

[94e-17-R18-NTN-NR] - Version 0.0.4

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 than the SID

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

To clarify the rationale 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 FRI
- 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 FRI
 - o As in Rel-17, NTN capable handset terminals are capable to operate with a terrestrial network. For VSAT UE, this is optional.
 - o 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 – Transion 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~~Optimized performance especially when addressing for handset terminals (including smart-phones 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 smart-phones 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 smart-phones 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 – Transion 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 identify 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]*
 - o *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]*
 - o *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]*
 - o *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]*
 - o *Identify an example band according to ITU allocation suitable for NTN 3GPP bands [RAN4]*
 - o *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]*
 - o *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 impact on the RAN1/2. Maybe this could be a RAN4-only topic at the first stage.

6 – Transion 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.
 - o **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
 - o **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
 - o **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]
 - o 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]
 - o 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]
 - o **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].**
 - o **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.**
 - o **For non-mobile VSAT, appropriate co-existence scenarios need to be identified [RAN4].**
 - o 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]
 - o 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/Ericsson 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*
 - o ***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]*
 - o *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]
 - o 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]*
 - o *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]
 - o ~~For Network based UE location, re-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 signalling 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
 - o For NTN -TN, optimize the mobility in idle/inactive mode and connected mode to prioritize TN over NTN or vice versa.
 - o 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 original 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 would 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 NGE0 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 NGE0) which are known terminology in 3GPP and in wider satellite ecosystem. 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 discuss 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 separated 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 NGE0 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 N GEO 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 N GEO, 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]
 - o 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]~~
 - o ~~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.~~

<p>We are also fine to remove all these three bullets</p>
<p>6 – ZTE Corporation</p> <p>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.</p> <p>We are also fine to remove all bullets.</p>
<p>7 – CATT</p> <p>We are fine to remove these bullets.</p>
<p>8 – THALES</p> <p>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.</p>
<p>9 – MediaTek Inc.</p> <p>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).</p>
<p>10 – Lenovo (Beijing) Ltd</p> <p>Lenovo, Motorola Mobility:</p> <p>We think it is better to keep these sub-bullets. The objective without these sub-bullets is too general to us.</p>
<p>11 – Beijing Xiaomi Mobile Software</p> <p>We are fine to remove the last three bullets</p>
<p>12 – Nokia France</p> <p>We support removing these three bullets. It is better to complete the evaluation first, and not pre-judge its outcome.</p>
<p>13 – Deutsche Telekom AG</p> <p>We support removal.</p>
<p>14 – Apple AB</p> <p>We are fine with removing these bullets, since these topics may be discussed after the study phase is completed.</p>
<p>15 – Ligado Networks</p> <p>We would prefer to keep the sub-bullets but would be also ok with Huawei's proposal to merge the first two.</p>
<p>16 – Intel Corporation SAS</p> <p>We agree to remove the last three bullets and focus on the first bullet to identify which physical channels require enhancements.</p>

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 NGE0 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 NGE0) 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]”*
 - o We suggest to replace this controversial statement above by **“Identify an example band according to ITU allocation suitable for NTN 3GPP bands [RAN4]”**
 - o 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] »*
 - o => 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]”*~~
 - o => 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 technical 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 FRI 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 NGESO (e.g. LEO, MEO, HEO) based satellite access to be considered

- o ~~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]
 - o ~~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]
 - o 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]
 - o ~~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].~~
 - o ~~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.~~
 - o ~~For non-mobile VSAT, appropriate co-existence scenarios need to be identified [RAN4].~~
 - o 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]
 - o 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 NGESO (e.g. LEO, MEO, HEO) based satellite access to be considered
 - o ~~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]
 - o ~~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].
 - o 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]
 - o ~~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].~~
 - o ~~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.~~
 - o ~~For non-mobile VSAT, appropriate co-existence scenarios need to be identified [RAN4].~~
 - o 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 Ericsson 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 proposal 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]*
 - o *For verification of Network based UE location, ~~re-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]
 - o 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]
 - o **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#9698 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]
 - o 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]
 - o As a baseline, RAN WGs shall assume that the number of satellites in view can be limited (including single satellite)
 - o 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)

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

11 – Intelsat

We are in agreement with the proposal

12 – Ericsson LM

OK

2.2 Moderator Summary and recommendation for further discussion