**3GPP TSG RAN Meeting #90-e RP-20XXXX**

**e-meeting, 7-11th December 2020**

Source: Thales (Email discussion moderator)

Title: Summary of email discussion [90E][27][R17\_NTN\_bands&scope] Fine tuning round

TDOC Type: report

Agenda Item: 9.8.6 Solutions for NR to support non-terrestrial networks (NTN) [RAN2 WI: NR\_NTN\_solutions]

Document for: discussion

Release: Rel-17

# Introduction

The following TDOC is submitted to the email discussion decided during RAN#90-E and referenced as follow :

* [90E][27][R17\_NTN\_bands&scope] Initial round (Thales)

Goal: Generate an agreeable way forward and handling NTN bands. Generate revised WID if needed.

Input contributions covered: 2296, 2403, 2707, 2732, 2404, 2406

Moderator: Nicolas Chuberre

The referred contributions entail:

1/ proposals related to the handling of NTN bands:

* RP-202296: “HAPS Bands”, Loon, Google, Intelsat, Softbank, Nokia
  + Proposal 1: Use the term HAPS for now. Terminologies and definitions of HAPS/HIBS should be followed by the ITU-R decision after they conclude studies for WRC-23.
  + Proposal 2: There is no need to specify any new HAPS specific bands in NTN WI but select at least one example band of the existing NR bands which is identified for HAPS deployment by operators.
  + Proposal 3: To demonstrate coexistence between HAPS and TN networks, RAN4 to study at least one example band.
* RP-202403: “Handling of satellite bands in 3GPP-follow-up” , Thales, Hughes Network Systems, Intelsat, Eutelsat, Inmarsat, ESA, Fraunhofer HHI, Fraunhofer IIS, Sateliot, Gatehouse
  + It proposes to revise the proposal 4 of RP-202120 Summary of email discussion [89E][28][Satellite\_bands], Thales (Email discussion moderator) as follow
    - Proposal 4: Traditional 3GPP work for developing generic requirements, such as inter-carrier co-existence to decide ACLR etc. should be followed where possible but may have to be adapted for the satellite case. Adaptations if needed shall be defined by RAN4. ~~Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications of nor cause degradation (in the sense of RAN4 co-existence studies) to present and future networks in 3GPP specified terrestrial bands.~~ The development of 3GPP specifications in satellite band for NTN use shall not impact the existing specifications of 3GPP terrestrial bands.
* RP-202707: “Frequency range considerations”, Thales
  + Proposal: For the development of 3GPP specifications in a satellite band falling fully or partly in 7-24 GHz frequency range, the recommendations of TR 38.820 should be taken into account

2/ proposals related to WI scope:

* RP-202404: “rational for the revision of WID NR-NTN-solutions”, Thales, Hughes Network systems, ZTE, Firstnet, Qualcomm, Intelsat, Samsung, ESA, CATT, Apple, Softbank
  + Proposal 1: Add at the end of the clause 3. Justification the following sentence
  + “As per TR 38.821, it shall be assumed that handheld devices with Power class 3 at least in FR1 and other devices (including fixed and moving platform mounted devices) are supported”.
  + Proposal 2: Add two principles in clause 4.1 Objective of SI or Core part WI or Testing part WI
    - “Handheld devices with Power class 3 at least in FR1 are supported
    - Other devices (including fixed and moving platform mounted devices) are supported.”
* RP-202406: “revised WID NR-NTN-solutions”, XXX
  + Proposed revisions in line with RP-202404
* RP-202732: “About fixed and moving platform mounted device for NTN”, Hughes Network Systems, Thales, Intelsat, ESA
  + Proposal 1: As per TR 38.821, it shall be assumed that both handheld UE (including smartphones) and other (fixed/moving platform mounted) UE are supported in the Rel-17 WI NR-NTN-solutions.

# Initial round discussion

## 2.1 NTN bands aspects

Based on the proposals related to NTN bands (in clause 1 of this TDOC), the following questions are proposed:

**Question NTNB-1 (related to RP-202403): Can the following proposed revision of *RP-202120’s Proposal 4 (endorsed at RAN#89-e)* related to the handling of “satellite” bands be approved?**

***Proposal 4: Traditional 3GPP work for developing generic requirements, such as inter-carrier co-existence to decide ACLR etc. should be followed where possible but may have to be adapted for the satellite case.*** ***Adaptations if needed shall be defined by RAN4. ~~Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications of nor cause degradation (in the sense of RAN4 co-existence studies) to present and future networks in 3GPP specified terrestrial bands~~*** ***The development of 3GPP specifications in satellite band for NTN use shall not impact the existing specifications of 3GPP terrestrial bands.***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree to revise the proposal 4 but with modifications to the above | We suggest the following alternative wording for the revision:  ***Proposal 4: Traditional 3GPP work for developing generic requirements, such as inter-carrier co-existence to decide ACLR etc. should be followed where possible but may have to be adapted for the satellite case. Adaptations if needed shall be defined by RAN4. ~~Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications of nor cause degradation (in the sense of RAN4 co-existence studies) to present and future networks in 3GPP specified terrestrial bands~~ The definition of new 3GPP bands (e.g. for NTN) shall not impact the existing specifications of 3GPP bands. Existing RAN4 adjacent channel coexistence study approach will be used to the possible extent and adapted if needed to take into account satellite communication systems specific deployment & operational characteristics.*** |
| Ligado | Disagree | We do not see the necessity to change the language previously endorsed at RAN#89-e. |
| T-Mobile USA | Disagree | We had already agreed to text in RAN#89e and do not need to revisit this again. |
| Hughes | Agree with comments | Agree with the alternative wording |
| Loon, Google | Agree | Agree with the alternative wording |
| SoftBank | ? | We would like to understand the motivation more why this revision is necessary on top of the previous agreement. |
| DISH | Disagree | The version endorsed in previous Plenary should be approved. The proposal here is trying to reverse some parts of the previously endorsed discussion points. |
| Intelsat | Agree | Agree with alternative wording |
| Ericsson |  | In our understanding, the agreement last meeting captures the essential aspect that RAN4 requirements need to ensure the same level of inter-operator co-existence.  Regarding the deleted sentence, our understanding is that the “nor cause degradation” part is referring to RAN4 co-existence simulations not showing degradation, which is why the “in the sense of RAN4 co-existence simulations” is added.  The Thales wording we understand as aiming to improve the clarity and avoid misunderstanding. What is missing is capturing that the requirements should be set such that the impact of victim networks seen in the co-existence simulations is the same as rel-15 NR. To capture that, we suggest adding the yellow sentence (or alternatively keeping the existing wording if it is now clear to everyone).  ***The definition of new 3GPP bands (e.g. for NTN) shall not impact the existing specifications of 3GPP bands. Existing RAN4 adjacent channel coexistence study approach will be used to the possible extent and adapted if needed to take into account satellite communication systems specific deployment & operational characteristics Requirements should be set such that no more than 5% loss in average and 5th percentile throughput in a victim network is seen in simulations in the same manner as Rel-15 NR*** |
| ZTE | Disagree | It seems that there is no strong reason to update the previous agreements |
| Inmarsat | Agree | Agree with alternative wording by Thales.  **RATIONALE:** Given the substantial difference between TN and NTN deployment scenarios and the lack of proper study, it is impossible to define such a specific KPI so early.  There is a general bona-fide agreement that the aim is to produce specifications that will allow peaceful co-existence, but, whilst TN-TN scenarios (upon which the 5% loss in average and 5th percentile throughput degradation KPI is based) are pretty well-known by now to 3GPP, this is not yet the case in TN-NTN/NTN-TN and NTN-NTN. As such, they need to be studied first. |
| Rakuten Mobile | Disagree | We don’t see the need to change the previous wording. |
| Panasonic | Agree with comments | We agree to the alternative wording by Thales |
| MediaTek |  | The issue of potential impact of new 3GPP bands for NTN on terrestrial bands could be up to RAN4 when discussing generic requirements, such as inter-carrier co-existence to decide ACLR. This may include performance metrics when discussing scenarios and requirements. |
| Huawei/HiSilicon |  | The latest proposal from RAN#89e seems OK as it was. Further details on RAN4 study methodologies can be left for RAN4 discussions where there is such expertise. |
| Eutelsat | Agree | Agree with wording as proposed by Thales in their comment above. |
| Apple |  | We would like to understand the motivation for this change as well and believe it is up to RAN4 when discussing these requirements. We don’t believe there is real need to change the existing agreements from RAN#89e. |

In summary:

* Agree: 0 organizations ()
* Agree with changes: 8 organizations (Thales, Hughes, Loon, Intelsat, Ericsson, Inmarsat, Panasonic, Eutelsat)
* Disagree: 6 organizations (Ligado, T-Mobile USA, Dish, ZTE, Rakuten Mobil)
* No opinion: 3 organisations (Softbank, Mediatek, Huawei)

About the suggestions

* Thales, Hughes, Loon, Intelsat, Inmarsat, Panasonic, Eutelsat propose a new wording
* Ericsson suggest to add on top of Thales et al’s new wording “***Requirements should be set such that no more than 5% loss in average and 5th percentile throughput in a victim network is seen in simulations in the same manner as Rel-15 NR***”
* Inmarsat, Mediatek, Huwaei: suggests to let RAN4 decide about the method and possibly impact associated to adjacent channel coexistence study between NTN/TN
* Softbank questions the motivation more why this revision is necessary on top of the previous agreement
  + *Moderator: During TSG-RAN#89-e, it was agreed that “proposal 1-4 are endorsed (see RP-202120) and further development of these proposals is planned for the next RAN #90e”. This is reflected in the chairman’s report (RP-202124).*

Based on the above, the moderator suggests to start again from the controversial proposal and suggest some corrections aiming at clarifications and refocus the sentence on 3GPP scope of responsibility.

* ***Proposal 4: Traditional 3GPP work for developing generic requirements, such as inter-carrier co-existence to decide ACLR etc. should be followed where possible but may have to be adapted for the satellite case. Adaptations if needed shall be defined by RAN4. Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications ~~of~~ nor cause degradation (in the sense of RAN4 adjacent channel co-existence studies) to the relevant networks ~~to present and future networks~~ in 3GPP specified ~~terrestrial~~ bands.”***

**Question NTNB-2 (related to RP-202707): Can the following proposal related to the handling of “Satellite” bands be approved as it is ?**

***Proposal: For the development of 3GPP specifications in a satellite band falling fully or partly in 7-24 GHz frequency range, the recommendations of TR 38.820 should be taken into account:***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree with modifications | Actually, there are no recommendations in the TR 38.820, therefore, we suggest an alternative wording for the proposal:  ***For the development of 3GPP specifications for ~~in a~~ satellite band falling fully or partly in 7-24 GHz frequency range, existing 3GPP specifications and studies ~~the recommendations of~~ (e.g. TR 38.820) should be taken into account*** |
| T-Mobile USA | Agree w/mod | as modified by Thales in their comment |
| Hughes | Agree | As modified above |
| SoftBank | ? | We don’t really sure what is the common understanding of the group, but we want to clarify first whether the development of a 3GPP specification for 7-24GHz is the scope of this WI.  If we understand correctly, the current NTN WID doesn’t explicitly says so. Also, Note 1 in the WID says that target is FR1 or FR2 (sited below for your reference)  *Note 1: It is assumed that this work item will be frequency agnostic and therefore we can consider that NTN can operate in FR1 or FR2 ranges.*  Since TR 38.820 mentions that we should specify many things from RAN1, 2 and 4 point of view, we want to clearly capture it in the WID (if we have a consensus to do so). |
| Intelsat | Agree | Agree with the modification as noted in the Thales response above |
| Ericsson | Disagree | Although there has been a study, 3GPP has not defined any UE (or BS) requirements in this range. If a band in this range is used then more work will be needed to build on the study on technology capabilities and consider UE architectures, requirements approach, FR etc.  Anyhow RAN4 can agree the example band, and clearly all relevant studies and standards should be taken into account. |
| ZTE |  | This proposal may not be needed since in last meeting we already agree that “***Proposal 3: The proponents of a RAN4 led “satellite” band specific WI are expected to reference all the relevant sources***” |
| Inmarsat | Agree with modified wording | Agree with modification proposed by Thales |
| Rakuten Mobile | Disagree | We don’t see the need of this proposed assumption. It is already mentioned as FR1 or FR2 targeted. Therefore, this proposal will change the WID scope itself, which was approved previously. |
| Panasonic | Agree with comments | We agree to the alternative wording by Thales |
| MediaTek |  | It can be up to RAN4 to check all relevant sources including TR 38.820 for satellite band specific WI as discussed and agreed in last meeting. |
| Huawei/HiSilicon | Agree with modifications | As per NTN WID, 7-24GHz is not included the WI scope, this is because that frequency range has not yet been defined by 3GPP. It would be good to finish what is in the WI scope before working on something not in the WI scope. We therefore provide some further revision based on Thales’s alternative wording:  ***The work for a satellite band falling fully or partly in 7-24 GHz frequency range can be considered after completion of exemplary band for FR1/FR2. For the development of 3GPP specifications for ~~in a~~ satellite band falling fully or partly in 7-24 GHz frequency range, if agreed, existing 3GPP specifications and studies ~~the recommendations of~~ (e.g. TR 38.820) should be taken into account*** |
| Eutelsat | Disagree | Further work would be needed to consider this frequency range. |
| Apple | Disagree | 3GPP hasn’t yet defined the specifications for UEs for 7-24GHz frequency ranges and thus will need to first do so before we can address this question. The reference TR and further discussions can happen after that. |

In summary:

* Agree: 1 organization (Intelsat)
* Agree with changes: 6 organizations (Thales, T-Mobile, Hughes, Inmarsat, Panasonic, Huawei)
* Disagree: 3 organizations (Ericsson, Rakuten, Eutelsat)
* No opinion: 3 organizations (Softbank, ZTE, Mediatek)

About the suggestions

* Thales proposes a new wording
* ZTE: statement not needed since already captured in proposal 3 of RP-202120
* Softbank request clarification on whether the development of a 3GPP specification for 7-24GHz is the scope of this WI
* Huawei suggest a new wording to clarify when such band can be discussed in 3GPP.

Based on the above, the moderator suggests to start from Huawei suggested wording

* ***The work for a satellite band falling fully or partly in 7-24 GHz frequency range can be considered once the work on exemplary band(s) has sufficiently progressed. For the development of 3GPP specifications for satellite band falling fully or partly in 7-24 GHz frequency range, if agreed, existing 3GPP specifications and studies (e.g. TR 38.820) should be taken into account.***

**Question NTNB-3 (related to RP-202296): Should RAN4 as part of the Rel-17 NR-NTN-solutions WI select as exemplary band, one of the existing NR bands which is identified for HAPS deployment by operators ?**

* *(see RP-202296’s Proposal 2: There is no need to specify any new HAPS specific bands in NTN WI but select at least one example band of the existing NR bands which is identified for HAPS deployment by operators.)*

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales |  | This is not a negligible activity and therefore additional TUs for RAN4 would need to be allocated accordingly. |
| T-Mobile USA | Disagree | An operator who is planning a deployment of an NTN should bring forth a band for whence they are planning testing or commercial deployments. If a vendor brings forth a band for testing that too would be acceptable. But to name a band just so there is a band defined is not an acceptable use of the limited resources in RAN4. The word ‘exemplary’ implies a show band and there is no need for the ‘if you build it they will come’ concept of spectrum definition work to occur. |
| Loon, Google | Agree | The intent of this change is to point that all terrestrial bands can be used by HAPS. Loon is using one such band in a country today. To establish the frame work we want to start with one ‘exemplary band’. |
| Qualcomm |  | Before proceeding with the work in RAN4, it would be good to clarify what is the exact scope of the work, and how to make sure it fits within the RAN4 budget.  This proposal, as worded, seems like a minimal amount of work “select one example band”, but the next proposal actually calls for a full study on coexistence (with potential new requirements, which may mean that a new band definition is needed) |
| SoftBank | Agree | As shown in RP-202296, HAPS interested companies are keen to identify an exemplary band. The current WID just says “Considering the potential bands to be used as example for the WID”, and hence it looks to us that the description is not limited to satellite bands. Why are additional TUs required? |
| DISH | Disagree | Before making these kind of agreements, co-existence should be studied (see NTNB-4 below) |
| Intelsat | Agree | In the interest of making progress this is reasonable. The choice of the ‘exemplary’ band may be a separate agreement/discussion. |
| Ericsson | Partially agree | The example band should correspond to one of the bands studied for high altitude IMT operation allowed by the Radio Regulations  Future updates of the specifications can include bands allowed by national regulatory framework, noting that RAN4 would need to understand the specifications impact of this due to the nature of large coverage by HIBS and potential interference to neighbors (usually studied by ITU as for example towards WRC-23) .  RAN4 should decide the example band. |
| ZTE |  | Workload in RAN4 should be well considered with clear scope and priority for this WI. Meanwhile, how to interpret the “exemplary band” is not clear. We may cannot assume that the IMT band (for terrestrial) can be directly taken as one example to support the new scenarios. The situation is different as satellite. |
| Inmarsat |  | Neither agree nor disagree. In our view, there is still some confusion around the scope of HAPS within NTN. Given that from a spectrum regulation perspective HAPS are very different from satellite, this distinction should be first clarified especially in the scope of RAN4. For HAPS, assumptions from TN can probably be used, for satellite NTN, they cannot, due to the very different regulatory frameworks. |
| Rakuten Mobile | Disagree | We should firstly clarify the scope of this WID. |
| MediaTek |  | It can be up to RAN4 to discuss an example band of the existing NR bands which is identified for HAPS deployment by operators. Scope of work should be clarified first in RAN4 and impact on RAN4 discussed. |
| Huawei/HiSilicon | Partially agree | Agree that there is no need to specify a new HAPS-specific bands in NTN WI.  Additional work is needed for this activity. Considering the high workload in RAN4, it is too early to agree on the work for the potential example band. |
| Eutelsat | Agree with qualification | We agree with Thales that this is not a negligible activity and, furthermore, extends the scope beyond that of satellite (LEO and GEO). Therefore, additional TUs for RAN4 would need to be allocated accordingly. |
| Apple |  | We agree with Thales as this is not a negligible activity and prefer HAPS systems use dedicated bands as allowed by radio regulations. |

In summary:

* Agree: 3 organization (Loon, Softbank, Intelsat)
* Agree with changes: 3 organizations (Ericsson, Huawei, Eutelsat)
* Disagree: 3 organizations (T-Mobile, Dish, Rakuten)
* No opinion: 4 organizations (Thales, QC, ZTE, Inmarsat, Mediatek)

About the suggestions

* Dish: Before making these kind of agreements, co-existence should be studied (see NTNB-4 below)
* QC, Thales, Rakuten, Eutelsat, MDK, ZTE: clarify work scope and load impact on RAN4
* E///: The example band should correspond to one of the bands studied for high altitude IMT operation allowed by the Radio Regulations

See moderator’s suggestions in the next paragraph (Question NTNB-4).

**Question NTNB-4 (related to RP-202296): Should RAN4 as part of the Rel-17 NR-NTN-solutions WI define the generic and core requirements for HAPS by considering at least one exemplary band for HAPS and as such undertake adjacent channel coexistence study between HAPS and TN ?**

* *(see RP-202296’s Proposal 3: To demonstrate coexistence between HAPS and TN networks, RAN4 to study at least one example band.)*

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales |  | This is not a negligible activity and therefore additional TUs for RAN4 would need to be allocated accordingly. |
| T-Mobile USA | Disagree | For the same reason stated in Question NTNB-3 |
| Loon, Google | Agree | For the same reason as in Q NTNB-3 |
| Qualcomm |  | Same answer as the previous one. |
| SoftBank | Agree | The comment in NTNB-3 applies |
| DISH | Disagree/Agree with modifications | The co-existence between HAPS and TN shall be studied for every HAPS band |
| Intelsat | Agree |  |
| Ericsson |  | See Answer to NTNWI-2 regarding terminology. We do agree that regardless of what it is called in the end, if HIBS/HAPS as IMT BS operation is to be supported then it is important for RAN4 to do co-existence studies in at least one example band, which aligns with the bands allowed by regulation for HIBS/HAPS as IMT BS operation, and requirements should be derived on this basis. As pointed out by Thales, the TUs should be reviewed as there is considerable work for both HIBS/ HAPS as IMT BS and satellite. |
| ZTE |  | Q NTNB-3 should be addressed firstly. |
| Inmarsat |  | Same comment as previous point. |
| Rakuten Mobile | Disagree | Same answer as Q NTNB-3. |
| MediaTek |  | First address NTNB-3 |
| Huawei/HiSilicon |  | Comment in NTNB-3 applies |
| Eutelsat |  | Same comment as previously. To reiterate, this is not a negligible activity and, furthermore, extends the scope beyond that of satellite (LEO and GEO). Therefore, additional TUs for RAN4 would need to be allocated accordingly. |
| Apple |  | Same comment as NTNB-3. |

Similar opinion responses as for Question NTNB-4?

About the suggestions

* Dish: The co-existence between HAPS and TN shall be studied for every HAPS band
* E//: do co-existence studies in at least one example band, which aligns with the bands allowed by regulation for HIBS/HAPS as IMT BS operation, and requirements should be derived on this basis
* Clarify work scope and work load

Based on the above, the moderator suggests the following

* ***The scope and work load associated to adjacent channel co-existence study(ies) between HAPS and TN in existing 3GPP band(s) allowed by regulation for HIBS/HAPS as IMT BS operation shall be clarified before being discussed to be part of the Rel-17 NR-NTN-solutions WI.***

## 2.2 WI NR-NTN-solutions revisions

Based on the proposals related to WI scope (in clause 1 of this TDOC), the following questions are proposed:

**Question NTNWI-1 (related to RP-202404/2406/2732): Can the following proposal be approved as it is ?**

* ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***
  + ***“As per TR 38.821, it shall be assumed that handheld devices with Power class 3 at least in FR1 and other devices (including fixed and moving platform mounted devices) are supported”.***
* ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***
  + ***“Handheld devices with Power class 3 at least in FR1 are supported***
  + ***Other devices (including fixed and moving platform mounted devices) are supported.”***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree | The intent is to clarify that there are different types of UE as identified in TR 38.821. Note that for the fixed and moving platform mounted devices, Rel-17 should consider the device as being a UE with a specific RF front-end (e.g. with dish, phased array antenna). |
| Hughes | Agree |  |
| Loon, Google | Agree |  |
| Qualcomm | Agree |  |
| SoftBank | Agree | Handheld is one of the important use cases for HAPS. If the proposal in NTNB-4 is agreed, handheld devices should be taken into consideration for the evaluation. |
| Samsung | Agree |  |
| Ericsson | Modification | Our understanding is that this works from a RAN1-3 perspective. For RAN4, as 3GPP works on spectrum allocated to mobile service only and to keep a manageable workload, we suggest to focus only on MSS in Rel-17. |
| ZTE | Agree | The proposed modification is just further clarification on terminal assumption, which is aligned with previous SI. |
| Inmarsat | Agree | Both proposals are agreeable. Side comment: there needs to be clarification that mobile service != MSS. This is a common misunderstanding. |
| Rakuten Mobile | Agree |  |
| Panasonic | Agree |  |
| MediaTek | Agree | Further clarification on terminal assumptions |
| Xiaomi | Agree |  |
| Huawei/HiSilicon | Modification/clarification needed | As per email discussion before RAN#86 (documented in RP-192500), the support of 3GPP class 3 is clear. Other UEs have been discussed in RP-192500, but was not captured in conclusion part. Therefore in the justification part of NTN WID, it includes “addressing at least 3GPP class 3 UE with and without GNSS capability”, and there is no explicit mentioning of “other UEs”.  It’s not clear the power class for other devices, and it is not clear which frequency range other devices belong to. The WI scope cannot be extended without clear understanding among companies. |
| Eutelsat | Partly agree with modification | There will be different types of UE and devices. As noted by Ericsson from a RAN 1, 2 and 3 perspective this proposal is workable. However, RAN4 must take into account the different UE RF characteristics and services in any study it performs. Hence we also agree with Ericsson the workload in RAN4 must be considered. |
| Apple | Partially Agree | Could we please get a clarification on the definition of “Other devices” – does this mean all possible fixed and moving platform mounted devices, like PC1 and VSAT UEs? |

In summary:

* Agree: 13 organization (Thales, Hughes, Loon, Google, Qualcomm, SB, Samsung, ZTE, Inmarsat, Rakuten, Panasonic, MDK, Xiaomi)
* Agree with changes: 3 organizations (E///, Huawei, Eutelsat)
* Disagree: 0 organizations ()
* No opinion: 0 organizations ()

About the suggestions

* E///: For RAN4, as 3GPP works on spectrum allocated to mobile service only and to keep a manageable workload, we suggest to focus only on MSS in Rel-17.
* HW: Clarify the power class and frequency range for other devices
* Eutelsat: RAN4 must take into account the different UE RF characteristics and services in any study it performs

Based on the above, the moderator suggests

* ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***
  + ***“As per TR 38.821, it shall be assumed that handheld devices with Power class 3 at least in FR1 and other devices (including fixed and moving platform mounted devices) at least in FR2 are supported”.***
* ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***
  + ***“Handheld devices with Power class 3 at least in FR1 are supported***
  + ***Other devices (including fixed and moving platform mounted devices) at least in FR2 are supported.”***

Note that TR 38.821 defines 2 W power class for one type of other devices in Table 6.1.1.1-3: UE characteristics for system level simulations. This can be used as the assumption for such device.

**Question NTNWI-2 (related to RP-202296): Can the following proposal be approved as is ?**

* ***Proposal 1: Use the term HAPS for now. Terminologies and definitions of HAPS/HIBS should be followed by the ITU-R decision after they conclude studies for WRC-23.***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree | No impact on the Rel-17 NR-NTN-solutions WID |
| T-Mobile USA | Agree |  |
| Hughes | Agree |  |
| Loon, Google | Agree |  |
| SoftBank | Agree |  |
| Samsung | Agree |  |
| Ericsson |  | Regarding terminology, our understanding is that in the Radio Regulations, HAPS is defined for Fixed Spectrum (FS) rather than mobile spectrum (MS). And HAPS as IMT BS is defined for mobile (MS) Towards WRC23, ITU have agreed to study the use of IMT Basestations in High Altitude Platforms in some bands of mobile spectrum. The Terminology HIBS refers to **H**igh Altitude Platform **I**MT **B**ase**S**tation; i.e. the specific case of high altitude platforms for IMT. The key thing is that we have a mutual understanding that what is considered is operation of IMT BS in High Altitude Platforms in mobile spectrum where regulation allows, which seems to be the case. The term “HAPS” is rather wider, so we prefer not to directly approve the proposal, and first of all check if we have a common understanding what we are studying or whether other companies have a different understanding of what kind of systems we are envisaging under “HAPS”.  As an alternative to HIBS, RAN4 could refer to HAPS as IMT BS |
| ZTE |  | For the discussion on satellite, no much impacts.  W.r.t the decision on this proposal, it's coupled with **Q NTNB-3 and Q NTNB-4**. From 3GPP perspective, if the co-existence on this case should be done, it definitely refers to the case that HAPS is IMT station. |
| Inmarsat | Agree | Previous comment on HAPS distinction vs other NTN still stands. |
| Rakuten Mobile |  | No strong view |
| Panasonic | Agree |  |
| Xiaomi | Agree | Before having clear common understanding on terminologies and definitions, we prefer to keep it as it is |
| Huawei/HiSilicon |  | According to Proposal 2 and Proposal 3 in RP-202296, the proponent only intends to consider HAPS using IMT spectrum in this WID. Though there will be some study until WRC23 for HIBS in terms of e.g. spectrum needs, the definition of HIBS itself is clear (HIBS is high-altitude platform stations as IMT base stations). For HAPS, the definition, as in 1.66A, is “A station located on an object at an altitude of 20 to 50 km and at a specified, nominal, fixed point relative to the Earth”. It is unclear what type of frequency to be used.  We suggest what is in the scope of this WI should be clearly clarified, no matter what terminology to use in the end. |
| Eutelsat | Agree |  |
|  |  |  |

In summary:

* Agree: 11 organization (Thales, T-Mobile, Hughes, Loon, Google, SB, SS, Intelsat, Panasonic, Xiaomi, Eutelsat)
* Agree with changes: 0 organizations ()
* Disagree: 0 organizations ()
* No opinion: 3 organizations (E///, ZTE, Rakuten, Huwaei)

About the suggestions

* E///, ZTE, HW wants to clarify what HAPS is as part of this WID

Based on the above, the moderator suggests to add in the justification clause of the WI NR-NTN-solutions

* ***In the context of this work item, HAPS refers a non-terrestrial network which service link (HAPS – UE) operates in mobile service allocated spectrum which regulation allows***

**Question NTNWI-3: Any other views on the revisions of the WI that should be considered ?**

| **Organization** | **Views** |
| --- | --- |
| Thales | No specific recommendations |
| T-Mobile USA | None at this time |
| Inmarsat | None for now. |

In summary:

* Agree: 0 organization ()
* Agree with changes: 0 organizations ()
* Disagree: 0 organizations ()
* No opinion: 0 organizations ()

About the suggestions

Based on the above, the moderator suggests

# Intermediate round discussion

## 3.1 NTN bands aspects

Based on the initial round discussion, the moderator suggests the follow new questions:

**Question NTNB-1bis (related to RP-202403): Can the following alternative proposed revision of *RP-202120’s Proposal 4 (endorsed at RAN#89-e)* related to the handling of “satellite” bands be approved?**

* ***Proposal 4: Traditional 3GPP work for developing generic requirements, such as inter-carrier co-existence to decide ACLR etc. should be followed where possible but may have to be adapted for the satellite case. Adaptations if needed shall be defined by RAN4. Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications ~~of~~ nor cause degradation (in the sense of RAN4 adjacent channel co-existence studies) to the relevant networks ~~to present and future networks~~ in 3GPP specified ~~terrestrial~~ bands.”***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| Apple |  | As in Initial round comments, we don’t believe the changes are needed for the existing RAN#89e agreements. |
| Ligado | Disagree | Per previous discussion we continue to believe the language agreed at RAN#89-e is satisfactory. |
| Rakuten Mobile | Disagree | Can you again clarify the motivation to change the previous wording? The alternative rewording does not change the principle. The purpose of this change is to remove “future networks”? Still don’t see the need to change. |
| DISH | Disagree | The proposed change is very ambiguous and overall not agreeable. Original wording endorsed by RAN#89e shall be used instead. |
| APT | Disagree | if the concern is to point out “*satellite bands being introduced in 3GPP are not new bands for satellite.”,* we may make a new proposal to make it clear rather than reverting the agreement. For example, “*Proposal: Satellite bands introduced in 3GPP for NTN may include the existing satellite band.”* |
| SoftBank |  | As long as counting the number of proponents/opponents, we don’t see any clear majority to modify the previous agreement. We prefer to have more discussions. |
| ZTE | Disagree | The original proposal is already clear. During the WG level discussion, RAN4 should take care of the impact between satellite band and TN. |
| MediaTek |  | The issue of potential impact of new 3GPP bands for NTN on terrestrial bands could be up to RAN4 when discussing generic requirements, such as inter-carrier co-existence to decide ACLR. This may include performance metrics when discussing scenarios and requirements. |
| Panasonic | Agree |  |
| Ericsson | Disagree | “RAN4 adjacent channel” is OK. However, the wording on “relevant networks” decreases the clarity of the agreement as it raises the question what is relevant. |
| Eutelsat | Partly Agree | There seems to be a fundamental difference of interpretation between the TN and NTN proponents. Unless this gap can be closed we will continue to debate this wording. There seems to be agreement that the RAN4 approach could be directly applicable in certain ‘frequencies-scenarios’ but not in others where it may produce misleading or results that are not meaningful. |
| Hughes | Agree |  |
| Loon, Google | Agree |  |

5 companies agree/partly agree while 6 companies disagree

Still lot of organizations don’t agree to modify the current proposal 4

The moderator would like to recall that during the RAN#89-e plenary, it was agreed that “proposal 1-4 are endorsed (see RP-202120) and further development of these proposals is planned for the next RAN #90e”. This is reflected in the chairman’s report (RP-202124).

In particular the last sentence of the current proposal 4 states includes a statement that “***nor cause degradation (in the sense of RAN4 co-existence studies) to present and future networks***” which is far from being clear. In particular it creates the impression that 3GPP has the means to demonstrate/verify that its specs will not cause performance degradation to any operational networks in present and in the future, while 3GPP cannot commit to this.

However 3GPP RAN4 uses a method to specify the ACLR/ACS requirements through adjacent channel coexistence study assuming that “Requirements should be set such that no more than 5% loss in average and 5th percentile throughput in a victim network is seen in simulations in the same manner as Rel-15 NR.” as Ericsson suggested.

Therefore the moderator advocate for the addition of a clarification note such that the proposal would become:

* ***Proposal 4: Traditional 3GPP work for developing generic requirements, such as inter-carrier co-existence to decide ACLR etc. should be followed where possible but may have to be adapted for the satellite case. Adaptations if needed shall be defined by RAN4. Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications of nor cause degradation (in the sense of RAN4 co-existence studies) to present and future networks in 3GPP specified terrestrial bands***
  + ***Note: The degradation caused to present and future networks in 3GPP specified terrestrial bands shall be understood as the performance degradation caused by the transmission of a NTN channel onto an adjacent TN channel. Simulations should be set such that no more than 5% loss in average and 5th percentile throughput in the adjacent channel of the victim network is seen in the same manner as Rel-15 NR.***

**Question NTNB-2bis (related to RP-202707): Can the following proposal related to the handling of “Satellite” bands be approved as it is ?**

* ***Proposal: The work for a satellite band falling fully or partly in 7-24 GHz frequency range can be considered once the work on exemplary band(s) has sufficiently progressed. For the development of 3GPP specifications for satellite band falling fully or partly in 7-24 GHz frequency range, if agreed, existing 3GPP specifications and studies (e.g. TR 38.820) should be taken into account.***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| Apple | Partially agree | As mentioned in the initial round comments, we prefer to revisit the NTN specific issues of UEs for the 7-24 GHz bands once 3GPP has completed its initial work. The TR reference and the relevance of the solutions can be discussed once this initial work is completed by 3GPP. |
| Rakuten Mobile | Disagree | The intension should be clarified. The intension for this proposal is to prevent from using the frequency range other than 7-24 GHz? It means 3GPP does not allow to use FR1 for satellite bands (service link), which is not acceptable for us. As summarized in RP-200838, there are some other possible bands to be used. 3GPP should not limit such usage, it should be part of ITU-R as agreed at the last meeting. |
| APT | Agree | Maybe, we only need the first part to prevent misleading.  *Proposal: The work for a satellite band falling fully or partly in 7-24 GHz frequency range can be considered once the work on exemplary band(s) has sufficiently progressed.*  Or if we understand correctly, we may clarify the intention as  Proposal: **Postpone** the work for a satellite band falling fully or partly in 7-24 GHz frequency range can be considered **until** **~~once~~** the work on exemplary band(s) has sufficiently progressed. |
| SoftBank |  | If this proposal is the common understanding among the group　and agreeable, it should be clarified in the WID. We are not sure if the allocated TUs are sufficient, though. |
| ZTE |  | This issue is not critical and the RAN4 work can be done with other example band. The discussion for the band within this range can be handled with corresponding issues for TN later. |
| MediaTek |  | It can be up to RAN4 to check all relevant sources including TR 38.820 for satellite band specific WI as discussed and agreed in last meeting. |
| Panasonic | Agree |  |
| Ericsson | Disagree | The proposal implies that we should work in this range; RAN4 should decide but it would be a much larger workload. It is not needed to state that relevant studies should be referred to; this is true for any spectrum range and was already captured in previous agreements. |
| Huawei/HiSilicon | Partially agree | As indicated in our response in the initial round, the NTN WI only includes FR1/FR2, while 7-24GHz range is not in the WI scope. We therefore suggest 7-24GHz frequency range can only be considered AFTER the exemplary band for FR1/FR2 is COMPLETED. It is not clear how to judge “is sufficiently progressed” as in the proposal. |
| Eutelsat | Disagree | Revisit only once initial work has been completed and appropriate techniques in RAN4 have been developed. |
| Inmarsat | Agree | Work on 7-24 GHz range is crucial to NTN and not so relevant for TN. This is a novel area, but missing it would mean missing the key mission of NTN WI. |
| Hughes | Agree |  |
| Loon, Google | Agree | If this is agreed to we should clarify in the WID |
| Xiaomi | Agree |  |

Still some disagreements. Main suggestions are to revisit the NTN specific issues of UEs for the 7-24 GHz bands once 3GPP has completed its initial work.

Based on the feedback, the moderator proposes to stop the discussion here and ask proponents to come back with a clarified approach.

**Question NTNB-3bis (related to RP-202296): Can the following proposal related to the handling of “Satellite” bands be approved as it is ?**

* ***The scope and work load associated to adjacent channel co-existence study(ies) between HAPS and TN in existing 3GPP band(s) allowed by regulation for HIBS/HAPS as IMT BS operation shall be clarified before being considered to be part of the Rel-17 NR-NTN-solutions WI.***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| Apple | Agree |  |
| Rakuten Mobile | Agree |  |
| DISH | Agree |  |
| APT | Agree |  |
| ZTE |  | Even with such clarification, it is still up to RAN4 to decide whether to take HAPS/HIB related to issue within this this WI considering the workload issue. |
| MediaTek |  | It can be up to RAN4 to discuss an example band of the existing NR bands which is identified for HAPS/HIBS deployment by operators. Scope of work should be clarified first in RAN4 and impact on RAN4 discussed. |
| Panasonic | Agree |  |
| Huawei/HiSilicon | Agree |  |
| Eutelsat | Agree |  |
| Inmarsat | Agree |  |
| Hughes | agree |  |
| Loon, Google |  | RAN4 will consider an example band for HAPS/HIBS in an existing NR band to address adjacent channel coex. Scope of work to be identified by RAN4 |
| Xiaomi | Agree |  |

Proposal agreeable as is.

Remarks: as suggested by MDK, ZTE, it is up to RAN4 to decide whether to take HAPS/HIB related to issue within this WI considering the workload issue.

## 3.2 WI NR-NTN-solutions revisions

Based on the initial round discussion, the moderator suggests the follow new questions:

**Question NTNWI-1bis (related to RP-202404/2406/2732): Can the following proposal be approved as it is ?**

* ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***
  + ***“As per TR 38.821, it shall be assumed that handheld devices with Power class 3 at least in FR1 and other devices (including fixed and moving platform mounted devices) at least in FR2 are supported”.***
* ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***
  + ***“Handheld devices with Power class 3 at least in FR1 are supported***
  + ***Other devices (including fixed and moving platform mounted devices) at least in FR2 are supported.”***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| Apple | Partially Agree | We are ok with proposal 1. However, in proposal 2, could the rapporteur please clarify if “Other devices” means all possible fixed and mobile platform mounted devices like PC1 UEs and VSAT UEs? |
| Samsung | Agree |  |
| Rakuten Mobile | Need clarification | Does this proposals intend to disallow to use other PCs like PC1? We don’t object to support PC3, but not acceptable to limit to only PC3. Other PCs must not be precluded. |
| APT | Agree | We have the same concern as APPLE’s. We did not use the term “other devices” in TR 38.821. What we use is “Other”. |
| SoftBank | Agree |  |
| ZTE | Agree with modification | W.r.t the FR2, to align with the terminology defined in RAN1, we can specify the UE type as VSAT firstly, i.e., with following updates:  ***~~Other devices~~ VSAT (including fixed and moving platform mounted devices)*** |
| MediaTek | Agree with modifications | Clarifications on device types. It is helpful to clarify antenna assumptions for the fixed and moving platform mounted devices for at least FR2 – i.e. VSAT |
| Panasonic | Agree |  |
| Ericsson | Modify | The implications to RAN4 should be captured. To avoid large workload, we understand the focus should be MSS. We also wonder why the limitation to PC3 and on the “other”. Proposed wording below is only about the RAN4 impact.   * ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***   + ***“As per TR 38.821, it shall be assumed that handheld devices with Power class 3 at least in FR1 and other devices (including fixed and moving platform mounted devices) at least in FR2 are supported in the RAN1-3 specifications”.*** * ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***   + ***“Handheld devices with Power class 3 at least in FR1 are supported***   + ***Other devices (including fixed and moving platform mounted devices) at least in FR2 are supported in the RAN1-3 specifications.”*** * ***The RAN4 work shall focus on MSS spectrum*** |
| Huawei/HiSilicon | Disagree | As we responded in the initial round, the scope of other devices should be clearly clarified. It should clear which power class is considered for other devices. Regarding frequency range, “at least for FR2” is not clear. Does it mean FR2 only, or it includes both FR1, FR2 and the 7-24GHz frequency range? |
| Eutelsat | Partially agree | FR1 is agreed, FR2 requires clarification. The terminology is undefined and needs specification before RAN4 type work can proceed (see also comments on NTNB-1bis). |
| Inmarsat | Agree |  |
| Hughes | agree |  |
| Xiaomi | Agree |  |

In summary:

* Agree: 1 organization (Thales, SS, Panasonic, APT, SB, Inmarsat, Hughes)
* Agree with changes: 6 organizations (Apple, Rakuten, ZTE, MDK, Ericsson, Eutelsat)
* Disagree: 3 organizations (Huwaei)

About the suggestions:

* Apple/APT: clarify if “Other devices” means all possible fixed and mobile platform mounted devices like PC1 UEs and VSAT UEs?
* Rakuten: Does this proposals intend to disallow to use other PCs like PC1? We don’t object to support PC3, but not acceptable to limit to only PC3. Other PCs must not be precluded.
* ZTE: W.r.t the FR2, to align with the terminology defined in RAN1, we can specify the UE type as VSAT firstly, i.e., with following updates:
* MDK: clarify antenna assumptions for the fixed and moving platform mounted devices for at least FR2 – i.e. VSAT
* Ericsson suggests to restrict RAN4 work on MSS spectrum

Based on the feedback, the moderator suggests to distinguish between handheld devices (any power class) and other devices equipped with external antenna and referred as “VSAT or OTHER” in TR 38.821. It is assumed that handheld devices apply mostly to FR1 band and any power class can be considered for NTN. The “VSAT” as defined in TR 38.821 can be considered for the Work item (60 cm aperture antenna, 2 Watts transmit power, …). Furthermore the rational for restricting RAN4 work to MSS spectrum is unclear. Any band in which NR radio interface can be operated should be eligible. Therefore, the moderator suggests a new wording along this lines

* ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***
  + ***“As per TR 38.821, it shall be assumed that handheld devices ~~with Power class 3~~ at least in FR1 and other devices with external antenna (including fixed and moving platform mounted devices) ~~at least in FR2~~ ~~are supported~~ can be considered for NTN”.***
* ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***
  + ***“Handheld devices ~~with Power class 3~~ at least in FR1 are supported (e.g. Power class 3)***
  + ***Other devices with external antenna (including fixed and moving platform mounted devices) at least in FR2 are supported. “VSAT” characteristics in TR 38.821 can be assumed.”***

**Question NTNWI-2bis (related to RP-202296): Can the following proposal be approved as is ?**

* ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***
  + ***“In the context of this work item, HAPS refers a non-terrestrial network which service link (HAPS – UE) operates in mobile service allocated spectrum which regulation allows”***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| Apple | Agree |  |
| Samsung | Agree |  |
| Rakuten Mobile | Agree |  |
| APT | Agree |  |
| SoftBank | Agree with modifications | Basically fine with moderator’s proposal. To further clarify what we aim to do for HAPS, we would suggest the following modification.   * + ***“In the context of this work item, HAPS refers a non-terrestrial network which service link (HAPS – UE such as handheld devices) operates in mobile service allocated spectrum which regulation allows”*** |
| ZTE |  | If HAPS related discussion will be handled, as clarification, at least we need to highlight the link between HAPS and UE should follow the 3GPP specification. Otherwise, the corresponding discussion will be out of scope of RAN4. |
| Panasonic | Agree |  |
| Ericsson |  | We think we should be more specific; firstly we should clarify that we are referring to high altitude platforms (“non-terrestrial network” could include Satellite…). Secondly we agree with ZTE that we should specifically refer to a 3GPP mobile service.  Regarding the naming, it can be sorted out later, but it may be the case that the wider name HAPS could cause confusion externally as to what we are considering and we encourage companies to check whether the naming is really the best.  ***In the context of this work item, HAPS refers a ~~non-terrestrial network~~  high altitude platform for which at least the service link (HAPS – UE) operates ~~in~~ a 3GPP specified NR mobile service in allocated spectrum which regulation allows***  ***The name “HAPS” may be revisited if an alternative term that better reflects the 3GPP scope is identified.*** |
| Huawei/HiSilicon | Agree |  |
| Eutelsat | Agree | Some further clarification would be helpful (e.g. SoftBank suggestion). |
| Inmarsat | Agree |  |
| Loon, Google | Agree with Softbank | Softbank rewording is acceptable |
| Xiaomi | Agree |  |

Suggestions from organizations

* SB: suggest ***“In the context of this work item, HAPS refers a non-terrestrial network which service link (HAPS – UE such as handheld devices) operates in mobile service allocated spectrum which regulation allows”***
  + Moderator view: This relates to the other point discussed in Question NTNWI-2bis
* ZTE: highlight the link between HAPS and UE should follow the 3GPP specification

Based on the feedbacks, the moderator suggests to adopt the suggested wording from Ericsson with small modifications:

* ***In the context of this work item, HAPS refers to a ~~non-terrestrial network~~  high altitude platform system for which at least the service link (HAPS – UE) operates ~~in~~ a 3GPP specified NR mobile service in allocated spectrum which regulation allows***

# Fine tuning round discussion

## 4.1 NTN bands aspects

Based on the intermediate round discussion, the moderator suggests the follow new questions:

**Question NTNB-1ter (related to RP-202403): Can the following alternative proposed revision of *RP-202120’s Proposal 4 (endorsed at RAN#89-e)* related to the handling of “satellite” bands be approved?**

* ***Proposal 4: Traditional 3GPP work for developing generic requirements, such as inter-carrier co-existence to decide ACLR etc. should be followed where possible but may have to be adapted for the satellite case. Adaptations if needed shall be defined by RAN4. Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications of nor cause degradation (in the sense of RAN4 co-existence studies) to present and future networks in 3GPP specified terrestrial bands***
  + ***Note: The degradation caused to present and future networks in 3GPP specified terrestrial bands shall be understood as the performance degradation caused by the transmission of a NTN channel onto an adjacent TN channel. Simulations should be set such that no more than 5% loss in average and 5th percentile***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| ESA | Agree | Indeed, the proposal 4 is unchanged as approved in RAN#89 and the additional note is an helpful clarification. |
| DISH Network | Disagree/Agree with modifications | The proposed note is not the only mechanism for potential degradation to TN in the currently endorsed version. The introduction of NTN band into 3GPP shall not impact networks specified for 3GPP terrestrial bands even if TN basestation would degrade NTN basestation. This is fully in line with the 3GPP practices (new band not impacting legacy)  We are OK with the proposed additional note only if this note is added as well.  ***Note: Co-existence analysis between TN (TN basestation transmit) band specified in 3GPP and NTN (NTN basestation receive) band shall not cause impacts to network in 3GPP specified TN band***  If the addition of this note is not acceptable then we can only agree the version endorsed in RAN#89-e |
| T-Mobile USA | Disagree | Agree with Dish’s comments. |
| AT&T | Disagree/Agree with modifications | Agree with DISH Network comments. |
| Ericsson | Agree | The clarification note is OK for us |
| APT | Agree | Support adding a note rather than reverting the agreement. Okay with the moderator’s and DISH’s proposals. |
| Ligado | Disagree | We agree with DISH above. |
| Rakuten Mobile | Disagree | We propose to at least remove the value like 5%, i.e. remove “Simulations should be set such that no more than 5% loss in average and 5th percentile” |
| Huawei/HiSilicon | Agree | We are fine with adding a note like this. |
| ZTE | Agree | Fine with specify the requirement. |
| Panasonic | Agree with comments | We agree to the alternative wording by DISH Network. |
| Eutelsat | Partially Agree | Agree with Thales, but with a further clarifying note: “It is further noted that this consideration of RAN4 procedures would be applicable for NTN in FR1 below 2.7 GHz. Frequency bands above this will require further consideration of methods to be applied.” |
| Hughes | Agree | The note is fine |
| MediaTek | Agree | We are fine with the wording. The clarifications are helpful. Our view is that there is no strong need for RAN Plenary to pre-empt discussions in RAN4. Potential impact of new 3GPP bands for NTN on terrestrial bands could be up to RAN4 when discussing generic requirements, such as inter-carrier co-existence to decide ACLR. RAN4 can also discuss performance metrics when discussing scenarios and requirements. |
| Nokia | Agree with modifications | We are also fine with Dish’s proposal. |
| Inmarsat | Agree |  |

All agree to add clarification note(s)

Suggestions for the existing note

* Rakuten: Remove “Simulations should be set such that no more than 5% loss in average and 5th percentile, ..”

Suggestions for additional notes

* Dish together with other T-Mobile, AT&T, APT, Ligado: “Note: Co-existence analysis between TN (TN basestation transmit) band specified in 3GPP and NTN (NTN basestation receive) band shall not cause impacts to network in 3GPP specified TN band”
* Eutelsat: “Note: It is further noted that this consideration of RAN4 procedures would be applicable for NTN in FR1 below 2.7 GHz. Frequency bands above this will require further consideration of methods to be applied.”
  + Moderator: Such note is not needed since this should be treated in RAN4

The moderator made a mistake in the clarification note since a part of it was missing (see outcomes of the intermediate round discussion). This missing part needs to be added to the first note.

The moderator suggests to add Dish note although it may already be covered by “***Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications of .. to present and future networks in 3GPP specified terrestrial bands”)***. Besides, it has already been agreed by RAN4#97-e that « NTN RF requirements shall be specified assuming no impact on TN RF requirements. ». However the moderator suggests some revisions to Dish’ note with the intent to clarify that we are talking about adjacent channel coexistence analysis and that 3GPP main purpose is to develop specifications but has no mean to verify performance of operational networks.

Therefore the new proposal becomes

* ***Proposal 4: Traditional 3GPP work for developing generic requirements, such as inter-carrier co-existence to decide ACLR etc. should be followed where possible but may have to be adapted for the satellite case. Adaptations if needed shall be defined by RAN4. Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications of nor cause degradation (in the sense of RAN4 co-existence studies) to present and future networks in 3GPP specified terrestrial bands.***
  + ***Note 1: The degradation caused to present and future networks in 3GPP specified terrestrial bands shall be understood as the performance degradation caused by the transmission of a NTN channel onto an adjacent TN channel. Simulations should be set such that no more than 5% loss in average and 5th percentile throughput in the adjacent channel of the victim network is seen in the same manner as Rel-15 NR.***
  + ***Note 2: Adjacent channel Co-existence analysis between TN (TN base station transmit) channel ~~band~~ specified in 3GPP and NTN (NTN base station receive) channel ~~band~~ shall not cause impacts to existing specifications of network in 3GPP specified TN band.***

## 4.2 WI NR-NTN-solutions revisions

Based on the initial round discussion, the moderator suggests the follow new questions:

**Question NTNWI-1ter (related to RP-202404/2406/2732): Can the following proposal be approved as it is ?**

* ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***
  + ***“As per TR 38.821, it shall be assumed that handheld devices at least in FR1 and other devices with external antenna (including fixed and moving platform mounted devices) can be considered for NTN”.***
* ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***
  + ***“Handheld devices at least in FR1 are supported (e.g. Power class 3)***
  + ***Other devices with external antenna (including fixed and moving platform mounted devices) at least in FR2 are supported. “VSAT” characteristics in TR 38.821 can be assumed.”***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| ESA | Agree |  |
| Ericsson | Modify | We are OK with this considering RAN1/2 specs.  We are concerned that this has not been discussed in the context of RAN4. How many co-existence scenarios are to be studied (considering co-existence of mobile, moving, fixed… ? different types of antenna characteristic ?). Also how does it relate to which example bands to select. The conclusions will have a potentially large impact on the amount of work in RAN4 and we think there is a need to discuss the interest and focus.  So we propose to add “for the RAN1-3 specifications” at the end of the second bullet for proposal 2 and in the justification.  After discussing in RAN4 these objectives could be reviewed.   * ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***   + ***“As per TR 38.821, it shall be assumed that handheld devices at least in FR1 and other devices with external antenna (including fixed and moving platform mounted devices) can be considered for NTN for the RAN1-3 specifications”.*** * ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***   + ***“Handheld devices at least in FR1 are supported (e.g. Power class 3)***   + ***Other devices with external antenna (including fixed and moving platform mounted devices) at least in FR2 are supported. “VSAT” characteristics in TR 38.821 can be assumed for the RAN1-3 specifications.”*** |
| APT | Agree |  |
| SoftBank | Agree |  |
| Samsung | Agree |  |

|  |  |  |
| --- | --- | --- |
| Apple | Agree with Comments | Considering that a couple of companies still have questions regarding the clarity objectives of Proposal 2, as a way forward, could we ensure that the wordings are accurate and limit handheld devices to FR1 for now i.e. remove the words “at least” since they give an impression that FR2 handheld devices are supported even though that doesn’t seem to be the case from the current study TR 38.821. For the “other devices” proposals, the reason we raised a concern earlier was for a clarification on FR2 operation in FDD mode which is not currently specified by 3GPP along with a major testing effort needed by RAN4 that might impact the WID timelines. Hence, request a modification to replace “other devices" with “VSAT”. |
| Rakuten Mobile | Agree |  |
| Huawei/HiSilicon | Agree with modification | As we respond in the first two rounds, we have concerns on the amount of RAN4 work for other devices (potential new power class and potential multiple frequency range). The proposal 1 and proposal 2 in NTNWI-1ter did not address our concerns. If power class and specific frequency band cannot be clearly clarified, we are fine with Ericsson’s approach to focus the proposal to RAN1-RAN3.  A bit more modification on top of Ericsson’s modification:   * ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***   + ***“As per TR 38.821, it shall be assumed that handheld devices at least in FR1 and other devices with external antenna (including fixed and moving platform mounted devices) can be considered for NTN for the RAN1-3 specifications”.*** * ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***   + ***“Handheld devices at least in FR1 are supported (e.g. Power class 3)***   + ***Other devices with external antenna (including fixed and moving platform mounted devices) at least in FR2 are supported for the RAN1-3 specifications. “VSAT” characteristics in TR 38.821 can be assumed*** ***for the RAN1-3 specifications.”*** |
| ZTE | Agree | But still prefer to highlight only VSAT is considered for FR2. |
| Panasonic | Agree |  |
| Eutelsat | Agree with comment | Same comment as Apple; Eutelsat believes RAN4 should focus on FR1 only for Release 17. |
| Hughes | Agree |  |
| MediaTek | Agree |  |
| Nokia | Agree |  |
| Inmarsat | Agree |  |

Some suggestions

* Huawei/Ericsson: assumptions on UE types is for the RAN1-3 specifications. RAN4 to decide to down select the UE characteristics and coexistence scenarios to be considered
* Apple/Eutelsat: remove FR2 handheld devices.
* Apple/ZTE: Replace “other devices” with VSAT
* Eutelsat: RAN4 should focus on FR1 only for Release 17.
  + Moderator: This is not in line with the current WI scope

Based on the feedback, the moderator suggest to adjust the wording of the proposals as follow:

* ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***
  + ***“As per TR 38.821, it shall be assumed that handheld devices ~~at least~~ in FR1 and ~~other~~ “VSAT” devices with external antenna (including fixed and moving platform mounted devices) can be considered for NTN for the RAN1-3 specifications”.***
* ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***
  + ***“Handheld devices ~~at least~~ in FR1 are supported (e.g. Power class 3)***
  + ***~~Other “~~VSAT” devices with external antenna (including fixed and moving platform mounted devices) at least in FR2 are supported for the RAN1-3 specifications. “VSAT” characteristics in TR 38.821 can be assumed for the RAN1-3 specifications.”***

**Question NTNWI-2ter (related to RP-202296): Can the following proposal be approved as is ?**

* ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***
  + ***“In the context of this work item, HAPS refers to a high altitude platform system for which at least the service link (HAPS – UE) operates a 3GPP specified NR mobile service in allocated spectrum which regulation allows”***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| T-Mobile USA | Agree |  |
| Ericsson | Modify | We agree with proposal 1.  We are still not convinced whether “HAPS” is in the end the right term or whether it is understood externally to be more generic. We are OK to update the WI as in proposal 1 so that the scope of the work is clear. We think it is useful to add a proposal 2 (note that the proposal 2 is not intended to be captured in the WID; just clarify that terminology may be adjusted if needed)  **Proposal 2: “If needed, the terminology “HAPS” may be adapted in case after review the adaptation more closely describes the scope of the work captured in proposal 1.** |
| APT | Agree | However, if we agree this, we may need a new agreement for HIBS in the future. |
| SoftBank | Agree | We agree with proposal 1.  As for proposal 2 by Ericsson, maybe we can continue the contribution-driven discussion without any additional agreement once we find the necessity. |
| Samsung | Agree |  |
| Rakuten Mobile | Agree |  |
| Huawei/HiSilicon | Agree |  |
| ZTE | Agree |  |
| Panasonic | Agree |  |
| Eutelsat | Agree |  |
| MediaTek | Agree |  |
| Nokia | Agree | We are also OK with the proposal from Ericsson. |
| Inmarsat | Agree |  |

Most agree but 2 suggestions

* APT: FFS for HIBS
* Ericsson: terminology may be adjusted if needed

Based on the feedback, the moderator suggest to adjust the wording of the proposals as follow:

* ***Proposal 1: Add in the justification clause of the WI NR-NTN-solutions the following sentence***
  + ***“In the context of this work item, HAPS refers to a high altitude platform system for which at least the service link (HAPS – UE) operates a 3GPP specified NR mobile service in allocated spectrum which regulation allows. If needed, the terminology “HAPS” may be revisited.”***

# Final round discussion

## 5.1 NTN bands aspects

Based on the fine tuning round discussion, the moderator suggests the follow new questions:

**Question NTNB-1quat (related to RP-202403): Can the following alternative proposed revision of *RP-202120’s Proposal 4 (endorsed at RAN#89-e)* related to the handling of “satellite” bands be approved?**

* ***Proposal 4: Traditional 3GPP work for developing generic requirements, such as inter-carrier co-existence to decide ACLR etc. should be followed where possible but may have to be adapted for the satellite case. Adaptations if needed shall be defined by RAN4. Satellite bands introduced in 3GPP for NTN shall neither impact the existing specifications of nor cause degradation (in the sense of RAN4 co-existence studies) to present and future networks in 3GPP specified terrestrial bands***
  + ***Note 1: The degradation caused to present and future networks in 3GPP specified terrestrial bands shall be understood as the performance degradation caused by the transmission of a NTN channel onto an adjacent TN channel. Simulations should be set such that no more than 5% loss in average and 5th percentile throughput in the adjacent channel of the victim network is seen in the same manner as Rel-15 NR.***
  + ***Note 2: Adjacent channel Co-existence analysis between TN (TN base station transmit) channel specified in 3GPP and NTN (NTN base station receive) channel shall not cause impacts to existing specifications of network in 3GPP specified TN band.***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |

## 5.2 WI NR-NTN-solutions revisions

Based on the fine tuning round discussion, the moderator suggests the follow new questions:

**Question NTNWI-1quat (related to RP-202404/2406/2732): Can the following proposal be approved as it is ?**

* ***Proposal 1: Add at the end of the Rel-17 “NR-NTN-solutions” WI’s clause 3. Justification the following sentence***
  + ***“As per TR 38.821, it shall be assumed that handheld devices in FR1 and “VSAT” devices with external antenna (including fixed and moving platform mounted devices) can be considered for NTN for the RAN1-3 specifications”.***
* ***Proposal 2: Add two principles in the Rel-17 “NR-NTN-solutions” WI’s clause 4.1 Objective of SI or Core part WI or Testing part WI***
  + ***“Handheld devices in FR1 are supported (e.g. Power class 3)***
  + ***“VSAT” devices with external antenna (including fixed and moving platform mounted devices) at least in FR2 are supported for the RAN1-3 specifications. “VSAT” characteristics in TR 38.821 can be assumed for the RAN1-3 specifications.”***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| Apple | Agree |  |
| Huawei/HiSilicon | Agree |  |

**Question NTNWI-2quat (related to RP-202296): Can the following proposal be approved as is ?**

* ***Proposal 1: Add in the justification clause of the WI NR-NTN-solutions the following sentence***
  + ***“In the context of this work item, HAPS refers to a high altitude platform system for which at least the service link (HAPS – UE) operates a 3GPP specified NR mobile service in allocated spectrum which regulation allows. If needed, the terminology “HAPS” may be revisited.”***

| **Organization** | **Agree/Agree with modifications/Disagree** | **Comments** |
| --- | --- | --- |
| Thales | Agree |  |
| Huawei/HiSilicon | Agree |  |

# Conclusion

The following proposals are agreed

## 6.1 Handling of NTN bands

***Proposal XX: The scope and work load associated to adjacent channel co-existence study(ies) between HAPS and TN in existing 3GPP band(s) allowed by regulation for HIBS/HAPS as IMT BS operation shall be clarified before being considered to be part of the Rel-17 NR-NTN-solutions WI.***

***END***