**3GPP TSG-RAN WG4 Meeting #112 draft R4-2413415**

**Maastricht, Netherlands, 19th – 23th Aug, 2024**

**Agenda item:** 8.9.6

**Source:** Moderator (CHTTL)

**Title:** Topic summary for [112][315] NR\_NTN\_Ku\_Band\_UE\_SAN\_RF

**Document for:** Information

# Introduction

In RAN#104, a work item for defining NR NTN Ku band was approved [RP-241690]. Based on the WID, RAN4 will define the Ku band, conduct coexistence study, and specify the RF requirements for satellite access node and NTN VSAT types for the Ku band.

This document is provided for the moderator summary on the SAN and UE RF part of the Rel-19 NR NTN Ku band work item, in which the following highlighted agenda items are supposed to be covered specifically:

|  |
| --- |
| * 1. Introduction of Ku Band for NR NTN [NR\_NTN\_Ku\_bands-Core]      1. General aspects and work plan [NR\_NTN\_Ku\_bands-Core]      2. Coexistence study based on ITU regulations [NR\_NTN\_Ku\_bands-Core]      3. System parameters [NR\_NTN\_Ku\_bands-Core]      4. UE RF requirements [NR\_NTN\_Ku\_bands-Core]      5. SAN RF core requirements [NR\_NTN\_Ku\_bands-Core]      6. Moderator summary and conclusions [NR\_duplex\_evo] |

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

# Topic #1: UE RF (agenda 8.9.4)

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411192**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411192.zip) | Ericsson | Proposal: Agree with the 3 above tables listing UE RF impacts when introducing new NTN Ku-band(s) support in TS 38.101-5. |
| [**R4-2411860**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411860.zip) | ZTE Corporation, Sanechips | Proposal 1: We need to discuss whether Fixed VSAT and Mobile VSAT can be supported in Ku band.  Proposal 2: To use the proposals in Table 2.1 for UE RF requirements for NTN Ku band. |
| [**R4-2411877**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411877.zip) | LG Electronics | Proposal 1: Consider Ku band #1a and #1b as FR2-NTN.    **Figure 2-2. Tx-Rx carrier frequency separation for Ku band #2a, and #2b**  Proposal 2: Consider Half Duplex FDD operation in condition that Tx-Rx carrier centre frequency separation is (X+Y)/2 MHz. Here, X = DL CBW, Y = UL CBW.    **Figure 2-3. Tx-Rx carrier frequency separation & guard band for Ku band #2a, and #2b**  Proposal 3: Consider minimum Tx-Rx carrier centre frequency separation or minimum guard band for FDD operation with #2a, and #2b.  Proposal 4: Consider UE capability on minimum Tx-Rx carrier centre frequency separation or minimum guard band for FDD operation with #2a, and #2b.  *(Moderator’s note: proposal 1 can be discussed in thread [314])* |
| [**R4-2412561**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412561.zip) | Samsung | Observation 1: The detailed UE RF requirements discussions can wait for the outcomes of the co-ex studies.  Observation 2: The reuglatory requirements are better to be collected in parallel with the co-ex studies, and these information will be helpful for defining the Tx and Rx requirements for NTN VSAT in Ku-band after the co-ex study results are available. |
| [**R4-2412961**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412961.zip) | Huawei, HiSilicon | Observation 1: Both Fixed VSAT, as well as Mobile VSAT (GSO connectivity only) are considered in this WI.  Observation 2: Both mechanical and electrically steered antennas are considered for VSAT terminals in this WI.  Observation 3: While there are some similarities among Ka/Ku bands, Ku VSAT specification shall be flexible enough to consider various implementations.  Observation 4: RAN4 can generally clarify and discuss the following issues in the first meeting.  1) How long is the Equivalent antenna aperture for VSAT assume?  2) RAN4 can discuss whether the common Tx/Rx antenna or separate Tx/Rx antenna is assumed for VSAT in Ku band.  3) For electronic steering antenna, the parameters for the parameterized array antenna model can be discussed in RAN4 referring to the table 8.1.1-1 of TR 38.921  4) The range of TRP is needed considering both mechanical steering antenna and electronic steering antenna.  5) RAN4 need to discuss the range of EIRP considering the applicable scenarios and implementation.  6) The UL/DL budget is needed to derive the minimum EIRP and EIS requirements. |

## Open issues summary

### Sub-topic 1-1: General issues for Ku band UE RF requirements

#### Issue 1-1-1: Supported VSAT Types in the NR NTN Ku band work

* [Moderator] In the NR NTN Ku band WID: Specify RF requirements for satellite access node and NTN VSAT types in 38.101-5 also considering existing regulations on antenna sizes for certain parts of the Ku band
* NTN VSAT types defined in current 38.101-5:

|  |  |  |
| --- | --- | --- |
| NTN VSAT class | NTN VSAT type | Type description |
| Fixed VSAT | 1 | Fixed VSAT communicating with GSO and LEO with mechanical steering antenna. |
|  | 22 | Fixed VSAT communicating with GSO and LEO with electronic steering antenna. |
|  | 3 | Fixed VSAT communicating with LEO only with electronic steering antenna. |
| Mobile VSAT | 4 | Mobile VSAT communicating with GSO with mechanical steering antenna. |
|  | 52 | Mobile VSAT communicating with GSO with electronic steering antenna. |
| NOTE 1: The NTN VSAT types are assuming NTN VSAT has only one antenna beam towards one satellite at a given time in this release.  NOTE 2: UE may need power reduction for meeting OFF-axis EIRP requirement defined in clause 9.2.2. Value is implementation dependent. | | |

* Proposals:
  + Proposal 1 (ZTE): We need to discuss whether Fixed VSAT and Mobile VSAT can be supported in Ku band.
  + [Proposal 2 (Huawei): Both Fixed VSAT, as well as Mobile VSAT (GSO connectivity only) are considered in this WI.]
  + [Proposal 3 (Huawei): Both mechanical and electrically steered antennas are considered for VSAT terminals in this WI.]
* Moderator Recommendation:
  + Discuss whether the following WF is agreeable
  + Both Fixed VSAT, as well as Mobile VSAT (GSO connectivity only) are considered in this Ku band WI.
    - Both mechanical and electrically steered antennas can be considered
  + The discussion on down selecting between FR1/FR2 approaches for the NTN Ku band will not be impacted by this WF.

#### Issue 1-1-2: Open issues to be discussed

* Options:
  + Option 1 (Huawei): RAN4 can generally clarify and discuss the following issues in the first meeting.
    - 1) How long is the Equivalent antenna aperture for VSAT assume?
    - 2) RAN4 can discuss whether the common Tx/Rx antenna or separate Tx/Rx antenna is assumed for VSAT in Ku band.
    - 3) For electronic steering antenna, the parameters for the parameterized array antenna model can be discussed in RAN4 referring to the table 8.1.1-1 of TR 38.921
    - 4) The range of TRP is needed considering both mechanical steering antenna and electronic steering antenna.
    - 5) RAN4 need to discuss the range of EIRP considering the applicable scenarios and implementation.
    - 6) The UL/DL budget is needed to derive the minimum EIRP and EIS requirements.
  + Option 2 (Samsung): The detailed UE RF requirements discussions can wait for the outcomes of the co-ex studies.
  + Option 3 (Samsung): The regulatory requirements are better to be collected in parallel with the co-ex studies, and these information will be helpful for defining the Tx and Rx requirements for NTN VSAT in Ku-band after the co-ex study results are available.
* Moderator Recommendation:
  + Discuss the following WF
  + Companies are encourage to provide the following information for the NTN Ku band [in the next meeting]:
    - Equivalent antenna aperture for the Ku band VSAT
    - Aspects on whether the common Tx/Rx antenna or separate Tx/Rx antenna can be assumed for VSAT in Ku band
    - [Parameterized array antenna model for electronic steering antenna based on the table 8.1.1-1 of TR 38.921]
    - The range of TRP/EIRP for the Ku band
    - The UL/DL budget
    - Regulatory requirements

#### Issue 1-1-3: Impact on UE RF requirements for the NTN Ku band

* Proposals:
  + Proposal 1 (Ericsson): Agree with the 3 below tables listing UE RF impacts when introducing new NTN Ku-band(s) support in TS 38.101-5.

**Table 1.2.1-1**

|  |  |
| --- | --- |
| Requirements | Expected impact |
| 4. General |  |
| 4.1 Relationship between minimum requirements and test requirements | No impact |
| 4.2 Applicability of minimum requirements | No impact |
| 4.3 Specification suffix information | No impact |
| 4.4 Relationship with other core specifications | No impact |
| 5. Operating bands and channel arrangement |  |
| 5.1 General | One for the frequency range should be updated to consider the new NTN Ku-band(s) |
| 5.2 Operating bands | One for the 2 bands tables should be updated to consider the new NTN Ku-band(s) |
| 5.3 UE channel bandwidth |  |
| 5.3.1 General | No impact |
| 5.3.2 Transmission bandwidth configuration | Depending on which channel BWs are introduced and which frequency range is selected, one of the FR1-NTN transmission bandwidth table should be updated. |
| 5.3.3 Minimum guardband and transmission bandwidth configuration | Depending on which channel BWs are introduced and which frequency range is selected, one of the FR1-NTN minimum guard band table should be updated. |
| 5.3.4 RB alignment | No impact |
| 5.3.5 UE channel bandwidth per operating band | Depending on which channel BWs are introduced and which frequency range is selected, one of the corresponding SAN channel bandwidth table should be updated. |
| 5.3.6 Asymmetric channel bandwidths | T |
| 5.4 Channel arrangement |  |
| 5.4.1 Channel spacing | No impact |
| 5.4.2 Channel raster | The channel raster ranges should be added for the new NTN Ku-band(s) in subclause 5.4.2.3 |
| 5.4.3 Synchronization raster | The sync raster ranges should be added for the new NTN Ku-band(s) in subclause 5.4.3.3 |
| 5.4.4 TX–RX frequency separation | The UE Tx-Rx separation table should be updated of the new NTN Ku-band(s) are part for FR1-NTN. |

**Table 1.2.1-2**

|  |  |
| --- | --- |
| **Requirements** | **Expected impacts** |
| 9.1 General | No impact |
| 9.2 Transmitted power |  |
| 9.2.1 NTN VSAT maximum output power | The minimum peak EIRP and maximum output power limits should be re-evaluated for the NTN Ku-band(s). |
| 9.2.2 Off-axis EIRP emission density limit within the operating band | Those requirements shall be re-evaluated depending on the considered Regulations. |
| 9.2.3 Configured transmitted power | No impact |
| 9.3 Output power dynamics | The ON/Off time mask transient period length might be reconsidered if the NTN Ku-band(s) are part of FR1-NTN |
| 9.4 Transmitter signal quality | No impact |
| 9.5 Output RF spectrum emissions |  |
| 9.5.1 Occupied bandwidth | No impact if NTN Ku-band(s) is part of FR2-NTN |
| 9.5.2 Out of Band Emissions |  |
| 9.5.2.1 General | Some editorials if FR1-NTN, no impact if FR2-NTN |
| 9.5.2.2 Spectrum emission mask | Some editorials if FR1-NTN, no impact if FR2-NTN on the general requirement.  The additional spectrum mask requirements shall be re-evaluated depending on the considered Regulations. |
| 9.5.2.3 Adjacent channel leakage ratio | The ACLR value shall be updated for the new NTN Ku-band(s) based on the ACLR value agreed in the coexistence study. |
| 9.5.3 Spurious Emissions | No impact if NTN Ku-band(s) is part of FR2-NTN |
| 9.6 Antenna pointing accuracy and performance | Those requirements shall be re-evaluated depending on the considered Regulations. |
| 9.7 Additional regional requirements indicated by NS | Those requirements shall be re-evaluated depending on the considered Regulations. |

**Table 1.2.1-3**

|  |  |
| --- | --- |
| Requirements | Expected impacts |
| 10.1 General | No impact |
| 10.2 Polarization characteristics | No impact |
| 10.3 OTA reference sensitivity level | The OTA reference sensitivity should be re-evaluated for the NTN Ku-band(s). |
| 10.4 Maximum input level | The maximum input level should be re-evaluated for the NTN Ku-band(s). |
| 10.5 Adjacent channel selectivity | The ACS value shall be updated for the new NTN Ku-band(s) based on the ACS value agreed in the coexistence study. |
| 10.6 Blocking characteristics | To be re-evaluated |
| 10.7 Spurious emissions | No impact |
| 10.8 Receiver antenna off-axis performance | Those requirements shall be re-evaluated depending on the considered Regulations. |

* + Proposal 2 (ZTE): To use the proposals in Table 1.2.1-4 for UE RF requirements for NTN Ku band.

**Table 1.2.1-4**

|  |  |
| --- | --- |
| **NR-NTN UE Tx/Rx requirement** | **Proposals for NTN Ku band** |
| UE maximum output power | Band specific --> Specification impact.  Need further check whether and which the following requirements defined for FR2-NTN bands can be reused.   * Minimum peak EIRP for Fixed VSAT * Maximum output power limits for Fixed VSAT * Minimum peak EIRP for Mobile VSAT * Maximum output power limits for Mobile VSAT |
| UE maximum output power reduction | Depend on the ACLR, SEM and EVM requirement and discussion could be postponed until other requirement is more clear. |
| UE additional maximum output power reduction | Band specific --> Specification impact.  Depend on other coexistence requirement or regulatory requirement. Operators’ input are encouraged. |
| Configured transmitted power | Not band specific --> No specification impact. |
| Minimum output power | Not applicable to VSAT. |
| Transmit OFF power | Not band specific --> No specification impact. |
| Transmit ON/OFF time mask | Not band specific --> No specification impact. |
| Power control | Not band specific --> No specification impact. |
| Frequency error | Not band specific --> No specification impact. |
| Transmit modulation quality | Not band specific --> No specification impact. |
| Occupied bandwidth | Not band specific.  If we divide Ku band to FR1, requirements for 20 MHz, 35 MHz, 50 MHz, 70 MHz and 100 MHz channel bandwidth need to be defined. |
| Spectrum emission mask | Specification impact. Need to check whether general SEM defined for FR2-NTN can be reused and whether additional SEM is needed for NTN Ku band. |
| Adjacent channel leakage ratio | Specification impact.  Depend on the outcome of coexistence study. |
| Spurious emissions | Specification impact.  Need to check whether general SEM defined for FR2-NTN can be reused, and whether on-axis and off-axis needs to be defined for Ku band. |
| Reference sensitivity level | Band specific --> Specification impact.  Need further study. |
| Max input level | If we divide Ku band to FR1, requirements for 20 MHz, 35 MHz, 50 MHz, 70 MHz and 100 MHz channel bandwidth need to be defined. |
| Adjacent channel selectivity | Specification impact.  Depend on the outcome of coexistence study. |
| Blocking characteristics | Need further study.  If we divide Ku band to FR1, requirements for 20 MHz, 35 MHz, 50 MHz, 70 MHz and 100 MHz channel bandwidth need to be defined. |
| Spurious response | Need further study.  If we divide Ku band to FR1, requirements for 20 MHz, 35 MHz, 50 MHz, 70 MHz and 100 MHz channel bandwidth need to be defined. |
| Intermodulation characteristics | NA |
| Spurious emissions | Not applicable to VSAT. |

* Moderator Recommendation:
  + Suggest to discuss whether the following WF on UE RF impact of NTN Ku band can be the starting point:
    - No additional specification impact on Configured transmitted power, Transmitter signal quality when introducing UE requirements for the NTN Ku band
    - The UE ACLR/ACS value will depend on the outcome of the coexistence study.
    - FFS on Output power dynamics, Spectrum emission mask, Blocking characteristics, Spurious response
    - Companies are encourage to check whether there is regulation impact on Off-axis EIRP emission density limit, Additional SEM, Antenna pointing accuracy and performance, Additional regional requirements indicated by NS, Receiver antenna off-axis.

*Moderator’s note: Propose to focus on checking the no impact part first.*

### Sub-topic 1-2: Ku band #2a, #2b related topics

#### Issue 1-2-1: Tx-Rx carrier frequency separation issue for Ku band #2a, #2b

* [Moderator] Note that the Ku band #2a and #2b belong to the 2nd priority in the WID.
* Proposals:
  + Proposal 1 (LGE): Consider Half Duplex FDD operation in condition that Tx-Rx carrier centre frequency separation is (X+Y)/2 MHz. Here, X = DL CBW, Y = UL CBW.
  + Proposal 2 (LGE): Consider minimum Tx-Rx carrier centre frequency separation or minimum guard band for FDD operation with #2a, and #2b.
  + Proposal 3 (LGE): Consider UE capability on minimum Tx-Rx carrier centre frequency separation or minimum guard band for FDD operation with #2a, and #2b.
* Moderator Recommendation:
  + Suggest to postpone the discussion to the future meetings.

# Topic #2: SAN RF (agenda 8.9.5)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

All Tdocs related to the following topics (agenda 8.9.5) are listed here:

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2411122**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411122.zip) | CATT | Proposal 1: Define SAN type 2-O RF core requirements for Ku-band.  Observation 1: Existing SAN RF core requirement for SAN type-2 excluding ACLR, ACS requirement can be applicable for SAN type 2-O for Ku-band.  Observation 2: Whether existing ACLR ACS for Ka-band is applicable for Ku-band is dependent on adjacent channel coexistence simulation for Ku-band. |
| [**R4-2411191**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411191.zip) | Ericsson | Proposal: Agree with the 5 above tables listing SAN RF impacts when introducing new NTN Ku-band(s) support in TS 38.108. |
| [**R4-2411861**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411861.zip) | ZTE Corporation, Sanechips | Proposal 1: We propose that GEO, LEO-600, and LEO-1200 should be allowed for NTN Ku band.  Proposal 2: We make the proposals as Table 2.2 for SAN RF requirements for NTN Ku band. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1: General issues for Ku band SAN RF requirements

#### Issue 2-1-1: Supported SAN classes for NR NTN Ku band

* Proposals:
  + Proposal 1 (ZTE): We propose that GEO, LEO-600, and LEO-1200 should be allowed for NTN Ku band.
* Moderator Recommendation:
  + Agree on the supported SAN classes for NR NTN Ku band include GEO, LEO-600, and LEO-1200.

#### Issue 2-1-2: Supported SAN type for NR NTN Ku band

* Proposals:
  + Proposal 1 (CATT): Define SAN type 2-O RF core requirements for Ku-band.
* Moderator Recommendation:
  + Suggest to wait for the result of FR1/FR2 down selection discussion in thread [314]

#### Issue 2-1-3: Impact on SAN RF requirements for the NTN Ku band

* Proposals:
  + Proposal 1 (Ericsson): Agree with the 5 below tables listing SAN RF impacts when introducing new NTN Ku-band(s) support in TS 38.108.

**Table 2.2.1-1**

|  |  |
| --- | --- |
| **Requirements** | **Expected impact** |
| 4. General |  |
| 4.1 Relationship with other core specifications | No impact |
| 4.2 Relationship between minimum requirements and test requirements | No impact |
| 4.3 Requirement reference points | No impact |
| 4.4 Satellite Access Node classes | No impact |
| 4.5 Regional requirements | To be updated based on considered Regulations and impacted requirements |
| 4.6 Applicability of minimum requirements | No impact |
| 5. Operating bands and channel arrangement |  |
| 5.1 General | One for the frequency range should be updated to consider the new NTN Ku-band(s) |
| 5.2 Operating bands | One for the 2 bands tables should be updated to consider the new NTN Ku-band(s) |
| 5.3 Satellite Access Node channel bandwidth |  |
| 5.3.1 General | No impact |
| 5.3.2 Transmission bandwidth configuration | Depending on which channel BWs are introduced and which frequency range is selected, one of the FR1-NTN transmission bandwidth table should be updated. |
| 5.3.3 Minimum guardband and transmission bandwidth configuration | Depending on which channel BWs are introduced and which frequency range is selected, one of the FR1-NTN minimum guard band table should be updated. |
| 5.3.4 RB alignment | No impact |
| 5.3.5 SAN channel bandwidth per operating band | Depending on which channel BWs are introduced and which frequency range is selected, one of the corresponding SAN channel bandwidth table should be updated. |
| 5.4 Channel arrangement |  |
| 5.4.1 Channel spacing | No impact |
| 5.4.2 Channel raster | The channel raster ranges should be added for the new NTN Ku-band(s) in subclause 5.4.2.3 |
| 5.4.3 Synchronization raster | The sync raster ranges should be added for the new NTN Ku-band(s) in subclause 5.4.3.3 |

**Table 2.2.1-2**

|  |  |
| --- | --- |
| **Requirements** | **Expected impact If NTN Ku-band(s) are part of FR1-NTN** |
| 6.1 General | No impact |
| 6.2 SAN output power | No impact |
| 6.3 Output power dynamics | If new channel BWs are introduced, the table “total power dynamic range” shall be updated. |
| 6.4 Transmit ON/OFF power | No impact |
| 6.5 Transmitted signal quality | No impact |
| 6.6 Unwanted emissions |  |
| 6.6.1 General | No impact |
| 6.6.2 Occupied bandwidth | No impact |
| 6.6.3 Adjacent Channel Leakage Power Ratio | The ACLR value shall be updated for the new NTN Ku-band(s) based on the ACLR value agreed in the coexistence study. |
| 6.6.4 Out-of-band emissions | No impact |
| 6.6.5 Transmitter spurious emissions | No impact |
| 6.7 Transmitter intermodulation | No impact |

**Table 2.2.1-3**

|  |  |  |
| --- | --- | --- |
| **Requirements** | **Expected impact** | |
|  | **If NTN Ku-band(s) are part of FR1-NTN** | **If NTN Ku-band(s) are part of FR2-NTN** |
| 9.1 General | No impact | No impact |
| 9.2 Radiated transmit power | No impact | No impact |
| 9.3 OTA Satellite Access Node output power | No impact | No impact |
| 9.4 OTA output power dynamics | If new channel BWs are introduced, the table “total power dynamic range” shall be updated. | No impact |
| 9.5 OTA transmit ON/OFF power | No impact | No impact |
| 9.6 OTA transmitted signal quality | No impact | No impact |
| 9.7 OTA unwanted emissions |  |  |
| 9.7.1 General | No impact | No impact |
| 9.7.2 OTA occupied bandwidth | No impact | No impact |
| 9.7.3 OTA Adjacent Channel Leakage Power Ratio | The ACLR value shall be updated for the new NTN Ku-band(s) based on the ACLR value agreed in the coexistence study. | The ACLR value shall be updated for the new NTN Ku-band(s) based on the ACLR value agreed in the coexistence study. |
| 9.7.4 OTA out-of-band emissions | No impact | No impact |
| 9.7.5 OTA transmitter spurious emissions | No impact | No impact |
| 9.8 OTA transmitter intermodulation | No impact | No impact |

**Table 2.2.1-4**

|  |  |
| --- | --- |
| **Requirements** | **Expected impact If NTN Ku-band(s) are part of FR1-NTN** |
| 7.1 General | No impact |
| 7.2 Reference sensitivity level | If new channel BWs are introduced, the REFSENS tables shall be updated. |
| 7.3 Dynamic range | If new channel BWs are introduced, the dynamic range table shall be updated. |
| 7.4 In-band selectivity and blocking |  |
| 7.4.1 Adjacent Channel Selectivity (ACS) | The SAN ACS tables for the new NTN Ku-band(s) based on the ACS value agreed in the coexistence study. |
| 7.4.2 In-band blocking | No impact |
| 7.5 Out-of-band blocking | No impact |
| 7.6 Receiver spurious emissions | No impact |
| 7.7 In-channel selectivity | If new channel BWs are introduced, the ICS tables shall be updated. |

**Table 2.2.1-5**

|  |  |  |
| --- | --- | --- |
| **Requirements** | **Expected impact** | |
| **If NTN Ku-band(s) are part of FR1-NTN** | **If NTN Ku-band(s) are part of FR2-NTN** |
| 10.1 General | No impact | No impact |
| 10.2 OTA sensitivity | No impact | No impact |
| 10.3 OTA reference sensitivity level | If new channel BWs are introduced, the REFSENS tables shall be updated. | No impact |
| 10.4 OTA dynamic range | If new channel BWs are introduced, the dynamic range table shall be updated. | No impact |
| 10.5 In-band selectivity and blocking |  |  |
| 10.5.1 Adjacent Channel Selectivity (ACS) | The SAN ACS tables for the new NTN Ku-band(s) based on the ACS value agreed in the coexistence study. | The SAN ACS tables for the new NTN Ku-band(s) based on the ACS value agreed in the coexistence study. |
| 10.5.2 OTA in-band blocking | No impact | No impact |
| 10.6 OTA out-of-band blocking | No impact | No impact |
| 10.7 OTA teceiver spurious emissions | No impact | No impact |
| 10.8 OTA in-channel selectivity | If new channel BWs are introduced, the ICS tables shall be updated. | No impact |

* + Proposal 2 (ZTE): We make the proposals as Table 2.2.1-6 for SAN RF requirements for NTN Ku band.

**Table 2.2.1-6**

|  |  |
| --- | --- |
| **NR BS RF Tx/Rx requirement** | **Proposal for NTN Ku band** |
| SAN output power | Need to discuss which SAN type can be supported. |
| Output power dynamics | Not band specific --> No specification impact. |
| Transmit ON/OFF power | Not applicable. |
| Transmitted signal quality | Not band specific --> No specification impact. |
| Occupied bandwidth | Not band specific --> No specification impact. |
| Adjacent Channel Leakage Power Ratio (ACLR) | It depends on the outcome of coexistence study. |
| Out-of-band emissions | It depends on the outcome of coexistence study and ITU recommendation. |
| Transmitter spurious emissions | To reuse the same spurious emission requirement defined in TS 38.108. |
| Transmitter intermodulation | Not applicable. |
| Reference sensitivity level | Declaration basis according to the noise figure of SAN, antenna array configuration, the target SNR, FRC. |
| Dynamic range | Not band specific.  If we divide Ku band to FR1, requirements for 20 MHz, 35 MHz, 50 MHz, 70 MHz and 100 MHz channel bandwidth need to be defined. |
| Adjacent channel selectivity | It depends on the outcome of coexistence study. |
| In-band blocking | It depends on the outcome of coexistence study. |
| Out-of-band blocking | Needs further check whether out-of-band blocking requirements can be reused. |
| Receiver spurious emissions | Not applicable. |
| Receiver intermodulation | Not applicable. |
| In-channel selectivity | Not band specific.  If we divide Ku band to FR1, requirements for 20 MHz, 35 MHz, 50 MHz, 70 MHz and 100 MHz channel bandwidth need to be defined. |

* Moderator Recommendation:
  + Suggest to discuss whether the following WF on SAN RF impact of NTN Ku band can be the starting point:
    - No additional specification impact on [SAN output power], Output power dynamics, Transmit ON/OFF power, Transmitted signal quality, Occupied bandwidth, Transmitter spurious emissions, Transmitter intermodulation, Receiver spurious emissions, Receiver intermodulation when introducing SAN requirements for the NTN Ku band
    - The SAN ACLR/ACS values will depend on the outcome of the coexistence study.
    - FFS on Out-of-band emissions, In-band blocking, Out-of-band blocking

*Moderator’s note: the impact on Reference sensitivity level, Dynamic range, In-channel selectivity will depend on the FR1/FR2 down selection and whether new channel BWs will be introduced, maybe can wait for the discussion result in the thread [314] first.*