**3GPP TSG RAN WG1 #109-e R1-220xxxx**

**e-Meeting, May 9th – 20th, 2022**

**Agenda item:** 8.12

**Source:** Moderator (CMCC)

**Title:** Moderator Summary for preparation phase on maintenance of Rel-17 WI on NR MBS

**Document for:** Discussion and Decision

## Introduction

The issues in contributions submitted to RAN1#109e are summarized in the tables of sections 2 and 3. An initial assessment on each of the maintenance issues is provided based on the following classification:

* *High priority (H):* high-priority item (essential, pending issues, broken spec components) and proposed editorial changes that either enhance the clarity of the specs or correct mistakes
* *Non-essential (N)*: all other purposes such as spec optimization and low priority issues
* *Editorial (E)*: editorial issues that will be handled as editorial CRs (to be communicated to the editors/chairs)

## Issues for agenda item “8.12.1 Mechanisms to improve reliability for RRC\_CONNECTED UEs”

**Table 1 - Mechanisms to improve reliability for RRC\_CONNECTED UE**

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| --- | --- | --- | --- | --- |
| **Issue#** | **Issue** | **References** | **FL initial assessment** | **Company inputs (if any)** |
| 1-1 | Multicast HARQ-ACK on PUSCH: UL-DAI issues for multicast for Type1 and Type 2 codebooks, including the case for multiple configured G-RNTIs  *FL Note: there are some TPs proposed regarding these issues, as editors noted in the CR discussion phase editors will handle it when more agreements are achieved.* | Huawei, ZTE,  TD-Tech, Nokia, Spreadtrum, CATT, vivo, Lenovo, Samsung, Apple, CMCC, DOCOMO, Google, Ericsson, Qualcomm | H |  |
| 1-2 | PUCCH resource determination when multiplexing HARQ-ACK for unicast and multicast (including the case of Alt1 for >1 TB where NACK-only is converted to ACK/NACK) | Huawei,  ZTE,  Nokia, CATT, vivo, Lenovo, Samsung, OPPO, CMCC, DOCOMO, MediaTek | H |  |
| 1-3 | NACK-only issues for Alt4, including:   * The mapping between PUCCH resources and TB combinations * Codebook for NACK-only * PDSCH processing timeline * Multiplexing NACK-only with other UCI/PUSCH except issue 1-6 * power determination of a PUCCH transmission for the “NACK-only” reporting mode. | Huawei  ZTE,  Nokia, CATT, vivo, NEC, Lenovo, Langbo, Samsung, OPPO, Apple, CMCC, DOCOMO, MediaTek, Ericsson | H |  |
| 1-4 | Type-1 HARQ codebook generation in cases where UE is configured with a mixture of ACK/NACK based HARQ and disabled HARQ for different G-RNTIs/G-CS-RNTIs | Huawei,  ZTE,  TD-Tech, Nokia,  Spreadtrum, CATT, vivo, ETRI, Lenovo, OPPO, CMCC, DOCOMO, MediaTek, Ericsson, Qualcomm | H |  |
| 1-5 | Type3/enhType3 clarification for multicast  *FL assessment: FL’s understanding is that the specs are clear for Type-3 HARQ codebook construction even in the case where some HARQ processes are used for DCIs scheduled with G-RNTI. Companies are invited to check during the preparation phase.* | Huawei, Nokia, vivo, Langbo, DOCOMO, LGE | N |  |
| 1-6 | PUCCH for NACK-only overlaps with SR  *FL assessment: This was discussed in GTW in last meeting with no conclusion and companies were inclined not to pursue this issue because decoding wrong plus the need of sending SR seems corner case. Companies are invited to check during the preparation phase.*  *Support multiplexing: ZTE, vivo, NEC, Lenovo, Apple, CMCC, DOCOMO, LGE, MediaTek, Ericsson*  *Not support multiplexing: Nokia, Samsung,* | ZTE, Nokia, vivo, NEC, Lenovo, Samsung, Apple, CMCC, DOCOMO, LGE, MediaTek, Ericsson | N | [ZTE] Considering that so many companies propose this issue in this meeting, we suggest to mark it as “H” in this meeting to give it a last try.  [Lenovo]: we suggest to treat it as high priority as SR multiplexing with NACK-only feedback needs to be resolved. |
| 1-7 | Enabling/disabling HARQ-ACK feedback indication in multicast DCI format 4-1  *FL assessment: this proposed optimization was discussed in the past but was never agreed.* | Lenovo | N | [Lenovo]: we suggest to treat it as high priority as whether HARQ-ACK feedback for DCI format 4-1 is enabled or disabled needs to be decided. |
| 1-8 | Multicast PUCCH overlapping with MSG3/MSGA PUSCH;  *FL Note: firstly raised in this meeting. Companies are invited to comment whether essential or not in preparation phase* | LGE | TBD | QC:  Not clear why we need to define a new rule specifically for collision between PUCCH for multicast and MSG3/MSGA PUSCH in a slot.  Samsung: Unclear what needs to be different for multicast PUCCH relative to unicast PUCCH. |
| 1-9 | Deferring HARQ-ACK for multicast SPS, including ACK/NACK based and NACK-only based.  *FL Note: firstly raised in this meeting. Companies are invited to comment whether essential or not in preparation phase* | LGE | TBD | QC:  Considering SPS HARQ deferral for SPS GC-PDSCH will impact the HARQ-ACK feedback of a group of UE, rather than one UE receiving unicast SPS PDSCH, we are not sure this SPS HARQ deferral can be simply extended for multicast feedback in Rel-17 or not.  Samsung: OK to discuss. We think that either multicast HARQ-ACK and SPS HARQ-ACK deferral should not be jointly supported (also no need for new FGs) or SPS HARQ-ACK deferral is supported regardless of the multicast HARQ-ACK mode and subject to no other specification requirements. |
| 1-10 | Multicast HARQ-ACK with PUCCH Cell Switching, including ACK/NACK based and NACK-only based.  *FL Note: firstly raised in this meeting. Companies are invited to comment whether essential or not in preparation phase* | LGE | TBD | QC:  It is not clear the motivation to support PUCCH cell switching for multicast, considering the feedback for multicast service may not be as urgent as URLLC unicast one.  Samsung: OK to discuss. Similar comments as for supporting SPS HARQ-ACK deferral. |
| 1-11 | TP/proposal for Type2 sub-codebook generation for G-CS-RNTI | CATT, Samsung | E | Samsung: Not editorial - specifications are incomplete. There are no relevant agreements for the Type-2 CB for G-CS-RNTI. |
| 1-12 | TP for reflecting PUCCH for NACK-only overlapping with CSI | Samsung | E |  |
| 1-13 | * TP#1 to correct TS38.213 that Alt1 can support more than 4 HARQ-ACK information bits; * TP#2 to clarify “other UCI” in clause 18 of TS38.213 does not include the other NACK-only HARQ-ACK nor CG-UCI | LGE | E |  |
| 1-14 | TP for removing the “PCell” condition for fallback operation with Type-1 HARQ-ACK codebook for multicast | Samsung | E |  |
| 1-15 | How to feedback for the SPS PDSCH associated with reactivation PDCCH, as described in section 4.1 of R1-2203194 | ZTE | TBD | [ZTE] We suggest H to clarify this issue in this meeting. Otherwise, it is not clear how to generate feedback for the SPS PDSCH associated with reactivation PDCCH. |
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## Issues for agenda item “8.12.2 others”

**Table 2 - Other maintenance issues on NR Multicast and Broadcast Services for RRC\_CONNECTED UEs**

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| --- | --- | --- | --- | --- |
| **Issue#** | **Issue** | **References** | **FL initial assessment** | **Company inputs (if any)** |
| **GC-PDSCH related issues** | | | | |
| 2-1 | SPS collision handling   * Clarification on FDMed/TDMed unicast PDSCH and GC-PDSCH reception capability * Collision handling between multicast SPS and unicast SPS as well as unicast/multicast DG | ZTE, CMCC, vivo, Xiaomi, Samsung | H | Huawei/HiSi: We think the current spec is sufficient, it was discussed in the last meeting with no consensus. We think it seems non-essential issue. |
| 2-2 | PDSCH simultaneous reception/restriction for RRC\_CONNECTED UEs   * MCCH/MTCH GC-PDSCH simultaneous reception/restriction * GC-PDSCH and RAR/SIB/Paging PDSCH simultaneous reception/restriction | CMCC, Huawei | H |  |
| 2-3 | TP for TS 38.202   * Capture the maximum value for the total number m1+m3 and m2+m4 of PDSCH for CCs * Include G-RNTI as part of reception type D4 in 38.202 and add DL-SCH as the associated channel | Ericsson | H |  |
| 2-4 | TPs for GC-PDSCH rate-matching for RRC\_CONNECTED UEs   * Capture RE-level rate-matching for PDSCH scheduled by DCI format 4\_1 * Support *RateMatchPatternLTE-CRS* for broadcast reception in RRC\_CONNECTED mode * Clarification on *RateMatchPattern(s)* configuration number per BWP * Capture sp-ZP-CSI-RS for multicast | Qualcomm, Huawei, Spreadtrum | H |  |
| 2-5 | Other TPs for GC-PDSCH   * Clarify the condition for the existence of TCI field in DCI format 4\_2 * Define the condition for disabling TB in DCI format 4\_2 * Capture MCCH-RNTI in 5.1.3.2 of 38.214 | DOCOMO | H |  |
| 2-6 | Scaling factor report for maximum date rate in FDMed unicast and multicast case  *FL Note: Has been discussed in last RAN1 meeting but some companies are not clear about the motivation. Companies are invited to comment whether essential or not in preparation phase* | Qualcomm, Ericsson | TBD | QC: suggest H  The legacy spec on max data rate calculation is for unicast. However, now there are different unicast and multicast parameters/capabilities. **The current spec is not clear on how to calculate max data rate in case of unicast only, MBS only and FDMed unicast+MBS in a symbol**. Also, RAN1 needs to discuss   * Whether to allow a UE to report a scaling factor for FDMed unicast and MBS * If it is not supported, or supported but not reported by UE, what value should be assumed for calculating the max data rate for FDMed unicast and MBS per CC.   Huawei/HiSi: it was discussed but not thoroughly discussed in the last meeting so for closing the issue it seems better to clarify how to calculating the max data even though not support UE reporting additional scaling factor. |
| 2-7 | Modify the formula of determination of TB(s) UE is not expected to handle in clause 5.1.3 of TS 38.214  *FL Note: firstly raised in this meeting. Companies are invited to comment whether essential or not in preparation phase* | Qualcomm | TBD | QC: suggest H  The legacy spec on restriction for LLR buffering of allocated TBs per slot is for unicast. However, now there are different unicast and MBS parameters/configurations. **The current spec is not clear on the restriction for LLR buffering of allocated TBs per slot in case of unicast only, MBS only and TDMed or FDMed unicast and MBS in a slot.** Also, RAN1 needs to discuss   * Whether to allow a UE to relax the restriction of the LLR buffering for FDMed unicast and MBS per slot in the serving cell * If it is not supported or it is supported but not reported by UE, what value should be assumed for the restriction for LLR buffering of allocated TBs for FDMed unicast and MBS per slot in the serving cell.   Huawei/HiSi: related issue with 2-6, suggest discussing and closing the issue. |
| 2-8 | Mis-alignment of TCI state activation application delay for GC-PDSCH and indication codepoints in DCI among different UEs | LGE | N |  |
| 2-9 | Different UE capabilities for *timeDurationForQCL* for GC-PDSCH  *FL Note: Low priority for FR2* | LGE | N |  |
| 2-10 | TP for multicast SPS activation validation when UE is only configured one multicast SPS | ASUSTeK | N |  |
| 2-11 | TP for clarification that if the number of PDSCHs in a slot exceeds the UE capability, it is up to UE implementation to decide to receive which PDSCH(s) | DOCOMO | N |  |
| **GC-PDCCH related issues** | | | | |
| 2-12 | Whether to include broadcast and MCCH-RNTI in at most 16 PDCCH receiving capability for RRC\_CONNECTED UEs | ZTE, Qualcomm, Huawei, LGE, Ericsson | H |  |
| 2-13 | Multicast and broadcast search space configuration RRC signaling alignment between TS 38.213 and TS 38.331 | CMCC | E |  |
| 2-14 | TCI state indication for multicast GC-PDCCH   * Clarify whether the existing MAC CE for unicast PDCCH can be also applied to multicast PDCCH   *FL Note: Companies are invited to comment whether essential or not in preparation phase* | LGE | TBD | Huawei/HiSi: TCI in for mat 4\_2 is configurable and can be 0 bits if not configured especially for the case that CORESET is dedicated for multicast. Does not seem essential issue. |
| 2-15 | Monitoring priority of multiple CORESETs that have same or different QCL-TypeD properties  *FL Note:* *Has been discussed in RAN1#108-e meeting without consensus.* *low priority for FR2.* | Samsung, Spreadtrum | N | Spreadtrum: Since the principle that the priority of MBS is equal to unicast is common understanding, we think it is natural to reuse the principle for FR2. If all is up to gNB scheduling, the flexibility of gNB may be limited. With what we have said, we are fine that it is not one critical issue. |
| 2-16 | Whether to configure DCI format 1\_0 in the same CSS for multicast  *FL Note:* *Has been discussed in several meetings without consensus.* | Qualcomm, Lenovo | N | [Lenovo]: we think this issue needs to be resolved otherwise the UE behaviors on PDCCH detection is not clear.  Huawei/HiSi: the current 331 does not support configuring DCI format 1\_0 in the CSS for multicast. Given some companies have concern to support it and even though 1\_0 is not configured in the CSS, retransmission via PTP can also happen, so nothing is broken. No need to further discuss this issue in our opinion. |
| 2-17 | Miscellaneous on multicast DCI formats fields   * *priorityIndicatorDCI-4-2* configuration for UE not supporting this feature * Explicit filed size configuration of DAI * Enabling/disabling HARQ-ACK feedback indication in multicast DCI format 4-1   *FL Note:* *Has been discussed in RAN1#108-e and many companies don’t think it’s necessary.* | DOCOMO, Lenovo | N |  |
| 2-18 | Multicast DCI format size alignment  *FL Note:* *Has been discussed in several meetings without consensus. The current spec is workable without any new agreement.* | Lenovo, Ericsson | N |  |
| **Other issues** | | | | |
| 2-19 | HARQ process management related issues   * Semi-static HARQ process configuration * NDI handling related to missed initial PTM transmission and PTP retransmission case   *FL Note:* *Has been discussed for several meeting without consensus whether to support dynamic HARQ process sharing in RAN1. The solutions proposed by companies are also diverged.* | ZTE, Nokia, Lenovo, Ericsson | N |  |
| 2-20 | UE indicates whether it can support combining PTM initial transmission and PTP retransmission in case of different circular buffer sizes  *FL Note:* *Has been discussed in RAN1#107b-e meeting without consensus* | Samsung | N | Samsung: The issue is that the agreement from RAN1#107 is not concluded. How can the gNB know whether or not a UE can soft combine PTM initial Tx and PTP reTx using the unicast-based LBRM when it is different than the multicast LBRM? Then, unicast reTx is not possible for a gNB to implement which is also against another corresponding agreement. |
| 2-21 | Optimization on timer-based active DL BWP switching to a default BWP  *FL Note:* *Has been discussed in RAN1#108-e meeting and most companies don’t think it’s necessary* | Ericsson | N |  |
| 2-22 | Configuring CFR per cell | Ericsson | N |  |

**Table 3 - Other maintenance issues on NR Broadcast Services for RRC\_IDLE/RRC\_INACTIVE UEs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Issue#** | **Issue** | **References** | **FL initial assessment** | **Company inputs (if any)** |
| 3-1 | Simultaneous PDSCH reception/restriction of RAR PDSCH and broadcast GC-PDSCH for RRC\_IDLE/INACTIVE UEs | Huawei | H  Can be merged with issue 2-2 |  |
| 3-2 | Broadcast search space configuration RRC signaling alignment between TS 38.213 and TS 38.331 | CMCC, vivo | E  Can be merged with issue 2-13 |  |
| 3-3 | TP for clarification on broadcast PDSCHs only rate matched around *rateMatchPatternToAddModList* configured for broadcast  *FL Note: firstly raised in this meeting. Companies are invited to comment whether essential or not in preparation phase* | Spreadtrum | TBD | Huawei/HiSi: seems valid issue. Rate matching patterns for unicast and broadcast should be separately configured because broadcast is received by IDLE/INACTIVE UEs as well.  Spreadtrum: The issue should be H. It is one very critical issue. Otherwise, the broadcast PDSCH could not be decoded correctly for UEs in idle/inactive state since it is not possible for idle UE to achieve the rateMatchPatternToAddModList configuration for unicast by RRC signaling.  In addition, we have decoupled ratematching patterns for unicast and multicast. Likewise, there is no reason to combine ratematching patterns for unicast and broadcast. |
| 3-4 | TP for clarification on PDSCH reception behavior of UE not supporting dynamic slot-level repetition for RRC\_IDLE/INATCIVE UEs  *FL Note: firstly raised in this meeting. Companies are invited to comment whether essential or not in preparation phase* | DOCOMO | TBD | Huawei/HiSi: not necessarily needed. From network perspective, if UEs does not support dynamic slot repetition, basically broadcast will be not scheduled with repetitions dynamically. |
| 3-5 | Supporting SPS for MTCH | Xiaomi | N |  |
| 3-6 | Not support TRS as a QCL source for MTCH transmission | Nokia | N |  |
|  | Determination of repetition number for PTM SPS PDSCH retransmission | Samsung |  | Samsung: Request to discuss how to determine the repetition number for PTM SPS PDSCH reTx in case of multiple G-RNTIs (mentioned in 2.4 of Tdoc R1-2203875). The “corresponding G-RNTI” in 5.1.2.1 of 38.214 is undefined for a G-CS-RNTI. |
| 3-7 | Typical configuration for MBS for RRC\_IDLE/RRC\_INACTIVE UEs | TD Tech, Chengdu TD Tech | H | We discuss the typical configuration for NR MBS for RRC\_IDLE/RRC\_INACITVE UEs and hope the related proposals are discussed to shorten the MBS interruption time during UE’ mobility between the cell.  **Proposal 1: Support the following typical configuration for broadcast mode to simplify the broadcast session reception during the UE mobility:**   * **The PTM configuration information of a broadcast session can be area specific. In other word, the source cell and target cell can have the same PTM configuration information for a broadcast session.**   **Proposal 2: Send an LS to RAN2 with the following information included:**   * **In order to reduce the broadcast session reception interruption time, for a broadcast session in the source cell and for each neighbour cell providing the broadcast session, RAN1 expects an additional bit is added to indicate whether or not the neighbour cell has the same PTM configuration information as the source cell.** |

## Issues for agenda item “8.12”

**Table 4 - Other maintenance issues on NR MBS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Issue#** | **Issue** | **References** | **FL initial assessment** | **Company inputs (if any)** |
| 4-1 | TP on NR MBS physical layer functionalities to TS 38.300 | Huawei | H |  |
|  |  |  |  |  |

## Conclusion

Based on the responses from participating companies during the preparation phase, the final FL recommendation is:

# References

AI 8.12：

1. R1-2204892 Text proposal to TS 38.300 on NR MBS Huawei, HiSilicon, CBN

AI 8.12.1:

1. R1-2203070 Mechanisms to improve reliability for RRC\_CONNECTED UEs Huawei, HiSilicon, CBN
2. R1-2203194 Maintenance of reliability improvement for MBS ZTE
3. R1-2203227 Open issues on reliability for NR MBS TD Tech Ltd
4. R1-2203287 Remaining Issues on Reliability Improvements for RRC\_CONNECTED UEs supporting MBS Nokia, Nokia Shanghai Bell
5. R1-2203314 Discussion on the remaining issues on mechanisms to improve MBS reliability for RRC\_CONNECTED UEs Spreadtrum Communications
6. R1-2203427 Remaining issues on reliability improvement mechanism for RRC\_CONNECTED UEs in MBS CATT
7. R1-2203526 Remaining issues on mechanisms to improve reliability for RRC\_CONNECTED UEs vivo
8. R1-2203613 Remaining issues on mechanisms to improve reliability for MBS ETRI
9. R1-2203677 Remaining Issues on Reliability Improvements for RRC\_CONNECTED UEs NEC
10. R1-2203699 Remaining issues on reliability improvement for RRC-CONNECTED UEs Lenovo
11. R1-2203838 Remaining issues on mechanisms to improve reliability for RRC\_CONNECTED UEs Langbo
12. R1-2203874 Maintenance on mechanisms to improve reliability Samsung
13. R1-2203974 Discussion on remaining issues of mechanism to improve reliability for RRC\_CONNECTED UEs OPPO
14. R1-2204216 Remaining issues on MBS reliability improvement for RRC\_connected UEs Apple
15. R1-2204282 Maintenance on mechanisms to improve reliability for RRC\_CONNECTED UEs CMCC
16. R1-2204354 Remaining issues on HARQ-ACK feedback procedure for multicast NTT DOCOMO, INC.
17. R1-2204502 Remaining reliability issues of MBS for RRC\_CONNECTED UEs Google Inc.
18. R1-2204622 Mechanisms to improve reliability of Broadcast/Multicast service LG Electronics
19. R1-2204717 Remaining issues on improve multicast reliability for RRC\_CONNECTED UEs MediaTek Inc.
20. R1-2204945 Remaining issues for improvement of reliability of NR MBS Ericsson
21. R1-2204994 Mechanisms to improve reliability for RRC\_CONNECTED UEs Qualcomm Incorporated

AI 8.12.2:

1. R1-2203195 Maintenance of other issues for broadcast and multicast ZTE
2. R1-2203288 Remaining Issues for NR MBS Nokia, Nokia Shanghai Bell
3. R1-2203315 Discussion on the remaining issues for MBS Spreadtrum Communications
4. R1-2203527 Maintenance on NR Multicast and Broadcast Services vivo
5. R1-2203700 Remaining issues on group scheduling mechanism for RRC\_CONNECTED UEs Lenovo
6. R1-2203776 Other remaining issues for multicast and broadcast xiaomi
7. R1-2203875 Maintenance on group scheduling for RRC\_CONNECTED UEs Samsung
8. R1-2204189 Discussion on MBS SPS activation validation ASUSTeK
9. R1-2204283 Maintenance on group scheduling mechanisms for NR multicast and broadcast services CMCC
10. R1-2204355 Remaining issues on group scheduling mechanisms for MBS NTT DOCOMO, INC.
11. R1-2204623 Other remaining issues for MBS LG Electronics
12. R1-2204891 Remaining issues for multicast and broadcast scheduling Huawei, HiSilicon, CBN
13. R1-2204946 Remaining issues for group scheduling of NR MBS Ericsson
14. R1-2204995 Other remaining issues for Rel-17 MBS Qualcomm Incorporated