**3GPP TSG-RAN WG4 Meeting#110bis R4-240xxxxx**

**Changsha, China, 15th – 19th April, 2024**

**Agenda item:** 6.16.5

**Source:** Moderator (ZTE)

**Title:** Topic summary for [110bis][121] NR\_NTN\_enh\_UERF\_R18

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.*

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: TBA
* 2nd round: TBA

It is appreciated that the delegates for this topic put their contact information in the table below.

Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: NTN UE Tx RF requirement

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **[R4-2404939](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404939.zip)** | Ericsson | NTN enhancement - NTN UE TRP requirement and Tx antenna performance |
| **[R4-2404941](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404941.zip)** | Ericsson, Thales | NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - additional Tx updates to the running CR |
| **[R4-2405176](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405176.zip)** | OPPO | Discussion on the minimum output power of NTN UE |
| **[R4-2405296](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405296.zip)** | Samsung | Discussion on NTN UE RF Tx requirements |
| **[R4-2405318](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405318.zip)** | Samsung | draft CR for TS 38.101-5 9.2.1 |
| **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)** | Huawei, HiSilicon | Discussion on Tx requirement for Ka band NTN UE |
| **[R4-2405341](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405341.zip)** | Huawei, HiSilicon | Draft CR for TR 38.863 to introduce some technical background for R18 NTN VSAT UE Tx requirements |
| **[R4-2405640](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405640.zip)** | ZTE Corporation | Further discussion on Tx RF requirements for NTN in Ka-band |
| **[R4-2405641](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405641.zip)** | ZTE Corporation | Draft CR to TS 38.101-5 Clause 9.3 Output power dynamics |
| **[R4-2405889](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405889.zip)** | Qualcomm Incorporated | VSAT type 2 and 5 MPR to meet OFF-axis EIRP |

## Open issues summary

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

### Sub-topic 1 Tx requirement

*Sub-topic description:*

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

**Issue 1-1: Maximum TRP**

* Proposal 1: Specify NTN VSAT (fixed and mobile) maximum TRP with a value of 35 dBm. [Ericsson, **[R4-2404939](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404939.zip)**]
* Proposal 2: The maximum TRP for VSAT types with parabolic antenna (i.e. with mechanical steering antenna), e.g. type 1 and type 4, can be specified as 33dBm/2W, which is same to the TR and co-ex assumptions. [Samsung,**[R4-2405296](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405296.zip)**]
* Proposal 3-1: The maximum TRP for VSAT types with phased array antenna (i.e. electronic steering antenna), e.g. Type 2, 3, 5, can be specified but depends on the assumption of antenna modelling and parameters, including maximum gain per element, maximum power per element, etc. [Samsung,**[R4-2405296](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405296.zip)**]
* Proposal 3-2: The assumptions together with the antenna modelling, if provided to derive maximum TRP, should comply with the rest RF requirements, including maximum EIRP, off-axis EIRP limit, off-axis spurious emission, etc. [Samsung,**[R4-2405296](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405296.zip)**]
* Proposal 4: VSAT can indicate a capability to declare the maximum TRP output power with 3dB tolerance. The higher bound of maximum TRP output power could be up to 47dBm. FFS on the declared lower boundary. The granularity can be 1dBm. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* **Recommended for further discussion:**
* For type 1 and type 4 with mechanical steering antenna (e.g. parabolic antenna)
  + Option 1: 35dBm
  + Option 2: 33dBm
* For type 2,3, 5 with electronic steering antenna (e.g. phase antenna array)
  + Option 1: 35dBm
  + Option 2: 33dBm
  + Option 3: 47dBm with 1dB reporting granularity.
  + Option 4: between 35dBm to 47dBm with simulation results provided to verify whether the agreed ACLR 14dBc is acceptable.

**Issue 1-2: Minimum output power**

* Proposal 1: The minimum output powers for NTN UE are proposed as below [OPPO, **[R4-2405176](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405176.zip)**].
  + For UE type 1/2/4/5: the minimum output power is -9.4dBm
  + For UE type 3: the minimum output power is -5.9dBm
* Proposal 2: Follow the same discussion assumption of minimum peak EIRP, the minimum output power can be specified as follows: [Samsung, **[R4-2405176](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405176.zip)**].
  + For (type 3 UE) fixed VSAT supporting LEO only with electronical steering antenna, specify the minimum output power as 52.9 dBm under the assumption of 600km orbit.
  + For (type 1,2,4,5 UE), specify the minimum output power as 66.3 dBm under the assumption of GSO.
* Proposal 3: define the minimum output power as following: [ZTE,**[R4-2405640](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405640.zip)**]
  + 61-9dB=52dBm for type3 UE supporting LEO 600km
  + 71-4dB=67dBm for type 1/2/4/5 UE supporting other scenarios
* Proposal 4: No need to specify Minimum output power requirement for Ka band VSAT. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* **Recommended for further discussion:** 
  + Option 1: 52~52.9dBm for type 3 UE and 66.3~67dBm for type 1,2,4,5 UE
  + Option 2: -5.9dBm for type 3 UE and -9.4dBm for type 1,2,4,5 UE
  + Option 3: not to define the requirement

**Issue 1-3: Transmit ON-OFF power**

* Proposal 1: it’s proposed that the OTA transmitter OFF TRP spectral density for Ka band VSAT shall be less than -36 dBm/MHz. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* Proposal 2: reuse the existing FR2-1 UE OFF power requirement for VSAT UE. [ZTE,**[R4-2405640](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405640.zip)**]
* **Recommended for further discussion:** 
  + Option 1: reusing FR2 BS OFF power requirement -36dBm/MHz
  + Option 2: to follow the existing FR2-1 OFF power requirement -35dBm/BW

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band | Channel bandwidth / Transmit OFF power (dBm) / measurement bandwidth | | | |
|  | 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| n512, n511, n510 | [-35] | [-35] | [-35] | [-35] |
|  | 47.58 MHz | 95.16 MHz | 190.20 MHz | 380.28 MHz |

**Issue 1-4: Transmit ON-OFF time mask**

* Proposal 1: it’s proposed to introduce some basic requirements for Ka band VSAT in Rel-18. If other features are identified in the future, they could be considered later. 5us transient period is applicable for Ka band VSAT. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* Proposal 2: reuse the existing FR2-1 UE transmit ON/OFF time mask power requirement for VSAT UE. [ZTE,**[R4-2405640](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405640.zip)**]
* Recommended WF:
  + Proposal 2 as baseline

**Issue 1-5: Transmit freq error**

* Proposal 1: if the assumption is changed to time-varying doppler drift, current frequency error requirements should be further discussed. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* Recommended WF:
  + Follow the agreement reached in R4-232197 with fixed doppler shift.
  + Time varying doppler shift will be discussed in Rel-19 RAN4 NTN WID.

**Issue 1-6: Transmit modulation quality**

* Proposal 1: The Transmit modulation quality requirements for TS 38.101-2 can’t be reused. RAN4 should further discuss whether to specify such requirements or not. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* Recommended WF:
  + Follow the agreement reached in [R4-2317648](file:///D:\\RAN4%23108bis\\Docs\\R4-2317648.zip), [R4-2321974](http://10.10.10.10/ftp/RAN/RAN4/Inbox/R4-2321974.zip)

**Issue 1-7: SEM**

* Proposal 1: NS value should be used for additional requirements specified in clause 9.5.2.2.2. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* Proposal 2: Before introducing clause 9.5.3.2 and 9.5.3.3 (EIRP based is controversial with TRP based declaration in clause 9.5.2.1.), it’s unclear whether new network signalling is needed to indicate different “Carrier-on” “Emissions disabled” and “Carrier-off” states. In clause 9.5.3.2.3, how can we know the parameter “K”? [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* Proposal 3: In table 9.5.3.1-1, the definition of OOB boundary is not aligned with SEM requirements. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* Proposal 4: propose to specify the VSAT SEM requirement as following: [ZTE,**[R4-2405640](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405640.zip)**]

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Basic limits  (dBm) | Measurement bandwidth |
| 0 MHz ≤ Δf < 2× BWUE | 0.5 MHz ≤ f\_offset < 2× BWUE + 0.5 MHz |  | 1 MHz |
| NOTE 1: BWUE is in the unit of MHz.  NOTE 2: SE limit is spurious emission limit specified in spurious emission clause 6.6.5.  NOTE 3: PSD attenuation as in ITU-R SM.1541-6 [9], Annex 5 OoB domain emission limits for earth services. | | | |

* Recommended WF:
  + Proposal 5 is agreed
  + Further discuss other proposals

**Issue 1-8: Power control requirement**

* Proposal 1: don’t reuse the existing power control requirement for NTN UE and further discuss the applicable requirement for it.: [ZTE,**[R4-2405640](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405640.zip)**]
* Recommended WF:
  + Don’t reuse the existing power control requirement for NTN UE.
  + Further discuss the applicable requirement if agreeable.

**Issue 1-9: MPR requirement for type 2 and type 5 to meet OFF-axis EIRP requirement**

* Proposal 1: MPR for UE type 2 to meet OFF-axis EIRP requirement is [Qualcomm, **[R4-2405889](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405889.zip)**]:
  + CEIL{14 – 10\*LOG10(LCRB\*SCS\*12/1e6),1}
* Recommended WF:
  + Further discuss the proposal 1

**Issue 1-10: MPR requirement for type 2 and type 5 to meet OFF-axis EIRP requirement**

* Proposal 1: To align the definition between angle theta (θ) in this draft CR and off-axis angle in ETSI standard. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* Proposal 2: it’s better to specify off-axis EIRP density requirements based on general requirements and additional reginal requirements by using network signalling in clause 9.2.2. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]
* Recommended WF:
  + Further discuss the proposal 2
  + For Proposal 1, it could be done offline for the corresponding draft CRs.

**Issue 1-11: Antenna performance**

* Proposal 1: Specify Antenna performance requirements for band n511 and n510 based on FCC 47 CFR 25.209. [Ericsson, **[R4-2404939](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404939.zip)**]
* Proposal 2: Antenna point accuracy should not be introduced into the spec until RAN4 fully discuss such requirements in detail. [Huawei, **[R4-2405339](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405339.zip)**]Recommended WF:
  + Further discuss the proposal 1
  + To clarify anything is not clear for antenna point accuracy.

# Topic #1: NTN UE Rx RF requirement

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **[R4-2404940](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404940.zip)** | Ericsson, Thales | NTN enhancement - NTN UE Rx antenna performance |
| **[R4-2404942](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404942.zip)** | Samsung | NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - additional Rx updates to the running CR |
| **[R4-2405314](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405314.zip)** | Samsung | Discussions on NTN UE RF Rx requirements |
| **[R4-2405338](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405338.zip)** | Huawei, HiSilicon | Draft CR for 38.101-5 to introduce clause 10.1~10.3 |
| **[R4-2405342](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405342.zip)** | Huawei, HiSilicon | Discussion on Rx requirement for Ka band NTN UE |
| **[R4-2405343](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405343.zip)** | Huawei, HiSilicon | Draft CR for TR 38.863 to introduce some technical background for R18 NTN VSAT UE Rx requirements |
| **[R4-2405642](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405642.zip)** | ZTE Corporation | Further discussion on Rx RF requirements for NTN in Ka-band |
| **[R4-2405643](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405643.zip)** | ZTE Corporation | Draft CR to TS 38.101-5 Clause 10.4 Maximum input power requirement |
| **[R4-2405644](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405644.zip)** | ZTE Corporation | Draft CR to TS 38.101-5 Clause 10.6 Blocking characteristics |
| **[R4-2405645](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405645.zip)** | ZTE Corporation | Draft CR to TS 38.101-5 Annex NTN VSAT related FRC |
| **[R4-2405974](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405974.zip)** | THALES, Magister Solutions Ltd, Eutelsat Group, ESA, Inmarsat, Viasat, Novamint, EchoStar, Amazon | On the ACS requirement issue for VSAT UE in above 10 GHz |

## Open issues summary

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

### Sub-topic 2 Rx requirement

*Sub-topic description:*

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

**Issue 2-1 Minimum EIS requirement**

* Proposal 1: [ZTE, **[R4-2405642](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405642.zip)**]
  + For the type 3, to specify the minimum EIS requirement as -115.6dBm or 50MHz and for the other channel bandwidth, the corresponding EIS requirement could be scaled with PRB based compared with 50MHz under the assumption of 600km orbit.
  + For the type 1,2,4,5, to specify the minimum EIS requirement as -122dBm for 50MHz and for the other channel bandwidth, the corresponding EIS requirement could be scaled with PRB based compared with 50MHz under the assumption of GSO orbit.
* **Recommended for further discussion:** 
  + Option 1:
* for type 3 UE, to specify minimum EIS as -115.6dBm for 50MHz, for the other channel bandwidth, the corresponding EIS requirement could be scaled with PRB based compared with 50MHz;
* for type 1/2/4/5 UE, to specify minimum EIS as -122dBm for 50MHz, for the other channel bandwidth, the corresponding EIS requirement could be scaled with PRB based compared with 50MHz
  + Option 2: other value

**Issue 2-2: Maximum input power**

* Proposal 1: [ZTE, **[R4-2405642](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405642.zip)**]
  + For the type 3, to specify the maximum input power as -109.6dBm for all channel bandwidth and applicable modulation order as 16QAM and [64QAM ][e.g. target SNR as 15dB]
  + For the type 1,2,4,5, to specify the maximum input power as -109.6dBm for all channel bandwidth and applicable modulation order as 16QAM and [64QAM] [e.g. target SNR as 18dB]
* Proposal 2: The maximum input power at VSAT OTA can be specified as -105 dBm if we re-use the SAN DL EIRP simulation assumptions as an upper limit, and assuming lowest LEO orbits as 200km. [Samsung, **[R4-2405314](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405314.zip)**]
* Proposal 3: it’s proposed to specify -101dBm as OTA maximum input level for (type 3 UE) fixed VSAT supporting LEO only with electronical steering antenna. [Huawei, **[R4-2405342](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405342.zip)**]
* Proposal 4: it’s proposed to define 64QAM for maximum input level tests. [Huawei, **[R4-2405342](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405342.zip)**]
* **Recommended for further discussion:** 
  + For type 3,
* Option 1: -109.6dBm with 16QAM and [64QAM ] for type 3.
* Option 2: -101dBm as maximum input power with 64QAM
* Option 3: -105dBm
  + For type 1/2/4/5:
* Option 1: -109.6dBm with 16QAM and [64QAM ] for type 3.
  + The exact MCS or coding rate for FRC of maximum input power need further discussion and confirmation.

**Issue 2-3: ACS**

* Proposal 1: ACS value of VSAT NTN at 17 GHz (DL Ka-band) shall not be higher than [23] dB and include the agreed notes at RAN4#110 to provide context of the coexistence studies. [THALES, Magister Solutions Ltd, Eutelsat Group, ESA, Inmarsat, Viasat, Novamint, EchoStar, Amazon, **[R4-2405974](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405974.zip)**]
* Proposal 2: The VSAT NTN ACS shall be tested with TDD type of interferer (to model interference of TN BS). [THALES, Magister Solutions Ltd, Eutelsat Group, ESA, Inmarsat, Viasat, Novamint, EchoStar, Amazon, **[R4-2405974](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405974.zip)**]
* Proposal 3: Discuss to use NTN VSAT EISREFSENS + 6 dB value to define wanted signal mean power (dBm) and NTN VSAT EISREFSENS\_50M + 26.17 + NTN VSAT ΔFR2\_REFSENS value to define interfering signal mean power (dBm). [THALES, Magister Solutions Ltd, Eutelsat Group, ESA, Inmarsat, Viasat, Novamint, EchoStar, Amazon, **[R4-2405974](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405974.zip)**]

Table x.x.x.x-1: OTA ACS requirement for NTN VSAT

|  |  |  |
| --- | --- | --- |
| *NTN VSAT channel bandwidth* of the *lowest/highest carrier* received (MHz) | Wanted signal mean power (dBm) | Interfering signal mean power (dBm) |
| 50, 100, 200, 400 | EISREFSENS + 6 dB (Note 1) | EISREFSENS\_50M + 26.17+ ΔFR2\_REFSENS |
| NOTE 1: EISREFSENS is given in clause 10.3 | | |

Table x.x.x.x-2: OTA ACS interferer frequency offset for NTN VSAT

|  |  |  |
| --- | --- | --- |
| *NTN VSAT channel bandwidth* of the *lowest/highest carrier* received (MHz) | Interfering signal centre frequency offset from the lower/upper NTN *VSAT RF Bandwidth* *edge* or sub*-block edge* inside a *sub-block gap* (MHz) | Type of interfering signal |
| 50 | ±24.29 |  |
| 100 | ±24.31 | 50 MHz OFDM TDD NR |
| 200 | ±24.29 | signal, 60 kHz SCS, 64 RBs |
| 400 | ±24.31 |  |

* Recommended WF:
  + Need further discussions online.

**Issue 2-4: Antenna off-axis performance**

* Proposal 1: Specify Rx antenna off-axis performance requirements for band n512 based on ETSI EN 301 360, EN 301 459, EN 303 699, EN 303 978. [Ericsson, Thales, **[R4-2404940](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2404940.zip)**]
* Recommended WF:
  + Need further discussions online.

**Issue 2-5: Polarization characteristics**

* Proposal 1: Either RHCP or LHCP is supported by Ka band VSAT in Rel-18. [Huawei, **[R4-2405342](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110bis/Docs/R4-2405342.zip)**]
* Recommended WF:
  + Need further discussions online.