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

**Prague, Czech Republic, Oct. 13th-17th, 2025**

**Agenda item: 8.12.1**

**Source: Samsung**

**Title: Report of Rel-19 MIMO MAC open issues for maintenance**

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

**Document for: Discussion and Decision**

# Introduction

This offline discussion aims to collect Rel-19 MIMO MAC open issues for maintenance according to the instruction below indicated in email thread **[POST131][000][Organizational] Schedule and Agenda** and in the RAN2#131bis meeting agenda.





The following CR review offline discussion is used to expand the scope to gather open issues.

* [Post131][217][MIMO\_Ph5] CR for TS 38.321 (Samsung)

Intended outcome: ~~Agree the CR for TS 38.321~~ and collect open issues for maintenance.

Deadline: **phase-1 Sep. 19th 1000 UTC; phase-2 Sep. 26th 1000 UTC.**

For phase-1 discussion, companies are invited to provide identified open issues and the corresponding suggested solutions by **Sep. 19th 1000 UTC**, so that Rapporteur can summarize the issues to be discussed in phase-2.

For phase-2 discussion by **Sep. 26th 1000 UTC**, companies please share views on the issues summarized by the Rapporteur. Based on the comments, Rapporteur will list the easy issues with promising solutions and the controversial issues to be further discussed based on tdoc contribution.

Companies are encouraged to spend time early to identify open issues and utilize this offline discussion to provide inputs in order to facilitate the tdoc preparation and the discussion at RAN2#131bis.

# Discussion

For phase-1 discussion by Sep 19th 1000 UTC, please provide the description of the identified issues and the potential solutions. As the outcome of phase-1 discussion, Rapporteur will indicate the issues to be discussed in phase-2. Some easy issues may not need phase-2 discussion.

* The identified issue should have potential MAC impact. Issues can include the ones discussed/proposed in RAN2 before but not solved/concluded, the ones with RAN2 impact caused by other WG (e.g., RAN1) but not identified before, and so on.
* For the proposed solution, companies are encouraged to provide the detailed TP, or if not possible, a high-level proposal at least.

For phase-2 discussion by Sep 26th 1000 UTC, please provide comments on the issues/solutions listed in phase-1 discussion outcome.

Companies are also encouraged to indicate miscellaneous and non-controversial issues (including editorial issues) here. Such issues can be provided until Sep 26th 1000 UTC and will be directly handled in the Rapporteur CR to be submitted to RAN2#131bis.

Please use the template below and fill in each block for one issue.

# [ASUSTeK] [Issue-1]

**[Issue Description]**:

The PUCCH resource of a UEI report configuration of a SCell can be configured on a PUCCH Cell associated with a different TAG from the SCell:



Currently, in this case, when TAT of a TAG of the SCell expires and PUSCH transmission for the CSI report becomes unavailable, the PUCCH resource of a UEI report configuration of the SCell is not released when the PUCCH resource is configured on a PUCCH Cell with a different TAG. This will cause unnecessary PUCCH transmission and the PUCCH resource will be occupied by the UE and cannot be reallocated for other uses. In addition, if RAN2 decides to not release PUCCH resource in this case, behavior of UEI beam reporting should be clarified when no PUSCH is available for CSI report (i.e., whether the UE still transmits the PUCCH when no PUSCH is available for CSI report).

**[Proposed Solution]**:

**Proposal 1: RAN2 to select from one of the options for UEI beam reporting in the following scenario: Upon STAG TAT expiry associated with a SCell configured with a UEI report configuration, if the PUCCH resource of the UEI report configuration is configured on a PCell or PUCCH-SCell of a different TAG with a running TAT, the UE:**

* + - * **Option 1: releases the PUCCH resource.**
      * **Option 2a: does not release the PUCCH resource. If a UEI beam report is triggered for the SCell, the UE transmits the PUCCH and does not transmit the PUSCH for the UEI beam report.**
      * **Option 2b: does not release the PUCCH resource. If a UEI beam report is triggered for the SCell, the UE does not transmit the PUCCH for the UEI beam report.**

**Proposal 2: Based on the selected option in P1, RAN2 to discuss spec impact for handling UEI report upon SCell TAT expiry.**

Possible TPs for each option are as below:

TP for option 1 (38.331):

|  |
| --- |
| 5.3.12 UE actions upon PUCCH/SRS release request  Upon receiving a PUCCH release request from lower layers, for all bandwidth parts of an indicated serving cell the UE shall:   1. release PUCCH-CSI-Resources configured in *CSI-ReportConfig*;   1> release PUCCH-CSI-Resources configured in *LTM-CSI-ReportConfig*;  1> release *SchedulingRequestResourceConfig* instances configured in *PUCCH-Config*;   1. release *pucch-Resource* configured in the *CSI-ReportUE-IBR*;   1> if the indicated serving cell is referred to by *pucch-Cell* included in *CSI-ReportUE-IBR* of an associated *CSI-ReportConfig*;  2> release *pucch-Resource* indicated in the associated *CSI-ReportUE-IBR*; |

TP for option 2 (38.321):

|  |
| --- |
| 5.2 Maintenance of Uplink Time Alignment  …  1> when a *timeAlignmentTimer* expires:  …  2> else:  3> if the *timeAlignmentTimer* is associated with a TAG for an SCell configured with only this TAG; or  3> 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 on 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.  … |

TP for option 2a (change can also be made in 38.321):

|  |
| --- |
| (38.214)  5.2.1.5.4 UE Initiated reporting  …  If the number of event instances determined by the counter for such reference signal is greater than or equal to *eventInstanceCount*, the UE transmits UEIRI on a PUCCH format 0 or format 1 in the PUCCH resource (in the CC provided by *pucchCell,* if configured, in the *CSI-ReportConfig*) configured by *PUCCHResource* in the *CSI-ReportConfig*. If *timeAlignmentTimer* associated with the Cell configured with the *CSI-ReportConfig* expires, the UE does not send a CSI report via PUSCH resource after transmission of UEIRI. |

TP for option 2b (change can also be made in 38.321):

|  |
| --- |
| (38.214)  5.2.1.5.4 UE Initiated reporting  …  If the number of event instances determined by the counter for such reference signal is greater than or equal to *eventInstanceCount* and *timeAlignmentTimer* associated with the Cell configured with the *CSI-ReportConfig* is running, the UE transmits UEIRI on a PUCCH format 0 or format 1 in the PUCCH resource (in the CC provided by *pucchCell,* if configured, in the *CSI-ReportConfig*) configured by *PUCCHResource* in the *CSI-ReportConfig*. |

**[Phase-2 Discussion]**:

# [Sharp] [Issue-2]

**[Issue description]**:

For the UE initiated beam measurement report transmission configured with Mode B, PUCCH resource could be configured in a dedicated BWP while PUSCH resource could be configured in another dedicated BWP.

CSI-ReportUE-IBR-r19 ::= SEQUENCE {

...

reportTransmissionMode-r19 CHOICE {

modeA-r19 NULL,

modeB-r19 SEQUENCE {

pusch-ResourceOfModeB-r19 SEQUENCE {

configuredGrantConfigIndex-r19 ConfiguredGrantConfigIndex-r16,

ul-BWP-Id-r19 BWP-Id,

servCellIndex-r19 ServCellIndex

},

…

pucch-Resource-r19 SEQUENCE {

…

resource PUCCH-ResourceId,

ul-BWP-Id-r19 BWP-Id,

pucch-Cell-r19 ENUMERATED {spCell, pucch-Scell}

}

}

It is not clear if the BWP for PUSCH resource is deactivated, whether the UE should transmit an associated PUCCH in an active BWP when there is a UE initiated beam measurement report.

**[Proposed Solution]**:

UE will not transmit a PUCCH for beam measurement report notification in Mode B if the BWP for the associated PUSCH is deactivated.

**[Phase-2 Discussion]**:

…

# [Ofinno] [Issue-3]

**[Issue description]**:

In legacy, 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, ….

|  |
| --- |
| **TS 38.321** 5.30 Handling of FR2 UL gap During the FR2 UL gap configured by *ul-GapFR2-Config* as specified in TS 38.331 [5], the MAC entity shall, on the Serving Cell(s) of FR2 single CC and intra-band CA, or on the Serving Cell(s) of FR2 inter-band CA where UE does not support *tx-Support-UL-GapFR2*:  1> only perform transmission of:  2> PRACH preamble as specified in clause 5.1.2 and 5.1.2a;  2> UL-SCH for Msg3 or the MSGA payload as specified in clause 5.4.2.2;  2> UL-SCH for configured grant;  2> the valid CSI report during SCell activation procedure where the valid CSI report is valid CQI with non-zero CQI index defined in TS 38.214 [7], clause 5.2.2.1, when the time period between UL gap colliding with CSI report of non-zero CQI and the slot where the SCell activation MAC CE or CSI report activation command is received is no less than 10 ms;  2> the valid L1 RSRP report during SCell activation procedure, where the valid L1 RSRP report is non lowest L1 RSRP defined in TS 38.133 [11], clause 10.1.6, when the time period between UL gap colliding with L1 RSRP reporting and the slot where the SCell activation MAC CE or CSI report activation command is received is no less than 10 ms;  2> the PUCCH transmission for SR, and link recovery request (LRR) defined in TS 38.133 [11], clause 8.5. |

According to the RAN1#120 agreement, the first PUCCH carrying a UE-initiated report indication has higher priority than a normal SR.

|  |
| --- |
| **RAN1#120 Agreement**  On beam report transmission procedure for UE-initiated/event-driven beam reporting, support the following option of dropping rule for the Case-1: the 1-bit first PUCCH is collided/overlapped with a PUCCH carrying normal SR and/or a PUCCH with normal LRR   * Option-1: LRR > **first PUCCH** > normal SR   Note: When the 1-bit first PUCCH is collided/overlapped with a PUCCH carrying normal SR and/or a PUCCH with normal LRR, only one of them is transmitted based on the above priority rule |

The PUCCH used for Mode A UE-initiated CSI reporting serves a function analogous to that of SR and is even assigned a higher priority. This prioritization signifies that the PUCCH associated with UE-initiated CSI reporting is deemed more critical than the SR. Since the normal SR is transmitted during FR2 UL gaps, the UE behavior should also be specified for cases where the higher-priority UE-initiated report indicator in PUCCH overlaps with an FR2 uplink gap. Given that UE-initiated CSI reporting is an important mechanism for maintaining the radio connection, dropping the first PUCCH during an FR2 uplink gap could negatively affect system performance.

For mode B, the type 1 CG PUSCH may fall within the FR2 UL gap. In legacy, the normal CG is transmitted during the FR2 UL gaps. Given that the Type 1 CG for UE-initiated CSI reporting is more important and is a key mechanism for radio connection maintenance, dropping the configured grant PUSCH during the FR2 UL gap could negatively impact system performance. Therefore, the CG type 1 for mode-B UE-initiated CSI reporting should also be transmitted during FR2 UL gaps

**[Proposed Solution]:**

**Solution: During FR2 UL gap, the UE performs:**

**PUCCH transmission for UE Initiated Report Indication; and**

**transmission of CG Type 1 for mode-B UE-initiated CSI reporting.**

|  |
| --- |
| **Text Proposal** 5.30 Handling of FR2 UL gap During the FR2 UL gap configured by *ul-GapFR2-Config* as specified in TS 38.331 [5], the MAC entity shall, on the Serving Cell(s) of FR2 single CC and intra-band CA, or on the Serving Cell(s) of FR2 inter-band CA where UE does not support *tx-Support-UL-GapFR2*:  1> only perform transmission of:  2> PRACH preamble as specified in clause 5.1.2 and 5.1.2a;  2> UL-SCH for Msg3 or the MSGA payload as specified in clause 5.4.2.2;  2> UL-SCH for configured grant;  2> Configured grant Type 1 for mode-B UE-initiated CSI reporting;  2> the valid CSI report during SCell activation procedure where the valid CSI report is valid CQI with non-zero CQI index defined in TS 38.214 [7], clause 5.2.2.1, when the time period between UL gap colliding with CSI report of non-zero CQI and the slot where the SCell activation MAC CE or CSI report activation command is received is no less than 10 ms;  2> the valid L1 RSRP report during SCell activation procedure, where the valid L1 RSRP report is non lowest L1 RSRP defined in TS 38.133 [11], clause 10.1.6, when the time period between UL gap colliding with L1 RSRP reporting and the slot where the SCell activation MAC CE or CSI report activation command is received is no less than 10 ms;  2> the PUCCH transmission for SR, UE Initiated Report Indication, and link recovery request (LRR) defined in TS 38.133 [11], clause 8.5. |

**[Phase-2 Discussion]**:

…

# [Ofinno] [Issue-4]

**[Issue description]**:

In legacy, the MAC spec defined the handling of the DRX ambiguity period. This is because the UE may not have sufficient processing time for PDCCH/TB decoding to determine whether the active time will be stopped by a DRX MAC CE or extended by PDCCH scheduling new transmission (e.g., to start or restart *drx-inactivityTimer*). To address this issue, a 4 ms ambiguity period was introduced for DRX operation when determining active time for reporting SRS/CSI or not. It was specified that in symbol n, the UE determines active time or not, and consequently whether to report SRS/CSI, by considering grants/assignments/DRX Command MAC CE received, and Scheduling Request sent 4 ms prior to symbol n. This behavior was defined in the MAC spec as highlighted below.

|  |
| --- |
| **TS 38.321** 5.7 Discontinuous Reception (DRX) …  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; and:  …  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 |

RAN2#129bis has agreed:

* In Mode A of UE-initiated CSI reporting, the active time of a DRX operation includes the time after a new UCI for UE-initiated beam reporting is sent on first PUCCH.

This has been specified in the latest CR of TS 38.321 as highlighted below.

|  |
| --- |
| **TS 38.321**  When DRX is configured, the Active Time for Serving Cells in a DRX group includes the time while:  - *…*  - a PDCCH scheduling a mode-A UE-initiated CSI report on PUSCH has not been received after transmitting UE Initiated Report Indication on PUCCH (as specified in TS 38.214 [7]). |

Like the legacy Scheduling Request scenario, the MAC entity is also ambiguous on determining whether the active time will be stopped or extended after transmitting a mode-A UE Initiated Report Indication on PUCCH, because the UE might lack sufficient processing time to decode the PDCCH/TB within the ambiguity period.

**[Proposed Solution]**:

**Solution: The active time ambiguity period of 4ms applies on UE Initiated Report Indication sent for mode-A UE-initiated CSI reporting.**

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| --- |
| **Text Proposal (The same change could be applied to other sections that specified the DRX ambiguity period)** 5.7 Discontinuous Reception (DRX) …  2> if the MAC entity would not be in Active Time considering grants/assignments/DRX Command MAC CE/Long DRX Command MAC CE received, Scheduling Request sent, and UE Initiated Report Indication sent for mode-A UE-initiated CSI reporting until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause; and:  …  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 |

**[Phase-2 Discussion]**:

…

# [Ofinno] [Issue-5]

**[Issue description]**:

In Rel-19 asymmetric DL sTRP/UL mTRP scenarios, 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.



In the Rel-19 asymmetric DL sTRP/UL mTRP scheme, a CG/PUSCH for SP-CSI can be associated with both TAGs of both TRPs. However, in the current spec, it’s unclear whether the UE clears the CG/PUSCH for SP-CSI if one or both of the TATs of both TAGs are expired.

For the case that UE is configured with a multi-panel simultaneous uplink transmission SDM scheme (*multipanelSchemeSDM*) for PUSCH, it is possible that some layers of the CG/PUSCH transmissions are mapped to the TCI state associated with a first TAG with expired TAT, while the other layers of the CG/PUSCH transmissions are mapped to the TCI state associated with a second TAG with running TAT. Since one of the two TAGs is not valid, the network may not be able to successfully decode the partial PUSCH transmissions that composed only partial of the layers corresponding to the still-valid TAG. The UE should clear the CG/PUSCH for SP-CSI even if only one of the two TATs of the two TAGs is expired.

**[Proposed Solution]:**

**Solution: when a serving cell is configured with *multipanelSchemeSDM*, the UE should clear any CG/PUSCH for SP-CSI if any of the activated TCI state(s) for the CG/PUSCH for SP-CSI is associated with the TAG of the expired TAT; otherwise, the UE should clear any CG/PUSCH for SP-CSI if all of the activated TCI state(s) for the CG/PUSCH for SP-CSI is associated with the TAG of the expired TAT**

|  |
| --- |
| **Text Proposal**  5.2 Maintenance of Uplink Time Alignment  1> when a *timeAlignmentTimer* expires:  …  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> if this Serving Cell is configured with *multipanelSchemeSDM*:  5> clear any configured uplink grant, if any of the activated TCI state(s) for the configured uplink grant is associated with the TAG of the expired *timeAlignmentTimer*;  5> clear any PUSCH resource for semi-persistent CSI reporting, if any of the activated TCI state(s) for the PUSCH resource is associated with the TAG of the expired *timeAlignmentTimer*;  4> else:  5> clear any configured uplink grant, if all of the activated TCI state(s) for the configured uplink grant is associated with the TAG of the expired *timeAlignmentTimer*;  5> clear any PUSCH resource for semi-persistent CSI reporting, if all of 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. |

**[Phase-2 Discussion]**:

…

# [Ofinno] [Issue-6]

**[Issue description]**:

In legacy, when there is a BSR triggered, the UE shall trigger a SR if there is no UL-SCH resource available. In TS 38.321 (as shown below), there is a NOTE highlights that UL-SCH resources are considered available if the MAC entity has an active configured grant.

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| **TS 38.321**  5.4.5 Buffer Status Reporting  …  The MAC entity shall:  …  2> if a Regular BSR has been triggered and *logicalChannelSR-DelayTimer* is not running:  3> if there is no UL-SCH resource available for a new transmission; or  3> if the MAC entity is configured with configured uplink grant(s) and the Regular BSR was triggered for a logical channel for which *logicalChannelSR-Mask* is set to *false*; or  3> if the UL-SCH resources available for a new transmission do not meet the LCP mapping restrictions (see clause 5.4.3.1) configured for the logical channel that triggered the BSR:  4> trigger a Scheduling Request.  NOTE 2: UL-SCH resources are considered available if the MAC entity has an active configured grant, or receives, or determines an uplink grant. If the MAC entity has determined at a given point in time that UL-SCH resources are available, this need not imply that UL-SCH resources are available for use at that point in time. |

However, the CG Type 1 for mode-B UE-initiated CSI reporting cannot be used to generate MAC PDU for UL-SCH data, so the MAC entity shall not consider an active CG Type 1 for mode-B UE-initiated CSI reporting as available UL-SCH resources. The MAC entity should be allowed to trigger a SR even if the MAC entity has an active CG Type 1 for mode-B UE-initiated CSI reporting.

**[Proposed Solution]:**

**Solution: CG Type 1 for mode-B UE-initiated CSI reporting should not be used to consider whether UL-SCH resources are available.**

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| --- |
| **Text Proposal (The same change could be applied to other sections that specified the same NOTE)**  5.4.5 Buffer Status Reporting  …  The MAC entity shall:  …  2> if a Regular BSR has been triggered and *logicalChannelSR-DelayTimer* is not running:  3> if there is no UL-SCH resource available for a new transmission; or  3> if the MAC entity is configured with configured uplink grant(s) and the Regular BSR was triggered for a logical channel for which *logicalChannelSR-Mask* is set to *false*; or  3> if the UL-SCH resources available for a new transmission do not meet the LCP mapping restrictions (see clause 5.4.3.1) configured for the logical channel that triggered the BSR:  4> trigger a Scheduling Request.  NOTE 2: UL-SCH resources are considered available if the MAC entity has an active configured grant (except for configured grant Type 1 for mode-B UE-initiated CSI reporting (configured in *pusch-ResourceOfModeB-r19*)), or receives, or determines an uplink grant. If the MAC entity has determined at a given point in time that UL-SCH resources are available, this need not imply that UL-SCH resources are available for use at that point in time. |

**[Phase-2 Discussion]:**

…

# [Company name] [Issue-X]

**[Issue description]**:

**[Proposed Solution]**:

**[Phase-2 Discussion]**:

…

# Conclusions

The following open issues are listed with suggested way forward.

…

# References

1. R2-2506202 Report from session on Rel-18 MIMO, Rel-19 MIMO, LPWUS, SBFD, NR Others RAN2 Vice Chairman (CATT)
2. R2-2506539 Rel-19 TS 38.321 CR#2100 Samsung