**3GPP T****SG-RAN WG2 Meeting #116bis-e DRAFT\_R2-22xxxxx**

**E-meeting, 17 – 25 January 2022**

**Agenda item:**8.1.3.2

**Source:** Huawei, HiSilicon

**Title:** Report of offline: [AT116bis-e][024][MBS] RRC Miscellaneous

**Document for:** Discussion and Decision

# 1 Introduction

This document aim at gathering companies views as part of the following offline discussion:

* [AT116bis-e][024][MBS] RRC Miscellaneous (Huawei)

Scope: Take into account R2-2200095 (L1 parameters), R2-2200814, R2-2200815, relevant Open Issues from R2-22000022 (blue-marked and other smaller, if any). Address FFS whether some explicit indication is needed for the UE to know that an RLC entity is configured for PTM transmission. Acknowledge the way MRB bearer configuration is captured in current running CR. Progress offline as much as possible by easy agreements, Identify points for further discussion if any.

Intended outcome: Report, Endorsed/confirmed updated RRC CR.

Deadline: Friday W1 (CB online if needed).

## Company contact details

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# 2 Discussion

## 2.1 L1 parameters handling

A list of MBS L1 parameters that need to be provided via RRC signalling was sent by RAN1 within an LS in [1]. The rapporteur provided the related update of the RRC CR in [2]. In [3], the rapporteur further clarified some of the decisions made during the introduction of L1 parameters into the RRC CR and it is worth for RAN2 to confirm them.

Firstly, the rapporteur decided to put MTCH/MCCH search space configuration in PDCCH-ConfigCommon instead of in SIBx, as was suggested by RAN1. The reason for this is to reuse the same way of configuring the MCCH/MTCH search space for the UEs in all RRC states, including RRC Connected. This is the same rationale which was used for Paging/SI search space configuration. Details can be found in [3].

**Question 1: Do you agree that MCCH/MTCH search space configuration can be included as part of PDCCH-ConfigCommon, to unify the search space configuration for UEs in all RRC states?**

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| **Company** | **Yes/No** | **Justification** |
| CATT | **No** | We prefer to follow RAN1 instruction that search spaces for MCCH and MTCH are included in SIBx and MCCH respectively.we do not think such information as part of broadcast PTM configuration should be delivered in dedicated RRC message.  And it will also align with the RAN2 agreement below,   * The two-step based approach (i.e. BCCH and MCCH) as adopted by LTE SC-PTM is reused for the transmission of PTM configuration for NR MBS delivery mode 2 |
| MediaTek | No | We have the same understanding as CATT |
| Samsung | No | As this is not in line with RAN1 LS, it needs to be first confirmed with RAN1. |
| Huawei, HiSilicon | Yes | For ASN.1 signaling design, we should not strictly follow RAN1’s recommendations for everything, especially because RAN2 is expert on this. In Rel-15, RAN2 has made a lot of efforts on how to design the signaling for dedicated search spaces and common search spaces, and the principle should be followed in Rel-17 (NOTE that in Rel-16 the principle has been well followed, e.g. for IAB).  RAN1 has specified the function of broadcast reception in IDLE/INACTIVE. Of course it is also working by including MCCH/MTCH search space in SIBX/MCCH for IDLE/INACTIVE UE. However, for the UE in RRC\_CONNECTED state, the broadcast reception configuration in a dedicated BWP which covers CFR for broadcast should be also considered, similar to paging/SI reception in dedicated BWP where Paging/SI search space needs to be explicitly indicated in PDCCH-ConfigCommon. Including MCCH/MTCH search space in PDCCH-ConfigCommon would be the unified solution for all RRC-states, and has followed the Rel-15 principle for Paging/SI.  Further, there are other impacts if we don’t follow this design. In case we configure MCCH/MTCH search space in SIBX/MCCH, we additionally need one flag per BWP to tell the UE whether broadcast reception is enabled in the dedicated BPW, when the BWP covers broadcast CFR, which makes the solution even more complicated. Note that in Rel-15, whether to receive paging/SI is only based on the presence of the paging/SI search spaces in PDCCH-ConfigCommon. By configuring MCCH/MTCH search spaces in PDCCH-ConfigCommon, the same principle would be followed.  We do recommend this signaling design consistent with Rel-15, and would like to ask companies if it is acceptable. |
| Xiaomi | No |  |
| Nokia | Yes | No strong view but this approach seems reasonable |
| Ericsson | Yes | We think the signaling structure and ASN.1 design is in the expertise of RAN2 and thus we should make this part of the framework that is already in place. |
| vivo | No | In our understanding, with proper CSS configuration for other SI reception, the UE in connected can smoothly obtain the SIBx and obtain the CSS configuration for MCCH/MTCH. The only issue we figure out is that the reception priority of the broadcast and unicast is not unclear. However, this is RAN1’s issue and we think that no RAN2 impact is expected. |
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Furthermore, in [3], it is pointed out that in the current L1 parameters list from RAN1, there is only one RRC parameter (pdsch-AggregationFactor-MTCH) for PDSCH configuration. However, there are some parameters which were agreed in RAN1 but not reflected in the LS. Based on checking RAN1 agreements, the rapporteur added more parameters for PDSCH broadcast configuration, as below:

PDSCH-ConfigBroadcast-r17 ::= SEQUENCE {

dataScramblingIdentityPDSCH-r17 INTEGER (0..1023) OPTIONAL, -- Need S

pdsch-TimeDomainAllocationList-r17 PDSCH-TimeDomainResourceAllocationList-r16 OPTIONAL, -- Need S,

rateMatchPatternToAddModList-r17 SEQUENCE (SIZE (1..maxNrofRateMatchPatterns)) OF RateMatchPattern OPTIONAL, -- Need R

mcs-Table-r17 ENUMERATED {qam256, qam64LowSE} OPTIONAL, -- Need S

xOverhead-r17 ENUMERATED { xOh6, xOh12, xOh18 } OPTIONAL -- Need S

}

In [3], the rapporteur proposed to confirm these parameters with RAN1.

**Question 2: Do you agree to send an LS to RAN1 to confirm that the above parameters should be added as part of broadcast PDSCH configuration?**

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| **Company** | **Yes/No** | **Justification** |
| CATT | **Yes** |  |
| MediaTek | Yes |  |
| Samsung | Yes |  |
| Xiaomi | Yes |  |
| Nokia | No | RAN1 should be able to inform missing parameters if any. No need to poll them for that. |
| Ericsson | No | Our understanding is that what was informed to RAN2 was new additions and that RAN1 assumes RAN2 can design what existing parameters is additionally needed for the function, i.e based on the current assumptions of the function in RAN1 and RAN2. |
| vivo | No | RAN1 is still discussing the detailed parameters which are fully determined yet. We can just waits for the updated list. |
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Furthermore, in [4] it is indicated that it is not entirely clear whether the intention from RAN1 is to allow only a single CFR to be configured for MCCH/MTCH or whether it should be possible for the network to configure more than that. RRC CR’s rapporteur’s understanding is that RAN1 assumed only a single CFR and this is how RRC CR was drafted.

**Question 3: Do you agree that a single CFR is used for MCCH and all MTCHs of all broadcast services in the cell? Please indicate in justification whether you see the need to confirm this with RAN1.**

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| **Company** | **Yes/No** | **Justification** |
| CATT | **Yes, and RAN1 confirmation is needed** | According to RAN1 LS, The CFR frequency resources(i.e. cfr-Config-MCCH-MTCH) used for MCCH and MTCH are configured in SIBx, and it is cell specific. This can be understood as that a single CFR is used for MCCH and all MTCHs of all broadcast services in the cell. But on the other hand, the PDSCH carrying MTCH(i.e. pdsch-Config-MTCH) is described as per CFR and included in MCCH, which implies that there may be multiple CFR in a cell. So it seems necessary to confirm with RAN1 on this. |
| MediaTek | Yes | We can inform RAN1 our decision |
| Samsung | Yes | Understand only a single CFR is meant. |
| Xiaomi | Yes |  |
| Nokia | No | We see a single CFR for all MTCH of all broadcast services as very limiting. Traffic data size of different broadcast services could vary a lot and we think depending on the broadcast services applied, the MTCH CFR/BWP could also be configured differently by network gNB for different broadcast services. The broadcast MTCH CFR/BWP can be configured per G-RNTI or G-CS-RNTI. We support sending an LS to confirm this with RAN1. We also think CFR/BWP for MCCH and MTCH can be configured differently for broadcast reception. |
| Ericsson | Yes | We understand that only one common CFR frequency range, PDCCH-config/PDSCH-config is used for MCCH/MTCH, as signaled in SIBx, unless additional configuration is provided by MCCH. MCCH may provide other PDCCH/PDSCH configurations for MTCH but cannot change the frequency range. This aspect is currently discussed in RAN1 and thus RAN1 confirmation is needed. |
| vivo | Yes | In the RAN1 session, there is a NOTE regarding the maximum number of CFR, as highlighted below.  *Note: The agreement till RAN1#106e only supports the same bandwidth configurations for the CFR of GC-PDCCH/PDSCH carrying MCCH and the CFR of GC-PDCCH/PDSCH carrying MTCH. This parameter can be split into two separate ones if MCCH and MTCH can be configured within different CFRs.*  However, no further official agreement is achieved yet. In other words, it is quite clear that there is only one CFR for MCCH and MTCHs. In this sense, we think LS to RAN1 is not needed. |
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Companies are further invited to raise any other issues with the way L1 parameters were introduced into the RRC running CR in [2].

**Question 4: Please provide comments towards the way L1 parameters were introduced in [2]?**

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| **Company** | **Issue** | **Proposed solution** |
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RAN1 sent an LS to RAN2 in [7] on MTCH scheduling window where they inform RAN2 that:

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| **Conclusion**  Is up to RAN2 decision:   * the configuration of the MTCH scheduling window parameters: monitoring periodicity and the starting of the periodicity: * whether the MTCH scheduling window is associated to one or multiple or all G-RNTIs   Send an LS to RAN2 to inform about RAN1 conclusion |

In [6], it is indicated that this window is only intended for SSB beam association and not used to restrict the scheduling in time domain which still follows the configuration of DRX and search space. In order to reduce the related overhead, it is proposed that for G-RNTIs configured with DRX, DRX periodicity and offset are reused for MTCH window determination and that explicit MTCH window periodicity and the offset can be optionally configured and is applicable commonly to all G-RNTIs for which DRX is not configured.

**Question 5: Do you agree that:**

1. **For G-RNTIs configured with DRX, DRX periodicity and offset are reused for MTCH window determination**
2. **Explicit MTCH window periodicity and the offset can be optionally configured and is applicable commonly to all G-RNTIs for which DRX is not configured?**

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| **Company** | **Yes / No** | **Justification** |
| CATT | **Partially Yes** | 1.Yes  2.No. we do not see the no need to define the MTCH window periodicity and offset, as UE should monitor G-RNTI in any slot if no DRX is configured for this service,according to the agreement below,  **//RAN2#116e**   * In case mtch-schedulingInfo is absent for a G-RNTI (i.e. no PTM DRX), the UE should monitor for PDCCH scrambled with G-RNTI in any slot according to the search space configured for MTCH. |
| MediaTek | Yes for 1 | For 2, we agree with CATT that UE may need to continuously monitor G-RNTI if no DRX configuration |
| Samsung | Yes (for 1) | Agree with CATT |
| Xiaomi | Yes |  |
| Nokia | No | If the window is indeed only intended for SSB beam association and not used to restrict the scheduling in time domain, then it should always follow DRX configuration, which would then become mandatory. |
| Ericsson | Yes for 1, comment | Agree w CATT |
| vivo | No | We agree with Nokia. The concept of the MTCH window is similar to the NR SI window. Besides, the motivation of using DRX periodicity and offset for MTCH window determination is not clear to us (no performance gain is found). In conclusion, we prefer to configure an explicit MTCH window periodicity and offset for UEs, regardless of DRX configuration (similarly to the NR SI window configuration). |
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## 2.2 RRC miscellaneous issues

### 2.2.1 Indication of RLC entity for PTM

In [4], it is indicated that since the RLC entities for PTM are initialized in a different way as compared to PTP RLC entities, the UE needs to be aware whether a certain RLC entity is PTP or PTM entity. Further, it is proposed to discuss whether this is indicated by using a reserved LCID space for multicast MTCH or using an indication in RRC configuration. On the other hand, [9] argues that for the RLC UM mode, the configuration and the RLC operation for PTP and PTM RLC entity is same and there is no need to explicitly indicate whether the MRB associated RLC entity is for PTM and PTP.

**Question 6: Do you agree that UE needs to be indicated whether a specific RLC entity is used for PTP or PTM transmissions? If yes, please indicate your preferred way of indicating this.**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Justification / preferred solution** |
| CATT | **Yes** | **UE need to perform the special variable initiation for the PTM RLC entity.No strong view on which way to go.** |
| MediaTek | No | We assume PTP is received via C-RNTI and PTM is received by G-RNTI. For PTM transmission, corresponding G-RNTI may be configured. According to this, the UE may know this is for PTM |
| Samsung | Yes |  |
| Xiaomi | Yes at least for AM | As the indication is anyway needed for RLC AM, we would consider that the indication for RLC UM can be kept in the specification as used for RLC AM to align the UE behaviours. |
| Nokia | Yes. | RLC entity for PTM will be initialized based on the first received PDU and thus UE must be configured how to initiate the RLC entity. |
| Ericsson | Yes | One way is to introduce a one-bit flag in RLC-BearerConfig IE to distinguish whether the RLC entity is for PTM transmission or not |
| vivo | Yes | The UE can implicitly know the association between the RLC entity and PTM/PTP leg PTM based on the RLC-BearerConfig (including used LCID) or the associated G-RNTI. Anyway, no explicit indication is needed. |
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### 2.2.2 MCCH / MTCH configuration for broadcast MBS

In [5], [6], [10], it is indicated that neither of PDCP functions is needed for MCCH and it is proposed to agree that PDCP sublayer is not used for MCCH.

**Question 7: Do you agree that PDCP sublayer is not used for MCCH?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Justification** |
| CATT | **Yes** | **None of the PDCP functions is used for MCCH** |
| MediaTek | Yes |  |
| Samsung | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes | Agree that the current PDCP functions does not seem to apply for MCCH. |
| Ericsson | Yes |  |
| vivo | Yes | It has been already captured in the stage-2 CR. |
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In [6], also a configuration of t-Reordering for PDCP of MTCH is discussed. It is indicated that this timer is currently not very useful as out of sequence delivery will not happen for MBS broadcast. On the other hand, it is indicated that in order to make the MBS feature future-proof, it is better to keep this timer as part of PDCP configuration for MTCH as it comes with no extra complexity on the UE side.

**Question 8: Do you agree that for broadcast MTCH, the default value of t-Reordering in PDCP configuration should be set to 0 ms and the network may optionally configure another value?**

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| **Company** | **Yes/No** | **Justification** |
| CATT | **partial** | **There is no out of order delivery for broadcast, so it is fine to set the value of t-Reordering to 0ms, but it seems no need to make it configurable.** |
| MediaTek | Yes |  |
| Samsung | Partially Yes | Default value of t-Reordering in PDCP configuration should be set to 0 ms |
| Xiaomi | Partially yes | Default value seems not essential. If there is no out-of-order delivery as confirmed by RAN1, we can add extra sentence in the field description that only 0ms is used. Then the UE can always follow the network configuration. |
| Nokia | No | We wonder why would we even need reordering for broadcast service? |
| Ericsson | Yes | Although not useful currently, network may optionally configure other values in case reordering will benefit some future use cases. |
| vivo | Partially Yes | 0 ms can be used as the default value and there is no need to make it configurable as blind retransmission is not agreed yet. |
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### 2.2.3 UE actions upon going to RRC\_IDLE

In [5], it is raised that upon going to RRC IDLE the UE shall perform cell selection, which may lead to service interruption if the UE selects another cell. On the other hand, cell selection is currently up to UE implementation to a large extent and hence the UE may still stay on the same cell, if it meets the criteria.

**Question 9: Do you think there is a need to modify the UE actions upon going to RRC IDLE for the UE receiving MBS broadcast service at the time of state transition?**

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| **Company** | **Yes/No** | **Justification** |
| CATT | **No** | **The legacy cell selection procedure upon UE going to RRC\_IDLE should not be changed.** |
| MediaTek | No |  |
| Samsung | Yes | Modification should be only for UEs receiving broadcast session. Cell selection step can be skipped for broadcast service continuity when UE goes to RRC\_IDLE and UE can continue broadcast service reception with existing configurations. Otherwise, we think UE may face interruption and need to reacquire the broadcast service configurations. Note that Cell reselection evaluation should be performed as usual. |
| Xiaomi | No | For cell selection, a smart UE implementation would select its interested MBS cell. |
| Nokia | No | Cell selection is up to UE implementation – nobody prevents UE from selecting current cell. If we mandate some UE behaviour we need to start defining how long UE need to look for this current cell and is not allowed to consider any other cells. This would have negative impact to user perception as the cell selection could be impacted. |
| Ericsson | No | Agree w Nokia |
| vivo | No | Upon going to RRC IDLE, the typical implementation of cell selection is that the UE firstly checks the serving cell, if the serving cell is suitable, then the UE will still stay in the serving cell. Therefore, we don’t think needing to modify the UE action. |
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### 2.2.4 UE broadcast reception related capabilities

[10] discusses whether the UE needs to be able to receive MCCH and MTCH simultaneously on the same cell and whether the UE needs to be able to receive multiple MTCH simultaneously on the same cell. It is argued that from the UE perspective there should be no such requirement. The rapporteur understands the intention here is to ask about the channels that are FDMed with each other, i.e. provided in the same slot.

**Question 10: Do you agree that:**

**1. The UE is not required to be able to receive MCCH and MTCH simultaneously on the same cell (i.e. in case MCCH and MTCH are provided in the same slot)?**

**2. The UE is not required to be able to receive multiple MTCHs simultaneously on the same cell (i.e. in case different MTCHs are provided in the same slot)?**

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| **Company** | **Yes/No** | **Justification** |
| CATT | **NA** | **It should be in RAN1 scope it the intention is to ask about the channels that are FDMed with each other.** |
| MediaTek | No | We think we need the input from RAN1 |
| Samsung | No | UE can receive multiple MTCHs based on its capability and it also concerns RAN1 |
| Xiaomi | No | We can wait for RAN1 capability discussion. |
| Nokia | No | This is analogous to BCCH/data reception in RRC\_CONNECTED and thus it could be possible to have simultaneous reception.  Then whether NW needs to know this is unlikely so probably no need to discuss this in detail. Proper UE will try to do simultaneous reception to minimize power consumption anyway. |
| Ericsson | No | We think that MCCH schedules MTCHs and thus they are not transmitted in the same timeslot. We are not sure if multiple MTCH and also what can be multiplexed in a MAC PDU. We need input from RAN1. |
| vivo | Not sure | Simultaneous reception issues should be in RAN1 scope. |
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Further, it is argued in [10] that the same should apply for simultaneous reception of MBS broadcast and unicast service in RRC Connected state. On the other hand, there is also a possibility that such simultaneous reception of MTCH and unicast data is supported as an optional UE capability.

**Question 11: Do you think that:**

**1. The UE can never receive MBS broadcast and unicast data simultaneously on the same cell (i.e. when MBS broadcast data and unicast data is provided in the same slot); or**

**2. An optional UE capability is specified for the simultaneous reception (i.e. in the same slot) of MBS broadcast data and unicast data in the same cell?**

**3. All the UEs support simultaneous reception of broadcast/unicast**

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| **Company** | **Preferred option** | **Justification** |
| CATT | **NA** | We think MII reporting mechanism is used to enable the simultaneous reception of MBS broadcast and unicast service in RRC Connected state.no additional solution is needed. |
| MediaTek | No | We think we need the input from RAN1 |
| Samsung | Option 2 |  |
| Xiaomi | No | We can wait for RAN1 capability discussion. |
| Nokia | 3 | UEs should always support simultaneous reception of broadcast/unicast to ease NW scheduling burden. |
| Ericsson | 3 |  |
| vivo | Not sure | Simultaneous reception issues should be in RAN1 scope. |
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### 2.2.5 Untreated issues

In [4] and [9] it is raised that in case multicast MBS can be supported on SCell, then G-RNTI configuration should be moved from cell group level configuration to cell level configuration. Since this depends on the outcome of RAN1 discussion on the multicast MBS reception support over SCell, no proposal for RAN2 decision is made at the moment, but this issue will have to be addressed in future.

[8] and [11] provide a set of general recommendations with respect to RRC signaling design and L1 parameters introduction into RRC specifications, which should be to a large extent aligned with the current RRC design. The remaining comments are invited as part of Q4 in section 2.1.

### 2.2.6 Other open issues

Here, companies are invited to raise any other open issues they identified with respect to RRC signalling and procedures that need to be addressed to finalize the work on MBS feature. For this question, please focus on the urgent issues / mistakes, not optimizations, and please consider other ongoing offline discussions.

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| **Company** | **Issue** | **Proposed solution** |
| Samsung | One open issue relates to RRC signalling - How deactivation of multicast session is signalled to the UE in RRC\_CONNECTED state.  There is an issue if “RRC reconfiguration message with release of MRB configuration for the multicast session” is used for deactivation purpose. In this case, UE will not be aware about session deactivation and will not monitor for group paging when it goes to IDLE/INACTIVE state. Further, higher layer would be informed about session release instead of deactivation. | RRC reconfiguration message with an explicit deactivation indication and MBS session ID is used for deactivation of multicast session.  Further MRB configuration for the deactivated multicast session can be released.  (Another option is to suspend the MRB configuration upon deactivation, if reactivation can be expected quickly for RRC\_CONNECTED UE) |
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# 3 Summary

TBD

# References

1. R2-2200095, LS on updated Rel-17 LTE and NR higher-layers parameter list, Source: RAN1
2. R2-2200814, 38.331 running CR for NR MBS, Huawei, HiSilicon
3. R2-2200815, Discussion on RRC Running CR update with L1 parameters, Huawei, HiSilicon
4. R2-2200236 Open Issues on Common RRC Aspects CATT discussion Rel-17 NR\_MBS-Core
5. R2-2200399 Discussion on MBS RRC issues Samsung discussion
6. R2-2200818 Discussion on RRC parameters for MCCH and MTCH Huawei, HiSilicon discussion Rel-17 NR\_MBS-Core
7. R1-2112850, LS on MTCH scheduling window, Source: RAN1
8. R2-2200578 Discussion on L3 open questions for NR MBS TD Tech, Chengdu TD Tech discussion Rel-17
9. R2-2200775 Discussion on receiving MBS under Scell Lenovo, Motorola Mobility discussion Rel-17
10. R2-2201119 Open issues for MBS RRC Running CR Apple discussion Rel-17 NR\_MBS-Core
11. R2-2201120 L1 configuration for MBS Apple discussion Rel-17 NR\_MBS-Core