

MEASUREMENT REPORT

FCC PART 25 Subpart B LTE

FCC ID: 2AD8UFZMFWH201

Applicant: Nokia Solutions and Networks, OY

Application Type: Certification

Product: Flexi Zone 2400

Model No.: FWH2


Brand Name: Nokia


FCC Classification: Licensed Non-Broadcast Station Transmitter (TNB)

FCC Rule Part(s): Part 25 Subpart B (Section 25.149)

Test Procedure(s): ANSI C63.26-2015, KDB 971168 D01v03r01

Test Date: January 06 ~ 11, 2022

Reviewed By: 
(Paddy Chen)

Approved By: 
(Chenz Ker)



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.26-2015. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Taiwan) Co., Ltd.

Revision History

| Report No. | Version | Description | Issue Date | Note |
|---------------|---------|----------------|------------|-------|
| 2001TW0004-U1 | Rev. 01 | Initial Report | 01-30-2022 | Valid |
| | | | | |

Note: This report is prepared for FCC Class II permissive supplement to MRT Original report No. 1812TW0108-U1, added new antenna and related data.

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§2.1033 General Information

| | |
|------------------------------|---|
| Applicant: | Nokia Solutions and Networks, OY |
| Applicant Address: | 2000 W. Lucent Lane, Naperville, Illinois, United States, 60563 |
| Manufacturer: | Nokia Solutions and Networks, OY |
| Manufacturer Address: | 2000 W. Lucent Lane, Naperville, Illinois, United States, 60563 |
| Test Site: | MRT Technology (Taiwan) Co., Ltd |
| Test Site Address: | No. 38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C) |

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Fuxing Rd., Taoyuan, Taiwan (R.O.C)

- MRT facility is a FCC registered (Reg. No. 153292) test facility with the site description report on file and is designated by the FCC as an Accredited Test Film.
- MRT facility is an IC registered (MRT Reg. No. 21723-1) test laboratory with the site description on file at Industry Canada.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (TAF) under the American Association for Laboratory Accreditation Program (TAF Cert. No. 3261) in EMC, Telecommunications and Radio testing for FCC, Industry Taiwan, EU and TELEC Rules.

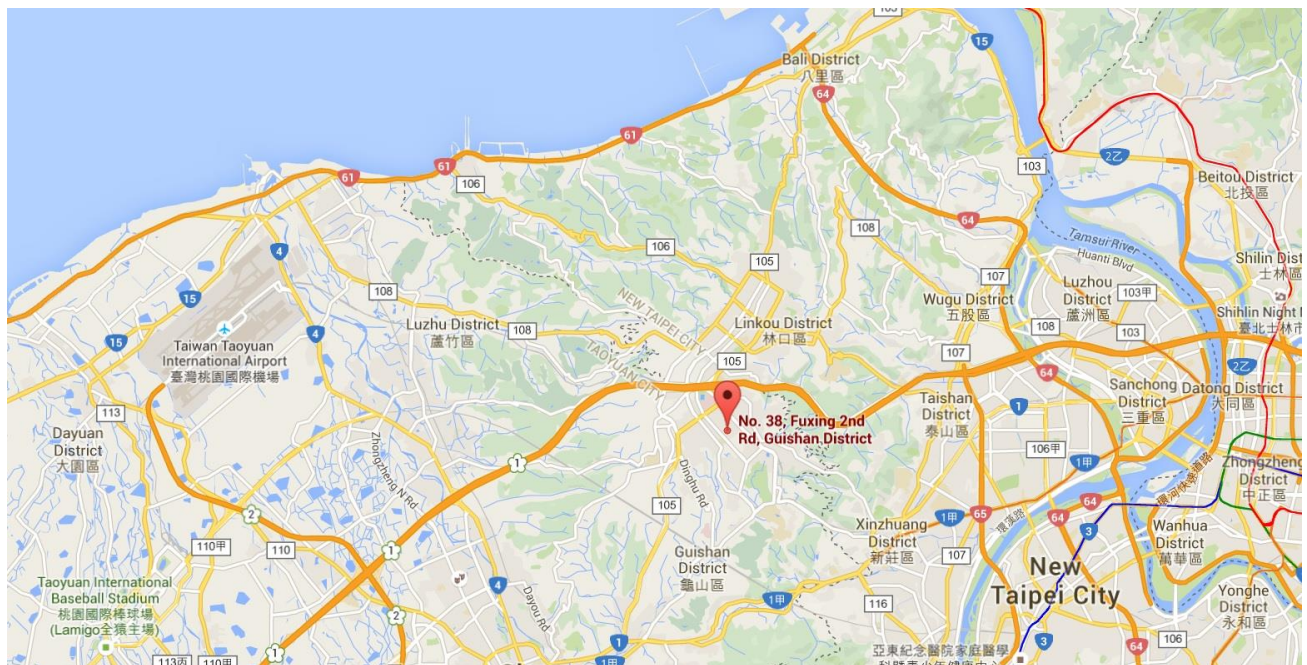
1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taoyuan City. These measurement tests were conducted at the MRT Technology (Taiwan) Co., Ltd. Facility located at No.38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 33377, Taiwan (R.O.C).



2. PRODUCT INFORMATION

2.1. Feature of Equipment under Test

| | |
|---|---|
| Product Name: | Flexi Zone 2400 |
| Model No.: | FWH2 |
| Brand Name: | Nokia |
| Serial No.: | EB191700006 |
| GPS Frequency Range: | 1575.42MHz |
| FCC ID of Built-in Bluetooth Module: | 2AD8UNBTM01 |
| LTE Operating Band: | LTE TDD Band 53 |
| Frequency Range: | Uplink: 2483.5 ~ 2495 MHz; Downlink: 2483.5 ~ 2495 MHz |
| Carriers: | Up to 1 carrier |
| Carrier Bandwidth: | 10MHz |
| Type of Modulation: | QPSK, 16QAM, 64QAM, 256QAM |
| T _x & R _x Configuration: | 2T _x & 2R _x |
| Maximum Output Power: | Conducted Power: 26.53dBm EIRP: 35.53dBm |
| Antenna Information: | Refer to section 2.2 Transmit Antenna is connected directly to the 6dB attenuator |
| Accessory Information: | |
| Attenuator: | Position: One attenuator connected directly to the FWH2 main and diversity antenna ports. Attenuation: 6dB Nokia Part Number: G37604 & G37612 |
| Remark: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer. | |

2.2. Antenna Information

| Technology | Antenna Type | Nokia Part Number | Antenna Gain |
|-------------|------------------------------------|-------------------|--------------|
| LTE Band 53 | Cross Polarized Flat Panel Antenna | HG2409XP | 9dBi |

2.3. Details of Test Mode

| Test Item | Test Frequency (MHz) | Channel Bandwidth (MHz) | Modulation |
|----------------------------|----------------------|-------------------------|----------------------------|
| Output Power | 2488.5, 2489, 2490 | 10 | QPSK, 16QAM, 64QAM, 256QAM |
| Radiated Spurious Emission | | | QPSK |

Note: Test Items “Radiated Spurious Emissions” have been assessed all the test modes, and showed the worst test data in this report.

2.4. Device Capabilities

This device contains the following capabilities:

LTE TDD Band 53.

2.5. Test Configuration

The device was tested per the guidance of KDB 971168 D01v03r01. ANSI C63.26-2015 was used to reference the appropriate EUT setup for radiated spurious emissions testing.

2.6. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

3. TEST EQUIPMENT CALIBRATION DATE

Radiated Emissions Test Equipment

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|----------------------------|--------------|---------------------------|-------------|----------------|----------------|
| Broadband TRILOG Antenna | SCHWARZBECK | VULB 9162 | MRTTWA00001 | 1 year | 2022/10/03 |
| Active Loop Antenna | SCHWARZBECK | FMZB 1519B | MRTTWA00002 | 1 year | 2022/05/06 |
| Broadband Hornantenna | SCHWARZBECK | BBHA 9120D | MRTTWA00003 | 1 year | 2022/04/21 |
| Breitband Hornantenna | SCHWARZBECK | BBHA 9170 | MRTTWA00004 | 1 year | 2022/04/28 |
| Broadband Preamplifier | SCHWARZBECK | BBV 9718 | MRTTWA00005 | 1 year | 2022/04/21 |
| Broadband Amplifier | SCHWARZBECK | BBV 9721 | MRTTWA00006 | 1 year | 2022/04/26 |
| Signal Analyzer | R&S | FSV40 | MRTTWA00007 | 1 year | 2022/03/23 |
| EMI Test Receiver | R&S | ESR3 | MRTTWA00009 | 1 year | 2022/03/24 |
| EXA Signal Analyzer | KEYSIGHT | N9010A | MRTTWA00012 | 1 year | 2022/10/12 |
| EXA Signal Analyzer | KEYSIGHT | N9010B | MRTTWA00074 | 1 year | 2022/07/13 |
| Antenna Cable | HUBERSUHNER | SF106 | MRTTWE00010 | 1 year | 2022/06/15 |
| Temperature/Humidity Meter | TFA | 35.1078.10.IT | MRTTWA00032 | 1 year | 2022/05/26 |
| Cable | Rosnol | K1K50-UP026 4-K1K50-4M | MRTTWE00012 | 1 year | 2022/06/20 |

Conducted Test Equipment

| Instrument | Manufacturer | Type No. | Asset No. | Cali. Interval | Cali. Due Date |
|--|--------------|---------------|-------------|------------------------------|----------------|
| X-Series USB Peak and Average Power Sensor | KEYSIGHT | U2021XA | MRTTWA00014 | 1 year | 2022/04/23 |
| X-Series USB Peak and Average Power Sensor | KEYSIGHT | U2021XA | MRTTWA00015 | 1 year | 2022/03/25 |
| EXA Signal Analyzer | KEYSIGHT | N9010A | MRTTWA00012 | 1 year | 2022/10/01 |
| EXA Signal Analyzer | KEYSIGHT | N9010B | MRTTWA00074 | 1 year | 2022/07/10 |
| Signal Analyzer | R&S | FSV40 | MRTTWA00007 | 1 year | 2022/03/23 |
| DC Power Supply | GWINSTEK | SPS-606 | MRTTWA00034 | Check by TRUE RMS MULTIMETER | |
| TRUE RMS MULTIMETER | FLUKE | 117 | MRTTWA00022 | 1 year | 2022/05/05 |
| Temperature & Humidity Chamber | TEN BILLION | TTH-B3UP | MRTTWA00036 | 1 year | 2022/11/04 |
| Temperature/Humidity Meter | TFA | 35.1078.10.IT | MRTTWA00033 | 1 year | 2022/03/08 |

| Software | Version | Function |
|--------------|---------|-------------------|
| EMI Software | V3 | EMI Test Software |

4. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

| Radiated Emission Measurement |
|---|
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 9kHz~30MHz: $\pm 3.92\text{dB}$ 30MHz~1GHz: $\pm 4.25\text{dB}$ 1GHz~18GHz: $\pm 4.40\text{dB}$ 18GHz~40GHz: $\pm 4.45\text{dB}$ |
| Output Power |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): $\pm 0.84\text{dB}$ |

5. TEST RESULT

5.1. Summary

| FCC Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|-----------------------------------|-----------------------------|--|----------------|-------------|-------------|
| 25.149 (c)(4)(iii) | Maximum Transmit Power | Conducted $\leq 30\text{dBm}$; EIRP $\leq 6\text{dBw}$ | Conducted | Pass | Section 5.2 |
| 2.1053; 25.149 (c)(4) (v) (vi) | Radiated Spurious Emissions | Refer to Section 5.3 | Radiated | Pass | Section 5.3 |

Notes:

1. The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
2. Test Items "Radiated Spurious Emissions" have been assessed all the test modes, and showed the worst test data in this report.

5.2. Maximum Transmit Power

5.2.1. Test Limit

The maximum transmit power is no more than 1 W with a peak EIRP of no more than 6 dBw.

EIRP Limit = 6 + 30 = 36 dBm

5.2.2. Test Procedure

KDB 971168 D01v03r01 - Section 5.2.4

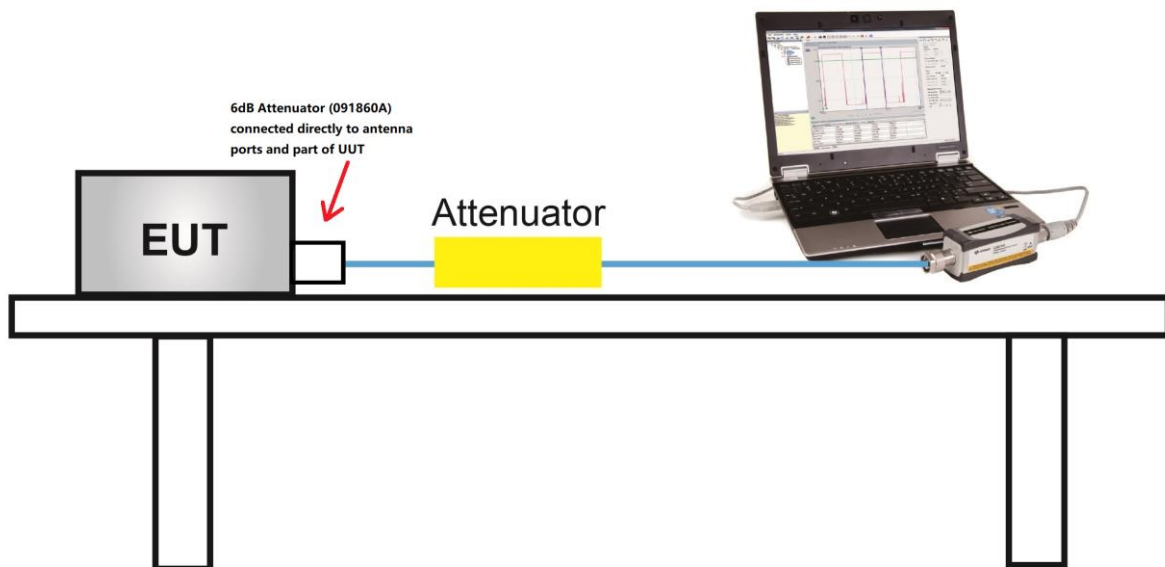
ANSI C63.26-2015 - Section 5.2.4.2

5.2.3. Test Setting

Method AVGPM-G (Measurement using a gated RF average-reading power meter)

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

5.2.4. Test Setup



5.2.5. Test Result

| | | | |
|---------------|-------------------------|--------------------|-----|
| Test Engineer | Peter Xu | Test Site | SR2 |
| Test Date | 2022/01/06 ~ 2022/01/08 | Test Configuration | B53 |
| Test Item | EIRP | | |

| Modulation | Frequency (MHz) | Output Power (dBm) | | Total Power (dBm) | Output Power Limit (dBm) | EIRP (dBm) | EIRP Limit (dBm) | Result |
|------------|-----------------|--------------------|---------|-------------------|--------------------------|------------|------------------|--------|
| | | Chain D | Chain M | | | | | |
| QPSK | 2488.5 | 23.15 | 23.34 | 26.26 | ≤ 30.00 | 35.26 | ≤ 36.00 | Pass |
| | 2489.0 | 23.17 | 23.28 | 26.24 | ≤ 30.00 | 35.24 | ≤ 36.00 | Pass |
| | 2490.0 | 23.35 | 23.69 | 26.53 | ≤ 30.00 | 35.53 | ≤ 36.00 | Pass |
| 16QAM | 2488.5 | 23.08 | 23.11 | 26.11 | ≤ 30.00 | 35.11 | ≤ 36.00 | Pass |
| | 2489.0 | 23.07 | 23.24 | 26.17 | ≤ 30.00 | 35.17 | ≤ 36.00 | Pass |
| | 2490.0 | 23.35 | 23.48 | 26.43 | ≤ 30.00 | 35.43 | ≤ 36.00 | Pass |
| 64QAM | 2488.5 | 22.97 | 23.10 | 26.05 | ≤ 30.00 | 35.05 | ≤ 36.00 | Pass |
| | 2489.0 | 23.03 | 23.22 | 26.14 | ≤ 30.00 | 35.14 | ≤ 36.00 | Pass |
| | 2490.0 | 23.24 | 23.51 | 26.39 | ≤ 30.00 | 35.39 | ≤ 36.00 | Pass |
| 256QAM | 2488.5 | 22.92 | 22.93 | 25.94 | ≤ 30.00 | 34.94 | ≤ 36.00 | Pass |
| | 2489.0 | 23.19 | 22.98 | 26.10 | ≤ 30.00 | 35.10 | ≤ 36.00 | Pass |
| | 2490.0 | 23.19 | 23.34 | 26.28 | ≤ 30.00 | 35.28 | ≤ 36.00 | Pass |

Note 1: The Total Average Power (dBm) = $10 \cdot \log\{10^{(\text{Chain D Average Power} / 10)} + 10^{(\text{Chain M Average Power} / 10)}\}$.

Note 2: EIRP (dBm) = Total Average Power (dBm) + Antenna Gain (dBi).

5.3. Radiated Spurious Emissions Measurement

5.3.1. Test Limit

Emissions below 2483.5 MHz are attenuated below the transmitter power (P) measured in watts by a factor of at least $40 + 10 \log (P)$ dB at the channel edge at 2483.5 MHz, $43 + 10 \log (P)$ dB at 5 MHz from the channel edge, and $55 + 10 \log (P)$ dB at X MHz from the channel edge where X is the greater of 6 MHz or the actual emission bandwidth.

Emissions above 2495 MHz are attenuated below the transmitter power (P) measured in watts by a factor of at least $43 + 10 \log (P)$ dB on all frequencies between the channel edge at 2495 MHz and X MHz from this channel edge and $55 + 10 \log (P)$ dB on all frequencies more than X MHz from this channel edge, where X is the greater of 6 MHz or the actual emission bandwidth.

5.3.2. Test Procedure Used

KDB 971168 D01v03r01 - Section 5.8

ANSI C63.26-2015 - Section 5.2.7

5.3.3. Test Setting

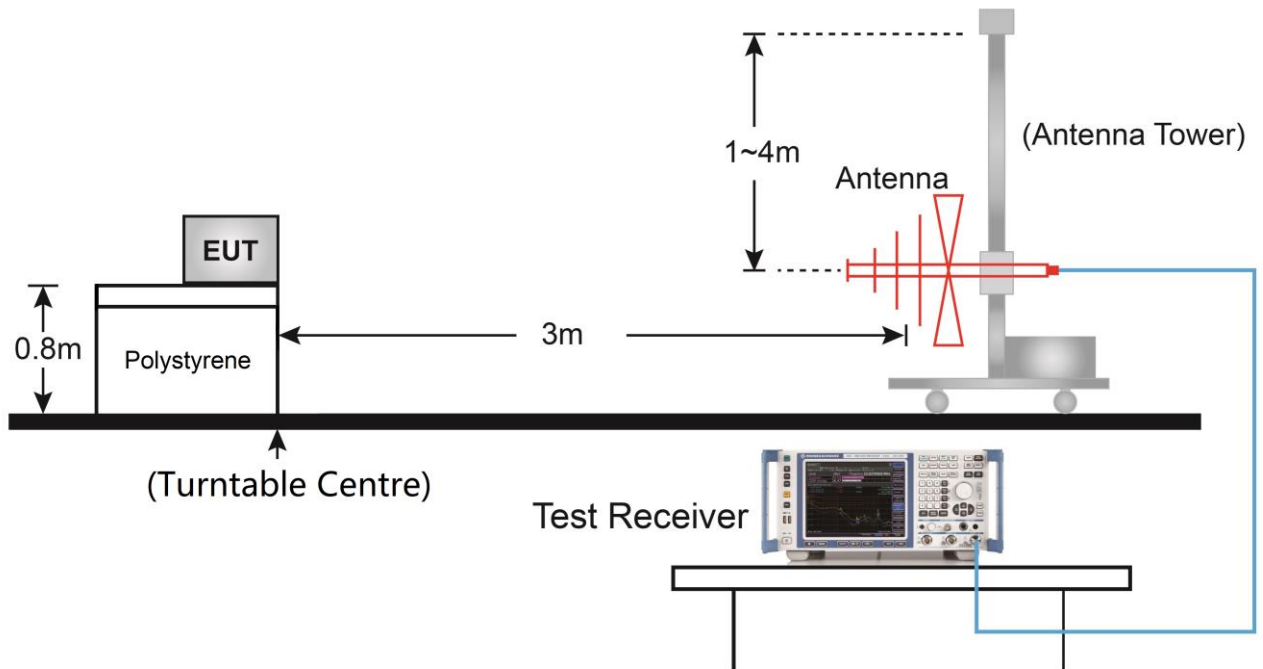
1. RBW = 100kHz or 1MHz
2. VBW $\geq 3 \cdot$ RBW
3. Sweep time = auto
4. Detector = power averaging (rms)
5. Set sweep trigger to "free run."
6. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple.

To accurately determine the average power over the on and off time of the transmitter, it can be necessary to increase the number of traces to be averaged above 100, or if using a manually configured sweep time, increase the sweep time

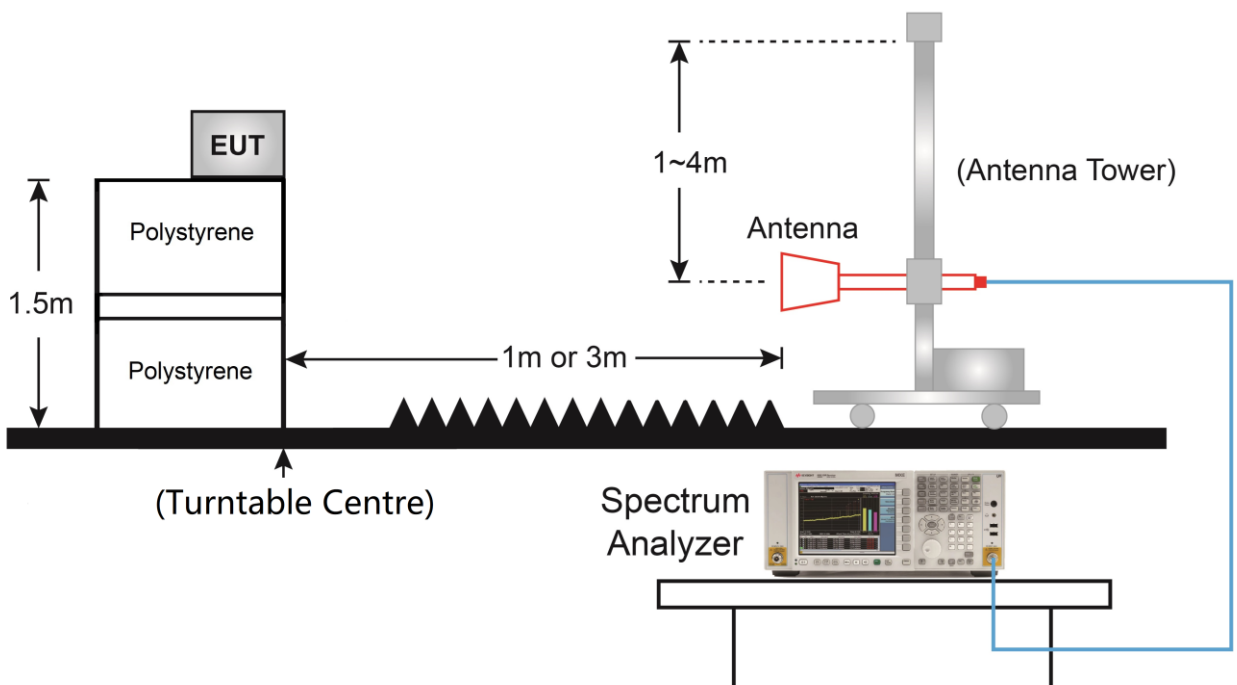
7. The trace was allowed to stabilize

5.3.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.3.5. Test Result

| | | | |
|---------------|-------------------------|--------------------|---------------|
| Test Engineer | Kevin Ker | Test Site | AC1 |
| Test Date | 2022/01/07 ~ 2022/01/10 | Test Configuration | B53, BW=10MHz |

| Frequency (MHz) | Reading Level (dBμV) | Factor (dB) | Measure Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Detector | Polarization |
|-----------------------|----------------------|-------------|------------------------|----------------|-------------|----------|--------------|
| Bottom Channel | | | | | | | |
| 103.24 | 4.76 | 18.49 | 23.25 | 70.30 | -47.05 | Peak | Horizontal |
| 417.52 | 1.20 | 23.67 | 24.87 | 70.30 | -45.43 | Peak | Horizontal |
| 41.64 | 14.24 | 19.73 | 33.97 | 70.30 | -36.33 | Peak | Vertical |
| 103.24 | 10.82 | 18.49 | 29.31 | 70.30 | -40.99 | Peak | Vertical |
| 4825.00 | 44.42 | 3.77 | 48.19 | 70.30 | -22.11 | Peak | Horizontal |
| 9755.00 | 42.49 | 14.07 | 56.56 | 70.30 | -13.74 | Peak | Horizontal |
| 4808.00 | 44.61 | 3.96 | 48.57 | 70.30 | -21.73 | Peak | Vertical |
| 9083.50 | 42.12 | 13.97 | 56.09 | 70.30 | -14.21 | Peak | Vertical |
| Middle Channel | | | | | | | |
| 144.95 | 7.99 | 15.05 | 23.04 | 70.30 | -47.26 | Peak | Horizontal |
| 581.45 | 2.55 | 26.96 | 29.51 | 70.30 | -40.79 | Peak | Horizontal |
| 33.88 | 15.44 | 17.70 | 33.14 | 70.30 | -37.16 | Peak | Vertical |
| 101.78 | 10.11 | 18.52 | 28.63 | 70.30 | -41.67 | Peak | Vertical |
| 3227.00 | 48.04 | -1.71 | 46.33 | 70.30 | -23.97 | Peak | Horizontal |
| 8752.00 | 41.88 | 13.22 | 55.10 | 70.30 | -15.20 | Peak | Horizontal |
| 5080.00 | 42.62 | 4.10 | 46.72 | 70.30 | -23.58 | Peak | Vertical |
| 9228.00 | 41.60 | 14.63 | 56.23 | 70.30 | -14.07 | Peak | Vertical |
| Top Channel | | | | | | | |
| 181.81 | 10.93 | 16.94 | 27.87 | 70.30 | -42.43 | Peak | Horizontal |
| 292.39 | 8.86 | 20.71 | 29.57 | 70.30 | -40.73 | Peak | Horizontal |
| 42.61 | 20.58 | 19.99 | 40.57 | 70.30 | -29.73 | Peak | Vertical |
| 322.46 | 8.75 | 21.51 | 30.26 | 70.30 | -40.04 | Peak | Vertical |
| 4986.50 | 45.11 | 3.81 | 48.92 | 70.30 | -21.38 | Peak | Horizontal |
| 7570.50 | 42.13 | 11.74 | 53.87 | 70.30 | -16.43 | Peak | Horizontal |
| 5148.00 | 44.19 | 4.21 | 48.40 | 70.30 | -21.90 | Peak | Vertical |
| 8148.50 | 42.52 | 11.95 | 54.47 | 70.30 | -15.83 | Peak | Vertical |

Note: Measure Level (dBμV/m) = Reading Level (dBμV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m) - Pre_Amplifier Gain (dB)

6. CONCLUSION

The data collected relate only the item(s) tested and show that the **Flexi Zone 2400, FCC ID: 2AD8UFZMFWH201** is compliance with Part 25 of the FCC Rules.

————— The End —————