3GPP TSG-RAN WG4 Meeting # 110 R4-240xxxx

Athens, Greece, Feb 26 – Mar 1, 2024

**Agenda item:** 8.18.9

**Source:** Moderator (ZTE)

**Title:** Topic summary for [110][130] NR\_NTN\_enh\_UERF

**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** |
| [**R4-2400285**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400285.zip) | Samsung | Discussions on NTN UE Tx RF requirements |
| [**R4-2400286**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400286.zip) | Samsung | draftCR to TS 38.101-5 sub-clause 9.2.1 |
| [**R4-2400712**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400712.zip) | Qualcomm Incorporated | VSAT device type reference architecture and requirements |
| [**R4-2400713**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400713.zip) | Qualcomm Incorporated | (NR\_NTN\_enh-Core) draft CR clarifications for the FCC requirements |
| [**R4-2402062**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402062.zip) | Huawei, HiSilicon | Discussion on Tx requirement for Ka band NTN UE |
| [**R4-2402329**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402329.zip) | Ericsson | NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - clauses 9.2.3 |
| [**R4-2402331**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402331.zip) | Ericsson | NTN enhancement: VSAT spurious emission |
| [**R4-2402332**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402332.zip) | Ericsson, Thales | NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - Tx spurious |
| [**R4-2402521**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402521.zip) | ZTE Corporation | Further discussion on UE Tx RF requirements for NTN in Ka-band |
| [**R4-2402526**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402526.zip) | ZTE Corporation | Draft CR to TS 38.101-5 Clause 9.3 Output power dynamics |
| [**R4-2402762**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402762.zip) | Ericsson, Thales | NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - Tx spurious |
| [**R4-2402924**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402924.zip) | THALES | Draft CR for 38101-5 |
| [**R4-2402523**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402523.zip) | ZTE Corporation , Thales | Joint contribution for NTN VSAT RF requirements in Ka-band |
| [**R4-2402933**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402933.zip) | THALES, Magister Solutions Ltd | Remaining issues on VSAT UE requirements for 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 Tx requirement

*Sub-topic description:*

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

**Issue 2-0: General**

**Issue 2-1: The minimum peak EIRP and minimum output power for VSAT**

* Proposal 1: The minimum peak EIRP for fixed VSAT UE supporting both GSO and LEO (UE Type 1 and 2) can be specified as [69.8] dBm plus implementation loss. And it should be noted that such requirement is derived based on minimum elevation angle as 30 degree. [Samsung, [**R4-2400285**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400285.zip)]
* Proposal 2: The minimum peak EIRP for fixed VSAT UE supporting LEO only (UE Type 3) can be specified as [67.6] dBm plus implementation loss. And it should be noted that such requirement is derived based on minimum elevation angle as 30 degree. [Samsung, [**R4-2400285**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400285.zip)]
* Proposal 3: The minimum peak EIRP for mobile VSAT UE supporting GSO (UE Type 4 and 5) can be specified as [69.8] dBm plus implementation loss. And it should be noted that such requirement is derived based on minimum elevation angle as 30 degree. [Samsung, [**R4-2400285**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400285.zip)]
* Proposal 4: For (type 3 UE) fixed VSAT supporting LEO only with electronical steering antenna, it’s proposed to specify the minimum EIRP as 60dBm. [Huawei,[**R4-2402062**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402062.zip)]
* Proposal 5: to consider the basic principle as described in section 2.1 to specify the minimum peak EIRP and minimum output power for VSAT. [ZTE, [**R4-2402521**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402521.zip)]

Basic principle:

* The minimum peak EIRP of NTN VSAT will at least support the low MCS at the SAN receiver side. Low MCS in the following calculation is based on QPSK with coding rate as 1/3, then corresponding SNR for 95% throughput should be around -1dB;
* For the minimum output power, it should be calculated based on the closest distance with 90 degree elevation angle; For the minimum peak EIRP is assumed as lowest supported elevation angle.
* Both minimum peak EIRP and minimum output power should be defined in the BW agnostic way similar as current specification.

The minimum EIRP could be derived as following:

Where:

* NF is 3.5dB for GEO and LEO at the Ka-band;
* BW is assumed as 100MHz since 100MHz as mandatory channel bandwidth, FFS for other bandwidth
* SNR is assumed as -1dB which is applicable for QPSK with 1/3 coding rate;
* IM is the implementation margin for low modulation order;
* SAN\_AntennaGain= 58.5-[3/0]dB; where 58.5dB is for GEO and 38.5dB is for LEO and 3dB margin is considered for VSAT is located at the beamprint edge which is corresponding to 3dB beamwidth of radiation beam. If VSAT is located at the center of beamprint, 0dB margin could be considered;
* Pathloss\_FreeSpace=32.44+20\*log10(D2)+20\*log10(f\_MHz); Note: if consider the pathloss captured in TR 38.811 clause 6.6, then LOS probability and shadow fading varying with elevation angle should be considered as well especially for the low elevation angle.
* f\_ML is assumed as 27GHz for UL direction;
* D2 is slant distance between VSAT and SAN and could be derived as following:
* Proposal 6: For the minimum output power, it should be calculated based on the closest distance with 90 degree elevation angle. [ZTE, Thales [**R4-2402523**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402523.zip)]
* Proposal 7: To define three sets of minimum EIRP requirements and minimum output power: [ZTE, Thales [**R4-2402523**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402523.zip)]
* Set 1: type 1/2 with GSO and LEO and further discuss which is the worst case.
* Set 2: type 3 with LEO600km
* Set 3: type 4/5 with GSO

Note: the minimum EIRP requirement for set1 and set 3 might be the same.

FFS:

* the supported elevation angle;
* The supported modulation orders;
* BW
* Atmosphere loss
* Channel model
* Recommended WF:
	+ Proposal 6 and proposal 7 is agreeable
	+ For other proposals, need further discussion
	+ The corresponding CR [R4-2400286](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400286.zip) from Samsung need to be postponed until the core requirement is agreed.

**Issue 2-2: Transmitter SEM**

* Proposal 1: propose to specify the VSAT SEM requirement as following: [ZTE, [**R4-2402521**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402521.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. |

* Proposal 2: On the other hand, SEM can be defined based on 1 MHz reference bandwidth. [Thales,[**R4-2402933**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402933.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× BW | 0.5 MHz ≤ f\_offset < 2× BW + 0.5 MHz |  | 1 MHz |
| NOTE 1: BW is in the unit of MHz;NOTE 2: SE limit is spurious emission limit specified in spurious emission clause 9.5.3, and is converted from the SE limit requirement defined on 4 kHz to a value defined over 1 MHz;NOTE 3: PSD attenuation as in ITU-R SM.1541-6 [6], Annex 5 OoB domain emission limits for earth stations. |

* Recommended WF:
	+ To be discuss online and it’s recommended to agreed.
	+ The corresponding CR [**R4-2402924**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402924.zip) from Thales need to be postponed until the core requirement is agreed.

**Issue 2-3: Transmitter spurious emission**

* Proposal1: Specify NTN VSAT Off-axis requirements for band n512 according to the following: [Ericsson,[**R4-2402331**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402331.zip)]
* Convert dBpW values in dBm (=dBpW – 90)
* Consider the same Off-axis spurious requirements for both fixed and mobile VSAT.
* Keep the frequency range 1.0-2.0 GHz (ETSI Harmonized Standards).
* Consider 100 kHz measurement bandwidth for the ”normal” limits (ERC 74-01, EN 301 360 and EN 301 459)
* Consider the 85 dBpW exceptions for the relevant frequency range (as specified in ERC 74-01, EN 301 360 and EN 301 459).
* Proposal2: Specify the NTN VSAT On-axis spurious requirements for band n512 for both mobile VSAT and fixed VSAT based on EN 303 0978. [Ericsson,[**R4-2402331**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402331.zip)]
* Proposal 3: General spurious emission limit to be defined based on a 4 kHz reference bandwidth. [Thales,[**R4-2402933**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402933.zip)] [**[R4-2402762](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402762.zip) (revised from [R4-2402332](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402332.zip))** from Ericsson, Thales]

|  |  |  |
| --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth |
| 30 MHz ≤ f ≤ 2nd harmonic of the upper frequency edge of the UL operating band in GHz | -13 dBm | 4 kHz |

* Proposal 4: propose to specify the VSAT spurious emission requirement as following: [ZTE, [**R4-2402521**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402521.zip)]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Spurious frequency range | Prated,c,sys(dBm) | Basic limit(dBm) | Measurement bandwidth(kHz) | Notes |
| 30 MHz – 2nd harmonic of the upper frequency edge of the DL operating band | ≤ 47 | -13 | 4 | NOTE 1, NOTE 2, NOTE 3 |
|  | > 47 | Prated,c,sys – 60dB |  |  |

* Recommended WF:
	+ Need further discussion
	+ The corresponding CR [**R4-2402762**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402762.zip) **(revised from** [**R4-2402332**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402332.zip)**)** from Ericsson Thales need to be postponed until the core requirement is agreed.

**Issue 2-4:** [**R4-2402329**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402329.zip)**, Configured transmitted power, Ericsson**

* Recommended WF:
	+ Need further discussions and postpone the draft CR until the core requirement is agreed.

**Issue 2-5:** [**R4-2402526**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402526.zip)**, transmitter output dynamics, ZTE**

* Recommended WF:
	+ Need further discussions and postpone the draft CR until the core requirement is agreed.

**Issue 2-6: the applicability of antenna type for GSO and LEO scenario**

* Proposal 1: Use paraboloid antennas as reference design for GSO deployments and arrays for LEO deployments [Qualcomm, [**R4-2400712**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400712.zip)]
* Proposal 2: Add the following definitions:
* Co-polarized transmission: when the DUT transmission antenna polarization is aligned with test antenna polarization.
* Cross-polarized transmission: when the DUT transmission antenna polarization is aligned with the tangent of the test antenna polarization.
* Recommended WF:
	+ The corresponding draft CR [R4-2400713](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2400713.zip) for the proposal 2 is endorsed.
	+ For the proposal 1, noted since this has been discussed in the previous RAN4 meetings.

**Issue 2-7: feature list**

* Proposal 1: to include the NTN features electronic/ mechanical steering antenna and fixed / mobile VSAT as Annex into feature list. [Huawei,[**R4-2402062**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402062.zip)]

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 40.NR\_NTN\_enh | 40-1 | VSAT UE type in NTN | Support of fixed or mobile VSAT (Very Small Aperture Terminal) UE typea) Type 1: a fixed VSAT, which is allowed to access to a cell for MSS (mobile satellite service) or FSS (fixed satellite service) from regulation perspective.b) Type 2: a mobile VSAT, which is allowed to access to an MSS cell from regulation perspective.A VSAT (Very Small Aperture Terminal) UE as defined in TS 38.101-5 must indicate support of this capability with only one type. If this capability is absent, a mobile VSAT is supported by default. |  | Yes | N/A | The network doesn’t know the VSAT UE type and cannot decide whether it’s allowed to handover this UE to an FSS cell. | Per UE | N/A | N/A | N/A | Support receiving access control indication in system information | Optional with capability signalling |
| 40.NR\_NTN\_enh | 40-2 | Beam steering  | Support of beam steering capability1. Type 1: Fully electronically-steered beam UEs
2. Type 2: Fully mechanically-steered beam UEs

A VSAT (Very Small Aperture Terminal) UE as defined in TS 38.101-5 must indicate support of this capability with only one type. |  | Yes  | N/A | Beam steering is not supported.  | Per-band | FDD only | N/A | N/A | The capability is not applicable for UE other than VSAT. | Optional with capability signaling |

* Proposal 2: we proposed the following UE feature list [Samsung,**[R4-2319179](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402062.zip)**]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 40.NR\_NTN\_enh | 40-1 | **VSAT antenna steering type** | 1. **Mechanical steering**
2. **Electronic steering**
 | **34-1** | **yes** | **N/A** | **The network cannot distinguish the UE steering times from different steering types.** | **Per UE** | **N/A** | **FR2 only** | **N/A** |  | **Conditionally mandatory with capability signalling, at least report one steering type for UE supporting NTN and operating in FR2-NTN bands.** |
|  |  | **VSAT mobility type** | 1. **Fixed**
2. **Mobile**
 | **34-1** | **yes** | **N/A** | **The network does not know whether it’s legitimate to handover a UE to a target satellite cell.** | **Per UE** | **N/A** | **FR2 only** | **N/A** |  | **Conditionally mandatory with capability signalling, at least report one mobility type for UE supporting NTN and FR2-NTN bands.** |

* Recommended WF:
	+ Need further discussions.

# Topic #1: NTN UE Rx RF requirement

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2402061**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402061.zip) | Huawei, HiSilicon | Draft CR for 38.101-5 to introduce clause 10.1~10.3 |
| [**R4-2402063**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402063.zip) | Huawei, HiSilicon | Discussion on Rx requirement for Ka band NTN UE |
| [**R4-2402330**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402330.zip) | Ericsson | NTN enhancement: draft CR to TS 38.101-5 NTN Ka-band - clauses 10.7 |
| [**R4-2402522**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402522.zip) | ZTE Corporation | Further discussion on UE Rx RF requirements for NTN in Ka-band |
| [**R4-2402527**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402527.zip) | ZTE Corporation | Draft CR to TS 38.101-5 Clause 10.4 Maximum input power requirement |
| [**R4-2402528**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402528.zip) | ZTE Corporation | Draft CR to TS 38.101-5 Clause 10.6 Blocking requirement |
| [**R4-2402529**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402529.zip) | ZTE Corporation | Draft CR to TS 38.101-5 Annex: NTN VSAT related FRC |

## 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 3 Rx requirement

*Sub-topic description:*

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

**Issue 2-1 REFSENS requirements**

* Proposal 1: -5dB G/T is proposed to derive the EIS requirements for fixed VSAT communicating with LEO only with electronical steering antenna. -115.6dBm EIS for 50MHz or -132.6dBm EIS per MHz can be specified in the spec. [Huawei, [R4-2402063](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402063.zip)]
* Proposal 2: to consider the basic principle as described in section 2.1 for minimum EIS requirements for VSAT. [ZTE, [R4-2402522](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402522.zip)]

The minimum EIS of NTN VSAT will support the NTN VSAT with capability of decoding low modulation order at the lowest supported elevation angle (e.g. 30 degree for GSO and FFS for LEO). Low MCS in the following calculation is based on QPSK with coding rate as 1/3, then corresponding SNR for 95% throughput should be around -1dB;

Where:

* SAN\_TxPower=X+30+10\*log10(BW)-[3/0]dB; X is assumed as 40 dBW/MHz for GEO and 10 dBW/MHz for LEO1200KM and 4 dBW/MHz for LEO600MHz; 3dB margin is considered for VSAT is located at the beamprint edge which is corresponding to 3dB beamwidth of radiation beam. If VSAT is located at the center of beamprint, 0dB margin could be considered
* Pathloss is the same as previous calculation for minimum peak EIRP and minimum output power; Note: if consider the pathloss captured in TR 38.811 clause 6.6, then LOS probability and shadow fading varying with elevation angle should be considered as well especially for the low elevation angle.
* Atmosphere loss is also the same as before.
* Proposal 3: For minimum EIS requirement,Lower aperture size/low antenna gain compared with 60cm/39.7dBi simulation assumption could be considered for minimum EIS requirement. [ZTE, Thales [**R4-2402523**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402523.zip)]
* Recommended WF:
	+ Proposal 3 is agreeable
	+ For other proposals, need further discussions.

**Issue 2-2: Maximum input power for NTN VSAT**

* Proposal 1: 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, [R4-2402063](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402063.zip)]
* Proposal 2: to consider the basic principle as described in section 2.2 for maximum input power for VSAT. [ZTE, [R4-2402522](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402522.zip)]

The maximum input power of NTN VSAT will support the NTN VSAT with capability of decoding highest modulation order at the supported elevation angle 90 closest to satellite, then corresponding SNR of DL 64QAM with 948/1024 coding rate for 95% throughput should be around 20dB;

Where:

* SAN\_TxPower=X+30+10\*log10(BW)-0dB; X is assumed as 40 dBW/MHz for GEO and 10 dBW/MHz for LEO1200KM and 4 dBW/MHz for LEO600MHz; 3dB margin is considered for VSAT is located at the beamprint edge which is corresponding to 3dB beamwidth of radiation beam. If VSAT is located at the center of beamprint, 0dB margin could be considered
* Pathloss is the same as previous calculation for minimum peak EIRP and minimum output power; Note: if consider the pathloss captured in TR 38.811 clause 6.6, then LOS probability and shadow fading varying with elevation angle should be considered as well especially for the low elevation angle.
* Atmosphere loss is also the same as before.



* Recommended WF:
	+ Proposal 1 is agreed
	+ Further discuss the exact value for maximum input power requirement.

**Issue 2-3: ACS**

* Proposal 1: Use an ACS value of 23 dB for VSAT NTN ACS at 17 GHz. [Thales]
	+ NOTE: In any case, currently, there is no practical reason for which ACS should be considered higher than 23 dB since there is no TN deployment at 17 GHz.
* Proposal 2: Solutions may include increasing Tx SAN power, increasing TN gNB antenna gain/directivity e.g. by increasing the number of antenna elements, decreasing TN gNB transmission power, using a guardband for a better protection from the TN gNB, increasing antenna gain of the VSAT UE or a combination of all. A note can be added in the specification for justifying 23 dB ACS. [Thales]
	+ NOTE: In any case, currently, there is no practical reason for which ACS should be considered higher than 23 dB since there is no TN deployment at 17 GHz.
* Recommended WF:
	+ Need to wait for the coexistence discussion [110][307].
	+ NOTE: Simulation results provided by THALES in R4-2402933 suggest the following 2/-6/ (a total of 5) potential solutions (or a combination of them):
	+ 1/ VSAT UE alone/default (which requires/indicates an ACS of 30-35 dBs as also confirmed/found in the simulations by other companies as well, with the current hypothesis)
	+ 2/ Increasing Tx SAN power by 6 dB (e.g. 10 dBW/MHz EIRP density instead of 4 dBW/MHz)
	+ 3/ Increasing TN gNB antenna gain by increasing the number of antenna elements (8x16 AAS -> 16x32 AAS, which corresponds to about 6dB antenna gain);
	+ 4/ Decreasing TN gNB transmission power by 6dB (Total TXP – 6dB  = 35 dBm);
	+ 5/ Using a frequency guard band for a better protection from the TN gNB (at least 5dB interference decrease from TN BS to NTN UE VSAT can be easily obtained as OFDM spectrum decreases with the increase of the guard band);
	+ 6/ Increasing antenna gain of the VSAT UE (e.g. by using a higher aperture such as 0.6 m -> 1.2 m NTN VSAT antenna diameter for instance or lower; in practice lower aperture can be also considered e.g. 0.8m or lower).

**Issue 2-4:** [**R4-2402061**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402061.zip)**, Huawei**

* Recommended WF:
	+ Postpone the endorsement until the core requirement was agreed

**Issue 2-5:** [**R4-2402330**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402330.zip)**, Ericsson**

* Recommended WF:
	+ Endorsed

**Issue 2-6:** [**R4-2402527**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402527.zip)**/**[**R4-2402528**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402527.zip)**/**[**R4-2402529**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402527.zip)**, ZTE**

* Recommended WF:
	+ Postpone the endorsement until the core requirement was agreed

**Issue 2-7: Others**

* Proposal 1: References and inputs should be carefully used between GSO and NGSO:

**i/ for GSO**

* (ESOMP/ESIM)

[EN 303 978 - V2.1.2 - Satellite Earth Stations and Systems (SES); Harmonised Standard for Earth Stations on Mobile Platforms (ESOMP) transmitting towards satellites in geostationary orbit, operating in the 27,5 GHz to 30,0 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU (etsi.org)](https://www.etsi.org/deliver/etsi_en/303900_303999/303978/02.01.02_60/en_303978v020102p.pdf)

* (initially developed for fixed terminals)

[EN 301 459 - V2.1.1 - Satellite Earth Stations and Systems (SES); Harmonised Standard for Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit, operating in the 29,5 GHz to 30,0 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU (etsi.org)](https://www.etsi.org/deliver/etsi_en/301400_301499/301459/02.01.01_60/en_301459v020101p.pdf)

* [EN 301 360 - V2.1.1 - Satellite Earth Stations and Systems (SES); Harmonised Standard for Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit, operating in the 27,5 GHz to 29,5 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU (etsi.org)](https://www.etsi.org/deliver/etsi_en/301300_301399/301360/02.01.01_60/en_301360v020101p.pdf)

**ii/ for NGSO**

* [EN 303 979 - V2.1.2 - Satellite Earth Stations and Systems (SES); Harmonised Standard for Earth Stations on Mobile Platforms (ESOMP) transmitting towards satellites in non-geostationary orbit, operating in the 27,5 GHz to 29,1 GHz and 29,5 GHz to 30,0 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU (etsi.org)](https://www.etsi.org/deliver/etsi_en/303900_303999/303979/02.01.02_60/en_303979v020102p.pdf)
* [EN 303 699 - V1.1.1 - Satellite Earth Stations and Systems (SES); Fixed earth stations communicating with non-geostationary satellite systems in the 20 GHz and 30 GHz FSS bands; Harmonised Standard for access to radio spectrum (etsi.org)](https://www.etsi.org/deliver/etsi_en/303600_303699/303699/01.01.01_60/en_303699v010101p.pdf)
* Proposal 2: RAN4 to decide if recommendation ERC 74-01 supersedes previous standards developed prior to ERC 74-01 and used as reference for TS 38.101-5.

NOTE: Please note that those standards (e.g. EN 303 978, EN 303 978, EN 303 699) have not yet been updated and therefore the recommendation is not yet applicable.

* Proposal 3: RAN4 to consider a minimum definition (based on manufacturer declaration) of pointing accuracy to allow some flexibility in the implementation, while still being consistent with the emission masks.
* Proposal 4: The manufacturer may select the right combination of pointing error and Off-Axis radiations to ensure, in any case, the resulting EIRP mask is met.
* Recommended WF:
	+ Need further discussions.

# Topic #2: PUSCH DMRS bundling

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2402064**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402064.zip) | Huawei, HiSilicon | CR for 38.101-5 to introduce Phase continuity requirements for NTN UE DMRS bundling |
| [**R4-2402496**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402496.zip) | Ericsson | Draft CR to 38.101-5 on DMRS bundling for FR1 |
| [**R4-2402497**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402497.zip) | Ericsson | Draft CR to 38.101-5 on DMRS bundling for FR2 |
| [**R4-2402498**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402498.zip) | Ericsson | LS on DMRS\_bundling capaiblity extension to FR2 FDD band |

## 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 General

*Sub-topic description:\*

**Issue 3-1: DMRS\_bundling capaiblity extension to FR2 FDD band**

* + Proposal-1:The new capability for DMRS bundling time window applicable to both NTN FR1 and FR2 band. [Ericsson,[R4-2402498](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402498.zip)]..
* Recommended for discussion
	+ To be further discussed online;
	+ From moderator perspective, the current phase continuity requirements cannot be directly reused without any justification.

**Issue 3-2:** [**R4-2402497**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402497.zip) **Draft CR to 38.101-5 on DMRS bundling for FR2**

* Recommended for discussion
	+ This is up to the decision of Issue 3-1.

**Issue 3-3: Draft CR to 38.101-5 on DMRS bundling for FR1**

* Recommended for discussion
	+ Consider the following two CRs to be agreed
* [R4-2402064](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402064.zip). CR from Huawei
* [R4-2402496](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_110/Docs/R4-2402496.zip) draft CR from Ericsson

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on … | YYY |  |
|  | LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |  |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx |  | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx |  | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents

# Annex

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
|  |  |  |

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)