[94e-28-R18-<5MHzDedSpec] - Version 0.0.5
RAN

3GPP TSG RAN Meeting #94e RP-213508

Electronic Meeting, 6th - 17th December, 2021

Title: Email discussion summary for [94e-28-R18-<5MHzDedSpec]

Document for: Decision

This NWM thread handles the proposed WID for NR support for dedicated spectrum less than 5MHz for FR1.

The starting point is the revision of the draft WID ([1], RP-212722) outcome of the October email discussion that can be found in https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-28-R18-lessthan5MHzDedSpec%5D/draft_WID_lessThan5MHz_RAN94e_v01_moderator.docx
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Other relevant tdocs submitted to RAN#94e are also considered here (see References).

1 Review of draft WID

The draft WID seemed to have reached a rather stable state after the previous rounds of email discussion. A couple of changes were proposed by the RAN Chair and are incorporated with change-tracking, also considering the points raised in [2], in the revised draft in https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-28-R18-lessthan5MHzDedSpec%5D/draft_WID_lessThan5MHz_RAN94e_v01_moderator.docx
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1.1 Initial round

Any remaining comments on the draft WID are invited here:

Feedback Form 1: Remaining comments on the WID

1 – Nokia Corporation This looks reasonable from our point of view
2 – Anterix Anterix and our partners are in full support of RP-212722, ”New WI: NR support for dedicated spectrum less than 5MHz for FR1”.
3 – Southern Linc. Southern Linc fully supports NR support for dedicated spectrum less than 5MHz for FR1.

4 – Classon Consulting

for FUTUREWEI Given the TU allocation, it is important to keep the RAN1 work as limited as possible which means minimum *specification* impact. That may need to be clarified. (The addition of functional support without optimization is OK, but it should be based off modifying the current design and not brand new unoptimized designs.) CSI-RS/TRS and PUCCH can probably be removed from the list as they are already functional/flexible.

5 – CMDI

Thanks Moderator for considering valid points. Generally, it is moving toward covergence. but there is still a question, how to evaluate it has been of functional support or it has not been? since it may work in 5dB SNR scenario, but it will not work under -3dB SNR enviroment. the key is not to introduce any new design to meet some specicial ”functional requirments”. We would like to propose,

Identify and specify necessary minimum ~~changes~~ mechanisms to enable PDCCH, CSI-RS/TRS, PUCCH, and PRACH for functional support without optimization and without changing existing design.

6 – vivo Communication Technology

We are supportive of this work in general. However, as commented also by other companies, there is concern on the unclear RAN1 impact, people have different understanding on what ”minimum changes” means. We understand RAN1 could allieviate the existing restrictions on CSI-RS/TRS BW to fit the <5MHz channel BW, which can be regarded as minimum changes. However, it is still not clear to us what minimum changes to PDCCH, PUCCH, PRACH can be introduced for what purposes, since these are fundamental NR design which has been flexible enough from Rel-15. We prefer to remove PDCCH, PUCCH, PRACH in that bullet if not clearly justified.

7 – MediaTek Inc.

We support the current version of the WID.

Regarding the impact to RAN1, we believe that Plenary can leave those technical details to RAN1 discussions. RAN1 only needs to introduce spec change if any problem of existing design is identified. And the change should be minimized. This is already clear in the objective in our view.

8 – QUALCOMM JAPAN LLC.

We support the version proposed by the moderator. We think that the current wording about functional support without optimization is enough such that RAN1 will only make the minimum amount of changes needed.

9 – ZTE Corporation

we are also supportive of this work in general. However for impacts on RAN1, we have the following observations and suggestions:

With puncturing 6 PRBs for PBCH channel for dedicated spectrum 3MHz (guard band has been considered), this will result in more than 5dB performance loss compared with ideal PBCH channel which might make NR system less competitive than LTE 3MHz system, therefore to minimize the performance degradation is still worthwhile and meaningful. In addition, puncturing will have the impacts on PDCCH CORSET#0. Therefore at least these two channels (PBCH, PDCCH CORESET#0) should be taken into account to check its performance degradation due to puncturing and try to minimize it in RAN1. For the other channels, like PUCCH, PRACH, we are fine to remove it; for CSI-RS impact in RAN1, we think the the changes might be limited to accommodate the 3MHz.

Based on the above considerations and we propose to have the following updates:

PBCH based on current design **while minimizing performance degradation**

Identify and specify necessary minimum changes to PDCCH, CSI-RS/TRS~~, PUCCH, and PRACH~~

10 – Swiss Federal Railways Ltd

UIC (International Union of the Railways)

In principle, UIC agrees with the procedure and the division of responsibilities according to RAN1 and RAN4. Accordingly, the individual work packages are included in the WI proposal. UIC's point of view is that the content of the subject areas in RAN1 / RAN4 has to be addressed in the necessary adjustments for the provision of CBW <5MHz. In addition, UIC assumes possible restrictions that may have an impact on the link budget. Regarding the aspect of the CBW approx. 3MHz, which was addressed in RP-213204, UIC would like to refer again to RWS-210280. Here the context was shown that for a period of approx. 10 years in Europe both systems FRMCS (Future Railway Mobile Communication System) with CBW approx. 3MHz and GSM-R can be operated at the same time. Flexibility plays an important role here, so that FRMCS can also use a CBW <3MHz, taking into account the systemic boundary conditions. Another important topics is the uplink in the rail communication context. Hence UIC is in favor to address relevant necessary adjustments applicable to PUCCH and PRACH.

11 – Shenzhen YZF Network Technolog

OPPO

We are generally fine with the current version. We also suggest to remove TRS/CSI-RS,PUCCH and PRACH. As for TRS/CSI-RS, there may be impact on the measurement in RAN4 while we don't see impact in RAN1.

12 – Samsung Electronics Co.

We share similar views with other companies. It is not clear on the "necessary minimum changes", especially for PUCCH, PRACH, as well as for CSI-RS/TRS. We understand that CORESET #0 might need some further check under smaller bandwidth. Consider RAN 1 work load, we suggest to delete "CSI-RS/TRS, PUCCH, and PRACH" and change "PDCCH" to "CORESET #0"

Another thing is that we would like to clarify 'from approximately 3 MHz' in the 1st main bullet regarding whether it means smaller than 3 MHz or larger than 3 MHz, which may give different impact on PBCH performance assuming that current PBCH design is directly reused.

13 – Deutsche Telekom AG

We still have a problem with the wording "dedicated" used throughout the WID.

We understand that this points to specific "dedicated" portions of the "dedicated" bands such as RMR-900 band, n8, n26 and n28 defined in the objectives. But does the wording "dedicated" also mean that the smaller than 5 MHz CBW is ONLY applicable in the specific part of the mentioned band ? I.e. that 3 MHz CBW is only applicable in n28 between 733-736 MHz (UL) and 788-791 MHz (DL) for PPDR. Or does it mean that the 3 MHz CBW would be applicable at any part of the band n28 ? (similar question for band n8)

14 – Orange

We are supportive of this WID for the use cases of RMR at 900 MHz and Public Safety at 700 MHz.

We also agree that the wording "functional support without optimization" is sufficient as a guidance within the WID description, and that detailed work will be adressed in RAN1 directly.

15 – Ericsson LM We have few comments on RAN4 specs: 1) The RRM performance target completion date in the WID. It is stated as RAN#102, which is same as core completion. The 38.133, RRM performance, target completion date should be RAN#104 i.e. 2 quarters after the core. This is according to RAN4 procedure and also aligned with performance target date for other specs e.g. TS 38.101-4. 2) There is no TS 38.141 spec rather 38.141-1 and 38.141-2. Both are BS performance and are needed. So please replace it with following specs using the same target completion date i.e. RAN#104. TS 38.141-1NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing TS 38.141-2NR; Base Station (BS) conformance testing Part 2: Radiated conformance testing
16 – Ericsson LM On the RAN1 aspects, we agree that ”functional support without optimization” is sufficient
17 – Intel Corporation (UK) Ltd We are fine with the latest version from the moderator.
18 – THALES We are generally supportive of this WID

1.1.1 Moderator’s comments on Initial Round

A majority of companies supported the revised WID as is. Several companies suggested some fine-tuning:

To Futurewei: That the mentioned impact is intended to refer to ”specification” impact can be clarified.

To companies suggesting to remove one or more of the mentioned physical signals/channels: There were suggestions in previous discussions that minor changes might be needed, so it seems wise to keep them in scope; of course, if no necessary changes are identified, then there won’t be any.

To companies suggesting that ”necessary minimum changes” is not sufficiently clear, or proposing to reinsert ”while minimizing performance degradation”, MediaTek summarised the situation well, and I can’t explain it better myself, so I quote their comment here: ”Regarding the impact to RAN1, we believe that Plenary can leave those technical details to RAN1 discussions. RAN1 only needs to introduce spec change if any problem of existing design is identified. And the change should be minimized. This is already clear in the objective in our view.” I have nevertheless inserted ”based on existing design”, which hopefully clarifies further while leaving RAN1 to its usual business.

To Samsung, regarding ”approximately 3MHz”: in the previous rounds of discussion it was indicated that there could be circumstances with FRMCS when it might be necessary to operate with about 2.8MHz of spectrum for NR.

To Deutsche Telekom, regarding the word ”dedicated” in the objectives: in my understanding, from the perspective of the RAN4 specifications, there would be no restriction on where in the listed bands the 3MHz CBW could be used; this would be up to the operator. I can modify the wording to make this clearer. Also the band number, n100, for the RMR_900 band is now defined, so we can use that.

To Ericsson: thank you for the corrections on the specification list.

1.2 Intermediate round

In the light of the initial round, a further revised draft WID is provided at
https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-28-R18-lessthan5MHzDedSpec%5D/draft_WID_lessThan5MHz_RAN94e_v02_moderator.docx

If there are any further essential comments, companies are invited to submit them here:

Feedback Form 2: Any further essential comments on WID v02

1 – ZTE Corporation

Thanks for moderators' great efforts to accommodate companies' comments received so far and update the WID , in general, we are fine with most of part, however for wording of minimizing performance degradation for PBCH channel and also CORESET#0, we still prefer to keep it in WID to give some guidance on future RAN1 work, otherwise the expected big performance degradation (more than 5dB performance loss for PBCH has been observed based on our evaluation results for puncturing) might cause NR based RAT less competitive than LTE 3MHz which should definitely be avoided for the benefit of its application at the end. To be short, we also seek for the minimize spec impact in RAN1, however its minimized performance loss should be also ensured with our best efforts.

2 – Apple (UK) Limited

Thanks to the moderator for updating the draft WID. We have two comments in section 4.1 Objectives:

1. We also support the wording "PBCH based on current design while minimizing performance degradation"

2. While it is stated "operate in spectrum allocations from approximately 3 MHz up to below 5 MHz" in both RAN1 and RAN4 objectives, RAN4 will only specify RF requirements for 3 MHz channel bandwidth in bands n100, n8, n26 and n28 and no other new channel bandwidth will be specified. Is this the common understanding?

3 – QUALCOMM JAPAN LLC.

We are fine with the moderator proposed WID and continue to support this work moving forward

4 – CMDI

As we commented in last round, we do not expect any change of the existing design, at the same time, it is strving for making it function at least, however, it is difficult to define what "functional support" is at this moment. In this sense, it maybe helpful to add a sub-bullet "investigate and define criteria/metrics for functional support"

5 – Panasonic Corporation

We support the propsal.

6 – MediaTek Inc.

The revised WID is fine to us.

7 – THALES

The revised WID is fine to us.

8 – Ericsson LM

The revised WID looks good to us

9 – Samsung Electronics Co.

Thanks to the moderator for your clarification (it seems that we missed previous discussion. Sorry about this).

The revised WID is fine to us.

10 – Anterix

We support the revised WID. Many thanks to the moderator for revising the WID, we fully support this and are looking forward to ensuring a future for our spectrum. We understand the performance related issues when compared to LTE that may happen due to puncturing. However, we are looking at how RE boosting may help alleviate these issues and allow NR performance to be improved

11 – vivo Communication Technology

The current version is acceptable to us.

12 – ZTE Corporation

To Anterix, Thanks for sharing your views and we think that we are on the same page to ensure its success for NR based dedicated system compared with LTE based system. Based on the existing BS Tx RF requirement in section 6.3.2.2 of TS 38.104, there is not RE power control requirement defined for PBCH channel, therefore at least it seems we have no basis at the current phase. In addition, to have whole channel power boosting for PBCH channel due to puncturing, this would result in higher rated output power of BS somehow which bring more implementation cost and power consumption at the end. Anyway, from our perspective, to keep the general guidance for minimizing performance degradation in the WID is still worthwhile and meaningful.

13 – Swiss Federal Railways Ltd

UIC (International Union of the Railways)

The provided revisions to the WID proposal are fine with us.

14 – Nokia Corporation

The current version is fine with us

15 – Nokia Corporation

and there is enough clarity for WGs now to do their work in this.

16 – Classon Consulting

for FUTUREWEI Thanks for the updated version, looks OK

17 – Intel Corporation (UK) Ltd We continue to support the latest version from the moderator.
18 – NOVAMINT We support the revised WID.
19 – Orange we are fine with the revised WID
20 – Deutsche Telekom AG The revised WID is fine with us under the consideration that the ”special” CBW is OPTIONAL for a UE supporting one on the listed bands, e.g. n8, n28 ...

1.2.1 Supporting companies list

Please indicate here if you would like your company to be listed as a supporting company on this WID:

Feedback Form 3: Supporting companies

1 – QUALCOMM JAPAN LLC. Please add ”Qualcomm Incorporated” to the list of supporting companies
2 – Panasonic Corporation We’d like to be supporting company.
3 – Ericsson LM Ericsson would like to be added as supporting company
4 – MediaTek Inc. Please add ”MediaTek inc” as one of the supporting companies
5 – Anterix Please add ”Anterix” as one of tte supporting companies.
6 – Southern Linc. Please add ”Southern Linc” to the list of supporting companies. Thanks.
7 – vivo Communication Technology vivo can support the WID.

8 – Swiss Federal Railways Ltd UIC (International Union of the Railways) Please add UIC to the list of supporting companies.
9 – Omnispace Omnispace supports this WID.
10 – Nokia Corporation Please add Nokia and Nokia Shanghai Bell as supporting companies
11 – Classon Consulting for FUTUREWE Please add FUTUREWEI as a supporting company.
12 – Intel Corporation (UK) Ltd Please add Intel as a supporting company. Thanks!
13 – NOVAMINT Please add ”Novamint” to the list of supporting companies.
14 – Deutsche Telekom AG Please add ”Deutsche Telekom” as supporter

1.2.2 Moderator’s comments on Intermediate round

It is pleasing to see that nearly all companies are now fully happy with the WID.

To Apple’s question 2: yes, your understanding is correct.

To Deutsche Telekom’s point, indeed it is understood that the new CBW would be optional in the listed bands, and this is clarified in the next version of the WID.

Three companies continued to discuss the handling of performance degradations and functional support, but most companies seem to feel the WID is OK as it is. Personally, I believe the WID sets the right tone for RAN1 to be able to consider wisely where to set the balance between specification impact and performance, to result in a system that can be considered to provide functional support.

I believe we can therefore close this discussion. The final version of the WID can be viewed at https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-28-R18-lessthan5MHzDedSpec%5D/draft_WID_lessThan5MHz_RAN94e_v03_moderator.docx (the only changes from v02 being the clarification of optionality of the new CBW, and the addition of supporting companies).

1.3 Final round

For the final round, we simply take a final opportunity for any further supporting companies to come forward.

Feedback Form 4: Additional supporting companies

1 – Samsung Electronics Co. Thank you very much for Moderator's effort. Please add "Samsung" as one of the supporting companies. Thank you very much for your efforts
2 – Samsung Electronics Co. Thank you very much for Moderator's effort. Please add "Samsung" as one of the supporting companies.
3 – ZTE Corporation Thanks for moderator's great efforts to draft the WID. In general, we are also supportive on this WID and we could further discuss how to ensure its performance in WG level. Please add ZTE Corporation and Sanechips as supporting companies.
4 – Xiaomi Communications Thanks moderator's effort. Please include Xiaomi in the supporting company list.
5 – Apple (UK) Limited Many thanks for the moderator's efforts and for confirming our understanding about RAN4 objectives. Please add Apple as a supporting company.

2 Conclusion

The final WID as a result of this discussion is provided for approval in RP-213571.

The Moderator thanks all companies for their very constructive discussion.

3 References

[1] RP-212722, "New WI: NR support for dedicated spectrum less than 5MHz for FR1", RAN4 chair (Huawei)

[2] RP-213204, "Discussion on WID on NR support for dedicated spectrum less than 5MHz for FR1", CMCC