

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)



Testing Laboratory
3261

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.

CONTENTS

Description	Page
1. INTRODUCTION	5
1.1. Scope	5
1.2. MRT Test Location	5
2. PRODUCT INFORMATION.....	6
2.1. Feature of Equipment under Test	6
2.2. Antenna Information	7
2.3. Details of Test Mode.....	7
2.4. Device Capabilities	7
2.5. Test Configuration	7
2.6. EMI Suppression Device(s)/Modifications	7
3. TEST EQUIPMENT CALIBRATION DATE	8
4. MEASUREMENT UNCERTAINTY	9
5. TEST RESULT	10
5.1. Summary	10
5.2. Maximum Transmit Power	11
5.2.1. Test Limit	11
5.2.2. Test Procedure	11
5.2.3. Test Setting	11
5.2.4. Test Setup	11
5.2.5. Test Result	12
5.3. Radiated Spurious Emissions Measurement.....	13
5.3.1. Test Limit	13
5.3.2. Test Procedure Used	13
5.3.3. Test Setting	13
5.3.4. Test Setup	14
5.3.5. Test Result	15
6. CONCLUSION.....	16

§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.

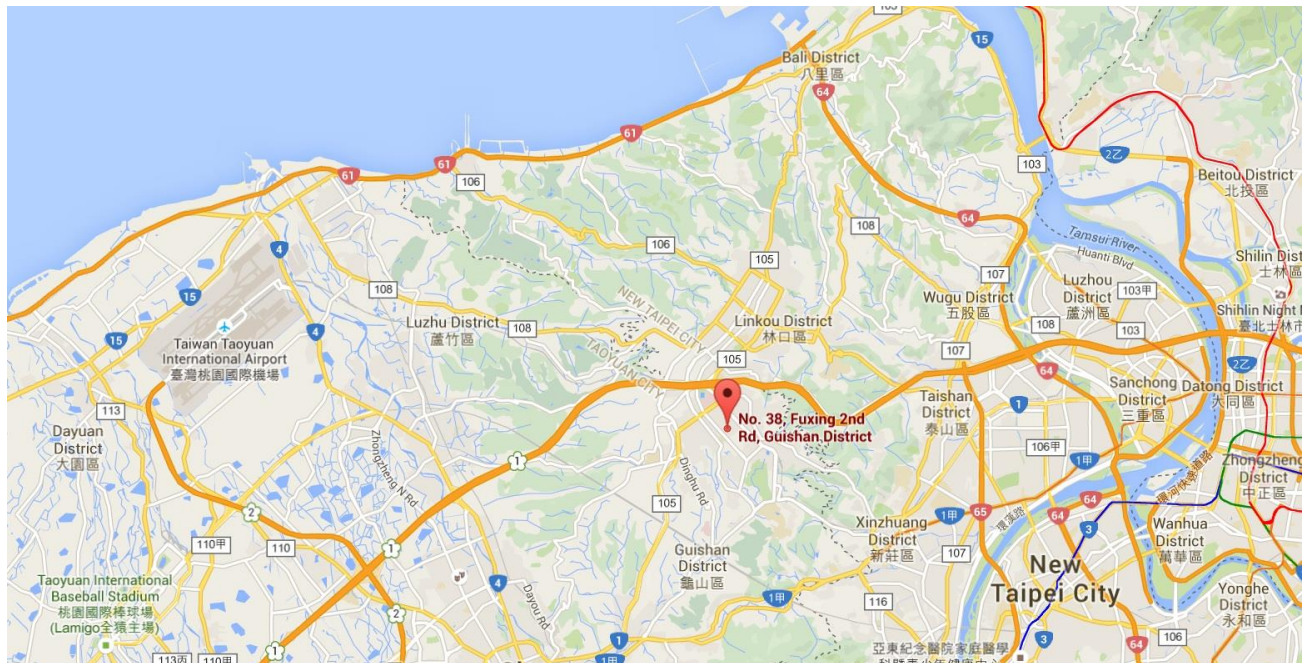
1. INTRODUCTION

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% ($U=2U_c(y)$): 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% ($U=2U_c(y)$): $\pm 0.84\text{dB}$

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

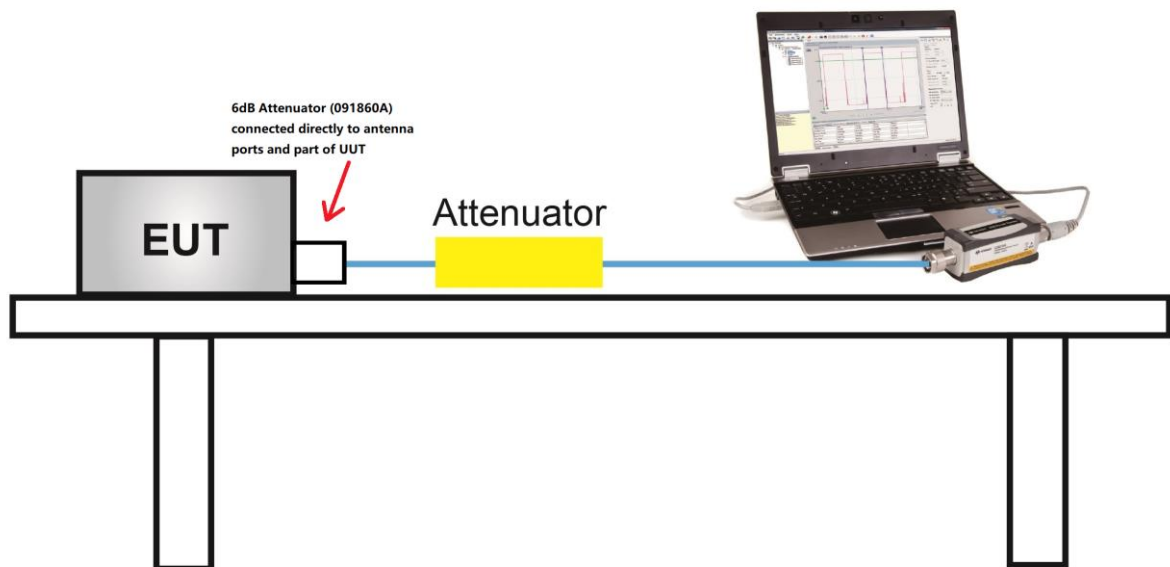
ANSI C63.26-2015 - Section 5.2.4.2

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

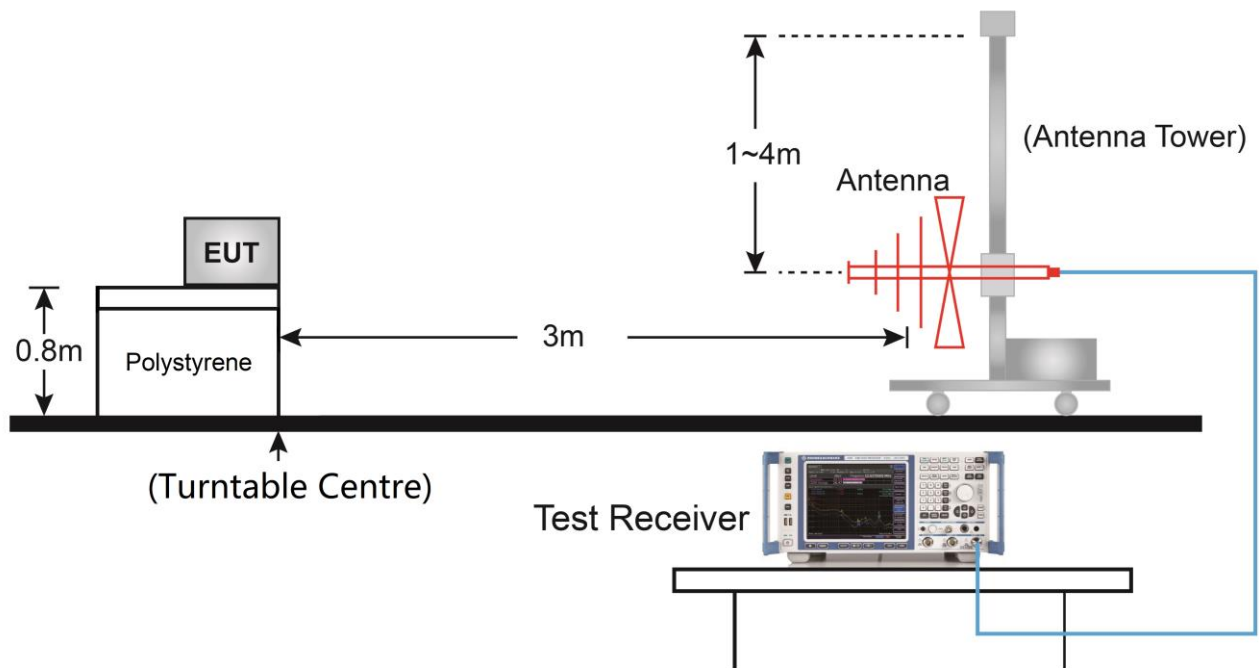
1. RBW = 100kHz or 1MHz
2. VBW $\geq 3 \times$ RBW
3. Sweep time = auto
4. Detector = power averaging (rms)
5. Set sweep trigger to "free run."
6. Trace average at least 100 traces in power averaging (rms) mode if sweep is set to auto-couple.

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

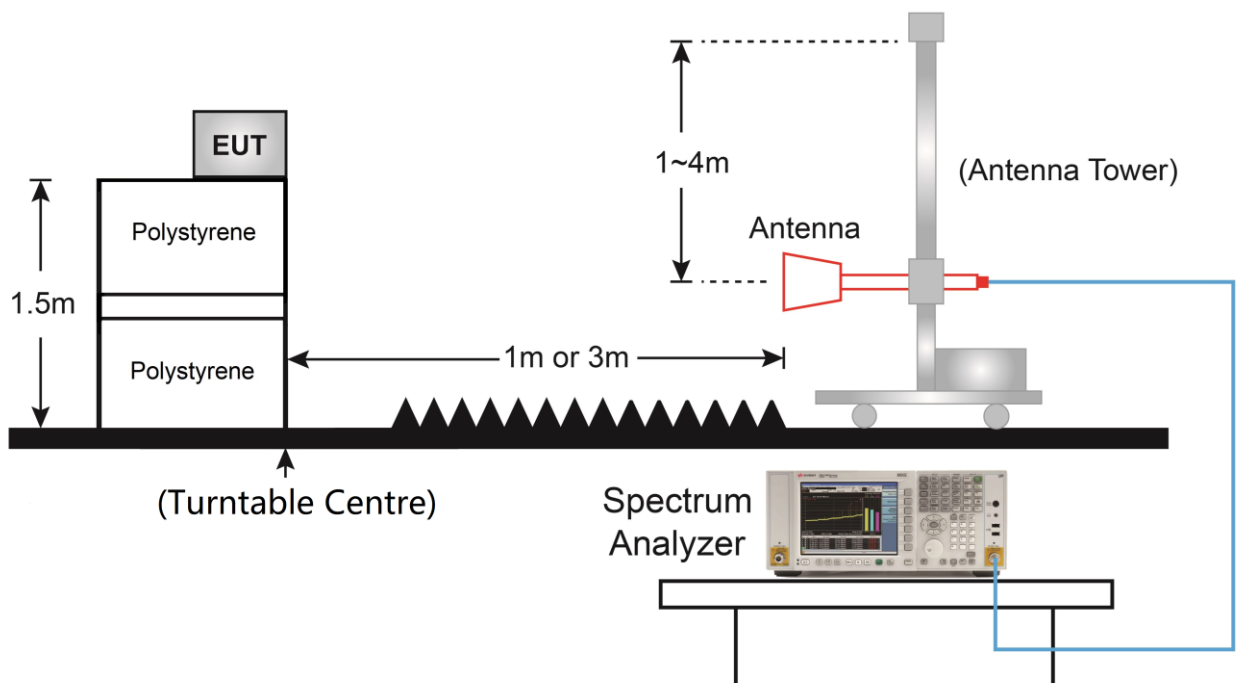
7. The trace was allowed to stabilize

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