**3GPP TSG RAN WG1 #103-e R1-200XXXX**

**e-Meeting, October 26th – November 13th, 2020**

**Agenda item: 8.12.3**

**Source:** Moderator (BBC)

**Title:** Summary # 3 on RAN basic functions for broadcast/multicast for UEs in RRC\_IDLE/ RRC\_INACTIVE states

**Document for:** Discussion and Decision

# Introduction

RAN1#103-e is the first 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:

[103-e-NR-MBS-03] Email discussion/approval for basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs– David (BBC)

* 1st check point: 11/5
* 2nd check point: 11/10
* 3rd check point: 11/12

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 R1-2009465 ([Inbox](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_103-e/Inbox/R1-2009465.zip)).

The discussion on prioritisation of issues to be discussed at RAN1#103-e, with the most recent proposals, can be found in R1-2009553 ([Inbox](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_103-e/Inbox/R1-2009553.zip)).

Section 2 includes (most stable) high priority issues for discussion at RAN1#103-e. For each issue the analysis from R1-2009465 is included from convenience. Each Issue includes Initial FL proposals where companies are welcomed to provide their inputs.

Section 3 includes (most stable) medium priority issues for discussion at RAN1#103-e, only after 2nd check point. For each issue the analysis from R1-2009465 is included from convenience.

Please use the “Navigation Pane” 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: Group scheduling for UEs in RRC\_IDLE/ RRC\_INACTIVE states

This issue has been discussed/mentioned in 7 tdocs (8 companies). At RAN1#102-e it was agreed that for RRC\_CONNECTED UEs, at least support group-common PDCCH with CRC scrambled by a common RNTI to schedule a group-common PDSCH, where the scrambling of the group-common PDSCH is based on the same common RNTI. This issue addresses group scheduling for UEs in RRC\_IDLE/ RRC\_INACTIVE states.

In particular:

* In [3, Chengdu TD Tech Ltd] for periodic scheduling, it proposed to support that the PDCCH with CRC scrambled with SPS G-RNTI is used to activate/de-activate the SPS PDSCH resource. For dynamic scheduling, it is proposed to support that the PDCCH with CRC scrambled with G-RNTI is transmitted with the allocated PDCCH resource and the PDSCH with G-RNTI used in the bit scrambling is transmitted with the allocated PDSCH resource.
* [6, CMCC] proposes the support of group-common PDCCH based group scheduling for RRC\_IDLE/ RRC\_INACTIVE UEs for MBS service reception.
* In [7, LGE] group scheduling of MBS data is discussed. Here it is discussed that a UE should be provided one or more search space sets in which the UE monitors PDCCH candidates to detect DCI with Group RNTI.
* In [8, Samsung] it is proposed that high layer signalling delivers CORESET for multicast and group-specific RNTI.
* In [12, Lenovo, MotoM] it is proposed to support a group-common DCI to schedule a group-common PDSCH for MBS for Idle/Inactive UEs.
* [13, Intel] proposes that RRC\_IDLE/INACTIVE UEs can be configured with a common MBS frequency resource and MBS CORESET within the common frequency resource by SIB where it can monitor the group common PDCCH within a CSS.
* In [16, Ericsson] it is observed that for Idle/Inactive UEs to receive the RRC Connected multicast transmission they need to reuse the RRC connected configuration, e.g. using the same G-RNTI. UEs in Idle/Inactive mode could use this to monitor the G-RNTI-based PDCCH and get the scheduling of the G-RNTI-based PDSCH, using the same processing as Connected UEs.

In the contributions above, the 7 inputs (8 companies) propose and/or discuss the support of group-common PDCCH based group scheduling for UEs in RRC\_IDLE/RRC\_INACTIVE sates.

Based on the above the FL makes the following proposal:

### **Initial FL proposal for Issue 1**

**Proposal 1:** For RRC\_IDLE/RRC\_INACTIVE UEs, support group-common PDCCH with CRC scrambled by a common RNTI to schedule a group-common PDSCH, where the scrambling of the group-common PDSCH is based on the same common RNTI.

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

|  |  |
| --- | --- |
| **company** | **comments** |
| (**Included by FL from Phase 1 discussions**)Nokia | (**Included by FL from Phase 1 discussions**)* Proposal 1: For RRC\_IDLE/RRC\_INACTIVE UEs, support group-common PDCCH with CRC scrambled by a common RNTI to schedule a group-common PDSCH, where the scrambling of the group-common PDSCH is based on the same common RNTI.
* FFS: Whether a group-common PDSCH can be configured to be used by both idle and connected mode UEs simultaneously?
 |
| (**Included by FL from Phase 1 discussions**)Ericsson | (**Included by FL from Phase 1 discussions**)Regarding Issue 1 it would be good to clarify if the Idle/Inactive UEs may use the same G-RNTI as the one used by RRC connected UEs or a different G-RNTI. As we propose in our RAN1 contribution R1- 2009307 it should be possible to use the same transmission for UEs in all RRC states, provided they are configured in RRC Connected (this is to better support exceptional cases in RRC Connected with congestion).As also others have mentioned, we wish to point out that there is a dependency with the RAN2 about this topic. |
| Samsung | Support Proposal 1 above. |

## Issue 3: Broadcast support by UEs in RRC\_IDLE/RRC\_INACTIVE state

This issue has been discussed/mentioned in 5 tdocs (7 companies). The inputs argue whether both multicast and broadcast type of services should supported/considered for UEs in RRC\_IDLE/RRC\_INACTIVE states.

In particular:

* [5, CATT, CBN] proposes that it is necessary for RRC\_IDLE/RRC\_INACTIVE UEs to receive MBS services in NR at least for broadcast service.
* In [11, Nokia, NSB] first discusses that supporting broadcast only in RRC\_IDLE/INACTIVE mode or support multicast only in RRC\_CONNECTED mode may simplify the specification work on RAN2 design a lot by considering the limited working timeframe in Rel-17 MBS. Based on this in [11] it is observed that it is still not clear whether there is the need to support both broadcast and multicast services in RRC\_IDLE/INACTIVE mode.
* In [14, Convida] two proposal are done. The first proposal supports using broadcast to deliver PTM transmission in RRC\_INACTIVE state and in RRC\_IDLE, while the second proposes that further study is needed to evaluate the benefits of using multicast to deliver PTM transmission in RRC\_INACTIVE state and in RRC\_IDLE state.
* [15, Qualcomm] makes two proposals. For the first proposal, multicast reception with high reliable QoS requirement is not supported for UEs in RRC\_IDLE/RRC\_INACTIVE states. For the second proposal, broadcast reception with no specific QoS requirement can be supported for UEs in RRC\_IDLE/INACTIVE/CONNECTED states.
* [16, Ericsson] proposes to study the reception of the same multicast service by UEs in all RRC states for the case when UEs have first been configured in RRC Connected.

In the inputs above for UEs in RRC\_IDLE/ RRC\_INACTIVE states: there are 3 inputs (4 companies) that support broadcast reception, there is 1 input (1 company) that proposes that multicast reception is not supported, and there are 3 inputs (3 companies) that either ask whether multicast reception is needed or propose that further studies are done for the reception of multicast.

Based on the above the FL makes the following initial proposals.

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

**Proposal 3**: broadcast service reception can be supported for UEs in RRC\_IDLE/INACTIVE/CONNECTED states.

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

|  |  |
| --- | --- |
| **company** | **comments** |
| Samsung | Support Proposal 3 above. |

## Issue 4: MBS frequency resources of UEs in RRC\_IDLE/ RRC\_INACTIVE states

This issue has been discussed in 14 tdocs (17 companies). This issue addresses the MBS frequency resource for UEs in RRC\_IDLE/ RRC\_INACTIVE states.

In particular:

* [2, Huawei, HiSilicon] proposes that for broadcast (SIB and/or MCCH) based mechanism, the frequency resource of MBS for UE in RRC\_IDLE/ RRC\_INACTIVE states can be the initial BWP or configured via SIB or MCCH.
* In [3, Chengdu TD Tech Ltd] it is first proposed that the frequency range [F1, F2] with the initial DL BWP contained can be set to provide the MBS for II-UEs (II-UEs stand for UEs in RRC\_IDLE/ RRC\_INACTIVE states). The frequency range [F1, F2] can be divided into several II-UE BWPs to lower the power consumption of II-UEs with each II-UE BWP containing the initial DL BWP. [13] also proposes that one or several secondary II-UE BWPs can be configured outside the frequency range [F1, F2] to meet the bandwidth requirement for MBS for II-UE. Each secondary II-UE BWP can not only provide the MBS for II-UEs, but they can also act as the initial DL BWP.
* [4, VIVO] proposes for MBS transmission bandwidth part, the following cases are supported for Rel-17 MBS. Case 1: The MBS transmission is included within the initial BWP. Case 2: The initial BWP is included within the MBS transmission bandwidth.
* [5, CATT, CBN] states that for RRC\_IDLE/RRC\_INACTIVE UEs, the CORESET#0 or the initial BWP can be configured into the mixed BWP. [5] also suggests that each UE should only support one common frequency resource to simplify the operation.
* [6, CMCC] discusses that if Rel-17 MBS service provided for RRC\_IDLE/RRC\_INACTIVE UE(s) is still in initial BWP, the bandwidth may be not enough, especially considering SSB, CORESET 0 and PDSCH associated with SI-RNTI have occupied many resources of initial BWP. Therefore, [6] proposes to further study whether to support a larger BWP used for MBS service reception for RRC\_IDLE/RRC\_INACTIVE UEs.
* In [7, LGE] it is proposed to support MBS transmission/reception based on a new MBS specific BWP as well as the initial/active BWP.
* [8, Samsung] discusses that to allow enough resources for multicast, larger bandwidth is allocated for multicast BWP. Not to have BWP switching between multicast BWP and initial BWP, it is better to have CORESET#0 included in multicast BWP. [8] makes the proposal that a separate BWP is configured for multicast.
* [10, ZTE] proposes that NR MBS supports configuring a MBS-specific DL BWP for MBS transmission for RRC\_IDLE/INACTIVE UEs via SIBx or multicast control information (e.g., carried on MCCH).
* [11, Nokia, NSB] first proposes to discuss if there is enough capacity for SC-MCCH in the initial BWP for RRC\_IDLE/INACTIVE UEs. [11] also observes that for avoiding BWP switching, the SC-MTCH (i.e. group common PDSCH) and SC-MCCH shall be provided in the same BWP. The final proposal in [11] is to discuss how to support BWP operation for RRC\_IDLE/INACTIVE UEs.
* [12, Lenovo, MotoM] first proposes that the group-common DCI is transmitted in CORESET 0 and the group-common PDSCH for MBS is transmitted within initial DL BWP. [12] further provides details on RB numbering and the payload size of frequency domain resource assignment (FDRA) indicator in the DCI.
* [13, Intel] proposes that RRC\_IDLE/INACTIVE UEs can be configured with a common MBS frequency resource and MBS CORESET within the common frequency resource by SIB where it can monitor the group common PDCCH within a CSS.
* [14, Convida] states that in unicast scenario, the initial BWP is used in RRC idle/inactive to support paging delivery, system information delivery, etc. However, if we further consider supporting MBS, the initial BWP may be not enough anymore. Therefore [14] proposes that enhancements on BWP operation are needed to support MBS for UEs in RRC\_IDLE/RRC\_INACTIVE states.
* [15, Qualcomm] proposes that the broadcast BWP can be same as initial BWP by default. FFS more than one Broadcast BWP and/or different Broadcast BWP for MCCH/MTCH(s).
* In [16, Ericsson] it first observed that in RRC Idle/Inactive the UE is required to monitor signalling, such as SIB1 and paging, in the initial BWP. [16] also observes that to avoid BWP switching in RRC Idle/Inactive, when receiving MBS, an RRC Idle/Inactive UE may be configured with a single BWP. Finally, [16] also observes that when an RRC Idle/Inactive UE is configured with a second BWP (may be same as for unicast), different from the initial BWP, and the initial BWP is a subset of that second BWP, the UE may both receive MBS data and monitor the initial BWP signaling without BWP switching.

In the inputs above regarding the common frequency resource to receive MBS data for UEs in RRC\_IDLE/ RRC\_INACTIVE states: 7 inputs (10 companies) support that it can be the initial BWP, 8 inputs (9 companies) support to define a specific MBS BWP, 4 inputs (4 companies) discuss that a specific BWP containing the initial BWP can avoid BWP switching, while 3 inputs (4 companies) propose/suggest to study enhancements to the initial BWP.

Based on the above the FL makes the following initial proposals.

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

**Proposal 5:** for RRC\_IDLE/RRC\_INACTIVE UEs, the initial BWP can be the default common frequency resource to receive MBS data.

* FFS: one/more MBS specific BWPs where to avoid BWP switching the MBS specific BWP(s) can contain the initial BWP.

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

|  |  |
| --- | --- |
| **company** | **comments** |
| (**Included by FL from Phase 1 discussions**)**Nokia** | **(Included by FL from Phase 1 discussions**)* For RRC\_IDLE/RRC\_INACTIVE UEs, if the initial BWP is considered as the default common frequency resource to receive MBS data, discuss whether there is enough capacity in initial BWP to contain MBS related MCCH and/or MTCH traffic
* If there is NOT enough capacity in initial BWP for RRC\_IDLE/INACTIVE UEs identified
	+ FFS: How to handle the issue, i.e. one/more MBS specific BWPs where to avoid BWP switching the MBS specific BWP(s) can contain the initial BWP.
 |
| (**Included by FL from Phase 1 discussions**)**Intel**  | **(Included by FL from Phase 1 discussions**)On issue 4, there can be some dependence on the discussion for RRC\_CONNECTED mode UEs i.e., if BWP framework is reused or a so-called MBS frequency region (as discussed in R1-2009000) can be defined which requires lesser configuration than BWP. In this case, the RRC\_IDLE/INACTIVE UEs may not be confined to only the initial active BWP and can be switched to the common MBS frequency resource via SIB. Furthermore, we tend to agree with the observation from Nokia above, that there may be need for wide BW compared to initial BWP. But the flexibility of switching by configuration can be left up to the network. Additionally, based on the common frequency resource design for RRC\_CONNECTED UEs, it may be possible to have similar design for the IDLE/INACTIVE case as well. Therefore, we prefer the following wording:* Proposal 5: for RRC\_IDLE/RRC\_INACTIVE UEs, the initial BWP can be the default common frequency resource to receive MBS data.
	+ FFS: one/more MBS specific common frequency resource(s) can be configured which may or may not contain the initial BWP.
	+ FFS: configuration details of common frequency resource when it is different from initial BWP
 |
| Samsung | It seems that what “default” means should be clarified. Also, we suggest to change “MBS data” to “PDSCH for MBS”. |

## Issue 6: Beam sweeping for UEs in RRC\_IDLE/ RRC\_INACTIVE states

This issue has been discussed in 8 tdocs (10 companies). This issue address beam sweeping mechanisms for MBS for UEs in RRC\_IDLE/ RRC\_INACTIVE states.

In particular:

* [2, Huawei, HiSilicon] discusses that beam sweeping mechanism is widely used for common channel transmissions in NR, such as SSB, SI and paging, in order to guarantee the coverage requirement. For example, one paging occasion contains multiple sub-occasions each linked with corresponding SSB index, so a UE only needs to monitor a subset of the sub-occasions for paging. [2] proposes that beam sweeping mechanism and the corresponding monitoring behaviour for multicast scheduling should be considered.
* [3, Chengdu TD Tech Ltd] proposes that the beams for transmitting the SS/PBCH Block are used to transmit the PTM bearer.
* In [4, VIVO] proposes that the MBS PDCCH monitoring occasion is associated with SSB and that the UE is only required to monitor the MBS PDCCH monitoring occasion associated with at least one SSB.
* [5, CATT, CBN] first proposes that multi-beam operation is supported for Rel-17 MBS transmission. [5] also proposes that for saving the frequency resource, the indications of PTP/PTM mode can be based on per-SSB.
* [6, CMCC] proposes that the association between SSB indexes and monitoring occasions for group-common PDCCH scheduling MBS PDSCH can be defined to support beam sweeping in RRC\_IDLE/RRC\_INACTIVE states.
* [10, ZTE] observes that for Rel-15 paging mechanism different UEs are separated into different POs, while for Rel-15 SIBx mechanism different SI messages are separated into different SI-windows. [10] compares paging and SIBx mechanisms and based on their analysis, the SIBx mechanism is more appropriate to Rel-17 broadcast. Hence, [10] proposes to consider beam sweeping mechanism for NR Rel-15 SIBx transmission as the starting point for Rel-17 broadcast.
* [14, Convida] proposes that beam sweeping mechanism can be considered for supporting MBS for UEs in RRC\_IDLE/RRC\_INACTIVE states. The details can be for further study.
* [15, Qualcomm] proposes that the UE may assume that PDCCH/PDSCH for MCCH is QCL’d with SSB or TRS if configured in SIB for broadcast reception.

In the inputs above for UEs in RRC\_IDLE/ RRC\_INACTIVE states: 8 inputs (10 companies) propose/consider the support of beam sweeping for MBS, 6 inputs (8 companies) discuss UE monitoring occasions are associated with a subset of the total SSB indexes, 1 input/company proposes that the UE monitoring and association is based on beam sweeping SIBx procedures, 1 input/company proposes that QCL assumptions based on SSB or TRS are configurable, and 1 input (2 companies) proposes that the PTP/PTM indications can be done per SSB.

Based on the above the FL makes the following initial proposals.

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

**Proposal 9**: for RRC\_IDLE/RRC\_INACTIVE UEs, beam sweeping is supported for Rel-17 MBS transmissions.

* FFS: UE monitoring occasions are associated with a subset of the total SSB indexes.
* FFS: UE monitoring and association is based on beam sweeping SIBx/paging procedures.
* FFS: QCL assumption based on SSB or TRS based on SIB configuration.
* FFS: PTP/PTM indications can be done per SSB.

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

|  |  |
| --- | --- |
| **company** | **comments** |
| Samsung | Before agreeing the proposal, can we clarify “MBS transmissions”? Does it include PDCCH for MBS or PDSCH for MBS or both? |

# Discussion on Medium Priority Issues (only after 2nd check point)

## Issue 7: PDCCH Search Space for UEs in RRC\_IDLE/ RRC\_INACTIVE states

This issue has been discussed in 5 tdocs (6 companies). This issue addresses initial aspects of the PDCCH common search spaces for UEs in RRC\_IDLE/ RRC\_INACTIVE states.

In particular:

* [2, Huawei, HiSilicon] discusses that control resource set (CORESET) and related common search space (CSS) set for multicast scheduling should be configured jointly or separately for MCCH and MTCH. If not, the default could be CORESET0 and Type0 CSS set.
* [4, vivo] proposes that the MBS-specific CORESET/searchingSpace can be configured.
* [6, CMCC] proposes that CSS is supported for group-common PDCCH monitoring in RRC\_IDLE/ RRC\_INACTIVE states. [6] also proposes that further study whether to define a new CSS type or reuse current CSS type.
* [7, LGE] proposes that assuming that RAN2 introduces a new MBMS SIB, if UE is interested to receive a MBS TB, UE monitors PDCCH for Type0A-PDCCH CSS set to detect a DCI with SI-RNTI and receive MBMS SIB on PDSCH for a serving frequency. [7] also proposes that assuming that RAN2 introduces a MCCH, if UE is interested to receive a MBS TB, UE monitors PDCCH for a PDCCH CSS set to detect a DCI with SC-RNTI and receive MCCH information on PDSCH where FFS on which type of PDCCH CSS set is used for MCCH, if supported. [7] also proposes to discuss whether to define a new type CSS set or a new MBS specific SS set (e.g. MSS) for group scheduling of MBS data.
* [15, Qualcomm] proposes that a new type of CSS is defined as the SS of PDCCH for MCCH, configured by SIB.

In the inputs above for UEs in RRC\_IDLE/ RRC\_INACTIVE states: 5 inputs (6 companies) support the definition/study of new CSS types, and 3 inputs (4 companies) discuss/propose to reuse existing CSS types.

Based on the above the FL makes the following initial proposals.

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

**Proposal 10**: for RRC\_IDLE/RRC\_INACTIVE UEs, CSS is supported for group-common PDCCH.

* FFS: reuse current CSS types and/or define a new CSS type.

## Issue 8: CORESET for UEs in RRC\_IDLE/ RRC\_INACTIVE states

This issue has been discussed in 7 tdocs (9 companies). This issue addresses whether new and/or existing control resource set (CORESET) are used for UEs in RRC\_IDLE/ RRC\_INACTIVE states.

In particular:

* [2, Huawei, HiSilicon] discusses that control resource set (CORESET) and related common search space (CSS) set for multicast scheduling should be configured jointly or separately for MCCH and MTCH. If not, the default could be CORESET0 and Type0 CSS set.
* [3, Chengdu TD Tech Ltd] proposes that at least one CORESET and SS group needs to be configured for each II-UE (II-UES stand for idle/inactive state UEs) BWP or each secondary II-UE BWP.
* [4, vivo] proposes that the MBS-specific CORESET/searchingSpace can be configured.
* [8, Samsung] proposes that high layer signalling also delivers CORESET for multicast and group-specific RNTI.
* [12, Lenovo, MotoM] proposes that the group-common DCI is transmitted in CORESET 0 and the group-common PDSCH for MBS is transmitted within initial DL BWP.
* [13, Intel] proposes that RRC\_IDLE/INACTIVE UEs can be configured with a common MBS frequency resource and MBS CORESET within the common frequency resource by SIB where it can monitor the group common PDCCH within a CSS.
* [15, Qualcomm] discusses that CORESET for MCCH can be same as CORESET0 by default. It is possible to configure the CORESET for MCCH by SIB. CORESET for brodcast MTCH can be CORESET0 or configured by MCCH within the Broadcast BWP. [15] proposes that CORESET of PDCCH for MCCH can be same as CORESET0 by default.

In the inputs above for UEs in RRC\_IDLE/ RRC\_INACTIVE states:7 inputs (9) companies discuss/support defining a MBS CORESET, where 3 inputs (4 companies) state that the MBS coreset could be the CORESET0.

Based on the above the FL makes the following initial proposals.

### **Initial FL proposal for Issue 8**

**Proposal 11**: for RRC\_IDLE/RRC\_INACTIVE UEs, an MBS-specific CORESET is defined where the CORESET of PDCCH can be CORESET0 by default.

# Summary

# References

1. RP-201038 *Revised Work Item on NR Multicast and Broadcast Services*, Huawei, HiSilicon
2. R1-2007564 *Discussion on multicast support for IDLE/INACTIVE UEs*, Huawei, HiSilicon
3. R1-2007639 *Basic functions for MBS for RRC\_IDLE/RRC\_INACTIVE UEs*, CHENGDU TD TECH LTD.
4. R1-2007693 *Discussion on basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE Ues*, vivo
5. R1-2007837 *Discussion on basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs*, CATT, CBN
6. R1-2008036 *Discussion on NR MBS in RRC\_IDLE/RRC\_INACTIVE states*, CMCC
7. R1-2008066 *Basic function for broadcast/multicast*, LG Electronics
8. R1-2008194 *On basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs*, Samsung
9. R1-2008244 *Discussion on enhancements for IDLE and INACTIVE state UEs*, OPPO
10. R1-2008828 *Basic Functions for Broadcast or Multicast for RRC\_IDLE or RRC\_INACTIVE UEs*, ZTE
11. R1-2008884 *Basic Functions for Broadcast / Multicast for RRC\_IDLE / RRC\_INACTIVE UEs,* Nokia, Nokia Shanghai Bell
12. R1-2008928 *Basic functions for broadcast/multicast in idle/inactive states*, Lenovo, Motorola Mobility
13. R1-2009002 *NR-MBS for RRC\_IDLE/INACTIVE UEs*, Intel Corporation
14. R1-2009167 *On NR multicast and broadcast for RRC\_IDLE/RRC\_INACTIVE UEs*, Convida Wireless
15. R1-2009276 *Discussion on broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs*, Qualcomm Incorporated
16. R1-2009307 *Support for NR multicast reception in RRC Inactive/Idle*, Ericsson