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

**Online, 09 - 20 May 2022**

**Agenda Item:** 6.1.3.1

**Source:** Huawei, HiSilicon

**Title:** Summary of offline discussion: [AT118-e][029][MBS] CP Broadcast (Huawei)

**Document for:** Discussion and decision

# Introduction

This document aims at gathering companies’ views for the following offline discussion:

* [AT118-e][029][MBS] CP Broadcast (Huawei)

Scope: Treat R2-2204604, R2-2204605, R2-2205112, R2-2205462, R2-2205747, R2-2206091, R2-2206108, R2-2204608, R2-2204682, R2-2205174, R2-2205215, R2-2205671, R2-2204607, R2-2204606, R2-2204829, R2-2205539, R2-2205744, R2-2205458, R2-2204681, R2-2205111, R2-2206159, R2-2206122, R2-2205712,

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

It is noted that some of the proposals provided in the Tdocs were resolved in the rapporteur CR in [25] and some were more related to UE capabilities, so not all issues are discussed in this document.

# Discussion

## MBS Interest Indication and MBS broadcast on SCell

In [1], it is noticed that it might happen that even though MII message is normally forwarded from source cell to target cell upon handover, it might happen that MII is sent from the UE to the gNB just before the handover. In this case the source gNB might have already sent *HandoverPreparationInformation* to target cell and the target cell will not be aware of UE’s interest in MBS services. The similar solution as in the case of *UEAssistanceInformation* message is then proposed, i.e.

|  |
| --- |
| **Proposal: If the UE initiated transmission of a *MBSInterestIndication* message for the corresponding cell group during the last 1 second when handover happens, and the UE will continue to receive the broadcast MBS in target cell, the UE will trigger transmission of a *MBSInterestIndication* message to target cell after handover.** |

The related CR is provided in [2].

**Question 1: Do companies agree that if the UE initiated transmission of a MBSInterestIndication message for the corresponding cell group during the last 1 second before handover happens, and the UE will continue to receive the broadcast MBS in target cell, the UE should trigger transmission of a MBSInterestIndication message to target cell after handover? Please also provide the comments towards the proposed CR in [2], if needed.**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | Intent is ok.  In the CR, there are some issues. Category should be F, not B.  Some typos can be corrected:  uopon -> upon  UE still continue -> continues |
| Samsung | - | Agree with intent, but CR draft seems ambiguous with condition “if *reconfigurationWithSync* was included in *masterCellGroup* or *secondaryCellGroup*” and initiation of MII for corresponding cell group. We think SCG is not concerned for broadcast reception and MII reporting. Further condition for SIB21 transmission in the target cell is required for reporting MII. |
|  |  |  |

In [3] it is observed that the network may not always provide a frequency information for a service in SIB21. In such case, the UE in RRC IDLE/INACTIVE may perform frequency prioritization for cell reselection if the frequency is provided in USD. However, according to current specifications, the UE in RRC CONNECTED mode will not treat such frequency as the frequency of interest for the sake of MII message. This leads to some discrepancy between service continuity for such services in RRC IDLE/INACTIVE and in RRC CONNECTED. Based on this, it was proposed to discuss the following question.

**Question 2: Do you agree it should be possible for the UE to include, in MBS Interest Indication, the frequency provided in USD even if this frequency is not provided in SIB21?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | Even if UE includes USD-configured frequency(ies) in the MII and is able to receive Broadcast service, network should know which service the UE is receiving in that freq. This can help NW to maintain service continuity of that freq in CONNCTED state as well. |
| Samsung | Yes | There is a discrepancy as cell reselection considers SIB21 or USD (in IDLE/INACTIVE) and MII considers only SIB21 (in CONNECTED). |

In [4], [6], [8] it is indicated that currently the UE may only report MII in case its PCell is providing SIB20. However, it is possible that the UE is interested in a service which is provided on an SCell. In this case SIB20 of the SCell will be provided with dedicated signalling while PCell may not even provide SIB20. [4], [6] and [10] propose to clarify the procedure so that the UE may report MII in this scenario.

**Question 3: Do you agree to clarify that if *SIB20* for SCell is provided, UE should be allowed to initiate the transmission of MII message and include TMGIs when setting the contents of MII, under the condition that the UE’s PCell is providing *SIB21*.**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| Samsung | Yes | Further, we should converge on a common term in specification e.g. “providing SIB20” instead of multiple terms presently used as broadcasting, scheduling etc. |

In [12], it is proposed that the UE should resend the MII in case the network does not reconfigure the UE in a way allowing the UE to receive an MBS service of interest.

**Question 4: Do you think the UE should be allowed** t**o resend the MII in case the network does not reconfigure the UE in a way allowing the UE to receive an MBS service of interest?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | Proposal seems ok but we wonder whether it is not already allowed. I.e., how is it restricted today or what spec clarification/change is expected? |
| Samsung | No | Resending of MII is not needed as it is up to NW implementation to provide SIB20. We do not see the purpose of resending MII by UE. |

In [5] and [7], it is indicated that frequent changes of UE’s interests in MBS broadcast services or changes of priority between unicast and broadcast services, may lead to excessive signalling overhead. Some proposals are made on how to address this potential issue are made, e.g. introduce a prohibit timer or to allow the network to turn MII on/off.

**Question 5: Do you think additional network control over MII reporting from the UE is needed? If, yes, please indicate your preferred option, e.g. from the ones mentioned in [5] and [7].**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | We do not think additional network control is needed.   * Current NR MII reporting behaviour is same as that in LTE MBMS. * It is up to NW whether to use or ignore UE reported MII. * MII is sent by the UE only when a UL resource is provided. Unlike UA signalling, “UE that (too) frequently changes its mind about what is interesting” does not make sense because the user trying to receive broadcast service and changing his/her mind in the timescale of milliseconds is not normal! |
| Samsung | No | Agree with Qualcomm. We have already discussed and settled on the issue in earlier meeting. |

In [9], it is proposed to clarify that *sCellSIB20* is provided only for a single SCell at a time. This is already captured in the rapporteur CR, so no further discussion is needed. Another proposal from [9] is to clarify that MCCH should be received from the cell upon reception of *sCellSIB20*.

**Question 6: Do companies agree to clarify in 38.331 that MCCH should be received from the cell upon reception of sCellSIB20, as proposed in [9]?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| Samsung | - | It depends as UE can receive interested broadcast service from either PCell or Scell at a time. If UE is already receiving interested broadcast service on PCell or SCell does not provide interested broadcast service, UE need not receive MCCH from SCell. |

In [10] and [11], it is proposed to clarify that:

1. The network does not configure *dormantBWP-Config* on an SCell which is used by the UE to receive MBS broadcast.
2. The network does not configure *sCellDeactivationTimer* when an SCell is configured for MBS broadcast.
3. The network does not indicate sCellState when an SCell is configured for MBS broadcast.

**Question 7: Do companies agree with bullets 1-3 mentioned above (as per the CR in [11])?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Partly | #1 and #2 are ok.  But wondering what #3 means. sCellState as it is currently defined “Indicates whether the SCell shall be considered to be in activated state upon SCell configuration.” So, not including this means SCell is not considered as activated upon configuration. Is that the intention?  Given that SCell cannot be dormant or deactivated for MBS, does this mean network always needs to activate MBS SCell with a MAC CE?  Then wondering, couldn’t this actually the opposite? I.e., isn’t it better for MBS SCell to be always activated upon config? Regarding the field sCellState, it can either be clarified that NW shall always include sCellState when SCell is configured for MBS broadcast. Or, field description can be clarified that for MBS SCell, it is considered as set to be activated regardless of this field being included or not (to avoid extension marker overhead).  Based on this, comments for the CR in [11]:  - change in conditional presence *SCellAddSync*: “and the SCell is not configured for MBS broadcast reception” -> See comment above. The change could be something like the field is mandatory present when the SCell is configured for MBS broadcast reception. OR, no change needed here if field description is clarified instead.  - in ***dormantBWP-Config*** field description “and the SCell is not configured for MBS broadcast reception” 🡪 should remove “and the SCell is” from the new text. It should be enough to add the rest.  - conditional presence *ServingCellWithoutPUCCH:* new text “or” should be “and” in the ‘except’ part. |
| Samsung | No | Broadcast is only best effort basis. Presently only configured and activated SCell is considered for broadcast reception. We think no new change is needed to redefine configuration for deactivation and dormant BWP. It is up to NW implementation to freely configure as required. |

[10] further proposes to clarify which cell is used for the DRX control when the UE is receiving MBS broadcast on an SCell, i.e. either SpCell or SCell.

**Question 8: Which cell should be used for DRX control by the UE for the MBS broadcast service received on an SCell:**

1. **SCell where the MBS broadcast service is provided**
2. **SpCell of the UE**

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| --- | --- | --- |
| **Company** | **a/b** | **Comments** |
| Qualcomm | a |  |
| Samsung | None | In CA, inter-subframe synchronization is assumed. |

## MCCH and MTCH reception

In [13] and [14], it is proposed to move the principles of mapping between MTCH PDCCH occasions and SSBs from TS 38.331 to TS 38.321.

**Question 9: Do you think the principles of mapping between MTCH PDCCH occasions and SSBs should be moved from TS 38.331 to TS 38.321?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes, see comments | We are ok to move the mapping from 38.331 to 38.321.  In RRC CR: The suggested text is incomplete. ms10 corresponds to cycle 10ms, but what about the offset (0..9)? The field description needs to clearly state what *cycle* and *offset* are from this jointly encoded field/IE. Also, better to add sub-clause in reference to 36.321.  Related to the changes: we believe it is beneficial to have MTCH monitoring window duration (within each cycle) as well. Current signalling only allows to configure cycle and offset, but it is unclear what the duration of each MTCH monitoring window is. We should have possibility to configure separate/non-overlapping MTCH monitoring window per G-RNTI, each having a window duration (smaller or same as the periodicity). But that is not possible with current signalling. |
| Samsung | No | The current 38.331 text is sufficient and clear. MAC spec does not capture 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 |

In [15], it is proposed to clarify in the specifications that:

1. The network is not allowed to change the contents of MCCH for different MCCH repetitions inside a single MCCH modification period.
2. The change MCCH notifications are sent in each MCCH repetition period throughout the first MCCH modification period where the new contents of MCCH are sent.

This behaviour is depicted in the following figure:



**Question 10: Do companies agree an additional clarification should be captured in TS 38.331 to confirm the intended network behaviour for MCCH modifications?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Ok with intent. See comments | We think the contradiction (discussed by [16]) is real and that should be addressed. However, unlike [16], we support to keep the concept of MCCH modification period.  Having said that, TP in [15] in 5.9.1.3 is incomplete and NOTE is not even needed.  Also not convinced the stopping conditions of acquiring MCCH are needed as shown in TP for 5.9.2.3. |
| Samsung | No | We think it is sufficiently clear that MCCH contents can change only at modification period boundary, and change notification & MCCH can be received in the same slot at each repetition occasion in the modification period. For broadcast reception, latency concern is only that UE should be able to setup service quickly. There is no real latency concern on network to provision and start a new service in between the modification period. Further, all this is consistent with the legacy SC-PTM behaviour. |

In [16] on the other hand it is proposed to completely resign from the MCCH modification period concept to allow for MCCH contents to be changed more dynamically. This means the UE is required to check whether MCCH content changed in every MCCH repetition period and to make it easier for the UE it is further proposed to modify the meaning of the 2-bit bitmap for change notification in a way that toggling of the value indicates there is a modification of MCCH information.

**Question 11: Do companies agree to remove the concept of MCCH modification period and redefine the 2-bit bitmap for change notification in a way that toggling of the value indicates there is a modification of MCCH information.**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | We agree there is contradiction in the current text that needs addressing. But we prefer to keep the concept of MCCH modification period. So, "acquires the new MCCH information starting from the same slot" needs updating. |
| Samsung | No | As commented in Q10. Modification period concept is essential |

In [17], it is proposed to introduce a configurable time offset between the MCCH notification and MCCH control channel in SIB in order to allow the UE to obtain better power savings.

**Question 12: Do companies agree to introduce a configurable time offset between the MCCH notification and MCCH control channel in SIB?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | With the concept of MCCH modification period, UE should know when the next modification boundary is.  There can be issues with such time offset. It seems the time offset is preconfigured. Then, for example, what if the notification is received around the edge of current boundary but the time offset is such that it pushes the next control for UE is pushed to next modification period?  We are not sure if the added complexity brings in enough gain to be justified. |
| Samsung | No | Agree with Qualcomm. We think power saving gain may not be significant with typically large modification period for broadcast services. |

## MRB configuration aspects

In [18], it is claimed that there is no clear use case of mapping multiple MRBs to one broadcast MBS session. Introducing multiple-to-one mapping between MRB and broadcast MBS session requires extra complexities at both the UE and the gNB. It is then proposed to disallow the 1:N mapping between MBS broadcast session and MRBs.

**Question 13: Do companies agree to disallow N:1 mapping between MBS broadcast session and MRBs (i.e. only 1:1 mapping between MBS session and MRB is allowed)?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | This goes against previous RAN2 agreement. It is up NW implementation and configuration how to map. So, there is no strong reason to restrict it. |
| Samsung | No | We prefer stick to earlier RAN2 agreement |

In [19], it is observed that the UE behavior upon modification of a configuration of a broadcast MRB is currently not specified. It is then proposed in [19] to specify that:

1. It is up to UE implementation to determine which MRB of an ongoing broadcast session has been modified.
2. For modification of a broadcast MRB, UE releases the concerned MRB and establishes it according to the new MRB configuration.

**Question 14: Do companies agree to specify the UE behaviour upon modification of a configuration of a broadcast MRB, as per bullets 1-2 above?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| Samsung | No | As in legacy MBMS, RRC determines the modification of configuration (i.e. changed parameter) and applies to lower layers. It is just modification and no release and establish of MRB is needed. |

## L1 parameters related issues

In [21], several modifications are proposed for *SIB20* and *CFR-ConfigMCCH-MTCH*, which would allow saving a few bits for some specific network configurations.

**Question 15: Do companies agree to introduce the changes in SIB20 and CFR-ConfigMCCH-MTCH signalling, as proposed by [21]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | The changes are simple, and it aligns with RAN1 agreements while making signalling more flexible and efficient. |
| Samsung | No strong view | This is a signalling optimization for 1 bit.  Note that RAN1 agreement quoted is about CORESET0 being used as default if CFR for GC-PDCCH/PDSCH is initial BWP and CORESET is not configured. It has no concern with or without the change. |

In [22], it is noted that the maximum number of rate matching patterns the UE needs to support is four at a BWP level and four at a cell level and this number includes rate match patterns for both unicast and MBS. However, if the same rate matching resource is configured in *PDSCH-config* for both unicast and MBS, this resource configuration might be counted as two since they are configured as different entities in unicast BWP and in CFR separately. Similar issue can happen for rate match patterns configured in *ServingCellConfig*/*ServingCellConfigCommon* and the rate matching resources configured in SIB20/MCCH for MBS broadcast. It is then proposed to clarify that:

1. Clarify that the same RateMatchPatternId configured in CFR and associated BWP should include the same resource configuration and it should be counted as one pattern for the evaluation of the total number of configured rate mating patterns at the UE.
2. Clarify that the same RateMatchPatternId configured in ServingCellConfig/ServingCellConfigCommon and SIB20/MCCH should include the same resource configuration and it should be counted as one pattern for the evaluation of the total number of configured rate mating patterns at the UE.

**Question 16: Do companies agree to clarify rate match patterns configuration limitations as per bullets 1-2 above?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes, see comments | Intent is ok, but for the text in the TP, some wording suggestion as follows:  “..same and ~~such rate match patterns~~ they are counted as a single rate match pattern ~~for the evaluation of~~ in the total configured..” |
| Samsung | Yes |  |

In [23], it is indicated that the mandatory UE capability is currently to support only a single CORESET in addition to CORESET0. Hence, the UE receiving MBS broadcast in RRC CONNECTED will have to use *commonControlResourceSetExt* configured in SIB20 for both unicast and MBS broadcast reception. However, it is currently only possible to configure TCI states for the CORESET(s) which are configured in the UE dedicated signalling (i.e. PDCCH-Config). Therefore, it is proposed in [23] to clarify that in case the network configures the control resource set with the same ControlResourceSetId as used for commonControlResourceSetExt via dedicated signalling, the configuration from PDCCH-Config always takes precedence and should not be updated by the UE based on SIB20 (similarly as currently captured for the CORESET configured by SIB1)

**Question 17: Do companies agree to clarify that in case the network configures via dedicated signalling the control resource set with the same ControlResourceSetId as used for commonControlResourceSetExt, the configuration from PDCCH-Config always takes precedence and should not be updated by the UE based on SIB20 (similarly as currently captured for the CORESET configured by SIB1).**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| Samsung | Yes |  |

## Other issues

In [24] some, it is proposed to confirm that maxFreqMBS should equal to 5 and maxNrofMRB-Broadcast should equal to 4. However, it was proposed by the RRC CR rapporteur to agree on the number 16 for maxFreqMBS, to align with the maximum number of carriers the UE may support in Carrier Aggregation. Therefore, the following question is asked.

**Question 18: Do companies agree to confirm that:**

1. ***maxFreqMBS-r17* = 16**
2. ***maxNrofMRB-Broadcast-r17* = 4**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| Samsung | No strong view |  |

In [20] notes it is not entirely clear by reading TS 38.304 what it means that “The cell […] is providing SIB20”. In consequence, it is proposed to clarify this using one of the following options:

1. Modify the word “providing” to “capable to broadcast”
2. Add a NOTE with “The UE considers the cell is providing SIB20 when SIB20 is configured in SIB1, regardless of broadcasting or notBroadcasting”

**Question 19: Do companies agree to clarify in TS38.304 the meaning of “The cell […] is providing SIB20”? If yes, please indicate your preferred option (e.g. as per bullet 1 or 2 above).**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes, but see comments | Prefer #1 and it should be enough to change “providing” to “capable of providing”, i.e., add “capable of”. |
| Samsung | Yes (prefer #2) | Note may be added. We can rather utilize “providing SIB20” consistently instead of different terms of broadcasting/scheduling/not broadcasting used in different places for MBS SIB in spec. |

Finally, companies are requested to indicate in case any other issue from the Tdocs in scope has to be discussed, e.g. it was not handled neither by the rapporteur CR nor by the questions above.

**Question 20: Any other issues?**

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| **Company** | **Issue / reference** | **Comments** |
| Qualcomm | PDCCH for MBS | All the configuration for MBS PDCCH (i.e. field pdcch-ConfigMulticast-r17) is OPTIONAL.  The field searchSpacesToAddModListExt2-r17 is OPTIONAL, both in PDCCH-Config, and in PDCCH-ConfigCommon.  Within that, dci-Format4-0, 4-1, 4-2, all are OPTIONAL.  However, if SearchSpaceExt2 is not configured, group-common PDCCH with DCI format 4\_0/1/2 are not supported. RAN2 should clarify the interpretation of ‘OPTIONAL’ and what is the default mode if not configured. |
|  |  |  |

# Conclusion

TBD

# References

1. R2-2204604 [RIL-O400]-MII reporting after Handover OPPO discussion Rel-17 NR\_MBS-Core
2. R2-2204605 [RIL-O400]-38331CR-MII reporting after handover OPPO CR Rel-17 38.331 17.0.0 2978 - F NR\_MBS-Core
3. R2-2205112 Frequency of interest in MBS Interest Indication Kyocera discussion Rel-17 R2-2202909
4. R2-2205462 [O406], [H006] MII Reporting Samsung R&D Institute India discussion Rel-17 38.331
5. R2-2205747 MBS Interested Indication Ericsson discussion Rel-17 NR\_MBS-Core
6. R2-2206091 [H006]Discussion on MII for MBS broadcast reception on SCell Huawei, HiSilicon discussion Rel-17 NR\_MBS-Core
7. R2-2206108 Discussion on MBS Interest Indication TCL Communication Ltd. discussion
8. R2-2204608 [RIL-O406] Discussion on broadcast reception over Scell OPPO discussion Rel-17 NR\_MBS-Core Revised
9. R2-2204682 [C009][C010] On broadcast reception on SCell CATT discussion Rel-17 38.331 NR\_MBS-Core
10. R2-2205174 Discussion on broadcast reception over SCell OPPO Beijing discussion Rel-17 NR\_MBS-Core R2-2204608
11. R2-2205215 RIL406: Configuration restriction for broadcast reception on SCell OPPO Beijing CR Rel-17 38.331 17.0.0 3056 - F NR\_MBS-Core
12. R2-2205671 Broadcast MBS reception on SCell (RIL A021) Apple discussion Rel-17 NR\_MBS-Core
13. R2-2204607 [RIL-O404]-38331CR-MTCH reception in beam sweeping OPPO CR Rel-17 38.331 17.0.0 2979 - F NR\_MBS-Core
14. R2-2204606 [RIL-O404]-38321CR-MTCH reception in beam sweeping OPPO CR Rel-17 38.321 17.0.0 1224 - F NR\_MBS-Core
15. R2-2204829 [V530]-[V532] Correction on MCCH Acquisition vivo discussion Rel-17 NR\_MBS-Core
16. R2-2205539 [I201] MCCH modification period and notification Intel Corporation discussion Rel-17 NR\_MBS-Core
17. R2-2205744 Broadcast session start and MCCH Ericsson discussion Rel-17 NR\_MBS-Core
18. R2-2205458 RIL(X305) Discussion on the number of MRBs mapped to a MBS session Xiaomi Communications discussion Rel-17 NR\_MBS-Core
19. R2-2204681 [C003] Discussion on UE behavior for Broadcast MRB Modification CATT, CBN discussion Rel-17 38.331 NR\_MBS-Core
20. R2-2205111 Clarification of “providing SIB20” in TS38.304 Kyocera discussion Rel-17
21. R2-2206159 SIB20 signalling issues including optionality for cfr-ConfigMCCH-MTCH-r17 Qualcomm Incorporated discussion Rel-17 NR\_MBS-Core
22. R2-2206121 Discussion on rate matching resources for unicast and MBS (RIL: H093) Huawei, HiSilicon discussion Rel-17 NR\_MBS-Core
23. R2-2206122 Discussion on configuration of additional common CORESET for MBS broadcast in RRC Connected mode (RIL: H009) Huawei, HiSilicon discussion Rel-17 NR\_MBS-Core
24. R2-2205712 Discussion on MRB Configuration Samsung discussion Rel-17 NR\_MBS-Core
25. R2-2205938 MBS corrections for TS 38.331 Huawei, HiSilicon