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

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

**Agenda item: 8.12.3**

**Source:** Moderator (BBC)

**Title:** Feature lead 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.  |
| OPPO | We think some clarifications are firstly needed for the followings:* The meaning of “contain” is not unclear to us. Does this mean the configuration signalling of one contains the configuration of the other? Or is it meant to say overlapping in frequency (PRBs / subcarriers)? I tend to think the intention is the latter one.
* In proposal 2, the SCS and CP of the initial BWP and the common frequency resource do not need to be the same as in proposal 1?

We are wondering, does it matter if we have an agreement that one of them “contains” the other one. It can always be up to network configuration that the two always overlap in frequency PRB so that there is no / minimal switching delay between the two. And if they are overlapping, should they be always fully overlap or partially, due to RF BW retuning? |
| Sony | We are OK with proposal 1. |
| Ericsson | Proposal 1&2 are contradicting each other if they both need to apply at the same time. We think they could be merged in such a way that either the CFR contains the Initial BWP or the Initial BWP contains the CFR. |
| Qualcomm | Similar concern on Proposal 2. It may complicate the UE behaviour in IDLE/INACTIVE mode. We suggest merging the two proposals and changing the wording as:**Proposal 1**: For RRC\_IDLE/RRC\_INACTIVE UEs, the common frequency resource for group-common PDCCH/PDSCH can be configured to contain the initial BWP and have the same SCS and CP as the initial BWP.**-FFS:** the common frequency resource for group-common PDCCH/PDSCH can be configured to be within the initial BWP and have the same SCS and CP as the initial BWP. |
| vivo | Agree with proposal 1 and proposal 2 in principle. As agree with Ericsson’s comment, re-wording may be needed. |
| Moderator | Thank you all for the comments so far.@Nokia, Lenovo, CATT: there seems to be stronger support to agree at this point only to the common frequency resource for group-common PDCCH/PDSCH can be configured to contain the initial BWP and have the same SCS and CP as the initial BWP, while leaving FFS the case that the CFR is contained within the Initial BWP. Would this be acceptable?@ OPPO: You are right, the intention with the word “contain” is that the common frequency resource and the Initial BWP overlap in frequency.@Ericsson: would the wording proposed by Qualcomm be more consistent? |
| Intel | Wording from Qualcomm is preferable since the original proposals contradict each other. On the use of the CFR being smaller than the initial BWP is not clear. If a smaller BW is desired, that can be handled using FDRA rather than configuration of the CFR itself. Therefore, we don’t think the FFS is necessary pending further clarifications from proponents. |
| Lenovo, Motorola Mobility | @Moderator: it is fine with us.  |
| Samsung | Agree with E/// in that the two proposals contradict each other. What needs to be decided is whether the CFR can be larger than the initial BWP (no issue with the CFR being same/within the initial BWP – proposal 2 is a gNB configuration).  |
| Spreadtrum | Support in general, and agree with Ericsson’s comment. |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):**Before discussing the relation of the common frequency resource to the Initial BWP, we need to determine the bandwidth of the common frequency resource for MBS. With the bandwidth of the common frequency resource, we can further discuss the relation of it to the initial BWP.We think proposals 1 and 2 give two possible relations of the common frequency resource to the initial BWP.The bandwidth of the common frequency resource can be determined based on the bandwidth requirement of the MBS in the cell.If the bandwidth of the common frequency resource can be provided by the initial BWP, proposal 2 can be supported to configure the common frequency resource within the initial BWP.If the bandwidth of the common frequency resource can be NOT provided by the initial BWP, proposal 1 can be supported to make the common frequency resource [F1, F2] for MBS contain the initial BWP, where [0, F] is used to indicate the frequency range of the carrier, F is the bandwidth of the carrier, 0<=F1/F2<=F and [F1, F2] can just satisfy the MBS bandwidth requirement.**If (F2-F1)>Fmin, the following questions need to be discussed, where Fmin indicates the RF channel bandwidth of the UE with the lowest RF channel bandwidth capacity among all defined UE classes. For example, Fmin=100MHz, the carrier bandwidth is 400MHZ, and the MBS bandwidth requirement in the cell is 150MHz.**1. **Does (F2-F1)> Fmin exist?**
2. **If (F2-F1)>Fmin exists, how to solve such question?**

**Based on the above discussion, we suggest proposals 1 and 2 can be combined as below. We hope the questions in yellow can be further discussed.****Proposal 1**: For RRC\_IDLE/RRC\_INACTIVE UEs, the defined/configured common frequency resource for group-common PDCCH/PDSCH can be contained by the initial DL BWP or contains the initial BWP with the same SCS and CP as the initial BWP. |
| CATT | @ Moderator: We are OK with it. |
| MTK | We are fine with proposal 2. E///’s comments can be acceptable. |
| NOKIA | @Moderator: To help better progress of the discussion, we are fine to leave FFS the case that the CFR is contained within the initial BWP. |
| Convida | We are ok with proposal 1 and proposal 2. |
| Ericsson | Regarding Proposal 1/2:In legacy NR, a UE receives everything within an active BWP. As the common frequency resource (CFR) is defined for RRC Connected, it is correspondingly always contained within a BWP: In 2A the CFR is the MBS BWP and in 2B the CFR is within the unicast BWP. Our understanding is consequently that reception for Idle/Inactive is also always done within a BWP, either a configured BWP (which with 2A may be an MBS BWP) or the initial BWP. Proposal 1 (original and QC update) is therefore not OK since reception is then not done within a BWP. We propose instead:**Proposal 1x**: For RRC\_IDLE/RRC\_INACTIVE UEs, the common frequency resource for group-common PDCCH/PDSCH is always configured within a BWP (or is identical with this in case of MBS BWP). This may be a configured BWP or the initial BWP.The configured BWP needs to contain the initial BWP and have the same SCS and CP as the initial BWP. With no configured BWP, the CFR may be configured within the Initial BWP.Note: The frequency window of the UE would match the configured BWP. Without BWP switching, the UE can then also receive the initial BWP and any configured frequency resource within the configured BWP. As a special case the configured BWP and the initial BWP are the same. |
| Moderator | Thank you all for the useful discussion.Based on the comments there is a strong support that the common frequency resource (CFR) for group-common PDCCH/PDSCH can have a larger frequency range than the range of the initial BWP and the CFR also contains (overlaps in frequency) with the Initial BWP.There has also been a discussion around the usefulness of **Proposal 2**. Since the configuration of a CFR within the Initial BWP may be up to the gNB implementation. **I think it would be helpful if companies can disagree if this is not a correct understanding.**I think the latest comments from Ericsson are also useful and I think may bring us closer to a consensus. In my understanding we would like to enable the following options for reception of group-common PDCCH/PDSCH for idle/inactive UEs:* the active BWP for idle/inactive UEs can be:
	+ initial BWP (as per agreement in RAN1#103e)
	+ a configured BWP (that name as MBS BWP is still under discussion)
		- the MBS BWP contains the initial BWP (completely overlaps in frequency with the initial BWP) and has the same SCS and CP as the initial BWP
* the configured common frequency resource for group-common PDCCH/PDSCH can be
	+ the active BWP
	+ a frequency region within the initial BWP (this may be FFS)

**Is this a common understanding?** Therefore, the moderator proposes the following revision to Proposal 1 (**Proposal 1-rev1**) using Ericsson’s wording as baseline with some editing and also including FFS to accommodate Qualcomm’s concern.**Proposal 1-rev1**: For RRC\_IDLE/RRC\_INACTIVE UEs, the common frequency resource (CFR) for group-common PDCCH/PDSCH is always configured within a BWP:* The BWP may be a configured BWP, in which case the CFR is identical to the BWP.
	+ The configured BWP needs to contain (and can be larger) than the initial BWP and have the same SCS and CP as the initial BWP.
	+ Note: The frequency window of the UE would match the configured BWP. Without BWP switching, the UE can then also receive the initial BWP and any configured frequency resource within the configured BWP.
* The BWP may be the initial BWP. In this case, the CFR is the initial BWP.
	+ FFS CFR can also be configured within the initial BWP.
 |

### **Second round FL proposals for Issue 1**

**Proposal 1-rev1**: For RRC\_IDLE/RRC\_INACTIVE UEs, the common frequency resource (CFR) for group-common PDCCH/PDSCH is always configured within a BWP:

* The BWP may be a configured BWP, in which case the CFR is identical to the BWP.
	+ The configured BWP needs to contain (and can be larger) than the initial BWP and have the same SCS and CP as the initial BWP.
	+ Note: The frequency window of the UE would match the configured BWP. Without BWP switching, the UE can then also receive the initial BWP and any configured frequency resource within the configured BWP.
* The BWP may be the initial BWP. In this case, the CFR is the initial BWP.
	+ FFS CFR can also be configured within the initial BWP.

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

|  |  |
| --- | --- |
| **company** | **comments** |
| ZTE | We support the updated proposal.Based on our understanding, the configuration of a CFR within the Initial BWP is up to the gNB implementation. Besides, if we are going to configure a common frequency resource larger than the initial BWP, the only way is to make it as an MBS BWP. Otherwise, the UE behaviours of allowing UE to receive outside the active BWP is not clear to us. |
| LG | We are generally fine with the updated proposal. We can also consider the following small update:* *The configured BWP needs to contain (and can be larger~~)~~ than) the initial BWP and have the same SCS and CP as the initial BWP.*
 |
| Lenovo, Motorola Mobility | We are OK with this proposal. |
| NOKIA | We fully agree with Ericsson’s earlier comment. And please find NOKIA’s re-wording proposal accordingly:**Proposal 1-rev1**: For RRC\_IDLE/RRC\_INACTIVE UEs, the common frequency resource (CFR) for group-common PDCCH/PDSCH is always configured within a BWP:* The BWP may be a configured BWP, in which case the CFR is identical to the BWP.
	+ The configured BWP needs to contain ~~(and can be larger) than~~ the initial BWP and have the same SCS and CP as the initial BWP.
	+ Note: The frequency window of the UE would match the configured BWP. Without BWP switching, the UE can then also receive the initial BWP and any configured frequency resource within the configured BWP.
* The BWP may be the initial BWP. In this case, the CFR ~~is~~ can be identical to the initial BWP as agreed default case.
	+ ~~FFS:~~ CFR can also be configured within the initial BWP.

Regarding the benefit and usefulness of the case “initial BWP contains the CFR or CFR configured within the initial BWP”, as we have stated in our Tdoc R1-2100512, 5G NR may need to support diverse broadcast services, some of the broadcast services may require in-frequent large payload to be transmitted, and some others may require frequent small broadcast payload to be transmitted. Therefore, different broadcast services can be configured with different DRX pattern in-time, as well as it can be configured with different CFR applied in-frequency, where the frequent monitoring of small payload broadcast services can be performed with CFR of even narrower bandwidth than initial BWP and that could provide even better power saving purpose for the frequent monitoring and reception idle/inactive UE.@Moderator: Based on the earlier feedback from each company. We see quite some companies (CMCC, Lenovo, CATT, NOKIA, MTK, Convida, as well as Ericsson) support the case of “CFR can be configured within the initial BWP”. Therefore, we proposal to delete the FFS as shown in above re-wording proposal. |
| Spreadtrum | We are OK with this proposal. |
| OPPO | The revised proposal 1 looks reasonable and we are fine with it. One small update suggestion along the line of moderator’s comment:The configured BWP needs to contain (and can be larger) than the initial BWP (overlap in frequency) and have the same SCS and CP as the initial BWP. |
| CATT | The direction of this proposal is reasonable, but further clarification is needed.* If the CFR is a MBS specific BWP, a UE may have to be configured/containing two independent but overlapped BWPs (initial BWP and MBS BWP in IDLE). How to avoid BWP switching here is not clear. The current issue is similar with the discussion in RRC\_CONNECTED UEs of Option 2A for MBS specific BWP. If the design are similar, then there should be no BWP switching observed for connected UEs and IDLE UEs. However, the switching issue is still uncertain.
 |
| Huawei, HiSilicon | We firstly want to clarify the real meaning by “initial BWP”. Since SIB1 can configure an initial downlink BWP which can be large up to the bandwidth of the carrier, which if is the initial BWP we are talking about, how could the CFR be larger than this initial BWP?So when we say contain or larger than initial BWP, for which we actually mean the bandwidth of CORESET0 spanning the initial BWP. In addition, last meeting has agreed initial BWP as the fault CFR, why is the second bullet needed? Therefore, I would suggest the proposal goes like: **Proposal 1-rev1**: For RRC\_IDLE/RRC\_INACTIVE UEs,* UE can be configured with a larger initial BWP than CORESET0 in SIB1 as the CFR for group-common PDCCH/PDSCH.
* CORESET0 spanning initial BWP if a larger initial BWP is not configured in SIB1 is used for the CFR for group-common PDCCH/PDSCH.
* FFS whether the CFR can be configured within the CORESET0 spanning initial BWP.
 |
| Ericsson | We think that a CFR configured within a BWP may be equal to or smaller than the BWP, at least for a configured BWP. In Option 2B the CFR is not a BWP so cannot be identical to the configured BWP but may share the same frequency range. We propose thus the following reformulation:**(E/// Updated) Proposal 1-rev1**: For RRC\_IDLE/RRC\_INACTIVE UEs, the common frequency resource (CFR) for group-common PDCCH/PDSCH is always configured within a BWP:* The BWP may be an RRC configured BWP, in which case the CFR may have the same size or be smaller than the configured BWP
	+ The RRC configured BWP needs to contain (and can be larger) than the initial BWP and have the same SCS and CP as the initial BWP.
	+ Note: The frequency window of the UE would match the configured BWP. Without BWP switching, the UE can then also receive the initial BWP and any configured frequency resource within the configured BWP.
* The BWP may be the initial BWP. In this case, the CFR can be configured to have the same size as the initial BWP.
	+ FFS CFR can be smaller than the initial BWP.
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## 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.  |
| OPPO | Since all common frequency resources (if multiple) need to overlap with the initial BWP, likely they will have the same SCS and CP length. As such, we don’t see the value of having more than one CFR to carry more than one service. |
| Ericsson |  |
| Qualcomm | Some examples for more than MBS CFR:* UEs may have different bandwidth capabilities, such as RedCap UEs. In this sense, if at most one MBS CFR is allowed, it may be too limited.
* The MBS CFR for control and data could be different. The UEs can camp on a smaller MBS CFR to monitor the control and go to a wider MBS CFR to receive the data for power saving.
 |
| vivo | Support the main bullet. For the FFS part, we are not clear with the motivations but are open to keep it as FFS. |
| Intel  | OK with the main bullet and only the first FFS. The second seems dependent on discussion in Issue 1. We also do not think multiple MBS CFR is required. Corner cases for RedCap UEs supporting MBS are not enough justify the complexity of all UEs specially when only low QoS broadcast reception only is allowed.  |
| Samsung | Support the proposal |
| Spreadtrum | Support the proposal |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):**We agree with proposal 3.But we think the number of the MBS common frequency resources is related to the MBS bandwidth requirement in the cell. Specifically the FFS items are related to the MBS bandwidth requirement in the cell.If the bandwidth is small, the MBS common frequency resource is within the initial BWP. One common frequency resource is OK.If the MBS bandwidth provided by the frequency range [F1, F2] with F2-F1<=Fmin is not enough to satisfy the MBS bandwidth requirement, one or several extra common frequency resources outside [F1, F2] shall be configured. |
| MTK | Support the main bullet. It’s no clear motivation to support multiple common frequency resource. |
| Convida  | We are OK with the proposal.  |
| Moderator | Thank you for the discussion.I think there is strong support to the main bullet of Proposal 3 (For RRC\_IDLE/RRC\_INACTIVE UEs, one common frequency resource for group-common PDCCH/PDSCH can be defined/configured.)However, whether to support more than one CFR there is no consensus and the opinion is quite divided. There are at least 7 companies that are fine with the proposal and the FFS on multiple CFRs. Since whether to define/configure more than one CFRs is an FFS and there are multiple companies that are interested in this feature, the moderator would propose to leave the FFS to give the opportunity for companies to defend their position at next meetings. I would remove the second FFS to leave the more than one CFR more general. Therefore, the moderator proposes the following **revision to Proposal 3**. **Proposal 3-rev1**: 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
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### **Second round FL proposals for Issue 2**

**Proposal 3-rev1**: 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

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

|  |  |
| --- | --- |
| **company** | **comments** |
| ZTE | We support the updated proposal. |
| LG | We are fine with the updated proposal. |
| Lenovo, Motorola Mobility | We are OK with this proposal. |
| NOKIA | Fine with us |
| Spreadtrum | Support. |
| OPPO | We are fine for now to keep FFS for more than one CFR. |
| CATT | Only support the main bullet. |
| Ericsson | We agree |

## 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:

|  |  |
| --- | --- |
| **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.  |
| OPPO | As commented for proposal 1 and 2, they should be clarified first, because both proposal 4 and 5 look like they are dealing with RRC configuration signalling. Furthermore, if both proposals are adopted, it seems like we have two different configuration mechanisms for the CFR. |
| Ericsson | We agree with P4&5 |
| Qualcomm | We support Proposal 4 and leave Proposal 5 FFS (due to similar concern for Proposal 2). |
| vivo | Not support the proposal 4. CMCC’s update is fine to us. |
| Moderator | Thank you for the comments.@CMCC: thank you for the wording but I think the proposed wording would only reiterate the following agreement at RAN1#103-e: Agreements: For RRC\_IDLE/RRC\_INACTIVE UEs, define/configure common frequency resource(s) for group-common PDCCH/PDSCH.@Huawei/HiSilicon: thank you for comment. I would like to ask a question for clarification (thanks!). If the common frequency resource is larger than the initial BWP, would the only option be to use a dedicated BPW since it would not be possible to confiture a frequency resource with respect to the initial BWP? @ OPPO: You are right, the intention with the word “contain” is that the common frequency resource and the Initial BWP overlap in frequency. |
| Intel | A common MBS frequency region configuration can be defined in lieu of an initial BWP with only the configurations necessary for reception of the MBS data which can address the concern of MBS frequency region being wider than initial BWP. The configuration of the frequency region can be enabled through SIB. Additionally, the design agreed for RRC\_CONNECTED UEs in 8.12.1 can be re-used here with necessary modifications w.r.t to initial BWP. This would ensure common design between idle and connected UEs.  |
| Samsung | Proposals 4 and 5 need to be considered together with Proposals 1 and 2.Support proposal 5 (gNB configuration), FFS for proposal 4. |
| Spreadtrum | Support proposal 4, and agree with CMCC that a general configuration for common frequency resource should be defined. |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):**The configuration/definition of the MBS common frequency resources is related to the MBS bandwidth. As we suggested for issue 1, the relation of the common frequency resource to the initial BWP has three cases and correspondingly there are three configurations. Proposals 4 and 5 provide two configurations.We think these two proposals can be combined as below.**Proposal 4**: For RRC\_IDLE/RRC\_INACTIVE UEs, for the case that the common frequency resource for group-common PDCCH/PDSCH contains the Initial BWP (if supported) or within the initial BWP (if supported), define a MBS specific BWP where the MBS specific BWP is not a real BWP if this MBS BWP is within the initial BWP.* FFS: details on start PRB, length PRB and reuse of SILV indication mechanisms.

**The third configuration for (F2-F1)>Fmin needs to be discussed.****We suggest the third configuration is done as below.****If (F2-F1)>Fmin (such case exists and needs to be solved), configure one common frequency resource [F3, F4] with F4-F3<=Fmin and containing the initial BWP, and then configure one or several common frequency resources outside [F3, F4] to support the MBS. The total valid bandwidth of all the common frequency resources is equal to the bandwidth requirement of the MBS.** **Each common frequency resource outside [F3, F4] acts as the initial BWP, which means that RRC\_IDLE/RRC\_INACTIVE UE can receive the MBS on the common frequency with no influence on camping on the cell ( Each common frequency resource outside [F3, F4] provides the same SI and paging information just as the initial BWP).**  |
| MTK | Support proposal 5, NOT support proposal 4. |
| Convida  | For proposal 4, we support the main bullet. For the sub-bullet, we suggest to reword it as ‘FFS the configuration details’ since using the start PRB, length PRB is one potential solution on configuring the MBS specific BWP, other solutions should not be precluded and should be also studied and considered. For proposal 5, we are OK the main bullet. Regarding the sub-bullet, same comment for proposal 4 applies to proposal 5. Other solutions should not be precluded and should be also considered. |
| Ericsson | We have the following comment on the CMCC’s change proposal of Proposal 4:In line with our comment about BWPs (P1/2), we think it is not possible to have the common frequency resource larger than the initial BWP, unless the CFR is contained within another larger BWP.The principle must be that reception always occurs within a BWP. The CFR may be part of this BWP. |
| Moderator | Thank you for the discussion.The discussion on this Issue 3 is related with the discussion on Issue 1, but I think it would be good to continue the discussion to check that we build a common understanding of the issues.Regarding whether a common definition for CFR can be used regardless of whether the CFR is larger or smaller than the initial BWP: it has been clarified that if the CFR is larger than the initial BWP we cannot rely on the frequency resource of the initial BWP to define it. **Therefore, the only option would be to configure a BWP**, which would have a larger frequency domain resource allocation. **Could we please confirm this is a common understanding by the different companies?**The motivation to have Proposals 4 (or modified version) is to be clear that in the case of CFR larger than initial BWP, we need to rely on defining a BWP and we cannot rely on configuring a frequency region with reference to the initial BWP .The motivation to have Proposal 5 (or a modified version) is to force that if the CFR is smaller than the initial BWP, a dedicated BWP is not defined but instead a frequency region within the initial BWP is used, since seems to be more efficient use of the BWP configuration.This probably needs more discussion, but I propose the following **revisions to Proposal 4 and Proposal 5** to check the opinions of the group while trying to accommodate concerns raised above. I would also be helpful if companies can provide their opinions on the questions and arguments above.**Proposal 4-rev1**: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), a dedicated BWP is configured.* FFS: configuration details.

**Proposal 5-rev1**:Study forRRC\_IDLE/RRC\_INACTIVE UEs, for the case that the Initial BWP contains the common frequency resource for group-common PDCCH/PDSCH (if supported), the common frequency resource can be configured as a frequency resource within the Initial BWP. |
| Ericsson | As stated elsewhere, Proposals 4&5 need in general to be harmonized with Proposal 1.We agree with **Proposal 4-rev1**Regarding **Proposal 5-rev1** we also agree but wish to point out that there is an overlap between Proposal 1-rev1 and Proposal 5-rev1, which both cover the aspect of configuring the CFR as a subset of the Initial BWP. |

### **Second round FL proposals for Issue 3**

**Proposal 4-rev1**: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), a dedicated BWP is configured.

* FFS: configuration details.

**Proposal 5-rev1**:Study forRRC\_IDLE/RRC\_INACTIVE UEs, for the case that the Initial BWP contains the common frequency resource for group-common PDCCH/PDSCH (if supported), the common frequency resource can be configured as a frequency resource within the Initial BWP.

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

|  |  |
| --- | --- |
| **company** | **comments** |
| ZTE | We support the updated FL proposal 4-rev1 and proposal 5-rev1.In our view, if the CFR is larger than the initial BWP we cannot rely on the frequency resource of the initial BWP to define it. Therefore, the only option would be to configure a BWP, which would have a larger frequency domain resource allocation. |
| LG | We are generally fine with the updated proposals. We could further clarify that the BWP dedicated to MBS, not UE, as follows:***Proposal 4-rev1****:**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), a MBS dedicated BWP is configured.* |
| Lenovo, Motorola Mobility | Generally, we are OK with **Proposal 4-rev1 and Proposal 5-rev1**.A small modification from our side is added to **Proposal 4-rev1:****Proposal 4-rev1**: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), a dedicated BWP which contains the common frequency resource is configured.* FFS: configuration details.
 |
| NOKIA | Agree with the FL’s proposal |
| Spreadtrum | We are generally fine with the updated proposals. Since Proposal 4-rev1 is to configure a dedicated MBS BWP, while Proposal 5-rev1 is to configure a common frequency resource within initial BWP, we think a similar *FFS(e.g. FFS: configuration details*.) should be added to Proposal 5-rev1 |
| OPPO | We are also generally fine with the revisions. Again, the suggestion is to clarify the word “contains” means overlap in frequency. |
| CATT | We still have concerns to configure MBS specific BWP for IDLE UEs.Proposal 4 can be further discussed. |
| Huawei, HiSilicon | Not ok with proposal 4-rev1, same comment as to issue 1. We think the initial BWP needs to be clarified, and at this moment I don’t think a dedicated BWP for broadcast. Since proposal 5-rev1 main bullet says study for, should be ok in general, however, similar comment to issue 1 which should be solved at first.  |

## 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? |
| OPPO | Not sure if proposal 6 is needed. And we share the same view as CMCC on proposal 7. |
| Ericsson | We agree with P6&7 |
| Qualcomm | Similar concerns as Huawei |
| vivo | Not support.We have no discussions on whether support multiple MBS services for UE in idle/inactive state which should be discuss first. |
| Intel  | Proposal 6: Not sure if this is needed. If initial BWP is used and CORESET is not configured, CORESET#0 is the default.Proposal 7: Do not support current wordingNot clear why multiple CORESETs are required for scheduling MBS for RRC\_IDLE UEs where only low QoS mode delivery is supported. Multicast and Unicast need not be mentioned in this context. Additionally, have we agreed that RRC\_IDLE UEs can receive multiple MBS services? |
| Samsung | OK for proposal 7 (minus unicast). No need for proposal 6. |
| Spreadtrum | We are fine with Proposal 6 and 7. |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):****We think the proposals 6 and 7 can be combined as below.****Proposal 6**: For RRC\_IDLE/RRC\_INACTIVE UEs, multiple CORESETs can be configured for the defined/configured common frequency resource for group-common PDCCH/PDSCH.* the configured CORESETs can be used to carry the PDCCH for the MBS control information and the PDCCH for the unicast service.
* FFS: detailed signalling for configuring CORESET(s) in a common frequency resource.
 |
| MTK | We have the similar view with CATT. |
| Convida | We are OK with proposal 6 and 7. |
| Moderator | Thank you for your contributions.There is no consensus on whether more than one coreset can be configured so more discussion is needed. I think at this moment the biggest disagreement is on whether multiple coresets can be configured. I would be convenient to discuss this aspect.While there are multiple companies that agree with defining multiple coresets, there are also companies that do not support it mainly for two reasons. First, they do not see a clear motivation and secondly it is argued that the configuration of multiple coresets is up to UE capability. However, from R1-2100189, it is clarified that *the number of CORESETs per BWP is limited to 5 (including common and UE-specific CORESETs) in Rel-16*. Then the questions, based on this understanding, whether companies would like to have the flexibility to use some of the total configurable coresets for the group-common PDCCH in idle/inactive UEs. **Could companies check this is a correct understanding?**Regarding Proposal 6, the views are quite divided. One option would be to leave it as study for companies to come back at next meetings with more discussion.This probably needs more discussion, but I propose the following **revisions to Proposal 6 and Proposal 7** to check the opinions of the group while trying to accommodate concerns raised above. I would also be helpful if companies can provide their opinions on the questions and arguments above.**Proposal 6-rev1**:Study for RRC\_IDLE/RRC\_INACTIVE UEs, whether 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-rev1**:For RRC\_IDLE/RRC\_INACTIVE UEs, multiple CORESETs can be configured for the defined/configured common frequency resource for group-common PDCCH/PDSCH.* FFS: the same configured CORESET can be used to schedule MBS control information reception, broadcast, multicast.
* FFS: 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).
 |

### **Second round FL proposals for Issue 4**

**Proposal 6-rev1**:Study for RRC\_IDLE/RRC\_INACTIVE UEs, whether 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-rev1**:For RRC\_IDLE/RRC\_INACTIVE UEs, multiple CORESETs can be configured for the defined/configured common frequency resource for group-common PDCCH/PDSCH.

* FFS: the same configured CORESET can be used to schedule MBS control information reception, broadcast, multicast.
* FFS: 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** |
| ZTE | Although we prefer the previous Proposal 6, we are ok with the updated proposal 6-rev1 and proposal 7-rev1. |
| LG | We are fine with the updated proposals. |
| NOKIA | To our view, the CORESET configuration may relate to the MBS CFR discussion in Issue 1, and therefore we have the following revising proposal:For the case that the Initial BWP as default CFR, (as agreed from last RAN1-103-e meeting)* For RRC\_IDLE/RRC\_INACTIVE UEs, an additional CORESET configured via legacy *commonControlResourceSet* can be also utilized for the defined/configured common frequency resource for group-common PDCCH/PDSCH in addition to CORESET 0.
	+ - the configured CORESET can be used to schedule MBS control information reception of broadcast (FFS: for multicast and unicast).

For the case that the common frequency resource for group-common PDCCH/PDSCH is larger than the Initial BWP (if supported), i.e. MBS BWP, * Either to configure a single CORESET, or to configure more than one CORESETs where with some CORESET(s) corresponding to the overlapped region with initial BWP

For the case that the Initial BWP contains the common frequency resource for group-common PDCCH/PDSCH (if supported)* FFS: whether to introduce a new narrower CORESET for narrower CFR specifically
 |
| Spreadtrum | We are fine with the updated proposals. |
| OPPO | We are fine to study proposal 6-rev1 further. For proposal 7-rev1, to us it is not about UE capability issue but rather the purpose. A UE is capable of up to 5 CORSETs does not mean it needs to use to its full capability. |
| Ericsson | We agree with Proposal 6-rev1 and Proposal 7-rev1 |
| Huawei, HiSilicon | We are not ok with proposal 7-rev1, because multiple CORESETS needs clarification whether one of them is CORESET0 regardless the initial BWP is a larger or CORESET0 bandwidth and how many multiple means.1st FFS I guess people are thinking about the CORESETS that are used for scheduling IDLE/Inactive UEs for broadcast and connected UE for multicast. I would say it is up to NW configuration. If NW would like to do it, then do it. What we should discuss or the discussion we should focus on is what spec is needed for scheduling IDLE/INACTIVE UEs. From this point, I don’t think we need this FFS. Again, similar comment to initial BWP in the 3rd FFS.  |

## 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 |
| OPPO | OK |
| Ericsson | We think it must first be clarified why a new CSS type is needed. |
| Qualcomm | Ok with the proposal |
| vivo | Support the main bullet. One question for the sub-bullet, since there is no overbooking for UE in idle/inactive state, could clarify what’s the motivation to discuss the monitoring priority issue? |
| Intel | The outcome from 8.12.1 on this issue can be re-used. While a distinct RNTI may be assumed for IDLE/INACTIVE UEs, a new search space set distinct from the search space set for RRC\_CONNECTED UEs supporting MBS is not required. |
| Samsung | No need for a new CSS-type. It would also be good to define what “new” CSS-type is. |
| Spreadtrum | Fine with the proposal. |
| TD Tech, Chengdu TD Tech | **We agree with proposal 8.** |
| MTK | As Intel commented, we can reuse the AI 8.12.1’s discussion outcome. |
| Convida | OK with the proposal  |
| Moderator | Thank you for comments.There is strong support for Proposal 8, but there are some companies that require more clarification.Regarding motivation to define a new CSS the following text from R1-2101065 is useful: “*CSS is agreed to be used for group-common PDCCH for RRC\_IDLE/RRC\_INACTIVE UEs. Because RRC\_CONNECTED UEs can receive the same group-common PDCCH and the corresponding scheduled group-common PDSCH for broadcast service with RRC\_IDLE/RRC\_INACTIVE UEs, the same CSS is used for all three RRC states.**As the discussion in our contribution [2], PDCCH overbooking rule should be considered in the discussion of CSS types for broadcast group-common PDCCH. For RRC\_IDLE/RRC\_INACTIVE UEs, only CSS can be monitored, and gNB can guarantee the monitored CSS PDCCHs not beyond the BD/CCEs limit. For RRC\_CONNECTED UEs, all configured CSS PDCCHs are counted into the monitored BD/CCEs and the left BD/CCEs capability are used for USS in Rel-15/16. However, it’s up to UE to receive Rel-17 broadcast services or not, that is UE may not receive some configured broadcast service CSS PDCCHs. If current CSS type is reused for broadcast group-common PDCCH and the same PDCCH overbooking rule is re-used for RRC\_CONNECTED UEs, the non-monitored BD/CCEs are occupied by these non-received broadcast group-common PDCCHs, which causing the reduction of USS scheduling opportunity.**Therefore, a new CSS type can be defined for broadcast group-common PDCCH, which can be monitored both by RRC\_IDLE/RRC\_INACTIVE UEs and RRC\_CONNECTED UEs. The monitoring priority of new type broadcast CSS is lower than legacy CSS and the non-monitored broadcast CSS group-common PDCCHs are not counted into the monitored BD/CCEs for RRC\_CONNECTED UEs.* ”There are also comments regarding reusing the solutions being discussed at RRC\_CONNECTED. I have therefore **modified Proposal 8** including an FFS to try to accommodate this.**Proposal 8-rev1**: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.
* FFS: alignment and/or reuse with solutions supported for RRC\_CONNECTED
 |

### **Second round FL proposals for Issue 5**

**Proposal 8-rev1**: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.
* FFS: alignment and/or reuse with solutions supported for RRC\_CONNECTED

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

|  |  |
| --- | --- |
| **company** | **comments** |
| ZTE | Support the proposal. |
| LG | We are fine with this updated proposal. |
| NOKIA | Agree with FL’s proposal |
| Spreadtrum | Support.  |
| OPPO | We are fine as well. |
| CATT | OK with the proposals. |
| Ericsson | We agree with a new CSS type for broadcast.Regarding multicast, we suggest keeping CSS type (existing and/or new) FFS, pending RAN2 decisions. |
| Huawei, HiSilicon | From UEs in IDLE/INACTIVE, why should the monitoring priority with respect to USS be discussed in the 1st FFS because UE in IDLE/INACTIVE only monitors CSS anyway.  |

## 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.
 |
| OPPO | We share the same view as CATT. |
| Sony | We are OK with the main bullet of the proposal 9. |
| Ericsson | We cannot agree to this Proposal now, since we think there are several issues to discuss first. For beam sweeping of multicast it must be ensured that Idle/Inactive UEs have the same monitoring occasions as connected UEs, to allow reception of the same transmission. We also question the use of beam sweeping for broadcast. Also the assumed QCL between SSB and PDCCH/PDSCH needs further discussion. |
| Qualcomm | Since multicast for IDLE/INACTIVE is FFS in RAN2, we should focus on broadcast beam sweeping for RAN1 discussion. |
| vivo | Agree with QC’s view. |
| Moderator | Thank you for comments and discussion.@CMCC, the first sub-bullet (“UE monitoring occasions are associated with…”) was intended for broadcast transmissions. This could be clarified in a new wording.@ZTE: in my understanding what has been proposed in the tdocs is that in a window the gNB would perform a full beam sweeping where each SSB index is associated with one spatial direction. A UE does not need to monitor all SSB indexes (i.e. directions) but only needs to monitor a subset of the SSB indexes, which would save power. Is this correct? please provide a better wording if you think adequate.@Nokia: this FFS is to accommodate tdoc inputs from Ericsson and Sony where the beam management procedures that allow UEs to negotiate beam assignment with the gNB would still be available for reception even when the UE is transition from connected to idle/inactive.  |
| Intel | This proposal needs further discussion. We can be ok with the main bullet, but the sub-bullets need further discussion. This issue can be discussed after other details are finalized.  |
| Samsung | The proposal should be further discussed. It is unclear what new UE behaviour is proposed. The following statement from the WID should also be kept in mind*Restrictions and assumptions:**FR2: we assume that there are no issues to provide Multicast / Broadcast transmissions in FR2. If any enhancements is needed it should be treated with lower priority compared to the minimum set of objectives above.*  |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):**For RRC\_IDLE/RRC\_INACTIVE UEs, only full beam sweeping can be used because gNB doesn’t know which UE is receiving the MBS. Therefore, proposal 9 can be updated as below.**Proposal 9**: For RRC\_IDLE/RRC\_INACTIVE UEs, the UE may assume that full beam sweeping is used for group-common PDCCH/PDSCH.* FFS：detailed full beam sweeping
	+ FFS: periodicity, offset, duration of the full beam sweeping

FFS: the relation between the monitoring occasions and the beams for group common PDSCH/PDCCH. |
| NOKIA | @Moderator: Many thanks for the clarification, we share the same above view as CATT and QC. |
| Convida | We share the same view as CATT and OPPO.  |
| Moderator | Thank you for comments.The first bullet seems to have wide support from various companies, but the sub-bullets need more discussion. Multiple companies have mentioned that more discussion is needed. It would be helpful to provide more specific comments so we can discuss in more detail specific aspects – thank you!I also think that given the current RAN2 agreements that confirm that idle/inactive UEs support broadcast reception where multicast reception is FFS, I propose that **we focus on broadcast reception** as raised by various companies in this round of discussion.Based on the comments and discussion above, I propose a **slight revision to proposal 9** with additional wording from TD Tech, Chengdu TD Tech. However, we need more discussion, please share your ideas on what aspects you think we should find consensus.**Proposal 9-rev1**:For RRC\_IDLE/RRC\_INACTIVE UEs, for broadcast reception, 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.
* FFS: the UE may assume full beam sweeping
* 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.
 |
| Ericsson | We cannot agree to this Proposal now, since we think there are several issues to discuss first. It should be possible to configure one operation mode of IDLE/INACTIVE broadcast reception so that the same PDCCH/PDSCH can be received as by UEs in RRC-Connected. The monitoring occasions in this mode follow DRX configuration for RRC connected UEs.In addition to such operation mode, we agree to an operation mode for IDLE/INACTIVE broadcast reception where monitoring occasions are defined differently from the DRX configuration for RRC-Connected UEs. For such additional mode, the FL proposal could be agreeable.For beam sweeping of multicast it must be ensured that Idle/Inactive UEs have the same monitoring occasions as connected UEs, to allow reception of the same transmission. |

### **Second round FL proposals for Issue 6**

**Proposal 9-rev1**:For RRC\_IDLE/RRC\_INACTIVE UEs, for broadcast reception, 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.
* FFS: the UE may assume full beam sweeping
* 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** |
| ZTE | Thanks moderator for the updated proposal. We support the proposal in principle.We understand the intention of the first bullet is to say that UE doesn’t need to monitor all the monitoring occasions within a timing window. Instead, UE may only need to monitor a subset of the MOs. Thus, we have a minor update on the first bullet. If this is the correct understanding, then we support this proposal. |
| LG | We are fine with the updated proposal. |
| NOKIA | For simplicity, we prefer to limit the discussion scope regarding beam sweeping for RRC\_Idle/Inactive state UEs. Therefore we have the following revising proposal:**Proposal 9-rev1**:For RRC\_IDLE/RRC\_INACTIVE UEs, for broadcast reception, 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.
* ~~FFS: the UE may assume full beam sweeping~~ 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.~~
 |
| Spreadtrum | Support.  |
| OPPO | Our preference is to agree on the main bullet only. There was also a question on the meaning of “subset of the total SSB indexes in a timing window”. And since the details of timing window is unclear, it is too earlier to agree on there will be a subset. The first subset also needs to be study further. |
| CATT | OK with the proposals. |
| Huawei, HiSilicon | General ok with the main bullets. 1st FFS: Could you clarify what “full beam sweeping” means? It does not seem the term normally used in the spec. The second FFS: I would comment the beam sweep framework for IDLE/INACTIVE can be considered to be reused for CONNECTED instead of the other way around because beam sweeping is more justified for IDLE/INACTIVE UEs. |

## 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 |
| OPPO | Share the same view as LG. |
| Ericsson | We disagree. It is difficult to see how e.g. Timing Advance could be maintained.Subject to RAN2 agreement, UEs in RRC Idle/Inactive should be able to receive the same multicast transmissions as UEs in RRC Connected. This includes reception of HARQ retransmissions triggered by other UEs. This needs to be harmonized with agreed solutions for RRC Connected |
| Qualcomm | HARQ-ACK feedback for IDLE/INACTIVE UEs are not in the scope of Rel17 WID. |
| vivo | Not support. We don’t support HARQ-ACK feedback for idle/inactive UEs. |
| Intel | We can only support NACK-only HARQ feedback not ACK/NACK based HARQ feedback. The proposal should be modified to study the case of NACK-only.  |
| Samsung | No need, not in scope. |
| Spreadtrum | Not support HARQ-ACK feedback for idle/inactive UEs. |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):**We suggest to support the HARQ-ACK feedback for the MBS for RRC\_IDLE/RRC\_INACTIVE UEs with the shared PUCCH resource(s).In detail, both the ACK/NACK feedback with the shared PUCCH resources and the NACK-ONLY feedback with the unique shared PUCCH resource can be used.For the ACK/NACK feedback with the shared PUCCH resources, CBG (code block group) based feedback can be used, where the shared PUCCH resources consist of (2^C-1 or 2^C) PUCCH sequences and C is the number of the code groups of a TB. In each beam coverage, when UEs in the beam coverage are located far away from the cell edge, the code group based feedback has the better resource efficiency. We hope such CBG based feedback can be supported for the flexible scheduling for the retransmission. |
| MTK | Not support. |
| Moderator | Thank you for comments.I think there is significant opposition to studying the potential support of HARQ feedback in idle/inactive UEs. Various companies have raised concerns that this would not be in the scope of the work item. Therefore, I propose that this feature is not supported in Rel-17.Just to make clear that we are not discarding the possibility of receiving HARQ retransmissions (without any UL from idle/inactive UEs), and to align to the wording in the WI, I make the **following revision to Proposal 10**:**Proposal 10-rev1**:RRC\_IDLE/RRC\_INACTIVE UEs do not support UL feedback to improve reliability of Broadcast/Multicast services in Rel-17. |

### **Second round FL proposals for Issue 7**

**Proposal 10-rev1**:RRC\_IDLE/RRC\_INACTIVE UEs do not support UL feedback to improve reliability of Broadcast/Multicast services in Rel-17.

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

|  |  |
| --- | --- |
| **company** | **comments** |
| ZTE | We feel that it is not needed to have an agreement or conclusion to preclude something for MBS. If companies have strong concern on supporting HARQ-ACK for RRC\_IDLE/RRC\_INACTIVE UEs, the discussion can stop here but we don’t feel we need an agreements/conclusion for this. |
| LG | We think that we can postpone this decision until separate discussion on NACK only HARQ feedback becomes stable. We could simply check whether NACK only HARQ feedback can be supported by RRC\_IDLE/RRC\_INACTIVE UEs without significant impact, later. |
| Lenovo, Motorola Mobility | We support this proposal. |
| NOKIA | Fully agree |
| Spreadtrum | Support.  |
| OPPO | Same view as LGE.  |
| CATT | Support this proposal. |
| Ericsson | We agree |

# 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.
 |
| OPPO | We also prefer to defer this discussion. |
| Ericsson | Subject to RAN2 agreement, UEs in RRC Idle/Inactive should be able to receive the same multicast transmissions as UEs in RRC Connected. This includes PDSCH repetition. This needs to be harmonized with agreed solutions for RRC Connected. |
| Qualcomm | No need to delay the main bullet. We are fine with Nokia’s suggestion.  |
| vivo | We agree to delay this discussion. |
| Intel | Solution to be agreed in 8.12.1 should be used with appropriate changes to configuration. Can be delayed till after agreements in 8.12.1 |
| ZTE | We are supportive of the main bullet. Regarding the first sub-bullet, we can make it as FFS for now as we are not clear how UE can be dynamically indicated with the repetition number. |
| Samsung | Can be deprioritized.  |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):**We agree with the main branch of proposal 11. We think the sub-branches need clarifying:1. What does “dynamic slot-level repetition number configured by higher layer signalling”mean? Dynamic slot-level repetition number can be realized with higher layer signalling?

What does “ slot-level an RV based timeleaving” mean?  |

## 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 |
| OPPO | Agree with LG. |
| Ericsson | Subject to RAN2 agreement, UEs in RRC Idle/Inactive should be able to receive the same multicast transmissions as UEs in RRC Connected. This includes SPS repetition. This needs to be harmonized with agreed solutions for RRC Connected. |
| Qualcomm | Need further study.  |
| vivo | One question is how/whether to support to activate/deactivate the SPS group-common PDSCH for MBS for RRC\_IDLE/RRC\_INACTIVE UEsWe prefer to delay this discussion. |
| Intel  | OK to support. Can defer till solution for CONNECTED mode UEs is finalized.  |
| ZTE | We support this proposal. |
| Samsung | Need further study for RRC\_IDLE/INACTIVE UEs. Can focus on more critical issues first. |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):**We agree with proposal 12. |

## 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. |
| OPPO | I think we are fine with the intention, but same as before, the meaning of “contain” should be clarified. |
| Ericsson | We agree |
| Qualcomm | Agree |
| vivo | Ok in principle. |
| Intel  | Ok  |
| ZTE | Support the proposal. |
| Samsung | What is the specification impact in order to agree to the proposal? It seems to be a gNB implementation issue.  |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):**We agree with the proposal. |

## 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 |
| OPPO | Agree with CMCC. |
| Ericsson | We disagree. The terminology of “high QoS” and “low QoS” should not be used and in any case should not be associated with multicast reception in different RRC states. Depending on network implementation, high QoS may also be achieved in Inactive/Idle.Subject to RAN2 agreement, UEs in RRC Idle/Inactive should be able to receive the same multicast transmissions as UEs in RRC Connected. This needs to be harmonized with agreed solutions for RRC Connected. |
| Qualcomm | Fine to leave it in RAN2.The intention is to focus the discussion of broadcast reception in RAN1 now. |
| vivo | Agree with CMCC. |
| Intel  | This is up to RAN2 and need not be discussed in RAN1. |
| ZTE | Maybe it is better to leave this to RAN2. |
| Samsung | Can revisit after RAN2 progress. |
| TD Tech, Chengdu TD Tech | **Our comments (TD Tech &Chengdu TD Tech):**We agree with the proposal. |

1. Proposals for potential discussion on GTW on 28 January

This are potential Proposals for discussion on the GTW on the 28 January 2021 for AI 8.12.3:

**Proposal 3-rev1**: 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

**Proposal 10-rev1**:RRC\_IDLE/RRC\_INACTIVE UEs do not support UL feedback to improve reliability of Broadcast/Multicast services in Rel-17.

**Proposal 8-rev1**: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.
* FFS: alignment and/or reuse with solutions supported for RRC\_CONNECTED

# 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