[95e-39-R17-TEIs] - Version 0.0.8
RAN

3GPP TSG-RAN Meeting #95-e RP-221008

Electronic Meeting, March 17 – 23, 2022

Agenda item: 9.9

Source: Moderator (RAN4 Chair)

Title: Moderator's summary of discussion [95e-39-R17-TEIs]

Document for: Report

1 Introduction

In this email thread we will discuss the following topics:

- Canada n77 and potential general solutions for similar issues: RP-220457, RP-220545, RP-220546, RP-220762
- Mandating 70MHz and 90MHz RF channel bandwidth: RP-220786
- Tx switching with multiple TAG: RP-220649

In this document, we capture comments and conclusions for this email thread.

2 Topic #1: Canada n77 and potential general solutions for similar issues

2.1 Companies' contribution list

The following contributions will be covered.

Table 1:

TDoc	Title	Source	Type	AI
RP-220457	Views on phased introduction of operation frequency ranges in an NR Band	Apple	Discussion	9.9

RP-220545	Regulatory Issues with wide global bands	T-Mobile USA Inc.	Discussion	9.9
RP-220546	Draft CR for 38.101-1: New Band number for n77 in Canada	T-Mobile USA Inc.	DraftCR	9.9
RP-220762	Handling of Canada n77 band	MediaTek Inc.	Discussion	9.9
RP-220038	LS on Canada band n77 (R4-2206568; to: RAN2; cc: RAN; contact: Telus)	RAN4	LS in	9.9

2.2 Initial round

2.2.1 Comments & responses

There is an LS from RAN4 RP-220038 for the issue of Canada n77. For the convenience the moderator copied the summary of the LS below.

Summary

RAN4 has discussed the above issue [1] and recommended a solution similar to that for US n77 band for enabling the signaling indication in Rel-17.

- *A capability bit- to indicate that a UE is capable of operating in the full range 3450-3980 MHz in Canada.*
- *New NS value: is only applicable in the range 3650-3980 MHz in Canada and used for barring existing devices not indicating capability bit from accessing a cell in 3650-3980 MHz from IDLE mode. The NS value will be defined in RAN4 when RAN2 decides to define the signaling bit.*

RAN4 also welcomes RAN2 to find more general solution in this regards.

In the moderator's view the topic could be divided into two sub-topics:

- Sub-topic #1: Solution specific to Canada n77 band.
    - Including RP-220546, RP-220762. And also take RP-220038 (RAN4 approved LS) into account
- Sub-topic #2: General solution for the similar cases in future

- Including RP-220457, RP-220545 and RP-220762

Sub-topic #1-1: Solution specific to Canada n77 band

- **Option 1:** Endorse RAN4 proposal in R4-2206568 in Rel-17. RAN2 is tasked to draft the corresponding CR to address n77 Canada, in Rel-17, for approval at RAN#96e / June 22. (Mediatek RP-220762)
- **Option 2:** Adds new band number nXYZ for n77, similar to how n90 was added for n41. (T-Mobile USA RP-220546)

Companies are invited to provide comments in the follow table.

Feedback Form 1:

1 – Samsung Electronics Co. We support option 1, i.e., following RAN4 agreements.
2 – TELUS We view option 1 as a necessary solution for the short term fix. Long term, a more general solution should be found within Rel-18.
3 – Bell Mobility We support option 1 following RAN4 agreements
4 – Ericsson LM Similar to how we think the ”new band” approach was cleanest and simplest for the US-case, we think it is also the cleanest and simplest for the Canada-case. It should be noted, the new band-approach is actually not a new band as such. It would simply be using a new band number for the same band. This new band number serves both as a UE-capability indication and a means to prevent noncertified UEs from accessing the newly opened part of the band.
5 – Qualcomm Korea We support option 1 for the specific Canada n77 issue
6 – Nokia Corporation We support Option 1 in this Canadian case. At the same time we understand the issues raised by T-Mobile USA in RP-220545. It is very unfortunate that there are UEs, which are not fully compliant with the 3GPP specifications and do not truly support the full range of a frequency band as some UEs are only certified for part of the frequency band. It would be important to avoid a situation where we will need to define new NS values and UE capabilities for the existing bands because not all UEs support the full frequency ranges.
7 – AT&T GNS Belgium SPRL We support Option 1 and following the RAN4 decision. RAN2 can discuss the RAN4 LS and the solution at the May WG meeting.

8 – ZTE Wistron Telecom AB Option 1 following the RAN4 decision at this moment. This kind of issues unfortunately originate from ”artificial” and non-technical reasons more or less, and a more general solution would be very helpful which requires joint efforts of RAN2 and RAN4.
9 – Qualcomm Korea To Nokia, it is not necessarily the case that the UE does not support the full band. Indeed, it probably does. However, my understanding of the problem is that it is only certified to operate over a portion of the band by the regulator since only that portion of the band was available in the country at the time of its certification. Therefore, while it is physically capable of operating on the other part of the band (because it supports the entire band by 3GPP standards), it is not legally allowed to do so unless it goes through a recertification.
10 – Apple (UK) Limited We support Option 1 as a mitigation to serve the urgent need for Canadian operators.
11 – MediaTek Inc. We support Option 1.
12 – Huawei Technologies France We slightly prefer option2 considering the compatibility. And this issue can be addressed in this RAN plenary instead of waiting for approval at RAN#96e. To make progress, either Option 1 or Option 2 is OK for us.
13 – vivo Communication Technology We support Option 1
14 – Guangdong OPPO Mobile Telecom. ok with option 1.
15 – T-Mobile USA Inc. We are fine with Option 1 for the Canadian operators. But in the future we would prefer to avoid custom signalling solutions.

Sub-topic 1-2: General solution for the similar cases in future

- **Proposal:** RAN Plenary should instruct RAN2 and RAN4 to work on a general solution for regulatory compliance issues for regional frequency ranges for large global bands

Companies are invited to provide comments in the follow table.

Feedback Form 2:

1 – Ericsson LM

We think the new band number-approach can be the long term solution for NR.

2 – Nokia Corporation

In our view it is important to discuss how to avoid similar situation in the future where new NS values and UE capabilities need to be added for the existing bands because not all UEs truly support the full frequency ranges. But we don't see need to postpone decision on the matter at hand for Canada.

3 – Qualcomm Korea

We think that it would be good to seek a general solution. However, we would like to more carefully consider all of the relevant aspects including subsets of bands, with or without different requirements, number of possible different subsets, supersets, etc. Thus, it may be more appropriate for formalize this activity as a SI or WI. Moreover, there may be impact to RAN5 as well to handle updated n77 details in the test configs/test procedures (RAN5 for example has already completed existing n77 definition test configs/test procedures), so overall although the technical aspects are well handled in the WG's, because of the necessary interaction and dependency between so many different working groups (RAN2, RAN4, RAN5), it may be more efficient to handle this SI/WI at RAN plenary level.

4 – Bell Mobility

We support the discussion of a general solution and solution for Canada to be completed by RAN96 following RAN4 agreements

5 – AT&T GNS Belgium SPRL

We also support the goal of defining a general solution to address regional subsets of bands independent of Sub-topic 1-1. We don't expect that the US n77 and the Canada n77 extensions to be unique as regulators across regions identify new spectrum. We tend to agree with Qualcomm that it might be better to formalize this activity. We think that a SI is sufficient in order to provide guidelines for the general solution.

6 – ZTE Wistron Telecom AB

We support to seek for a general solution via joint RAN2-RAN4 efforts.

In particular, defining new bands may not be a sustainable solution since the unused band numbers are limited and may not accommodate all country-wise requests for wider bands.

7 – Apple (UK) Limited

We support to develop a general solution to resolve the potential recurring issue on phased introduction of operation frequency ranges in an NR band.

8 – China Mobile Com. Corporation

We support to develop a generic solution to resolve the similar issues, either in RAN4 or in RAN. We observed the similar issues for some LTE bands already in the past, and now more issues have been identified for NR.

9 – Huawei Technologies France We share the similar view with Ericsson that the new band number-approach can be the long term solution for NR. And the new solution shall not have an impact on the legacy UE. Not sure whether SI/WI is needed, since the door for new bands introduction are always open.
10 – MediaTek Inc. We think that it is good to seek a long-term generic solution in Rel-18.
11 – vivo Communication Technology We support the proposal, and a generic approach to solve the similar issues in many countries is prefered.
12 – Guangdong OPPO Mobile Telecom. It might needs better understanding of the issue. Currently RAN5 test cases are defined based on the whole band and testing the Low/Mid/High channels in each band to verify UE performance. Thus, once UE is certified with the RAN5 test cases, this UE will perform well globally. From this perspective, we may consider the issue here as not a new issue, or not a common issue. It happens only when there is specific regulation forbidden UE from access some spectrum if it is not tested with this specific spectrum in this country. (This is not encourage to test each countries specific spectrum as a general testing approach since once this happens then UE has to tested with all the countries spectrum, this will defeat the purpose of conformance testing and global certifications.) However, once there is regulation like US and Canada that forbidden UE from accessing some spectrum if not certified by their regulatory no matter this UE has passed the RAN5/global certification like GCF or not, then we are ok to find a solution for this issue in RAN2 or RAN4.

Sub-topic 1-3: Comments and potential agreements on the detailed general solutions

There are a number of candidate solutions on the table. More discussions would be needed.

- **Option 1:** Add a Note to clarify the UE will operate in a certain frequency range within a band for certain countries/regions
- **Option 1a:** Add a Note to clarify the UE will operate in a certain frequency range within a band for certain countries/regions, and define the new NS value as well as UE capability (as approved in RP-220038)
- **Option 2**: New bands
- **Option 2a:** New country specific band numbers for sub-bands
- **Option 3:** New per-band bitmap to indicate which frequency ranges of the band where the UE is certified to operate in the country, e.g., Bit 0 = 3650-3980 MHz in Canada, Bit 1 through Bit n: reserved for future use
- **Option 4:** New per-band bitmap to indicate which 50MHz blocks of the band the UE supports in the given country
- **Option 5:** Reuse of ModifiedMPR-Behavior and new UE capability

Companies are invited to provide comments in the follow table.

Feedback Form 3:

1 – TELUS

Options 3, 4 or 5 seem to be the best candidates for a long term solutions.

2 – Ericsson LM

It is not clear to us what the difference is between 2 and 2a. But to use a new band number for the (hopefully not too common) cases when this happens, is perhaps the best way forward.

3 – Qualcomm Korea

More consideration may be helpful for a long term solution if it is even needed at all. A systematic way to address this would be better than choosing from a list of 7 options at this time.

4 – AT&T GNS Belgium SPRL

We agree with Qualcomm that a more systematic way to address the long term solution should be considered as opposed to choosing a solution at this meeting. The proposal to consider a SI for this effort would be our preference.

5 – ZTE Wistron Telecom AB

We share the similar view as Qualcomm. It requires more studies to find a long-term sustainable solution which might not be listed here, and we don't see the urgency of a RAN plenary decision on this.

6 – Apple (UK) Limited

Our preference is "*modifiedMPR-Behavior* bits" based solution as UE capability indication for the benefits as presented in RP-220457.

7 – China Mobile Com. Corporation

We think it is difficult to choose one option at this moment. The motivation to define global band number in 3GPP is for the ecosystem. UE supporting certain bands should support the whole frequency range. We are afraid that we are opening the door to allow UE to support part of the bands and cause fragmentation. This need to be carefully considered.

8 – Huawei Technologies France

Prefer option 2.

Comments on option 5. If we can reuse the current capability *modifiedMPR-Behaviour*, why do we need to specify new capability?

Option 3, option 4 and option 5 are the kind of solution using UE capability to distinguish different frequency range which UE support in a same band. We wonder whether the new NS IE is still needed to bar legacy UE for these methods.

Based on the slide 8 solution comparison in RP-220545, any solutions have cons except for option 2. We don't think it's very challenging to add a new band number from implementation perspective.

9 – MediaTek Inc.

We think options 3, 4 or 5 seem to be the good candidates for long-term generic solutions.

10 – vivo Communication Technology

We share similar views with QC, a long term solution is needed. This is common issue that UE will operate in a certain frequency range within a band for certain countries.

11 – Guangdong OPPO Mobile Telecom.

We are not quite understand the reason of regulations to forbidden UE from access some spectrum if this UE has passed the tests in RAN5 since UEs are tested with whole band (Low/Mid/High channels). With defining a signaling to indicate which part of the band this UE supports and certified may lead to UE ecosystem fragmentation, i.e. there are many UEs that only support part of bands here and there. Therefore, the discussion here should only limited to the situation when there is regulation only certify part of the band and forbidden UE from accessing NW of other part of un-certified part of band.

In this case, Option 1a is good enough since we don't expect there will be many other bands/regulation restrictions come since this is a global requirement and certification.

2.2.2 Summary

Sub-topic #1-1: Solution specific to Canada n77 band

12 companies supported Option 1. One company preferred Option 2 but can accept Option 1. One company thought "new band" approach was the best one. Because Option 1 is aligned with the approved RAN4 LS R4-2206568 (=RP-220038) sent to RAN2 and CC RAN and there is no majority companies' view to resert the agreement, the moderator' understanding is that the agreement in R4-2206568 remains and the following work in RAN2 and RAN4 should be done based on it.

So the moderator proposes that

- **Proposal #1:** RAN tasks RAN4 and RAN2 to finalize the work to address Canada n77 issue based on RP-220038 in TEI-17 and provide CRs for approval in RAN#96e.

Sub-topic 1-2: General solution for the similar cases in future

The issue can be formulated as how the network can differentiate a UE which is only allowed to support a portion of band by the regional regulation and certified accordingly when the spectrum of the band is allocated in a phased manner in the region.

For US n77 and Canada n77, RAN4 agreed adding new NS values and UE capability. But some companies thought such solution is not sustainable considering the limited available bit numbers for NS value and thus would like to have a general solution.

In the moderator's understanding, 8 companies supported the potential general solution without introducing new bands. Among those 8 companeis, 3 companies proposed a SI/WI to systematically study all the aspects in either RAN or RAN4.

However, 4 companies may have different views. Among them, 2 companies preferred to define the new band(s). 1 company commented that the similar situation of introdution of new NS value and capability for the

existing bands should be avoided. 1 company questioned the impact on global certification, but was not against to solve the specific issue due to a certain regional regulation.

If viewing defining new bands as a kind of general solutions for the issue, then companeis are not far from each other. Combining the comments for Topic #1-2 and Topic #1-3, it would be reasonable to divide the potential solutions into two categories:

- The solution of introduction of new bands
- The potential solutions without introduction of new bands

To move forward, the moderator modified the proposal trying to capture all the companies'comments.

- **Proposal #2:** it is recommended to have a [two-quarter] RAN-level [SI or WI] to systematically study and provide a general solution for regulatory compliance issues for regional frequency ranges on large global bands considering
  - The solution of introduction of new bands
  - Other potential solutions without introduction of new bands, i.e., reusing the existing band numbers
  - NOTE: the UE should be ensured to support the full frequency range on its supported bands, and the fragmentation of market should be avoided.

Sub-topic 1-3: Comments and potential agreements on the detailed general solutions

Companies' views are diverse. But all the optional solutions can be further discussed if Proposal #2 is agreeable. In the moderator's view, there is no need to further discuss sub-topic 1-3.

2.3 Intermediate round

2.3.1 Comments & responses

Sub-topic #1-1: Solution specific to Canada n77 band

Check if the proposal #1 is agreeable.

- **Proposal #1:** RAN tasks RAN4 and RAN2 to finalize the work to address Canada n77 issue based on RP-220038 in TEI-17 and provide CRs for approval in RAN#96e.

Companies are invited to provide comments in the table below.

Feedback Form 4:

1 – Qualcomm Korea Agreeable
2 – Apple (UK) Limited Agreeable
3 – AT&T GNS Belgium SPRL We support the moderator proposal.
4 – MediaTek Inc. We support the proposal.
5 – Samsung Electronics Co. We agree with Moderator proposal
6 – Intel Corporation (UK) Ltd We support the proposal
7 – Nokia Corporation We agree with Moderator's proposal.
8 – ZTE Wistron Telecom AB We are fine with Moderator's proposal.
9 – Guangdong OPPO Mobile Telecom. ok
10 – Huawei Technologies France We are ok with the moderator's proposal
11 – Ericsson LM We can accept this proposal.

Sub-topic 1-2: General solution for the similar cases in future

- **Proposal #2:** it is recommended to have a [two-quarter] RAN-level [SI or WI] to systematically study and provide a general solution for regulatory compliance issues for regional frequency ranges on large global bands considering
  - The solution of introduction of new bands
  - Other potential solutions without introduction of new bands, i.e., reusing the existing band numbers

- NOTE: the UE should be ensured to support the full frequency range on its supported bands, and the fragmentation of market should be avoided.

In the moderator's view, SI would be sufficent. After the general solution is decided, the individual spectrum related WI could be approved based on the request from operators like the other WIs for introduction of new bands.

Companies are invited to provide comments in the table below.

Feedback Form 5:

1 – T-Mobile USA Inc. We support a RAN level SI.
2 – Qualcomm Korea We also support a RAN level SI. We suggest that companies can submit SID for general solution for approval at RAN #96e so that the focus can now be on the Canada specific solution. We don't think a SI for general solution needs to be agreed at this RAN meeting.
3 – Apple (UK) Limited We are okay with the Proposal #2.
4 – AT&T GNS Belgium SPRL We also support the moderator's position that an SI is sufficient. However, we think that the proposal as worded is too focused on defining new bands as the primary solution. Either, the first two sub-bullets can be removed or modified as follows. - ~~The solution of i~~Introduction of new bands - ~~Other potential s~~Solutions without introduction of new bands, i.e., reusing the existing band numbers with appropriate signalling to differentiate UE support
5 – MediaTek Inc. We support SI. Reusing the existing band numbers with appropriate signalling to differentiate UE already works and we are okay to study further.
6 – Intel Corporation (UK) Ltd We support further work in 3GPP to define generic solutions and think that RAN4/RAN2 involvement is required. Our first preference is to initiate new SI/WI in the WG-level rather than in RAN level. The high-level scope of the work is fine for us.
7 – Nokia Corporation We support a RAN level study item.

8 – ZTE Wistron Telecom AB

A RAN SI would be feasible, and AT&T's revision is fine with us.

9 – Ericsson LM

The root cause of these problems we have seen in US and Canada for n77 seem more to be due to what is happening in regulatory bodies, rather than something that is happening in 3GPP. If this is not a 3GPP-problem we also do not think a 3GPP solution is the right way to go.

We think that **if** a RAN-level SI is to be started, the scope should not be to study potential 3GPP solutions for these types of problems, but instead be to better understand whether the actual cause for these issues are the regulators and hence that they should update their specifications/ways of working, which could be the outcome of such a study. For now, we suggest to we postpone this discussion to the next plenary rather than rushing adding a new RAN SI/WI for this topic now. We also do not think/hope that these problems are going to be frequent so we do not see any need to rush this decision now.

2.3.2 Summary

Sub-topic #1-1: Solution specific to Canada n77 band

All the companies agreed on Proposal #1. So the moderator proposes to endorse Proposal #1.

- **Proposal #1:** RAN tasks RAN4 and RAN2 to finalize the work to address Canada n77 issue based on RP-220038 in TEI-17 and provide CRs for approval in RAN#96e.

Sub-topic 1-2: General solution for the similar cases in future

9 companies made comments. Most companies supported to have a RAN-level SI. AT&T provided the modification, which seemed acceptable to some companies. 1 company supported SI but thought the SI needs be agreed in the next RAN. 1 company supported SI or WI but preferred to have a new SI/WI in WG level. 1 company thought there is no need to rush for decision, had comment on the objetives, and suggest to postpone the discussion until the next plenary.

Based on the most of companies' view, the moderator would like to try if the company can provide the compromise and accept the proposal #2 with the modification from AT&T. If it not agreeable, the moderator would like to encourage the suggestion for the way forward.

- **Proposal #2:** It is recommended to have a two-quarter RAN-level SI to systematically study and provide a general solution for regulatory compliance issues for regional frequency ranges on large global bands considering
  - ~~The solution of i~~Introduction of new bands
  - ~~Other potential s~~Solutions without introduction of new bands, i.e., reusing the existing band numbers with appropriate signalling to differentiate UE support
  - ~~NOTE:~~ The UE should be ensured to support the full frequency range on its supported bands, and the fragmentation of market should be avoided.
  - NOTE: The SI is expected to be submitted for approval in RAN#96.

From the moderator perspective, can any proponent provide the band with such regualtion problem for this study?

2.4 Final round

2.4.1 Comments & responses

Sub-topic 1-2: General solution for the similar cases in future

- **Proposal #2:** It is recommended to have a two-quarter RAN-level SI to systematically study and provide a general solution for regulatory compliance issues for regional frequency ranges on large global bands considering
  - ~~The solution of i~~Introduction of new bands
  - ~~Other potential s~~Solutions without introduction of new bands, i.e., reusing the existing band numbers with appropriate signalling to differentiate UE support
  - ~~NOTE:~~ The UE should be ensured to support the full frequency range on its supported bands, and the fragmentation of market should be avoided.
  - NOTE: The SI is expected to be submitted in RAN#96.

Companies are invited to provide the comments in the table below.

Feedback Form 6:

1 – Qualcomm Korea We are ok with the moderator's proposal and volunteer to lead this study if agreeable to other companies.
2 – Intel Corporation (UK) Ltd As commented before, we are supportive to have further 3GPP work on the generic solutions to address the problem. However, we don't think RAN-level SI is the best approach. RAN-level SIs typically focus on requirements, uses cases, deployment scenarios, while technical solutions are always studied/defined in WGs-level SI/WIs. So, we would like to understand why this SI shall be a RAN-led and the work on identification of technical solutions cannot be done in the WGs directly. In summary, for technical solutions we prefer to initiate a SI in RAN2/4.
3 – T-Mobile USA Inc. We support the moderator's proposal. The reason we support a RAN level SI is that it is slow for RAN2 and RAN4 to communicate via LSs. We would rather avoid a situation where RAN4 says the solution should be new signalling, and RAN2 says the solution should be new band numbers. We would have preferred that the bullets refer to "new band numbers" rather than "new bands" because as we described in RP-220545, they would not really be new bands but new band numbers like n90. But since this is the final round we are OK with keeping the wording as is.

4 – AT&T GNS Belgium SPRL

We support the moderator's proposal. We also agree with T-Mobile that having this as a RAN level SI can avoid unnecessary delays and remove the burden from the WGs until an agreeable general solution can be confirmed. The WGs will anyway be responsible for the technical work based on the RAN guidance.

5 – MediaTek Inc.

We are okay with the moderator's proposal.

6 – vivo Communication Technology

We are OK with the updated proposal.

7 – ZTE Wistron Telecom AB

We are fine with Moderator's proposal.

8 – Nokia Corporation

We are ok with the moderator's proposal. We also agree with Ericsson's comment in the end of the intermediate round that it is important to understand the root cause for these issue so that we can find a suitable solution for the problem. The current wording does to directly address that part in the main scope of the study. It might be good to include to make sure that all companies have the same understanding of the intent.

9 – Ericsson LM

We are not sure if our comment from the intermediate round regarding the scope was fully considered:

We think that Step 1 in a study is to understand if a 3GPP solution is necessary at all. If the problem we saw in n77 in US and n77 in Canada is something that came from issues with how regulators has acted. Only when we understand the cause for these problems, we could decide if a RAN based solution is needed and only then we should look in to solutions.

In our understanding these types of problems has not happened frequent in the past (ever?) before n77 US/Canada issue. So the first step must be to understand **why** we see these problems.

2.4.2 Summary

6 companies supported the proposal from the moderator. 1 companies thought it should not be RAN level study. 2 companeis proposed to understand the root cause first before working on the general solution.

T-Mobile and AT&T provided the reason why the RAN level study is preferred. The moderator wonders if it is OK. Regarding the scope, the moderator is fine to add the bullet to investigate the root cause of the problem.

The moderator proposes the following modification to see if it is acceptable. If no quick convergence, the moderator suggested that the companies can come back in the next meeting.

- **Proposal #2:** It is recommended to have a two-quarter RAN-level SI to systematically study ~~and provide a general solution for~~the regulatory compliance issues for regional frequency ranges on large global bands ~~considering~~
  - Investigate and identify the root cause of this issue as the first step

- Provide a general solution for regulatory compliance issues for regional frequency ranges on large global bands considering
    - ~~The solution of i~~Introduction of new bands
    - ~~Other potential s~~Solutions without introduction of new bands, i.e., reusing the existing band numbers with appropriate signalling to differentiate UE support
    - ~~NOTE:~~ The UE should be ensured to support the full frequency range on its supported bands, and the fragmentation of market should be avoided.
- NOTE: The SI is expected to be submitted in RAN#96

During the extendede round discussion on March 23rd, Proposal #2 was modified to capture the company's comments.

Sub-topic 1-2: General solution for n77-like issues ~~the similar cases in future~~

- **Proposal #2:** It is recommended to have a two-quarter RAN-level SI to systematically study ~~and provide a general solution for~~the regulatory compliance issues for regional frequency ranges on large global bands ~~considering~~
    - Investigate and identify the root cause of this issue as the first step
    - If needed (pending outcome of the bullet above), ~~P~~provide a general solution for regulatory compliance issues for regional frequency ranges on large global bands considering
        - ~~The solution of i~~Introduction of new bands
        - ~~Other potential s~~Solutions without introduction of new bands, i.e., reusing the existing band numbers with appropriate signalling to differentiate UE support
        - ~~NOTE:~~ The UE should be ensured to support the full frequency range on its supported bands, and the fragmentation of market should be avoided.
    - NOTE: The SI is expected to be submitted in RAN#96

3 Topic #2: Mandating 70MHz and 90MHz

3.1 Companies' contribution list

The following contribution will be covered.

Table 2:

TDoc	Title	Source	Type	AI
RP-220786	Mandatory 70 MHz and 90 MHz RF channel bandwidth in TS 38.101-1	Rogers Communications Canada, AT&T	CR	9.9

3.2 Initial round

3.2.1 Comments & responses

Sub-topic 2-1: Mandate 70MHz and 90MHz channel bandwidths

- **Proposal:** Update Table 5.3.5-1 of 3GPP TS 38.101-1 by:
    - changing RF channel bandwidth 70 MHz from optional to mandatory for bands n77 and n78
    - changing RF channel bandwidth 90 MHz from optional to mandatory for bands n48 and n77

Companies are invited to provide comments below.

Feedback Form 7:

1 – T-Mobile USA Inc. We support the proposal.
2 – ZTE Wistron Telecom AB If we approve the proposal, there could be some legacy Rel-17 UEs which do not support 70MHz or 90MHz (since it is optional before the approval), and some new Rel-17 UEs with such support. How the network differentiates these two types of UEs in the same big release (Rel-17) could be an issue.
3 – Apple (UK) Limited We are fine with the proposal to remove the optionality for these two channel BWs for n77 and n48 in Rel-17.
4 – Nokia Corporation We are fine with the proposal
5 – MediaTek Inc. From UE perspective, we are fine with the proposal.

Sub-topic 2-2: Other comments on CR RP-220786

Companies are invited to provide comments in the follow table if they had other comments on CR RP-220786.

Feedback Form 8:

3.2.2 Summary

4 companies are fine with the proposal. 1 company had concen on backward compatible issue for network. In the intermediate round, the group can try to address the concern from the company. If the concern was addressed, then the CR could be agreed.

3.3 Intermediate round

3.3.1 Comments & responses

Does the backward compatible issue exist and how to address the concern from company.

- *There could be some legacy Rel-17 UEs which do not support 70MHz or 90MHz (since it is optional before the approval), and some new Rel-17 UEs with such support. How the network differentiates these two types of UEs in the same big release (Rel-17) could be an issue.*

The moderator encourages companies to address the concern above. Please make comments in the table below. if the concern was addressed then the CRs could be approved.

Feedback Form 9:

1 – AT&T GNS Belgium SPRL We are surprised to see this comment raised at RAN Plenary as there were no concerns raised at the RAN4 meeting concerning this issue. We think that the CR can be agreed as is given the previous RAN4 discussion amongst UE and BS vendors and the approved RAN4 WF to finalize this in the Rel-17 core work timeline.
2 – Apple (UK) Limited Would it be possible to have ”legacy Rel-17 UEs” in the field already as Rel-17 ASN.1 would not be frozen till June 2022?
3 – Intel Corporation (UK) Ltd We support the proposal to mandate 70MHz and 90MHz operation. First of all, we don’t think there could be any “*legacy Rel-17 UEs*” since Rel-17 specs incl. ASN.1 are not finalized. Also, in our understanding the both 90MHz and 70MHz are currently optional and UE indicates the support of these features using capability signalling. So, we do not see any ambiguity in any case.
4 – ZTE Wistron Telecom AB The optionality of CBW is in principle up to RAN4’s decision. The concern raised here is because RAN4 changes the optionality of 70/90MHz from optional to mandatory within the same big release. However, if companies think there is no such Rel-17 UEs without support of 70MHz and 90MHz, then the issue does not exist, and we are fine with the change.

3.3.2 Summary

Topic #2: Mandating 70MHz and 90MHz

Based on the comments, the concern in the initial round was addressed, and there was no other comments on the CR. So the modator would like to suggest to approve the company’s CR.

- Moderator recommend to approve RP-220786.

Then no final round is needed for this topic.

4 Topic#3: Tx switching with muliple TAG for 2 bands

4.1 Companies' contribution list

The following contribution will be covered.

Table 3:

TDoc	Title	Source	Type	AI
RP-220649	TX switching and multiple TAG for 2 bands	L.M. Ericsson Limited	Discussion	9.9

4.2 Initial round

4.2.1 Comments & responses

Sub-topic 3-1: Extension of switching to multiple TAG in Rel-17 for UL CA

- **Proposal:** RAN tasks RAN4 to agree extension of switching to multiple TAG in Rel-17 for UL CA
    - The basic change in annex 1 should be recommended to be adopted
    - RAN4 can decide whether to add additional timing diagrams for multiple TAG for information or not in May.

Companies are invited to provide comments in the follow table.

Feedback Form 10:

1 – AT&T GNS Belgium SPRL We support the proposal to remove the two-band deployment restriction in Rel-17.
2 – T-Mobile USA Inc. We support the proposal.
3 – ZTE Wistron Telecom AB We are fine if RAN4 discuss the feasibility of extending to multiple TAGs. Some concerns from us: (1) For non-colocated scenarios, the period between the end of transmission on one band and the start of transmission on the other band may be larger than that in the single TAG scenario. In this case, what would the system gain from Tx switching? Does it worth performing Tx switching in this case? (2) All the work related were done under the assumption of single TAG. We may need to check its impacts on the agreements already made if such assumption does not exist, e.g., the current switching period set

{35/140/210us} etc.

(3) Is there any commercial demand for this extension at this stage?

More discussions may be required before approving the extension.

4 – Qualcomm Technologies Int

We would prefer the other possibility as provided in 649: Clarify the scope of the Rel-18 WI to include 2 bands switching. This is a new feature or at least modification of the feature so we should do it properly rather than with one CR.

On technical issue, UE might support > 1 TAGs for inter-band CA but for the CA with operation with TX switching, UE might not. The capability *supportedNumberTAG* therefore can not be used but it needs to be excluded for this feature and we need a new capability e.g. *supportedNumberTAG-TXswitching*.

5 – Huawei Technologies France

According to the Feb email discussion, companies already agreed that multiple TAG for 2 bands need to be addressed before 3 or 4 bands. Further clarification on RAN1 multi-carrier enhancement WI can be discussed on RAN plenary. Thus we cannot accept for the proposal for Rel-17. Ok with clarification in the Rel-18 RAN1 led WI.

6 – vivo Communication Technology

We prefer not to discuss this in Rel-17 anymore, since it is already quite late stage for Rel-17 and this is not that ”small”. Actually, it has been discussed but not accepted before. Clarification in Rel-18 seems a more natural and aligned way.

7 – Nokia Corporation

There should be no ambiguity in the current situation:

- 2-TAG support was specifically ruled out on the Rel-17 WI FR1 requirements enhancement WI: ”Note 2: Only addressing the case of single TAG for the two UL carriers for SUL and for UL CA.” [RP-21.899]
- 2-TAG support is specifically included in the Rel-18 WI multicarrier enhancements WI, and even though the same WI brings in 3-band support it in our view in no way implies that 2-TAG support would not be there for 2-band cases. ”...., and to support dynamic Tx carrier switching across the configured bands for both single TAG and multiple TAGs configurations (RAN1, RAN4)” [RP-213577]

At this stage of Rel-17 it would seem too late to discuss the extension of the Rel-17 WI to cover also the 2-TAG case, but we are not in fundamental opposition of such a discussion. However, it doesn’t seem like an extension to a case that the Rel-17 WI ruled out would be a Rel-17 TEI. It should be a revision of the Rel-17 WID.

If there is a concern that the Rel-18 WI is not clear on whether or not the 2-TAG support is possible with 2-band cases, we’d be OK to make the support of those cases chrystal clear in the Rel-18 WI.

8 – CATT

We support the proposal to remove the two-band deployment restriction. Regarding the release, I am open for discussion.

9 – MediaTek Inc.

- This is too late in Rel-17. Even if the spec change is not big, but there is a big change in the UE implementation. We prefer to discuss in Rel-18.
- On page 6 of RP-220649, the shadow region is not clear whether is avoided by network scheduling or UE implementation. We have a very strong view to avoid parallel transmissions on the 2 CCs at the same time. **How** to avoid this may need some more discussion. But it is not clear from RP-220649.
- Multi-TAG is already one of the objectives in the Rel-18 RAN1 led new WI ”Multi-carrier enhancements”. We need to avoid parallel discussions across WGs. Considering this, we would suggest to do this under the RAN1-led WI, rather than RAN4

10 – China Mobile Com. Corporation

According to the pre RAN#95 email discussion, common understanding it that this issue is covered by ”multi-carrier enhancement” WI, clarification on multi carrier enhancement WI can be considered if people still think it is not clear enough.

11 – China Telecom Corporation Ltd.

To our understanding, the main specification impacts to support multi-TAG are to update the UL outage time and DL interruption time, due to the misalignment of timing in the two bands.

Regarding the UE capability of *supportedNumberTAG* for Tx switching as raised by QC, since a new BC list for Tx switching is reported by UE according to RAN2 design, the *supportedNumberTAG* can already be reported separately for UE configured with Tx switching.

So, with the corresponding UE capability already supported in Rel-16/17, we can consider a middle approach of defining the requirement in Rel-18 and release independent from an early release.

12 – Guangdong OPPO Mobile Telecom.

It was agreed in pre RAN discussion that this scenario is covered by RAN1 lead Rel-18 WI multi carrier enhancement, therefore no need to further discuss in Rel-17.

13 – NTT DOCOMO INC.

We are supportive on the proposal for Rel-17.

14 – VODAFONE Group Plc

We support the proposal

15 – Ericsson France S.A.S

Thanks for the responses.

To ZTE: The network will need to avoid scheduling in 1 symbol in some cases to account for the misalignment. There is still a gain because otherwise TX switching cannot be deployed in non-co-located

scenarios. As we have discussed in RAN4, there is no need to change the switching times and no impact to UE behaviour.

To Qualcomm: We do not understand why there would need to be a separate capability for this case. Note that, as we have discussed in RAN4, the UE behaviour is the same both with and without multiple TAG (the network differs); the restriction in the specification is basically artificial.

To mediatek: Our proposal, as discussed in RAN4 is that the shadow region is avoided by network implementation (not scheduling in a symbol if needed), not UE implementation. Anyhow it is optional.

Looking at the comments, we are rather disappointed that more consideration has not been paid to our contributions in RAN4 over several meetings, which answer all of these questions. However, as a compromise, the CT proposal is a way forward, that we include in the Rel-18 multi-carrier enhancements and consider release independence for the switching band pairs.

If we would go this way, the Rel-18 scope could be clarified with a note:

o Note: Extension of TX switching for 2 bands to multiple TAG configurations is included in the scope

4.2.2 Summary

6 companies supported the proposal. 9 companies had concern on it. 8 companeis thought that it seemed too late to discuss the Tx switching with multiple TAG on 2 bands in Rel-17 because there would be non-trivial impacts on the specficiation or UE implementations, and prefered to discuss it in Rel-18. 1 company questioned the benefit for non-collcocated scenario and if there is the commercial demand. 1 company thought the new capability would be needed.

The compromise would be to define the requirements in Rel-18 and apply to UE in a release independent way. (In moderator's view, we should be careful to apply the release independency considering that the new signaling would be needed.)

Based on the companies' comment the moderator proposed the following for further discussions:

- **Proposal #3:** To support Tx switching with multiple TAG on 2 bands, it is proposed to add the following note in Rel-18 WI on multi-carrier enhancements, and consider release independence for the switching band pairs
  - Note: Extension of TX switching for 2 bands to multiple TAG configurations is included in the scope.

4.3 Intermediate round

4.3.1 Comments & responses

Sub-topic 3-1: Extension of switching to multiple TAG in Rel-17 for UL CA

- **Proposal #3:** To support Tx switching with multiple TAG on 2 bands, it is proposed to add the following note in Rel-18 WI on multi-carrier enhancements, and consider release independence for the switching band pairs

- Note: Extension of TX switching for 2 bands to multiple TAG configurations is included in the scope.

Companies are invited to provide comments in the table below.

Feedback Form 11:

1 – T-Mobile USA Inc. We support the proposal.
2 – Nokia Corporation OK with the proposal
3 – AT&T GNS Belgium SPRL We support the moderator proposal.
4 – MediaTek Inc. We are fine with the proposal
5 – China Telecom Corporation Ltd. We are ok with the proposal.
6 – Intel Corporation (UK) Ltd We support the proposal
7 – Ericsson France S.A.S We are OK with the proposal
8 – China Mobile Com. Corporation OK with moderator proposal.
9 – Guangdong OPPO Mobile Telecom. Ok with proposal, however, similar view as moderator that whether it can be release independent to earlier release needs further discussion, and it can not be considered as release independent automatically.
10 – CATT we support the moderator's proposal.
11 – ZTE Wistron Telecom AB Fine with the proposal. Some minor editorial change?

- Note: Extension of TX switching ~~for~~between 2 bands ~~to~~with multiple TAG configurations is included in the scope.
12 – VODAFONE Group Plc We are fine with the moderator's proposal
13 – Huawei Technologies France Wer are ok with the moderator's proposal
14 – vivo Communication Technology OK with the moderator's proposal. Not sure whether we should mention the release independent in the WID, but can accept this if no more comments from other companies.

4.3.2 Summary

Almost all the companies can go with Proposal #3. 1 company suggested the modification. 2 company thought that whether it can be release independent needs further discussion.

So the moderator would like to check if the proposal#3 with modifications is agreeable.

- **Proposal #3:** To support Tx switching with multiple TAG on 2 bands, it is proposed to add the following note in Rel-18 WI on multi-carrier enhancements, and ~~consider~~discuss release independence for the switching band pairs
  - Note: Extension of TX switching ~~for~~between 2 bands ~~to~~ with multiple TAG configurations is included in the scope.

4.4 Final round

4.4.1 Comments & responses

Sub-topic 3-1: Extension of switching to multiple TAG in Rel-17 for UL CA

- **Proposal #3:** To support Tx switching with multiple TAG on 2 bands, it is proposed to add the following note in Rel-18 WI on multi-carrier enhancements, and ~~consider~~discuss release independence for the switching band pairs
  - Note: Extension of TX switching ~~for~~between 2 bands ~~to~~ with multiple TAG configurations is included in the scope.

Companies are invited to provide comments in the table below, if any.

And the moderator will inform the rapporteur of this WI on this potential change. According to GTW discussion so far, it would be better to modify the WID in next RAN plenary. But the moderator would like to leave it to decison of the rapporteur.

Feedback Form 12:

1 – Qualcomm Technologies Int The topic heading is Rel-17 but the proposal is to add it to Rel-18 WI. If the context is Rel-18 as normally Rel-18 WI are, we are fine but if the intention of this is to work on Rel-17, then we need some more clearer way to say this.
2 – AT&T GNS Belgium SPRL We prefer the language presented in the intermediate round for Proposal 3 which was supported by most companies as we think that it conveys the intent of the proponent (Ericsson). We would prefer to keep the language presented in the intermediate round for now.
3 – vivo Communication Technology Share Qualcomm's view that some coordination would be needed between Rel-17 and Rel-18 WIs, and there may be more discussion needed before this conclusion can be accepted in the Rel-18 WI for thorough review from interested parties.
4 – China Mobile Com. Corporation The title of this topic can be updated to remove "Rel-17". In case we endorse the proposal in this RAN pleanry, WID can be updated in next RAN pleanry.
5 – China Telecom Corporation Ltd. We are fine with the proposal, and fine to endorse the proposal in this RAN plenary and update the WID in RAN #96.
6 – Guangdong OPPO Mobile Telecom. ok with proposal.
7 – VODAFONE Group Plc We support the moderator's proposal but agree that the R17/R18 distinction should be clearer, whether part of the work can start already in R17 or that it is to be done solely in the Multicarrier enhancements for R18
8 – Ericsson France S.A.S Since we are now discussing a Rel-18 WID update and potential release independence, we are OK to remove "Rel-17" from the title. Regarding the wording, the changes to the note do not change much but make the note clearer, so we are OK. Changing "consider" release independence to "discuss" somewhat changes the emphasis from aiming to do release independence if it is possible to discussing whether it is even useful, so we agree with AT&T on that point that "consider" would be better than "discuss". We note that even with "consider", we are not somehow mandating release independence if it turns out to be not feasible.

4.4.2 Summary

5 companies were OK to remove "Rel-17" from the sub-topic title. The moderator is fine. The title is written based on the proposal from the proponent and the proposal iteself would not be ambiguous. But it would be fine to remove Rel-17 to make the proposal clearer.

2 companies clearly indicated to prefer the wording in the intermediate round, while no other companies expressed the different views. So the moderator recommends to go with the wording in the intermedaite round. Hope no back-and-forth discussion is needed.

And considering that the meeting is almost closed and the Rel-18 item does not start yet, the moderator would like to suggest to modify the Rel-18 WID on multi-carrier enhancements in RAN#96.

Sub-topic 3-1: Extension of switching to multiple TAG ~~in Rel-17~~ for UL CA

- **Proposal #3:** To support Tx switching with multiple TAG on 2 bands, it is proposed to add the following note in Rel-18 WI on multi-carrier enhancements in RAN#96, and consider release independence for the switching band pairs
  - Note: Extension of TX switching for 2 bands to multiple TAG configurations is included in the scope.

After the discussion in GTW on March 23rd, company commented that the work should be limited to RAN4. Thus Proposal #3 is further revised as below.

- **Proposal #3:** To support Tx switching with multiple TAG on 2 bands, it is proposed to add the following note in Rel-18 WI on multi-carrier enhancements in RAN#96, and consider release independence for the switching band pairs
  - Note: Extension of TX switching for 2 bands to multiple TAG configurations is included in the scope. The work is limited to RAN4.

5 Summary of Recommendations

In this section all the recommendations are summarized after GTW on March 23rd.

Sub-topic #1-1: Solution specific to Canada n77 band (endorsed before starting final round)

All the companies agreed on Proposal #1. So the moderator proposes to endorse Proposal #1.

- **Proposal #1:** RAN tasks RAN4 and RAN2 to finalize the work to address Canada n77 issue based on RP-220038 in TEI-17 and provide CRs for approval in RAN#96e.

Sub-topic 1-2: General solution for the similar cases in future (proposed to be endorsed after final round)

- **Proposal #2:** It is recommended to have a two-quarter RAN-level SI to systematically study the regulatory compliance issues for regional frequency ranges on large global bands
  - Investigate and identify the root cause of this issue as the first step
  - If needed (pending outcome of the bullet above), provide a general solution for regulatory compliance issues for regional frequency ranges on large global bands considering

    - Introduction of new bands
    - Solutions without introduction of new bands, i.e., reusing the existing band numbers with appropriate signalling to differentiate UE support
    - The UE should be ensured to support the full frequency range on its supported bands, and the fragmentation of market should be avoided.

- NOTE: The SI is expected to be submitted in RAN#96

Topic #2: Mandating 70MHz and 90MHz(endorsed before starting final round)

- Moderator recommend to approve RP-220786.

Sub-topic 3-1: Extension of switching to multiple TAG for UL CA (proposed to be endorsed after final round)

- **Proposal #3:** To support Tx switching with multiple TAG on 2 bands, it is proposed to add the following note in Rel-18 WI on multi-carrier enhancements in RAN#96, and consider release independence for the switching band pairs

    - Note: Extension of TX switching for 2 bands to multiple TAG configurations is included in the scope. The work is limited to RAN4.