[94e-17-R18-NTN-NR] - Version 0.0.10
RAN

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Agenda Item: 8A.2

Source: RAN Vice-Chair (AT&T)

Title: Moderator's summary for discussion [94e-17-R18-NTN-NR]

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This thread covers the discussion [94e-17-R18-NTN-NR] as identified in the email "[94e-01-Organizational] RAN R18 summary RP-213469, list of email threads for RAN R18 discussion, and Monday's GTW" from the RAN Chair.

Deadlines for the discussion over NWM are provided by the RAN Chair in "Draft RAN#94-e_Timeplan v0.zip" in the first page, "Time plan for RAN#94-e during the meeting week - Week 1."

A summary of the Rel-18 Package, the proposed TU budget, and proposed detailed scope for each potential WI or SI are provided in RP-213469 along with the supporting documents contained therein.

Per the guidance from the RAN Chair, the objectives (and associated justifications) of the WID have been revised based on the detailed scope provided as the starting point for further discussion during RAN#94-e.

1 Initial Round

The initial round will focus on providing feedback on the revised WID based on the detailed scope provided by the RAN Chair. The revised WID with revision marking can be found at the following link.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-17-R18-NTN-NR%5D/Rev1%20of%20RP-212713%20WID%20NR%20NTN%20Enhancements-rm.docx

The goal is to get to a clear and limited scope that can be accomplished within the TU budget defined by the RAN Chair and RAN WG Chairs. The feedback forms will be used to collect the high-level views/concerns on the WID. In addition, if any specific revisions/comments on the WID are necessary, please provide them in the appropriate feedback forms directly. The moderator will merge any necessary updates based on the outcome of the discussions.

1.1 Collection of company views

1.1.1 General high-level views and Justification

Feedback Form 1: General high-level views and Justification

1 – Guangdong OPPO Mobile Telecom.

The justification does not include mobility enhancement which is okay at this stage. However, based on the progress of discussions in section 1.1.4, the justification might need to be revised accordingly.

2 – T-Mobile USA Inc.

Using a different antenna gain (-5dBi instead of 0dBi), may have other impacts and before proceeding, RAN4 should sign off on that suggestion.

3 – THALES

=Thales> Overall the scope is fine for us. However we have some suggestions aiming at clarifying things

1/ In clause 2.3 Other related Work Items and dependencies, we suggest to replace

"*800026 Study on architecture aspects for using satellite access in 5G (FS5GSATARCH)*" by "*890034 Integration of satellite systems in the 5G architecture (5GSAT_ARCH)*" since the WID is more relevant that the SID

2/ In clause 3 "Justification", we do recommend the following clarifications:

To clarify the rational for network verified UE location, we suggest to replace:

- *"Address requirements, if needed based on the study outcome, associated with regulated services regarding a network verified UE location i.e. to be able to check the UE reported location information."*

By

- *"Identify requirements, which mandate the network operator to cross check the UE location reported by the UE, which needs to be carried out in order to fulfil the regulatory requirements (e.g. Lawful intercept, emergency call, Public Warning System ,...) regarding a network verified UE location i.e. to be able to check the UE reported location information and specify if needed mechanisms to fulfill the regulatory requirements.*

Note that the following may be considered for the study on network verified UE location to identify relevant requirements:

- *For emergency communications, see for example*

o *https://www.fcc.gov/document/wireless-e911-location-accuracy-requirements-6*

o *Standardisation Request for E112 (as regards hand-held mobile phones in support of Directive 2014/53/EU)*

- *For lawful intercept, see 3GPP S3i210282*

o *"SA3LI notes that any method which relies solely on UE-generated location information is unlikely to be considered reliable for network selection purposes. Therefore, a method such as GNSS/A-GNSS cannot be considered as reliable or trusted unless the information provided by the UE can be verified by the network."*

3/ In clause 4.1 Objective of SI or Core part WI or Testing part WI (general part)

We suggest to replace the following points

- *Both "VSAT" devices with directive antenna (including fixed and moving platform mounted devices and commercial handset terminals (e.g. Power class 3) are supported in FR1*
- *Only "VSAT" devices with directive antenna (including fixed and moving platform mounted devices) are supported in above 10 GHz bands.*

by

- *"VSAT" devices with directive antenna (including fixed and moving platform mounted devices as well as commercial handset terminals (e.g. Power class 3) are supported in FR1*
  - *As in Rel-17, NTN capable handset terminals are capable to operate with a terrestrial network. For VSAT UE, this is optional.*
  - *Only "VSAT" devices with directive antenna (including fixed and moving platform mounted devices) are supported in above 10 GHz bands.*

4 – Ligado Networks

We agree with OPPO comments re: mobility management. Otherwise the justification is good.

5 – MediaTek Inc.

We are fine with the justification.

6 – Classon Consulting

for FUTUREWEI Overall the item still seems pretty big, we shouldn't add back additional objectives and should consider if some study objectives should be removed to increase the chance for normative work for the other study objectives.

7 – ESA

We support the identified objectives and we agree with Thales' revisions.

8 – Beijing Xiaomi Mobile Software

We share the same view that the mobility enhancements should be included with a limited scope in Rel-18.

9 – Transsion Holdings

We are fine with this justification and suggest to add NTN-TN mobility and service continuity back if there is available time.

10 – CATT

We share the view with OPPO and some other companies that mobility enhancement should be included in Rel-18, and we suggest to consider the potential RAN3 impacts for mobility.

11 – China Mobile Group Device Co.

Partially agree the current objectives.

However, mobility enhancements for NTN-NTN and NTN-TN should also be covered, especially NTN-TN mobility due to lack of discussion in R17

12 – ZTE Corporation

The updates on the justification are needed once the detailed scope is consolidated.

13 – Samsung Electronics Co.

In order to meet the tight TU budget, we suggest to discuss how to scope down more.

14 – DOCOMO Communications Lab.

- Implicit support of HAPS/ATG should be captured (i.e. brackets corresponding to this should be removed)
- Mobility part should be added for justification if it is re-included, i.e. we share the view with OPPO.

15 – LG Electronics Inc.

We are generally fine with justification.

16 – vivo Mobile Communication Co.

We would like to prioritize mobility enhancement considering the NTN characteristics such as large propagation delay and satellite movement. The related objective can be further narrow down.

In addition, to better accommodate TU plan, we prefer to deprioritize the network verified UE location part, since the verification of UE location by CN has been specified in TS 23.501 in R17 and this issue is not urgent.

17 – Panasonic Corporation

We are fine with the justification.

18 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are fine with the justification.

19 – HUAWEI TECHNOLOGIES Co. Ltd.

We support T-Mobile to remove “e.g., -5dBi instead of 0 dBi antenna gain” given that the detailed value should be discussed first in working groups as part of the study.

20 – TURKCELL

Mobility enhancements should be included in 3GPP Rel-18. We share the concerns of other companies related to mobility.

21 – HUGHES Network Systems Ltd

We support the identified objectives and we agree with Thales' revisions.

Additional revision to the Section 3 Justification (2nd para 2nd bullet) as below:

- ~~Offer o~~Optimize~~d~~ performance ~~especially when addressing~~ for handset terminals (including smartphones with more realistic assumptions on antenna gains, e.g., including device with -5dBi ~~instead of 0 dBi~~ antenna gain) w.r.t. coverage ~~considering~~ taking into account the NTN characteristics ~~such as~~ i.e. large propagation delay and satellite movement.

22 – Apple AB

We also think that mobility management may need to be reconsidered, but overall we are fine with the justification.

23 – VODAFONE Group Plc

ok, and agree that the implicit support for HAPS should be included.

24 – Deutsche Telekom AG

We also agree with DOCOMO and Vodafone that there should be a clear mentioning of implicit support of HAPS in the general and justification part.

25 – Lockheed Martin

Generally OK, with the following comments:

- Agree with Thales that the wording could be changed as suggested" 1/ In clause 2.3 Other related Work Items and dependencies, we suggest to replace "*800026 Study on architecture aspects for using satellite access in 5G (FS5GSATARCH)*" by "*890034 Integration of satellite systems in the 5G architecture (5GSAT_ARCH)*".
- We also observe that NTN-TN and NTN-NTN Mobility is an important aspect worth including. One main reason is that the commercial success of NTN will at least partly depend on the NTN & TN cooperation.

26 – Sony Europe B.V.

We also agree with OPPO and others that mobility and service continuity should be added to the justification section.

For downscoping, positioning may be considered.

27 – Ericsson LM

We see that many propose to add items to this WID. Given that Rel-18 is already quite loaded, we should try to downsize this WID.

In particular, the proposal to state in Sec. 4.1 that NTN capable terminals should be capable to operate with a terrestrial network introduces additional (and unnecessary) complexity even before the actual work starts – the decision whether to operate with terrestrial networks in addition to NTNs should be left to terminal vendors. We should not include that statement.

28 – Sequans Communications

We are generally fine with the justification and high-level objectives, as well as with Thales proposed revisions.

29 – Intel Corporation SAS

We would like to use the terminology of 'network-based positioning' which is being used in 3GPP rather than 'network verified UE location' not being used in 3GPP. We propose the following revision for the corresponding bullet in justification section.

- Address requirements, if needed based on the study outcome, associated with regulated services regarding ~~a network verified UE location i.e.~~ network-based positioning to be able to check the UE reported location information.

30 – Inmarsat

We are fine with the justification and high level objectives. We also agree with Thales proposed changes.

31 – Intelsat

We are fine with the explanation. Agree with Thales proposal.

1.1.2 Objective: Coverage enhancement

Feedback Form 2: Objective: Coverage enhancement

1 – Guangdong OPPO Mobile Telecom.

We are fine with the current objective proposal.

2 – T-Mobile USA Inc.

As mentioned above I would like to see RAN4 sign off on the idea of using a different antenna gain for the modelling and use cases. There could be coexistence understanding impacts and it would be prudent to determine if this is a valid change in considering the link budget. While I agree that the model that is currently used is not close to the actual gains seen in devices I am not sure if changing our modelling assumptions will cause other problems.

3 – THALES

Overall the scope is fine for us, however for clarification purposes, we suggest to replace the following sentence:

- *The objectives need to cover the use case of voice and low-data rate services using commercial smartphones with more realistic assumptions on antenna gains, e.g., -5dBi instead of 0dBi typically assumed for link budget analysis for terrestrial networks.*

by

- *The objectives need to cover the use case of voice and low-data rate services using commercial smartphones with more realistic assumptions on antenna gains, e.g., including devices with -5dBi antenna gain. Note that of 0dBi is currently assumed for link budget analysis for non-terrestrial networks.*

In addition, we suggest to replace

· *"candidate channels" by "physical radio channels"*

· *"Intent is to optimize the RAN to work" by "Intent is to optimize the NTN based NG-RAN to work"*

4 – Ligado Networks

We agree with the proposed objective.

5 – MediaTek Inc.

Repetition enhancements can be de-prioritized.

DL Link budget with antenna gain of -5 dBi can already be closed with Rel-17 Coverage enhancements in all Set 1 & Set 2 GEO / LEO-600/1200 scenarios.

UL link budget can be closed in all Set 1 LEO 600 / 1200 scenarios and Set 2 scenarios in LEO 600. The link budget in UL in Set 1 GEO can be closed by reduction of UL bandwidth from 0.360 MHz to 0.180 MHz.

These figures are conservatives as this is the worst case at beam edge. This seems sufficient for most cases that can be readily be supported without enhancements.

It seems unreasonable to increase the number of repetitions for eMBB due to impact on capacity and user data rates.

Improved diversity techniques / reduced polarization loss could further improved the link budget to give some margin without use of repetitions.

6 – Classon Consulting

for FUTUREWEI Suggest deprioritizing the objective related to low-rate codecs (or prioritizing the other coverage objectives).

7 – ESA

We are fine with this objective

8 – Beijing Xiaomi Mobile Software

Suggest to focus on the support of smart phone. support of the VSAT device in CE should be de-prioritized.

9 – Transsion Holdings

We are good with this objective.

10 – China Mobile Group Device Co.

Support

11 – ZTE Corporation

Regarding the coverage enhancement part, we are fine to focus on the VOIP service for smartphones only. For the detailed scope, we also share the view that repetition-based solutions can be deprioritized.

12 – Samsung Electronics Co.

Generally okay. We suggest to remove the following to scope down.

~~- Study, and if justified, improve the performance of low-rate codecs in link budget limited situation including reducing RAN protocol overhead for VoNR [RAN2,RAN1] [Liaise with SA2/SA4 as necessary]~~

- ~~NOTE: Intent is to optimize the RAN to work with the lowest rate codec currently available and will not introduce a new codec.~~

13 – Spreadtrum Communications

We are supportive of this objective.

14 – CATT

Generally, we are fine with the objective.

Just to clarify, do we focus on FR1 only for this objective?

15 – DOCOMO Communications Lab.

We do not think it is better to list any candidate of solutions in WID. It should be discussed in the study phase.

16 – LG Electronics Inc.

We don't think the objective on the repetition has been justified sufficiently. So, the second bullet can be removed. Also, enhancement on the "diversity" on top of the polarization loss is too broad.

17 – vivo Mobile Communication Co.

We are fine with the coverage performance evaluation part. But for the detailed study parts, we would like to:

- deprioritize the objective on improved diversity techniques, since it was agreed to left it to UE implementation since NR R15, there is no need to reopen this issue for NR NTN.
- deprioritize the objective on reducing RAN protocol overhead for VoNR, since very limited benefit can be got by pursuing such an optimization.

18 – Deutsche Telekom AG

We are fine with the objectives as it reflects the reality of handheld devices better. The potential "side impacts" mentioned by T-Mobile USA obviously need to be evaluated ...

19 – Panasonic Corporation

We are fine with the objective.

20 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are fine with the contents of proposal.

RAN2 could be involved for supporting repetition enhancements as in Rel-17 Coverage Enhancement.

21 – HUAWEI TECHNOLOGIES Co. Ltd.

We have below considerations:

1. Similar to the comment above, the detailed value of the antenna gain can be discussed during the study hence we suggest to remove "e.g., -5dBi instead of 0dBi typically assumed for link budget analysis for terrestrial networks".

2. Given the amount of available TUs for this item, particularly in RAN1, it is preferable that only the absolutely necessary evaluation is performed. When identifying the candidate channel(s) for coverage improvements, the coverage enhancement study outcome in TR38.830 can be referenced. Analysis can also be used to assist identifying the candidate channel(s), instead of RAN1 launching a full-blown evaluation campaign for all physical channels of NTN.

3. There is no need to list all candidate techniques for potential enhancement since the potential WI scope depends on the outcome of evaluation. Therefore, we suggest the first two sub-bullets for candidate techniques to be merged

4. We suggest to remove objective for low-rate codecs, given the limited gain of overall reduction as analyzed in RP-213165. We have raised our comments several times but have not received any response.

We therefore propose to revise the coverage part as below:

The objectives need to cover the use case of voice and low-data rate services using commercial smartphones with more realistic assumptions on antenna gains~~, e.g., -5dBi instead of 0dBi typically assumed for link budget analysis for terrestrial networks~~.

· *~~Evaluate the coverage performance and i~~**I**dentify the candidate channel(s) that have coverage issues specific to NTN with following target services taking into account the studies in TR38.830 where appropriate, as well as general coverage enhancement techniques specified in Rel-18 [RAN1]*

VoIP and low-data rate services for commercial handset terminals

· *Study, and if justified, specify NTN-specific ~~repetitions~~ enhancements (**e.g. repetitions**) beyond techniques covered in Rel-17 CovEnh WI for the relevant channels [RAN1]*

~~· *Study, and if justified, specify NTN-specific techniques for improved diversity and/or reduced polarization loss [RAN1]*~~

~~· *Study, and if justified, improve the performance of low-rate codecs in link budget limited situation including reducing RAN protocol overhead for VoNR [RAN1,RAN2] [Liaise with SA2/SA4 as necessary]*~~

~~*NOTE: Intent is to optimize the RAN to work with the lowest rate codec currently available and will not introduce a new codec.*~~

22 – TURKCELL

We agree with the objective proposal. We share T-Mobile USA's concerns.

23 – HUGHES Network Systems Ltd

We are fine with the overall scope is fine , suggest the following revision to the objective:

The Rel-18 NTN objectives are focused on ~~the applicability of~~ developing the solutions ~~developed by general NR~~ for coverage enhancement to NTN, and identifying potential issues and enhancements ~~if necessary, considering the~~ taking into account NTN characteristics including large propagation delay and satellite movement. Only NTN-specific characteristics are to be included in this coverage enhancement work, otherwise it should be part of another WI (e.g., UL enhancement of coverage). The ~~objectives~~ work needs to cover the use case ~~of~~ for voice and low-data rate services using commercial smartphones with more realistic assumptions on antenna gains, e.g., including devices with -5dBi antenna gain. ~~instead of~~ Note that 0dBi typically assumed for link budget analysis for non-terrestrial networks.

24 – Apple AB

We are generally fine with this.

We think smaller antenna gain of smart phones will affect the coverage of both uplink and downlink. Hence, we support that the objective of coverage enhancement covers both uplink and downlink.

Besides small antenna gain of smart phones, we notice that ITU regulation of limiting power flux density may impact (or reduce) the downlink transmission power and hence affect the coverage of downlink channels. This ITU regulation of power flux density limitation is discussed in our contribution RP-212997. We suggest including this power flux density limitation as one exemplary justification of this coverage enhancement objective, e.g., adding this following sentence to the end of the first paragraph: "***The evaluation should also take into account any related regulatory requirements, e.g., ITU limitation of power flux density.***"

On additional comment is on the need to liaise with SA2/SA4 (in square brackets) for improving performance of low-rate codecs. Since we don't want to introduce a new codec, what is the need to liaise with SA4? Also, we thin there is no need to involve SA2 at this stage; of course we can always liaise with them as needed, this is normal business.

25 – Qualcomm Incorporated

We are OK with the current text.

26 – Lockheed Martin

We agree and emphasize that -5 dBi UE Antenna Gain should be included in the studies.

27 – Ericsson LM

It is unclear to us what would be NTN specific with repetition enhancements and voice enhancements. Looks to us as something which, if needed, should be considered elsewhere.

28 – Sequans Communications

We are generally fine.

29 – Intel Corporation SAS

It is not clear if the evaluation/study corresponding to the 1st, 2nd and 3rd bullets will be started simultaneously or the 2nd and the 3rd bullet will (possibly) start after RAN#97.

In our understanding RAN1 should first identify if there is any issue with coverage for a physical channel and only after it RAN1 can consider enhancements for that physical channel. Considering the above and considering

the paragraph in the end of the coverage enhancement objective in the draft WID, in our view the 2nd and the 3rd bullets can be removed.

30 – Inmarsat

No concerns about the proposal, we are fine with this. We think it's important to cover realistic antenna performance when modeling UE coverage, because the lack of this has caused arguably some confusion in Release 17. Let's use something that resembles an actual device.

31 – Sony Europe B.V.

We think there are specific issues that arise because of repetition enhancements in NTN for example - need for timing and frequency tracking between repetitions that may need considered under this objective.

32 – Intelsat

Proposal is acceptable. Let's define practical assumptions for UE.

33 – Nokia France

Some of the listed "candidate set" of objectives are clearly not NTN-specific, for example:

- improved diversity (which is also much too broad and vague)
- "improve the performance of low-rate codecs in link budget limited situations including reducing RAN protocol overhead for VoNR".

The WI should focus on only aspects that are truly NTN-specific, in order to avoid multiplying divergent solutions between TN and NTN based NR.

From the proposed candidate set, we would therefore recommend focusing on polarization loss and reliance on GNSS, which also limits coverage due to the GNSS link budget. For polarization loss, it should be noted that all UEs would need to support any techniques specified for reducing polarization loss if the techniques were to be useful.

1.1.3 Objective: NR-NTN deployment in above 10 GHz bands

Feedback Form 3: Objective: NR-NTN deployment in above 10 GHz bands

1 – Guangdong OPPO Mobile Telecom.

We are fine with the current objective proposal.

2 – THALES

Overall the scope is fine for us, however, we have some concerns with some controversial wordings especially related to degradation onto present and future networks which needs to be modified leveraging the agreements made in Rel-17 NR-NTN on FR1. Besides, we need to define an example band considering the full harmonized Ka band frequency range (17.7-20.2 and 27.5-30.0) allocated by ITU-R to satellite services. Besides, there is no need to restrict it to some specific portions of these band.

Therefore suggest to replace the following points

- *Study and identify NTN bands (example band(s)?): Analysis of regulations and adjacent channel co-existence scenarios [RAN4]*
    - *Consider at least a portion of the Ka band as the example band, according to ITU allocation; identify which parts of the Ka band are suitable as 3GPP bands [RAN4]*
    - *Study implications of FDD operation in FR2 and derive requirements for the identified part(s) of the Ka band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4]*
    - *Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that 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. [RAN4]*

By

- *Study and identify NTN bands above 10 GHz: Analysis of relevant regulations and relevant adjacent channel co-existence scenarios [RAN4]*
    - *Identify an example band according to ITU allocation suitable for NTN 3GPP bands [RAN4]*
    - *Study the implications of existing FDD operation in above 10 GHz bands and derive requirements for the identified example band appropriately. Existing satellite bands introduced in 3GPP for NTN shall not impact the existing 3GPP TDD specifications for terrestrial bands (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4, RAN1]*
    - *Relevant coexistence scenarios across adjacent bands (i.e. the relevant adjacent channel) in line with RAN4 process as agreed for NTN in FR1 and the related analysis to be considered in RAN4*

In addition, we suggest

- To replace *"Targeted UE types: fixed and mobile VSAT"* by *"Targeted UE types: static and mobile VSAT"*
- to replace *"Satellite BS" by "Satellite access node"*
- to add *"Timing/frequency error requirements"* in the list of set of parameters to specify

3 – MediaTek Inc.

Overall we are supportive of the objective, and would be open to some fine tuning of the text as needed.

4 – ESA

We support this objective and we agree with Thales' revisions.

5 – Beijing Xiaomi Mobile Software

Not sure about the potential impacy on the RAN1/2. Maybe this could be a RAN4-only topic at the first stage.

6 – Transsion Holdings

We are good with this objective.

7 – China Mobile Group Device Co.

Support the provided objectives.

8 – CATT

We are fine with this objective, also fine with the Thales's revision.

9 – ZTE Corporation

We are in general supportive. But clarification on the UE types and existing restrictions for application according to the ITU regulation should also be considered. Then, as proposed in our contribution, the following updates are needed:

The work item aims at specifying enhancements for NG-RAN based NTN (non-terrestrial networks) according to the following assumptions [with implicit compatibility to support HAPS (high altitude platform station) and ATG (air to ground) scenario:

- ~~GEO~~ GSO and NGSO (LEO and MEO) with transparent payload.
  - **ESIM device is not applicable for NGSO**

- Note: In Rel-17 WID, "VSAT" device with an external antenna on a moving platform is equivalent to a device that operates on platforms in motion**, and this is referred to as ESIM including ESIM on board aircraft (aeronautical ESIM), ESIM on board ships (maritime ESIM) and ESIM on land vehicles (land ESIM).**

10 – DOCOMO Communications Lab.

OK with the current version. We do not see any RAN1 impact.

11 – LG Electronics Inc.

We are ok with current version

12 – China Telecommunications

We share similar view with ZTE to add the note that "**ESIM device is not applicable for NGSO**" and also clarify that "**ESIM including ESIM on board aircraft (aeronautical ESIM), ESIM on board ships (maritime ESIM) and ESIM on land vehicles (land ESIM)**", considering the coexistence with TN and the RAN4 workload for co-existence study.

13 – vivo Mobile Communication Co.

We are fine with the objective on NR-NTN deployment in above 10 GHz bands.

14 – Ericsson France S.A.S

We also think that in order to be clear on the scope and tasks, we should avoid generalizing the different types of ESIM as "mobile VSAT" and we should refer to the different types of ESIM (land, air, sea). We should follow regulatory decisions for ESIM, and be clear both in the specification work and in the specifications what the assumptions are behind the requirements. We are fine with the updates proposed by ZTE, but think there should be some more clarifications in addition to the ZTE ones to be clear on the scope:

The following assumptions are taken as baseline for this work:

- ***GSO*** *and NGSO (e.g. LEO, MEO, HEO) based satellite access to be considered*
  - ***NGSO is not applicable for ESIM scenarios in Ka band***
- *Targeted UE types: fixed and mobile VSAT. VSAT UE characteristics from TR38.821 to be considered in priority but additional NTN UE classes may be considered if justified*
  - ***Regarding mobile VSAT, three types of terminal and scenario exist; airborne, maritime and land based ESIM.***
- *FDD mode is assumed for satellite operation above 10 GHz, while TDD mode is assumed for terrestrial operation in FR2*
- *The harmonized Ka band frequency range (17.7-20.2 and 27.5-30.0) as common across all regions will serve as reference*

The following covers the objectives for NR-NTN deployment in above 10 GHz bands.

- *Study and identify NTN bands: Analysis of regulations and adjacent channel co-existence scenarios [RAN4]*
  - *Consider at least a portion of the Ka band as the example band, according to ITU allocation; identify which parts of the Ka band are suitable as 3GPP bands [RAN4]*
  - *Study implications of FDD operation in FR2 and derive requirements for the identified part(s) of the Ka band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4]*
  - ***For airborne and maritime ESIM terminals and scenarios, a large geographical separation to TN is assumed. This assumption shall be captured in the specification [RAN4].***
  - ***For land based ESIM scenarios and terminals, appropriate co-existence scenarios need to be identified taking into account the regulatory condition of no interference towards terrestrial networks [RAN4]. The assumed scenarios need to be captured in the specification.***
  - ***For non-mobile VSAT, appropriate co-existence scenarios need to be identified [RAN4].***
  - *Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that 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. [RAN4]*
  - *Definition of NTN band(s) above 10 GHz does not change the current FR1/FR2 definition, nor automatically apply to future terrestrial bands defined in this frequency region; (see proposal 2 of the approved way forward RP-211596 in RAN#92-e) [RAN4]*
- *Specify Rx/Tx requirements for satellite BS and different VSAT UE class (not only 60 cm aperture) as appropriate for the identified example band [RAN4]*
- *Identify values for physical layer parameters such as time relationship related enhancement (e.g. K_offset), subcarrier spacing for different UL/DL signals/channels, PRACH configuration index for FDD above 10 GHz. Introduction of new values for physical layer parameters (e.g., SCS for a given signal/channel) on top of already defined values is not in scope. [RAN1,RAN4]*

15 – Deutsche Telekom AG

We think that this objective should be split of the main NTN evolution WI as this is purely or mainly RAN4 related work. The proponents should come back with this for the March 2022 plenary when this can be considered as any other RAN4 SID/WID in the RAN4 packaging.

We are not supporting to onclude this entire section as objective here.

16 – Panasonic Corporation

We are generally fine with the objective and agree with Thales revisions.

17 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

If the values for physical layer parameters are chosen from the existing FR1 and FR2 sets, we think RAN4 only is fine.

18 – HUAWEI TECHNOLOGIES Co. Ltd.

we share similar obsevation with ZTE/CTC/Ericcson on ESIM. We would like to clarify according to ITU RESOLUTION 169 (WRC-19), Use of the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service,

- There are three types of ESIMs: maritime ESIMs, aeronautical ESIMs and land ESIMs;
- Different ESIM types differ from each other in terms of regulatory requirements;
- ESIM only applies to geostationary-satellite orbit

As different ESIM types differ from each other in terms of regulatory requirements, different co-existence studies apply to these types. So when capture Note 1 of RP-211596 into Rel-18 NR NTN work item, it is suggested to explicitly list different ESIM types. Considering ESIM only applies to geostationary-satellite orbit, it is suggested to reflect such aspect in the Rel-18 NR NTN work item. The following are suggested:

The following assumptions are taken a baseline for this work:

- *GEO and NGSO (e.g. LEO, MEO, HEO) based satellite access to be considered* ***for fixed VSAT, and GEO based satellite access to be considered for ESIMs***
- *Targeted UE types: fixed and mobile VSAT. VSAT UE characteristics from TR38.821 to be considered in priority but additional NTN UE classes may be considered if justified*
  - ***Mobile VSAT includes: maritime ESIMs, aeronautical ESIMs and land ESIMs. Whether any or which type(s) to be specified depends on the outcome of the regulation analysis and co-existence study.***
- *FDD mode is assumed for satellite operation above 10 GHz, while TDD mode is assumed for terrestrial operation in FR2*
- *The harmonized Ka band frequency range (17.7-20.2 and 27.5-30.0) as common across all regions will serve as reference*

The following covers the objectives for NR-NTN deployment in above 10 GHz bands.

- *Study and identify NTN bands: Analysis of regulations and adjacent channel co-existence scenarios [RAN4]*
    - *Consider at least a portion of the Ka band as the example band, according to ITU allocation; identify which parts of the Ka band are suitable as 3GPP bands [RAN4]*
        - ***taking into account deployment type (e.g. fixed VSAT, maritime ESIM, aeronautical ESIM and land ESIM).***

Apart from ESIM, we suggest to add RAN1 for the last objective as below:

*Identify values for physical layer parameters chosen from the existing FR1 and FR2 sets. The following set of parameters to specify, but not necessarily limited to, are listed.as follows [RAN4**, RAN1**]:*

19 – Apple AB

We are generally supportive but we would like this objective to be made crisper. We think ”above 10 GHz” sounds too broad. The WI objectives mention several times Ka band, which is fine, but “above 10GHz” may include both Ku and Ka bands, and even high frequency Q/V band. So our view is to be more specific about the bands under consideration.

20 – HUGHES Network Systems Ltd

We support this objective of NR-NTN deployment in above 10 GHz bands and fully agreed with the revision proposed by Thales.

21 – TURKCELL

We’re generally ok with this objective. We need to share the details of ESIMs.

22 – Qualcomm Incorporated

Although the overall spirit seems to reflect the previously agreed WF in RP-211596, we suggest to make the following minor modifications:

Main bullet: “Study and identify an example band for NTN-NR in above 10GHz: Analysis of regulations and adjacent channel co-existence scenarios”

Sub-bullet: It would be good to clarify what is the frequency range of the Ka band, as endorsed in the following note in RP-211596: “Note 2: The Ka band (17.7-20.2 and 27.5-30) as common across all regions is priority”

23 – HuaWei Technologies Co.

RAN4 Chair: it would be better to decide the example frequency range(s) at the beginning of WI rather than leaving it to WI phase since there seem quite a number of objectives for study to keep a reasonable workload in RAN4. The other frequency range(s) or bands can be introduced in a release independent way.

24 – Sony Europe B.V.

This should be RAN4

25 – Sequans Communications

We are generally fine with the objective and also support Thales clarifications. The assumption part might also be moved with other assumptions at beginning of 4.1.

26 – Intel Corporation SAS

The proposed objective is fine with us.

27 – Inmarsat

We agree with the objectives proposed and share similar concern as Thales regarding the wording in relation to degradation towards present and future networks. It's very confusing and not in scope for 3GPP. We will have to be in line with regulation anyways. So we agree with proposed changes by Thales.

28 – Intelsat

Agree with Thales's changes.

29 – Eutelsat S.A.

We agree with Thales' revisions as provided above. It is important to be clear that, as for NTN in FR1 bands, we are looking at NTN-TN coexistence with TN at the NTN band *edge*.

30 – Nokia France

As already mentioned during the email discussions, this work requires a significant amount of effort, as it involves FDD in FR2, for which no requirements yet exist, and it also involves frequencies between FR1 and FR2, for which no framework has yet been agreed. It is also imperative that thorough coexistence studies are performed between NTN and TN systems for the Ka band. It is therefore important that sufficient TUs are allocated to this work. The current proposal massively underestimates the required TUs.

Additionally, the objectives relating to Earth Stations in Motion (ESIM) need clarification, as explained above by Ericsson.

1.1.4 Objective: Network verified UE location

Feedback Form 4: Objective: Network verified UE location

1 – T-Mobile USA Inc.

In the study of regulatory requirements for network verified location, those must be the minimum performance requirements and where applicable should be matched to the time that this feature would be available e.g. in the US z-axis is required in 2025 and with rel-18 being finished in Dec 2023 considering product lead times, it would be incumbent that NTN meet that sort of regulatory location requirement.

2 – THALES

Overall the scope is fine for us.

We believe that this objective will have impact in RAN3 as well and especially on the exchange between NG-RAN and core network functions.

Reference to regulatory requirements have been provided in clause 1.1.1

3 – MediaTek Inc.

The scope is generally fine. The sub-bullet under the 2nd bullet is ambiguous. Propose to add "verification of" text below to clarify

O For "verification of" Network based UE location, re-use of Rel-17 UE-specific Timing Advance report can be considered as baseline

4 – ESA

We support this objective.

5 – Beijing Xiaomi Mobile Software

We are basically fine with this objective.

6 – China Mobile Group Device Co.

Agree

7 – CATT

Generally, we are fine with the objective.

Just to clarify, should RAN3 be involved for the 2nd bullet "Study and evaluate solutions for network to verify UE reported location information [RAN2,RAN1]"? We assume maybe some coordination between the gNBs, or between RAN and CN is needed.

8 – ZTE Corporation

We are fine with the current objective with the following clarification:

1. Since the RAN-level study on the requirement and regulation are still needed, the corresponding works for "·Study and evaluate solutions for network to verify UE reported location information [RAN1]" may need to be postponed till the previous objective is concluded. Otherwise, without clear requirements, it's hard to evaluate the corresponding candidates.

2. For the leading WG on the "Study and evaluate solutions for network to verify UE reported location information [RAN2,RAN1]", in our view, the key point of solutions is to justify whether some assistance information can be used to verify the accuracy of report location with additional evaluation, it's better to take the RAN1 as the leading group on this aspect.

- *Study and evaluate solutions for network to verify UE reported location information [**RAN1,RAN2**]*

9 – Samsung Electronics Co.

In the second bullet, we propose to add "if needed" after "study and evaluate". Depending on the conclusion of RAN study, it can be done or not in each WG.

10 – DOCOMO Communications Lab.

We think that what is NW-verified UE location should be clarified. We can see that companies' understanding is different. Some assume that it is just to inform GNSS-acquired UE location. Others think that it is like positioning feature in TN.

If this aspect is also discussed in the study phase at RAN plenary, it should be clarified in the WID and the bullet of "For Network based UE location, re-use of Rel-17..." should be removed. Depending on the required accuracy, it might be true that the Rel-17 mechanism based on GNSS cannot be considered baseline.

11 – LG Electronics Inc.

We think meaning and the related work of "network-verified UE location" should be firstly clarified whether it is the same as Network-based UE location or not.

12 – vivo Mobile Communication Co.

As explained in section 1.1.1, we prefer to deprioritize this objective from NR-NTN in R18.

13 – Eutelsat S.A.

We support this objective.

14 – Guangdong OPPO Mobile Telecom.

The wording suggested for the second bullet in the WID may cause confusion. There are two ways to interpret the objective: 1) RAN1/RAN2 should study and evaluate solution for verification; 2) RAN1/RAN2 should study and evaluate solutions for positioning. We believe interpretation 2) should be in line with the objective. Moreover, Network based UE location is explicitly mentioned in the sub-bullet, does it mean that this is the only solution to be studied and evaluated or other solutions can be considered? To remove the confusion, we suggest that the following rewording could be considered.

- Study and evaluate solutions**, e.g. Network based UE location,** for network to verify UE reported location information [RAN2,RAN1]
    - For Network based UE location, re-use of Rel-17 UE-specific Timing Advance report **and/or Rel-17 positioning method** can be considered ~~**as baseline**~~

15 – Panasonic Corporation

We are fine with the objective.

16 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

For the first bullet, regulatory requirements for network verified UE location need to be defined, then only solutions for verification of reported location may be studied and evaluated. It is not clear who will be involved in the definition of the regulatory requirements. It would be beneficial to add [RAN] at the end of first bullet.

For the second bullet, the description is too broad, and the objectives can be limited by defining specific positioning solutions to be studied. Specifically, we would prefer to remove the sub bullet or at least modify "For verification of UE reported location". The second objective would also involve RAN 3 aspects since it involves the NG-RAN architecture and the LMF.

For the NOTE, our understanding is that the focus is that UE gets its own position based on GNSS and report that to gNB, meanwhile UE also utilize the position to compensate uplink time/frequency. If this is the case, then we think this can be within NR NTN. If in future, we discuss/specify mechanism for UE positioning in NTN network, that is, we discuss physical signal/procedure for UE positioning based on

NTN network rather than GNSS, then it can be discussed in the positioning topic or evolve expert of that topic.

17 – HUAWEI TECHNOLOGIES Co. Ltd.

We support the revised objectives to focus on network verified UE location. For the second objective, the main bullet talks about network to verify UE reported location information, while the sub-bullet talks about network-based UE location. We suggest revise the sub-bullet as follows

- *Study and evaluate solutions for network to verify UE reported location information considering regulatory requirements and considering that the number of satellites in view can be limited (including single satellite) [RAN1,RAN2, RAN3]*
  - *For* ~~***Network based UE location***~~ ***UE reported location information****, re-use of Rel-17 UE-specific Timing Advance report can be considered as baseline*

18 – HUGHES Network Systems Ltd

The overall scope is fine. We support the objective.

19 – Qualcomm Incorporated

Regarding position location, our view is that we should state very clearly what is the objective of position location. If we cannot converge during this week, we can have a RAN-level study.

There are 3 main use cases for position location regarding NTN:

1) Meeting regulatory requirements (emergency call routing, PLMN selection, regional content restriction).

2) Replacing GNSS for RAN access (i.e., use 3GPP-based positioning for acquiring UE position and using it for pre-compensation)

3) Commercial use cases

We think the NTN positioning work in this release should focus on 1) and 2), while leaving the door open to using it for 3). In our understanding, 1) and 2) require a much smaller accuracy than solutions for terrestrial (e.g. km-level accuracy may be acceptable).

Regarding the specific objectives, we think what RAN1/RAN2 should do is to study existing techniques, focusing on sparse number of satellites, and conclude what techniques can be used, with potentially some enhancements.

In this sense, we propose to modify the objective as follows:

1) Change network-verified UE location to “network-based UE location”, with the understanding that “network-based UE location” refers to “UE location using the 3GPP network” instead of GNSS (i.e., UE-based, UE-assisted, network-based are all in scope).

2) Change the bullet to “Study, evaluate and specify necessary enhancements to existing positioning techniques to support UE location using a 3GPP NTN network [RAN1, RAN2]”

20 – Fraunhofer IIS

We agree to the proposed objective

21 – HUGHES Network Systems Ltd

Propose a minor revision to the 2nd bullet:

- Study and evaluate solutions for network to verify UE reported location information considering regulatory requirements and considering that the number of satellites in view can be limited (including single satellite) [RAN1,RAN2, RAN3]
  - ~~For Network based UE location, r~~**R**e-use of Rel-17 UE-specific Timing Advance report can be considered as baseline

22 – TURKCELL

We're generally fine with this objective. The regulatory requirements should be addressed with the 'Network verified UE Location' objective.

23 – Ericsson LM

While the issue of "network-based" vs "network-verified" has been clarified for most of the objective, there is still a sub-bullet that talks about "network based UE location". To further clarify, we propose to replace "*For Network based UE location, re-use of Rel-17 UE-specific Timing Advance report can be considered as baseline*" by "*As a baseline for the location information reported by the UE, re-use of Rel-17 UE-specific Timing Advance report can be considered"*.

24 – Sequans Communications

We are ok with this objective.

25 – Intel Corporation SAS

1) We would like to use the terminology of 'network-based positioning' which is being used in 3GPP rather than 'network verified UE location' not being used in 3GPP.

We are not yet clear if Rel-17 TA report can be considered as baseline solution (there is even no requirements so far). We propose the following revision for the corresponding subbullet, "For network-based positioning, at least one positioning method defined up to Rel-17 is supported".

2) We have not found any relevant regulation although we understand in-region identification is important. Unless the proponent can provide evident reference to regulation, the wording of regulation needs to be removed.

3) For objectives related to positioning, we prefer it to be included in positioning SI/WI.

26 – Sony Europe B.V.

We agree that "network verified UE location" should be clarified - specifically whether this is about a RAT-dependent location or verification of a GNSS reported location.

27 – Intelsat

Overall scope and objectives are acceptable

28 – InterDigital

We support this objective

29 – Nokia France

It seems there are still different understandings about the intention of this objective. Network verified/based UE location could begin with a RAN-level study of the scenarios and requirements.

1.1.5 Objective: Other comments

This section will focus on collecting comments and suggestions concerning mobility & service continuity enhancements.

Feedback Form 5: Objective: Other comments

1 – Guangdong OPPO Mobile Telecom.

We are concerned about removing the previous objective after RANP#93 on ”NTN-TN and NTN-NTN mobility and service continuity enhancements”. Rel-17 NTN didn’t manage to address handover interruption and RLF reduction issues and we think these deserve to be looked into in Rel-18, especially considering smart phones which are the main targeted devices.

2 – Ligado Networks

We agree with OPPO that handover and RLF reduction should be addressed in Release 18.

3 – Classon Consulting

for FUTUREWEI OK to keep it removed, the item is already big.

4 – Beijing Xiaomi Mobile Software

It is important to guarantee the service quality and reduce UE power consumption for UE mobility between TN and NTN. The Rel-17 mechanism for service continuity between TN and NTN will lead much handover interruption and UE power consumption. It is needed to specify the mobility enhancements to support enhanced integration between TN and NTN.

5 – Transsion Holdings

Similar view with OPPO and suggest to continue discussion on service continuity and mobility.

6 – China Mobile Group Device Co.

Mobility enhancement for guaranteeing the service continuity and reducing radio link failure is important for both intra-NTN and NTN-TN. In particular, the topic about the reduction of delay and signaling overhead is almost not discussed in R17. Therefore, mobility enhancements are essential for R18, at least it shouldn’t be completely removed. Some opponents mention that the current scope is already wide, however, the most part is for RAN4 and RAN1, especially NR-NTN deployment in above 10 GHz bands may be a separate RAN4-only topic, the study workload in RAN2 is indeed very low.

7 – CATT

Share the view with OPPO and CMCC that Mobility enhancement is essential, which should not be simply removed from the scope of Rel-18. Considering the load of the WI, maybe we can try to minimize the scope of the ”mobility” objective. we give an example as below:

4.1.x NTN-TN and NTN-NTN mobility and service continuity enhancements

This work considers existing methods from NR TN as baseline for NTN-TN mobility as well as Rel-17 WI outcome and the further mobility enhancements objectives are listed below.

- *Address handover interruption, handover signalling overhead [RAN2,RAN1]*
- *Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2,RAN4,RAN1]*
- *Identify and specify the necessary enhancement to Xn/NG signallings to exchange necessary information between NTN gNBs or between TN gNB and NTN gNB. [RAN3]*

8 – ZTE Corporation

We also share the views that potential supports on the mobility part can be considered. Considering the workload, limited discussion on followings can be prioritized.

- Reduce handover signaling overhead
- Specify NTN -TN and NTN -NTN mobility enhancement
  - For NTN -TN, optimize the mobility in idle/inactive mode and connected mode to prioritize TN over NTN or vice versa.
  - For NTN -NTN, optimize the mobility in connected mode to handover a group of UEs to another cell.

9 – DOCOMO Communications Lab.

Mobility aspect should be re-included since Rel-17 NTN spec will be insufficient. Limited scope is fine for us.

10 – vivo Mobile Communication Co.

We have a concern on removing the mobility enhancement part which were considered as necessary in the pre-meeting email discussion by quite a lot of companies. Within that scope, we prefer keeping the first two bullets regarding “handover overhead/interruption reduction” and “enhancements on NTN-TN, & NTN-NTN service continuity” which are important to NTN mobility performance.

11 – Deutsche Telekom AG

As all other comments in this direction ... we are surprised that the orginal objective 4.1.3 on ”NTN-TN and NTN-NTN mobility and service continuity enhancements” has been removed ?! For us this is the most important improvement of NTN Rel-18 evolution.

We propose to re-include it

12 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

RAN3 TUs have been allocated for this WI and RAN3 specs have been listed in the list of impacted specs, however RAN3 has not been added as a secondary WG and there are no RAN3-specific objectives in the WID. We think RAN3 part should be clarified.

13 – HUAWEI TECHNOLOGIES Co. Ltd.

We are fine to remove mobility and service continuity from the objectives.

As we commented in the previous email discussion, the objectives are too general and lack of details. Follow the general guideline from RAN Chair in RP-213469 "Should try to avoid "generic enhancements"-like scope!", it is reasonable to remove the mobility related objectives in the original draft WID in RP-212713.

14 – Apple AB

We expect that NTN-TN mobility (even in idle mode) will not be completely finished in Release 17. At the very least, we think there should be some time allotted in Release 18 to properly complete the Release 17 enhancements for NTN-TN mobility. Our preference would be to keep this objective over network verified UE location, for down-scoping purposes, as indicated previously.

15 – HUGHES Network Systems Ltd

Rel-17 NTN did not manage to address handover interruption and RLF reduction issues, we think mobility and service continuity enhancements need to be included in Rel-18.

16 – VODAFONE Group Plc

For R18 workload reasons, we are happy to leave NTN <-> TN mobility as a candidate for releases *after* R18.

17 – Qualcomm Incorporated

It is also a bit unclear to us why the mobility objectives were removed, since this is something that RAN2 hasn't focused on in Rel-17, but we are open to further discussion on this topic.

18 – TURKCELL

We don't support removing 'NTN-TN and NTN-NTN mobility and service continuity enhancements'. Mobility enhancement is essential for us.

19 – Lockheed Martin

- We also observe that NTN-TN and NTN-NTN Mobility is an important aspect worth including. One main reason is that the commercial success of NTN will at least partly depend on the NTN & TN cooperation.

20 – Sony Europe B.V.

Similar view as OPPO and We are also concerned about removing mobility and service continuity objectives. R17 did not address signalling overhead issues.

21 – Ericsson LM

We note that the aspect of explicit specification of regenerative architecture has been dropped. We appreciate there were views that it can be considered an implementation option. However, considering that a regenerative architecture could reduce the need for various other enhancements we think it should be clarified that regenerative architecture (even if not needing additional specification) is an option to generally consider when determining need for enhancements.

For the sake of progress and a manageable scope we prefer to move forward and not add more/back objectives.

In general, we would prefer not to (re-)introduce NTN-specific enhancements without full consensus on their proven benefits.

22 – Inmarsat

We tend to agree with Oppo's and others view that NTN-TN service continuity enhancements should not be dropped.
A key value is the ability to move between TN and NTN, if this mechanism doesn't work, we are missing half of the solution.

23 – Intelsat

Service continuity and transition between TN and NTN is important and provide important aspect for hybrid services.

24 – InterDigital

Similar view with OPPO and other companies that mobility and service continuity objective shouldn't be dropped.

1.1.6 Expected Output and Time scale (Section 5 of the WID)

Feedback Form 6: Expected Output and Time scale (Section 5 of the WID)

1 – THALES

We suggest to

· add a subsequent *TR 38.xxx "NTN related RF and coexistence aspects in above 10 GHz"* among the list of new specifications.

· add a subsequent spec among the existing spec impacted: *38.101-2 "NR; User Equipment (UE) radio transmission and reception, part 2: Range 2 standalone NTN specific characteristics"*

· to replace "*Satellite Node*" by "*Satellite Access Node*" for TS 38.108 and 38.181

2 – Samsung Electronics Co.

(TS 38.xxx NR; User Equipment (UE) radio transmission and reception, part X: VSAT)

We are of the view that a unified NTN UE specification is needed. So before RAN made a clear decision on this aspect, whether a specific VSAT TS is needed shall be pended.

(Impacted existing TS/TR Table: 38.101-4 NR; User Equipment (UE) radio transmission and reception, part 4: performance requirements, NTN specific characteristics)

We are of the view that a unified NTN UE specification is needed. So before RAN made a clear decision on this aspect, whether NTN specific characteristics woulde be integrated into existing TS 38.101-4 shall be pended.

(Expected Outcome and time scale, Impacted existing TS/TR Table)

Add TR 38.863 Solutions for NR to support non-terrestrial networks (NTN): Non-terrestrial networks (NTN) related RF and co-existence aspects in the table

3 – Spark NZ Ltd

Spark recommends that the list of specifications to be updated and structure should follow the discussion under agenda item 9.3.2.2.

4 – THALES

After second thoughts:

we suggest not to add a subsequent *TR 38.xxx "NTN related RF and coexistence aspects in above 10 GHz"* among the list of new specifications.

Instead, in line with Samsung we recommend to add the TR 38.863 Solutions for NR to support non-terrestrial networks (NTN): Non-terrestrial networks (NTN) related RF and co-existence aspects in the table of impacted existing TS/TR

5 – HUAWEI TECHNOLOGIES Co. Ltd.

The coexistence study above 10 GHz and RF requirements for VSAT and satellite access node can be recorded into a separate TR. Therefore, we suggest to add a TR 38.xxx "NTN related coexistence study for above 10 GHz and RF requirement for VSAT and satellite access node".

6 – Qualcomm Incorporated

At this stage, it is unclear to us if we need a formal TR for the "UE location" part. Maybe we can revisit this part once the objective is stable.

7 – HUGHES Network Systems Ltd

We agreed with Thales second thoughts above

8 – Ericsson LM

It is too early to include TSs 38.101 and 38.133 in the list of affected specifications. We suggest to remove for now and consider during RAN4 work after Rel-17 aspects have been concluded.

9 – Intelsat

We agree with Thales second input

10 – Inmarsat

We are of the view that NTN and TN UE specs should be as much as possible unified. Use of beamforming and directional type antennas in UEs in FR2 is not uncommon, so there aren't very good reasons to think this cannot apply also to static and mobile VSAT. How the physical antenna is implemented is an implementation detail that should have little to do with 3GPP spec.

1.2 Moderator Summary and recommendation for further discussion

Thanks for the initial round feedback. Based on the feedback received, the moderator has provided the further revised WID at the following link using yellow highlighting to show the proposed revisions after the initial round.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-17-R18-NTN-NR%5D/Rev2%20of%20RP-212713%20WID%20NR%20NTN%20Enhancements-rm.docx

The revisions are based on the summary of each topic as listed in the intermediate round section.

2 Intermediate Round

The intermediate round will focus on providing feedback on the further revised WID based on the outcome of the initial round and the moderator way forward. The comments should be provided in the appropriate feedback forms as opposed to revising the moderator provided WID.

2.1 Collection of company views

2.1.1 General high-level views and justification

Concerning the Thales proposed revisions, the moderator has updated the related work items and dependencies and the justification section related to the rationale for network verified UE location with respect to some examples of regulatory requirements. However, the moderator has kept the language related to the study outcome and to keep the text closer to a justification as opposed to an objective. The proposed updates concerning VSAT terminals was not adopted since the suggestion is mixing FR1 with the >10GHz topic.

A number of companies commented that aspects of the mobility & service continuity enhancements be added back to the WID. However, there are other comments received from multiple companies that the scope is agreeable or is already large and further downscoping should occur. No updates are proposed to this aspect at this time and further discussion will be held in the Final Round, if necessary, on this topic after taking it during the GTW.

A few companies commented about the -5dBi antenna gain example that was provided in the justification and objective for coverage enhancement and that this value should be defined at the working group level. As opposed to removing the example, the moderator has proposed to add a statement that the specific realistic antenna gain assumption will be determined at the working group level.

Concerning the Hughes Network Systems revision to the justification for coverage enhancements, the

moderator has kept the original language since it seemed agreeable during the October email discussion and the proposed updates are more limiting. Companies are encouraged to provide feedback during the intermediate round if the Hughes Network Systems revision is acceptable or not.

Concerning the Intel comment to use network-based positioning as opposed to network verified UE location, the moderator has kept the original language since it seemed agreeable during the October email discussion. Companies are encouraged to provide feedback during the intermediate round if the Intel revision is acceptable or not.

Feedback Form 7: General high-level views and justification

1 – Samsung Electronics Co. Generally okay and one comments for coverage enhancements to scope down. There are still many topics for RAN1 compared to TU budget.
2 – LG Electronics Inc. We are generally fine.
3 – HUAWEI TECHNOLOGIES Co. Ltd. Given that the value of the realistic antenna gains will be determined in working group discussions, it may not be so necessary to provide -5dBi as an example.
4 – CATT We are fine with the justification.
5 – THALES We do thank the moderator for its hard effort. Overall we are fine with the scope of the WI and its three down selected topics. These are the minimum set of topics to be addressed in this release. We suggest the moderator to adopt GSO and NGSO instead of GEO and NGEO since this is a decision of the on-going NR-NTN WI reflected in the endorsed draft running CR [R2-2111613] where the following definition has been introduced *"Geosynchronous Orbit: Earth-centered orbit at approximately 35786 kilometres above Earth's surface and synchronised with Earth's rotation. A geostationary orbit is a non-inclined geosynchronous orbit, i.e. in the Earth's equator plane."* If needed the following modification could be implemented: · *"Offer optimized performance especially when addressing handset terminals (including smartphones with more realistic assumptions on antenna gains~~, e.g., -5dBi instead of 0 dBi antenna gain with the specific realistic antenna gain assumption~~ to be determined at the working group level) w.r.t. coverage considering the NTN characteristics such as large propagation delay and satellite movement."*

6 – MediaTek Inc.

We are generally fine with Section 3 justification in the draft WID. We have preference to keep GSO and NGSO (instead of GEO and NGEO) which are known terminology in 3GPP and in wider satellite echo-system. It is not necessary to mention "e.g., -5dBi instead of 0 dBi antenna gain", this can be removed.

7 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are generally fine with the justification.

8 – Nokia France

Thank you to the Moderator for your efforts to converge this WID.

We have a couple of remaining general comments:

1. The objective on >10GHz would be better separated out into a separate RAN4-led WI. This is a very specific topic, without impact outside RAN4, and the work management would be more transparent if it had its own dedicated TU allocation.

2. We are still concerned about removing the previous objective on "NTN-TN and NTN-NTN mobility and service continuity enhancements". Rel-18 should at least include the TN-NTN mobility aspects and IDLE_mode prioritization that were deprioritized from Rel-17, in addition to power consumption aspects. As commented by several operators in the initial round, we see this as the most useful component of the work.

9 – Beijing Xiaomi Mobile Software

We have concern on remove the entire mobility enhancements. At least the TN/NTN mobility and handover aspects should be included in Rel-18 scope.

10 – Deutsche Telekom AG

Ok, let's discsuss tonight, but mobility objective should be re-included (as also Nokia and Xiaomi say above my comment) and multiple companies said in the initial round .. Also the above 10 GHz needs to be clarified and seperated out into a RAN4 lead SI.

11 – Apple AB

Looks good

12 – Inmarsat

Many thanks for the summary/
We agree with the overall scope, and we also support Thales proposed modifications.
GEO and NGEO should be changed respectively to GSO and NGSO in line with the ongoing WI and with the more general accepted definition.

We can leave the determination of the value for UE antenna gain to working group discussion.

13 – SoftBank Corp.

Thank you for summary.

We consider the brackets should be removed to mention implicit support of HAPS/ATG as Docomo, Vodafone and DT mentioned initial round.

14 – Ligado Networks

We are ok with this. We prefer use of GSO / NGSO terminology.

15 – Omnispace

The summary is fine with us and we would also prefer the GSO & NGSO terminology.

16 – Intelsat

Thank you to the moderator for diligently working on this. We agree with the WI scope and the selected topics.

We would suggest that GEO and NGEO be replaced with GSO and NGSO as well.

We also support the modification removing "-5 dBi instead of 0 dBi antenna gain with the specific realistic antenna gain assumptions" with statements that indicate the assumptions will be determined at the working group level.

17 – Rakuten Mobile

We also support including mobility enhancements NTN to TN.

18 – Intel Corporation SAS

Revisions for justification section looks fine for us.

We still prefer to use the terminology of 'network-based positioning' rather than 'network verified UE location'. This issue can be considered in the discussion for the corresponding objective.

19 – VODAFONE Group Plc

agree with Softbank comment

20 – TURKCELL

We are still concerned about removing the entire mobility enhancements. We support Nokia proposal related with the objective on >10GHz. It would be better separated out into a separate RAN4-led WI.

21 – Classon Consulting

for FUTUREWEI Generally OK. Mobility should not be re-added. Can consider to spin off the >10GHz to RAN4-led.

22 – Ericsson LM

Similar to Thales we think it would be good to align with Rel-17 WI and refer to GSO and NGSO instead of GEO and NGEO, respectively.

We also support the clarification of antenna gain assumptions to be determined by the working groups:

"• *Offer optimized performance especially when addressing handset terminals (including smartphones with more realistic assumptions on antenna gains~~, e.g., -5dBi instead of 0 dBi antenna gain with the specific realistic antenna gain assumption~~ to be determined at the working group level) w.r.t. coverage considering the NTN characteristics such as large propagation delay and satellite movement.*"

23 – Sequans Communications

We are generally ok. We would be open to keep a mobility objective, covering at least mobility enhancements that were deprioritized in Rel-17 (e.g. TN/NTN mobility).

2.1.2 Objective: Coverage enhancement

Concerning the Thales proposed revisions, the moderator has integrated the revisions (with some paraphrasing to also modify the text related to the -5dBi value) as they seem to highlight the NTN-specific aspects which should not be controversial.

CATT raised a question if we are focusing on FR1 only for this objective. The moderator's view is that we are focusing on FR1 only for this objective based on the assumptions listed in the objective section and the removal of VSAT from the introductory text for this objective.

Concerning the Hughes Network Systems revision to the objective for coverage enhancements, the moderator has kept the original language with the exception of some editorial updates since it seemed agreeable during the October email discussion and the proposed updates removed the key statement that the general NR solutions for coverage enhancements should be leveraged.

Further comments were received that were also provided during the October email discussion concerning the set of candidate solutions to study. As the goal is to provide as much detail concerning the set of items that could be considered as part of the study, the moderator's view is that the addition of "Study, and if justified, specify ..." was the compromise approach reached during the October email discussion to satisfy the large number of companies that wanted these aspects to be studied. No further updates have been made to the draft WID concerning these items at this time. In the moderator's view, all items listed clearly identify that the focus should be on NTN-specific aspects. If there are no NTN-specific aspects to consider based on the outcome of Rel-17 activities, the study scope would be adjusted accordingly with a WID revision.

Further discussion can be held in the intermediate round to determine if there is a majority view to remove the last three sub-bullets of candidate solutions and if the remaining text is sufficient for RAN1 and RAN2 to scope the study phase. A separate feedback form has been added for this question in addition to a general feedback form for Objective: Coverage enhancement.

Do you agree to remove the last three bullets as shown below from the objective?

- Study, and if justified, specify NTN-specific repetitions enhancements beyond techniques covered in Rel-17 CovEnh WI for the relevant channels [RAN1,RAN2]
- Study, and if justified, specify NTN-specific techniques for improved diversity and/or reduced polarization loss [RAN1]
- Study, and if justified, improve the performance of low-rate codecs in link budget limited situation including reducing RAN protocol overhead for VoNR [RAN2,RAN1] [Liaise with SA2/SA4 as necessary]

NOTE: Intent is to optimize the NTN-based NG-RAN to work with the lowest rate codec currently available and will not introduce a new codec.

Feedback Form 8: Do you agree to remove the last three bullets from the objective?

1 – Samsung Electronics Co.

Generally okay. As repeating our views, we suggest to scope down by adding ”as a second priority”. The TU budget with 1 TU is not enough to do all of those topics for coverage enhancement.

- Study, and if justified, as a second priority, improve the performance of low-rate codecs in link budget limited situation including reducing RAN protocol overhead for VoNR [RAN2,RAN1] [Liaise with SA2/SA4 as necessary]
  - NOTE: Intent is to optimize the NTN-based NG-RAN to work with the lowest rate codec currently available and will not introduce a new codec.

2 – LG Electronics Inc.

We are ok to remove at least for first bullet and diversity in second bullet. For other topics, we are open for the further discussion.

3 – Guangdong OPPO Mobile Telecom.

We think that keeping these three bullets can give a good guideline for the WGs to conduct the study. From the moderator summary, the moderator suggests to provide as much as details. Thus, it may not be preferred to limit the study scope.

4 – DOCOMO Communications Lab.

Support to remove these bullets.

5 – HUAWEI TECHNOLOGIES Co. Ltd.

On the first two bullets, we share the view there is no need to list all candidate techniques for potential enhancement since the potential WI scope depends on the outcome of evaluation. Therefore, we suggest the first two sub-bullets for candidate techniques to be merged.

On the last bullet, we suggest to remove it since we have not seen any gain of RAN protocol overhead reduction as analyzed in RP-213165. We have raised our comments several times but have not received any response.

- Study, and if justified, specify NTN-specific ~~repetitions~~ enhancements (**e.g. repetitions**) beyond techniques covered in Rel-17 CovEnh WI for the relevant channels [RAN1,RAN2]
- ~~Study, and if justified, specify NTN-specific techniques for improved diversity and/or reduced polarization loss [RAN1]~~
- ~~Study, and if justified, improve the performance of low-rate codecs in link budget limited situation including reducing RAN protocol overhead for VoNR [RAN2,RAN1] [Liaise with SA2/SA4 as necessary]~~
  - ~~NOTE: Intent is to optimize the NTN-based NG-RAN to work with the lowest rate codec currently available and will not introduce a new codec.~~

We are also fine to remove all these three bullets

6 – ZTE Corporation

Regarding all three bullets, in our view, the 2nd one is more NTN-specific and the others are generic to all scenarios. maybe we can try to prioritize this one.

We are also fine to remove all bullets.

7 – CATT

We are fine to remove these bullets.

8 – THALES

We don't think it is necessary the last 3 bullets points because, they should be studied however, as stated, they won't be necessarily specified.

9 – MediaTek Inc.

The 2nd bullet and 3rd bullet can be kept. The first bullet is not NTN specific and can be de-prioritized (to our understanding, it was well discussed in Rel-17 NR NTN WI and NR Coverage, with no consensus achieved).

10 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We think it is better to keep these sub-bullets. The objective without these sub-bullets is too general to us.

11 – Beijing Xiaomi Mobile Software

We are fine to remove the last three bullets

12 – Nokia France

We support removing these three bullets. It is better to complete the evaluation first, and not pre-judge its outcome.

13 – Deutsche Telekom AG

We support removal.

14 – Apple AB

We are fine with removing these bullets, since these topics may be discussed after the study phase is completed.

15 – Ligado Networks

We would prefer to keep the sub-bullets but would be also ok with Huawei's proposal to merge the first two.

16 – Intel Corporation SAS

We agree to remove the last three bullets and focus on the first bullet to identify which physical channels require enhancements.

17 – Qualcomm Incorporated

No. The bullets clearly state what is the scope of the potential enhancements, namely:

1) Enhancements to repetitions techniques.
2) Techniques for improved diversity and recovery of polarization loss.
3) Improvement of low-rate codecs, including reduction of RAN protocol overhead.

Without these improvements, the study is very ill-defined and will lead to endless discussions in the WGs. Additionally, the main bullet only lists RAN1 as a WG, while the study should also include RAN2, as currently clarified by the last sub-bullet.

18 – HUGHES Network Systems Ltd

Ok to remove - it will be subject to the conclusion of the evaluation anyway.

19 – TURKCELL

We support the removal of these bullets.

20 – Classon Consulting

for FUTUREWEI Support to merge the 1st and 2nd. The third should be removed.

21 – Ericsson LM

We support Huawei's proposal of merging the first two sub-bullets and removing the last one. In the first sub-bullet, the phrase "if justified, specify" could also be removed, since we anyway will update/revise the WID after the study phase.

22 – Sequans Communications

We are fine with the proposal to remove those bullets.

General feedback for Objective: Coverage enhancement will be captured in the following feedback form.

Feedback Form 9: Objective: Coverage enhancement

1 – Guangdong OPPO Mobile Telecom.

The current objective is fine to us.

2 – HUAWEI TECHNOLOGIES Co. Ltd.

Given that the value of the realistic antenna gains will be determined in working group discussion, it may not be so necessary to provide -5dBi as an example.

3 – THALES

We are fine with the present objective

4 – MediaTek Inc.

Generally fine with this objective. It can be a second priority overall. Proponents should align understanding on the needs and potential gains with other companies. It would be helpful to narrow the scope of study to fit 1 TU [6]-month study for Coverage enhancements.

5 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

The objective with sub-bullets kept is OK to us.

6 – Nokia France

If the three sub-bullets are removed, we are fine with this objective.

7 – Apple AB

We would like to reiterate our earlier comment: Besides small antenna gain of smart phones, we notice that ITU regulation of limiting power flux density may impact (or reduce) the downlink transmission power and hence affect the coverage of downlink channels. This ITU regulation of power flux density limitation is discussed in our contribution RP-212997. We suggest including this power flux density limitation as one exemplary justification of this coverage enhancement objective, e.g., adding this following sentence to the end of the first paragraph: "*The evaluation should also take into account any related regulatory requirements, e.g., ITU limitation of power flux density*"

8 – ZTE Corporation

We are generally fine with the comments provided for the previous question. Moreover, we also think the view on power flux from Apple is reasonable and similar to the UE antenna gain, we need to take the realistic assumption for both sides in the assumptions.

9 – Intel Corporation SAS

Other than the issue with three last bullet we are fine with the proposed wording for the objective.

10 – Qualcomm Incorporated

The text in its current form is acceptable to us.

11 – HUGHES Network Systems Ltd

OK with present objectives

12 – TURKCELL

We are fine with the present objective.

13 – Ericsson LM

We agree with Huawei that the -5dBi example is not needed as the value will be determined in working groups. However, we think it needs to be clarified that since the assumptions will impact RAN4 aspects, the assumptions need to be checked by RAN4 even if RAN4 is not involved in the coverage enhancement part more generally.

14 – Lockheed Martin

We agree with the -5dBi antenna gain consideration.

2.1.3 Objective: NR-NTN deployment in above 10 GHz bands

Concerning the proposed revisions from Thales, the moderator has kept the original text with the exception of modifying "satellite BS" to "satellite access node". The changes related to the operating band(s) and the co-existence aspects are removing key aspects that were defined in the previous WF and during the FR1 work. In addition, the existing text related to these aspects was agreed during the October email discussion. As far as terminology, the moderator has tried to keep similar terms as used in TR 38.821. For the request to add "Timing/frequency error requirements" in the list of set of parameters to specify, the moderator would like to see other views on this in the intermediate round. The list of parameters is presently not limited to the items shown so there seems to be flexibility for this item to be considered even if not specifically listed.

As a response to the Xiaomi comment, the existing objectives are all RAN4 items and there are no defined RAN1/RAN2 items in the revised WID.

Concerning the comments from ZTE, China Telecom, Ericsson, Huawei, and Nokia on ESIM devices, the moderator has taken the Ericsson suggested text as the revisions seem to address the superset of comments. Concerning GSO and NGSO usage, the moderator has utilized GEO and NGEO to keep consistent with TR 38.821.

Concerning the feedback from Nokia that the number of RAN4 TUs is not sufficient, the moderator would like to get the view from the RAN4 Chair during the GTW time or offline.

Some companies presented concerns around the identification of example bands and that the present text related to >10GHz is too open. The moderator has suggested text in the revised WID that the example band(s) shall be identified early in the WI and other bands can be added in a release independent manner as suggested by Huawei. The identification of example band(s) can be addressed by RAN4 based on the expected workload and the WID can be further revised in the future to identify the example band(s) determined by RAN4.

Concerning the feedback from Deutsche Telekom that this objective should be considered later in March 2022 Plenary, the WF in RP-211596 mentioned that this work would start after March 2022 once FR1 NTN coexistence study is stable enough. Based on this WF, the moderator suggests adding this text to the objective to clarify this aspect so that this objective can be considered at RAN#94e as part of the overall package given that the work on the example band(s) are typically handled in the corresponding feature WI.

Concerning the comment from Huawei to add RAN1 to the identification of physical layer parameters, the moderator has kept this as RAN4 only based on the RAN Chair's proposed detailed scope updates which were meant to remove the RAN1 dependency. Certainly, there may be need for RAN4 to liaison with RAN1 but this can occur whether RAN1 is listed or not.

Feedback Form 10: Objective: NR-NTN deployment in above 10 GHz bands

1 – HUAWEI TECHNOLOGIES Co. Ltd.

As we commend earlier, different VSAT types differ from each other in terms of regulatory requirements, different co-existence studies apply to these types. It does not seem practical that RAN4 can define all

VSAT types in one release. So we suggest the objectives are not written in a way suggesting all types should be supported in Rel-18. We suggest revision below:

· *Targeted UE types: fixed and mobile VSAT. VSAT UE characteristics from TR38.821 to be considered in priority but additional NTN UE classes may be considered if justified*

o *Regarding mobile VSAT, three types of terminal and scenario exist; airborne, maritime and land based ESIM.*

o ***Which type(s) to be specified depends on the outcome of the regulation analysis and co-existence study***

· *For airborne and maritime ESIM terminals and scenarios, a large geographical separation to TN is assumed. This assumption shall be captured in the specification,* ***if the corresponding ESIM type(s) are supported*** *[RAN4].*

For land based ESIM scenarios and terminals, appropriate co-existence scenarios need to be identified taking into account the regulatory condition of no interference towards terrestrial networks [RAN4]. The assumed scenarios need to be captured in the specification ***if the corresponding ESIM type is supported****.*

2 – MediaTek Inc.

We are generally supportive of this objective. We have preference to keep GSO and NGSO (instead of GEO and NGEO) which are known terminology in 3GPP and in wider satellite echo-system.

3 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are fine with the objective.

4 – Nokia France

1. As mentioned above, the objective on >10GHz would be better separated out into a separate RAN4-led WI. This is a very specific topic, without impact outside RAN4, and the work management would be more transparent if it had its own dedicated TU allocation.

2. In the main bullet, ”example band” should be singular, as in the sub-bullet. The work should focus on one example band to start with. It is already stated that ”Additional bands can be introduced in a release-independent manner”, which is fine.

3. We support the proposed modifications above by Huawei.

5 – THALES

We would like to emphasize the importance of this topic for all satellite players. It has been discussed over the past 18 months. It has been decided at RAN#92-e to start a study in March 2022 (see RP-211596) and therefore it is necessary to scope the work already at this plenary.

We see no reason to add the statement “~~*NGEO is not applicable for ESIM scenarios in Ka band*~~”. Note that ETSI has developed a harmonized standard for ESOMP (Earth Stations on Mobile Platforms) for NGSO in Ka band in ETSI EN 303 979.

Here under are specific comments with respect to the following bullet points

- *"Consider at least a portion of the Ka band as the example band, according to ITU allocation; identify which parts of the Ka band are suitable as 3GPP bands [RAN4]"*
  - We suggest to replace this controversial statement above by "***Identify an example band according to ITU allocation suitable for NTN 3GPP bands [RAN4]***"
  - Rational: The NTN band will necessarily include the full band, as this is how satellites generally operate in above 10 GHz bands. Moreover we recommend to consider as example band the whole harmonized Ka band frequency range (17.7-20.2 and 27.5-30.0) which is common across all regions according to ITU allocation. Note that this intent has been made clear to TSG-RAN since December 2017 (see RP-172272).
- *"Study implications of FDD operation in FR2 and derive requirements for the identified part(s) of the Ka band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4] »*
  - => We suggest to modify the above as "*Study implications of FDD operation in ~~FR2~~* ***above 10 GHz bands*** *and ...*"

The following three bullet points should be removed since it precludes the analysis of the relevant regulations and/or relevant coexistence scenarios:

- ~~*"For airborne and maritime ESIM terminals and scenarios, a large geographical separation to TN is assumed. This assumption shall be captured in the specification [RAN4].*~~
- ~~*"For land based ESIM scenarios and terminals, appropriate co-existence scenarios need to be identified taking into account the regulatory condition of no interference towards terrestrial networks [RAN4]. The assumed scenarios need to be captured in the specification.*~~
- ~~*"For non-mobile VSAT, appropriate co-existence scenarios need to be identified [RAN4].*~~

As per the following bullet point

- ~~*"Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that 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. [RAN4]"*~~
  - => We suggest to replace this controversial statement above by "***Relevant coexistence scenarios across adjacent bands (i.e. the relevant adjacent channel) in line with RAN4 process as agreed for NTN in FR1 and the related analysis to be considered in RAN4***"

Note: The outcome of this work could also be applicable to other satellite bands above 10 GHz; It is assumed that any specific frequency band definitions may be handled via separate release-independent WIs after the analysis has been completed.

6 – Ericsson France S.A.S

The scope proposed by the moderator is fine. We agree with Huawei that there is a need to consider which types of terminal should be specified considering the regulatory situation and available RAN4 resources, and support to add the text they suggest.

In our view, it is essential to be clear about what kinds of scenario and terminal are to be considered. If it is left open to all kinds of terminal and deployment then it is not possible to predict the workload in RAN4. The proposed statements on ESIM reflect the regulatory conditions for ESIM scenarios that we should keep to. We should not set the scope to consider ESIM deployments not allowed in ITU (e.g. NGSO, maritime that is not out at sea etc.) as it will needlessly reduce focus in RAN4 and increase workload. Hence the need to clarify GSO, maritime coastal limit assumption, aircraft height assumption etc.

Regarding the comments on whether this work should be separated into RAN4; in general RAN4 work should be kept within a feature WI. However, in this case the feature is from Rel-17 and this work is to open up further deployment and spectrum possibilities, so it could also be acceptable to discuss separately in the context of the RAN4 package, and indeed possibly a good idea to handle RAN4 driven work together.

7 – Eutelsat S.A.

We support the modifications from Thales, many of which were already made in the previous round.

Specifically on the subject of ESIM, it is difficult to see how this could be of relevance here: For one, at the last World Radio Conference (WRC-19) the ITU-R established a framework for ESIM transmitting in the band 27.5 – 29.5 GHz - however this same WRC-19 also confirmed its previous and explicit decision *not* to identify IMT in this band.

8 – HISPASAT SA

Ok with the proposal from Thales.

Emphasis on leaving ESIM and scenarios discussion, focusing on thecnical analysis on >10ghz bands.

9 – HuaWei Technologies Co.

RAN4 Chair: regarding RAN4 part and TU, if the objectives are too open, more TU would needed. So I still suggest to decide one example band when approving WID. So far the total number of TUs (RF) for NTN is almost the highest one.

10 – Intel Corporation SAS

We are fine with the revised objective.

11 – Inmarsat

We support adopting the proposed wording from Thales, many of which were already proposed in the previous round as highlighted by Eutelsat, but were not included in the summary.

To further clarify:
1) We should focus on solving the technical problems and not debating or making our own regulations. At the moment the focus of this WI should be to establish the general framework and solve any technical gaps without adding useless additional burden which will just increase the scope for no good reason.

2) Considering also that as highlighted by Thales, the framework in ITU for ESOMP in NGSO exists, there is no basis to drop the NGSO scope.
The scenarios for NR NTN include both GSO and NGSO, so both should be addressed for the work above 10 GHz.
Generally, the work done should be agnostic of the specific frequency bands, and hence applicable not only to Ka but to other satellite FDD bands above 10 GHz.

3) However, since there seems to be a strong consensus on containing the scope, we should identify an example band, as suggested by Thales with the following wording.
"***Identify an example band according to ITU allocation suitable for NTN 3GPP bands [RAN4]***"

Then, when choosing an example band, we recommend to consider the whole harmonized Ka band frequency range (17.7-20.2 and 27.5-30.0) common across all regions and well-defined by ITU allocations.
Thales proposed wording is fine:
"

- **Rational: The NTN band will necessarily include the full band, as this is how satellites generally operate in above 10 GHz bands. Moreover we recommend to consider as example band the whole harmonized Ka band frequency range (17.7-20.2 and 27.5-30.0) which is common across all regions according to ITU allocation. Note that this intent has been made clear to TSG-RAN since December 2017 (see RP-172272).**

"

Other bands would then be able to leverage this technical work but would be addressed through individual RAN4 band WIs as typical. Thales' note captures this quite nicely:
"Note: The outcome of this work could also be applicable to other satellite bands above 10 GHz; It is assumed that any specific frequency band definitions may be handled via separate release-independent WIs after the analysis has been completed."

4) The UE scenarios in question are actually very simple if we assume both static and moving VSAT and we assume both GSO and NGSO. There is no need at this stage to overcomplicate it by wasting time in trying to identify a subset of VSAT UEs, instead of saving TUs we will end up wasting more TUs (discussions on above 10 GHz happened so far in RAN and RAN4 are a proof of this).
We can keep the general wording with slight adjustments (that were proposed in previous round):
"
The following assumptions are taken a baseline for this work:

- **GSO and NGSO (e.g. LEO, MEO, HEO) based satellite access to be considered**
- **Targeted UE types: fixed and mobile VSAT. VSAT UE characteristics from TR38.821 to be considered in priority but additional NTN UE classes may be considered if justified**

"

5) As per the coexistence scenarios, we should avoid overcomplicating (and thus adding additional TU load), we support the proposed simplified wording by Thales:

"Relevant coexistence scenarios across adjacent bands (i.e. the relevant adjacent channel) in line with RAN4 process as agreed for NTN in FR1 and the related analysis to be considered in RAN4"

The process should be followed and focus should be on adjacent band coexistence where relevant, without attempting to derail the scope.

12 – HUGHES Network Systems Ltd

We support the modifications from Thales.

We want to emphasize again our comments:

In the 1st paragraph, unnecessary to have sub-bullet, we rather let the ITU regulation be the reference

The following assumptions are taken a baseline for this work:

- GEO and NGE~~S~~O (e.g. LEO, MEO, HEO) based satellite access to be considered

- ~~NGEO is not applicable for ESIM scenarios in Ka band.~~

In the 2nd paragraph 1st bullet - i) the work is to identify and example band ii) unnecessary to introduce additional sub-bullets on ESIM as these can be referred to in regulations, ii) we propose to remove ”present and future networks”, as this reflects network deployment. Therefore, our proposed revisions below:

- Study and identify NTN bands (example band(s)?): Analysis of regulations and adjacent channel co-existence scenarios. The example band(s) shall be identified early in the WI. Additional bands can be introduced in a release-independent manner. [RAN4]
  - ~~Consider at least a portion of the Ka band as~~ Identify an ~~the~~ example band, according to ITU allocation; identify which parts of the Ka band are suitable as 3GPP bands [RAN4]
  - Study implications of FDD operation in FR2 and derive requirements for the identified part(s) of the Ka band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4]
  - ~~For airborne and maritime ESIM terminals and scenarios, a large geographical separation to TN is assumed. This assumption shall be captured in the specification [RAN4].~~
  - ~~For land based ESIM scenarios and terminals, appropriate co-existence scenarios need to be identified taking into account the regulatory condition of no interference towards terrestrial networks [RAN4]. The assumed scenarios need to be captured in the specification.~~
  - ~~For non-mobile VSAT, appropriate co-existence scenarios need to be identified [RAN4].~~
  - Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that 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. [RAN4]
  - Definition of NTN band(s) above 10 GHz does not change the current FR1/FR2 definition, nor automatically apply to future terrestrial bands defined in this frequency region; (see proposal 2 of the approved way forward RP-211596 in RAN#92-e) [RAN4]

13 – Intelsat

We also support the removal of the statement “NGEO is not applicable for ESIM scenarios in Ka band”

We are also in agreement with the comment from Thales for replacing the statement, *“~~Consider at least a portion of the Ka band as the example band, according to ITU allocation; identify which parts of the Ka band are suitable as 3GPP bands [RAN4]”~~ with* “*Identify an example band according to ITU allocation suitable for NTN 3GPP bands [RAN4]*”

Concerning the statement on “Study implications of FDD operation in FR2…” we also agree to replace FR2 with “above 10 GHz bands”

14 – Classon Consulting

for FUTUREWEI Use cases/examples should be as clear as possible. OK to consider spinning off to RAN4 led.

15 – TURKCELL

We support the proposed modifications above by Huawei. The objective on >10GHz should be separated into a separate RAN4-led WI.

16 – HUGHES Network Systems Ltd

Please consider these latest inputs.

We want to emphasize again our comments:

In the 1st paragraph, unnecessary to have sub-bullet, we rather let the ITU regulation be the reference

The following assumptions are taken a baseline for this work:

- GEO and NGE~~S~~O (e.g. LEO, MEO, HEO) based satellite access to be considered
  - ~~NGEO is not applicable for ESIM scenarios in Ka band.~~

In the 2nd paragraph 1st bullet - i) the work is to identify and example band ii) unnecessary to introduce additional sub-bullets on ESIM as these can be referred to in regulations, ii) we propose to stick to RAN4 principal and fundamental process on co-existence analysis and relevant coexistence scenarios. Therefore, our proposed revisions below:

- Study and identify NTN bands (example band(s)?): Analysis of regulations and adjacent channel co-existence scenarios. The example band(s) shall be identified early in the WI. Additional bands can be introduced in a release-independent manner. [RAN4]
  - ~~Consider at least a portion of the Ka band as~~ Identify an ~~the~~ example band, according to ITU allocation; ~~identify which parts of the Ka band are~~ suitable ~~as~~ for 3GPP bands [RAN4].
  - Study implications of FDD operation in >10 GHz ~~FR2~~ and derive requirements for the identified part(s) of the Ka band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4]
  - ~~For airborne and maritime ESIM terminals and scenarios, a large geographical separation to TN is assumed. This assumption shall be captured in the specification [RAN4].~~
  - ~~For land based ESIM scenarios and terminals, appropriate co-existence scenarios need to be identified taking into account the regulatory condition of no interference towards terrestrial networks [RAN4]. The assumed scenarios need to be captured in the specification.~~
  - ~~For non-mobile VSAT, appropriate co-existence scenarios need to be identified [RAN4].~~
  - Relevant coexistence scenarios across adjacent bands and analysis to be considered in line with RAN4 process ~~if and where applicable,~~ to ensure that satellite bands introduced in 3GPP for NTN shall not ~~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.~~ [RAN4]

2.1.4 Objective: Network verified UE location

Concerning the comment from T-Mobile that the study of regulatory requirements for network verified location must ensure that the minimum performance is applicable to the time that this feature would be available should be covered as part of the study. The moderator is not clear if any additional information is needed.

The moderator has added RAN3 based on the comment from Thales and CATT and updated the secondary WGs accordingly. In addition, the moderator has added the clarification suggested by MediaTek concerning the sub-bullet under the second bullet to the revised WID. The moderator has also added [RAN] after the first objective based on the comment from Lenovo/Motorola Mobility.

As the RAN study phase has been added, the moderator has incorporated the suggested text from Samsung to

add “if needed” to the follow-on objective.

Many companies requested further clarification on network verified UE location and its relationship to network-based positioning. The moderator suggests updating the WID for the follow-on objective to clarify most of these points after progress has been made in the RAN study concerning detailed regulatory requirements for network verified UE location as opposed to modifying the text at this time given the previous outcome of the October email discussions. However, the suggested text from Ericsson concerning the sub-bullet of the follow-on objective that removes the specific reference to network-based UE location could be a way forward for now. The moderator would like to collect company views in the intermediate round if the proposed text can address the concerns raised above until the WID is updated after the RAN study.

Concerning the feedback from Intel and Qualcomm to focus on the use of network-based positioning, the moderator suggests keeping network verified UE location usage at this time until the RAN study is complete. This approach is in line with the RAN Chair proposed detailed scope revisions which removed most references to network-based positioning. In addition, many companies were agreeable in past email discussions that focusing on network verified UE location could be handled in the NR NTN enhancement WI as opposed to the Positioning enhancement WI.

Further discussion can be held in the intermediate round to determine if there is a majority view to modify the sub-bullet for the follow-on objective based on the Ericssion proposal. A separate feedback form has been added for this question in addition to a general feedback form for Objective: Network verified UE location.

Do you agree to modify the sub-bullet of the follow-on objective based on the Ericsson proposal to the following text for the initial version of the WID?

“As a baseline for the location information reported by the UE, re-use of Rel-17 UE-specific Timing Advance report can be considered.”

Feedback Form 11: Do you agree to modify the sub-bullet of the follow-on objective based on the Ericsson proposal?

1 – LG Electronics Inc.

In our view, reporting of location information and TA seems different. So, we think proposed sentence from Ericsson is little bit misleading. Our suggestion is simply revise the sentence as

“As a baseline, re-use of Rel-17 UE-specific Timing Advance report can be considered” or use the revision by moderator.

2 – Guangdong OPPO Mobile Telecom.

Regarding Ericsson’s proposal, it is not in line with our understanding. The location information reported by UE should be UE-specific GNSS coordinates from R17. It is quite puzzling why we should take UE specific TA report as baseline. Moreover, the objective is to study and evaluate possible solutions that can provide the network with assistance information to cross check the location information reported by UE. This in our opinion includes R17 positioning information and R17 UE specific TA reporting.

3 – DOCOMO Communications Lab.

At first we are not sure Rel-17 UE-specific TA report is a baseline. It depends on outcome of the study phase at RAN plenary, where further clarification on network verified UE location and its relationship to network-based positioning should be discussed as moderator said above. With this assumption, ”as a

baseline" should be removed. Then we are fine with either text from draft WID or Ericsson's version or LGE's version. Alternatively, the bullet can be removed if companies' views are divergent.

4 – HUAWEI TECHNOLOGIES Co. Ltd.

We support the direction of Ericsson's change. the comments by OPPO is also valid, so we suggest to revise Ericsson's proosal as below:

As a baseline for the ~~location~~ information reported by the UE **for position verification purpose**, re-use of Rel-17 UE-specific Timing Advance report can be considered

5 – ZTE Corporation

We are also supportive of the updates from Ericsson and it should be clarified that the reported information is to verify the position (reported position).

6 – CATT

Similar view with OPPO that the revised text may cause some confusion.

As RAN2 is discussing how to report the location information, where the location information means the GNSS info, or GNSS like info. RAN2 is also discussing report of TA(timing advance) in Uu interface.

Maybe we can revise the sentence to "the UE specific location information (GNSS info) or Timing Advance reported by the UE could be considered. "

7 – THALES

For clarification purposes, we suggest two modifications below:

- *"Study detailed regulatory requirement for network-verified UE location, e.g. accuracy requirement (at RAN plenary, from RAN#95 to RAN#96). [RAN]*
- *Study and evaluate, if needed, **RAT dependent** solutions for network to verify UE reported location information [RAN2,RAN1,RAN3]*
    - *~~For verification of Network based UE location, r~~**R**e-use of Rel-17 UE-specific Timing Advance report can be considered as baseline"*

8 – MediaTek Inc.

We are fine with the baseline for the location information reported by the UE as proposed by Ericsson, and also the further clarifying revision proposed by Huawei.

9 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

In our point of view, the sub-bullet should be deleted as without the result of accuracy requirement study, it would be too soon to consider GNSS based methods. However, we would prefer to keep the text in the revised version.

10 – Beijing Xiaomi Mobile Software

The statement is confusing. We support the update from Huawei.

11 – Apple AB

We have a preference for the text suggested by the moderator since the Ericsson version does not quite capture the fact that the network is verifying location information supplied by the UE which is the intent of this objective.

12 – Nokia France

The proposed modification by Huawei is the clearest, but given the evident confusion between companies, it would be better to delete the second bullet altogether and revisit it after the conclusion of the RAN study.

The RAN study should also consider network-based positioning requirements, so we propose writing this objective as follows:

- Study detailed regulatory requirement for network-verified **and network-based** UE location, e.g. accuracy requirements (at RAN plenary, from RAN#95 to RAN#96). [RAN]
    - RAN to determine by RAN#98 whether the study has identified any need for Network verified **and/or Network based** UE location specification support in Rel-18.

13 – Fraunhofer IIS

We share the view of Huawei, Xiaomi and Thales. Both HW's and Thales's text proposals provide the clarification needed.

14 – Intel Corporation SAS

In our view network verified UE location is confusing, as far as we know it was not used in 3GPP before. So, we don't agree with current revision for this bullet in the draft WID.

Also, unless requirements are identified we can't consider any solution as baseline. So, we propose to delete this sub-bullet or change it to 'Rel-17 UE-specific Timing Advance report can be considered'.

Furthermore, to clarify that Rel-17 network-based positioning can be considered we propose the following addition to the sub-bullet 'Rel-17 UE-specific Timing Advance report **and network-based positioning methods defined up to Rel-17** can be considered'.

15 – Qualcomm Incorporated

Given that we don't know the requirements (regulatory and accuracy), it seems premature to agree on a baseline technique. We suggest to remove that sub-bullet altogether, and add a note saying that the objective will be revised based on the outcome of the RAN study.

16 – HUGHES Network Systems Ltd

OK with changes proposed by Thales

17 – Ericsson LM

We think the clarification is needed and agree it can be made clearer. We think the proposal by Huawei; i.e.

"As a baseline for the ~~location~~ information reported by the UE **for position verification purpose**, re-use of Rel-17 UE-specific Timing Advance report can be considered"

is good.

18 – Sequans Communications

We see some possible confusion in this statement. The update from Huawei is clearer.

19 – TURKCELL

We are fine with Nokia's updated text proposal.

General feedback for Objective: Network verified UE location will be captured in the following feedback form.

Feedback Form 12: Objective: Network verified UE location

1 – Samsung Electronics Co.

OK

2 – LG Electronics Inc.

We are ok with the revision.

3 – DOCOMO Communications Lab.

We think companies may not have common understanding that relationship between NW-verified UE location and NW-based UE location will be discussed at the study phase in RAN plenary. To have common understanding on what will be discussed there, we suggest to add one sub-bullet as follows:

- Study detailed regulatory requirement for network-verified UE location, e.g. accuracy requirement (at RAN plenary, from RAN#95 to RAN#96). [RAN]
  - **Including further clarification on network verified UE location and its relationship to network-based positioning.**

4 – HUAWEI TECHNOLOGIES Co. Ltd.

We are fine as long as the suggestion in feedback form 11 is captured.

5 – CATT

See the comments in Feedback Form 11□confusion should be avoided.

6 – THALES

We agree with the overall approach to undertake a RAN level study and then a normative activity if needed. We suggest the following corrections since the study on regulatory requirements will take place in RAN#95 and #96:

*"RAN to determine by RAN#**96**~~98~~ whether the study has identified any need for Network verified ~~and/or Network based~~ UE location specification support in Rel-18."*

We do recommend to address this topic in the Rel-18 eNR-NTN WID given the specific expertise required for RAT dependent location methods in NTN context.

Furthermore:

We would like to emphasize that the following may be considered for the study on network verified UE location to identify relevant requirements:

· For emergency communications, see for example

o https://www.fcc.gov/document/wireless-e911-location-accuracy-requirements-6

o Standardisation Request for E112 (as regards hand-held mobile phones in support of Directive 2014/53/EU)

· For lawful intercept, see 3GPP S3i210282

o "SA3LI notes that any method which relies solely on UE-generated location information is unlikely to be considered reliable for network selection purposes. Therefore, a method such as GNSS/A-GNSS cannot be considered as reliable or trusted unless the information provided by the UE can be verified by the network."

We would also like to clarify that the solution defined in clause 5.4.11.4 Verification of UE location of TS 23.501 and further in clause 6.10.1 of TS 23.273 is either not reliable if it is based on UE provided location (See above SA3-LI's comment) or not accurate enough if it is based on radio Cell Id since the later may corresponds to a coverage footprint that can span across multiple countries. Therefore, this network verified UE location feature adapted to NTN is necessary for NTN to support nationally regulated services and shall be addressed in Rel-18.

7 – MediaTek Inc.

We are generally fine with this objective. The moderator clarifications and revisions are helpful.

8 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are generally fine with the revisions. However, we still feel that the scope in the second bullet is very broad and can be down scoped by confining it to one or two positioning methods. Secondly, the "network verified location" needs clarity as this terminology has not been used in 3GPP. We would suggest having a note that clearly defines "network verified UE location" to have all companies on the same page.

9 – Apple AB

Looks good.

10 – Nokia France

As stated above, we propose writing this objective as follows:

- Study detailed regulatory requirement for network-verified **and network-based** UE location, e.g. accuracy requirements (at RAN plenary, from RAN#95 to RAN#96). [RAN]
    - RAN to determine by RAN#98 whether the study has identified any need for Network verified **and/or Network based** UE location specification support in Rel-18.

Additional details can be added after completion of the RAN study.

11 – Intel Corporation SAS

As we commented previously, we prefer not to use terminology of network verified UE location. We prefer to use network-based positioning terminology which has already been used in 3GPP. We are fine to accept the objective in draft WID if our revision for the sub-bullet proposed by Intel in Feedback Form 11 is adopted so it is clarified that network-based positioning is considered.

12 – Qualcomm Incorporated

At the current state, it is unclear how we can agree on details of the techniques / solutions if we don't even agree on the requirements. Thus, we suggest to add the objective as a placeholder to be updated after the RAN study is completed.

Also, the current text does not take into account the number of satellites, which may slightly change the techniques that are currently used for terrestrial.

In view of the above, we suggest to modify the text as follows:

- Study and evaluate, if needed, solutions for network to verify UE reported location information [RAN2, RAN1, RAN3]
  - As a baseline, RAN WGs shall assume that the number of satellites in view can be limited (including single satellite)
  - This objective is to be revised based on the outcome of the RAN plenary study.

Regarding the inclusion of RAN3, we are a bit unclear on the exact impact. What would be the TS containing the changes?

13 – Classon Consulting

for FUTUREWEI focus should be on verification

14 – Ericsson LM

We are fine as long as our comments in Feedback Form 11 are taken into account.

2.1.5 Objective: Other comments

Many companies expressed concern with removing the mobility & service continuity enhancements as proposed in the detailed scope in RP- 213469. Yet, there are opposing views and comments in the general high-level views that the latest revised draft WID also needs to be downscoped. The moderator suggests taking this topic on the GTW as opposed to taking additional comments on this during the intermediate round. The moderator will update the WF for the final round based on the GTW outcome.

2.1.6 Expected Output and Time scale (Section 5 of the WID)

Concerning the Thales comment to modify the TS titles for 38.108 and 38.181, the moderator has not made these changes since the titles need to match the titles in the 3GU Portal.

The NR UE specifications in 38.101-X and 38.133 have been removed from the list for now until the Rel-17 discussion is concluded concerning the need for separate NTN specifications versus including NTN aspects in the existing NR UE specifications.

The moderator has added some remarks to the new TR/TS section to capture the comments from Samsung and Qualcomm.

Additional specifications may need to be removed from the list based on the final outcome of the mobility & service continuity enhancements topic.

For the intermediate round, companies are encouraged to provide their views as to any additional revisions that are necessary to these tables.

Feedback Form 13: Expected Output and Time scale (Section 5 of the WID)

1 – Samsung Electronics Co. OK
2 – HUAWEI TECHNOLOGIES Co. Ltd. We are fine to capture the study outcome in existing TR 38.863
3 – ZTE Corporation ok
4 – CATT ok
5 – THALES We are fine with the changes proposed by the moderator
6 – MediaTek Inc. Ok
7 – Lenovo (Beijing) Ltd **Lenovo, Motorola Mobility:** We are fine with this.
8 – Beijing Xiaomi Mobile Software Fine with it.
9 – Inmarsat We are ok with the changes proposed.
10 – HUGHES Network Systems Ltd We are fine with moderator's proposal

11 – Intelsat We are in agreement with the proposal
12 – Ericsson LM OK

2.2 Moderator Summary and recommendation for further discussion

Thanks for the intermediate round feedback. Based on the feedback received and the outcome of the Wednesday GTW, the moderator has provided the further revised WID (Rev4) at the following link using green highlighting to show the proposed revisions after the intermediate round and Wednesday GTW.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-17-R18-NTN-NR%5D/Rev4%20of%20RP-212713%20WID%20NR%20NTN%20Enhancements-rm.docx

The revisions are based on the summary of each topic as listed in the final round section.

3 Final Round

The final round will focus on providing feedback on the further revised WID based on the outcome of the Wednesday GTW and the proposed WF on the WID from the moderator as well as the proposals from the RAN Chair. The goal will be to arrive at an agreeable WID after the final round. The comments should be provided in the appropriate feedback forms as opposed to revising the moderator provided WID.

3.1 Collection of company views

3.1.1 General high-level views and justification

The moderator has updated the revised WID to utilize GSO and NGSO based on the latest developments in the Rel-17 NR-NTN work.

There were still comments related to adding mobility & service continuity enhancements back to the WID. This was further discussed during the Wednesday GTW and the outcome was to add this objective back in and to limit the number of sub-bullets to one item to be selected from the first two sub-bullets. The RAN2 Chair provided feedback that if the scope is limited to one sub-bullet that the work should be able to fit in the 1TU available. The moderator has updated this proposal in the revised WID and further comments will be collected on this topic in the final round in section 3.1.5. In addition, the justification section has been updated accordingly to account for this outcome.

A few companies commented about removing the -5dBi antenna gain in the example that was provided in the justification and objective for coverage enhancement. The moderator proposes to remove -5dBi while keeping the aspects that a realistic antenna gain assumption instead of 0 dBi antenna gain will be determined at the working group level.

A few companies would prefer to the >10GHz objective to a separate RAN4-led WI. During the GTW, the RAN Chair indicated that this objective will be considered in this WI during this meeting. This can be

reconsidered in the future.

Please provide your views if the justification section can be agreed.

Feedback Form 14: General high-level views and justification

1 – Verizon UK Ltd For the US GSO and NGSO licensing, the FCC 20-159 order has provided a framework in the following frequency bands · GSO and NGSO MSS: 19.7-20.2 GHz and 29.5-30 GHz And, it is not accurate to state that the frequency ranges in the current objective are common across all regions for the objective above 10GHz band deployment. Therefore, following modification are suggested in order to align on FCC order, · The harmonized Ka band frequency range ~~(17.7-20.2 and 27.5-30.0)~~ as common across all regions will serve as reference
2 – Panasonic Corporation We are fine with the justification.
3 – Transsion Holdings We Transsion are fine with justification and would like to co-source this WID
4 – Lenovo (Beijing) Ltd **Lenovo, Motorola Mobility:** We are OK with the justification.
5 – THALES The revisions suggested by the moderator are agreeable
6 – Classon Consulting for FUTUREWEI Please add FUTUREWEI as a supporting company.
7 – NOVAMINT The revisions proposed by the moderator are agreable
8 – MediaTek Inc. We are fine with the justification
9 – Intelsat The proposed revisions are acceptable

10 – STE IDIRECT IRELAND LTD

We support the revised justifications.

11 – Airbus

We accept the revisions and support the justification

12 – Nokia France

We are mainly fine with the justification section, except that ”mobility and service continuity” is inserted in a slightly surprising place.

We would suggest to move it to a new bullet at the end, ”Provide mobility and service continuity enhancements”.

13 – Lockheed Martin

Lockheed Martin agrees with the revisions proposed.

14 – Intel Corporation SAS

In principle the justification section looks good for us. However, we have two comments on the terminology.

- For regulatory requirements, it is not clear if regulation exist which mandates network to avoid relying solely on UE-reported UE location. Thanks, Thales, for clarifying that aspect in the NWM, it seems this requirement is taken from SA3 paper. So, considering the above, in our view it is better to delete word ‘regulatory’.
- For network verified UE location, as we commented multiple times, network verified UE location is not clear. There is no clue how it is verified. So, it opens the door for many different interpretations. If companies still want to use terminology of network-verified UE location we prefer to at least clarify it, e.g. ‘… a network verified UE location i.e., to be able to check the UE reported location information **(e.g. estimate UE location at the network side)**…’

15 – Fraunhofer IIS

We agree to the proposed revisions of the justification.

16 – HUGHES Network Systems Ltd

We support the proposed revisions by the moderator. Thank you

17 – Apple AB

Looks good.

18 – Sequans Communications

We are fine with the justification.

3.1.2 Objective: Coverage enhancement

Given that there were no objections to removing the brackets around implicit compatibility to support HAPS (high altitude platform station) and ATG (air to ground) scenarios, the moderator has removed the brackets in the latest revised WID.

As identified in the general section, the moderator has removed the -5dBi value.

Concerning the discussion around the possible removal of the last three sub-bullets of candidate solutions, the company views in the intermediate round were mixed with no clear majority. This was further discussed on the Wednesday GTW and it was decided based on the RAN Chair proposal to clearly note that the last three sub-bullets are provided as examples. The moderator has updated the revised WID accordingly and has modified the text that the objectives will be updated since the items listed are only provided as examples and are not necessarily representative of the outcome of the study phase.

The suggestion from Apple to add downlink aspects that can impact coverage seemed reasonable. The moderator added, "The evaluation should also take into account any related regulatory requirements, e.g., ITU limitation of power flux density," to the end of the first paragraph.

Feedback Form 15: Objective: Coverage enhancement

1 – DOCOMO Communications Lab. We accept the three bullets listed as examples, i.e. OK with the current version.
2 – CATT We are fine with the latest revision.
3 – vivo Mobile Communication Co. We support the current version.
4 – Guangdong OPPO Mobile Telecom. This objective is fine to us. But we would request a clarification on the time plan with two questions. Question 1: For the 6-month study phase, whether RAN study and WG study start at the same time or sequentially? This is not clear from the WID. Question 2: it seems that there is a gap between the end of the 6-month study phase and RAN#98 in December and the WG work is expected to be pending in this gap? Would it be more reasonable to change it to RAN#96 or RAN#97?
5 – Guangdong OPPO Mobile Telecom. Sorry, please ignore our previous comment, which is meant to comment on objective 3.1.4. We are fine with the current objective for 3.1.2.
6 – Samsung Electronics Co. It is good to indicate those three sub-bullets as examples as the Chairman's guidance.

7 – LG Electronics Inc.

We are fine with modified objective.

8 – Panasonic Corporation

We are fine with the objective.

9 – Transsion Holdings

We are fine with the latest version.

10 – ZTE Corporation

We are fine with the objective by taking these three bullets as examples.

11 – TURKCELL

We are fine with the latest revision.

12 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are OK with the objective.

13 – HUAWEI TECHNOLOGIES Co. Ltd.

There is no need to list in detail the candidate techniques if they were just examples. However, considering the current situation, it seems that our previous suggestion is a good compromise, i.e. merge the first two sub-bullets and list the candidate techniques as examples. On the last sub-bullet, we would like to emphasize again that the potential of RAN protocol overhead reduction is very limited as analyzed in RP-213165. We don't think it is technically justified to include this bullet even as examples. We suggest the following change

The following items are shown as examples of areas to consider:

- *Study, and if justified, specify NTN-specific ~~repetitions~~ enhancements (**e.g. repetitions, diversity**) beyond techniques covered in Rel-17 CovEnh WI for the relevant channels [RAN1,RAN2]*
- ~~*Study, and if justified, specify NTN-specific techniques for improved diversity and/or reduced polarization loss [RAN1]*~~
- ~~*Study, and if justified, improve the performance of low-rate codecs in link budget limited situation including reducing RAN protocol overhead for VoNR [RAN2,RAN1] [Liaise with SA2/SA4 as necessary]*~~
  - ~~*NOTE: Intent is to optimize the NTN-based NG-RAN to work with the lowest rate codec currently available and will not introduce a new codec.*~~

14 – THALES

The revisions suggested by the moderator are agreeable

15 – Classon Consulting

for FUTUREWEI The guidance in the GTW was to have an example *list*, not to keep a bunch of study and specify sub-objectives with the word ”Examples” in front of it. So there should just be a single sub-bullet such as:

- Study, and if justified, specify NTN-specific enhancements (e.g., blah blah)

16 – Beijing Xiaomi Mobile Software

Not sure if the last bullet is a NTN-specific one. But if we can’t converge on the listed solutions, it is acceptable to us to take these three bullets as examples.

17 – NOVAMINT

we are fine with the revisions suggested by the moderator.

18 – MediaTek Inc.

On the first bullet, use of repetitions was discussed in Rel-17 NR NTN, and we see no need to re-open the discussions in Rel-18.

19 – InterDigital

We are ok with this objective

20 – STE IDIRECT IRELAND LTD

We support the revisions suggested by the moderator.

21 – Intelsat

The proposed revision by Moderator is acceptable

22 – Airbus

We support the revisions suggested by the Moderator

23 – Nokia France

We agree with the comment from Futurewei.

24 – Lockheed Martin

Lockheed Martin agrees with the revisions proposed.

25 – Qualcomm Incorporated

We think the current version captures the agreement made in the GTW.

26 – Intel Corporation SAS

We support to list the three bullets as examples. It allows to focus on identifying issues with coverage at the initial study phase.

27 – Ericsson LM Ok in principle, although we still consider, e.g., repetitions and low-rate codec performance improvements to be not specific to NTN. As examples it is also not clear why ”Study and if justified specify…” is needed. That can be dropped. Regarding the coverage enhancement objective we think we should also clarify the need for RAN4 to check and confirm assumptions about antenna gain from RAN4 p-o-v. As RAN4 is not otherwise participating in the work on this particular objective this may need to be spelt out more explicitly.
28 – HUGHES Network Systems Ltd The revisions suggested by the moderator are agreeable. Thank you
29 – Fraunhofer IIS We agree with the revisions.
30 – Apple AB Looks ok to us. We think we don’t need to provide so many examples of enhancements but are OK with it, if the majority wants it.
31 – Sequans Communications We are ok with the proposed changes.
32 – Ligado Networks We agree with the moderator proposal and the example sub bullets.

3.1.3 Objective: NR-NTN deployment in above 10 GHz bands

A few companies expressed the desire to move this to a RAN4-specific WI. During the Wednesday GTW, the RAN Chair indicated to keep the objective in this WI during this meeting. This can be reconsidered in the future.

Based on RAN4 Chair feedback, the objective has been updated to clearly reflect the identification of one (1) example band to fit into the defined TUs. In addition, there were also concerns raised by others concerning having more than one band as part of this work.

Some feedback was received in the intermediate round to modify the text related to “at least a portion of the Ka band”, to modify FR2 to bands above 10GHz in “Study implications of FDD operation in FR2” and to modify some of the text concerning co-existence aspects. During the GTW, Verizon asked to remove the specific frequency ranges listed as the harmonized Ka band frequency range.

The moderator is hesitant to modify this text as it is in complete alignment with the RAN approved WF in RP-211596 which was accepted by both NTN and TN proponents as well as the text agreed concerning the FR1 co-existence aspects. In addition, it is the moderator’s view that the term FR2 was used in the WF specifically since FDD would be added in FR2 where only TDD exists today. During the Wednesday GTW, the RAN Chair indicated that we need to keep with previously agreed text unless we can reach consensus on modified text. Further discussion can be held amongst interested parties to determine if any updated text can reach consensus.

Removed the sub-bullet that "NGSO is not applicable for ESIM scenarios in Ka band" based on the Thales comment that ETSI has developed a harmonized standard for ESOMP (Earth Stations on Mobile Platforms) for NGSO in Ka band in ETSI EN 303 979.

Concerning ESIM devices, the moderator suggestion in the intermediate round to take the Ericsson suggested text was not accepted by all. The moderator has removed the Ericsson text for the sub-bullets for the bands study and recommends adding the text, "Which type(s) to be specified depends on the outcome of the regulation analysis and co-existence study" as suggested by Huawei to the sub-bullet on mobile VSAT. All other aspects can be considered as part of the regulation analysis and co-existence study.

Feedback Form 16: Objective: NR-NTN deployment in above 10 GHz bands

1 – Guangdong OPPO Mobile Telecom. We are fine with this objective.
2 – LG Electronics Inc. We are fine with objective.
3 – Panasonic Corporation We are fine with the objective.
4 – Transsion Holdings We are fine with the latest version.
5 – Lenovo (Beijing) Ltd **Lenovo, Motorola Mobility:** We are OK with the objective.
6 – HUAWEI TECHNOLOGIES Co. Ltd. We have problem to agree with moderator recommendation below: *Removed the sub-bullet that "NGSO is not applicable for ESIM scenarios in Ka band" based on the Thales comment that ETSI has developed a harmonized standard for ESOMP (Earth Stations on Mobile Platforms) for NGSO in Ka band in ETSI EN 303 979.* According to our knowledge, up to now, only GSO ESIM is allowed in ITU, while NGSO ESIM is being studied as WRC-23 AI. We are OK to add this bullet back with some revision. *GSO and NGSO (e.g. LEO, MEO, HEO) based satellite access to be considered* - *NGSO is not applicable for ESIM scenarios in Ka band* ***from ITU perspective*** We also noticed that (though we commented in the previous response) Note 1 of the agreed document RP-211596 has not being captured in any objective. We suggest it to be captured as below:

- *Consider at least a portion of the Ka band as the example band, according to ITU allocation; identify which parts of the Ka band are suitable as 3GPP bands* ***taking into account deployment type (e.g. fixed VSAT, maritime ESIM, aeronautical ESIM and land ESIM).*** *[RAN4]*

7 – THALES

1/ Given that the harmonized Ka band frequency range (17.7-20.2 GHz and 27.5-30.0 GHz) is allocated to satellite services across all regions/countries (see ITU radio regulations, edition 2020), it should be considered as the example band and therefore we suggest to modify the following bullet. This doesn't preclude that additional specific regulations may apply in selected countries:

· *"Consider* ***~~at least a portion of~~*** *the* ***harmonized*** *Ka band as the example band, according to ITU allocation;* ***~~identify which parts of the Ka band are suitable as 3GPP bands~~*** *[RAN4]"*

2/ For clarification purposes, we suggest to modify the following bullet point

· *"Study* ***the*** *implications of FDD operation in FR2 and derive requirements for the identified* ***example*** ***~~part(s) of the Ka~~*** *band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4] »*

3/ As expressed earlier (See RP-212820), we have serious concerns with the following bullet. 3GPP doesn't have the mean to control network deployment and operations. Moreover, we should further clarify the scope of coexistence studies. Therefore, we request the following modifications:

· "*Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that satellite bands introduced in 3GPP for NTN shall* ***~~neither~~*** ***not*** *impact the existing* ***terrestrial band*** *specifications* ***(and shall not*** ***~~of nor~~*** *cause-degradation* ***~~(~~*** *in the sense of RAN4 co-existence studies* ***~~)~~*** *to* ***~~present and future~~*** *networks in 3GPP specified terrestrial bands* ***adjacent to the NTN band)****. [RAN4]"*

4/ It is essential to leverage the work carried out in RAN4 during the Rel-17 NR-NTN-solution WI to prevent unnecessary discussions on the process therefore we suggest to add the following bullet point:

· *"****For this, RAN4 process as agreed for NTN in FR1 shall be leveraged for coexistence analysis in above 10 GHz bands*** *[RAN4]."*

5/ We suggest to also involve RAN1 especially for the last sub bullet below. Therefore we propose the following modifications:

*"Identify values for physical layer parameters chosen from the existing FR1 and FR2 sets. The following set of parameters to specify, but not necessarily limited to, are listed~~:~~ as follows [RAN4****, RAN1****]:*

· *time relationship related enhancement (e.g. K_offset)*

· *subcarrier spacing for different UL/DL signals/channels,*

· *PRACH configuration index for FDD above 10 GHz"*

8 – Avanti

We are Ok with Thales amended text

9 – NOVAMINT

We fully support the views, points and suggestions expressed by Thales above

10 – MediaTek Inc.

We are generally fine with this objective

11 – Intelsat

We concur with Thales's revision. It adds more clarity and point back to RAN 4 process and lesson learned.

12 – Omnispace

We concur with and support Thales' views and revisions above

13 – Magister Solutions Ltd

We fully support the Thales proposal above.

14 – Gatehouse Satcom A/S

We support the modification suggestions and views of Thales above.

15 – Eutelsat S.A.

We also support the Thales proposal above.

On a related point, we express concern on arguments that we must keep, unless there is a full consensus to change, previous text on the basis that is had been fully agreed in the RAN approved WF in RP-211596. In the view of many, including ourselves, the discussion and finalization of the objectives was deferred to this present meeting.

16 – Inmarsat

We first of all thank the moderator for the new revised objective proposal, however, as expressed during the previous round and in the GTW, we would like to adjust the wording of certain parts.
In this respect, we fully support the wording proposed by Thales, as we think provides a reasonable compromise whilst allowing a fair treatment of NTN.

In regards to the Ka band frequency range and in response to Verizon's comments during the GTW, we would like to note that the fact that country/regional regulations may restrict the deployment in certain parts of the harmonized Ka band has no bearing on 3GPP's ability to specify the existing harmonized Ka as an NTN band. Of course as expressed by Thales' wording, this in turn doesn't preclude that additional specific regulations may apply in selected countries.

As a matter of fact this is not uncommon in 3GPP, for example 3GPP has in the past specified bands that did not have global regulatory approval, such as n258 which is only allowed in very specific countries and has been explicitly excluded by ITU from being identified for IMT.

Therefore, we strongly support considering the full harmonized Ka band (17.5-20.2 GHz DL, 27.5-30.0 GHz UL) as identified by ITU-R as example band. The relevant regional/country regulations will apply as normal.

17 – STE IDIRECT IRELAND LTD

We support the amended text suggested by Thales

18 – Airbus

We also fully support the text proposed by Thales

19 – Sateliot

We support Thales amended text

20 – Lockheed Martin

Generally, we support this topic and suggest that proposed edits be considered for approval.

21 – Ericsson France S.A.S

We are concerned that embedded in the objectives is a potentially very large amount of RAN4 work; multiple terminal types, potentially deployment scenarios for each terminal type, Satellite orbits etc. To enable RAN4 planning, it would be good to clarify the scenarios; it would even be good to understand which to focus on.

We think it is important and useful to use the ITU terminology on ESIM (Land, Air, Maritime) rather than a generic term mobile VSAT. It may be that in the end the same requirements apply to each, but clearly the scenarios differ and it should be understood that a decision needs to be made on which to investigate. The proposed objectives reflect this to some extent, but the proposal from Huawei is helpful in clarifying it further.

Our additional proposals actually left it open for RAN4 to discuss on land and mobile VSAT deployments, whilst following the ITU scenarios for air and land. We are curious why the proposals would not be agreeable, since they basically suggest to either follow the same scenarios as the regulator suggests or discuss for the land and air scenarios. Does not adopting the scenarios imply that there are more scenarios for maritime and air to be discussed in RAN4 ? If we do not include these sentences we should at least adopt the Huawei proposal.

Regarding ESIM and NGSO, the statement from Huawei is clearly correct for a global band and we support it.

Regarding the Thales proposals, we think that there is a need to assess which part of the Ka band is suitable as the example and oppose proposals (1) and (2) (for example, are the 3GPP requirements the same for the whole band ?). For proposal (3), we're not sure how the text implies the standard contolling the network deployment. For the wording, we propose to add "or overlapping"

"*Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that satellite bands introduced in 3GPP for NTN shall* ***~~neither~~ not*** *impact the existing* ***terrestrial band*** *specifications* ***(and shall not*** *~~of nor~~ cause-degradation* ***~~(~~*** *in the sense of RAN4 co-existence studies* ***~~)~~*** *to* ***~~present and future~~*** *networks in 3GPP specified terrestrial bands* ***adjacent to or overlapping the NTN band)****. [RAN4]"*

Thales proposal 4 is OK. Regarding Thales proposal 5, we are not sure why RAN1 needs to be involved if no change is needed to the RAN1 specification.

22 – Verizon UK Ltd

(I used a wrong location for our comment early! Now, I remove it from section 3.1.1 to here! Basically, our comment is to repeat the regulatory requirements for this work)

For the US GSO and NGSO licensing, the **FCC 20-159A1** order has provided a framework in the following frequency bands

- GSO and NGSO MSS: **19.7-20.2 GHz and 29.5-30** GHz

And, it is not accurate to state that the frequency ranges in the current objective are common across all regions for the objective above 10GHz band deployment. Therefore, following modification are suggested in order to align on FCC order,

· The harmonized Ka band frequency range **~~(17.7-20.2 and 27.5-30.0)~~** as common across all regions will serve as reference

23 – Intel Corporation SAS

We are fine with the current version for this objective.

24 – Nokia France

We are fully aligned with the comments from Ericsson.

We also agree with the two proposals from Huawei.

25 – Leonardo SpA

We support the amended text proposed by Thales

26 – HUGHES Network Systems Ltd

First, we thank the moderator for this work.

We fully support the revision proposed by Thales and would like to re-emphasize again the rationales:

1/ ITU allocation of satellite Ka-band is actually (17.3-20.2 and 27.0 -30.0 GHz). The harmonized Ka-band frequency range is (17.7-20.2 GHz and 27.5-30.0 GHz) across all regions/countries is **already a portion** of Ka-band (see ITU radio regulations, edition 2020)**.** As such, we suggest modifying the following bullet. This doesn't preclude additional or specific regulations in some countries:

- *"Consider **~~at least a portion of~~** the **harmonized** Ka band as the example band, according to ITU allocation; **~~identify which parts of the Ka band are suitable as 3GPP bands~~** [RAN4]"*

2/ For the above reason, we suggest modifying the following bullet point

- *"Study **the** implications of FDD operation in FR2 and derive requirements for the identified **example ~~part(s) of the Ka~~** band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4] »*

3/ As expressed in earlier rounds, satellite companies have serious concerns with this bullet. **ITU-R and National/Country regulations (including FCC) have taken into considerations all the potential impact and necessary resolutions. 3GPP does not need to replicate this, rather to stick to RAN4 principal and fundamental process on co-existence analysis. We do not have control over network deployment and operations**. Therefore, we request the following modifications:

- "*Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that satellite bands introduced in 3GPP for NTN shall **~~neither~~ not** impact the existing **terrestrial band** specifications **(and shall not ~~of nor~~** cause-degradation **~~(~~**in the sense of RAN4 co-existence studies**~~)~~** to **~~present and future~~** networks in 3GPP specified ~~terrestrial~~ **adjacent** bands**)**. [RAN4]"*

4/ It is essential to leverage the work carried out in RAN4 during the Rel-17 NR-NTN-solution WI to prevent unnecessary discussions and workload on the process therefore we suggest adding the following bullet point:

- *"**For this, RAN4 process as agreed for NTN in FR1 shall be leveraged for coexistence analysis in above 10 GHz bands** [RAN4]."*

27 – HISPASAT SA

First thanks to the moderator and all the participants in this discussion.

We fully support Thales comments on this item discussion, focused on identifying the correct scope in terms of bands and study impacts.

We'd also like to emphasize some rationals, following Eutelsat/Hughes/Inmarsat comments:

- Consider the harmonized Ka-band frequency range as the example band, according to ITU allocation. Following change proposed:
  - *"Consider **~~at least a portion of~~** the **harmonized** Ka band as the example band, according to ITU allocation; **~~identify which parts of the Ka band are suitable as 3GPP bands~~** [RAN4]"*
- As deeply discussed in early meetings, following bullets need to be aligned with the actual operation of the ITU-R and national/country regulations, whose effort ensures the right resolutions and considerations on regards of bands and service impacts. For that, we propose following modifications on these bullets:
  - *"Study **the** implications of FDD operation in FR2 and derive requirements for the identified **example ~~part(s) of the Ka~~** band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for **adjacent** terrestrial bands (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4] »*
  - "*Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that satellite bands introduced in 3GPP for NTN shall **~~neither~~ not** impact the existing **terrestrial band** specifications **(and shall not ~~of nor~~** cause degradation **~~(~~** in the sense of RAN4 co-existence studies**~~)~~** to **~~present and future~~** networks in 3GPP specified ~~terrestrial~~ **adjacent** bands**)**. [RAN4]"*
- Finally, following last bullet, also consider the previous effort achieved in RAN4 for below 10GHz that should be replicated in this WI:
  - *"**For this, RAN4 process as agreed for NTN in FR1 shall be leveraged for coexistence analysis in above 10 GHz bands** [RAN4]."*

28 – Fraunhofer IIS

We support the modifications by Thales and also support the view on the Ka-Band frequency range as stated by Inmarsat. As the relevant regional/country regulations will apply as normal, the frequency range in the 3GPP band definition should be as broad as possible.

29 – Catapult

We fully support the Thales proposal.

30 – Ericsson France S.A.S

Regarding the Verizon comment, since this band should be an example band it would be good to keep to global harmonization and ITU conditions, so we also think it is better to remove the frequency range:

· The harmonized Ka band frequency range ~~**(17.7-20.2 and 27.5-30.0)**~~ as common across all regions will serve as reference

31 – Nokia France

We would also like to flag again that this topic is really quite independent of the rest of the NTN work, and needs dedicated RAN4 work management for the spectrum and coexistence work. It would therefore be much better from a work management point of view to handle this separately from the main NTN item, so that completion of one is fully independent of the other. We hope this can be discussed again in the GTW session.

32 – Verizon UK Ltd

1) For the proposal below, we agree with the comments from Ericsson!

In our view, even if we take the harmonized band as a reference here, we still need to check in RAN4 whether to consider all or a portion of the harmonized band. Therefore, the original objective should be not changed.

2) We respect the ITU-R allocation decision, but also follow the national/country regulations. And this should be reflected in the objective below,

"Consider at least a portion of the harmonize Ka band as the example band, according to ITU allocation ***and*** **all country regulatory (including FCC) requirements**; identify which parts of the Ka band are suitable as 3GPP bands [RAN4]

33 – THALES

On what basis 3GPP can refuse to define a portion of band allocated by ITU-R to a service eligible for 3GPP in all countries around the world but shared with another service in a limited number of countries ?

3.1.4 Objective: Network verified UE location

Feedback during the intermediate round was still mixed concerning the use of network-based and/or network verified.

The moderator recommends removing the sub-bullet related to network-based positioning given that there is no consensus on this item. In the end, the details related to the WG study phase can be determined during the RAN study phase and the WID can be updated accordingly at that time.

There seemed to be consensus to keep this objective with the modification above when asked by the RAN Chair on the Wednesday GTW. Final round feedback should be limited to the case if there is a strong objection to the revised WID presented for the final round.

Feedback Form 17: Objective: Network verified UE location

1 – DOCOMO Communications Lab.

We are OK to determine details at the RAN study phase. But at least companies should have common understanding on whether the details to be discussed at the RAN study include ”further clarification on network verified UE location and its relationship to network-based positioning”. Moderator assumes it is included as mentioned at previous round.

Still we suggest to capture explicitly this aspect for common understanding. The following update is one possible way. Another way is fine for us as long as this aspect is clarified.

- Study detailed regulatory requirement for network-verified UE location, e.g. accuracy requirement (at RAN plenary, from RAN#95 to RAN#96). [RAN]
  - **Including further clarification on network verified UE location and its relationship to network-based positioning.**
  - Study and evaluate, if needed, solutions for network to verify UE reported location information [RAN2,RAN1,RAN3]

2 – Guangdong OPPO Mobile Telecom.

This objective is fine to us. But we would request a clarification on the time plan with two questions.

Question 1: For the 6-month study phase, whether RAN study and WG study start at the same time or sequentially? This is not clear from the WID.

Question 2: it seems that there is a gap between the end of the 6-month study phase and RAN#98 in December and the WG work is expected to be pending in this gap? Would it be more reasonable to change it to RAN#96 or RAN#97?

3 – Samsung Electronics Co.

OK to remove the details and postpone after RAN study.

Just for further clarifications, we need to make the common understanding for ”network-verified positioning”, which would not lead to positioning enhancements for NTN, but is for the network to know the UE’s position based on UE reported information.

4 – LG Electronics Inc.

We are fine with modified objective.

5 – Panasonic Corporation

We are fine with the objective.

6 – Transsion Holdings

We are fine with the latest version.

7 – ZTE Corporation

We are fine with the current objective and it should be clarified that the intention is to allow the verification of UE’s location instead of defining a solution to enhance the positioning for NTN.

8 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are fine with the revised proposal. However, as pointed out by OPPO, the time plan for study phase needs a bit clarity. In our understanding, the study phase is sequential where RAN study is followed by WG study.

9 – Sony Europe B.V.

We are ok with the latest version

10 – THALES

We agree with the proposed text. However we have same question as Oppo

11 – HUAWEI TECHNOLOGIES Co. Ltd.

We are fine with the latest version

12 – Classon Consulting

for FUTUREWEI Similar view as Samsung. We can accept the RAN study and objective as written, but not further additions.

13 – Beijing Xiaomi Mobile Software

Fine with current description.

14 – NOVAMINT

We are fine with the modified objective. And we should clarify the time plan as raised out by Oppo.

15 – MediaTek Inc.

We are generally supportive of this objective. The moderator revisions are helpful.

16 – InterDigital

We are fine with modified objective in general but it would be good to clarify the timeline for RAN study and WG level study as suggested by several companies.

17 – STE IDIRECT IRELAND LTD

We support the latest version.

18 – Intelsat

We agree on the proposed objective.

19 – Airbus

We support the modified objective and would also support a clarification of the time plan as raised by OPPO.

20 – Lockheed Martin

Lockheed Martin agrees with the revisions proposed.

21 – Sateliot

We are fine with the revised objective

22 – Nokia France

We support the proposal from Docomo.

It should also be clarified that the WG phase starts after the RAN level study.

23 – Qualcomm Incorporated

We are OK with the current version, and also OK with the revision from Docomo.

24 – Intel Corporation SAS

We still think that we need to at least mention network-based positioning. Network-verified UE location term is not clear since there is no clue how to achieve verification. Network-based UE location is exactly what should be done to check/verify the UE location. Multiple companies had similar comments before. For example, solution proposed by Nokia can be used (adopted for the latest WID version below). Wording proposed by Docomo can be also used to solve the issue.

• Study detailed regulatory requirement for network-verified **and network-based** UE location, e.g. accuracy requirement (at RAN plenary, from RAN#95 to RAN#96). [RAN]

- Study and evaluate, if needed, solutions for network to verify UE reported location information [RAN2,RAN1,RAN3]

RAN to determine by RAN#98 whether the study has identified any need for Network verified **and/or Network based** UE location specification support in Rel-18.

Also, as we commented earlier, we prefer to consider this objective under positioning WI for better project management since this is related to positioning and positioning experts will be involved.

As we commented for justification section (feedback form 14), we prefer to delete word regulatory.

25 – Ericsson LM

We are ok with moderator's proposal. As network-based location is no longer mentioned, there is less risk for ambiguity/confusion.

26 – HUGHES Network Systems Ltd

We support the proposed revisions by the moderator. Thank you

27 – Apple AB

Looks good. We have some concern that network verification is either not needed or not feasible, but we can leave that to the study.

28 – Catapult

We support the proposed objective.

29 – Fraunhofer IIS

We agree with the moderators suggestion of discussing regulatory requirements and performance targets first, followed by a study on potential solutions.

30 – Sequans Communications

We are ok with the updated proposal, as well as with the proposal from Docomo.

3.1.5 Objective: NTN-TN and NTN-NTN mobility and service continuity enhancements

As noted in the general section, the decision at the Wednesday GTW was to add this objective back in and to limit the number of sub-bullets to one item to be selected from the first two sub-bullets. The RAN2 Chair provided feedback that if the scope is limited to one sub-bullet that the work should be able to fit in the 1TU available. The moderator has updated this proposal in the revised WID and further comments will be collected in the final round. In the feedback form, please provide any general comments and your company selected sub-bullet.

Feedback Form 18: NTN-TN and NTN-NTN mobility and service continuity enhancements

1 – CATT

As recommended by RAN Chair, we are ok to keep the first two bullets of the Mobility part.

To support service continuity enhancement for NTN-TN and NTN-NTN mobility, coordination between the gNBs may be needed, thus it seems better to add RAN3 there, i.e. revising the 2nd bullet to:

- Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2,**RAN3,**RAN4]

2 – Deutsche Telekom AG

We agree with the CATT observation and also confirm that ”Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements” would be the most relevant baseline feature enhancement for Rel-18.

For NTN - NTN we only see a need to consider this for HAPS NTN-NTN (which might not even need consideration) and NTN_Sat-NTN_HAPS mobility.

NTN-TN should be specified bi-directional for NTNSAT-TN and NTN_HAPS-TN

Without considering at least this most important bullet of objective 4 we hardly see that we can agree the approval on this WI

3 – Guangdong OPPO Mobile Telecom.

Among the two sub-bullets, we have a slight preference to take the following item.

- Address handover interruption and handover signalling overhead
  But we can be flexible to accept the second item, if it helps to reach consensus.

4 – vivo Mobile Communication Co.

We support the 2nd sub-bullet of "Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements" as this is more important from our perspective to enhance the mobility performance in NTN. Per our understanding of previous discussions and from the perspective of TU allocation, we think this objective should mainly aim at the connected mobility enhancement, and suggest to clarify this in the WID.

5 – LG Electronics Inc.

According to RAN chair's compromising recommendation to choose one bullet, we prefer the second bullet.

If we update the objective for clear discussion point, we can update as "Specify inter-Network(NTN to TN, and TN to NTN) and NTN-NTN measurement/mobility for improving service continuity.

6 – Panasonic Corporation

We think that "Specify NTN-TN and NTN-NTN measurement/mobility" is essential, while "service continuity enhancements" and "Address handover interruption and handover signalling overhead" are optimization. Therefore "Specify NTN-TN and NTN-NTN measurement/mobility" (or "Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements") should be selected.

7 – ZTE Corporation

Although we prefer to keep both, and the 2nd one can be considered with consideration on the payload. Moreover,

Specify NTN-TN and NTN -NTN measurement/mobility and service continuity enhancements.

Regarding the details, the leftovers from Rel-17 can be considered for NTN-TN mobility including e.g. address PCI confusion among TN, NTN, and HAPS cells and optimizing the mobility in idle/inactive mode and connected mode to prioritize TN over NTN or vice versa. For the NTN-NTN, optimization on the mobility in connected mode is more critical.

8 – Transsion Holdings

Both sub-bullets are fine for us. Due to there are some commons in between. We may prefer to keep second one "Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2,RAN4]", because TN-NTN mobility had discussed in R17 which had been down prioritized in #115-e meeting. We can continue to discuss from this release.

9 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We think the second sub-bullet "Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2,RAN4]" is more essential. And RAN3 could be included.

10 – Sony Europe B.V.

We are ok with both the sub bullets in general. Terrestrial networks HO procedure was taken as a baseline for Rl-17 NTN HO and this will result in a UE receiving a HO command every few seconds even if it does not move. So, we think HO signaling reduction is an important topic for rel-18. At the same time we share the view with other companies above that NTN-TN service continuity is equally important. We dont see much need for NTN-NTN HO and HO interruption and not critical functions for rel-18. So, our preference is to combine HO signaling reduction and NTN-TN service continuity as one bullet.

11 – THALES

If only one sub bullet shall remain, we have a preference for "*Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements*"

This should involve [RAN1, RAN2,RAN4]

12 – Classon Consulting

for FUTUREWEI We believe the RAN2 chair was extremely generous to indicate that one of these bullets would fit. Between the two, we prefer the second objective without RAN1 involvement.

13 – Beijing Xiaomi Mobile Software

If we need to chosen one from the two, we prefer to keep "Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements" although we think both aspects should be addressed in Rel-18.

14 – HUAWEI TECHNOLOGIES Co. Ltd.

For the handover interruption, time-based CHO and location-based CHO were specified in Rel-17 NR NTN. We think the handover interruption is already sufficiently low to support traffic/services provided by NTN. For "handover signaling overhead", it is too generic and leaving such open-ended bullet without clear target would only cause time wasting in WGs. Therefore we cannot accept this bullet.

We prefer to go with the second bullet and list a bit more detailed targets to make the work focus.

We suggest to update the objective as following:

~~· *Address handover interruption and handover signalling overhead [RAN2,RAN1]*~~

· *Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2, RAN4]*

- ***For NTN-TN, optimize the measurement mechanism by indicating neighbor cell information to avoid unnecessary measurements in idle/inactive modes***
- ***For NTN-NTN, optimize the handover by indicating neighbor cell with priority list according to serving time to avoid unnecessary measurements.***

15 – NOVAMINT

If we have to choose, we would prefer to keep "*Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements*"

16 – MediaTek Inc.

We have preference for 2nd bullet on NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements.

17 – InterDigital

We also think the 2nd bullet ”Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements” is an essential feature should be covered in Rel-18 while the 1st bullet is rather optimization. Therefore, we prefer to keep the 2nd bullet if we need to choose one.

18 – Inmarsat

We share the same views as others that, if we have to choose only one bullet, we prefer to keep as we think it’s more essential to clean mobility framework both between NTN and TN, as well as between NTNs: “*Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements*”

19 – STE IDIRECT IRELAND LTD

We support the following bullet point “*Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements*”

20 – Intelsat

We support the 2nd bullet on NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements.

21 – Airbus

If only one sub-bullet is to remain we prefer ”NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements” (without any a-priori restrictions of scope)

22 – Sateliot

Our preference is to keep the 2nd bullet on NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements.

23 – Lockheed Martin

According to Lockheed Martin, if only one bullet topic were to be selected, the following should be kept:

Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2,RAN4]

24 – Nokia France

We support the second bullet. We do not see it necessary to elaborate the bullet further.

25 – Qualcomm Incorporated

We would prefer to focus on NTN-NTN rather than NTN-TN, but the 2nd bullet is acceptable to us. In case some of the solutions have RAN1 impact, we would propose to add ”RAN1” as a 3rd working group for that objective.

26 – Intel Corporation SAS

We have the following comments which in our view allow to reduce the scope and help to make mobility enhancements objective manageable in RAN2 considering limited TUs.

- In our view we need to clarify that the first bullet is considered for NTN-NTN handover only.
- For NTN-NTN mobility in the second bullet, it seems that it is more general than the first bullet (actually scope in the first bullet can be still considered if the second bullet is agreed). So, in order to reduce the workload we prefer to focus on the NTN-TN measurement/mobility, NTN-NTN can be removed. We hope that this comment is acceptable considering that several companies indicated interest to address NTN-TN measurement/mobility specifically.

Based on the above comments we suggest the following revision.

- Address handover interruption and handover signalling overhead **for NTN-NTN** [RAN2,RAN1]
- Specify NTN-TN ~~**and NTN-NTN**~~ measurement/mobility and service continuity enhancements [RAN2,RAN4]

For downselection between subobjectives, we have slight preference to consider the second bullet.

27 – HUGHES Network Systems Ltd

We are ok to keep the first two bullets but if have to choose prefer the keep the 2nd part. Thank you

28 – Apple AB

We also think the 2nd bullet can be prioritized. Unfortunately the wording is quite vague (in some sense handover optimization can be thought of as service continuity enhancement). We suggest that the objective should be further specified, perhaps in the next RAN meeting to ensure focused discussion in RAN2.

29 – Ericsson LM

The discussion seems mostly to be about whether to include one or the other sub-objective, but bringing limited clarity to what the work would comprise more specifically or what effort is needed. Without being more concrete we would not know what to do with this.

30 – Fraunhofer IIS

We appreciate to take this important objective back in the WID.

As single bullet point, we prefer the 2nd one ”Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements”, which are basic features to support handover.

31 – Sequans Communications

If we have to keep only one bullet point, our preference is the 2nd bullet ”Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements”

32 – Ligado Networks

We agree with the moderator proposal.

3.1.6 Expected Output and Time scale (Section 5 of the WID)

The revised WID provided in the intermediate round was acceptable to all companies that provided feedback. Any further refinement, based on the outcome of the Wednesday GTW, as well as the projected time scale can be provided in the following feedback form.

Feedback Form 19: Expected Output and Time scale (Section 5 of the WID)

1 – THALES We are fine with the text
2 – Inmarsat We apologize if this is clear to other, but to us it is not fully clear whether this question/summary refers to the scope and wording of the WID objectives or just the expected output and time scale. If the latter, we are ok with it. if the former, in that respect the intermediate round WID was not fully acceptable to us and refinements have been proposed for some of the objectives.
3 – HUGHES Network Systems Ltd We are OK with the text

3.2 Moderator Summary and way forward proposals

Thanks for the final round feedback. Based on the feedback received, the moderator has provided the further revised WID at the following link using blue highlighting to show the proposed revisions after the final round.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-17-R18-NTN-NR%5D/Rev5%20of%20RP-212713%20WID%20NR%20NTN%20Enhancements-rm.docx

Please find the moderator summary and way forward proposals for each topic below. The final conclusions will be updated after the Thursday GTW session.

General high-level views and justification:

The vast majority of companies supported the Justification provided by the moderator in Rev4 of the WID.

There was one comment from Nokia that the insertion of the “mobility and service continuity” item was done in a surprising place. The moderator had only reverted to the original text in the WID that was presented at the beginning of RAN#94e as an outcome of the October email discussions. However, there should not be much controversy to split the item into a separate bullet to make it more visible. The moderator has provided this update in the revised WID while keeping the text, “considering the NTN characteristics such as large propagation delay and satellite movement.”

Intel asked to remove the word “regulatory” in the justification for Network verified UE location. As the RAN study is to focus on the detailed regulatory requirement for network-verified UE location, the moderator suggests to keep the word “regulatory” in the justification section as it was agreed by all companies except for one.

In addition, Intel asked to provide some clarification on Network verified UE location by suggesting an example. As the example fits within possible solutions for the network to verify UE reported location information, it seems non-controversial to add this example. The moderator has updated the revised WID accordingly.

Objective: Coverage enhancement:

The vast majority of companies supported the objective as written.

Huawei, Futurewei, MediaTek, Nokia, and Ericsson raised concerns with the three bullet items even when listed as examples as confirmed on the Wednesday GTW. The moderator proposes to keep to the agreed way forward from the GTW as there were no objections raised with the RAN Chair's proposed way forward at that time.

Ericsson suggested to add RAN4 to the coverage enhancement objective given the fact that RAN4 would need to check the current assumption for the UE antenna gain. The moderator has added RAN4 based on this request.

Objective: NR-NTN deployment in above 10 GHz bands:

A number of companies were fine with the objective as shown in Rev4 of the WID.

Huawei proposed to add the clarification that NGSO is not applicable for ESIM scenarios in Ka band from ITU perspective. The moderator proposes to add this statement as it is an accurate status of the ITU situation. In addition, there was a comment to add the deployment type aspects of Note 1 of the agreed WF in RP-211596 to an objective which was supported by Ericsson and Nokia. The moderator has added the exact text from the agreed WF to the end of the first objective. The further clarifications on ESIM types are listed in the overall assumptions.

Thales provided suggested updates to the list of objectives which were supported by a number of companies but also not agreed by all. The moderator has suggested some updates in the revised WID as a recommended WF as shown in blue highlighting. The majority of the requested changes were added with the exception of changing the "consider part of" aspect and the request to add "adjacent to the NTN band" to the co-existence item. These points can be further discussed on the GTW. In addition, there was a request to add RAN1 to the last sub-bullet. The moderator has not taken this change since the intent of utilizing existing values was to remove the RAN1 dependency and this was also commented by others.

Ericsson and Nokia are concerned about the potentially very large amount of RAN4 work; multiple terminal types, potentially deployment scenarios for each terminal type, Satellite orbits etc. The moderator is highlighting the statements, "Analysis of regulations and adjacent channel co-existence scenarios." as well as "Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure ..." can be used as justification RAN4 to limit the work.

Verizon expressed concern with indicating the frequency ranges for the harmonized Ka band frequency range which was supported by Ericsson. Given that this range is only identified as a reference, the moderator has proposed to keep the frequency ranges at this time and this can be further discussed on the GTW.

Nokia expressed the desire to move this to a RAN4-specific WI again. During the Wednesday GTW, the RAN Chair indicated to keep the objective in this WI during this meeting.

Objective: Network verified UE location:

The vast majority of companies supported the objective as written.

OPPO and others asked for clarifying the timeline for "Network verified UE location." The moderator would like to provide the following. The main bullet "Study detailed regulatory requirement for network-verified UE location, e.g. accuracy requirement (at RAN plenary, from RAN#95 to RAN#96)" addresses only the RAN-led study based on the detailed scope shared by the RAN Chair. The sub-bullet "Study and evaluate, if needed, solutions for network to verify UE reported location information [RAN1,RAN2,RAN1,RAN3]" is the WG study phase of 6-month duration based on the regulatory requirement RAN-led study to derive clear & limited scope. This results in the check at RAN#98.

Concerning the comments from Samsung which were supported by some companies concerning a common understanding that "network-verified positioning" would not lead to positioning enhancements for NTN, the moderator suggests that Samsung ask the RAN Chair and Secretary that this statement be captured in the meeting minutes. There does not seem to be any necessity to modify the WID.

DOCOMO provided a request to further clarify network verified UE location and its relationship to network-based positioning. Intel raised the similar concerns in the Justification section. These comments were supported by a limited number of companies. The moderator proposes to keep the existing text in the WID given the example suggested by Intel that was added to the Justification section and based on the majority of the companies preferring to remove text related to network-based positioning in the objectives for now.

Objective: NTN-TN and NTN-NTN mobility and service continuity enhancements:

Concerning the decision to limit the scope to one item to be selected from the first two sub-bullets, there was overwhelming support for the second sub-bullet, "Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2,RAN4]."

A few companies provided possible clarifications or to modify the bullet item, but it is not feasible to determine the level of agreement to these clarifications at this time since this topic was only considered in the final round.

As the wording for the second bullet is quite vague since it mentions "enhancements", the moderator suggests updating the WID to further refine the objective at the next RAN meeting to ensure focused discussion in RAN2 based on the suggestion from Apple.

Expected Output and Time scale (Section 5 of the WID):

No additional comments for revisions were received. This section will need to be completed with the time scale and the final list of specifications once the decision is taken next week on the RAN4 NTN specifications. The final revisions to this section will need to be done next week.

4 Week 2 Initial Round

Final approval of the WID was not possible during the first week. Based on the feedback received during the Thursday GTW and further emails, the moderator has provided a further revised WID at the following link using grey highlighting to show the proposed revisions after week 1.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-17-R18-NTN-NR%5D/Rev6%20of%20RP-212713%20WID%20NR%20NTN%20Enhancements-rm.docx

The week 2 initial round will focus on providing feedback on the last remaining open issues and the further revised WID. The goal will be to arrive at an agreeable WID (at least the technical content) as soon as possible in the second week. The expected output and time scale section of the WID will need to be updated based on the outcome of the email discussion in [94e-41-R17-NRNTN-RAN4Spec]. Please find the moderator summary and way forward proposals for each topic below. The comments should be provided in the appropriate feedback forms as opposed to revising the moderator provided WID.

4.1 Collection of company views

4.1.1 Objective: Coverage enhancement

Additional comments were received over email from MediaTek and Huawei after the first week summary was uploaded concerning the example list of areas of study.

During the Wednesday GTW, the RAN Chair asked for the set to be clearly separated as a list of examples as opposed to listing them as specific areas for study. As moderator, I kept with the agreed way forward from the GTW as there were no objections raised with the RAN Chair's proposed way forward at that time. The moderator has provided an additional clarifying sentence (underlined below) in the latest revision of the WID to further emphasize that the items are examples and are not necessarily the actual items that will be studied based on the evaluation of coverage issues specific to NTN.

"The following items are shown as examples of areas to consider. <u>The actual items for study will be based on the evaluation of coverage issues specific to NTN identified above.</u>"

It is the moderator's view from the previous discussions in October as well as during this RAN#94e meeting that any removal of the examples at this stage would clearly not be agreed by the vast majority of companies. In addition, the removal would go counter to the RAN Chair guidance from the Wednesday GTW. Please provide your views on the additional sentence suggested by the moderator.

Feedback Form 20: Objective: Coverage enhancement

1 – CATT Agree to add the additional sentence suggested by the moderator.
2 – DOCOMO Communications Lab. OK with the latest version.
3 – Guangdong OPPO Mobile Telecom. We are ok with the update from the moderator.
4 – THALES We are fine with the objective suggested by the moderator, as is
5 – ESA Ok

6 – NOVAMINT

We are OK with the moderator's proposal.

7 – Classon Consulting

for FUTUREWEI The guidance in the GTW was to have an example *list*, not to keep a bunch of study and specify sub-objectives with the word "Examples" in front of it. Repeating our earlier comment, it would look much nicer to have a single sub-bullet such as:

- Study, and if justified, specify NTN-specific enhancements (e.g., blah blah)

This is in line with the GTW, and is not reopening anything. No strong feeling either way on the additional proposed sentence.

8 – HUGHES Network Systems Ltd

We are fine with the moderator's proposal. Thank you

9 – HISPASAT SA

We thank the moderator for the proposed way forward, Hispasat is fine with the suggested objective.

10 – Intel Corporation SAS

We are fine to introduce the additional sentence suggested by the moderator.

11 – MediaTek Inc.

The list of examples is un-necessarily detailed for WID. As mentioned by FUTUREWEI, it can be just one bullet

- Study, and if justified, specify NTN-specific enhancements – (e.g. …)

The guidance of GTW was not to have any text revisions on the list of examples. On the "e.g.", further alignment of company understanding will be helpful. Alternatively, such discussion could be done in RAN1, RAN2 based on the output of the evaluation of what the NTN-specific aspects could be (the main first bullet).

- We are not clear on why SA4 is mentioned, if the intention is to re-use existing low-rate codecs and also not clear on need to re-open discussions on NTN-specific repetition enhancements since these were discussed in Rel-17 NR NTN.
- We understand the antenna loss will degrade the link budget, but this does not change the conclusions of Rel-17 that higher level of repetitions is not needed in Rel-17 and not clear on benefits in Rel-18. Generally, we should avoid pre-empting RAN1 discussions during SI and jump straight to "if justified, specify" especially for topics well discussed during Rel-17 NTN WI which are not NTN specific.

The moderator sentence "The actual items for study will be based on the evaluation of coverage issues specific to NTN identified above" is helpful.

12 – Nokia France

We agree with the comments from Futurewei and MediaTek. A more appropriate way to write the list of examples for a SI could be as follows:

The following items are shown as examples of areas to consider in the next step of the study. The actual items for study will be based on the evaluation of coverage issues specific to NTN identified above.

- ~~Study, and if justified, specify~~ NTN-specific repetitions enhancements beyond techniques covered in Rel-17 CovEnh WI for the relevant channels [RAN1,RAN2]
- ~~Study, and if justified, specify~~ NTN-specific techniques for improved diversity and/or reduced polarization loss [RAN1]
- ~~Study, and if justified, improve the~~ Improved performance of low-rate codecs in link budget limited situation including reducing RAN protocol overhead for VoNR [RAN2,RAN1] [Liaise with SA2/SA4 as necessary]
    - NOTE: Intent is to optimize the NTN-based NG-RAN to work with the lowest rate codec currently available and will not introduce a new codec.

13 – Apple GmbH

We support the update from the moderator. We are also fine with compacting the potential solutions in a single sub-bullet, as suggested by some companies.

14 – Beijing Xiaomi Mobile Software

We are fine with the moderator's suggestion on the additional sentence. If the group can't converge on the listed solutions, we are also fine to go with Futurewei's suggestion.

15 – ZTE Corporation

The only pending issue for this topic is how to list the "examples" for further discussion. And we slightly prefer the updates from Nokia since it's more aligned with the intention of these examples.

16 – Intelsat

We agree with the objective proposed by the moderator.

17 – HUAWEI TECHNOLOGIES Co. Ltd.

We agree with Futurewei, Mediatek and Apple etc that a single sub-bullet including all examples is a proper way to go. The added sentence by moderator helps a bit, but it does not seem fullly address concerns raised by companies.

18 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are OK with moderator's proposal.

19 – TURKCELL

We share the concerns of Futurewei, MediaTek, Nokia and Huawei. We need a better way to write examples. We continue with Nokia's text proposal.

20 – Qualcomm Incorporated

We think the scope of this item was already clear from the outcome on the GTW. We suggest to go ahead with the current version as suggested by the moderator and close the discussion.

21 – Rakuten Mobile

We propose to modify the Note regarding New Codec introduction for coverage enhancement.

- NOTE: Intent is to optimize the NTN-based NG-RAN to work with the lowest rate codec currently available and not through introduction of a new codec.

22 – Gatehouse Satcom A/S

We agree with the moderator's proposal.

23 – Sequans Communications

We are fine with the moderator's proposal.

4.1.2 Objective: NR-NTN deployment in above 10 GHz bands

The moderator proposed way forward on the first week Thursday GTW was not agreed as written. In addition, there was limited GTW time to evaluate alternate proposed text. The remaining contentious items in the list of objectives are the "consider at least a portion of the Ka band" aspect, the request to add "adjacent to the NTN band" to the co-existence item, and the exact list of frequencies related to the harmonized Ka band frequency range. Please provide any recommended edits to this objective as written in the latest draft WID with the goal of reaching compromise on these aspects.

Feedback Form 21: Objective: NR-NTN deployment in above 10 GHz bands

1 – THALES

We thank the moderator for his effort. We would suggest the following changes compared to rev6 attached:

1/

- GSO and NGSO (e.g. LEO, MEO, HEO) based satellite access to be considered
  - ~~NGSO is not applicable for ESIM scenarios in Ka band from ITU perspective~~ **ESIM scenarios for NGSO are de-prioritized**

2/

· The **satellite** harmonized Ka band frequency range (17.7-20.2 and 27.5-30.0) as common across all regions will serve as reference

3/

· ~~Consider at least a portion of the Ka band as the example band, according to ITU allocation; identify which parts of the Ka band are suitable as 3GPP bands taking into account deployment type (e.g. VSAT, ESIM)~~ **Consider the satellite harmonized Ka band as a reference, according to ITU allocation; taking into account deployment type (e.g. VSAT, ESIM), scenarios, and regulations, define an example band suitable for development of generic 3GPP minimum performance requirements (the example RAN4 band may be a portion of or the entire harmonized Ka band). [RAN4]**

- **Note: In that we assume that the NTN-TN adjacent band coexistence will be performed at Ka band edges, therefore the example RAN4 band shall cover the lower edge of the reference band at 27.5 GHz and the upper edge of the reference band at 30.0 GHz**

4/

- Study implications of FDD operation in FR2 and derive requirements for the identified example band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands **adjacent to the NTN band** (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4]

5/

- Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that satellite bands introduced in 3GPP for NTN shall not impact the existing specifications and shall not cause degradation (in the sense of RAN4 co-existence studies) to networks in 3GPP specified terrestrial bands **adjacent to the NTN band**. [RAN4]

6/

- For **all the above** ~~this~~, RAN4 process as agreed for NTN in FR1 shall be **used** ~~leveraged~~ for coexistence analysis in above 10 GHz bands [RAN4].

2 – ESA

Along with the spirit to find a good way forward, ESA supports the suggestions proposed by Thales. ESIM in NGSO can be de-prioritized and the satellite Ka-band harmonized is a good reference to start with.

3 – NOVAMINT

We support the suggestions proposed by Thales.

4 – HUGHES Network Systems Ltd

We thank the moderator for this effort.

We are in-line with and fully support the recommended changes to Rev6, provided by Thales.

5 – HISPASAT SA

Thanks again to the moderator for the great effort on this discussion. Following the initially proposed changes in v6 and with the aim of ensuring a common understanding, **we do support the proposal from Thales.**

6 – Intelsat

We thank the moderator for the summary discussion.

We are in agreement and support Rev6 changes, proposed by Thales.

7 – HUAWEI TECHNOLOGIES Co. Ltd.

We fail to see the the motivation of the revision below from Thales:

~~*"NGSO is not applicable for ESIM scenarios in Ka band from ITU perspective*~~ ***ESIM scenarios for NGSO are de-prioritized"***

The revision seems suggest that ESIM for NGSO is in the scope of this WI, though with low priority. We do not think there is agreement on that yet. We prefer to the stay with the original wording.

8 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are OK with Thales's revision.

9 – Eutelsat S.A.

Eutelsat supports the suggestions proposed by Thales and the view expressed by ESA.

10 – Ericsson France S.A.S

Regarding the proposal from the moderator, we would like to see some more focus on which scenarios to consider, however we think that it is stabilizing towards what we can achieve at this stage. The comments we made on the frequency range indication for the Ka band still stand.

For the Thales proposals, thanks for the effort for a way forward. For proposal 3, regarding the note, it seems to imply that the example band is the whole Ka band and also that co-existence should be with terrestrial bands that are adjacent to the Satellite band, but not considering overlapping satellite and terrestrial bands. In our view, we should leave open which portion of the Ka band is suited to the example band, but the generic co-existence requirements should enable creation of an example and subsequent bands within the whole range. (Taking into account that the co-existence requirements may differ between terminal and deployment type; TBD). We propose the note could be updated as follows:

Note: Therefore, the RAN4 co-existence study should be sufficient to produce generic co-existence requirements enabling band(s) at or between the lower edge of the reference band at 27.5 GHz (UL) or 17.2GHz (DL) and the upper edge of the reference band at 30.0 GHz (UL) or 20.2GHz (DL) for the designated scenarios / terminal types. The example band and future bands should be able to use these co-existence requirements (for the considered terminal/deployment).

Regarding points (4) and (5), we should also consider Satellite bands that are overlapping the terrestrial: **adjacent to or overlapping the NTN band**

(Note by the way that with "overlapping" we do not mean co-channel. We mean that the 3GPP TN and Satellite bands overlap but that individual channels are different; i.e. the co-existence scenario is still an adjacent channel scenario. This could be further clarified if needed).

Regarding point (6), we are fine to use the RAN4 process (i.e. agree on scenarios, use monte-carlo co-existence simulations to determine the ACIR levels with 5% loss, identify ACLR/ACS). The proposal seems to envisage no change at all from FR1; whilst this is probably fine it may be good to use "should" instead of "shall" or "leveraged" instead of "used" just in case there is a need to do anything slightly different for FR2 (although we can't envisage what at this stage)

For **all the above** ~~this~~, RAN4 process as agreed for NTN in FR1 **should** be **used** ~~leveraged~~ for coexistence analysis in above 10 GHz bands [RAN4].

11 – Qualcomm Incorporated

To try to alleviate the concerns on "at least a portion of the Ka band", we would like to highlight that this work is to introduce the "example band", which does not even need to be the one used for commercial deployments. We could add a NOTE saying that "bands other than the example band may be introduced later in a release-independent manner".

12 – Catapult

We support the suggestions proposed by Thales.

13 – Sateliot

We support the changes proposed by Thales.

14 – Nokia France

We thank Thales for the great efforts to find a compromise way forward. We also support the additional text proposed by Ericsson.

4.1.3 Objective: Network verified UE location

Further comments were received from Intel over email after the first week summary was uploaded concerning the need for further clarification on network verified UE location and its relationship to network-based positioning. The following additional sub-bullet (in bold text) as suggested by NTT DOCOMO in the week 1 final round could be considered as a possible way to address this comment.

- Study detailed regulatory requirement for network-verified UE location, e.g. accuracy requirement (at RAN plenary, from RAN#95 to RAN#96). [RAN]
  - **Including further clarification on network verified UE location and its relationship to network-based positioning**
  - Study and evaluate, if needed, solutions for network to verify UE reported location information [RAN2,RAN1,RAN3]

This additional sub-bullet was supported by a number of companies in the week 1 final round but it is not clear if it is supported by the majority of companies. The moderator would like to collect views if there are any objections to adding this sub-bullet. Based on the outcome, any necessary update will be reflected in the next revision of the WID.

Feedback Form 22: Objective: Network verified UE location

1 – CATT

We are fine with the existing objective, i.e. focusing on Network verified UE location in NR NTN Rel-18.

If needed, we could further investigate the requirements and potential enhancements for network based UE location in the future release.

2 – DOCOMO Communications Lab.

At least some clarification is necessary.

Currently companies' understanding seems divergent. Some assumes NW-based positioning like TN is not included in this objective, but other thinks included. Moderator recommended to discuss the relationship with NW-based positioning at RAN plenary study, but some are saying that it is not discussed at the study phase since NW-based positioning is not included in this objective. These issues result from ambiguity of definition of "NW-verified UE location".

Under this situation, we can easily guess that discussion at RAN plenary becomes quite controversial and the progress becomes poor. To avoid such an unfortunate situation, we hope to have sufficient clarification of this objective in this discussion.

3 – Guangdong OPPO Mobile Telecom.

We are ok for adding one more sub-bullet, but we hope it is clear that it is under RAN's responsibility. So suggest to add [RAN] at the end of the sub-bullet.

4 – THALES

We are fine with the objective suggested by the moderator, as is

5 – ESA

Ok

6 – NOVAMINT

We are OK with the moderator's proposal.

7 – Classon Consulting

for FUTUREWEI The point from Intel was already raised in NWM before the last GTW, was raised by Intel and discussed in the last GTW, and not agreed. We do not think we should reopen the objective that was stable after the GTW to discuss further.

8 – HUGHES Network Systems Ltd

We are fine with the moderator's proposal. Thank you

9 – HISPASAT SA

We are fine with the objective proposed by the moderator.

10 – Intel Corporation SAS

We support the additional bullet.

In our view, as we explained in previous rounds, clarification is needed w.r.t. network-verified UE location, while network-based positioning shall be used in order to estimate UE location and verify if UE-reported UE location is correct, if needed, according to identified requirements.

11 – MediaTek Inc.

The RAN-Plenary level study should focus on NTN-based location verification. We do not support adding the text "and its relationship to network-based positioning" for RAN-level Plenary study.

- It is not clear what NTN-based positioning is, as there is no 3GPP solution specified for NTN-based positioning . The TN positioning method (i.e. terrestrial like OTDOA) cannot readily be used for NTN to our understanding.
- NTN-based positioning will require involvement from RAN1 / RAN2 positioning experts and would likely have significant impact on RAN1 scope if NTN based positioning is to be specified in NTN WI. This could considered in future releases

12 – Nokia France

We are OK with this objective and consider the additional sub-bullet (which may be RAN-led) to be helpful.

13 – Apple GmbH

We are fine to add this sub-bullet to clarify the relationship between network verified UE location and network-based positioning, and think this work is RAN level discussion.

14 – Beijing Xiaomi Mobile Software

We are fine with the new bullet. It is clear to us the focus in Rel-17 is the network verified UE location given the limited TU allocation. However, we think it is beneficial to study the potential requirement and relationship related to the netwerk verified UE location for network based UE location. The nomative work for network based UE location can be done in later release.

15 – ZTE Corporation

In general, we are supportive of RAN-level discussion to clarify the requirements. Regarding the newly added bullet, it's unclear that how can we conduct such a discussion in RAN. Do we need to trigger conduct evaluation to justify the feasibility or other? If the intention is to clarify the scope/motivation of "verification"□it should be done before the endorsement of this item.

16 – Intelsat

We agree with the Moderator proposal.

17 – HUAWEI TECHNOLOGIES Co. Ltd.

We prefer to stay with the existing objective, i.e. without adding the new sub-bullet. Network-based positioning has been discussed and dropped in the previous rounds, and re-openning discussion of network-based positoning will likely make the study less focused.

18 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We share OPPO's view that if the new sub-bullet is added, it needs to be clear and RAN should be responsible.

19 – TURKCELL We are fine with the moderator's proposal.
20 – Qualcomm Incorporated We are OK with the new sub-bullet, with the understanding that it will be discussed in RAN.
21 – Sateliot No objection to adding the new sub-bullet.
22 – Gatehouse Satcom A/S We agree with the moderator's proposal.
23 – Ericsson LM We are ok with the current objective (Rev6) and agree with CATT and others that network based positioning can be considered for a future release.

4.1.4 Objective: NTN-TN and NTN-NTN mobility and service continuity enhancements

In principle, the "Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2,RAN4]." objective is acceptable.

In the week 1 final round, there was a comment from CATT (supported by Lenovo/Motorola Mobility) to add RAN3 to the objective. The addition of RAN3 at this time seems reasonable given the topic. The moderator has added RAN3 in the latest revision of the WID.

Additional clarifications concerning the enhancements could be considered during week 2 but this would further extend the discussion and take away focus from the more contentious items to solve in this WID as well as take away time from delegates to follow topics for Rel-17 during RAN#94e.

As RAN WG work (other than RAN1) for Rel-18 will not start until 3Q'22, the moderator suggests updating the WID to further refine the objective at RAN#95e to ensure focused discussion in RAN2 based on the original suggestion from Apple. This will also allow for the Rel-17 NR-NTN work item outcome to be known when developing the additional clarifications. Please indicate if there are any strong objections to this proposal.

Feedback Form 23: Objective: NTN-TN and NTN-NTN mobility and service continuity enhancements

1 – CATT We are fine to invlove RAN3 in this objective. For now, we can agree with the objective as the moderator proposed. If needed, we can further refine the objective at RAN#95e according to the outcome of RAN2 Rel-17 WI.
2 – Guangdong OPPO Mobile Telecom. We are ok with the current version.

3 – THALES

We are fine with the objective suggested by the moderator, as is

4 – ESA

ok

5 – NOVAMINT

We are OK with the moderator's proposal.

6 – HUGHES Network Systems Ltd

We are fine with the moderator's proposal. Thank you

7 – Intel Corporation SAS

We support the suggestion to further refine the objective at RAN#95e to avoid very broad formulation. Furthermore, if it is acceptable by other companies, in order to exclude the enhancements for handover interruption and handover signalling overhead (1st bullet) we can add a note (e.g. enhancements for handover interruption and handover signalling overhead are not considered).

8 – MediaTek Inc.

We are fine with the current objective version.

9 – Apple GmbH

We support the proposal to further refine this objective at RAN#95e meeting, based on Rel-17 NR-NTN work item outcome.

10 – Beijing Xiaomi Mobile Software

We can accept the current objective.

11 – ZTE Corporation

We are supportive of the current objective and let's refine it at RAN#95e.

12 – Intelsat

Moderator's proposal is acceptable

13 – Lenovo (Beijing) Ltd

Lenovo, Motorola Mobility:

We are OK with the current objective.

14 – TURKCELL

We are fine with the moderator's proposal.

15 – Qualcomm Incorporated We are OK with the current version, and are OK to further clarify in March. We understand NTN-TN refers to mobility between NR TN and NR NTN, and NTN-NTN refers to mobility within NR NTN. Otherwise, clarification would be needed. We also think it would be worth cleaning up the following paragraph, since now we have a single objective: This work considers existing methods from NR TN as well as outcome of Rel-17 NR NTN WI as baseline for NTN-TN mobility. ~~as well as Rel-17 WI outcome and the further mobility enhancements objectives based on confirmation of feasibility and impact are listed below.~~
16 – Gatehouse Satcom A/S We agree with the moderator's proposal.
17 – Rakuten Mobile Agree with the proposal
18 – Sequans Communications We are ok with the proposal.

4.2 Moderator Summary and way forward proposals

Thanks for the comments during the week 2 initial round. Based on the feedback received, the moderator has provided a further revised WID at the following link using teal highlighting (starting to run out of colors) to show the proposed revisions.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-17-R18-NTN-NR%5D/Rev7%20of%20RP-212713%20WID%20NR%20NTN%20Enhancements-rm.docx

Please find the moderator summary and way forward proposals for each topic below.

Objective: Coverage enhancement

The vast majority of companies supported the latest text from the moderator in Rev6 of the WID.

Similar comments were received during the week 2 initial round concerning the modification of the three bullets to collapse them into one bullet or to remove/modify particular items from the example list. These comments were supported by a limited number of companies. As noted previously, the moderator proposes to keep to the agreed way forward from the GTW as noted by the RAN Chair which was to take the existing bullets and make it clear that they are listed as examples.

Nokia suggested updated text concerning how the examples could be listed. The proposed updates to the text from Nokia seemed agreeable and match the list of examples which were identified at the time of the first week Wednesday GTW. The moderator proposed way forward is to capture the text from Nokia and close this objective for further discussion.

Objective: NR-NTN deployment in above 10 GHz bands

During the week 2 initial round, there were a number of text proposal updates from Thales to work towards a

way forward.

The suggestion to modify the sub-bullet on ESIM scenarios in Ka band was not accepted by the company that proposed the existing sub-bullet since the modification implies that the use case is part of the work even though it would be de-prioritized. The moderator has kept the existing sub-bullet for now.

The proposed updates to the "Study and identify NTN example band" sub-bullets are moving in the direction to resolve some of the concerns raised previously by many companies. In addition, Ericsson proposed some updated text based on the Thales proposals.

The moderator proposed way forward is to take the Thales provided text for the "Study and identify NTN example band" sub-bullets with the exception of the additional note under the first sub-bullet concerning NTN-TN adjacent band coexistence and to modify the "shall" to "should" in the RAN4 process sub-bullet based on the Ericsson comment that there may need to be some adjustments that are unforeseen at this time. The moderator view on the additional note under the first sub-bullet provided by Thales is that this aspect is already captured in the co-existence study sub-bullets (no need to duplicate) and is part of normal RAN4 process. In addition, the moderator has updated the reference to regulations in the first sub-bullet to add clarification that they are ITU-R/regional regulations to address some of the previous concerns from Verizon.

Objective: Network verified UE location

All companies except for CATT, Futurewei, Huawei, MediaTek, and Ericsson agreed with the moderator proposal to add the additional sub-bullet.

A number of companies commented that it should be clear that the sub-bullet is related to the RAN study. The moderator has added [RAN] to the sub-bullet in the latest revised WID.

As the additional sub-bullet would be a RAN-level discussion with the goal of clarifying the relationship to network-based positioning and to provide a better understanding of network verified UE location prior to the RAN WG study, the majority of companies agreed that this extra sub-bullet added value. The additional sub-bullet does not propose any modification to existing UE network-based positioning mechanisms.

Given that the follow-on RAN WG study would evaluate solutions for the network to verify the UE reported location information, the additional clarity should help to focus the RAN WG study.

The moderator proposed way forward is to consider the text in the latest revised WID and close this objective for further discussion.

Objective: NTN-TN and NTN-NTN mobility and service continuity enhancements

All companies supported the moderator way forward to update the WID to further refine the objective at RAN#95e in order to provide additional clarity concerning the enhancements prior to RAN WGs starting the work. There were no objections to adding RAN3 to the objective.

Intel suggested to add a parenthetical statement to the single objective which indicates that the enhancements for handover interruption and handover signalling overhead are excluded. As this aspect was part of the downselection already documented in this NWM discussion, the moderator would prefer to keep the existing objective in the bullet item as written in Rev6 since there were no objections in this round.

Qualcomm suggested an editorial update to the introductory text given that there is only one objective listed. This editorial update seems reasonable and does not change the intent of the introductory text. The moderator has updated the text in the latest revised WID accordingly.

The moderator proposed way forward is to consider the text in the latest revised WID and close this objective for further discussion.

5 Week 2 Intermediate Round

The moderator has provided a further revised WID at the following link using teal highlighting to show the proposed revisions.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-17-R18-NTN-NR%5D/Rev7%20of%20RP-212713%20WID%20NR%20NTN%20Enhancements-rm.docx

The comments should be provided in the appropriate feedback form as opposed to revising the moderator provided WID.

5.1 Collection of company views

5.1.1 Objective: NR-NTN deployment in above 10 GHz bands

Please provide any recommended edits to this objective as written in the latest draft WID with the goal of reaching compromise on these aspects quickly.

Feedback Form 24: Objective: NR-NTN deployment in above 10 GHz bands

1 – ZTE Corporation

We are in general fine with the current proposal. Regarding the following sentence, it's preferred to remove the VSAT from the bracket since only ESIM refers to different deployment types.

- Consider the satellite harmonized Ka band as a reference, according to ITU allocation; taking into account deployment type (e.g. ~~**VSAT,**~~ ESIM), scenarios, and ITU-R/regional regulations, define an example band suitable for development of generic 3GPP minimum performance requirements (the example RAN4 band may be a portion of or the entire harmonized Ka band). [RAN4]

2 – THALES

We do thank the moderator for its efforts and believe that we are very close to an agreeable text.

However we still suggest the following modifications:

1/ "*The following assumptions are taken a baseline for this work:*

- *GSO and NGSO (e.g. LEO, MEO, HEO) based satellite access to be considered*
  - ~~*NGSO is not applicable for ESIM scenarios in Ka band from ITU perspective*~~ ***ESIM scenarios for NGSO in Ka band are not considered in this WI***
  - ***coexistence between overlapping NTN and TN band portions are out of 3GPP scope"***

2/ "*Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that satellite bands introduced in 3GPP for NTN shall not impact the existing specifications and shall not cause degradation (in the sense of RAN4 co-existence studies) to networks in 3GPP specified terrestrial bands adjacent to the NTN band.* ***In that we assume that the NTN-TN adjacent band coexistence will be performed at Ka band edges****[RAN4]*"

3 – NOVAMINT

We believe we are very close to an agreeable proposal and we support the suggestion from Thales for this.

4 – ESA

Thanks to the moderator's effort in making this new version. We support the current text and the changes proposed by Thales.

5 – Ericsson France S.A.S

As in the previous round, for the main part the objectives are as stable as we can get to right now although there is a need to clarify the scenarios further in RAN4.

Regarding the addition of "adjacent to the NTN band", if this is added then the 3GPP specification is not providing any kind of co-existence protection in the case of overlapping terrestrial and NTN bands. We propose that the text is updated to "adjacent to or overlapping the NTN band" or removed.

If there are concerns on the feasibility of co-existence for overlapping bands then the co-existence could be firstly studied and specified if possible, or alternatively the 3GPP TS should state that co-existence of NTN and TN channels in overlapping bands is not supported.

6 – HISPASAT SA

Thanks to the moderator for leading the discussions and getting to a so close conclusion and agreeable version. As a compromise and positive way forward, we do support proposal from Thales.

7 – HUAWEI TECHNOLOGIES Co. Ltd.

The proposal from moderator looks fine. We are also fine with the further revision from Thales: ~~*NGSO is not applicable for ESIM scenarios in Ka band from ITU perspective*~~ ***ESIM scenarios for NGSO in Ka band are not considered in this WI.***

8 – Inmarsat

Many thanks to the moderator's hard work in helping us reach an agreement, we also feel we are very very close and this is a very important topic for us and a sensitive subject.

We thank Thales for the proposed wording which we think addresses the remaining concerns and we thus **support the wording changes proposed by Thales.**

@HUAWEI: Many thanks for accepting this compromise wording.

It appears that the last remaining concern is in regards to Ericsson's latest comment. It is our understanding that the wording proposed by Thales does capture the current 3GPP process correctly.
@Ericsson: Many thanks, we appreciate the will to converge. On the remaining item, please could we ask you to clarify, based on your last sentence "or alternatively the 3GPP TS should state that co-existence of NTN and TN channels in overlapping bands is not supported", what is the discrepancy between that and the proposed Thales wording?

Thank you
9 – VODAFONE Group Plc with regard to the text (not on 10 GHz) that says: *Have a 1-TU 6-month study phase....* you might want to clarify whether the 1 TU applies to RAN 1 or 2 or 4 (or all of them)
10 – HUGHES Network Systems Ltd We thank the moderator for this effort. As a compromise and positive way forward, we support the current text and the changes proposed by Thales. Thank you.
11 – Omnispace As a compromise we support the current text with Thales proposed updates.
12 – Airbus We support the current text and changes proposed by Thales

5.2 Moderator Summary and way forward proposals

Thanks for the comments during the week 2 intermediate round and for working towards a compromise proposal. Based on the feedback received, the moderator has provided a further revised WID at the following link using dark green highlighting to show the proposed revisions.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-17-R18-NTN-NR%5D/Rev8%20of%20RP-212713%20WID%20NR%20NTN%20Enhancements-rm.docx

Please find the moderator summary and way forward proposal below.

Objective: NR-NTN deployment in above 10 GHz bands

The following assumptions are taken a baseline for this work:

- GSO and NGSO (e.g. LEO, MEO, HEO) based satellite access to be considered
  - ESIM scenarios for NGSO in Ka band are not considered in this WI.
- Targeted UE types: fixed and mobile VSAT. VSAT UE characteristics from TR38.821 to be considered in priority but additional NTN UE classes may be considered if justified
  - Regarding mobile VSAT, three types of terminal and scenario exist; airborne, maritime and land based ESIM. Which type(s) to be specified depends on the outcome of the regulation analysis and co-existence study.

- FDD mode is assumed for satellite operation above 10 GHz, while TDD mode is assumed for terrestrial operation in FR2
- The harmonized Ka band frequency range (17.7-20.2 and 27.5-30.0) as common across all regions will serve as reference
- Co-existence between overlapping NTN and TN band portions is out of 3GPP scope

The following covers the objectives for NR-NTN deployment in above 10 GHz bands. In accordance with the WF in RP-211596, this work would start after March 2022 once FR1 NTN coexistence study is stable enough.

- Study and identify NTN example band: Analysis of regulations and adjacent channel co-existence scenarios. The example band shall be identified early in the WI. Additional bands can be introduced in a release-independent manner. [RAN4]
    - Consider the satellite harmonized Ka band as a reference, according to ITU allocation; taking into account deployment type (e.g. VSAT, ESIM), scenarios, and ITU-R/regional regulations, define an example band suitable for development of generic 3GPP minimum performance requirements (the example RAN4 band may be a portion of or the entire harmonized Ka band). [RAN4]
    - Study implications of FDD operation in FR2 and derive requirements for the identified example band appropriately. Satellite bands introduced in 3GPP for NTN for FDD shall not impact the existing 3GPP TDD specifications for terrestrial bands adjacent to the NTN band (see note 3 of the approved way forward RP-211596 in RAN#92-e). [RAN4]
    - Relevant coexistence scenarios and analysis to be considered in RAN4, if and where applicable, to ensure that satellite bands introduced in 3GPP for NTN shall not impact the existing specifications and shall not cause degradation (in the sense of RAN4 co-existence studies) to networks in 3GPP specified terrestrial bands adjacent to the NTN band. In that, it is assumed that the NTN-TN adjacent band coexistence will be performed at Ka band edges. [RAN4]
    - For all the above, RAN4 process as agreed for NTN in FR1 should be used for coexistence analysis in above 10 GHz bands [RAN4].
    - Definition of NTN band(s) above 10 GHz does not change the current FR1/FR2 definition, nor automatically apply to future terrestrial bands defined in this frequency region; (see proposal 2 of the approved way forward RP-211596 in RAN#92-e) [RAN4]
- Specify Rx/Tx requirements for satellite access node and different VSAT UE class (not only 60 cm aperture) as appropriate for the identified example band [RAN4]
- Identify values for physical layer parameters chosen from the existing FR1 and FR2 sets. The following set of parameters to specify, but not necessarily limited to, are listed.as follows [RAN4]:
    - time relationship related enhancement (e.g. K_offset)
    - subcarrier spacing for different UL/DL signals/channels
    - PRACH configuration index for FDD above 10 GHz.