FCC PART 15C TEST REPORT FOR CERTIFICATION
On Behalf of

DONGGUAN KEYCEO ELECTRONICS TECHNOLOGY CO.,LTD

2.4G Wireless Mouse

Model Number: M43

Additional Model: M42, M25, M26, M36, M37, XXX, XXXX, XXXXX
(X can be 0-9 & A-Z & blank)

FCC ID: 2A8YW-PC394A-1

Applicant	DONGGUAN KEYCEO ELECTRONICS TECHNOLOGY CO.,LTD
Address:	No.1,factory building,Tangkou,Miaoyi,Miaobianwang Village,
	Shipai Town,Dongguan,Guangdong,China
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

Report Number:	ESTE-R2211097
Date of Test:	Oct. 17~Nov. 10, 2022
Date of Report:	Nov. 11, 2022

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EST Technology Co., Ltd.

Applicant: **Address:**	DONGGUAN KEYCEO ELECTRONICS TECHNOLOGY CO.,LTD No.1,factory building,Tangkou,Miaoyi,Miaobianwang Village, Shipai Town,Dongguan,Guangdong,China
Manufacturer: **Address:**	DONGGUAN KEYCEO ELECTRONICS TECHNOLOGY CO.,LTD No.1,factory building,Tangkou,Miaoyi,Miaobianwang Village, Shipai Town,Dongguan,Guangdong,China
Factory: **Address:**	DONGGUAN KEYCEO ELECTRONICS TECHNOLOGY CO.,LTD No.1,factory building,Tangkou,Miaoyi,Miaobianwang Village, Shipai Town,Dongguan,Guangdong,China
E.U.T:	2.4G Wireless Mouse
Model Number:	M43
Additional Model:	M42, M25, M26, M36, M37, XXX, XXXX, XXXXX (X can be 0-9 & A-Z & blank) Note: They are identical except model name.
Power Supply:	DC 1.5V From Battery
Trade Name:	------ Serial No.: ------
Date of Receipt:	Oct. 17, 2022 Date of Test: Oct. 17~Nov. 10, 2022
Test Specification:	FCC Part 15 Subpart C (15.249) ANSI C63.10:2013
Test Result:	The device described above is tested by EST Technology Co., Ltd. The measurement results were contained in this test report and EST Technology Co., Ltd. was assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliance with the FCC Rules and Regulations Part 15 Subpart C requirements. This report applies to above tested sample only and shall not be reproduced in part without written approval of EST Technology Co., Ltd. **Date:** Nov. 11, 2022

Prepared by:	Reviewed by:	Approved by:
Emily Cai / Assistant	Seven Wang / Engineer	Iceman Hu / Manager

Other Aspects:

None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

This test report is based on a single evaluation of one sample of above mentioned products ,It is not permitted to be duplicated in extracts without written approval of EST Technology Co., Ltd.

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

Product Name	:	2.4G Wireless Mouse
Model Number	:	M43
Software Version	:	N/A
Hardware Version	:	N/A
Operation frequency	:	2405MHz-2475MHz
Number of channel	:	8
Field Strength of Fundamental	:	95.17dBμV/m
Modulation Type	:	GFSK
Sample Type	:	Prototype production

Note: For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

1.2. Antenna Information

Ant No.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	-	-	PCB	-	1.6

Note: This information is provided by the applicant.

1.3. Information of RF Cable

Cable Loss(dB)	Provided by
1.0	DONGGUAN KEYCEO ELECTRONICS TECHNOLOGY CO.,LTD
Note: 1.The customer declared the loss value of the RF Cable, and the test results of this report only apply to the sample as received. 2. This information is provided by the applicant.	

2. SUMMARY OF TEST

2.1. Summary of test result

No.	Description of Test Item	FCC Standard Section	Results
1	Field Strength of Fundamental	15.249(a)	PASS
2	Radiated Spurious Emissions and Band Edge	15.205 15.209 15.249(a)(c)(d)(e) 15.35(b)	PASS
3	20dB Bandwidth	15.215	PASS
4	AC Power Line Conducted Emissions	15.207	N/A
5	Antenna Requirement	15.203	PASS

Note: “N/A” denotes test is not applicable in this test report.

2.2. Test Facilities

EMC Lab : Certificated by CNAS, CHINA
Registration No.: L5288
This Certificate is valid until: November 12, 2023

Certificated by FCC, USA
Designation Number: CN1215
This Certificate is valid until: January 31, 2024

Certificated by A2LA, USA
Registration No.: 4366.01
This Certificate is valid until: January 31, 2024

Certificated by Industry Canada
CAB identifier No.: CN0035
This Certificate is valid until: January 31, 2024

Certificated by VCCI, Japan
Registration No.:C-14103; T-20073; R-13663; R-20103; G-20097
Date of registration: Apr. 20, 2020
This Certificate is valid until: Apr. 19, 2023

Certificated by TUV Rheinland, Germany
Registration No.: UA 50413872 0001
Date of registration: July 31, 2018

Certificated by Intertek
Registration No.: 2011-RTL-L2-64
Date of registration: November 08, 2018

Name of Firm : EST Technology Co., Ltd.

Site Location : Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China

2.3. Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	±3.48dB
Uncertainty for spurious emissions test (Below 30MHz)	±1.62 dB
Uncertainty for spurious emissions test (30MHz-1GHz)	±4.60 dB(Polarize: H)
	±4.68 dB(Polarize: V)
Uncertainty for spurious emissions test (1GHz to 18GHz)	±4.96dB
Uncertainty for radio frequency	7×10^{-8}
Uncertainty for conducted RF Power	1.08dB
Uncertainty for Power density test	0.26dB

Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2.4. Assistant equipment used for test

Item	Equipment	Brand	Model Name/Type No.	FCC ID	Series No.
-	-	-	-	-	-

Item	Shielded Type	Ferrite Core	Length	Note
-	-	-	-	-

2.5. Block Diagram

For radiated emissions test: EUT was placed on a turn table, which is 0.8 (or 1.5) meter high above ground. EUT was beset into test mode by software before test.

EUT

DC 1.5V From Battery

(EUT: 2.4G Wireless Mouse)

2.6. Test Mode

The test mode was selected for the final test as listed below.

Test Item	Test Mode	Test Channel
Field Strength of Fundamental	TX	Low/Middle/High
Radiated Spurious Emissions	TX	Low/Middle/High
20dB Bandwidth&99% Occupied Bandwidth	TX	Low/Middle/High

Note:In radiated measurement,the EUT had been pre-scan on the positioned of each 3 axis(X,Y,Z), the worst case was found when positioned on **X-plane.**

2.7. Power Setting of Test Software

Software Name	N/A		
Frequency(MHz)	2405	2451	2475
Setting	Default	Default	Default

Note: This information is provided by the applicant.

2.8. Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2405	6	2463
2	2411	7	2469
3	2417	8	2475
4	2451		
5	2457		

2.9. Test Equipment List

For conducted emission test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESHS30	EST-E001	LISAI	June 13,22	1 Year
Artificial Mains Network	Rohde & Schwarz	ENV216	EST-E002	LISAI	June 13,22	1 Year
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	EST-E078	LISAI	June 13,22	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A

For radiated emission test(9kHz-30MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	EST-E047	LISAI	June 13,22	1 Year
Active Loop Antenna	SCHWAREBECK	FMZB 1519B	EST-E054	LISAI	June 13,22	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
9kHz-30MHz Cable	N/A	EST-001	N/A	N/A	N/A	N/A

For radiated emissions test (30MHz-1000MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
EMI Test Receiver	Rohde & Schwarz	ESR7	EST-E047	LISAI	June 13,22	1 Year
Bilog Antenna	Teseq	CBL 6111D	EST-E034	LISAI	June 13,22	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
30-1000MHz Cable	N/A	EST-002	N/A	N/A	N/A	N/A

For radiated emission test(Above 1000MHz)						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
Horn Antenna	SCHWARZBECK	BBHA9120D	EST-E031	LISAI	June 13,22	1 Year
Horn Antenna	Com-Power	AHA-840	EST-E133	LISAI	June 13,22	1 Year
Low Noise Amplifier	RF	TRLA-010180G45N	EST-E142	LISAI	June 13,22	1 Year
Spectrum Analyzer	Rohde &Schwarz	FSV40	EST-E069	LISAI	June 13,22	1 Year
Test Software	Audix	e3-6.111221a	N/A	N/A	N/A	N/A
Above 1GHz Cable	N/A	EST-003	N/A	N/A	N/A	N/A

For connect EUT antenna terminal test						
Equipment	Manufacturer	Model No.	Serial No.	Calibration Body	Last Cal.	Next Cal.
TS 1120	Tonscend	/	/	/	/	/
Test Software	Tonscend	TS1120-3	3.2.11	/	/	/
RF Control Unit	Tonscend	JS0806-2	EST-E134	LISAI	June 13,22	1 Year
Signal and Spectrum Analyzer	Rohde &Schwarz	FSV 40	EST-E136	LISAI	June 13,22	1 Year

3. FIELD STRENGTH OF FUNDAMENTAL

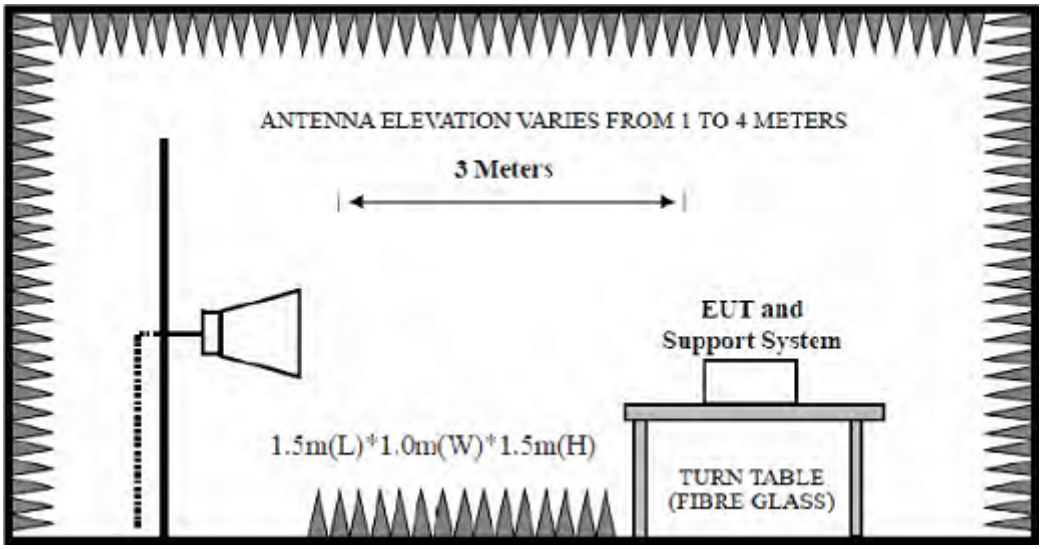
3.1. Limit

Fundamental frequency	Field strength of fundamental@3m (millivolts/meter)	Average Limit@3m dBμV/m	Peak Limit@3m dBμV/m
902-928MHz	50	94	114
2400-2483.5MHz	50	94	114
5725-5875MHz	50	94	114
24.0-24.25	250	108	128

Note：

1. Average Limit (dBμV/m)=20×log[1000×Field Strength (mV/m)].
2. Peak Limit (dBμV/m)= Average Limit (dBμV/m)+20dB

3.2. Test Setup



3.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting
RBW	≥OBW
VBW	3×RBW
Start frequency	2405MHz
Stop frequency	2475MHz
Sweep Time	Auto
Detector	PEAK/AVG
Trace Mode	Max Hold

3.4. Test Procedure

a. EUT was placed on a turn table, which is 1.5 meter high above the ground.
b. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower.
c. Spectrum analyzer setting parameters in accordance with section 3.3.
d. Set the EUT transmit continuously with maximum output power.
e. The turn table can rotate 360 degrees to determine the position of the maximum emission level.
f. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test,record the average and peak value.
g. Repeat above procedures until all channels were measured.
h. Record the results in the test report.

3.5. Test Result

Test frequency (MHz)	Fundamental frequency (MHz)	Field strength of fundamental level (dBμV/m)		Limit (dBμV/m)		Result	Antenna Pole (H/V)
		Avg	Peak	Avg	Peak		
2405	2405.09	78.79	95.17	94	114	Pass	V
	2405.09	72.68	84.99	94	114	Pass	H
2451	2451.02	77.01	90.02	94	114	Pass	V
	2451.19	70.03	84.2	94	114	Pass	H
2475	2475.15	79.01	92.34	94	114	Pass	V
	2475.23	78.36	91.23	94	114	Pass	H

Low Channel(2405MHz)

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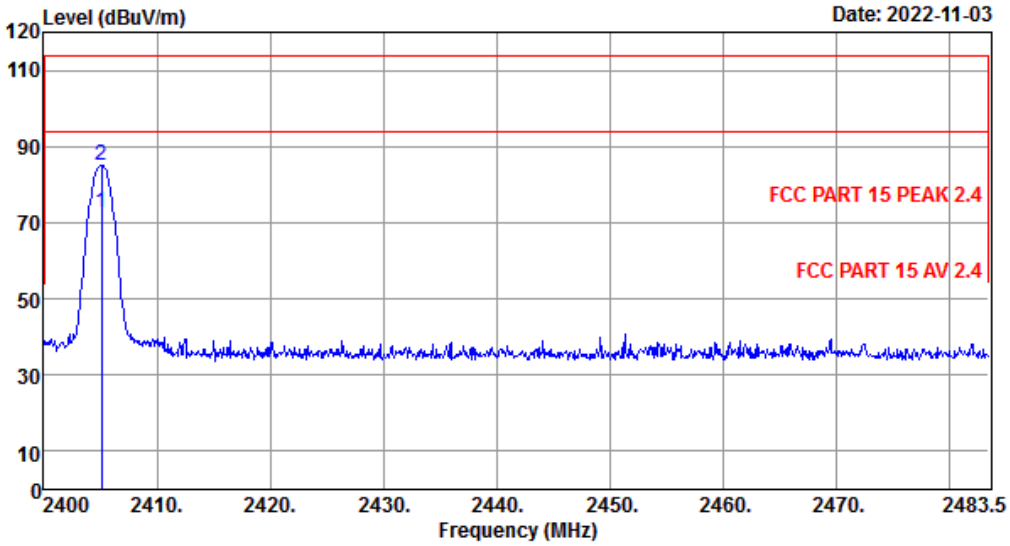

Site no. : 1# 966 Chamber Data no. : 11
Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2405MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2405.09	27.47	3.48	46.48	78.21	72.68	94.00	21.32	Average
2	2405.09	27.47	3.48	46.48	90.52	84.99	114.00	29.01	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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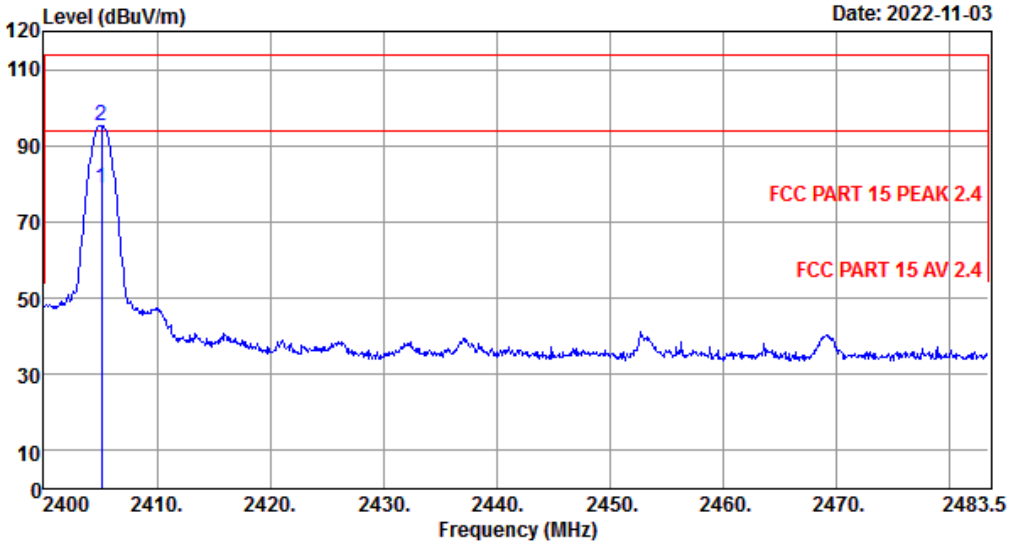

Site no. : 1# 966 Chamber Data no. : 12
Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : VERTICAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2405MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2405.09	27.47	3.48	46.48	84.32	78.79	94.00	15.21	Average
2	2405.09	27.47	3.48	46.48	100.70	95.17	114.00	18.83	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

Middle Channel(2451MHz)

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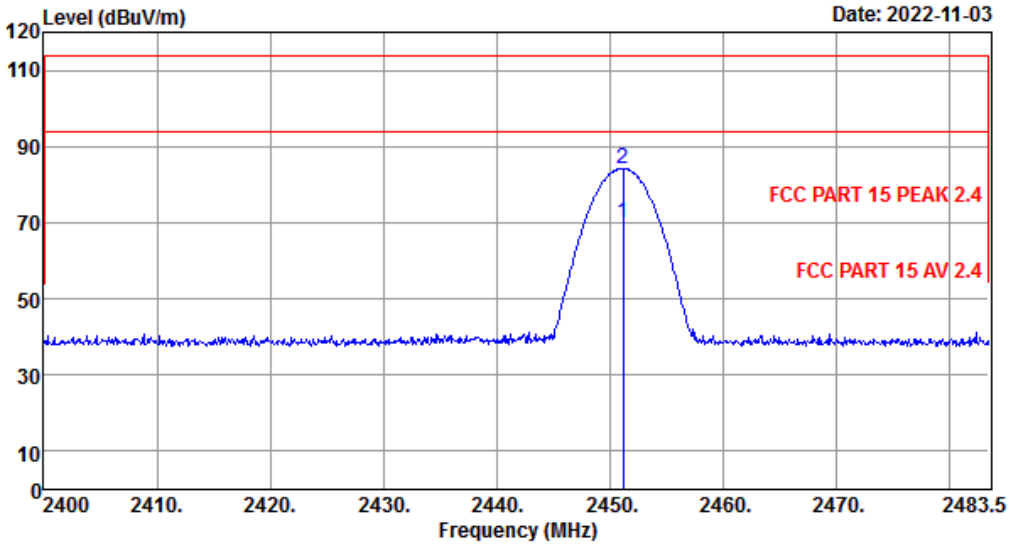

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Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2451MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2451.19	27.61	3.50	46.46	75.38	70.03	94.00	23.97	Average
2	2451.19	27.61	3.50	46.46	89.55	84.20	114.00	29.80	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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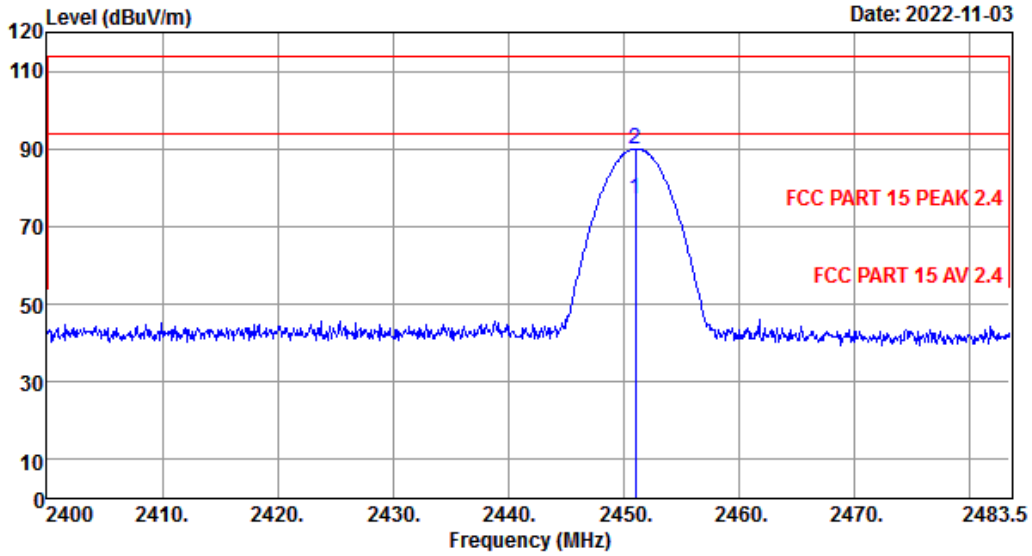
Data: 14 File: \\EMC-966-1\test data\2022\RF\X\Xin Lai Zhi Neng\M43.EM6 (16)

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Site no.      : 1# 966 Chamber              Data no.  : 14
Dis. / Ant.   : 3m   BBHA9120D 1-18G 2208   Ant. pol. : VERTICAL
Limit         : FCC PART 15 PEAK 2.4
Env. / Ins.   : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer      : JBR
EUT           : 2.4G Wireless Mouse
Power         : DC 1.5V From Battery
M/N           : M43
Test Mode     : TX 2451MHz
```

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2451.02	27.61	3.50	46.46	82.36	77.01	94.00	16.99	Average
2	2451.02	27.61	3.50	46.46	95.37	90.02	114.00	23.98	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

High Channel(2475MHz)

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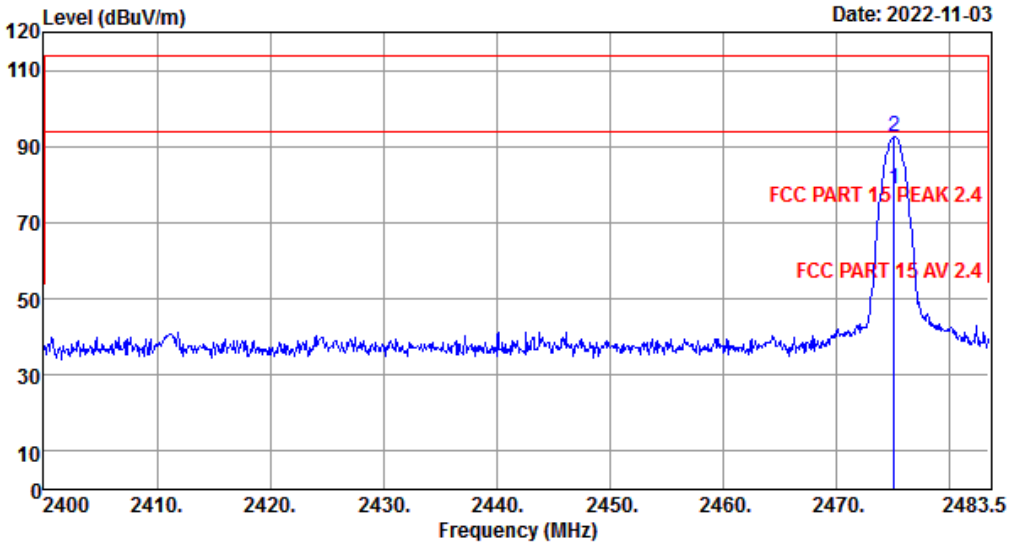
Data: 15 File: \\EMC-966-1\test data\2022\RF\X\Xin Lai Zhi Neng\M43.EM6 (16)



Site no. : 1# 966 Chamber Data no. : 15
Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : VERTICAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2475MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2475.15	27.68	3.51	46.45	84.27	79.01	94.00	14.99	Average
2	2475.15	27.68	3.51	46.45	97.60	92.34	114.00	21.66	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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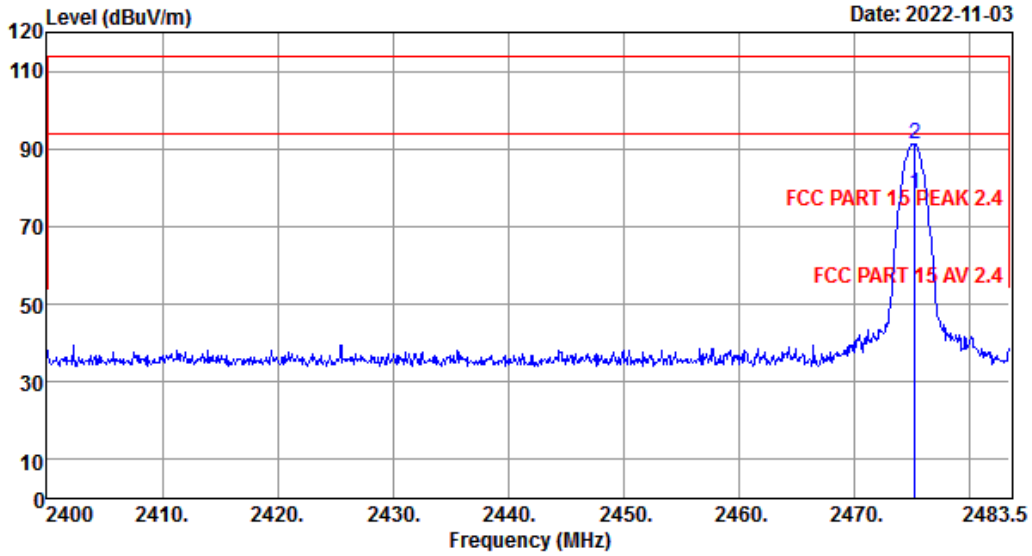


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Site no.      : 1# 966 Chamber              Data no.  : 16
Dis. / Ant.   : 3m   BBHA9120D 1-18G 2208   Ant. pol. : HORIZONTAL
Limit         : FCC PART 15 PEAK 2.4
Env. / Ins.   : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer      : JBR
EUT           : 2.4G Wireless Mouse
Power         : DC 1.5V From Battery
M/N           : M43
Test Mode     : TX 2475MHz
```

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2475.23	27.68	3.51	46.45	83.62	78.36	94.00	15.64	Average
2	2475.23	27.68	3.51	46.45	96.49	91.23	114.00	22.77	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

4. RADIATED SPURIOUS EMISSIONS AND BAND EDGE

4.1. Limit

(a) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of harmonics@3m (microvolts/meter)	Average Limit@3m dBμV/m	Peak Limit@3m dBμV/m
902-928MHz	500	54	74
2400-2483.5MHz	500	54	74
5725-5875MHz	500	54	74
24.0-24.25	2500	68	88

(b) Field strength limits are specified at a distance of 3 meters.

(c) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

15.209 Radiated emission limits

Frequency (MHz)	Field Strength(μV/m)	Distance(m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

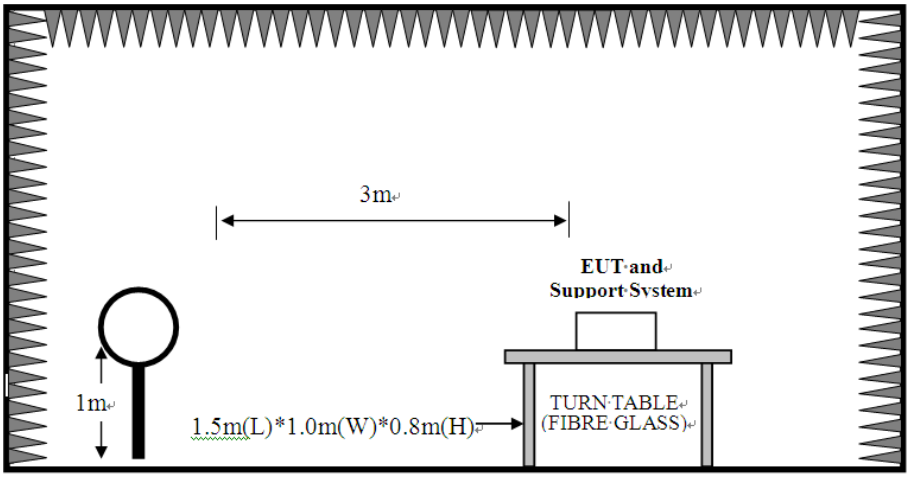
(d) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation

Note:

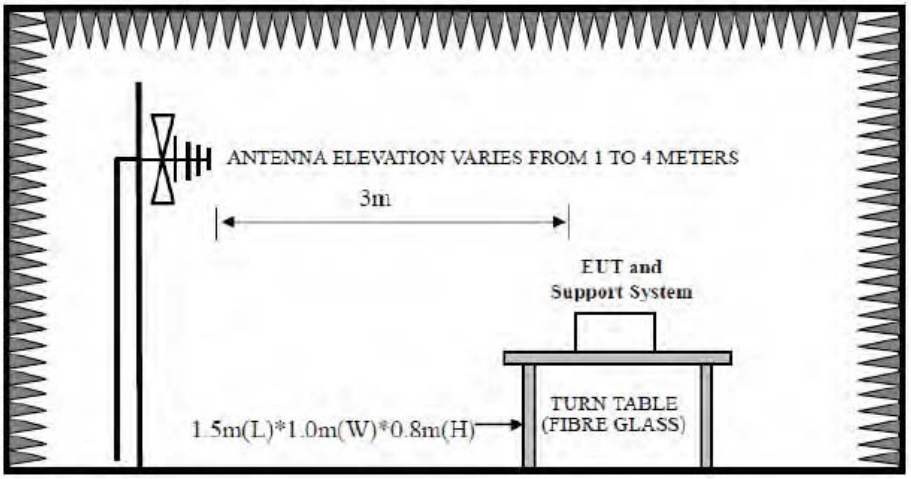
(1) Emission level dBμV = 20 log Emission level μV/m.
(2) The smaller limit shall apply at the cross point between two frequency bands.
(3) Distance is the distance in meters between the measuring instrument,antenna and the closest point of any part of the device or system.

4.2. Test Setup

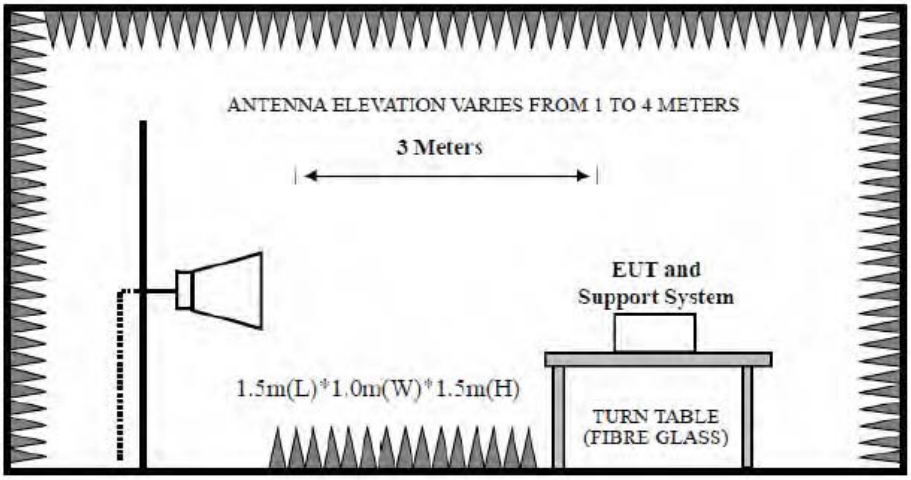
9kHz~30MHz



30~1000MHz



Above 1GHz



4.3. Spectrum Analyzer Setting

For 9KHz-150KHz

Spectrum Parameters	Setting
RBW	300Hz(for Peak&AVG)/CISPR 200Hz(for QP)
VBW	300Hz(for Peak&AVG)/CISPR 200Hz(for QP)
Start frequency	9KHz
Stop frequency	150KHz
Sweep Time	Auto
Detector	PEAK/QP/AVG
Trace Mode	Max Hold

For 150KHz-30MHz

Spectrum Parameters	Setting
RBW	9KHz
VBW	9KHz
Start frequency	150KHz
Stop frequency	30MHz
Sweep Time	Auto
Detector	QP
Trace Mode	Max Hold

For 30MHz-1000MHz

Spectrum Parameters	Setting
RBW	120KHz
VBW	300KHz
Start frequency	30MHz
Stop frequency	1000MHz
Sweep Time	Auto
Detector	QP
Trace Mode	Max Hold

For Above 1GHz

Spectrum Parameters	Setting
RBW	1MHz
VBW	3MHz
Start frequency	1GHz
Stop frequency	10 Times Carrier Frequency
Sweep Time	Auto
Detector	PEAK
Trace Mode	Max Hold

4.4. Test Procedure

a. EUT was placed on a turn table, which is 0.8 meter high above ground for below 1GHz test, and which is 1.5 meter high above ground for above 1GHz test.
b. EUT is set 3 meters away from the receiving antenna, which is mounted on a antenna tower.
c. Set the EUT transmit continuously with maximum output power.
d. The turn table can rotate 360 degrees to determine the position of the maximum emission level.
e. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on test.
f. Spectrum analyzer setting parameters in accordance with section 4.3.
g. Repeat above procedures until all channels were measured.
h. Record the results in the test report.

Note:

1. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.
2. The frequency 2405MHz/2451MHz/2475MHz are fundamental frequency.

4.5. Test Result

Radiated Emissions Below 1GHz

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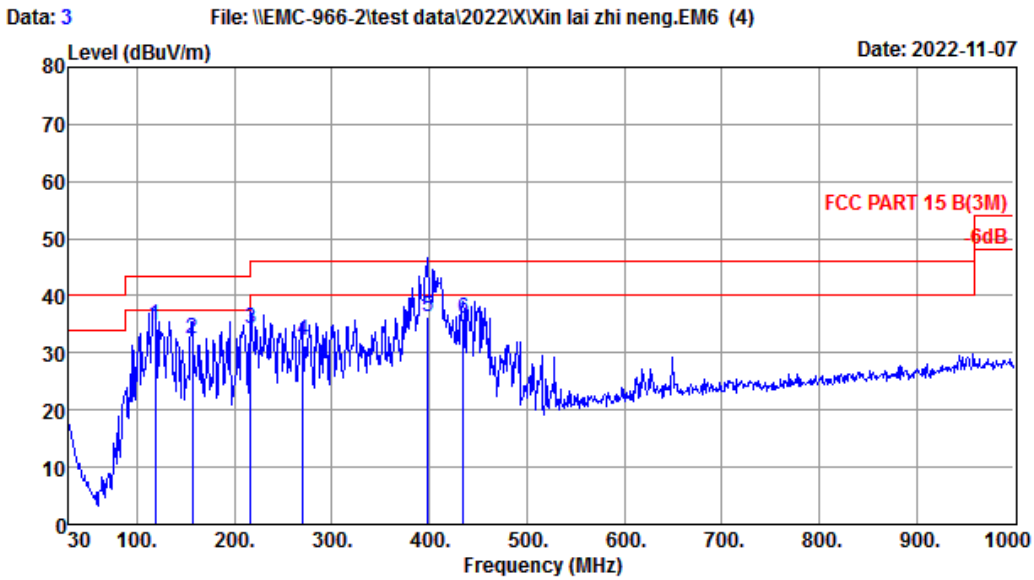

Site no. : 2# 966 chamber Data no. : 3
Dis. / Ant. : 3m 47018 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:25.5℃;Humi:55.5%;Press:101.52kPa
Engineer : Frank
EUT : 2.4G Wireless Mouse
Power : DC 1.5V
M/N : M43
Test Mode : TX Mode

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	118.27	11.68	0.87	22.30	34.85	43.50	8.65	QP
2	157.07	11.66	1.03	19.71	32.40	43.50	11.10	QP
3	216.24	9.74	1.21	23.19	34.14	46.00	11.86	QP
4	270.56	13.60	1.55	17.14	32.29	46.00	13.71	QP
5	398.60	16.39	1.81	18.10	36.30	46.00	9.70	QP
6	434.49	17.15	2.01	16.81	35.97	46.00	10.03	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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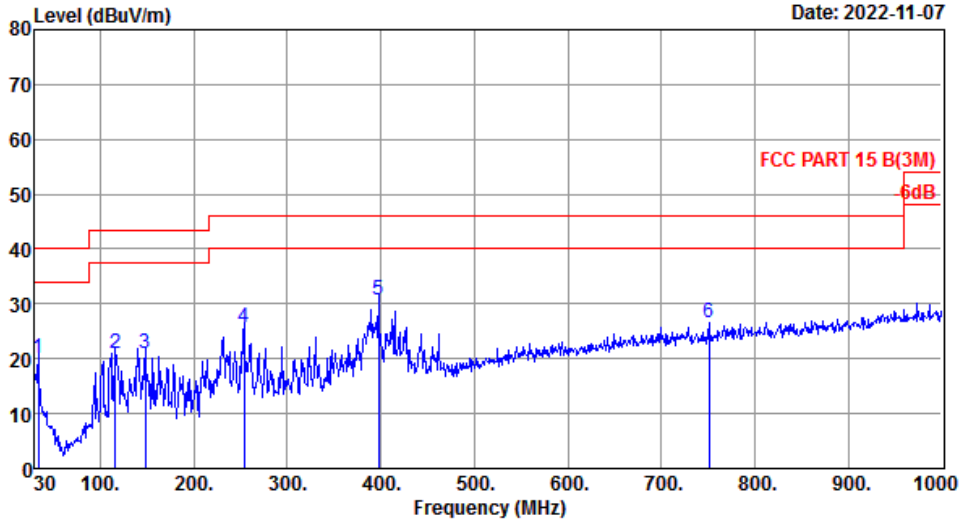
Data: 4 File: \\EMC-966-2\test data\2022\X\Xin lai zhi neng.EM6 (4)



Site no. : 2# 966 chamber Data no. : 4
Dis. / Ant. : 3m 47018 Ant. pol. : VERTICAL
Limit : FCC PART 15 B(3M)
Env. / Ins. : Temp:25.5℃;Humi:55.5%;Press:101.52kPa
Engineer : Frank
EUT : 2.4G Wireless Mouse
Power : DC 1.5V
M/N : M43
Test Mode : TX Mode

	Freq. (MHz)	ANT Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	33.88	15.90	0.22	3.83	19.95	40.00	20.05	QP
2	116.33	11.76	0.86	8.33	20.95	43.50	22.55	QP
3	148.34	11.98	1.00	7.98	20.96	43.50	22.54	QP
4	254.07	13.68	1.43	10.53	25.64	46.00	20.36	QP
5	397.63	16.38	1.80	12.43	30.61	46.00	15.39	QP
6	750.71	22.33	3.12	1.10	26.55	46.00	19.45	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

Note:

1. The amplitude of 9KHz to 30MHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.
2. All channels had been pre-test,only the worst case was reported.

Radiated Emissions Above 1G

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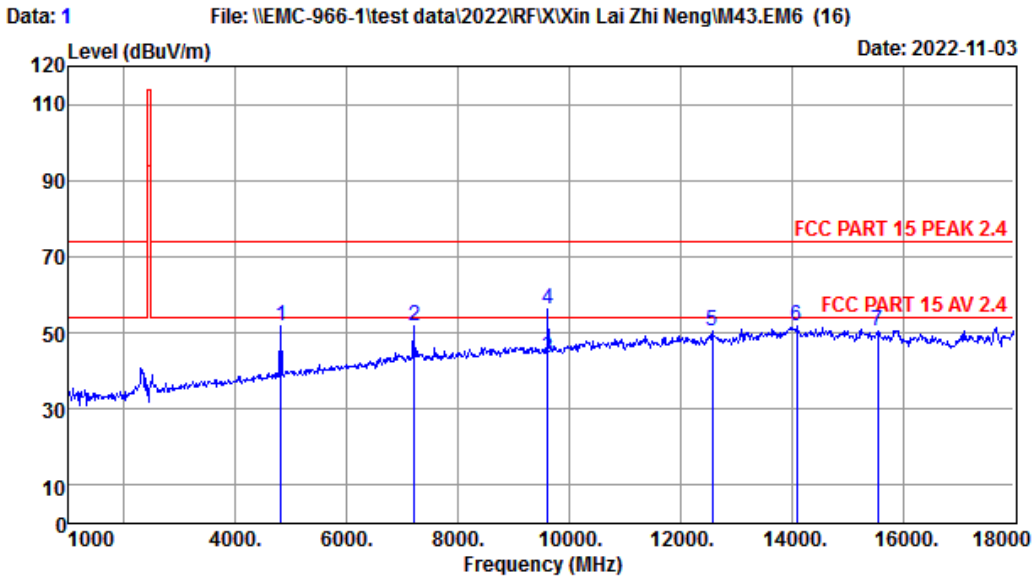

Site no. : 1# 966 Chamber Data no. : 1
Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2405MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4810.00	32.40	4.90	45.44	49.77	51.63	74.00	22.37	Peak
2	7215.00	36.17	6.26	44.98	44.29	51.74	74.00	22.26	Peak
3	9620.00	38.12	7.44	44.58	32.28	43.26	54.00	10.74	Average
4	9620.00	38.12	7.44	44.58	45.30	56.28	74.00	17.72	Peak
5	12577.00	39.32	8.56	42.79	35.48	50.57	74.00	23.43	Peak
6	14090.00	39.96	9.15	42.17	34.76	51.70	74.00	22.30	Peak
7	15552.00	38.56	9.55	44.85	37.08	50.34	74.00	23.66	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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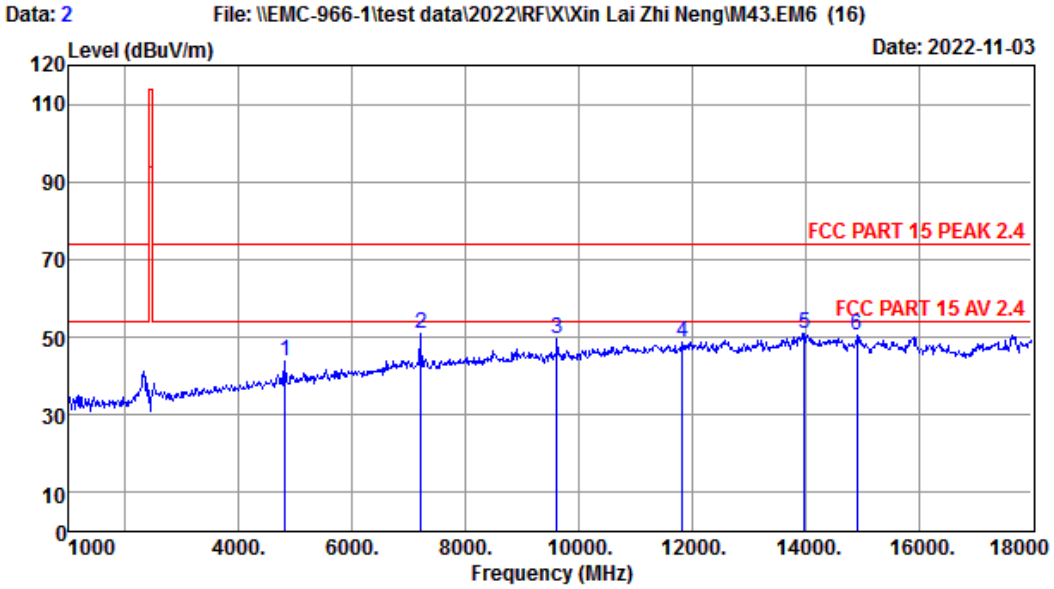

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Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : VERTICAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2405MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4810.00	32.40	4.90	45.44	41.88	43.74	74.00	30.26	Peak
2	7215.00	36.17	6.26	44.98	43.30	50.75	74.00	23.25	Peak
3	9620.00	38.12	7.44	44.58	38.80	49.78	74.00	24.22	Peak
4	11829.00	38.82	8.18	43.29	35.13	48.84	74.00	25.16	Peak
5	13988.00	40.00	9.11	41.93	33.63	50.81	74.00	23.19	Peak
6	14906.00	39.55	9.40	44.04	35.46	50.37	74.00	23.63	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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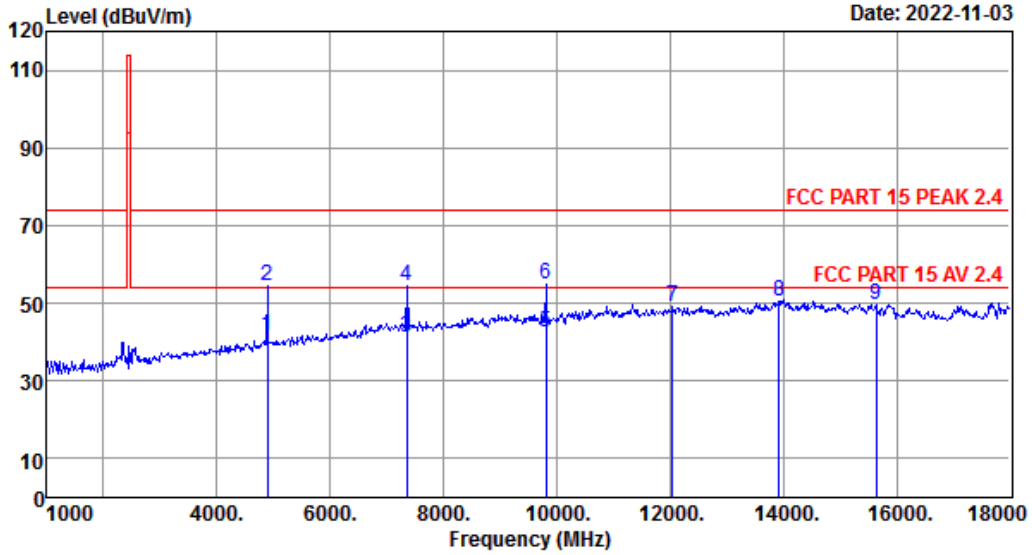
Data: 3 File: \\EMC-966-1\test data\2022\RF\X\Xin Lai Zhi Neng\M43.EM6 (16)



Site no. : 1# 966 Chamber Data no. : 3
Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : VERTICAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2451MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4893.00	32.58	4.94	45.41	39.35	41.46	54.00	12.54	Average
2	4893.00	32.58	4.94	45.41	52.29	54.40	74.00	19.60	Peak
3	7358.00	36.29	6.37	44.96	33.27	40.97	54.00	13.03	Average
4	7358.00	36.29	6.37	44.96	46.81	54.51	74.00	19.49	Peak
5	9806.00	38.16	7.55	44.54	31.25	42.42	54.00	11.58	Average
6	9806.00	38.16	7.55	44.54	43.79	54.96	74.00	19.04	Peak
7	12050.00	38.85	8.28	43.14	35.30	49.29	74.00	24.71	Peak
8	13920.00	39.98	9.03	41.89	33.47	50.59	74.00	23.41	Peak
9	15637.00	38.42	9.56	44.81	36.36	49.53	74.00	24.47	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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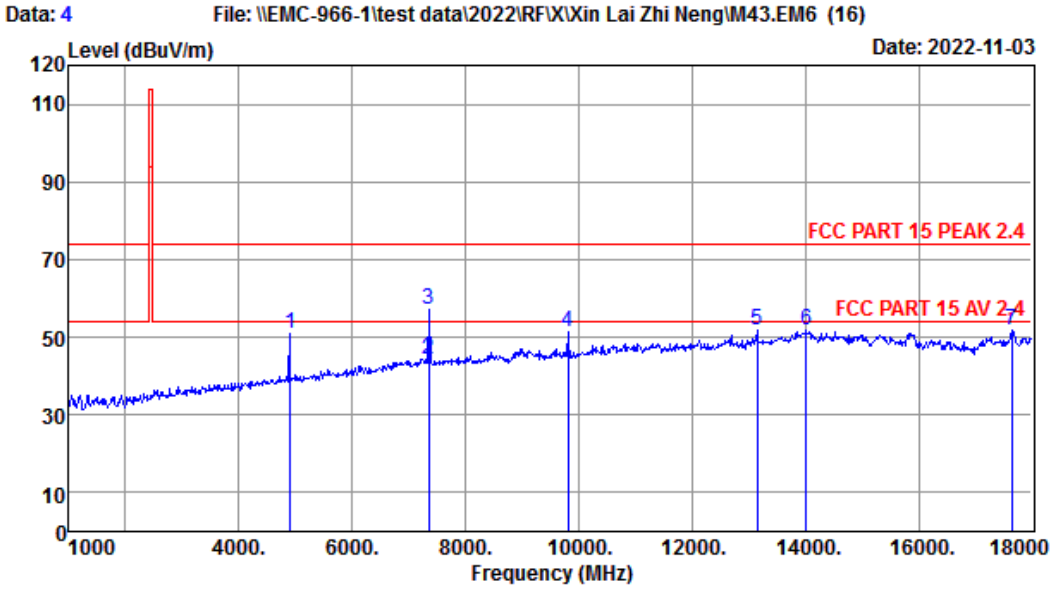

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Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2451MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4902.00	32.59	4.95	45.40	48.85	50.99	74.00	23.01	Peak
2	7353.00	36.28	6.37	44.96	36.57	44.26	54.00	9.74	Average
3	7353.00	36.28	6.37	44.96	49.56	57.25	74.00	16.75	Peak
4	9804.00	38.16	7.55	44.55	40.25	51.41	74.00	22.59	Peak
5	13155.00	39.75	8.63	42.40	35.93	51.91	74.00	22.09	Peak
6	14022.00	39.99	9.13	42.01	34.60	51.71	74.00	22.29	Peak
7	17643.00	40.42	10.53	43.91	34.59	51.63	74.00	22.37	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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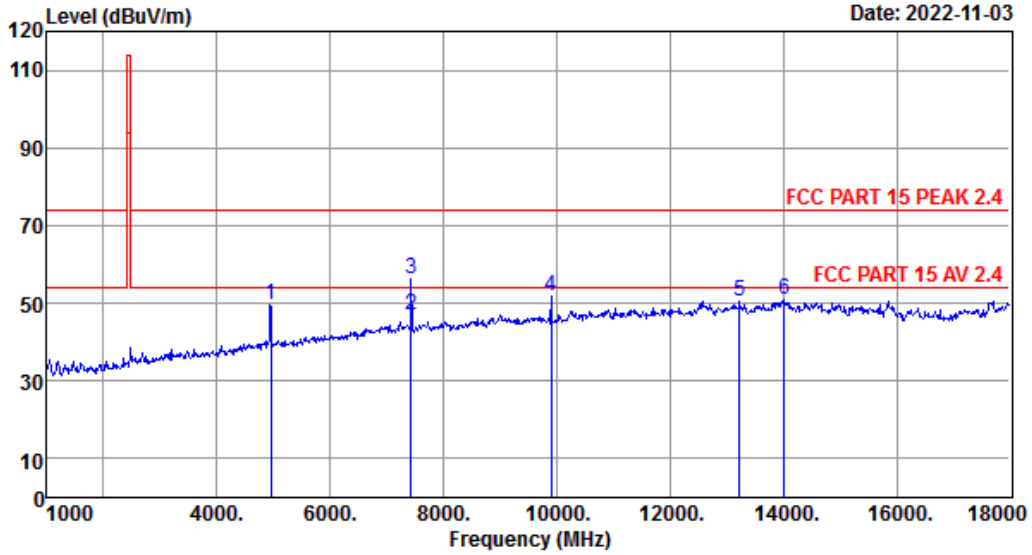

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Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2475MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4950.00	32.69	4.97	45.38	47.20	49.48	74.00	24.52	Peak
2	7425.00	36.34	6.42	44.95	39.16	46.97	54.00	7.03	Average
3	7425.00	36.34	6.42	44.95	48.27	56.08	74.00	17.92	Peak
4	9900.00	38.18	7.60	44.53	40.50	51.75	74.00	22.25	Peak
5	13223.00	39.77	8.61	42.36	34.40	50.42	74.00	23.58	Peak
6	14022.00	39.99	9.13	42.01	33.81	50.92	74.00	23.08	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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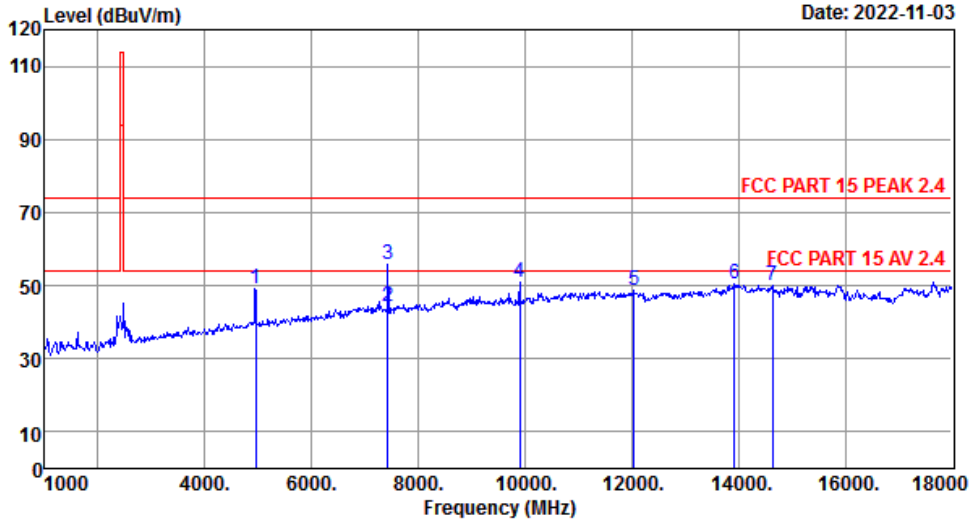


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Dis. / Ant.   : 3m   BBHA9120D 1-18G 2208   Ant. pol. : VERTICAL
Limit         : FCC PART 15 PEAK 2.4
Env. / Ins.   : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer      : JBR
EUT           : 2.4G Wireless Mouse
Power         : DC 1.5V From Battery
M/N           : M43
Test Mode     : TX 2475MHz
```

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	4950.00	32.69	4.97	45.38	47.01	49.29	74.00	24.71	Peak
2	7425.00	36.34	6.42	44.95	36.38	44.19	54.00	9.81	Average
3	7425.00	36.34	6.42	44.95	48.06	55.87	74.00	18.13	Peak
4	9900.00	38.18	7.60	44.53	39.84	51.09	74.00	22.91	Peak
5	12050.00	38.85	8.28	43.14	34.84	48.83	74.00	25.17	Peak
6	13920.00	39.98	9.03	41.89	33.27	50.39	74.00	23.61	Peak
7	14634.00	39.68	9.32	43.41	34.41	50.00	74.00	24.00	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

Note:

1. The amplitude of 18GHz to 25GHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Radiated Band Edge

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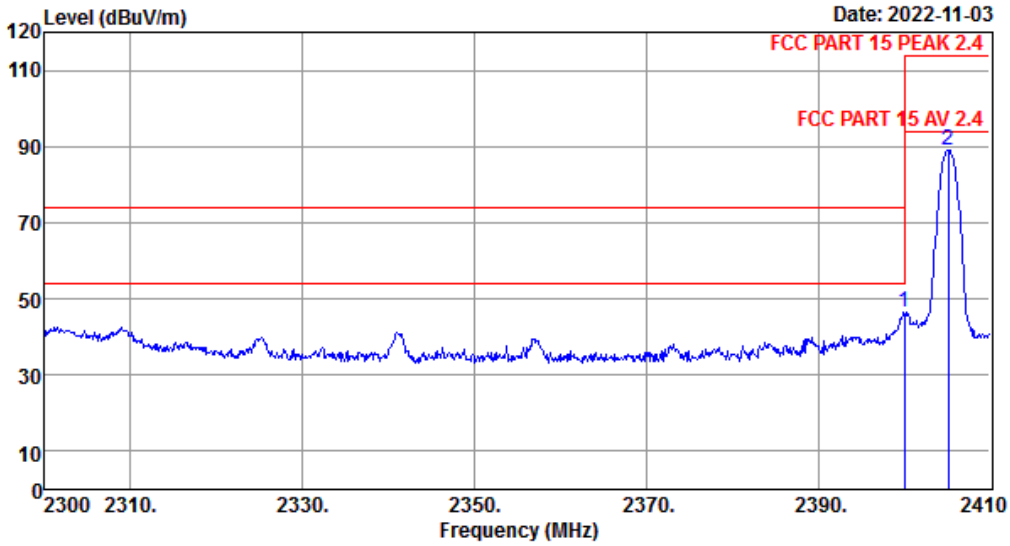
Data: 7 File: \\EMC-966-1\test data\2022\RF\X\Xin Lai Zhi Neng\M43.EM6 (16)



Site no. : 1# 966 Chamber Data no. : 7
Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : VERTICAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2405MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2400.00	27.46	3.48	46.48	52.13	46.59	74.00	27.41	Peak
2	2405.16	27.47	3.48	46.48	94.69	89.16	114.00	24.84	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

EST Technology

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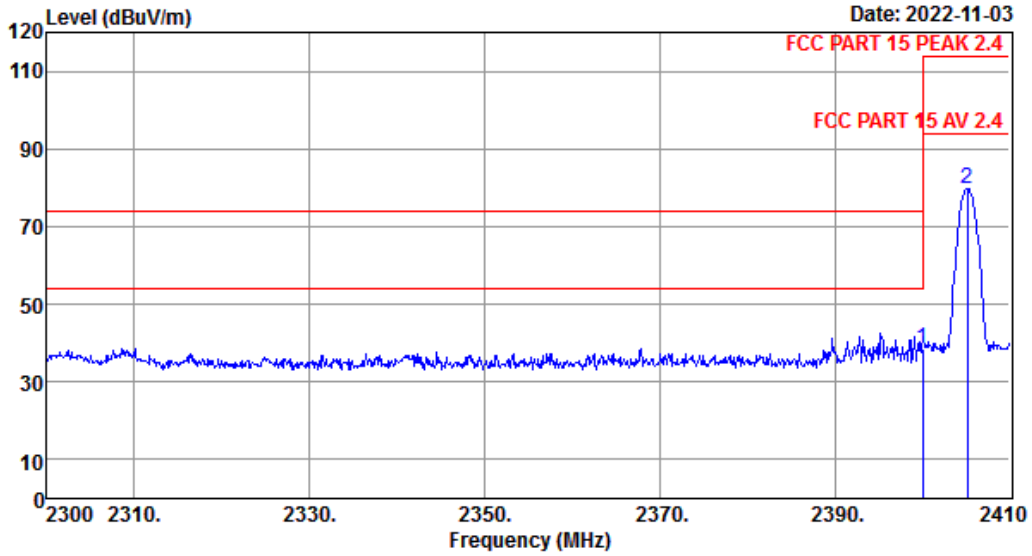
Data: 8 File: \\EMC-966-1\test data\2022\RF\X\Xin Lai Zhi Neng\M43.EM6 (16)



Site no. : 1# 966 Chamber Data no. : 8
Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2405MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2400.00	27.46	3.48	46.48	44.24	38.70	74.00	35.30	Peak
2	2405.16	27.47	3.48	46.48	85.31	79.78	114.00	34.22	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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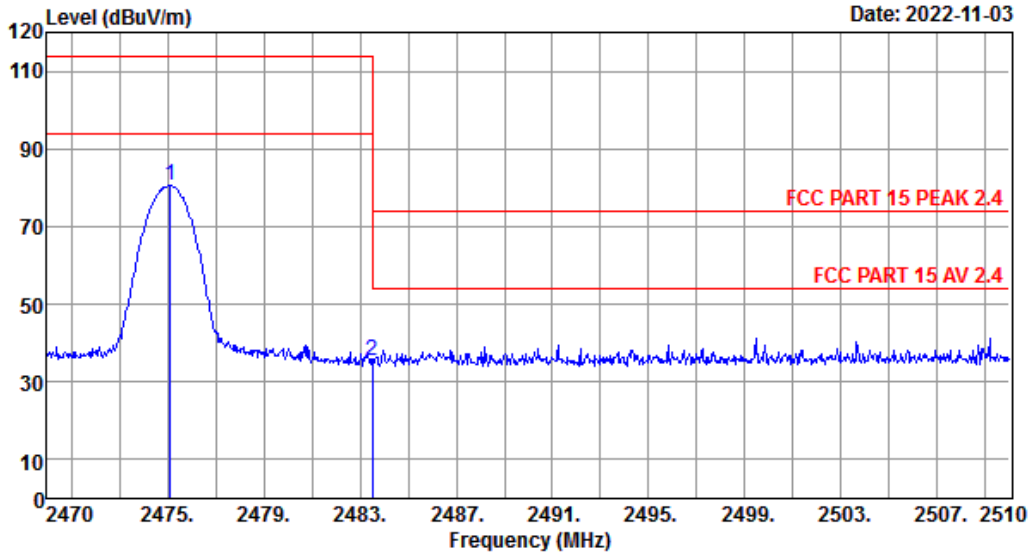
Data: 9 File: \\EMC-966-1\test data\2022\RF\X\Xin Lai Zhi Neng\M43.EM6 (16)



Site no. : 1# 966 Chamber Data no. : 9
Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : HORIZONTAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2475MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2475.12	27.68	3.51	46.45	85.74	80.48	114.00	33.52	Peak
2	2483.50	27.70	3.51	46.44	40.47	35.24	74.00	38.76	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

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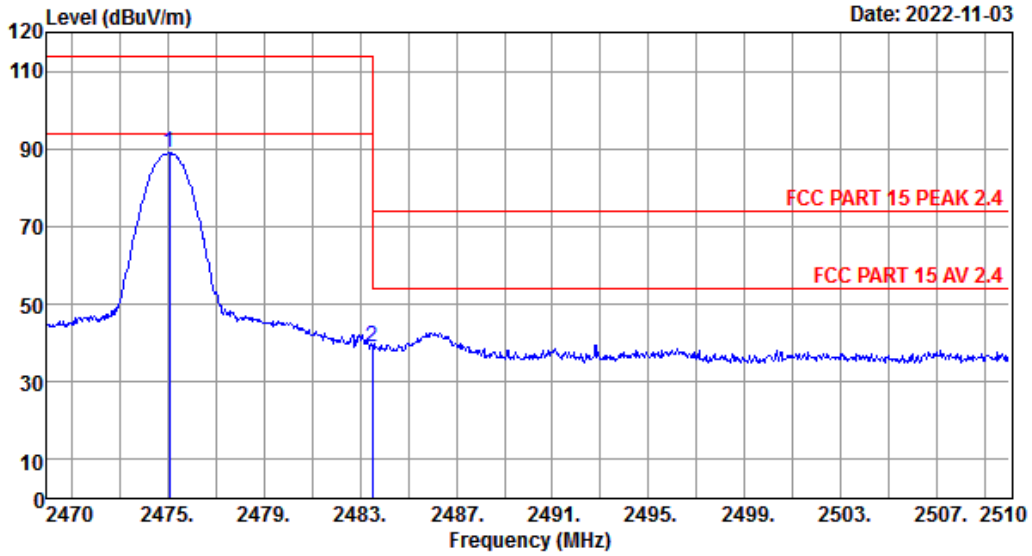
Data: 10 File: \\EMC-966-1\test data\2022\RF\X\Xin Lai Zhi Neng\M43.EM6 (16)



Site no. : 1# 966 Chamber Data no. : 10
Dis. / Ant. : 3m BBHA9120D 1-18G 2208 Ant. pol. : VERTICAL
Limit : FCC PART 15 PEAK 2.4
Env. / Ins. : Temp:20.3℃;Humi:51%;Press:101.52kPa
Engineer : JBR
EUT : 2.4G Wireless Mouse
Power : DC 1.5V From Battery
M/N : M43
Test Mode : TX 2475MHz

	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Amp Factor (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2475.08	27.68	3.51	46.45	94.12	88.86	114.00	25.14	Peak
2	2483.50	27.70	3.51	46.44	44.01	38.78	74.00	35.22	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss - Amp Factor + Reading.
2. Margin= Limit - Emission Level.
3. The emission levels that are 20dB below the official limit are not reported.

5. 20DB BANDWIDTH

5.1. Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

5.2. Test Setup

5.3. Spectrum Analyzer Setting

Spectrum Parameters	Setting
RBW	1%~5% OBW
VBW	3×RBW
Span	two times and five times the OBW
Sweep Time	Auto
Detector	Peak
Trace Mode	Max Hold

5.4. Test Procedure

a. Connect EUT antenna terminal to the spectrum analyzer with RF cable.
b. Spectrum analyzer setting parameters in accordance with section 5.3.
c. Set the EUT transmit continuously with maximum output power.
d. Allow trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.
e. Repeat above procedures until all modes and channels were measured.
f. Record the results in the test report.

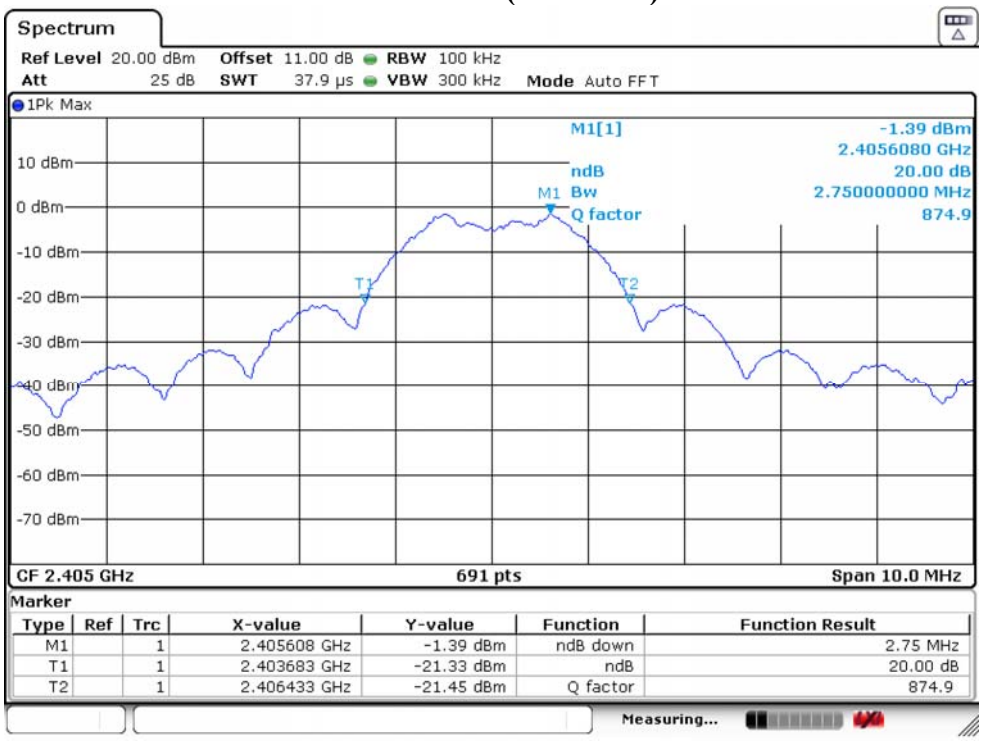
5.5. Test Condition

Temperature	20.3℃	Relative Humidity	51%	Test Voltage	DC 1.5V

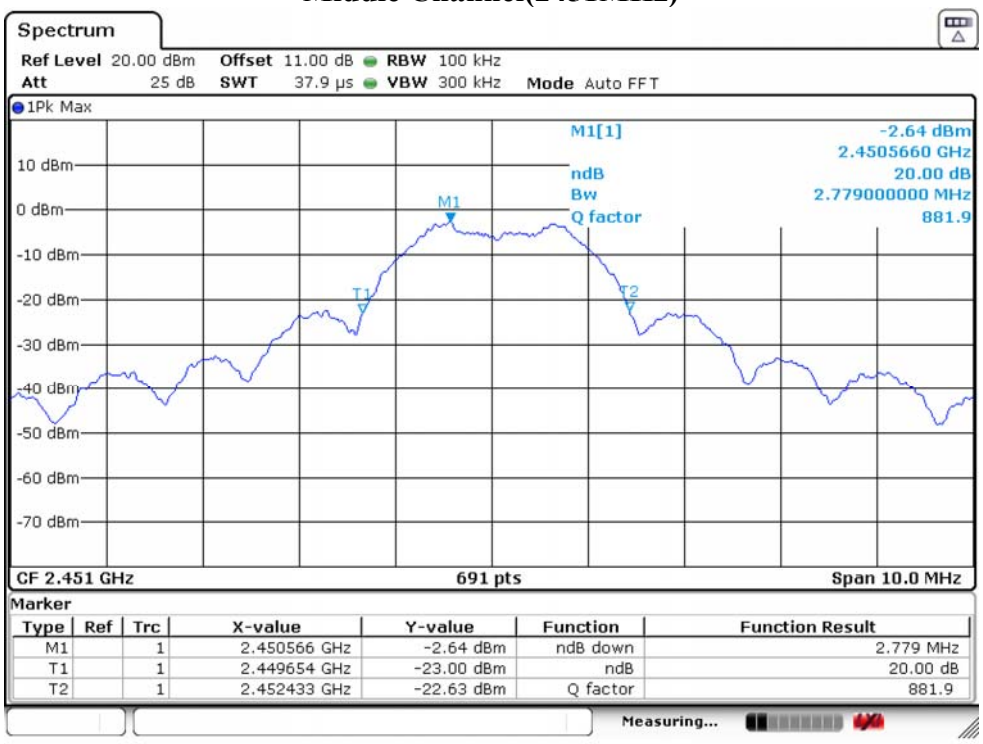
5.6. Test Result

Test Frequency (MHz)	20dB Bandwidth (MHz)	Result
2405	2.750	Pass
2451	2.779	Pass
2475	2.779	Pass

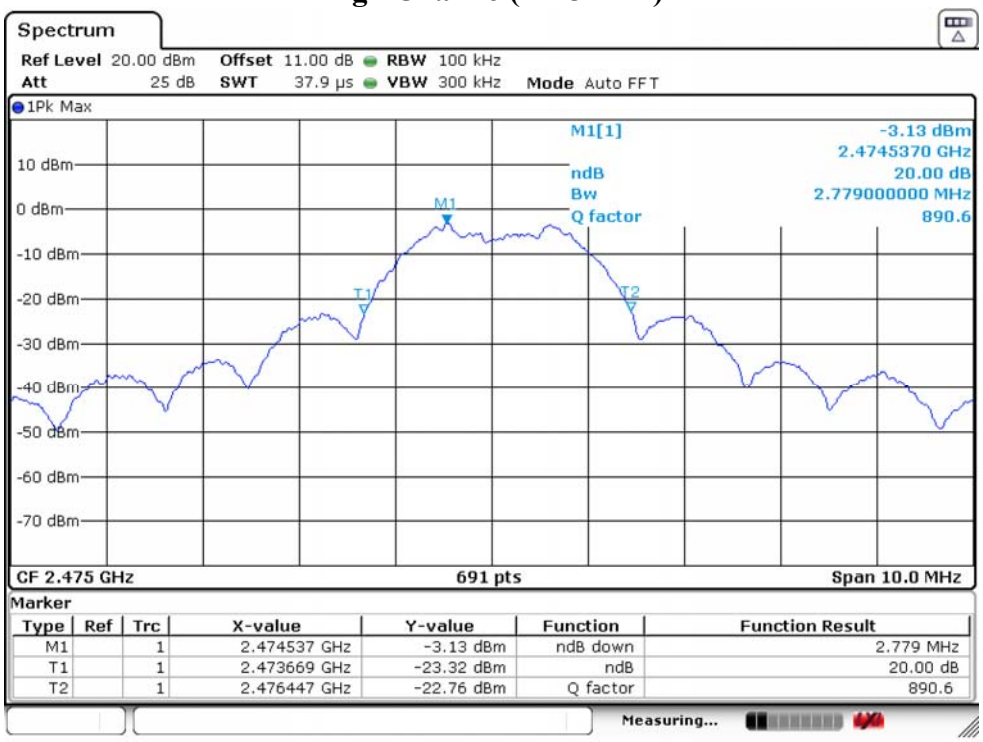
Low Channel(2405MHz)



Middle Channel(2451MHz)



High Channel(2475MHz)



6. ANTENNA REQUIREMENTS

6.1. Limit

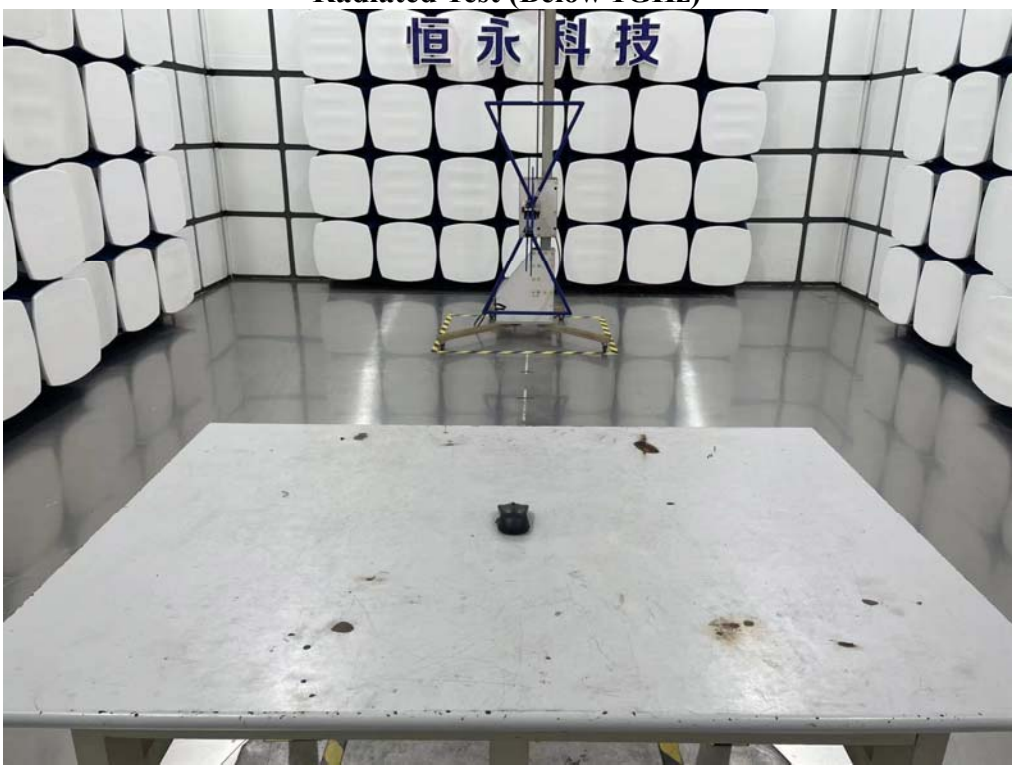
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

6.2. Test Result

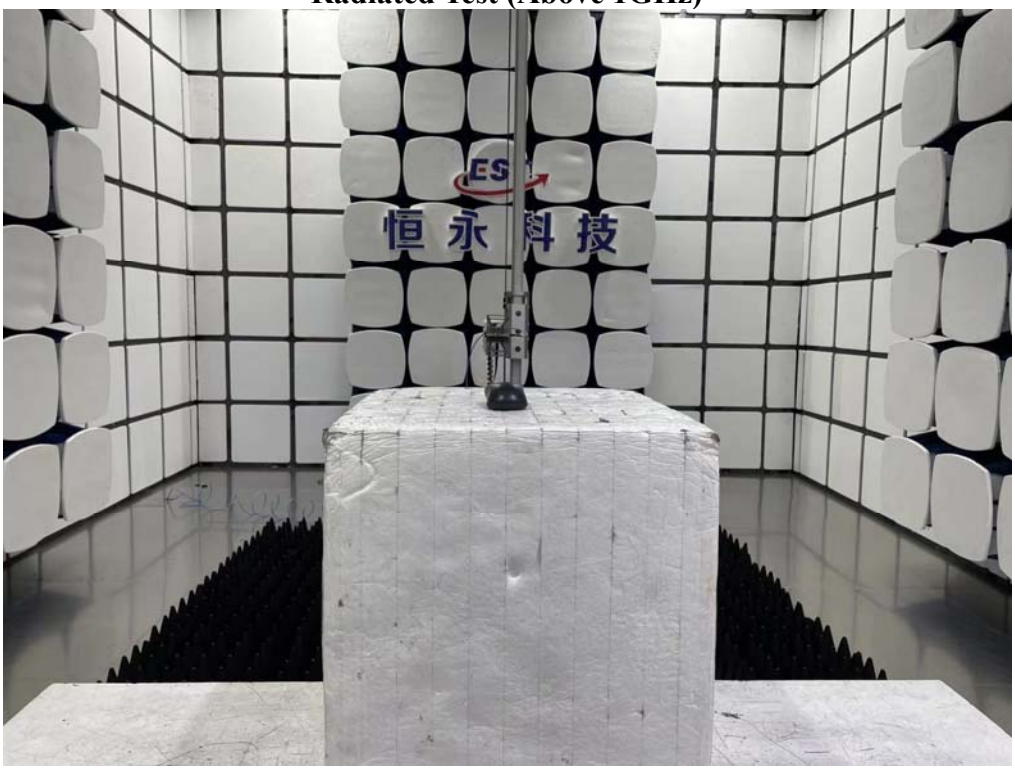
The antennas used for this product is PCB antenna ,so compliance with antenna requirements.
(Please refer to the EUT photo for details)

7. TEST SETUP PHOTO

Radiated Test (Below 1GHz)



Radiated Test (Above 1GHz)



8. EUT PHOTO

External Photos

M/N: M43

External Photos

M/N: M43

External Photos

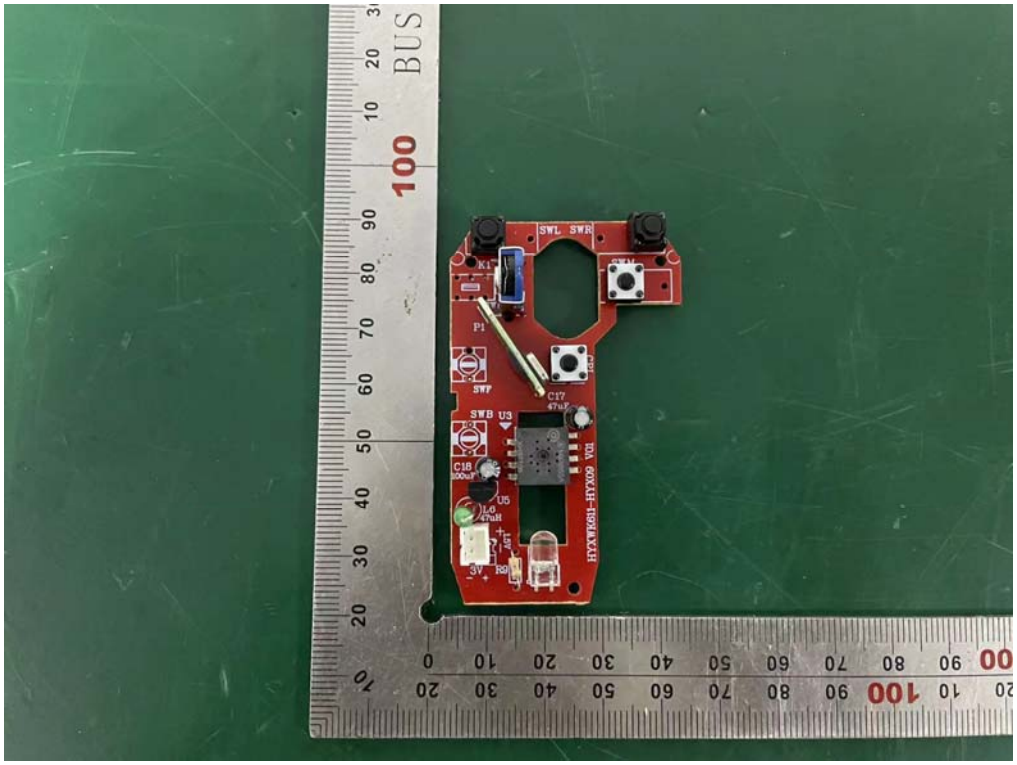
M/N: M43

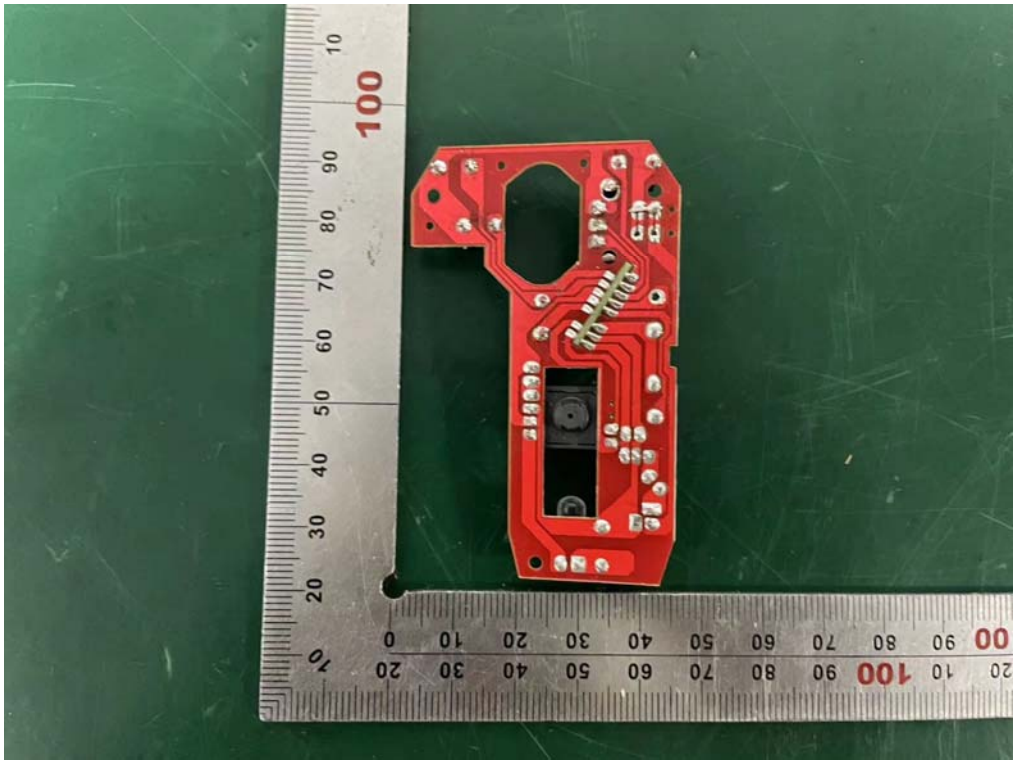
Internal Photos

M/N: M43

Internal Photos

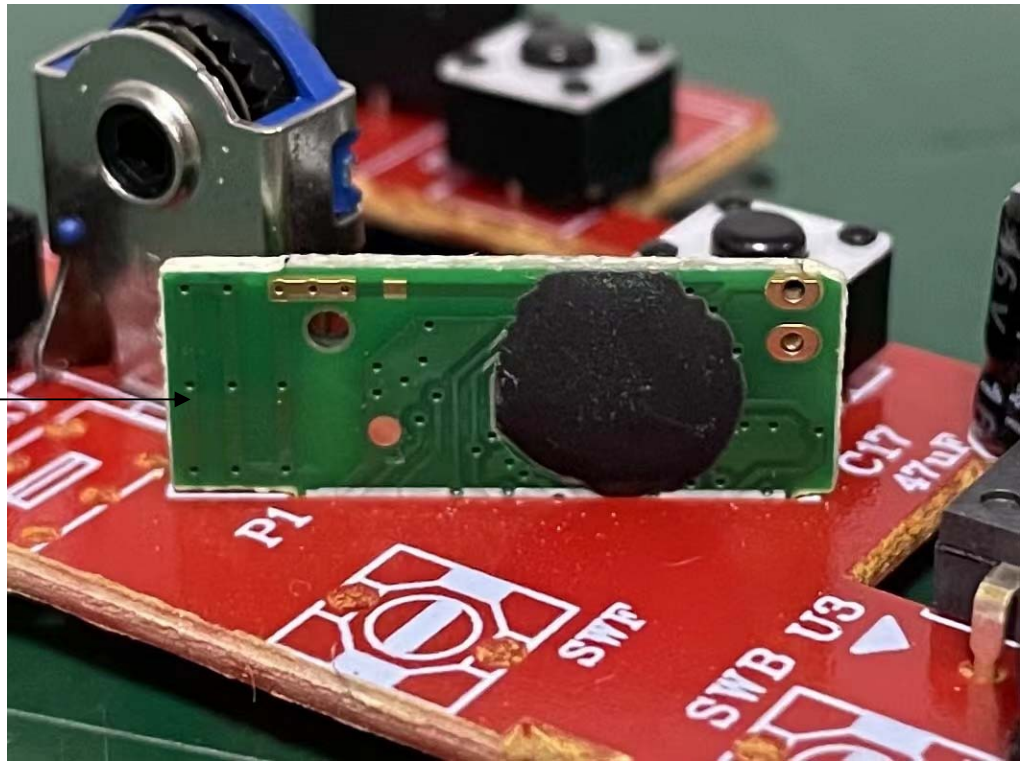
M/N: M43

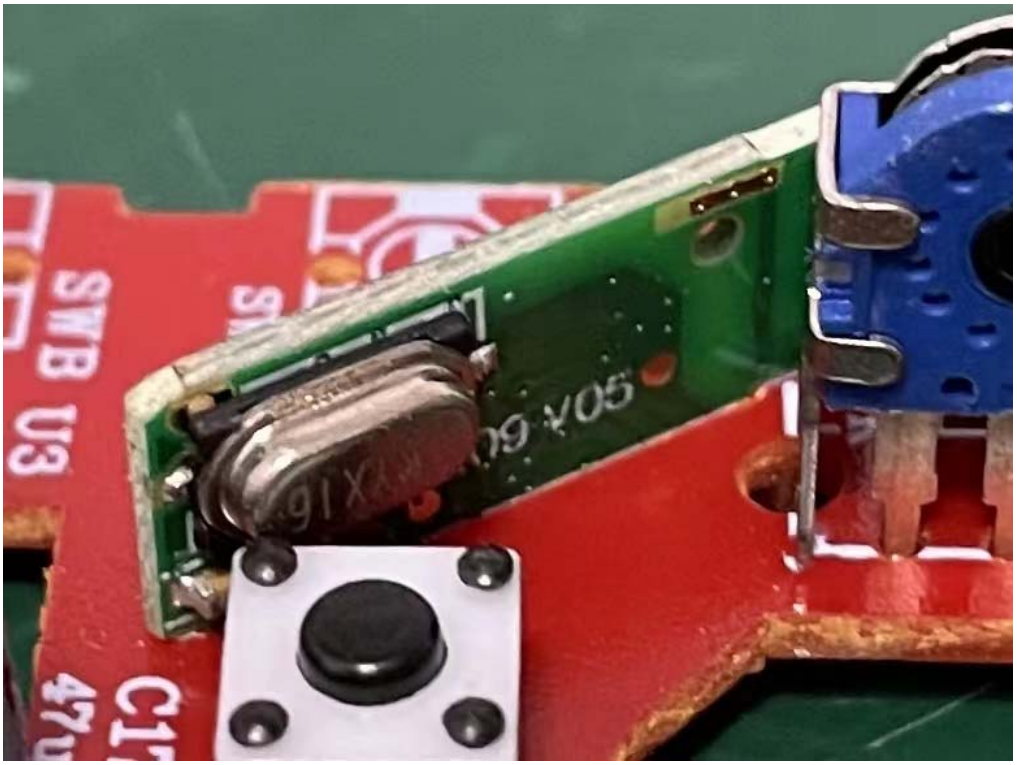




Internal Photos

M/N: M43





End of Test Report