3GPP TSG RAN WG1 #110bis-e R1-22xxxxx

**E-Meeting, October 10th – 19th, 2022**

**Agenda item: 8.8**

**Source: Moderator (China Telecom)**

**Title: [110bis-e-R17-CovEnh-01] Summary of email discussion to determine maintenance issues**

**Document for: Discussion and Decision**

# Introduction

This contribution is a summary of the following email discussion to identify maintenance issues for Rel-17 NR coverage enhancements in RAN1#110bis-e.

[110bis-e-R17-CovEnh-01] Email discussion to determine maintenance issues to be handled in RAN1#110bis-e by October 12 – Jianchi (China Telecom)

* Additional email discussions will be set up once the maintenance issues for RAN1#110bis-e are determined

# Discussion

## Enhancements on PUSCH repetition type A

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| **Issues** | **Related contributions** | **Initial assessment** |
| **Issue#1**: Restriction on K2 offset for DG-PUSCH with K>1 and Out-of-order handling when AvailableSlotCounting is enabled | [R1-2209227], [R1-2210160] | Suggest **NOT** to be discussed in RAN1#110bis-e. |
| **Issue#2**: Adding the missing dropping case for PUSCH repetitions and TBoMS due to DAPS handover (i.e., adding the reference to Clause 15 of TS38.213) | [R1-2209468] | Suggest waiting until progress is made in AI 7.2. |
| **Issue#3**: Adding the missing dropping case for TBoMS with a configured grant due to HD-FDD operation (i.e., adding the reference to Clause 17.2 of TS38.213) | [R1-2209468] | Suggest **NOT** to be discussed in AI 8.8. (The proposed correction is to be reviewed under AI 8.6) |

FL’s comments:

**Issue#1**

These two contributions are both discussing the clarification of out-of-order issue. FL’s observation is that the discussion of out-of-order issue would fallback to the discussion on the necessity of the K2 offset restriction, because the clarification seems unnecessary if the restriction is adopted. For the K2 offset restriction, we would be very likely to land in the dead-lock situation again. Moreover, the arguments which had raised in the past meetings are as the following looks more like a Rel-15/16 issue.

* Arguments from chipset vendors: The legacy UE implementation might be based on the assumption that the gNB never choose the K2 offset that indicates the invalid slot for PUSCH transmission, although that is not explicitly prohibited by Rel-15/16 RAN1 specifications. Rel-17 CovEnh UE implementation follows the same principle in terms of the use of the K2 offset.
* Arguments from network vendors: Rel-15/16 RAN1 specifications do not have the restriction on the network’s choice of the K2 offset value. For Rel-17 CovEnh operation, any additional restriction on the K2 offset value is acceptable.

Based on the above observation, FL’s initial assessment on this issue is “not to discuss it in this meeting.”

**Issue#2**

For the dropping rule for PUSCH repetition and TBoMS described in TS38.214, ZTE is proposing adding the reference to Clause 15 of TS38.213 so that it covers the case when UE cancels the transmission on the source cell during dual active protocol stack-based (DAPS) handover. The proposed correction looks valid. On the other hand, this issue exists in Rel-16 as well, and the similar corrections are proposed for Rel-16 in R1-2209465 under AI 7.2. If the proposals for Rel-16 are agreed, the mirror CR would be likely to apply to Rel-17 as well. Therefore, it is suggested waiting for progress in AI 7.2 discussion, and then discuss the proposed correction focusing on what has not been covered by the corrections agreed for Rel-16, if necessary.

**Issue#3**

For the dropping rules for PUSCH repetition and TBoMS described in TS38.214, ZTE is pointing out that the reference to Clause 17.2 of TS38.213 is missing for Type-2 CG-PUSCH with TBoMS. The proposed correction looks valid. On the other hand, there is a joint proposal [R1-2209779] from 5 companies under AI8.6, and R17 RedCap Moderator’s summary document [R1-2210245] has already captured the ZTE’s proposed correction as well. Therefore, it is suggested leaving this issue to R17 RedCap Moderator and not discussing it in AI 8.8.

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| **Company** | **Views** |
| Spreadtrum | Issue#1: Support FL’s assessment  Issue#2: Support FL’s assessment  Issue#3: Support FL’s assessment |
| Apple | Issue#1: agree with FL’s assessment, no further discussion is needed.  Issue#2: no need to discuss, this is mirrored of Rel-15 CR R1-2209465.  Issue#3: agree with FL’s assessment. |
| CATT | Agree with FL’s assessment for all three issues. |
| Xiaomi | Agree with FL’s assessment for Issue#1-Issue#3. |
| Panasonic | Issue#1: Although we prefer to make the specification clearer on the out-of-order issue, considering the situation in the previous meetings, the FL’s initial assessment is acceptable.  Issue#2: We support FL’s initial assessment.  Issue#3: We support FL’s initial assessment |
| NTT DOCOMO | Support the moderator's assessment for all three issues. |
| ZTE | Issue#1: Support FL’s assessment  Issue#2: We are ok to wait for the progress in AI 7.2. Considering Issue#3 proposed in R1-2209468 would be discussed in RedCap WI, we are also ok to treat Issue#2 as a mirror Rel-17 CR of Rel-16 CR R1-2209465.  Issue#3: Ok with FL’s suggestion. |
| Nokia/NSB | Issue#1: We would prefer clarifying this issue once and for all, since we would like to avoid future debates on aligning the understanding of the specification for future implementations. Ambiguity is never welcome, if you can spot it in advance, and in the case RAN1 can. Having said this, there seems to be only 2 companies willing to discuss this, hence FL’s initial assessment seems correct.  Issue#2: We support FL’s initial assessment.  Issue#3: We support FL’s initial assessment |
| vivo | Fine with FL’s suggestions for all the 3 items. |
| Sharp | Support FL’s initial assessment for all the 3 issues. |
| Lenovo | Issue #1: fine with FL’s initial assessment for progress. Agree with FL’s initial assessment for issue #2 and issue #3. |
| Intel | Issue#1: Agree with FL suggestion.  Issue#2: Agree with FL suggestion  Issue#3: Agree with FL suggestion |
| Samsung | Agree with FL assessment for issues 1 and 3. For issue 2, no need to discuss here, the same CR is proposed in another AI. |
| QC | Okay with FL’s assessment on all 3 issues. |
| InterDigital | Agree with FL’s assessment on all 3 issues. |
| Huawei, HiSilicon | OK. |
| Ericsson | Issue#1: Support FL’s assessment. The issue has been discussed thoroughly in RAN1#109 meeting.  Issue#2: Support FL’s assessment. The CR changes the collision handling rule for PUSCH repetition Type A based on physical slots and PUSCH repetition Type B. Both are out of the scope of AI 8.8 and can be discussed in AI 7.2 first.  Issue#3: Support FL’s assessment. |
| OPPO | Agree with FL’s assessment for all three issues. |

## Joint channel estimation

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| **Issues** | **Related contributions** | **Initial assessment** |
| **Issue#1**: DMRS bundling for multiple carriers | R1-2208414, R1-2208415, R1-2208766, R1-2209035, R1-2209226, R1-2209461, R1-2209462, R1-2209532, R1-2209561, R1-2209668, R1-2209707, R1-2209872, R1-2209948, R1-2210180 | This issue is discussed in [110bis-e-R17-CovEnh-02]. |
| **Issue#2**: UE behavior of restarting DMRS bundling | R1-2208608, R1-2208766, R1-2208840, R1-2208841, R1-2208943, R1-2209035, R1-2209132, R1-2209308, R1-2209669, R1-2209707, R1-2209872, R1-2209948, R1-2210162 | **[High Priority]** Suggest to be discussed in RAN1#110bis-e based on RAN#97e’s guidance. |
| **Issue#3:** Group common TPC commands with format 2\_2 | R1-2210181, R1-2210182 | Suggest **NOT** to be discussed in RAN1#110bis-e.  This issue was discussed extensively in past RAN1 meetings and some companies think no further discussion on this issue. From FL understanding, it’s very difficult to achieve consensus. |
| **Issue#4:** m-TRPs mapping with DMRS bundling | R1-2210162, R1-2210163, R1-2210164 | Suggest **NOT** to be discussed in RAN1#110bis-e.  This issue was discussed in RAN1#110. The majority companies think it’s not proper to introduce a new feature or optimization during the maintenance phase. |
| **Issue#5:** Correction on events for determining TDW | R1-2210214 | **[Low Priority]** Suggest to be discussed in RAN1#110bis-e. |

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| **Company** | **Views** |
| Spreadtrum | Support FL’s assessments for Issue#1-Issue#5 |
| Apple | Issue#2: agree with FL’s assessment.  Issue#3: agree with FL’s assessment. The issue was concluded in RAN1#109-e meeting.  Issue#4: agree with FL’s assessment.  Issue#5: agree with FL’s assessment. |
| CATT | Agree with FL’s assessment for all five issues. |
| Xiaomi | Agree with FL’s assessment for Issue#1-Issue#5 |
| Panasonic | We support FL’s initial assessment. |
| NTT DOCOMO | Support the moderator’s assessment. |
| ZTE | Agree with FL’s assessments. |
| Nokia/NSB | Agree with FL’s assessment |
| vivo | Fine with FL’s initial assessment. |
| Sharp | Support FL’s initial assessment. |
| Lenovo | Agree with FL’s assessment |
| Intel | Agree with FL’s assessment |
| Samsung | Agree with FL assessment. |
| QC | Okay with FL’s assessment |
| InterDigital | Agree with FL’s assessment |
| Huawei,, HiSilicon | OK with the arrangement except for the priority. Suggest to remove the priority because it is unclear how to handle priority in the CR email thread. |
| Ericsson | We support FL’s assessments for Issue#1, #2, #4, and #5.  For Issue#3, our intention is to address how to interpret the spec given that agreement could not be reached on DCI 2\_2 TPC in RAN1#109. Our interpretation of the current specs is if a TPC command is to take effect during a configured time domain window, the UE will follow the legacy behavior and abide by the TPC command and therefore break phase continuity. Even if some UEs ignore the TPC command so as to keep phase continuity, to be on the safe side, the network would not perform DMRS bundling between and after the time it takes effect, in the same way as if TPC command is a dynamic event. The CR in R1-2210182 attempts to clarify this. The CR will also have the benefit of more clearly defining power consistency, in that it is not maintained when TPC is applied with the CR, whereas the current RAN1 and RAN4 specs do not define power consistency. Nevertheless, we do understand the difficulty in achieving consensus with respect to power control and DMRS bundling, and if no other company sees a benefit in this clarification, we can accept not discussing issue #3. |
| OPPO | Agree with FL’s assessment. |

## Type A PUSCH repetitions for Msg3

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| **Issues** | **Related contributions** | **Initial assessment** |
| **Issue#1**: Correction on MCS determination of RAR grant | R1-2208942 | Not essential. Suggest **NOT** to be discussed in RAN1#110bis-e. |

FL’s comments:

In R1-2208942, CATT proposes to clarify the MCS determination with using the first sixteen indexes for PUSCH scheduled by RAR UL grant described in Clause 8.2 of TS 38.213 is only applicable to the case that UE doesn’t request Msg3 repetition. From FL perspective, the current specification is already clear, because the MCS determination rule in case of UE requesting Msg3 repetition has been clearly specified in Clause 8.3 of TS 38.213 with referring details to Clause 6 of TS 39.214. There is no ambiguity here.

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| **Company** | **Views** |
| Spreadtrum | Support FL’s assessment. |
| Apple | agree with FL’s assessment. |
| CATT | In our view, the correction is valid, and can eliminate the contradictory between Clause 8.2 and Clause 8.3. But we can live with the majorities’ view. |
| Xiaomi | Support FL’s assessment. |
| Panasonic | We support FL’s initial assessment. |
| NTT DOCOMO | Support the moderator’s assessment. |
| ZTE | Agree with FL’s assessment. |
| Nokia/NSB | Agree with FL’s assessment |
| vivo | Fine with FL’s initial assessment. |
| Sharp | Support FL’s initial assessment. |
| Lenovo | Agree with FL’s assessment |
| Intel | Agree with FL’s assessment |
| Samsung | Fine with FL assessment. |
| QC | Okay with FL’s assessment. |
| InterDigital | Agree with FL’s assessment |
| Ericsson | Support FL’s assessment.  The sentence “The UE determines the MCS of the PUSCH transmission from the first sixteen indexes of the applicable MCS index table for PUSCH as described in [6, TS 38.214]” is clear. If a UE request Msg3 repetitions, the legacy MCS index tables are not applicable, and the UE should instead refer to the configured MCS indexes in SIB1 as specified in 38.214. |
| OPPO | Agree with FL’s assessment. |

## Summary and recommendation

For enhancements on PUSCH repetition type A and Type A PUSCH repetitions for Msg3, the majority views are very clear that no issue is discussed in AI 8.8 in RAN1#110bis-e.

For joint channel estimation, following issues are recommended for discussion in AI 8.8 in RAN1#110bis-e:

* **Issue#2**: UE behavior of restarting DMRS bundling
* **Issue#5:** Correction on events for determining TDW

# Conclusion

The following maintenance issues on Rel-17 NR coverage enhancements are identified for email discussion in RAN1 #110bis-e.

# References

1. [R1-2208608](file:///C:\Users\HP\AppData\Local\Docs\R1-2208608.zip) UE behavior of restarting DMRS bundling vivo
2. [R1-2208766](file:///C:\Users\HP\AppData\Local\Docs\R1-2208766.zip) Maintenance on Rel-17 NR coverage enhancements China Telecom
3. [R1-2208840](file:///C:\Users\HP\AppData\Local\Docs\R1-2208840.zip) Disussion on remaining issue of coverage enhancement OPPO
4. [R1-2208841](file:///C:\Users\HP\AppData\Local\Docs\R1-2208841.zip) Draft CR for coverage enhancement OPPO
5. [R1-2208942](file:///C:\Users\HP\AppData\Local\Docs\R1-2208942.zip) Correction on MCS determination of RAR grant CATT
6. [R1-2208943](file:///C:\Users\HP\AppData\Local\Docs\R1-2208943.zip) Discussion on UE behavior of restarting DMRS bundling CATT
7. [R1-2209035](file:///C:\Users\HP\AppData\Local\Docs\R1-2209035.zip) Discussion on remaining issues for DMRS bundling Intel Corporation
8. [R1-2209132](file:///C:\Users\HP\AppData\Local\Docs\R1-2209132.zip) Discussion on joint channel estimation for PUSCH and PUCCH Panasonic
9. [R1-2209226](file:///C:\Users\HP\AppData\Local\Docs\R1-2209226.zip) Remaining issues on joint channel estimation for Rel-17 NR coverage enhancements Lenovo
10. [R1-2209227](file:///C:\Users\HP\AppData\Local\Docs\R1-2209227.zip) Remaining issues on PUSCH repetition type A enhancement Lenovo
11. [R1-2209308](file:///C:\Users\HP\AppData\Local\Docs\R1-2209308.zip) Maintenance on NR coverage enhancement CMCC
12. [R1-2209468](file:///C:\Users\HP\AppData\Local\Docs\R1-2209468.zip) Correction on cancellation of PUSCH repetitions and TBoMS ZTE
13. [R1-2209532](file:///C:\Users\HP\AppData\Local\Docs\R1-2209532.zip) Discussion on RAN4 Reply LS for DMRS bundling MediaTek Inc.
14. [R1-2209561](file:///C:\Users\HP\AppData\Local\Docs\R1-2209561.zip) Discussion on RAN4 LS on DMRS bundling Apple
15. [R1-2209669](file:///C:\Users\HP\AppData\Local\Docs\R1-2209669.zip) Discussion on DMRS Bundling Restart Ericsson
16. [R1-2209707](file:///C:\Users\HP\AppData\Local\Docs\R1-2209707.zip) Maintenance on NR coverage enhancement Samsung
17. [R1-2209872](file:///C:\Users\HP\AppData\Local\Docs\R1-2209872.zip) Discussion on remaining issues for NR coverage enhancement NTT DOCOMO, INC.
18. [R1-2209948](file:///C:\Users\HP\AppData\Local\Docs\R1-2209948.zip) Discussion on remaining issues in NR Coverage Enhancement Qualcomm Incorporated
19. [R1-2210160](file:///C:\Users\HP\AppData\Local\Docs\R1-2210160.zip) Remaining issues on enhancements for PUSCH repetition type A Nokia, Nokia Shanghai Bell
20. [R1-2210161](file:///C:\Users\HP\AppData\Local\Docs\R1-2210161.zip) Change request on out of order PUSCH scheduling in case of counting on available slots Nokia, Nokia Shanghai Bell
21. [R1-2210162](file:///C:\Users\HP\AppData\Local\Docs\R1-2210162.zip) Remaining issues on joint channel estimation for PUSCH and PUCCH Nokia, Nokia Shanghai Bell
22. [R1-2210163](file:///C:\Users\HP\AppData\Local\Docs\R1-2210163.zip) Change request on SRS resource sets mapping for supporting PUSCH repetition type A with joint channel estimation Nokia, Nokia Shanghai Bell
23. [R1-2210164](file:///C:\Users\HP\AppData\Local\Docs\R1-2210164.zip) Change request on spatial settings or power control parameters sets mapping for supporting PUCCH repetition with joint channel estimation Nokia, Nokia Shanghai Bell
24. [R1-2210181](file:///C:\Users\HP\AppData\Local\Docs\R1-2210181.zip) Discussion on Power Control with DMRS Bundling Ericsson
25. [R1-2210182](file:///C:\Users\HP\AppData\Local\Docs\R1-2210182.zip) Correction for Power Control with DMRS Bundling Ericsson
26. [R1-2210214](file:///C:\Users\HP\AppData\Local\Docs\R1-2210214.zip) Correction on events for determining time domain window for bundling DM-RS Huawei, HiSilicon