3GPP TSG-RAN WG2 Meeting#121bis-e R2-23xxxxx

Electronic Meeting, 17 – 26 April, 2023

**Agenda Item: 7.11. 2.2**

**Source: Apple**

**Title: Report of** **[AT121bis-e][604][eMBS] UP issues for Multicast in RRC Inactive (Apple)**

**Document for: Discussion and Decision**

# Introduction

This document captures the outcome of the following email discussion:

* [AT121bis-e][604][eMBS] UP issues for Multicast in RRC Inactive (Apple)

      Scope: Treat the remaining proposals from R2-2303420, revisit the Working Agreement from the online session to understand what the issue is and whether it can be turned into agreement

      Outcome: List of proposals for offline agreement and, if needed, a list of proposals for online discussion in W2

      Deadline: Report available Tuesday W2 1200 UTC, interim deadlines up to the rapporteur

Please provide your comments before next Monday (04/24/2023) 10:00 UTC.

Final proposals are to be sent out on reflector around 11:00 UTC of Monday W2, if no objection is found in the next 24hours (before the report availability deadline) the proposal can be declared agreed.

# Contact Points

Rapporteur encourages the participating delegates to provide their contact information in this table.

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| --- | --- | --- |
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# Discussion

## Remaining proposals

#### **[1. SPS]**

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| Observation: R17 multicast SPS in CONNECTED state cannot be directly used for multicast SPS in RRC\_INACTIVE state. Proposal 6.1 (for discussion, 10/16): RAN2 to first discuss how multicast SPS work in RRC\_INACTIVE, before deciding whether to support it. Proposal 7.1 (for discussion): Discuss whether the SPS activation is via MCCH or via L1 activation/deactivation command without HARQ feedback. Proposal 7.2 (for discussion): For the SPS activation via L1 command without HARQ feedback, it should be further checked with RAN1.  |

On whether to support multicast SPS in INACTIVE, RAN2 company’s views are diverse. Based on current situation, moderator’s understanding is that it's impossible to reach consensus on RAN2 assumption whether to support it or not, and companies can further discuss the how it can work in next meeting. Meanwhile, since supporting multicast SPS in INACTIVE has RAN1 impact, we can check with RAN1 on the feasibility to support it.

##### **Question 1: Do you agree to check with RAN1 on the feasibility to support the multicast SPS in INACTIVE?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| MediaTek | OK to ask RAN1 | Supporting SPS is not a simple “yes or no”question. The point is how does UE provide feedback when receiving the activation notification if there is no HARQ feedback in INACTIVE state. Consider its’ complexity, we can ask RAN1’s view. |
| CATT | Yes | Suspend the discussion in RAN2 until RAN1 contirm it is feasible |
| ZTE | Yes | Same view with MTK and CATT.Also we can check the wording in the LS later. |
| LGE | Yes | The following assumption needs to be informed to RAN1. We assume that multicast SPS in RRC\_INACTIVE can be supported at least in similar manner with multicapst SPS in RRC\_CONNECTED configured with HARQ feedabck disabled. |
| Qualcomm | No | Agree with MediaTek views above. It is not easy to support SPS in RRC\_INACTIVE. It is clear that at least for the SPS deactivation/release case, there needs to be A/N. And we already agreed in RRC\_INACTIVE, HARQ feedback is disabled. Multicast SPS without A/N feedback is not same as legacy multicast SPS anymore. For a multicast SPS release, r17 supports unicast release and multicast release. The multicast UEs in CONN can get unicast release, which is not possible for multicast INACTIVE UEs. So, it is more likely for multicast INACTIVE not receiving release command and keeps monitoring PDSCH occasions. It's also not realistic that gNB keep sending multicast release without knowing whether all UEs received the release or not. RAN1 has no TU to study the potential impact of this new SPS.  So, to us, it is clear this cannot be supported, and fail to see why even bother to ask RAN1. |
| Nokia | No | We think that supporting multicast SPS in INACTIVE does not require RAN1 changes, UE just cannot acknowledge the activation/deactivation. Therefore, we assume L1 activation/deactivation with repetitions if needed, but that is supported already.  |
| Huawei, HiSilicon | No | This is a decision we can make in RAN2. SPS shouldn’t be supported due to the following issues:1. How to make sure the UEs receive the L1 Activation/deactivation indications. The repetition way doesn’t work, as the SPS occasion is related to the timing of receiving L1 indication. If using repetition, different UE will may receive the L1 indication at different times and interprets different SPS occasions.
2. How does a UE moving to this cell receive a L1 indication sent already to the other UEs previously? This is within RAN2 scope.
3. What happens if NW uses unicast way for the CONNECTED UEs? (as indicated by QC.)
 |
| Sharp | No | According to current discussion, it obvious that RAN1 should be involved if SPS is supported, but RAN1 has no TU on this WI. |
| NEC | No | More issues need to be conisdered to support SPS for multicast reception in RRC\_INACTIVE, e.g., whether G-CS-RNTI is used? Whether SPS is working without HARQ?We prefer not to support this feature then there is no need to ask RAN1. |
| Lenovo | No | We think RAN2 can make the decision firstly.1. On one side, it is beneficial the SPS PDSCH resources can be shared for both UEs in RRC\_CONNECTD and RRC\_INACTIVE state. It is also beneficial for UE power saving.
2. On the other side, we tend to agree that UE may miss the SPS activation/deactivation indication e.g. due to mobility.

We would prefer RAN2 to investigate it for one more meeting to discuss the detailed impact analysis.  |
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#### **[2. DRX]**

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| Proposal 8.1 (for agreement, 14/17): For the DRX operation for multicast in RRC\_INACTIVE, take the multicast DRX but disable HARQ RTT and DRX Retransmission as baseline.  |

##### **Question 2: Do you agree with proposal 8.1?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| MediaTek | Yes |  |
| CATT | Yes | Multicast DRX operation should be taken as baseline. |
| ZTE | Yes |  |
| LGE | Yes |  |
| Qualcomm | Yes |  |
| Nokia | No | This would render UEs in INACTIVE state unable to receive HARQ retransmissions that have been requested by UEs in CONNECTED mode.Such retransmissions would be clearly beneficial for the UE in RRC\_INACTIVE state and in our view this does not require a new complicated functionality. |
| Huawei, HiSilicon | See comments | Share similar concern with Nokia.Suggest to reword as:For the DRX operation for multicast in RRC\_INACTIVE, take the multicast DRX as baseline with unicast DRX related aspects removed. |
| Sharp | Yes |  |
| NEC | Yes | Reusing Multicast DRX framework is OK for us. But the details e.g., the handling of specific timer can be FFS |
| Lenovo | See comments. | HARQ retransmission by PTM may be beneficial for RRC\_INACTIVE UE.For the DRX operation for multicast in RRC\_INACTIVE, take the multicast DRX but disable unicast related HARQ RTT and DRX Retransmission as baseline. FFS handling on PTM related HARQ RTT and DRX Retransmission. |
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#### **[3. LCID and RNTI]**

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| Proposal 9 (for agreement, 17/17): The common LCID space is used for multicast MRB and unicast DRB regardless of UE RRC state (i.e. no change on the LCID table for MTCH). Proposal 10 (for agreement, 15/17): Introduce a new LCID in Table 6.2.1-1 for multicast MCCH. Proposal 11.1 (for agreement, 16/17): Introduce new RNTI in Table 7.1-1 for multicast MCCH. |

##### **Question 3a: Do you agree with proposal 9, proposal 10, and proposal 11.1?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| MediaTek | No | Proposal 10 and proposal 11 are highly related to the open issue in proposal 11.2, so we suggest to discuss them together. |
| CATT | Yes | These proposal should be strightforward. |
| LGE | Yes for P9/P11.1No for P10 | For identifying a logical channel for multicast MCCH, we think new RNTI for multicast MCCH is introducde according to P11.1. The MCCH logical channel can be identified by the new RNTI. There is no need to introudcue new LCID for MCCH. |
| Qualcomm | Ok for P9. No for P10 & 11.1 | Same comment as MTK. Also see next question. |
| Nokia | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Sharp | Yes |  |
| NEC | Yes |  |
| Lenovo | Yes | Since RAN2 tend to use DCI 4.0 for MCCH, a new RNTI is needed to distinguish the broadcast MCCH defined in Rrl-17. |
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| Proposal 11.2 (for discussion): Following open issues on new RNTI for multicast MCCH need further discussion:- Open issue 1: whether the RNTI is per cell or per multicast session; - Open issue 2: whether the RNTI is fix value or configurable. - Open issue 3: whether to consider reusing legacy RNTI(e.g., G-RNTI). |

On open issue 2, majority view is to make the RNTI as fix value.

On open issue 3, majority view is not to rely on legacy G-RNTI.

Moderator would like to check company’s view and try to make some progress on Open issue 2 and 3 in this meeting.

##### **Question 3b: Do you agree the following proposals on the MCCH RNTI?**

* **Proposal a: The RNTI for MCCH schedule is defined as a fix value in spec.**
* **Proposal b: We do not consider reusing legacy RNTI for MCCH scheduling.**

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| Company | Yes or No | Comments |
| MediaTek | No | These three open issue are related. While reusing broadcast way may be feasible, we believe that there are more effective solution for multicast, i.e., configuring multicast MCCH per session, and using G-RNTI for different sessions. (LCID can be used to differentiate MCCH and MTCH)Several benefits can be realized:1. Security. G-RNTI can only be provided by dedicated signling in the initial config, so that unauthorized UE will not be able to obtain the MCCH content even if it can read the new SIB.
2. Power saving. UE will not be notified by other multicast session configuration change, and thus reduce the unnecessary MCCH monitoring.
3. RNTI monitoring. UE only need to monitor G-RNTI in RRC INACTIVE state.

In our understanding, multicast is expected to be exclusive and not public to every UE. If one single MCCH-RNTI is used, then there will be no other way to ensure that UE should join in first (as agreed earlier). UE can obtain the PTM configuration anyway by SIB-MCCH. |
| CATT | Yes | On Proposal a:No strong motivation/benifit to use a configurable MCCH RNTI, we suggest just follow the similar way as broadcast MCCH, i.e., a fixed value.On Proposal b:Using G-RNTI for MCCH scheduing means per-session MCCH in a cell, which is overkill. |
| ZTE | Yes |  |
| LGE | Yes |  |
| Qualcomm | No | Agree with MediaTek’s explanation. We need mechanism to make sure that UEs which has not joined a session are not allowed to receive it before joining. So, for these issues, we think Rel-17 multicast G-RNTI can be reused. This is consistent with the earlier agreement that it should be possible to use same PDSCH/PDCCH between CONN and INACTIVE for multicast delivery. |
| Nokia | Proposal a – No strong viewProposal b - Yes | Using legacy RNTI is not feasible. If MCCH-RNTI of broadcast is referred to, since RAN2 agreed to define a new MCCH different than broadcast, it is not feasible to have the same MCCH-RNTI to also schedule multicast MCCH. If G-RNTI is referred to, still it is not clear how this could work and the need for changing the broadcast functionality is not clear. Note that broadcast MCCH operation is having a majority support among the RAN2 group. |
| Huawei, HiSilicon | Proposal a – Maybe no Proposal b - Yes | On Proposal a:We see some benefit of making the RNTI configurable, i.e., if multicast in INACTIVE is not provided, the RNTI can be used for other cases.On Proposal b:Same view with CATT and Nokia. |
| Sharp | Yes |  |
| NEC | Yes |   |
| Lenovo | Yes | On Proposal a:We assume single RNTI should be applicable to all multicast sessions. In this case, a fix RNTI is preferred for simplicity.On Proposal b:Same view with Nokia. |
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#### **[4. L2 operation during RRC state transition]**

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| Proposal 12 (for agreement, 13/17): When entering RRC\_INACTIVE state, UE does not suspend multicast MRB(s) configured for the multicast reception in RRC\_INACTIVE. Proposal 13 (for agreement, 13/17): When entering RRC\_INACTIVE state, UE doesnot stop the MAC DRX timers (i.e. drx-onDurationTimerPTM or drx-InactivityTimerPTM) configured for the multicast reception in RRC\_INACTIVE.Proposal 14 (for discussion, 12/17): RAN2 to discuss whether to support the HARQ continuation for MBS multicast reception (i.e. not flushing the soft buffer used for MBS multicast) during the RRC state transition. |

During post meeting discussion, company's comments may related to the different understandings on the PTM configuration design and content in RRCRelease message. For example, if network doesnot provide the PTM configuration based on multicast configuration in CONNECTED state, but provides the full set of the PTM configuration for multicast INACTIVE reception (i.e. totally different from the config in CONNECTED), the HARQ continuation and service continuity cannot be supported. But how to design the PTM configuration is still FFS and up to CP discussion.

Therefore, in UP discussion, since the motivation is to support L2 service continuity during RRC state transition, we can assume that PTM configuration design is possible to support the service continuity.

Moderator suggests companies provide your view based on the PTM configuration design which can support the service continuity.

##### **Question 4: Do you agree with proposal 12, proposal 13, and proposal 14?**

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| Company | Yes or No | Comments |
| MediaTek | Comment | Regarding proposal 12 and 13, there may be instances where the network desires the UE to sleep when there is temporally no data. In such cases UE should follow the legacy INACTIVE behavior. We propose to add a condition to checks whether the RRCRelease message (with suspend configuration) includes the PTM configuration. If the PTM configuration is included, the UE should not suspend multicast MRBs. |
| CATT | Comments | Agree with P13.P12,P14 can be FFS for the moment |
| ZTE | Comments | Our concern is similar to previous comments to the post email discussion. for P12- "**Other dedicated RRC messages will not be used to provide PTM configuration for MBS multicast for INACTIVE**." if we do not suspend, it is against to previous agreement.- if above can be clarified, e.g., above previous agreement does not apply to an active and ongoing multicast session, we may be able to have above agreement.discussion on P13/14 can wait for P12. |
| LGE | Yes and comment | When PDCCH/PDSCH can be shared, PTM configuraiton for RRC\_INACTIVE should be same with that for RRC\_CONNECTED. Therefore, at least for that case, P12/P13/P14 are supported.When PDCCH/PDSCH is not shared, it may need to be further discussed. However, even in that case, we think that it seems better for service coninuity that PTM configuraion related to L2 operations is same. |
| Qualcomm | Ok for P12, P13Comment for P14 | P14 is about “RAN2 to discuss”. We prefer to leave it to UE implementation, without specifically disallowing or requiring the flushing of the soft buffer. |
| Nokia | Yes |  |
| Huawei, HiSilicon | Comments | Suggest to postpone the discussion for now as this is not urgent, until the signaling design for multicast in RRC\_INACTIVE is clearer. Otherwise, there may be some further issues to address if the conclusion here cannot (or is hard to) be supported by signaling design. |
| Sharp | See comments | Yes for P14, but P12 and P13, we should take the state of the multicast session into consideration, .i.e., not suspend of MRB and keeping running of the DRX timer only for the multicast session configured to be received in RRC-INACTIVE and in activated state. |
| NEC | Comments | Share same view with HW. |
| Lenovo | Yes |  |
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#### **[5. L2 operation during mobility]**

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| Proposal 15.1 (for agreement, 12/17): UE does not need to re-establish PDCP entity (i.e. re-initiate the PDCP variables) of the multicast MRB if PDCP COUNT can be sync between source and target cell during INACTIVE mobility. Proposal 15.2 (for discussion): If PDCP count is sync between source and target cells, following open issues on PDCP handling during INACTIVE mobility need further discussion:* Open issue 1: How does UE know PDCP count is sync between cells?
* Open issue 2: Whether to standardize the UE PDCP operation during INACTIVE mobility?

Proposal 16.1 (for discussion): If PDCP count is not sync between source and target cells, following open issues on PDCP operation during INACTIVE mobility needs to be considered:* Open issue 1: What’s the UE operation if PDCP count is not sync between cells?
* Open issue 2: How does UE know PDCP count is not sync between cells?
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Company’s views are diverse, also it may be impacted by the CP discussion on the PTM configuration across cells. So moderator suggests to postpone the discussion to next meeting.

##### **Question 5: Do you agree to postpone the discussion on L2 operation during mobility?**

* **Proposal a: Postpone the discussion on L2 operation during mobility to next meeting.**

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| Company | Yes or No | Comments |
| MediaTek | Yes | Ok to postpone |
| CATT | Yes | OK to discuss it next meeting.  |
| ZTE | Yes | Let s go F2F. |
| LGE | Yes | Further discussion is needed about open issues mentioned in P15.2 and P16.1. |
| Qualcomm | Ok to postpone |  |
| Nokia | May be yes. | For Proposal 15.2Issue 1: UE should be provided with this information, otherwise, the UE is not aware. This can be done, e.g., via an explicit or implicit indication. Other opportunity is to indicate LCID mapping of source cell to the target cell, so that the UE can map the MRBs of the source to the target.Issue 2: If UE is supposed to receive data in INACTIVE, then PDCP behaviour has to be specified (similar to MBS broadcast reception in Rel17)For Proposal 16.1Issue 1: MBS broadcast operation is one option.Issue 2: Please see the answer above for 15.2 issue 1. |
| Huawei, HiSilicon | Comments | This seems not related to discussion of PTM configuration across cells. This is the handling of UE PDCP window handling during mobility, which doesn’t depend on whether PTM configuration is same or not but on whether PDCP COUNT is synchronized. From our perspective, Proposal 15.1 should be straightforward. If PDCP COUNT is synchronized, why would the UE re-establish the PDCP entity?Regarding the concern about how UE knows about the synchronized status, we think each cell can just indicate to the UE whether the cell is synchronized. If the UE receive indication in both source and target, it means they are synchronized. There is no need to explicitly indicate which cell and which cell are synchronized. The principle is similar to Rel-17: if the cell is synchronized, then based on implementation the QoS Flow to MRB mapping should be aligned across cells based on NW implementation. |
| Sharp | Yes |  |
| NEC | Yes | We can revisit it based on some agreements on the mobility of multicast reception in RRC\_INACTIVE. |
| Lenovo | See Comments. | We tend to agree with Huawei.At least P15.1 should be agreeable. The PDCP entity re-establishment is not necessary. And the network has been known whether PDCP count are sync-ed following Rel-17 procedure. |
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#### **[6. Others]**

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| Proposal 17.1 (for discussion): Check with RAN1 with the following two issues:* Issue 1: Whether PDSCH aggregation is supported (HARQ related)?
* Issue 2: Whether separate CSS for R18 multicast MCCH/MTCH is supported (CFR configuration related)?

Proposal 17.2 (for discussion): Clarify that the R18 INACTIVE multicast reception scheme is only applicable for the UE in RRC\_INACTIVE state.  |

The two proposals may be acceptable to majority, so moderator would like to check company’s views and try to make some progress.

##### **Question 6a: Do you agree with proposal 17.1 and include the two issues in LS to RAN1?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| MediaTek | Yes |  |
| CATT | See comment | We can assume PDSCH aggregatiopn is supported(as in R17 multicast) and reuse the CSS for R17 multicast MCCH/MTCH,and then cofirm with RAN1. |
| ZTE | OK |  |
| LGE | Yes |  |
| Qualcomm | See comment | Similar to CATT, RAN2 can agree RAN2 understandings and ask for confirmation with RAN1 if needed.Issue 1: PDSCH aggregation is not limited to “HARQ related”, so please remove “(HARQ related)”. RAN2 can assume that PDSCH aggregation is supported (as that is supported in Rel17 multicast in CONN as well as broadcast MTCH). Issue 2: It is related to DCI formats. But the issue is not clear: separate from what? R17 multicast uses Type3-CSS, different from Type0B-CSS of r17 broadcast MCCH/MTCH. So, we can agree on RAN2 understanding to reuse at least type-3 CSS for multicast MTCH (same as multicast in CONN) and ask whether a different CSS is needed for R18 multicast MCCH/MTCH. |
| Nokia | Yes  |  |
| Huawei, HiSilicon | Yes with comment | Agree with CATT.Separate CSS(es) for MCCH and MTCH are supported in Rel-17. We see no issue to follow this in Rel-18. Also this is not quite related to CFR configuration. |
| NEC | Yes |  |
| Lenovo | Yes |  |
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##### **Question 6b: Do you agree with proposal 17.2?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| MediaTek | Comment | It may need more discussion and clarification. The question is how to limit UE’s behavior to avoid them from receiving multicast by INACTIVE scheme. And does it mean different resources are used for multicast in RRC CONNECTED and INACTIVE state? |
| CATT | See comment | It can be discussed later on whether to allow R18 connected UE to read multicast MCCH. |
| ZTE | OK to discuss |  |
| LGE | Yes |  |
| Qualcomm | Yes but see comment | We believe this proposal is related to our earlier comment: Is Rel-18 MBS UE in CONNECTED expected to receive and use multicast MCCH?And our view is it should not be needed/expected as otherwise it might be NBC to rel17 UEs in the same cell.So, we propose to update the proposal to be more specific to multicast MCCH reception in CONNECTED mode. |
| Nokia  | Comment | This is a Stage 2 decision, it should not be discussed in UP email discussion. |
| Huawei, HiSilicon | Yes | We see no benefit but just potential confusions if UEs in RRC\_CONNECTED receives multicast by using mechanism designed for RRC\_INACTIVE.  |
| Sharp | Yes |  |
| NEC | Comment | It is a little confusing, the suggestion wording is shown below:Proposal 17.2 (for discussion): Clarify that the R18 INACTIVE multicast reception scheme (e.g., Multicast MCCH) is only applicable for the UE in RRC\_INACTIVE state. |
| Lenovo | No | Since MCCH is anyway used for UEs in RRC\_INACTIVE state, it would be better to allow the UE to monitor MCCH for PTM configuration update in RRC\_CONNECTED state to save signalling overhead. |
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## Working agreement revisit

Following agreements were made during the online discussion on multicast CFR in INACTIVE.

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| * **Case B and case D are not supported for multicast CFR in RRC\_INACTIVE;**
* **Whether multicast CFR in RRC\_CONNECTED and in RRC\_INACTIVE are different is up to NW implementation. FFS whether this causes some issues which need to be addressed.**
* **Working Agreement: The same CFR is used for multicast MCCH and MTCH.**
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About the 3rd bullet, the working agreement instead of agreement was made due to one company’s concern on the potential RedCap enhancement. For proress, moderator would like to clarify that the agreement can be revisited if Redcap UE is supported and any issue is found.

#### **Question 7: Do you agree to change the working agreement to the agreement below?**

**Agreement: The same CFR is used for multicast MCCH and MTCH. It can be revisited if Redcap UE is supported and there is any issue found.**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| MediaTek | Yes |  |
| CATT | Yes |  |
| ZTE | Yes |  |
| LGE | Yes |  |
| Qualcomm | No | We are obviously ok with the first sentence as that is the current WA.The second part of the proposed agreement seems to suggest ‘RedCap UEs is supported’ is still FFS. We do not agree that support of RedCap UEs is FFS. RedCap UEs shall be supported.What is not discussed yet is any **RedCap specific enhancements** for multicast in INACTIVE. So, we suggest changing it to the following:**The same CFR is used for multicast MCCH and MTCH. It can be revisited if ~~Redcap UE is supported and~~ there is any issue found, e.g. for RedCap UEs supporting MBS.** |
| Nokia | Yes (comment) | RedCap enhancements are discussed only under “broadcast”. We do not need to do any work for them in “multicast.  |
| CBN | Yes |  |
| Huawei, HiSilicon | Yes with comment | As Redcap related issue is under discussion in TEI-R18, we prefer to discuss it there if there is any issue to avoid any potential conflicts.  |
| Sharp | Yes |  |
| NEC | Yes with comment | We slightly prefer to only capture “The same CFR is used for multicast MCCH and MTCH” for the current stage.If some agreements related RedCap is achieved, we anyway can enhance the CFR mechanism. |
| Lenovo | Yes |  |
|  |  |  |

# Conclusion

Based on the above discussion, wepropose that: