3GPP TSG RAN WG4#96-e R4-201XXXX

Electronic meeting, August 17th – 28th, 2020

**Source:** Nokia, Nokia Shanghai Bell

**Title:** TP to TS 38.174: Maximum output power requirements

**Agenda item:** 7.4.2.2.1

**Document for:**  Approval

# 1 Introduction

A text proposal to TS 38.174 is provided based on earlier agreements summarized below.

From [1]:

* No upper limit on the output power in FR1 for wide area IAB-MT
* no TRP upper limit on the output power for [medium range/local area] IAB-MT of type 2-O

From [2]

* IAB-MT Tx power is declared by manufacturer using same framework as BS Tx power declaration

From [3]

* No max Tx power for FR2

From [4]

* IAB-DU transmit power RF requirement is imported from NR BS spec

Comments have been inserted in places where further agreements are needed before finalizing the text. Additionally the TP is based on the assumptions that 24 dBm max output power per TABC is adopted for local area IAB-MT and no minimum number of transceivers is specified for IAB-MT type 1-O.

This TP is intended to be further updated based on feedback and agreements in RAN4#96-e.

This TP has been updated based on agreements and comments during 1st round discussion and received comments. Changes include

Section 6.1: Clarified that declarations for Ncells and TAB connector Tx min cell groups are separate for IAB-MT and IAB-DU

Section 6.2; Combined IAB-DU and IAB-MT requirements in the same section as the requirements are exactly same with the exception that there is no medium range IAB-MT. Separate tables are still used for IAB-DU and IAB-MT to improve clarity.

Section 9.2 and 9.3: Clarified that declarations are done for IAB-DU and IAB-MT separately. Combined IAB-DU and IAB-MT requirements in the same section as the requirements are exactly same with the exception that there is no medium range IAB-MT and output power scaling is different between IAB-DU type 1-O and IAB-MT type 1-O. Separate tables are still used for IAB-DU and IAB-MT to improve clarity.

# 2 References

[1] R4-2005487, WF on maximum transmission power at IAB-MT

[2] R4-2002495, WF on IAB-MT Tx power requirements

[3] R4-2002494, WF on IAB class definition

[4] R4-2002498, WF on IAB-DU Tx Requirements

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## 6.1 General

Unless otherwise stated, the conducted transmitter characteristics are specified at the *TAB connector* for *IAB-DU* and *IAB-MT type 1-H*, with a full complement of transceiver units for the configuration in normal operating conditions.

For *IAB-DU* and *IAB-MT* *type 1-H* the manufacturer shall declare the minimum number of supported geographical cells (i.e. geographical areas covered by beams). The declaration is done separately for IAB-DU and IAB-MT. The minimum number of supported geographical cells (Ncells) relates to the setting with the minimum amount of cell splitting supported with transmission on all *TAB connectors* supporting the *operating band*, or with minimum amount of transmitted beams.

For *IAB-DU* and *IAB-MT* *type 1-H* manufacturer shall also declare *TAB connector TX min cell groups*. The declaration is done separately for IAB-DU and IAB-MT. Every *TAB connector* of the *IAB-DU type 1-H* and IAB-MT type 1-H supporting transmission in an *operating band* shall map to one *TAB connector* *TX min cell group* supporting the same *operating band*,where mapping of *TAB connector*s to cells/beams is implementation dependent.

The number of *active transmitter units* that are considered when calculating the conducted TX emissions limits (NTXU,counted) for *IAB-DU and IAB-MT type 1-H* is calculated as follows:

 NTXU,counted = *min(NTXU,active , 8×Ncells)*

NTXU,countedpercell is used for scaling of *basic limits* and is derived as NTXU,countedpercell = NTXU,counted / Ncells

NOTE: NTXU,active depends on the actual number of *active transmitter unit*s and is independent to the declaration of Ncells.

## 6.2 IAB output power

### 6.2.1 General

The IAB type 1-H conducted output power requirement is at *TAB connector* for *IAB type 1-H*.

The *rated carrier output power* of the *IAB type 1-H* shall be as specified in table 6.2.1-1 for *IAB-DU type 1-H* and in table 6.2.1-2 for *IAB-MT type 1-H*.

Table 6.2.1-1: *IAB-DU type 1-H* rated output power limits for IAB-DU classes

| IAB-DU class | Prated,c,sys | Prated,c,TABC |
| --- | --- | --- |
| Wide Area IAB-DU | (Note) | (Note) |
| Medium Range IAB-DU | ≤ 38 dBm +10log(NTXU,counted) | ≤ 38 dBm |
| Local Area IAB-DU | ≤ 24 dBm +10log(NTXU,counted) | ≤ 24 dBm |
| NOTE: There is no upper limit for the Prated,c,sys or Prated,c,TABC of the Wide Area IAB-DU. |

Table 6.2.1-2: *IAB-MT type 1-H* rated output power limits for IAB-MT classes

| IAB-MT class | Prated,c,sys | Prated,c,TABC |
| --- | --- | --- |
| Wide Area IAB-MT | (Note) | (Note) |
| Local Area IAB-MT | ≤ 24 dBm +10log(NTXU,counted) | ≤ 24 dBm |
| NOTE: There is no upper limit for the Prated,c,sys or Prated,c,TABC of the Wide area IAB-MT. |

### 6.2.2 Minimum requirement for IAB type 1-H

In normal conditions, Pmax,c,TABC shall remain within +2 dB and -2 dB of the *rated carrier output power* Prated,c,TABC for each *TAB connector* as declared by the manufacturer.

In extreme conditions, Pmax,c,TABC shall remain within +2.5 dB and -2.5 dB of the *rated carrier output power* Prated,c,TABC for each *TAB connector* as declared by the manufacturer.

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the range of conditions defined as normal.

### 6.2.3 Additional requirements (regional)

In certain regions, additional regional requirements may apply.

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## 6.3 Output power dynamics

<Unchanged sections omitted>

## 9.1 General

Radiated transmitter characteristics requirements apply on the *IAB-DU* and *IAB-MT type 1-H*, *IAB-DU* and *IAB-MT type 1-O*, or *IAB-DU* and *IAB-MT type 2-O* including all its functional components active and for all foreseen modes of operation unless otherwise stated.

## 9.2 Radiated transmit power

### 9.2.1 General

*IAB-DU* and *IAB-MT type 1-H, IAB-DU* and *IAB-MT type 1-O* and *IAB-DU* and *IAB-MT type 2-O* are declared to support one or more beams, as per manufacturer's declarations specified in [TS 38.XXX [X]]. Radiated transmit power is defined as the EIRP level for a declared beam at a specific *beam peak direction*. Declarations are done for IAB-DU and IAB-MT separately.

For each beam, the requirement is based on declaration of a beam identity, *reference beam direction pair*, beamwidth, *rated beam EIRP*, *OTA peak directions set*, the *beam direction pairs* at the maximum steering directions and their associated *rated beam EIRP* and beamwidth(s).

For a declared beam and *beam direction pair*, the *rated beam EIRP* level is the maximum power that the base station is declared to radiate at the associated *beam peak direction* during the *transmitter ON period*.

For each *beam peak direction* associated with a *beam direction pair* within the *OTA peak directions set*, a specific *rated beam EIRP* level may be claimed. Any claimed value shall be met within the accuracy requirement as described below. *Rated beam EIRP* is only required to be declared for the *beam direction pairs* subject to conformance testing as detailed in TS 38.141-2 [6].

NOTE 1: *OTA peak directions set* is set of *beam peak directions* for which the EIRP accuracy requirement is intended to be met. The *beam peak directions* are related to a corresponding contiguous range or discrete list of *beam centre directions* by the *beam direction pairs* included in the set.

NOTE 2: A *beam direction pair* is data set consisting of the *beam centre direction* and the related *beam peak direction.*

NOTE 3: A declared EIRP value is a value provided by the manufacturer for verification according to the conformance specification declaration requirements, whereas a claimed EIRP value is provided by the manufacturer to the equipment user for normal operation of the equipment and is not subject to formal conformance testing.

 For *operating bands* where the supported *fractional bandwidth* (FBW) is larger than 6%, two rated carrier EIRP may be declared by manufacturer:

- Prated,c,FBWlow for lower supported frequency range, and

- Prated,c,FBWhigh for higher supported frequency range.

For frequencies in between FFBWlow and FFBWhigh the rated carrier EIRP is:

- Prated,c,FBWlow, for the carrier whose carrier frequency is within frequency range FFBWlow ≤ f < (FFBWlow +FFBWhigh) / 2,

- Prated,c,FBWhigh, for the carrier whose carrier frequency is within frequency range (FFBWlow +FFBWhigh) / 2 ≤ f ≤FFBWhigh.

### 9.2.3 IAB radiated transmit power

#### 9.2.3.1 Minimum requirement for IAB type 1-H and IAB type 1-O

For each declared beam, in normal conditions, for any specific *beam peak direction* associated with a *beam direction pair* within the *OTA peak directions set*, a manufacturer claimed EIRP level in the corresponding *beam peak direction* shall be achievable to within ±2.2 dB of the claimed value.

For *IAB type 1-O* only, for each declared beam, in extreme conditions, for any specific *beam peak direction* associated with a *beam direction pair* within the *OTA peak directions set*, a manufacturer claimed EIRP level in the corresponding *beam peak direction* shall be achievable to within ±2.7 dB of the claimed value.

Normal and extreme conditions are defined in [TS 38.141-2, annex B [6]].

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the range of conditions defined as normal.

#### 9.2.3.2 Minimum requirement for IAB type 2-O

For each declared beam, in normal conditions, for any specific *beam peak direction* associated with a *beam direction pair* within the *OTA peak directions set*, a manufacturer claimed EIRP level in the corresponding *beam peak direction* shall be achievable to within ± 3.4 dB of the claimed value.

For each declared beam, in extreme conditions, for any specific *beam peak direction* associated with a *beam direction pair* within the *OTA peak directions set*, a manufacturer claimed EIRP level in the corresponding *beam peak direction* shall be achievable to within ± 4.5 dB of the claimed value.

Normal and extreme conditions are defined in [TS 38.141-2, annex B [6]].

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the range of conditions defined as normal.

## 9.3 IAB output power

### 9.3.1 General

OTA IAB output power is declared as the TRP radiated requirement, with the output power accuracy requirement defined at the RIB during the *transmitter ON period*. TRP does not change with beamforming settings as long as the *beam peak direction* is within the *OTA peak directions set*. Thus the TRP accuracy requirement must be met for any beamforming setting for which the *beam peak direction* is within the *OTA peak directions set*. Declarations are made separately for IAB-DU and IAB-MT.

The IAB *rated carrier TRP output power* for *IAB type 1-O* shall be within limits as specified in table 9.3.1-1 for *IAB-DU type 1-O* and in table 9.3.1-2 for *IAB-MT type 1-O*.

Table 9.3.1-1: IAB-DU *rated carrier TRP output power* limits for *IAB-DU type 1-O*

|  |  |
| --- | --- |
| IAB-DU class | Prated,c,TRP |
| Wide Area IAB-DU  | (note) |
| Medium Range IAB-DU | ≤ + 47 dBm |
| Local Area IAB-DU | ≤ + 33 dBm |
| NOTE: There is no upper limit for the Prated,c,TRP of the Wide Area IAB-DU |

Table 9.3.1-2: IAB-MT *rated carrier TRP output power* limits for *IAB-MT type 1-O*

|  |  |
| --- | --- |
| IAB-MT class | Prated,c,TRP |
| Wide Area IAB-MT  | (note) |
| Local Area IAB-MT | ≤ 24 dBm + 10log(NTXU,counted) |
| NOTE: There is no upper limit for the Prated,c,TRP of the Wide Area IAB-MT. |

There is no upper limit for the *rated carrier TRP output power* of *IAB type 2-O*.

Despite the general requirements for the IAB output power described in clauses 9.3.2 – 9.3.3, additional regional requirements might be applicable.

NOTE: In certain regions, power limits corresponding to IAB classes may apply for *IAB type 2-O*.

### 9.3.2 Minimum requirement for IAB type 1-O

In normal conditions, the *IAB type 1-O* *maximum carrier TRP output power*, Pmax,c,TRP measured at the RIB shall remain within ±2 dB of the *rated carrier TRP output power* Prated,c,TRP, as declared by the manufacturer.

Normal conditions are defined in TS 38.141-1, annex B [6].

### 9.3.3 Minimum requirement for IAB type 2-O

In normal conditions, the *IAB type 2-O* *maximum carrier TRP output power*, Pmax,c,TRP measured at the RIB shall remain within ±3 dB of the *rated carrier TRP output power* Prated,c,TRP, as declared by the manufacturer.

Normal conditions are defined in TS 38.141-2, annex B [6].

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## 9.4 OTA output power dynamics

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