**3GPP TSG RAN WG1 #108-e R1-2nnnnn**

**e-Meeting, February 21st – March 3rd, 2022**

**Agenda Item: 8.16.10**

**Source: Moderator (AT&T)**

**Title: Summary of UE features for IAB enhancements**

**Document for:** **Discussion/Decision**

# Introduction

This document presents the summary of email discussion/approval [108-e-R17-UE-features-eIAB-01] during RAN1 #108-e. According to the Chairman’s Notes:

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| [108-e-R17-UE-features-eIAB-01] Email discussion on UE features for IAB enhancements – Ralf (AT&T)* 1st check point: February 25
* Final check point: March 3
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The following was discussed and/or agreed during RAN1 #108-e within the scope of [108-e-R17-UE-features-eIAB-01]. All proposals are based on the latest RAN1 UE features list for Rel-17 NR in [1].

# Summary of Contributions Submitted to RAN1 #108-e

The following is the moderator’s summary of contributions submitted to RAN1 #108-e in this agenda item.

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| 31. NR\_IAB\_enh | 31-1 | Guard symbols  | 1) Support Rel-17 DesiredGuardSymbols reporting2) Support Rel-17 ProvidedGuardSymbols reception | one or more of {31-4, 31-5} | Yes | N/A | Guard symbols reporting and reception associated with Case 6 and 7 timings are not supported | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impactNote: If an IAB node does not support a certain timing mode, the reported/provided values shall be ignored | Optional with capability signalling. |

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| Company | Summary |
| Huawei/HiSilicon [2] |  |
| Nokia/Nokia Shanghai Bell [3] |  |
| ZTE/Sanechips [4] |  |
| Samsung [5] | It was agreed in RAN1#107-e that Rel-17 Guard symbols are required for the cases of Case#6/#7 MT TX to/from Case#1 DU TX/RX. It means Feature 20-7 (Case 1 OTA timing alignment) is needed as a pre-requisite for Feature 31-1. Therefore, it is proposed to add Feature 20-7 as a pre-requisite for Feature 31-1.**Proposal: Feature 20-7 is added as a pre-requisite for Feature 31-1.** |
| Intel Corporation [6] |  |
| Ericsson [7] | In RAN1#107-e, the following agreement on enhancement of Desired/Provided Guard Symbols was achieved:

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| **Agreement:** The following RAN1#106bis-e agreement is updated.The MAC-CE signaling of Desired/Provided Guard Symbols is enhanced to optionally indicate the number of guard symbols required for switching between at least the following cases:* **~~Case#6 MT Tx and [Case #7] DU [Tx]/Rx~~**
* **~~Case#7 MT Tx (to support Case #7 at parent node) and DU Tx/Rx~~**
* A: Case #6 MT TX to/from Case #1 DU RX
* D: Case #7 MT TX **(to support Case #7 at parent node)** to/from Case #1 DU RX
* G: Case #7 MT TX **(to support Case #7 at parent node)** to/from Case #1 DU TX
* (Working Assumption) H: Case #6 MT TX to/from Case #1 DU TX
* Association with IAB-MT’s DL Rx beam via TCI state ID and RS ID (SSB ID and/or CSI-RS ID) or UL TX beam via SRI
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The above agreement confirms the two components of the FG 31-1 Guard Symbols:1) Support Rel-17 DesiredGuardSymbols reporting2) Support Rel-17 ProvidedGuardSymbols reception

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| 31. NR\_IAB\_enh | 31-1 | Guard symbols  | 1) Support Rel-17 DesiredGuardSymbols reporting2) Support Rel-17 ProvidedGuardSymbols reception | one or more of {31-4, 31-5} | Yes | N/A | Guard symbols reporting and reception associated with Case 6 and 7 timings are not supported | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impactNote: If an IAB node does not support a certain timing mode, the reported/provided values shall be ignored | Optional with capability signalling. |

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| 31. NR\_IAB\_enh | 31-2 | IAB-DU beam restriction indication | Support restricted IAB-DU Beam Indication reception |  | Yes | N/A | Parent-node cannot indicate restricted beams at the IAB-DU. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Summary |
| Huawei/HiSilicon [2] |  |
| Nokia/Nokia Shanghai Bell [3] |  |
| ZTE/Sanechips [4] |  |
| Samsung [5] |  |
| Intel Corporation [6] |  |
| Ericsson [7] | In RAN1#107-e, the following agreements on IAB-DU beam restriction indication were achieved:

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| **Agreement:**In addition to SSB ID, CSI-RS ID may be additionally used as the RS ID for a restricted beam indication from the parent node to the IAB node. * STC index may be additionally indicated along with SSB ID if more than one STC is configured at the IAB node.
* Note: This does not mean that IAB-specific CSI-RS should be developed and requires no additional specification work

**Agreement:**The restricted beam indication from the parent node to the IAB node may be indicated to be associated with some combination (one or multiple) of the following IAB-node’s configurations: * {MT CC, DU cell} pair and optionally may be indicated to be associated with only {DU cell} if independent of MT CC(s)
* Multiplexing mode info (i.e. multiplexing info in 38.473) and optionally may be indicated to be applicable to non-overlapping frequency resources
* Slot index
* Association with IAB-MT’s DL Rx beam via TCI state ID and RS ID (SSB ID and/or CSI-RS ID) or UL TX beam via SRI
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Based on the above first agreement from RAN1#107-e, the component of FG 31-2 should be updated to1. Support SSB (incl. STC index) and CSI-RS ID based restricted IAB-DU Beam Indication reception

To include the above second agreement from RAN1#107-e, an additional component should be included:1. Support association between restricted beam indication and {MT CC, DU cell} pair, and/or multiplexing mode, and/or slot index, and/or IAB-MT DL/UL beam

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| 31. NR\_IAB\_enh | 31-2 | IAB-DU beam restriction indication | 1. Support SSB (incl. STC index) and CSI-RS ID based restricted IAB-DU Beam Indication reception
2. Support association between restricted beam indication association and {MT CC, DU cell} pair, and/or multiplexing mode, and/or slot index, and/or IAB-MT DL/UL beam
 |  | Yes | N/A | Parent-node cannot indicate restricted beams at the IAB-DU. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| 31. NR\_IAB\_enh | 31-3 | IAB-MT beam recommendation indication | Support recommended IAB-MT Beam Indication transmission1) IAB-MT DL beam2) IAB-MT UL beam |  | yes | N/A | IAB-node cannot indicate recommended IAB-MT DL/UL beam to parent node | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Summary |
| Huawei/HiSilicon [2] |  |
| Nokia/Nokia Shanghai Bell [3] |  |
| ZTE/Sanechips [4] |  |
| Samsung [5] |  |
| Intel Corporation [6] |  |
| Ericsson [7] | In RAN1#107-e, the following agreements on IAB-MT beam recommendation indication were achieved:

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| **Agreement:**The recommended beam indication from the IAB-MT to the parent node are provided using the following: * For DL Rx beam(s)
	+ DL TCI state ID and RS ID (SSB ID and/or CSI-RS ID)
* For UL Tx beam(s)
	+ SRI

**Agreement:**The recommended beam indication from the IAB node to the parent node may be indicated to be associated with some combination (one or multiple) of the following IAB-node’s configurations: * {MT CC, DU cell} pair and optionally may be indicated to be associated with only {MT CC} if independent of DU cell(s)
* Multiplexing mode info (i.e. multiplexing info in 38.473) and optionally may be indicated to be applicable to non-overlapping frequency resources
* Slot index
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To implement the above agreements, the components of FG 31-3 should include1) Support TCI state ID and RS ID based recommended IAB-MT DL beam indication transmission2) Support SRI based recommended IAB-MT UL beam indication transmission3) Support association between recommended beam indication and {MT CC, DU cell} pair, and/or multiplexing mode, and/or slot index

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| 31. NR\_IAB\_enh | 31-3 | IAB-MT beam recommendation indication | ~~Support recommended IAB-MT Beam Indication transmission~~1) Support TCI state ID and RS ID based recommended IAB-MT DL beam indication transmission2) Support SRI based recommended IAB-MT UL beam indication transmission3) Support association between recommended beam indication association and {MT CC, DU cell} pair, and/or multiplexing mode, and/or slot index  |  | yes | N/A | IAB-node cannot indicate recommended IAB-MT DL/UL beam to parent node | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| 31. NR\_IAB\_enh | 31-4 | Case 6 timing alignment | Support Case 6 timing alignment indication reception |  | Yes | N/A | Switching across different timing cases (i.e., Case 1 at IAB-node, Case 6 at IAB-node, and/or Case 7 at theParent) is not supported. When to perform Case 6 timing at the IAB-node cannot be controlled by the parent node. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Summary |
| Huawei/HiSilicon [2] |  |
| Nokia/Nokia Shanghai Bell [3] |  |
| ZTE/Sanechips [4] |  |
| Samsung [5] | It was agreed in RAN1#107-e that the T\_delta range is updated to support Case 6 timing. It means Feature 20-7 (Case 1 OTA timing alignment) is needed as a pre-requisite for Feature 31-4. Therefore, it is proposed to add Feature 20-7 as a pre-requisite for Feature 31-4.**Proposal: Feature 20-7 is added as a pre-requisite for Feature 31-4.** |
| Intel Corporation [6] | RAN1#107e has the following agreement regarding Case#6 timing alignment signaling. * ***A child IAB-MT can inform a parent node via MAC-CE whether Case 6 timing is required for simultaneous operation.***

Accordingly, FG 31-4 needs to be extended to support IAB-MT transmission to inform its parent node whether Case#6 timing is required. **Proposal:** Revise FG 31-4 as follows to support IAB-MT transmission to inform its parent node whether Case#6 timing is required.

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| Index | Feature group | Components |
| 31-4 | Case 6 timing alignment  | 1. Support Case 6 timing alignment indication reception

2) Support Case 6 required or not information transmission |

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| Ericsson [7] | In RAN1#107-e, the following agreements on Case 6 timing alignment were achieved:

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| **Agreement:**A child IAB-MT can inform a parent node via MAC-CE whether Case 6 timing is required for simultaneous operation.**Agreement:**A Timing Case Indication received from a serving cell is applicable to all other cells in the same timing advance group (TAG). **Agreement:**Select Alt 2 from the aforementioned RAN1#106b-e agreement without specification impact other than the following:* Alt A: the T\_delta range is updated to support Case 6 timing.

FFS: Update of one way delay estimation equation in TS38.213 subclause 14 |

Based on the above three agreements the components in FG 31-4 Case 6 timing alignment should include: 1. Support Case 6 Timing Mode Indication reception being applicable for all cells in the same timing advance group (TAG).
2. Support T\_delta reception
3. Support signalling to the parent-node that Case 6 Timing Mode is required for simultaneous transmission

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| 31. NR\_IAB\_enh | 31-4 | Case 6 timing alignment | 1. Support Case 6 ~~t~~Timing ~~alignment~~ Mode ~~i~~Indication reception being applicable for all cells in the same timing advance group (TAG).
2. Support T\_delta reception

Support signalling to the parent-node that Case 6 Timing Mode is required for simultaneous transmission  |  | Yes | N/A | Switching across different timing cases (i.e., Case 1 at IAB-node, Case 6 at IAB-node, and/or Case 7 at theParent) is not supported. When to perform Case 6 timing at the IAB-node cannot be controlled by the parent node. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| 31. NR\_IAB\_enh | 31-5 | Case 7 timing alignment | 1.) Support Case7 timing offset indication reception2.) Support Case 7 timing at parent-node indication reception |  | Yes | N/A | Parent-node cannot adopt both (and switch between) Case 1 and Case 7 timing.  | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Summary |
| Huawei/HiSilicon [2] |  |
| Nokia/Nokia Shanghai Bell [3] |  |
| ZTE/Sanechips [4] |  |
| Samsung [5] |  |
| Intel Corporation [6] |  |
| Ericsson [7] | In RAN1#107-e, the following agreement on Case 7 timing alignment was achieved:

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| **Agreement:**The dynamic range of the MAC CE case #7 timing offset indication is 12 bits.* FFS the numerical values of the endpoints of the range

**Agreement:**A Timing Case Indication received from a serving cell is applicable to all other cells in the same timing advance group (TAG).  |

Based on the above two agreements the components in FG 31-5 Case 7 timing alignment should include: 1.) Support Case 7 Timing Offset Indication reception. 2.) Support Case 7 Timing Mode at parent-node indication reception being applicable for all cells in the same timing advance group (TAG).

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| 31. NR\_IAB\_enh | 31-5 | Case 7 timing alignment | 1) Support Case 7 ~~t~~Timing ~~o~~Offset ~~i~~Indication reception2) Support Case 7 ~~t~~Timing Mode at parent-node indication reception being applicable for all cells in the same timing advance group (TAG) |  | Yes | N/A | Parent-node cannot adopt both (and switch between) Case 1 and Case 7 timing.  | Per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| 31. NR\_IAB\_enh | 31-6 | DL TX power adjustment | 1.) Support Desired DL TX Power Adjustment reporting2.) Support DL TX Power Adjustment reception |  | Yes | N/A | Parent-node’s DL TX power adjustment reporting and reception is not supported. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Summary |
| Huawei/HiSilicon [2] |  |
| Nokia/Nokia Shanghai Bell [3] |  |
| ZTE/Sanechips [4] |  |
| Samsung [5] |  |
| Intel Corporation [6] |  |
| Ericsson [7] | In RAN1#107-e, the following agreements on parent IAB-DU DL TX power control were achieved:

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| **Agreement:**TCI state ID and RS ID (SSB ID and/or CSI-RS ID) is used to indicate IAB-MT’s DL beam for the desired/provided DL TX power adjustment indication by the IAB-node/the parent-node.In case the desired/provided DL TX power adjustment indication does not include information about the associated IAB-MT’s DL beams, the adjustment is applied to all MT’s DL beams. **Agreement:**The provided DL TX power adjustment is applied only to PDSCH and its associated DMRS and PTRS.**Agreement:**The indicated desired/provided DL TX power adjustment is in terms of a relative offset to the PDSCH a CSI-RS TX power that is RRC configured.**Agreement:**The indication of the desired/provided DL TX power adjustment and desired UL PSD range can further include:* An indication of whether a desired/provided power configuration or adjustment is applied on FDM resources where the simultaneous MT’s and DU’s signals are non-overlapping in the frequency-domain and/or on non-FDM resources where the simultaneous MT’s and DU’s signals may overlap in the frequency-domain, for a given (MT CC, DU cell).

**Agreement:**Support optionally indicating “slot index” in the provided DL TX power adjustment indication, that comprises indicating a list of one or multiple slot indices for which the associated DL power adjustment is applied.* Support of “slot index” indication in the desired DL TX power adjustment indication
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Based on the above agreements from the RAN1#107-e meeting, the FG 31-6 should include the following components:1) Support TCI state ID and RS ID based Desired DL TX Power Adjustment reporting for PDSCH and its associated DMRS and PTRS2) Support TCI state ID and RS ID based DL TX Power Adjustment reception for PDSCH and its associated DMRS and PTRS3) Support association between indication of desired/provided DL TX power adjustment to frequency-domain resource, and/or slot index

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| 31. NR\_IAB\_enh | 31-6 | DL TX power adjustment | 1) Support TCI state ID and RS ID based Desired DL TX Power Adjustment reporting for PDSCH and its associated DMRS and PTRS2) Support TCI state ID and RS ID based DL TX Power Adjustment reception for PDSCH and its associated DMRS and PTRS3) Support association between indication of desired/provided DL TX power adjustment to frequency-domain resource, and/or slot index  |  | Yes | N/A | Parent-node’s DL TX power adjustment reporting and reception is not supported. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| 31. NR\_IAB\_enh | 31-7 | [Desired] UL TX power adjustment  | Support [Desired IAB-MT PSD range] reporting |  | Yes | N/A | Desired MT’s UL PSD range reporting is not supported. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Summary |
| Huawei/HiSilicon [2] | The support of desired IAB-MT UL PSD range reporting is an important feature for IAB node to operate simultaneous Tx. By reporting the UL PSD range, the parent node can schedule the IAB-MT with UL Tx transmission power levels which is favorable for IAB-DU to transmit at the same time. For FG 31-7, the name of the feature and the description are still in brackets. ***Proposal 1:*** *Remove the brackets in FG 31-7 as follows*

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| 31. NR\_IAB\_enh | 31-7 | Desired UL TX power adjustment  | Support Desired IAB-MT PSD range reporting |  | Yes | N/A | Desired MT’s UL PSD range reporting is not supported. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Nokia/Nokia Shanghai Bell [3] | It is fine to confirm the text in brackets in principle. One alternative formulation that is more precise is ”Desired power range adjustment”. |
| ZTE/Sanechips [4] |  |
| Samsung [5] |  |
| Intel Corporation [6] |  |
| Ericsson [7] | In RAN1#107-e, the following agreements on IAB-MT UL TX power control were achieved:

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| **Agreement:**SRI is used to indicate IAB-MT’s UL beam for the desired UL PSD range indication.In case the desired UL PSD range indication does not include information about the associated IAB-MT’s UL beams, the PSD range is applied to all MT’s UL beams. **Agreement:**The indication of the desired/provided DL TX power adjustment and desired UL PSD range can further include:* An indication of whether a desired/provided power configuration or adjustment is applied on FDM resources where the simultaneous MT’s and DU’s signals are non-overlapping in the frequency-domain and/or on non-FDM resources where the simultaneous MT’s and DU’s signals may overlap in the frequency-domain, for a given (MT CC, DU cell).
 |

Based on the above two agreements from the RAN1#107-e meeting, the FG 31-7 should include the following components:1. Support SRI based Desired IAB-MT PSD range reporting
2. Support association between indication of desired UL PSD range to frequency-domain resource, and/or slot index, for a given {MTCC, DU cell}

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| 31. NR\_IAB\_enh | 31-7 | ~~[Desired]~~ UL TX power range for simultaneous transmission | 1. Support SRI based Desired IAB-MT PSD range reporting
2. Support association between indication of desired UL PSD range to frequency-domain resource, and/or slot index, for a given {MT CC, DU cell}
 |  | Yes | N/A | Reporting of IAB-MT’s desired UL PSD range for simultaneous transmission is not supported. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| 31. NR\_IAB\_enh | [31-8] | [Dynamic indication of Rel-17 or FDM soft resource availability] | Support monitoring DCI Format 2\_5 scrambled by AI-RNTI for indication of FDM soft resource availability to an IAB node |  | Yes | N/A | The IAB-node is unable to receive explicit availability indication for Soft resources | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling |

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| Company | Summary |
| Huawei/HiSilicon [2] | For the dynamic FDM soft resource availability indication, the following was agreed in RAN1#107-e:

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| **Agreement**For DCI format 2\_5 indicating availability for the soft resources of the respective RB sets corresponding to a given time resource of the child IAB-DU cell:* *AvailabiltyCombination* can be extended to include multiple *resourceAvailabilty*, where each *resourceAvailabilty* includes availability indication for one RB set group
	+ One RB set group consists of one or multiple RB sets
 |

FG 31-8 is in brackets since it was unclear then whether there will be any enhancement to the dynamic indication of IAB-DU soft resource. Given the above agreement, in Rel-17, “*AvailabiltyCombination*” can be extended to include multiple *resourceAvailabilty*, where each resourceAvailabilty includes availability indication for one RB set group. Hence we propose:***Proposal 2:*** *For FG 31-8, adopt the following changes** *Remove the brackets for [31-8]*
* *Remove the bracket and “or” for [Dynamic indication of Rel-17 or FDM soft resource availability]*

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| 31. NR\_IAB\_enh | 31-8 | Dynamic indication of Rel-17 FDM soft resource availability | Support monitoring DCI Format 2\_5 scrambled by AI-RNTI for indication of FDM soft resource availability to an IAB node |  | Yes | N/A | The IAB-node is unable to receive explicit availability indication for Soft resources | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling |

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| Nokia/Nokia Shanghai Bell [3] | o Some further clarification is needed on the intent of this FG. It should not be about enhancement to monitoring DCI 2\_5 itself, but on supporting the enhanced resource configurations, which happens to be pointed by DCI 2\_5. o Consequence if not supported should be: The IAB-node is unable to receive explicit availability indication for FDM Soft resources. |
| ZTE/Sanechips [4] |  |
| Samsung [5] |  |
| Intel Corporation [6] |  |
| Ericsson [7] | In RAN1#107-e, the following agreement on frequency-domain DCI format 2\_5 was achieved:

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| **Agreement:** For DCI format 2\_5 indicating availability for the soft resources of the respective RB sets corresponding to a given time resource of the child IAB-DU cell:* *AvailabiltyCombination* can be extended to include multiple *resourceAvailabilty*, where each *resourceAvailabilty* includes availability indication for one RB set group
	+ One RB set group consists of one or multiple RB sets
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RAN1 has only agreed to enhance the availabilityCombination to include multiple resourceAvailability for one or multiple RB set groups of the frequency domain resource.The name of FL 31-8 should be changed to “**Dynamic indication of FDM soft resource availability**”.

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| 31. NR\_IAB\_enh | 31-8 | Dynamic indication of ~~Rel-17 or~~ FDM soft resource availability | Support monitoring DCI Format 2\_5 scrambled by AI-RNTI for indication of FDM soft resource availability to an IAB node |  | Yes | N/A | The IAB-node is unable to receive explicit availability indication for Rel-17 or FDM soft resources | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling |

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**Other**

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| Company | Summary |
| Huawei/HiSilicon [2] |  |
| Nokia/Nokia Shanghai Bell [3] |  |
| ZTE/Sanechips [4] | According to the following agreement from RAN1#107e meeting, a child IAB-MT can inform a parent node via MAC-CE whether Case 6 timing is required for simultaneous operation.

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| **Agreement**A child IAB-MT can inform a parent node via MAC-CE whether Case 6 timing is required for simultaneous operation. |

***Proposal: Add the following FG to reflect the agreement of RAN1#107-e:***

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 31-x | [Case 6 Timing required] | Support [Case 6 Timing required] Indication transmission |  | yes | N/A | IAB-MT cannot indicate whether Case 6 timing is required for simultaneous operation to parent node | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

Moreover, based on the following agreements in RAN1#107-e:

|  |
| --- |
| **Agreement of RAN1#106bis-e**RAN1 to downselect in RAN1#107-e one of the following for an OTA timing synchronization mechanism to enable/maintain Case 6 timing mode:* Alt 1: no change or enhancement to the Rel-16 OTA synchronization specification is supported in Rel-17 for Case 6 timing.
* Alt 2: in Rel-17 the Rel-16 OTA synchronization specification is updated to support OTA synchronization for an IAB-node operating solely in Case 6 timing during IAB-MT Tx.
	+ FFS range of T\_delta.

NOTE: this is to provide a feasible solution to the RAN1#103-e agreement: “An IAB-node can rely on an OTA timing synchronization mechanism to enable/maintain Case 6 timing mode”**Agreement of RAN1#107-e**Select Alt 2 from the aforementioned RAN1#106b-e agreement without specification impact other than the following:* Alt A: the T\_delta range is updated to support Case 6 timing.

FFS: Update of one way delay estimation equation in TS38.213 subclause 14 |

Although updated T\_delta range, i.e., Alt 2, is agreed to support OTA synchronization for an IAB-node operating solely in Case 6 timing during IAB-MT Tx, it does not necessarily mean the new T\_delta range should mandatory for Case 6 timing. From our point views, when Case 1 timing is in operation with Case 6 timing, there is no problem in obtaining DL-Tx timing to support OTA synchronization via Rel-16 T\_delta range, and we prefer to make an optional UE feature to reflect this.***Proposal: Add the following FG to reflect the agreements of RAN1#106bis-e and RAN1#107-e:***

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| 31-y | [Updated T\_delta range] | Support [Updated T\_delta range] reception |  | Yes | 31-4 | The updated T\_delta range for an IAB-node operating solely in Case 6 timing is not supported.  | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

 |
| Samsung [5] |  |
| Intel Corporation [6] | RAN1#107e has the following agreements regarding RRC signaling enhancements for frequency-domain soft availability indication. * *For DCI format 2\_5 indicating availability for the soft resources of the respective RB sets corresponding to a given time resource of the child IAB-DU cell:*
* *AvailabiltyCombination can be extended to include multiple resourceAvailabilty, where each resourceAvailabilty includes availability indication for one RB set group*
	+ *One RB set group consists of one or multiple RB sets*

Accordingly, new feature group is needed to support RRC signaling enhancements for frequency-domain RB set group soft availability indication. **Proposal:** Add the following new FG to to support RRC signaling enhancements for frequency-domain RB set group soft availability indication.

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| 31-7 | Frequency-domain soft availability | Support MT reception of frequency-domain soft availability configuration  |  | yes | N/A | IAB-node cannot interprete soft availability indication from parent node | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

RAN1#107e has the following agreement regarding indication of whether FDM is required or not. * *Support indication of whether FDM is required or not for an enhanced multiplexing operation mode to donor-CU.*

Accordingly, new feature group is needed to support FDM required or not transmission to donor CU. **Proposal:** Add the following new FG to to support FDM required or not transmission to donor CU.

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| 31-8 | FDM required or not indication | Support MT transmission of FDM required or not indication |  | yes | N/A | Donor CU will not be aware of IAB-node’s multiplexing operation mode of FDM required or not  | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

RAN1#107e has the following agreement regarding timing case indication. * *An IAB-MT is provided with a Timing Case Indication via MAC-CE that explicitly indicates a list of slots and their associated UL TX timing cases (i.e., one of {Case 1, Case 6, Case 7} for each slot).*

Accordingly, new feature group is needed to support Timing Case Indication Reception. **Proposal:** Add the following new FG to to support Timing Case Indication Reception.

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| 31-9 | Timing Case Indication | Support MT reception of Timing Case Indication  |  | yes | N/A | IAB-node cannot be controlled by parent node regarding timing cases  | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

 |
| Ericsson [7] | In RAN1#106bis-e, the following agreement on transmission directional conflict handling in IAB DC scenarios was achieved:

|  |
| --- |
| **Agreement**Select the following alternative to handle potential indication conflict of symbols configured as semi-static flexible by one parent node, but not the other in inter-donor DC scenarios if the IAB MT of the dual-connected IAB-node does not support simultaneous Tx and Rx on different carriers:* Alt. 1. The IAB MT does not expect to receive conflicting DCI formats including DCI2\_0 and dynamic scheduling grants from different parents. FFS: Explicitly captured in the specification or left as a network configuration error case without specification impact

Select the following alternative to handle potential indication conflict of symbols configured as semi-static flexible by both parent nodes in inter-donor DC scenarios if the IAB MT of the dual-connected IAB-node does not support simultaneous Tx and Rx on different carriers:* Alt. 5: If a conflict occurs, the IAB MT is expected to perform as scheduled by MCG
 |

The FG 14-5 (Half-duplex UE behavior in TDD CA for same SCS) is about the UE’s capability to support for directional collision handling between reference and other cells(s) for half-duplex operation in CA with same SCS. Following the Rel-16 TDD CA case, a similar FG group should be introduced for IAB-MT’s capability to handle the transmission directional collision handling in the DC scenarios.

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| 31. NR\_IAB\_enh | 31-x | Half-duplex IAB-MT behaviour in TDD DC | Support for directional collision handling between MCG and SCG for half-duplex operation in DC |  | Yes | N/A | The IAB-node is unable to receive/transmit from the dual connected parent nodes for slots with conflicting configurations | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling |

 |

# Discussion/Approval Items during RAN1 #108-e — First Checkpoint

After review of contributions submitted to RAN1 #108-e in this agenda item, the following topics were identified by the moderator for discussion/approval during RAN1 #108-e.

**General comments**

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

# Issue 1: FG 31-1

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 31. NR\_IAB\_enh | 31-1 | Guard symbols  | 1) Support Rel-17 DesiredGuardSymbols reporting2) Support Rel-17 ProvidedGuardSymbols reception | one or more of {31-4, 31-5}, 20-7 | Yes | N/A | Guard symbols reporting and reception associated with Case 6 and 7 timings are not supported | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impactNote: If an IAB node does not support a certain timing mode, the reported/provided values shall be ignored | Optional with capability signalling. |

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| Company | Comments/Questions/Suggestions |
| **Ericsson** | We are not supporting adding 20-7 as a prerequisite to 31-1 since OTA timing itself is not mandated. For example, with GNSS, 20-7 is not needed. |

# Issue 2: FG 31-2

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 31. NR\_IAB\_enh | 31-2 | IAB-DU beam restriction indication | 1.) Support SSB (incl. STC index) and CSI-RS ID based restricted IAB-DU Beam Indication reception2.) Support association between restricted beam indication association and {MT CC, DU cell} pair, and/or multiplexing mode, and/or slot index, and/or IAB-MT DL/UL beam |  | Yes | N/A | Parent-node cannot indicate restricted beams at the IAB-DU. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Comments/Questions/Suggestions |
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# Issue 3: FG 31-3

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 31. NR\_IAB\_enh | 31-3 | IAB-MT beam recommendation indication | ~~Support recommended IAB-MT Beam Indication transmission~~1) Support TCI state ID and RS ID based recommended IAB-MT DL beam indication transmission2) Support SRI based recommended IAB-MT UL beam indication transmission3) Support association between recommended beam indication association and {MT CC, DU cell} pair, and/or multiplexing mode, and/or slot index |  | yes | N/A | IAB-node cannot indicate recommended IAB-MT DL/UL beam to parent node | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Comments/Questions/Suggestions |
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# Issue 4: FG 31-4

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 31. NR\_IAB\_enh | 31-4 | Case 6 timing alignment | 1) Support Case 6 timing ~~alignment~~ mode indication reception being applicable for all cells in the same timing advance group (TAG)2) Support T\_delta reception3) Support signalling to the parent-node that Case 6 Timing Mode is required for simultaneous transmission | 20-7 | Yes | N/A | Switching across different timing cases (i.e., Case 1 at IAB-node, Case 6 at IAB-node, and/or Case 7 at theParent) is not supported. When to perform Case 6 timing at the IAB-node cannot be controlled by the parent node. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Comments/Questions/Suggestions |
| **Ericsson** | Similar to FG 31-1, we do not think 20-7 should be mandated for this feature. |

# Issue 5: FG 31-5

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 31. NR\_IAB\_enh | 31-5 | Case 7 timing alignment | 1.) Support Case7 timing offset indication reception2.) Support Case 7 timing mode at parent-node indication reception being applicable for all cells in the same timing advance group (TAG) |  | Yes | N/A | Parent-node cannot adopt both (and switch between) Case 1 and Case 7 timing.  | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Comments/Questions/Suggestions |
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# Issue 6: FG 31-6

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 31. NR\_IAB\_enh | 31-6 | DL TX power adjustment | 1.) Support TCI state ID and RS ID based Desired DL TX Power Adjustment reporting for PDSCH and its associated DMRS and PTRS2.) Support TCI state ID and RS ID based DL TX Power Adjustment reception for PDSCH and its associated DMRS and PTRS3.) Support association between indication of desired/provided DL TX power adjustment to frequency-domain resource, and/or slot index |  | Yes | N/A | Parent-node’s DL TX power adjustment reporting and reception is not supported. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Comments/Questions/Suggestions |
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# Issue 7: FG 31-7

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 31. NR\_IAB\_enh | 31-7 | ~~[~~Desired~~]~~ UL TX power adjustment  | 1.) Support SRI based ~~[~~Desired IAB-MT PSD range~~]~~ reporting2.) Support association between indication of desired UL PSD range to frequency-domain resource, and/or slot index, for a given {MT CC, DU cell} |  | Yes | N/A | Desired MT’s UL PSD range reporting is not supported. | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Comments/Questions/Suggestions |
| **Ericsson** | In order to be aligned with naming in FG 31-1, we think “Desired” can be omitted from the parameter name. |

# Issue 8: FG 31-8

After review of contributions submitted to RAN1 #108-e in this agenda item, the following is proposed by the moderator. Companies submitted the following views on the moderator’s proposals.

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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| 31. NR\_IAB\_enh | ~~[~~31-8~~]~~ | [Dynamic indication of ~~Rel-17 or~~ FDM soft resource availability~~]~~ | Support monitoring DCI Format 2\_5 scrambled by AI-RNTI for indication of FDM soft resource availability to an IAB node |  | Yes | N/A | The IAB-node is unable to receive explicit availability indication for FDM Soft resources | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling |

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| Company | Comments/Questions/Suggestions |
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# Issue 9: New FGs

The following new FGs were proposed in contributions submitted to RAN1 #108-e in this agenda item. **Please indicate in the table below which of these proposed FGs should be discussed during RAN1 #108-e.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 31-10a | Case 6 Timing required | Support Case 6 Timing required Indication transmission |  | yes | N/A | IAB-MT cannot indicate whether Case 6 timing is required for simultaneous operation to parent node | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |
| 31-10b | Updated T\_delta range | Support Updated T\_delta range reception |  | Yes | 31-4 | The updated T\_delta range for an IAB-node operating solely in Case 6 timing is not supported.  | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |
| 31-10c | Frequency-domain soft availability | Support MT reception of frequency-domain soft availability configuration  |  | yes | N/A | IAB-node cannot interprete soft availability indication from parent node | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |
| 31-10d | FDM required or not indication | Support MT transmission of FDM required or not indication |  | yes | N/A | Donor CU will not be aware of IAB-node’s multiplexing operation mode of FDM required or not  | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |
| 31-10e | Timing Case Indication | Support MT reception of Timing Case Indication  |  | yes | N/A | IAB-node cannot be controlled by parent node regarding timing cases  | Per IAB-node | no | no | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |
| 31-10f | Half-duplex IAB-MT behaviour in TDD DC | Support for directional collision handling between MCG and SCG for half-duplex operation in DC |  | Yes | N/A | The IAB-node is unable to receive/transmit from the dual connected parent nodes for slots with conflicting configurations | per IAB node | No | No | support mixture of FDD/TDD and/or FR1/FR2  | IAB-MT impact | Optional with capability signalling. |

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| Company | Comments/Questions/Suggestions |
| **Ericsson** | 31-10a/b/e are subcomponents of either 31-4 or 31-5 and are already included in the proposed updates to those FGs.31-10c can be agreed but may also be needed for Rel-16 if agreed.31-10d is not a UE-feature since it is F1AP signaling from IAB-DU to donor CU. |

# Discussion/Approval Items during RAN1 #108-e — Second Checkpoint

Based on the comments/questions/suggestions received by the first checkpoint, the following are the revised proposals and/or proposed agreements by the moderator. Companies submitted the following views on the moderator’s proposals.

***[Please submit all comments/questions/suggestions here, late comments/questions/suggestions submitted in Section 3 will not be considered]***

**General comments**

|  |  |
| --- | --- |
| Company | Comments/Questions/Suggestions |
|  |  |

# Issue 1: FG

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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# Discussion/Approval Items during RAN1 #108-e — Third Checkpoint

Based on the comments/questions/suggestions received by the second checkpoint, the following are the revised proposals and/or proposed agreements by the moderator. Companies submitted the following views on the moderator’s proposals.

***[Please submit all comments/questions/suggestions here, late comments/questions/suggestions submitted in Section 4 will not be considered]***

**General comments**

|  |  |
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| Company | Comments/Questions/Suggestions |
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# Issue 1: FG

**Proposal: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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# Summary of Final Proposals for Agreements

This Section summarizes the final proposals for agreement in RAN1 #108-e by email. There are no tables for comments.

***[All comments must be directly made on the RAN1 email reflector]***

Companies can continue to update their comments in the previous Sections, however, these are no longer monitored by the moderator. Any such comments will be for archival purposes only and will not influence the outcome of this email discussion. Any objection to any of the proposals in this Section must be voiced directly on the RAN1 email reflector.

**Possible Agreement: Adopt the following changes highlighted in chromatic fonts, while keeping the yellow highlighting, if any, as shown**

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# Conclusion

After further discussion on the RAN1 email reflector the following was agreed as part of this email discussion:

# References

1. R1-2200780, Updated RAN1 UE features list for Rel-17 NR after RAN1 #108-e, Moderators (AT&T, NTT DOCOMO, INC.)
2. R1-2200928, Rel-17 UE features for IAB, Huawei/HiSilicon
3. R1-2201417, On UE features for IAB enhancements, Nokia/Nokia Shanghai Bell
4. R1-2201459, Discussion on NR Rel-17 IAB MT Features, ZTE/Sanechips
5. R1-2201528, UE features for NR IAB, Samsung
6. R1-2201724, UE features for IAB, Intel Corporation
7. R1-2202405, UE features for enhanced IAB, Ericsson