3GPP TSG-RAN WG2 Meeting #117-e ***R2-220wxyz***

Electronic Meeting, Feb 21– March 3, 2022

**Agenda item: 8.1.4**

**Source: MediaTek**

**Title: [AT117-e][044][MBS] UE capabilities (MediaTek)**

**Document for:**  **Discussion**

# 1. Introduction

This paper is to trigger the following email discussion of UE capabilities in MBS:

* [AT117-e][044][MBS] UE capabilities (MediaTek)

 Scope: Ph1 Collect comments on the initial CRs in [R2-2202786](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2202786.zip), [R2-2202787](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2202787.zip), as a basis for further updates. Treat [R2-2202269](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2202269.zip), [R2-2202671](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2202671.zip), [R2-2203118](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2203118.zip), [R2-2203120](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2203120.zip). Avoid overlap with the other issues discussions. Determine agreeable parts, discussion points etc.

 Intended outcome: Report

 Deadline: W1 Thursday, for online CB W1 Friday.

## 1.1 Contacts

Contact person for each participating company:

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| --- | --- | --- |
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# 2. Discussion

## 2.1 Capabilities for HARQ process number of MCCH/MTCH

As discussion in [3], a discussion may be needed to determine whether dedicated broadcast HARQ processes are used for MCCH and MTCH. According to the status of RAN1 discussion on the issue, the network may have no need to manage any specific HARQ process for broadcast transmission.Accordingly, there seems to be no need to define any UE capability for this.

#### Question 1: Do companies agree that no capability is defined for the number of HARQ procress for MBS Broadcast reception?

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| --- | --- | --- |
| **Company** | **Answer (Yes/No)** | **Comments** |
| OPPO | Yes  |  |
| Qualcomm | Yes |  |
| CATT | yes | Agreed with the rapporteur’s summary. As per the current RAN1 discussion on this issue, no UE capability is needed for dedicated HARQ of broadcast reception. |
| Nokia | Yes |  |
| vivo | Yes | RAN1 has already concluded no additional HARQ processes are required in the RAN1#107bis-e meeting (2022, Jan). Therefore, no new capability is required as no new UE requirement is needed.* Conclusion:

Additional HARQ process(es) is(are) not introduced for Rel-17 MBS broadcast reception on serving cell.* + Note: The UE is not expected to support hardware for more HARQ processes for receiving broadcast in Rel-17 in addition to the maximum number of HARQ processes supported for receiving unicast in Rel-16, i.e. the HARQ process resources are shared between broadcast, unicast and multicast
 |
| Apple | Yes |  |
| Samsung | Yes | Aligned with RAN1 conclusion |
| MediaTek | Yes |  |
| Ericsson | Yes |  |
| LGE | Yes |  |
| Intel | Yes |  |
| Futurewei | Yes |  |
| Sharp | Yes |  |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes |  |
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**Summary:** all companies agree that no capability is defined for the number of HARQ procress for MBS Broadcast reception. Therefore it is proposed:

**Proposal 1: No capability is defined for the number of HARQ procress for MBS Broadcast reception.**

## 2.2 UE capability for maximum MRB number

In the last RAN2 meeting, the following agreements were reached for MRB number.

* [026] Reuse the current defined max RB (i.e. 16 RB per UE). Additional note shall be added to TS 38.306 to clarify the max RB is a total number for MRBs and DRBs, and the total number of RBs for split-MRB is considered as two.
* [026] An optional UE capability of *maxMRB-Add* for additional MRBs support is adopted for multicast.

In reference document [4], the default number of MRBs is discussed. We need to further discuss about maximum number of Multicast MRBs may be supported as part of total 16 (MRBs + DRBs). Different UE implementations may support different number of Multicast MRBs. For a UE supporting larger number of MRBs, the maximum number of DRBs that can be supported by the UE will be reduced (as the sum is 16). However this may be conditionally mandatory without capability signalling for Multicast MBS-capable UEs.

As proposed in [4], for UE supporting more than 4 MRBs within the current 16 RB limit, actual number of supported MRBs can be indicated by a new optional capability.

Regarding the previous agreement on *maxMRB-Add,* a clarficaiton may be needed to clarify the 16 RB limit can be broken and what is the maximum if the answer is yes. We may assume another 16 RBs for this addition.

#### Question 2a: Do companies agree that the default number of MRBs supported is 4 (within the current MRBs + DRBs = 16 limit), which is conditionally mandatory without capability signalling for Multicast MBS-capable UEs?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| OPPO | Yes with comments | We are not sure whether the type of MRB (i.e. only PTM leg, only PTP leg, both) will impact the total number of MRB and DRB? |
| Qualcomm | Yes | 4 MRBs correspond to each of PTM and PTP corresponds to One leg.Ex : Two MRBs each with PTM + PTP corresponds to 4 count. |
| CATT | No | We prefer not to define a separate UE capability for default number of MRBs supported by UE, and just follow the current definition about the max number of RBs that UE can support, i.e., the total number of MRBs+DRBs supported by UE is up to 16.  |
| Nokia | Yes | 4 MRBs should be sufficient – one can combine multiple session into one MRB even. |
| vivo | No  | From UE point of view, the function and handling methods of MRB and DRB are quite similar. So, as long as MRBs + DRBs <= 16 limit, nothing would be broken at the UE side. We fail to see the motivation of using the default value 4 as the number of MRB supporting.  |
| Apple | Comments | We are fine with 16 limit for MRB+DRB, but we don't know why the default number of MRB is 4. If the default number is need, we prefer the number is 1.  |
| Samsung | No | We think there is no need to define a separate UE capability for default number of MRBs supported. Max RB (MRBs+DRBs) = 16 is sufficient and no further limitation is needed. |
| MediaTek | No | Agree with CATT and no separate limitation is need for MRB. The current limitation MRBs + DRBs = 16 can be reused. |
| Ericsson | No | This limit is not needed. Agree w Samsung |
| LGE | No | Given the max 16 RB limitation and the assumption that the required UE capability for a DRB would not be much different from that for a MRB, if is sufficient for network to take the max 16 limitation into account for its MRB+DRB configuration, and there is no need to introduce an assumption on the minimum number of MRBs supported by UE. So, the minimum capability is not needed. |
| Intel | No | We think the limit of Max RB (MRBs+DRBs) = 16 is sufficient, and there is no need to define default number of 4 MRBs. |
| Futurewei | No | Current overall limit is good enough. No additional limit is needed. |
| Sharp | No | The limit of MRB+ DRB is sufficient. |
| Xiaomi | No | We think that the limitation of MRBs + DRBs = 16 can be used, and if companies want to have a default number of MRBs, we agree with Apple that 1 MRB should be considered.  |
| Huawei, HiSilicon | No | We agree with Samsung. We should just clarify this number is for multicast MRBs + DRBs. |
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**Summary:** according to the reply, a clear majority of the companies (10/14) did not see the need to define a separate UE capability for the default number of MRBs supported. Therefore it is proposed:

**Proposal 2: No capability is defined for the default number of MRBs supported.**

#### Question 2b: Do companies agree that the UE takes a new optional capability to report its supported MRB number if the UE supports more than 4 MRBs within the current 16 RB limit?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| OPPO | Yes  |  |
| Qualcomm | Yes | This is very much needed to enable different UE implementations to implement different number of MRBs and to convey how many minimum DRBs are supported by UE. |
| CATT | No | Same view as Q2a. Since we do not support to define the default number of MRBs by UE as a new capability, this additional indication is also not needed. |
| Nokia | Yes |  |
| vivo | No | The supported MRB number can be 16 as long as MRB + DRB <= 16 limit. |
| Apple | Comment | UE can report the supported MRB number in total (within the 16 RB limit) to NW. |
| Samsung | No | No need to define a separate UE capability for default number of MRBs supported |
| MediaTek | No | In the last meeting’s agreement, the current max RB number is reused (i.e. 16 RB per UE). For a UE supporting number of MRBs from 4 to 16, there is no need to introduce a new option capability. The maximum number of Multicast MRBs can be supported as part of total 16, and the maximum number of DRBs will be reduced. |
| Ericsson | No | Not needed, see Q2a |
| LGE | No | See the answer for Q2a |
| Intel | No | As reply in Q2a. |
| Futurewei | No |  |
| Sharp | No |  |
| Xiaomi | Comment | We agree with Apple. |
| Huawei, HiSilicon | No | We think the signalling is only needed to indicate additional MRBs that are on top of 16 RBs mandatorily supported by the UE. |
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**Summary: this discussion is related to Q2a,** according to the reply, almost the same companies who replied no see no need to define an optional UE capability to report its supported MRB number if the UE supports more than 4 MRBs within the current 16 RB limit, since the concept of default MRB number is not preferred according to the reply for Q2a. No proposal is made for this discussion.

#### Question 2c: Do companies agree that previously agreed capability maxMRB-Add indicates additional number of MRBs supported by the UE beyond the current limit of MRBs + DRBs = 16 and the maximum value for the additional MRBs can be 16?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| OPPO | Not sure  |  |
| Qualcomm  | Yes |  |
| CATT | Yes with comments | We suggest to follow the last meeting’s agreement, i.e., maxMRB-Add is only for multicast MRB that can be additionally added when beyond the current limit of MRBs+DRBs=16. For the detailed value of maxMRB-Add, it seems 16 is sufficient since this value only applies to multicast MRB.  |
| Nokia | Yes |  |
| vivo | Yes |  |
| Samsung | Yes |  |
| MediaTek | Not sure | maxMRB-Add can be used to indicates additional number of MRBs beyond the current limit of MRBs + DRBs = 16 and this is optional to UE. However the maximum number of MRB may affect the maximum number of G-RNTI/ G-CS-RNTI. Therefore we suggest to further discuss the need for additional MRB beyond the limit of MRBs + DRBs = 16. |
| Ericsson | Yes |  |
| LGE | Yes | The value 16 seem fine as max value for the additonal MRBs. |
| Intel | Yes |  |
| Futurewei | Yes |  |
| Sharp | Yes |  |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes |  |
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**Summary:** according to the reply, a clear majority of the companies (11/14) agreed that the previously agreed capability maxMRB-Add can be used to indicate additional number of MRBs supported by the UE beyond the current limit of MRBs + DRBs = 16 and the maximum value for the additional MRBs can be 16. Therefore it is proposed:

**Proposal 3: maxMRB-Add can be used to indicate additional number of MRBs supported by the UE beyond the current limit of MRBs + DRBs = 16 and the maximum value for the additional MRBs can be 16.**

## 2.3 MBS support on MRDC

As proposed in reference document [6], the MRB types of delivery mode 1 in Rel-17 can only include, MCG MRB (i.e. only one PTM leg via MCG), SCG MRB (i.e. only one PTM leg via SCG) and CA split MRB (i.e. one PTP leg and one PTM leg in the same MAC), and the MRB types of delivery mode 2 in Rel-17 can only include MCG MRB (i.e. only one PTM leg via MCG) and SCG MRB (i.e. only one PTM leg via SCG).

The rapporteur is not sure if we can handle this discussion at the last meeting on MR-DC, then at phase-one discussion of this email thread, the intention is just to collect the opinion from the companies on the MBS support on MRDC.

#### Question 3: Do companies agree to discuss the MBS support on MRDC at Rel-17 and if yes what is the intended spec impact?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| OPPO | Yes  | Only MN terminated MCG kind of bearer is configurd for MRB if MR-DC is configured.The 37.340 should be changed. |
| Qualcomm | No |  |
| CATT | No | Considering the limited TUs and MSB WID, MBS reception on SCG should not be considered in R17 scope. Moreover, the R17 MBS WID also indicates that MBS should be supported in NR-SA, and it is also not prevented for the scenarios in which the MN is an NR node (i.e. NE-DC and NR-DC).  |
| Nokia | Maybe (not high priority) | This is also partly discussed in the offline-43 where Apple (R2-2202555) indicates that to support MR DC MBS WI should not require extra standardization thus they propose not to support cross carrier scheduling for PTM on SCell as well as multicast MRB is at most configured with one PTP link. So we think MRDC is part of WI but we can support it but with minimum effort i.e. if there is specification impacts then likely there is no time to do that unless changes are extremely simple (e.g. just some ASN.1 configuration issues) but we cannot expect RAN1 to start working on optimizations to support this. |
| vivo | No  | Considering the limited time and potential technical issues (e.g. whether and how to do FDMed/TDMed transmission within one slot in case of DC ), we prefer not to consider DC deployment.  |
| Apple | Comment | We assume the question is to discuss whether to support the MBS reception on SCG. We donot support to cosider the SCG case in R17. But for the MBS reception on MCG in MR-DC, according to WID description, it can be supported without extra standardization. This part is covered in offline#43.  |
| Samsung | No |  |
| MediaTek | No | Considering the time limit, we prefer to postpone MBS reception on SCG and only focus on NR-SA. |
| Ericsson | No | Not sure there is any time. |
| LGE | No | The question is not crystal clear. If the question is whether to consider MBS on SCG with some specificiation work, our answer is NO. We cannot easily assume that MBS on SCG can be supported with minimal specification efforts before we look into details, but we do not have time to look at those. MBS on SCG by UE implementation is always allowed.  |
| Intel | No | We don’t think it is necessary to consider MBS reception in SCG. |
| Futurewei | No |  |
| Sharp | No |  |
| Xiaomi | Comment | We think that at least for broadcast MRB, there is no extra complexity of support broadcast MRB in SCG. We do not think that we should have some extra restriction to prohibiting the UE receiving broadcast MRB from SCG. |
| Huawei, HiSilicon | No | This is the last meeting of the WI, so there is no time for this. |
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**Summary:** according to the reply, a clear majority of the companies prefer not to to discuss the MBS support on MRDC at Rel-17 considering the limited time for Rel-17 discussion and the potential technical issues. A few companies think that Rel-17 MBS may support it with minimum effort or no extra effort. Therefore it is proposed as below to follow the majority view:

**Proposal 4: the discussion of the MBS support on MRDC at Rel-17 is postponed.**

## 2.4 MBS reception on Scell and non-serving cell

Mulitple reference documents discuss the design details for UE capability of receiving broadcast service on Scell and non-serving cell when the UE is in RRC connected state. However the corresponding discussion was managed by R2-2203343 (Report of: [Pre117-e][001][MBS] CP open Issues Input CP). We can discuss the issues when there is conclusion on the issue during the online discussion of R2-2203343.

No question is casted for this section at phase-one discussion of this email thread.

## 2.5 Other issues

#### Question 4: Companies are invited to comment if there are any other issues for MBS UE capabilities that needs to be discussed during this email discussion.

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|  **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon |  | We do not have to discuss that during this meeting, but RAN2 should also agree on the minimum number of broadcast MRBs that should be supported by the UE.  |
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# 3. Final Summary and Proposal

Based on the email discussion, the following proposals are made for mbs UE capbility, with the easy proposals highlighted in green for online session:

**Proposal 1: No capability is defined for the number of HARQ procress for MBS Broadcast reception.**

**Proposal 2: No capability is defined for the default number of MRBs supported.**

**Proposal 3: maxMRB-Add can be used to indicate additional number of MRBs supported by the UE beyond the current limit of MRBs + DRBs = 16 and the maximum value for the additional MRBs can be 16.**

**Proposal 4: the discussion of the MBS support on MRDC at Rel-17 is postponed.**

# 4. Reference

[1]R2-2202786 Draft 306 CR for MBS UE capabilities MediaTek Inc. draftCR Rel-17 38.306 16.7.0 B NR\_MBS-Core

[2]R2-2202787 Draft 331 CR for MBS UE capabilities MediaTek Inc. draftCR Rel-17 38.331 16.7.0 B NR\_MBS-Core

[3]R2-2202269 Discussions on NR MBS UE Capabilities CATT, CBN discussion Rel-17 NR\_MBS-Core

[4]R2-2202671 MBS UE capability for supporting Multicast MRBs Qualcomm India Pvt Ltd discussion Rel-17 NR\_MBS\_enh-Core R2-2200531

[5]R2-2203118 Remaining issue of MBS UE capability Xiaomi Communications discussion Rel-17 NR\_MBS-Core

[6]R2-2203120 Discussion on MBS support on MRDC Xiaomi Communications discussion Rel-17 NR\_MBS-Core R2-2201380