**3GPP TSG RAN WG1 #110bis-e** **R1-22xxxxx**

**e-Meeting, October 10th – 19th, 2022**

**Agenda Item:** 8.10

**Source:** Moderator (Qualcomm Incorporated)

**Title:** Summary #1 of [110bis-e-R17-eIAB-02]

**Document for:** Discussion and decision

# Introduction

This contribution provides a summary to support the following email discussion for agenda item 8.10, based on the recommendations following the preparation discussion in [110bis-e-R17-eIAB-01]:

[110bis-e-R17-eIAB-02] Email discussion on remaining eIAB maintenance issues by October 17 – Luca (Qualcomm)

* Topic #1. Coexistence of TD and FD DU resource configurations
* Topic #2. Corrections on RB set size for Rel-17 IAB FDM multiplexing
* Topic #4. Correction on the formula of Case-7 UL Tx timing for eIAB in TS 38.213
* Topic #5. Additional specification for DL Tx power adjustment
* Topic #8. Draft CR on guard symbols MAC CEs
* Topic #9. Draft CR on timing case indication
* Topic #11. Handling of interference between adjacent RB sets in FDM operation
* For alignment CRs: Topic #6 (R1-2208788), Topic #7 (R1-2208787), Topic #10 (R1-2210229)

# Discussion plan

There are 11 topics identified based on the contributions and draft CRs [1] – [16] submitted for agenda item 8.10.

Based on the guidance from the discussion in [110bis-e-R17-eIAB-01] the following topics should be included in this discussion: #1, #2,, #4, #5, #6, #7, #8, #9, #10, #11.

# Discussion topics

## Topic #1. Coexistence of TD and FD DU resource configurations

Related decisions from prior meetings:

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| RAN1-106bise Working Assumption:  If both the Rel-16 time domain H/S/NA configuration and Rel-17 frequency domain H/S/NA configuration are provided for a given RB set within a slot, one of the following is selected:  Alt. 1: An IAB node applies the frequency domain H/S/NA only if the IAB node is currently operating in a non-TDM multiplexing mode in the slot, otherwise the Rel-16 time domain H/S/NA configuration is applied.  **RAN1-107e Agreement**:  Whether or not an IAB node can operate under a given non-TDM multiplexing mode (i.e. multiplexing info in 38.473) is left to IAB implementation in Rel-17  **RAN1-109e Conclusion**  If both Rel-16 H/S/NA and Rel-17 H/S/NA are configured for a given resource and the child node is operating in TDM multiplexing mode, consider the following alternatives until RAN1#110:   * ~~Alt. 1: the child node follows the Rel-16 H/S/NA configuration for the resource~~ * Alt. 2: the child node follows the Rel-17 H/S/NA configuration for the resource * Alt. 3: A resource configured with Rel-16 H or Rel-16 S with dynamic indication of availability overrides the Rel-17 H/S/NA configuration, otherwise the child node follows the Rel-17 H/S/NA configuration for the resource * Alt. 4 the child node follows the Rel-16 or Rel-17 H/S/NA based on implicit indication (e.g. Case 6 timing indication) between parent and child node.     RAN1-110 Working Assumption  If Rel-16 H/S/NA resource configuration and Rel-17 H/S/NA resource configuration are both provided for a given RB set within a slot:  Alt 3b. A resource configured with ~~Rel-16 H or~~ Rel-16 S with dynamic indication of availability overrides the Rel-17 H/S/NA configuration, otherwise the child node follows the Rel-17 H/S/NA configuration for the resource. |

Related input from contributions:

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| Huawei, Hisilicon  [1], [7] | ***Proposal 1: If Rel-16 H/S/NA resource configuration and Rel-17 H/S/NA resource configuration are both provided for a given RB set within a slot:***   * ***A symbol configured with Rel-16 S with dynamic indication indicating available overrides the Rel-17 H/S/NA configuration*** * ***For a symbol configured with Rel-16 S with dynamic indication indicating “no indication of availability”, the child node follows the Rel-17 H/S/NA configuration for the symbol*** * ***For a symbol configured with Rel-16 S without receiving dynamic indication of availability, the child node follows the Rel-17 H/S/NA configuration for the symbol*** * ***For a symbol configured with Rel-16 H/NA, the child node follows the Rel-17 H/S/NA configuration for the symbol***   ***Proposal 2: If both Rel-16 H/S/NA and Rel-17 H/S/NA resource configuration are both provided for a given RB set within a slot, and both Rel-16 and Rel-17 dynamic indication of resource availability are received by child node:***   * ***A symbol configured with Rel-16 S with Rel-16 dynamic indication indicating available overrides the Rel-17 H/S/NA configuration*** * ***For a symbol configured with Rel-16 S with Rel-16 dynamic indication indicating “no indication of availability”, the child node follows the Rel-17 H/S/NA configuration and Rel-17 dynamic indication to determine resource availability for the RB set in the symbol***   ***Proposal 3: If only Rel-16 H/S/NA resource configuration is provided for a given a slot:***   * ***If Rel-16 dynamic indication of availability is not configured by RRC or not provided by DCI, the child node ignores the Rel-17 dynamic availability indication, if any.*** * ***If both Rel-16 and Rel-17 dynamic indication of availability are configured and received, the child node ignores the Rel-17 dynamic availability indication.*** |
| Lenovo  [6] | ***Observation 1: Compared to Al1. 2, Alt. 3b facilitates a fallback mode and provides higher resource efficiency if the IAB node is not capable of performing FDM at a particular moment.***  ***Observation 2: Separate application of T-HSNA and F-HSNA is a special case of joint application. If joint application is agreed, the IAB-CU still has the possibility of separate (non-overlapping) configurations. Alt. 3b allows higher flexibility for resource configuration by the IAB-CU without loss of generality for TDM-only or FDM-only configurations if desired in a specific implementation.***  ***Observation 3: Since the IAB-CU cannot be informed of whether an IAB node’s channel conditions at a specific time allows simultaneous MT-DU operations, the safe choice for the IAB-CU with Alt. 2 could be to avoid Rel-17 H/S/NA configuration, which could make the new specification useless in practice.***  ***Proposal: Confirm the working assumption from RAN1#110, agenda item 8.10.*** |
| Qualcomm  [9] |  |
| Nokia, Nokia Shanghai Bell  [10] |  |
| Ericsson  [16] | **Proposal 1 If both Rel-16 time-domain H/S/NA configuration and Rel-17 frequency domain H/S/NA configuration are provided for a given RB set within a slot, the AvailabilityCombinationsPerCell-r17 is used to provide dynamic availability indication for both Rel-16 and Rel-17 Soft resource.** |

Based on the contributions it seems the WA from RAN1#110 can be confirmed. However, there are two related aspects requiring discussion:

1. The WA states that “A resource configured with Rel-16 H or Rel-16 S with dynamic indication of availability overrides the Rel-17 H/S/NA configuration”. The question is whether ‘dynamic indication of availability’ refers solely to the explicit indication of availability via DCI or also includes the implicit determination of availability.
2. Whether the behavior described in the WA is contingent on the mechanism (Rel-16 vs. Rel-17) to provide the explicit indication of availability.

In regard to 1) the FL understanding is that ‘dynamic indication of availability’ includes the implicit determination of availability, as that was the intent of the related FL proposal that led to the WA in RAN1#110. Moreover, there does not seem any advantage of precluding an implicitly determined time domain S resource to override the Rel-17 FDM configuration for the given symbol, in fact there seems to be a disadvantage in precluding it.

In regard to 2) the FL understanding is that the mechanism to provide the explicit indication of availability has no bearing on the behavior described by the WA. Moreover, assuming both Rel-16 and Rel-17 mechanisms can be used to provide an explicit indication of availability, there will never by a conflict since there is only the possibility to provide an indication of availability and there is no possibility to provide an indication of unavailability.

As a result the FL recommends we confirm the WA and adopt the corresponding TP change in TS 38.213:

**FL Proposal 3.1**

**Confirm the WA from RAN1#110:**

**If Rel-16 H/S/NA resource configuration and Rel-17 H/S/NA resource configuration are both provided for a given RB set within a slot:**

**Alt 3b. A resource configured with Rel-16 S with dynamic indication of availability overrides the Rel-17 H/S/NA configuration, otherwise the child node follows the Rel-17 H/S/NA configuration for the resource.**

**Adopt the following TP in TS38.213:**

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| **Company** | **Comments** |
| Ericsson | **Support the proposal.** However, we disagree with the FL conclusions that both Rel-16 and Rel-17 mechanisms can be used to provide an explicit indication of availability, if it is not clear whether an indication of availability refers to the Rel-16 or Rel-17 *AvailabilityCombinations*. The DCI itself looks the same. |
| Nokia | Support the proposal. |
| Lenovo, Motorola Mobility | Re: FL’s conclusion, our understanding of dynamic indication of availability is explicit signaling. Please note that the effort is to ensure that the IAB node and its parent node are on the same page on which configuration is to be used. We won’t achieve this goal by allowing implicit determination at the IAB node. **We support confirming the WA, but we do not agree with the FL’s conclusion and the CR** that seems to follow the conclusion in “*can transmit or receive in the symbol*.” Further discussion seems needed. |
| AT&T | Support the proposal. If the intention is to exclude implicit determination of availability that should be made clear in the agreement/CR, otherwise the current text should be understood that both explicit and implicit mechanisms are supported. We do not see a need to restrict the behavior to either Rel-16 or Rel-17 DCI format 2\_5 since in either case the parent node will provide that indication and so it should be clear between the child and parent what Tx/Rx behaviors are possible in that symbol. |
| Samsung | We share a view with the FL about 2). On the other hand, for 1), we tend to agree with Lenovo that the intention is to ensure IAB and parent IAB are on the same page and then implicit indication does not serve the intention. |
| Huawei, HiSilicon | We are fine to confirm the working assumption.  On 1), we think the dynamic indication of availability is explicit signaling. The implicit determination if the parent node assumes Rel-17 H/S/NA to preform scheduling while the IAB node assumes Rel-16 to determine resource availability. The benefit of including implicit determination can hardly be achieved.  On 2) , we are open to discuss whether both Rel-16 and Rel-17 explicit indication of availability are possible. The fundamental issue is if one resource is only configured with Rel-16 H/S/NA, is it possible to indicate the resource availability using a Rel-17 availability indicator. |

## Topic #2. Corrections on RB set size for Rel-17 IAB FDM multiplexing

Related input from contributions:

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| Nokia, Nokia Shanghai Bell  [5] | *Graphical user interface, text, application  Description automatically generatedGraphical user interface, text, application  Description automatically generated* |

This topic was discussed extensively in RAN1#110 in the context of the reply LS to R1-2205705.

The FL assessment is that all companies are in alignment on the fact the aforementioned highlighted portion of the RAN1#105-e agreement (N is at least the # PRBs that are corresponding to the MT’s # PRBs of an RBG) needs to be captured in the specifications. On the other hand there are diverging views on whether that is actually the case. It is the FL understanding that the divergence likely stems from two different interpretations:

1. Interpretation 1: the agreement indicates an operational constraint that the specification should reflect so that the network shall enforce it.
2. Interpretation 2: the agreement indicates a constraint that is already reflected in the values that were eventually agreed for N in RAN1#106-e:

RAN1#106-e Agreement

N is a configured number of PRBs, where the CU configures N

* N = {2, 4, 8, 16, 32, 64}
* FFS: Value(s) of N in case of multiple configured BWPs at the IAB-MT
* This agreement does not revert any existing RAN1 agreement

The FL view is that regardless of the interpretation, given the possible values of N were defined and agreed, it is a network configuration issue to ensure the system is configured properly for best system performance. It is expected that in any case the network will use a suitable configuration for the desired system performance, which is true in general for network parameters. In that context, the FL believes this is not a critical issue and if there is no consensus on the interpretation of the RAN1#105-e agreement, the current specifications are acceptable.

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| **Company** | **Comments** |
| ZTE, Sanechips | We are OK to discuss whether RAN1 spec can capture this agreement, but we cannot accept the CR in[5], it is far beyond the agreement we have achieved in RAN1#105-e, especially for the ‘*RBG size ‘Configuration 1’ of the smallest BWP configured for the IAB node* ’ part. |
| Ericsson | **Support the CR.** In the RAN1 #106 agreement, the last bullet was explicitly included to not invalidate the RAN1 #105 agreement that the PRB set size is at least the size of an RBG. Without including the RB set size limitation in the spec, that part of the RAN1 #105 agreement is indeed invalidated. For that reason, Interpretation 2 is incorrect.  In response to ZTE, on the contrary, we think the draft CR provides maximum flexibility in the selection of the RB set size and is therefore not at all “far beyond the agreement.” |
| Nokia | Support the proposal. Regarding ZTE’s comment, we share a similar view with Ericsson. The intent of the proposal is to provide the maximum flexibility in configuring the minimum RB set size. Any other constraint would be more restrictive. |
| Lenovo, Motorola Mobility | It is crucial to honor agreements and hopefully we’ll be able to conclude this topic in the current meeting. We support this CR or a revised version that is accepted to reflect the RAN1 agreement.  Our reading of the agreement is as follows:  If we had “an MT’s #PRBs of an RBG,” it would seem to mean Interpretation 2, i.e., a constraint on values in the specification.  But the agreement reads “the MT’s #PRBs of an RBG,” which seems to mean the specific MT being configured. This suggests an operation-related specification, i.e., Interpretation 1.  We think **Interpretation 1 is closer to the agreement**, which is in line with the CR. We’ll be fine with revising details as requested by ZTE or other companies. |
| AT&T | Let’s capture that at least interpretation 1 is the correct way to capture that RAN1#105 agreement which needs to be reflected in RAN1 specifications as discussed in the email thread. |
| Samsung | Taking into account the guideline from Chair, we are OK with discussing how to capture it in RAN1 spec and open to further suggestion in order to well reflect the agreement in RAN1 spec. |
| Huawei, HiSilicon | We don’t support the CR.  First, it is not consistent with the agreement for both interpretation 1 and interpretation 2.  Secondly, following the direction of interpretation 1 will lead to additional issues as discussed before, e.g. what if an IAB-MT is configured with multiple BWPs or multiple CCs.  Finally, we agree with the FL’s analysis that there are two possible interpretations of the agreement and believe with interpretation 1 put an unnecessary restriction. We don’t understand how this could provide any flexibility given that interpretation 1 clearly put a restriction how the RS set size can be configured since it is coupled with the RBG size of the IAB-MT. |

## Topic #4. Correction on the formula of Case-7 UL Tx timing for eIAB in TS 38.213

Related input from contributions:

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| ZTE, Sanechips  [2] | *Text  Description automatically generated* |

The FL assessment is that the CR has merit and it needs to be implemented to reflect the aforementioned agreement.

**FL Proposal 3.4**

**Endorse draft CR in R1-2208786.**

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| **Company** | **Comments** |
| ZTE, Sanechips | Support, it reflects the agreement of RAN1#108-e, BTW, similar discussion has been made for OTA formula, and TTA is used instead of NTA+NTA,offset. |
| Ericsson | Support |
| Nokia | Support the proposal. |
| Lenovo, Motorola Mobility | Support |
| Samsung | OK |
| Huawei, HiSilicon | We don’t see a strong need for the change. |

## Topic #5. Additional specification for DL Tx power adjustment

Related input from contributions:

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| Ericsson  [11], [12] | **Proposal 1 The following RAN1#107-e agreement is amended as: The indicated desired/provided DL Tx power adjustment is in terms of a relative offset to the non-offset PDSCH Tx power, as derived from a CSI-RS TX power that is RRC configured.** |

This topic was briefly addressed in RAN1#110 but there was no time to conclude. Based on the input in [12] it seems the proposed CR is necessary to avoid being limited by the agreed dynamic range for DL TX Power Adjustment.

**FL Proposal 3.5**

**Endorse draft CR in R1-2210225.**

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| **Company** | **Comments** |
| ETRI | Support. |
| ZTE, Sanechips | Not support, RAN2 has made their spec based on the agreement of RAN1#107-e, and current spec works well, no further changes are necessary. |
| Ericsson | Support |
| Nokia | Support the proposal. |
| Lenovo, Motorola Mobility | Fine |
| Huawei, HiSilicon |  |

## Topic #6. Corrections on misaligment for MAC CE or RRC parameters for eIAB TS 38.213

Related input from contributions:

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| ZTE, Sanechips  [4] |  |

The FL assessment is that the CR has merit.

**FL Proposal 3.6**

**Endorse draft CR in R1-2208788.**

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| **Company** | **Comments** |
| ETRI | OK with other than change #3.  Change #3 in 8788 is overlapped with Topic #5 above. |
| ZTE, Sanechips | Support |
| Ericsson | Support. Share ETRI’s concern about the 3rd change. |
| Nokia | Support the proposal. |
| Lenovo, Motorola Mobility | Support |
| Samsung | OK |
| Huawei, HiSilicon | Okay |

## Topic #7. Correction on the position related to the description that the RB set is equivalent to hard for eIAB in TS 38.213

Related input from contributions:

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| ZTE, Sanechips  [3] |  |

The FL assessment is that the CR has merit.

**FL Proposal 3.7**

**Endorse draft CR in R1-2208787.**

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| **Company** | **Comments** |
| ZTE, Sanechips | Support |
| Ericsson | The proposed changes overlap with the proposed changes proposed in topic #10 which provides additional improvements in spec readability. |
| Nokia | Support the proposal. |
| Lenovo, Motorola Mobility | Fine |
| Huawei, HiSilicon | Okay |

## Topic #8. Draft CR on guard symbols MAC CEs

Related input from contributions:

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| Ericsson  [13] |  |

The FL assessment is that the CR has merit. For reference here is also the related RAN1#106-e agreement:

RAN1#106-e Agreement

MAC-CE signaling of Desired/Provided Guard Symbols is enhanced (e.g. using the same Rel-16 MAC-CE design) to support indication of guard symbols additionally required for Case #6 and Case #7 timing cases.

* FFS: Number of guard symbols associated with Case #6 and Case #7 timing modes
* FFS: Need for explicit indication of guard symbols switching between timing cases

**FL Proposal 3.8**

**Endorse draft CR in R1-2210227.**

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| **Company** | **Comments** |
| ZTE, Sanechips | OK |
| Ericsson | Support |
| Nokia | Support the proposal. |
| Lenovo, Motorola Mobility | Fine |
| Samsung | OK |
| Huawei, HiSilicon | We don’t see the need for the CR. |

## Topic #9. Draft CR on timing case indication

Related input from contributions:

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| Ericsson  [14] |  |

The FL assessment is that the CR has merit.

**FL Proposal 3.9**

**Endorse draft CR in R1-2210228.**

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| **Company** | **Comments** |
| ZTE, Sanechips | We prefer to change the text to cover both explicit case-1 indication case and default case 1 case:  If the indicated IAB-MT transmission timing mode in a slot is set to 'Case1' or the IAB-MT transmission timing mode indication in a slot is not provided, the IAB-MT transmission time is determined as for a "UE" in clause 4.2. |
| Ericsson | Support |
| Nokia | Prefer ZTE’s proposed modification. |
| Lenovo, Motorola Mobility | Support, and okay with ZTE’s version. |
| Samsung | OK with the revision from ZTE. |
| Huawei, HiSilicon | Support ZTE’s revision |

## Topic #10. Draft CR on Hard/Soft/Not Available resource definition

Related input from contributions:

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| Ericsson  [15] |  |

The FL assessment is that the CR has merit.

**FL Proposal 3.10**

**Endorse draft CR in R1-2210229.**

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| **Company** | **Comments** |
| ZTE, Sanechips | OK |
| Ericsson | Support |
| Nokia | Support the proposal. |
| Lenovo, Motorola Mobility | Fine |
| AT&T | Support |
| Samsung | OK |
| Huawei, HiSilicon | OK |

## Topic #11. Handling of interference between adjacent RB sets in FDM operation

Related input from contributions:

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| Huawei, Hisilicon  [1] | ***Observation 1: Guard band can provide better frequency domain isolation and may be needed to enable the FDM operation between MT and DU.***  ***Observation 2: Placing the guard band on DU resource by implementation to achieve the FDM violates the definition of DU hard resources.***  ***Proposal 4: The guard band including its size and location should be made aware of by IAB node’s parent node and donor node to facilitate efficient FDM operation.*** |
| Ericsson  [16] | **Observation 1 Allowing the DU unconditional use of Hard resources, irrespective of interference on Soft or Not Available resources, assumes static channel conditions and will require a different solution for Rel-18 mIAB.**  **Proposal 2 To address the adjacent channel leakage between RB sets in FDM operation, RAN1 to decide to adopt**  **a. Alt 1: RAN1 based solution, restricting Hard resource utilization, or**  **b. Alt 2: RAN4 based solution, imposing adjacent leakage requirements into NA and Soft-NIA resources.** |

The FL assessment is that the issue related to this topic can be handled by implementation and with existing specifications, a view that was shared by a majority of companies in prior meetings.

In regard to the proposal in [1], at this stage of the WI it seems too late to introduce new signaling for a non critical issue.

In regard to the proposal in [16], the motivation of forward compatibility to Rel-18 mIAB is understandable, but it is a Rel-18 issue outside of the scope of Rel-17 maintenance for eIAB.

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| **Company** | **Comments** |
| ZTE, Sanechips | We support FL assessment. |
| Ericsson | With respect to Proposal 2 in [16], in our understanding, that means that RAN1 agrees that RAN4 will specify adjacent leakage requirements into NA and Soft-NIA resources. In that case, we propose that **RAN1 sends an LS to RAN4**, informing RAN4 about the possible leakage from Hard into NA and Soft-NIA resources.  We wonder why we did specify guard symbols for Rel-16 and additional guard symbols in Rel-17 for UL/DL switching coordination if the corresponding frequency domain problem can be left to implementation. |
| Nokia | Agree with FL assessment. Correction is not necessary. |
| Lenovo, Motorola Mobility | Agree with FL assessment. |
| AT&T | Both [1] and [16] have merit – especially for mobile IAB nodes. Unfortunately, there was no consensus for this in Rel-17 so we believe this may have to be handled in other WGs (RAN2? RAN4?) or TUs added to RAN1. |
| Samsung | OK with FL assessment. |
| Huawei, HiSilicon | Agree with FL assessment. We prefer not to discuss this at maintenance phase. |

# References

[1] R1-2208471 Remaining issues on resource multiplexing for IAB, Huawei, HiSilicon

[2] R1-2208786 Correction on the formula of Case-7 UL Tx timing for eIAB in TS 38.213, ZTE, Sanechips

[3] R1-2208787 Correction on the position related to the description that the RB set is equivalent to hard for eIAB in TS 38.213, ZTE, Sanechips

[4] R1-2208788 Corrections on misalignment for MAC CE or RRC parameters for eIAB TS 38.213, ZTE, Sanechips

[5] R1-2209084 Correction on RB set size for Rel-17 IAB FDM multiplexing, Nokia, Nokia Shanghai Bell

[6] R1-2209118 Resource multiplexing in enhanced IAB systems, Lenovo

[7] R1-2209834 Correction on coexistance between Rel-16 and Rel-17 H/S/NA configuration, Huawei, HiSilicon

[8] R1-2209835 Correction on TDD configuration for IAB-MT, Huawei, HiSilicon

[9] R1-2209949 Draft CR on FD and TD DU resource configuration coexistence, Qualcomm

[10] R1-2210170 Clarification on Rel-16 and Rel-17 H/S/NA Configuration, Nokia, Nokia Shanghai Bell

[11] R1-2210225 Draft CR on DL Tx power control, Ericsson

[12] R1-2210226 Discussion on DL Tx power control, Ericsson

[13] R1-2210227 Draft CR on guard symbols MAC CEs, Ericsson

[14] R1-2210228 Draft CR on timing case indication, Ericsson

[15] R1-2210229 Draft CR on Hard/Soft/Not Available resource definition, Ericsson

[16] R1-2210230 Maintenance on enhanced IAB, Ericsson