



FCC TEST REPORT

**Test report
On Behalf of
Guangzhou Maipai Electronics Co.,Ltd
For
2.4 Wireless mouse
Model No.: M7158

FCC ID: 2AFVE-M7158**

Prepared for : Guangzhou Maipai Electronics Co.,Ltd
Room 202, No.94, Shinan Road, Xianchong Village, Qiaonan Street, Panyu District, Guangzhou, China

Prepared By : Shenzhen HUAKE Testing Technology Co., Ltd.
1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

Date of Test: Sept. 10, 2019 ~ Sept. 17, 2019
Date of Report: Sept. 17, 2019
Report Number: HK1909092282-E



TEST RESULT CERTIFICATION

Applicant's name : Guangzhou Maipai Electronics Co.,Ltd
Address : Room 202, No.94, Shinan Road, Xianchong Village, Qiaonan Street, Panyu District, Guangzhou, China
Manufacture's Name : Guangzhou Maipai Electronics Co.,Ltd
Address : Room 202, No.94, Shinan Road, Xianchong Village, Qiaonan Street, Panyu District, Guangzhou, China

Product description

Trade Mark: /

Product name : 2.4 Wireless mouse

Model and/or type reference : M7158

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

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Date of Test :

Date (s) of performance of tests : Sept. 10, 2019 ~ Sept. 17, 2019

Date of Issue : Sept. 17, 2019

Test Result : **Pass**

Testing Engineer :

(Gary Qian)

Technical Manager :

(Eden Hu)

Authorized Signatory :

(Jason Zhou)



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1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	N/A
RADIATED EMISSION TEST	COMPLIANT
BAND EDGE	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

1.2 TEST FACILITY

Test Firm : Shenzhen HUAKE Testing Technology Co., Ltd.

Address : 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

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	2.4 Wireless mouse
Trade Mark	N/A
Model Name	M7158
Serial Model	/
Model Difference	/
FCC ID	2AFVE-M7158
Antenna Type	PCB Antenna
Antenna Gain	0dBi
BT Operation frequency	2402.65MHZ to 2480.65MHz
Number of Channels	16CH
Modulation Type	GFSK
Power Source	DC 1.5V From Battery
Power Rating	DC 1.5V From Battery



2.2 Carrier Frequency of Channels

Channel List							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402.65	05	2422.65	9	2441.65	13	2463.65
02	2407.65	06	2426.65	10	2445.65	14	2466.65
03	2414.65	07	2436.65	11	2453.65	15	2473.65
04	2419.65	08	2439.65	12	2459.65	16	2480.65

2.3 Operation of EUT during testing

Operating Mode

The mode is used: **Transmitting mode**

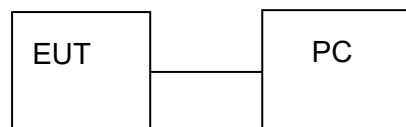
Low Channel: 2402.65MHz

Middle Channel: 2441.65MHz

High Channel: 2480.65MHz

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Radiation and Above1GHz Radiation testing:



PC information:

Model: TP00067A

Input: DC20V, 2.25-3.25A

Output: 5VDC, 0.5A



2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 27, 2018	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 27, 2018	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 27, 2018	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 27, 2018	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 27, 2018	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 27, 2018	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 27, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 27, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 27, 2018	1 Year
10.	Horn Antenna	Schwarzbeck	9120D	HKE-013	Dec. 27, 2018	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 27, 2018	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 27, 2018	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JY3120-B Version	HKE-083	Dec. 27, 2018	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 27, 2018	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 27, 2018	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Dec. 27, 2018	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Dec. 27, 2018	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 27, 2018	3 Year



3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

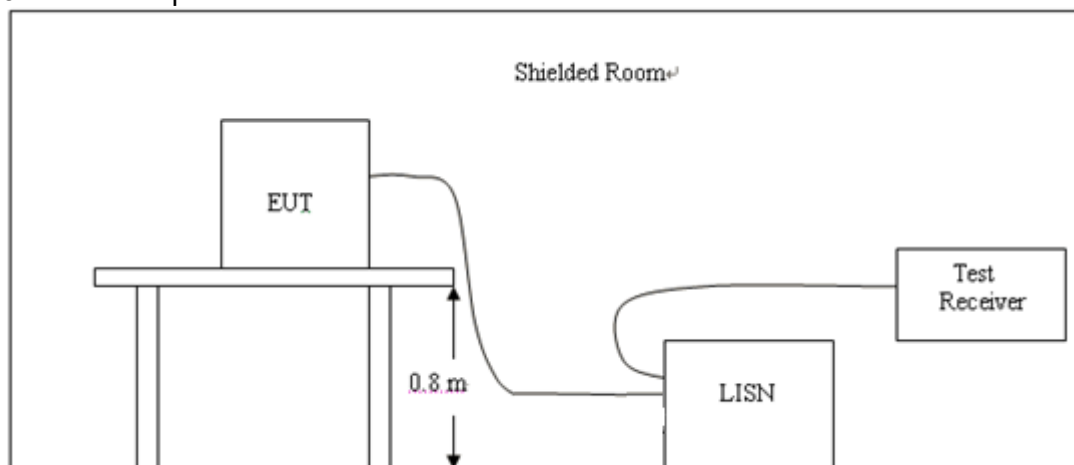
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

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

N/A



4 RADIATED EMISSION TEST

4.1 Radiation Limit

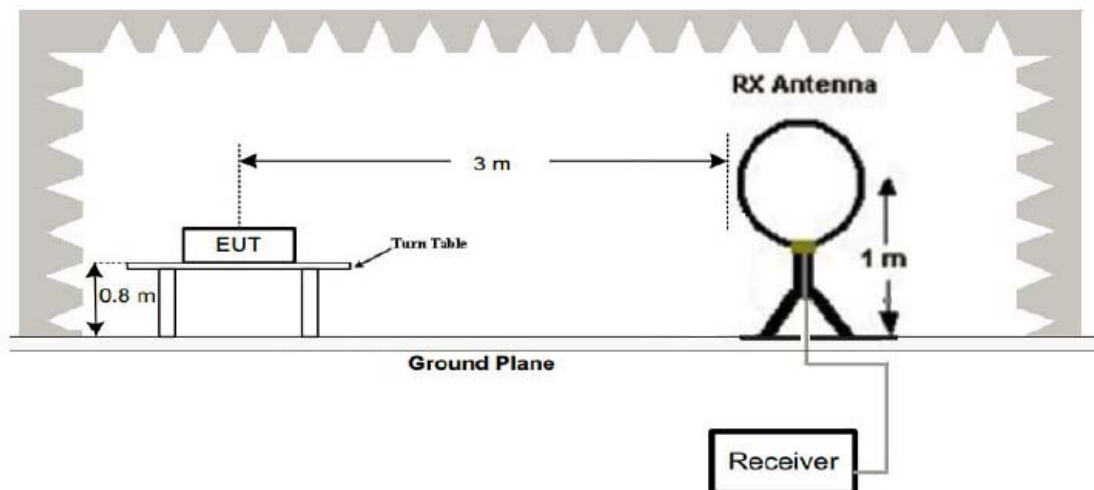
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

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

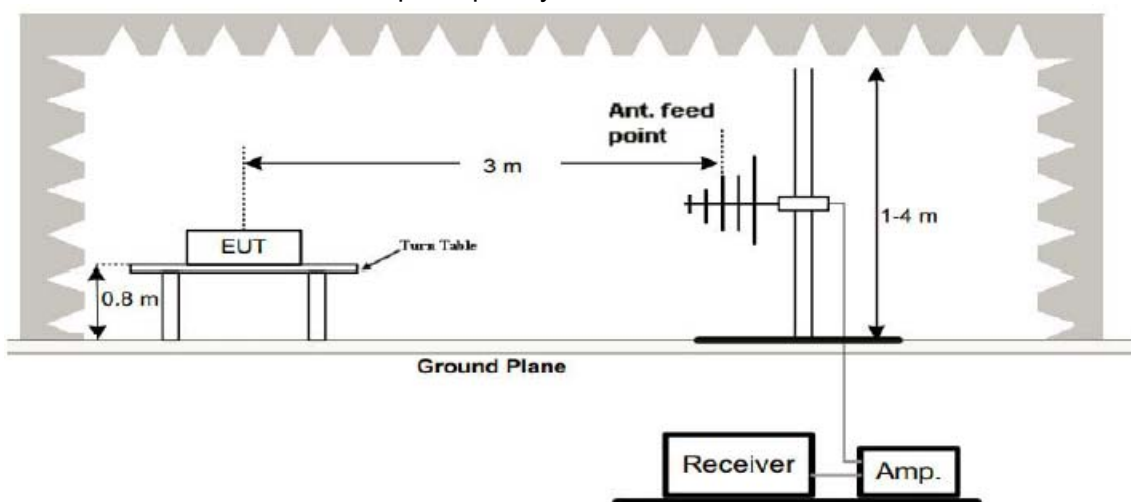
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

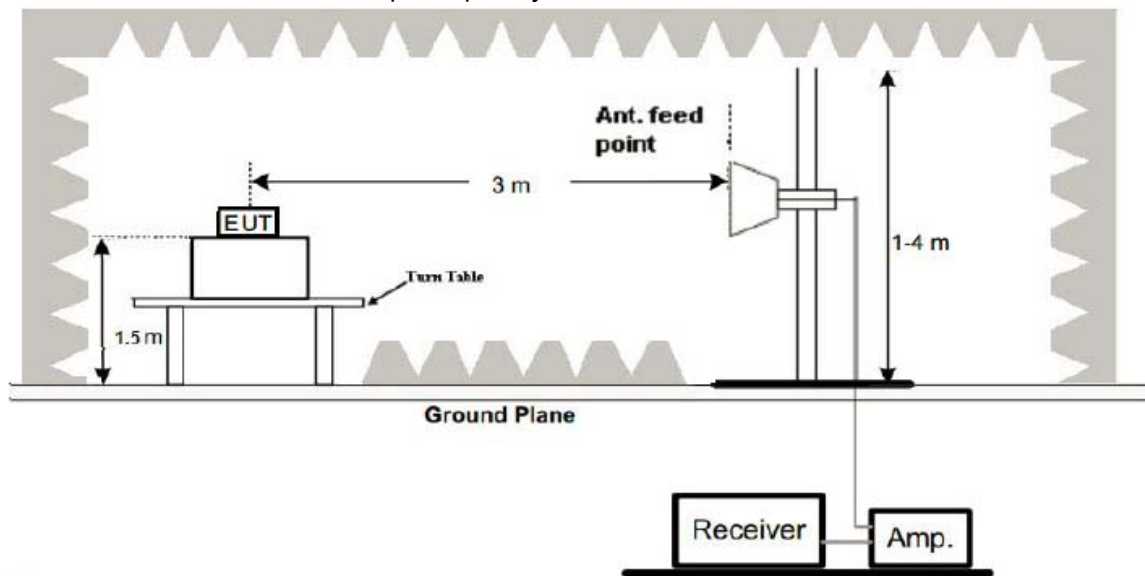
(1) Radiated Emission Test-Up Frequency Below 30MHz



(2) Radiated Emission Test-Up Frequency 30MHz~1GHz



(3) Radiated Emission Test-Up Frequency Above 1GHz



4.3 Test Procedure

1. 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.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:

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

4.4 Test Result

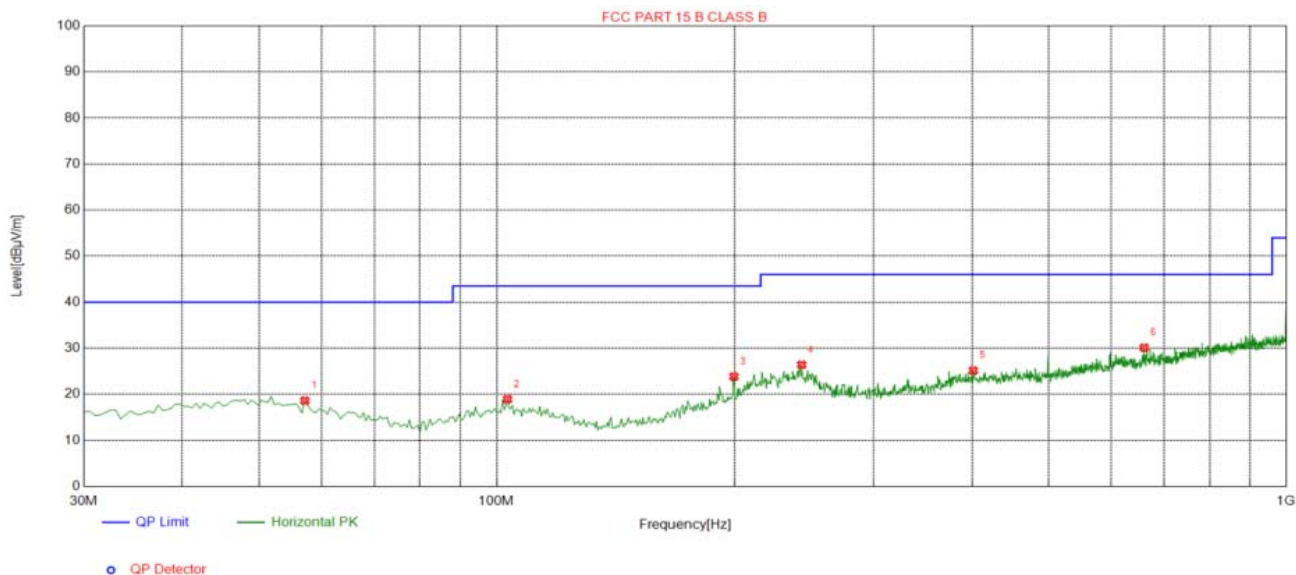
PASS

All the test modes completed for test. The worst case of Radiated Emission is CH 2402.65; the test data of this mode was reported.



Below 1GHz Test Results:

Antenna polarity: H

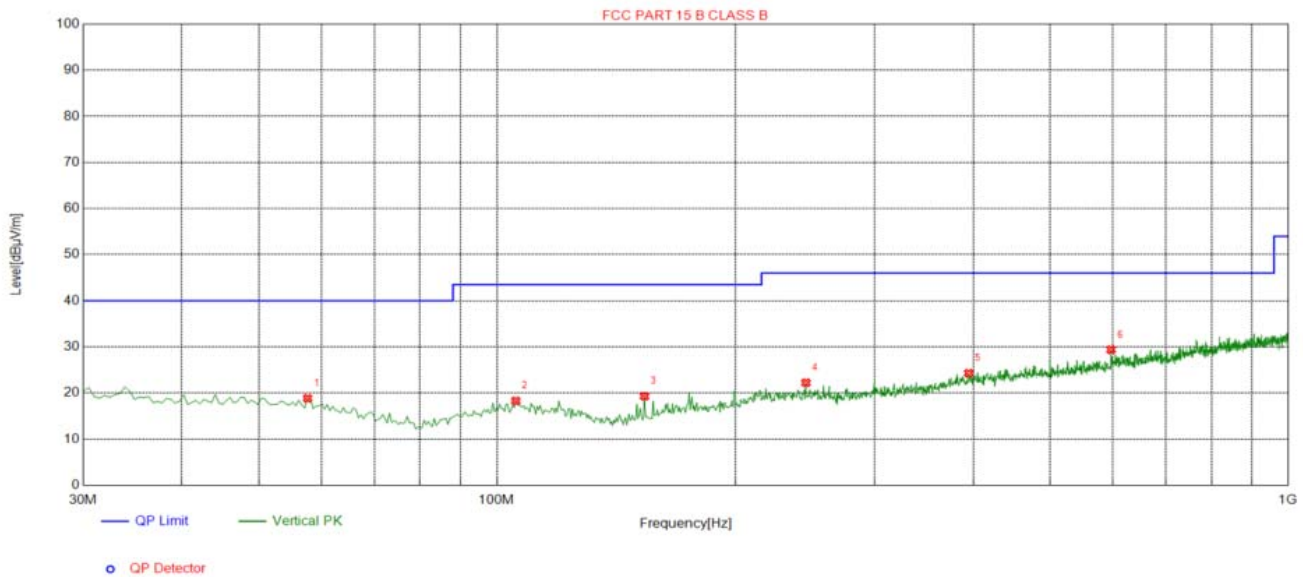


Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	57.1600	18.60	-14.73	40.00	21.40	100	77	Horizontal
2	103.235	18.91	-15.41	43.50	24.59	100	348	Horizontal
3	199.750	23.83	-15.08	43.50	19.67	100	118	Horizontal
4	243.400	26.40	-13.70	46.00	19.60	100	50	Horizontal
5	401.510	25.13	-10.38	46.00	20.87	100	199	Horizontal
6	660.985	30.10	-5.13	46.00	15.90	100	20	Horizontal

Remark: Transd = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level



Antenna polarity: V



Suspected List								
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB]	Limit [dBμV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	57.6450	18.82	-14.80	40.00	21.18	100	12	Vertical
2	105.660	18.28	-15.42	43.50	25.22	100	12	Vertical
3	153.675	19.30	-18.68	43.50	24.20	100	26	Vertical
4	245.825	22.23	-13.58	46.00	23.77	100	274	Vertical
5	394.720	24.29	-10.53	46.00	21.71	100	257	Vertical
6	597.450	29.38	-6.28	46.00	16.62	100	120	Vertical

Remark: Transd = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level

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 (2402.65MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2402.65	111.31	-5.84	105.47	114	-8.53	peak
2402.65	87.02	-5.84	81.18	94	-12.82	AVG
4805.3	56.48	-3.64	52.84	74	-21.16	peak
4805.3	46.38	-3.64	42.74	54	-11.26	AVG
7207.95	52.77	-0.95	51.82	74	-22.18	peak
7207.95	40.62	-0.95	39.67	54	-14.33	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2402.65	110.32	-5.84	104.48	114	-9.52	peak
2402.65	84.55	-5.84	78.71	94	-15.29	AVG
4805.3	56.79	-3.64	53.15	74	-20.85	peak
4805.3	47.85	-3.64	44.21	54	-9.79	AVG
7207.95	54.21	-0.95	53.26	74	-20.74	peak
7207.95	39.66	-0.95	38.71	54	-15.29	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH Middle (2441.65MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2441.65	110.09	-5.71	104.38	114	-9.62	peak
2441.65	84.27	-5.71	78.56	94	-15.44	AVG
4883.3	54.29	-3.51	50.78	74	-23.22	peak
4883.3	44.39	-3.51	40.88	54	-13.12	AVG
7324.95	52.08	-0.82	51.26	74	-22.74	peak
7324.95	38.68	-0.82	37.86	54	-16.14	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2441.65	107.66	-5.71	101.95	114	-12.05	peak
2441.65	73.46	-5.71	67.75	94	-26.25	AVG
4883.3	54.12	-3.51	50.61	74	-23.39	peak
4883.3	44.98	-3.51	41.47	54	-12.53	AVG
7324.95	55.24	-0.82	54.42	74	-19.58	peak
7324.95	42.36	-0.82	41.54	54	-12.46	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



CH High (2480.65MHz)

Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480.65	106.54	-5.65	100.89	114	-13.11	peak
2480.65	73.58	-5.65	67.93	94	-26.07	AVG
4961.3	53.98	-3.43	50.55	74	-23.45	peak
4961.3	42.31	-3.43	38.88	54	-15.12	AVG
7441.95	52.44	-0.75	51.69	74	-22.31	peak
7441.95	37.12	-0.75	36.37	54	-17.63	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480.65	105.44	-5.65	99.79	114	-14.21	peak
2480.65	84.12	-5.65	78.47	94	-15.53	AVG
4961.3	54.66	-3.43	51.23	74	-22.77	peak
4961.3	43.29	-3.43	39.86	54	-14.14	AVG
7441.95	52.36	-0.75	51.61	74	-22.39	peak
7441.95	38.22	-0.75	37.47	54	-16.53	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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 BAND EDGE

5.1 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.

5.2 Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 100KHz and VBM to 300KHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength. The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW to 100 KHz and VBW to 300 KHz, to measure the conducted peak band edge.



PASS

Horizontal (Worst case)

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310	55.11	-5.81	49.3	74	-24.7	peak
2310	/	-5.81	/	54	/	AVG
2390	51.98	-5.84	46.14	74	-27.86	peak
2390	/	-5.84	/	54	/	AVG
2400	53.77	-5.84	47.93	74	-26.07	peak
2400	/	-5.84	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Operation Mode: TX CH High (2480.65MHz)

Horizontal (Worst case)

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.50	56.03	-5.65	50.38	74	-23.62	peak
2483.50	/	-5.65	/	54	/	AVG
2500.00	53.11	-5.65	47.46	74	-26.54	peak
2500.00	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.50	54.66	-5.65	49.01	74	-24.99	peak
2483.50	/	-5.65	/	54	/	AVG
2500.00	53.49	-5.65	47.84	74	-26.16	peak
2500.00	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						



6 OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Setup

Same as Radiated Emission Measurement

6.2 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= 300 KHz, Span=2MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

6.3 Measurement Equipment Used

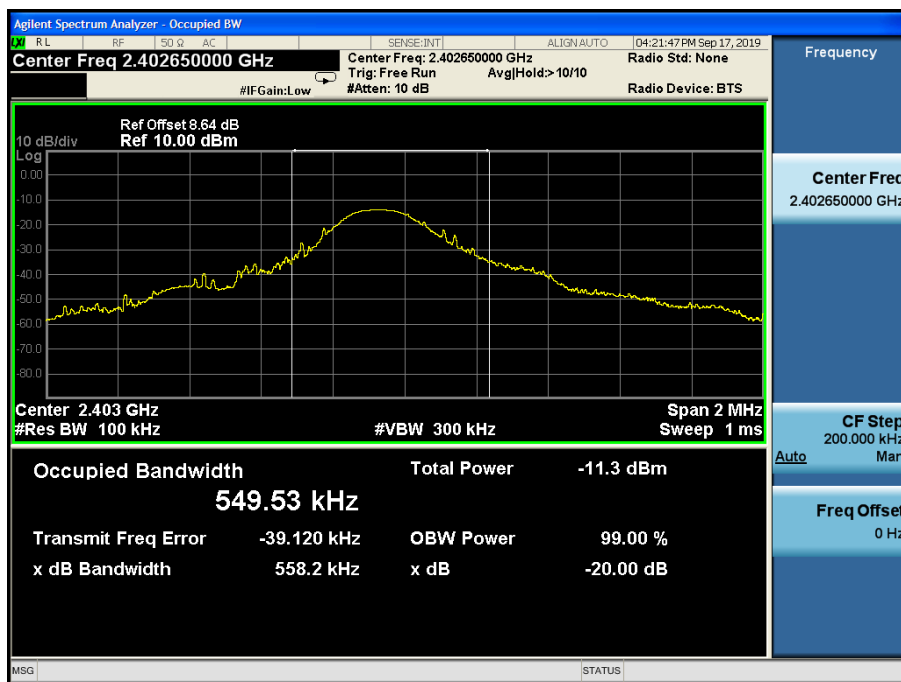
Same as Radiated Emission Measurement

6.4 Test Result

PASS

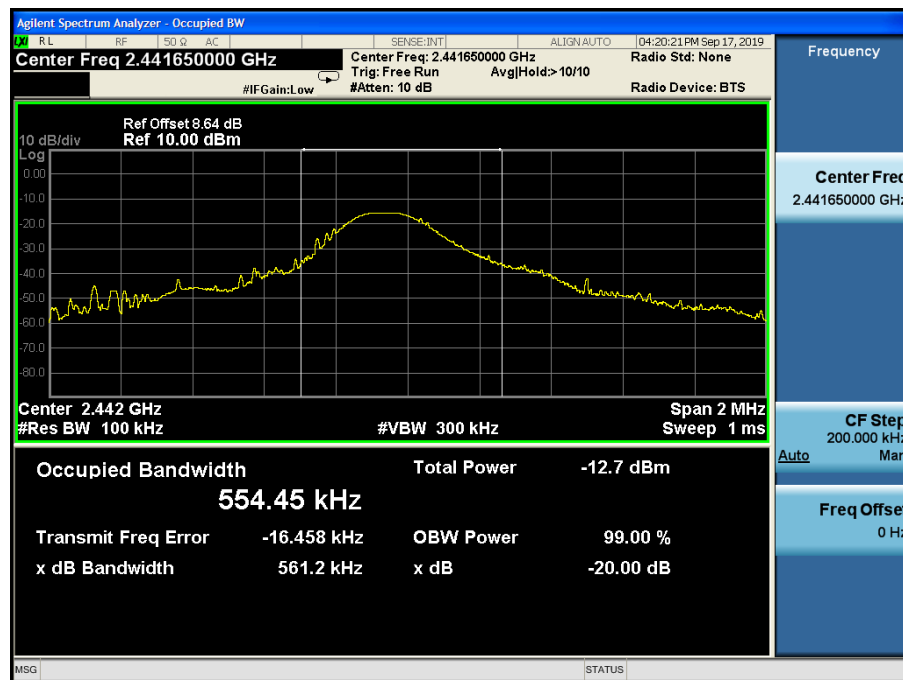
Frequency	20dB Bandwidth (MHz)	Result
2402.65 MHz	0.5582	PASS
2441.65MHz	0.5612	PASS
2480.65 MHz	0.5950	PASS

CH: 2402.65MHz

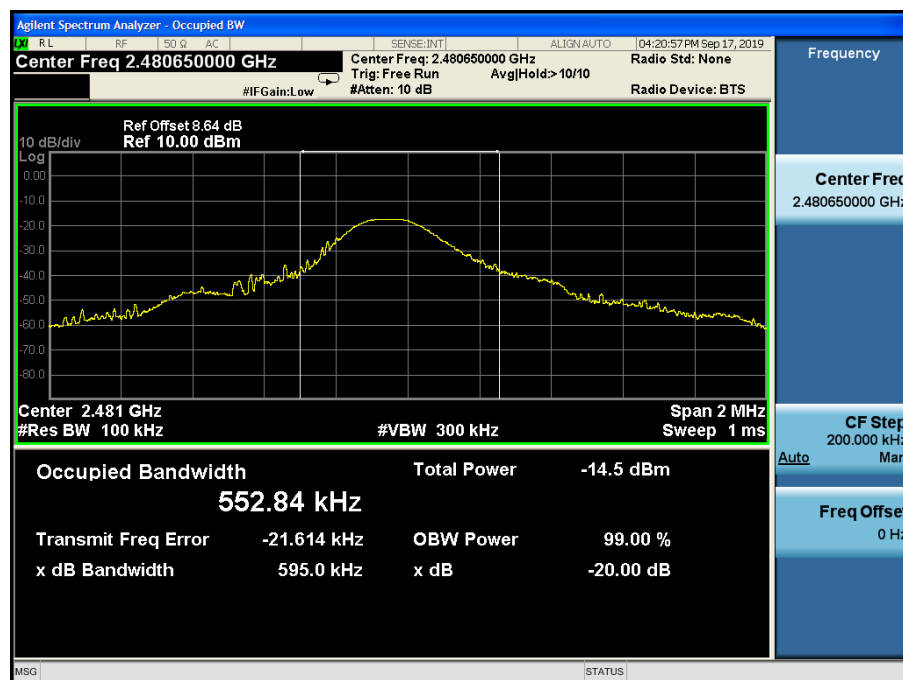




CH: 2441.65MHz



CH: 2480.65MHz





7 ANTENNA REQUIREMENT

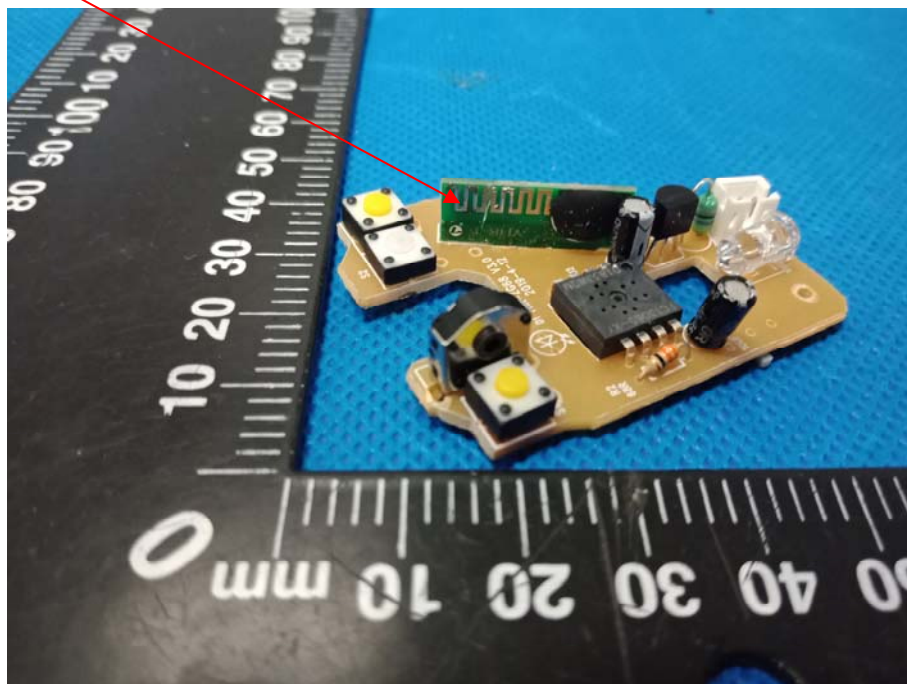
Standard Applicable

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. And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Antenna Connected Construction

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

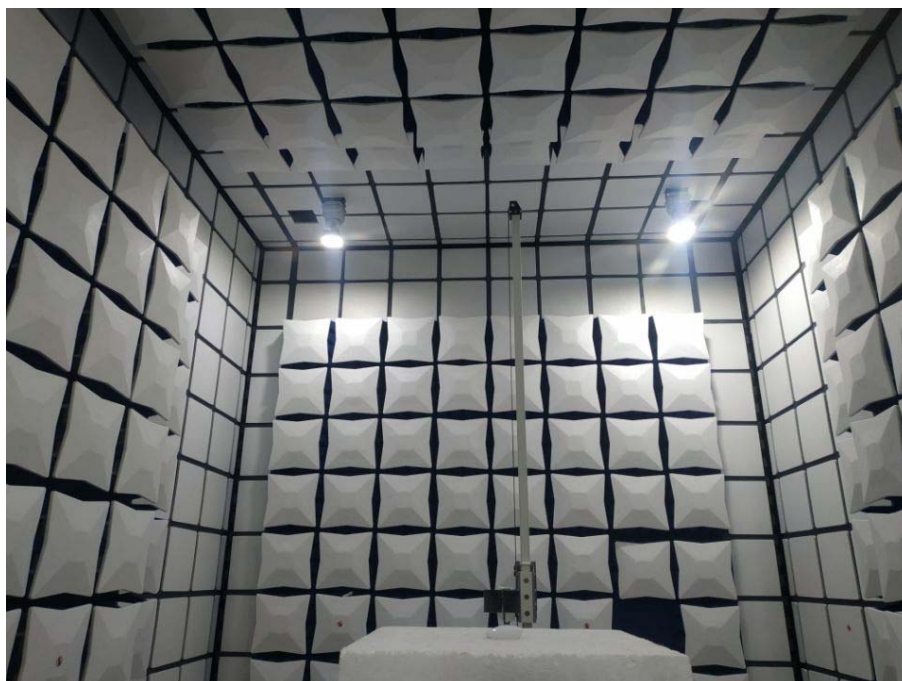
ANTENNA





8 PHOTOGRAPH OF TEST

8.1 Radiated Emission





9 PHOTOS OF THE EUT

Reference to the reporter : ANNEX A of external photos and ANNEX B of internal photos

-----End of test report-----