**3GPP TSG-RAN WG4 Meeting#105 R4-221xxxx**

**Toulouse, France,14th Nov – 18th Nov,2022**

**Agenda item:** 8.23.4

**Source:** Moderator (ZTE)

**Title:** Email discussion summary for [105][139] 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.

Contact information

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

The e-mail discussion covers UE RF requirements for NTN in Ka-band. All contributions submitted are divided into the following Topics:

1. UE RF requirement for NTN in Ka-band

# Topic #1: UE RF requirement

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **R4-2219041** | Xiaomi | Discussion for NR to support non-terrestrial networks  **Observation 1: the term VSAT and ESIM describe UE types by different dimensions**  **Observation 2: it could use fixed and mobile VSAT to distinguish the UE types, and mobile VSAT further classified by different mobile platform which is also aligned with the description in WID.**  **Observation 3: because the antenna array gain should be considered from system performance for ka band, it is better only define radiated test metrics for ka band.**  **Observation 4: conducted test could be possible for VSAT UE with parabolic antenna.**  **Observation 5: if conducted test is adopted, it should be studied how to meet those regulation requirements specified as EIRP**  **Observation 6: conducted test is not feasible for VSAT UE with phase antenna array.**  **Proposal 1: the UE characteristics from Ts 38.821 could be as starting point to define the new power class.** |
| **R4-2219336** | THALES | NTN Terminals in above 10 GHz  **Proposal 1:** RAN4 to use aperture and power class to differentiate among directive terminals in above 10 GHz.  **Proposal 2:** RAN4 to discuss about Power Class definition for terminals in above 10 GHz.  **Proposal 3:** RAN4 to define one type of “NTN terminals” for above 10 GHz (covering VSAT and ESIM) as part of the NR\_NTN\_enh WI, but different classes characterised by a set of parameters (i.e. antenna aperture, pointing accuracy, Tx power, Noise figure, …).  **Note:** This terminal can be considered for different deployment types.  **Proposal 4:** Discuss a unified name can be used for future 3GPP standardization work to avoid some confusions, for example “NTN terminal”.  **Proposal 5:** RAN4 to use the following above 10 GHz NTN terminal parameters:  NTN Terminal Parameters   |  |  |  |  | | --- | --- | --- | --- | | **NTN Terminal Parameters** |  | **Tx (Uplink)** | **Rx (Downlink)** | | Polarisation |  | Circular | Circular | | Low Frequency | (MHz) | 27 500 | 17 700 | | Centre frequency |  | 28 750 | 18 950 | | High frequency |  | 30 000 | 20 200 | | Efficiency |  | 60% | 57% | | On-axis antenna gain at Fc | (dBi) | 42,9 | 39,0 | | Output power | (W) | 2 |  | | Output power | (dBW) | 3,0 |  | | Output loss | (dB) | -1,0 |  | | EIRP |  | **44,9** |  | | Receiver noise figure | (dB) |  | 1,2 | | Feeder loss | (dB) |  | -0,50 | | Sky temperature | (K) |  | 30 | | Ground temperature | (K) |  | 10 | | Antenna temperature | (K) |  | 40 | | G/T figure of merit | (dB/K) |  | **16,5** |   **Proposal 6:** With respect to NTN terminal secondary lobes, RAN4 to use the recommendation from ITU-R S.465-5:  cid:image040.png@01D8CE6D.E85A78B0 |
| **R4-2219381** | ZTE Corporation | Further discussion on UE RF requirements for NTN in Ka-band  **Proposal 1**: RAN4 should discuss whether all following use case should be included in Rel-18 or any deprioritization considering the workload and there are any commonalities between different use cases.   * Aeronautical ESIM or A-ESIM * Maritime ESIM or M-ESIM * Land ESIM or L-ESIM * Fixed VSAT   **Proposal 2**：At least parabolic/Dish antenna for fixed VSAT and ESIM should be considered in Rel-18 as first priority. Regarding the phase antenna array for ESIM, this could be discussed in the 2nd phase if there are no much market demand on it.  **Observation 1**: merits and demerits between parabolic antenna and phase antenna array are summarized in table 2.   |  |  |  |  | | --- | --- | --- | --- | | Parabolic antenna/Dish antenna | The beam tracking for parabolic antenna could be maintained by 3-Axis Stabilized + Auto Skew operation platform with assistance information Built in Gyro or GPS information. Basically, the beam steering capability is mechanical steering which is expected to be slower than digital beam steering.  Antenna aperture and output power of transceiver will decide the final EIRP values. | Mature and cheap and easy to be installed in many use cases. | A bit too bulky for some use case, for instance, aircraft or other portable mobile small BS. | | Phase antenna array | The beam tracking could be maintained by phase antenna array with digital beamforming, the beam steering capability is digital steering instead of mechanical steering  Antenna array size and output power of transceiver will decide the final EIRP values. | The beam steering capability is digital level which should be much faster than parabolic antenna by 3-Axis Stabilized + Auto Skew operation platform. | A bit expensive and might be not so typical for lots of use case. |   **Observation 2:** RF part for fixed VSAT and ESIM should be similar, however the satellite tracking capability might be different between ESIM connecting with GSO and fixed VSAT connecting with GSO or NGSO.  **Proposal 3**: if satellite tracking capability is part of RF requirement and the required satellite tracking capability are also different between ESIM and fixed VSAT, then we need to specify the different power class for ESIM and fixed VSAT.  **Proposal 4:** for ESIM or fixed VSAT with parabolic antenna implementation, then at least conducted requirement should be defined/specified and further discuss whether we need to specify the radiated requirements for it.  **Proposal 5:** for ESIM or [fixed VSAT] with phase antenna array, only radiated requirement should be defined/specified.  **Proposal 6**: the transmit power 33dBm could be used as baseline for power class definition of VSAT or ESIM with parabolic antenna.  **Proposal 7**: for VSAT or ESIM with parabolic antenna, propose not to define EIRP limit for it and leave this to the implementation based on the legacy approach.  **Proposal 8:** for VSAT and ESIM with phase antenna array, minimum peak EIRP, UE maximum output power limits and UE spherical coverage requirements should be defined. More inputs from satellite vendors are needed especially for the range of the required EIRP covering different kind of service.  **Proposal 9:** for VSAT and ESIM with parabolic antenna, beam correspondence is not needed since its uplink satellite tracking capability is not replying on downlink SSB or CSI-RS signals.  **Proposal 10:** for VSAT and ESIM with phase antenna array, beam correspondence is not needed since its uplink satellite tracking capability might be not replying on downlink SSB or CSI-RS signals anymore. |
| **R4-2219631** | Huawei, HiSilicon | Discussion on Ka band NTN UE  **Proposal 1: it’s proposed specify a unified term for future 3GPP standardization work to avoid some confusion.**  **Option 1: ESIM - Earth Stations In Motion**  **Option 2: VSAT - Very Small Aperture Terminal**  **Proposal 2: As ESIM has a clear definition and regulation in ITU, we prefer to use “Option 1: ESIM - Earth Stations In Motion” as a unified term for future 3GPP standardization work.**  **Proposal 3: Considering the huge workloads, it’s proposed to consider L-ESIM as first priority in R18. A-ESIM and L-ESIM can be discussed after completion of L-ESIM.**  **Observation 1: generally dish antennas are suitable to Medium Earth Orbit or High Earth orbit (GSO) scenarios and can achieve a good antenna gain to compensate the larger path loss.**  **Observation 2: phased array antennas are more suitable to Low Earth Orbit scenarios.**  **Proposal 4: if LEO scenario is the first priority, it’s recommended to assume phased array antennas in R18. If MEO/GSO scenarios are the first priorities, it’s recommended to assume dish antennas in R18.**  **Observation 3: IF conversion stage could be assumed in Ka band NTN terminal. The specific details, e.g. exact frequency of the IF and single/multiple IF stages, can be left to implementation.**  **Observation 4: The maximum peak EIRP in normal direction should depend on the specific deployed scenarios. Different earth orbit may need different values of maximum EIRP in normal direction based on link budget and capability demands. Thus, only one kind of power class is not enough for NTN terminals.**  **Observation 5: the delta value between maximum peak EIRP in normal direction and minimum peak EIRP in slant beam depends on the maximum angle of beam steering and direction pattern of antenna element.**  **Observation 6: it is meaningless to specify spherical coverage for Ka band NTN terminals since narrow beam is implemented to achieve higher antenna gain.**  **Proposal 5: It’s proposed to develop a new sets of output power/EIRP/TRP requirements for Ka band NTN terminals.**  **Proposal 6: leveraging ephemeris information and GNSS signals can be a candidate solution for selecting UL/DL beam. However, selecting UL/DL beams based on the DL measurements is still needed for the scenarios that UE can’t acquire the accurate GNSS signals and ephemeris information.**  **Proposal 7: The OTA reference sensitivity requirements should be verified with the test metric of EIS. But the required antenna gains are different for different scenarios or earth orbits.** **It's up to implementation to achieve enough isolation between Tx and Rx antennas, so that Tx signal will have no impacts on Rx.** |
| **R4-2219989** | Qualcomm Incorporated | NTN UE device types for >10 GHz  **Observation: There is a benefit for indicating UE types to distinguish capability, function, and requirements of the UE.**  **Observation: Signaling options to indicate UE type include**   1. **Using the power class to represent the UE type encompassing more than output power,** 2. **Defining a new signaling IE to represent UE type,** 3. **Using the power class and discrete capabilities (some of which are already available, others to be added as needed) to represent UE type.** |
| **R4-2220027** | Intel Corporation | RF requirements for NTN UE  **Observation 1:** To assess which performance metrics and regulatory information will be included in the NTN UE power class definition, RAN4 should first align on the characteristics of the UE within this work item.  **Proposal 1:** Further discuss the full description of NTN UE and agree on the characteristics to be used to define its power class.  **Observation 2:** The *general* FR2 power class framework can be used for NTN UEs, i.e., the power class definition will include RF performance metrics and capture relevant regulatory stipulations for the NTN UE represented in the class.  **Observation 3:** After we agree on the detailed characteristics of the NTN UE, RAN4 should further discuss which performance requirements and regulatory information will be included in the power class definition. |

## 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 power class and UE types for VSAT UE

*Sub-topic description:\*

*Moderator’s highlights:*

From the moderator’s understanding from ITU-R perspective, ESIM is usually targeted for FSS under the current ITU regulatory framework and whether whole FSS band should be included for NTN Ka-band definition is still under the discussion. In short, from ITU definition perspective, ESIM should be applicable for FSS band in GEO scenario. In addition, for MSS band, we should use Mobile Earth Station (MES) instead of ESIM.

For MSS-band, we might have mobile earth station (MES) to be defined.

For FSS-band, we might have fixed earth station and earth station in motion (ESIM) to be defined.

**Issue 1-1: The terminology alignment for NTN UE in Ka-band from ITU perspective**

* Proposal :
  + Option 1: As ESIM has a clear definition and regulation in ITU, we prefer to use “Option 1: ESIM - Earth Stations In Motion” as a unified term for future 3GPP standardization work.. [Huawei,R4-2219631]
* Recommended for GTW discussion:
  + Please share the views for UE types for both MSS and FSS in general
  + Further discuss how to consolidate it into single one which could be applicable for both MSS and FSS if possible in the following other issues.

**Issue 1-2: The scope of NTN UE in Ka-band from 3GPP perspective**

* Proposal :
  + Option 1: RAN4 should discuss whether all following use case should be included in Rel-18 or any deprioritization considering the workload and there are any commonalities between different use cases. [ZTE R4-2219381]
* Aeronautical ESIM or A-ESIM
* Maritime ESIM or M-ESIM
* Land ESIM or L-ESIM
* Fixed VSAT
  + Option 2: Considering the huge workloads, it’s proposed to consider L-ESIM as first priority in R18. A-ESIM and L-ESIM can be discussed after completion of L-ESIM. [Huawei,R4-2219631]
  + Option 3: other
* Recommended for GTW discussion:
  + Q1: Whether for FSS band, L-ESIM should be discussed as first priority and for the types e.g. fixed VSAT, A-ESIM and M-ESIM should be treated as second priority;
  + Q2: Any priority for MSS-band;

Moderator note: for ESIM in FSS band, only GSO should be supported based on the ITU recommendation.

**Issue 1-3: Whether and how to consolidate the terminology for future 3GPP standardization work to avoid some confusion.**

* Proposal :
  + Proposal 1: it’s proposed specify a unified term for future 3GPP standardization work to avoid some confusion. [Huawei,R4-2219631]

Option 1: ESIM - Earth Stations In Motion

Option 2: VSAT - Very Small Aperture Terminal

* + Proposal 2: As ESIM has a clear definition and regulation in ITU, we prefer to use “Option 1: ESIM - Earth Stations In Motion” as a unified term for future 3GPP standardization work. [Huawei,R4-2219631]
  + Proposal 3: it could use fixed and mobile VSAT to distinguish the UE types, and mobile VSAT further classified by different mobile platform which is also aligned with the description in WID. [Xiaomi R4-2219041]
  + Proposal 4: RAN4 to define one type of “NTN terminals” for above 10 GHz (covering VSAT and ESIM) as part of the NR\_NTN\_enh WI, but different classes characterised by a set of parameters (i.e. antenna aperture, pointing accuracy, Tx power, Noise figure, …). [THALES R4-2219336]

Note: This terminal can be considered for different deployment types.

* + Proposal 5: Discuss a unified name can be used for future 3GPP standardization work to avoid some confusions, for example “NTN terminal”. [THALES R4-2219336]
* Recommended for GTW discussion:

Moderator note:

ESIM should be specific to be deployed in GSO scenario in FSS band, it might be better to use fixed and mobile VSAT as general one. Maybe fixed and mobile VSAT could be further consolidated if no RF requirement difference are identified at the end.

**Issue 1-4: Antenna assumptions for NTN UE in Ka-band**

* Proposal :
  + Proposal 1: At least parabolic/Dish antenna for fixed VSAT and ESIM should be considered in Rel-18 as first priority. Regarding the phase antenna array for ESIM, this could be discussed in the 2nd phase if there are no much market demand on it. [ZTE R4-2219381]
  + Proposal 2: generally dish antennas are suitable to Medium Earth Orbit or High Earth orbit (GSO) scenarios and can achieve a good antenna gain to compensate the larger path loss. [Huawei,R4-2219631]
  + Proposal 3: phased array antennas are more suitable to Low Earth Orbit scenarios. [Huawei,R4-2219631]
  + Proposal 4: if LEO scenario is the first priority, it’s recommended to assume phased array antennas in R18. If MEO/GSO scenarios are the first priorities, it’s recommended to assume dish antennas in R18. [Huawei,R4-2219631]
  + Proposal 5: RAN4 to use the following above 10 GHz NTN terminal parameters: [THALES R4-2219336]

NTN Terminal Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **NTN Terminal Parameters** |  | **Tx (Uplink)** | **Rx (Downlink)** |
| Polarisation |  | Circular | Circular |
| Low Frequency | (MHz) | 27 500 | 17 700 |
| Centre frequency |  | 28 750 | 18 950 |
| High frequency |  | 30 000 | 20 200 |
| Efficiency |  | 60% | 57% |
| On-axis antenna gain at Fc | (dBi) | 42,9 | 39,0 |
| Output power | (W) | 2 |  |
| Output power | (dBW) | 3,0 |  |
| Output loss | (dB) | -1,0 |  |
| EIRP |  | **44,9** |  |
| Receiver noise figure | (dB) |  | 1,2 |
| Feeder loss | (dB) |  | -0,50 |
| Sky temperature | (K) |  | 30 |
| Ground temperature | (K) |  | 10 |
| Antenna temperature | (K) |  | 40 |
| G/T figure of merit | (dB/K) |  | **16,5** |

Moderator note for proposal 5: band definition is still under the discussion in system parameter part and EIRP should be dBW. Proposal 5 is for Dish antenna only.

* Recommended for GTW discussion:

Q1: Whether both dish antenna and phase antenna array could be considered for NTN UE in Ka-band;

Q2: Further discuss its respective applicability of antenna assumption to satellite orbit;

**Issue 1-5: Side lobes assumption for NTN UE in Ka-band**

* Proposal :
  + Proposal 1: With respect to NTN terminal secondary lobes, RAN4 to use the recommendation from ITU-R S.465-5 [THALES R4-2219336]
* Recommended for GTW discussion:

Moderator note for proposal 1: side lobe assumption for antenna is only used for the coexistence simulation only and potential spherical coverage requirement if needed, I don’t see its necessity to be discussed in this meeting.

**Issue 1-6: How to differentiate UE types for NTN UE in Ka-band;**

* Proposal :
  + Proposal 1: RAN4 to use aperture and power class to differentiate among directive terminals in above 10 GHz. [THALES R4-2219336]
  + Proposal 2: Further discuss the full description of NTN UE and agree on the characteristics to be used to define its power class. [Intel Corporation,R4-2220027]

Observation 1: To assess which performance metrics and regulatory information will be included in the NTN UE power class definition, RAN4 should first align on the characteristics of the UE within this work item.

* + Proposal 3: Signaling options to indicate UE type include [Qualcomm,R4-2219989]
* Using the power class to represent the UE type encompassing more than output power,
* Defining a new signaling IE to represent UE type,
* Using the power class and discrete capabilities (some of which are already available, others to be added as needed) to represent UE type.
  + Proposal 3: if satellite tracking capability is part of RF requirement and the required satellite tracking capability are also different between ESIM and fixed VSAT, then we need to specify the different power class for ESIM and fixed VSAT. [ZTE R4-2219381]
* Recommended for GTW discussion:

Moderator note: we need to agree on the fixed and mobile VSAT firstly for NTN UE in Ka-band, then further discuss its antenna assumption (e.g. dish antenna or phase antenna array) and its corresponding transmit power, finally we could draw the conclusion how many UE types are needed. In short, this could reply on lots of progress in other issues.

### Sub-topic 2 Beam correspondence

*Sub-topic description:*

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

**Issue 2-1: Beam correspondence requirement**

* Proposals
  + Proposal 1: for VSAT and ESIM with parabolic antenna, beam correspondence is not needed since its uplink satellite tracking capability is not replying on downlink SSB or CSI-RS signals. [ZTE R4-2219381]
  + Proposal 2: for VSAT and ESIM with phase antenna array, beam correspondence is not needed since its uplink satellite tracking capability might be not replying on downlink SSB or CSI-RS signals anymore. [ZTE R4-2219381]
  + Proposal 3: leveraging ephemeris information and GNSS signals can be a candidate solution for selecting UL/DL beam. However, selecting UL/DL beams based on the DL measurements is still needed for the scenarios that UE can’t acquire the accurate GNSS signals and ephemeris information. [Huawei,R4-2219631]
* Recommended for GTW discussion:
  + Q1: Whether for fixed or mobile VSAT in both FSS and MSS-band, BC is not needed if satellite ephemeris information and GNSS signals could be available at ground terminal side;
  + Q2: justify the scenario where UE cannot acquire the accurate GNSS signals and ephemeris information;
  + Q3: if to define the BC requirement for NTN UE in Ka-band, we should clarify it should be based on Rel-15 BC or Rel-16 eBC requirement. Whether BC in initial access and RRC\_INACTIVE Status in Rel-18 are also applicable for NTN UE in Ka-band?

### Sub-topic 3 Implementation assumption for NTN VSAT UE

*Sub-topic description:*

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

**Issue 3-1: IF conversion**

* Proposals
  + Proposal 1: IF conversion stage could be assumed in Ka band NTN terminal. The specific details, e.g. exact frequency of the IF and single/multiple IF stages, can be left to implementation. [Huawei,R4-2219631]
* Recommended for GTW discussion
  + Companies’ views are encouraged during the meeting.

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### Sub-topic 4 RF requirements for NTN UE in Ka-band

*Sub-topic description:*

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

**Issue 4-1: For NTN UE with parabolic antenna, whether conducted requirement or radiated requirement or both should be defined.**

* Proposals
  + Proposal 1: because the antenna array gain should be considered from system performance for ka band, it is better only define radiated test metrics for ka band. [Xiaomi R4-2219041]
  + Proposal 2:: conducted test could be possible for VSAT UE with parabolic antenna. [Xiaomi R4-2219041]
  + Proposal 3: if conducted test is adopted, it should be studied how to meet those regulation requirements specified as EIRP [Xiaomi R4-2219041]
  + Proposal 4: for ESIM or fixed VSAT with parabolic antenna implementation, then at least conducted requirement should be defined/specified and further discuss whether we need to specify the radiated requirements for it. [ZTE R4-2219381]
  + Proposal 5: for VSAT or ESIM with parabolic antenna, propose not to define EIRP limit for it and leave this to the implementation based on the legacy approach. [ZTE R4-2219381]
  + Proposal 6: It’s proposed to develop a new sets of output power/EIRP/TRP requirements for Ka band NTN terminals. [Huawei,R4-2219631]
* Recommended for GTW discussion
  + For NTN UE with parabolic antenna, to define the conducted requirement and further discuss how to define radiated requirement for it (e.g. EIRP limits, etc)

**Issue 4-2: For NTN UE with phase antenna array, radiated requirement only to be defined?**

* Proposals
  + Proposal 1: conducted test is not feasible for VSAT UE with phase antenna array. [Xiaomi R4-2219041]
  + Proposal 2: for ESIM or [fixed VSAT] with phase antenna array, only radiated requirement should be defined/specified. [ZTE R4-2219381]
  + Proposal 3: It’s proposed to develop a new sets of output power/EIRP/TRP requirements for Ka band NTN terminals. [Huawei,R4-2219631]
* Recommended for GTW discussion
  + For NTN UE with phase antenna array if defined, only radiated requirements are to be specified.

**Issue 4-3: Other specific RF requirements for NTN UE in Ka-band**

* + Proposal 1: [ZTE R4-2219381]

|  |  |  |
| --- | --- | --- |
|  | **Band-specific or not** | **Applicability** |
| **Transmitter Characteristics** |  |  |
| General | No | To follow the existing text from TN UE in TS 38.101-2 |
| Tx power | Yes | To define new power for NTN VSAT with parabolic antenna should be defined and the following requirement should be considered:   * Power class : 33dBm   If necessary, new power for NTN VSAT with phase antenna array should be defined and the following requirement should be considered   * UE minimum peak EIRP * UE maximum output power limits * UE spherical coverage (TBD %-tile CDF should be revisited for NTN VSAT UE) |
| MPR | No | This depends on the ACLR, SEM and EVM requirement and discussion could be postponed until other requirement is more clear. |
| A-MPR | Yes | This depends on other coexistence requirement or regulatory requirement. Operators ‘s input are encouraged. |
| Configured Tx power | No | To follow the existing text from TN UE in TS 38.101-1 for NTN VSAT with parabolic antenna .  To follow the existing text from TN UE in TS 38.101-2 for NTN VSAT with phase antenna array |
| Output Power Dynamics | No | The minimum output power for NTN VSAT UE, this could be further discussed.  Transmitter OFF power and ON-OFF time mask and power control related parameter in TS 38.101-1/2 could be good starting point. |
| Transmit signal quality |  |  |
| - Frequency error | No | to follow the requirement defined in TS38.101-5 where UE UL pre-compensation is still needed. |
| - Transmit modulation quality | No | To follow the existing requirement defined for TS 38.101-1/2, however the maximum modulation order could be further discussed similar as Rel-17 NR over NTN  Carrier leakage and in-band emission are also power class specific requirement and this could be further discussed. |
| Output RF spectrum emissions |  |  |
| - Occupied bandwidth | No | To follow the existing requirement defined for TS 38.101-1/2. |
| - Out of band emission |  |  |
| - SEM | No | This depends on the outcome of coexistence study. |
| - Additional SEM | Yes | additional requirement are expected for ITU resolution 169 in WRC-19 and [156] for WRC-15 |
| - ACLR | No | This depends on the outcome of coexistence study. |
| - Spurious emission |  |  |
| - General | No | To follow the existing requirement defined for TS 38.101-2. |
| - For UE coexistence | Yes | Coexistence requirement for the surrounding TN bands should be considered. |
| Transmit intermodulation | No | Not applicable similar as FR2 UE RF |
| Beam correspondence | No | Please see the above analysis |
| **Receiver characteristics** |  |  |
| General | No |  |
| Diversity characteristics | No |  |
| Reference sensitivity | Yes | For NTN VSAT with parabolic antenna, the following requirements should be defined for NTN VSAT UE.   * conducted sensitivity power level   For NTN VSAT with phase antenna array, the following requirements should be defined for NTN VSAT UE.   * Reference sensitivity power level * EIS spherical coverage requirement |
| Maximum input level | No | Further system level evaluation is needed and this requirement might be relaxed similar as Rel-17 NR NTN. |
| ACS | No | This depends on the outcome of coexistence study. |
| Blocking characteristics |  |  |
| - In-band | No | This depends on the outcome of coexistence study. |
| - Out-of-band | NA | NA |
| - Narrow band | NA | NA |
| Spurious response | NA | NA. |
| Intermodulation | NA | NA |
| Spurious emissions | No | To follow the existing requirement defined for TS 38.101-1/2. |

* + Proposal 2: it is meaningless to specify spherical coverage for Ka band NTN terminals since narrow beam is implemented to achieve higher antenna gain. [Huawei,R4-2219631]
  + Proposal 3: It’s proposed to develop a new sets of output power/EIRP/TRP requirements for Ka band NTN terminals. [Huawei,R4-2219631]
  + Proposal 4: The OTA reference sensitivity requirements should be verified with the test metric of EIS. But the required antenna gains are different for different scenarios or earth orbits. It's up to implementation to achieve enough isolation between Tx and Rx antennas, so that Tx signal will have no impacts on Rx. [Huawei,R4-2219631]
* Recommend
  + Companies’ views are encouraged during the meeting.

# 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 |  |
|  |  |  |  |  |  |
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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)