**3GPP TSG-RAN WG2 Meeting #131 R2-250xxxx**

**Bengaluru, India, August 25th – 29th, 2025**

**Agenda item: 8.12.1**

**Source: Samsung**

**Title: Report of MAC open issues for MIMO**

**WID/SID: NR\_MIMO\_Ph5**

**Document for: Discussion and Decision**

# Introduction

This document includes a list of open issues according to the following email discussion:

* [Post130][219][MIMO\_Ph5] Running CR for 38.321 (Samsung)

Intended outcome: Updated and reviewed the CR for endorsement, update the open issue list if needed, can also discuss open issues to form proposals to the next meeting

Deadline: Long

Companies are invited to provide comments on open issues by **1st August 1000 UTC** to allow Rapporteur to summarize and formulate initial proposals. Based on the input, we may consider a short second-round discussion, if necessary, to be finalized by Aug. 8th.

# Discussion

## Issue 1: When the TAT of the sTAG expires, whether/how to release PUCCH/type-1 CG resource for UEI report.

In RAN2#130 meeting, UE behavior for UEI report at TAT expiry was raised and discussed. The following agreement has been made regarding the release of PUCCH/PUSCH resource, which follows the legacy release behavior at TAT expiry for pTAG. Note according to Rel-19 WID, UEI report is for sTRP, so the scope is limited to a single TAG per cell.

RAN2#130

* When the TAT of the pTAG expires, UE releases PUCCH resource for mode-A/B UEI report and clears type-1 CG for mode-B UEI report. FFS for the case when the TAT expires on the sTAG.

For sTAG expiry the legacy behavior of PUCCH release and type-1 CG clear should be followed as well.

To be more specific, according to the latest RRC parameter list (R2-2505000, also see endorsed RRC running CR R2-2504184), PUCCH and type-1 CG for UE-initiated report are configured with explicit resource ID, BWP ID, and cell indication.

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| **RAN2 Parent IE** | **Parameter name in the spec** | **Description** | **Value range** |
| CSI-ReportConfig | configuredPUSCHResourceOfModeB-r19 | This parameter is used to inform Type-1 CG PUSCH resource for second channel in mode-B | configuredGrantConfigIndex, UL bwp-Id, serving cell index |
| CSI-ReportConfig | PUCCHResource-r19 | This parameter is used to configure the periodic PUCCH resource for first PUCCH carrying UEIRI- to request dynamically scheduled PUSCH to carry UE-initated/event-driven beam report for mode-A- to notify Type-1 CG PUSCH to carry UE-initated/event-driven beam reportfor mode-B. | periodicityAndOffset, PUCCH-ResourceID, BWP-Id, pucchCell-r19 |
| CSI-ReportConfig | pucchCell-r19 | This parameter is used to indicate one from {SpCell, PUCCH-Scell} as the cell of the configured PUCCH resource for first PUCCH carrying UEIRI. | {SpCell, PUCCH-Scell}  |

Note for *pucchCell-r19*, according to RAN1 last meeting’s agreement, only an indication between SpCell and SCell is enough with no need of serving cell index. In Rapporteur’s understanding, this is based on the assumption that NW can by implementation configure unique PUCCH-resourceIDs for different cells to avoid ambiguity.

Given explicit resource ID, BWP ID, and cell indication, the PUCCH or the type-1 CG for UEI report point to the resource configured in *PUCCH-config* or *ConfiguredGrantConfig* for the indicated BWP of the indicated serving cell, so that UE knows the PUCCH/type-1 CG is associated to a specific serving cell and the corresponding TAT(s).

The current behavior for TAT expiry is as follows.

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| 5.2 Maintenance of Uplink Time Alignment…The MAC entity shall:…1> when a *timeAlignmentTimer* expires:2> if the *timeAlignmentTimer* is associated with a PTAG and the SpCell is not configured with two PTAGs; or2> if the *timeAlignmentTimer* is associated with a PTAG, the SpCell is configured with two PTAGs, and the *timeAlignmentTimer* associated with the other PTAG is not running:3> flush all HARQ buffers for all Serving Cells;3> notify RRC to release PUCCH for all Serving Cells, if configured;3> notify RRC to release SRS for all Serving Cells, if configured;3> clear any configured downlink assignments and configured uplink grants;3> clear any PUSCH resource for semi-persistent CSI reporting;3> consider all running *timeAlignmentTimer*s as expired;3> maintain NTA (defined in TS 38.211 [8]) of all TAGs.2> else:3> if the *timeAlignmentTimer* is associated with a TAG for an SCell configured with only this TAG; or3> if the *timeAlignmentTimer* is associated with a TAG for an SCell, and if the SCell is configured with two TAGs and *the timeAlignmentTimer* associated with the other TAG is not running:4> flush all HARQ buffers for all such SCells;4> notify RRC to release PUCCH, if configured for all such SCells;4> notify RRC to release SRS, if configured for all such SCells;4> clear any configured downlink assignments and configured uplink grants for all such SCells;4> clear any PUSCH resource for semi-persistent CSI reporting for all such SCells;4> maintain NTA (defined in TS 38.211 [8]) of this TAG.3> else if the *timeAlignmentTimer* is associated with a TAG for a Serving Cell configured with two TAGs, and if the *timeAlignmentTimer* associated with the other TAG is running, for all such Serving Cells:4> clear any configured downlink assignment, if the activated TCI state(s) for all PUCCH resources configured for the configured downlink assignment is associated with the TAG of the expired *timeAlignmentTimer*;4> clear any configured uplink grant, if the activated TCI state(s) for the configured uplink grant is associated with the TAG of the expired *timeAlignmentTimer*;4> clear any PUSCH resource for semi-persistent CSI reporting, if the activated TCI state(s) for the PUSCH resource is associated with the TAG of the expired *timeAlignmentTimer*;4> maintain NTA (defined in TS 38.211 [8]) of this TAG. |

In the current procedure for sTAG (i.e. TAT of the single TAG for a SCell is expired), all PUCCH/configured UL grant configured for such a SCell are released by RRC or cleared in MAC. According to this, if the PUCCH of a UEI report configuration is pointed to this SCell (i.e., the PUCCH resource is associated to the expired TAT), it is released by RRC; if the type-1 CG of a UEI report configuration is pointed to this SCell (i.e., the type-1 CG is associated to the expired TAT), it is cleared as a configured UL grant. The current MAC procedure already supports this behavior.

**Q1: Do you agree the following view?**

**If the PUCCH/type-1 CG of a UEI report configuration is pointed to a SCell whose TAT of the single sTAG is expired, this PUCCH for the SCell is released by RRC and this type-1 CG for the SCell is cleared as a configured UL grant. There is no MAC specification impact.**

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| **Company** | **Y/N** | **Comments** |
| CATT | Yes |  |
| ASUSTeK | Yes | An agreement can be made (for the previous FFS sTAG part) to confirm the understanding that the PUCCH resource configured on PCell (or PUCCH SCell) for CSI reporting of an SCell will be released when TAT of sTAG of the SCell is expired.  |
| Sharp | Yes |  |
| Huawei, HiSilicon | Yes | We share the same understanding on the UE behavior, but it is worth noting that the RAN2 term “configured uplink grant of UEI report” should be consistent with RAN1 spec. Thus we support to have an agreement on the UE behavior in RAN2.  |
| Ofinno | Yes, but  | We agree with the proposed view; however, we believe there are two potential cases worth highlighting for further discussion given the fact that the PUCCH resource and the Type 1 CG may be configured on **different serving cells associated with different TAGs**.Case 1: The TAT of the TAG associated with the PUCCH resource (e.g., TAG 1) expires, while the TAT of the TAG associated with the Type 1 CG (e.g., TAG 2) remains running. According to the proposal, the UE releases the PUCCH resource but retains the Type 1 CG. However, since the UE cannot perform the PUCCH transmission for the UEI report, the retained Type 1 CG cannot be utilized. If the UE instead clears the Type 1 CG in such a case, the network could reassign those resources to other UEs, improving overall resource efficiency and system capacity.Case 2: Conversely, if the TAT of the TAG (e.g., TAG 2) associated with the Type 1 CG expires while the TAT for the PUCCH-associated TAG (e.g., TAG 1) is still running, the proposal suggests clearing the Type 1 CG resources. In this case, since the UE cannot use the Type 1 CG, there is also no need to perform the PUCCH transmission for the UEI report. In this case, the UE is better to release the PUCCH resource with the similar reasons as above. In section 2.3, rapporteur also emphasizes that without the report in PUSCH, the PUCCH notification is meaningless; and without PUCCH notification, the report in PUSCH cannot be received properly. |
| OPPO | Yes |  |
| ZTE | Yes |  |
| Nokia | Yes | The corresponding agreement can be made for the FFS part in the last meeting.  |
| CMCC | Yes |  |
| Ericsson | Yes |  |
| Samsung | Yes | Regarding the case that PUCCH resource and type-1 CG are on different serving cells and on different TAGs, if the TAT of only one cell is expired while the other is still running, releasing/clearing both resources can be an optimization for efficient resource allocation, but may not be necessary. For example, if PUCCH resource is released due to serving cell #1’s TAT expired and type-1 CG is on serving cell #2 whose TAT is still running, cell #1 can be recovered and PUCCH resource can be reconfigured on cell #1. If PUCCH resource is on serving cell #1 whose TAT is still running and type-1 CG on serving cell #2 is cleared due to serving cell #2’s TAT expired, it could be beneficial to still transmit PUCCH for notification, and NW can recover TAT on cell #2 if the report is needed since NW knows the expiry, or NW may just leave it as the report may not be critical.  |
| Apple | Yes |  |

**Summary:**

All agree with the following proposal.

**Proposal 1 (12/12): If the PUCCH of a UEI report configuration is pointed to a SCell whose TAT of the single sTAG is expired, this PUCCH for the SCell is released by RRC. If the type-1 CG of a UEI report configuration is pointed to a SCell whose TAT of the single sTAG is expired, this type-1 CG for the SCell is cleared as a configured UL grant. There is no MAC specification impact.**

One company mentioned that for a UEI report the PUCCH resource and the type-1 CG can be configured on different serving cells belonging to different TAGs, since the two resources should be used together for a UEI report, if either one resource is released/cleared due to TAT expired the other one should also be released/cleared. In Rapporteur’s view, this is an optimization for efficient resource allocation, which is not critical considering the end of Rel-19. Companies can submit contributions on this if interested. It can be further discussed if more are interested based on contributions.

## Issue 2: Does UE initiate RACH when UEI report is triggered and to be transmitted but TAT is expired?

Based on discussion during RAN2#130 meeting, different options are listed below.

**Option 1**: UE does not initiate RACH when UEI report is triggered and to be transmitted but TAT (associated to the UEI report resource) is expired.

* This option follows legacy behavior upon TAT expired (i.e., CSI report is not transmitted), and has no specification impact.
* UE can wait for PDCCH ordered RACH for UL resynchronization and RRC reconfiguration for new resource, and can rely on BFD/BFR for the worse case.
* This is a unified solution for mode-A and mode-B.

**Option 2**: UE initiates RACH when UEI report is triggered and to be transmitted but there is no PUCCH or type-1 CG as the associated TAT is expired, and UE waits for NW to reconfigure new resource for UEI report.

* The concern raised during the meeting is that the triggered UEI report may become stale and be discarded while performing RACH and waiting for new resources, so it is not necessary to initiate RACH. However, whether to maintain/discard a triggered report in certain timeline may be purely up to UE implementation or RAN1 issue, and we don’t need to discuss here.
* Some companies expressed the view that UE does not need to maintain the previously triggered UEI report if any new report is triggered, and UE always transmits the latest triggered report. Here we consider the scenario that a latest triggered report needs to be transmitted (not discarded).

**Option 3**: UE initiates RACH when UEI report is triggered and to be transmitted but there is no PUCCH or type-1 CG as the associated TAT is expired, and UE indicates the cause of RACH (e.g., in Msg3).

* By this option, UE explicitly informs NW the cause of RACH at the earliest occasion, so NW can reconfigure new resource for UEI report as early as possible (e.g., in Msg4).
* This option has more MAC specification impact.

**Option 4**: UE initiates RACH when UEI report is triggered and to be transmitted but there is no PUCCH or type-1 CG as the associated TAT is expired, and UE transmits UCI for the report in Msg3 or using the uplink grant scheduled by PDCCH addressed to C-RNTI based on which RA procedure is completed.

* This option intends to use the earliest DG to reduce the interruption of UEI report at the best effort.
* This behavior implicitly informs NW the cause of RACH so NW can reconfigure new resource as early as possible.
* This option also has RAN1 impact.

**Q2: Which option(s) do you support? Please indicate with support, acceptable, not acceptable, etc.**

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| **Company** | **1/2/3/4/others** | **Comments** |
| CATT | Support Option 1;Acceptable to Option 2;Not acceptable to Option 3 and Option 4 with UCI reporting in Msg3;Acceptable to Option 4 using the uplink grant scheduled by PDCCH addressed to C-RNTI based on which RA procedure is completed | For Option 4 with UCI reporting by Msg3, we have concern on whether the RAR can provide the enough resource for UCI reporting. As far as our understanding, for connected UE with expired TA, the UL grant allocated in RAR only ensures to send the C-RNTI MAC CE because the NW does not know the exact data to be transmitted by UE. In this case, it’s hard for the NW to estimate the UL grant for UCI reporting in Msg3. |
| ASUSTeK | Support RACH initiation, and prefer Option 3 and report in Msg3 in Option 4 | The RACH would be beneficial if the network can acknowledge the cause of the RACH in order to reconfigure/provide UL grant for corresponding UEI beam report as early as possible. While it may not be suitable to transmit the report via UCI with Msg3, a notification or a report carried in Msg3 (or a dedicated preamble) would be helpful for the NW to quickly perform related actions. |
| Sharp | Support Option 3 | Share the view with ASUSTek, if RA is initiated, it is benefit to inform network about the cause of RACH and get the new configuration for report. |
| Huawei, HiSilicon | Support Option-3. Not support Option-4 | We echo the comment from ASUSTeK that it is beneficial for network to early identify the failure case, which is similar to BFR-RA. Regarding the solutions, Option 4 doesn’t work due to the reason that:1. If UCI is piggyback in Msg3, it would be difficult to decode Msg3 for network side.2. If UCI is carried together with C-RNTI in Msg3, we share the concern from CATT that the uplink grant size/coverage would be an issue. Therefore, we think Option 3 is the only feasible direction and how to indicate can be discussed based on contributions in the next RAN2 meeting.  |
| Ofinno | Support: Options 1 (with an indication to PHY upon TAT expiry)Not acceptable: Option 2Support: Options 3/4 | We agree that merely initiating RACH without any additional behavior has the issues pointed out by the Rapporteur in Option 2. Therefore, our primary preference is **Option 1**, **with the addition of an cross-layer indication to the PHY layer upon TAT expiry**. This would allow the PHY layer to cancel an already triggered UEI beam report or stop event evaluation if the report has not yet been triggered. In legacy systems, periodic or semi-persistent CSI reports are not transmitted once the TAT expires. If a similar behavior is applied to UEI beam reporting, i.e., the UEI beam report is not transmitted upon TAT expiry, it remains unclear whether the triggered UEI beam report remains pending, and whether the associated counters and timers used for event evaluation are reset or maintained.Initiating RACH can be beneficial when the network is aware of the cause for the RACH procedure. If the cause is unknown, the delay in configuring new resources for the UEI beam report may result in an outdated report. Moreover, Option 3 is to provide a simple cause which we believe is also a unified solution for mode-A and mode-B. With these rationales, we prefer **Option 3**, followed by **Option 4**, which appears to have more impact on RAN1. |
| OPPO | Support Option 1; Option 2 is acceptable; Option 4 is not acceptable. | From our understanding, there is no issue for Option 1. The network which wants to get the UEI beam report should reconfigure the PUCCH resource and CG resource, as the expiry of the TAT is known by the gNB. If the PUCCH/PUSCH resource for UEI report is not reconfigured, this means that the network would rely on the (Rel-17/18) legacy beam measurement report for beam management.The extra RAN1 specification change should be avoided. If most companies want to avoid the issue of BFD/BFR caused by Option 1, we think that we can add MAC CE in Msg3 to indicate the RACH cause. |
| ZTE | Support Option 1 | If we try to trigger RACH, the network needs to get some information from Rach procedure, e.g. option 3 and option 4, but both of the option 3 and option 4 would introduce much spec impact. Thus if there is no strong motivation to trigger RACH, we should avoid much spec impact. |
| Nokia | Support: Options 1 (with an indication to PHY upon TAT expiry)Support: Options 2/3 | In general we support, initiating the RACH because the report is UE initiated and is time critical. So, we acknowledge that initiating RACH alone, without additional actions, has the limitations highlighted by the Rapporteur for Option 2.RACH initiation can be useful when the network understands the cause, if the cause is unclear, delays in configuring new resources could make the report outdated. For this reason, we prefer Option 3, as it offers a simple and unified cause mechanism for both mode‑A and mode‑B. It may not be suitable to transmit the report via UCI with Msg3 (Option 4 is not preferred)We are also open to Option 1 supplemented by a cross‑layer indication to the PHY layer upon TAT expiry as mentioned by Offino.  |
| CMCC | Acceptable: Options 1 (to reduce the impact of the protocol)Not acceptable: Option 2Support: Options 3/4 | If the purpose is to reduce the impact of the protocol, we can accept Option1 to follow the traditional TAT expired behavior. If it is considered to deliver beam reports as timely as possible (such as critical beam failures), Option 3/4 is preferred. Whether to add instructions or carry UCI directly with reports in msg3 can be discussed at the next RAN2 meeting. However, in Option 2, if NW reconfiguration is still awaited after RACH is triggered, the purpose of triggering RACH is not recognized. |
| Ericsson | Support Option 1 as baseline, discuss further Options with RACH. | Option 1 aligns with legacy in that CSI-reports are not transmitted upon TAT expiry. The gNB would in general be aware of the TAT expiry. Even if performing RACH is to be supported, it is unclear if the delay of the report makes the information very useful. The spec. impact needs to be considered also |
| Samsung | Support Option 3/4,Acceptable Option 1/2. | We support to initiate RA, which can at least resynchronize UL. For Option 3, an indication in Msg3 is helpful to inform the cause of RA is to transmit UEI report. RAR UL grant can be at least 56 or 64 bits for CCCH or CCCH1. For connected UE, C-RNTI MAC CE is always transmitted in Msg3, remaining bits can be used to send an indication of UEI report MAC CE. For Option 4, support transmits UCI in Msg5 using the uplink grant scheduled by PDCCH addressed to C-RNTI based on which RA procedure is completed. |
| Apple | Support Option 1 | In legacy, CSI report doesn’t trigger RACH when TAT expires. We should follow the same way for UEI beam report, i.e. no RACH initiation by the UEI beam report.  |

**Summary:**

Option 1: 7 support (including 2 support with an indication to PHY upon TAT expiry), 2 acceptable

Option 2: 1 support, 3 acceptable, 2 not acceptable

Option 3: 7 support, 1 acceptable with MAC CE in Msg3, 1 not acceptable

Option 4: 4 support, 1 acceptable UCI in Msg5, 3 not acceptable UCI in Msg3.

Based on the comments, Option 1 and Option 3 can be considered as way-forward for further discussion. Strong concern is raised by several companies regarding UCI in Msg3.

For Option 1, two companies mentioned an indication to PHY upon TAT expiry would be needed. However currently we don’t specify any indication to PHY for TAT expiry (PHY should know TAT expiry anyway by implementation).

For Option 3, companies share the view that RACH can be beneficial. How to indicates the cause of RACH need to be discussed by contribution (e.g., MAC CE in Msg3).

Based on the above, the following proposal is considered.

**Proposal 2: Regarding whether UE initiate RACH when UEI report is triggered but TAT is expired, select one of the following options:**

**- Option 1: UE does not initiate RACH when UEI report is triggered but there is no PUCCH or type-1 CG due to the associated TAT is expired. No MAC impacts.**

**- Option 3: UE initiates RACH when UEI report is triggered but there is no PUCCH or type-1 CG due to the associated TAT is expired, and UE indicates the cause of RACH. Discuss how to indicate the cause of RACH (e.g., MAC CE in Msg3).**

For mode-A UEI report, TAT can be expired after PUCCH and before mode-A PUSCH for a triggered report. Some think the case can be handled by NW implementation to initiate PDCCH ordered RACH. Some think a unified solution from Q2 can be applied to this case.

**Q3: If you support Option 2/3/4 in Q2, which option you support for the case that TAT is expired after PUCCH and before mode-A PUSCH for a triggered report?**

**Option A: handle by NW and no new UE behavior.**

**Option B: apply same solution as Option 2/3/4.**

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| **Company** | **A/B** | **Comments** |
| CATT | Option A |  |
| ASUSTeK | Option B | We prefer to have a unified solution for all cases. |
| Sharp | Option B |  |
| Huawei, HiSilicon | No strong view | This case is different from that in Q2 where in Q3, PUCCH can be considered as the indication so that the NW can be aware of the situation, so it can be up to NW implementation. So we prefer Option A, but can compromise to Option B. |
| Ofinno | Option B | This situation may happen for both Mode-A/Mode-B. Transmitting the PUCCH transmission does not mean that NW can successfully receive it. So, we prefer to apply the same solution as Option 2/3/4. |
| OPPO | Option A |  |
| Nokia | Option B |  |
| CMCC | Option A | If PUCCH, as the first channel, is valid before TAT, then it is similar to the indication of initiating RACH in Q2, and we believe that it can be up to NW implementation. |
| Ericsson | Option A |  |
| Samsung  | Option A |  |

**Summary:**

Option A: 6 support

Option B: 4 support

**Proposal 3 (6/10): For mode-A UEI report if TAT is expired after transmitting PUCCH and before PUSCH for a triggered report, no enhancement is needed.**

## Issue 3: UEI report in DRX

In the current DRX procedure as highlighted below, UE does not report periodic CSI on PUCCH or semi-persistent CSI on PUSCH/PUCCH outside DRX active time, but reports aperiodic CSI on PUSCH outside DRX active time. In addition, if CSI masking is setup (i.e., *csi-Mask* is configured as true), UE does not report CSI on PUCCH and if *drx-onDurationTimer* is not running.

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| 5.7 Discontinuous Reception (DRX)…When DRX is configured, the MAC entity shall: …1> if DCP monitoring is configured for the active DL BWP as specified in TS 38.213 [6], clause 10.3; and1> if the current symbol n occurs within *drx-onDurationTimer* duration; and1> if *drx-onDurationTimer* associated with the current DRX cycle is not started as specified in this clause:2> if the MAC entity would not be in Active Time considering grants/assignments/DRX Command MAC CE/Long DRX Command MAC CE received and Scheduling Request sent until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause; and2> if *allowCSI-SRS-Tx-MulticastDRX-Active* is not configured, or if *cfr-ConfigMulticast* is not configured for any of the active BWP(s) of the Serving Cell(s), or if all multicast DRXes would not be in Active Time considering multicast assignments/DRX Command MAC CE for MBS multicast received until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in Clause 5.7b and all multicast sessions are configured with multicast DRX:3> not transmit periodic SRS and semi-persistent SRS defined in TS 38.214 [7];3> not report semi-persistent CSI configured on PUSCH;3> not report semi-persistent CSI on PUCCH;3> if *ps-TransmitPeriodicL1-RSRP* is not configured with value *true*:4> not report periodic CSI that is L1-RSRP on PUCCH.3> if *ps-TransmitOtherPeriodicCSI* is not configured with value *true*:4> not report periodic CSI that is not L1-RSRP on PUCCH.1> else:2> in current symbol n, if a DRX group would not be in Active Time considering grants/assignments scheduled on Serving Cell(s) in this DRX group and DRX Command MAC CE/Long DRX Command MAC CE received and Scheduling Request sent until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause; and2> if *allowCSI-SRS-Tx-MulticastDRX-Active* is not configured, or if *cfr-ConfigMulticast* is not configured for any of the active BWP(s) of the Serving Cell(s), or, in current symbol n, if all multicast DRXes corresponding to the DRX group would not be in Active Time considering multicast assignments/DRX Command MAC CE for MBS multicast received until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in Clause 5.7b and all multicast sessions corresponding to the DRX group are configured with multicast DRX:3> not transmit periodic SRS and semi-persistent SRS defined in TS 38.214 [7] in this DRX group;3> not report CSI on PUCCH and semi-persistent CSI configured on PUSCH in this DRX group.2> if CSI masking (*csi-Mask*) is setup by upper layers:3> in current symbol n, if *drx-onDurationTimer* of a DRX group would not be running considering grants/assignments scheduled on Serving Cell(s) in this DRX group and DRX Command MAC CE/Long DRX Command MAC CE received until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause; and3> if *allowCSI-SRS-Tx-MulticastDRX-Active* is not configured, or if *cfr-ConfigMulticast* is not configured for any of the active BWP(s) of the Serving Cell(s), or, in current symbol n, if *drx-onDurationTimerPTM(s)* of all multicast DRXes corresponding to the DRX group would not be running considering DRX Command MAC CE for MBS multicast received until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in Clause 5.7b and all multicast sessions corresponding to the DRX group are configured with multicast DRX:4> not report CSI on PUCCH in this DRX group.…Regardless of whether the MAC entity is monitoring PDCCH or not on the Serving Cells in a DRX group, the MAC entity transmits HARQ feedback, aperiodic CSI on PUSCH, and aperiodic SRS defined in TS 38.214 [7] on the Serving Cells in the DRX group when such is expected. |

For UE-initiated report, each report consists of two steps, the first step on PUCCH and the second step on PUSCH. In Rapporteur’s view, we can strive to apply the same rule for both steps of each report to simplify design. From another aspect, the two steps should be considered together since without the report in PUSCH the PUCCH notification is meaningless, and without PUCCH notification the report in PUSCH cannot be received properly.

The mode-A UE-initiated report is similar to aperiodic CSI report on PUSCH, for example, in terms of CSI trigger state indicated in DCI, DG-based report resource, aperiodic triggering. Thus, we can consider applying the same principle as for aperiodic CSI report, meaning mode-A UE-initiated report can be transmitted regardless of DRX active time.

**Q4: Do you agree the following view?**

**Regardless of whether the MAC entity is monitoring PDCCH or not on the Serving Cells in a DRX group, the MAC entity transmits mode-A UE-initiated CSI report on PUCCH and PUSCH on the Serving Cells in the DRX group when such is expected.**

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| **Company** | **Y/N** | **Comments** |
| CATT | Yes |  |
| ASUSTeK | Yes |  |
| Sharp  | Yes |  |
| Huawei, HiSilicon | Yes | Note that the term of **mode-A UE-initiated CSI report on PUCCH and PUSCH** should be aligned with RAN1 spec.  |
| Ofinno | Yes | The similar rule of aperiodic CSI reporting should be applied for mode-A of UE-initiated CSI reporting. |
| OPPO | Yes |  |
| ZTE | Yes | Agree with Ofinno |
| Nokia | Yes |  |
| CMCC | Yes |  |
| Ericsson | Yes |  |
| Samsung | Yes |  |
| Apple | Yes |  |

**Summary:**

All agree with the following proposal.

**Proposal 4 (12/12): Regardless of whether the MAC entity is monitoring PDCCH or not on the Serving Cells in a DRX group, the MAC entity transmits mode-A UE-initiated CSI reporting on PUCCH and PUSCH on the Serving Cells in the DRX group when such is expected.**

On the other hand, mode-B UE-initiated report can be considered similar to semi-persistent CSI report in terms of the pre-configured report resource, while also being aperiodic in terms of the triggering. In this sense, mode-B UE-initiated report in DRX can follow the principle of either SP CSI report or AP CSI report.

**Q5: Which option do you support?**

**Option 1: UE transmits PUCCH/PUSCH for mode-B UE-initiated CSI report regardless of DRX Active Time (i.e., same as mode-A in Q4).**

**Option 2: UE does not transmit PUCCH/PUSCH for mode-B if either PUCCH or PUSCH (first valid type-1 CG occasion) is outside DRX Active Time.**

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| **Company** | **1/2/others** | **Comments** |
| CATT | Option 2 |  |
| ASUSTeK | Option 1 |  |
| Sharp | Option 1  |  |
| Huawei, HiSilicon | Option 2 | Aligned with semi-persistent CSI report |
| Ofinno | Option 2 | For option 2, it should be UE does “not” transmit…?Since RAN1 has agreed to reuse the multiplexing/prioritization rules of SP-CSI for Mode-B UEI beam reporting in RAN1 #120b meeting, we view the Mode-B UE-initiated report as functionally similar to a semi-persistent CSI report. Therefore, we prefer Option 2, but we are also fine with Option 1. **RAN1 #120b Agreement**On beam report transmission procedure for UE-initiated/event-driven beam reporting, for the case the pre-configured Type-1 CG PUSCH carry the beam report, for the second UL channel in Mode-B, reuse the intra-UE multiplexing/prioritization rules of PUSCH with SP-CSI for Type-1 CG PUSCH with UEI-BR for Mode B |
| OPPO | Option 1 |  |
| Nokia | Option 2 | ‘UE does **not** transmit….’ Aligned with semi-persistent CSI report |
| CMCC | Option 2 |  |
| Ericsson | Option 2 | With the suggested correction to the O2 formulation |
| Samsung  | Option 2 |  |
| Apple | Option 2 |  |

**Summary:**

Option 1: 3 supports

Option 2: 8 supports

**Proposal 5 (8/11): UE does not transmit PUCCH/PUSCH for mode-B if either PUCCH or PUSCH (first valid type-1 CG occasion) is outside DRX Active Time.**

## Issue 4: UEI report in cell DTX/DRX

In the current procedure for cell DTX, UE monitors PDCCH on the serving cell during the cell DTX Active Period. For UEI report, the issue is after transmitting the first step PUCCH of mode-A report whether UE monitors PDCCH outside cell DTX Active Period.

|  |
| --- |
| 5.34.2 Cell Discontinuous Transmission…1> if cell DTX operation is deactivated for this Serving Cell; or1> if the Serving Cell is in the cell DTX Active Period:2> monitor PDCCH on this Serving Cell, as specified in TS 38.213 [6] and other clauses of this specification.1> if any *drx-RetransmissionTimerDL*, *drx-RetransmissionTimerUL* or *drx-RetransmissionTimerSL* (as described in clause 5.7) is running on any Serving Cell in the DRX group of this Serving Cell; or1> if *ra-ContentionResolutionTimer* (as described in clause 5.1.5) or *msgB-ResponseWindow* (as described in clause 5.1.4a) is running; or1> if a Scheduling Request is sent on PUCCH and is pending (as described in clause 5.4.4 or 5.22.1.5); or1> if a PDCCH indicating a new transmission addressed to the C-RNTI of the MAC entity has not been received after successful reception of a Random Access Response for the Random Access Preamble not selected by the MAC entity among the contention-based Random Access Preamble (as described in clauses 5.1.4 and 5.1.4a):2> monitor PDCCH on the Serving Cells in the DRX group of this Serving Cell, as specified in TS 38.213 [6] and other clauses of this specification.1> if *ra-ResponseWindow* (as described in clause 5.1.4) is running and this Serving Cell is the SpCell:2> monitor PDCCH on this Serving Cell (as described in clause 5.1.4).… |

In one option, UEI report can be considered as an exception case that NW can accommodate outside the cell DRX Active Period and schedule the report by DCI in PDCCH, so UE monitors PDCCH after transmitting PUCCH for UEI report regardless of cell DTX Active Period.

From the other aspect, UEI report may not be important during cell DTX inactive time, the schedule of mode-A PUSCH is up to NW decision and NW can schedule during cell DTX Active Period or deactivate cell DTX to schedule UEI report.

**Q6: Which option do you agree?**

**Option 1: Regardless of cell DTX Active Period, UE monitors PDCCH if PDCCH scheduling mode-A PUSCH has not been received after transmitting PUCCH for mode-A UEI report.**

**Option 2: no impact to cell DTX**

|  |  |  |
| --- | --- | --- |
| **Company** | **1/2/others** | **Comments** |
| CATT | Option 2 |  |
| ASUSTeK | Option 2 |  |
| Sharp | Option 2  |  |
| Huawei, HiSilicon |  | No strong view, but think it can be more flexible, which is up to NW configuration.  |
| Ofinno | Option 1 | We support Option 1. The UE-initiated CSI report is important even outside the current DTX active period, as it prepares the network with timely channel state information for the upcoming DTX active interval. Otherwise, the UE may need to perform the UE-initiated CSI reporting at the beginning of the next active period, leading to a delay in data transmission. Additionally, postponing the UE-initiated CSI reporting for Event 1 until the DTX active period may increase the risk of beam failure due to outdated channel information. |
| OPPO | Option 2 |  |
| ZTE | Option 2 |  |
| Nokia | Option 2 |  |
| CMCC | Option 2 |  |
| Ericsson | Option 2 |  |
| Samsung | Option 2 |  |
| Apple | Option 2 |  |

**Summary:**

Option 1: 1 support

Option 2: 11 support

**Proposal 6 (11/12): For mode-A UEI report, regarding monitoring PDCCH for DG in cell DTX, no enhancement is needed.**

In the current behaviour for cell DRX, outside the cell DRX Active Period UE does not transmit SR, does not report periodic CSI on PUCCH or semi-persistent CSI on PUCCH/PUSCH. For UEI report, the rule for UEI report PUCCH/PUSCH has to be discussed.

|  |
| --- |
| 5.34.3 Cell Discontinuous Reception…1> if cell DRX is activated and the Serving Cell is not in the cell DRX Active Period:2> not instruct the physical layer to signal a SR on a PUCCH resource for SR;2> not increment the *SR\_COUNTER* for a SR;2> not start the *sr-ProhibitTimer* for a SR;2> not deliver any configured uplink grant and the associated HARQ information to the HARQ entity;2> not instruct a HARQ process associated with a configured uplink grant to trigger a new transmission or a retransmission;2> not report CSI on PUCCH and semi-persistent CSI configured on PUSCH;2> if an emergency service is initiated by upper layers and this Serving Cell is the SpCell:3> initiate a Random Access procedure (as specified in clause 5.1.1).NOTE 2: How the MAC layer in the UE is aware of an ongoing emergency service is up to UE implementation.2> if upper layers provide Access Identity 1 or Access Identity 2 and this Serving Cell is the SpCell:3> initiate a Random Access procedure (as specified in clause 5.1.1). |

The possible options for UEI report are listed as follows. Note the PUSCH for mode-A UEI report is scheduled by NW and UE shall transmit if scheduled by NW regardless of cell DRX, so there should be no spec. impact.

**Q7: Which option(s) do you agree?**

**Option A-0: the PUSCH for mode-A UEI report is scheduled by NW and UE shall transmit if scheduled by NW regardless of cell DRX, no MAC spec. impact.**

**Option A-1: UE does not transmit mode-A UEI report PUCCH outside cell DRX Active Period.**

**Option A-2: UE transmits mode-A UEI report PUCCH regardless cell DRX Active Period.**

**Option B-1: UE does not transmit PUCCH/PUSCH for mode-B UEI report if either the PUCCH or PUSCH (first valid type-1 CG occasion) for a report is outside cell DRX Active Period.**

**Option B-2: UE transmits PUCCH/PUSCH for mode-B UEI report regardless cell DRX Active Period.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **A-0/1/2/others** | **B-1/2/others** | **Comments** |
| CATT | Option A-0/1 | Option B-1 |  |
| ASUSTeK | Option A-0/1 | Option B-1 |  |
| Sharp | Option A-0/1 | Option B-1 |  |
| Huawei, HiSilicon | Option A-0/1 | Option B-1 |  |
| Ofinno | Option A-0 and A-1 | Option B-1 | For Mode-A of UEI reporting, we can follow the legacy aperiodic CSI reporting. The network may choose to transmit a DCI to schedule the second PUSCH carrying the UE-initiated CSI report outside of the cell DRX active period. If the network transmits such a DCI, the UE can transmit the UE-initiated CSI report outside the cell DRX active period, similar to the behavior for aperiodic CSI reporting (Option A-0).Furthermore, since the first PUCCH transmission in Mode A is functionally similar to a legacy SR, the UE may follow the legacy behavior for SR under cell DRX, i.e., the UE does not transmit the first PUCCH when the serving cell is not in the cell DRX active period (Option A-1). In Mode-B of UEI reporting, for the first PUCCH transmission, we propose aligning with the legacy behavior of SR transmission under cell DRX, i.e., the UE does not transmit the first PUCCH when the serving cell is outside the DRX active period. Furthermore, if the configured Type 1 CG occasion falls outside the cell DRX active period, consistent with legacy behavior (i.e., the UE does not transmit Type 1 CG outside the DRX active period), there is no need to transmit the first PUCCH even if it falls within the DRX active time. This is because the UE would not be able to use the Type 1 CG occasion for the actual UEI report transmission. Therefore, we support Option B-1. |
| OPPO | Option A-0/1 | Option B-1 |  |
| ZTE | Option A-0/1 | Option B-1 |  |
| Nokia | Option A-0/1 | Option B-1 |  |
| CMCC | Option A-0&1 | Option B-1 |  |
| Ericsson | Option A-0/1 | B-1 |  |
| Samsung | Option A-0/1 | Option B-1 |  |
| Apple | Option A-0/1 | Option B-1 |  |

**Summary:**

All agree with Option A-1/0, and Option B-1.

**Proposal 7 (12/12): Regarding UEI report in cell DRX:**

* **If the PUSCH for mode-A UEI report is scheduled by NW, UE shall transmit regardless of cell DRX, no MAC spec. impact.**
* **UE does not transmit mode-A UEI report PUCCH outside cell DRX Active Period.**
* **UE does not transmit PUCCH/PUSCH for mode-B UEI report if either the PUCCH or PUSCH (first valid type-1 CG occasion) for a report is outside cell DRX Active Period.**

## Issue 5: sDCI mTRP 2TA in LTM cell switch

Regarding sDCI mTRP 2TA, the following agreements have been reached.

RAN2#129bis

**For 2TA in asymmetric DL sTRP/UL mTRP scenario with pathloss offset configured Rel-18 2TA operation is applied with the following RRC changes:**

**• remove the restriction that RRC field tag2 is configured only if coresetPoolIndex is configured with more than one value;**

**• a single n-TimingAdvanceoffset is configured, i.e., n-TimingAdvanceOffset2 is not configured for 2TA in asymmetric DL sTRP/UL mTRP scenario.**

RAN2#130

* 2TA operation is supported for Rel-19 single-DCI mTRP without the restriction that coresetPoolIndex needs to be configured with more than one value, and single-DCI mTRP 2TA is applied to both the scenarios that PL offset is configured and PL offset is not configured.
* Regarding Rel-19 sDCI mTRP 2TA operation for the scenario PL offset is not configured (UE is configured with SSB-MTC-additionalPCI), RAN2 assumes both n-TimingAdvanceoffset and n-TimingAdvanceOffset2 are configured unless RAN1 has different agreement.
* Introduce a new RRC parameter per BWP that explicitly enables the Rel-19 sDCI-mTRP 2TA, and clarify in FD of tag2 to include all cases where tag2 is configured that “it is optionally configured in a serving cell for mDCI mTRP 2TA if coresetPoolIndex for a BWP is configured with more than one value, and for sDCI mTRP 2TA if [the new parameter] is configured.”

Rel-19 sDCI mTRP 2TA is supported for both cases that PL offset is configured and PL offset is not configured. The existing configuration *tag2*, which was introduced for Rel-18 mDCI mTRP 2TA, is reused for Rel-19 sDCI mTRP 2TA with field description updated. MAC behaviour on 2TA is not impacted, i.e., same behaviour is applied to support Rel-19 sDCI mTRP 2TA.

We aim to discuss whether/how to support Rel-19 sDCI mTRP 2TA by identifying the MAC impact on legacy behaviour. We only consider legacy Rel-18 LTM cell switch, which does not support PL offset for LTM candidate TCI states. This limits the case to sDCI mTRP 2TA with no PL offset. In Rapporteur’s view, there is no MAC impact identified to support Rel-19 sDCI mTRP 2TA (with no PL offset) for Rel-18 LTM cell switch, meaning legacy LTM cell switch procedure can be applied with no change.

**Q8: Do you agree the following view?**

**sDCI mTRP 2TA (in case of no PL offset) is supported for legacy Rel-18 LTM cell switch with no MAC specification impact.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| CATT | Yes |  |
| ASUSTeK | Yes |  |
| Sharp | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Ofinno | Yes | In the absence of PL offset configuration, in our view, the current LTM cell switch procedure can be reused with no MAC impact. |
| OPPO | Yes |  |
| ZTE | Yes |  |
| CMCC | Yes |  |
| Ericsson | Yes |  |
| Samsung | Yes |  |
| Apple | Yes |  |

**Summary:**

All agree with the view.

**Proposal 8 (12/12): sDCI mTRP 2TA (in case of no PL offset) is supported for legacy Rel-18 LTM cell switch with no MAC specification impact.**

# Other issues

Companies are invited to describe any other issues which have potential MAC impacts.

|  |  |
| --- | --- |
| **Company** | **Other issues (please describe the issue and the potential MAC impacts)** |
| Huawei, HiSilicon | We need to discuss how to handle the configured uplink grant of UEIBM report for SCell deactivation case, i.e. clear or suspend. **TS 38.321-i40 clause 5.9**1> else if an SCell Activation/Deactivation MAC CE or an Enhanced SCell Activation/Deactivation MAC CE is received deactivating the SCell; or1> if the *sCellDeactivationTimer* associated with the activated SCell expires; or1> if the SCG associated with the activated SCell is deactivated:2> deactivate the SCell according to the timing defined in TS 38.213 [6];2> stop the *sCellDeactivationTimer* associated with the SCell;2> stop the *bwp-InactivityTimer* associated with the SCell;2> deactivate any active BWP associated with the SCell;2> clear any configured downlink assignment and any configured uplink grant Type 2 associated with the SCell respectively;2> clear any PUSCH resource for semi-persistent CSI reporting associated with the SCell;2> suspend any configured uplink grant Type 1 associated with the SCell;2> flush all HARQ buffers associated with the SCell;2> cancel, if any, triggered consistent LBT failure for the SCell.Rapp: following the existing behavior, type-1 CG for UEI report is suspended. There should be no exception for mode-B UEI report, and no spec. change to follow existing behavior for UEI report. |
| Ofinno | 1. Whether to support Rel-19 sDCI mTRP 2TA **with** **PL offset** for Rel-18 LTM cell switch. If it is supported, how to indicate the up-to-date PL offset for LTM cell switch?

Rapp: in my understanding, without specification impact the current Rel-18 LTM cannot support sDCI mTRP 2TA with PL offset. Since this is a cross-WI issue which requires spec. impact, it can be raised in TEI.1. Whether the UE performs PUCCH/PUSCH transmissions for both mode-A and mode-B UEI reports during FR2 uplink gap. According to the legacy MAC spec, in order not to degrade the system performance, the UE can still perform some critical uplink transmissions during FR2 UL gap such as Msg1/Msg3/MsgA, SR, LRR, UL-SCH for configured grant, and **CSI/L1-RSRP report during SCell activation**. Given that UE-initiated CSI reporting is also a key mechanism for radio connection maintenance, it is worth to discuss this issue.

Rapp: the issue was mentioned in the post129bis open issue discussion. However, there seems not much interest from companies. In Rapporteur’s understanding, there is no strong motivation to support UEI report during FR2 Ul gap since the existing CSI/L1-RSRP report can work. 1. In our view, RAN1 does not restrict the application of Rel-18 multi-TRP uplink schemes, such as Multi-TRP PUSCH/PUCCH repetitions and simultaneous multiple-panel PUSCH/PUCCH transmissions, in asymmetric DL sTRP/UL mTRP scenarios, which are based on single-DCI multi-TRP configurations. That is, the UE may transmit repetitions of a PUSCH or PUCCH transmission to both the anchor TRP and the UL-only TRP, or it may perform simultaneous PUSCH/PUCCH transmission using two panels (e.g., via *multipanelSchemeSDM* or *multipanelSchemeSFN*) targeting both TRPs.

Under the multi-DCI multi-TRP scheme specified in Rel-18, if the TAT of one TAG expires while another TAG's TAT is running, the UE clears any configured uplink grant and any PUSCH resource for semi-persistent CSI reporting associated with the expired TAG because the configured uplink grants (and the PUSCH resources for semi-persistent CSI reporting) should be associated with the same TAG. However, in the Rel-19 single-DCI multi-TRP scheme, the configured uplink grants (and the PUSCH resources for semi-persistent CSI reporting) may be associated with **both TAGs** (e.g., when *applyIndicatedTCI-State* is set to ‘both’, or when the SRS resource set indicator in the DCI activating the semi-persistent CSI reporting is set to ‘10’ or ‘11’).Therefore, there is a need to discuss the MAC behavior of TAT expiry for single-DCI multi-TRP scenarios (e.g., when the configured uplink grants (and the PUSCH resources for semi-persistent CSI reporting) are associated with **both TAGs**). Rapp: in my understanding there is no different between Rel-18 mDCI mTRP with 2TA and Rel-19 sDCI mTRP with 2TA, and the current behavior is applied, i.e., the resource is cleared if all the activated TCI states for the resource are associated to the expired TAT.  |
|  |  |
|  |  |
|  |  |
|  |  |

**Summary:**

In Rapporteur’s view, the issues mentioned above are not critical. Companies can submit contributions on these issues if interested. It can be further discussed if more are interested based on contributions.

# Conclusions

The following proposals are provided based on companies’ input. Contributions are welcome on the proposals for discussion (i.e., P2 and P3).

Proposal for easy agreement:

**Proposal 1 (12/12): If the PUCCH of a UEI report configuration is pointed to a SCell whose TAT of the single sTAG is expired, this PUCCH for the SCell is released by RRC. If the type-1 CG of a UEI report configuration is pointed to a SCell whose TAT of the single sTAG is expired, this type-1 CG for the SCell is cleared as a configured UL grant. There is no MAC specification impact.**

**Proposal 4 (12/12): Regardless of whether the MAC entity is monitoring PDCCH or not on the Serving Cells in a DRX group, the MAC entity transmits mode-A UE-initiated CSI reporting on PUCCH and PUSCH on the Serving Cells in the DRX group when such is expected.**

**Proposal 5 (8/11): UE does not transmit PUCCH/PUSCH for mode-B if either PUCCH or PUSCH (first valid type-1 CG occasion) is outside DRX Active Time.**

**Proposal 6 (11/12): For mode-A UEI report, regarding monitoring PDCCH for DG in cell DTX, no enhancement is needed.**

**Proposal 7 (12/12): Regarding UEI report in cell DRX:**

* **If the PUSCH for mode-A UEI report is scheduled by NW, UE shall transmit regardless of cell DRX, no MAC spec. impact.**
* **UE does not transmit mode-A UEI report PUCCH outside cell DRX Active Period.**
* **UE does not transmit PUCCH/PUSCH for mode-B UEI report if either the PUCCH or PUSCH (first valid type-1 CG occasion) for a report is outside cell DRX Active Period.**

**Proposal 8 (12/12): sDCI mTRP 2TA (in case of no PL offset) is supported for legacy Rel-18 LTM cell switch with no MAC specification impact.**

Proposal for discussion:

**Proposal 2: Regarding whether to initiate RACH when UEI report is triggered but TAT is expired, select one of the following options:**

* **Option 1: UE does not initiate RACH when UEI report is triggered but there is no PUCCH or type-1 CG due to the associated TAT is expired. No MAC impacts.**
* **Option 3: UE initiates RACH when UEI report is triggered but there is no PUCCH or type-1 CG due to the associated TAT is expired, and UE indicates the cause of RACH. Discuss how to indicate the cause of RACH (e.g., MAC CE in Msg3).**

**Proposal 3 (6/10): For mode-A UEI report, if TAT is expired after transmitting PUCCH and before PUSCH for a triggered report, no enhancement is needed.**

# References

1. R2-2504672 Report from session on Rel-18 MIMO, Rel-19 MIMO, LPWUS, SBFD, NR Others RAN2 Vice Chairman (CATT)
2. R2-2504732 Report of offline discussion [AT130][202][MIMO\_Ph5] Samsung