3GPP RAN WG4 Meeting #94-e R4-2000007

Online, 24 February – 6th March 2020

Agenda item: 9.14.2

Source: Apple Inc.

Title: A-MPR Proposal for B41/n41 EN-DC

WI/SI: LTE\_NR\_B41\_Bn41\_PC29dBm

Release: Rel-16

Document for: Approval

# 1 Introduction

A way forward was agreed in RAN4#91 [1] to introduce optional and improved EN-DC A-MPR values for B41/n41 29 dBm power class. This paper provides values for 10dB antenna isolation.

# 2 Discussion

The following assumptions for the measurements were used:

* Power Class 2 Tx chains (LTE and NR)
* Equal power (LTE and NR)
* LTE with QPSK SC-OFDMA and SCS 15kHz
* NR with QPSK CP-OFDM and SCS 15kHz

Measurements were done for LTE 20MHz and NR 40MHz with different allocation sizes and allocation positions. Furthermore, full allocations measurements with different channel BWs have been conducted. The power reduction results are given in Table1. The table also provides power reduction values if checked against ACLR, SEM and Spur requirements. For this check the RBs were placed in LTE and NR channels at various places equally spaced away from EN-DC center frequency. The highest power reduction value observed is reported in the table.

**Table1: Measurement results for EN-DC (n)41**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| LTE | | NR | | | | -13 dBm/MHz | -25 dBm/MHz | -30 dBm/MHz | Check:  ACLR, SEM, Spur | |
| BW MHz | RB | BW  MHz | SCS  kHz | Type | RB | NS01 / NS04 | Limited |
| 20 | 1 | 40 | 15 | CP-OFDM | 1 | 11 | 15 | 18 | 11 / 15 | SEM |
| 20 | 3 | 40 | 15 | CP-OFDM | 3 | 10 | 14.5 | 17.5 | 10 / 14 | SEM |
| 20 | 6 | 40 | 15 | CP-OFDM | 6 | 8 | 14 | 17 | 8 / 9 | SEM |
| 20 | 33 | 40 | 15 | CP-OFDM | 33 | 5.5 | 12 | 14 | 6 | ACLR |
| 20 | 70 | 40 | 15 | CP-OFDM | 70 | 4 | 10 | 12.5 | 6 | ACLR |
| 10 | 50 | 10 | 15 | CP-OFDM | 52 | 0 | 5 | 7 | 4 | ACLR |
| 20 | 100 | 20 | 15 | CP-OFDM | 106 | 0 | 4 | 6 | 5.5 | ACLR |
| 20 | 100 | 30 | 15 | CP-OFDM | 160 | 0 | 3 | 5 | 5.5 | ACLR |
| 20 | 100 | 40 | 15 | CP-OFDM | 216 | 0 | 3 | 5 | 6 | ACLR |

From the given measurements a proposal is compiled for the optional A-MPR values. The proposal takes into account that the signal has to comply to SEM, ACLR and Spur requirements. Hence, these values are taken if -13dBm/MHz, 25dBm/MHz or 30dBm/MHz provides lower power reduction values.

Proposal:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **-13dBm/MHz** | | | | |
| **MA =** | **11 :** | **0** | **< B <** | **0.54** |
|  | **10 :** | **0.54** | **< B <** | **1.08** |
|  | **9 :** | **1.08** | **< B <** | **2.16** |
|  | **8 :** | **2.16** | **< B <** | **5.4** |
|  | **6 :** | **5.4** | **< B <** | **11.88** |
|  | **6 :** | **11.88** | **< B <** | **25.2** |
|  | **6 :** | **25.2** | **< B <** | **-** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **-25dBm/MHz** | | | | |
| **MA =** | **15 :** | **0** | **< B <** | **1.08** |
|  | **14 :** | **1.08** | **< B <** | **5.4** |
|  | **12 :** | **5.4** | **< B <** | **25.2** |
|  | **10 :** | **25.2** | **< B <** | **-** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| -30dBm/MHz | | | | |
| MA = | 18 : | 0 | < B < | 1.08 |
|  | 17 : | 1.08 | < B < | 2.16 |
|  | 14 : | 2.16 | < B < | 11.88 |
|  | 12.5 : | 11.88 | < B < | 25.2 |
|  | 6 : | 25.2 | < B < | - |

# 3 Conclusions

This paper provides measurement results for different allocations for EN-DC (n)41 A-MPR with 10dB antenna isolation. Based on the measurements results, we propose the following:

Proposal:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **-13dBm/MHz** | | | | |
| **MA =** | **11 :** | **0** | **< B <** | **0.54** |
|  | **10 :** | **0.54** | **< B <** | **1.08** |
|  | **9 :** | **1.08** | **< B <** | **2.16** |
|  | **8 :** | **2.16** | **< B <** | **5.4** |
|  | **6 :** | **5.4** | **< B <** | **11.88** |
|  | **6 :** | **11.88** | **< B <** | **25.2** |
|  | **6 :** | **25.2** | **< B <** | **-** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **-25dBm/MHz** | | | | |
| **MA =** | **15 :** | **0** | **< B <** | **1.08** |
|  | **14 :** | **1.08** | **< B <** | **5.4** |
|  | **12 :** | **5.4** | **< B <** | **25.2** |
|  | **10 :** | **25.2** | **< B <** | **-** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| -30dBm/MHz | | | | |
| MA = | 18 : | 0 | < B < | 1.08 |
|  | 17 : | 1.08 | < B < | 2.16 |
|  | 14 : | 2.16 | < B < | 11.88 |
|  | 12.5 : | 11.88 | < B < | 25.2 |
|  | 6 : | 25.2 | < B < | - |

# 4 References

1. R4-1910306 “WF on B41/n41 29 dBm Power Class and EN-DC A-MPR Improvement”, Sprint, RAN4 #92, August 2019.