**3GPP TSG-RAN WG2 Meeting #113bis-eR2-210xxxx**

**Electronic, 12th - 20th April, 2021**

Agenda Item: 8.1.3

Source: Huawei, HiSilicon

**Title: Report of offline discussion: [AT113bis-e][032][MBS17] MCCH scheduling and Change notification (Huawei)**

Document for: Discussion and decision

# Introduction

This documents aims at gathering and summarizing companies views for the following offline discussion:

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| * [AT113bis-e][032][MBS17] MCCH scheduling and Change notification (Huawei)

Scope: Progress remaninig proposals from R2-2103909 to reach agreements and FFS points. Make an LS to RAN1 based on agreements and provided comments (e.g. consider whether some info on MTCH need to be provided).  Intended outcome: Report, Agreements, Approved LS out.  Deadline: Report/Agreements Friday April 16, LS out Monday April 19 1800 UTC |

Based on the e-mail discussion summary in [1], the following agreements were made during an online session of RAN2#113bis-e meeting:

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| * The MCCH transmission window is defined by MCCH repetition period, MCCH window duration and radio frame/slot offset.
* New RNTI is defined for scheduling MCCH.
* The concept of MCCH transmission window, similar to the one used for LTE SC-PTM, is used for NR MCCH scheduling. The exact parameters to define the window are FFS (discussed in the following proposals).
* Common search space is needed for MCCH scheduling. RAN2 should request RAN1 to discuss the details of CSS for MCCH.
* R2 assumes PDCCH occasions for MCCH search space are associated with SSBs in a pre-defined manner so that the UE can receive MCCH scheduling on PDCCH occasions according to its detected SSB.
* R2 assumes, In case searchSpace#0 is configured for MCCH (if allowed, pending RAN1 decision), the mapping between PDCCH occasions and SSBs is the same as for SIB1.
* R2 assumes that If common search space other than searchSpace#0 is configured for MCCH (if allowed, pending RAN1 decision), the PDCCH monitoring occasions for MCCH message which are not overlapping with UL symbols are sequentially numbered from one in the MCCH transmission window and mapped to SSBs using the similar rule as defined for OSI in TS 38.331.
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Previous RAN2 and RAN1 agreements relevant for this discussion are also copied below for convenience:

* **RAN2#113e**

Agreements

* 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.
* Assume it is possible to reuse LTE SC-PTM mechanism for the CONNECTED UEs to receive the PTM configuration for NR MBS delivery mode 2, i.e. broadcast based manner.
* Assume that MCCH change notification mechanism is used to notify the changes of MCCH configuration due to session start for delivery mode 2 of NR MBS (other cases FFS, if any).
* **RAN1-103e and RAN1-104e**

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|  Agreements**:** For RRC\_IDLE/RRC\_INACTIVE UEs, CSS is supported for group-common PDCCH.* FFS: reuse current CSS type, define a new CSS type, etc.
* FFS other details.

Agreements: For RRC\_IDLE/RRC\_INACTIVE UEs, define/configure common frequency resource(s) for group-common PDCCH/PDSCH.* the UE may assume the initial BWP as the default common frequency resource for group-common PDCCH/PDSCH, if a specific common frequency resource is not configured.
* FFS: the relation of the common frequency resource(s) (if configured) and initial BWP.
* FFS: whether to configure one/more common frequency resources
* FFS: configuration and definition details of the common frequency resource

Agreements**:** For RRC\_IDLE/RRC\_INACTIVE UEs, CSS is supported for group-common PDCCH.* FFS: reuse current CSS type, define a new CSS type, etc.
* FFS other details.

Agreements: For RRC\_IDLE/RRC\_INACTIVE UEs, a CORESET can be configured within the common frequency resource for group-common PDCCH/PDSCH. CORESET0 is used by default if the common frequency resource for group-common PDCCH/PDSCH is the initial BWP and the CORESET is not configured.* FFS: configuration details of the CORESET for group-common PDCCH/PDSCH

Agreement:For RRC\_IDLE/RRC\_INACTIVE UEs, for broadcast reception, the UE may assume that group-common PDCCH/PDSCH is QCL’d with SSB.* It is up to UE implementation whether UE monitors monitoring occasions corresponding to all SSB indexes or monitoring occasions corresponding to a subset of all SSB indexes.
* FFS: association rules between SSB indexes and UE monitoring occasions.
* FFS: group-common PDCCH/PDSCH is QCl’d with TRS if configured

Agreement:For RRC\_IDLE/RRC\_INACTIVE UEs, for broadcast reception, further study the following cases of a configured/defined specific common frequency resource (CFR) for group-common PDCCH/PDSCH, and identify which case(s) will be supported:* [Case E] the case where a CFR is defined based on a configured BWP.
	+ In particular, study the following:
		- whether a configured BWP for MBS is needed or not.
		- whether BWP switching is needed or not.
	+ In this study, the configured BWP has the following properties:
		- The configured BWP is different than the initial BWP where the frequency resources of this initial BWP are configured smaller than the full carrier bandwidth.
		- The CFR has the frequency resources identical to the configured BWP.
		- The configured BWP needs to fully contain the initial BWP in frequency domain and has the same SCS and CP as the initial BWP.
	+ Note: The configured BWP is not larger than the carrier bandwidth
* the case where the initial BWP fully contains the CFR in the frequency domain.
	+ In this study the following sub-cases are considered:
		- [Case B] A CFR with smaller size than the initial BWP, where the initial BWP has the same frequency resources as CORESET0. In this case the CFR has the frequency resources confined within the initial BWP and have the same SCS and CP as the initial BWP.
		- [Case D] A CFR with smaller size than the initial BWP, where the initial BWP has the frequency resources configured by SIB1. In this case the CFR has the frequency resources confined within the initial BWP and have the same SCS and CP as the initial BWP.
	+ In particular, study the following:
		- Whether the considered two options with a CFR with smaller size than the initial BWP are needed or not for MBS.
* the case where the initial BWP has same size as the CFR in the frequency domain.
	+ In this study the following two sub-cases are considered:
		- [Case A] A CFR with the same size as the initial BWP, where the initial BWP has the same frequency resources as CORESET0. In this case the CFR has the same frequency resources and same SCS and CP as the initial BWP.
		- [Case C] A CFR with same size as the initial BWP, where the initial BWP has the frequency resources configured by SIB1. In this case the CFR has the same frequency resources and same SCS and CP as the initial BWP.
	+ In particular, study the following:
		- Whether the considered two options with a CFR with the same size as the initial BWP are needed or not for MBS.
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In Section 3, companies are requested to raise any issues with the remaining proposals from [1].

In Section 4, companies are rquested to provide their views on the additional contents of an LS to RAN1.

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# Remaining proposals from the “[Post113-e][053][MBS17] MCCH scheduling and MCCH change notification” e-mail discussion

The following proposals, which result from the “[Post113-e][053][MBS17] MCCH scheduling and MCCH change notification” e-mail discussion as summarized in [1], were not discussed during the online session due to lack of time:

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| **Proposal 7: Working assumption (pending RAN1 disucssions and decisions): the transmission bandwidth for MCCH shall be configured in the way allowing the UE to monitor Paging/SI and to receive MCCH simultaneously without BWP switch.** **Proposal 9: Request RAN1 to discuss the details of the configuration of the bandwidth for MCCH reception.** **Proposal 10: As a baseline, a new RNTI different from MCCH-RNTI and P-RNTI is introduced for MCCH change notification and no additional information (such as the 8 bits bitmap in LTE) is needed. The details of DCI design can be left for RAN1 to discuss.****Proposal 11: There is no change notification for session stop or MCCH message modification for ongoing services and the UE which is receiving MBS session is required to monitor at least one MCCH repetition period in every MCCH modification period.****Proposal 12: The modification period is defined for NR MCCH and NR MCCH contents are only allowed to be modified at each modification period boundary.****Proposal 13: The updated MCCH message should be sent in the same MCCH modification period where the change notification is sent.** |

The goal is to attempt agreeing them via the offline discussion. Therefore, companies are requested to indicate whether any of the above proposals is not agreeable to them. Companies are requested to consider other companies views and the summary of the e-mail discussion as provided in [1] .

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| **Company** | **Objected proposal** | **Clarification and alternative proposal** |
| TCL Communication LTD. | Proposal 10 | In our view, we should not preclude the support of additional information (i.e., 8 bits bitmap option) since this is related to whether multiple MCCHs are to be supported or not which is agreed to be handled later during the last email discussion. In addition, we also see that even if single MCCH (i.e., one MCCH with diverse instances of modification periods and repetition periods, etc.) is agreed to handle the diverse scheduling requirements of different MBS service, the additional bitmap may also be required to differentiate the notification changes configurations of different MCCH instances configured for different MBS services. **Alternative 1:** P10: As a baseline, a new RNTI different from MCCH-RNTI and P-RNTI is introduced for MCCH change notification. The details of DCI design can be left for RAN1 to discuss and the details of supporting additional information (e.g., 8 bit bitmap) is FFS. |
| Qualcomm | P7, P10,P11 | **P7:** We think this can be discussed after RAN1 progress. It depends on CFR discussion in RAN1, whether it is part of Initial BWP, same as BWP or seprate from Initial BWP, how UE can monitor both Initial BWP and separate MBS BWP if they are not overlapping etc.**P10:** for Multiple MCCH, we think multiple bits in DCI can be used (option 2) or use seprate RNTIs for each MCCH (option 1). We should not restrict design to single MCCH only. Alternatively, we can agree to change proposal to “As a baseline, a new RNTI different from MCCH-RNTI and P-RNTI is introduced for MCCH change notification ~~and no additional information (such as the 8 bits bitmap in LTE) is needed.~~ The details of DCI design can be left for RAN1 to discuss.”**P11:** we prefer Option 3 insted of Option 1. MCCH change notification be used to indicate Session Start/Stop/Change and UE is not required to read MCCH all the time when receiving Broadcast service and helps UE to save some power and processing resources. |
| MediaTek | P7, P10 | We have some comments on both P7 and P10.. P7: Currently RAN1 discusses CFR for MBS reception. However from RAN2 perspective, we see no harm to show RAN2 view to RAN1: no BWP switching is expected when the UE simultenously monitor Paging/SI and receive MCCH. Then we agree to keep P7 as is.  P10: We agree with Qualcomm on the wording update to make it open to support multiple MCCHs. In any case, the details of DCI design is up to RAN1. |
| CATT | P7,P10 | P7:it is a pure RAN1 issue and is under discussion by RAN1,we do not see the necessaity to make such working assumption in RAN2.P10:Agree with QC and MTK to remove the wording “**no additional information (such as the 8 bits bitmap in LTE) is needed,** **The details of DCI design can be left for RAN1 to discuss.**”How to use the bitmap in DCI design may also need to be decided by RAN2. |
| Futurewei | P10, P11 | P10 and P11 are related. If the change notification is only for indication session activation only, we don’t see a need to use new RNTI dedicated for this. An RNTI will need to involve corresponding RAN1 operations which increase the complexity. Using multiple RNTI to perform blind detection may also increase UE power consumption. So we think P10 Option 3 – using MCCH-RNTI is sufficient.The change notification could also be used for UE power saving if session stop can be notified to the UEs. Anyway, the UE need to monitor the first MCCH cycle in each notification period for notification itself, not sure adding a new RNTI for the notification is more helpful even in this case. We slightly prefer making the notification also include other cases for UE power saving. |
| Lenovo, Motorola Mobility | P7 | P7：we understand the intention of P7. However, P7 should be discussed in RAN1 as CFR v.s. BWP. RAN2 just needs to inform and ask RAN1 to support MCCH reception and design. P10: we don’t see the necessity of multiple MCCHs for broadcast sessions which are with low QoS requirements. We support P10. |
| Kyocera | P10, P11 | For P10, we still think RAN2 should further discuss the design details. We’re fine with the new RNTI, but think the latter part “no additional information (such as the 8 bits bitmap in LTE) is needed” depends on the cases e.g., if introducing multiple MCCH. For P11, we think the change notification due to any modification of MCCH contents could be beneficial for UE power saving, since the UE does not need to decode MCCH in every modification period.  |
| vivo | P10, P11 | For P10, in our understanding, the 8-bit bitmap is the only essential component in the DCI (i.e. 8-bit bitmap and reserved bits) in LTE. Based on this fact, we think anyway some meaningful bits (e.g. LTE-alike bitmap) shall be included in the DCI and agree with Qualcomm’s proposed P10. For P11, we think anyway some meaningful bits can be included in the DCI (i.e. the fallback DCI size can contain more than 8 meaningful bits, otherwise, reserved bits are padded). Thus, notification for MCCH modification can be easily supported (via DCI bitmap/codepoint as in NB-IoT) to reduce UE blind decoding on MCCH monitoring, which will not bring extra complexity and signaling overhead, in terms of DCI design and transmission.  |
| LGE | P11 | The notification mechanism is for the purpose of UE power saving. According to the proposal, UE should monitor periodically even though the MCCH is not changed. We prefer option 2 or 3 I the UE is not required to monitor MCCH when there is no change in the MCCH. |
| Spreadtrum | P7 | P7: The CFP or BWP is discussed in RAN1, we think it is unnecessary to make working assumption in RAN2. |
| Xiaomi | P10 | The number of bits in DCI could be discussed after we decide the detailed functions of the MCCH change notification. |
| OPPO | P7 , P10 | For P7, it is up to RAN1.For P10, I do not understand why there is a P-RNTI for MCCH? |
| Ericsson | P10, P11 | P10: We are not sure if a different RNTI is needed for MCCH notification and control channel, and we think we can leave the decision to RAN1, together with DCI format to use.P11: We think that the requirement for the UE to continuously acquire the MCCH control channel during an active session to check if the session has stopped is not very power efficient, and in case there are bits in the notification DCI available, why RAN2 does not consider to introduce a stop bit? We also think that in MCPTT there can be concurrent sessions (e.g. voice, video, data) which may also start at the same time. Does the notification support that multiple sessions are started in the same MP? Perhaps we need a single notification bit for this as is currently proposed, but in the procedure text is should be clarified that more than one session could have started. |
| ZTE | P10, P11 | P10 and P11 are rooted in the same issue:**- what is such notification for?**Only above "why" issue is clear for us, we can then discuss "how".It was in Rel-14 for NB/eMTC considerations including bandwidth part like transmission (SC-MCCH and SC-MTCH can be sent in different narrow bands) and power consumption were taken into consideration, new scenarios and new notification mechanisms were introduced: - change of on going services (by DCI with G-RNTI/SC-RNTI other than only using SC-N-RNTI)- session stop indication (by SC-PTM Stop Indication MAC Control Element)Above consideration shall also be included in current discussion about NR MBS MCCH change notification design.We suggest starting discussion on issues below step by step:- scenarios of change notification (e.g., session start, PTM config update, and session stop)- mechanisms to deliver such notification  |
| Convida Wireless | P10, P11 | P10: We agree with the spirit of the proposal but have the same reservations about the wording as expressed by the TCL, QCOM, MediaTek, and CATT, and others. RAN2 has not yet decided whether or not we will have multiple MCCH. In our view, multiple MCCH may be useful to deal with the varied MBS services that may be carried. In such cases, there are at least 2 ways to deal with the multiple MCCH (different RNTI per MCCH, or single RNTI with an additional bitmap). Consequently, we also suggest to remove the text **”and no additional information (such as the 8 bits bitmap in LTE) is needed”**P11: For power savings, we think the network should use MCCH change notification for session stop or MCCH message modification. We don’t see the need to have the UE monitor the MCCH in at least one MCCH repetition period every MCCH transmission window. |
| NEC | P10,P11 | For P10: In LTE DCI format 1c, 8bitmap is used for indication of MBSFN area. So this is not needed. But details is up to RAN1. Furthermore, even with multiple MCCH, the MCCH list to be updated can be included in a DCI format, with only one G-RNTI is sufficient. For P11: we think MCCH change notification be used to indicate Session Start/Stop/Change and UE is not required to read MCCH, which can enhance the power saving for UE, otherwise why the UE is still monitoring the MTCH after the session is stopped.  |

Summary:

The following proposals received no objections and hence can be considered agreeable without further discussion:

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| **Agreeable proposals:****Proposal 9: Request RAN1 to discuss the details of the configuration of the bandwidth for MCCH reception.** **Proposal 12: The modification period is defined for NR MCCH and NR MCCH contents are only allowed to be modified at each modification period boundary.****Proposal 13: The updated MCCH message should be sent in the same MCCH modification period where the change notification is sent.** |

For the remaining proposals, there was at least one objection raised. The concerns are summarized in the table below:

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| **Proposal** | **Raised concerns** | **Rapporteur proposal** |
| **Proposal 7: Working assumption (pending RAN1 disucssions and decisions): the transmission bandwidth for MCCH shall be configured in the way allowing the UE to monitor Paging/SI and to receive MCCH simultaneously without BWP switch.**  | 5 companies objected to this proposal with the following concerns:* This depends on CFR discussions in RAN1 and can be decided in RAN1
 | This can be left for RAN1 discussion, but it would be worth clarifying that MCCH needs to be received in INACTIVE/IDLE together with Paging/SI notifications. It can be then up to RAN1 to decide about any BWP/CFR limitations or switching etc.Updated proposal:**Proposal 7’: UE should be able to monitor/read both MCCH channel and notifications for SI/Paging simultaneously. It is up to RAN1 to decide how this is ensured.** |
| **Proposal 10: As a baseline, a new RNTI different from MCCH-RNTI and P-RNTI is introduced for MCCH change notification and no additional information (such as the 8 bits bitmap in LTE) is needed. The details of DCI design can be left for RAN1 to discuss.** | 13 companies objected this proposal with the following concerns:* In order to support notificaitons for multiple MCCH (if agreed), a bitmap in the DCI might be useful (TCL, QCM, MTK, CATT, Convida
* There seems to be no need to have a dedicated RNTI (other than MCCH-RNTI) for notifications only (FW, Ericsson
* Since RAN1 will discuss the details of DCI, they can also decide about the need for a separate RNTI, other than MCCH-RNTI
* Additional bit in the DCI can be used to indicate session stop and modification (FW, E///
* It is unclear from the proposal whether the start of multiple sessions can be informed using a single bit (E///
* The number of bit can be decided when we agree on the final functionality of MCCH notification (Xiaomi, ZTE
 | There are concerns on both aspects of this proposal, i.e.:* Usage of RNTI different than MCCH-RNTI
* Restricting the contents of the DCI used for notification

It was also noted by several companies that those aspects go together, so they could be both discussed by RAN1 and this is the proposal that the rapporteur would like to bring for further discussion:**Proposal 10’: It is up to RAN1 to to decide about the RNTI and DCI format used for MCCH change notifications.**  |
| **Proposal 11: There is no change notification for session stop or MCCH message modification for ongoing services and the UE which is receiving MBS session is required to monitor at least one MCCH repetition period in every MCCH modification period.** | 9 companies objected this proposal with the following concerns:* For UE power consumption saving, a notification can be used to indicate session stop and modification as well, e.g. with an dditional bit in the DCI (FW, Kyocera, vivo, LG, Convida, NEC, QCM)
 | There is a number of companies raising an issue of UE power consumption when the UEs need to receive MCCH each modification period. On the other hand, it should be noted that during the pre-meeting e-mail discussion, there was majority of 17 companies in favour of agreeing P10 as it is there and there were also concerns raised for the approach where each session modification has to be notified, i.e. signaling overhead, potential impact on the power consumption of UEs not yet receiving any service. It was also raised by some companies that this issue is interrelated with the DCI design which is to take place in RAN1. It is then suggested to keep it open for the moment whether to introduce the notifications due to session stop/modification, list both options (i.e. notification and reading MCCH each modification period) and ask RAN1 to consider this for notification DCI design and provide feedback to RAN2.**Proposal 11’: RAN2 agrees there are two options for the UE to get aware of session stop/modification:*** **Reading MCCH once per each MCCH modification period when receiving an ongoing broadcast session**
* **DCI used for MCCH notification indicates the change of an ongoing broadcast session**

**RAN1 should be informed about those options considered by RAN2 and, consider it for DCI design for MCCH notification and provide feedback, as necessary.** |

Based on the summary above, the following updated proposals are brought forward:

**Proposal 7’: UE should be able to monitor/read both MCCH channel and notifications for SI/Paging simultaneously. It is up to RAN1 to decide how this is ensured.**

**Proposal 10’: It is up to RAN1 to to decide about the RNTI and DCI format used for MCCH change notifications.**

**Proposal 11’: RAN2 agrees there are two options for the UE to get aware of session stop/modification:**

* **Reading MCCH once per each MCCH modification period when receiving an ongoing broadcast session**
* **DCI used for MCCH notification indicates the change of an ongoing broadcast session**

**RAN1 should be informed about those options considered by RAN2 and, consider it for DCI design for MCCH notification and provide feedback, as necessary.**

# Details of the LS to RAN1

In addition to progressing the proposals as in Section 2, the intention of the offline discussion is to agree on the contents of the LS to be sent to RAN1. The proposals themselves will have to be obviously included, but it was also raised during the discussion that RAN1 would benefit from additional explanations about the overall MBS framework and the channel structure of MBS as agreed in RAN2 so far. Considering the companies comments and overall RAN2 progress, the rapporteur believes, RAN1 would benefit from the explanations on the following points:

* MBS delivery modes as being defined by RAN2, i.e. DM1/DM2.
* MBS channel definitions

Some proposals were already included draft LS(s) provided in [2] and in the Annex of [3]. Based on these and based on the online comments, the rapporteur would like to suggest the following explanations to be included in RAN1 LS.

**Logical channel definitions:**

* RAN2 defines two types of logical channel used for MBS:
	+ MTCH: A point-to-multipoint downlink channel for transmitting traffic data from the network to the UE using MBS transmission. This channel is utilized for delivery of MBS data for both multicast and broadcast sessions.
	+ MCCH: A point-to-multipoint downlink channel used for transmismitting MBS control information from the network to the UE, for one or several MTCH(s) associated with broadcast session(s).

**Question 1: Do you agree with the above high-level, working definitions of MTCH and MCCH.**

*NOTE: These definitions are intended for inclusion in RAN1 LS, but if agreed could be also captured in the running stage-2 CR.*

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| **Company** | **Yes/No** | **If no, please raise you concerns and propose alternative wording** | **Rapporteur reply** |
| TCL Communication LTD. | No | The difiniaiton give some sort of indication or sense that the MTCH is shared channel for delivery of both multicast and broadcast sessions at the same time. Alternative: MTCH: A point-to-multipoint downlink channel for transmitting traffic data from the network to the UE using MBS transmission. This channel is utilized for delivery of MBS data for multicast or broadcast session | Based on other comments, it may be better to remove broadcast/multicast session from the description. |
| TD Tech&Chengdu TD Tech | Yes | Comments：1. Delivery modes 1 and 2 need to be defined before MCCH an MTCH.
2. MTCH is traffic channel while MCCH is control channel.
3. MTCH is used for both multicast session and broadcast session.
4. Hope the definitions can be updated as below.

MTCH: A point-to-multipoint downlink traffic channel for transmitting MBS session data from the network to the UE using Point-to-Multipoint mode.MCCH: A point-to-multipoint downlink control channel used for transmismitting MBS session control information from the network to the UE using Point-to-Multipoint mode, for one or several MTCH(s) associated with delivery mode 2. | It would be better to keep thee definitions simple and avoid using DM1/DM2 terminology here. These points can be included in DM1/DM2 descriptions informed to RAN1. |
| Qualcomm | Yes but | It is ok to indicate logical channel definitions and we can also indicate “FFS: support for multiple MCCH”. The reason to include this FFS is to let RAN1 DCI impacts if any. | There is also opposition to raise multiple MCCH.  |
| MediaTek | Yes | Meanwhile, we also agree with Qualcomm to make the support for multiple MCCHs as FFS | See reply to QCM. |
| CATT | Generally Yes,but | For MCCH,it is not decided yet whether it can be used for the group notification of multicast session activation,which is under discussion offline.so the wording “associated with broadcast session(s)” is accurate at least for now. |  |
| Nokia | Yes | OK to include FFS on multiple MCCH as it may have some impact to RAN1 although we do not expect much | See reply to QCM. |
| Futurewei | Yes | Understand there are detailed description on DM1, DM2. But may be better to make it clear the MCCH/MTCH association with DM1 and DM2 at the beginning. Consider:Bullet 1: This channel is utilized for delivery of MBS data for both multicast and broadcast sessions in DM1 and DM2 respectively.Bullet 2: MCCH: A point-to-multipoint downlink channel used for transmismitting MBS control information from the network to the UE in DM2,… | Please see the reply to TD Tech. |
| Lenovo, Motorola Mobility | Yes, but see comments | MTCH: RAN2 has not agreed that MTCH is used for DM 1 yet. We are not sure whether MTCH is applicable to both DM1 and DM2 or not and whether we need to distinguish the traffic logic channels between DM1 and DM2 or not.* + MTCH: A point-to-multipoint downlink channel for transmitting traffic data from the network to the UE using MBS transmission. This channel is utilized for delivery of MBS data for ~~both multicast and~~ at least broadcast sessions.

MCCH: whether support multicast session reception in RRC\_INACITVE is still under discussion and MCCH is one of options to provide MTCH configuration for the multicast session reception in RRC\_INACTIVE as online discussion.MCCH: A point-to-multipoint downlink channel used for transmismitting MBS control information from the network to the UE, for one or several MTCH(s) associated with broadcast session(s) (FFS multicast sessions). | It is OK to limit these definitions to broadcast session only for now (also OPPO raised that for multicast with PTP only there might be no need for MTCH). On whether MCCH is used for multicast session, this is not needed for RAN1 LS at least as it has not impact to them, especially considering that mutlicast support in inactive was deprioritzed by RAN2. |
| Samsung | Yes | RAN2 did not agree multiple MCCH at all and also it is not supported by clear majority. Thus, we do not need to inform those premature aspect to RAN1 at this time. |  |
| Kyocera | Yes | We’re just wondering what is intended in “using MBS transmission” in the MTCH definition. We wonder if it can be removed, in case it’s just redundant.  | OK with suggestion |
| vivo | Yes with comment | Considering whether MCCH can be used for group notification and/or used for multicast reception in INACTIVE is not decided, we propose the expression in MCCH that “*for one or several MTCH(s) associated with broadcast session(s).*” should be removed. | What is captured in the proposed definition is what is already agreed. Why should it be removed due to something that has not been agreed and was deprioritized during this meeting? |
| Intel | Yes |  |  |
| LGE | Yes | We are OK to indlcude FFS on multiple MCCHs. |  |
| APT | Yes | MCCH for group notification is under [031] email discussion. May need further address depend on the outcome. |  |
| Spreadtrum | Yes with comment | Whether the MCCH can be used for the group indication for activation/deactivation of Multicast session is under discussion yet, and whether the MTCH can be used for multicast session is not clear. So we propose to remove“*for one or several MTCH(s) associated with broadcast session(s)*”. | Please see the reply to vivo |
| Xiaomi | Yes | Ok to add FFS for multiple MCCH(s). |  |
| OPPO | Yes with comments | I wonder the MCCH and MTCH is only used for broadcast or also used for multicast.For multicast with PTP tanmission, it is one to one transmission and whether MCCH and MTCH are also used? | OK, please also see the reply to Lenovo. |
| Ericsson | No | We do not understand why these logical chanel definitions are beneficial or necessary to progress the RAN1 work. This is not visible to RAN1. It might be relevant for RAN1 to know that the MTCH is mapped on DL-SCH and is using G-GRNTI, But this was not agreed (yet) in the architecture discussions (e.g. see group scheduling [R2-2104494](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104494.zip)). The definitions are a good start, but they should and need not be included in the LS to RAN1.What we discussed during the online session was that it might be beneficial for RAN1 to consider the same design for MTCH and MCCH for broadcast. We think that are difference for the multicast and broadcast MTCH from RAN1 perspective (e.g. BWP/CFR, beams, UL feedback, DRX). We also think there should be a common architecture discussion where both multicast and broadcast is discussed. And we were also a bit surprised to see this architecture discussion pop-up in this MCCH offline discussion, i.e. this is not within the scope of this offline discussion.  | The goal is not to have those definitions being the final one, but it is to make RAN1 aware of the fact that there will be logical channel for traffic and there will be a logical channel for control information, at least for broadcast sessions. The details will have to be discussed further of course. |
| ZTE | Yes | Confused by companies' input to have multiple MCCH. I believe we are just syncing up on the definition for now, and we are just supposed to agree with the above high-level, working definitions. |  |
| Convida Wireless | Yes, but | We agree with some of the clarifications from TD Tech&Chengdu TD Tech. Also, we don’t think RAN2 has agreed that MCCH will not be used for multicast. Maybe we should add an FFS o MTCH: A point-to-multipoint downlink traffic channel for transmitting MBS session data from the network to the UE ~~using MBS transmission~~. This channel is utilized for delivery of MBS data for both multicast and broadcast sessions. o MCCH: A point-to-multipoint downlink control channel used for transmismitting MBS control information from the network to the UE, for one or several MTCH(s) associated with broadcast session(s) (FFS for multicast session(s)). | The definition captures what is agreed and support for multicast in Inactive is deprioritized, so there is no need to confuse RAN1 with this.  |
| NEC | Yes but with comments | Multiple MCCH will have large impact to the spec. Before RAN2 draws the final conclusion, we better not to inform RAN1 regarding multiple MCCH design.  |  |

Summary:

All but one company agree that it is useful to provide general MCCH and MTCH definitions to RAN1. Main points which were raised with respect to the proposed definitions:

* It is yet unclear whether MTCH is used for multicast session.
* Some companies would like to consider the support of multiple MCCH and inform this to RAN1 already. There is also a number of companies opposing to inform this to RAN1 before agreeing in RAN2.

Based on the above, the rapporteur will include the overall channel definitions in the draft LS to RAN1, considering the above points. Also, the rapporteur will make it clear that these definitions, at least for now, are applicable only to broadcast session delivery using DM2.**Delivery modes definitions:**

* RAN2 is working on two MBS delivery modes (DM1 and DM2), summarized as follows:
	+ DM1 is used for multicast session delivery and is applicable to UEs in RRC Connected state (FFS UEs in RRC Inactive). The UE is provided with MBS configuration (including MTCH configuration, e.g. G-RNTI) using dedicated RRC signalling when the UE is in RRC Connected state. This delivery mode does not utilize MCCH channel.
	+ DM2 is used for broadcast session (FFS multicast session) delivery and is applicable to UEs in all RRC states. The UE is provided with MBS configuration using common RRC signalling in a two-step based approach, i.e. a new SIB for MBS will be used to provide the transmission configuration of MCCH. Based on the MCCH configuration received via SIB, UE reads MCCH, which carries configuration of MTCH(s), e.g. G-RNTI. The MTCH configuration acquired from MCCH is applied by the UE for MTCH reception regardless of UE’s RRC state (for RRC\_CONNECTED state, the possibility to receive MTCH can be further subject to UE’s configuration and capabilities).

**Question 2: Do you agree to include the above description of DM1 and DM2 in RAN1 LS?**

*NOTE: DM descriptions above are intented only as clarification for RAN1 LS, there is no intention to agree them as official definitions.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes/No** | **If no, please raise you concerns and propose alternative wording** | **Rapporteur reply** |
| TCL Communication LTD. | Yes/maybe |  |  |
| TD Tech&Chengdu TD Tech | Yes | Some comments on DM1 and DM2:1. DM1 and DM2 are defined before MTCH and MCCH are defined because MCCH is associated with DM2.
2. For DM1, how to delivery MBS session control information has no agreement.
3. Multicast uses DM1. hether or not multicast can use DM2 is not decided yet.
4. Hope the definitions can be updated as below.
	* DM1 is used for multicast session delivery and is applicable to UEs in RRC Connected state (FFS UEs in RRC Inactive). DM1 can use both the PTM bearer and the PTP bearer for multicast session delivery.
	* DM2 is used for broadcast session (FFS multicast session) delivery and is applicable to UEs in all RRC states. DM2 can only use PTM bearer for broadcast session delivery. An MBS specific SIB is introduced to send the MCCH configuration information (FFS: the MCCH change notification related configuration information). MCCH is used to send the PTM bearer configuration information of each MBS session with DM2.
 | OK to mention PTP and PTM transmission applicability.  |
| Qualcomm | May be Yes |  |  |
| MediaTek | Yes |  |  |
| CATT | Generally Yes,but | At least for now,regarding DM1,we can not say“This delivery mode does not utilize MCCH channel”.As it is not decided yet which channel(MCCH or PCCH) is used for the group notification of multicast session(i.e. via DM1) activation to UE in idle/inactive. | This point was added to make it clear that the configuration of MTCH is not read from MCCH in DM1. However, to avoid any confusion, this sentence can be removed.  |
| Nokia | Yes | We are fine the the definitions. We could note that there may be group notification that needs to be monitored for DM1 in IDLE/INACTIVE but we have not yet agreed on that or any details. So it would be quite vague e.g. *FFS whether for DM1 UE in IDLE/INACTIVE states will need to monitor group notification channel (e.g. PCCH or MCCH)*Of course this could change based on another email discussion. | This seems not to have an impact on RAN1 and to avoid confusion the sentence on DM1 not using MCCH can be removed. |
| Futurewei  | Yes | DM1 and DM2 are the terminoledge defined and widely use in RAN2. It also has implication to RAN1. It would be better to let RAN1 also understand the motivation of DM1 and DM2 agreed in RAN2: DM1 can deliver the MBS service with high QoS requirement, in which UE feedback and network retransmission are supported. MD2 is used to deliver the MBS service with low QoS requirement, in which UE UL feedback and network retransmission (such as HARQ) is not supported.  | OK to mention PTM and PTP applicability to DM1 and DM2. |
| Lenovo, Motorola Mobility | Yes |  |  |
| Samsung | Yes but | For group notification to idle/inactive UEs, MCCH may be used (it is supported by multiple companies and not precluded). So, a sentence “This delivery mode does not utilize MCCH channel.” needs to be removed. | See reply to CATT/Nokia. |
| Kyocera | Yes |  |  |
| vivo | Yes with comment | Same view with Samsung. |  |
| Intel | Yes with comment | We agree with others that "This delivery mode does not utilize MCCH channel" depends on the outcome of email discussion "[AT113bis-e][031][MBS17] MBS session activation". | See reply to CATT/Nokia. |
| LGE | Yes |  |  |
| APT | Yes | Minor suggestion as below: The UE is provided with MBS configuration using common RRC signalling in a two-step based approach, i.e. a new SIB for MBS will be used to provide the transmission configuration of MCCH. Based on the MCCH configuration received via SIB, UE reads MCCH, which carries “transmission” configuration of MTCH(s), e.g. G-RNTI. | OK |
| Spreadtrum | Yes with comment | Agree with Samsung. |  |
| Xiaomi | Yes |  |  |
| OPPO | Yes  |  |  |
| Ericsson | No | We have similar comments as for the logical channels, i.e. this is not visible to RAN1, and is not needed to progress the work in RAN1. DM1/DM2 were introduced for discussion sake, to discuss broadcast and multicast reception in different RRC states. But DM1/DM2 definitions were removed from the running CR 38.300, because there was no consensus how DM1/DM2 are defined (e.g. connected to QoS or RRC states). We also think that the main differences between DM1/DM2, i.e. the real definitions, are not included above, i.e. DM1 can only be received after UE joined the session, while DM2 is broadcasted in a certain service area and can be received by the UE without going to connected mode. We disagree that multicast via DM2 is FFS, e.g. that UE can receive multicast using MCCH for notification and configuration in idle/inactive, just like broadcast session. In our understanding RAN2 did not agree that this is FFS. Multicast reception in inactive has been down-prioritized. Multicast via DM2 would have impoact on other WGs like RAN3/SA2, i.e. RAN2 cannot decide on that, and we cannot include this in the LS to RAN1. We do not see the need for DM1/DM2 terminology. In our understanding we can continue to use broadcast and multicast session,  | The goal is to raise awareness in RAN1 about overall design in RAN2. It surely makes no harm to RAN1, especially that the agreements to be notified to RAN1 speak of DM2 at least. These are only working definitions to ease the work.  |
| ZTE | Yes with comments | We can leave "This delivery mode does not utilize MCCH channel" for later discussion. | See reply to CATT/Nokia. |
| Convida Wireless | Yes, but | For the definition of Delivery Mode 1, suggest to remove “This delivery mode does not utilize MCCH channel” | See reply to CATT/Nokia. |
| NEC | Yes with comments | For DM1, we have not agreed how to utilize MCCH channel, how many MCCH channels.Furthermore, for TMGI, G-RNTI likely parameters, we haven’t have conclusion how to configure them to UE, maybe by USD, MCCH, rather than RRC deciated signaling.  | It seems to be acommon understanding that within DM1 the MBS configuration is provided with dedicated RRC signalling. |

Summary:

All but one company agree that it is useful to provide DM1/DM2 definitions to RAN1. Main points which were raised with respect to the proposed definitions:

* Applicability of PTP and PTM modes to delivery modes.
* Clarify that for group notification for DM1 usage of either PCH or MCCH is considered in RAN2

Based on the above, the rapporteur will include the DM1/DM2 definitions in the draft LS to RAN1, considering the above points.

Finally, companies are requested to raise any other agreements or issues related to this discussion which they think RAN1 should be informed about.

**Question 3: Are there any other agreements or issues related to MCCH/MTCH delivery that RAN2 should inform RAN1 about at the moment?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Comments** | **Rapporteur reply** |
| TD Tech&Chengdu TD Tech | 1. MBS session related RNTI: G-RNTI, CS-G-RNIT (for SPS PDSCH), MCCH-RNTI, MCCH-N-RNTI for MCCH change notification, (FFS: group paging for multicast service in RRC\_INACTIVE state?)
 | For RNTIs related to MCCH we can let RAN1 discuss further (as suggested by P10’) OK for FFS on group notification as suggested by Nokia as well. |
| Qualcomm | But we need to inform RAN1 about this agreement as well.* Chair: RAN2 will prioritize Active Multicast support in RRC Connected mode in Rel-17. If time permits Multicast support for RRC Inactive can be considered later (once connected mode Multicast solution, and Broadcast solution has become more mature).
 | Yes, they should be aware of this. |
| Nokia | Agree with Qualcomm |  |
| Futurewei | Any RAN2 agreed newly added RNTI for MBS especially in DM2 other than G-RNTI.The three agreements of RAN2 assumptions:**R2 assumes PDCCH occasions for MCCH search space are associated with SSBs in a pre-defined manner …**Ask RAN1 to provide more details on CFR. | The agreements from this discussion will be of course included. OK to consider more agreements with RAN1 impact if we reach any during this meeting. |
| Xiaomi | We need to inform RAN1 to provide the configuration of the MCCH change notification:1. Association with SSB
2. Search space/CORESET
 | See reply to Futurewei. |
| ZTE | We might need to ask RAN1 about whether we need a separate RNTI for the MCCH change notification, since DCI with SC-RNTI can do the same thing. | See reply to TD Tech |
|  |  |  |

Summary:

In addition to the agreements related to MCCH, RAN1 should be informed about the following agreement:

* Chair: RAN2 will prioritize Active Multicast support in RRC Connected mode in Rel-17. If time permits Multicast support for RRC Inactive can be considered later (once connected mode Multicast solution, and Broadcast solution has become more mature).

Other agreements with RAN1 impact, if reached during the meeting can also be considered.

# Conclusion

Based on the offline discussion, the following proposals are deemed agreeable (no objection in the offline)

|  |
| --- |
| **Agreeable proposals:****Proposal 9: Request RAN1 to discuss the details of the configuration of the bandwidth for MCCH reception.** **Proposal 12: The modification period is defined for NR MCCH and NR MCCH contents are only allowed to be modified at each modification period boundary.****Proposal 13: The updated MCCH message should be sent in the same MCCH modification period where the change notification is sent.** |

Based on the comments received towards proposals 7, 10 and 11 from [1] in sections 3 and 4, as well based on further comments received during the discussion on RAN2 reflector, the following updated proposals are brought forward for discussion and agreement:

**Proposal 7’: UE in RRC IDLE/INACTIVE should be able to monitor/read both MCCH channel and SI/Paging without BWP switch. It is up to RAN1 to decide how this is ensured.**

**Proposal 10’: It is up to RAN1 to to decide about the RNTI and DCI format used for MCCH change notifications.**

**Proposal 11’: RAN2 will discuss and down-select from the following two options for the UE to get aware of session stop/modification:**

* **Reading MCCH once per each MCCH modification period when receiving an ongoing broadcast session**
* **DCI used for MCCH notification indicates the change of an ongoing broadcast session**

**RAN1 should be informed about those options considered by RAN2 and, consider it for DCI design for MCCH notification and provide feedback, as necessary.**

The draft of the LS to RAN1 is provided by the rapporteur in a separate document.

# References

1. R2-2103909, Report of e-mail discussion: [Post113-e][053][MBS17] MCCH scheduling and MCCH change notification (Huawei)
2. R2-2103706, LS on delivery mode 2 transmission *(draft)*, CMCC
3. R2-2104509, Report of e-mail discussion: [Post113-e][053][MBS17] MCCH scheduling and MCCH change notification (Huawei)