**3GPP TSG-RAN WG2 Meeting #113bis-e *R2-210xxxx***

**Online, 12–20 April 2021**

**Agenda item: 5.3.1**

**Source: Samsung**

**Title: Report of [AT113bis-e][003][NR15] MAC (Samsung)**

**Document for: Discussion and Agreement**

# 1 Introduction

This is to report the result of the following email discussion in RAN2#113bis-e Meeting [1].

* [AT113bis-e][003][NR15] MAC (Samsung)

Scope: Treat R2-2102683, R2-2102684, R2-2103848, R2-2104053, R2-2104091, R2-2104092, R2-2103448, R2-2104086,

Phase 1, determine agreeable parts, Phase 2, for agreeable parts Work on CRs.

Intended outcome: Report and Agreed-in-principle CRs.

Deadline: Schedule A

# 2 Contact Information

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| --- | --- |
| Company | Contact: Name (E-mail) |
| Samsung | Jaehyuk JANG (jack.jang@samsung.com) |
| LG | SunYoung LEE (ssunyoung.lee@lge.com) |
| Ericsson | Mats Folke (mats.folke@ericsson.com) |
| Lenovo | Joachim Löhr (jlohr@lenovo.com) |
| Huawei, HiSilicon | Chong Lou (louchong@huawei.com) |
| OPPO | ShiCong(shicong@oppo.com) |
| Qualcomm | Linhai He (linhaihe@qti.qualcomm.com) |
| Apple | Fangli XU (fangle\_xu@apple.com) |
| vivo | Yitao Mo (yitao.mo@vivo.com) |
| ZTE | Dong Fei (Dong.fei@zte.com.cn) |
| ASUSTeK | Xinra Kung (Xinra\_Kung@asus.com) |
| CATT | Pierre Bertrand (pierrebertrand@catt.cn) |
| Xiaomi | Yumin Wu (wuyumin@xiaomi.com) |
| MediaTek | Pradeep Jose (pradeep[dot]jose[at]mediatek[dot]com) |
| Nokia | Chunli Wu (Chunli.wu@nokia-sbell.com) |
| Intel | Yujian Zhang (yujian.zhang@intel.com) |

# 3 Discussion

## 3.1 Correction to DRX active time criteria with CSI masking

R2-2102683 Correction to DRX active time criteria with CSI masking Qualcomm Incorporated CR Rel-15 38.321 15.12.0 1063 - F NR\_newRAT-Core

R2-2102684 Correction to DRX active time criteria with CSI masking Qualcomm Incorporated CR Rel-16 38.321 16.4.0 1064 - F NR\_newRAT-Core

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| --- | --- | --- |
| Company | Agree as is; Agree with changes; Disagree | Detailed Comments |
| Samsung | Agree as is (Rel-15)  Rel-16 CR should be Cat.A | We are fine with the change. The error came from Rel-11 LTE text, and can be corrected in NR from Rel-15.  The category of Rel-16 CR should be Cat. A. |
| LG | Disagree | We understood the intention, however the text has been there since Rel-11 and nothing is broken as grants/assignments does not have impact on *drx-onDurationTimer*. |
| Ericsson | Disagree | The current text does not contain any error. A skilled implementor would recognize that there is no need to take grants and assignments into account. |
| Lenovo | Disagree | We have similar view as Ericsson/LG that current text is sufficiently clear and intended behaviour should be well understood |
| Huawei, HiSilicon | Agree with the intention | This issue was discussed in RAN2#107bis Chongqing meeting, and it seems to have been acknowledged by several companies. We understand that no UE behaviour would be changed with this CR which can be considered as text improvement, better than LTE. |
| OPPO | Disagree | We think receiving grants/assignments may have impact on short/long DRX cycle switching thus may have impacts on starting drx-ondurationTimer, therefore, it would be safe to leave the text there considering also the text was there since LTE Rel-11 as indicated by previous companies. |
| Qualcomm | Agree as is | We understand that the current text without the proposed change can work without error. However, inclusion of grants/assignments in that paragraph can cause confusion. In fact, this CR was requested by our developers. They understand that technically grants/assignments are not needed in UE’s decision but they are confused why something unnecessary are still captured in the spec.  This CR is more about text improvement than fixing a bug, to prevent repeated confusions down the road (the same reason why we fix typos in the spec). The fact that it has been there since LTE should not be an excuse preventing us from making the MAC spec be as accurate and as easy to read as possible. |
| Apple | Agree with the intention | We think the change is just the clarification and there is no impact on UE behavior. |
| vivo | No strong view | It seems either way can work well. We can follow the majority view. Besides, if this polishment is agreeable, we are wondering whether the LTE text should be updated accordingly? |
| ZTE | Disagree | We understand this have been discussed before, and there is no room for misunderstanding |
| ASUSTeK | Agree with the intention | Share the same view with Qualcomm for the last paragraph. |
| CATT | Disagree | No strong view though. Since it is inherited from LTE and nothing is broken without the CR, we slightly prefer no change. |
| Xiaomi | Agree with the intention | We think that this change has no impact on the UE implementation, as the grant/assignment does not impact the *drx-onDurationTimer*. |
| MediaTek | Agree as is |  |
| Nokia | Disagree | For Rel-16, OnDurationTimer running or not actually depends on WUS which is also impacted by UL grant and DL assignment reception. And long/short DRX depends on UL grants/DL assignment too. |
| Intel | Disagree | Agree with OPPO that grants/assignments can affect whether short DRX or long DRX is used, therefore has impact on whether *drx-onDurationTimer* is started. This was discussed in LTE Rel-11 e.g. R2-123455. In UP Chair notes R2-130674, following was captured:  R2-130633 Removing optionality on CSI/SRS transmission during transient state Samsung, Huawei, HiSilicon, Nokia Siemens Networks, Panasonic, Renesas Mobile Europe Ltd., Research In Motion UK Limited CR 36.321 0629 - F REL-11 TEI11, LTE-L23  - QC wonders whether On Duration is impacted by UL grant. Samsung is concerned about sudden On Duration by UL grant. |

**Conclusion:**

**TBD**

## 3.2 Error handling of MAC PDU with invalid order of MAC subPDUs.

R2-2103848 Error handling of invalid MAC PDU formats Apple discussion Rel-15 NR\_newRAT-Core

The discussion paper includes the following proposals and also the curresponding TP for the proposal 1:

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| Proposal 1: RAN2 to specify the intended error behavior in clause 5.13 of TS 38.321.  Proposal 2: RAN2 to discuss the intended behavior including whether it can be up to implementation. |
| When a MAC entity receives a MAC PDU for the MAC entity's C-RNTI or CS-RNTI, or by the configured downlink assignment, containing a MAC CE placed at an invalid order within the MAC PDU, the MAC entity shall at least:  1> discard the received MAC CE and any remaining subPDUs in the MAC PDU. |

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| Company | Do you agree with Proposal 1 in R2-2103848? | Detailed Comments |
| Samsung | No;  can be up to implementation | Even though a transmitter (i.e. either UE or gNB) must follow the procedures as defined in TS 38.321 subclause 6.1.2, the proposed behaviour seems overkill, and to define a new behaviour according to the Proposal 1 would even cause unexpected interoperability issue. Hence, we think it can be left to UE/network implementation. |
| LG | No | The reason of having invalid value checking for error handling is to cope with the case where misalignment between the UE and the NW happens due to e.g., loss of signalling or etc. The bad implementation, i.e., violation of the specification, needs not to be covered by error handling. |
| Ericsson |  | Currently the UE behaviour is not speficied.  Question to Apple: Has this behaviour (incorrect order of MAC sub-PDUs) been seen in field? |
| Lenovo | No | We think that this would be some overspecification which is unnecessary. Agree with LG that we don’t specify error handling for erroneous implementations. |
|  |  |  |
| Huawei, HiSilicon | No but | Same question as Ericsson, appreciate if Apple and other vendors who have seen this issue would provide more clarifications.  For the sake of removing the concerns from this contribution, we think it is sufficient to confirm that we can leave it to UE/NW implementation. |
| OPPO | No | We prefer to keep the current spec as it is, and also agree we should not specify error handling for error implementations. |
| Qualcomm | No | This is an error case that can be handled by UE implementation. |
| Apple | Agree | This is an error scenario for which the current specification allows multiple interpretations. As a result, some receiver may be able to process part of the MAC PDU while another receiver may drop the whole MAC PDU. The order of MAC CEs in the MAC PDU is an essential part of the MAC PDU format, and we propose to specify clearly what the intended error handling behavior shall be at the receiver, in case the format is not followed by a transmitter. This should remove the ambiguity and avoid interoperability issues as well. This LTE MAC spec defines a handling of unknown, unforeseen and erroneous protocol data, including e.g. invalid values. If companies have a different preference on the expected error handling, we are open to discuss this as well. We would like to clarify RAN2’s understanding of the intended error handling. |
| vivo | No | We share a similar view with Ericsson that we are also wondering whether the case mentioned in the CR is valid. Anyway, we think UE implementation can handle this issue. |
| ZTE | No | As network vendor, We believe the scenario described from apple CR is not existing. A gNB would never compose a MAC PDU with a sequence not following specification |
| CATT | No | We share the same view with LG. We don’t need to elaborate the solution for bad NW implementation. |
| Xiaomi | No | We need to understand how/why this happens. As the Rel-15 UE is already in the field, this could be left to the UE implementation. |
| MediaTek | No | This is an error case that can a) be avoided by NW implementation and b) if it occurs, can be handled by UE implementation |
| Nokia | No | Clear from the figures. No need to overs specify error cases. |
| Intel | No | There seems no need to specify UE behavior to handle wrong gNB implementation. |

**Conclusion:**

**TBD**

## 3.3 Whether to have further clarification on reporting multiplexed CSI on PUCCH in DRX

R2-2104053 Clarification on reporting multiplexed CSI on PUCCH in DRX Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core

The discussion paper includes the following proposal:

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| Observation 1: Based on the current NOTE in TS 38.321, in DRX non-Active Time, the UE may still report the CSI which is originally configured on a PUCCH resource outside DRX Active Time on PUCCH.  Proposal 1: Clarify that the NOTE relevant to CSI multiplexed with other UCI(s) in subclause 5.7 of TS 38.321 only refers to the case that the UE performs CSI multiplexing in DRX Active Time or in the on-duration period if CSI masking is setup but would report the multiplexed CSI on a PUCCH resource outside DRX Active Time or outside on-duration period if CSI masking is setup. |

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| Company | Do you agree with Observation 1 and Proposal 1 in R2-2104053? | Detailed Comments |
| Samsung | No | From the condition at the beginning of the sentence (i.e. "*If a UE multiplexes a CSI configured on PUCCH with other overlapping UCI(s) according to the procedure specified in TS 38.213 [6] clause 9.2.5*"), sensible implementation would not consider the Case 2 in R2-2104053, and thus no further changes would be needed. |
| LG | No | Considering how CSI-masking works without CSI multiplexing, it could be naturally understood that the case2 in 4053 is not the intended case of the current Note.  If it is assumed that Note lets UE to multiplex CSI/ACK outside the Active Time, it is also questionable what if the multiplexed PUCCH now falls into Active Time. |
| Ericsson | No | It should be obvious that interpretation 1 is the correct one. No need to clarify. |
| Lenovo | No | Don’t see a need for the clarification |
| Huawei, HiSilicon |  | We understand that, from the current MAC and PHY spec, UCI multiplexing doesn't take DRX operation into account and hence we are concerned on the ambiguity of Case 2. The feature of UCI multiplexing is valued by both UE and NW side as discussed over long period in NR. Therefore, we think it would be clear to clarify the common understanding in the minutes to avoid any potential risk for inter-operability issue as stated in the coversheet. |
| OPPO | No | No need to clarify. |
| Qualcomm | Disagree with Observation 1. Fine with Proposal 1 but do not think it is needed | We do not think the interpretation of “the Note” on UCI multiplexing as stated in Observation 1 is correct. The current MAC spec specifies that CSI on PUCCH are not sent outside DRX active time. Hence in Case 2, MAC entity in a sensible implementation would instruct PHY not to generate a CSI if its PUCCH resource is located outside DRX active time, regardless of whether there is a overlapping UCI or not.  If the intention of Proposal 1 is to clarify that Case 2 does not need to be considered, we are fine with that. But we do not think it is necessary, as the current spec is sufficiently clear on that (as we have commented above). |
| Apple | No | Case 1 is the intended scenario, but we think current spec doesnot need to be changed. |
| vivo | No | In our understanding, the UE will not handle the CSI report in the mentioned case2 since all the potential PUCCH resource is out of DRX ACTIVE/onDuration, based on the current MAC spec. In this sense, the proposed clarification is not needed. |
| ZTE | No | Since the NOTE indicates that it shall be up to implementation, we agree with the understanding from Qualcomm, no more clarification is needed. |
| CATT | No | There is no need for clarification. |
| Xiaomi | No | It seems that all companies have the same understanding. Not sure the clarification is really needed. |
| MediaTek | No | It seems obvious that case 1 is the intended scenario.We do not see the need for further clarification. |
| Nokia | No | Procedure says CSI on PUCCH shall not be sent when not in active time, while the NOTE says the exceptional case if there is other CSI to be sent out of active time then CSI can be sent. Current specification is fine. The addition from the CR is rather confusing. |
| Intel | No | We think case 1 is the correct interpretation, but no need to clarify. |

**Conclusion:**

**TBD**

## 3.4 Clarification on DL HARQ process number

R2-2104091 Clarification on DL HARQ process number Huawei, HiSilicon CR Rel-15 38.321 15.12.0 1092 - F NR\_newRAT-Core

R2-2104092 Clarification on DL HARQ process number Huawei, HiSilicon CR Rel-16 38.321 16.4.0 1093 - A NR\_newRAT-Core

|  |  |  |
| --- | --- | --- |
| Company | Agree as is; Agree with changes; Disagree | Detailed Comments |
| Samsung | Disagree | We do not see any ambiguity with the sentence "*The dedicated broadcast HARQ process is used for BCCH.*", and thus the CR is not needed. |
| LG | Disagree | Due to the text *The dedicated broadcast HARQ process is used for BCCH*, we also think it is clear. |
| Ericsson | Disagree | The interpretation of the text is that there is a set of parallel HARQ processes and there is a dedicated HARQ process for BCCH. No problem and in line with their clarification. |
| Lenovo | Disagree | We don’t see any ambiguity. |
| Huawei, HiSilicon | Agree as is | In NR, the total number of DL HARQ numbers are configured by NW, and hence we see some benefit to clearly state that the broadcast HARQ process is not counted in the total number for unicast to avoid any potential misalignment for implementation. We are fine to capture the common understanding in the minutes if it is achieved. |
| OPPO | Disagree | No ambiguity, it seesm in LTE the clarification was made in phy spec which should be the same case in NR. |
| Qualcomm | Disagree | We have the same comment as Ericsson. |
| Apple | Disagree | We think current spec is clear to indicate the dedicate broadcast HARQ process is used for BCCH. |
| vivo | Disagree | Of course, the counting of DL HARQ processes will not take the dedicated broadcast HARQ process into count. The current test is quite clear. |
| ZTE | Disagree |  |
| CATT | Disagree | The current specification is clear enough. |
| Xiaomi | Disagree | We share the same view as Samsung and Ericsson. |
| MediaTek | Disagree | The correct interpretation is that there are a set of HARQ processes for unicast, and a dedicated HARQ process for broadcast. The spec seems is clear to us. |
| Nokia | Disagree | If anything unclear in PHY, it should be clarified in RAN1. |
| Intel | Disagree | No ambiguity since the wording “dedicated broadcast HARQ process” is used. |

## 3.5 Correction on Truncated BSR

R2-2103448 Correction on Truncated BSR ASUSTeK CR Rel-16 38.321 16.4.0 1088 - F NR\_newRAT-Core

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| --- | --- | --- |
| Company | Agree as is; Agree with changes; Disagree | Detailed Comments |
| Samsung | Disagree | RAN2 had discussed the issue (several times), and the current text captures the intention correctly: the text in subclause 5.4.5 is about which LCGs would be included but does not specify the actual order of LCG in the MAC CE, while the text in subclause 6.1.3.1 is about the actual order in the MAC CE. Hence, the CR is not needed. |
| LG | Disagree | The current specification is correct, i.e., LCG to be reported is selected based on the LCG priority whereas the order of inclusion is is ascending order.  RAN2#99 agreement  6. For truncated BSR the LCGs are selected based highest order of priority  RAN2#100 agreement:  => L field for both. Bitmap indicates which LCG has data is available for tructated BSR and for long BSR the bitmap includes all LCG being reported.  => The BS order is in order of LCG index for both cases |
| Ericsson | Disagree | This has been discussed, explained, and dismissed a number of times, as presented by Samsung and LG. |
| Lenmovo | Disagree | Agree with other companies |
| Huawei, HiSilicon | Disagree | Agree with above |
| OPPO | Disagree | RAN2 had discuss this issues, 5.4.5 decides which LCGs can be reported but 6.1.3.1 specifies the order of the BS field in the format, thus the spec is clear. |
| Qualcomm | Disagree | We have the same comment as Samsung. |
| Apple | Disagree | We agree that current text reflects RAN2 agreements correctly. |
| vivo | Disagree | Deciding which LCG should be included is totally independent of the actual order of LCG included in MAC CE. In this sense, there is no contradiction. |
| ZTE | Disagree |  |
| ASUSTeK | Agree with changes | According to the comments from other companies, section 5.4.5 is just about which LCG(s) could/would be included (Step 1) and section 6.1.3.1 is about the actual order (Step 2). However, this CR thought that Step 1 and Step 2 seem independent and contradictory to each other.  One example is shown as bleow.    The key of how to interpret the current spec correctly/ accurately/ easily is to explicitly show 6.1.3.1 (Step 2) is performed after 5.4.5 (Step 1). To prevent unnecessary confusion/discussion in the future (like this CR), we may consider the following text proposal.  6.1.3.1 Buffer Status Report MAC CEs  […]  - Buffer Size: The Buffer Size field identifies the […] For the Long BSR format and the Long Truncated BSR format, the Buffer Size fields are included in ascending order based on the LCGi of the reported LCG(s) as specified in section 5.4.5. For the Long Truncated BSR format the number of Buffer Size fields included is maximised, while not exceeding the number of padding bits. […] |
| CATT | Disagree | The specification is clear and non-ambiguous, as explained by LG and other companies. |
| Xiaomi | Disagree | Agree with Samsung and LG. |
| MediaTek | Disagree | Agree with others that this has been discussed and dismissed on several occasions. |
| Nokia | Disagree | Agree with others. Current specification is correct. |
| Intel | Disagree | Section 5.4.5 is about which LCGs to be included for reporting. |

## 3.6 Clarification on SUL switch

R2-2104086 Clarification on SUL switch LG Electronics UK CR Rel-16 38.321 16.4.0 1091 - F TEI16

|  |  |  |
| --- | --- | --- |
| Company | Agree as is; Agree with changes; Disagree | Detailed Comments |
| Samsung | Disagree | We do not see ambiguity, as 'SUL switch' here should be interpreted as both switching from NUL to SUL and switching from SUL to NUL. Hence, the CR is not needed. |
| LG | Agree | Without explicit definition of SUL switch, it seems not clear what SUL switch exactly means. |
| Ericsson | Disagree | There is no ambiguity. The CR is not needed. |
| Lenovo | Disagree | We don’t see any ambiguity. |
| Huawei, HiSilicon | Disagree | Not needed. |
| OPPO | Disagree | We don’t see the ambiguity proposed in the CR. |
| Qualcomm | Disagree | We have the same comment as Samsung. |
| Apple | Disagree | “SUL switch” is not very accurate, but we donot see ambiguity. |
| vivo | Disagree | SUL switch is more succinct and direct. |
| ZTE | DIsagree | There is no room for misunderstanding. |
| CATT | Disagree | We think the current specification is clear enough. |
| Xiaomi | Disagree | Agree with Samsung. |
| MediaTek | Disagree | We do not see any ambiguity in the interpretation of SUL switch |
| Nokia | No strong opinion | No strong need to correct. |
| Intel | No strong view | We understand the intention is to use the same expression in the first paragraph in the same section (“Switching between the NUL carrier and the SUL carrier means…”), but we also agree that this is not an essential correction. |

# 4 Conclusion

**TBD**

# 5 References

[1] R2-113bise Chairman notes 2021-04-11.docx