

3GPP TSG-RAN Meeting #95 Electronic RP-220951

Electronic Meeting, March 17 - 23, 2022

Agenda item: 9.5.1.2

Source: RAN1 Vice-Chair (Huawei)

Title: Moderator's summary for discussion [95e-29-R17-52.6-71GHz-WI]

Document for: Discussion

1 Introduction

Contributions submitted to agenda 9.5.1.2 on the release 17 WI on extending current NR operation to 71GHz [RAN1 WI: NR_ext_to_71GHz] consist of:

- Status report [2]
- Exception request [3]
- Discussion papers [4][5] on L1 UE features on PRACH and PUCCH enhancements

Contribution [1] supports an exception request for this WI in Q2.

Corresponding sections are provided for collecting companies' views on the proposals in these contributions. Please provide your input on initial round by the deadline of Friday, 18th March 11:00 UTC.

2 Initial round

2.1 Status report

The status report from the rapporteur proposes:

- 90% completion
- Extension of the WI until June 2022, with request for RAN4 TUs in Q2 (R4RF 2 TU, R4RD 1 TU)
- A list of open issues for RAN4 listing the incomplete objectives of the WID

The list of RAN4 open issues is the following:

- Core specifications for UE, gNB and RRM requirements [RAN4]:
 - Specify new band(s) for the frequency range from 52.6GHz-71GHz. The band(s) definition should include UL/DL operation and excludes ITS spectrum in this frequency range.
 - Specify gNB and UE RF core requirements for the band(s) in the above frequency range, including a limited set of example band combinations (see Note 1).
 - Specify RRM/RLM/BM core requirements.
- Specify the following requirements [RAN4]
 - Base station demodulation performance requirements
 - UE demodulation performance requirements
 - Radio Resource Management performance requirements, including RRM/RLM test cases
 - Base station conformance testing
 - Study and define NR 52.6-71 GHz BS OTA methods

The moderator would like to note that the list of incomplete objectives doesn't go into the details of the specific issues listed in the exception request for RAN4, which is in principle fine as long as the two lists are consistent. If the exception request is agreeable, it will be the primary reference for RAN4 work in Q2.

Companies are asked to provide comments (if any) on the above points from the status report, or indicate if the status report is acceptable in its current form in RP-220535 (assuming that the exception request will be approved).

Feedback Form 1: Comments on the status report in RP-220535

1 – Ericsson LM

We have comment on target completion date for Performance Part:

1) RAN4 core part is extended until June. In the next quarter RAN4 will mainly focus on core part and cannot spend much effort on performance part e.g. BS RF conformance testing, RRM test cases etc. Most performance issues including BS RF and RRM highly depend on core completion. Therefore we suggest to extend the performance part also for 1 quarter i.e. until December 2022.

2) Open issues related to RAN4 needs to be aligned with the exception sheet.

<p>2 – Apple (UK) Limited</p> <p>We agree if core part is extended, perf. part should be extended as well.</p>
<p>3 – Intel</p> <p>For Performance part extension we are ok with Ericsson proposal. Meantime, we are fine to come back to this discussion in June, since this is not urgent.</p>
<p>4 – ZTE Corporation</p> <p>For the performance part, we think that it could be checked at next June meeting and we don't see its urgency to make the decision during this RAN-P meeting.</p> <p>For the core part, we are fine to have one quarter extension to complete the work.</p>
<p>5 – ZTE Corporation</p> <p>For extension of performance part to Dec, 2022, we think that this could be checked at next June meeting. We don't see its urgency to make this decision this meeting.</p> <p>For extension of core part, we are fine to have one quarter extension to complete the work.</p>
<p>6 – Nokia Corporation</p> <p>We agree with Ericsson's comments above.</p>
<p>7 – Huawei Technologies Sweden AB</p> <p>We agree with Ericsson view. We would slightly prefer to fix this issue already now so that we do not have to come back to the same discussion in June.</p>

2.1.1 Summary of initial round

Responses suggested also extending the target date for the performance part to December 2022, while one company suggested to wait for making that decision until June 2022. Given that 5 companies out of 6 agree to extend the performance part already now, it is proposed to revise the SR to extend the performance part target to Dec 2022.

It was also suggested to align the list of open issues in the status report with the list of open issues in the exception sheet. Since no comments were received against that suggestion, let's assume that the list of open issues in RAN4 in the status report will be updated once an agreement is found on the exception sheet.

Please find the corresponding proposals in the intermediate round section.

2.2 Exception sheet

The exception request provides a list of open issues for RAN4 to work on in Q2:

RF core requirements in 38.101-2

- Core requirements including operating bands, channel raster, sync raster, MPR, A-MPR, SEM, spurious,

blocking, CA, and ACS

Requirements in 38.101-3

- Inter-band CA configurations

Requirements in 38.104

- 38.104 clause 9.6.2 (EVM window length within pending on conformance feasibility issues).
- 38.104 clause 9.6.3 (Intraband non-contiguous CA TAE)
- 38.104 clause 9.7.3 (ACLR pending on the support of non-contiguous CA in Rel-17)
- 38.104 clause 10.3 (FRC parameters for FR2 OTA reference sensitivity level)
- 38.104 clause 10.7 (receiver spurious emissions for n264)
- 38.104 clause 10.8 (modulated interfering signal type for receiver intermodulation requirement)

Requirements in 38.133

- 38.133 clause 7.5 (Maximum Transmission Timing Difference)
- 38.133 clause 7.6 (Maximum Receive Timing Difference)
- Receive beam sweeping scaling factor for RRM requirements
- Impact of LBT on RRM requirements

Given the list of open issues, it is the moderator's understanding that there is indeed a need for an exception in RAN4 for this WI. Therefore, companies are asked to comment on the detailed list with the aim to ensure that the exception sheet contains exactly the open issues that RAN4 needs to complete in Q2.

Feedback Form 2: Comments on the list of RAN4 open issues in the exception sheet in RP-220536

1 – Ericsson LM

Our understanding is that the exception sheet in 536 will be updated as confirmed by the rapporteur on RAN4 reflector.

2 – Apple (UK) Limited

Given the large amount of remaining issues and only one quarter extension, we propose to do some down-scoping by taking CA within FR2-2 out of the exception sheet.

3 – Intel

In accordance to the latest discussion in RAN4 reflector the update list of open issues is as follows:

RF core requirements in 38.101-2

Core requirements including operating bands, channel raster, sync raster, MPR, A-MPR, SEM, spurious, blocking, CA, and ACS

Requirements in 38.101-3

Inter-band CA configurations

Requirements in 38.104

38.104 clause 9.6.2 (EVM window length within pending on conformance feasibility issues).

38.104 clause 9.6.3 (Intraband non-contiguous CA TAE)

38.104 clause 9.7.3 (ACLR pending on the support of non-contiguous CA in Rel-17)

38.104 clause 10.3 (FRC parameters for FR2 OTA reference sensitivity level)

38.104 clause 10.7 (receiver spurious emissions for n264)

38.104 clause 10.8 (modulated interfering signal type for receiver intermodulation requirement)

Requirements in 38.133

38.133 clause 7.1.2.1 (Gradual timing adjustment)

38.133 clause 7.5 (Maximum Transmission Timing Difference)

38.133 clause 7.6 (Maximum Receive Timing Difference)

38.133 clause 7.3.2.2 (Timing Advance adjustment accuracy)

38.133 clause 9.2.5 (Intra-frequency measurements without measurement gaps)

38.133 clause 9.2.6 (Intra-frequency measurements with measurement gaps)

38.133 clause 9.3.4 (Inter-frequency measurements with measurement gaps)

38.133 clause 9.3.9 (Inter-frequency measurements without measurement gaps)

Receive beam sweeping scaling factor for RRM requirements

Impact of LBT on RRM requirements

Frame boundary alignment tolerance of PDSCH when deriveSSB-IndexFromCell is disabled

The exception sheet can be updated once the list is confirmed in this email thread.

4 – ZTE Corporation

we tend to agree with Apple that some down-scoping of the leftover should be done e.g. intra-band non-contiguous CA case if there are no market demand or operator request.

5 – Nokia Corporation

Exception sheet has the following shortcomings:

For 38.101-2

- Operating bands are not open
- Mandatory/optional UE channel bandwidths missing

- Optional faster transient missing
- Max input power missing
- FRCs missing

For 38.101-3

- Inter-band CA combinations are not necessarily open

For 38.104

- Rx spurious for n264 are not open

6 – Huawei Technologies Sweden AB

Agree that the SR and exception sheet shall be aligned. For down-scoping, we would be fine to remove CA within FR2-2, as well as the intra-band non-contiguous CA case, as to reflect some previous agreements. Further clarifications:

- Requirements in 38.101-3: Inter-band CA configurations: example inter-band CA combos were already introduced, so this open issue may be already removed.
- 38.104 clause 9.6.3 (Intraband non-contiguous CA TAE): suggest to exclude the non-cont CA from Rel-17 WI explicitly
- 38.104 clause 9.7.3 (ACLR pending on the support of non-contiguous CA in Rel-17): suggest to exclude the non-cont CA from Rel-17 WI explicitly
- 38.104 clause 10.7 (receiver spurious emissions for n264): there was n264 draft CR endorsed and subject to the regulation availability. No need to list it as open issue anymore.

2.2.1 Summary of initial round

Intel provided an updated list of RAN4 open issues for the exception sheet, as discussed on the RAN4 email reflector. Since the list was newly provided during the initial round, comments will be collected on the list in the intermediate round, considering the responses already provided and summarized below.

Two companies commented that the following issues are already closed, and asked to remove them:

- operating bands in 38.101-2
- inter-band CA configurations in 38.101-3
- receiver spurious emissions for n264 in 38.104 clause 10.7.

One company pointed out additional open issues for 38.101-2:

- Mandatory/optional UE channel bandwidths
- Optional faster transient
- Max input power
- FRCs

Three companies proposed to reduce the objectives to help the WI completion. The objectives proposed to be down-scoped from Rel-17 are CA within FR2-2, including down-scoping intra-band non-contiguous CA. If so, the following open issues would be removed from the exception sheet:

- 38.104 clause 9.6.3 (Intraband non-contiguous CA TAE)
- 38.104 clause 9.7.3 (ACLR pending on the support of non-contiguous CA in Rel-17)

The corresponding proposals can be found in the intermediate round section.

2.3 Layer 1 Features

Two contributions are submitted on Feature Groups (FGs) for PRACH and PUCCH enhancements, with a discussion on whether those enhancements should be made applicable not only to unlicensed bands in FR2-2 but also to licensed bands in FR2-2.

The latest RAN1 list of L1 Features includes the following FGs:

- 24-1c Multi-RB support PUCCH format 0/1/4 for 120 kHz in FR2-2
- 24-4c Multi-RB PUCCH format 0/1/4 for 480 kHz in FR2-2
- 24-5c Multi-RB PUCCH format 0/1/4 for 960 kHz in FR2-2
- 24-1b Wideband PRACH for 120 kHz in FR2-2
- 24-4b Wideband PRACH for 480 kHz in FR2-2

FGs 24-1c, 24-4c and 24-5c include a note saying “This FG is only supported in bands under PSD limitation in shared spectrum operation”.

For FGs 24-1b and 24-4b, a similar note appears in square brackets as [Note: This FG is only supported in bands for shared spectrum operation].

The proposals from [4] are:

Proposal 1 [RP-220611]: For feature 24-1c/4c/5c, remove the note “This FG is only supported in bands under PSD limitation in shared spectrum operation”.

Proposal 2 [RP-220611]: For feature 24-1b/4b, remove the note “[Note: This FG is only supported in bands for shared spectrum operation]”.

An alternative proposal from [4] would be to replace the notes with “This FG is only supported when PSD limitation applies...” without any reference to shared or licensed spectrum.

In [5], it is proposed to seek RAN guidance on the interpretation of the objective of the WID corresponding to the PRACH enhancements reflected in FGs 4-1b and 24-4b:

Proposal 1 [RP-220667]: *Guidance from RAN plenary is needed to clarify the intention and work scope of PRACH design in the WID.*

- Physical layer aspects including [RAN1]:

- Specify support for PRACH sequence lengths (i.e. L=139, L=571 and L=1151) and study, if needed, specify support for RO configuration for non-consecutive RACH occasions (RO) in time domain for operation in shared spectrum

The moderator sees the following options for this discussion:

- **Option 1:** remove the notes under FGs 24-1c, 24-4c and 24-5c for PUCCH and remove the bracketed notes under FGs 24-1b and 24-4b for PRACH, i.e. making these FGs applicable to both unlicensed and licensed bands in FR2-2 without any condition on PSD limitations.
- **Option 2:** change the notes under FGs 24-1c, 24-4c and 24-5c for PUCCH and FGs 24-1b and 24-4b for PRACH to “This FG is only supported when PSD limitation applies”, or something similar like “This FG is only supported for bands where PSD limitation applies”.
- **Option 3:** keep the note under FGs 24-1c, 24-4c and 24-5c for PUCCH and keep the note (without the square brackets) under FGs 24-1b and 24-4b for PRACH. Under this option, it can also be discussed to exactly align the wording of the notes under all 5 FGs.

Companies are asked to provide their views on the options above for Multi-RB PUCCH and Wideband PRACH FGs.

Feedback Form 3: Is option 1 agreeable for Multi-RB PUCCH (i.e. proposal 1 in RP-220611), otherwise which other option is acceptable?

1 – Guangdong OPPO Mobile Telecom.

we support option 2 or option 3 and we don't support option 1.

2 – Ericsson LM

We support Option 1 and do not support option 2. Option 3 leads to spending unnecessary WG time on this issue.

There is no technical reasons to restrict the developed features for only unlicensed. When regulations for licensed bands are introduced in the future, it is likely that there would be PSD limitations. Multi-RB PUCCH and long-sequence PRACH are designed to increase the total transmit power (and thus coverage) in such scenarios.

3 – MediaTek Inc.

Option 3 is the only reasonable way forward here. Enabling this for anything other than what has been agreed so far (or agreed in square brackets) is essentially adding a new radio configuration after the RAN1 spec has been agreed is equivalent to adding new functionality. The WI is already desperately behind schedule, without now trying to change the applicability of defined features.

4 – MediaTek Inc.

Just to clarify that option 1 is not acceptable. In option 3 which we support it seems 24-5c is missing from the description.

5 – Samsung Electronics Co.

We share a similar view with MTK. The current WID is clear and option 3 covers well.

6 – NTT DOCOMO INC.

Our best preference is Option 1. We share the same understanding as Ericsson. Our understanding is that the notes under FGs 24-1c, 24-4c and 24-5c come from WID description only, which we are not sure whether technically motivated. Moreover, we do not think enabling this in licensed band is equivalent to adding new functionality. It is rather to align PHY design among lic/unlic bands, which we believe is more friendly for practical implementation.

7 – Apple Benelux B.V.

We do not support Option 1. We can support Option 2 or Option 3 with Option 3 preferred

8 – HUAWEI TECHNOLOGIES Co. Ltd.

We don't support option 1, option 3 should be taken for Multi-RB PUCCH.

Firstly, the note was already agreed for multi-RB PUCCH in RAN1#107b-e, we don't see any motivation to revert the agreement. Secondly, there is no licensed band defined for FR2-2 yet. Thirdly, even if there is any licensed band defined for FR2-2 in the future, we don't think there is need to use multi-RB PUCCH on licensed band from coverage perspective, because on licensed band UE always can boost the power on the single PRB PUCCH. Note that multi-RB PUCCH is motivated due to the PSD limitation in unlicensed band regulation, the same motivation for interlaced PUCCH in Rel-16, which is only applied to unlicensed band.

9 – CATT

We support Option 1 . Option 2. Option 3 will introduce unnecessary restriction and more specification effort for WG.

10 – Huawei Tech.(UK) Co.. Ltd

From Moderator: just to clarify based on Mediatek's comment that 24-5c is indeed missing from the description of option 3 and should be considered as included in option 3. This will be updated in the intermediate round.

11 – LG Electronics Inc.

From our understanding, both of multi-RB PUCCH and wideband PRACH are motivated to boost its transmission power under PSD limitation. Thus, it would be reasonable to apply the same rule to both of them. In that sense, we can accept Option 1, considering that licensed and unlicensed spectrum will be differentiated by band number and UE capability signalings for 24-1c/4c/5c/1b/4b are defined by per band. We are also fine with Option 2 having the same note for multi-RB PUCCH and wideband PRACH.

12 – Intel

Our preference is option 1. Agree with Ericsson and Docomo's comments.

13 – Qualcomm Incorporated

Our first preference is Option 1 but we are quite ok with Option 2 as well. Option 2 seems a reasonable compromise. As a side note, if Option 2 is chosen, we think that it is best if the wording ultimately chosen omits mentioning bands because that would lead to the further discussion of how to clarify the applicability to bands that have both PSD limitation and no PSD limitation in different regions.

We do not understand the rationale of the companies supporting Option 3 only. For those companies who believe it is impossible that licensed bands in FR2-2 can have PSD limitation, Option 2 and Option 3 are anyhow identical, so no reason to prefer one but object to the other. For those companies who believe it is possible that licensed bands in FR2-2 have PSD limitation, the 60GHz coverage range and related competitiveness should be of prime concern given the very high frequency of this FR. So supporting Option 3 only would make sense only to those companies who don't care about licensed band operation in FR2-2 at all, but we are unsure which companies among the Option 3 supporters fall in this category.

14 – ZTE Corporation

We support Option 1 and also share same understanding as Ericsson and Docomo. Besides, For wideband PRACH (i.e. FG 24-1b and 4b), we think current WID on PRACH sequence length is clear, that is, "for operation in shared spectrum" is only to apply to "RO configuration for non-consecutive RACH occasions (RO) in time domain", *Not* for "PRACH sequence lengths". Based on this, it is reasonable to remove the bracketed notes under FGs 24-1b and 24-4b for PRACH. However, for multi-RB PUCCH, although it is limited for operation in unlicensed band from WID description, we don't see any harm of extending it to licensed band, instead to bring the improvement in coverage performance.

15 – Nokia Corporation

We support option 1. It is difficult to understand why it would not be acceptable, given that all these features are defined per band. In case UE doesn't want to support it on licensed bands, it is perfectly capable of indicating support only on unlicensed bands, if so desired.

Feedback Form 4: Is option 1 agreeable for Wideband PRACH (i.e. proposal 2 in RP-220611), otherwise which other option is acceptable?

1 – Guangdong OPPO Mobile Telecom.

we support option 2 or option 3 and we don't support option 1.

2 – Ericsson LM

We support Option 1 and do not support option 2. Option 3 leads to spending unnecessary WG time on this issue.

There is no technical reasons to restrict the developed features for only unlicensed. When regulations for licensed bands are introduced in the future, it is likely that there would be PSD limitations. Multi-RB PUCCH and long-sequence PRACH are designed to increase the total transmit power (and thus coverage) in such scenarios.

3 – MediaTek Inc.

Option 3 is the only reasonable way forward here. Enabling this for anything other than what has been agreed so far (or agreed in square brackets) is essentially adding a new radio configuration after the RAN1 spec has been agreed is equivalent to adding new functionality. The WI is already desperately behind schedule, without now trying to change the applicability of defined features.

4 – MediaTek Inc.

Option 1 is not agreeable

5 – Samsung Electronics Co.

Same here, option 3 is preferred

6 – NTT DOCOMO INC.

Support Option 1 as well as wideband PUCCH.

7 – Apple Benelux B.V.

We do not support Option 1. We can support Option 2 or Option 3 with Option 3 preferred

8 – HUAWEI TECHNOLOGIES Co. Ltd.

We don't support option 1, option 3 should be taken for Wideband PRACH.

Firstly, in our understanding, the objective description means that wideband PRACH is only for unlicensed band. Secondly, wideband PRACH is motivated due to the PSD limitation in unlicensed band regulation, the same motivation for the wideband PRACH in Rel-16, which is only applied to unlicensed band. Thirdly, there is no licensed band defined for FR2-2 yet.

9 – CATT

We support Option 1 . Option 2. Option 3 will introduce unnecessary restriction and more specification effort for WG.

10 – LG Electronics Inc.

Same as above, we can accept Option 1 and also OK with Option 2.

11 – Intel

Our preference is option 1. Agree with Ericsson comments.

12 – Qualcomm Incorporated

Same comment as for PUCCH, repeating it here for convenience.

Our first preference is Option 1 but we are quite ok with Option 2 as well. Option 2 seems a reasonable compromise. As a side note, if Option 2 is chosen, we think that it is best if the wording ultimately chosen omits mentioning bands because that would lead to the further discussion of how to clarify the applicability to bands that have both PSD limitation and no PSD limitation in different regions.

We do not understand the rationale of the companies supporting Option 3 only. For those companies who believe it is impossible that licensed bands in FR2-2 can have PSD limitation, Option 2 and Option 3 are anyhow identical, so no reason to prefer one but object to the other. For those companies who believe it is possible that licensed bands in FR2-2 have PSD limitation, the 60GHz coverage range and related competitiveness should be of prime concern given the very high frequency of this FR. So supporting Option 3 only would make sense only to those companies who don't care about licensed band operation in FR2-2 at all, but we are unsure which companies among the Option 3 supporters fall in this category.

13 – ZTE Corporation

Same position and reason as above. we support Option 1

14 – Nokia Corporation

We support option 1. It is difficult to understand why it would not be acceptable, given that all these features are defined per band. In case UE doesn't want to support it on licensed bands, it is perfectly capable of indicating support only on unlicensed bands, if so desired.

2.3.1 Summary of initial round

The responses were there same for multi-RB PUCCH and for wideband PRACH, so we can continue discussing all FGs jointly. Given the different views on the interpretation of the WID, including the interpretation that the WID doesn't limit the applicability of multi-RB PUCCH enhancements to unlicensed bands only, it seems pointless to debate the interpretation of the WID based on the wording of the WID. Debating the necessity of multi-RB PUCCH and for wideband PRACH for licensed bands in FR2-2 doesn't seem useful since there is so far no such band defined in regulations. So it seems difficult to progress other than based on companies' preferences and the possibility to compromise.

In summary, option 1 has the most supporters (8) but also the most companies who were explicitly against (5). Option 3 was supported by the 5 companies who don't support option 1. Only two companies expressed explicit concerns on option 3 and option 2 but there might be more companies with concerns especially on option 3, while option 2 was supported by 4 companies. One concern expressed on option 3 was that it would require unnecessary additional time in WG (the moderator is unsure whether this is due to the possibility of leaving the exact wording to the WG, but the moderator assumes that in case of option 3 the wording would be decided at RAN#95e).

It was also pointed out that the reporting type for these FGs is already agreed to be per band, which allows the possibility for a UE to support the FGs for unlicensed bands and not for licensed bands in FR2-2, as would be the case with option 3. While not many comments were received on option 2, the moderator proposes to continue collecting views based on option 2 to see if this could be an agreeable compromise.

The corresponding proposals can be found in the intermediate round section.

3 Intermediate round

3.1 Status report

Proposal 1: modify the SR in RP-220535 to extend the target date for the performance part to December 2022.

Proposal 2: modify the SR in RP-220535 to align the list of RAN4 open issues with the exception sheet, once the details of the exception sheet are agreeable.

Feedback Form 5: Do you agree with proposals 1 and 2 above?

1 – Qualcomm Incorporated Support the proposal
2 – Ericsson LM Support the proposal
3 – Apple (UK) Limited Both proposals are OK.
4 – Intel agree
5 – ZTE Corporation Fine with the proposal.
6 – Huawei Technologies Sweden AB We support both proposals.
7 – Nokia Corporation Support the proposal

3.1.1 Summary of intermediate round

All companies agreed with the proposals below:

Proposal 1: modify the SR in RP-220535 to extend the target date for the performance part to December 2022

Proposal 2: modify the SR in RP-220535 to align the list of open issues with the exception sheet

3.2 Exception sheet

Proposal 3: down-scope CA within FR2-2 (including both intra-band contiguous CA and intra-band non-contiguous CA) from Rel-17.

Feedback Form 6: Do you agree with proposal 3?

1 – Qualcomm Incorporated

We understand the need to down-scope work in RAN4 to ensure on-time completion. However, we believe intra-band contiguous CA, especially for 120KHz SCS, is a useful deployment scenario to effectively compete with other RATs. We should strive to complete that. We are fine to down-scope intraband non-contiguous CA.

2 – Ericsson LM

We agree with QC that intra-band contiguous CA for 120 kHz SCS should be supported in R17. It is also realistic to complete intra-band contiguous CA in R17.

But we are fine to down scope intra-band non-contiguous CA in R17.

3 – Apple (UK) Limited

It is good to down-scope intra-band non-contiguous CA. For intra-band contiguous CA, if the group wants to keep it, we are fine and hope to revisit it in June RAN plenary if the work is not completed.

4 – Intel

We think that CA within FR2-2 is an essential feature to enable competitive performances with other competing technologies in FR2-2 space. Therefore, we prefer to keep the objective and check the progress in May meeting. At least intra-band (contiguous & non-contiguous) CA (without SCS restrictions) shall be kept.

5 – ZTE Corporation

For intra-band contiguous CA case, we support to keep it, however for intra-band non-contiguous CA case, if there are no much use case or strong market demand, it could be dropped in Rel-17.

6 – LG Electronics Inc.

We prefer to keep at least intra-band contiguous CA in Rel-17.

7 – Huawei Technologies Sweden AB

We support down scoping the following in Rel-17:

- intra-band non-contiguous CA

- (as well as the **inter-band** CA in FR2-2 which was not explicitly mentioned so far – not sure if it isn't too late to add it to the list during the Intermediate round).

8 – Nokia Corporation

We think it is important to keep intra-band contiguous CA (without SCS restrictions). We can be fine with downscoping intra-band non-contiguous CA though, if needed.

Proposal 4: updated list of RAN4 open issues for exception sheet:

- with additional open issues (as indicated in the list below)
- with deleted open issues (as indicated in the list below), two of which are removed based on the proposed down-scoping of CA within FR2-2 and intra-band non-contiguous CA

RF core requirements in 38.101-2

- Core requirements including
 - *operating bands*
 - channel raster
 - sync raster
 - MPR
 - A-MPR
 - SEM
 - Spurious
 - Blocking
 - CA
 - ACS
 - *Mandatory/optional UE channel bandwidths (newly added)*
 - *Optional faster transient (newly added)*
 - *Max input power (newly added)*
 - *FRCs (newly added)*

Requirements in 38.101-3

- *Inter-band CA configurations*

Requirements in 38.104

- 38.104 clause 9.6.2 (EVM window length within pending on conformance feasibility issues).

- 38.104 clause 9.6.3 (*Intraband non-contiguous CA TAE*)
- 38.104 clause 9.7.3 (*ACLR pending on the support of non-contiguous CA in Rel-17*)
- 38.104 clause 10.3 (FRC parameters for FR2 OTA reference sensitivity level)
- 38.104 clause 10.7 (*receiver spurious emissions for n264*)
- 38.104 clause 10.8 (modulated interfering signal type for receiver intermodulation requirement)

Requirements in 38.133

- 38.133 clause 7.1.2.1 (Gradual timing adjustment)
- 38.133 clause 7.5 (Maximum Transmission Timing Difference)
- 38.133 clause 7.6 (Maximum Receive Timing Difference)
- 38.133 clause 7.3.2.2 (Timing Advance adjustment accuracy)
- 38.133 clause 9.2.5 (Intra-frequency measurements without measurement gaps)
- 38.133 clause 9.2.6 (Intra-frequency measurements with measurement gaps)
- 38.133 clause 9.3.4 (Inter-frequency measurements with measurement gaps)
- 38.133 clause 9.3.9 (Inter-frequency measurements without measurement gaps)
- Receive beam sweeping scaling factor for RRM requirements
- Impact of LBT on RRM requirements
- Frame boundary alignment tolerance of PDSCH when deriveSSB-IndexFromCell is disabled

Feedback Form 7: Do you agree with proposal 4?

1 – Qualcomm Incorporated

For 38.101-2, we do not agree “Optional faster transient” is to be added. There were proposals to introduce the optional capability but it is not agreed so far. Adding this to the core requirement seems to imply the optional capability is agreed. We should leave the decision to introduce the capability or not in RAN4. For 38.101-3, we don’t think the inter-band CA configuration should be removed. For proposal 3, we are discussing intra-band CA within FR2-2. Inter-band CA also covers CA with FR1 or FR2-1.

2 – Apple (UK) Limited

We think it is a bit early to say RAN4 agreed to add optional faster transient, and therefore it should not be added in the list of open issues. That said, we are fine to leave it to further discussion in RAN4.

3 – Intel

- 1) 38.101-2: “Optional faster transient” – we are ok with Qualcomm proposal to discuss this directly in RAN4 and it may not be a part of exception sheet. Ok to remove operating bands
- 2) 38.101-3: Inter-band CA configurations – agree with Qualcomm that this is relevant CA combinations of FR1/FR2-1. Since Big CRs are not finalized, this task can be kept.

3) 38.104: Ok to remove receiver spurious emissions for n264. Intra-band CA support depends on the outcome of discussion for proposal 3, but we strongly think we should keep it as listed as explained in our comments for proposal 3

4 – ZTE Corporation

For intra-band CA case, we still propose to keep the contiguous CA case. For inter-band CA, FR1+FR2-2, based on agreed CR in **R4-2206053**, RAN4 already agreed the CR, we don't see the reason to remove that inter-band CA case.

5 – Huawei Technologies Sweden AB

- Inter-band CA in 38.101-3: initial set of band combinations were already agreed in RAN4. Still, if companies prefer to keep it as open issue, we are fine (as long as good justification is provided).
- Requirements in 38.104: RF requirements for intra-band non-cont CA to follow conclusion on Proposal 3.
- Requirements in 38.133: we have noticed one minor issue related to the last bullet on the frame boundary alignment tolerance of PDSCH when deriveSSB-IndexFromCell is disabled: it seems to be already concluded in R4-2206919. So it can be removed from the exception.

6 – Nokia Corporation

We are OK with the list in general, but there is another point that is missing from the RRM list which we would like to have included is regarding 120 kHz SCS UL timing accuracy requirement in

- 38.133 clause 7.1.2 (Te requirements for 120 kHz SCS)

As for faster transient, it would be cleaner to have it listed, even if including a clarification that the need for it has to be agreed too.

3.2.1 Summary of intermediate round

The majority of companies indicated a preference to down-scope only intra-band non-contiguous CA, while one company preferred to keep it in Rel-17 and check again in June TSG. Therefore the updated proposal 3 is provided:

Updated Proposal 3: down-scope intra-band non-contiguous CA within FR2-2 from Rel-17.

Regarding the list of open issues for the exception sheet, based on proposal 3 two requirements in 38.104 can be deleted. There seems to be consensus to also delete receiver spurious emissions for n264. Two companies did not agree removing inter-band CA configurations in 38.101-3. The majority of companies preferred not listing optional faster transient as this would still require an agreement to support in RAN4.

Finally, one company indicated that "frame boundary alignment tolerance of PDSCH when deriveSSB-IndexFromCell is disabled" is already completed, and one company asked to add "38.133 clause 7.1.2 (Te requirements for 120 kHz SCS)". These last two points would require further discussion and confirmation from other companies.

An updated list for further discussion based on the above summary is provided below:

RF core requirements in 38.101-2

- Core requirements including

- channel raster, sync raster, MPR, A-MPR, SEM, Spurious, Blocking, CA, ACS, Max input power, FRCs, Mandatory/optional UE channel bandwidths
- ~~operating bands, optional faster transient~~

Requirements in 38.101-3

- Inter-band CA configurations

Requirements in 38.104

- 38.104 clause 9.6.2 (EVM window length within pending on conformance feasibility issues).
- ~~38.104 clause 9.6.3 (Intraband non-contiguous CA TAE)~~ (note: based on down-scoping intra-band CA)
- ~~38.104 clause 9.7.3 (ACLR pending on the support of non-contiguous CA in Rel-17)~~ (note: based on down-scoping intra-band CA)
- 38.104 clause 10.3 (FRC parameters for FR2 OTA reference sensitivity level)
- ~~38.104 clause 10.7 (receiver spurious emissions for n264)~~
- 38.104 clause 10.8 (modulated interfering signal type for receiver intermodulation requirement)

Requirements in 38.133

- 38.133 clause 7.1.2 (Te requirements for 120 kHz SCS)
- 38.133 clause 7.1.2.1 (Gradual timing adjustment)
- 38.133 clause 7.5 (Maximum Transmission Timing Difference)
- 38.133 clause 7.6 (Maximum Receive Timing Difference)
- 38.133 clause 7.3.2.2 (Timing Advance adjustment accuracy)
- 38.133 clause 9.2.5 (Intra-frequency measurements without measurement gaps)
- 38.133 clause 9.2.6 (Intra-frequency measurements with measurement gaps)
- 38.133 clause 9.3.4 (Inter-frequency measurements with measurement gaps)
- 38.133 clause 9.3.9 (Inter-frequency measurements without measurement gaps)
- Receive beam sweeping scaling factor for RRM requirements
- Impact of LBT on RRM requirements
- Frame boundary alignment tolerance of PDSCH when deriveSSB-IndexFromCell is disabled (already completed?)

3.3 Layer 1 Features

Proposal 5 (option 2): replace the notes under FGs 24-1c, 24-4c and 24-5c for multi-RB PUCCH, and replace the bracketed notes under FGs 24-1b and 24-4b for wideband PRACH, with “This FG is only supported when PSD limitation applies”.

Feedback Form 8: Do you agree with or can you accept proposal 5?

1 – MediaTek Inc.

@ Moderator: although it is tagged FR2-2 in each capability, please could you clarify that this proposal is only applicable for bands with FR2-2? Also, is this ”bands where PSD limitation applies via regulation”? Or something more generic?

2 – MediaTek Inc.

Sorry I wasn’t clear enough:

@ Moderator: although it is tagged FR2-2 in each capability, please could you clarify that this proposal is only applicable for bands **within** FR2-2 **range**? Also, is this ”bands where PSD limitation applies via regulation”? Or something more generic?

3 – Qualcomm Incorporated

As commented in our first round response, our preference is option 1. However, we believe option 2 as in the current proposal is an acceptable compromise.

As to the comment from MediaTek, we believe this PSD limitation is from regulation, and we are discussing bands within FR2-2.

4 – Samsung Electronics Co.

We are also similar view as MTK and not clear about PSD limitation. We may propose to change such as ”This FG is only supported when PSD limitation applies in FR2-2 based on the regional regulations.”

5 – ZTE Corporation

Although we can accept this compromise option, there are similar views with MTK, that is, need to further clarify ”PSD limitation”.

6 – vivo Mobile Communication Co.

Our original preference is option3. But current formulation is also acceptable to us if FR-2-2 is clarified for PSD limitation.

7 – Apple Benelux B.V.

Although our primary preference is option 3, we are fine with Option 2 with the PSD limitation clarified as based on regulations and for FR2-2 only

8 – Intel

We would like to ask clarification on how the note would be interpreted.

For the same (unlicensed) band n263, there could be regulatory regions where PSD limitation is applicable and there could be regulatory regions where PSD limitation is NOT applicable.

For UE that supports this feature for n263 and originally placed in regulatory region with PSD, but later moves to a regulatory region that does not have PSD limitation. How is the feature expected to be interpreted with the note added?

From the UE perspective, it will support the feature regardless of geographical region. The note seems to be something that is intended to govern gNB behavior (not UE behavior), where in regions where PSD limitation does not apply, gNB shall not configure a wideband PRACH and PUCCH.

If the above interpretation is correct, we don't understand why this should be captured in the "UE" feature list. At best it should be captured in 37.213 or 38.213, although we are not sure if such restrictions at the gNB is necessary.

We would like to understand from the proponents of having the note, on how this feature is intended to be interpreted when UE is in different regulatory domain but uses the same band (i.e. n263).

9 – CATT

We still prefer option 1 and we have similar question as intel about how to interpret option 2.

10 – Guangdong OPPO Mobile Telecom.

We can accept option 2.

11 – MediaTek Inc.

Option 3 is the preference, but we could be ok with Option 2 if clarified it is for FR2-2 only, and where PSD is restricted by regulation. However, it would be best to indicate clearly in normative spec text (if not already) that this is only applicable for FR2-2 operation. In the Note it could refer to only being applicable for operation where regulations apply PSD limitation on transmission power.

12 – Ericsson LM

Our preference is Option 1 (and we are not supportive of Option 3). If Option 1 is not agreed, we would be fine with the Option 2 for the compromise it offers. Considering the comments, if we adopt the direction that Option 2 suggests, we can discuss further to clarify the details.

13 – LG Electronics Inc.

As we commented previously, we are OK as long as the same handling is applied to multi-RB PUCCH and wideband PRACH. However, if Proposal 5 is to be adopted, it seems that the question asked by Intel needs to be addressed.

14 – Huawei Tech.(UK) Co.. Ltd

Moderator: thanks for responses. Reading the comments there is good support for going with option 2 as a compromise, and for clarifying that the proposed note applies within FR2-2 based on the regional regulations. Therefore, I would like to provide an updated proposal 5 in advance of the GTW session for everyone to check:

Updated proposal 5 (option 2): replace the notes under FGs 24-1c, 24-4c and 24-5c for multi-RB PUCCH, and replace the bracketed notes under FGs 24-1b and 24-4b for wideband PRACH, with “This FG is only supported when PSD limitation applies within FR2-2 based on the regional regulations”

Please provide your further comments (if any) by today’s deadline of Monday, 21st March 11:00 UTC.

15 – HUAWEI TECHNOLOGIES Co. Ltd.

Although we prefer option 3 as expressed in the initial round, we can accept compromising to option 2 and fine with the updated proposal 5 from the moderator. Regarding the question raised by Intel, in our understanding, for a certain band with PSD in some regions but no PSD limitation for some other regions, this FG is only applied in the regions with PSD limitations, that is only in those regions the UE can report the support of this FG to gNB. In regions with no PSD limitation for this band, even if the UE actually supports this FG for the regions with PSD limitation, the UE will not report the support of this FG to gNB.

16 – Nokia Corporation

Though not our preference we can accept the moderator’s proposal in general, including proposal 5 above. Having said that, we do share the concerns from Intel on the most practical way of capturing such restriction. Is the intention to prohibit the UE of reporting the capability, e.g. if it moves to a region where the PSD limitation does not apply? Or is the intention to say UE in such region should not be configured to use such feature, even if it is declared as supported?

17 – MediaTek Inc.

Moderator latest proposal seems ok. I think even if the UE reports this always then the note is still worthwhile as it indicates where its usage is applicable.

3.3.1 Summary of intermediate round

Companies asked for clarifying that the note applies within FR2-2, and that the PSD limitation come from regional regulations. Some companies asked for clarification on the interpretation of such note and asked whether some corresponding requirement should be specified in RAN4 TS.

The updated proposal 5 is provided accordingly:

Updated Proposal 5 (option 2): replace the notes under FGs 24-1c, 24-4c and 24-5c for multi-RB PUCCH, and replace the bracketed notes under FGs 24-1b and 24-4b for wideband PRACH, with “This FG is only supported when PSD limitation applies within FR2-2 based on the regional regulations”

4 Final round

4.1 Status report

Proposals 1 and 2 below from RP-220889 were agreed on GTW on Monday March 21:

Proposal 1 (agreed): modify the SR in RP-220535 to extend the target date for the performance part to December 2022.

Proposal 2 (agreed): modify the SR in RP-220535 to align the list of open issues with the exception sheet.

4.2 Exception sheet

Final proposal 3 below from RP-220889 was agreed on GTW on Monday March 21, with a clarification that this is from the perspective of RF requirements:

Final Proposal 3 (agreed): down-scope intra-band non-contiguous CA within FR2-2 from Rel-17.

Let's continue the discussion to finalize the list of RAN4 open issues for the exception sheet, starting with list below. In particular, comments are requested on the proposals to add "38.133 clause 7.1.2 (Te requirements for 120 kHz SCS)" and to remove "Frame boundary alignment tolerance of PDSCH when deriveSSB-IndexFromCell is disabled".

The full list of proposed open issues for discussion is provided below, where striked-out items from intermediate round have been removed based on the responses and the GTW discussion.

Final Proposal 4: updated list of RAN4 open issues for the exception sheet (and the status report)

RF core requirements in 38.101-2

- Core requirements including

- channel raster, sync raster, MPR, A-MPR, SEM, Spurious, Blocking, CA, ACS, Max input power, FRCs, Mandatory/optional UE channel bandwidths

Requirements in 38.101-3

- Inter-band CA configurations

Requirements in 38.104

- 38.104 clause 9.6.2 (EVM window length within pending on conformance feasibility issues).
- 38.104 clause 10.3 (FRC parameters for FR2 OTA reference sensitivity level)
- 38.104 clause 10.8 (modulated interfering signal type for receiver intermodulation requirement)

Requirements in 38.133

- 38.133 clause 7.1.2 (Te requirements for 120 kHz SCS) (*note: added after intermediate round*)
- 38.133 clause 7.1.2.1 (Gradual timing adjustment)
- 38.133 clause 7.5 (Maximum Transmission Timing Difference)
- 38.133 clause 7.6 (Maximum Receive Timing Difference)
- 38.133 clause 7.3.2.2 (Timing Advance adjustment accuracy)
- 38.133 clause 9.2.5 (Intra-frequency measurements without measurement gaps)
- 38.133 clause 9.2.6 (Intra-frequency measurements with measurement gaps)
- 38.133 clause 9.3.4 (Inter-frequency measurements with measurement gaps)
- 38.133 clause 9.3.9 (Inter-frequency measurements without measurement gaps)
- Receive beam sweeping scaling factor for RRM requirements
- Impact of LBT on RRM requirements
- ~~Frame boundary alignment tolerance of PDSCH when deriveSSB-IndexFromCell is disabled~~

Feedback Form 9: Do you agree with updated proposal 4?

1 – Apple (UK) Limited

A small change for clarity: Te requirements for 120 kHz SCS -> Te requirements for 120 kHz UL signal SCS

2 – Huawei Tech.(UK) Co.. Ltd

Moderator: thanks Apple for the comment, let's consider this update as part of the final round discussion. Other companies, please comment if you have a concern on the update from Apple. Thanks.

3 – Nokia Corporation

As original proponents of including the clause which Apple #1 is amending above, we can confirm this change is fine for us.

4 – vivo Mobile Communication Co.

Support the latest list of open issues from moderators.

5 – Ericsson LM

It is fine for us as well

6 – Huawei Technologies Sweden AB

We are fine with the current list of RAN4 open issues for the exception sheet.

4.3 Layer 1 Features

Final proposal 5 below from RP-220889 was agreed on GTW on Monday March 21, changing "supported" with "applicable" as written below:

Final Proposal 5 (agreed): replace the notes under FGs 24-1c, 24-4c and 24-5c for multi-RB PUCCH, and replace the bracketed notes under FGs 24-1b and 24-4b for wideband PRACH, with "This FG is only applicable when PSD limitation applies within FR2-2 based on the regional regulations"

5 Conclusion

The following proposals from RP-220889 were agreed on GTW on Monday March 21:

Proposal 1 (agreed): modify the SR in RP-220535 to extend the target date for the performance part to December 2022.

Proposal 2 (agreed): modify the SR in RP-220535 to align the list of open issues with the exception sheet.

Final proposal 3 from RP-220889 was also agreed on GTW on Monday March 21 with the verbal clarification that the agreement to down-scope intra-band non-contiguous CA within FR2-2 in Rel-17 pertains to completion of the RF core requirements and is not intended to change how channelization for FR2-2 is developed.

Final Proposal 3 (agreed): down-scope intra-band non-contiguous CA within FR2-2 from Rel-17.

Final Proposal 5 (agreed): replace the notes under FGs 24-1c, 24-4c and 24-5c for multi-RB PUCCH, and replace the bracketed notes under FGs 24-1b and 24-4b for wideband PRACH, with "This FG is only applicable when PSD limitation applies within FR2-2 based on the regional regulations"

Based on the final round of discussion, the list of RAN4 open issues for the exception sheet is agreeable as copied below in Update Final Proposal 4:

Updated Final Proposal 4: list of RAN4 open issues for the exception sheet (and the status report)

RF core requirements in 38.101-2

- Core requirements including channel raster, sync raster, MPR, A-MPR, SEM, Spurious, Blocking, CA, ACS, Max input power, FRCs, Mandatory/optional UE channel bandwidths

Requirements in 38.101-3

- Inter-band CA configurations

Requirements in 38.104

- 38.104 clause 9.6.2 (EVM window length within pending on conformance feasibility issues).
- 38.104 clause 10.3 (FRC parameters for FR2 OTA reference sensitivity level)
- 38.104 clause 10.8 (modulated interfering signal type for receiver intermodulation requirement)

Requirements in 38.133

- 38.133 clause 7.1.2 (Te requirements for 120 kHz UL signal SCS)
- 38.133 clause 7.1.2.1 (Gradual timing adjustment)
- 38.133 clause 7.5 (Maximum Transmission Timing Difference)
- 38.133 clause 7.6 (Maximum Receive Timing Difference)
- 38.133 clause 7.3.2.2 (Timing Advance adjustment accuracy)
- 38.133 clause 9.2.5 (Intra-frequency measurements without measurement gaps)
- 38.133 clause 9.2.6 (Intra-frequency measurements with measurement gaps)
- 38.133 clause 9.3.4 (Inter-frequency measurements with measurement gaps)
- 38.133 clause 9.3.9 (Inter-frequency measurements without measurement gaps)
- Receive beam sweeping scaling factor for RRM requirements
- Impact of LBT on RRM requirements

Thanks to everyone for the constructive discussion on this work item.

6 References

- [1] RP-220403 Rel-17 Specification Finalization Nokia
- [2] RP-220535 SR for Extending current NR operation to 71GHz Qualcomm CDMA Technologies
- [3] RP-220536 Exception sheet on Extending current NR operation to 71GHz Qualcomm CDMA Technologies
- [4] RP-220611 Clarification of the applicability of certain new signal formats in 71GHz Qualcomm Incorporated
- [5] RP-220667 Views on work scope of PRACH for Rel-17 extending NR operation to 71GHz ZTE, Sanechips