**3GPP TSG RAN WG1 #104-e R1-200XXXX**

**e-Meeting, January 25th – February 5th, 2021**

**Agenda item: 8.12.3**

**Source:** Moderator (BBC)

**Title:** Summary # 2 on RAN basic functions for broadcast/multicast for UEs in RRC\_IDLE/ RRC\_INACTIVE states

**Document for:** Discussion and Decision

# Introduction

RAN1#104-e is the second meeting that discusses the AI 8.12.3 on Basic functions for broadcast/multicast for RRC\_IDLE/ RRC\_INACTIVE UEs. The information of the email thread on this topic and the check points on the discussion provided by RAN1 Chairman is shown below:

[104-e-NR-MBS-03] Email discussion/approval on basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs with checkpoints for agreements on Jan-28, Feb-02, Feb-05 – David (BBC)

A summary of the analysis and key issues identified from the technical inputs to this meeting to AI 8.12.3 can be found in R1-2101721 ([Inbox](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Inbox/R1-2101721.zip)).

Section 2 includes an initial proposal of High Priority issues for discussion at RAN1#104-e. Section 3 includes an initial proposal on Medium Priority issues for discussion at RAN1#104-e. Each Issue includes Initial FL proposals where companies are welcomed to provide their inputs.

Please use the “Navigation Pane” of Word to quickly find the proposals and the different rounds of discussions in this document.

Section 4 will include any agreements reached from the discussions.

# Discussion on High Priority Issues

## Issue 1: MBS Common Frequency Resource: relation to the Initial BWP

### **Initial FL proposals for Issue 1**

**Proposal 1**: For RRC\_IDLE/RRC\_INACTIVE UEs, the defined/configured common frequency resource for group-common PDCCH/PDSCH contains the initial BWP and has the same SCS and CP as the initial BWP.

**Proposal 2**: For RRC\_IDLE/RRC\_INACTIVE UEs, the initial BWP contains the defined/configured common frequency resource for group-common PDCCH/PDSCH.

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | Fine with proposal 1 and proposal 2. |
| ZTE | We support proposal 1 from the perspective of providing sufficient capacity for multicast transmission.  Regarding Proposal 2, we didn’t see a strong need to support a common frequency resource smaller than initial BWP. Could the proponents clarify the necessity. |
| LG | We are fine with Proposal 1. We also wonder if we have a strong need for Proposal 2. |
| Lenovo, Motorola Mobility | We are OK with Proposal 1 and Proposal 2. We think whether the initial DL BWP contains the common frequency resource or vice versa is dependent on gNB configuration. |
| CATT | Support proposal 1, and also OK with proposal 2.  Either for proposal 1 or proposal 2, the common frequency resource for IDLE/INACTIVE UEs are configured by network based on different scenarios/QoS requirements. When HD video services are transmitted, large common frequency resource for broadcast is needed. When the band requirement is narrow, a small common frequency resource can be confined within the initial BWP. Even a smaller common frequency resource is configured within the initial BWP, a UE has to support initial BWP anyway. So from our understanding, either proposal 1 or 2 is up to gNB configuration. |
| Apple | We are ok with proposal 1. We are not clear the motivation of proposal 2. |
| NOKIA | Agree with the above two proposals by FL |
| Huawei, HiSilicon | Ok with proposal 1 but not clear why proposal 2 is needed. |

## Issue 2: Number of MBS Common Frequency Resources

### **Initial FL proposal for Issue 2**

**Proposal 3**: For RRC\_IDLE/RRC\_INACTIVE UEs, one common frequency resource for group-common PDCCH/PDSCH can be defined/configured.

* FFS: whether to define/configure more than one common frequency resources
* FFS: if more than one common frequency resource are configured, either the common frequency resource can be fully confined within the initial BWP and other configured common frequency resources, or the common frequency resource can be configured to contain the entire initial BWP and other common frequency resources**.**

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | We are not sure about the motivation of configuring multiple common frequency resources, because the multiple broadcast services are common for all Idle/inactive UEs in the cell, gNB can configure a proper bandwidth of one common frequency resource to transmit multiple group-common PDCCHs/PDSCHs. |
| ZTE | We are ok with the main bullet.  For IDLE/INACTIVE UEs, it seems not necessary to support more than one common frequency resource. But for connected UEs, it can be further studied. |
| LG | We are fine with this proposal. |
| Lenovo, Motorola Mobility | We think at most one common frequency resource for IDLE/Inactive UEs for receiving multicast. So we propose to add “at most” in the main bullet and delete the two sub-bullets. |
| CATT | Only support the main bullet.  For the two FFS sub-bullets, the motivation and benefit is not clear to configure more than one common frequency resources. Furthermore, if needed, a larger common frequency resource instead of multiple common frequency resources can be configured for UEs. |
| Apple | We are ok with the main bullet. |
| NOKIA | Agree with FL’s proposal.  Besides, we could like to add the third bullet point in below:   * FFS: if more than one common frequency resources (CFR) are configured, mechanism on support of multiple CFRs, i.e. CFR switching, changing indication, etc. |
| Huawei, HiSilicon | We don’t see the need for multiple common frequency resources for IDLE/INACTIVE UE. |

## Issue 3: Configuration/Definition of MBS Common Frequency Resources

### **Initial FL proposals for Issue 3**

**Proposal 4**: For RRC\_IDLE/RRC\_INACTIVE UEs, for the case that the common frequency resource for group-common PDCCH/PDSCH is larger than the Initial BWP (if supported), define a MBS specific BWP.

* FFS: details on start PRB, length PRB and reuse of SILV indication mechanisms.

**Proposal 5**: For RRC\_IDLE/RRC\_INACTIVE Ues, for the case that the Initial BWP contains the common frequency resource for group-common PDCCH/PDSCH (if supported), configure a MBS frequency resource within the Initial BWP.

* FFS: details on start PRB, length PRB and reuse of SILV indication mechanisms.

Please provide your company’s views and comments in the table below:

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| --- | --- |
| **company** | **comments** |
| CMCC | Not support proposal 4 and 5.  We think a general definition for common frequency resource is enough, regardless the common frequency resource is larger or smaller than initial BWP, e.g.,  For RRC\_IDLE/RRC\_INACTIVE Ues, configure a MBS frequency resource larger than (if supported) or within (if supported) the Initial BWP  ~~for the case that the common frequency resource for group-common PDCCH/PDSCH is larger than the Initial BWP (if supported), define a MBS specific BWP.~~   * FFS: details on start PRB, length PRB and reuse of SILV indication mechanisms.   In addition, whether adopt option 2A (MBS specific BWP) or option 2B (MBS resource region) for RRC\_CONNECTED Ues are still under discussion in AI 8.12.1, we can defer this issue after the process of RRC\_CONNECTED Ues. |
| ZTE | We agree with proposal 4. And the same method for BWP configuration can be reused for configuring MBS specific BWP. |
| LG | We are fine with Proposal 4. MBS specific BWP can be configured by SIB (or MCCH). |
| Lenovo, Motorola Mobility | We are OK to delay this discussion after we have agreement on the relationship between initial DL BWP and common frequency resource. |
| CATT | Not support proposal 4.  For proposal 5, it can be supported and up to gNB configuration. |
| Apple | we can discuss these proposals after MBS BWP or common frequency region is determined for RRC\_CONNECTED UE. |
| NOKIA | Agree with the FL’s proposal |
| Huawei, HiSilicon | Whether call it MBS specific BWP can wait and see the progress in AI 8.12.1. We primarily think about the case that common frequency resource if configured contains the initial BWP. |

## Issue 4: CORESET configuration for group-common PDCCH/PDSCH

### **Initial FL proposals for Issue 4**

**Proposal 6**: For RRC\_IDLE/RRC\_INACTIVE UEs, network can configure the common CORESET configured by RRC signalling *commonControlResourceSet* for group-common PDCCH/PDSCH if the common frequency resource is the initial BWP and a CORESET is not configured.

**Proposal 7**: For RRC\_IDLE/RRC\_INACTIVE UEs, multiple CORESETs can be configured for the defined/configured common frequency resource for group-common PDCCH/PDSCH.

* the same configured CORESET can be used to schedule MBS control information reception, broadcast, multicast and unicast.
* multiple CORESETs can be configured to independently schedule different MBS services and/or channels for control and traffic.
* FFS: definition of new RRC parameters to configure CORESET in a common frequency resource larger than Initial BWP (if supported).

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | Not support.  We are not sure the motivation to support multiple CORESETs to differentiate multiple MBS services and/or channels for control and traffic.  In addition, whether to support more than one CORESETs in addition to CORESET 0 is an optional capability of UE. For all IDLE/INACTIVE UEs in the cell, gNB can only configure one additional CORESET in addition to CORESET 0. Therefore, we think we can modify the proposal like this:  **Proposal 7**: For RRC\_IDLE/RRC\_INACTIVE UEs, at most one ~~multiple~~ CORESET~~s~~ can be configured for the defined/configured common frequency resource for group-common PDCCH/PDSCH in addition to CORESET 0.   * the same configured CORESET can be used to schedule MBS control information reception, broadcast, multicast and unicast. * ~~multiple CORESETs can be configured to independently schedule different MBS services and/or channels for control and traffic.~~ * FFS: definition of new RRC parameters to configure CORESET in a common frequency resource larger than Initial BWP (if supported). |
| ZTE | Support both proposal 6 and proposal 7. |
| LG | We are fine with Proposal 6 and 7. |
| Lenovo, Motorola Mobility | Proposal 6: generally fine with us.  Proposal 7: The motivation is not clear to us. We think one CORESET is enough for idle/inactive UEs. |
| CATT | Not supporting neither proposal 6 nor proposal 7.  We share the similar views form CMCC.  For Proposal 6, it has been agreed in last meeting that the 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.  For proposal 7, the motivation and benefit to configure multiple CORESETs is unclear. One common frequency with one CORESET (if configured) is enough for MBS services |
| Apple | We are ok with proposal 6. |
| NOKIA | We are fine with Proposal 6 and Proposal 7 |
| Huawei, HiSilicon | If the common resource is initial BWP, it is nature to use COREST0. In addition, one more CORESET can be configured, the configured CORESET can be used for scheduling broadcast, but sure why used for multicast and unicast? |

## Issue 5: Search Space (SS) for group-common PDCCH/PDSCH

### **Initial FL proposal for Issue 5**

**Proposal 8**: For RRC\_IDLE/RRC\_INACTIVE UEs, a new CSS type is defined for group-common PDCCH.

* FFS: monitoring priority with respect to existing CSS and USS.

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | Support. |
| ZTE | Fine with the proposal. |
| LG | We are fine with this proposal. |
| CATT | OK with this proposal.  We think either defines a new CSS for MBS or reuses the current CSS type is OK, as long as the priority of the MBS SS can be adjusted according to the MBS services. |
| Apple | We are ok with this proposal. |
| NOKIA | Agree with FL’s proposal |
| Huawei, HiSilicon | Thinking about the case that the same group-common PDCCH and the corresponding scheduled group-common PDSCH can be received by both RRC\_IDLE/RRC\_INACTIVE UEs and RRC\_CONNECTED UEs, it is better to discuss it later after seeing progress in AI 8.12.1 |

## Issue 6: Beam Sweeping for group-common PDCCH/PDSCH

### **Initial FL proposal for Issue 6**

**Proposal 9**: For RRC\_IDLE/RRC\_INACTIVE UEs, the UE may assume that group-common PDCCH/PDSCH is QCL’d with SSB if configured.

* UE monitoring occasions are associated with a subset of the total SSB indexes in a timing window.
  + FFS: definition details of timing window such as periodicity and offset
  + FFS: association rules between SSB indexes and UE monitoring occasions.
* for broadcast reception, full beam sweeping is supported.
* FFS: (re)use of RRC\_CONNECTED beam configuration for RRC\_IDLE/RRC\_INACTIVE UEs states.
* FFS: group-common PDCCH/PDSCH is QCL’d with TRS if configured.

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | As RAN2 agreement, IDLE/INACTIVE UE only support broadcast sessions, can moderator clarify whether the first sub-bullet is also used for broadcast reception or only for multicast reception?   * For Rel-17, R2 specifies two *modes*:   1: One *delivery mode* for high QoS (reliability, latency) requirement, to be available in CONNECTED (possibly the UE can switch to other states when there is no data reception TBD)  2: One *delivery mode* for “low” QoS requirement, where the UE can also receive data in INACTIVE/IDLE (details TBD).  R2 assumes (for R17) that delivery mode 1 is used only for multicast sessions.  R2 assumes that delivery mode 2 is used for broadcast sessions.  The applicability of delivery mode 2 to multicast sessions is FFS. |
| ZTE | We are fine with the proposal.  Regarding the first bullet, does “a subset of the total SSB indexes” refer to a subset of the SSB total index or a subset of the total transmitted SSBs? Our understanding is “a subset of the total transmitted SSBs”. Maybe we can clarify it. |
| LG | We are generally fine with this proposal. |
| Lenovo, Motorola Mobility | We are generally fine with this proposal. |
| CATT | OK with the main bullet of Proposal 9.  All the sub-bullets need further clarifications and discussions. |
| NOKIA | Could the FL clarify a bit about the below bullet point, what is the intention here?   * FFS: (re)use of RRC\_CONNECTED beam configuration for RRC\_IDLE/RRC\_INACTIVE UEs states. |

## Issue 7: HARQ feedback for RRC\_IDLE/RRC\_INACTIVE UE states

### **Initial FL proposal for Issue 7**

**Proposal 10**: For RRC\_IDLE/RRC\_INACTIVE UEs, study the potential support of HARQ feedback.

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | We prefer not support HARQ feedback for RRC\_IDLE/RRC\_INACTIVE UEs. |
| ZTE | We support to study HARQ-ACK feedback for RRC\_IDLE/RRC\_INACTIVE UEs. |
| LG | We are fine with NACK only based HARQ feedback from RRC\_IDLE/INACTIVE UEs for PTM scheme 1. But, we do not support ACK/NACK based HARQ feedback from RRC\_IDLE/INACTIVE UEs, regardless of whether UEs in RRC\_CONNECTED support ACK/NACK based HARQ feedback. |
| Lenovo, Motorola Mobility | We don’t support HARQ-ACK feedback for idle/inactive UEs. |
| CATT | At least for Rel-17 MBS, HARQ-ACK feedback is NOT supported/discussed for RRC\_IDLE/RRC\_INACTIVE UEs. |
| Apple | We don’t support HARQ-ACK feedback for idle/inactive UEs. |
| NOKIA | NO, it is out of the working scope of Rel17 MBS as stated in the WID |

# Discussion on Medium Priority Issues

## Issue 8: PDSCH repetition

### **Initial FL proposals for Issue 8**

**Proposal 11**: For RRC\_IDLE/RRC\_INACTIVE UEs, support slot-level repetition for group-common PDSCH.

* semi-static and dynamic slot-level repetition number configured by higher layer signalling.
* FFS: support of consecutive slot-level and RV-based time-interleaving for group-common PDSCH.

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | We can defer this issue after the process of AI 8.12.2. |
| LG | We are generally fine with this proposal. But, We are also OK to defer this issue until RAN1 makes some progress in AI 8.12.2. |
| Lenovo, Motorola Mobility | We agree to delay this discussion. |
| CATT | Support this proposal.  Slot-level repetition for group-common PDSCH can essentially enhance the reception performance |
| Apple | We agree to delay this discussion. |
| NOKIA | We would like to leave the first bullet point as FFS as shown in below:  **Proposal 11**: For RRC\_IDLE/RRC\_INACTIVE UEs, support slot-level repetition for group-common PDSCH.   * FFS: semi-static and dynamic slot-level repetition number configured by higher layer signalling. * FFS: support of consecutive slot-level and RV-based time-interleaving for group-common PDSCH. |

## Issue 9: PDSCH Semi Persistent Scheduling

### **Initial FL proposals for Issue 9**

**Proposal 12**: Support SPS group-common PDSCH for MBS for RRC\_IDLE/RRC\_INACTIVE UEs.

* FFS: whether to support more than one SPS group-common PDSCH configuration per UE

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | Support. |
| LG | We suggest to defer this issue until RAN1 makes some progress on MBS SPS for RRC\_CONNECTED UEs. |
| Lenovo, Motorola Mobility | We agree with LG’s proposal. |
| CATT | This proposal can be deferred for discussion in this AI.  The motivation/scenarios should be first discussed, as well as the potential benefit. |
| NOKIA | Agree with FL’s proposal |

## Issue 10: MBS Common Frequency Resource: relation with Unicast BWP

### **Initial FL proposals for Issue 10**

**Proposal 13**:for broadcast reception, the same group-common PDCCH and the corresponding scheduled group-common PDSCH can be received by both RRC\_IDLE/RRC\_INACTIVE UEs and RRC\_CONNECTED UEs when UE-specific active BWP of RRC\_CONNECTED UE contains the common frequency resource of RRC\_IDLE/INACTIVE UEs.

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | Support. |
| LG | We are fine with this proposal. We also think that the same group-common PDCCH and the corresponding scheduled group-common PDSCH can be received by both RRC\_IDLE/RRC\_INACTIVE UEs and RRC\_CONNECTED UEs depending on UE capability, when UE-specific active BWP of RRC\_CONNECTED UE does not contain the common frequency resource of RRC\_IDLE/INACTIVE UEs. |
| Lenovo, Motorola Mobility | We are OK with this proposal. |
| CATT | Support.  Another case that UE-specific active BWP of RRC\_CONNECTED UE does not contain the common frequency resource of RRC\_IDLE/INACTIVE UEs should also be considered. The corresponding scheme/solution should also be discussed. We would like to add an FFS as a sub-bullet under this proposal.  **Proposal 13**:for broadcast reception, the same group-common PDCCH and the corresponding scheduled group-common PDSCH can be received by both RRC\_IDLE/RRC\_INACTIVE UEs and RRC\_CONNECTED UEs when UE-specific active BWP of RRC\_CONNECTED UE contains the common frequency resource of RRC\_IDLE/INACTIVE UEs.   * FFS: the case when UE-specific active BWP of RRC\_CONNECTED UE does not contain the common frequency resource of RRC\_IDLE/INACTIVE UEs. |
| Apple | We are OK with this proposal. |
| NOKIA | We have below re-wording proposal:  **Proposal 13**:For broadcast reception, the same common frequency resource that carrying the group-common PDCCH and the corresponding scheduled group-common PDSCH can be received by both RRC\_IDLE/RRC\_INACTIVE UEs and RRC\_CONNECTED UEs. For RRC\_CONNECTED UEs, the common frequency resource can be confined within a configured dedicated BWP. |

## Issue 11: Multicast reception by UEs in IDLE/INACTIVE states

### **Initial FL proposals for Issue 11**

**Proposal 14**:For RRC\_IDLE/RRC\_INACTIVE UEs, Multicast reception with high QoS requirement (reliability, latency) is not supported for UEs in RRC\_IDLE/RRC\_INACTIVE states.

* FFS: multicast reception with low QoS requirement (reliability, latency) for For RRC\_IDLE/RRC\_INACTIVE UEs, subject to final RAN2 confirmation.

Please provide your company’s views and comments in the table below:

|  |  |
| --- | --- |
| **company** | **comments** |
| CMCC | We think this issue is up to RAN2’s decision, and is not necessary to discuss in RAN1. |
| LG | We are generally fine with this proposal. But, some level of QoS requirements (but not so high requirement) could be supported for RRC\_IDLE/RRC\_INACTIVE UEs, based on repetitions and NACK only based HARQ feedback. |
| Lenovo, Motorola Mobility | We agree with CMCC. |
| CATT | This issue can be discussed in RAN2 rather than RAN1. |
| Apple | Agree with CMCC. |
| NOKIA | Agree with FL’s proposal, and also agree with CMCC’s comment |

# Summary

# References

1. RP-201038 Revised Work Item on NR Multicast and Broadcast Services, Huawei, HiSilicon
2. R1-2100108 Discussion on basic Functions for Broadcast or Multicast for RRC\_IDLE or RRC\_INACTIVE UEs, ZTE
3. R1-2100146 Discussion on support for IDLE and INACTIVE state UEs, OPPO
4. R1-2100191 Discussion on multicast support for IDLE/INACTIVE UEs, Huawei, HiSilicon
5. R1-2100356 Discussion on basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs, CATT, CBN
6. R1-2100471 Discussion on basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE Ues, vivo
7. R1-2100512 Basic Functions for Broadcast / Multicast for RRC\_IDLE / RRC\_INACTIVE Ues, Nokia, Nokia Shanghai Bell
8. R1-2100615 Common frequency resource for NR PTM transmission, MediaTek Inc.
9. R1-2100676 NR-MBS for RRC\_IDLE/INACTIVE UEs, Intel Corporation
10. R1-2100770 Basic functions for broadcast/multicast in idle/inactive states, Lenovo, Motorola Mobility
11. R1-2100873 Considerations on MBS functions for RRC\_IDLE UEs, Sony
12. R1-2100908 Basic function for broadcast/multicast, LG Electronics
13. R1-2101065 Discussion on NR MBS in RRC\_IDLE/ RRC\_INACTIVE states, CMCC
14. R1-2101236 On basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs, Samsung
15. R1-2101361 Discussion on MBS for RRC\_IDLE/RRC\_INACTIVE UEs, Apple
16. R1-2101426 On NR multicast and broadcast for RRC\_IDLE/RRC\_INACTIVE UEs, Convida Wireless
17. R1-2101489 Views on group scheduling for Multicast RRC\_IDLE/INACTIVE UEs, Qualcomm Incorporated
18. R1-2101638 Basic functions for MBS for RRC\_IDLE/RRC\_INACTIVE UEs, CHENGDU TD TECH LTD.
19. R1-2101728 Support for NR multicast reception in RRC Inactive/Idle, Ericsson
20. R1-2009276 *Discussion on broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs*, Qualcomm Incorporated
21. R1-2009307 *Support for NR multicast reception in RRC Inactive/Idle*, Ericsson