. | The ACLR of the Satellite to be varied/defined.  The ACS of the gNodeB is fixed. |
| 8 | TN with NTN | UE UL | Satellite DL | 11 GHz | UE uplink interfering with Ku Band VSAT receiver. | The ACLR of the UE is fixed.  The ACS of the VSAT to be varied/defined. |

The frequency and bandwidth are listed in Table 6b.1-3.

Table 6b.1-3: Proposed frequency and bandwidth for co-existence study

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Frequency | Bandwidth | Duplex mode | Frequency reuse factor |
| TN Urban macro | 11/14 GHz | 100MHz | TDD | 1 |
| GEO | 11GHz (DL)/14GHz(UL) | 100MHz per beam | FDD | 2 |
| LEO | 11GHz (DL)/14GHz(UL) | 100MHz per beam | FDD | 2 |
| Note: FRF=1 with single polarization has been adopted for calibration. For co-existence simulation, assume FRF=2 with two polarizations (RHCP, LHCP). | | | | |

## 6b.2 Co-existence simulation assumption for 11/14GHz

### 6b.2.1 Network layout model

#### 6b.2.1.1 Co-existence between NTN satellite and TN

Cellular cell structure is considered for both NTN and TN network layout.

Referring to TR 38.811 Section 6.3 and Annex A, a 3D global coordinate system is considered (Earth-Centred Earth Fixed) for simulating NTN beams direction and location on the earth surface. It means the NTN beam location, TN randomly dropping location are generated with a set of three parameters (x,y,z).

Deployment of NTN satellite and TN cells and UEs for co-existence study is listed in Table 6b.2.1.1-1.

**Table 6b.2.1.1-1: Network and UE deployment**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. | Combination | Aggressor | Victim | Which NTN cell/UE to observe? | Which TN/UE to observe? | Which TN cells in a TN to observe? |
| 1b | TN with NTN | NTN UL | TN UL | NTN cell:  Nadir point.  NTN UE:  NTN UEs randomly dropped in TN clusters. | TN randomly placed in this NTN beam | Only the active TN clusters which contain NTN UE(s) |
| 2b | TN with NTN | TN UL | NTN UL | NTN cell:  Observe NTN central beam for SINR, 6 adjacent beams for inter-beam interference.  NTN UE:  NTN UEs randomly dropped in TN clusters | Consider an active rate of 20% for TN | Only the active TN cells in central NTN beam |
| 3b | TN with NTN | NTN UL | TN DL | NTN cell:  Nadir point  NTN UE:  NTN UEs randomly dropped in TN clusters. | TN clusters randomly placed in this NTN beam | All active TN clusters which contain NTN UE(s) |
| NTN cell:  NTN cell with satellite at low elevation (to be further discussed for GEO and LEO，interested companies can bring analysis and results for other values).  NTN UE:  NTN UEs randomly dropped in TN clusters. | TN clusters randomly placed in this NTN beam | Only the active TN clusters which contain NTN UE(s) |
| 4b | TN with NTN | TN DL | NTN UL | NTN cell:  Observe NTN central beam for SINR, 6 adjacent beams for inter-beam interference.  NTN UE:  NTN UEs randomly dropped in TN clusters | Consider the active rate of 20% for TN. | All active TN cells in central NTN beam |
| 5b | TN with NTN | TN DL | NTN DL | NTN cell:  Observe NTN central beam for SINR, 6 adjacent beams for inter-beam interference.  NTN UE:  NTN UEs randomly dropped in TN clusters. | One cluster with 19 TN cells (57 sectors) randomly placed in the central NTN beam | Only the active TN clusters which contain the NTN UE(s) |
| 6b | TN with NTN | NTN DL | TN DL | NTN cell:  Nadir point.  NTN UE:  NTN UEs randomly dropped in TN clusters. | TN clusters randomly placed in this NTN beam | All in central NTN beam |
| NTN cell:  NTN cell with satellite at low elevation (to be further discussed for GEO and LEO, interested companies can bring analysis and results for other values)  NTN UE:  NTN UEs randomly dropped in TN clusters | TN clusters randomly placed in this NTN beam |
| 7b | TN with NTN | NTN DL | TN UL | NTN cell:  Nadir point  NTN UE:  NTN UEs randomly dropped in TN clusters. | TN clusters randomly placed in this NTN beam | Only the active TN clusters which contain NTN UE(s) |
| NTN cell:  NTN cell with satellite at low elevation (to be further discussed for GEO and LEO，interested companies can bring analysis and results for other values).  NTN UE:  NTN UEs randomly dropped in TN clusters. | TN clusters randomly placed in this NTN beam | Only the active TN clusters which contain NTN UE(s) |
| 8b | TN with NTN | TN UL | NTN DL | NTN cell:  Observe NTN central beam for SINR, 6 adjacent beams for inter-beam interference.  NTN UE:  NTN UEs randomly dropped in TN clusters | Consider the active rate of 20% for TN | All active TN cells in central NTN beam |

### 6b.2.2 System parameters

#### 6b.2.2.1 Satellite parameters

Set-1 satellite parameters are listed in Table 6b.2.2.1-2 according to TR 38.821 [6].

The satellite max Tx power can be calculated by the equation as below:

Table 6b.2.2.1-1: NRB configuration per BandWidth size and SCS

|  |  |
| --- | --- |
| Configuration Ku-band | NRB (100MHz BW) |
| SCS 30 kHz | 273 |

Table 6b.2.2.1-2: Satellite parameters for co-existence study

|  |  |  |  |
| --- | --- | --- | --- |
| Satellite orbit | | GEO | LEO-600 |
| Satellite altitude | | 35786 km | 600 km |
| Satellite antenna pattern | | Section 6.4.1 in [2] | Section 6.4.1 in [2] |
| Payload characteristics for DL transmissions | | | |
| Equivalent satellite antenna aperture | Ku-band  (i.e. 11 GHz for DL) | 4 m | 0.91 m |
| Satellite EIRP density |  | 43 dBW/MHz | 7 dBW/MHz |
| Satellite Tx max Gain |  | 43 dBi | 38.5 dBi |
| 3dB beamwidth |  | 0.400 deg | 1.768 deg |
| Satellite beam diameter |  | 250 km | 19 km |
| Payload characteristics for UL transmissions | | | |
| Equivalent satellite antenna aperture | Ku-band  (i.e. 14 GHz for UL) | 4 m | 0.714 m |
| G/T | 16.5 dB K-1 | 10.9 dB K-1 |
| Satellite RX max Gain | 44 dBi | 38.5 dBi |

Table 6b.2.2.1-3: Other parameters for NTN satellite

|  |  |  |
| --- | --- | --- |
| Parameters | NTN satellite | Remark |
| Carrier frequency | 14GHz(UL) / 11GHz(DL) |  |
| The number of active UE (UL) | 10 UEs and 27RBs per UE for GEO and LEO |  |
| The number of active UE (DL) | 1 | Same with TN |
| Traffic model | Full buffer |  |
| DL power control | NO |  |
| UL power control | See Session 6b.2.6.2 |  |
| NTN satellite Noise Figure in dB | See Table 6b.2.2.1-4 |  |
| Handover margin | 3dB |  |

Table 6b.2.2.1-4: NTN satellite Noise Figure in dB

|  |  |  |
| --- | --- | --- |
| Satellite | GEO | LEO 600 |
| G/T (dB K-1) | 16.5 | 10.9 |
| NF (dB) | 3 | 3 |

#### 6b.2.2.2 NTN UE parameters

The NTN UE antenna characteristics are given in Table 6b.2.2.2-1

Table 6b.2.2.2-1: NTN UE antenna characteristics for system level simulations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **VSAT Antenna Characteristics** | | | |
| 1 |  | **VSAT phased array – 45x45** | **VSAT phased array – 78x78** | **VSAT Parabolic** |
| 1.1 | Antenna pattern | TR 38.922 | TR 38.922 | Circular Aperture  TR 38.863 Clause 6.2.3.1 |
| 1.2 | Element gain (dBi) (Note 1) | 3.5 | 3.5 | N/A |
| 1.3 | Y axis / Z axis element 3 dB beam width of single element (degree) | 90° for Y axis  90° for Z axis | 90° for Y axis  90° for Z axis | N/A |
| 1.4 | Y axis / Z axis element front‑to‑back ratio (dB) | 30 dB | 30 dB | N/A |
| 1.5 | Antenna polarization (Note 5) | Circular (RHCP or LHCP) | Circular (RHCP or LHCP) | Circular (RHCP or LHCP) |
| 1.6 | Antenna array configuration (Y axis × Z axis)(Note 3) | 45x45 elements | 78x78 elements | 60 cm diameter aperture |
| 1.7 | Number of supported polarizations, *P* | 1 | 1 | 1 |
| 1.8 | Y axis / Z axis radiating element spacing | 0.5 lambda | 0.5 lambda | N/A |
| 1.9 | Array Ohmic loss (dB) (Note 1) | 2 | 2 | N/A |
| 1.10 | Conducted power (before Ohmic loss) per antenna element (dBm) (Note 2) | 6.9 | 9.1 | N/A |
| 1.11 | Tx Transmit power | 10 Watts (Both GEO and LEO) | 50 Watts (Only GEO) | 10 Watts (Both GEO and LEO) |
| 1.12 | Maximum coverage angle in the horizontal plane (degrees) | 0~360 degrees | 0~360 degrees | 0~360 degrees |
| 1.13 | Vertical coverage range (degrees) between beam direction and normal direction | 0~60 degrees | 0~60 degrees | 0~60 degrees |
| 1.14 | Normal direction | Toward X+ axis | Toward X+ axis | Toward X+ axis |
| 1.15 | Max EIRP Value | 76.6 dBm | 88.2 dBm | 76.6 dBm |
| 1.16 | Noise Figure | 6 dB | 6.0 dB | 2.5 dB |
| Note 1: The element gain in row 1.2 includes the loss given in row 1.9.  Note 2: The conducted power per element assumes Y axis × Z axis ×Number of supported polarizations elements (i.e. power per Y axis / Z axis polarized element).  Note 3: All of the Y axis × Z axis elements are assumed as the horizontal radiating elements in the horizontal plane.  Note 4: Antenna model for NTN VSAT uses circular polarization, but since many GEO satellites use linear polarization evaluations are conducted by converting to linear polarization | | | | |



The altitudes of NTN UE for different use case are defined in Table 6b.2.2.2-2.

Table 6b.2.2.2-2: NTN UE altitude

|  |  |  |  |
| --- | --- | --- | --- |
| Use case | M-ESIM | A-ESIM | L-ESIM |
| Altitude | 22.5m | 3-14km | 1.5m |
| Note 1: Co-existence evaluation is only limited to L-ESIM. | | | |

#### 6b.2.2.3 TN parameters

TN parameters for co-existence study are given in Table 6b.2.2.3-1, Table 6b.2.2.3-2 and Table 6b.2.2.3-3.

Table 6b.2.2.3-1: Simulation assumptions of TN NR

|  |  |
| --- | --- |
| Carrier frequency in GHz | 11 and 14 |
| Size of each nominal channel BW in MHz | 100 |
| Transmission bandwidth in MHz | 98.28 |
| Environment | Urban macro |
| Network layout | hexagonal grid, 19 macro sites, 3 sectors per site with wrap around |
| Inter-site distance in meter | 450m |
| UE number per cell | 3 |
| System loading and activity | 20% |
| Network location | See Table 6b.2.1.1-2 |
| DL subcarrier spacing | 30kHz |
| UL | OFDMA |
| DL power control | No |
| UL power control | See Section 6b.2.6.2 |
| Frequency reuse | 1 |
| Number of scheduled UE per cell (DL) | Same as the number of BS beam |
| Number of scheduled UE per cell (UL) | Same as the number of BS beam |
| BS height | 25 |
| UE antenna height in meter | 1.5 |
| UE TX power in dBm | -40 to 23 |
| Building penetration loss | 3GPP TR 38.803 |
| Cell selection margin in dB | 3 |
| BS-MS min distance in meters | 35 |
| BS noise figure in dB | 10 |
| UE noise figure in dB | 10 |
| BS-UE path-loss model | TR 38.901 |
| Standard deviation of BS-UE log-normal shadow fading in dB | Deployment scenario related, referring to TR 38.901. |
| Shadowing correlation | Between cells: 1.0  Between sites: 0.5 |
| Link-level performance model | See Section 6b.2.9 |
| UE distribution | Uniform |
| Evaluation metrics | See Section 6b.2.8 |

**Table 6b.2.2.3-2: ACLR/ACS for TN (11 GHz)**

|  |  |  |
| --- | --- | --- |
|  | | **NR** |
| BS | ACLR | 37 dB |
| ACS | 40 dB |
| UE | ACLR | 24 dB |
| ACS | 31 dB |

**Table 6b.2.2.3-3: ACLR/ACS for TN (14 GHz)**

|  |  |  |
| --- | --- | --- |
|  | | **NR** |
| BS | ACLR | 30 dB |
| ACS | 30 dB |
| UE | ACLR | 24 dB |
| ACS | 24 dB |

### 6b.2.3 Antenna and beam forming pattern modelling

#### 6b.2.3.1 Satellite parameters

In Rel-18, antenna pattern in section 6.4.1 of TR 38.811 is reused for NTN SAN and NTN UE.

The following normalized antenna gain pattern, corresponding to a typical reflector antenna with a circular aperture, is considered.

1

For UE,

where:

- J1(x) is the Bessel function of the first kind and first order with argument ‘x’;

- ais the radius of the antenna's circular aperture;

- k = 2f/c is the wave number;

- f is the frequency of operation;

- c is the speed of light in a vacuum and  is the angle measured from the bore sight of the antenna's main beam.

Note that *ka* equals to the number of wavelengths on the circumference of the aperture and is independent of the operating frequency. And the sin() function is in radian.

The beam layout definition for a single satellite simulation in Ku-Band is defined in Table 6b.2.3.1-1.

Table 6b.2.3.1-1: Beam layout definition for single satellite simulation

|  |  |
| --- | --- |
| Beam layout definition | Same with Table 6.2.3.1-1 |
| Number of beams | Same with Table 6.2.3.1-1 |
| UV plane illustration (extracted from [19]) | Same with Table 6.2.3.1-1 |
| UV plane convention | Same with Table 6.2.3.1-1 |
| Adjacent beam spacing on UV plane | Same with Table 6.2.3.1-1 |
| Central beam bore sight direction definition | Baseline:  Case 1: Central beam center is considered at nadir point  Case 2: 35° for GEO and LEO |
| Frequency-reuse factor | FRF=2    Do not consider interference leakage from adjacent beams for co-ex study. For example for the figure above, do not consider the interference leakage from green, blue and purple beams when study SINR for the red beam. |
| Polarization re-use | Enable  Note: Polarization re-use should apply only if circular polarization for terminal antenna is considered |
| UEs outdoor/indoor distribution | 100% outdoor |
| UE distribution | Same with Table 6.2.3.1-1 |
| UE configuration | Mobile VSAT for GSO and NGSO |
| UE orientation | Random Ideal Tracking serving beam |
| UE attachment | RSRP |

#### 6b.2.3.2 TN BS antenna and beam forming pattern modelling

The parameters in Table 6b.2.3.2-1, Table 6b.2.3.2-2, Table 6b.2.3.2-3 and Table 6b.2.3.2-4 are used for BS antenna pattern in the coexistence study.

Table 6b.2.3.2-1: TN BS antenna modelling for Urban macro scenario for 11 GHz

|  |  |
| --- | --- |
| Parameters | Values for 11 GHz |
| Scenario | Urban macro |
| Antenna pattern | AAS model see below (from TR 38.922) |
| Element gain GE,max (dBi) | 6.4 |
| Horizontal 3dB /vertical 3dB beam width of single element | 90º for H  65º for V |
| Horizontal/vertical front‑to‑back ratio (dB) | 30 for both H/V |
| Antenna polarization | Linear ±45º |
| Antenna array configuration (Row × Column)  (Note 4) | 8x16 |
| Horizontal/Vertical radiating sub-array or element spacing (Note 5) | 0.5 of wavelength for H, 2.1 of wavelength for V |
| Number of element rows in sub-array | 3 |
| Vertical element separation in sub-array () | 0.7 of wavelength for V |
| Pre-set sub-array down-tilt (degrees) (Note 6) | 3 |
| Array Ohmic loss LE (dB) | 2 |
| Conducted power (before Ohmic loss) per antenna element (dBm) | 22 |
| Mechanical downtilt (degrees) | 6 |

Table 6b.2.3.2-2: Array antenna model details

| Description | Equation | Unit |
| --- | --- | --- |
| Peak normalized element radiation pattern |  | dB |
| Peak gain normalized element radiation pattern |  | dBi |
| Composite array radiation pattern | , where | dBi |

Table 6b.2.3.2-3: TN BS antenna modelling for Urban macro scenario for 14 GHz

|  |  |
| --- | --- |
| Parameters | Values for 14GHz |
| Scenario | Urban macro |
| Antenna pattern | Extended AAS model see below (from TR 38.922) |
| Element gain GE,max (dBi) | 6.4 |
| Horizontal 3dB /vertical 3dB beam width of single element | 90º for H  65º for V |
| Horizontal/vertical front‑to‑back ratio Am (dB) | 30 for both H/V |
| Side lobe suppression SLAv (dB) | 30 |
| Antenna polarization | Linear ±45º |
| Antenna array configuration (Row × Column) | 16 × 24 elements |
| Horizontal/Vertical radiating element spacing | H = 0.5 λ  V = 2.8λ |
| Number of element rows in sub-array | 4 |
| Vertical element separation in sub-array () | 0.7 of wavelength of V |
| Pre-set sub-array down-tilt (degrees) | 3 |
| Array Ohmic loss LE (dB) | 2 |
| Conducted power (before Ohmic loss) per antenna element (dBm) | 17.14 |
| Base station horizontal coverage range (degrees) | +/-60 |
| Base station vertical coverage range (degrees) (Note 1) | 90-100 |
| Mechanical down-tilt (degrees) | 6 |

Table 6b.2.3.2-4: Extended AAS model

| Description | Equation |
| --- | --- |
| Peak normalized element radiation pattern |  |
| Peak gain normalized element radiation pattern |  |
| Sub-array excitation |  |
| Sub-array radiation pattern | , where |
| Array excitation |  |
| Composite array radiation pattern | , where |

#### 6b.2.3.3 TN UE antenna model

The UE is expected to have a conducted interface assuming an isotropic radiation pattern antenna and without beamforming.

### 6b.2.4 ACIR model

ACLR modelling for TN and NTN co-existence study referring to clause 5.1.1.4.1 and 5.1.1.4.2 in TR 36.942 [8] is used as baseline. The number of RBs refers to Table 6b.2.2.1-3 and Table 6b.2.2.4-1 respectively.

### 6b.2.5 Propagation model

Propagation models between NTN and TN components used for the coexistence study are listed in Table 6b.2.5-1.

Table 6a.2.5-1: Propagation models between NTN and TN

|  |  |
| --- | --- |
| Link | Propagation model |
| TN BS to Mobile VSAT on roof | Free space path loss |
| TN BS to L-ESIM at 1.5 m | UMa as in 3GPP TR 38.803 |
| TN BS to TN UE | UMa as in 3GPP TR 38.803 |
| TN UE to Mobile VSAT on roof | UMa as in 3GPP TR 38.803 (BS is to be replaced with VSAT) |
| TN UE to L-ESIM | Umi |
| Satellite to TN BS/UE | 3GPP TR 38.821, Refer to Table 6.6.2-2 TR 38.811 for NLOS Clutter Loss assumptions |
| Satellite to VSAT/ESIM | 3GPP TR 38.821, Refer to Table 6.6.2-2 TR 38.811 for NLOS Clutter Loss assumptions |
| TN BS to Satellite | 3GPP TR 38.821, Refer to Table 6.6.2-2 TR 38.811 for NLOS Clutter Loss assumptions |
| Note1: For the propagation models which use the 3GPP TR 38.821 [3], to use same assumptions as in [3] and consider the atmospheric losses and the scintillation losses.  Note2: TN BS height is 25m | |

For the

### 6b.2.6 Transmission power control model

#### 6b.2.6.1 UL TPC

Following UL power control model for both NTN and TN are used as starting point.



Where,

- Pmax = maximum UE Tx power, i.e. 23 dBm for TN UE;

- Rmin = minimum power reduction ratio, i.e. -63 dB for TN UE, and [-63 dB by assuming NTN UE min Tx power as -30dBm as starting point] for NTN UE;

- CLx-ile and γ are set as following:

- γ = 1;

- CLx-ile = –SNR\_target + Pmax – Thermal Noise – BS/SAN\_NoiseFigure - 10\*log10(BW), considering SNR\_target is 15dB and BW is actual UL BW.

#### 6b.2.6.2 DL TPC

For downlink scenario, no power control scheme is applied.

### 6b.2.7 Received power model

The received power in downlink and uplink scenarios is defined as below:

*RX\_PWR = TX\_PWR – Path loss + G\_TX + G\_RX*

where:

- RX\_PWR is the received power

- TX\_PWR is the transmitted power

- G\_TX is the transmitter antenna gain (directional array gain)

- G\_RX is the receiver antenna gain (directional array gain).

### 6b.2.8 Performance metric

For NR, the average throughput loss and 5%-ile throughput loss should be less than 5%.

For NTN, the average throughput loss and 5%-ile throughput loss should be less than 5%.

### 6b.2.9 Throughput ~ SNR mapping

Adopt Section 5.2.7 of TR 38.803 [20] as the SINR-Throughput performance metrics

## 6b.3 Co-existence simulation methodology for 11/14GHz

### 6b.3.1 Simulation procedure

See Section 6.3.1 of TR 38.863, noting the FRF and network deployment for NTN and TN in above 10GHz are specified accordingly.

Following approaches for the deployment of NTN UE and satellite are used:

- The satellite should be generated in the visible area/sky of NTN UE;

- NTN UEs point to the satellite accurately;

- The position of the satellite should guarantee that NTN UE vertical angle towards the satellite;

- For calibration, use 35 degree instead of the range;

- SAN elevation angle value, 35, & 90 degrees (computed from the centre of the beam), for co-existence -simulation.

- Horizontal angle of NTN UEs should be calculated based on the satellite position;

- Use 35m as minimum distance assumed between VSAT and TN BS for co-ex study.

### 6b.3.2 Methods and principle to process co-existence simulation results

In order to process the co-existence simulation results received for all different scenarios and assumptions, the following steps are adopted:

- Step 1: Discuss and agree on the most stringent scenario(s) for each scenario (Scenario 1, 2, 3…,8);

- Step 2: Discuss and determine the required ACIR from results of the most stringent case(s) for each scenario;

- Step 3: Use equation to derive corresponding ACLR or ACS from the agreed ACIR for each scenario

It is noted that the averaged ACIR for the most stringent case in each scenario would be derived by taking the average among the interpolated ACIR results derived from each company’s results for that case.

Moreover, the following considerations are adopted to deal with major disputes for the selected cases’ results in each scenario:

- If the required ACIR results, from the contributor who did not participate or their results is still not well-aligned in calibration table, has a difference larger than 10 dB with most others, this result can be not considered in the discussion.

- If the required ACIR results, from one contributor, has a difference larger than 10 dB with most others, this result can be not considered in the discussion.

# C.1 Calibration assumptions at 11/14 GHz

Assumptions in Section 6b.2 are adopted as the baseline for calibration. It should be noted there are different parts which are listed in Table C.1-1 and Table C.1-2.

Table C.1-1: NTN Assumptions for calibration

|  |  |  |
| --- | --- | --- |
| Propagation model 38.811[5] considerations | Basic path loss | Yes (including Clutter Loss from Table 6.6.2-1 TR 38.811) |
| Atmospheric loss | 0 |
| Ionospheric or scintillation loss | 0 |
| O2I / building-entry loss | N/A |
| NTN SINR | SINR statistics target | Central beam (UL/DL) |
| Interference | Co-channel interference from 6 adjacent beams |
| BW / #UE | 100MHz / 1 DL, 10UL |
| Polarization gain with 3dB | not considered |
| Elevation angle | 35 degrees for GEO and LEO |
| Scenario | Urban |
| VSAT phased array | Antenna characteristics | 45x45 antenna elements - Refer to Table 6a.2.2.2-1 |
| VSAT NF | 6 dB |

Table C.1-2: TN Assumptions for calibration

|  |  |  |
| --- | --- | --- |
| Calibration assumptions | | |
| **TN AAS BS** | Antenna characteristics | Refer to Table 6a.2.3.2-1 and Table 6a.2.3.2-2 for 11 GHz  Refer to Table 6a.2.3.2-3 and Table 6a.2.3.2-4 for 14 GHz |
| Scenario | Urban |
| #UE: 1 DL/ 3 UL |
| 100% Outdoor |
| ISD 0.45 KM |
| **TN UE** | Antenna characteristics | Omni-directional radiation pattern with 0 dBi gain |