**3GPP TSG-RAN WG2 Meeting #118electronic R2-220xxxx**

**Online, May 9th – May 20th, 2022**

**Agenda Item: 6.1.3.2**

**Source: OPPO**

**Title: [AT118-e][031][MBS] MAC (OPPO)**

**Document for: Discussion and decision**

# Introduction

This paper is to trigger the following email discussion of MAC open issues in MBS.

* [AT118-e][031][MBS] MAC (OPPO)

Scope: Treat R2-2205483, R2-2205129, R2-2205122, R2-2204609, R2-2204833, R2-2205457, R2-2205218, R2-2205437, R2-2205447, R2-2205540, R2-2204667, R2-2204744, R2-2204832, R2-2204969, R2-2205156, R2-2205449, R2-2205035, R2-2205154, R2-2205480, R2-2204831, R2-2204834, R2-2204891, R2-2204904, R2-2204905, R2-2205628, R2-2205629, R2-2205673, R2-2205709, R2-2205713, R2-2205128, R2-2205481, R2-2205748

Collect one round of comments, pave the way for on-line agreement (identify agreeable points, discussion points),

Intended outcome: Report

Deadline: For online CB W1 Friday

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# Discussion

## 2.1 Multicast

### 2.1.1 CSI-mask on CSI reporting for multicast

Currently, csi-Mask IE is configured per MAC entity.

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| MAC-CellGroupConfig ::= SEQUENCE {  ==omit some IEs====  csi-Mask BOOLEAN ==omit some IEs====  } |

If the *drx-onDurationTimer* is not running, UE configured with the *csi-Mask* cannot report CSI on PUCCH even if the *drx-onDurationTimerPTM* is running and some companies think it will impact the MBS data secheuling. So they propose that when *allowCSI-SRS-Tx-MulticastDRX-Active* and *csi-Mask* are configured, the UE does not report CSI on PUCCH when both *drx-onDurationTimer* and *drx-onDurationTimerPTM* are not running.

However, some companies have different view based on some reasons, e.g. for the purpose of CSI masking if all MBS DRX on duration are not overlapped, or any multiplexing of individual PUCCH resources linked to MBS DRX would not be possible in time domain alone, or no need to further increase the complexity.

One company think new configuration (i.e. multicast-CSI-mask) to control the CSI report on PUCCH only during the multicast DRX on duration.

**Option 1**: When *allowCSI-SRS-Tx-MulticastDRX-Active* and *csi-Mask* are configured, the UE does not report CSI on PUCCH when both *drx-onDurationTimer* and *drx-onDurationTimerPTM* are not running.

**Option 2**: CSI masking only considers unicast DRX, i.e. excludes MBS DRX (No spec change).

**Option 3**: New configuration (i.e. multicast-CSI-mask) to control the CSI report on PUCCH only during the multicast DRX on duration.

**Q1: Which option do companies prefer?**

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| Company | Option 1/2/3? | Comments |
| Huawei, HiSilicon | Option 1 | Allowing UE to report CSI during *drx-onDurationTimerPTM* running aligns with legacy principle with unicast DRX, for which legacy CSI-mask can be reused for simplicity. |
| Nokia | 2  1 | Aligned with the original intention of the mask, simple.  Our understanding is that when allowCSI-SRS-Tx-MulticastDRX-Active is not configured, this would be similar to option 2 so would also be acceptable. |
| CATT | Option 2 | When CSI mask is configured for uncast, the network can utilize the PUCCH resources for other UEs. So when CSI mask is applied to multicast, the UE is allowed to report CSI on PUCCH even the on duration timer for unicast is not running but on duration timer for multicast is running. This is not helpful for PUCCH utilization.  On the other hand, it has been agreed that the UE can report periodic/semi-persistent SRS and CSI on PUCCH and semi-persistent CSI configured on PUSCH when the UE is in DRX Active for unicast and multicast, we think the benefits on better scheduling is not so obvious. |
| Samsung | 2 | We think both DRX cycles of multicast DRX and unicast DRX are likely to be aligned to maximize the power saving gain. Then, gain of the enhancements is not big. |
| LGE | Option 2 | We think that the purpose of CSI masking is to limit CSI reporting to on-duration to share PUCCH resource among UEs. It seems simple and sufficient to consider unicast DRX for CSI masking. If multicast DRX is taken into account, it is difficult to achieve the purpose of CSI masking considering various overlapping patterns among multiple DRX cyles (e.g. unicast DRX cycle, multicast DRX cycle per G-RNTI). |
| OPPO | Option 1 | If allowCSI-SRS-Tx-MulticastDRX-Active is not configured, it is same as option 2. So CSI-reporting can rely on configuration of allowCSI-SRS-Tx-MulticastDRX-Active. |
| MediaTek | Option 1 | CSI-mask should be aligned for both unicast and multicast DRX for simplicity. So for the case which RRC indicate CSI-masking, and the multicast DRX is considered in active time but the drx-onDurationTimerPTM is not running, the CSI shall not be reported |
| Qualcomm | Option 1 | Multicast data traffic pattern may not be same as Unicast data traffic (Multicast and Unicast DRX cycles may or may not align or overlap in all cases) and some UEs may be multicast only UEs, for these cases it is beneneficial to report CSI when Multicast DRX PTM Onduration timer is running even if Unicast DRX Ondruration timer is not running. Same PUCCH resources can be used for Unicast or Multicast based on how GNB configures to UEs. If Multicast DRX Onduration timer is not running and if UE is not allowed to report CSI, the same PUCCH resources can be used by GNB for configuring to other Unicast UEs to enable PUCCH resource multiplexing. |
| Futurewei | Option 1 | When csi-Mask is configured, normally with the same reason for both unicast and MBS. Option 2 to limit csi-mask being only applicable to unicast is not right. Option 3 is not necessary and increased complexity. |
| Spreadtrum | Option 1 | CSI-mask can be used for unicast and multicast for simplicity. PUCCH resource sharing for CSI reporting can be up to gNB implimentation. |
| Lenovo | Option 1 | The benefit of CSI-mask provides the flexibility for allowing UE more efficient power saving when CSI reporting is not unnecessary which should be applied to multicast DRX as well. |
| Ericsson | Option 1 | This would align to having the same mechanism for MBS independently to Unicast On-duaration and allows for different patterns in data activity. |
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### 2.1.2 DCP on CSI reporting for multicast

RAN2 assumed that DCP monitoring may be configured when multicast DRX is configured. First, RAN2 should confirm whether DCP monitoring can be configured with multicast DRX.

**Q2: Do companies agree DCP monitoring can be configured with multicast DRX?**

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| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Yes | No significant issue has been identified with this RAN2 assumption made in last meeting. |
| Nokia | Yes | Already assumed at the last meeting. |
| CATT | Yes |  |
| Samsung | Yes | DCP monitoring for unicast DRX can be configured independently |
| LGE | Yes | Most of companies seem to support it. We can accept it for progress. |
| OPPO | Yes |  |
| MediaTek | Yes |  |
| Qualomm | Yes |  |
| Futurewei | Yes |  |
| Spreadtrum | Yes |  |
| Lenovo | Yes |  |
| Ericsson | Yes |  |
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It is common understanding that the DCP monitoring only affects whether *drx-onDurationTimer* is started*,* no impact on the starting of *drx-onDurationTimerPTM*.

Some companies think that to make multicast scheduling efficient, UE should be allowed to report CSI/SRS even the DCP conditions are satisfied if multicast DRX is in Active Time.

However, some companies have different view, e.g. how to reduce the impact of DCP on multicast DRX can be left to gNB implementation.

**Option 1**: If *allowCSI-SRS-Tx-MulticastDRX-Active* is configured, UE can report CSI/SRS even when the conditions for DCP and unicast DRX in TS 38321 are satisfied, if multicast DRX is in Active Time.

**Option 2**: How to reduce the impact of DCP monitoring on multicast DRX can be implemented by gNB without the spec impacts.

**Q3: Which option do companies prefer?**

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| Company | Option 1/2? | Comments |
| Huawei, HiSilicon | Option 1 | We prefer a clean procedural text in MAC specification to make the spec consistent.  Option 1 means configuration of DCP has no impact on CSI reporting for multicast, which should be the intention of decopling DCP and multicast DRX.  While Option 2 actually means configuration of DCP will restrict CSI reporting for multicast, which is not in line with the text when DCP is not configured. |
| Nokia | 1 | UE shall report |
| CATT | Option 1 | Agree with Huawei,in the sense of decopling DCP and multicast DRX,We think option 1 is reasonable. |
| Samsung | 2 |  |
| LGE | Option 2 | If CSI reporting is specified as option 1, power saving gain will be much reduced. If CSI reporting for multicast DRX is beneficial in a certain situation, CSI can be reported by gNB implementation. For example, the parameter of *ps-Wakeup* can be used to control it. |
| OPPO | Option 1 | Same reason as Q1. |
| MediaTek | Option 1 | Agree with Huawei |
| Qaulcomm | Option 1 | Same view as Huawei. |
| Futurewei | Option 1 | When allowed, as long as multicast is active time, CSI report is conducted. It shall not be impacted by unicast DRX as well as DCP. |
| Spreadtrum | Option 2 | We prefer to option2 considering the UE power saving. |
| Lenovo | Option 1 |  |
| Ericsson | Option 1 | Agree w Huawei |
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Currently, IE *allowCSI-SRS-Tx-MulticastDRX-Active* is configured per MAC entity and one company think it should be configured per MBS DRX to achieve better power efficiency and scheduling flexibility.

**Q4: Do companies agree IE *allowCSI-SRS-Tx-MulticastDRX-Active* is configured per MAC (no spec change), not configured per multicast DRX?**

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| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Yes | CSI reporting based on the indication is used for all multicast scheduling in a MAC entity. It doesn’t seem to be useful to further allow the flexibility. |
| Nokia | Yes |  |
| CATT | Yes | Per muliticast DRX is not necessary |
| Samsung | Yes | Just for flexibility but gain is not clear. |
| LGE | Yes | We support to configure the IE per MAC. The IE per multicast DRX looks an excessive control. |
| OPPO | Yes |  |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Futurewei | Yes | Yes for simplicity. But acknowledge that per DRX allows to handle low quality and high quality multicast sessions differently for meeting quality requirement and power saving respectively. |
| Spreadtrum | Yes |  |
| Lenovo | Yes |  |
| Ericsson | Yes |  |
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### 2.1.3 Others on CSI reporting for multicast

Currently, if UE is configured with both secondary DRX group and *allowCSI-SRS-Tx-MulticastDRX-Active*, and if one DRX group is not in Active Time, only when **all** multicast DRXs are not in Active Time, UE does not report CSI in the DRX group.

Considering dual DRXs are configured and one is for FR1 and another is for FR2, one company propose if *allowCSI-SRS-Tx-MulticastDRX-Active* is configured, UE does not report CSI in a DRX group if unicast DRX and all multicast DRXs of the DRX group are not in Active Time.

**Q5: Do companies agree the below proposal:**

**Proposal: If *allowCSI-SRS-Tx-MulticastDRX-Active* is configured, UE does not report CSI in a DRX group if unicast DRX and all multicast DRXs of the DRX group are not in Active Time.**

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| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Yes | Similar to CSI reporting for unicast, CSI reporting for multicast should also be considered within the same DRX group. Please note that multicast can only be scheduled in a single serving cell, which means it can only be in one DRX group.  There is no point controlling CSI reporting on DRX group 1 by multicast DRX configured for DRX group 2. |
| Nokia | Yes | Note that there is a clean up from ZTE in R2-2205629 that might simplify the description. |
| CATT | Yes |  |
| Samsung | See comment | Multicast DRX is configured per CG and does not have its DRX group. The proposal may need to be rephrased:  If *allowCSI-SRS-Tx-MulticastDRX-Active* is configured, UE does not report CSI in a DRX group if unicast DRX of the DRX group and all multicast DRXs ~~of the DRX group~~ are not in Active Time. |
| LGE | Yes | We generally agree. One question is that multicast transmissions are expected to be configured in both DRX groups (e.g. DRX group for FR1 and DRX gropu for FR2). |
| OPPO | Yes |  |
| MediaTek | Yes | We prefer to add a word to the proposal to make it more clear.  **Proposal: If *allowCSI-SRS-Tx-MulticastDRX-Active* is configured, UE does not report CSI in a DRX group only if unicast DRX and all multicast DRXs of the DRX group are not in Active Time.** |
| Qualcomm | Yes | Same view as Huawei and Samsung. |
| Futurewei | Yes |  |
| Spreadtrum | Yes |  |
| Lenovo | Yes | Same view as Huawei and Samsung that there is only group for Multicast DRX. |
| Ericsson | Yes | Agree with Samsung |
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If DRX is not configured for some multicasts, only when all multicast DRXs are not in Active Time, UE does not report CSI in the DRX group. This will prevent the UE from reporting CSI report for the multicast service that is not configured with multicast DRX and affects the scheduling efficiency. One company propose if *allowCSI-SRS-Tx-MulticastDRX-Active* is configured, UE is allowed to report CSI if some of the multicasts are not configured with multicast DRX.

**Q6: Do companies agree the below proposal:**

**Proposal: If *allowCSI-SRS-Tx-MulticastDRX-Active* is configured, UE is allowed to report CSI if some of the multicasts are not configured with multicast DRX.**

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| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Yes | If some of the multicasts are not configured with DRX, it means UE should keep monitoring the related G-RNTIs although there is no “Active Time”. In this case, it is not reasonable to prevent UE from reporting CSI for multicast scheduling. |
| Nokia | Yes | Seems to make sense |
| CATT | Yes | Agree with Huawei |
| Samsung | Yes |  |
| LGE | Yes |  |
| OPPO | Yes |  |
| MediaTek | Yes | Agree with Huawei |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| Spreadtrum | Yes |  |
| Lenovo | Yes |  |
| Ericsson | Yes |  |
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### 2.1.4 Multicast DRX related changes

Due to L1 PTP retransmission for the initial transmission of PTM transmission controlled by DCI, the MAC entity is required to start the corresponding *drx-HARQ-RTT-TimerDL* and *drx-RetransmissionTimerDL* and then stop both *drx-RetransmissionTimerDL* and *drx-RetransmissionTimerDL-PTM*

HARQ process is shared by unicast and multicast and one company propose to stop both *drx-RetransmissionTimerDL* and *drx-RetransmissionTimerDL-PTM* in section 5.7.

The corresponding TP is as follows:

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| When DRX is configured, the MAC entity shall:  1> if a MAC PDU is received in a configured downlink assignment:  2> start the *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback;  NOTE 1a: If Serving cell is configured with *downlinkHARQ-FeedbackDisabled* and DL HARQ feedback is disabled, *drx-HARQ-RTT-TimerDL* is not started for the corresponding HARQ process.  NOTE 1b: If this Serving Cell is part of a non-terrestrial network, the latest UE-gNB RTT value shall be used to set *drx-HARQ-RTT-TimerDL* and *drx-HARQ-RTT-TimerUL* length prior to timer start (see TS 38.331 [5] clause [X]).  2> stop the *drx-RetransmissionTimerDL-PTM* for the corresponding HARQ process;  2> stop the *drx-RetransmissionTimerDL* for the corresponding HARQ process.  **…**  1> if a DRX group is in Active Time:  2> monitor the PDCCH on the Serving Cells in this DRX group as specified in TS 38.213 [6];  2> if the PDCCH indicates a DL transmission; or  2> if the PDCCH indicates a one-shot HARQ feedback as specified in clause 9.1.4 of TS 38.213 [6]; or  2> if the PDCCH indicates a retransmission of HARQ feedback as specified in clause 9.1.5 of TS 38.213 [6]:  3> start or restart the *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process(es) whose HARQ feedback is reported in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback;  NOTE 3: When HARQ feedback is postponed by PDSCH-to-HARQ\_feedback timing indicating an inapplicable k1 value, as specified in TS 38.213 [6], the corresponding transmission opportunity to send the DL HARQ feedback is indicated in a later PDCCH requesting the HARQ-ACK feedback.  3> stop the *drx-RetransmissionTimerDL-PTM* for the corresponding HARQ process(es) whose HARQ feedback is reported;  3> stop the *drx-RetransmissionTimerDL* for the corresponding HARQ process(es) whose HARQ feedback is reported.  3> if the PDSCH-to-HARQ\_feedback timing indicate an inapplicable k1 value as specified in TS 38.213 [6]:  4> start the *drx-RetransmissionTimerDL* in the first symbol after the (end of the last) PDSCH transmission (within a bundle) for the corresponding HARQ process. |

**Q7: Do companies agree the below proposal and the above proposed changes?**

**Proposal: Stop both drx-RetransmissionTimerDL and drx-RetransmissionTimerDL-PTM in section 5.7 if multicast DRX is configured.**

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| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Yes | When unicast/PTP transmission or SPS is received for one HARQ process, there will be no PTM retransmission for this HARQ process. So the *drx-RetransmissionTimerDL-PTM* can be stopped. |
| Nokia | Yes |  |
| CATT | Yes |  |
| Samsung | Yes | If the PDCCH indicates DL unicast transmission, the corresponding HP will not be used by PTM. Thus, it’s natural to stop the timers to avoid unnecessary Active Time. |
| LGE | Yes |  |
| OPPO | Yes | Agree with the proposal and add “if multicast DRX is configured” after the proposed changes. |
| ASUSTeK | Yes |  |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| Spreadtrum | Yes |  |
| Lenovo | Yes |  |
| Ericsson | Yes |  |
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In Nokia paper [R2-2205156], it clarifies in MAC spec section 5.7 that DRX Command MAC CE refers to DRX Command MAC CE with DCI scrambled with C-RNTI or CS-RNTI and configured downlink assignment does not include configured downlink multicast assignment.

**Q8: Do companies agree the changes in section 5.7 proposed in annex of [R2-2205156]?**

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| Company | Yes/No? | Comments |
| Huawei, HiSilicon | No strong opinion | We agree with the intention but this seems quite straightforward even without change. |
| Nokia | Yes |  |
| CATT | Yes | The change is helpful as chapter 5.7 is not completely independent from multicast. |
| Samsung | Yes | Simple change |
| LGE | Partially yes | Yes for the change of configured DL assignment.  Regarding DRX Command MAC CE with DCI scrambled with C-RNTI, we share the problem pointed out. We see another issue with it. In case of PTP retransmission, DRX Command MAC CE with DCI scrambled with C-RNTI should be considered to be received for a multicast DRX cycle. The multicast DRX cycle can be iendtified by subPDU for data in the MAC PDU or the associated G-RNTI of the HARQ process. |
| OPPO | Yes |  |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| Spreadtrum | Yes |  |
| Lenovo | Yes |  |
| Ericsson | Yes |  |
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Due to L1 PTP retransmission for the initial transmission of PTM transmission controlled by DCI, the MAC entity is required to start the corresponding *drx-HARQ-RTT-TimerDL* and *drx-RetransmissionTimerDL*. One company proposed that *drx-HARQ-RTT-TimerDL* is only started when the corresponding *HARQ-FeedbackOptionMulticast* is set to *ack-nack* and when DRX is configured.

**Q9: Do companies agree the changes proposed in [R2-2204834]?**

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| Company | Yes/No? | Comments |
| Huawei, HiSilicon | See comments | Agree with “*drx-HARQ-RTT-TimerDL* is only started when the corresponding *HARQ-FeedbackOptionMulticast* is set to *ack-nack*”.  But for “and when DRX is configured”, it seems not that necessary. |
| Nokia | Yes | Makes sense if NACK-only feedback uses common resource, i.e., not possible to know which UE sent NACK.  Agree with Huawei on the need of “when DRX is configured” |
| CATT | No | Even for nack-only mode,RAN1 does not limit it to use shared PUCCH resources(RAN1 conclusion:  PUCCH resource for NACK-only can be shared by UEs transmitting the NACK-only based HARQ-ACK feedback.), the network can also receive NACK and can do retransmission based on NACK. So we think the change is not correct. |
| Samsung | No | drx-HARQ-RTT-TimerDL should be started for nack-only case. gNB may allocate the retranmission and the UE should be able to receive it by extending the Active Time. |
| LGE | Yes | It is o.k. because PUCCH resource for nack-only mode is shared by UEs of a multicast group. One question is whether PUCCH resource for nack-only is always shared by UEs of a multicast group or not. |
| OPPO | No | Current text is clear. |
| MediaTek | No | Agree with CATT |
| Qualcomm | Yes | for Nack only case, C-RNTI based Re-Tx is not possible and UE is not required to start *drx-HARQ-RTT-TimerDL.* |
| Futurewei |  | No strong opinion. Current sentence is for PTP, so It is ok without additional clarification. |
| Spreadtrum | Yes | Besides, we also think the “when DRX is configured” is not needed. |
| Lenovo | Yes | Agree with Qualcomm. |
| Ericsson | No | We agree w CATT and Samsung |
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One company think whether HARQ feedback is enabled has no impact on UE behavior of stopping the retransmission timers after receiving a DL multicast transmission and propose TP in section 5.7b.

**Q10: Do companies agree the changes proposed in [R2-2205481]?**

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| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Yes | Even if HARQ feedback is disabled, UE should stop the retransmission timers, if running, for the corresponding HARQ process if a DL multicast transmission is received. |
| Nokia | Partiially yes | Stopping drx-RetransmissionTimerDL always regardless of HARQ feedback enabling makes sense but for drx-RetransmissionTimerDL-PTM no change needed since the timer is not started if HARQ feedback is not enabled. |
| CATT | Partiially yes | Agree with Nokia |
| Samsung | Yes | Since no further DL assignment is expected, it’s natural to stop the timer. |
| LGE | Yes |  |
| OPPO | Partiially yes | Agree with Nokia |
| MediaTek | Yes | Agree with Huawei |
| Qualcomm | Yes | Same view as Nokia. |
| Futurewei | Partially yes | Agree with Nokia |
| Spreadtrum | Yes | Agree with Nokia |
| Lenovo | Yes |  |
| Ericsson | Yes | For the case of no feedback enabled |
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## 2.2 Broadcast

### 2.2.1 Broadcast DRX related changes

In [R2-2205218], it proposed to add one note to highlight the timing for DRX duration calculation when SCell is configured for broadcast MBS reception.

NOTE X: If a SCell is configured for MBS broadcast reception, the SFN of this SCell is used to calculate the DRX duration, otherwise the SFN of the SpCell is used.

**Q11: Do companies agree the below proposal and the changes proposed in [R2-2205218]?**

**Proposal: If a SCell is configured for MBS broadcast reception, the SFN of this SCell is used to calculate the DRX duration, otherwise the SFN of the SpCell is used.**

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| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | See comments | Agree with the intention, but should clarify that this doesn’t require UE to read MIB of SCell. The UE can derive the SFN of SCell from SFN of SpCell. |
| Nokia | Yes |  |
| CATT | No | It may be better to align with the unicast DRX principle  //38.321, 5.7 Discontinuous Reception (DRX)  NOTE 2: In case of unaligned SFN across carriers in a cell group, the SFN of the SpCell is used to calculate the DRX duration.  [OPPO] It is for broadcast, it will be always based on SFN of the cell who broadcasts MCCH. |
| Samsung | No | In CA, inter-subframe synchronization is assumed. Agree with CATT. |
| LGE | Yes | We agree to the proposal. However, it is not sure that NOTE is required because it can be inferred from the RRC description (5.9.3.3 Broadcast MRB establishment).  1> receive DL-SCH on the cell where the *MBSBroadcastConfiguration* message was received for the MBS broadcast service for which the broadcast MRB is established and using *g-RNTI* and *mtch-SchedulingInfo* (if included) in this message for this MBS broadcast service; |
| OPPO | Yes | It is for broadcast, it will be always based on SFN of the cell who broadcasts MCCH.. |
| MediaTek | No | We assume SFN operation is transparent to the UE |
| Qualcomm | Yes |  |
| Futurewei | No | When SCell is used, the UE is in connected mode and can simply following SFN of Spcell. Agree with CATT. |
| Spreadtrum | Yes |  |
| Lenovo | Yes | It is broadcast. It is not possible for the UE to follow the SFN of Spcell since the DRX configuration is also applied to other UEs without CA configuraiton in the cell. |
| Ericsson | No |  |
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### 2.2.2 HARQ process related changes for broadcast MBS

There is no NDI and HARQ process id in DCI for broadcast scheduling, there is repetition for MTCH according to the text of beam sweeping of MTCH like OSI. At the same time, RAN1 agree to use *pdsch-AggregationFactor* also for broadcast MBS scheduling.

In [R2-2205437/ R2-2204609/ R2-2204833], companies proposed to add text for HARQ process handling for broadcast MBS reception, but the wordings are different.

Which text do you preferred?

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| --- | --- |
| Option 1  R2-2204609 | For each received TB and associated HARQ information, the HARQ process shall:  1> if the NDI, when provided, has been toggled compared to the value of the previous received transmission corresponding to this TB; or  1> if the HARQ process is equal to the broadcast process, and this is the first received transmission for the TB according to the system information schedule indicated by RRC; or  1> if the HARQ process is associated with a transmission indicated with a MCCH-RNTI or a G-RNTI for MBS broadcast, and this is the first received transmission for the TB according to the MCCH or MTCH schedule indicated by RRC; or |
| Option 2  R2-2205437 | For each received TB and associated HARQ information, the HARQ process shall:  1> if the NDI, when provided, has been toggled compared to the value of the previous received transmission corresponding to this TB; or  1> if the HARQ process is equal to the broadcast process, and this is the first received transmission for the TB according to the system information schedule indicated by RRC; or   1. if the HARQ process is associated with a transmission indicated with a MCCH-RNTI or a G-RNTI for MBS broadcast, and this is the first received transmission for the TB according to the scheduling indicated by DCI as specified in TS 38.214 [7]; or |
| Option 3  R2-2204833 | For each received TB and associated HARQ information, the HARQ process shall:  1> if the NDI, when provided, has been toggled compared to the value of the previous received transmission corresponding to this TB; or  1> if the HARQ process is equal to the broadcast process, and this is the first received transmission for the TB according to the system information schedule indicated by RRC; or  1> if the HARQ process is allocated for the received TB for MCCH or broadcast MTCH, and this is the first received transmission for the TB according to the scheduling information indicated by RRC; or |

**Q12: Do companies agree the changes and which text do companies prefer in [R2-2205437/ R2-2204609/ R2-2204833]?**

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| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Maybe no | We think another condition can cover the case of MBS broadcast:  1> if this is the very first received transmission for this TB (i.e. there is no previous NDI for this TB): |
| Nokia | Yes | Option 1 rather than option 3. Option 2 seems to assume scheduling via DCI ? |
| CATT | Yes  None | We think there is no retransmission for MCCH or broadcast MTCH. So the the modification can be:  For each received TB and associated HARQ information, the HARQ process shall:  1> if the NDI, when provided, has been toggled compared to the value of the previous received transmission corresponding to this TB; or  1> if the HARQ process is equal to the broadcast process, and this is the first received transmission for the TB according to the system information schedule indicated by RRC; or  1> if the HARQ process is associated with a transmission indicated with a MCCH-RNTI or a G-RNTI for MBS broadcast; or |
| Samsung | Yes | MAC spec should consider this case. We prefer Option 2, which is consistent with 38.214 v17.10 section 5.1.2.1  “When receiving PDSCH scheduled by DCI format 4\_0 in PDCCH with CRC scrambled by G-RNTI for MTCH, if the UE is configured with *pdsch-AggregationFactor* in the *pdsch-Config-MTCH*, the same symbol allocation is applied across the *pdsch-AggregationFactor* consecutive slots.”  For Option 1 and Option 3, “MTCH schedule” and “scheduling information indicated by RRC” are ambiguous description. |
| LGE | Yes – Option 1 |  |
| OPPO | Yes | Option 1 |
| MediaTek | Yes | Option 1 |
| Qualcomm | Yes  Option 2 | Same view as Samsung. |
| Futurewei | Yes | Option 1 |
| Spreadtrum | Yes | Option 1 |
| Lenovo | Yes | Option 1 |
| Ericsson | Yes | Option 1, agree that the use of “schedule, …” is not clear still |
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In [R2-2205437], company proposed MCCH should be readily identified with the MCCH-RNTI and be delivered to upper layers due to no multiplexing for MCCH and proposed the following text:

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| 1> if the data for this TB was successfully decoded before:  2> if the HARQ process is equal to the broadcast process; or  2> if the HARQ process is associated with a transmission indicated with a MCCH-RNTI:  3> deliver the decoded MAC PDU to upper layers.  2> else if this is the first successful decoding of the data for this TB:  3> deliver the decoded MAC PDU to the disassembly and demultiplexing entity. |

**Q13: Do companies agree the changes above proposed in [R2-2205437]?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | No | MAC PDU for MCCH should be first delivered to the disassembly and demultiplexing entity for MAC header disassemble before delivery, as there is a MAC header for this MAC PDU. |
| Nokia | No | Agree with Huawei BUT why do we actually need an LCID, couldn’t we use a transparent MAC for MCCH since it is scheduled with MCCH-RNTI ? |
| CATT | No | Agree with Huawei |
| Samsung | Yes |  |
| LGE | Yes | This change is also aligned with change of Figure 4.2.2-1 and Figure 4.2.2-2 handled in Q20. |
| OPPO | No | MCCH is different from BCCH. For BCCH, there is TM RLC and no MAC subheader. For MCCH, there is UM RLC and also MAC subheader. Anyway, MAC will remove the subheader even if there is no multiplexing. |
| MediaTek | No | Agree with Huawei |
| Qualcomm | No | Same view as Huawei |
| Futurewei | No | Agree with Huawei/OPPO |
| Spreadtrum | No | Agree with Huawei |
| Lenovo | No | Agree with Huawei |
| Ericsson | No | Agree w Huawei |
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In [R2-2205457], company proposed to add text to clarify how to select HARQ process for MCCH/MTCH reception.

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| The number of parallel DL HARQ processes per HARQ entity is specified in TS 38.214 [7]. The dedicated broadcast HARQ process is used for BCCH. For MCCH or broadcast MTCH, the UE implementation selects an HARQ process other than the dedicated broadcast HARQ process. |

**Q14: Do companies agree the changes above proposed in [R2-2205457]?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Postpone | Should wait for reply LS from RAN1 first. |
| Nokia |  | It would be good to define a dedicated HARQ process for MCCH similar to BCCH. For broadcast MTCH the addition makes sense. |
| CATT | No | not needed, there is already a NOTE in the spec  //38.321  NOTE: It is up to UE impletentation to allocate the received TB for MCCH or broadcast MTCH to one HARQ process. |
| Samsung | No | NOTE is already there in spec. It is also already clear that dedicated broadcast HARQ process is only for BCCH.  *NOTE: It is up to UE impletentation to allocate the received TB for MCCH or broadcast MTCH to one HARQ process.* |
| LGE | No | We think the following NOTE already covers the intention.  NOTE: It is up to UE impletentation to allocate the received TB for MCCH or broadcast MTCH to one HARQ process. |
| OPPO | No | Agree with LGE. |
| MediaTek | Yes | It is good to clarify the UE’s behavior. Also ok to wait for RAN1 |
| Qualcomm | No | Same view as CATT and Samsung. |
| Futurewei | No | Agree with above companies points. |
| Spreadtrum | No | Agree with CATT. |
| Lenovo | No |  |
| Ericsson | No | Not needed |
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### 2.2.3 Other proposed changes

In [R2-2204606], company proposed to capture text for MTCH reception via beam sweeping in 38.321, not in 38.331.

**Q15: Do companies agree the below proposal and agree the corresponding changes proposed in [R2-2204606]?**

**Proposal: Capture text for MTCH reception via beam sweeping in 38.321, not in 38.331.**

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| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | No strong view | Either way is fine for us. |
| Nokia | ~ | No strong view. |
| CATT | No strong view |  |
| Samsung | No | The current 331 text is enough. MAC spec does not similar texts for other cast type. Also, in 38.321 CR, ordering of text description for “PDCCH reception” and “mapping for PDCCH monitoring occasion for MTCH” is ambiguous |
| LGE | No | We think RRC is proper for the description. If it is required to capture it in a lower layer, physical layer spec. seems more proper than mac spec. because it is related to beam sweeping opreration. |
| OPPO | Yes | MTCH is data, it is better to capture the text for data reception in 38.321.  For MCCH,OSI reception, they are signalling and it is OK to capture text for data reception in 38.331. |
| MediaTek | No strong view |  |
| Qualcomm |  | May be RRC is better place than MAC. |
| Futurewei | No | Do not see a strong reason to make the change. |
| Spreadtrum | No strong view |  |
| Lenovo | No strong view |  |
| Ericsson | No | MAC does not describe these currently, also the text is not clear. |
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In [R2-2205218], company proposed one note in 5.9 to clarify that the SCell cannot be deactivated by MAC CE if the SCell is configured for broadcast reception.

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| NOTE X: The SCell configured for MBS broadcast reception cannot be deactivated via the SCell Activation/Deactivation MAC CE and Enhanced SCell Activation/Deactivation MAC CE. |

**Q16: Do companies agree the below proposal and the changes proposed in [R2-2205218]?**

**Proposals: The SCell configured for MBS broadcast reception cannot be deactivated via the SCell Activation/Deactivation MAC CE and Enhanced SCell Activation/Deactivation MAC CE.**

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| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | No | It is up to NW implementation. If the UE supports MBS broadcast reception on non-serving cell, it has no problem to deactivate this SCell. |
| Nokia | No | Wouldn’t that unecessarily increase power consumption and require the deactivation timer to be set to infinity always? |
| CATT | No | It is up to NW implementation. |
| Samsung | No | Broadcast reception via SCell it up to UE implementation? |
| LGE | No | Considering that UE can receive MBS broadcast in RRC\_IDLE/INACTIVE and in non-serving cell depending on UE capability, the NOTE does not need to be captured. It may be left to UE implementation. |
| OPPO | Yes |  |
| MediaTek | No |  |
| Qualcomm |  | Intention is OK. UE can only receive Broadcast in CFR only if BWP is Active (i.e SCell has to be activated). But if same broadcast service is not available in other frequnecies, there is no choice for NW other than keeping SCell activated. We are fine to leave it upto NW implementation. |
| Futurewei | No |  |
| Spreadtrum | No | It is up to NW implementation. |
| Lenovo | No | How to receive the broadcast in Scell is up to UE implementation. |
| Ericsson | No | Both UE and NW means to use SCell is up to implementation. |
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The following changes proposed in [R2-2204833].

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| When the MAC entity needs to read BCCH, the MAC entity may, based on the scheduling information from RRC:  1> if a downlink assignment for this PDCCH occasion has been received on the PDCCH for the SI-RNTI;  2> indicate a downlink assignment and redundancy version for the dedicated broadcast HARQ process to the HARQ entity.  When the MAC entity needs to read MCCH, the MAC entity may, based on the scheduling information from RRC:  1> if a downlink assignment for this PDCCH occasion has been received on the PDCCH for the MCCH-RNTI;  2> indicate a downlink assignment and redundancy version for the dedicated broadcast HARQ process to the HARQ entity. |

**Q17: Do companies agree the changes proposed in [R2-2204833]?**

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| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | No | This seems not necessary as it may not be possible for soft combining due to possible segmentation of RLC PDUs of MCCH, e.g. RLC SNs will be different for different TBs. |
| Nokia | Yes |  |
| CATT | No | “the dedicated broadcast HARQ process” is for BCCH,can not be used for MCCH |
| Samsung | No | There’s no broadcast HARQ process. |
| LGE | See comments | We agree to the intention that presence of DL assignment and the associated HARQ information need to be indicated to the HARQ entity. However, we need to discuss TP improvement. At least, ‘the dedicated broadcast HARQ process’ needs to be changed because it is UE implementation to select a HARQ process. |
| OPPO | No | Cannot see the necessary. |
| MediaTek | No | Agree with CATT |
| Qualcomm | Yes |  |
| Futurewei | No |  |
| Spreadtrum | Yes | Agree with LGE |
| Lenovo | No |  |
| Ericsson | No strong opinion | Not necessarily needed but if added the HARQ process is up to UE to select and should be changed. |
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In [R2-2205447], company proposed the text in MAC reset section to excluding broadcast related timer and HARQ process handling. Do you agree the changes?

**Q18: Do companies agree the changes proposed in [R2-2205447]?**

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| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Yes |  |
| Nokia | No | Not needed at this stage. |
| CATT | Yes |  |
| Samsung | Yes | Broadcast timers should not be stopped. |
| LGE | Yes |  |
| OPPO | No strong view | Following majority view. |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| Spreadtrum | Yes |  |
| Lenovo | Yes |  |
| Ericsson | Yes |  |
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## 2.3 others

In [R2-2205122/ R2-2205129], companies proposed text to clarify discarding unexpected sub PDU for broadcast MBS reception. In previour MAC running CR discussion, most companies agreed to add text in secion 5.3.3, not 5.13. it is better not to open this discussion again, i.e. the yellow highlight text in 5.3.3 below will be kept.

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| 5.3.3 Disassembly and demultiplexing The MAC entity shall disassemble and demultiplex a MAC PDU as defined in clauses 6.1.2 and 6.1.5a.  When a MAC entity receives a MAC PDU for MAC entity's G-RNTI or G-CS-RNTI, or by the configured downlink assignment for MBS multicast containing an LCID or eLCID which is not configured, the MAC entity shall at least:  1> discard the received subPDU. |

Due to L1 PTP retransmission for the initial transmission of PTM transmission, the UE may receive a MAC PDU scambmed with C-RNTI or CS-RNTI for retrsnamission of MBS multicast scampbed with G-RNTI or SPS. It is not clear how to handle this case and it is already captured in 5.13 for a error case.

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| 5.13 Handling of unknown, unforeseen and erroneous protocol data 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 Reserved LCID or eLCID value, or an LCID or eLCID value the MAC Entity does not support, the MAC entity shall at least:  1> discard the received subPDU and any remaining subPDUs in the MAC PDU.  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 an LCID or eLCID value which is not configured, the MAC entity shall at least:  1> discard the received subPDU. |

**Option 1**: Due to L1 PTP retransmission for the initial transmission of PTM transmission, when UE receive a MAC PDU scambmed with C-RNTI or CS-RNTI for retrsnamission of MBS multicast scampbed with G-RNTI or SPS, UE discard the unexpected subPDU according to 5.13, i.e. no spec change.

**Option 2**: Due to L1 PTP retransmission for the initial transmission of PTM transmission, when UE receive a MAC PDU scambmed with C-RNTI or CS-RNTI for retrsnamission of MBS multicast scampbed with G-RNTI or SPS, UE discard the unexpected subPDU according to 5.3.3, i.e. add corresponding text for CS-RNTI and C-RNTI case in multicast reception in 5.3.3.

**Q19: Which option do companies prefer and do companies agree the changes proposed in [R2-2205122] if option 2 is chosen?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Option 1 | No need for duplicated handling as already covered by section 5.13. |
| Nokia | Yes | Option 2. |
| CATT | Option 1 |  |
| Samsung | 1 |  |
| LGE | Yes – Option 2 | For the first change in R2-2205122, we think that handling of PTP retransmission case is considered as a normal operation for the received MBS subPDUs containing (e)LCID which is not configured. Therefore, it would be better to specify all handling of MBS MAC PDU in one place. With option 1, it may be confusing whether handling for MBS MAC PDU received by C-RNTI/CS-RNTI is intentionally missing in 5.3.3 or not.  For the second change in R2-2205122, we think that it is not clear that the UE discards only the received subPDU containing an (e)LCID which is not configured with the current text, and the second change makes it clear. |
| OPPO | Option 1 |  |
| MediaTek | Yes | Option 2 |
| Qualcomm | Option 2 |  |
| Futurewei | Option 1 |  |
| Spreadtrum | Yes | Option 2 |
| Lenovo | Option 1 |  |
| Ericsson | Option 1 | (text needs some work..) |
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In [R2-2205483], company proposed to change the HARQ model for MCCH and broadcast MTCH in Figure 4.2.2-1 and Figure 4.2.2-2.

**Q20: Do companies agree the changes proposed in [R2-2205483]?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No? | Comments |
| Huawei, HiSilicon | Yes | Otherwise it is not aligned with the agreed HARQ modelling. |
| Nokia | Yes | It would be good to define a dedicated HARQ process for MCCH since currently MBS broadcast always uses at least 2 HARQ processes. |
| CATT | Yes |  |
| Samsung | Yes | HP is shared by unicast, multicast and broadcast. |
| LGE | Yes |  |
| OPPO | Yes |  |
| MediaTek | Yes |  |
| Qualcomm | Yes |  |
| Futurewei | Yes |  |
| Spreadtrum | Yes |  |
| Lenovo | Yes |  |
| Ericsson | Yes | To align the HARQ model. |
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## 2.4 Any other issues?

**Q21: Any other open issues?**

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| Company | Issues | Comments |
| Huawei, HiSilicon | For unicast DRX, retransmission timer and RTT timer are maintained per HARQ process. Similarly, for multicast DRX, retransmission timer and RTT timer are also maintained per HARQ process. Besides, according to the current specs, multicast DRX is configured and operated per G-RNTI/G-CS-RNTI. In other words, network may configure different values for retransmission timer or RTT timer corresponding to different G-RNTIs/G-CS-RNTIs. Considering that HARQ processes are shared by unicast and multicast, there may be multiple sets of retransmission timers and RTT timers associated with the same HARQ process, for unicast DRX and multiple multicast DRXs.  **Proposal: RAN2 to confirm that retransmission timer and RTT timer of multicast DRX are maintained per G-RNTI/G-CS-RNTI per HARQ process and further study the impact on multicast DRX operation.** |  |
| Nokia | What about the restructuring proposed by ZTE in 5629? |  |
| ASUSTeK | In addition to Q7 in 2.1.4 (Multicast DRX), the second proposal as below in R2-2205128 seems missing. Probabaly we can add one more question Q7-1.  In R2#117, we just agree to start the unicast RTT Timer, and DRX Retx timer for unicast would be naturally started (if needed) after its unicast RTT timer expires. Hence, the action of stopping DRX Retx timer for unicast should be removed (since it was not fully discussed). Actually, if DRX Retx timer for unicast is already running but stopped here, UE may miss potential unicast transmission from NW.  **Proposal 2: If UE receives a PDCCH indicating a multicast transmission, not stop the corresponding *drx-RetransmissionTimerDL* for unicast.** |  |
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# Conclusions

Based on the discussion above, we propose:

# Reference

General

R2-2205483 Correction on the figures of MAC structure overview Huawei, HiSilicon CR Rel-17 38.321 17.0.0 1272 - F NR\_MBS-Core

R2-2205129 Handling of MAC PDU for MBS with Reserved LCID ASUSTeK discussion Rel-17 38.321 NR\_MBS-Core

R2-2205122 Clarification on MBS MAC subPDU discard LG Electronics Inc., Nokia, Nokia Shanghai Bell draftCR Rel-17 38.321 17.0.0 F NR\_MBS-Core

Broadcast

R2-2204609 38321CR-Corrections on MCCH and MTCH reception OPPO CR Rel-17 38.321 17.0.0 1225 - F NR\_MBS-Core

R2-2204833 Correction on DL Data Transfer for MBS vivo discussion Rel-17 NR\_MBS-Core

R2-2205457 Clarification on the HARQ process used for broadcast MBS Xiaomi Communications draftCR Rel-17 38.321 17.0.0 F NR\_MBS-Core

R2-2205218 [RIL406]The timing for broadcast DRX and SCell deactivation restriction OPPO Beijing CR Rel-17 38.321 17.0.0 1263 - F NR\_MBS-Core

R2-2205437 HARQ Process Handling for MBS Broadcast Samsung R&D Institute India discussion Rel-17 38.321

R2-2205447 MBS Broadcast Retention Samsung R&D Institute India discussion Rel-17 38.321

Multicast

R2-2205540 Remaining MBS user plane open issues Intel Corporation discussion Rel-17 NR\_MBS-Core

R2-2204667 Consideration on MAC Remaining Issues of MBS CATT discussion Rel-17 38.323 NR\_MBS-Core

R2-2204744 Corrections on MBS Spreadtrum Communications discussion Rel-17

R2-2204832 Discussion on the Coexistence of DCP and Multicast DRX vivo discussion Rel-17 NR\_MBS-Core

R2-2204969 Remaining issues on MBS user plane Lenovo discussion Rel-17

R2-2205156 DCP monitoring/WUS and MBS DRX and miscellaneous corrections to DRX Nokia, Nokia Shanghai Bell discussion Rel-17 38.321 NR\_MBS-Core

R2-2205449 WUS and DCP monitoring for MBS Multicast Samsung R&D Institute India discussion Rel-17 38.321

R2-2205035 Discussion on CSI and SRS reporting issues CMCC discussion Rel-17 NR\_MBS-Core

R2-2205154 CSI Mask for MBS Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_MBS-Core

R2-2205480 Remaining issues on CSI reporting for multicast Huawei, HiSilicon discussion Rel-17 NR\_MBS-Core

R2-2204831 Discussion on CSI-mask Configuration with Multicast DRX vivo discussion Rel-17 NR\_MBS-Core

R2-2204834 Correction on Multicast DRX vivo discussion Rel-17 NR\_MBS-Core

R2-2204891 Discussion on the impact of CSI and SRS due to multicast DRX NEC Europe Ltd discussion Rel-17 NR\_MBS-Core

R2-2204904 The timing for broadcast DRX and editorial corrections for multicast DRX OPPO CR Rel-17 38.321 17.0.0 1241 - F NR\_MBS-Core

R2-2204905 Corrections on CSI-mask and DCP coexistence for multicast DRX MediaTek inc. discussion Rel-17 NR\_MBS-Core

R2-2205628 CSI and SRS reporting in MBS DRX ZTE, Sanechips discussion Rel-17 NR\_MBS-Core

R2-2205629 Correction on CSI and SRS reporting for multicast DRX to 38321 ZTE, Sanechips CR Rel-17 38.321 17.0.0 1276 - F NR\_MBS-Core

R2-2205673 Leftover issues on multicast DRX mechanism Apple discussion Rel-17 NR\_MBS-Core

R2-2205709 Discussion on CSI reporting due to multicast DRX LG Electronics Inc. discussion Rel-17 NR\_MBS-Core

R2-2205713 Remaining Issues on Multicast DRX Samsung discussion Rel-17 NR\_MBS-Core

R2-2205128 Discussion on unicast retransmission for MBS transmission ASUSTeK discussion Rel-17 38.321 NR\_MBS-Core

R2-2205481 Clarification on DRX timers for multicast Huawei, HiSilicon discussion Rel-17 NR\_MBS-Core

R2-2205748 Multicast and CSI, SRS and DCP Ericsson discussion Rel-17 NR\_MBS-Core