3GPP TSG-RAN WG4 #102-e R4-22xxxx

Electronic meeting, 12st February – 3rd March 2022

Source: Ericsson

Title: WF on other conducted RF requirements

Agenda Item: 10.5.2.3

Document for: Approval

# Introduction

This Way Forward captures agreements and discussion for the FR1 RF requirements other than OOB gain and ACRR (which are handled in a separate WF)

# Discussion

Definition of upper power limit as per carrier or per passband

For the BS, the output power limit is defined per carrier. The concept of a carrier is not defined in the repeater specification. However, defining the output power limit per passband may not allow for a sufficiently large TX power for a repeater supporting a large passband bandwidth.

Output power upper limit (e.g. 24dBm 38dBm) is per carrier or per passband width:

* Option 1: per carrier
  + Proponents of this option please clarify how the carrier bandwidth and position is defined in the repeater core/conformance specifications
* Option 2: per passband
* Option 3: Per carrier, assuming the nominal channel bandwidth min(100MHz, passband)
* Option 4: As a PSD limit in dBm/MHz

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| **Company** | **Comment** |
| Ericsson | The repeater specification needs to be able to enable compliance to core requirements and conformance testing independent of how the gNB and UE would be configured with carriers in a deployed network. Our understanding is that the only way to achieve this is to assume a nominal carrier bandwidth in the repeater specification. This does not imply that the repeater could not be operated with other bandwidths than the nominal configured at the gNB/UE.  We also understand the concern that the power limits may not be suitable if the passband is wide and is likely to contain several carriers.  We have added two further options that may help resolve the dilemma. One is to define a power limit per carrier based on an assumed nominal bandwidth. The other is to define a PSD limit. We have a slight preference for option 4 over option 3. |
| Huawei | This has come up in the drafting of the output power section TP. We agree that it is difficult to use the concept of carrier for a repeater so do not agree with option 1 however option 3 or 4 seems like a good compromise. Option 4 is perhaps more flexible as it completely removes the concept of a carrier. However if the passband is less than the assumed BW used to calculate the PSD level (e.g. 100MHz) then it is perhaps restrictive. What is the suggested value i.e. what carrier BW do we regard as nominal? As we already have the concept of nominal BW agreed then perhaps option 3 is the better choice. |

Definition of channel bandwidth for ACLR

For the ACLR requirement, a channel bandwidth is required.

* Option 1: Define a nominal bandwidth min(100MHz, passband)
* Option 2: Depending on agreement for the upper power limit, define the bandwidth is the same as the carrier size
  + Proponents of this option please clarify how the carrier bandwidth and position is defined in the repeater core and conformance specifications

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| Ericsson | Similar to above, in our understanding to define core requirements and enable conformance testing an assumption needs to be made on the bandwidth for requirement and test definition purposes. This does not prevent operation with other bandwidths. We think that option 1 is a reasonable way to achieve an assumption. |
| Huawei | Did we not agree this last meeting? maybe it was in square brackets? We are ok with option 1 and it matches our view on the upper power limits above. |

Protection of the FDD BS receiver

* Define an optional requirement based on 30dB CL assumption.
  + -96dBm/100kHz for WA
  + -91dBm/100kHz for MR
  + -88dBm/100kHz for LA
* The repeater can declare the limit that it supports. if repeater declares that it does not support above requirements, increased the requirement is -53dBm/MHz, which implies an increased CL (73dB) is required.

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| Huawei | This is agreement already I guess but just to add to the discussion the 2nd declaration is covered in the BS specification a different (and probably more flexible) way with the following note:  “The current state-of-the-art technology does not allow a single generic solution for co-location with other system on adjacent frequencies for 30dB BS-BS minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942 [4].”  This allows for allowable coupling to be declared so the appropriate site eng. solution can be selected – it seems more flexible? |
| Ericsson | To Huawei: The note you refer to is in the context of co-location requirements towards another band where the other band is adjacent and hence within the Fobue. Or did I miss something?  Here the requirement is for protection of the BS receiver in the own FDD band. The BS requirement is just the -96/91/88 dBm values. The repeater spec has a relaxed requirement. The proposal here is to add the option to declare that the repeater fulfils the same requirement as a BS and hence could be co-located like a BS. |

Applicable scenarios for co-existence related spurious emissions requirements

* Co-existence spurious emission requirements are applicable for both DL and UL.
* Repeater declares separately co-existence support at the BS side and the UE side.

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| Huawei | It seems these are agreements? We have no wish to change agreements but looking at the 2nd bullet as both sides will be in the same geographical area then they will have the same requirement so the 2nd bullet seems somewhat unnecessary but if its already agreed ok. |
| Ericsson | One example where the two sides could be different “geographical areas” would be an inside/outside where one side is outdoors on the outside of a wall and the other side indoors on the inside of a wall. It may be then that the outside part could possibly be co-located or in the same geographical area but the inside part would not be. |

Lower power limit for EVM

* The lower power limit for EVM is a requirement, not a declaration.
* The lower power limit will be an absolute PSD level
* 50% EVM and 2dB IM assumed
* No limit on the repeater gain for meeting EVM within the power limits in the core specification
  + FFS for conformance
* The lower power limits are agreed as follows (depending on modulation and repeater class):

**Table : x.x-1 Minimum input power for EVM**

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| class | Minimum input power spectral density (dBm/MHz) | |
| Up to 64 QAM | 256QAM  note 1 |
| WA | -82 | -75 |
| MR | -77 | -70 |
| LA | -74 | -67 |
| Note 1: 256 QAM is optional by manufacturers declaration | | |

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| **Company** | **Comment** |
| Huawei | Ok – if its agreed to use the 2dB IM I will carry that agreement over to the FR2 radiated. |
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Inside passband emissions

* For DL inside OBUE, adopt the same class specific OBUE as for the BS
* For UL inside OBUE
  + for WA, reuse BS OBUE requirements.
  + for LA, reuse UE SEM requirements but further discuss which frequency offset ranges would be captured:
    - Option 1: the whole range
    - Option 2: less than channel bandwidth i.e. -10dBm/MHz and -13dBm/MHz.
    - Option 3: larger than channel bandwidth i.e. -25dBm/MHz

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| Huawei | Why not the whole range? |
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Input IMD

* 1MHz measurement bandwidth for FR1 input IMD
* Discussion on testing points for input IMD is postponed for conformance part.
* General input IMD requirement is applicable for both DL and UL.

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