**3GPP TSG RAN#89e RP-20xxxx**

**e-Meeting, September 14th – 18th, 2020**

**Agenda item:**

**Source:** 3GPP TSG RAN1 Chairman

**Title:** Handling overlapped objectives in Rel-17 RAN1 items

**Document for:** Discussion/Decision

# Introduction

In this document, we will provide a summary on how to handle overlapped objectives in Rel-17 RAN1 items based on the following two contributions:

* RP-201658 Handling of overlapping discussion across WI/Sis vivo
* RP-201760 On overlapping focus of PUCCH repetition enhancements across Rel-17 SI/WIs Nokia, Nokia SB

# Proposals

In total, there are three proposals presented in RP-201658 and RP-201760, which are discussed below.

## HARQ-ACK on PUCCH

As proposed in RP-201658:

* ***Proposal 1:*** *To treat the following enhancements for HARQ-ACK on PUCCH in URLLC/IIOT\_enh WI and do not consider them further in Cov\_enh item.*
	+ *UCI size reduction for HARQ-ACK on PUCCH*
	+ *Rel-16 PUSCH-repetition-Type-B like PUCCH repetition*
	+ *Short/mini-slot/sub-slot based PUCCH repetition*
	+ *Dynamic PUCCH repetition factor indication*
	+ *Power control enhancements for PUCCH carrying HARQ-ACK*

In RP-201760, it was observed that:

* *Observation: Discussions & studies on PUCCH repetition enhancements are, besides in the Rel-17 IIoT & URLLC Enhancements WI, also taking place in the Rel-17 SI on Coverage Enhancements and in the M-TRP enhancements in the Rel-17 MIMO WI with the same proposed enhancements. Overlapping discussions and potentially the specification of competing solutions in more than one Rel-17 WI is clearly inefficient and should be prevented.*

Conseqeuently, it was proposed that:

* ***Proposal 2:*** *Studies on TDMed PUCCH (i.e. PUCCH repetition) to be continued for the multi-TRP case based on RAN1#102-e agreements in the Rel-17 feMIMO WI, with the aim that if specified to also support the special case of having only a single TRP.*
	+ *Related studies and discussions in the Rel-17 IIoT & URLLC WI including sub-slot or sub-slot type of PUCCH repetition, PUCCH TPC enhancements as well as support of dynamic repetition indication and repetition of all (incl. short) PUCCH formats are to be minimized.*
	+ *Studies on the same techniques in the ongoing Rel-17 Coverage Enhancements SI are to be minimized for the rest of the SI phase or at least RAN should take this into account when defining the objectives of the follow-up Coverage Enhancements WI in one of the next RAN meetings.*

Questions:

* Do you agree with proposal 1 and proposal 2?
	+ Please elaborate the detailed thoughts
* Any other thoughts?

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| **Company** | **Views** |
| Nokia, NSB | We support proposal 2 for the reasons described in RP-201670 (Nokia).  |
| FUTUREWEI | Between proposal 1 and 2, we prefer proposal 1. Furthermore, in FeMIMO WI, the related work should be on mTRP perspective and not on generic PUCCH repetition work. |
| Intel | <On Proposal 1>We don’t support proposal 1 for the following reason.There should be no issue with keeping the potential overlap between URLLC and CovEnh since the overlaps happen in the study phase and it may be important to look into the potential enhancements in the appropriate assumptions of a given WI/SI.<On Proposal 2>We are fine with main bullet of proposal 2 for the following reason, but think a single sub-bullet is sufficient stating “*Studies involving the same solutions in Rel-17 IIoT & URLLC WI and Coverage Enhancements SI should take this into account*”.We tend to agree with the analyses in RP-201670. Basically, it is identified that the agreements on TDMed PUCCH (i.e. PUCCH repetitions) are already in normative state, and also that MIMO is better positioned to generalize single-TRP and multi-TRP operation. On the other hand, we think a single sub-bullet is sufficient stating “*Studies involving the same solutions in Rel-17 IIoT & URLLC WI and Coverage Enhancements SI should take this into account*”. In this way, it does not preclude having other solutions or enhanced solutions in the other SI/WIs while clarifying the discussions in MIMO WI on the solutions based on agreements in RAN1 #102e will continue without expanding scope in MIMO WID. |
| Panasonic | On proposal 1, we support it as to improve the reliability of short PUCCH and to increase the coverage of short PUCCH are quite same technique. Note that to increase the coverage/reliability of long PUCCH is not so related to URLLC/IIOT\_enh WI because of the latency and it should be covered by Coverage Enhancements SI.On proposal 2, following discussion points would be more suitable in URLLC/IIOT\_enh WI.- the interaction with PUSCH related to processing time and the processing order- the priority handlingTherefore, single TRP handling should be handled in URLLC/IIOT\_enh WI and its extension to multpile TRP operation should be carried out in feMIMO WI. |
| ZTE | **On Proposal 1:** Moving all these potential enhancements into URLLC/IIoT WI would significantly increase the workload there and may impact the overall progress of the normative work. It would be more appropriate to discuss this when NR CE SI moving to WI phase. At that time, a more prudent decision could be made based on further evaluations and a better workload balance. **On Proposal 2:**The focus in FeMIMO WI should be on enhancements for multiple TRP rather than single TRP. This should not only apply to PUCCH repetition but also other enhancements for PUCCH and also enhancements to PUSCH/PDCCH as in FeMIMO WI scope.**Other:**In case we plan to make some decisions on detailed work split in this RAN meeting, how to handling A-CSI on PUCCH should also be considered. It was discussed in both URLLC/IIoT WI and CE SI in RAN1#102-e meeting. |
| Samsung | We do not support either proposal 1 or proposal 2. Proposal 1 focuses only on HARQ-ACK and includes aspects that seem irrelevant to the URLLC WI. Proposal 2 intends to include in multi-TRP aspects related to PUCCH coverage enhancements when there is no such correlation or relevant WI objective.CovEnh should remain the WI dealing with coverage enhancements, including for PUCCH. There is no reason to modify WIDs. Some overlapping of issues among WIs is not without precedent and can be handled in RAN1 as in past cases. MIMO should handle only TDM aspects related to M-TRP. URLCC should handle only ‘sub-slot’ related aspects or they can also be handled in CovEnh. |
| vivo | First of all, we think the most important thing is to find a solution to avoid duplicated discussion in different WI/SIs or email threads as much as possible. Indeed we had past experience that some overlapping discussion across different items, but now the overlapping has became too much as discussed in both 1658 and 1760 especially considering the e-meeting efficiency, so some management action is required. URLLC is work item and coverage enhancement is now still study item. To evaluating PUCCH coverage problem is importantt for coverage study, however, if we are going to discuss the details of each proposed enhanced schemes (as feature leads had already trying to discuss), it would be good to have a single place to talk about a particular enhancement to avoid duplicated design.We support proposal 1 as the resolution of overlapping between coverage enh and URLLC/IIOT regarding PUCCH related enhancements. 1760 made good point about overlapping discussion on PUCCH repetitions for single and multiple TRPs, our preference would be to develop a basic single TRP solutions in URLLC/IIOT WI and based on which the multiple TRP solutions can be further developed in FeMIMO WI.  |
| CATT | Between proposal 1 and proposal 2, we prefer proposal 2. Both IIoT/URLLC and FeMIMO are Rel-17 WIs. It is desirable to maximize the commonality between the solutions for single-TRP and multi-TRPs cases. |
| OPPO | For PUCCH repetition enhancement and power control enhancement, mentioned by two proposals, we are fine with main bullet of proposal 2 and agree with sub-bullet updated by Intel to include requirements or solutions from Rel-17 IIoT & URLLC WI and Coverage Enhancements SI. ***Updated Proposal 2:*** *Studies on TDMed PUCCH (i.e. PUCCH repetition) to be continued for the multi-TRP case based on RAN1#102-e agreements in the Rel-17 feMIMO WI, with the aim that if specified to also support the special case of having only a single TRP.** *Studies involving the same solutions in Rel-17 IIoT & URLLC WI and Coverage Enhancements SI should take this into account*

For UCI size reduction, mentioned by proposal 1 only, we are fine to leave it in Rel-17 IIoT & URLLC WI and prefer to continue discussion in Intra-UE multiplexing/prioritization .The justification is as below:* UCI size reduction,i.e. HARQ-ACK compression/compaction, has been discussed in Intra-UE multiplexing/prioritization and captured in agreement in RAN1 102e.
* It could cover both UCI size reduction with the same priority and UCI size reduction with different priorities. The later can not be covered in coverage enhancement, but it is important to ensure URLLC reliability.

***Updated Proposal 1:*** *To treat the following enhancements in Intra-UE multiplexing/prioritization in Rel-17 URLLC/IIOT\_enh WI and do not consider them further in Cov\_enh item.* * *UCI size reduction for HARQ-ACK on PUCCH, including UCIs with the same priority and UCIs with different priorities.*
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| NEC | We don’t support proposal 1 or 2.For proposal 1, if the conclusion in URLLC/IIOT\_enh WI can be used in coverage enhancement, this will be reflected in the coverage WID preparation. Theres is no need to make the proposal 1 right now.For proposal 2, the overlapping issue for feMIMO and IIoT & URLLC is different. If there is contradiction in the futhre meetings, RAN1 can handle it. So no RAN conclusion is needed. |
| Qulcomm | We support Proposal 2. Choosing PUCCH repetition over using a longer PUCCH duration should be motivated by attaining some diversity (changing beams, changing QCL, changing frequency), which aligns well with the mTRP design objectives.  |
| LG | For proposal 1, we think work split can be done in RAN1 reflecting the discussion and do not support official split in this RAN meeting. For example, PUCCH repetition can be treated in URLLC/IIOT but coverage enhancement may also treat extreme cases of PUCCH repetition.For proposal 2, we don’t see strong necessity of work split between MTRP and coverage enhancement at this point of time since they need to be discussed in RAN1 in different motivations of each item. |
| NTT DOCOMO | We basically prefer proposal 2 compared with proposal 1 as single TRP case is a subset of multi-TRP case. On the other hand, we can also understand comments from other companies that sub-slot related aspects should be discussed in URLLC/IIoT WI. In that sense, we can be flexible and Intel’s update may be fine. Other than PUCCH repetition enhancement, e.g., UCI payload size reduction, we think such potential enhancements can be discussed in CovEnh SI and URLLC/IIoT WI, and when CovEnh SI is finished we can discuss scope of WIs to avoid the overlapping. |
| Huawei, HiSilicon  | In our understanding, proposal 1 is to address the potential overlapping between Rel-17 URLLC/IIoT WI and Rel-17 coverage enhancement SI. We are open with discussing it either under Rel-17 URLLC or under Rel-17 coverage enhancements, but slightly prefer the way as shown in proposal 1 here, since the sub-bullets given in proposal 1 here are more related to enhancements for reliability and/or latency. If we go with proposal 1 here, other enhancements proposed in coverage SI can still be discussed in coverage SI, e.g. DMRS less PUCCH. Propoal 2 is to address the potential overlapping between Rel-17 URLLC/IIoT WI and Rel-17 MIMO WI. We can understand the intention but we prefer not to put all discussion under MIMO WI at least from workload balance perspective. Similar as what we did in Rel-16, Rel-17 URLLC/IIoT can still focus on the enhancements for single TRP, while MIMO can focus on multi-TRP and/or multi-beam. That is, PUCCH enhancements for single TRP can be discussed in Rel-17 URLLC/IIoT WI, while mTRP specific issues can be further discussed in Rel-17 MIMO agenda, e.g. PUCCH transmission with different beams related issues.  |
| Ericsson | **General:**We support the intentions behind these proposals and completely agree that parallel works on the same feature in different WI that result in developing features capable of solving the same problems, should be avoided. That means that any decision from WGs or RAN plenary if needed, to ensure this goal is supported. Having said that, we think the waiting one more WG meeting would help to have a better clarity on the scope of supported proposals. The reason is that all the proposals are in form of FFS without clear outcome of support at this stage. Limiting the discussion to one WI affects the motivations needed for supporting the enhancement in discussion. When consensus has reached to develop a feature, coordination between different SIs/WIs is crucial to avoid overlapping. Therefore, we see this discussion definitely increase the awareness on the identified overlapping topics. This understanding should help RAN1 in the next meeting to be committed to avoid overlapping when developing the features. If needed, further decisions can be made in next plenary. **Details comments on Proposals:*** On Proposal 1 in RP-201658 and Overlap between URLLC and Cov. Enh, our view is that:
	+ Support of Type B PUCCH repetition or dynamic repetition is not imporving the coverage but improve the method for enabling repetition.
	+ In Cov. Enhancemnt, the focus is on UCI payload of maximum 11 bits to ensure good coverage is achieved in for at least UCI of 11 bits. This is different from enabling methods for payload reduction that are discussed under eURLLC.
* On Proposal 2 in RP-201760, PUCCH repetiton enhancement is discussed in eURLLC/eMIMO/Cov.Enh (all as FFS). Our view is that:
	+ The solutions developed should be generic appiclabe to both a super set and sub-sets of the super-set. We should avoid unnecessary fragmentations and customized solutions when possible.
		- A solution developed for m-TRP should work single TRP.
		- A solution developed for 2-level priority should work for single (low) priority.
		- A solution developed for sub-slot based, should be applicable to slot based.
	+ Support of Type B PUCCH repetition or dynamic repetition is not imporving the coverage but improve the method for enabling repetition (similar to Proposal 1).

Therefore, we propose to update the proposals as the following:**Update proposal:*** Focus to continue discussions in eURLLC and eMIMO WIs on enhancements needed for PUCCH repetitions. If/When developing soltions the followings are considered:
	+ A solution developed for m-TRP should work single TRP.
	+ A solution developed for 2-level priority should work for single (low) priority.
	+ A solution developed for sub-slot based, should be applicable to slot based.
* Minimize/[avoid] discussions on support of Type B PUCCH repetition or dynamic repetition of PUCCH in Cov. Enh. SI.
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Based the feedbacks so far, the following is proposed:

Proposal:

* Handling of overlapped objectives involving Rel-17 feMIMO, Rel-17 IIoT/URLLC and Rel-17 Coverage Enhancements is to be discussed in RAN#90-e.

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| **Company** | **Views** |
| Nokia, NSB | For the proposal from the moderator, it still needs to be clarified what is the expected handling of these objectives in Q4 in RAN1. The fact that there are many different views above indicate that there are different views on which discussions belong in each WID. Without a guidance from RAN Plenary, companies will be compelled to submit contributions to both WIDs, which in turn will require significant extra work from feature leads to separate the proposals and try to avoid conflicting decisions during RAN1#103-e. It is likely to increase the email traffic during the meeting as well, when trying to sort out which decisions belong where. Since the topics are typically chaired by different persons in RAN1, this is a non-trivial task. Hence, if we are going for the proposal above, it needs to be extended with a guidance from RAN1 chairman on the way forward for these topics in Q4.  |
| Intel | Support proposal |
| FUTUREWEI | Support proposal |
| Panasonic | Support proposal |
| vivo | Similar to what commented by Nokia, we think it would be better to have some guidance so as to improve the efficiency of WG discussion in Q4. Even if we cannot agree to any resolution this meeting, we hope the issue is now well acknowleged. The proposal by RAN1 Chair gives companies to have more time to think about the issue and the potential resolution. Although not preferred, but we are fine to discuss further and make a decision in RAN#90e. |

## Coverage enhancement features involving Rel-17 RedCap and CovEnh SIs

As proposed in RP-201658:

* ***Proposal 3****: we suggest the following work split between Cov\_enh and RedCap item for coverage enhancement features*
	+ *During “coverage problem” identification process, to carry on coverage study for bottleneck channel identification for normal UE and RedCap UE individually together with the target for improvement*
	+ *During the “technical enhancement” process*
		- *To discuss UL channel relate enhancement techniques (if any) in Cov\_enh for both normal UE and RedCap UEs*
		- *To discuss DL channel related enhancement techniques (if any) in RedCap for both normal UE (if applicable) and RedCap UEs.*

Questions:

* Do you agree with proposal 3?
	+ Please elaborate the detailed thoughts
* Any other thoughts?

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| **Company** | **Views** |
| Nokia, NSB | Given that those are both SIs with a similar timeline, we do not see significant concern on the related coverage studies, as to our understanding the underlying assumptions for those UEs are different enough to justify separate studies. Potential sinergies can be further considered when moving to a WID phase.  |
| FUTUREWEI | The proposal is not needed at this point. We can discuss how to align the normative work when converting them to WIs. |
| Intel | Such work-split is not necessary at this stage. Evaluation methodology and assumptions in RedCap SI for studies on coverage performance for RedCap UEs are already being maximally aligned with CE SI approaches. Thus, we may not need to decide on any scoping now. We also agree with Nokia that potential overlaps on normative work can be avoided with proper scoping of the WIs. |
| Panasonic | Although work item split can be proposed direction depending on the outcome of study item, at this momemnt of SI, it is not required to agree proposal 3 for now. |
| ZTE | We agree that a proper handling on the scope can be considered further to avoid potential overlapping. While, it may be a bit premature as commented by other companies, and it could be discussed when moving to WIs.  |
| Samsung | There is no need for proposal 3. The scope of each SI is clear. The handling on potential overlapping can be discussed during WID drafting later.  |
| China Telecom | Since both CovEnh and RedCap are SIs and the scenarios/targets are different, we do not see the necessity of work-split at this stage. But we do agree that overlapping should be avoided during WI phase. This can be done during the scoping of the WIs based on the outcome of SIs. |
| vivo | As mentioned in proposal 3 above, during the study item phase, i.e. the “*“coverage problem” identification process*”, we can continue current evaluation in both coverage SI and Redcap SI (no need to adjust the scope now) and keep in mind that proper split of objectives should be done when converting the two SIs into WIs at RAN#90/91. |
| CATT | We agree with the comments above that proposal 3 is not needed for now. We can further discuss how to split the work across different items when moving to WIs. |
| OPPO | The proposed change is to reduced the possible duplicated work further. If we can agree how to differenciate the works, we can do it. For simply divding the task by UL and DL, we are hesitate in this stage as the evalutation assumption and enhancement target are different in 2 SI. Then, this means we should take 2 approachs in each SI.Thus, we prefer to solve the problem until sufficient study is done. |
| Spreadtrum | We agree the Proposal 3.As mentioned by vivo, it is related to “coverage problem” idinfication process. If it is agreed to compensate the bottleneck channel **for the reference NR UE** within the same deployment scenario in RedCap, we do not see the difference b/w RedCap and CE in term of coverage compensation both for normal UE. As well known, the bottleneck channel is always the UL channel which is seldom affected by the currently proposed device complexity reduction. So, if we do not split the boundary properly, we may not reach the RedCap SID objective “Coverage recovery to compensate for potential coverage reduction due to the device complexity reduction” finally.  |
| NEC | We don’t agree with proposal 3. The work split can be handled in WID preparation. |
| Qualcomm | Regarding the first part of the proposal on the “coverage problem” identification process: Although some ongoing coordination is needed to avoid duplication of work, the current SIDs reflect already what is being proposed.Regarding the second part of the proposal on the the “technical enhancement” process: We don’t think that an agreement is needed now. The concrete way of avoiding duplication of work should be decided as part of the WID drafting discussion.  |
| LG | We don’t see a strong need of DL-UL separation between two items. |
| NTT DOCOMO | We also think at least second sub-bullet of proposal 3 should be discussed when SIs are finished. |
| Huawei, HiSilicon  | Similar issue is also under the discussion in the email thread [89E][24][R17\_REDCAP\_scope], we think it would be good to have this discussion in only one email thread, we prefer to discuss it in the email thread for Redcap scope.  |
| Ericsson | We don’t see any action needed at this stage from RAN plenary.The motivations for study in these two SI are different. CovEnh focuses on general coverage enhancement, while RedCap focuses on coverage compensation due to UE complexity reduction (borrowing CovEnh solutions and/or coming up with RedCap specific solutions).Splitting based on UL and DL between these two at this stage is imature.As we mentioned in [89E][24][R17\_REDCAP\_scope], the relation between the RedCap WI and CE WI can be sorted out when the corresponding WIDs are produced (i.e. no need to discuss it in this meeting). |

Based the feedbacks so far, the following is proposed:

Proposal:

* No need to further discuss overlapped coverage enhancement features involving Rel-17 RedCap SI and Rel-17 CovEnh SI at this stage.

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| **Company** | **Views** |
| Intel | Support proposal |
| FUTUREWEI | Support proposal |
| Panasonic | Support proposal |
| vivo | Fine with the proposal for now. We assume a propoer work split is to be done during the drafting of Cov\_enh and RedCap WIDs.  |

## Other Aspects

Questions:

* Any other thoughts?

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| **Company** | **Views** |
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# Conclusion

Based on the email discussion, the following are proposed:

* Handling of overlapped objectives involving Rel-17 feMIMO, Rel-17 IIoT/URLLC and Rel-17 Coverage Enhancements is to be discussed in RAN#90-e.
* No need to further discuss overlapped coverage enhancement features involving Rel-17 RedCap SI and Rel-17 CovEnh SI at this stage.

# References

RP-201658 Handling of overlapping discussion across WI/Sis vivo

RP-201760 On overlapping focus of PUCCH repetition enhancements across Rel-17 SI/WIs Nokia, Nokia SB