3GPP TSG RAN WG1 Meeting #108-e R1-22xxxxx

21st February – 3rd March 2022

Agenda Item: 8.10

Source: Moderator (Qualcomm Incorporated)

Title: Summary of [108-e-R17-eIAB-03] Email discussion on Rel-17 MAC-CE and F1AP for eIAB

Document for: Discussion and decision

This document provides a summary of the following email discussion on non-RRC upper layer parameters to support eIAB physical layer operation:

[108-e-R17-eIAB-03] Email discussion on Rel-17 MAC-CE and F1AP for eIAB by February 25– Luca (Qualcomm)

The starting point from the discussion is largely based on the outcome of the related discussion in RAN1#107-e, reflected in [1]. Additional input was provided in [2][3]. RRC parameters were removed from this discussion and moved to the 108-e-R17-RRC-eIAB] thread. Track changes was enabled to highlight modifications from [1] for parameters within the scope of this discussion.

The plan is to continue this WI specific discussion using this format. Once completed, the output of this discussion will be folded into a consolidated eIAB LS to RAN2 and RAN3 with all eIAB upper layer parameters (RRC, MAC-CE and F1AP), which will merge in the output from the related email discussion on RRC parameters [108-e-R17-RRC-eIAB].

| **Param. ID** | **Sub-feature group** | **New or existing parameter** | **Parameter name in specification** | **Description** | **Value range** | **Default value** | **IAB node specific/IAB nodes common** | **Specification** | **Signaling** | **Comment** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P01 | Resource multiplexing | New | Rel-17 frequency-domain IAB-DU-Resource-Configuration-H/S/NA-Config (final name in specification to be determined by RAN2/3) | Indicates H/S/NA attributes per RB set, per D/U/F resource type within a slot, for multiple slots and/or over a subset of slots. | {Hard, Soft, Not Available} per RB set, per resource type in a slot [TBD relative to IAB-DU-Resource-Configuration-TDD-Config]  |  | IAB node specific |  | **F1AP** | **RAN1 #105-e**AgreementFor frequency domain multiplexing, H/S/NA configurations for an IAB-node are provided separately in addition to the Rel-16 H/S/NA**Agreement**If an IAB node is configured with a frequency-domain H/S/NA configuration down select between the following options:* Alt. 1 Either the Rel-16 H/S/NA configuration or frequency domain configuration is applied for a given resource
	+ FFS: Whether configurations are switched with per-slot, per-resource type within a slot, or per-symbol granularity
* Alt. 2 The Rel-16 H/S/NA configuration and frequency domain configuration are jointly applied

**RAN1 #106-e****Agreement**The semi-static configuration of H/S/NA resource type in frequency domain is provided per RB set, per D/U/F resource type within a slot.**RAN1#106bis-e**AgreementThe Rel-17 frequency domain H/S/NA configuration is provided across multiple slots and/or over a subset of slots only, with the same time-domain granularity and pattern duration as the Rel-16 H/S/NA configuration (i.e. gNB-DU Cell Resource Configuration (9.3.1.107 in TS 38.473 [8])).* For a given slot, different H/S/NA resource types can be configured for different RB sets
* Additional signaling details (e.g. bitmap, slot pattern, etc.) can be left up to RAN3
* FFS: The number of different frequency domain configurations at a given time
 |
| P02 | Resource multiplexing | New | RB Set Configuration | Indicates the configuration for up to M non-overlapping RB sets for a given DU cell, used for frequency domain resource allocation via [Rel-17 frequency-domain IAB-DU-Resource-Configuration-H/S/NA-Config].For a given DU cell, the RB set size, in terms of number of PRBs, is N.  | * List of values for N = {2, 4, 8, 16, 32, 64}
* [N is at least the # PRBs corresponding to the MT’s configured #PRB of an RBG]
* M = 8.
 |  | IAB node specific |  | **F1AP** | **RAN1 #105-e****Agreement**The minimum resource size for configuring the frequency domain granularity is a set of N RBs:• Candidate values for N: {4, 8, 16, other values TBD}• N is at least the # PRBs that are corresponding to the MT’s # PRBs of an RBG).FFS: Scaling or configuration of N based on system BW or size of IAB-MT BWP**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

**Requires intra/inter CU coordination:** No**RAN1 #106bis-e****Agreement**A single value for the RB set size, N, is configured for a given IAB-DU cell’s Rel-17 frequency domain H/S/NA configuration.**RAN1 #107-e****Agreement**The maximum number of non-overlapping RB sets configurable per DU cell is M* where, M is to be selected from one of values from 4, 8, 16
* DU frequency configuration information should be provided to the parent node.

**Agreement**The value of the maximum number of contiguous and non-overlapping RB sets configurable per DU cell, M is 8. **RAN1 #108-e****Agreement****The start RB index of the first RB set for the Rel-17 IAB-DU HSNA resource configuration is the lowest index of RB of the IAB-DU cell** |
| P03 | Resource multiplexing | New | Frequency Domain H/S/NA Configuration Reference SCS | Indicates reference SCS to be applied to Rel-17 IAB-DU-Resource-Configuration-H/S/NA-Config at a given IAB-DU's cell. | FR1: {15kHz, 30kHz, 60kHz}FR2: {60kHz, 120kHz} |  | IAB node specific |  | **F1AP** | **RAN1 #106-e****Agreement**A Reference SCS is configured for frequency domain H/S/NA configuration.**Requires intra/inter CU coordination:** No |
| P05 | Resource multiplexing | New | Peer Parent Common Resource Configuration | Indicates the semi-static and/or cell-common higher layer configuration (e.g. SSB, CORESET 0, and RACH and configurations) from/for different parent nodes. | FFS (at least cell-common higher layer configuration (e.g. SSB, CORESET 0, and RACH and configurations) |  | IAB node specific |  | **F1AP and Xn** | **RAN1 #106-e****Agreement**For intra-donor and inter-donor DC scenarios, coordinating the semi-static and/or cell-common higher layer configuration (e.g. SSB, CORESET 0, and RACH and configurations) from/for different parent nodes. |
| P10 | Resource multiplexing | New | Rel-17 Desired Guard Symbols  | Number of symbols the IAB node would like the parent IAB node not to use at the edge (beginning or end) of a slot for the following transitions between the IAB node MT and DU per cell:* Case #6 MT TX to/from Case #1 DU RX
* Case #7 MT TX (to support Case #7 at parent node) to/from Case #1 DU RX
* Case #7 MT TX (to support Case #7 at parent node) to/from Case #1 DU TX
* Case #6 MT TX to/from Case #1 DU TX
 | **0-7 symbols** | RAN2 to fill | IAB node specific | 38.321 | **MAC-CE** | **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

**RAN1 #106bis-e****Agreement****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**

**RAN1 #107-e****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

**RAN1 #108-e****Agreement**The working assumption in the following RAN1#107-e agreement is confirmed.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:* 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

(Confirmed Working Assumption) H: Case #6 MT TX to/from Case #1 DU TX**Agreement****The number of desired/provided guard symbols indicated for Rel-17 cases should be in the range of 0-7 symbols.** |
| P11 | Resource multiplexing | New | Rel-17 Provided Guard Symbols  | Number of symbols the IAB node uses at the edge (beginning or end) of a slot for the following transitions between the IAB node MT and DU at the child node per cell:* Case #6 MT TX to/from Case #1 DU RX
* Case #7 MT TX (to support Case #7 at parent node) to/from Case #1 DU RX
* Case #7 MT TX (to support Case #7 at parent node) to/from Case #1 DU TX
* Case #6 MT TX to/from Case #1 DU TX
 | **0-7 symbols** | RAN2 to fill | IAB node specific | 38.321 | **MAC-CE** |
| P12 | FFS: Resource multiplexing or Interference management | New | *Child IAB-DU Restricted Beam Indication* | Signaling from an IAB-node/IAB-donor to a child node indicating beams of the child IAB-DU in the direction of which simultaneous operation is restricted.**SSB ID (and additionally STC index, if needed) and/or** CSI-RS ID **can be used to indicate child IAB-DU’s restricted beams.****The indication can optionally comprise some combination (one or multiple) of the following IAB node’s parameters, associated with the indicated beam restriction:*** Multiplexing mode info (i.e. multiplexing info in 38.473) and optionally may be indicated to be applicable to non-overlapping frequency resources
* {MT CC, DU cell} pair and optionally may be indicated to be associated with only {DU cell} if independent of MT CC(s)
* 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
* **Slot index**
 | The maximum number of restricted beams per DU cell in a given indication (including all associated parameters/conditions) is 8.**List of slots indicated by “slot index” can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots.** | N/A | IAB node specific | 38.321 | **MAC-CE** | **RAN1 #106-e****Agreement**MAC-CE signaling from a parent node is supported for indication of beams of an IAB-DU in the direction of which simultaneous operation is restricted* FFS: Details of beam indication (e.g. TCI state ID, Spatial relation information ID, RS ID (including CSI-RS, SRS, SSB, etc.))
* FFS: Applicability to other beams

**Agreement****Spatial domain restrictions from a parent node or recommendations from a child node is limited to a subset of time resources in which simultaneous operation is applied.*** **FFS: Handling of frequency resources in case of FDM operation**
* **FFS: Support for implicit/explicit indication of the simultaneous operation mode**

**RAN1 #106bis-e****Agreement****RS ID, based on the IAB node’s DU configurations, is used by a parent node to indicate beams of an IAB-DU in the direction of which simultaneous operation is restricted*** **At least SSB ID and [STC index] are supported**
* **FFS: Whether restrictions are indicated to apply differently for H or S resources**
* **FFS: Informing the parent node of SRS configuration of the IAB-MT (if collocated with the IAB-DU)**

**Agreement****The restricted beam indication from the parent node to the IAB node may be indicated (or specified) to be associated with some combination (one or multiple) of the following IAB node’s parameters:*** **[Multiplexing mode]**
* **[MT’s DL beam (e.g. TCI state id)] or MT’s UL beam (e.g., SRI id)**
* **[DU resource configuration (e.g. soft resources)]**
* **[Slot index]**

**RAN1 #107-e**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 workAgreement:- The maximum number of recommended beams per MT CC in a given indication (including all associated parameters/conditions) is 8.* The maximum number of restricted beams per DU cell in a given indication (including all associated parameters/conditions) is 8.

Agreement:The IAB-DU is expected to apply the indicated beam restriction within its soft resources that are not explicitly indicated as available.  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

**RAN1#108-e**Agreement* **The list of slots associated with a given timing cases provided to an IAB-MT by the Timing Case Indication MAC CE (P15 in [108-e-R17-eIAB-03]) can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots**
* **This agreement extends to other eIAB MAC CEs including:**
	+ **Child IAB-DU Restricted Beam Indication MAC CE (P12 in [108-e-R17-eIAB-03])**
	+ **Desired DL TX Power Adjustment MAC CE (P17 in [108-e-R17-eIAB-03])**
	+ **DL TX Power Adjustment MAC CE (P18 in [108-e-R17-eIAB-03])**
	+ **Desired IAB-MT PSD range MAC CE (P19 in [108-e-R17-eIAB-03])**
	+ **IAB-MT Recommended Beam Indication MAC CE (P23 in [108-e-R17-eIAB-03])**

**Agreement****The following IAB-DU behavior is defined in case of multiple indicated beam restrictions or recommendations with different configurations across indications:****• Alt1: Each MAC CE indication provides complete information on beam restriction per DU cell (or recommendation per MT serving cell) including the associated parameters and conditions. A 2nd MAC CE indication overrides 1st MAC CE indication, including the associated parameters and conditions.** |
| P13 | Interference management | Existing parameter | *Intended TDD DL-UL Configuration* | Rel-16 *Intended TDD DL-UL Configuration* is extended to support IAB-specific UFD patterns. | Permutation: ENUMERATED (DFU, UFD, …) | DFU | IAB node specific |  | **F1AP and Xn** | **RAN1#105-e**AgreementRel-16 CLI coordination signalling (Intended TDD DL-UL Configuration) is extended to support IAB specific UFD patterns.FFS: Support the exchange of IAB-DU H/S/NA resource configuration information among neighbouring IAB-nodes/IAB-donors for CLI management purposes. |
| P14 | FFS: Resource multiplexing or Interference management | New | Peer DU Resource Configuration | Indicates the DU resource configuration (UL/DL/FL, H/S/NA) of the peer IAB-node or donor DU that can be used for resource coordination in case of DC, for interference management, and/or for resource coordination. | *(Rel-16) gNB-DU Cell Resource Configuration* (which includes SCS, DUF TX periodicity, DUF config, HSNA periodicity and HSNA config) *+ (Rel-17 frequency-domain) gNB-DU Cell Resource Configuration* (which includes “Rel-17 IAB-DU-Resource-Configuration-H/S/NA-Config”, “RB Set Configuration”, and “Frequency Domain H/S/NA Configuration Reference SCS”) |  | IAB node specific |  | **F1AP and Xn** | **RAN1#106-e****Agreement****For intra-donor and inter-donor DC scenarios, in addition to coordination at the donor CU(s), a parent-node can be made aware of the DU resource configuration (UL/DL/FL, H/S/NA) of the other peer parent node that connects to the same IAB-node.****RAN1#106-e****Agreement**Support the exchange of semi-static Rel-16 IAB-DU H/S/NA resource configuration information and Rel-17 frequency domain IAB-DU H/S/NA resource configuration information among neighbouring IAB-nodes/IAB-donorsAlso related to parameter “Peer Parent DU Resource Configuration” as common signaling may be desirable.**RAN1 #107-e****Agreement**The maximum number of non-overlapping RB sets configurable per DU cell is M* where, M is to be selected from one of values from 4, 8, 16
* DU frequency configuration information should be provided to the parent node.
 |
| P15 | Timing control | New | Timing Case Indication | The parent-node indicates to an IAB-node a list of slots and their associated UL TX timing cases (i.e., one of {Case 1, Case 6, Case 7} for each slot). | {Case 1, Case 6, Case 7} per slot, for a number of slots. **The list of slots can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots.** | N/A | IAB node specific | 38.321 | **MAC-CE** | **RAN1#104-e****Agreement**Switching between Case 1, Case 6, and Case 7 timing is supported.* FFS whether Case 6 and Case 7 timing shall be restricted to certain resources, e.g. excluding resources used for access or TDM backhaul
* FFS details on switching including the switching conditions
* FFS relationship between switching timing modes with the usage/indication of different resource multiplexing modes
* FFS whether Rel-16 OTA synchronization shall be enhanced to support switching timing modes

**RAN1#105-e****Agreement**An IAB-node is indicated when Case 6 timing is performed at the IAB-node.* FFS details of the indication (e.g. semi-static and/or dynamic, implicit and/or explicit, linkage to multiplexing capability, etc.).

FFS whether an IAB-node is also indicated when Case 7 timing is performed at the IAB-node.**RAN1#106-e****Agreement**An IAB-node is explicitly indicated by the parent node when Case 6 timing is performed at the IAB-node at least for specific time resources.* FFS: whether the indication should be associated with another dimensions, e.g. multiplexing cases
* FFS whether an IAB-node is explicitly indicated by the parent node when Case 7 timing is performed at the IAB-node.

**RAN1#106-e****Agreement**An IAB-node is explicitly indicated by the parent node when Case 7 timing is performed at the parent node.FFS for signalling details**RAN1#106bis-e****Agreement**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). **RAN1#107**Agreement: 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). Agreement: A Timing Case Indication received from a serving cell is applicable to all other cells in the same timing advance group (TAG).**RAN1#108-e**Agreement* **The list of slots associated with a given timing cases provided to an IAB-MT by the Timing Case Indication MAC CE (P15 in [108-e-R17-eIAB-03]) can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots**
* **This agreement extends to other eIAB MAC CEs including:**
	+ **Child IAB-DU Restricted Beam Indication MAC CE (P12 in [108-e-R17-eIAB-03])**
	+ **Desired DL TX Power Adjustment MAC CE (P17 in [108-e-R17-eIAB-03])**
	+ **DL TX Power Adjustment MAC CE (P18 in [108-e-R17-eIAB-03])**
	+ **Desired IAB-MT PSD range MAC CE (P19 in [108-e-R17-eIAB-03])**
	+ **IAB-MT Recommended Beam Indication MAC CE (P23 in [108-e-R17-eIAB-03])**
 |
| P16 | Timing control | New | Case7 Timing Offset | The parent-node indicates to an IAB-node an offset to be used by the IAB-MT to set its UL TX timing based on the legacy TA loop and the indicated offset. | FFS endpoint values. The granularity is the same as the UL TA granularity. The range is 12 bits. | RAN2 to fill | IAB node specific | 38.321 | **MAC-CE** | **RAN1#106-e****Agreement**For Case 7 timing at a parent node, the IAB-MT Tx timing of the node is obtained via the legacy TA loop plus an offset from the parent node.FFS range, granularity, and signaling details of the offset.**RAN1#106bis-e****Agreement**Case 7 UL timing offset is indicated by the parent-node via MAC-CE.**Agreement**The granularity of Case 7 UL timing offset is the same as the UL TA granularity.**RAN1#107-e****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
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| P17 | Power control | New | Desired DL TX Power Adjustment | The IAB-MT indicates to its parent-node, its desired DL TX power adjustment to assist with the parent-node’s DL TX power allocation. **The indication can optionally comprise some combination (one or multiple) of the following IAB node’s parameters, associated with the indicated desired DL TX power adjustment:*** Multiplexing mode
* MT’s DL beam: (TCI state ID and RS ID (SSB ID and/or CSI-RS ID) is used to indicate IAB-MT’s DL beam. If no information about the associated IAB-MT’s DL beams is present, the adjustment is applied to all MT’s DL beams.)
* (MT CC, DU cell) pair
* DU resource configuration: an indication of whether a desired power 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).
* Slot index
 | FFS range of values for DL TX power. **List of slots indicated by “slot index” can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots.** | N/A | IAB node specific | 38.321 | **MAC-CE** | **RAN1#104-e****Agreement**Support an IAB-node indicating information to assist with the DL power control of its parent-node towards the IAB-node without mandating an expected behavior at the parent node.* Note: At least the assistance information is for supporting the simultaneous operation within the IAB-node to avoid power imbalance
* FFS: type of assistance information (e.g., desired received power, power adjustment, preferred CSI-RS resource)
* FFS: whether this information is provided to the parent-node, the CU, or both.
* FFS: applicability of the assistance information (e.g. relation to beams or multiplexing modes)

FFS: the channel carrying this assistance information**RAN1#105-e****Agreement**The information to assist DL power allocation of the parent-node is indicated by the IAB-MT to the parent node DU in terms of desired power adjustment.* FFS applicability of assistance information, e.g. per multiplexing scenario, per resource, etc.

**RAN1#106-e****Agreement**The desired DL TX power adjustment, indicated by the IAB-MT to its parent-node to assist with the parent-node’s DL TX power allocation, is provided at least for specific time resources. The desired DL TX power adjustment can further be associated with spatial configuration. (e.g., MT’s DL RX beams).* FFS: signalling details, e.g. indication via MAC-CE, PUCCH, or legacy CSI framework.

**RAN1#106bis-e****Agreement**The following alternative is selected for the association between the indicated parent-node’s DL TX power adjustment, provided by an IAB-MT to its parent-node, and IAB-node’s resources and/or configurations:* Alt 2. The desired DL TX power adjustment is indicated to be associated with some combination (one or multiple) of the following IAB-node’s configurations:
	+ Multiplexing mode
	+ MT’s DL beam (e.g. TCI state id)
	+ (MT CC, DU cell) pair
	+ DU resource configuration
	+ FFS: Slot index
	+ FFS: timing mode (e.g., Case-7 timing)

**Agreement****The desired parent-node’s DL TX power adjustment, provided by an IAB-MT to its parent-node, is indicated via MAC-CE.*** **The indication further includes the associated configurations and/or resources for which the indicated power adjustment is applicable.**
* **The indicated adjustment is in terms of a relative offset to a reference DL TX power.**
	+ FFS: the reference power (e.g., an RS such as CSI-RS, etc) for the indication of desired adjustment.
	+ FFS: the range of values for the indicated adjustment.

**RAN1#107-e****Agreement**The indicated desired/provided DL TX power adjustment is in terms of a relative offset to a CSI-RS TX power that is RRC configured.**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**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**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).**RAN1#108-e**Agreement* **The list of slots associated with a given timing cases provided to an IAB-MT by the Timing Case Indication MAC CE (P15 in [108-e-R17-eIAB-03]) can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots**
* **This agreement extends to other eIAB MAC CEs including:**
	+ **Child IAB-DU Restricted Beam Indication MAC CE (P12 in [108-e-R17-eIAB-03])**
	+ **Desired DL TX Power Adjustment MAC CE (P17 in [108-e-R17-eIAB-03])**
	+ **DL TX Power Adjustment MAC CE (P18 in [108-e-R17-eIAB-03])**
	+ **Desired IAB-MT PSD range MAC CE (P19 in [108-e-R17-eIAB-03])**
	+ **IAB-MT Recommended Beam Indication MAC CE (P23 in [108-e-R17-eIAB-03])**
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| P18 | Power control | New | DL TX Power Adjustment | The parent-node indicates to the IAB-node an adjustment to the parent-node’s DL TX power (e.g., in response to receiving Desired DL TX Power Adjustment from the IAB-node). **The indication can optionally comprise some combination (one or multiple) of the following IAB node’s parameters, associated with the indicated DL TX power adjustment:*** **Multiplexing mode**
* **MT’s DL beam:** (TCI state ID and RS ID (SSB ID and/or CSI-RS ID) is used to indicate IAB-MT’s DL beam. If no information about the associated IAB-MT’s DL beams is present, the adjustment is applied to all MT’s DL beams.)
* **(MT CC, DU cell) pair**
* **DU resource configuration:** an indication of whether a provided power 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).
* **Slot index**
 | FFS range of values for DL TX power. **List of slots indicated by “slot index” can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots.** | N/A | IAB node specific | 38.321 | **MAC-CE** | **RAN1#106-e****Agreement**Support an IAB-node indicating adjustment to its DL TX power to a child node (e.g., in response to receiving the DL TX power assistance information from the child node) at least for specific time resources.The DL TX power adjustment indication can further be associated with spatial configuration. (e.g., MT’s DL RX beams).FFS: signalling details.**RAN1#106bis-e****Agreement****The DL TX power adjustment, provided by the parent-node to IAB-MT, is indicated to be associated with some combination (one or multiple) of the following IAB-node’s configurations:*** **Multiplexing mode**
* **MT’s DL beam (e.g., TCI state id, RS id)**
* **(MT CC, DU cell) pair**
* **DU resource configuration**
* **FFS: DL signal/channel type**
* **FFS: slot index**
* **FFS: timing mode (e.g., Case-7 timing)**

**Agreement****The DL TX power adjustment, provided by the parent-node to the IAB-MT, is indicated via MAC-CE.*** **The indication further includes the associated configurations and/or resources for which the indicated power adjustment is applicable.**
* **The indicated adjustment is in terms of a relative offset to a reference DL TX power.**
	+ FFS: the reference power (e.g., an RS such as CSI-RS, etc) for the indication of DL Tx power adjustment.
	+ FFS: the range of values for the indicated adjustment.

**Agreement****The indicated DL TX power adjustment is not applied to SSBs.*** **FFS: any other cell-specific/semi-static DL signal to be exempted.**
* **FFS: applicability of the indicated TX power adjustment to other RS/channel which share the same QCL Type-D assumption.**

**RAN1#107-e****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:**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:**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.* FFS: support of “slot index” indication in the desired DL TX power adjustment
* FFS: support of “slot index” indication in the desired UL PSD range indication

**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

**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).****RAN1#108-e**Agreement* **The list of slots associated with a given timing cases provided to an IAB-MT by the Timing Case Indication MAC CE (P15 in [108-e-R17-eIAB-03]) can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots**
* **This agreement extends to other eIAB MAC CEs including:**
	+ **Child IAB-DU Restricted Beam Indication MAC CE (P12 in [108-e-R17-eIAB-03])**
	+ **Desired DL TX Power Adjustment MAC CE (P17 in [108-e-R17-eIAB-03])**
	+ **DL TX Power Adjustment MAC CE (P18 in [108-e-R17-eIAB-03])**
	+ **Desired IAB-MT PSD range MAC CE (P19 in [108-e-R17-eIAB-03])**
	+ **IAB-MT Recommended Beam Indication MAC CE (P23 in [108-e-R17-eIAB-03])**
 |
| P19 | Power control | New | Desired IAB-MT PSD range | The IAB-node indicates to its parent-node, its desired PSD range to help with its MT’s UL TX power control. **The indication can optionally comprise some combination (one or multiple) of the following IAB node’s parameters, associated with the indicated desired PSD range:*** **Multiplexing mode,**
* **MT’s UL beam (SRI id;** if information about the associated IAB-MT’s UL beams is not present, the PSD range is applied to all MT’s UL beams.**),**
* **(MT CC, DU cell) pair,**
* **DU resource configuration:** an indication of whether a desired UL PSD range 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).
* **FFS: slot index**
* **FFS: timing mode (e.g., Case-6 timing)**
 | FFS | N/A | IAB node specific | 38.321 | **MAC-CE** | **RAN1#106-e****Agreement** Support an IAB-node indicating its desired IAB-MT PSD range to help with its MT’s UL TX power control. This information is provided to the parent node.FFS: applicability of assistance information, e.g., per multiplexing scenario, per resource, etc.FFS: signaling details, including the possibility to extend PHR.**RAN1#106bis-e****Agreement****The desired IAB-MT’s UL PSD range, provided by the IAB-MT to its parent-node, is indicated to be associated with some combination (one or multiple) of the following IAB-node’s configurations:*** **Multiplexing mode,**
* **MT’s UL beam (e.g., SRI id),**
* **(MT CC, DU cell) pair,**
* **DU resource configuration**
* **FFS: slot index**
* **FFS: timing mode (e.g., Case-6 timing)**

**Agreement****The desired IAB-MT’s UL PSD range, provided by an IAB-MT to its parent-node, is indicated via a new MAC-CE.*** **The indication further includes the associated configurations for which the indicated PSD range is applicable.**
* **FFS: the range of values for the indicated PSD range and whether RAN4 input is needed.**
* **FFS: IAB-MT’s behaviour in case the configured/indicated UL TX power is outside the indicated desired PSD range and whether RAN4 input is needed.**

**RAN1#107-e****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).
 |
| P21 | Resource multiplexing | New | *Child IAB-MT Link NA Resource Configuration* (final name in specification to be determined by RAN2/3) | IAB-donor CU indicates, to an IAB-node/donor DU, NA attribute per D/U/F resource type within a slot, for a child IAB-MT. | {NA Downlink: ENUMERATED (true, false), NA Uplink: ENUMERATED (true, false)NA Flexible: ENUMERATED (true, false)} per slot, per child IAB-MT  |  | IAB node specific |  | **F1AP** | **RAN1#106-bis-e****Agreement:** In DC scenarios, support per-child MT link-NA resource configuration.* This configuration can be made available to IAB node as well.
 |
| P22 | Resource multiplexing | New | *FDMrequired* (final name in specification to be determined by RAN3) | The IAB-node indicates to Donor CU whether FDM is required or not for an enhanced multiplexing operation [for a given (MT CC, DU cell) pair]. | {FDM required, FDM not required} per multiplexing mode (DU\_RX/MT\_RX, DU\_TX/MT\_TX, DU\_TX/MT\_RX, DU\_RX/MT\_TX) per IAB-MT cell and DU cell pair |  | IAB node specific |  | **F1AP** | **RAN1#107-e****Agreement:** **Support indication of whether FDM is required or not for an enhanced multiplexing operation mode to donor CU.** |
| P23 | FFS: Resource multiplexing or Interference management | New | *IAB-MT Recommended Beam Indication* | Signaling from an IAB-node to its parent-node indicating the recommended beams of the IAB-MT for DL RX beams and/or UL TX beams.For DL Rx beam(s) indication, DL TCI state ID and RS ID (SSB ID and/or CSI-RS ID) can be used.For UL Tx beam(s) indication, SRI can be used.**The indication can optionally comprise some combination (one or multiple) of the following IAB node’s parameters, associated with the indicated beam restriction:*** Multiplexing mode info (i.e. multiplexing info in 38.473) and optionally may be indicated to be applicable to non-overlapping frequency resources
* {MT CC, DU cell} pair and optionally may be indicated to be associated with only {MT CC} if independent of DU cell(s)
* **Slot index**
 | The maximum number of recommended beams per MT CC in a given indication (including all associated parameters/conditions) is 8.**List of slots indicated by “slot index” can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots.** |  | IAB node specific |  | **MAC-CE** | **RAN1 #106-e****Agreement****Spatial domain restrictions from a parent node or recommendations from a child node is limited to a subset of time resources in which simultaneous operation is applied.*** **FFS: Handling of frequency resources in case of FDM operation**
* **FFS: Support for implicit/explicit indication of the simultaneous operation mode**

**RAN1 #106bis-e****Agreement**The recommended beam indication from the IAB-MT to the parent node are provided via MAC-CE:* For DL Rx beam(s): using one or more of the following:
	+ DL TCI state ID
		- FFS: UE/IAB-MT does not assume that DL Tx power adjustment (if provided) is applied to the SSB index (if supported) indicated as QCLed reference signal in DL TCI state ID.
	+ [RS ID]
	+ [R17 DL TCI, or joint DL/UL TCI ID]
* For UL Tx beam(s): using one or more of the following:
	+ [Spatial relation]
	+ [RS ID]
	+ [R17 UL TCI, or joint DL/UL TCI ID]
	+ [SRI]

**RAN1 #107-e****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

**Agreement****- The maximum number of recommended beams per MT CC in a given indication (including all associated parameters/conditions) is 8.****- The maximum number of restricted beams per DU cell in a given indication (including all associated parameters/conditions) is 8.****RAN1#108-e**Agreement* **The list of slots associated with a given timing cases provided to an IAB-MT by the Timing Case Indication MAC CE (P15 in [108-e-R17-eIAB-03]) can have the following ranges for periodicity: {16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120} slots**
* **This agreement extends to other eIAB MAC CEs including:**
	+ **Child IAB-DU Restricted Beam Indication MAC CE (P12 in [108-e-R17-eIAB-03])**
	+ **Desired DL TX Power Adjustment MAC CE (P17 in [108-e-R17-eIAB-03])**
	+ **DL TX Power Adjustment MAC CE (P18 in [108-e-R17-eIAB-03])**
	+ **Desired IAB-MT PSD range MAC CE (P19 in [108-e-R17-eIAB-03])**
	+ **IAB-MT Recommended Beam Indication MAC CE (P23 in [108-e-R17-eIAB-03])**

**Agreement****The following IAB-DU behavior is defined in case of multiple indicated beam restrictions or recommendations with different configurations across indications:****• Alt1: Each MAC CE indication provides complete information on beam restriction per DU cell (or recommendation per MT serving cell) including the associated parameters and conditions. A 2nd MAC CE indication overrides 1st MAC CE indication, including the associated parameters and conditions.** |
| P25 | Timing control | Existing | *Timing Delta MAC CE* | The Timing Delta MAC CE carries Tdelta which is used to determine the timing adjustment.Upon reception of a Timing Delta MAC CE the IAB node shall:- apply the value of Tdelta as specified in TS 38.213.The Tdelta range is updated to support Case 6 timing. | FFS: updated range of Tdelta | N/A | IAB node specific | 38.321 | **MAC-CE** | **RAN1 #106bis-e****Agreement**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”**RAN1 #107-e****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 |
| P26 | Resource multiplexing | New | *Child DU cell frequency configuration* | Indicates the DU cell frequency configuration to the parent-node. This information comprises* [NR FreqInfo (38.473, 9.3.1.17)]
* [Carrier List (38.473, 9.3.1.137)]
 | FFS |  | IAB node specific |  | **F1-AP** | **RAN1 #107-e****Agreement**The maximum number of non-overlapping RB sets configurable per DU cell is M* where, M is to be selected from one of values from 4, 8, 16
* DU frequency configuration information should be provided to the parent node.

**Moderator’s note:** Rel-17 DU frequency configuration information of IAB DU in P01, P02 and P03 should be also provided to the parent node. |
| P27 | Timing Control |  | *Case6 timing required* | A child IAB-MT can inform a parent node whether Case 6 timing is required for simultaneous operation. |  |  | IAB node specific |  | **MAC-CE** | **RAN1 #107-e****Agreement**: A child IAB-MT can inform a parent node via MAC-CE whether Case 6 timing is required for simultaneous operation. |

NOTE: the Parameter ID field is an arbitrary field that was added to facilitate referencing a particular row in the parameters table when commenting.

Companies are encouraged to provide feedback on the above, in the following table:

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Support in general.**P26:** It should be clarified whether P26 is restricted to FDM or also valid for TDM. |
| ZTE, Sanechips | Support in general.**P10 and P11:**The description should be updated accordingly based on agreements in RAN1#107e and 108e.**P12, P17 and P18:** Slot index should be included based on agreements in RAN1#107e.**P26:** The DU cell frequency configuration should also comprise other Rel-17 frequency-domain IAB-DU-Resource-Configuration, such as DU-Resource-configuration in P01, P02 and P03. A note could be added in description as follows:**Note: Rel-17 DU frequency configuration information of IAB DU in P01, P02 and P03 should be also provided to the parent node.** |

The table has been updated according to the moderator’s understanding of the most recent agreements. The moderator acknowledges and agrees with the comments from Ericsson and ZTE. A note is added to P26, per ZTE’s suggestion. The moderator believes that the clarification sought by Ericsson for P26 should be brought up for discussion and agreement under 8.10.1.

Companies are encouraged to provide feedback on the above, in the following table:

|  |  |
| --- | --- |
| Company | Comments |
|  |  |
|  |  |
|  |  |

References

[1] R1-2112966 – Summary of [107-e-R17-RRC-eIAB] Email discussion on Rel-17 higher layer parameters (RRC, MAC-CE, and F1AP) for eIAB – Moderator (Qualcomm)

[2] R1-2201458 – Remaining issue on higher layers parameter list for Rel-17 IAB – ZTE

[2] R1-2202404– Higher layer parameters (RRC, MAC-CE, F1AP, XnAp) for enhanced IAB – Ericsson