FCC TEST REPORT

FCC ID: 2BCA3-M01

Product	:	Wireless Mouse
Model Name	:	M01
Brand	:	N/A
Report No.	:	PTC23071707501E-FC01

Prepared for

Shenzhen Leader-Union Technology Co., Ltd.

3F, No.90, Alley 5, Hekan Village, Ban Tian, LongGang District, Shenzhen, China

Prepared by

Precise Testing & Certification Co., Ltd.

Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

1 TEST RESULT CERTIFICATION

Applicant's name	:	Shenzhen Leader-Union Technology Co., Ltd.
Address	:	3F, No.90, Alley 5, Hekan Village, Ban Tian, LongGang District, Shenzhen, China
Manufacture's name	:	Shenzhen Leader-Union Technology Co., Ltd.
Address	:	3F, No.90, Alley 5, Hekan Village, Ban Tian, LongGang District, Shenzhen, China
Product name	:	Wireless Mouse
Model name	:	M01
Standards	:	FCC Part15 Subpart C, Paragraph 15.249
Test procedure	:	ANSI C63.10: 2013
Test Date	:	Jul. 26, 2023 to Jul. 31, 2023
Date of Issue	:	Aug. 07, 2023
Test Result	:	Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.
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Test Engineer:

Simon Pu / Engineer

Technical Manager:

Ronnie Liu / Manager

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2 Test Summary

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

Remark:N/A

2.1 Test Site

Precise Testing & Certification Co., Ltd.

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A

FCC Designation Number: CN1219

3 General Information

3.1 General Description of E.U.T.

Product Name	:	Wireless Mouse
Model Name	:	M01
Operation Frequency	:	2402-2480MHz
Modulation	:	GFSK
Number of Channels	:	40
Antenna installation	:	PCB antenna
Antenna Gain	:	0dBi
Power supply	:	Battery : AA(DC1.5 V)

3.2 Channel List

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The details of test channels and bandwidth were for RF conductive measurement.

Channel List:

1CH	**2402 MHz**	**21CH**	2442 MHz
2CH	2404 MHz	**22CH**	2444 MHz
3CH	2406 MHz	**23CH**	2446 MHz
4CH	2408 MHz	**24CH**	2448 MHz
5CH	2410 MHz	**25CH**	2450 MHz
6CH	2412 MHz	**26CH**	2452 MHz
7CH	2414 MHz	**27CH**	2454 MHz
8CH	2416 MHz	**28CH**	2456 MHz
9CH	2418 MHz	**29CH**	2458 MHz
10CH	2420 MHz	**30CH**	2460 MHz
11CH	2422 MHz	**31CH**	2462 MHz
12CH	2424 MHz	**32CH**	2464 MHz
13CH	2426 MHz	**33CH**	2466 MHz
14CH	2428 MHz	**34CH**	2468 MHz
15CH	2430 MHz	**35CH**	2470 MHz
16CH	2432 MHz	**36CH**	2472 MHz
17CH	2434 MHz	**37CH**	2474 MHz
18CH	2436 MHz	**38CH**	2476 MHz
19CH	2438 MHz	**39CH**	2478 MHz
20CH	**2440 MHz**	**40CH**	**2480 MHz**

Note:

1. Test of channel was included the lowest 2402MHz, middle 2440MHz and highest frequency 2480MHz in highest data rate and to perform the test, then record on this report.
2. EUT used the new batteries during test.

4 Equipment During Test

4.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	Calibration cycle
MXG Signal Analyzer	Agilent	N9020A	SER MY5111038	10Hz-30GHz	Aug. 21, 2023	1 year
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Aug. 21, 2023	1 year
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Aug. 21, 2023	1 year
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Aug. 21, 2023	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	Calibration cycle
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Aug. 21, 2023	1 year
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Aug. 21, 2023	1 year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Aug. 21, 2023	1 year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Aug. 21, 2023	1 year
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Aug. 21, 2023	1 year
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Aug. 21, 2023	1 year
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Aug. 21, 2023	1 year
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Aug. 21, 2023	1 year
Horn Antenna	SCHWARZBECK	BBHA 9170	9170-181	14GHz-40GHz	Aug. 21, 2023	1 year
Amplifier	SCHWARZBECK	BBV 9721	9721-205	18GHz-40GHz	Aug. 21, 2023	1 year
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Aug. 21, 2023	1 year
RF Cable	R&S	R204	R21X	1GHz-40GHz	Aug. 21, 2023	1 year

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	Calibration cycle
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Aug. 21, 2023	1 year
Artificial Mains Network	Rohde&Schwarz	ENV216	102453	9KHz-300MHz	Aug. 21, 2023	1 year
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Aug. 21, 2023	1 year

4.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	$\pm 1 \times 10^{-6}$
Bandwidth	$\pm 1.5 \times 10^{-6}$
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB
Radiated Emission(9KHz~30MHz)	±3.15dB

4.3 Description of Support Units

Equipment	Model No.	Series No.
NOTEBOOK	TPN-C126	N/A

5 Conducted Emission

Test Requirement	:	FCC CFR 47 Part 15 Section 15.207
Test Method	:	ANSI C63.10: 2013
Test Result	:	PASS
Frequency Range	:	150kHz to 30MHz
Class/Severity	:	Class B

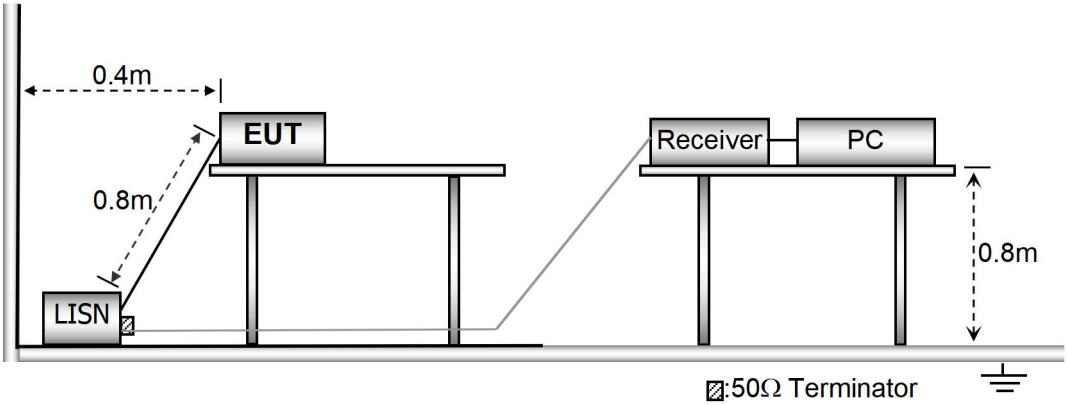
5.1 E.U.T. Operation

Operating Environment :

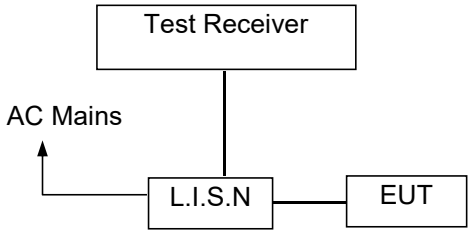
Temperature	:	25.5 °C
Humidity	:	51 % RH
Atmospheric Pressure	:	101.2kPa

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.



5.3 Test SET-UP (Block Diagram of Configuration)



5.4 Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

5.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:
1. The lower limit shall apply at the transition frequencies
2.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

5.6 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.7 Conducted Emission Test Result

N/A

Not applicable for equipment operated with DC power supply.

6 Radiated Emission and Band Edge

6.1 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.

6.2 Test Setup

Figure 1. Below 30MHz

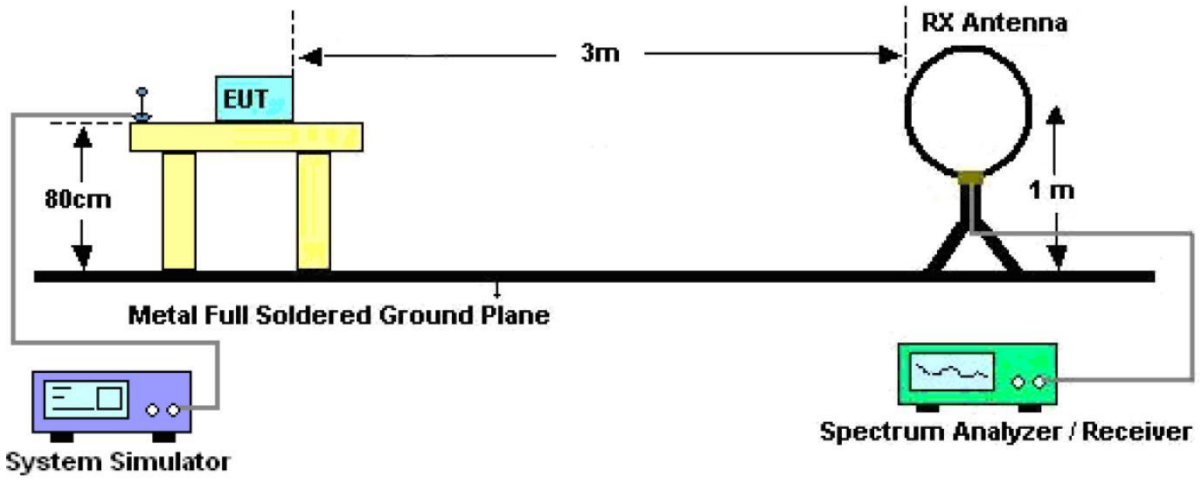


Figure 2. 30MHz to 1GHz

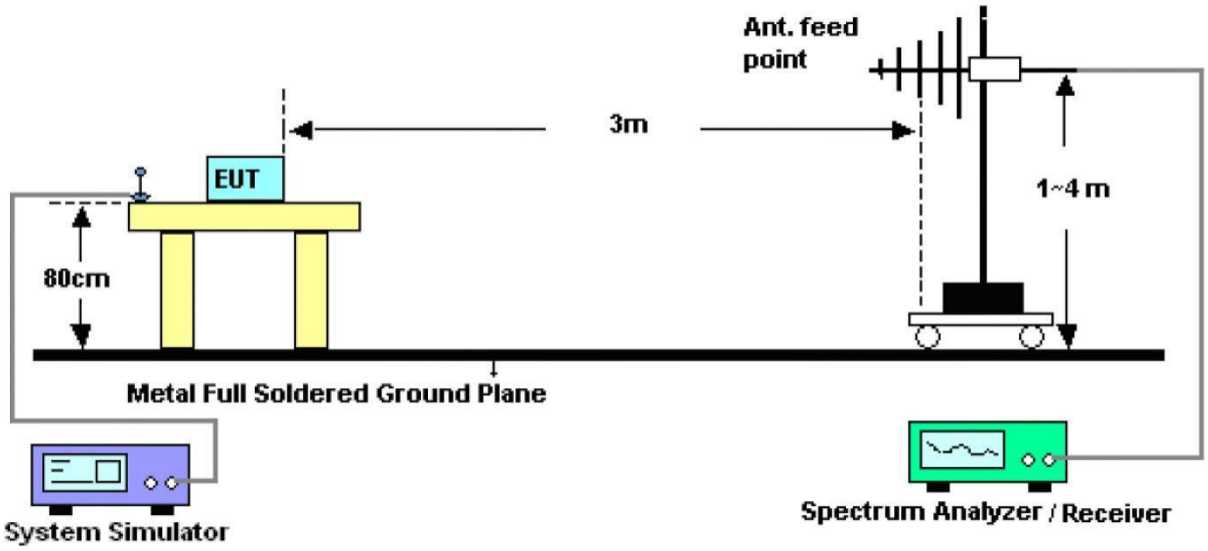
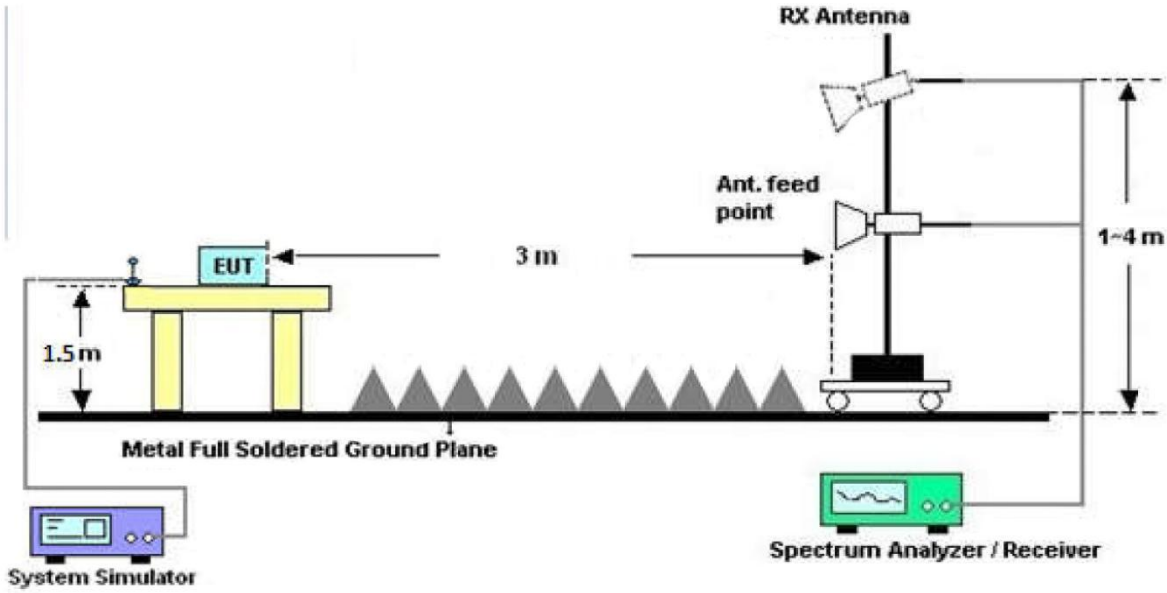


Figure 3. Above 1 GHz



6.3 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.

6.4 Test Data

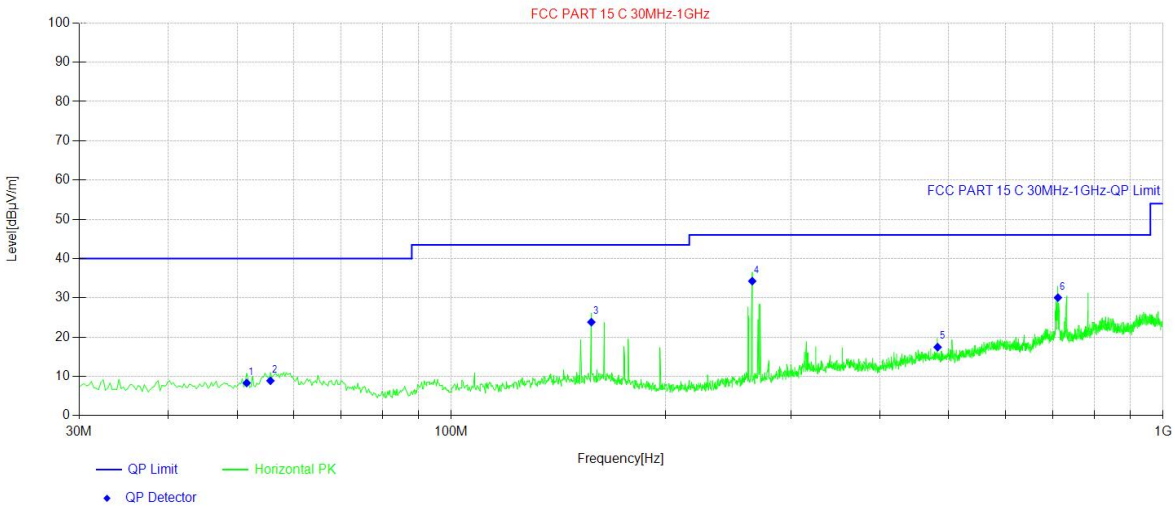
PASS

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 channel which is the worst case, only the worst case is recorded in the report

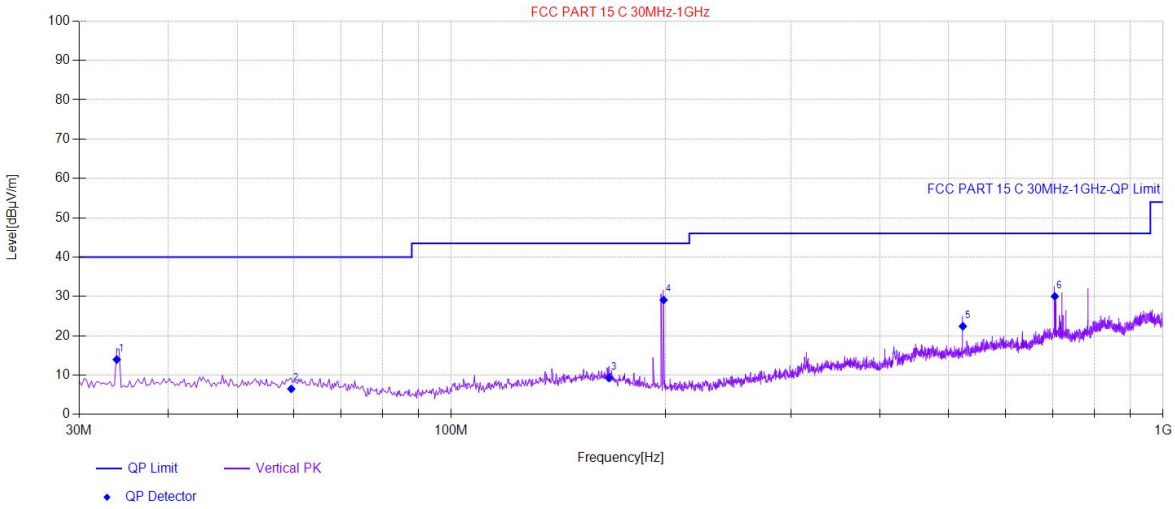
Test plot for Horizontal



Final Data List[QP]								
NO.	Freq. [MHz]	QP Reading [dBµV/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity	Verdict
1	51.58	26.09	-17.77	8.32	40.00	31.68	Horizontal	PASS
2	55.71	26.81	-17.92	8.89	40.00	31.11	Horizontal	PASS
3	157.31	39.79	-15.97	23.82	43.50	19.68	Horizontal	PASS
4	264.74	50.81	-16.55	34.26	46.00	11.74	Horizontal	PASS
5	482.26	28.71	-11.26	17.45	46.00	28.55	Horizontal	PASS
6	711.67	36.4	-6.34	30.06	46.00	15.94	Horizontal	PASS

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Test plot for Vertical



Final Data List[QP]								
NO.	Freq. [MHz]	QP Reading [dBµV/m]	Factor [dB]	QP Value [dBµV/m]	QP Limit [dBµV/m]	QP Margin [dB]	Polarity	Verdict
1	33.88	32.08	-18.12	13.96	40.00	26.04	Vertical	PASS
2	59.59	24.33	-17.82	6.51	40.00	33.49	Vertical	PASS
3	166.53	25.32	-16.04	9.28	43.50	34.22	Vertical	PASS
4	198.78	47.85	-18.75	29.10	43.50	14.40	Vertical	PASS
5	523.25	32.47	-10.05	22.42	46.00	23.58	Vertical	PASS
6	704.64	36.51	-6.49	30.02	46.00	15.98	Vertical	PASS

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Test Frequency 1GHz-25GHz

Test Mode: 1CH (Low channel)									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Detector
2402.0000	94.38	31.12	2.18	35.33	92.35	114	-21.65	V	Peak
2402.0000	81.37	31.12	2.18	35.33	79.74	94	-14.26	V	AVG
4804.0000	49.81	34.01	2.58	34.65	51.75	74	-22.25	V	Peak
4804.0000	37.12	34.01	2.58	34.65	39.45	54	-14.55	V	AVG
7206.0000	46.10	36.16	2.97	35.07	50.16	74	-23.84	V	Peak
7206.0000	36.89	36.16	2.97	35.07	37.98	54	-16.02	V	AVG
2402.0000	92.05	31.12	2.18	35.33	90.02	114	-23.98	H	Peak
2402.0000	81.62	31.12	2.18	35.33	79.99	94	-14.01	H	AVG
4804.0000	49.60	34.01	2.58	34.65	51.54	74	-22.46	H	Peak
4804.0000	37.80	34.01	2.58	34.65	40.13	54	-13.87	H	AVG
7206.0000	46.81	36.16	2.97	35.07	50.87	74	-23.13	H	Peak
7206.0000	35.22	36.16	2.97	35.07	36.31	54	-17.69	H	AVG

Test Mode: 20CH (Middle channel)									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Detector
2440.0000	92.43	31.12	2.2	34.51	91.24	114	-22.76	V	Peak
2440.0000	84.65	31.22	2.2	34.51	83.56	94	-10.44	V	AVG
4880.0000	48.97	34.98	2.49	34.14	52.30	74	-21.7	V	Peak
4880.0000	37.61	34.98	2.49	34.14	40.94	54	-13.06	V	AVG
7320.0000	46.61	36.01	3.01	34.56	51.07	74	-22.93	V	Peak
7320.0000	36.36	36.01	3.01	34.56	40.82	54	-13.18	V	AVG
2440.0000	92.72	31.12	2.2	34.51	91.53	114	-22.47	H	Peak
2440.0000	84.90	31.12	2.2	34.51	83.71	94	-10.29	H	AVG
4880.0000	49.35	34.98	2.49	34.14	52.68	74	-21.32	H	Peak
4880.0000	37.14	34.98	2.49	34.14	40.47	54	-13.53	H	AVG
7320.0000	47.11	36.01	3.01	34.56	51.57	74	-22.43	H	Peak
7320.0000	36.41	36.01	3.01	34.56	40.87	54	-13.13	H	AVG

Test Mode: 40CH (High channel)									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Detector
2480.0000	95.49	31.65	2.23	36.07	93.30	114	-20.70	V	Peak
2480.0000	84.38	31.65	2.23	36.07	82.19	94	-11.81	V	AVG
4960.0000	49.15	35.06	2.6	34.93	51.88	74	-22.12	V	Peak
4960.0000	36.58	35.06	2.6	34.93	39.31	54	-14.69	V	AVG
7440.0000	46.40	36.19	3.12	35.11	50.60	74	-23.40	V	Peak
7440.0000	36.79	36.19	3.12	35.11	40.99	54	-13.01	V	AVG
2480.0000	93.04	31.65	2.23	36.07	90.85	114	-23.15	H	Peak
2480.0000	83.56	31.65	2.23	36.07	81.37	94	-12.63	H	AVG
4960.0000	48.75	35.06	2.6	34.93	51.48	74	-22.52	H	Peak
4960.0000	36.19	35.06	2.6	34.93	38.92	54	-15.08	H	AVG
7440.0000	46.04	36.19	3.12	35.11	50.24	74	-23.76	H	Peak
7440.0000	36.43	36.19	3.12	35.11	40.63	54	-13.37	H	AVG

Note: 1. The testing has been conformed to 10*2402MHz=24020MHz. 10*2440MHz=24400MHz. 10*2480MHz=24800MHz.

2. All other emissions more than 30dB below the limit.

3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Reading + Factor
Margin=Emission Level-Limit

Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

Test Mode: Low Channel 2402MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2390.00	40.53	29.15	3.41	34.01	39.08	74	-34.92	H	Peak
2400.00	57.88	29.16	3.43	34.01	56.46	74	-17.54	H	Peak
2390.00	40.77	29.15	3.41	34.01	39.32	74	-34.68	V	Peak
2400.00	56.08	29.16	3.43	34.01	54.66	74	-19.34	V	Peak
2390.00	34.97	29.15	3.41	34.01	33.52	54	-20.48	H	AV
2400.00	40.59	29.16	3.43	34.01	39.17	54	-14.83	H	AV
2390.00	36.01	29.15	3.41	34.01	34.56	54	-19.44	V	AV
2400.00	43.50	29.16	3.43	34.01	42.08	54	-11.92	V	AV

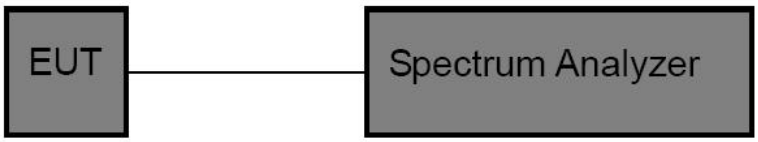
Test Mode: High Channel 2480MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2483.50	46.82	29.28	3.53	34.03	45.60	74	-28.40	H	Peak
2500.00	41.29	29.30	3.56	34.03	40.12	74	-33.88	H	Peak
2483.50	47.88	29.28	3.53	34.03	46.66	74	-27.34	V	Peak
2500.00	41.15	29.30	3.56	34.03	39.98	74	-34.02	V	Peak
2483.50	39.24	29.28	3.53	34.03	38.02	54	-15.98	H	AV
2500.00	33.03	29.30	3.56	34.03	31.86	54	-22.14	H	AV
2483.50	39.35	29.28	3.53	34.03	38.13	54	-15.87	V	AV
2500.00	33.25	29.30	3.56	34.03	32.08	54	-21.92	V	AV

7 20dB Bandwidth Test

7.1 Test Standard and Limit

Test Standard	FCC Part15 C Section 15.249

7.2 Test Setup



7.3 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 = 30kHz, VBW≥3*RBW =100kHz,

Detector= Average

Trace mode= Max hold.

Sweep- auto couple.

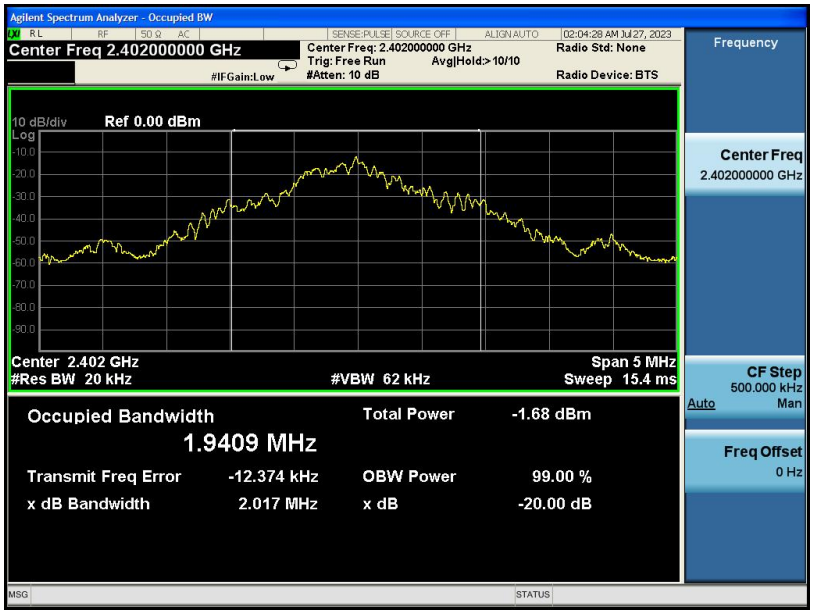
4. Mark the peak frequency and –20dB (upper and lower) frequency.

5. Repeat until all the rest channels are investigated.

7.4 Test Data

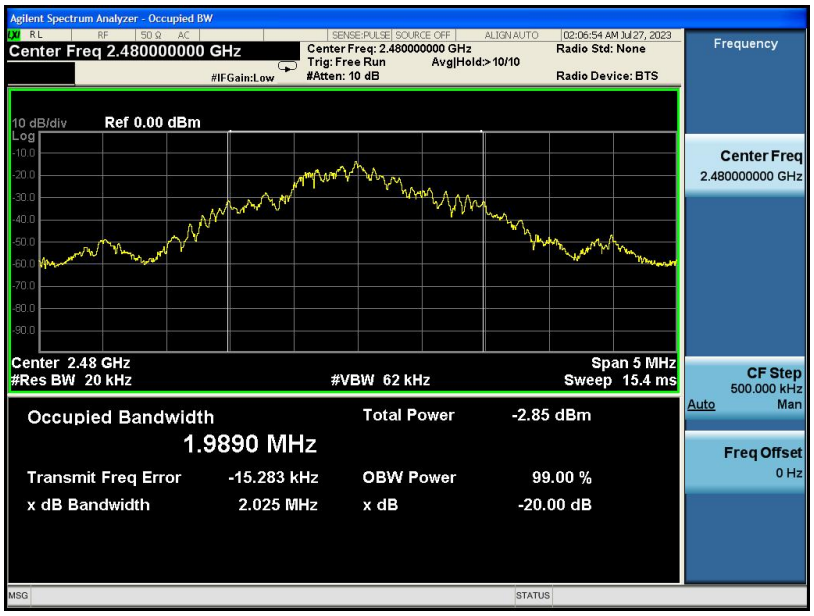
Test Item	:	20dB Bandwidth	Test Mode	:	TX
Test Voltage	:	DC 1.5V	Temperature	:	22.4℃
Test Result	:	PASS	Humidity	:	55%RH

Frequency (MHz)	Bandwidth (MHz)	Result
2402MHZ	2.017	PASS
2440MHZ	2.023	PASS
2480MHZ	2.025	PASS



Test Mode: Low

Test Mode: Middle



Test Mode: High

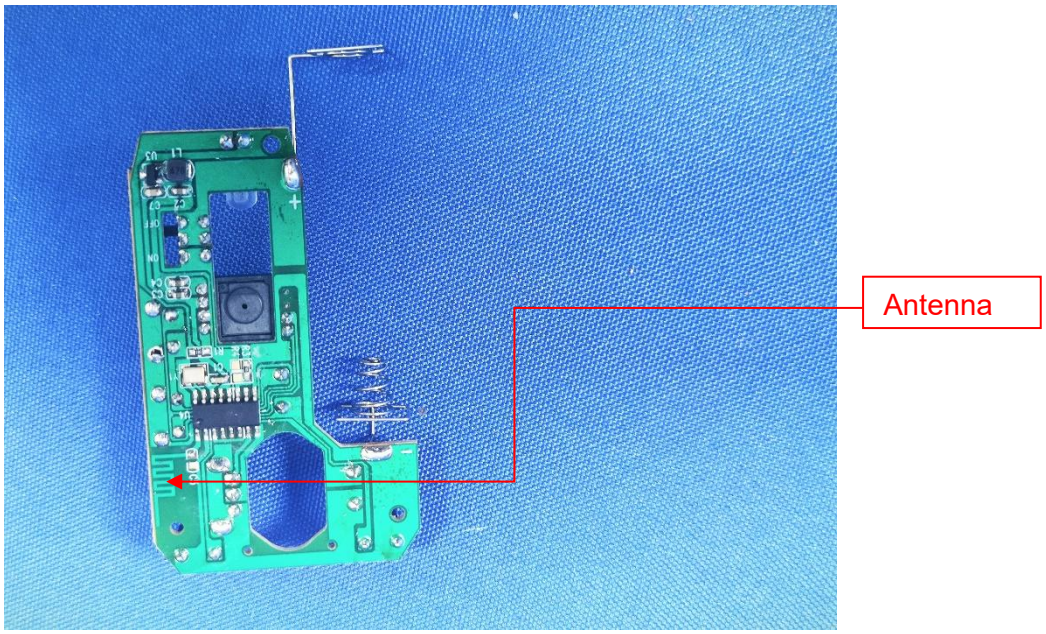
8 Antenna Requirement

8.1 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.

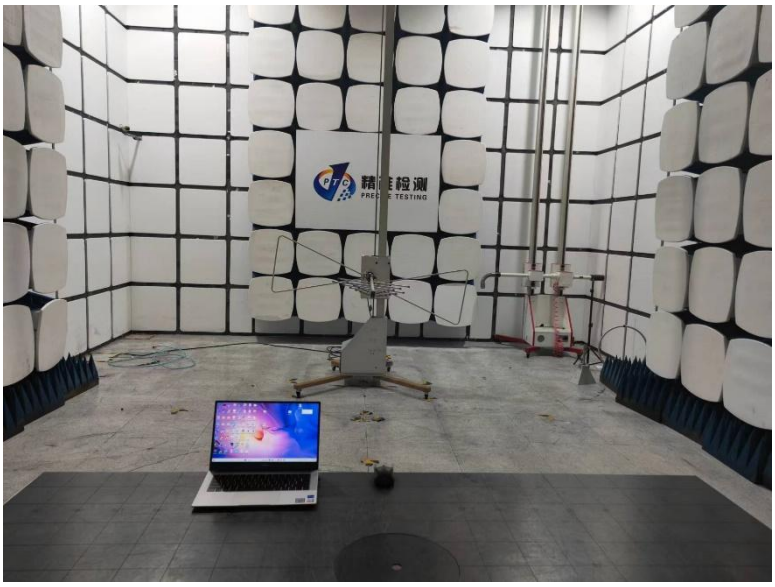
8.2 Antenna Connected Construction

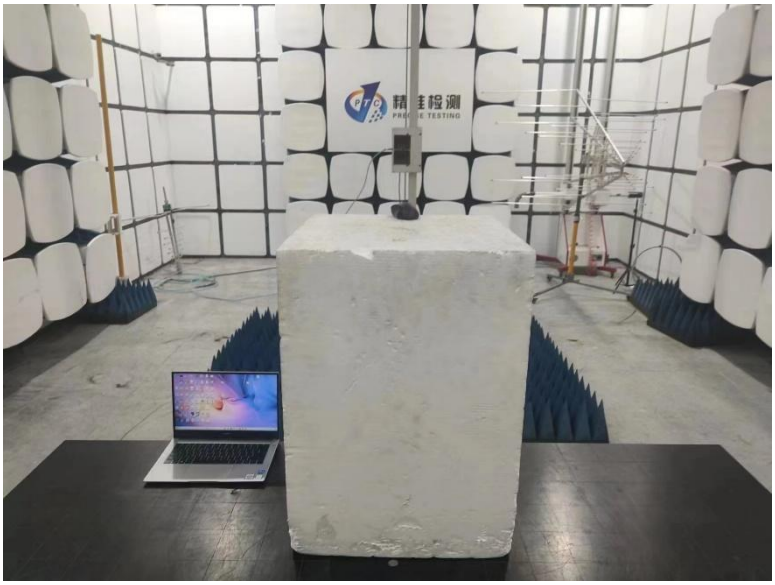
The antenna is a PCB Antenna which permanently attached, and the best case gain of the antenna is 0 dBi. It complies with the standard requirement.



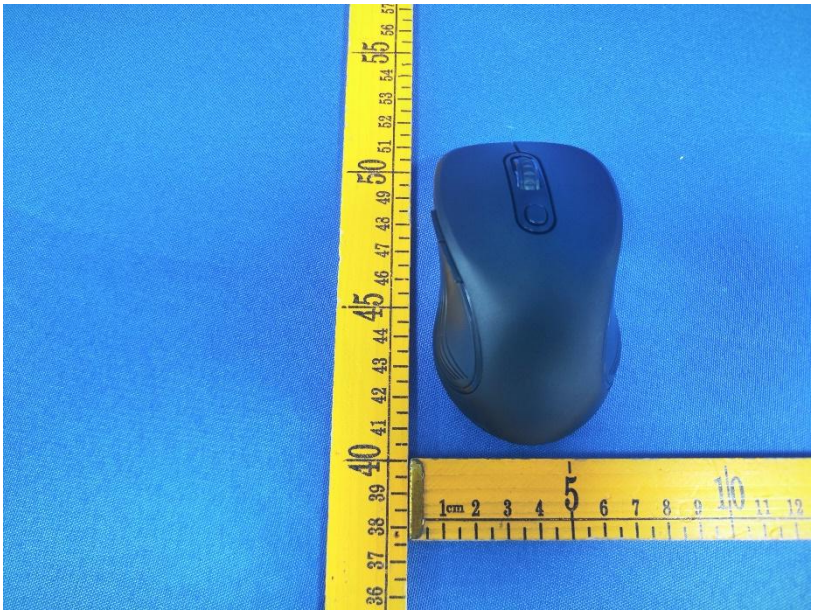
9 APPENDIX I -- TEST SETUP PHOTOGRAPH

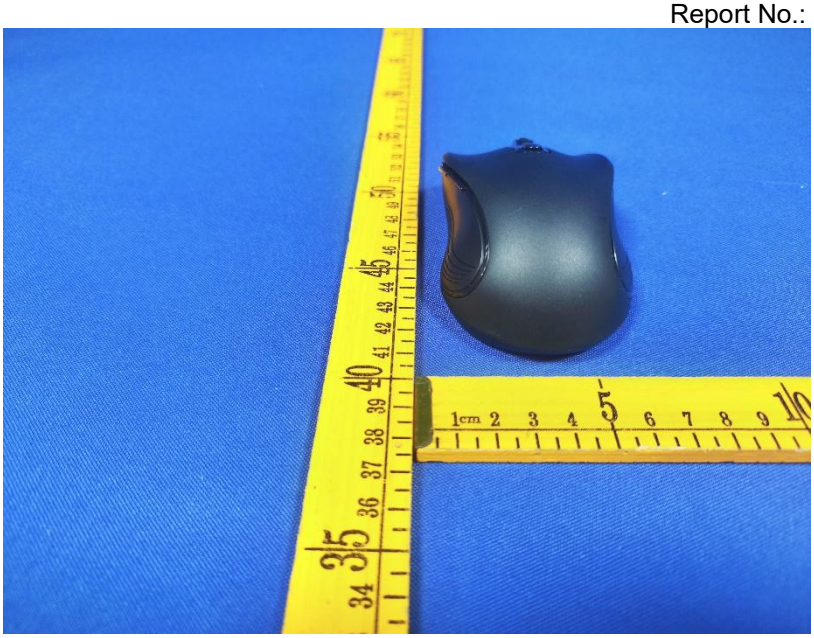
RADIATED EMISSION TEST



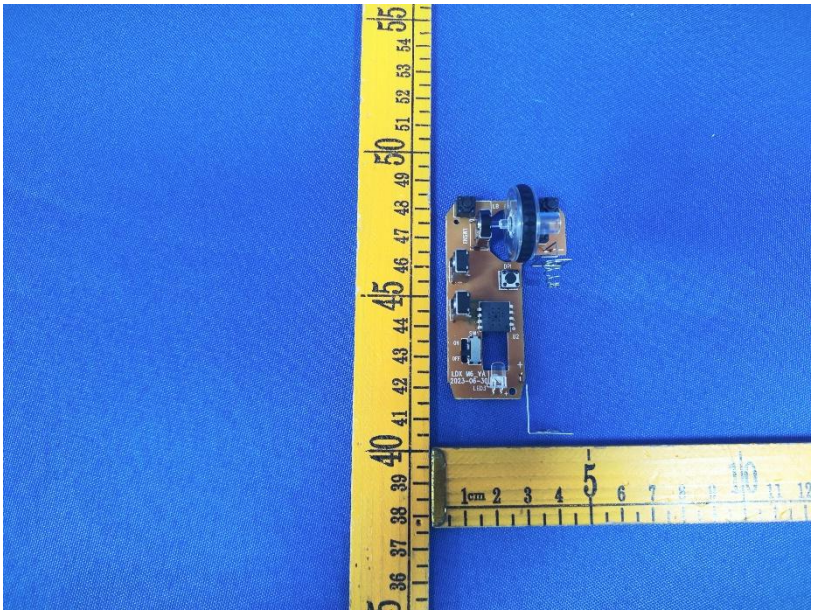


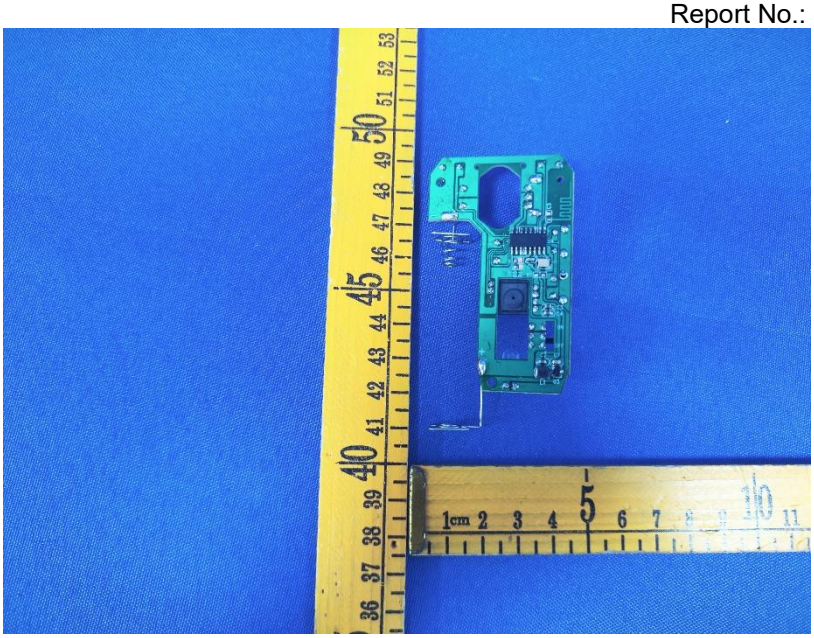
10 APPENDIX II -- EXTERNAL PHOTOGRAPH

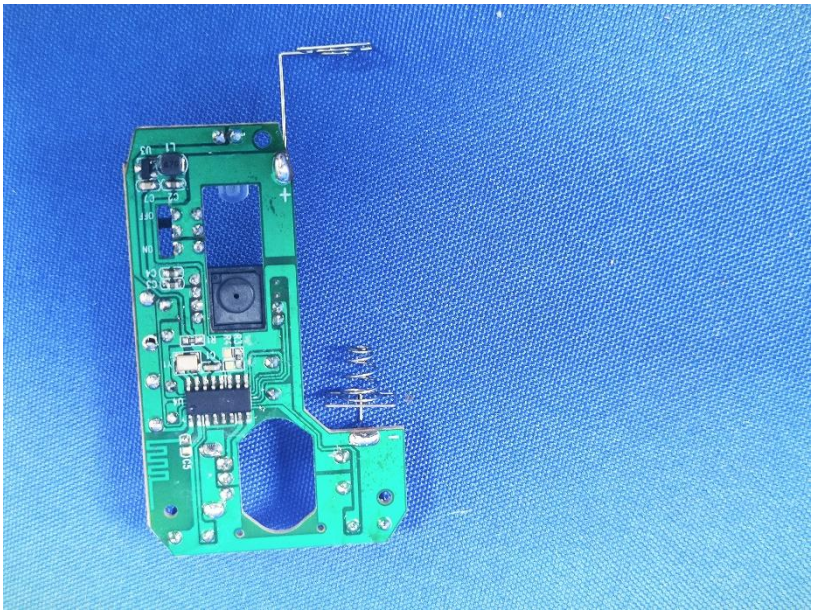


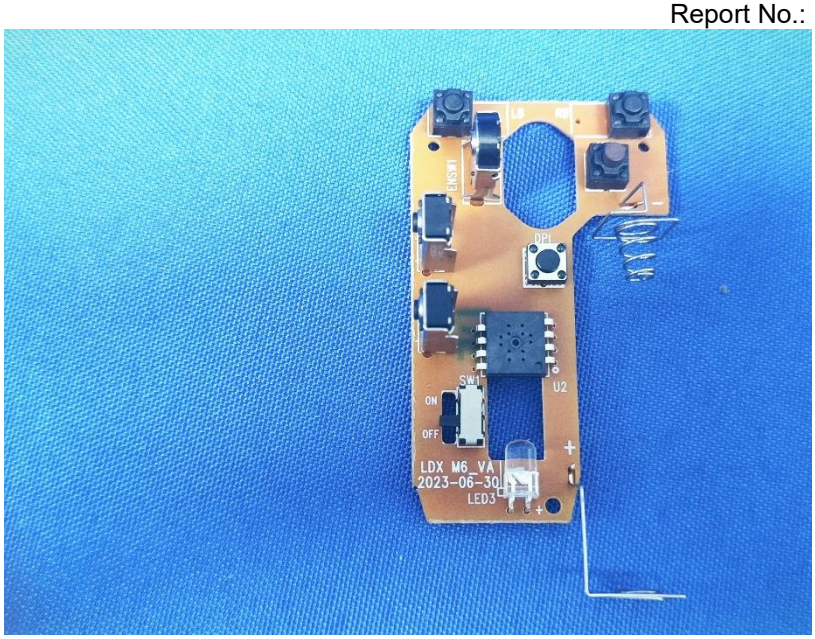


11 APPENDIX III -- INTERNAL PHOTOGRAPH









********THE END REPORT********