3GPP TSG-RAN WG3 #119bis-e R3-231902

Online, April 17 - 27, 2022

Agenda Item: 13.3

Source: Qualcomm (Moderator)

Title: Summary of CB: #IAB3\_MobEnh

Document for: Discussion

# Introduction

This paper captures the following CB discussion:

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| **CB: # IAB3\_MobEnh**  **- Discuss and converge on TAC/RANAC handling between mIAB-MT, its co-located mIAB-DU and its serving donor CU**  **- Any impact over RRC? Need to LS RAN2?**  **- Discuss and converge on OAM involvement and configuration of mobile IAB-DU during mIAB-DU migration and partial migration**  **- Discuss and converge on which information, if any, can be shared between two logical DUs in case of IAB-DU migration**  **- Converge on how Source donor CU of mobile IAB-MT informs the target donor CU of mobile IAB-MT that the migrating node is a mobile IAB-node, based on the agreement that this is carried out via explicit indication in XnAP HO Request message**  (moderator - QC)  Summary of offline disc [R3-231902](file:///C:\temporary\RAN3\RAN3%20April%2023\CB%20discussions\CB%20IAB3%20MobEnh\Inbox\R3-231902.zip) |

The CB has the following phases:

**Phase I：Converge on open issues. Deadline is Tuesday, April 18, 2023, End of Day.**

**Phase II：If needed.**

The following contributions are included in this CB:

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| [R3-231276](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231276.zip) | Other aspects for mobile IAB (CATT) | discussion |
| [R3-231310](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231310.zip) | Enhancements for mobility of IAB-node and its served UEs (Qualcomm Inc.) | discussion |
| [R3-231358](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231358.zip) | Discussion on enhancements to IAB node migration in mobile IAB scenario (ZTE) | discussion |
| [R3-231442](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231442.zip) | Mobility enhancements for mobile IAB-node and its served UE (Lenovo) | discussion |
| [R3-231472](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231472.zip) | Discussion on mobility enhancements (Nokia, Nokia Shanghai Bell) | discussion |
| [R3-231484](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231484.zip) | (TP for NR\_mobile\_IAB BL CR for TS 38.423): Mobility enhancement for mobile IAB (Huawei) | other |
| [R3-231525](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231525.zip) | Discussion on mobility enhancement (Xiaomi) | discussion |
| [R3-231536](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231536.zip) | IAB-Node Mobility Enhancements (Ericsson) | discussion |
| [R3-231719](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231719.zip) | Discussion on mobility enhancements (Samsung) | discussion |

# For the Chairman’s Notes

**[To be updated].**

# Discussion - Phase I

## TAC/RANAC

RAN3 agreed that to support dynamic TAC

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| *RAN3 to further discuss the following options for TAC/RANAC issue:*  *- Option 1: The TAC/RANAC for the mobile IAB cell can be changed in order to* ***reflect the physical location*** *when the mobile IAB-node moves.*  *- Option 2: Using static TAC/RANAC for mobile IAB when it moves. Involvement of SA2 may be needed*  *Dynamic TACs:*  *Static TAC solution is not pursued.*  *RAN3 assumes that dynamic TAC solution should be supported.*  *Capture on stage 2 that the TAC/RANAC broadcast by the mobile IAB-DU can be changed in order to* ***reflect the mIAB-node’s physical location****. It needs to be further discussed how the mobile IAB-DU’s TAC/RANAC is changed and what Stage 3 impacts are (if any).* |

**There is a wide spread of views on the reconfigurability of TAC (RANAC):**

[R3-231276] CATT, [R3-231358] ZTE, and [R3-231484] Huawei propose that the mIAB-DU cell’s TAC may need to be reconfigurable by the mIAB-DU’s CU.

[R3-231358] ZTE proposed that the mIAB-DU cell’s TAC may need to be reconfigurable by the mIAB-MT’s CU or the mIAB-DU’s CU.

[R3-231536] Ericsson proposes that the mIAB-DU cell’s TAC can be copied over from the mIAB-MT.

[R3-231525] Xiaomi proposes that no ST3 change is needed for TAC reconfiguration.

The Moderator believes that it is easier to decide on the configurability of TAC (RANAC) after some principal issues have been resolved.

Firstly, the Moderator would like to ensure that RAN3 has a common understanding of the “IAB-node’s physical location”. In the context of the TA/RNA discussion, a reasonable approach is to consider the mIAB-node’s physical location as to be represented by the mIAB-MT’s cell ID.

**Question 1a: Do you agree that in the context of the TAC/RANAC discussion, the “IAB-node’s physical location” is represented by the mIAB-MT’s cell ID? If not, which parameter should represent the mIAB-node’s physical location?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | This is a convenient interpretation, and it also aligns with the AMF’s understanding of UE location. |
| Huawei | No | Somehow confused on the intention of this question 1a, why discuss this again. It has been clarified during RAN3-119 online discussion that the physical location can be interpreted as location served by the DU’s F1 terminating donor CU, or the location served by the MT’s donor CU, based on operator’s preference. |
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The next question is whether the TA (or RNA) associated with by the mIAB-DU’s TAC (RANAC) broadcast needs to align with a TA (or RNA) associated with the TAC (RANAC) broadcast by the surrounding stationary network. The Moderator believes that this is not absolutely necessary. The operator could define a dedicated set of TAs (or RNAs), which are only used by mIAB-nodes and have different sizes and shapes than the TAs (or RNAs) of the outside network.

**Question 1b: Does the TA (or RNA) used by the mIAB-DU have to align in size and shape with the TA (or RNA) used by the surrounding stationary network?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No preference | It may be convenient to align the TA or (RNA) seen inside the vehicle with that of the outside network, but it is not necessary. |
| Huawei | Not mandatory | The TA planning should be up to operator. Either mobile IAB specific TA/RNA or reuse the current TA/RNA is possible. |
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Even if the TA (or RNA) used by the IAB-DU is aligned with that used by the outside network, the question arises whether they should have to carry the same TAC (or RANAC) or if it is permitted that they use separate TACs (or RANACs).

**Question 1c: Can the TAC (or RANAC) broadcasted inside the vehicle be different than the TAC (or RANAC) outside the vehicle even if the inside and outside TAs (or RNAs) align?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | It may be beneficial to allocate a separate set of TACs (RANACs) for mobile IAB-nodes than for the outside network. |
| Huawei |  | If the inside TA/RNA align with the outside TA/RNA, the TAC/RANAC will be same. |
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Further discussion on TAC/RANAC configuration is included in the next section.

## OAM configuration of mIAB-DU

This topic refers to all configurations that are performed via OAM for a gNB-DU or Rel-16/17 IAB-DU. **This includes all information that a gNB-DU or Rel-16/17 IAB-DU reports to the CU in F1 Setup Request, which primarily is the served-cell info, and (optionally) SIB1.**

**It further includes configurations that a gNB-DU or Rel-16/17 IAB-DU does not report to the CU (e.g., physical beam pattern or the IP address of the mIAB-DU’s CU).**

For gNB-DUs and Rel-16/17 IAB-DUs, the assumption is that these parameters do not change frequently since the nodes do not move. The operator can therefore perform OAM-based match-up in the configuration of these nodes and the surrounding RAN. These assumptions do not hold for mIAB-DUs, and the question arises if the existing assumptions to what extend the OAM-based configuration framework can still be applied, of if, e.g., CU-based (re)configurability is necessary.

[R3-231276] CATT, [R3-231310] Qualcomm, [R3-231472] Nokia, [R3-231484] Huawei, [R3-231536] Ericsson, and [R3-231719] Samsung believe that OAM- and pre-configuration can generally be used for mIAB-DUs. [R3-231276] CATT further proposes that at DU-migration, some of the OAM- or pre-configured parameters can be copied over. [R3-231310] Qualcomm propose that dynamic parameters can be derived from a lookup table based on the mIAB-DU’s current location for those parameters that do not change frequently and apply over an extended area.

[R3-231472] Nokia and [R3-231536] Ericsson propose that everything can be done via OAM-/pre-configuration and no CU-configurability needs to be considered for these parameters.

[R3-231310] Qualcomm, [R3-231358] ZTE, [R3-231442] Lenovo, [R3-231484] Huawei, [R3-231525] Xiaomi propose that the mIAB-DU cell’s NCGI may need to be reconfigurable by the mIAB-DU’s CU.

**The moderator believes that the OAM-/pre-configuration of parameters is always up to implementation. The discussion therefore focuses on those parameters that cannot always follow legacy OAM- or pre-configuration and might require CU-based reconfiguration.**

There seems to be strong support that the NCGI is one of such parameters.

**Question 2a: Do you agree that at DU-migration, the target mIAB-DU-cell’s NCGI can be (re-)configured by the target mIAB-DU’s CU? If yes, why? If not, why not?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | NCGI = PLMN ID + gNB-ID + Cell ID. The Cell ID has only between 4 to 14 bits.  This Cell ID space needs to be shared among all stationary cells and mIAB-cells at gNB level. With only 4 to 14bits, this ID space becomes a critical resource, which requires dynamic Cell ID allocation when mIAB-DUs migrate in and out. Only the gNB-CU is in the position to perform this Cell ID allocation.  OAM cannot perform this dynamic Cell ID allocation since the gNB may connect to a different OAM than the mIAB-node. |
| Huawei | Yes | The NCGI is related to the F1 terminating donor CU because it contains the gNB ID part, allowing the F1 terminating CU reconfigure NCGI to the mobile IAB-DU will provides flexibility and be efficient when IAB moves. |
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There were different views on the configuration of TAC/RANAC.

In case we agree that the TAC (or RANAC) broadcast inside the vehicle must always be the same as that broadcast by the surrounding network, the mIAB-DU could certainly copy over the TAC (RANAC) from the one seen by the mIAB-MT.

If we allow for scenarios, where inside and outside TACs (RANACs) are different, the mIAB-DU’s TAC (RANAC) would have to be configured and could not just be copied from that seen by the mIAB-MT. The question arises if the change of the in-vehicle TAC (RANAC) should be CU-reconfigurable, and in this case, whether it is the MT’s CU or the DU’s CU that reconfigures the mIAB-DU-cell’s TAC.

**Question 2b: Please provide feedback on 1) and 2):**

1. **In case RAN3 agrees that the in-vehicle TAC is always the same as the TAC of the outside network, the mIAB-DU can copy the TAC from the mIAB-MT.**
2. **In case RAN3 allows in-vehicle TAC to be different than outside TAC, the TAC broadcasted by the mIAB-DU:**
   1. **Is (re-)configurable by the mIAB-DU’s CU,**
   2. **Is (re-)configurable by the mIAB-MT’s CU.**

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| **Company** | **Feedback** |
| Qualcomm | 1: Agree,  2a: Agree,  2b: Do not agree. In this case, the mIAB-MT’s CU may not know what TAC the mIAB-DU should have. |
| Huawei | 1: disagree. The parameter used by IAB-DU’s cell should controlled by the network, rather than decided by itself.  2a: agree, and this also apply to the case that the in-vehicle TAC is same as the out side TAC.  2b: disagree. The DU’s parameter is configured by the OAM or the F1 terminating CU, not the MT’s CU. |
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Are there any other parameters that need to be CU-configurable.

**Question 2c: Which other parameters, that are usually OAM-/pre-configured, may need CU-based (re-)configuration? Why and when would such CU-based (re-)configurability necessary?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | See comment | Presently, we don’t see the need for CU-based reconfigurability of any other OAM-configured parameter. However, we should keep this issue open until the end of the WI. |
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| Huawei |  | Agree with QC |
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Further, on OAM-based configuration:

[R3-231472] Nokia proposes that RAN3 sends an LS to SA5 to inquire how the mIAB-node can change the OAM system while moving across the network.

[R3-231536] Ericsson proposes that the (target) mIAB-DU selects an OAM based on the mIAB-node’s location or the (target) mIAB-DU’s CU.

**Question 2d: Do you agree that:**

**1) For OAM-based (re-)configuration, the IAB-node selects the OAM based on the IAB-node’s location?**

**2) An LS to be sent to SA5? If yes, what would be the questions for SA5?**

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| **Company** | **Comments** |
| Qualcomm | 1. Yes 2. Yes. Question for SA5   How the IAB-node determines the OAM to be used? E.g., FQDN based on mIAB-MT’s gNB-ID? |
| Huawei | 1. Not sure how the IAB-node can “select” the OAM, we can ask SA5 in the LS out. 2. Yes.   The question can be “How can the mobile IAB node know the address of OAM it should connect to, during its moving? ” |
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## Sharing of dynamic configuration between logical mIAB-DUs

This topic refers to the dynamic information configured by the mIAB-DU’s CU or the mIAB-MT’s CU.

[R3-231276] CATT proposes that parameters configured by the mIAB-MT’s CU, such as BH RLC configuration, BAP address and default BAP configuration, can be shared by both mIAB-DUs.

[R3-231276] CATT further proposes that UE-associated information can be shared between both mIAB-DUs such as UE F1AP ID, C-RNTI, DL UP TNL info and CellGroupConfig. The authors emphasize that such inter-DU sharing would imply that the equivalent information is shared between the DUs’ CUs.

[R3-231358] ZTE proposes that the DUs can share UE context such as SRB/DRB configurations, QoS info, UL BAP mapping. They also emphasize that this context needs to be shared between the DUs’ CUs.

[R3-231442] Lenovo proposed to have PHY/MAC/RLC info shared between both DUs.

[R3-231484] Huawei proposes that the default BH configuration can be pre-configured on the mIAB-node. Also, some cell configurations can be shared so enable inter-DU handover without UE measurement report.

[R3-231536] Ericsson prefers to postpone any further discussion on these topics until after more progress has been made.

The Moderator believes that there are several misperceptions related to dynamic sharing and for this reason, it might be good to have at least a brief discussion.

**Question 3a: Sharing on mIAB-MT’s configuration: Should BH RLC configuration, BAP address and default BAP configuration be shared between both mIAB DUs?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | See comment | Baseline: BAP address and default BAP configuration is shared by both DUs.  Baseline: BH RLC channels configured via F1AP are DU-specific.  We may want to agree on these baselines. |
| Huawei | See comment | We generally agree with QC on the baseline for the MT’s configuration. |
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**Question 3b: Sharing on mIAB-DU’s configuration: Should UE access link’s cell configuration be shared? What are the benefits? How do CUs know about the sharing?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Nothing new needed | During DU migration, the UE is handed over between both CUs. In this process, the target DU can update the UE’s cell configuration. It is up to the target DU’s implementation if it wishes to change the UE’s cell configuration. Nothing new needs to be defined. |
| Huawei | Yes | For mobile IAB, the relative positions between the UE and the two logical DUs do not change. If the two logical DUs have some configurations in common (e.g., the same beam directions, the same slot configurations, and different carriers), the UE’s target cell can be directly assigned without the measurement, if there is a mapping relationship between the cells served by two different DUs.  The CU can know the sharing if the IAB-DU sends 1-to-1 mapping relationship of cells to the CU. |
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**Question 3c: Sharing on mIAB-DU’s configuration: Should UE-associated F1 configuration be shared (F1-U GTP-U tunnel configuration)? What are the benefits? How do CUs know about the sharing?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | F1-U tunnels are established between target DU and its CU. There is no benefit to share any F1-U information between source-DU/CU and target-DU/CU. In fact, this should be avoided since it might create collisions in the TEID space. |
| Huawei | No | If shared, there may be TEID collision issue, at least from the CU side. So, the F1-U tunnel can not be shared directly. |
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**Question 3d: Sharing of UE context info: Should UE SRB/DRB be shared? What are the benefits? How do CUs know about the sharing?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | This information is already passed in the HO preparation.  The CU needs to perform the UE Context Setup with the target DU. It is not clear what can be saved by “sharing the SRB/DRB” context. |
| Huawei |  | After HO among two CUs, the Key should be updated anyway, so it seems that the UE’s SRB/DRB configuration cannot be shared directly. |
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**Question 3e: Anything else to be shared?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No |  |
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## Handover related issues

Two issues need to be discussed:

**Issue 1: For mIAB-MT handover, the target CU should know that the mIAB-MT refers to an mIAB-node.**

[R3-132484] Huawei proposes that a mIAB-indicator is included int the HO request for the mIAB-MT.

[R3-131536] Ericsson emphasizes that the target CU of mIAB-MT handover knows that the mIAB-MT refers to an mIAB-node since the mIAB-node indicator is included in the UE capabilities included in the HO request.

The Moderator believes that nothing else needs to be done here. Further, if anything would have to be done, it would be part of the AI 13.2

**Issue 2: For UE handover decision, the source target CU should know that the target cells resides on an mIAB-node.**

This was proposed by [R3-231442] Lenovo, [R3-131719] Samsung and [R3-231310] Qualcomm. Further, [R3-231358] ZTE proposes to include mobile cell-type information into the neighbor detection function.

**Question 4a: Do you agree that for UE handover, the source CU should know that the target cell belongs to an mIAB-node?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| Huawei | No | First, it is not necessary. If the HO is for UE, it does not need to know the target cell is a fixed cell or mobile cell. If the HO is for an IAB-node, the target donor can reject the HO request if the HO request if the target cell is served by a mobile IAB. The logic is same as Rel-17, where the source CU does not need to know whether the target cell support IAB or not also.  Second, if the source CU want to know some information on the iab-support, this can achieve by OAM implementation. No spec impact is expected. |
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This could be facilitated by including the mIAB-indicator in the “Served Cells To Update NR” IE in the Xn NG-RAN NODE CONFIGURATION UPDATE message.

**Question 4b: Do you agree that the mIAB-cell indicator is included in the “Served Cells To Update NR” IE in the Xn NG-RAN NODE CONFIGURATION UPDATE message?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| Huawei | No | Please see our response for Q4a. |
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## Others

**Question 5: Anything issues not addressed?**

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| **Company** | **Comments** |
| Huawei | Not sure why the Issue 1 in 3.4 should be discussed in 13.2. in previous meeting, we discussed the issue and reached agreements in 13.3. And we have two papers submitted to AI 13.3 in this meeting to discuss this issue. So, we suggest to add question for this issue 1 in 3.4 in this CB.  Our view is that **explicit signaling is needed**, because we have concerns about the indication through UE capability. The UE capability is not used for admission control during the HO process. Thus, it is not mandatory that the target CU should reject a UE’s HO request just because it cannot support some enhanced UE features (e.g., new features introduced in rel-17, or later) which is unknown to the target CU. Instead, it may accept the UE and just provides basic services to UE (e.g., only support Rel-15 NR UE features). But for mobile IAB node, the target CU should reject the HO request if it not support the mobile IAB, because it may not able to provide services (e.g. support consecutive partial migration, DU migration, etc.) which are required for the IAB node mobility. |
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# Discussion - Phase II

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# References

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| [R3-231276](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231276.zip) | Other aspects for mobile IAB (CATT) | discussion |
| [R3-231310](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231310.zip) | Enhancements for mobility of IAB-node and its served UEs (Qualcomm Inc.) | discussion |
| [R3-231358](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231358.zip) | Discussion on enhancements to IAB node migration in mobile IAB scenario (ZTE) | discussion |
| [R3-231442](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231442.zip) | Mobility enhancements for mobile IAB-node and its served UE (Lenovo) | discussion |
| [R3-231472](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231472.zip) | Discussion on mobility enhancements (Nokia, Nokia Shanghai Bell) | discussion |
| [R3-231484](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231484.zip) | (TP for NR\_mobile\_IAB BL CR for TS 38.423): Mobility enhancement for mobile IAB (Huawei) | other |
| [R3-231525](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231525.zip) | Discussion on mobility enhancement (Xiaomi) | discussion |
| [R3-231536](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231536.zip) | IAB-Node Mobility Enhancements (Ericsson) | discussion |
| [R3-231719](file:///D:\会议硬盘\TSGR3_119bis-e\Docs\R3-231719.zip) | Discussion on mobility enhancements (Samsung) | discussion |