**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] Initial 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. |
|  |  |  |

**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. |
|  |  |  |

**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. |
|  |  |  |

**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. |
|  |  |  |

## 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. |
|  |  |  |

**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 |  |
|  |  |  |

**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. |

# Intermediate round discussion

# Fine tuning round discussion

# Conclusion

***END***