



# FCC RADIO TEST REPORT

**FCC ID: 2AWKK-KBM**

**Product:** Multi-Purpose Keyboard Mouse

**Trade Name:** N/A

**Model Name:** KBM-MMXX-0

**Serial Model:** NA

**Report No.:** PTC20060102676E-FC01

## **Prepared for**

KeyWest Technologies LLC

P.O.Box 1582, Bowie, Maryland, 20717 ,USA

## **Prepared by**

DongGuan Precise testing & Certification Corp. Ltd

Building D, Baoding Technology Park, Guangming Road 2, Guangming  
Community, Dongcheng District, Dongguan, Guangdong, China



## TEST RESULT CERTIFICATION

**Applicant's name**..... : KeyWest Technologies LLC  
**Address**..... : P.O.Box 1582, Bowie, Maryland, 20717 ,USA  
**Manufacture's Name**..... : ShenZhen Lamye Technology Co., Ltd.  
**Address**..... : Room407, Yangnan Building, No 272 Chuang Ye 2 Road, Baoan District, Shenzhen, China

### Product description

**Product name**..... : Multi-Purpose Keyboard Mouse  
**Trade Mark**..... : N/A  
**Model and/or type reference** . : KBM-MMXX-0

**Standards**..... : FCC Rules and Regulations Part 15 Subpart C Section 15.249,  
ANSI C63.10: 2013

This device described above has been tested by DongGuan Precise testing & Certification Corp. Ltd, 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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**Date of Test**..... :

**Date (s) of performance of tests**..... : Jun. 1 ~ 05, 2020

**Date of Issue**..... : Jun. 08, 2020

**Test Result**..... : Pass

Prepared by:

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Leo Yang / Engineer

Reviewer:

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Chris Du / Manager



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## 1. TEST SUMMARY

### 1.1 TEST PROCEDURES AND RESULTS

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Emissions	15.205(a)/15.209/15.249(d)	PASS
Bandwidth	15.249	PASS
Emissions from out of band	15.249	PASS
Antenna Requirement	15.203	PASS

### 1.2 TEST FACILITY

Test Firm : DongGuan Precise testing & Certification Corp. Ltd

Address : Building D, Baoding Technology Park, Guangming Road 2, Guangming Community, Dongcheng District, Dongguan, Guangdong, Chinaa

FCC Registration Number: CN1219

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1

### 1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty(9kHz-30MHz) = 3.08dB, k=2

Radiated emission expanded uncertainty(30MHz-1000MHz) = 4.42dB, k=2

Radiated emission expanded uncertainty(Above 1GHz) = 4.06dB, k=2

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	Multi-Purpose Keyboard Mouse
Trade Mark	N/A
Model Name	KBM-MMXX-0
Serial No.	N/A
Model Difference	N/A
FCC ID	2AWKK-KBM
Antenna Type	PCB Antenna
Antenna Gain	0dBi
Frequency Range	2406-2476MHz
Number of Channels	16CH
Modulation Type	GFSK
Power Source	Micro USB 5V or 3.7V from battery(AA, 3.7V)

Table for auxiliary equipment:

Equipment Description	Manufacturer	Model	S/N	Remark
Adapter	BI	BI05-050100	N/A	DC 5V/1A

## 2.2 Carrier Frequency of Channels

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2406	05	2424	09	2447	13	2467
02	2411	06	2429	10	2451	14	2469
03	2414	07	2433	11	2455	15	2473
04	2417	08	2436	12	2459	16	2476

## 2.3 Operation of EUT during testing

### Operating Mode

The mode is used: Transmitting mode

Low Channel: 2406MHz

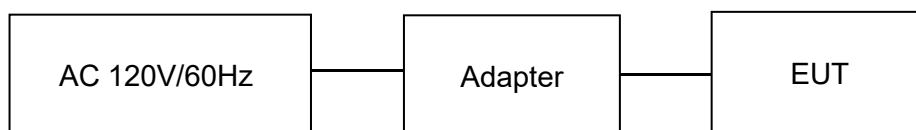
Middle Channel: 2436MHz

High Channel: 2476MHz

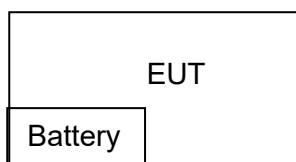
Test SW Version: RF Test\_v1.0

## 2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:



Operation of EUT during Radiation testing:





## 2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
CONDUCTED EMISSIONS TEST					
1	AMN	Schwarzbeck	NNLK8121	8121370	2020.09.09
2	AMN	ETS	3810/2	00020199	2020.09.09
3	EMI TEST RECEIVER	Rohde&Schwarz	ESCI	101210	2020.09.09
4	AAN	TESEQ	T8-Cat6	38888	2020.09.09
RADIATED EMISSION TEST					
1	EMI Test Receiver	Rohde&Schwarz	ESCI	101417	2020.09.18
2	Loop Antenna	Schwarzbeck	FMZB 1519	012	2020.09.18
3	Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	2020.09.18
4	Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	2020.09.18
5	Cable	Schwarzbeck	PLF-100	549489	2020.09.18
6	Spectrum Analyzer	Agilent	E4407B	MY45109572	2020.09.18
7	Horn Antenna	SCHWARZBECK	9120D	9120D-1246	2020.09.18
8	Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	2020.09.18
9	Cable	H+S	CBL-26	N/A	2020.09.18
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2020.09.18
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2020.09.18
12	Active Loop Antenna	Com-Power	AL-130R	10160009	2021.03.20
13	Power Meter	KEYSIGHT	N1911A	MY50520168	2021.03.20
Test software					
1	E3	Audix	6.101223a	N/A	N/A

### 3. CONDUCTED EMISSIONS TEST

#### 3.1 Conducted Power Line Emission Limit

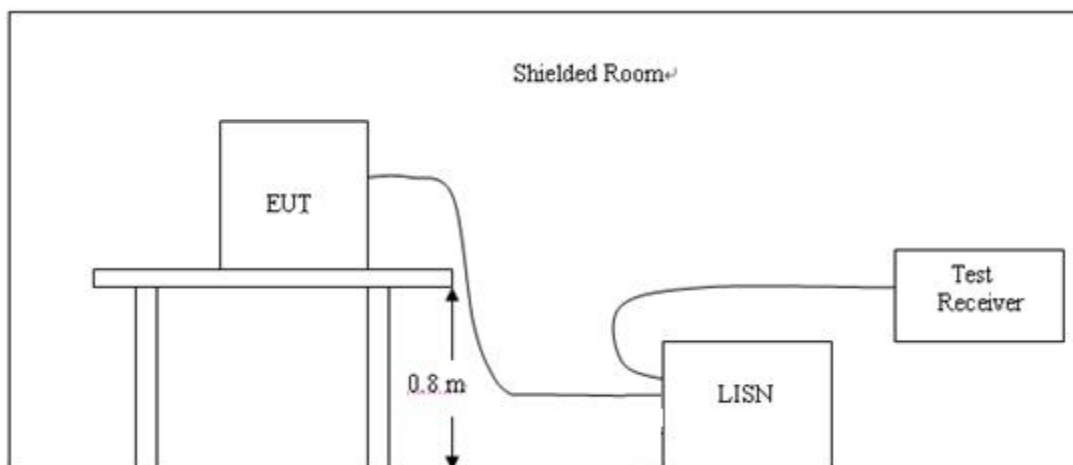
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage(dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15~0.50	79	66	66~56*	56~46*
0.50~5.00	73	60	56	46
5.00~30.0	73	60	60	50

\* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

#### 3.2 Test Setup



#### 3.3 Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

#### 3.4 Test Result

Pass

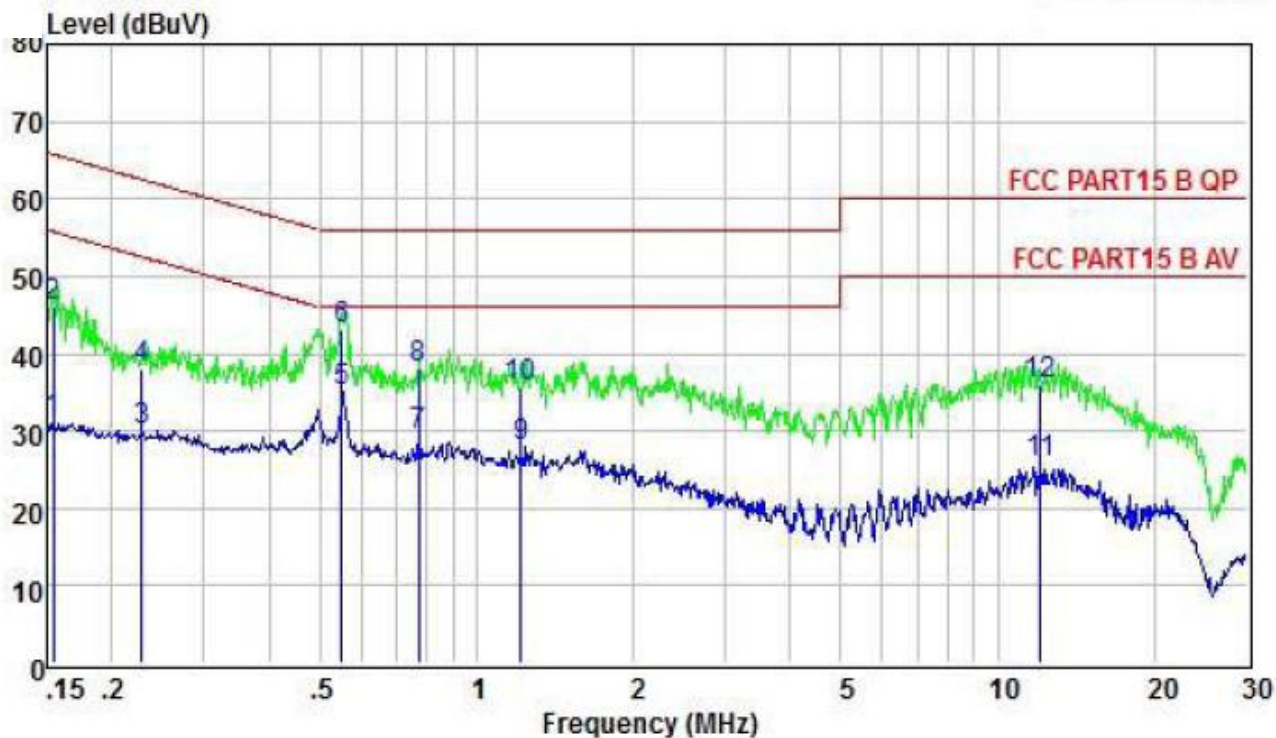
Remark:

1. All modes were tested at AC 120V and 240V, only the worst result of AC 120V was reported.
2. All modes of Low, Middle, and High channel were tested, only the worst result of High Channel was reported as below:





Temperature:	25°C	Relative Humidity:	48%
Test Date:	Jun. 02, 2020	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Line
Test Mode:	Transmitting mode of GFSK 2406MHz		

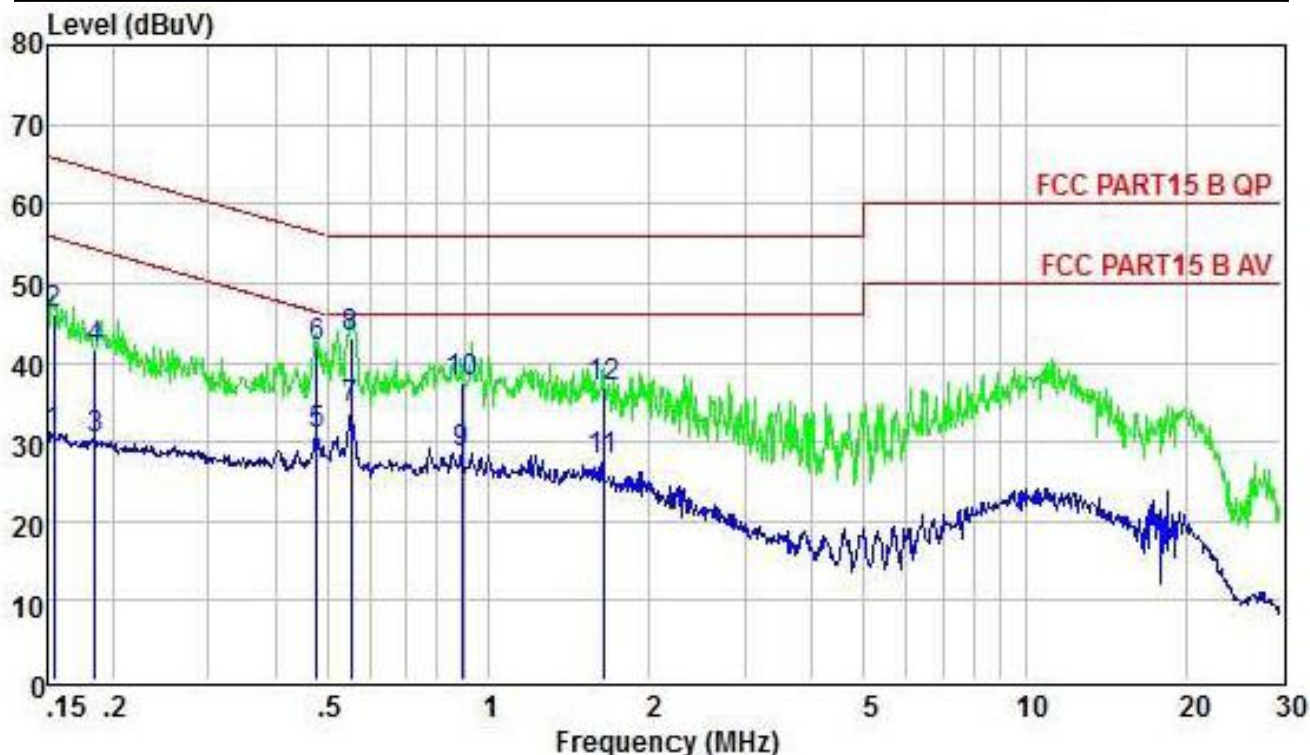


	Freq	Level	Limit	Over	Remark
	MHz	dBuV	dBuV	dB	
1	0.15	31.24	55.78	-24.54	Average
2	0.15	46.00	65.78	-19.78	QP
3	0.23	30.13	52.52	-22.39	Average
4	0.23	38.00	62.52	-24.52	QP
5	0.55	35.12	46.00	-10.88	Average
6	0.55	43.25	56.00	-12.75	QP
7	0.78	29.34	46.00	-16.66	Average
8	0.78	38.00	56.00	-18.00	QP
9	1.22	28.08	46.00	-17.92	Average
10	1.22	35.80	56.00	-20.20	QP
11	12.06	26.02	50.00	-23.98	Average
12	12.06	35.89	60.00	-24.11	QP

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.



Temperature:	25°C	Relative Humidity:	48%
Test Date:	Jun. 02, 2020	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Neutral
Test Mode:	Transmitting mode of GFSK 2406MHz		



	Freq	Level	Limit	Over	
	MHz	dBuV	Line	Limit	Remark
1	0.15	30.97	55.78	-24.81	Average
2	0.15	45.98	65.78	-19.80	QP
3	0.18	30.37	54.28	-23.91	Average
4	0.18	41.50	64.28	-22.78	QP
5	0.48	30.98	46.36	-15.38	Average
6	0.48	42.00	56.36	-14.36	QP
7	0.56	34.28	46.00	-11.72	Average
8	0.56	43.25	56.00	-12.75	QP
9	0.89	28.47	46.00	-17.53	Average
10	0.89	37.33	56.00	-18.67	QP
11	1.64	27.74	46.00	-18.26	Average
12	1.64	36.80	56.00	-19.20	QP

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

## 4. RADIATED EMISSION TEST

### 4.1 Radiation Limit

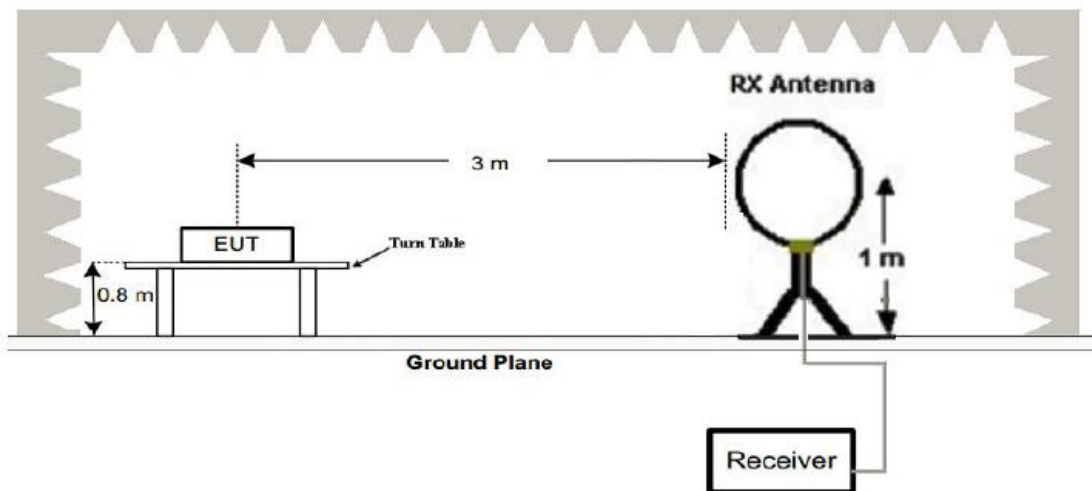
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

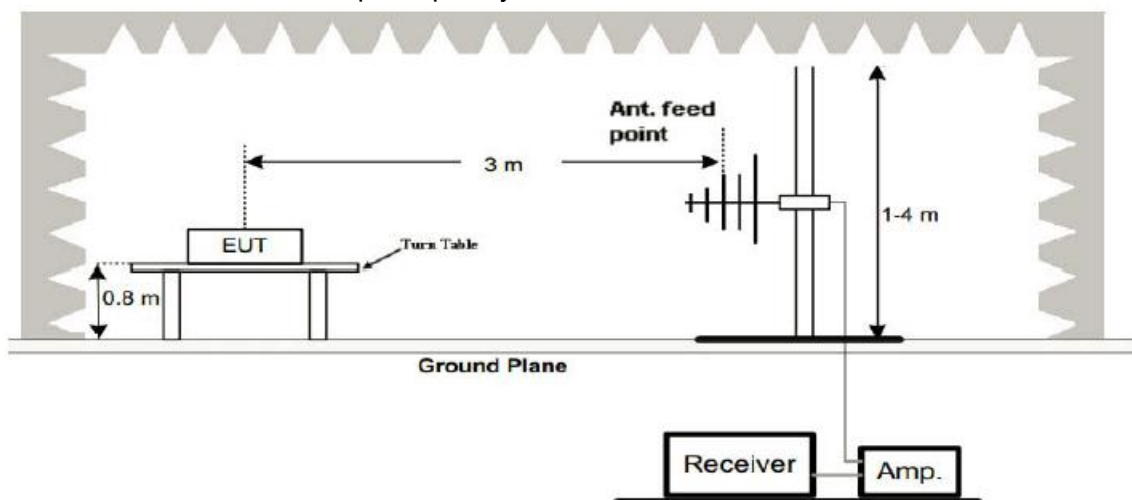
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

### 4.2 Test Setup

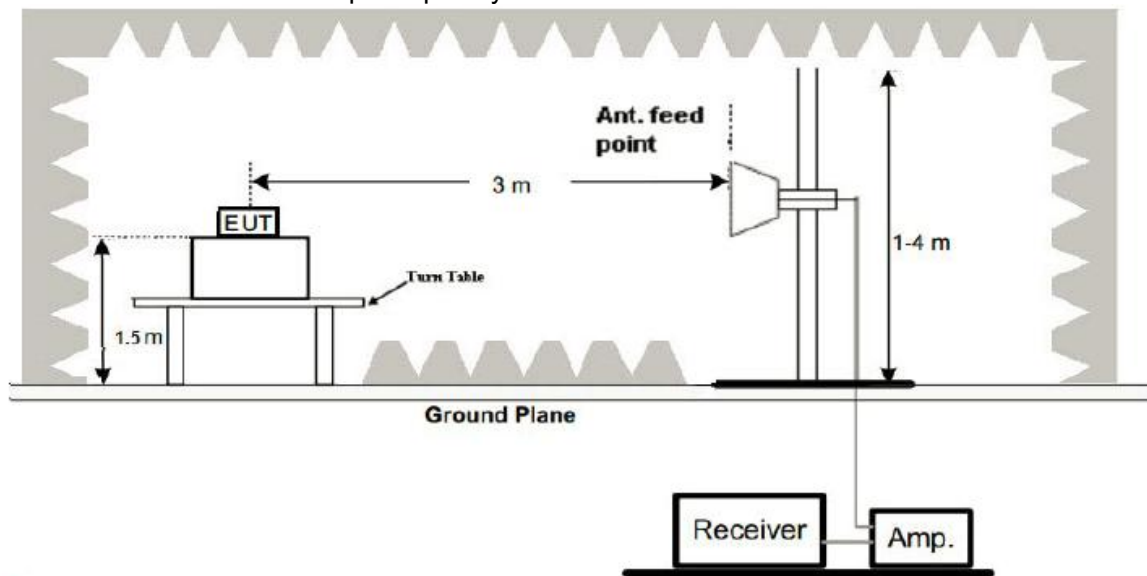
#### 1. Radiated Emission Test-Up Frequency Below 30MHz



#### 2. Radiated Emission Test-Up Frequency 30MHz~1GHz



### 3. Radiated Emission Test-Up Frequency Above 1GHz



### 4.3 Test Procedure

- Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
- The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until the measurements for all frequencies are complete.
- The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).
- The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

Note:

For battery operated equipment, the equipment tests shall be performed using a new battery.

### 4.4 Test Result

PASS

Remark:

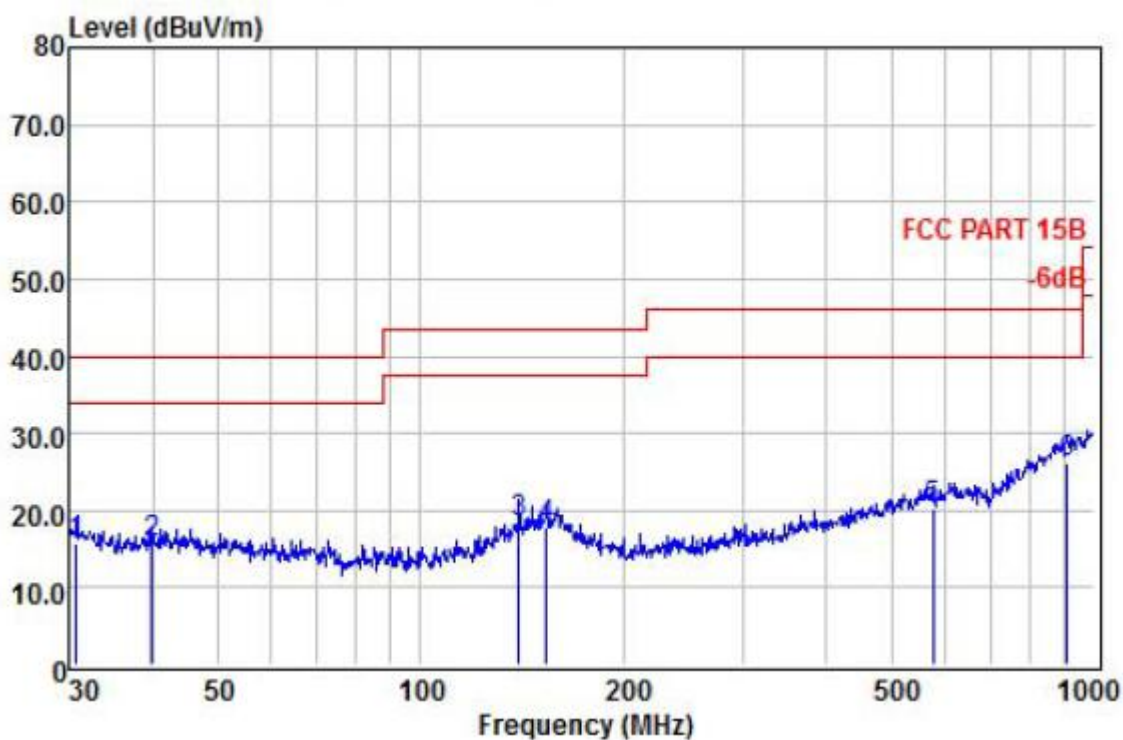
- All the test modes completed for test. The worst case of Radiated Emission is High channel, the test data of this mode was reported.
- By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.
- Radiated emission test from 9KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9KHz to 30MHz and not recorded in this report.





## Below 1GHz Test Results:

Temperature:	22°C	Relative Humidity:	48%
Test Date:	Jun. 02, 2020	Pressure:	1010hPa
Test Voltage:	DC 3.7V	Polarization:	Horizontal
Test Mode:	Transmitting mode of GFSK 2406MHz		

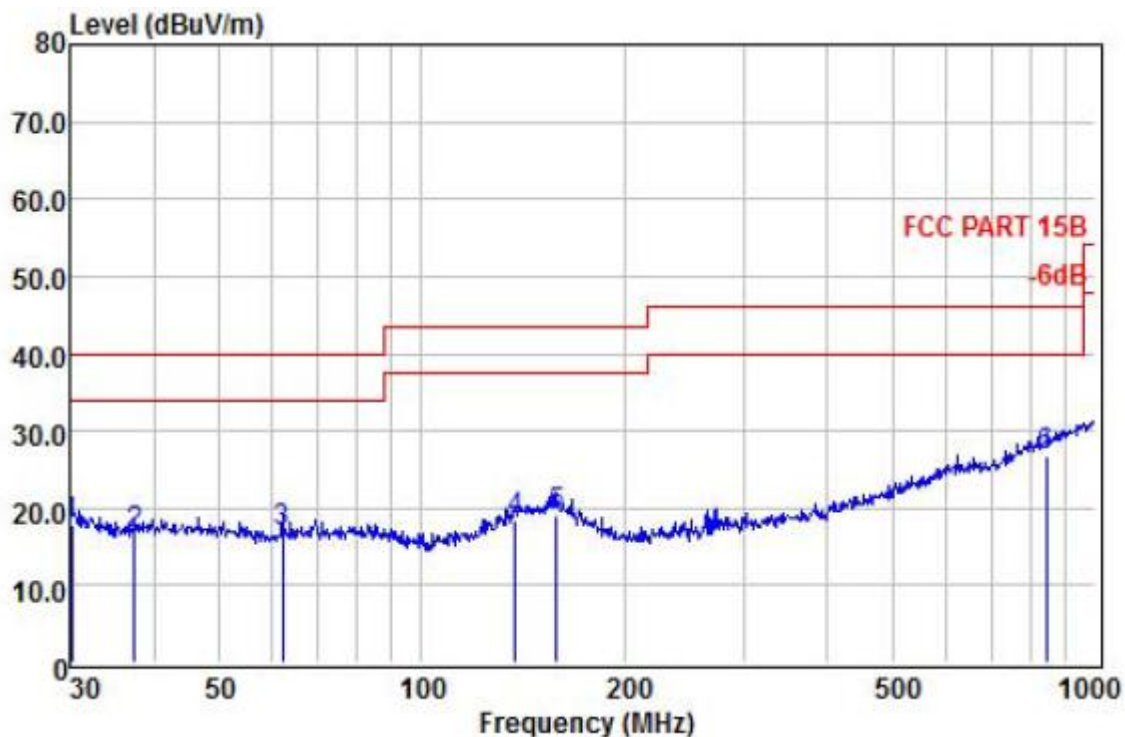


	Freq	Read	Antenna	Cable	Level	Limit	Over	
	MHz	Level	Factor	Loss	dBuV/m	Line	Limit	Remark
		dBuV	dB/m	dB		dBuV/m	dB	
1	30.75	0.95	14.48	0.32	15.75	40.00	-24.25	QP
2	39.85	2.11	13.48	0.13	15.72	40.00	-24.28	QP
3	139.85	2.89	15.20	0.23	18.32	43.50	-25.18	QP
4	153.74	2.13	15.56	0.23	17.92	43.50	-25.58	QP
5	576.64	1.65	17.33	1.14	20.12	46.00	-25.88	QP
6	912.86	1.95	22.71	1.64	26.30	46.00	-19.70	QP

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit  
Factor = Ant. Factor + Cable Loss



Temperature:	22°C	Relative Humidity:	48%
Test Date:	Jun. 02, 2020	Pressure:	1010hPa
Test Voltage:	DC 5V from adapter	Polarization:	Vertical
Test Mode:	Transmitting mode of GFSK 2406MHz		



	Freq	ReadAntenna	Cable		Limit	Over	
	MHz	Level	Factor	Loss	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB
1	30.21	2.80	14.71	0.34	17.85	40.00	-22.15 QP
2	37.42	3.26	13.15	0.18	16.59	40.00	-23.41 QP
3	62.00	4.77	12.08	0.13	16.98	40.00	-23.02 QP
4	137.90	3.19	14.94	0.23	18.36	43.50	-25.14 QP
5	158.67	3.00	15.67	0.23	18.90	43.50	-24.60 QP
6	848.06	3.38	21.85	1.52	26.75	46.00	-19.25 QP

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit  
Factor = Ant. Factor + Cable Loss

Remark:

- (1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

### Above 1 GHz Test Results:

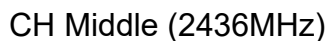
#### CH Low (2406MHz)

Horizontal:

[illegible]

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Type
2406	108.44	-5.79	102.65	114	-11.35	PK
2406	79.09	-5.79	73.30	94	-20.70	AV
4812	57.90	-3.58	54.32	74	-19.68	PK
4812	49.21	-3.58	45.63	54	-8.37	AV
7218	52.57	-0.91	51.66	74	-22.34	PK
7218	45.57	-0.91	44.66	54	-9.34	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						



Horizontal:

Vertical:

[illegible]





CH High (2476MHz)  
Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type
2476	107.14	-5.72	101.42	114	-12.58	PK
2476	78.79	-5.72	73.07	94	-20.93	AV
4952	57.78	-3.51	54.27	74	-19.73	PK
4952	49.16	-3.51	45.65	54	-8.35	AV
7428	54.18	-0.83	53.35	74	-20.65	PK
7428	44.92	-0.83	44.09	54	-9.91	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	Type
2476	107.33	-5.72	101.61	114	-12.39	PK
2476	79.11	-5.72	73.39	94	-20.61	AV
4952	59.95	-3.51	56.44	74	-17.56	PK
4952	48.35	-3.51	44.84	54	-9.16	AV
7428	56.20	-0.83	55.37	74	-18.63	PK
7428	45.07	-0.83	44.24	54	-9.76	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Margin = Absolute Level – Limit						

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "---" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
- (7) All modes of operation were investigated and the worst-case emissions are reported.

## 5. OCCUPIED BANDWIDTH MEASUREMENT

### 5.1 Test Setup

Same as Radiated Emission Measurement

### 5.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on ANSI C63.10 section 6.9.2: RBW=100KHz, VBW=300KHz, Span=3MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.

### 5.3 Measurement Equipment Used

Same as Radiated Emission Measurement

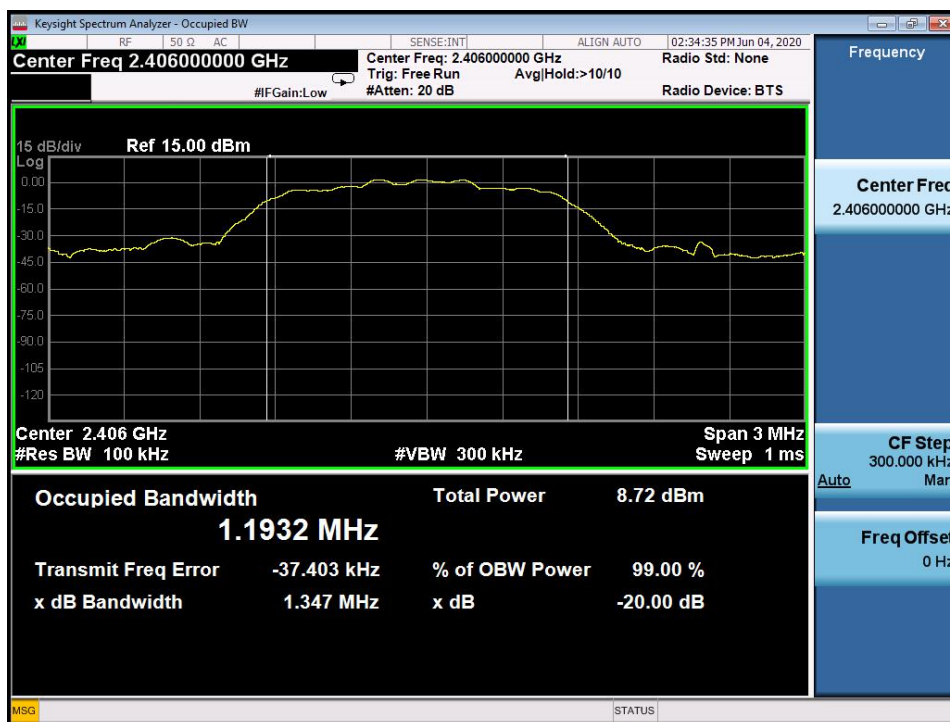
### 5.4 Test Result

PASS

GFSK Modulation:

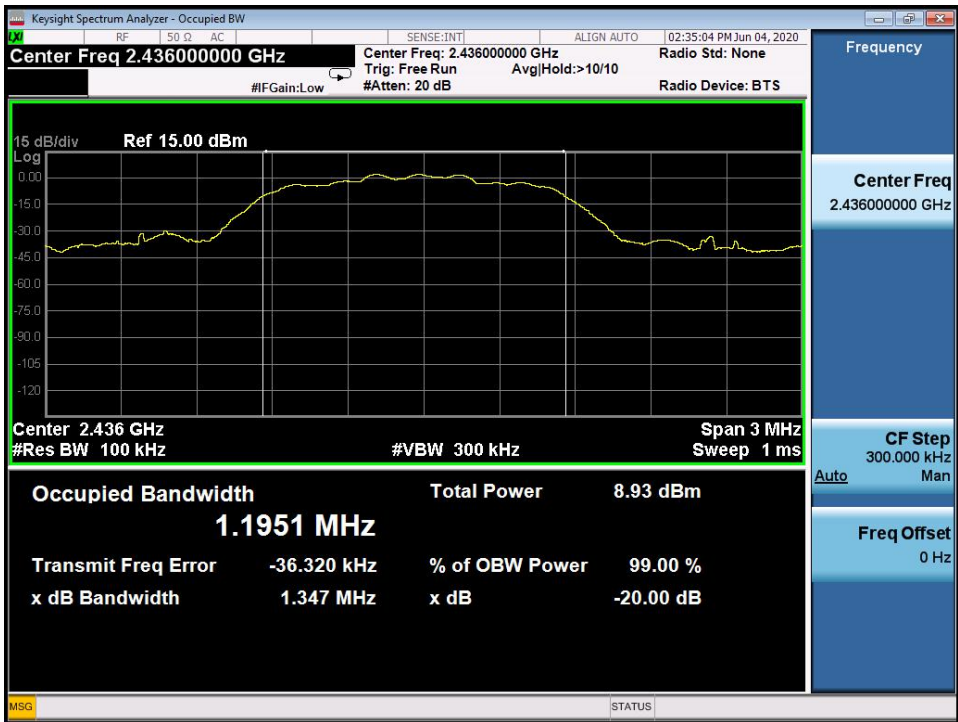
Frequency (MHz)	20dB Bandwidth (MHz)	Result
2406	1.347	PASS
2436	1.347	PASS
2476	1.348	PASS

CH: 2406MHz

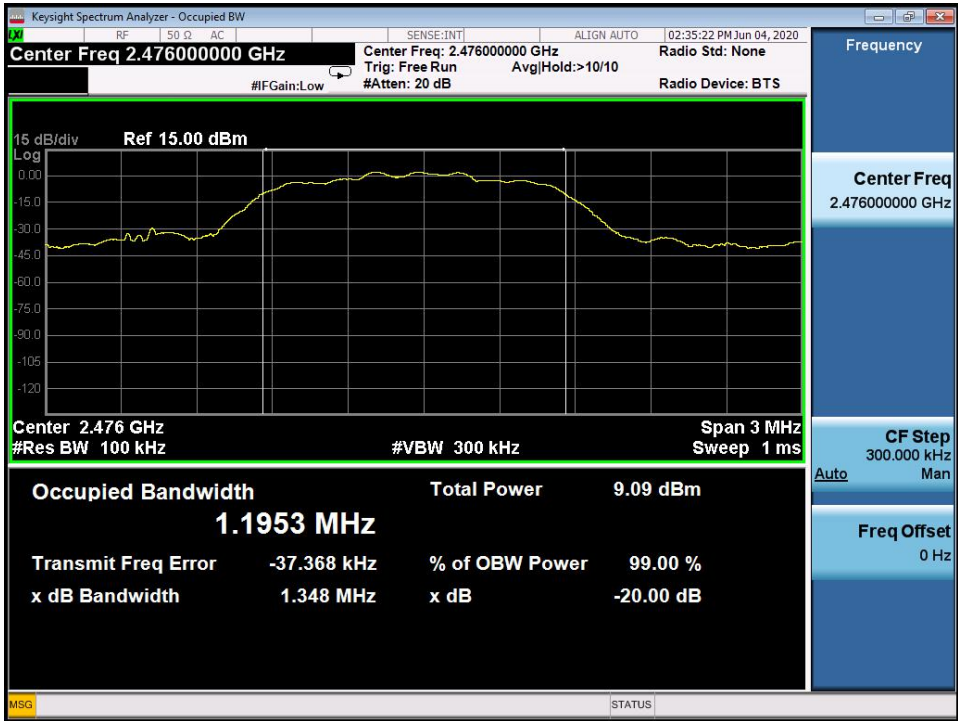




CH: 2436MHz



CH: 2476MHz



## 6. BAND EDGE

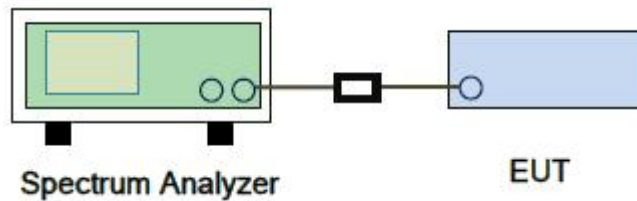
### 6.1 Limits

FCC PART 15.249(d) 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.

### 6.2 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
- Set both RBW and VBW of spectrum analyzer to 1MHz.
- Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency. - Repeat above procedures until all measured frequencies were complete..

### 6.3 Test Setup



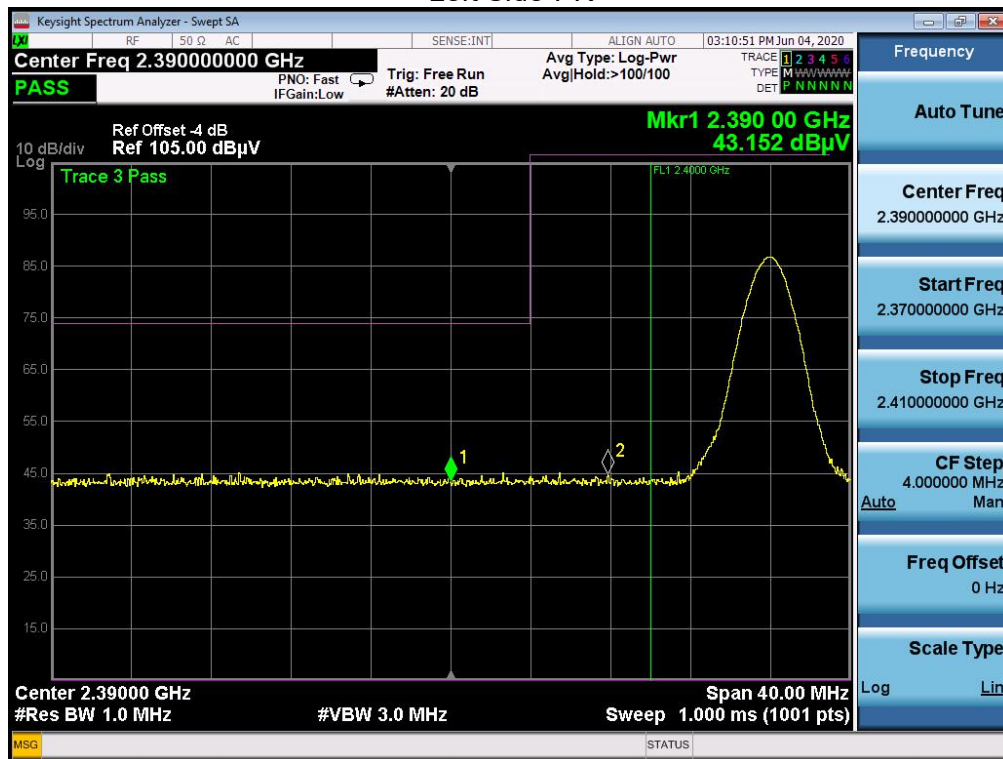
### 6.4 Test Result

PASS

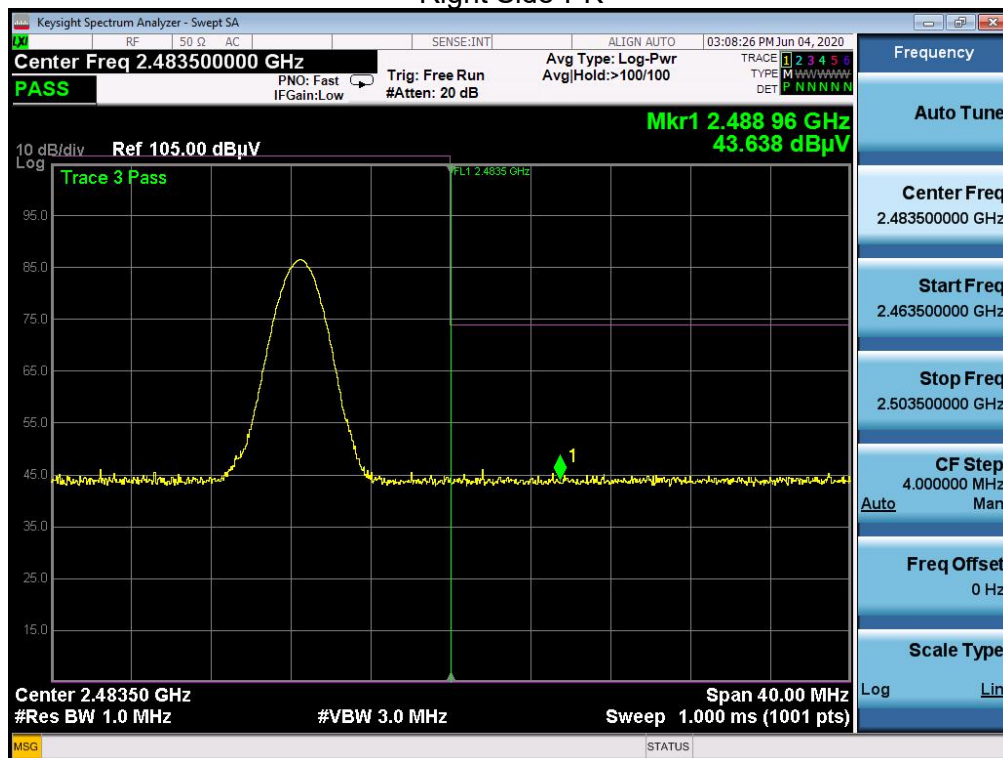


## Test Plots:

Left Side-PK



Right Side-PK





## 7. ANTENNA REQUIREMENT

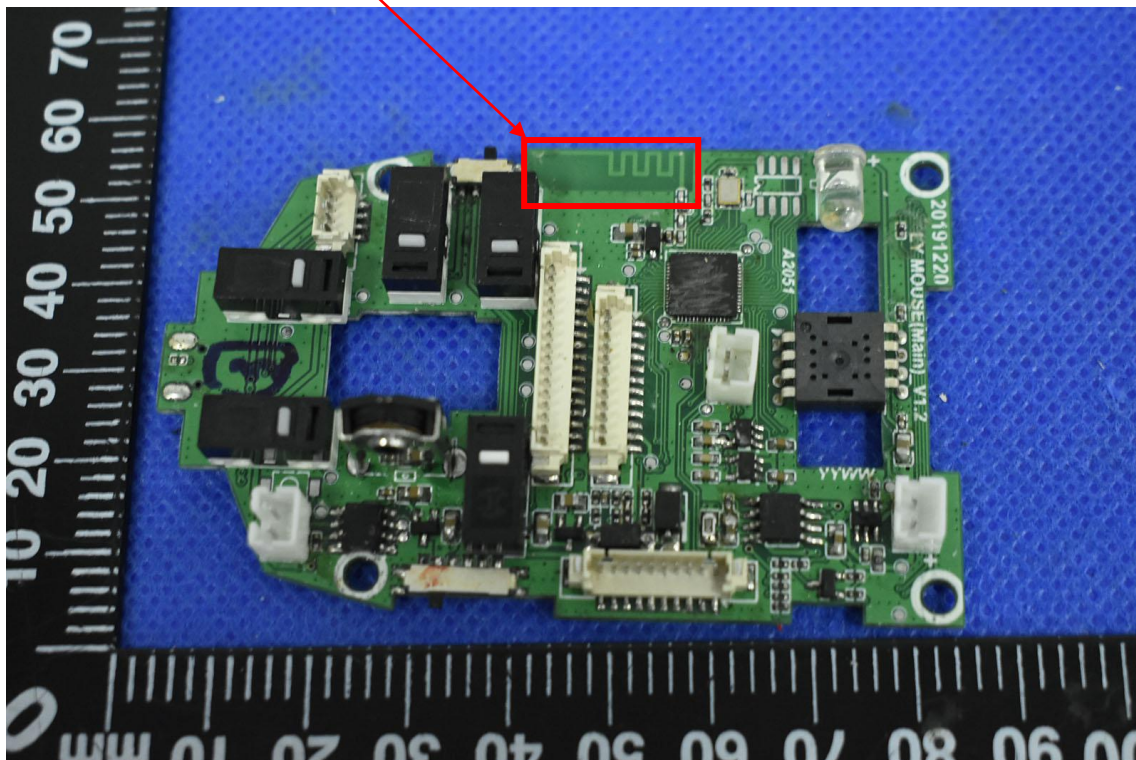
Standard Applicable:

For intentional device, according to FCC 47 CFR Section 15.203, 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.

Antenna Connected Construction

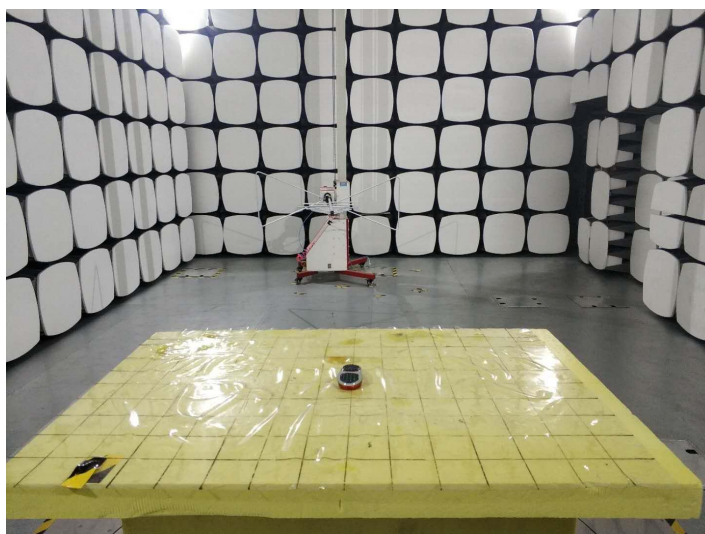
The antenna used in this product is an PCB Antenna, The directional gains of antenna used for transmitting is 0dBi.

ANTENNA:

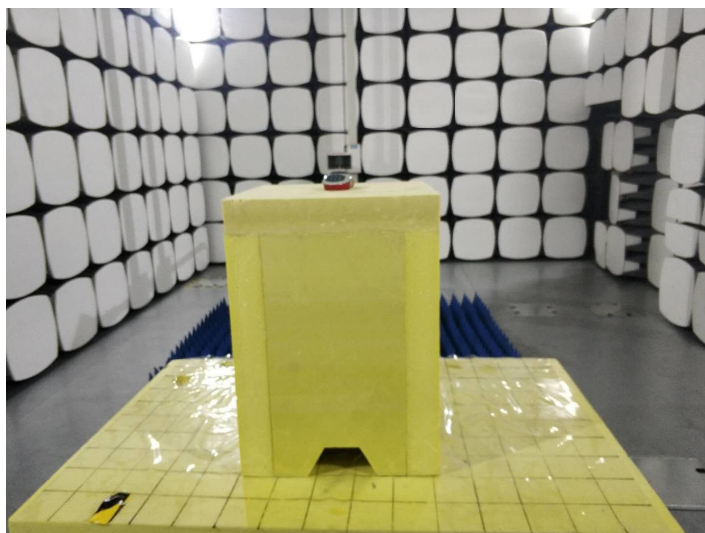


## 8. PHOTOGRAPH OF TEST

**Radiated Emission  
(Below 1G)**



**Radiated Emission  
(Above 1G)**



**Conducted Emission**



\*\*\*End of Report\*\*\*