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:	Licensed LPAS Device (TLD)
FCC Rule Part(s):	Part 74 Subpart H (Section 74.861)
Result:	Complies
Received Date:	2024-07-05
Test Date:	2024-07-23 ~ 2024-07-28

Reviewed By: Jame Yuan

Approved By: Robin Wu

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-U4	V01	Initial Report	2024-08-17	Valid

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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 74.861
- KDB 206256 D01v02r01
- ANSI C63.26-2015
- 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)): 2.3dB
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
74.861(e)(1)(ii)	RF Output Power	Conducted	Pass
74.861(e)(4)	Frequency Stability		Pass
74.861(e)(5)	Occupied Bandwidth		Pass
74.861(e)(6)	Emission Mask		Pass
74.861(e)(7)	Necessary Bandwidth		Pass
74.861(e)(7)	Radiated Spurious Emission	Radiated	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. RF Output Power Measurement

5.2.1. Test Limit

The conducted power may not exceed 250mW in 470 ~ 608 MHz band.

5.2.2. Test Procedure

ANSI C63.26-2015 - Section 5.2.4.2

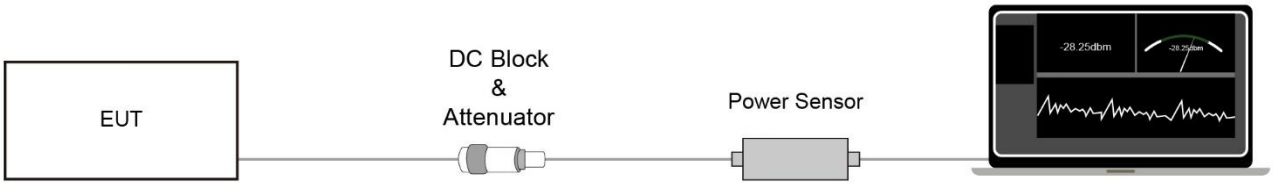
5.2.3. Test Setting

The output of the EUT was connected to an RF average power meter through fixed attenuation.

The EUT was set to transmit on the low, middle, and high frequencies in each power level.

Measure the average power of the transmitter.

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 transmitter shall be 0.005 percent.

5.3.2. Test Procedure

ANSI C63.26 - Section 5.6.3

5.3.3. Test Setting

Frequency Stability Under Temperature Variations:

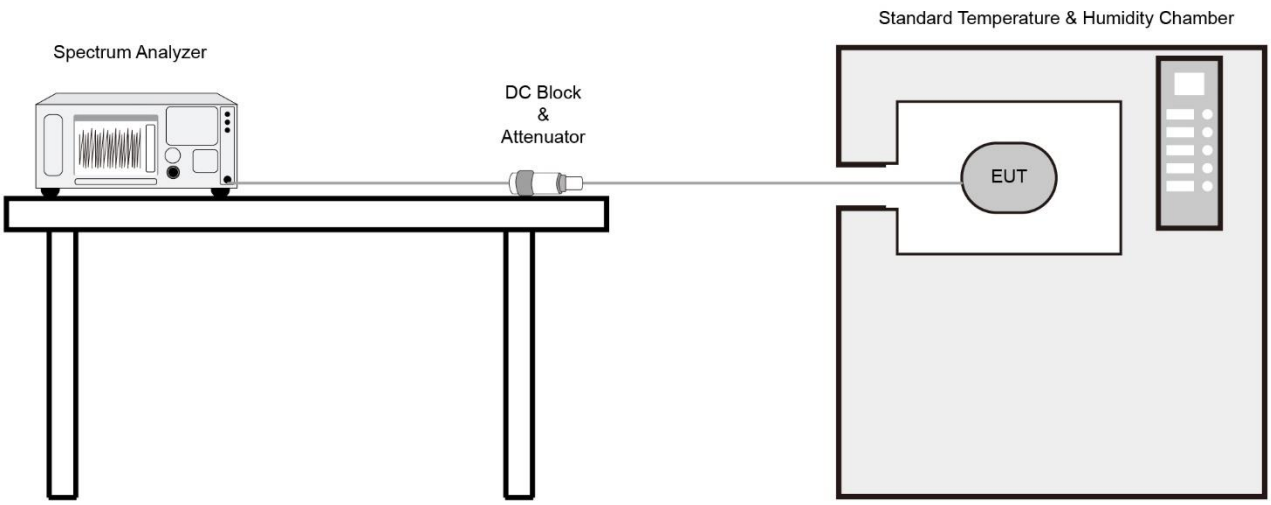
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. 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 AC power supply / 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 (If a product is specified to operate over a range of input voltage then the −15% variation is applied to the lowermost voltage and the +15%is applied to the uppermost voltage), record the maximum frequency change.

5.3.4. Test Setup



5.3.5. Test Result

Refer to Appendix A.2.

5.4. 99% Occupied Bandwidth Measurement

5.4.1. Test Limit

The operating bandwidth shall not exceed 200 kHz.

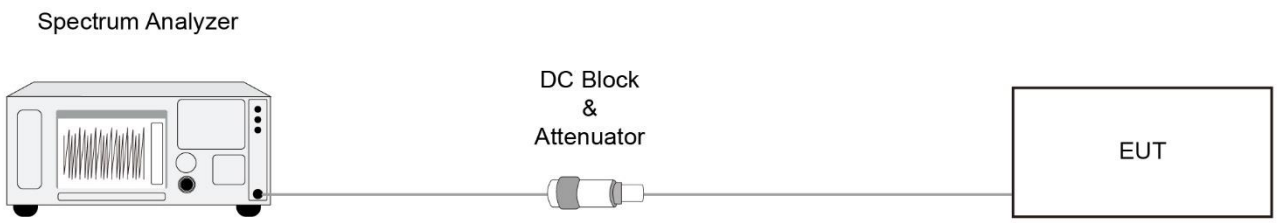
5.4.2. Test Procedure

ANSI C63.26-2015 - Section 5.4.4

5.4.3. Test Setting

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 - 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. Reported the measured 99% occupied bandwidth

5.4.4. Test Setup



5.4.5. Test Result

Refer to Appendix A.3.

5.5. Out-of-band Emission Mask Measurement

5.5.1. Test Limit

The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(i) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;

(ii) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;

(iii) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least 43+10log10 (mean output power in watts) dB.

5.5.2. Test Procedure

ANSI C63.26 - Section 5.7

5.5.3. Test Setting

Emission Mask

a) The EUT was connected to a spectrum analyzer. The un-modulated carrier signal level was measured and recorded.

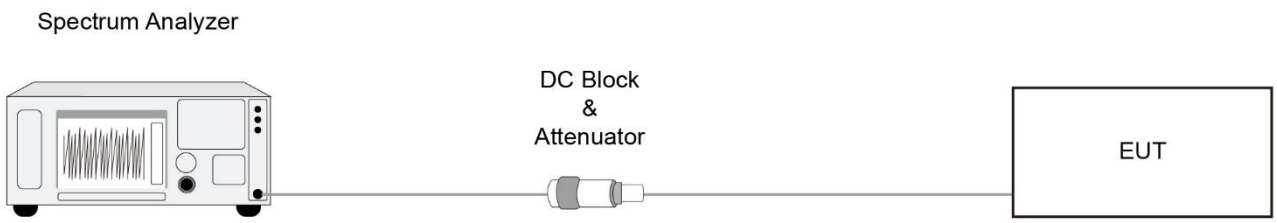
b) The EUT was modulated with typical digital modulation.

c) The spectrum analyzer center frequency was set to the EUT operating frequency; span was set to 2 MHz; resolution bandwidth was set to 1 MHz; video bandwidth set to 3 MHz; sweep time set to 3 s; after clear/write, max-hold was set; Marker 1 was set to RMS, then Marker 1 was set to reference value.

d) The RMS output power was recorded and used to set the reference level on the spectrum analyzer.

e) The spectrum analyzer span was then set to 1.5 MHz; resolution bandwidth set to 2 kHz, video bandwidth set to 5 kHz, sweep time to Auto.

5.5.4. Test Setup



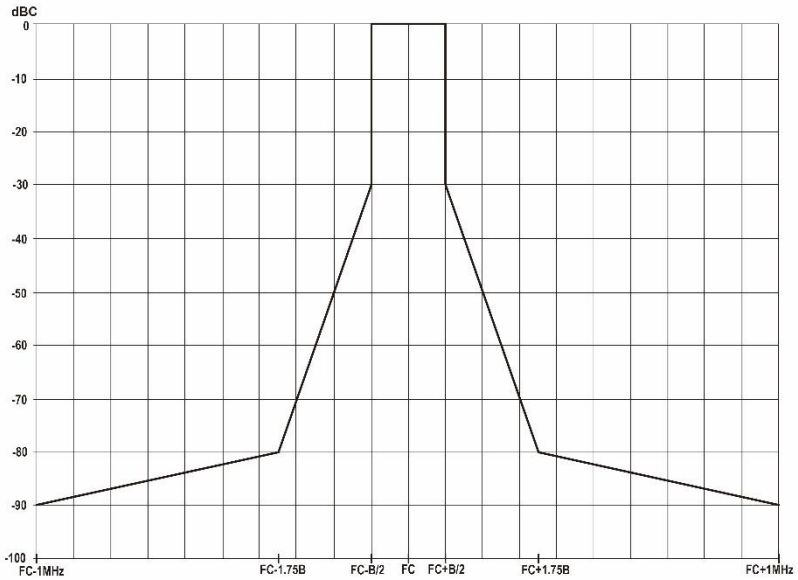
5.5.5. Test Result

Refer to Appendix A.4.

5.6. Necessary Bandwidth Measurement

5.6.1. Test Limit

Digital emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.2.2 of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2, the transmitter output spectrum shall be within the mask defined as below figure.



5.6.2. Test Procedure

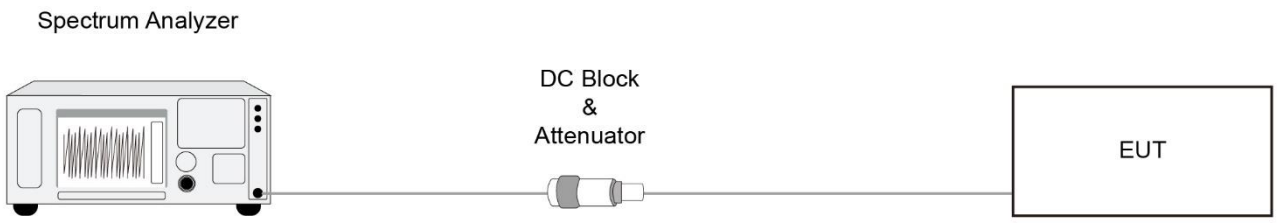
EN 300 422-1 V1.4.2 clause 8.3.2.1.

5.6.3. 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.

5.6.4. Test Setup



5.6.5. Test Result

Refer to Appendix A.5.

5.7. Radiated Spurious Emissions Measurement

5.7.1. Test Limit

According to FCC Part 74.861(e)(7), beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 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

5.7.2. Test Procedure

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

5.7.3. 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.

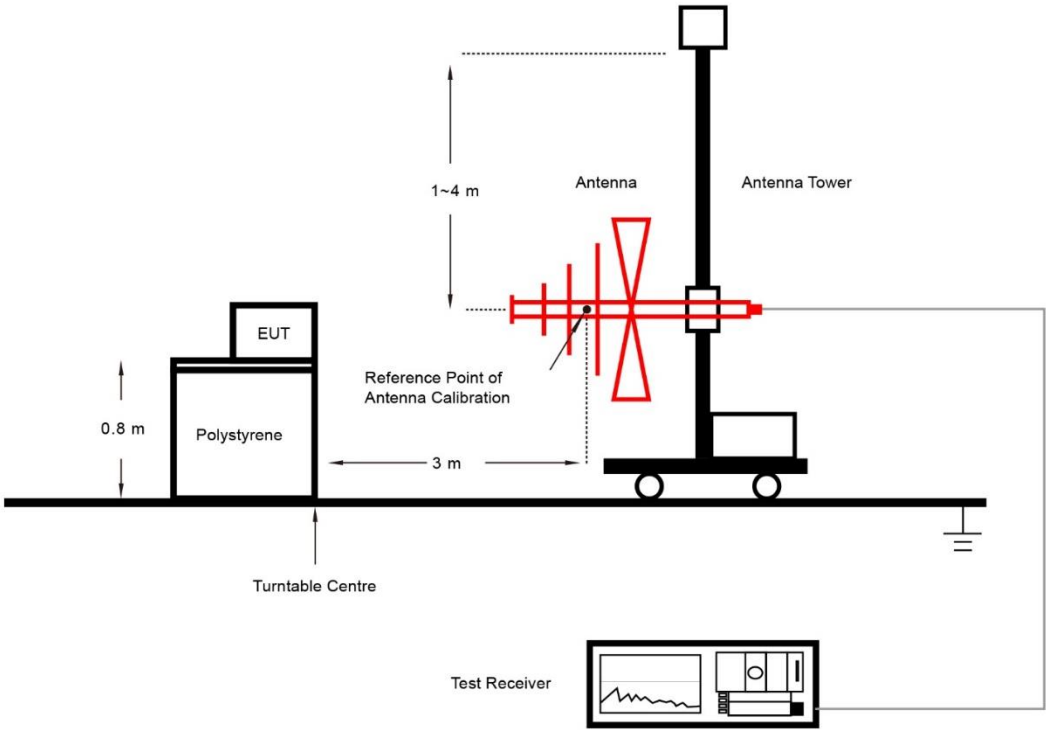
Compliance with the emission limits shall be demonstrated using an RMS Average detector.

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

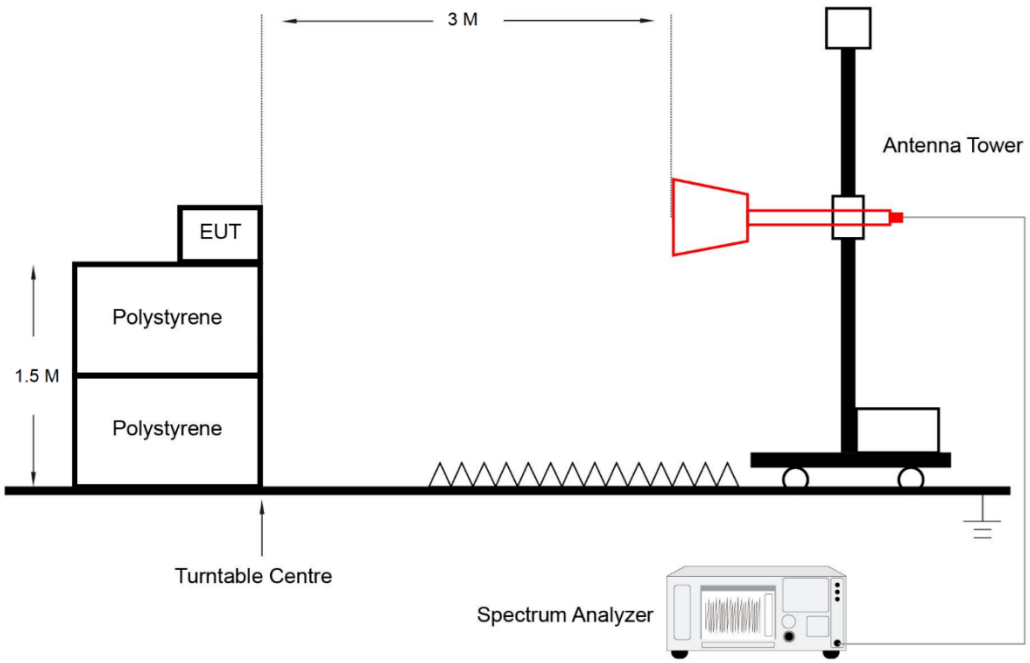
At each frequency at which a component is detected, the sample shall be rotated to obtain maximum response and the effective radiated power of that component determined by a substitution measurement.

5.7.4. Test Setup

Below 1GHz Test Setup:



Above 1GHz Test Setup:



5.7.5. Test Result

Refer to Appendix A.6.

Appendix A – Test Result

A.1 RF Output Power Test Result

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

Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)	Test Result
20mW Power Level			
470.150	12.86	≤ 23.98	Pass
492.125	12.85	≤ 23.98	Pass
514.000	12.74	≤ 23.98	Pass

Note: Limit = 10*Log (250mW) = 23.98 dBm.

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)} $*10^2$.

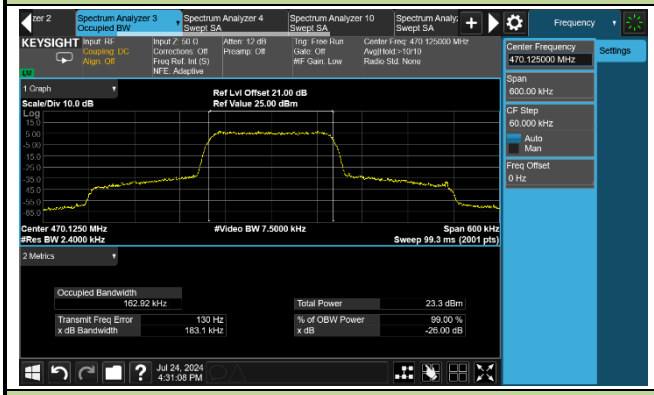
A.3 99% Occupied Bandwidth Test Result

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

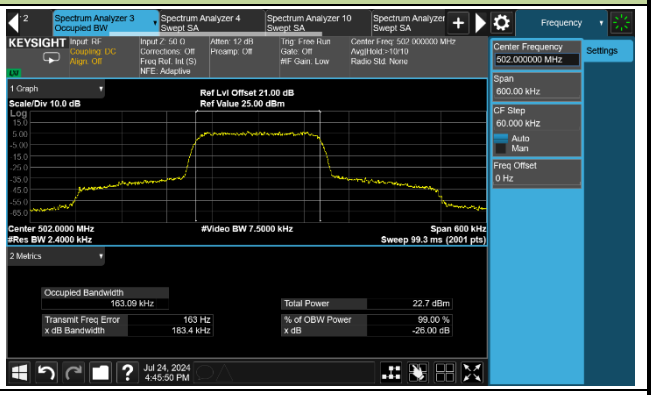
Test Mode	Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Result
STD (20mW)	470.150	162.92	< 200	Pass
	502.000	163.09	< 200	Pass
	534.000	163.06	< 200	Pass

99% Occupied Bandwidth

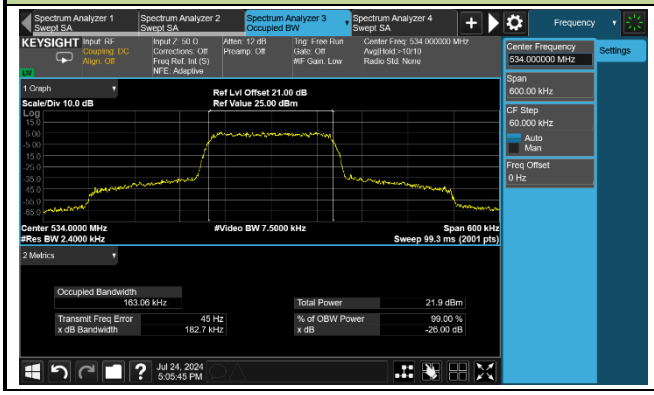
470.125 MHz



502.000MHz

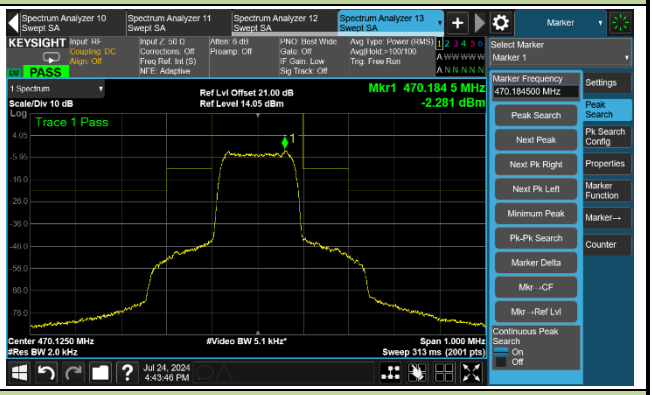
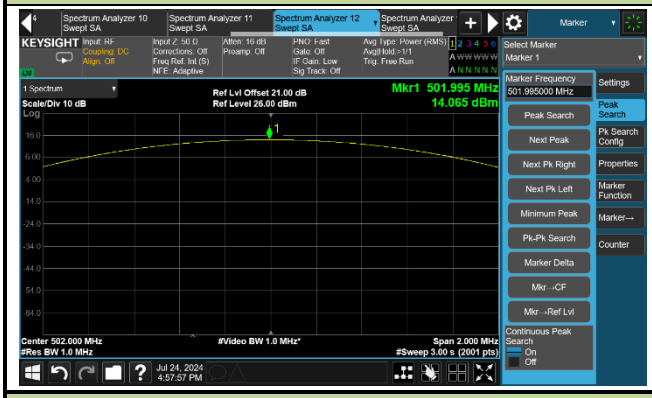
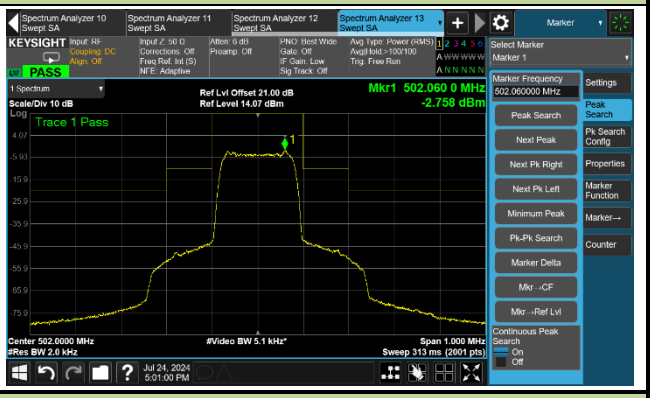
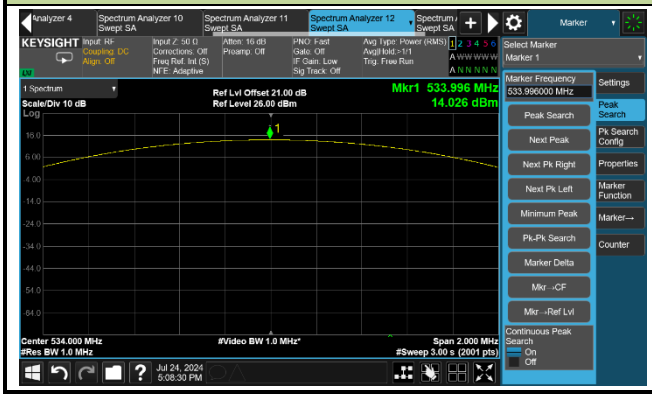
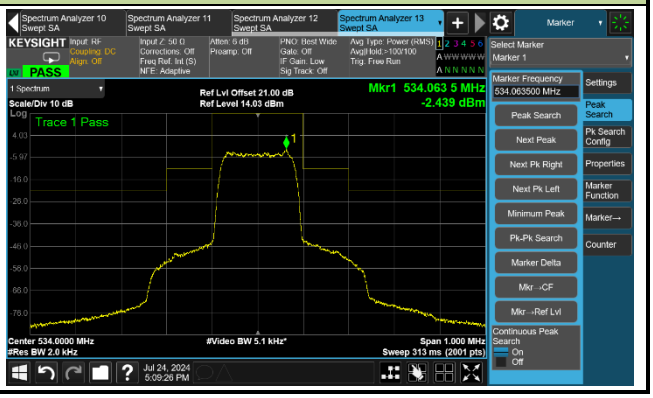


534.000MHz



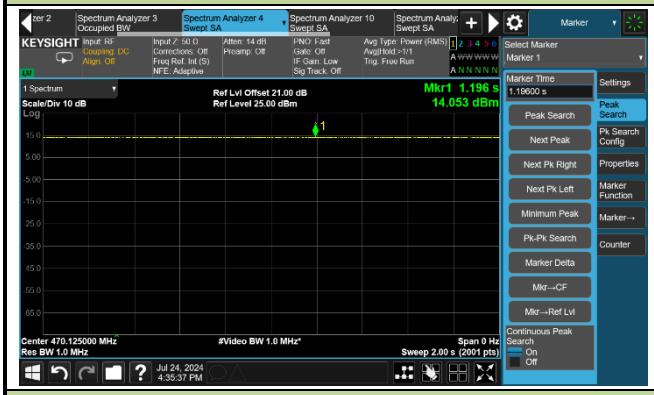
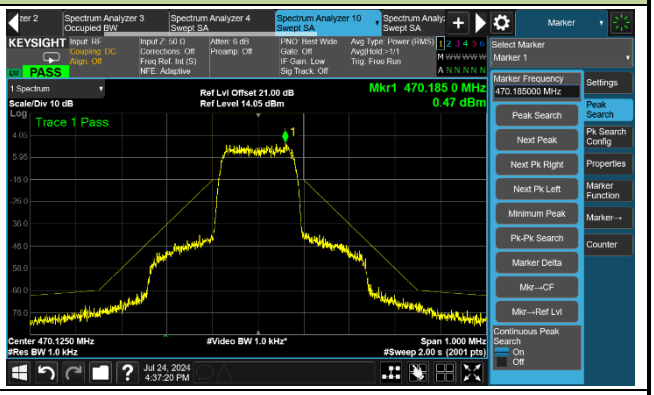
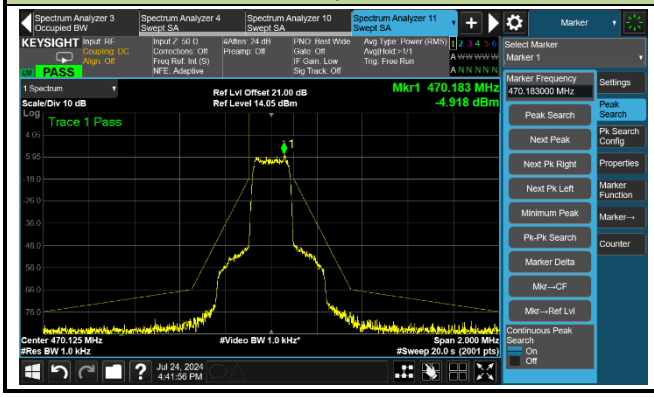
A.4 Out-of-band Emission Mask Test Result

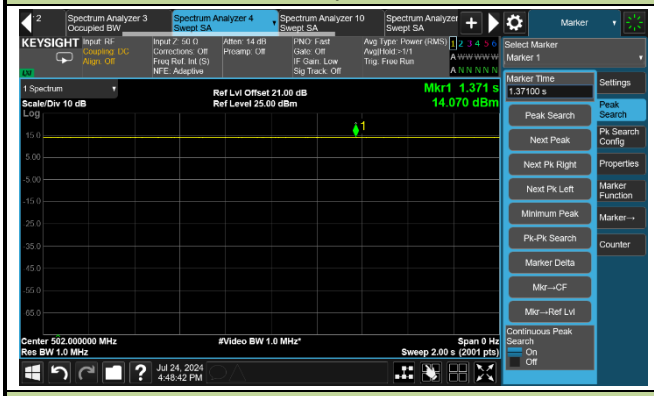
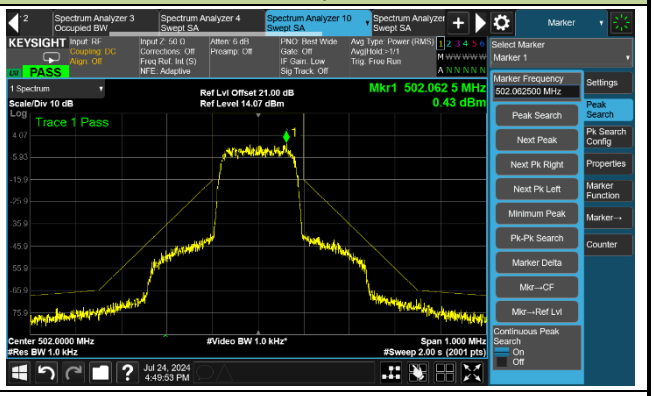
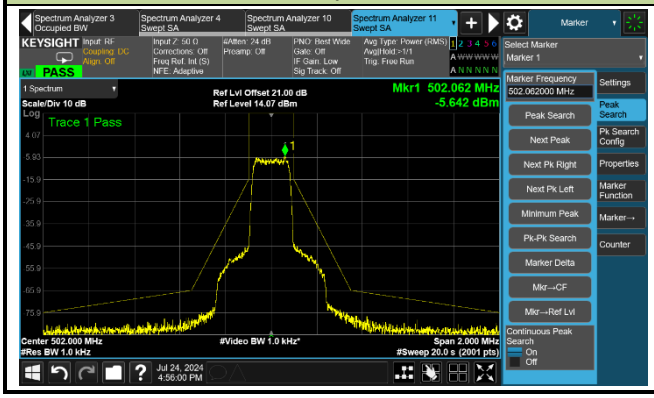
Test Site	WZ-SR5	Test Engineer	Lynn Yang
Test Date	2024-07-24		

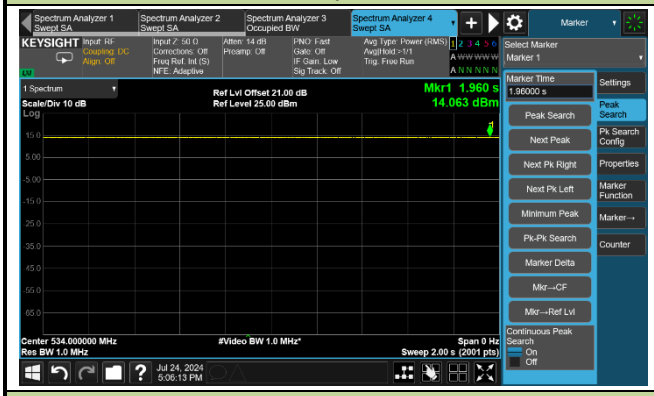
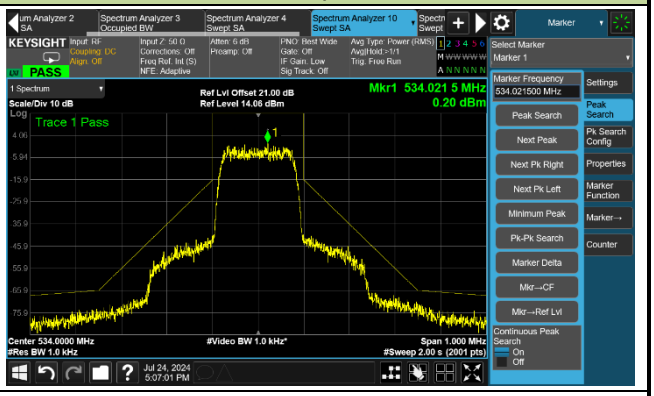
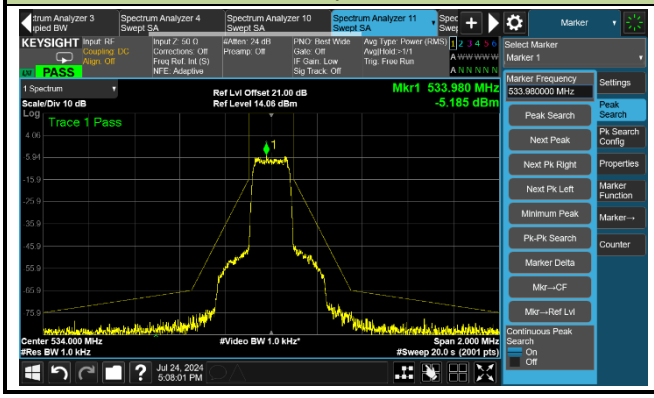
Emission Mask – 20mW	
Channel 470.125MHz	
Reference Level	Emission Mask
	
Channel 502.000 MHz	
Reference Level	Emission Mask
	
Channel 534.000 MHz	
Reference Level	Emission Mask
	

A.5 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.6 Radiated Spurious Emissions 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.

Appendix B – Test Setup Photograph

Refer to “ 2407RSU017-UT” file.

Appendix C – EUT Photograph

Refer to “2407RSU017-UE” file.