**3GPP TSG-RAN WG4 Meeting # 109 [Draft] R4-2318202**

**Chicago, USA, November 13 - November 17, 2023**

**Agenda item:** 8.26.9

**Source:** Moderator (Samsung)

**Title:** Topic summary for [109][310] NR\_NTN\_enh\_Part3

**Document for:** Information

# Introduction

This document captures issues related to the coexistence aspect of NR NTN enhancement work item in Rel-18. It contains a summary of the contributions under Agenda Item 8.26.2 at TSG-RAN WG4 #109, together with identified key open issues, and recommends topics/questions to be handled during this meeting.

The purpose of this document is to facilitate discussions to reach consensus on coexistence studies and to conclude ACIR values of NTN UE and SAN.

A total of 10 TDOCs were received for this agenda and 2 topics are listed as below to cover proposals and contents in these documents as appropriate.

• Topic #1: Simulation assumptions

• Topic #2: Co-existence study results

# Topic #1: Simulation assumptions

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2319260 | CATT, Ericsson, Huawei, Qualcomm, Samsung, Thales, ZTE | **Proposal 1:** Companies are encouraged to consider following settings for Issues in 25 degree * For UL: decrease RB numbers
* For DL

 - Drop users below -10dB SNR with current Tx power settings OR - Increase satellite Tx power. * For Case 5, use Uma between TN BS and NTN UE rather than Free Space model

 - For Fixed VSAT (22.5m) use Uma while using the VSAT height as UE height - For L-ESIM (1.5m) use Uma.**Proposal 2:** Change NTN UE antenna model parameter as below 1  For UE, where: - J1(x) is the Bessel function of the first kind and first order with argument ‘x’;- a is 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.**Proposal 3:** RAN4 to approve the updates captured in Attachment 1 in track changes**Proposal 4:** Further discuss the work to incorporate co-existence study into TR38.863 |
| R4-2320392 | Qualcomm | **Proposal 4: The usage of L-ESIM at lower elevation angles i.e., 25 degrees need to be further discussed because it can cause some coexistence issues for TN BS. Given that the antenna of L-ESIM will be mounted on top of a car or train or other moving object, so lower elevation angles don’t make sense to be considered.****Proposal 5: The system parameters for lower elevation angles at 25 degrees need to be revised either by increasing the satellite or NTN UEs TX power or decreasing the number of RBs because most of NTN UEs in DL or UL will be out of coverage even without adjacent interference from TN.** **Proposal 9: To avoid the confusion, the ACLR and ACS values for 17GHz in the following Table copied from [1] should be removed after ACLR/ACS requirements are specified for NTN.** |
| R4-2320970 | Thales, Magister Solutions Ltd | **Observation 1:** It does not seem realistic (there is not such FR2 NR deployment to our knowledge) entirely covering an NTN beam, especially in GEO scenario. * This is particularly important for instance for Scenario #4 & Scenario #8 **(“All active TN cells in central NTN beam”)** or
* Scenario #2 (with “Only the active TN cells in central NTN beam”) – consider the active TN cells **from all clusters**? or the active TN cells **from only one cluster**?

**Observation 2:** Especially at lower elevation angles (i.e. 25°) – value decided at RAN4#108 (as mean value between 20° and 30° elevation angle) the satellite beam footprint is much larger than the satellite beam footprint at 90°.**Observation 3:** For this reason, the scaling factor applied for TN deployment for 25° NTN elevation angle is much higher than the scaling factor applied for TN deployment for 90° NTN elevation angle:Scaling Factor

|  |  |  |
| --- | --- | --- |
| **Orbit** | **90°** | **25°** |
| LEO600 | **13.8 dB** | **23.5 dB** |
| LEO1200 | **19.6 dB** | **28.6 dB** |
| GEO | **29.1 dB** | **33.4 dB** |

**Note:** Please also note that for previous results, 20% TN activity was assumed as agreed.**Proposal 1:** Consider a cellular Terrestrial Network (TN) not larger than 50 km diameter.**Proposal 2:** Companies to check/compare scaling factor values.**Proposal 3:** Companies to use same scaling factor values for lower NTN SAN elevation angle (e.g. 25°) and 90° NTN SAN elevation angle.Scaling Factor

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

**Observation 4:** Same as for FR1 TN-NTN coexistence simulations, simulations in above 10 GHz TN-NTN coexistence simulations show that NTN SAN and NTN UE are both victims. Therefore, once more, the NTN is a potential victim of the TN (acting as aggressor) and not vice-versa. This may be explained by the high density scenarios assumed by TN, but not only.**Proposal 4:** 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. 25° elevation angle is too pessimistic.**Proposal 5:** RAN4 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**Proposal 6:** If + X dBs TN ACLR/ACS are not sufficient increase even more the TN requirements at 17 GHz (currently there is no TN specification on this frequency band).**Proposal 7:** Alternatively, RAN4 could also decide to increase the guardband of NTN CBW.**Proposal 8:** Alternatively, RAN4 could also decide to consider a different ACLR model from the fixed one.**Proposal 9:** Other options shall not be precluded in order to have more realistic assumptions for the deployment.**Proposal 10:** Derive requirements from 90° elevation angle and further discuss lower elevation angles.**Proposal 11:** Decrease the number of RBs in UL for better VSAT NTN UE propagation and lower SAN SCS. |

## Open issues summary

**Issue 1-1: NTN UE antenna model**

* Proposals
	+ Option 1: Change NTN UE antenna model parameter as below

|  |
| --- |
| 1  For UE, where: - J1(x) is the Bessel function of the first kind and first order with argument ‘x’;- a is 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. |

* Recommended WF
	+ Agree on Option 1

**Issue 1-2 TN diameter**

* Proposals
	+ Option 1: Consider a cellular Terrestrial Network (TN) not larger than 50 km diameter.
* Recommended WF
	+ Pause the discussion unless no conclusions can be made for Issue 2-2

**Issue 1-3 Scaling factor**

* Proposals
	+ Option 1: 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
	+ Pause the discussion unless no conclusions can be made for Issue 2-2

**Issue 1-4: Further consideration for 25˚ cases**

*[Editor’s note on background of Issue 1-4]*

*[As observed by several companies, 5% throughputs in 25˚ elevation angle cases cannot guarantee the performance of NTN systems. Therefore, several options to improve the performance from simulation aspect are proposed during offline.]*

* Proposals
	+ Option 1: Following settings can be considered to resolve issues in 25 degree cases
		- For UL: decrease RB numbers
		- For DL

- Drop users below -10dB SNR with current Tx power settings OR

- Increase satellite Tx power.

* + - For Case 5, use Uma between TN BS and NTN UE rather than Free Space model

- For Fixed VSAT (22.5m) use Uma while using the VSAT height as UE height

- For L-ESIM (1.5m) use Uma.

* + - 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 ACLRUE ACS | UE ACLRBS ACS |
| 17 GHz  | [30] + XdB | [26] + XdB | [19] + XdB | [25] + XdB | [23.8] +XdB | [18.2] +XdB |
| 27 GHz  | 28 | 24 | 17 | 23 | 21.8 | 16.2 |

* + - To increase the guard band of NTN CBW.
	+ Option 2: Do not consider lower elevation angle, e.g. 25 degree cases, for L-ESIM
	+ Option 3: Focus on 90 degree cases and consider other values rather than 25 degree, e.g. 45 degree
	+ Option 4: In case that cell edge throughput is NaN due to the out of coverage, RAN4 can conclude based on average throughput loss.
	+ Option 5: Other alternatives are not precluded.
* Recommended WF
	+ Discuss collected co-existence results first to check whether any conclusion on results of 25 degree cases can be made.
	+ If no conclusions on results of 25 degree cases can be made, first consider Option 4, 3 and 2. And then agree to implement Option 1 to further check the results.

**Issue 1-5 Updated simulation assumptions**

* Proposals
	+ Option 1: RAN4 to approve the updated simulation assumptions in Attachment 1.
* Recommended WF
	+ Agree on Option 1
	+ **[New Tdoc is needed.]**

**Issue 1-6 Updated calibration result table**

* Proposals
	+ Option 1: Include the updated calibration table in to TR38.863.
* Recommended WF
	+ Agree on Option 1
	+ **[New Tdoc is needed.]**

# Topic #2: Co-existence study results

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2318298 | CATT | Coexistence results have been provided in this document  |
| R4-2318493 | CATT | Observation 1: Required ACIR for Ka-band NTN co-existence is as below:From above Table 2-2, for case 2, required ACIR @ 5% throughput loss for GEO, LEO-1200 and LEO-600 is 37.5, 33.5 and 33, respectively, comparing with BS ACS (24dB), the required ACIR(for SAN ACS) is larger. And for case 5, required ACIR @ 5% throughput loss for GEO, LEO-1200 and LEO-600 is 38.2, 38.5 and >40, respectively, comparing with TN UE ACS (25dB), the required ACIR (for NTN UE ACS) is larger. |
| R4-2319566 | Ericsson | Coexistence results have been provided in this document |
| R4-2319567 | Ericsson | Observation1: Scenarios 2, 3, 6 and 7 don’t cause any coexistence issue for all considered types of satellites and NTN UEs, at 90- or 25-degrees elevation angles.Observation2: For scenario 1, at 25-degrees elevation angle, 20dB ACIR would be needed to guarantee coexistence. Observation3: For scenario 4, 20-25 dB ACIR would be needed to guarantee coexistence.Observation4: Scenario 5 is the problematic scenario for this coexistence study, requiring 40dB or more ACIR value to have NTN and TN coexisting properly. Observation5: For scenario 8, 15-20 dB ACIR would be needed to guarantee coexistence.Observation6: For scenario 5 with fixed VSAT and 6 dB NF few dB ACIR less are required to guarantee coexistence.Observation7: At 25 degrees elevation angle, many 5-percentile results are not relevant, most likely due to the un-sufficient link budget. Further investigation would be needed to better understand if there is any impact on the conclusion. Observation8: Further results would be needed to confirm this, but mobile VSAT seems to require few dB more ACIR than fixed VSAT, at least in scenario 5.**Proposal: The following table captures our current proposals based on the explanations given before.**

|  |  |  |
| --- | --- | --- |
| **Device** | **Requirement** | **Value** |
| **SAN** | **ACLR** | **Between 20 and 30 dB** |
| **ACS** | **More accurate results are needed** |
| **Fixed VSAT (2.5dB NF)** | **ACLR** | **22 dB** |
| **ACS** | **Further discussion would be needed but, considering the DL frequency range, it should be possible to converge on an acceptable value.**  |

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| R4-2319777 | Samsung | Observation 1: Basic on the study results of Scenario 1, 2, 3, 6, 7 and 8, no observable interference can be identified.Observation 2: In scenario 4, 0-17dB ACIR results are needed in order to make sure the throughput loss criteria can be met in the NTN network.Observation 3: In scenario 5, 16-30dB ACIR results are needed in order to make sure the throughput loss criteria in the NTN network.Observation 4: No edge (5%) UE throughput can be observed from those study results, therefore due to the high coupling loss value between SAN and VSAT UE.**Proposal 1: To include these co-existence simulation results in TR 38.863 and update co-existence results table accordingly.** **Proposal 2: To define an ACIR value of 30dB based on following results.**

|  |  |
| --- | --- |
|  | ACIR |
| Scenario 4 | 17dB |
| Scenario 5 | 30dB |

**Proposal 3: To update calibration results table with in accordance to Attachment 2.**  |
| R4-2319890 | Huawei, HiSilicon | Observation 1: the INR (from adj. channel) is very small for LEO600 scenario 1 at 50% CDF point, even if ACIR is configured as 5dB or 10dB.Observation 2: the SINR difference among different ACIR values is very small for LEO600 scenario 1.Observation 3: the throughput loss is less than 5% for LEO600 scenario 1, even if ACIR = 5 or 10.Observation 4: the throughput loss is less than 5% for LEO600 scenario 2, even if ACIR = 5 or 10.Observation 5: the throughput loss is less than 5% for LEO600 scenario 3, even if ACIR = 5 or 10.Observation 6: the throughput loss is less than 5% for LEO600 scenario 4, even if ACIR = 5 or 10.Observation 7: the throughput loss can’t be less than 5% for LEO600 scenario 5, even if ACIR > 20.Observation 8: the throughput loss is less than 5% for scenario 6, even if ACIR = 5 or 10.Observation 9: the throughput loss is less than 5% for scenario 7, even if ACIR = 5 or 10.Observation 10: The throughput loss can’t be less than 5% for LEO600/1200 scenario 8 at 25 degree elevation, even if ACIR > 20. The throughput loss is very close to 5% for LEO600/1200 scenario 8 at 90 degree elevation, when ACIR = 20. The throughput loss is less than 5% for GEO scenario 8, when ACIR = 20.**Proposal 1: For scenarios 1, 2, 3, 4, 6 and 7, ACIR = 5 or 10 can guarantee the coexistence between TN system and NTN system.** **Proposal 2: For scenarios 5 and 8, RAN4 can further investigate how to solve the issue for some cases that the throughput loss can’t be less than 5%.** |
| R4-2320330 | ZTE | Coexistence results have been provided in this document**Observation 1:** Regarding ACLR requirement for SAN transmitter, 0dB ACIR requirement is enough.**Observation 2:** Regarding ACS requirement for SAN receiver, 14dB ACIR requirement for GEO and 18dBc for LEO is enough.**Observation 3:** for Fixed VSAT, the 8dB ACIR requirement from transmitter perspective is enough. **Observation 4:** for L-ESIM, the 0dB ACIR requirement from transmitter perspective is workable due to high coupling loss between NTN VSAT and TN UL.**Observation 5:** for Fixed VSAT, more than 40dB ACIR requirement from receiver side is needed for some scenarios. **Observation 6:** for L-ESIM, the 32dB ACIR requirement from transmitter perspective is enough.  |
| R4-2320392 | Qualcomm | Observation 1: The ACIR values for scenario 1 for VSAT under worst case assumption with 25 degrees of elevation can be 15 dB and the BS ACS of 24 dB can be respected. Hence the ACLR of the NTN UE VSAT can be defined with 15 dB with no problem. Observation 2: The ACIR values for scenario 1 for L-ESIM under worst case assumption with 25 degrees of elevation can be 30 dB and the BS ACS of 24 dB can’t be respected. However, at elevation angle of 90 degrees, lower ACIR observed about 0 dB. Observation 3: The ACIR values for scenario 2 are between 10 to 15 dB for different satellite altitudes and elevation angles. Hence, the TN UE ACLR of 17 dB can be respected. Given that, the ACS of the satellite can be defined with 15 dB with no problem. However, the system parameters for the elevation angle at 25 degrees should be revised either by increasing the TX power of the NTN UEs or decreasing the RBs to avoid the out of coverage. Observation 4: The ACIR values for scenario 3 are about 0 dB for all the satellite altitudes and the different elevation angles considering either VSAT or L-ESIM. The TN UE ACS of 23 dB can be respected. Hence the ACLR of the NTN UE can be defined with less value than 23 dB with no problem based on other scenarios. Observation 5: The ACIR values for scenario 4 are between 5 to 15 dB for different satellite altitudes and different elevation angles. The TN BS ACLR of 28 dB can be respected. Hence the ACS of the satellite can be defined with 15 dB with no problem. However, the system parameters for the elevation angle at 25 degrees should be revised either by increasing the TX power of the NTN UEs or decreasing the RBs to avoid the out of coverage. Observation 6: The ACIR value for scenario 5 is between 40 to 50 dB considering different elevation angles for VSAT UEs which is exceeding the TN BS ACLR of 30 dB. Hence this scenario will be problematic without using a coordination distance between the BS and the VSAT or using a frequency guard band between the NTN and TN operation. That will need further discussions. Furthermore, the system parameters for the elevation angle at 25 degrees should be revised either by increasing the satellite TX power or decreasing the RBs to avoid the out of coverage. Observation 7: The ACIR value for scenario 5 is between 35 to 50 dB considering different elevation angles for L-ESIM UEs which is exceeding the TN BS ACLR of 30 dB. Similarly, to VSAT, either coordination distance needed or a frequency guard band between the NTN and TN operation bands needed. That will need further discussions. Furthermore, the system parameters for the elevation angle at 25 degrees should be revised either by increasing the satellite TX power or decreasing the RBs to avoid the out of coverage. Observation 8: The ACIR values for scenario 6 are 0 dB for all the satellite altitudes and at different elevation angles. The TN UE ACS of 25 dB can be respected. Hence the ACLR of the NTN Satellite can be defined with less value than 25 dB with no problem or based on other scenarios.**Proposal 1: Based on the observations 1, 2 and 4, the ACLR for NTN UE VSAT is 15 dB. For L-ESIM the required ACIR is 30 dB at 25 degree which makes the coexistence is problematic, however at 90 degrees there is no problem and the ACLR value can follow the VSAT or even less.****Proposal 2: Based on observation 3 and 5, the ACS of the satellite is 15dB.** **Proposal 3: Based on observation 8, the satellite ACLR can be less than 25 dB since the ACIR values are very small with 0 dB.** **Proposal 6: In case that cell edge throughput is NaN due to the out of coverage, RAN4 can conclude based on average throughput loss.** **Proposal 7: Bases on observation 6 and 7, the ACS of NTN UE for either VSAT or L-ESIM is difficult to be defined because the ACIR values are between 35 and 50 dB. That will need either a frequency guard band or a coordination between TN and NTN which need further discussion.****Proposal 8: To adopt the ACLR/ACS values as shown in Table 10 based on the above proposals.****Table 10: Summary of the required ACLR/ACS values based on the coexistence results.**

|  |  |  |
| --- | --- | --- |
|  | **ACLR** | **ACS** |
| **Satellite (GEO/LEO)** | Less than 25 dB (**Note 1**) | 15 dB |
| **VSAT**  | 15 dB | [30 dB] **(Note 3)** |
| **L-ESIM** | Less than 15 dB (**Note 2**) | [30 dB] **(Note 3)** |
| **Note 1: The ACIR values is very low about 0 dB under worst case, and the TN UE ACS is 25 dB, so any ACLR value below 25 dB can be used.** **Note 2: Stringent ACIR values with 30 dB for low elevation angles. That will make lower elevation angles for L-ESIM is problematic. The antenna of L-ESIM will be mounted on top of a car or train or other moving object, so lower elevation angles don’t make sense to be considered.** **Note 3: The required ACIR is between 35-50 dB from the simulation results. Given that, the BS ACLR is 30 dB so the ACS can be used as maximum value of 30 dB and to further discuss defining guard band between TN and NTN operation.** |

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| R4-2320970 | Thales, Magister Solutions Ltd | **Observations Scenario 1:** * For this scenario, the coexistence requirements are relaxed
* 90° and 25° SAN elevation cases are most challenging but still < 1% throughput loss with 10 dB UE ACLR
* Low number of NTN UEs decreases ACI

**Observations Scenario 2:** * 10 dB SAN ACS provides < 3% throughput loss with 25° elevation angle with scaling enabled
* With 25° SAN elevation case, about ~25% TN UEs have > 0 dBi ACI antenna gain

**Observations Scenario 3:** * For this scenario, the coexistence requirements are relaxed
* 90° and 25° SAN elevation cases are most challenging but still < 1% throughput loss with 10 dB UE ACLR
* Low number of NTN UEs decrease the likelihood of NTN UE and TN UE being close

**Observations Scenario 4:** * Very challenging ACI for NTN
* **~30 dB requirement SAN ACS for 90° SAN elevation case**
* 25° SAN elevation case unfeasible with the current (unrealistic TN deployment) assumptions

**Observations Scenario 5:** * 25° and 90° SAN elevation cases give similar requirements
* **~20 dB NTN UE ACS requirement**
* Assumed cluster orientation is not the worst case in 25° SAN elevation case: NTN UE and gNB never pointing to each other

**Observations Scenario 6:** * For this scenario, the coexistence requirements are (very) relaxed
* Very large margin noticed

**Observations Scenario 7:** * For this scenario, the coexistence requirements are relaxed

**Observations Scenario 8:** * 570 TN UEs interfering 10 NTN UEs -> High change that TN UE(s) close to a NTN UE
* 19 dB TN UE ACLR is quite low. Not much to gain with 20+ dB NTN UE ACS.
* However, **17 GHz TN requirements are not specified by any kind of specification**, so they could be increased to accommodate with NTN requirements.

**Proposal 12:** The proposed parameters for ACLR and ACS requirements resulted from coexistence analysis in above 10 GHz are (for 90° elevation angle):

|  |  |  |
| --- | --- | --- |
| **Parameter** | **LEO** | **GEO** |
| NTN SAN ACLR [dB] | 10 | 10 |
| NTN SAN ACS [dB] | 30 | 30 |
| NTN UE ACLR [dB] | 10 | 10 |
| NTN UE ACS [dB] | 30 | 30 |

  |

## Open issues summary

**Issue 2-1: Co-existence study results**

* Proposals
	+ Option 1: Incorporate all input co-existence study results into the collection table.
* Recommended WF
	+ Agree on Option 1.
	+ **[New Tdoc is needed.]**

**Issue 2-2: Treatment of NaN value**

* Proposals
	+ Option 1: In case that cell edge throughput is NaN due to the out of coverage, RAN4 can conclude based on average throughput loss.
* Recommended WF
	+ Agree on Option 1.

**Issue 2-3: Conclusion on ACIR**

* Proposals
	+ Option 1:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Case | Case1 | Case2 | Case3 | Case4 | Case5 | Case6 | Case7 | Case8 |
| Frequency | 27GHz | 27GHz | 27GHz | 27GHz | 17GHz | 17GHz | 17GHz | 17GHz |
| Aggressor | NTN UL | TN UL | NTN UL | TN DL | TN DL | NTN DL | NTN DL | TN UL |
| Victim | TN UL | NTN UL | TN DL | NTN UL | NTN DL | TN DL | TN UL | NTN DL |
| Required ACIR (dB) | GEO |  |  |  |  |  |  |  |  |
| LEO-1200 (UE NF=2.5dB) |  |  |  |  |  |  |  |  |
| LEO-600 (UE NF=2.5dB) |  |  |  |  |  |  |  |  |
| LEO-1200 (UE NF=6dB) |  |  |  |  |  |  |  |  |
| LEO-600 (UE NF=6dB) |  |  |  |  |  |  |  |  |

* Recommended WF
	+ Companies to express their views on worst cases for final conclusion on ACIR.

**Issue 2-4: Parameters to determine ACLR & ACS**

* Proposals
	+ Option 1: Use following table to derive ACLR and ACS of NTN SAN & UE

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

* + Option 2: Other approaches are not precluded.
	+ Option 3: To avoid the confusion, the ACLR and ACS values for 17GHz in the Table above should be removed after ACLR/ACS requirements are specified for NTN.
* Recommended WF
	+ Discuss this issue after Issue 2-3 is concluded.

**Issue 2-5: ACLR & ACS**

* Proposals
	+ Option 1:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Case | Case1 | Case2 | Case3 | Case4 | Case5 | Case6 | Case7 | Case8 |
| Frequency | 27GHz | 27GHz | 27GHz | 27GHz | 17GHz | 17GHz | 17GHz | 17GHz |
| Aggressor | NTN UL | TN UL | NTN UL | TN DL | TN DL | NTN DL | NTN DL | TN UL |
| Victim | TN UL | NTN UL | TN DL | NTN UL | NTN DL | TN DL | TN UL | NTN DL |
| NTN Requirement to be defined | UE ACLR | SAN ACS | UE ACLR | SAN ACS | UE ACS | SAN ACLR | SAN ACLR | UE ACS |
| GEO |  |  |  |  |  |  |  |  |
| LEO-1200(UE NF=2.5dB) |  |  |  |  |  |  |  |  |
| LEO-600(UE NF=2.5dB) |  |  |  |  |  |  |  |  |
| LEO-1200(UE NF=6dB) |  |  |  |  |  |  |  |  |
| LEO-600(UE NF=6dB) |  |  |  |  |  |  |  |  |

* Recommended WF
	+ Discuss this issue after Issue 2-2 is concluded.
	+ For information, following values are proposed by proponents.

|  |  |  |
| --- | --- | --- |
|  | ACLR | ACS |
| SAN (GEO) | * Option 1: 10
* Option 2: <25
* Option 3: 20~30
 | * Option 1:30
* Option 2:15
* Option 3: TBD
 |
| SAN (LEO-600) | * Option 1: 10
* Option 2:<25
* Option 3: 20~30
 | * Option 1: 30
* Option 2:15
* Option 3: TBD
 |
| SAN (LEO-1200) | * Option 1: 10
* Option 2: 15
* Option 3: 20~30
 | * Option 1: 30
* Option 2:15
* Option 3: TBD
 |
| VSAT | * Option 1: 10
* Option 2:15
* Option 3: 22
 | * Option 1: 30
* Option 2: [30]
* Option 3: TBD
 |
| L-ESIM | * Option 1: 10
* Option 2:<15
* Option 3: TBD
 | * Option 1: 30
* Option 2: [30]
* Option 3: TBD
 |
| Notes may be added  |

# Attachment 1 Updated Simulation assumptions