**3GPP TSG-****RAN WG4 Meeting** **#111 R4-2409926
Fukuoka, Japan, 20th – 24th May, 2024**

**Agenda item: 7.10.3**

**Source:** **CAICT**

**Title: Analysis of FR2 MIMO OTA measurement campaign and Proposals on performance requirements**

**Document for: Approval**

# 1 Introduction

In 3GPP Rel-18 FR2 MIMO OTA measurement campaign, volunteer labs provided measurement data for specifying FR2 MIMO OTA performance requirements [1]-[3]. It was also agreed to include the PAD measurement results into the data pool [4]. This contribution presents the final analysis of all measurement data submitted by volunteer labs based on the Framework for FR2 MIMO OTA requirements development [4]. The detailed analysis data is attached in the Excel worksheet of this contribution.

# 2 Discussion

At the last meeting, it was agreed to take the average values of PAD measurement results with one top and on bottom outliers removed, as captured in the WF [5],

|  |
| --- |
| **Issue 2-3-2: How to process the PAD measurement results to be included into the data pool*** Take the average values of PAD measurement results with one top and on bottom outliers removed.
 |

Besides, Lab A indicated that their results are 3 dB more optimistic due to the way the power is set at the center of the test zone, and thus their MASC results should be corrected by 3-dB offset [1].

Based on the PAD measurement results submitted by volunteer labs [6], the average values are calculated and listed in Table 1, based on the following four options:

* Option 1: linear average in mW with Lab A’s original data
* Option 2: linear average in dB with Lab A’s original data
* Option 3: linear average in mW with Lab A’s corrected data
* Option 4: linear average in dB with Lab A’s corrected data

Top and bottom values have been removed before averaging.

Table 1 (a). Average values of PAD measurement results (with Lab A’s original data)

|  |  |  |  |
| --- | --- | --- | --- |
| **Device** | **Band** | **MASC70 measurement result [dBm/120kHz]** | **Average values [dBm/120kHz]** |
| **Lab A** | **Lab B** | **Lab C** | **Lab D** | **Lab E** | **Linear average in mW** | **Linear average in dB** |
| PAD 1 | n261 | -104.97 (top) | -101.79 | -100.64 (bottom) | NA | NA | -101.79  | -101.79  |
| PAD 2 | n261 | -108.56 (top) | -104.92 | -103.87 (bottom) | NA | -105.41 | -105.16  | -105.17  |
| PAD 3 | n261 | -105.40 (top) | -101.92 | -101.22 (bottom) | NA | -103.31 | -102.56  | -102.61  |
| PAD 4 | n257 | -108.76 | -105.80 | -104.59 | NA | -106.01 | For n257, cannot be included |

Table 1 (b). Average values of PAD measurement results (with Lab A’s corrected data)

|  |  |  |  |
| --- | --- | --- | --- |
| **Device** | **Band** | **MASC70 measurement result [dBm/120kHz]** | **Average values [dBm/120kHz]** |
| **Lab A** | **Lab B** | **Lab C** | **Lab D** | **Lab E** | **Linear average in mW** | **Linear average in dB** |
| PAD 1 | n261 | -101.97 (top) | -101.79 | -100.64 (bottom) | NA | NA | -101.79  | -101.79  |
| PAD 2 | n261 | -105.56 (top) | -104.92 | -103.87 (bottom) | NA | -105.41 | -105.16  | -105.17  |
| PAD 3 | n261 | -102.40  | -101.92 | -101.22 (bottom) | NA | -103.31 (top) | -102.15  | -102.16  |
| PAD 4 | n257 | -105.76  | -105.80 | -104.59 | NA | -106.01 | For n257, cannot be included |

The CDF curves of the MASC data pool for band n261 is plotted in Fig. 1 based on the four options

(a) Option 1

(b) Option 2

(c) Option 3

(d) Option 4

Figure 1. CDF of measurement data at band n261

The MASC values at 80%, 85%, 90%, 95% percentiles of the CDF curves based on the four options are the same, and summarized in Table 2.

Table 2. Summary of MASC CDF analysis results [dBm/120 kHz]

|  |  |
| --- | --- |
| **Percentile (pass rate)** | **n261 MASC70** |
| **80%-tile** | -100.54 |
| **85%-tile** | -100.26 |
| **90%-tile** | -100.11 |
| **95%-tile** | -99.85  |
| Amount of DUT samples | 13 |

For FR1 MIMO OTA, it was agreed that the value at [85%] percentile of the CDF curve can be selected as the starting point for requirement discussion. Due to the smaller amount of FR2 DUT samples, we propose to select the range of 80% to 90% percentile values as starting point.

**Proposal 1: Select the values in the range of 80% ~ 90% percentile of the CDF curve, i.e., -100.5 ~ -100.1 dBm/120 kHz, as starting point for requirement discussion.**

# 3 Conclusion

This contribution provides the final analysis of FR2 MIMO OTA measurement campaign and proposals on performance requirements.

**Proposal 1: Select the values in the range of 80% ~ 90% percentile of the CDF curve, i.e., -100.5 ~ -100.1 dBm/120 kHz, as starting point for requirement discussion.**

# References

1. R4-2409928, On FR2 MIMO OTA measurement results, Apple, 3GPP RAN4#111, May 2024.
2. R4-2407664, FR2 MIMO OTA measurement campaign data submission, CAICT, CMCC, 3GPP RAN4#111, May 2024.
3. R4-2409425, FR2 MIMO OTA measurement campaign data submission, Huawei, HiSilicon, 3GPP RAN4#111, May 2024.
4. R4-2407662, Updated Framework and time plan for FR2 MIMO OTA performance requirements development (May 2024), CAICT, 3GPP RAN4#111, May 2024.
5. R4-2406083, WF for [110bis][337] NR\_MIMO\_OTA\_enh, CAICT, 3GPP RAN4#110bis, Apr. 2024.
6. R4-2407663, Summary of 3GPP Rel-18 FR2 MIMO OTA lab alignment results, 3GPP RAN4#110bis, Apr. 2024.