FCC Test Report

Client Name	:	**ZADEZ TECHNOLOGY CO., LIMITED.**
Client Address	:	**RM 1005, 10/F HO KING COMM CTR, 2-16 FA YUEN ST MONGKOK KLN, HONG KONG, China**
Product Name	:	**Multimode wireless mouse**
Report Date	:	**Sept. 22, 2022**

Shenzhen Anbotek Compliance Laboratory Limited

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TEST REPORT

Applicant	:	ZADEZ TECHNOLOGY CO., LIMITED.
Manufacturer	:	DONGGUAN SHANGGUI ELECTRONICS CO., LTD.
Product Name	:	Multimode wireless mouse
Model No.	:	M-352
Trade Mark	:	ZADEZ
Rating(s)	:	Input: Mouse:1.5V⎓ 2.63mA; Dangle:5V⎓
Test Standard(s)	:	**FCC Part15 Subpart C, Paragraph 15.249**
Test Method(s)	:	**ANSI C63.10: 2020**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Receipt	Sept. 07, 2022
Date of Test	Sept. 07~19, 2022
Prepared by	(Ella Liang)
Approved & Authorized Signer	(Kingkong Jin)

Revision History

Report Version	Description	Issued Date
R00	Original Issue.	Sept. 22, 2022

1. General Information

1.1. Client Information

Applicant	:	ZADEZ TECHNOLOGY CO., LIMITED.
Address	:	RM 1005, 10/F HO KING COMM CTR, 2-16 FA YUEN ST MONGKOK KLN, HONG KONG, China
Manufacturer	:	DONGGUAN SHANGGUI ELECTRONICS CO., LTD.
Address	:	No.7, 7th Str. YinCheng Rd., Xiabian Village, Chang'an Town, Dongguan City, G.D, China
Factory	:	DONGGUAN SHANGGUI ELECTRONICS CO., LTD.
Address	:	No.7, 7th Str. YinCheng Rd., Xiabian Village, Chang'an Town, Dongguan City, G.D, China

1.2. Description of Device (EUT)

Product Name	:	Multimode wireless mouse
Model No.	:	M-352
Trade Mark	:	ZADEZ
Test Power Supply	:	DC 1.5V
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Adapter	:	N/A
RF Specification		
Operation Frequency	:	2403~2480MHz
Number of Channel	:	16 Channels
Modulation Type	:	GFSK
Antenna Type	:	PCB antenna
Antenna Gain(Peak)	:	-2.39dBi (Provided by customer)
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		

1.3. Auxiliary Equipment Used During Test

Description	Rating(s)
--	--

1.4. Description of Test Configuration

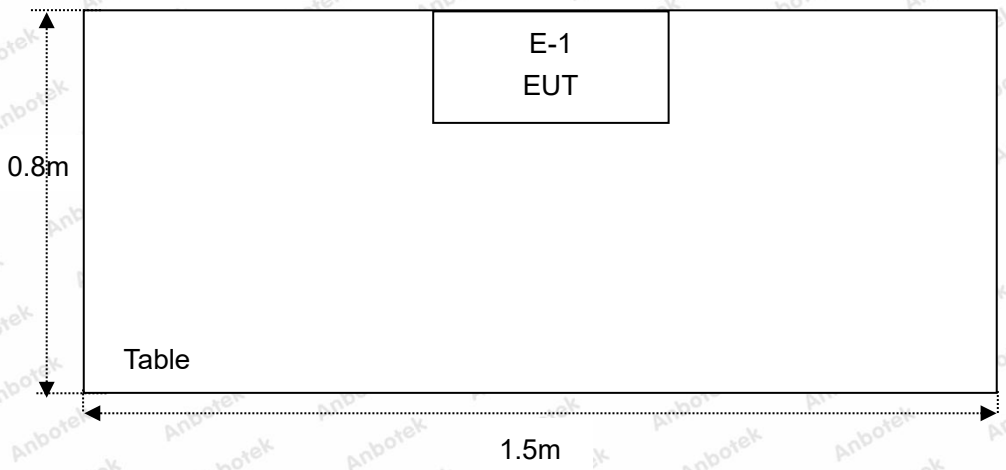
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	**2403**	1	2426	**2**	**2441**	3	2463	4	2407
5	2422	6	2445	7	2466	8	2414	9	2436
10	2459	11	2473	12	2419	13	2439	14	2453
15	**2480**								

Note:

1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.
2. EUT was tested with Channel 0, 2 and 15.

1.5. Description of Test Setup

RE



1.6. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Schwarzbeck	NSLK 8127	8127386	Sept. 7, 2022	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Sept. 7, 2022	1 Year
3.	Spectrum Analysis	Keysight	N9020A	MY53100616	Nov.11 , 2021	1 Year
4.	Preamplifier	SKET Electronic	BK1G18G30 D	KD17503	Oct. 25, 2021	1 Year
5.	Pre-amplifier	EMtrace	RP01A	50017	Sept. 7, 2022	1 Year
6.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 02, 2020	2 Year
7.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	01417	Nov. 02, 2020	2 Year
8.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 02, 2020	2 Year
9.	Test Software	Ferrari Technology	EZ-EMC	N/A	N/A	N/A
10.	Switch box	Meike	/	/	Nov. 10, 2021	1 Year
11.	Power Sensor box	Meike	/	/	Oct. 23, 2021	1 Year
12.	MXG RF Vector Signal Generator	Agilent	N5182A	MY47420822	Feb. 28, 2022	1 Year
13.	Signal Generator	Agilent	E4425B	GB39340038	Oct. 23, 2021	1 Year
14.	DC Power Supply	Longwei	TPR-6420D	020215240	N/A	N/A

1.7. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

1.8. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

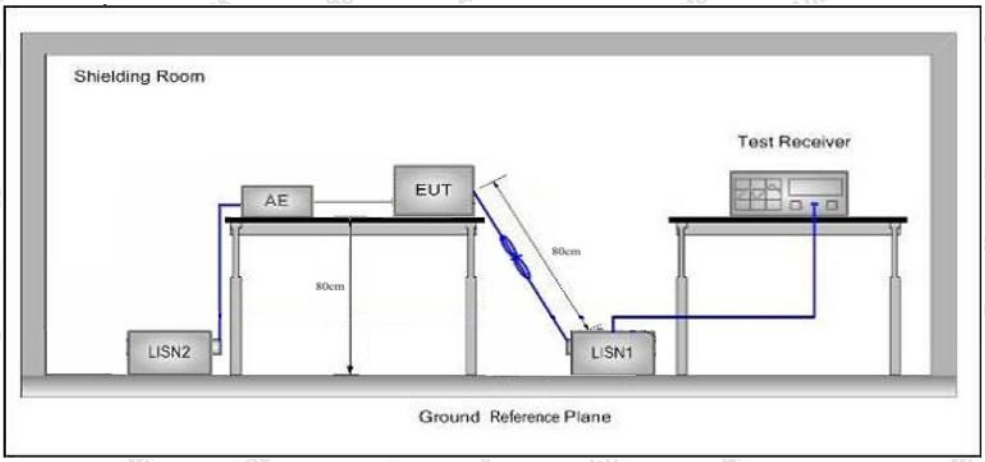
Standard Section	Test Item	Result
15.203	Antenna Requirement	PASS
15.207	Conducted Emission	N/A
15.205/15.209/15.249	Radiated Emission	PASS
15.249(d)	Band Edge	PASS
15.215(c)	20dB Bandwidth	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		

3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2020 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Not applicable for equipment operated with DC power supply.

4. Radiated Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:
(1)The lower limit shall apply at the transition frequency.
(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Test Standard	FCC Part15 C Section 15.249					
Test Limit	Frequency (MHz)	Field Strength of fundamental ((millivolts /meter)	Field Strength of Harmonics (microvolts/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	2400~2483.5	50	-	114.0	Peak	3
	2400~2483.5	50	-	94.0	Average	3
	2400~2483.5	-	500	74.0	Peak	3
	2400~2483.5	-	500	54.0	Average	3

Remark:
(1) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

4.2. Test Setup

Figure 1. Below 30MHz

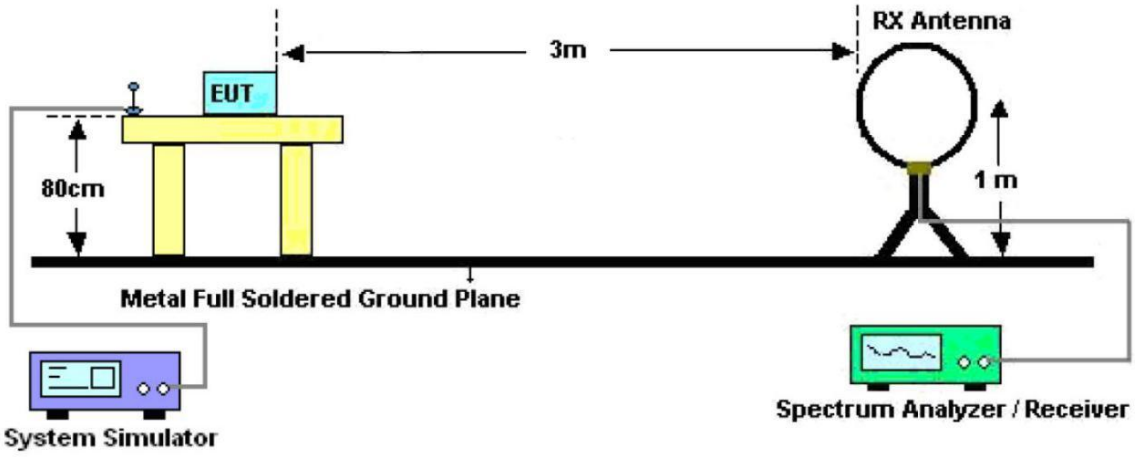


Figure 2. 30MHz to 1GHz

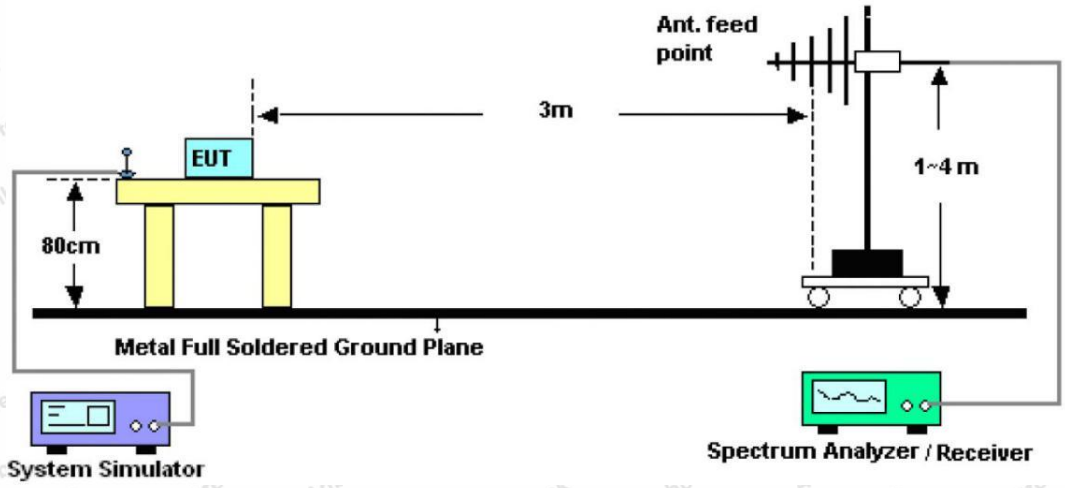
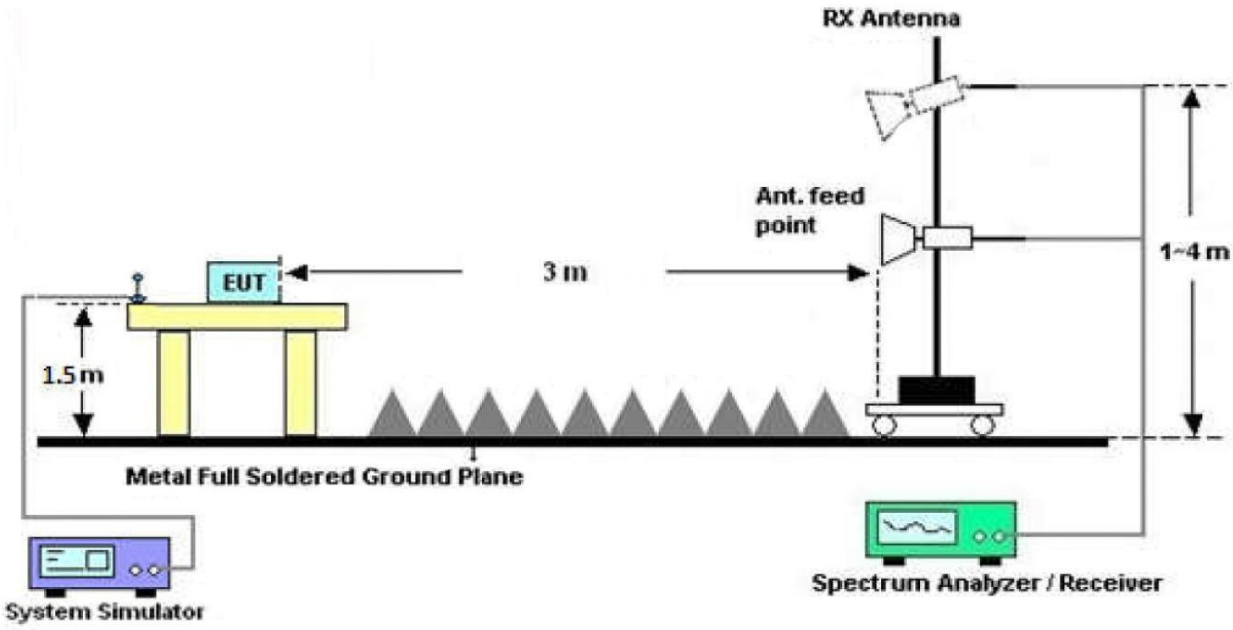


Figure 3. Above 1 GHz



4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz,Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

4.4. Test Data

PASS

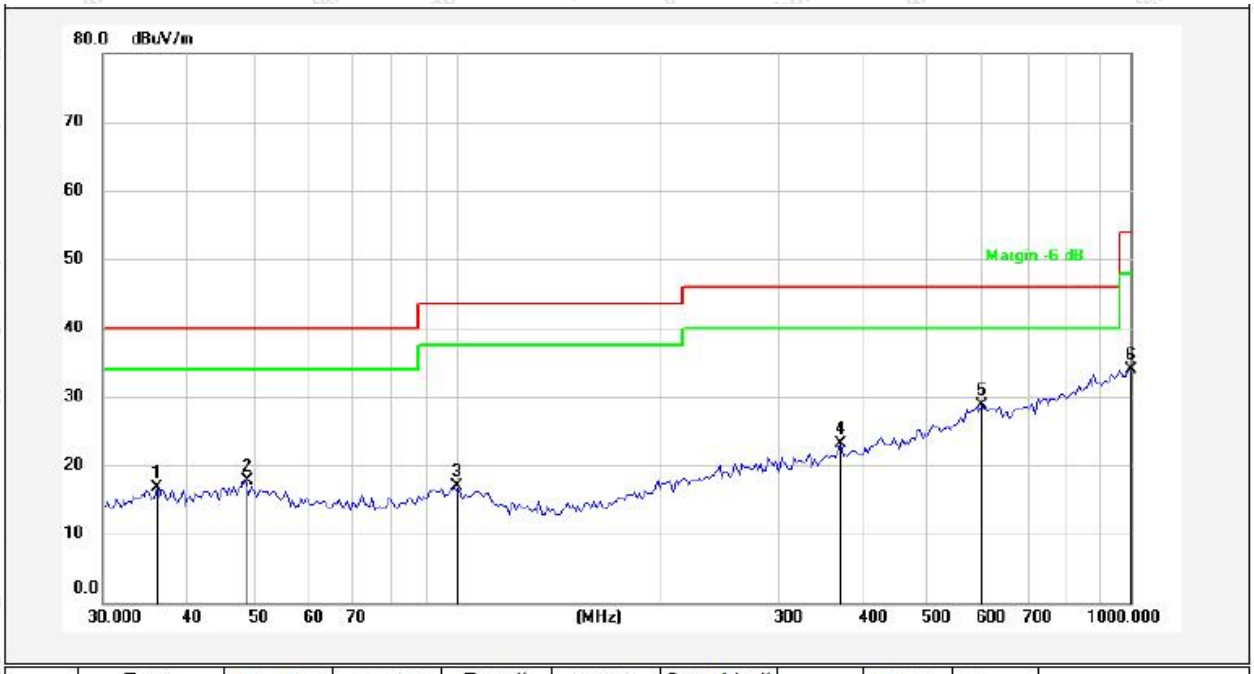
During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

During the test, pre-scan all the modes, and found the Middle CH (2441MHz) which is the worst case, only the worst case is recorded in the report.

Test Results (30~1000MHz)

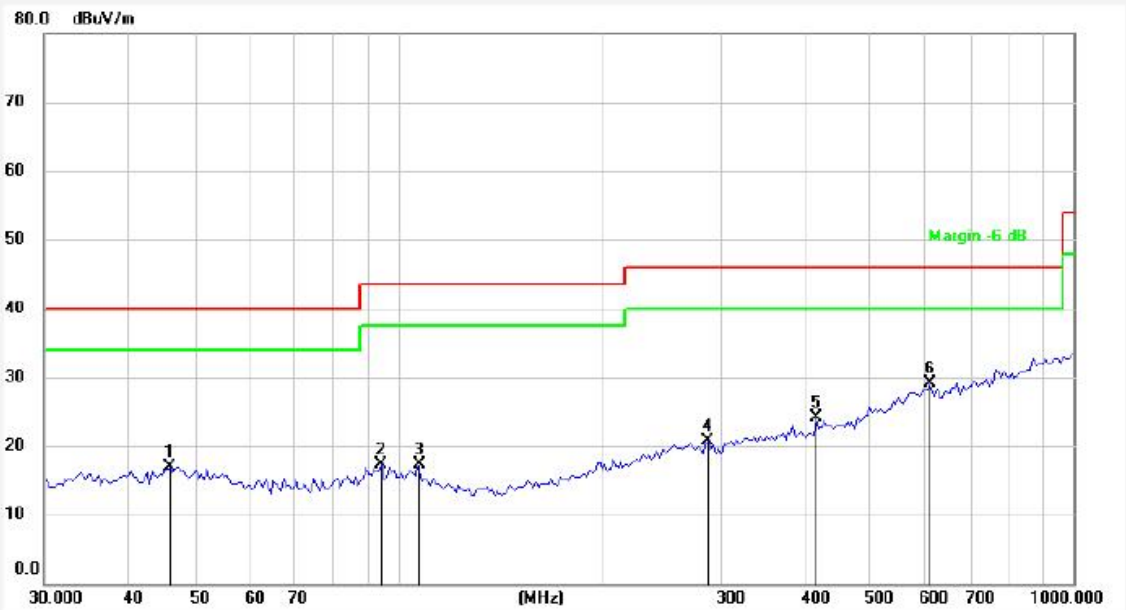
Test Mode: Middle CH (2441MHz)
Power Source: DC 1.5V
Polarization: Vertical
Temp.(℃)/Hum.(%RH): 22.5℃/50%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	36.0638	31.90	-15.12	16.78	40.00	-23.22	QP			
2	48.5867	31.99	-14.35	17.64	40.00	-22.36	QP			
3	99.7028	31.18	-14.34	16.84	43.50	-26.66	QP			
4	371.3528	31.84	-8.81	23.03	46.00	-22.97	QP			
5	601.4265	29.99	-1.34	28.65	46.00	-17.35	QP			
6	1000.0000	27.59	6.32	33.91	54.00	-20.09	QP			

Test Results (30~1000MHz)

Test Mode:	Middle CH (2441MHz)
Power Source:	DC 1.5V
Polarization:	Horizontal
Temp.(℃)/Hum.(%RH):	22.5℃/50%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	46.0971	31.22	-14.34	16.88	40.00	-23.12	QP			
2	94.5941	32.05	-14.84	17.21	43.50	-26.29	QP			
3	106.9461	32.00	-14.73	17.27	43.50	-26.23	QP			
4	287.9904	31.49	-10.86	20.63	46.00	-25.37	QP			
5	416.1791	31.50	-7.49	24.01	46.00	-21.99	QP			
6	612.0642	30.57	-1.48	29.09	46.00	-16.91	QP			

Test Results (1GHz-25GHz)

Test channel: Lowest						
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2403.00	80.84	9.75	90.59	114.00	-23.41	Vertical
4806.00	27.52	15.27	42.79	74.00	-31.21	Vertical
7209.00	27.74	18.09	45.83	74.00	-28.17	Vertical
9612.00	28.27	23.76	52.03	74.00	-21.97	Vertical
12015.00	*			74.00		Vertical
14418.00	*			74.00		Vertical
2403.00	81.92	9.75	91.67	114.00	-22.33	Horizontal
4806.00	27.27	15.27	42.54	74.00	-31.46	Horizontal
7209.00	27.92	18.09	46.01	74.00	-27.99	Horizontal
9612.00	27.71	23.76	51.47	74.00	-22.53	Horizontal
12015.00	*			74.00		Horizontal
14418.00	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
2403.00	70.77	9.75	80.52	94.00	-13.48	Vertical
4806.00	15.79	15.27	31.06	54.00	-22.94	Vertical
7209.00	16.79	18.09	34.88	54.00	-19.12	Vertical
9612.00	17.74	23.76	41.50	54.00	-12.50	Vertical
12015.00	*			54.00		Vertical
14418.00	*			54.00		Vertical
2403.00	72.15	9.75	81.90	94.00	-12.10	Horizontal
4806.00	15.60	15.27	30.87	54.00	-23.13	Horizontal
7209.00	16.95	18.09	35.04	54.00	-18.96	Horizontal
9612.00	17.22	23.76	40.98	54.00	-13.02	Horizontal
12015.00	*			54.00		Horizontal
14418.00	*			54.00		Horizontal

Remark:

1.Result =Reading + Factor

2. "*" means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Test Results (1GHz-25GHz)

Test channel: Middle						
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2441.00	84.08	9.75	93.83	114.00	-20.17	Vertical
4882.00	26.13	15.27	41.40	74.00	-32.60	Vertical
7323.00	31.50	18.09	49.59	74.00	-24.41	Vertical
9764.00	28.79	23.76	52.55	74.00	-21.45	Vertical
12205.00	*			74.00		Vertical
14646.00	*			74.00		Vertical
2441.00	80.21	9.75	89.96	114.00	-24.04	Horizontal
4882.00	25.54	15.27	40.81	74.00	-33.19	Horizontal
7323.00	31.87	18.09	49.96	74.00	-24.04	Horizontal
9764.00	31.04	23.76	54.80	74.00	-19.20	Horizontal
12205.00	*			74.00		Horizontal
14646.00	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
2441.00	71.76	9.75	81.51	94.00	-12.49	Vertical
4882.00	17.29	15.27	32.56	54.00	-21.44	Vertical
7323.00	15.27	18.09	33.36	54.00	-20.64	Vertical
9764.00	17.36	23.76	41.12	54.00	-12.88	Vertical
12205.00	*			54.00		Vertical
14646.00	*			54.00		Vertical
2441.00	69.10	9.75	78.85	94.00	-15.15	Horizontal
4882.00	13.06	15.27	28.33	54.00	-25.67	Horizontal
7323.00	16.24	18.09	34.33	54.00	-19.67	Horizontal
9764.00	17.34	23.76	41.10	54.00	-12.90	Horizontal
12205.00	*			54.00		Horizontal
14646.00	*			54.00		Horizontal

Remark:

1.Result =Reading + Factor

2. "*" means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Test Results (1GHz-25GHz)

Test channel: Highest						
Peak value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2480.00	81.93	9.75	91.68	114.00	-22.32	Vertical
4960.00	30.51	15.27	45.78	74.00	-28.23	Vertical
7440.00	27.53	18.09	45.62	74.00	-28.38	Vertical
9920.00	31.50	23.76	55.26	74.00	-18.74	Vertical
12400.00	*			74.00		Vertical
14880.00	*			74.00		Vertical
2480.00	82.51	9.75	92.26	114.00	-21.74	Horizontal
4960.00	25.87	15.27	41.14	74.00	-32.86	Horizontal
7440.00	31.45	18.09	49.54	74.00	-24.46	Horizontal
9920.00	27.21	23.76	50.97	74.00	-23.03	Horizontal
12400.00	*			74.00		Horizontal
14880.00	*			74.00		Horizontal
Average value:						
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
2480.00	73.49	9.75	83.24	94.00	-10.76	Vertical
4960.00	14.94	15.27	30.21	54.00	-23.80	Vertical
7440.00	17.97	18.09	36.06	54.00	-17.94	Vertical
9920.00	15.71	23.76	39.47	54.00	-14.53	Vertical
12400.00	*			54.00		Vertical
14880.00	*			54.00		Vertical
2480.00	70.88	9.75	80.63	94.00	-13.37	Horizontal
4960.00	13.30	15.27	28.57	54.00	-25.43	Horizontal
7440.00	20.77	18.09	38.86	54.00	-15.14	Horizontal
9920.00	18.71	23.76	42.47	54.00	-11.53	Horizontal
12400.00	*			54.00		Horizontal
14880.00	*			54.00		Horizontal

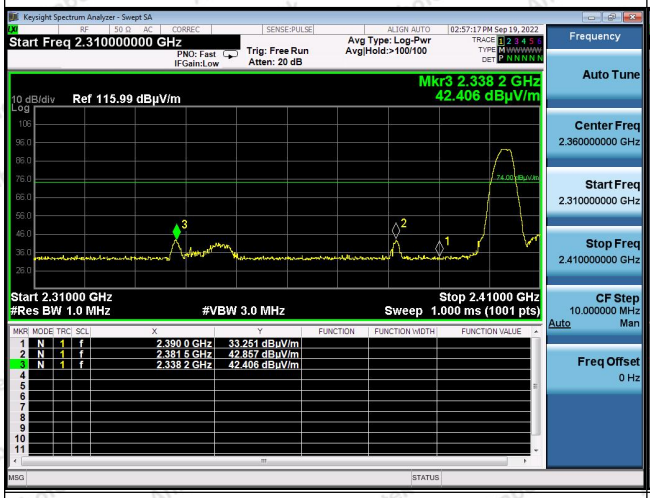
Remark:

1.Result =Reading + Factor

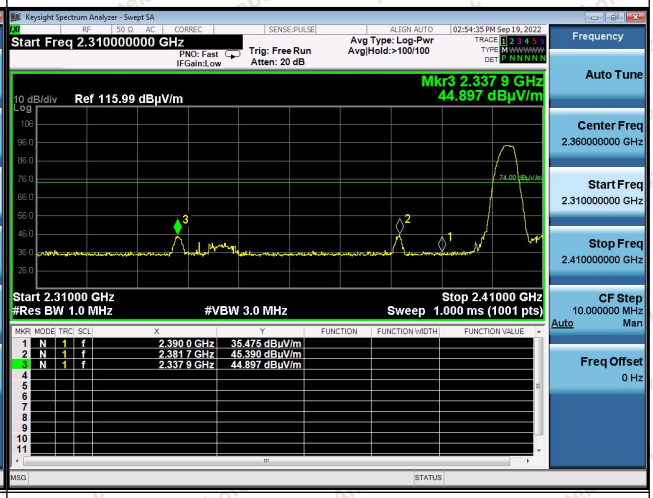
2. "*" means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Radiated Band Edge:

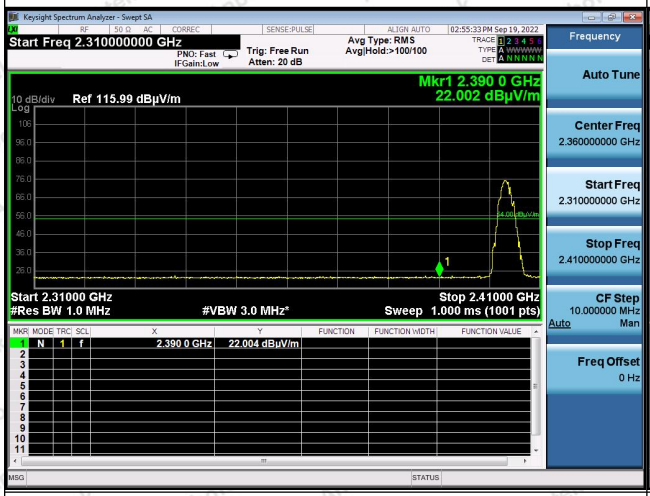
Test Mode: Lowest



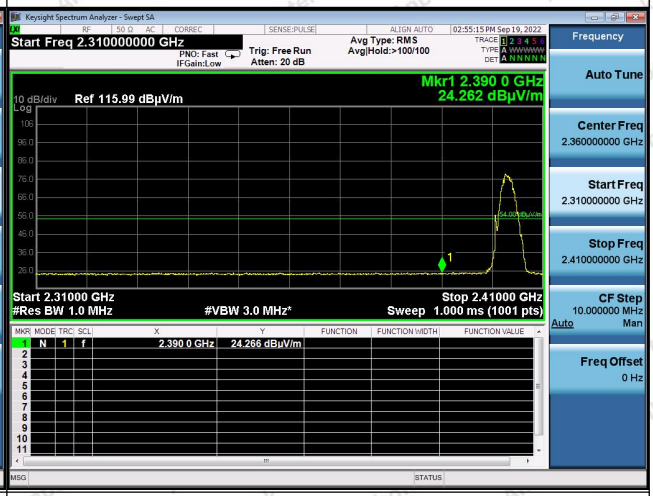
Peak Value(Vertical)



Peak Value(Horizontal)

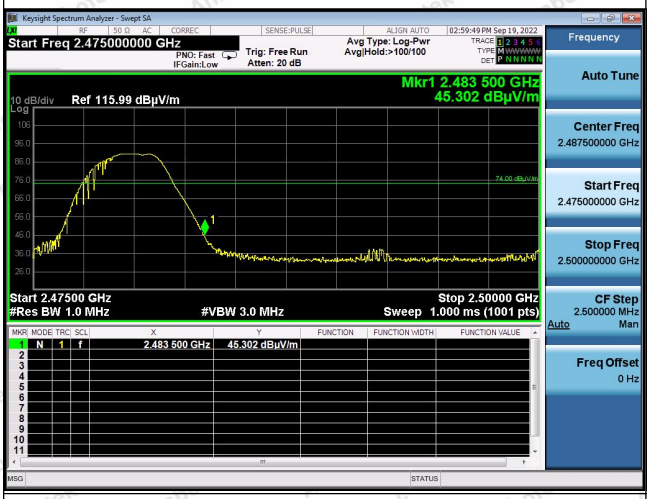


Average Value(Vertical)

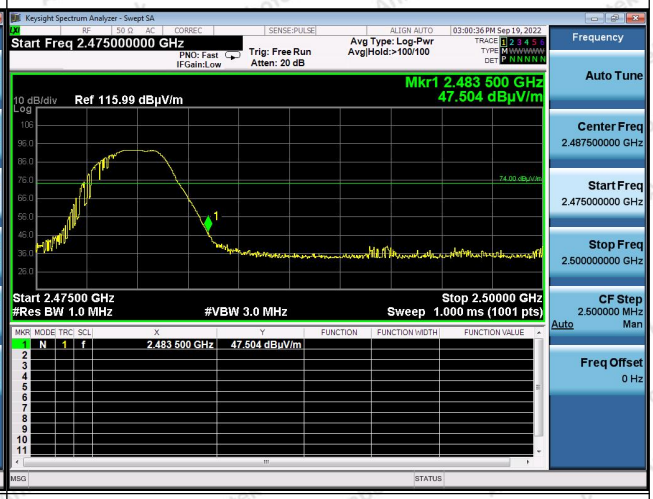


Average Value(Horizontal)

Test Mode: Highest

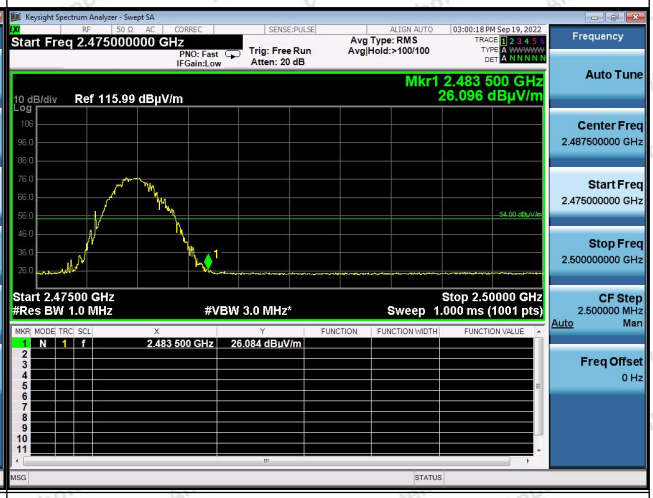


Peak Value(Vertical)



Peak Value(Horizontal)

Average Value(Vertical)



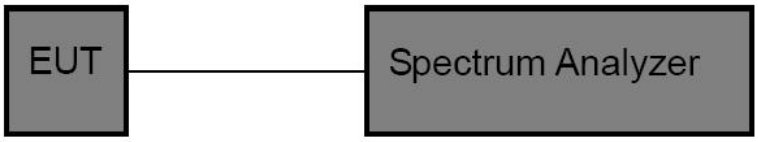
Average Value(Horizontal)

5. 20dB Bandwidth Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.215(c)
Test Limit	N/A

5.2. Test Setup



5.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:
   RBW = 68kHz, VBW≥3*RBW ≈180kHz,
   Detector= Average
   Trace mode= Max hold.
   Sweep- auto couple.
4. Mark the peak frequency and –20dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

5.4. 5.4. Test Data

Test Item	:	20dB Bandwidth	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 1.5V	Temperature	:	22.4℃
Test Result	:	PASS	Humidity	:	55%RH

Channel	Bandwidth (MHz)	Result
Low	2.625	PASS
Middle	2.613	PASS
High	2.632	PASS

Low Channel

Mid Channel

High Channel

6. Antenna Requirement

6.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203
Requirement	1) 15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

6.2. Antenna Connected Construction

The antenna is a PCB Antenna which permanently attached, and the best case gain of the antenna is -2.39 dBi. It complies with the standard requirement.

APPENDIX I -- TEST SETUP PHOTOGRAPH

Please refer to separated files Appendix I -- Test Setup Photograph

APPENDIX II -- EXTERNAL PHOTOGRAPH

Please refer to separated files Appendix II -- External Photograph

APPENDIX III -- INTERNAL PHOTOGRAPH

Please refer to separated files Appendix III -- Internal Photograph

---------- End of Report ----------