3GPP TSG-RAN WG1 Meeting #100bis-e R1-200xxxx

e-Meeting, April 20th – April 30th, 2020

**Agenda Item:** **7.2.3.3**

**Source: AT&T**

**Title: Summary on [100b-e-NR-IAB-03] Email discussion/approval regarding IAB Operation in Paired Spectrum**

**Document for:** **Discussion/Approval**

# Introduction

This contribution provides a summary on maintenance issues for IAB operation in paired spectrum.

# Resource multiplexing among backhaul and access links

The following issues for maintenance of Rel-16 IAB were identified to be discussed via email in RAN1#100bis-e:

[100b-e-NR-IAB-03] Email discussion/approval regarding IAB Operation in Paired Spectrum

* DU Resource Configuration
* Soft resource availability indication in paired spectrum

By 4/24, with potential TP/LS by 4/29 (ATT, Thomas)

## DU Resource Configuration

**Source**: R1-2001952, R1-2002203, R1-2002650

**Background:** In RAN1#99 meeting, following working assumption regarding IAB in paired spectrum was captured in the chairman’s note as:

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| Working assumption:  For paired spectrum, the H/S/NA DU resource configuration framework is extended with the following:   * Two separate H/S/NA per-cell DU semi-static configurations are provided (with slot level resolution) for downlink and uplink   FFS: whether the definition of half-duplex operation has to be modified for IAB nodes operating in paired spectrum |

Confirming the WA (as well as discussing any additional specification impact) was raised during RAN1#100-e, however was not concluded.

**FL Proposal 2.1.1: Confirm the WA, update the IAB higher layer parameters list, and inform RAN3.**

**Discussion:**

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| **Company** | **Do you agree with Proposal 2.1.1?** | **Comments** |
| **Huawei** | **Yes** | Given that there is no FDD band defined in RAN4 for IAB operation, we think it may be okay to restrict it to slot-level configuration for paired spectrum in Rel-16. |
| **Intel** | **Yes** | None. |
| **CMCC** | **Yes** | To confirm the working assumption, one thing that needs to be further clarified is the slot level resolution of the indications. The indication resolution is related to the “default resource type” of the paired spectrum. Some companies raised the point that in practical networks, there are no flexible resources for the paired spectrum, I’m not sure it is the point from the spec perspective. In our view, we may not exclude the cases of having partial DL slots with D and F symbols (or partial UL slots with U and F symbols) in the paired spectrum, and in such cases, the slot level resolution may be too rough.  However, as HW mentioned in their comments, since no FDD band defined in RAN4 for IAB so far, we are also fine with the slot level resolution. |
| **Qualcomm** | **Yes, in principle, but some more discussion is required** | While we were and still are a proponent of the current WA, we think there is a slight issue that needs to be resolved: specifically, the H/S/NA resource attribute was defined to be ‘per D/U/F resource type’, where the D/U/F is the resource marking provided in the DU configuration. Currently such D/U/F configuration provided by the CU to the DU is specified solely in TDD context and it is not clear how things are expected to work for FDD. One option could be to change the definition of the two H/S/NA configurations such that the H/S/NA attributes do not refer to the TDD DU configuration, but rather to D and U slots respectively, under the assumption that in FDD all slots will be D on downlink and U on uplink. A cleaner approach might be to simply duplicate the D/U/F configuration (the second configuration would be optional and it would be added for FDD only), so that there is one pattern for the downlink frequency and one pattern for the uplink frequency. The two H/S/NA configurations would then map to the two D/U/F configurations without requiring any change in meaning. This approach also seems to be more forward compatible as it also allows for F symbols to be used in FDD (which is consistent with FDD support as defined in the SFI framework). |
| **vivo** | **Yes** |  |
| **Ericsson** | **Partially** | See response on FL Proposal 2.1.2. |
| **Nokia** | **Yes** | We can simply confirm the WA as there is no critical issue with this. |

**FL Proposal 2.1.2: For paired spectrum, the DU resource configuration framework is extended with the following:**

**Alt. 1: Two separate H/S/NA per-cell DU semi-static configurations are provided (with slot level resolution in Rel-16) for downlink slots and uplink slots respectively instead of per D/U/F resource type**

**Alt. 2: Two separate per-cell DU semi-static configurations are provided where one configuration only includes D/F resources and corresponding H/S/NA attributes and the other configuration only includes U/F resources and corresponding H/S/NA attributes**

**Discussion:**

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| **Company** | **Do you prefer Alt 1. Or Alt. 2 in Proposal 2.1.2?** | **Comments** |
| **Qualcomm** | **Prefer Alt. 2** | The main reason for the preference for Alt.2 is that if we decouple H/S/NA from D/U/F, then there is an inconsistency with the release of soft resources via DCI format 2\_5 where the released resources are also associated with D/U/F. |

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| **LG** | **Prefer Alt2.** | We also think inconsistency between D/U/F and H/S/NA is not preferred. |
| **Ericsson** | **Prefer Alt. 2** | We agree on confirming the WA. However, since there is no FDD band supported in IAB Rel-16, we do not see a need to update the IAB higher layer parameters list, inform RAN3 in the current situation nor extend the DU resource configuration framework for operation in paired spectrum. |
| **Nokia** | **Support Alt.1** | Not objecting Alt.2 as well.  In both Alt 1 and 2, two separate H/S/NA per-cell DU semi-static configurations are provided. In DL direction, U may not be configured in DL directions of FDD, and H/S/NA only applies on top of the available resource types. So, Alt.2 is implicitly satisfied. |
| **CMCC** | **Alt. 2** | Basically, we are fine with both alternatives in Rel-16 stage. In our view, Alt. 2 needs less spec efforts than Alt. 1. |
| **Huawei** | **Alt.2** | Alt.2 is more consistent with the definition for TDD. From signaling poin of view, it just duplicate of the configuration for TDD in each slot. Eventually there may be no restriction from signaling point of view, just a restriction of CU configuration. Suggest update below  **Alt. 2: For paired spectrum, ~~T~~two separate per-cell DU semi-static configurations are provided respectively for DL and UL where ~~one~~ each configuration includes D/U/F resources and corresponding H/S/NA attributes ~~and the other configuration only includes U/F resources and corresponding H/S/NA attributes~~** |

## IAB Node Multiplexing Capability

**Source**: R1-2001952, R1-2002650

**Background:** In RAN1#98bis and RAN1#99 meetings, following are agreed and captured in the Chairman’s notes:

Working assumption:

For paired spectrum, the H/S/NA DU resource configuration framework is extended with the following:

* Two separate H/S/NA per-cell DU semi-static configurations are provided (with slot level resolution) for downlink and uplink

FFS: whether the definition of half-duplex operation has to be modified for IAB nodes operating in paired spectrum

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| Agreements**:**  The donor CU and the parent node can be made aware of the multiplexing capability between MT and DU (TDM required, TDM not required) of an IAB node to for any {MT CC, DU cell} pair.   * Signaling details up to RAN2/RAN3.   Agreements**:**  The indication of the multiplexing capability for the case of no-TDM between IAB MT and IAB DU is additionally provided with respect to each transmission-direction combination (per MT CC/DU cell pair):   * MT-TX/DU-TX * MT-TX/DU-RX * MT-RX/DU-TX * MT-RX/DU-RX   Note: This agreement does not require any additional specification impact in RAN1 in Rel-16, i.e. in Rel-16 the ehaviou of the IAB node is only defined for TDM cases. The ehaviou for no-TDM is left to IAB-node/network implementation in Rel-16. |

According to above agreements, TDM between IAB-node MT and IAB-node DU is a default ehaviour in Rel-16 IAB. However, in case of paired spectrum, uplink and downlink are separated in frequency domain and therefore there was a FFS point related to the half-duplex operation definition for IAB nodes.

**FL Conclusion 2.2**: No additional specification impact for 38.213 is required for the definition of half-duplex operation in case of IAB nodes operating in paired spectrum. Further discussion of the multiplexing capability indication for IAB nodes operating in paired spectrum can be discussed under the IAB-MT Features agenda item.

**Discussion:**

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| **Company** | **Do you agree with Conclusion 2.2?** | **Comments** |
| **Huawei** | **Yes** | Given that there is no specific standard impact for half duplex operation in unpaired spectrum except the potential capability related discussion, we don’t see particular spec impact for IAB nodes operating in paired spectrum. Maybe we can remove the FFS bullet completely for now and see whether there is any issue popping up in the IAB-MT feature discussion. |
| **Intel** | **Yes** | None |
| **CMCC** | **Yes** | For IAB nodes in paired spectrum, even the IAB DU/MT can operate in downlink and uplink simultaneously, the half-duplex constraint still exists between the IAB DU and MT. In our view, no spec impact is required for the definition of half-duplex operation for IAB nodes operating in paired spectrum, and the FFS point can be removed. |
| **Qualcomm** | **Yes** | The half-duplex constraint between the MT and DU of a given IAB node applies irrespective of whether paired or unpaired spectrum is used in the upstream and downstream links of the IAB node. |
| **Vivo** | **Yes** |  |
| **LG** | **Yes, but some more discussion is required.** | We tend to agree that there is no 213 spec impact regarding multiplexing capability. But, we think it should be clarified on the default multiplexing capability in the paired spectrum, since transmission-direction combinations of MT-Tx/DU-Tx and MT-Rx/DU-Rx (which is natural behavior in paired spectrum) can operate simultaneously. Or, IAB node shall report this multiplexing capability. |
| **Ericsson** | **Yes, no spec impact required;**  **No, no further discussion is needed.** | We do not see additional specification impact for 38.213 for half-duplex operation in paired spectrum. However, similar to our response on FL Proposal 2.1, since there is no FDD band supported in IAB Rel-16, we do not see a need for a further discussion of the multiplexing capability indication for paired spectrum operation. |
| **Nokia** | **Yes** | None. |

# Summary

T**BD**