[97e-10-R18-Regional-Subsets-Bands] - Version 0.0.4
RAN

3GPP TSG-RAN #97-e RP-22xxxx

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Electronic Meeting

Agenda item: 9.2.2

Source: Moderator (Qualcomm Incorporated)

Title: Email discussion summary for [97e-10-R18-Regional-Subsets-Bands]

Document for: Information

1 Introduction

This document summarizes the email discussion on the UE support of regionally-defined subsets of an NR band. The following documents are treated in this thread.

Table 1: Contributions for [97e-10-R18-Regional-Subsets-Bands]

RP-222177	Text proposal for Study on UE support of regionally-defined subsets of an NR band	Apple
RP-222210	TP for TR38.xxx Band Subsets; Root cause and New band number	T-Mobile USA Inc.
RP-222221	TR 38.893 V0.0.1: Study on UE support of regionally-defined subsets of an NR band	Qualcomm Incorpo
RP-222223	TP for TR 38.893: Views on UE support of regionally-defined subsets of an NR band	Qualcomm Incorpo
RP-222365	On UE support of regionally-defined bands	Nokia, Nokia Shan
RP-222368	Generic solution for n77-like issues	Ericsson
RP-222510	Discussion on UE support of regionally-defined subsets of an NR band	Huawei, HiSilicon

2 Initial Round

2.1 Proposals and comments

Skeleton TR

Can the skeleton TR, introduction, scope, and references in RP-222221 be agreed?

Feedback Form 1: Skeleton TR, introduction, scope, and references

1 – Nokia Corporation

The skeleton is mostly fine but we think clause 4 could have sub-clauses: The aim of the clause is to identify the problems discussed in the SI, with the main problem being that the spectrum availability in a region may change over time. Having a clause name as "Root cause" implies there is only one issue, but that is not clear yet. We do know (based on the n77 discussions) on one problem, but do not yet know if that is the only case and the SI should identify if there are others. So we would propose to slightly modify the TR structure as shown below (intent doesn't change, this just allows for a better analysis):

4. Issues caused by regional spectrum availability changing over time

4.1 Issue 1: TBA

4.2 Issue 2: TBA

4.3 Issue 3: TBA

This also helps because (to our understanding) the n77 issues were already slightly different for US and Canada, so identifying those would help a lot for any future cases. And (as we discuss below) had the NOTE 12 not been there in TS38.101-1 for US, there may have been no issues in the first place, i.e. RAN4 specification statement without clear UE requirements are also a potential issue, and the TR should also consider that.

2 – T-Mobile USA Inc.

The skeleton looks fine to us. We don't have a strong view on separating clause 4 into sub-clauses. That would be fine with us.

3 – ZTE Wistron Telecom AB

In general the TR skeleton is fine. However, it seems to us that the contents of Introduction part could be moved to Section 4 (Root cause).

4 – MediaTek Inc.

In general, the skeleton looks fine to us. Regarding clause 4, whether to have sub-clauses or not, we need to think about it and provide comments later on.

5 – Intel Corporation (UK) Ltd

The TR skeleton looks reasonable to us

6 – AT&T GNS Belgium SPRL

The TR skeleton looks good to us. Additional sub-clauses can be added as necessary if there is consensus to do so.

7 – Huawei Technologies France

In general, the TR skeleton is fine. Separating clause 4 seems better as some issues raised by companies can be addressed clearly.

8 – Verizon UK Ltd

We are ok with the TR skeleton.

Root cause

The first objective from the SID

- Investigate and identify the root cause of issues associated with regional frequency allocations, using U.S. and Canadian treatment of n77 as examples, as the first step

The root cause is discussed in documents RP-222210 from T-Mobile (with TP), RP-222223 from Qualcomm (with TP), RP-222365 from Nokia (no TP), RP-222368 from Ericsson (no TP), and RP-222510 from Huawei (no TP). The moderator suggests to collect comments in the initial round on the individual proposals from each of these papers. Are there any disagreements with any of the points in these papers on root cause? Are there any missing elements on root cause not addressed by these papers? In the intermediate round, the moderator will suggest one company to merge all of the documents including comments feedback received during the initial round together into a single TP for further discussion and possible agreement in intermediate and final rounds.

Feedback Form 2: Comments on root causes

1 – Nokia Corporation

The core issue with n77 was whether UEs supporting n77 globally still support it even in the US without any modifications. The problem with n7 occurred because the NOTE 12 in TS38.101-1 did not make it clear what the frequency restriction means in practice, i.e. there were no requirements associated to it (e.g. that UEs in the US would have to bar cells not belonging to that frequency or anything similar). That's what caused all the trouble.

We would also like the remind that the SI is about issues requiring regional sub-band allocations, not generic CA problems. For the 700/800/900 MHz, there is an existing SI so we shouldn't mix that with this aspect unless it is specifically related with regional spectrum allocations (which it doesn't seem to be, based on RP-221464).

For the TR, (at least) the following could be listed as issues/root causes of the problems:

Issue 1: Available frequencies changing over time regionally (e.g. n77 in US and Canada)

Issue 2: No UE requirements or clear behaviour for a regional frequency restriction (e.g. NOTE 12 in TS38.101-1)

Issue 3: Requirement that only certified UEs are allowed to camp on a regionally-defined part of a band (e.g. NS_55/57 in n77)

2 – Qualcomm Korea

To Nokia: Our understanding of the n77 situation is not that the NOTE12 didn't have any requirements attached to it (many notes do not I believe), but rather that two different subsets of the band were introduced at different times. As a result an ambiguity was introduced where the network can not distinguish an earlier device that supports only one of the subsets from a later device that supports both of them. This seems to be captured in Issue 1 and 3 in Nokia's comment. For Issue 2, even if a requirement had been specified for NOTE12, it's not clear that the ambiguity caused when a second subset was enabled would have been averted. But perhaps Nokia's Issue 2 was addressing some other aspect related to global n77 devices similar to the questions raised in Huawei's RP-222510.

3 – T-Mobile USA Inc.

In the Qualcomm TP, we don't agree with this "in theory, it may only support the 3.45 – 3.55 GHz subset but that is not expected." Since 3.7-3-98 was introduced first, a UE operating in the US can only support only 3.7-3.98 GHz or both 3.45-3.55 GHz and 3.7-3.98 GHz. A UE cannot support 3.45-3.55 GHz only. That would break the existing signalling. We also don't think this SI should include CA between the 700, 800, and 900 MHz bands, as that has a separate SI.

We also don't agree with the three issues that Nokia lists above as being the root cause. Issue 1 alone is not a problem. Many countries have available frequencies that change over time. This only becomes problematic when the UE can only be certified to operate in the part of the band where there are regulations at the time of manufacture. We agree with Qualcomm that Issue 2 (Note 12) is not really a root cause, either. And Issue 3 is not a root cause, but more an issue related to the solution (namely introducing new capability signalling that legacy roaming UEs do not support).

In our view, the root cause is that in some countries UEs can only be certified for part of a band where regulations exist, and the part of the band where regulations exist can change over time.

4 – SoftBank Corp.

It is quite natural that a country allocating a part of 3GPP band has a domestic authentication/certification procedure only for the part since there is no regulation other than the allocated range. Considering that we were perfectly fine while we had 3.7 - 3.98GHz alone for the US, the root cause is, when the second batch(US DoD) came up, to try to use n77 without paying attention to the certification requirements in US/Canada (I.e Issue 3).

It seems that the problem this time comes from a procedual aspect of a regulation(UE certification) which we do not address normally in RAN4/RAN5 context (we only check if existing requirements could be fit to the given regulation) and all we can say is that a proponent should watch out for such a procedual aspect also.

So we tend to agree with Issue 1 and 3 of Nokia as a root cause, but deleting (e.g. NS_55/57 in n77)

5 – Guangdong OPPO Mobile Telecom.

We share similar view as Tmobile-USA about the rout cause of this issue, i.e. UE only certified the part of band which was allocated in different time.

However, not sure whether this actually somehow contradict with the 3GPP requirement definition and UE certification basic principles that requirements are defined per 3GPP bands and UE are designed for it then certified for the whole band (low/mid/high frequency). After that this UE is a global roaming UE without violate regulations in principle.

With the n77 regulation requirements in US/Canada, it is not clear how the roaming UEs will be handled since they are not certified by regulations . Are these 3GPP compliant UEs will be bared from access any n77?

6 – CHTTL

Regarding 700/800/900MHz, if some spectrum range restrictions is introduced for some combinations in the spec for a while, we are wondering if there is any issue to remove the restrictions at the later stage, but anyway we are ok to focus on n77 in this SI.

7 – Samsung Electronics Co.

We agree the analysis from T-Mobile USA and Qualcomm. This issue only exists under two conditions meet:

1) Regional certification required

2) Multiple subsets of bands made available by regulator in different times

8 – Apple GmbH

As summarised by Samsung, the issue emerges under the following conditions:

1) Regional certification required

2) Multiple subsets of bands made available by regulator in different times

And as a side remark, condition 2) is not only about new (sub-)bands, but also potentially changed regulatory requirements in the existing (sub-)bands.

9 – Intel Corporation (UK) Ltd

In our understanding the basic principles for supporting bands are:

- a/ UE supporting a band must support the entire band.
- b/ In order to ship a UE supporting a band the UE must have passed conformance tests and be certified for that band. Based on principle a/ this testing and certification must be for the entire band. Note that when the UE is conformance tested it can only be tested against those RF emission requirements that exist and have been specified by 3GPP at the time of the testing (this is obvious but worth stating).

If the above principles had been followed then when the later portion of the n77 band was deployed the existing UEs would all have been able to use the new portion of the band without issues. Instead, the UE conformance testing was limited only to the original portion of the band and UE may have been implemented to prevent them from using other portions of the band. In this case the RAN4 specification included the Note 12 which could be interpreted to justify such a UE implementation. In our view real root cause of the n77 issues was that the original conformance testing of the UEs only covered a portion of the band.

The fact that portions of a band may become available for use at different times, or that different portions of a band are used by different countries, is not the root cause - this is business as usual that 3GPP has been coping with for many years.

Of course it is possible that the later used portion of the n77 band to be used could have required some different RF emission requirements. This is the situation for which the NS mechanism was designed. An NS value would have been defined and associated to the different RF emission requirements and a legacy UE, not supporting the new RF emission requirements, would not be able to access the cell from idle/inactive (based on existing rules in RRC spec). Proprietary UE implementations should not have been necessary to prevent RF emissions in the new portion that are not compliant with regulation.

Note, however, there is one deficiency with the current NS mechanism as currently network does not know whether the UE supports an NS value and hence the network is not able to prevent a connected mode handover to a cell of the new deployment. The connected mode handover issue is not a concern when the new deployment is in different country from the original deployment (and no land border). The connected mode handover issue can be addressed by provide the supported NS values in UE capability signalling to the network.

10 – Huawei Technologies France

As companies responded that ***this only becomes problematic when the UE can only be certified to operate in the part of the band where there are regulations at the time of manufacture***, I'd like to invite companies to think about whether UE which can only be certified to operate in the part of the band (e.g. band n77) are allowed to declare the support of band n77 and access to the frequency range which is not certified part of the band n77. In my understanding, if a UE declares to support band n77, it should be capable of supporting full band n77 frequency range and verified for the whole band (low/mid/high frequency). Otherwise, it isn't allowed to declare the support of band n77 based on current specification. However, currently a UE which can only be certified to operate in the part of the band without the whole band (low/mid/high frequency) verification due to the regulation, indicates the support of band n77 and can access to the frequency range which is not certified part of the band n77.

If this contradiction is the root cause, it seems that we have two directions to solve this:

1) We could follow current specification design, i.e. if a UE declares the support of one band, it means that it should be capable of supporting full band frequency range and verified for the whole band (low/mid/high frequency).

2) We may need to change or improve the current specification design, i.e. even if a UE declares the support of one band, it doesn't mean that it is capable of (allowed) supporting full band frequency range or verified for the whole band (low/mid/high frequency). We still need sub-capabilities to indicate the real sub-frequency range which is supported and verified by UE.

11 – AT&T GNS Belgium SPRL

We generally support the TP for the root cause as defined in Qualcomm's doc but would like to remove the text "(in theory, it may only support the 3.45 – 3.55 GHz subset but that is not expected)". The UE shall support the originally defined subset. This is also how the RAN2 specification reads.

12 – AT&T GNS Belgium SPRL

We would also like to see more input from other regions in order to understand the full scope before making any final decisions on solutions as understanding the full scope may lead to other solution possibilities or the need to consider different solutions depending on the specific regulatory situation.

13 – Verizon UK Ltd

We still believe that the goal of 3GPP defining the band n77 is to expect the UEs supporting n77 globally. For this, we may need to understand other regions' requirements before making any final decisions on solutions and if 3GPP could lead to possible solutions needed.

We agree that the root issue is that in some countries UEs can only be certified for part of a band where regulations exist, and the part of the band where regulations exist can change over time as T-Mobile mentioned.

Details of solutions using a new band or new band number

Solutions using a new band or a new band number have been proposed in several papers. In this section, we only discuss the details of a solution that would use new bands or band numbers. What details should be included in such a solution? In a later section, we can discuss whether new bands or band numbers is the preferred solution. In the intermediate round, the moderator will suggest one company to merge all of the documents including comments feedback received during the initial round together into a single TP for further discussion and possible agreement in intermediate and final rounds.

Feedback Form 3: Details of solutions using a new band or band number

1 – Nokia Corporation

Creating new band (number) requires no new signalling and is natively supported since Rel-15 by all UEs. It also need not create any additional BCs in UE capability signalling: For example, the band n90 was created as a variant of band n41 and is the same except for requiring the use of the 7.5 kHz offset in the UL, and all BCs for n41 are automatically valid also for n90 (i.e. UE indicating support for bands n41 and n90 only lists BCs for n41, but they also apply for n90).

2 – Qualcomm Korea

If a new band number is adopted as a solution, it is imperative that the band combinations do not have to be redefined and signaled by the UE. There should be rules written that the new band number inherits the same band combinations of the parent band.

3 – T-Mobile USA Inc.

In our TP we stress that the solution would be a new band number and not a new band. The Qualcomm

TP in RP-222223 Lists “New band approach” as one solution. Maybe we should have one sub-clause with a “New band” and a separate clause with a “New band number” to clearly distinguish between these two options, where the former would require new BCSs and the latter would not. Otherwise, if we only document one of these solutions we feel strongly that it should be called a “New band number” and not a ”New band.”

We agree with Nokia that creating a new band number requires no new signalling, and we covered that in our TP. We also agree with Nokia and Qualcomm that the new band number would not need band combinations and BCSs, because like n90, the new band number could re-use the band combinations of the original band.

4 – Guangdong OPPO Mobile Telecom.

Is it correct understanding that for roaming UE, it can always report supporting both old and new bands even not certified by local regulation?

And does UE supporting both old and new bands need to be tested once in RAN5 or need to be tested twice, once for old band and the other for new band? If twice then it is big burden for UE.

5 – Samsung Electronics Co.

New band number can be considered as defualt solution, and RAN/RAN4 can continue the effort on the analysis of specification impact with new band number introduced.

6 – CHTTL

It seems like both the ”New band” (in RP-222223) and ”New band number” solutions basically have the same principle that the requirements from an original band or a parent band are applied, the difference is the description of the CA aspects?

7 – Intel Corporation (UK) Ltd

The new band and new band number solutions, although closely related, should be considered as distinct solutions.

New Band - We understand new band to mean a totally independent band (no rules or requirements that link it to the original band). This solution is fully supported in today’s specifications. No specification work is required. The only concern is that it may result in increased number of CA/DC band combinations that need to be reported in the UE capability signalling.

New Band Number - This solution is not yet fully supported in today’s specifications. The proposal assigns a new band number to a portion of an existing band. The new band number can be used control access to the new portion of the band both for access from idle/inactive and connected mode handover. It is possible that this approach could be introduced with no new signalling, but there would be specification rules so that a UE doesn’t need to report CA/DC band combinations including the new band number. The proposal seems feasible but careful specification work will be required to ensure everything is clear.

8 – Ericsson LM

Aside from what we have described in our paper (RP-222368): We assume that the new band number will cover both the original and new ranges. Using n77 in USA (noting that n77 was restricted to C-band in US) as an example, the gNB would broadcast **both** n77 and the new band number in the C-band, and (only) the new band number in the DoD-band. With this approach, a UE will not include band combinations using the new band. Band combinations advertised for n77 (would apply also for the new band (C-band + DoD-band), and no confusion that intra-band CA becomes inter-band.

If the new band only applies to the new range (e.g. DoD-band) it is less clear that the UE shall omit BCs, and also confusion that intra-band CA becomes inter-band.

But note: We do agree that a UE supporting the new range must support the old range, regardless.

9 – Huawei Technologies France

If new bands and band numbers are two different solutions, it's better to clarify it in the TR.

10 – NTT DOCOMO INC.

We should clarify whether redefining and indication of band combination including a new band should be omitted or not. Our view is it should be omitted.

And the frequency range of a new band is the same with or the portion of the original band also should be clarified. If we omit redefining and indication of BCs for a new band, we guess the frequency range is the same with the original band, but we are open to discuss it.

11 – AT&T GNS Belgium SPRL

We also think that it is important to also clearly define the differences between the introduction of a new band or a new band number. We don't see the n41 and n90 case as similar to the n77 case since there were differences in the UL between n41 and n90. For n77, there were no core requirement differences in the subsets of n77.

12 – Verizon UK Ltd

We agree with AT&T.

Details of solutions not using a new band or new band number

Some papers also described an approach not using new bands or band numbers. In this section, we only discuss the details of a solution that does not use new bands or band numbers. What details should be included in such a solution? In a later section, we can discuss whether new bands or band numbers is the preferred solution. In the intermediate round, the moderator will suggest one company to merge all of the documents including comments feedback received during the initial round together into a single TP for further discussion and possible agreement in intermediate and final rounds.

Feedback Form 4: Details of solutions not using a new band or new band number

1 – Nokia Corporation

For these types of solutions, we would like to understand if there are issues that they can solve that are **not** solved problems by the new band numbers. We haven't seen any such so far, and would like to understand if there are any such cases.

2 – Qualcomm Korea

While this may not be a deciding factor, one advantage of using the same band number is a closer association with the parent band. It is likely the case that outside of 3GPP WG's, the Band n90 is not well understood to be associated with Band n41. Therefore, it is less likely to be recognized and well supported in the ecosystem. Imagine if the introduction of new child bands became more commonplace so that there were a dozen of them – it may be detrimental in building a robust ecosystem.

3 – T-Mobile USA Inc.

We agree with Nokia. We haven't seen an issue that is not solved by the new band number. So far, we are not aware of this issue in countries other than the US and Canada. It would be useful to know if there are other countries with a similar issue related to certification only being possible for a subset of a band where there are currently regulations. So far we haven't seen evidence that this is a widespread problem that would require dozens of new band numbers. But, even if there were new band numbers, a new band number solution would be better than dozens of instances of new custom capability and NS signalling.

4 – Guangdong OPPO Mobile Telecom.

We tend to agree with T-Mobile USA comment that this is not a widespread problem, this is not something new that some country allocate part of spectrum earlier then part of the spectrum later on. Regarding new band/band number or NS values both can solve this issue in general.

5 – MediaTek Inc.

We share similar view as Qualcomm.

6 – Intel Corporation (UK) Ltd

The other possible solution is the use of NS values. A large part of this is already specified today but it would be necessary to add the UE capability signalling so the network knows the NS values supported by the UE and can therefore control handovers.

Note that if the principle of supporting, testing and certifying the whole band is followed then the NS mechanism (or indeed any of the other solutions) is only needed for when the later portion of the band has different RF emission requirements - it would not have to be used for that the RF emission requirements are the same as the original portion.

7 – Huawei Technologies France

We agree with Nokia and T-Mobile USA. A new band number solution would be better than dozens of instances of new custom capability and NS signaling.

8 – AT&T GNS Belgium SPRL

We support the TP for the new signalling approach as proposed by QC to capture the initial input on solutions not using a new band or new band number. The definition of a new band or band number every time seems too limiting and adds overhead. This should be decided on a case-by-case basis.

9 – Verizon UK Ltd

Comparing globalization of the band n77 vs. new signalling, we support the solution with new signaling proposed by Qualcomm.

Other issues

Document RP-222223 discussed whether consideration for UE support of regionally defined subsets of a band should be restricted to the root cause from Band n77 as identified in the first objective of the SI.

Document RP-222510 states ”Since BS has to comply with regional regulation and spectrum allocation, if UE follow the BS scheduling, there is no risk for UE to comply with the regulation” suggesting that a solution may not be necessary and the UE need not self restrict which subsets it can operate in since the BS will only schedule those which are allowed by the regulator. The following proposals are made

Proposal 1: It’s better to elaborate the difference between US/Canada n77 and other countries’ common regulatory compliance about spectrum allocation when we investigate the root cause.

Proposal 2: It’s better to clarify the specific conditions where it’s allowed that UEs can restrict operating frequency ranges of the supported band n77 from 3GPP perspective.

Proposal 3: It’s better to discuss whether the reginal UE is allowed to roam to other countries or not.

Proposal 4: Considering the strict regulatory compliance about spectrum allocation, it’s better to clarify whether the global UEs which can support full frequency range band n77 without restriction are allowed to roam to these countries. If so, please further elaborate how these UEs can be guaranteed to meet the regulatory compliance about spectrum allocation and whether the regional UE can follow the same mechanism.

Feedback Form 5: Comments on other issues

1 – Nokia Corporation

The issues with n77 came about because of the NOTE 12 made spectrum restrictions for US but didn’t create any corresponding requirements. This made the roaming UE situation unclear, and also created the issues when spectrum availability changed for US and Canada: Operators need to ensure regulatory compliance, and operators want to ensure only certified UEs camp on their cells. Had there been RAN4

requirements on these, the issues may not have happened at all.

2 – Qualcomm Korea

We do not fully agree with the comment from Nokia and with the proposals in R4-222510. In our understanding, in some countries it is not the operator nor is it the basestation that takes responsibility for the UE meeting regulations. That responsibility falls on the UE OEM. It is the UE that undergoes compliance testing and certification for its emissions and requirements. If a device for some reason violates regulations, it is generally not the operator nor the infrastructure vendor who will be sought after by enforcement agencies unless it is a more systemic problem across all UE's.

3 – T-Mobile USA Inc.

We agree with Qualcomm. The fundamental issue is that in the USA UE vendors can only allow their devices to operate in parts of the band where there are FCC regulations at the time of device certification. Also, a Canadian operator stated that in Canada if a UE operates in part of a band that it was not certified to operated in, the UE vendor, the RAN vendor and the operator can all be held liable. It would be great if these regulatory challenges didn't exist, but they do and so we have to live with them.

4 – SoftBank Corp.

We'd like to put comments to Prop-1/4 but beforehand:

On the issues relevant to NOTE 12, we tend to agree with Qualcomm/T-moblie US.

On BS scheduling, we do not agree with 2510 since the issue this time is whether a UE is certificated in a given spectrum or not.

Note that since we are NOT a North American operator, please feel free to put a comment on US/Canada aspect, esp. when our comment is not right.

Prop-1: This would also happen in other regions but it is largely up to the relevant regulation. In Japan for example, we have a remedy solution for the case and normally this could not be a problem.

Prop-2: For US and Canada, it has been captured in 101-1 it seems.

Prop-3: Normally, apart from some special types of UEs or specific limitation through implementation (using MCC+MNC type of solution), we do not see a "regional" UE. For US_n77, without NS_55/57, we believe that the UE is requested to cover full range of n77 and the UE can roam to any n77 countries. (Or we should say 3GPP spec. should be created as such.)

Prop-4: We are not 100% sure about from which rule the issue of this time comes in US/Canada but even in the US_n77, we believe that roaming-in UEs are excluded from the UE authentication procedure of FCC (at least conditionally). This is written in the website below, the 7th item of FAQ-1:

https://www.fcc.gov/oet/ea/importation

We need to check nation by nation but it is expected that regulatory requirement on UE authentication is relaxed for roaming-in users.

5 – Guangdong OPPO Mobile Telecom.

Thanks Softbank for the clarification of Proposal-4, is it correct understanding that Roaming UEs are exempted from local regulation certification issue in US/Canada? And roaming UE can access the old and new allocated n77 band in US/Canada?

6 – MediaTek Inc.

We share similar view as Qualcomm/T-moblie US.

7 – Intel Corporation (UK) Ltd

We would like to understand better the problem described by Qualcomm, T-Mobile and other regarding the certification of UEs for USA (and maybe Canada also). Many UEs sold in USA will be cable of supporting bands for global roaming and therefore they will be capable of transmitting on frequencies that are not permitted for use within the USA. This has been normal situation for many years. I would like to understand better why for the n77 case it was judged not possible to sell a UE that could transmit on the parts of n77 that were not permitted for use within the USA at that time.

8 – Huawei Technologies France

Many thanks for Softbank's response and important information.

For proposal 3, maybe my question is not clear. I'd like to understand if a UE which can only be certified to operate in the part of the band (e.g. band n77 cases UE in Canada/US) are allowed to roam to other countries since it isn't verified for the whole band(low/mid/high frequency).

9 – AT&T GNS Belgium SPRL

We also share the view of QC. In the case of n77, the benefits of utilizing the existing wider frequency band were considered based on the reguatory environment and the expectations for additional subsets to be defined over time.

Recommended solution

Between the solutions that use a new band or band number and those that don't, is there a preference for which solution to adopt as a general solution in case a similar problem arises in the future? What are the advantages and disadvantages to justify your preference? Or is a different solution needed more aligned with BS scheduling and roaming restrictions as discussed in RP-222510?

Feedback Form 6: Recommended solution

1 – Nokia Corporation

New bands or band numbers.

Considering the problems discussed in contributions, no cases that could not be solved with new bands or

band numbers have been presented. That's why we see this as the baseline solution.

2 – T-Mobile USA Inc.

We prefer a new band number because it doesn't require new signalling.

We do not agree with the suggestion in RP-222510 that BS scheduling could solve the problem. Without capability signalling (the original solution for the USA and Canada) or a new band number, the BS would not know if the UE is certified to operate in the entire band in the USA, or a subset of the band.

3 – Guangdong OPPO Mobile Telecom.

Considering this is not a wide issue as commented above (at least from the feedback of operators), both the capability signaling + NS value, and new band number could solve it.

4 – Samsung Electronics Co.

New band or new band number can be considered as default solution.

5 – CHTTL

if New band (number) is recommended, the below aspect must be included: for the UE support New band or new band number, the UE shall mandatory support the original band or so called parent band as well.

6 – MediaTek Inc.

We think both the capability signaling + NS value, and new band number could solve the issue.

If new band (number) is recommended, the suggestion from company is "for the UE support New band or new band number, the UE shall mandatory support the original band or so called parent band as well.". One clarification question. Before coming out decision, to know the rationale/impact without these additional wordings is necessary.

7 – Intel Corporation (UK) Ltd

At this stage it may be too early to conclude a single recommended solution but preferable to make progress on the root cause and potential solutions before making a decision.

8 – Ericsson LM

As indicated already in (http://www.3gpp.org/ftp//tsg_ran/WG4_Radio/TSGR4_100-e/Docs//R4-2112822.zip), we still favor the new band approach.

9 – Huawei Technologies France

Both solutions could solve this issue. However, the specification change is limited for new band number solution. Alternatively, we could list the pros and cons for further trade-off at this stage or in next meeting.

10 – AT&T GNS Belgium SPRL Both solutions can solver the issue but the optimal solution depends on the particular regulatory situation. Defining a new band or band number for every case without understanding if there are any needed performance differences can have time to market impacts. Solutions should be decided on a case-by-case basis.
11 – Verizon UK Ltd It is too early to make a new band decision. In general, we agree with the Qualcomm proposal (with new signalling).

2.2 Initial round summary

Skeleton TR

All companies were generally fine with the skeleton TR. There were suggestions for improvement such as adding subsections to the root case section and moving some content from the introduction to the root cause, but these suggestions were not unanimous. There was no objection to the skeleton TR.

The moderator suggests to agree to the skeleton TR RP-222221 without modification. No further discussion is needed for further rounds.

Root cause

Most companies understood the root cause to be

1) Regional certification required

2) Multiple subsets of bands made available by regulator in different times

However, there were a wide variety of other comments received as well. Companies did not appear to want to consider other subset restrictions such as 700/800/900, but to rather focus specifically on the restrictions exemplified by n77. There were also comments on how any such restrictions apply to an n77, inbound roaming of UE's that don't meet certification, etc.

The moderator proposes that a single company (T-Mobile USA) volunteer to merge the TP's and comments received for further discussion in the intermediate and final rounds.

Details of solutions using a new band or new band number

It was commented that new band should be distinguished from new band number as separate solutions. The new band or new band number approach was appealing due to the understanding that signalling already exists. Details on CA, frequency ranges still to be further discussed in the second round.

The moderator suggests splitting new band and new band number into separate solutions and further discussing the details in the intermediate round.

Details of solutions not using a new band or new band number

Views were split with some commenters not seeing any benefit of a signalling approach compared to new band or new band number, while other commenters preferred signalling. *Further discussion is needed to reach a common understanding on the relative merits of new signalling other than by band numbering.*

Other issues

The main issues discussed here were certification, what is needed before a device can operate (transmit) on a frequency range in a country, and if inbound roamers are also required to meet the regulations. The US and Canada can be taken as an example recognizing that different countries may have different approaches for regulation.

Moderator suggests a single company (Qualcomm) formulate a TP (new tdoc number needed) to capture the common understanding of these aspects. This can then be further discussed and refined in the intermediate and final rounds.

Recommended solution

Several companies commented that it is premature to agree to a recommended solution at this point, but the focus instead should be on identifying the root cause, detailing the various possible solutions. The moderator agrees.

Moderator suggests deferring any further discussion on recommended solution, but rather to focus the work on the other sections for the intermediate round.

3 Intermediate round

3.1 Proposals and comments

Root cause

T-Mobile to merge the TP's (thanks!). TP will be uploaded to Inbox\[97e-10-R18-Regional-Subsets-Bands] when available. Comments left here in the NWM feedback form would be appreciated.

Feedback Form 7: Root cause merged TP

1 – Qualcomm Korea Thanks to T-Mobile for drafting a merged TP on root cause. First, a very minor comment ... when your refer to frequency ranges such as 3450 - 3550, it would be better to include the units (MHz). In the last paragraph, you write that four conditions must be met, but you only list three conditions. Should that be changed to three conditions needing to be met?
2 – SoftBank Corp. Thank T-mobile US for creating the draft TP. For clarification on logic in the second last paragraph of the first page:

The second sentence says ”(While) for initial access UEs that would not operate on 3450-3550MHz in the US would not attempt to that part of the band”. Was NS_55 introduced to guarantee this requirement, not for roaming UEs as mentioned in the 6th line? Then afterward, R2 requested an IE (extendedBand-n77-r16) for proper HO/CA setting to a UE, i.e., avoiding US DoD as a target of HO/CA. If this understanding is correct, it seems that the current TP goes in reverse direction.

3 – AT&T

Thanks to T-Mobile for providing the initial draft.

We generally have no issue with the facts presented here. However, the logic for addressing the US n77 allocation with Note 12 needs to be examined. Certainly, the option to create a new band number was available when the original text was written, but it wasn't pursued. A more complete analysis would treat that aspect.

We believe that the conclusion is confusing and needs discussion, if only to reorganize the text. It may also be premature to adopt this conclusion without some agreement that the larger issue in question is confined to n77 or that the review of n77 history is sufficient to form a comprehensive conclusion and pursue a general solution.

A copy with miscellaneous editorial clarifications has been uploaded (link = https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/10-R18-Regional-Subsets-Bands%5D/Draft_RP-222619_TP_for_TR_38.893_band_subsets_root_cause-ATT.docx)

4 – Huawei Technologies France

For this sentence “**However, concerns were also raised that a roaming UE that did not indicate extendedBand-n77-r16 might attempt to access 3450-3550 MHz, causing confusion and potentially negative consequences.**” Some clarifications are needed. Based on the feedback from companies, a roaming UE or global UE (which can support full and n77 and be certified under the full band n77 frequency range) is allowed to access US network both 3450-3550 MHz and 3700-3890 MHz without technical issues. I'd like to know why a roaming UE that did not indicate extendedBand-n77-r16 might attempt to access 3450-3550 MHz, causing confusion and potentially negative consequences. I'm not sure what the negative consequences are. Could proponent further clarify this point?

5 – Huawei Technologies France

For this sentence “**However, concerns were also raised that a roaming UE that did not indicate extendedBand-n77-r16 might attempt to access 3450-3550 MHz, causing confusion and potentially negative consequences.**” Some clarifications are needed. Based on the feedback from companies, a roaming UE or global UE (which can support full and n77 and be certified under the full band n77 frequency range) is allowed to access US network both 3450-3550 MHz and 3700-3890 MHz without technical issues. I'd like to know why a roaming UE that did not indicate extendedBand-n77-r16 might attempt to access 3450-3550 MHz, causing confusion and potentially negative consequences. I'm not sure what the negative consequences are. Could proponent further clarify this point?

6 – T-Mobile USA Inc.

To Qualcomm: Thanks for the comment on adding MHz.

To Softbank: I think AT&T clarified the wording. Thanks.

To AT&T and Apple: Thanks for the revisions.

To Huawei: The negative consequences that we heard during the discussing of adding extendedBand-n77-r16 was that if a UE attempted to access 3450-3550 MHz in the US and did not indicate extendedBand-n77-r16, the gNB might check the UE capabilities and reject the UE because it did not indicated extendedBand-n77-r16. Then the UE would not know why it was rejected and might continually try to access 3450-3550 MHz, wasting RACH resources. While T-Mobile USA argued that there should be a work-around to this, other companies felt strongly that NS signalling was needed to bar UEs that do not indicate extendedBand-n77-r16 from attempting to access 3450-3550 MHz in the US. I believe RAN2 sent an LS to RAN4 and RAN stating that new NS signalling was necessary.

We have placed a revision in the inbox:

Directory Listing /ftp/tsg_ran/TSG_RAN/TSGR_97e/Inbox/Drafts/[97e-10-R18-Regional-Subsets-Bands] (3gpp.org)

Details of solutions using a new band or new band number

New band and new band number should be treated as separate solutions. Further discussion is invited. In particular, proponents are suggested to provide details.

Feedback Form 8: Details on comments on ”new band” solution

Feedback Form 9: Details and comments on ”new band number” solution

1 – Ericsson LM

We think that the new band/new band number solution is equivalent. The new band number is just a construct to handle these issues and there will be no actual new band, just that we create a new ”mock-band” by using a new band number. This approach addressed the requirements for the solution (i.e. requirements are 1) allow the gNB to know if the UE supports the new range and 2) that a legacy UE does not camp on/connects to the cells in the new range.

Details of solutions not using a new band or new band number

Further discussion is invited. In particular, proponents are suggested to provide details.

Feedback Form 10: Details and comments on solutions not using new band (number)

Other issues

A common understanding on issues pertaining to UE regulatory certification and roaming should be documented in a TP from Qualcomm (thanks!). TP will be uploaded to Inbox\[97e-10-R18-Regional-Subsets-Bands] when available. Comments left here in the NWM feedback form would be appreciated.

Feedback Form 11: Comments on other issues pertaining to regulatory certification, roaming, etc.

1 – Qualcomm Korea

Draft TP has been uploaded

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_97e/Inbox/Drafts/%5B97e-10-R18-Regional-Subsets-Bands%5D/RP-222xxx_TP_for_TR_38.893_subsets_bands.docx

2 – AT&T

Thanks to Qualcomm for providing the TP.

I propose to add some introductory text to the second paragraph as follows:

UE vendors may choose to pursue certification for some countries but not others. In view of the regional regulatory differences described above, we recognize that there may be ambiguity with regards to exactly which regulatory requirements are supported in any given UE implementation. It is important to understand how this ambiguity could affect regulatory compliance when UEs roam in countries in which they are not certified. Two scenarios are identified for clarification for feasibility of roaming:

3 – Guangdong OPPO Mobile Telecom.

1. For the 1st scenario (UE is certified to operate only in part of a band), it seems like already a conclusion description, does it the common understanding now saying "*However, 3GPP compliance allows the UE to operate in any country across the entire band so long as all regional requirements are met*". For this UE apparently it only be tested with part of the band, its not clear how this UE can be operate in any country across the entire band?

2. For the 2nd scenario (UE can support the frequency range of the full band without restriction), it is open question, does it will be studied in this SI?

4 – Ericsson LM

Spontaneously, we agree with the assumptions from QC that are captured in the TP. However, we think that this TP needs more polishing as the outcome of the study should not be a set of questions, we should rather have some requirements that are used to evaluate the solutions.

We think that a non-USA UE traveling to USA should be allowed to use cells in the C-band. This is at least what the n77-solution we have in place now will allow, and also what the new band number solution would allow.

We further think that a USA-UEs traveling to another country would be allowed to be in the whole n77 band assuming no additional local regulations apply there. This is at least how the n77-solution we have in place now will allow, and also what the new band number solution would allow.

5 – Huawei Technologies France

Thanks Qualcomm for drafting this TP and responding these issues. I share the similar views with OPPO and Ericsson. We'd better to give some clear answers about these issues instead of leaving a set of questions open. Otherwise, it makes industry confused and unexpected interoperation issues may occur.

As Ericsson comment, if a non-USA UE traveling to USA should be allowed to use cells in the C-band, not sure why we introduce a new NS value to bar a roaming UE that did not indicate extendedBand-n77-r16 might attempt to access 3450-3550 MHz as stated in T-Mobile's TP.

6 – T-Mobile USA Inc.

To Huawei: There is no problem with a roaming UE accessing the C-Band (3700-3980 MHz). NS_55 was added to prevent roaming UEs that do not indicate extendedBand-n77-r16 from attempting to access the DoD band (3450-3550 MHz). As we stated above, T-Mobile did not think that NS signalling was needed, but in our understanding RAN2 decided that it was based on concerns about the gNB being confused because the UE attempted to access 3450-3550 MHz without indicating extendedBand-n77-r16 and rejecting the UE's access attempts over and over.

3.2 Intermediate round summary

TP's on root cause and other issues were discussed in the intermediate round. Comments were received, but it appears the TP's are not quite ready for agreement yet. The moderator suggests the authors to revise the drafts to address the comments as needed and try to finalize the TP's for agreement by the end of the final round. On the "other issues" TP, several companies commented that the TP should not pose open questions to which the moderator agrees. The moderator suggests company experts provide the answers to these open questions in the final round. If there are no answers available, the TP can state "no answers were identified by 3GPP". If the answers are contradicting, the TP can list these and also state "different companies in 3GPP had different views". Other ideas of course are also welcome.

On solutions, only one comment was received. The moderator interprets that companies are not yet prepared to discuss details of solutions since the group has not yet reached a common understanding on root cause and other issues. Therefore, the moderator suggests to keep the discussion on solutions open in the final round in case there are further comments but the outcome may be that solutions will have to be discussed and agreed in the next meeting.

4 Final round

4.1 Proposals and comments

Root cause

Continue refining the draft with the aim of providing an agreeable TP by the end of the final round.

Feedback Form 12: Final comments on root cause TP

1 – Qualcomm Korea The current version of the TP ATT-Apple_TMUS looks fine for us.
2 – T-Mobile USA Inc. We are also fine with the ATT-APPLE_TMUS version of the TP
3 – AT&T As it is premature to draw conclusions on the root cause, we recommend that the 3 conclusions at the end of the section as well as the introductory sentence (*It is therefore concluded that the root cause of the issue* ...) be removed from the TP. If future work on the TR confirms these conditions, they can be reintroduced in a clearer form at the next RAN plenary meeting.
4 – SoftBank Corp. Concerning the TP, I think I made misunderstanding. It seems that ”UE not certified for 3450-3550MHz in the US would not attempt to access that part of the band” can be achieved without an aid of NS_55. If this is right, I am fine with the TP. Sorry for bothering.
5 – Ericsson LM The new polishing by Nokia seem fine to us.
6 – Nokia Corporation I provided the comment on the wrong question, it seems, so to copy it here We provided some additional comments to the TP on root causes - see Draft_RP-222619_TP_for_TR_38.893_band_subset ATT-Apple_TMUS_Nokia.docx There were some slight discrepancies on the n77 that could be misunderstood: Because there were no actions specified on UEs having to bar cells on n77 parts not allowed in the US, it was never clear what UEs would do (especially roaming UEs). The text in the previous was a little bit contradicting itself, so we tried to make it clearer.
7 – Nokia Corporation I provided the comment on the wrong question, it seems, so to copy it here We provided some additional comments to the TP on root causes - see Draft_RP-222619_TP_for_TR_38.893_band_subset ATT-Apple_TMUS_Nokia.docx

There were some slight discrepancies on the n77 that could be misunderstood: Because there were no actions specified on UEs having to bar cells on n77 parts not allowed in the US, it was never clear what UEs would do (especially roaming UEs). The text in the previous was a little bit contradicting itself, so we tried to make it clearer.

8 – Nokia Corporation

I provided the comment on the wrong question, it seems, so to copy it here

We provided some additional comments to the TP on root causes - see Draft_RP-222619_TP_for_TR_38.893_band_subset ATT-Apple_TMUS_Nokia.docx

There were some slight discrepancies on the n77 that could be misunderstood: Because there were no actions specified on UEs having to bar cells on n77 parts not allowed in the US, it was never clear what UEs would do (especially roaming UEs). The text in the previous was a little bit contradicting itself, so we tried to make it clearer.

Details of solutions using a new band or new band number

Feedback Form 13: Comments on solutions using a new band

1 – AT&T

We assume that most companies have more-or-less similar views on the difference between resolving this problem with new bands versus new band numbers. To avoid any misunderstanding and to facilitate consensus on this topic, we believe the difference should be captured in the TR. It may be too late to draft agreeable text at this point in the meeting cycle, so this should be a priority at RAN#98e.

2 – Huawei Technologies France

Generally, we are fine with Nokia's revision. It seems that companies have different understanding about the following parts. I'd like to know which one is the common understanding. Or both statements are correct? If so, I think we can keep both.

Original version: UE that would not operate on 3450-3550MHz in the US would not attempt to access that part of the band.

Nokia's revision: UEs not certified by FCC for 3450-3550 MHz in the US might not attempt to access that part of the band, but since this was not specified, it was not clear whether all UEs behaved in the same manner.

Feedback Form 14: Comments on solutions using a new band number

1 – AT&T

See our comments above in *Comments on solutions using a new band number*.

Details of solutions not using a new band or new band number

Feedback Form 15: Comments on solutions not using a new band (number)

Other issues

Continue refining the draft with the aim of providing an agreeable TP by the end of the final round.

Feedback Form 16: Final comments on TP for other issues

1 – Qualcomm Korea

We have uploaded a revision of the TP (v03) into the inbox/drafts. We added the text in front of paragraph2 suggested by Nokia. We reworded it to be according to the suggestion from Ericsson to be more suitable for a TR to make statements rather than posing questions. Comments appreciate on this version, or if companies would prefer the older one.

2 – T-Mobile USA Inc.

We are fine with v03 of the TP.

3 – SoftBank Corp.

We are fine with v03 and the current TP is well-crafted. It is better not to go into details of each country's laws so the suggestion to check/follow the relevant regulation sounds like a rational conclusion.

4 – AT&T

We are fine with v03

5 – Nokia Corporation

We provided some additional comments to the TP on root causes - see Draft_RP-222619_TP_for_TR_38.893_band_subset ATT-Apple_TMUS_Nokia.docx

There were some slight discrepancies on the n77 that could be misunderstood: Because there were no actions specified on UEs having to bar cells on n77 parts not allowed in the US, it was never clear what UEs would do (especially roaming UEs). The text in the previous was a little bit contradicting itself, so we tried to make it clearer.

On the v03 for the roaming, that seems fine to us.

6 – Ericsson LM

The current TP (v3) still contains a question, which perhaps is not the best way to stricture this Technical Report. Here is the paragraph with the question mark (from v3):

*The second scenario is if a UE can support the frequency range of the full band (example: n77) without restriction, is it allowed to roam to countries where certification is necessary for operation**?** This aspect has to be evaluated for each country based on prevailing regulation. Whether the roaming UE is required to be certified by a country's regulator to be allowed to operate is subject to each country's laws.*

Perhaps a better formulation is this:

The second scenario is if a UE can support the frequency range of a band based on the 3GPP requirements but not certified for additional regional requirements in a subset of the band in a certain foreign country. This UE shall be allowed to roam in the subset of the band where no additional regional requirements apply, but should not be allowed to roam in the subset of the band in the foreign country where the additional regional requirements apply.

I hope this is capturing what QC had in mind with the original wording. If there are different understandings, perhaps we can postpone this part of the TR to the next plenary.

7 – Nokia Corporation

The wording suggestion from Ericsson to TP v3 looks good to us - indeed it's better to avoid "questions" in the TR text.

8 – Huawei Technologies France

The wording suggestion from Ericsson looks fine to us.

4.2 Final round summary and recommendations

Although the gap is small, there is still not quite consensus on the TP for root causes. One company preferred to remove the conclusion of root causes while another company proposed to add text indicating that the problem was caused because the specifications did not define the behavior of devices outside the allowed frequency range.

On the TP for other issues, v03 was mostly agreeable but there was a suggestion from one company to revise the wording in the last paragraph.

Given how close the TP's appear to be for approval, the short time frame for the SI, and the fact that many of the comments were received during a time window where it was not feasible for all companies to properly review them (the moderator included), *it is suggested to further discuss these two TP's during an extended round.*

5 Extended round

If allowed by the chairman, an extended round is used to finalize the TP's on root cause and other issues.

5.1 Proposals and comments

Root cause

It is urged for companies to agree to root causes including the conclusion of the root cause study. Otherwise, it may be difficult to proceed to solutions if the root causes are still unknown. Furthermore, the SI objectives state that the first step is to identify the root cause and then proceed to solutions.

Feedback Form 17: Comments on root cause TP

1 – Qualcomm Korea

We don't necessarily agree with the text added by Nokia in the final round. If my reading is correct, the text is basically indicating that another cause (or maybe even the root cause) of the n77 problem was "there were no clear requirements what UEs would do if they encountered a cell using additional spectrum for n77 in the USA". However, there as Note 12 that reads "In the USA this band is restricted to 3700 – 3980 MHz." So it seems pretty clear that the UE should not be operating outside of this range in the USA. If it encounters a cell outside of this range in the USA, there doesn't seem to be any room to interpret that it should go ahead and try to connect. So clarify or completeness of the specification doesn't seem to be the problem, but rather that the allowed frequency range and therefore the spec note changed over time in separate instances. But maybe I've misunderstood the proposal and would be happy to receive clarification.

2 – T-Mobile USA Inc.

To AT&T: The sentence at the end and the three bullet points were not in our original TP, they were a result of the merger with the Qualcomm TP. So, I guess we would be OK with deleting them, but since we spent time discussing them it seems like it would be good to capture them. Would this be more acceptable?

~~It is therefore concluded that~~ *Therefore, the root cause of issue requiring UE band subset support is summarized by the following meeting all of the three conditions listed below*

3 – AT&T

I have uploaded a new version of the root-cause document which addresses some of the points I've raised.

(Draft_RP-222619_TP_for_TR_38.893_band_subsets_root_cause-ATT-Apple_TMUS-ATT.docx)

Please note that I accidently uploaded with Show-Markup set to none. Revision tracking is still enabled and no revisions are accepted. I apologize for any inconvenience.

4 – SoftBank Corp.

It seems that:

1) Current TP is wriiten under an assumption that UEs under FCC certification will stop accessing n77 ranges by themselves other than specified in Note 12 in the US, probably <u>by implementation</u> such as checking MCC+MNC. Then the remaining issue is about handling of roaming-in UEs.

2) Nokia's TP is written in the way that there is no such assumption/mechanisim specified in 3GPP desipit Note 12: so UEs can access any n77 even in the US and Canada then NS_55/57 are needed to stop them.)

We should clarify how the TP assumes the assumption. (I also thought if 1) alone is right.) It is not difficult to settle if we can agree one of these assumptions to take.

5 – Qualcomm Korea

To Softbank: We think it must be 1). Our understanding is the FCC expects devices to be able to meet all FCC requirements without NS signalling from the basestation. Our understanding is the FCC will not signal NS_55 in its certification testing.

6 – SoftBank Corp.

To Qualcomm: Thanks for the clarification. I heard some regulators dislike NS and this could also be a case. (Note: RF regulations tend to handle RF equipment just a hardware so they believe such a behaviour is unlikely, regardless of reality...)

If this is the hidden assumption, we are OK and we should go with the current TP.

7 – Nokia Corporation

To Qualcomm: The earlier version made it seem like there was only ever problem for networks, which is simply not true. The problem was that **network could not know how UEs would behave because the NOTE 12 was not definining any clear UE requirements**.

To be more precise: If we look at the original NOTE 12, it says that the band ”is restricted to 3700-3890 MHz in the US”. But this does notspecify any UE behaviour for camping in cells outside this range in the US. One could interpret this so that UE should bar the cells outside the 3700-3890 MHz, but this was **not specified**, it would only be UE implementation choice (same as for how UE knows it is in the US). There is no text in the specification defining a clear UE behaviour should it find a cell outside 3700-3890 MHz in the US: Should the UE bar the cell? Or not even measure it? Or just camp normally? None of this is still defined in the specifications if NS_01 is used. The reason for the NS_55 was to ensure exact UE behaviour in the extended part. Yes, it is conceivable that mostUEs might do it anyway, but networks could not be certain of this, and could not differentiate between UEs that would not access the extended part from those that would.

8 – Nokia Corporation

And one more point: Network **cannot** assume all UEs are implemented in one way if the specification allows different interpretations. That is the reason specifications exist - they guarantee inter-operability by defining the minimum requirements **all UEs** must follow.

9 – Huawei Technologies France

As companies are confident that UEs under FCC certification will stop accessing n77 ranges by themselves other than specified in Note 12 in the US, probably by implementation, we believe that’s true. And current TP is written based on this assumption.

However, we tend to understand Nokia’s proposals from a different perspective. In fact, we do have two kinds of UEs which have two different behaviors about whether to access to 3450 ~ 3550 without indicating extendedBand-n77-r16, as it’s stated in current TP.

We think two points are not contradictory and just different perspectives, so it’s better to capture both of them into this root cause clause.

Other issues

Additional rewording of the TP was proposed in the final round. It should be verified whether all companies can agree to this rewording and that it does not change the intended meaning of the text. Or if does change the intended meaning of the text, this change is agreeable.

Feedback Form 18: Comments on other issues TP

1 – Qualcomm Korea

I've uploaded v04 based partially but not entirely on the suggestion from Ericsson. I did reword to make a statement rather than a rhetorical question. However, I retained the v03 text that whether or not a UE can roam in a country without certification depends on the laws of that country. This is a different from Ericsson's text which stated the UE can operate so long as there are no additional restrictions. Unless Ericsson and others can definitively state that all countries will allow roaming UE's without certification so long as no additional restrictions apply, then it may be better to say that it depends on the laws of that country.

2 – Guangdong OPPO Mobile Telecom.

Thanks QC for the updated version. One question for clarification regarding the UE only certified part of band in US, does it mean this UE also compliant/certified for the whole band? If yes, then global roaming is ok. If not, probably should not roaming, but currently there is no solution to forbid this.

3 – SoftBank Corp.

To OPPO: My view is

This is addressed in the TP v04 starting with "The first scenario is". And I guess there are two "certifications": one is solely for FCC, defined for FCC regulation compliance and imposed to UEs to be sold in the US. The other is based on RAN5 conformance spec that covers global requirements speficied in RAN5. The "a part of band" certification is only for FCC and there is nothing to do with roaming-out and we sould rely on RAN5 conformance to rely on for global operation of the UE.

Normally, for UEs sold in the US, the UE should pass both "certifications".

4 – Ericsson LM

@Qualcomm: We are fine with your update.

5 – Huawei Technologies France

We agree with Softbank's clarification. In our understanding, only UEs which pass GCF certification are allowed to roaming. Given the UEs sold in the US should pass both FCC certification and GCF certification, there should be no issue to roam to other countries and it's better to capture this statement to address the concerns.

6 – ZTE Wistron Telecom AB

In general we are fine with the update. Just a minor change on the last sentence of the third paragraph:

The first scenario is if a UE is certified to operate only in part of a band (e.g. band n77 cases UE in Canada/US). In this scenario, the UE is only allowed to operate within the subset of the band for which it is certified in the country where this certification is necessary. Because the UE in addition to the above regulatory certification is also compliant to 3GPP requirements (e.g., for Band n77), it is required that the UE can support the entire band. Therefore, this UE when roaming to a country which does not have any regional regulatory requirements shall be able to operate on the entirety of the band. If this country does have regional **regulatory** requirements, the UE shall abide by them to operate in this country.

5.2 Extended round summary and recommendations