RF MEASUREMENT REPORT

FCC ID:	DD4ULXD6G50
Applicant:	Shure Incorporated
Product:	Wireless Boundary Transmitter
Model No.:	ULXD6/C G50, ULXD6/O G50 ULXD6W/C G50, ULXD6W/O G50
Brand Name:	SHURE, SHURE
FCC Classification:	Part 15 Wireless Microphone (DWM)
FCC Rule Part(s):	Part 15 Subpart C (Section 15.236)
Result:	Complies
Received Date:	2024-07-05
Test Date:	2024-07-23 ~ 2024-07-28

Reviewed By: Jame Yuan

Approved By: Robin Wu

ilac-MRA

ACCREDITED
TESTING LABORATORY
CERTIFICATE #3628.01

The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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

Revision History

Report No.	Version	Description	Issue Date	Note
2407RSU017-U1	V01	Initial Report	2024-08-17	Valid

CONTENTS

Description Page

CONTENTS **3**

1. General Information **5**

1.1. Applicant 5
1.2. Manufacturer 5
1.3. Testing Facility 5
1.4. Product Information 6
1.5. Radio Specification under Test 6
1.6. Working Frequencies 6

2. Test Configuration **7**

2.1. Test Mode 7
2.2. Test Software 7
2.3. Applied Standards 7
2.4. Test Environment Condition 7

3. Measuring Instrument **8**

4. Decision Rules and Measurement Uncertainty **9**

4.1. Decision Rules 9
4.2. Measurement Uncertainty 9

5. Test Result **10**

5.1. Summary 10
5.2. 99% Occupied Bandwidth Measurement 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 11
5.3. Frequency Tolerance Measurement 12
5.3.1. Test Limit 12
5.3.2. Test Procedure 12
5.3.3. Test Setting 12
5.3.4. Test Setup 13
5.3.5. Test Result 13
5.4. Necessary Bandwidth Measurement 14
5.4.1. Test Limit 14
5.4.2. Test Procedure 14

5.4.3. Test Setting 14
5.4.4. Test Setup 14
5.4.5. Test Result 14
5.5. Output Power Measurement 15
5.5.1. Test Limit 15
5.5.2. Test Procedure 15
5.5.3. Test Setting 15
5.5.4. Test Setup 15
5.5.5. Test Result 15
5.6. Radiated Spurious Emission Measurement 16
5.6.1. Test Limit 16
5.6.2. Test Procedure 16
5.6.3. Test Setting 16
5.6.4. Test Setup 17
5.6.5. Test Result 18
5.7. AC Conducted Emissions Measurement 19
5.7.1. Test Limit 19
5.7.2. Test Setup 19
5.7.3. Test Result 19

Appendix A – Test Result 20

A.1 99% Occupied Bandwidth Test Result 20
A.2 Frequency Tolerance Test Result 21
A.3 Necessary Bandwidth Test Result 22
A.4 Output Power Test Result 25
A.5 Radiated Spurious Emission Test Result 26
A.6 AC Conducted Emissions Test Result 27

Appendix B - Test Setup Photograph 28

Appendix C - EUT Photograph 29

1. General Information

1.1. Applicant

Shure Incorporated

5800 West Touhy Avenue, Niles, IL 60714-4608, USA

1.2. Manufacturer

Shure Incorporated

5800 West Touhy Avenue, Niles, IL 60714-4608, USA

1.3. Testing Facility

☒	**Test Site – MRT Suzhou Laboratory**
	Laboratory Location (Suzhou - Wuzhong) D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China **Laboratory Location (Suzhou - SIP)** 4b Building, Liando U Valley, No.200 Xingpu Rd., Shengpu Town, Suzhou Industrial Park, China **Laboratory Location (Suzhou - Wujiang)** Building 1, No.1 Xingdong Road, Wujiang, Suzhou, Jiangsu, People's Republic of China
	Laboratory Accreditations
	A2LA: 3628.01 CNAS: L10551 FCC: CN1166 ISED: CN0001 VCCI: ☐R-20025 ☐G-20034 ☐C-20020 ☐T-20020 ☐R-20141 ☐G-20134 ☐C-20103 ☐T-20104
☐	**Test Site – MRT Shenzhen Laboratory**
	Laboratory Location (Shenzhen) 1G, Building A, Junxiangda Building, Zhongshanyuan Road West, Nanshan District, Shenzhen, China
	Laboratory Accreditations
	A2LA: 3628.02 CNAS: L10551 FCC: CN1284 ISED: CN0105
☐	**Test Site – MRT Taiwan Laboratory**
	Laboratory Location (Taiwan) No. 38, Fuxing 2nd Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)
	Laboratory Accreditations
	TAF: 3261 FCC: 291082, TW3261 ISED: TW3261

1.4. Product Information

Product Name	Wireless Boundary Transmitter
Model No.	ULXD6/C G50, ULXD6/O G50 ULXD6W/C G50, ULXD6W/O G50
Serial No.	328A33527
Frequency Range	470 ~ 534 MHz
Power Type	2 * AA alkaline batteries or Rechargeable Li-battery
Operating Temperature	-10 ~ 45°C
Note 1: The information of EUT was provided by the manufacturer, and the accuracy of the information shall be the responsibility of the manufacturer. Note 2: The difference between ULXD6/C and ULXD6/O is that the EUT has different built-in MIC.And ULXD6 enclose color is black and ULXD6W enclose color is white. Note 3: The EUT has two working modes (STD Mode & HD Mode) and two modes can be switched from the digital wireless receiver.	

1.5. Radio Specification under Test

Frequency Range	470 ~ 534 MHz
Declared Power Level	1mW & 10mW & 20mW
Type of Modulation	8PSK
Channel Spacing	25kHz
Antenna Type	PIFA
Antenna Gain	-8.80 dBi

Note: Power level and transmit frequency can be selected using the front panel controls.

1.6. Working Frequencies

Bottom Channel (MHz)	Middle Channel (MHz)	Top Channel (MHz)
470.125	502.000	534.000

2. Test Configuration

2.1. Test Mode

Mode 1: Transmit at G50 Band (20mW)

2.2. Test Software

The test utility software used during testing was “teraterm”, and the version was V4.103, all test commands were provided by the manufacturer.

2.3. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15.236
- KDB 206256 D01v02r01
- ANSI C63.10-2013
- ETSI EN 300 422 - 1 V 1.4.2

2.4. Test Environment Condition

Ambient Temperature	15 ~ 35°C
Relative Humidity	20 ~ 75%RH

3. Measuring Instrument

Instrument	Manufacturer	Model No.	Asset No.	Cali. Interval	Cali. Due Date	Test Site
USB Power Sensor	Keysight	U2021XA	MRTSUE06447	1 year	2025-05-08	WZ-SR5
Thermohygrometer	testo	608-H1	MRTSUE06402	1 year	2025-05-12	WZ-SR5
Shielding Room	HUAMING	WZ-SR5	MRTSUE06442	N/A	N/A	WZ-SR5
Signal Analyzer	Keysight	N9010B	MRTSUE06457	1 year	2025-05-08	WZ-SR5/ WZ-TR3
Temperature Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2024-09-27	WZ-TR3
Thermohygrometer	testo	608-H1	MRTSUE11268	1 year	2024-12-14	WZ-TR3
Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2024-08-09	WZ-AC1
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2024-11-09	WZ-AC1
TRILOG Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2025-05-15	WZ-AC1
Anechoic Chamber	TDK	WZ-AC1	MRTSUE06212	1 year	2025-04-19	WZ-AC1
Signal Analyzer	Keysight	N9010B	MRTSUE06607	1 year	2024-10-23	WZ-AC1
Thermohygrometer	testo	608-H1	MRTSUE11039	1 year	2024-10-25	WZ-AC1

Software	Version	Function
e3	19910a	RE & CE
Controller_MF 7802	2.03C	RE Antenna & Turntable
BenchVue Power Meter	2018.1	Power

4. Decision Rules and Measurement Uncertainty

4.1. Decision Rules

The Decision Rule is based on Simple Acceptance in accordance with ISO Guide 98-4: 2012 Clause 8.2. (Measurement uncertainty is not taken into account when stating conformity with a specified requirement.

4.2. 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.

AC Conducted Emission Measurement
The maximum measurement uncertainty is evaluated as: 9kHz~150kHz: 3.58dB 150kHz~30MHz: 3.20dB
Radiated Emission Measurement
The maximum measurement uncertainty is evaluated as: Coaxial: 9kHz~30MHz: 2.61dB Coplanar: 9kHz~30MHz: 2.62dB Horizontal: 30MHz~200MHz: 3.79dB 200MHz~1GHz: 3.91dB 1GHz~40GHz: 4.99dB Vertical: 30MHz~200MHz: 4.06dB 200MHz~1GHz: 5.21dB 1GHz~40GHz: 4.90dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.2dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 1.4dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% (U=2Uc(y)): 2.7%

5. Test Result

5.1. Summary

FCC Part Section(s)	Test Description	Test Condition	Test Result
15.236(f)(2)	Occupied Bandwidth	Conducted	Pass
15.236(f)(3)	Frequency Tolerance		Pass
15.236(g)	Necessary Bandwidth		Pass
15.236(d)(1)	RF Output Power		Pass
15.236(g)	Radiated Spurious Emission	Radiated	Pass
15.207	AC Conducted Emissions 150kHz - 30MHz	Line Conducted	N/A

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) “N/A” means that this item is not applicable, and the detail information refer to relevant section.

5.2. 99% Occupied Bandwidth Measurement

5.2.1. Test Limit

The operating bandwidth shall not exceed 200 kHz.

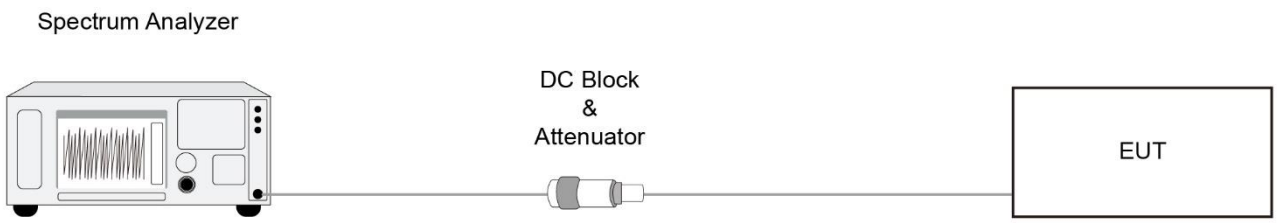
5.2.2. Test Procedure

ANSI C63.10-2013 - Section 6.9.3

5.2.3. Test Setting

1. The frequency span for the spectrum analyzer shall be between 1.5 times and 5.0 times the OBW.
2. Set RBW ≥ 1% to 5% of the OBW
3. VBW = Approximately three times RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace to stabilize
8. Use the 99% power bandwidth function of the instrument and report the measured bandwidth.

5.2.4. Test Setup



5.2.5. Test Result

Refer to Appendix A.1.

5.3. Frequency Tolerance Measurement

5.3.1. Test Limit

The frequency tolerance of the carrier signal shall be maintained within ±0.005% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. Battery operated equipment shall be tested using a new battery.

5.3.2. Test Procedure

ANSI C63.10-2013 - Section 6.8

5.3.3. Test Setting

The EUT was programmed to transmit with an unmodulated carrier.

Frequency Stability Under Temperature Variations:

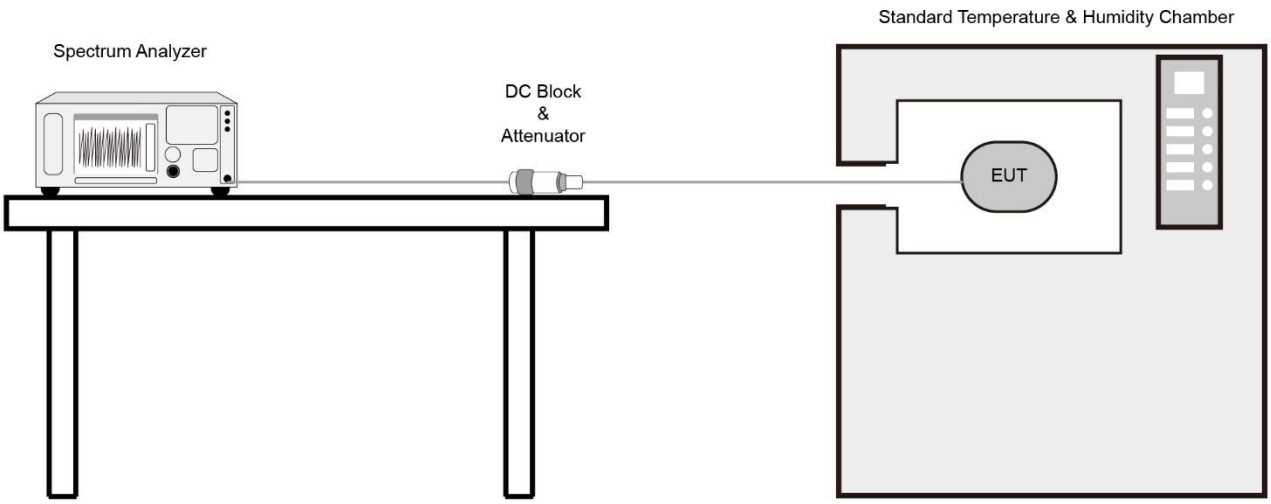
The equipment under test was connected to an external DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C. Use a variable DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

5.3.4. Test Setup



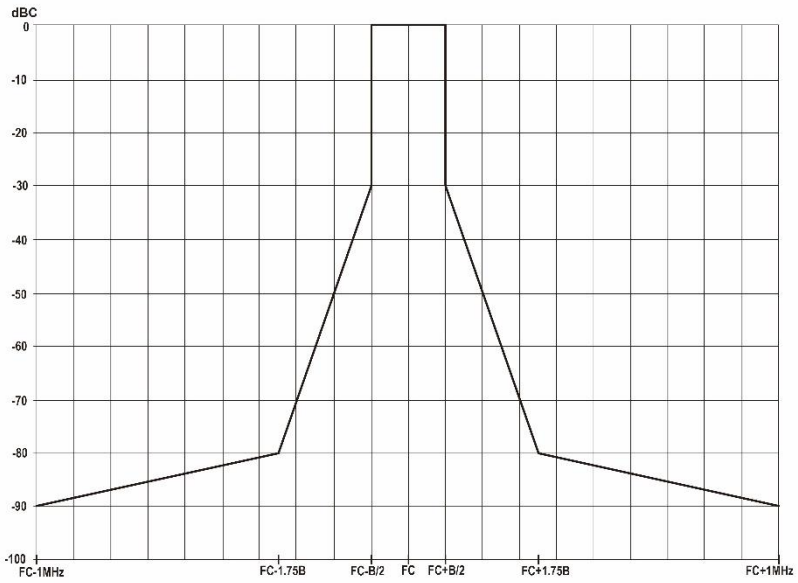
5.3.5. Test Result

Refer to Appendix A.2.

5.4. Necessary Bandwidth Measurement

5.4.1. Test Limit

According to EN 300 422-1 V1.4.2 clause 8.3.2.2, the transmitter output spectrum shall be within the mask defined as below figure.



5.4.2. Test Procedure

ETSI EN 300 422-1 V1.4.2 clause 8.3.2.1.

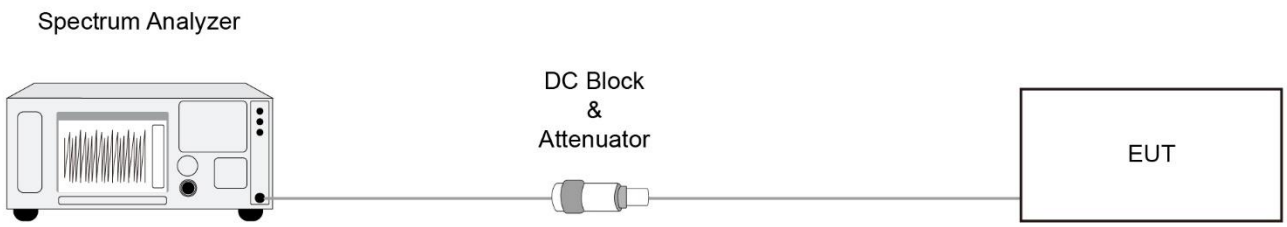
5.4.3. Test Setting

The EUT was powered up and the transmit frequency & power output of the EUT were selected.

The spectrum analyzer center frequency is set to the nominal EUT channel center frequency.

Only bottom and top channel is required, at an output power level of 2mW & 10mW & 35mW.

5.4.4. Test Setup



5.4.5. Test Result

Refer to Appendix A.3.

5.5. Output Power Measurement

5.5.1. Test Limit

In the bands allocated and assigned for broadcast television and in the 600 MHz service band: 50 mW EIRP.

In the 600 MHz guard band and the 600 MHz duplex gap: 20 mW EIRP.

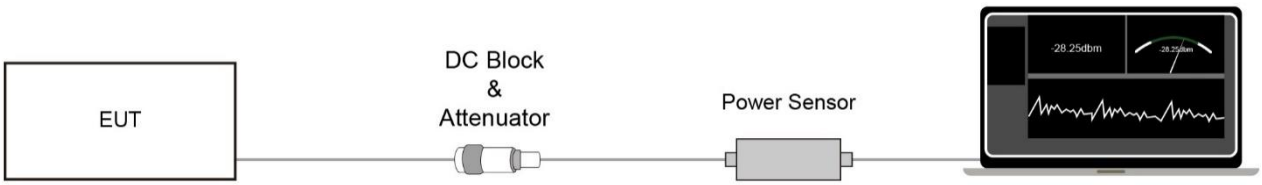
5.5.2. Test Procedure

ANSI C63.10 - 2013 - Section 11.9.2.3.2

5.5.3. Test Setting

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter.

5.5.4. Test Setup



5.5.5. Test Result

Refer to Appendix A.4.

5.6. Radiated Spurious Emission Measurement

5.6.1. Test Limit

According to FCC Part 15.236(g), emissions outside of this band shall comply with the limits specified in section 8.4.3 of ETSI EN 300 422-1 V1.4.2.

State	Frequency Range		
	47MHz to 74MHz, 87.5MHz to 137MHz 174MHz to 230MHz, 470MHz to 862MHz	Other Frequencies below 1000MHz	Frequencies above 1000MHz
Operation	4nW	250nW	1uW
Standby	2nW	2nW	20nW

5.6.2. Test Procedure

ETSI EN 300 422-1 V1.4.2 clause 8.4.2.

5.6.3. Test Setting

Table 1 - RBW as a function of frequency

Frequency	RBW
25 ~ 30 MHz	9 kHz
30 ~ 1000 MHz	100 kHz
1000 ~ 6000 MHz	1 MHz

Emissions shall be investigated up to the 10th harmonic of the fundamental.

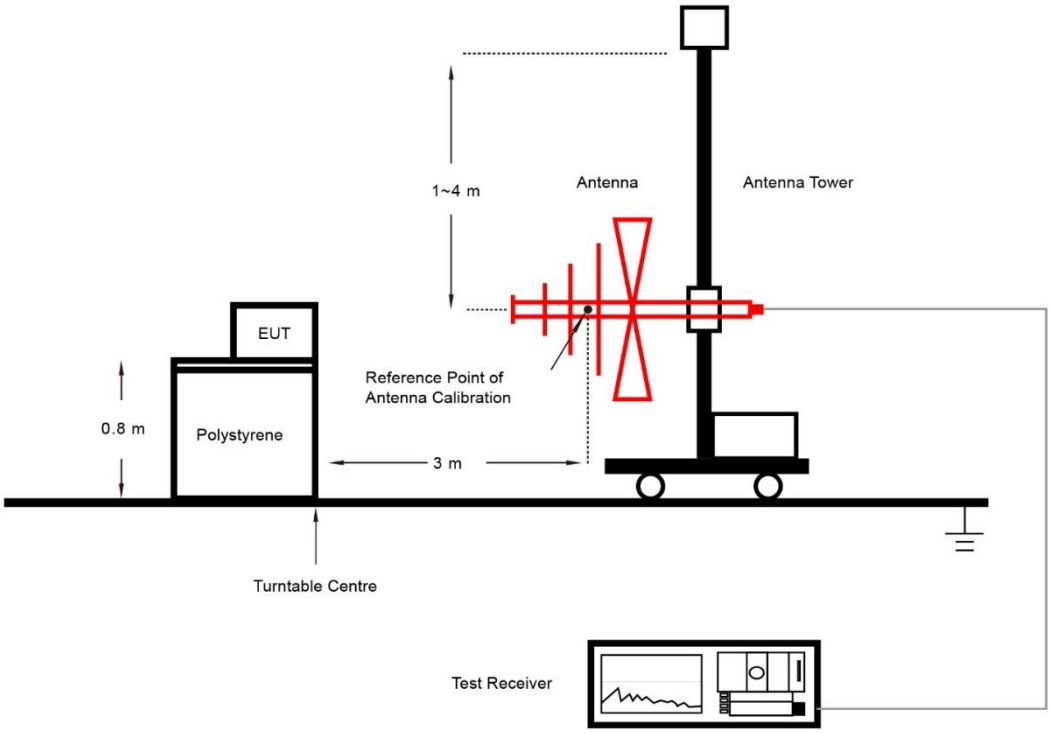
All the emissions shall be demonstrated using a QP detector below 1 GHz and an RMS Average detector above 1 GHz.

All significant broadband and narrowband signals found in the preliminary sweeps were measured using a peak detector at a test distance of 3 meters.

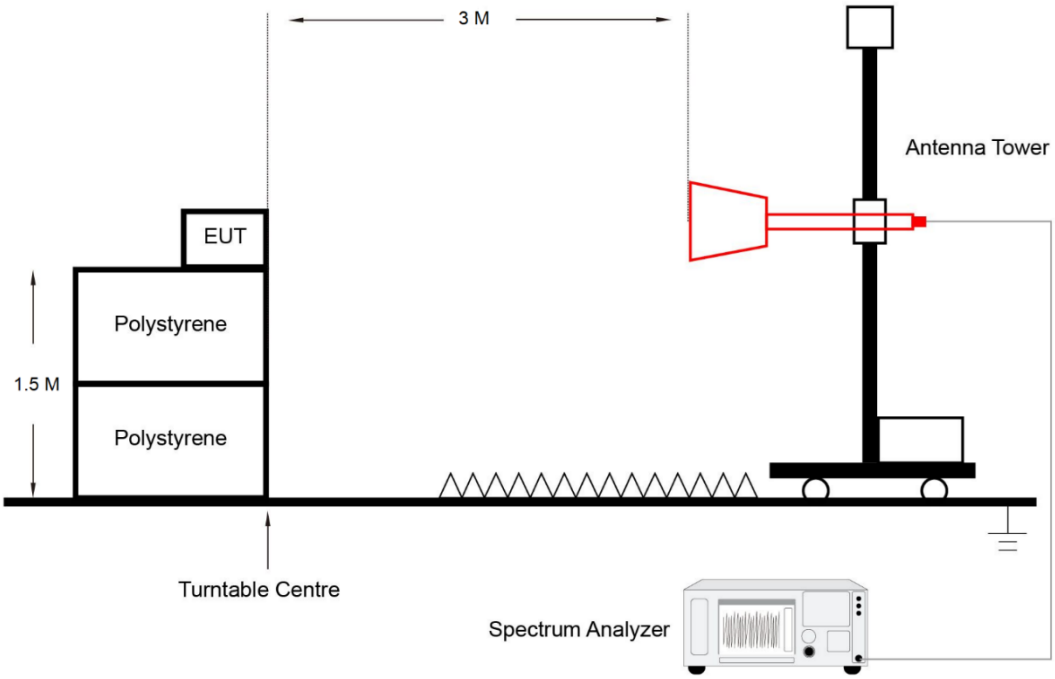
at each frequency at which a component is detected, the sample shall be rotated to obtain maximum response and the effective radiated power of that component determined by a substitution measurement.

5.6.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.6.5. Test Result

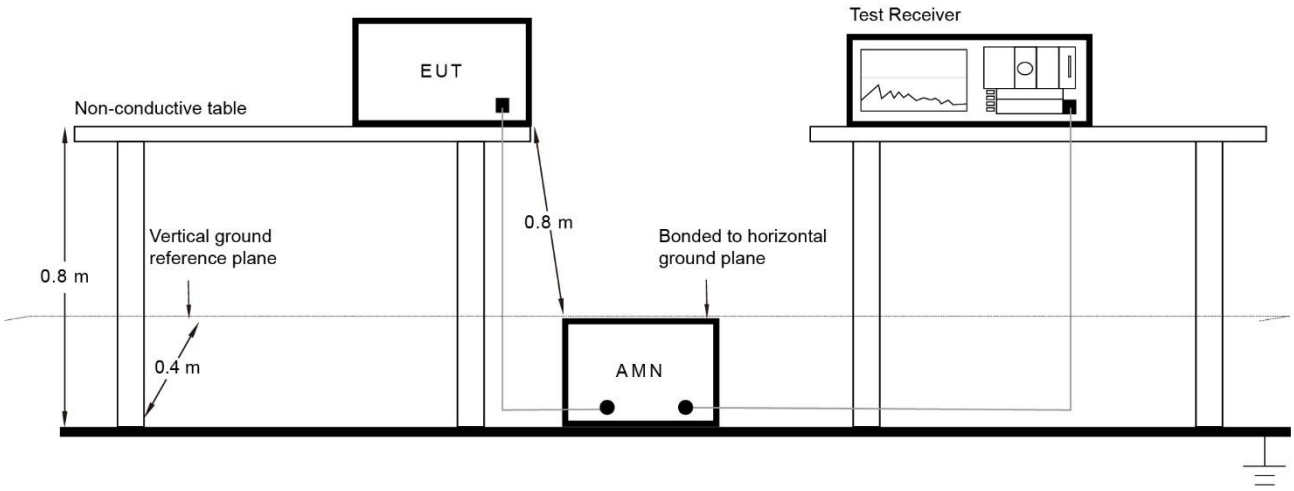
Refer to Appendix A.5.

5.7. AC Conducted Emissions Measurement

5.7.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBμV)	Average (dBμV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50
Note 1: The lower limit shall apply at the transition frequencies. Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.		

5.7.2. Test Setup



5.7.3. Test Result

Refer to Appendix A.6.

Appendix A – Test Result

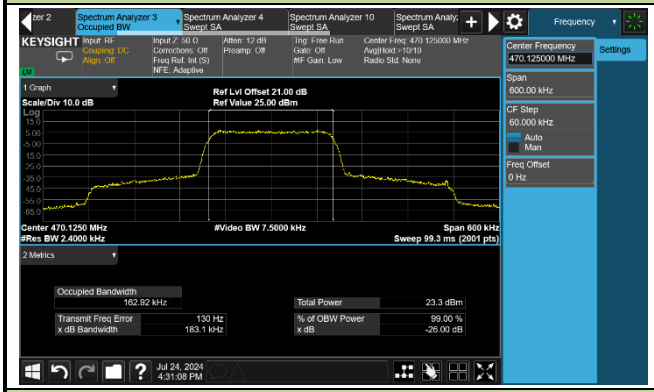
A.1 99% Occupied Bandwidth Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2024-07-24		

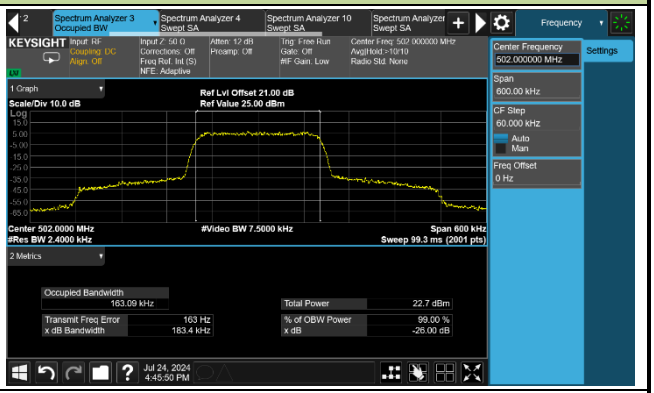
Mode	Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Result
P=20mW	470.150	162.92	< 200	Pass
	502.000	163.09	< 200	Pass
	534.000	163.06	< 200	Pass

99% Occupied Bandwidth

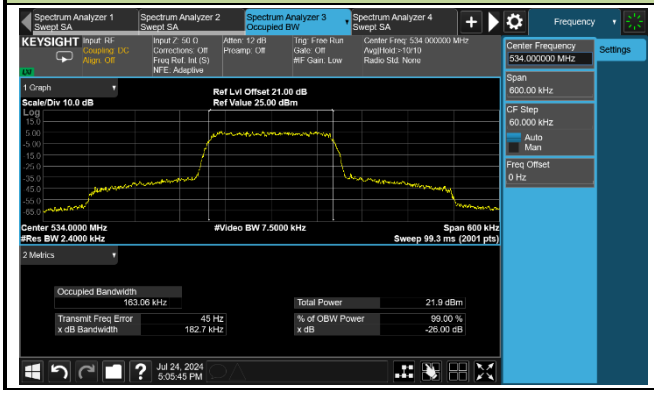
470.125 MHz



502.000MHz



534.000MHz



A.2 Frequency Tolerance Test Result

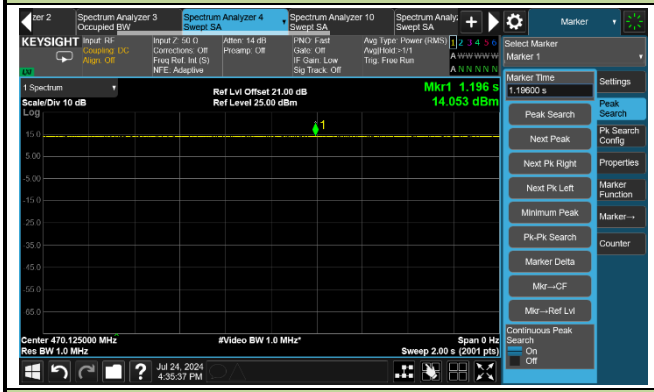
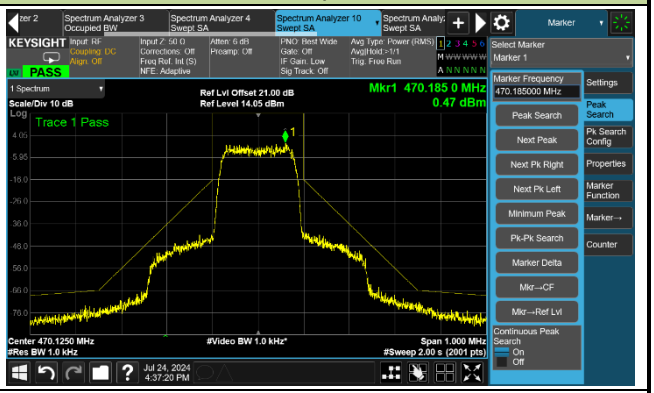
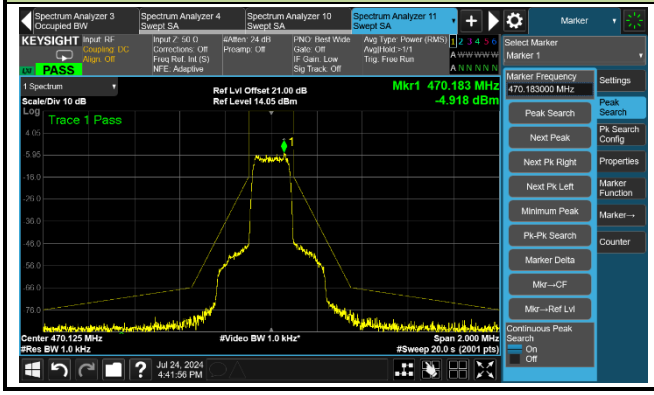
Test Site	WZ-TR3	Test Engineer	Lynn Yang
Test Date	2024-07-25~2024-07-26	Test Mode	470.125MHz

Voltage (%)	Power (DC)	Temp (°C)	Frequency Tolerance (ppm)			
			0 minutes	2 minutes	5 minutes	10 minutes
100	3.6	- 10	0.000006	0.000005	0.000005	0.000005
		0	-0.000024	-0.000024	-0.000024	-0.000024
		+ 10	-0.000019	-0.000019	-0.000019	-0.000020
		+ 20	-0.000027	-0.000027	-0.000026	-0.000026
		+ 30	-0.000013	-0.000008	-0.000009	-0.000010
		+ 40	0.000013	0.000017	0.000019	0.000019
		+ 50	0.000034	0.000038	0.000040	0.000042
115	4.14	+ 20	0.000035	0.000034	0.000033	0.000033
85	3.06	+ 20	0.000160	0.000160	0.000160	0.000160

Note: Frequency Tolerance (ppm) = {[Measured Frequency (Hz) - Declared Frequency (Hz)] / Declared Frequency (Hz)} $*10^2$.

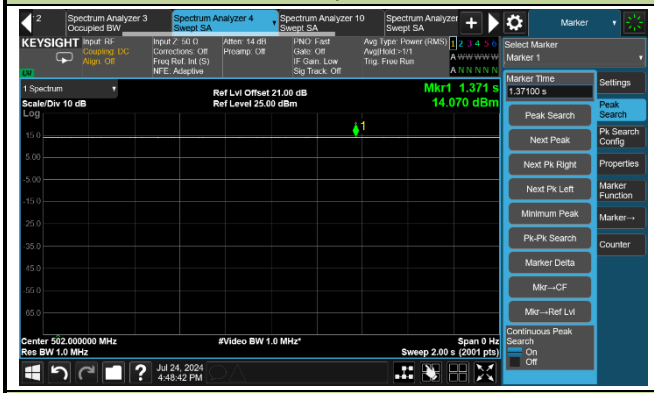
A.3 Necessary Bandwidth Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2024-07-24		

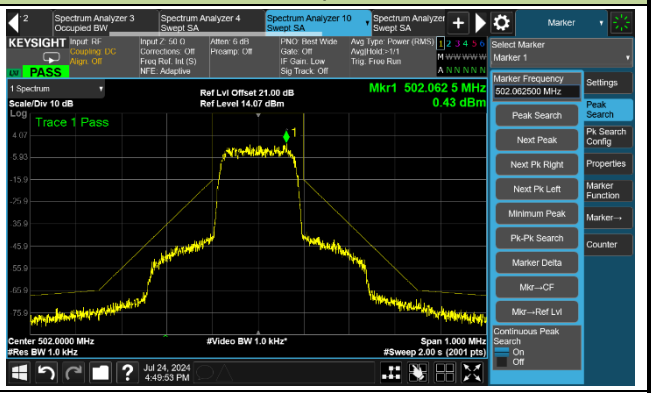
Necessary Bandwidth - 20mW, 470.125MHz	
Step 1	Step 2
	
Step 3	
	

Necessary Bandwidth - 20mW, 502.000MHz

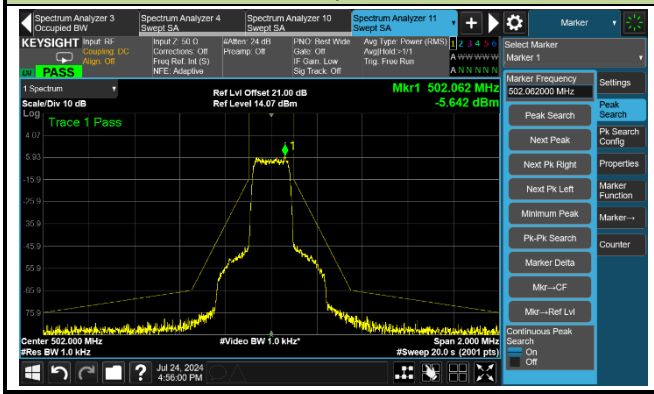
Step 1

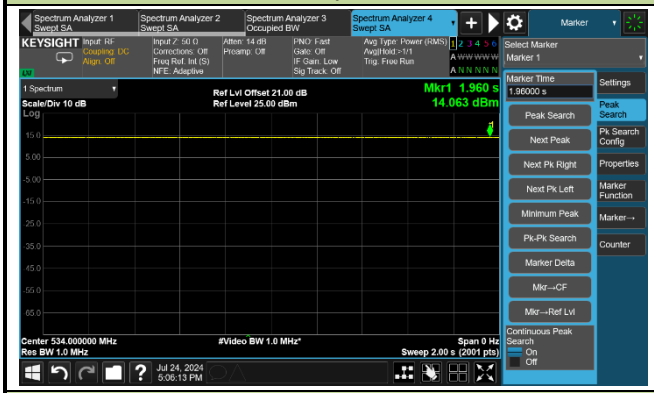
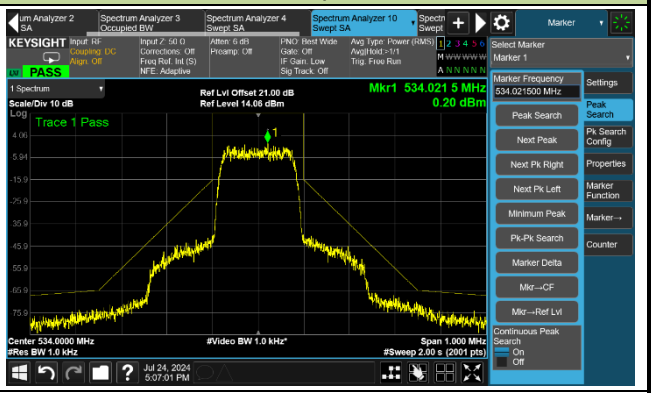
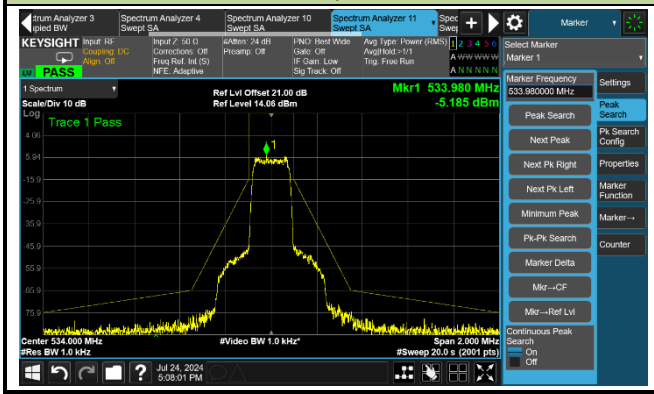


Step 2



Step 3



Necessary Bandwidth - 20mW, 534.000MHz	
Step 1	Step 2
	
Step 3	
	

A.4 Output Power Test Result

Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2024-07-23		

Frequency (MHz)	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Test Result
P=20mW					
470.125	12.86	-8.80	4.06	16.99	Pass
502.000	12.85	-8.80	4.05	16.99	Pass
534.000	12.74	-8.80	3.94	16.99	Pass

Note 1: Limit = 10*Log (50mW) = 16.99 dBm.

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

A.5 Radiated Spurious Emission Test Result

Test Site	WZ-AC1	Test Engineer	Frank Xue
Test Date	2024-07-26 ~ 2024-07-29		

Test Channel (MHz)	Frequency (MHz)	Reading Level (dBm)	Substitution Factor (dB)	Measure Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Polarization
470.125	52.504	-105.2	30.6	-74.6	-54.0	-20.6	Peak	Horizontal
	717.148	-103.9	37.9	-66.0	-54.0	-12.0	Peak	Horizontal
	96.057	-104.3	39.3	-65.0	-54.0	-11.0	Peak	Vertical
	678.736	-103.2	36.4	-66.8	-54.0	-12.8	Peak	Vertical
	2229.578	-64.6	8.5	-56.1	-30.0	-26.1	Peak	Horizontal
	4328.846	-66.3	14.2	-52.1	-30.0	-22.1	Peak	Horizontal
	2359.458	-65.2	9.3	-55.9	-30.0	-25.9	Peak	Vertical
	5163.476	-68.5	17.3	-51.2	-30.0	-21.2	Peak	Vertical
502.000	50.079	-105.2	31.1	-74.1	-54.0	-20.1	Peak	Horizontal
	620.245	-103.0	34.6	-68.4	-54.0	-14.4	Peak	Horizontal
	98.094	-104.6	39.3	-65.3	-54.0	-11.3	Peak	Vertical
	623.640	-103.4	35.5	-67.9	-54.0	-13.9	Peak	Vertical
	4151.845	-67.0	13.8	-53.2	-30.0	-23.2	Peak	Horizontal
	4854.827	-67.7	16.0	-51.7	-30.0	-21.7	Peak	Horizontal
	2222.797	-65.2	9.3	-55.9	-30.0	-25.9	Peak	Vertical
	5588.029	-68.8	18.3	-50.5	-30.0	-20.5	Peak	Vertical
534.000	49.885	-104.9	31.3	-73.6	-54.0	-19.6	Peak	Horizontal
	719.670	-103.3	37.8	-65.5	-54.0	-11.5	Peak	Horizontal
	96.736	-104.8	39.2	-65.6	-54.0	-11.6	Peak	Vertical
	697.748	-103.5	37.2	-66.3	-54.0	-12.3	Peak	Vertical
	2230.377	-64.1	8.5	-55.6	-30.0	-25.6	Peak	Horizontal
	4699.064	-66.7	15.4	-51.3	-30.0	-21.3	Peak	Horizontal
	2240.792	-64.1	9.0	-55.1	-30.0	-25.1	Peak	Vertical
	4314.134	-66.7	15.2	-51.5	-30.0	-21.5	Peak	Vertical

Note 1: Measure Level (dBm) = Reading Level (dBm) + Substitution Factor (dB)

Note 2: Substitution Factor (dB) = Cable Loss (dB) + Space Attenuation (dB) - Antenna Gain (dBi) - 2.15 (dB)

Note 3: QP measurement was not performed when peak measure level was lower than the QP limit.

RMS measurement was not performed when peak measure level was lower than the RMS limit.

A.6 AC Conducted Emissions Test Result

The EUT is powered by battery, so this item is not applicable.

Appendix B - Test Setup Photograph

Refer to “2407RSU017-UT” file.

Appendix C - EUT Photograph

Refer to “2407RSU017-UE” file.