**3GPP TSG-RAN WG4 Meeting #102-e R4-220xxxx**

Online, 21 Feb - 03 Mar 2022

**Source:** Huawei

**Title:** TP to TS 38.106 clause 6.1 and 6.2

**Agenda Item:** 10.5.2.1

**Document for:** Approval

# Introduction

This paper is based on the TP submitted to the last meeting (R4-2201930) and comments received during the meeting. As follows:

capital R in Repeater in some places needed.

[Response] Looking at the E-UTRA repeater specification the word “repeater” does not use a capital R in most cases (Unless its at the start of a sentence). Definitions for multi-word terms use a mixture of capitals and not (generally the older definitions use capitals). I am ok to always use capital R for repeater if thats consensus, but do not think its necessary. For the moment I have retained the small r (this can be cleaned up by rapporteur perhaps when big CR is implemented?)

In section 6.2.2 instead of specifying exactly rated power plus 10 dB, the wording from E-UTRA could be re-used: “When the power of all signals is increased by 10 dB, compared to the power level that produce the maximum rated output power, the requirements shall still be met.”

This conveys better that instead of having two power levels, the requirements are met *up to* 10 dB higher power, i.e. also between the two levels.

[Response] As we use the input power and the ALC power condition in a number of places I think its important to define it a bit more carefully that the description in 36.106. Hence I tried to use defined terms that would link to the declarations (in the conformance spec). However the point about the requirement being up to 10dB more is valid I have amended to text to try to incorporate this.

This TP was submitted as R4-2205971 and has been updated below based on comments received in the 1st round review as follows:

Ericsson: The term “maximum carrier output power” should be removed as it is not used. Or if it is used, the word “carrier” should be dropped as there are no carriers for a repeater.

[Response] Agree – its removed

CMCC: it seems we should add the “channel bandwidth” item as it is used into the ACLR or CACLR definition.

Channel bandwidth: The RF bandwidth supporting a single E-UTRA RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell. The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

[Response] The intention of the terms/symbols/abbreviations contributions in this TP is to include the ones used in the TP not to be a complete list, R4-2205128 is a general contribution with the whole list, the editor can merge the lists when compiling the TP’s so I propose to not add the suggested terms to this TP.

NEC: It seems output power is defined per pass band in “3.1 Terms” but it is considered per carrier in “6.2 Repeater output power”. We do not think the output power per pass band is limited to 24 dBm for Local Area repeater, for example. Considering output power is defined per carrier in LTE FDD repeater spec and output power limit is related to the regulatory requirements defined per carrier, we think output power in NR repeater spec should be defined per carrier, too.

[Response] The intention was to remove all references to carrier power as it is not possible to define carriers for a repeater the definition using the term carrier is a mistake because I based the definitions on the BS and missed that one when updating, (similar to Ericsson’s comment above). As to the issue if 24dBm is sufficient, I seem to remember this was discussed but looking through the past WF’s I see no formal mention of it. All the WF agreements refer to “maximum output power” rather than carrier power so my understanding is its the total power in the passband,

For symbols, we may need suffix “AC” to indicate it is defined per antenna connector. We may use the same symbols with suffix “TRP” for repeater type 2-O.

[Response] Ok updated, I will also check the OTA definitions

CMCC2: about the output power is per passband or per carrier, we share the same view with NEC. It should be per carrier. in BS spec, the 38dBm and 24dBm power upper limits are also defined per carrier. for DL, repeater reuse the same requirements as gNB. So our preference is to update the definition of “maximum carrier output power” as:

Maximum carrier output power: mean power level measured per carrier at the antenna connector.

Although repeater doesn’t generate the carrier, there should be “carrier” concept in the spec.

[Response] As in my response to NEC above, our view is we don’t have the carrier concept in the spec how can the repeater possibly know how many carriers it will be amplifying? But this is perhaps a discussion for the WF rather than the TP as it’s a fundamental issue with the agreements we made. My understanding was we were discussing total power, carrier power is not mentioned in any of the WF. I have not changed for now.

# TP to TS 38.106 v.0.0.1

< Start of changes >

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

Definition format (Normal)

**<defined term>:** <definition>.

**antenna connector:** connector at the conducted interface of the repeater *type 1-C*

**pass band: [**The frequency range in which the repeater operates in with operational configuration, this frequency range can correspond to one or several consecutive nominal channels, if they are not consecutive each subset of channels shall be considered as an individual pass band, a repeater can have one or several pass bands, all channels within the passband(s) shall belong to a single operator or collaborating operators.]

**rated output power**: mean power level associated with a *pass band* the manufacturer has declared to be available at the *antenna connector*.

**repeater type 1-C**: NR repeater operating at FR1 with a requirement set consisting only of conducted requirements defined at individual antenna connectors.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

Symbol format (EW)

<symbol> <Explanation>

Prated,out\_AC Maximum rated output power at the antenna connector

Prated,in\_AC Input power intended to produce the maximum rated output power (Prated,out) at the antenna connector

Pmax,out\_AC *Maximum output power* measuredper *antenna connector* at the antenna connector

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

<ABBREVIATION> <Expansion>

< next change >

## 6.1 General

Unless otherwise stated, the conducted transmitter characteristics are specified at the *antenna connector* for *repeater type 1-C* configuration in normal operating conditions.

Requirements apply in both DL and UL unless otherwise stated.

For the DL the antenna connector on the BS side is the input and the antenna connector on the UE side is the output.

For the UL the antenna connector on the UE side is the input and the antenna connector on the BS side is the output.

## 6.2 Repeater output power

### 6.2.1 General

The repeater conducted output power requirement is at the *antenna connector*.

The maximum *rated output power* of the *repeater type 1-C* shall be as specified in table 6.2.1-1 and table 6.2.1-2.

Table 6.2.1-1: *repeater type 1-C* DL transmission classes rated output power limits for repeater classes

|  |  |
| --- | --- |
| repeater class | Prated,out\_AC |
| Wide Area repeater | (Note) |
| Medium Range repeater | ≤ 38 dBm + 10\*log (max {1, ceil (passband bandwidth/[20MHz])) |
| Local Area repeater | ≤ 24 dBm + 10\*log (max {1, ceil (passband bandwidth/[20MHz])) |
| NOTE: There is no upper limit for the Prated,out\_AC rated output power of the Wide Area repeater | |

Table 6.2.1-2: *repeater type 1-C* UL transmission classes rated output power limits for repeater classes

|  |  |
| --- | --- |
| repeater class | Prated,out |
| Wide Area repeater | (Note) |
| Local Area repeater | ≤ 24 dBm+ 10\*log (max {1, ceil (passband bandwidth/[20MHz])) |
| NOTE: There is no upper limit for the Prated,out\_AC rated output power of the Wide Area repeater. | |

### 6.2.2 Minimum requirement

The requirements shall apply at maximum gain, with NR signals in the pass band of the repeater at:

The level that produce the maximum *rated output power* (Prated,in\_AC).

Up to:

The level that produce the maximum *rated output power* (Prated,in\_AC) plus 10dB

In normal conditions, the measured output power, Pmax,out\_AC shall remain within +2 dB and -2 dB of the *rated output power* Prated,out\_AC, declared by the manufacturer.

In extreme conditions, the measured output power, Pmax,out\_AC shall remain within +2.5 dB and -2.5 dB of the *rated output power* Prated,out\_AC, declared by the manufacturer.

< End of change >