Shenzhen TCT Testing Technology Co., Ltd.

FCC ID TEST REPORT

for

Wireless Mouse

Model: WS5406

FCC ID: ZX3WS5406

Prepared for : Shenzhen Kingree Electronic Co.,Ltd
3-6F, 70 Building,Bohua Tech Park, Shangwei Industrial Area, Zhangkeng jing,Guanlan Street,Shenzhen,China.

Prepared by: Shenzhen TCT Testing Technology Co.,Ltd
1F, Building 1, Yibaolai Industrial Park, Qiaotou Village, Fuyong Town, Baoan District, Shenzhen, Guangdong, China

TEL: +86-0755-27363466
FAX: +86-0755-27673332

Report Number：TCS1209003-1
Date of Test： September 10~14, 2012
Date of Report： September 14, 2012

Special Statement：

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

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

CNAS-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of testing Laboratories.

FCC-Registration No.: 899988

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 899988.

IC- Registration No.: IC5205A-02

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration IC No.: 5205A-01.

Test Report Conclusion

Content

Shenzhen TCT Testing Technology Co., Ltd.

1.0 General Details

1.1 Test Lab Details

Name : Shenzhen TCT Testing Technology Co.,Ltd

Address: 1F, Building 1, Yibaolai Industrial Park, Qiaotou Village, Fuyong Town, Baoan District, Shenzhen, Guangdong, China

Telephone: +86-0755-27363466

Fax: +86-0755-27673332

Shenzhen Timeway Technology Consulting Co., Ltd.

Site on File with the Federal Communications Commission – United Sates

Registration Number: 899988

For 3m & 10 m OATS

Site Listed with Industry Canada of Ottawa, Canada

Registration Number: IC: 5205A-01

For 3m & 10 m OATS

1.2 Applicant Details

Applicant: Shenzhen Kingree Electronic Co.,Ltd

Address: 3-6F,70 Building,Bohua Tech Park, Shangwei Industrial Area,Zhangkeng jing,Guanlan Street,Shenzhen,China.

Telephone: 0755-29570180

Fax: 0755-29570160

1.3 Description of EUT

Product:	Wireless Mouse
Manufacturer:	Shenzhen Kingree Electronic Co.,Ltd
Brand Name:	N/A
Model Number:	WS5406
Additional Model Name	N/A
Additional Trade Name	N/A
Rating:	DC 3V (2*AAA batteries)
Modulation Type:	FHSS
Channel number:	39
Channel spacing	2 MHz
Operation Frequency	2403~2479MHz
Antenna Designation	A PCB printed antenna and the maximum gain is 2dBi

1.4 Submitted Sample

1 Sample

1.5 Test Duration

2012-09-12 to 2012-09-14

1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.7dB

Radiated Emissions Uncertainty =4.5dB

1.7 Test Engineer

The sample tested by 

Printed name: Jack Kang

2.0	**Test Equipments**				
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	2011-12-04	2012-12-03
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	2011-12-04	2012-12-03
System Controller	CT	SC100	-	2012-02-17	2013-02-16
Spectrum Analyzer	ROHDE&SCHWARZ	FSU	-	2012-02-17	2013-02-16
Pre-amplifier	Agilent	8447D	83153007374	2012-02-17	2013-02-16
Pre-amplifier	Agilent	8449B	3008A01738	2012-02-17	2013-02-16
Triple-loop antenna	ROHDE&SCHWARZ	HM020	843885/002	2012-02-17	2013-02-16
Horn Antenna	ETS LINDGREN	3117	--	2012-02-17	2013-02-16

3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Notes
FCC Part 15:2011, Paragraph 15.207	Conducted Emission Test	PASS	N/A
FCC Part 15:2011 Subpart C Paragraph 15.249(a) FCC Part 15:2011, Paragraph 15.209	Radiated Emission Test	PASS	Complies
FCC Part 15:2011 Subpart C Paragraph 15.249(d) Limit	Band Edge Test	PASS	Complies
FCC Part 15:2011 Subpart C Paragraph 15.215(c)	20 dB Bandwidth	PASS	Complies

3.2 Test Standards

FCC Part 15:2011 Subpart C, Paragraph 15.249

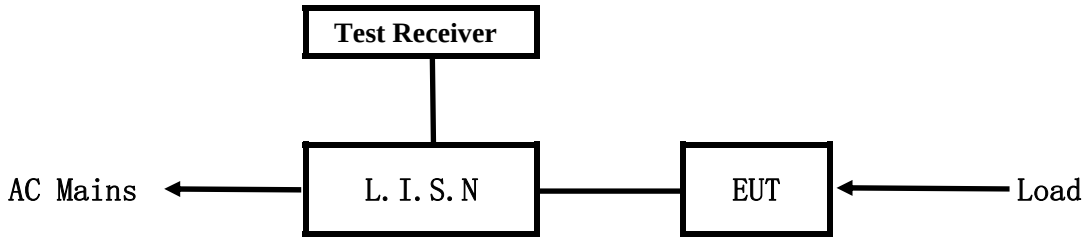
4.0 EUT Modification

No modification by Shenzhen TCT Testing Technology Co., Ltd

Note: N/A=Not Applicable

5. Power Line Conducted Emission Test

5.1 Schematics of the test



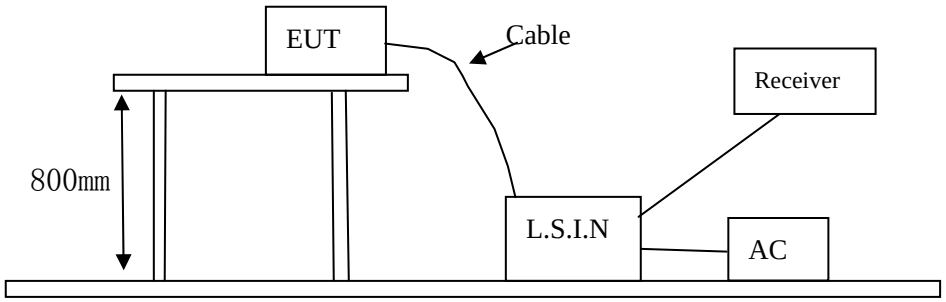
EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2009.The Frequency spectrum From 0.15MHz to 30MHz was investigated.

Test Voltage: 120V~, 60Hz

Block diagram of Test setup



5.3 EUT Operating Condition

Operating condition is according to ANSI C63.10 -2009

A Setup the EUT and simulators as shown on the following

B Enable AF signal and confirm EUT active to normal condition

5.4 Test Equipment

Please refer to the Section 2

5.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency(MHz)	Class A Limits (dB μ V)		Class B Limits (dB μ V)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ～ 0.50	79.0	66.0	66.0～56.0*	56.0～46.0*
0.50 ～ 5.00	73.0	60.0	56.0	46.0
5.00 ～ 30.00	73.0	60.0	60.0	50.0

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The tighter limit shall apply at the transition frequencies

5.6 Photo documentation of the test set-up
Please refer to the Section 11

5.7 Test specification:
Environmental conditions: Temperature: 22° C Humidity: 51% Atmospheric pressure: 103kPa

Frequency range: 0.15 MHz – 30 MHz

The test was carried out in the following operation mode(s):
- Normal wireless communication

5.8 Test result

Min. limit margin --

The requirements are FULFILLED

Remarks: **The EUT is powered by batteries, so the test item is not applicable.**

A Conducted Emission on Line Terminal of the power line (150kHz to 30MHz)

EUT Description:

Operation Mode:

Tested By:

Test date:

Start Frequency	Stop Frequency	Step	IF BW	Detector	Final M-Time
0.15MHz	30MHz	4.5KHz	10KHz	QP+AV	1s

Frequency (MHz)	Reading(dBμV)				Limit (dBμV)	
	Line		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
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B **Conducted Emission on Neutral Terminal of the power line (150kHz to 30MHz)**

EUT Description:

Operation Mode:

Tested By:

Test Data:

Start Frequency	Stop Frequency	Step	IF BW	Detector	Final M-Time
0.15MHz	30MHz	4.5KHz	10KHz	QP+AV	1s

Frequency (MHz)	Reading(dBμV)				Limit (dBμV)	
	Live		Neutral			
	Quasi-peak	Average	Quasi-peak	Average	Quasi-peak	Average
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6 Radiated Emission Test

6.1 Test Method and test Procedure:

(1) The EUT was tested according to ANSI C63.10 –2009. The radiated test was performed at Timeway Laboratory. This site is on file with the FCC laboratory division, Registration No.899988

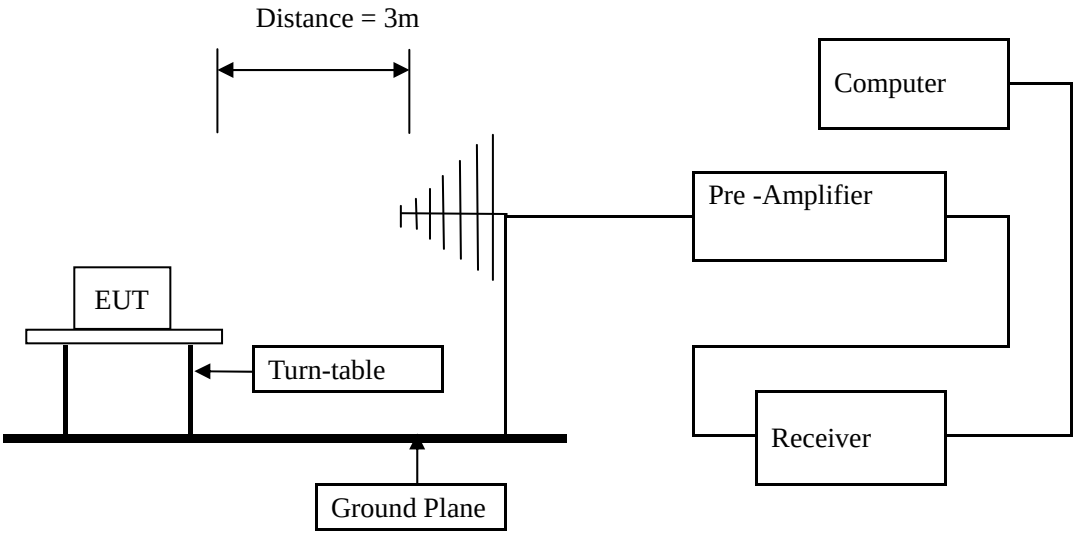
(2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2009.

(3) The frequency spectrum from 30 MHz to 25 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.

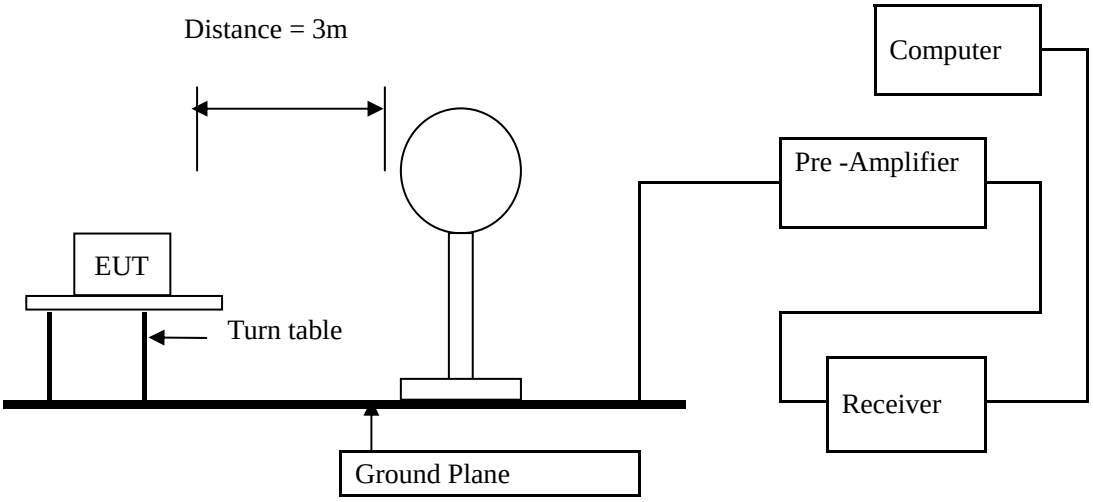
(4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.

(5) The antenna polarization: Vertical polarization and Horizontal polarization.

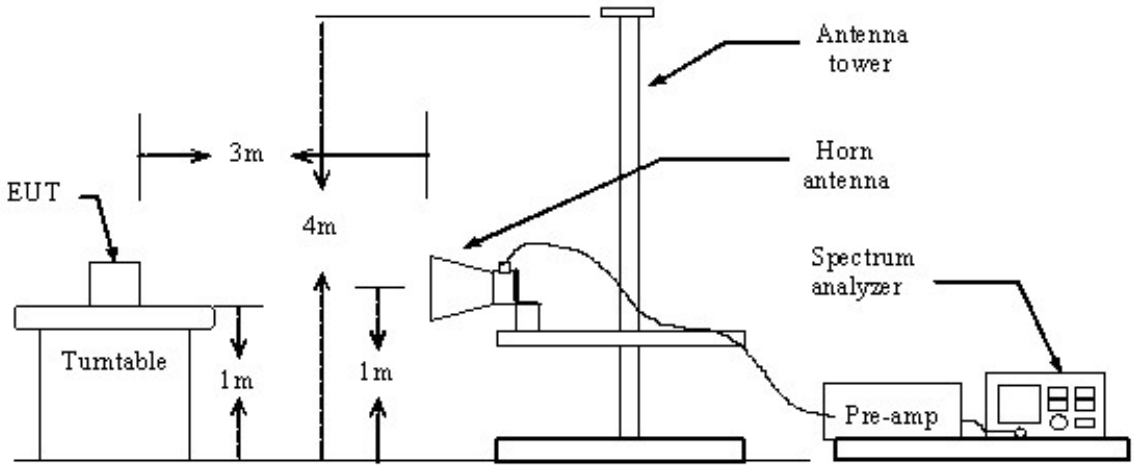
Block diagram of Test setup



Block diagram of Test setup for frequency below 30MHz



Block diagram of Test setup for frequency above 1GHz



6.2 EUT Operating Condition

Operating condition is according to ANSI C63.10 -2009

6.3 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

A FCC Part 15:2011 Subpart C Paragraph 15.249(a) Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)			Field Strength of Harmonics (3m)		
	mV/m	**dBuV/m**		**uV/m**	**dBuV/m**	
2400-2483.5	50	94 (Average)	114 (Peak)	500	54 (Average)	74 (Peak)

Note: 1. RF Field Strength (dBuV) = 20 log RF Voltage (uV)

2.Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

B. Frequencies in restricted band are complied to limit on Paragraph 15.209.

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
0.009-0.490	3	20log 2400/F (kHz) + 80
0.490-1.705	3	20log 24000/F (kHz) + 40
1.705-30	3	20log 30 + 40
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note: 1. RF Voltage (dBuV) = 20 log RF Voltage (uV)

2. In the Above Table, the tighter limit applies at the band edges.

3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT

4. This is a handhold device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.

5. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz.As to 1G-25G, the final emission level got using PK and AV detector.

6. If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula Ld1 = Ld2 * (d2/d1)

6.4 Photo documentation of the test set-up

Please refer to the Section 11

6.5 Test Equipment:

Please refer to the Section 2

6.6 Test specification:

Environmental conditions: Temperature 23° C Humidity: 49% Atmospheric pressure: 103kPa

6.7 Test result

A Fundamental & Harmonics Radiated Emission Data (1000MHz-25000MHz)

Low channel: 2403 MHz				
Frequency (MHz)	**Emission PK/AV (dBuV/m)**	**Horizontal / Vertical**	**Limits PK/AV (dBuV/m)**	**Margin (dB)**
2403	89.83(PK)	H	114/94	24.17
2403	92.36(PK)	V	114/94	21.64
4806	44.27(PK)	H	74/54	29.73
4806	46.52(PK)	V	74/54	27.48
7209	--	H	74/54	--
7209	--	V	74/54	--
9612	--	H/V	74/54	--
12015	--	H/V	74/54	--
14418	--	H/V	74/54	--
16821	--	H/V	74/54	--
19224	--	H/V	74/54	--
21627	--	H/V	74/54	--
24030	--	H/V	74/54	--

Middle channel: 2441 MHz				
Frequency (MHz)	**Emission PK/AV (dBuV/m)**	**Horizontal / Vertical**	**Limits PK/AV (dBuV/m)**	**Margin (dB)**
2441	86.56 (PK)	H	114/94	27.44
2441	91.27 (PK)	V	114/94	22.73
4882	42.63 (PK)	H	74/54	31.37
4882	47.46 (PK)	V	74/54	26.54
7323	--	H	74/54	--
7323	--	V	74/54	--
9764	--	H/V	74/54	--
12205	--	H/V	74/54	--
14646	--	H/V	74/54	--
17087	--	H/V	74/54	--
19528	--	H/V	74/54	--
21969	--	H/V	74/54	--
24410	--	H/V	74/54	--

High channel: 2479 MHz				
Frequency (MHz)	**Emission PK/AV (dBuV/m)**	**Horizontal / Vertical**	**Limits PK/AV (dBuV/m)**	**Margin (dB)**
2479	86.63 (PK)	H	114/94	27.37
2479	90.36 (PK)	V	114/94	23.64
4958	43.94 (PK)	H	74/54	30.06
4958	46.73 (PK)	V	74/54	27.27
7437	--	H/V	74/54	--
9916	--	H/V	74/54	--
12395	--	H/V	74/54	--
14874	--	H/V	74/54	--
17353	--	H/V	74/54	--
19832	--	H/V	74/54	--
22311	--	H/V	74/54	--
24790	--	H/V	74/54	--

Note: 1) PK= Peak, AV= Average

2) Emission Level = Reading Level + Antenna Factor + Cable Loss.

3) Margin= Limit – Emission Level

4) According to section 15.35(b), the peak limit is 20dB higher than the average limit

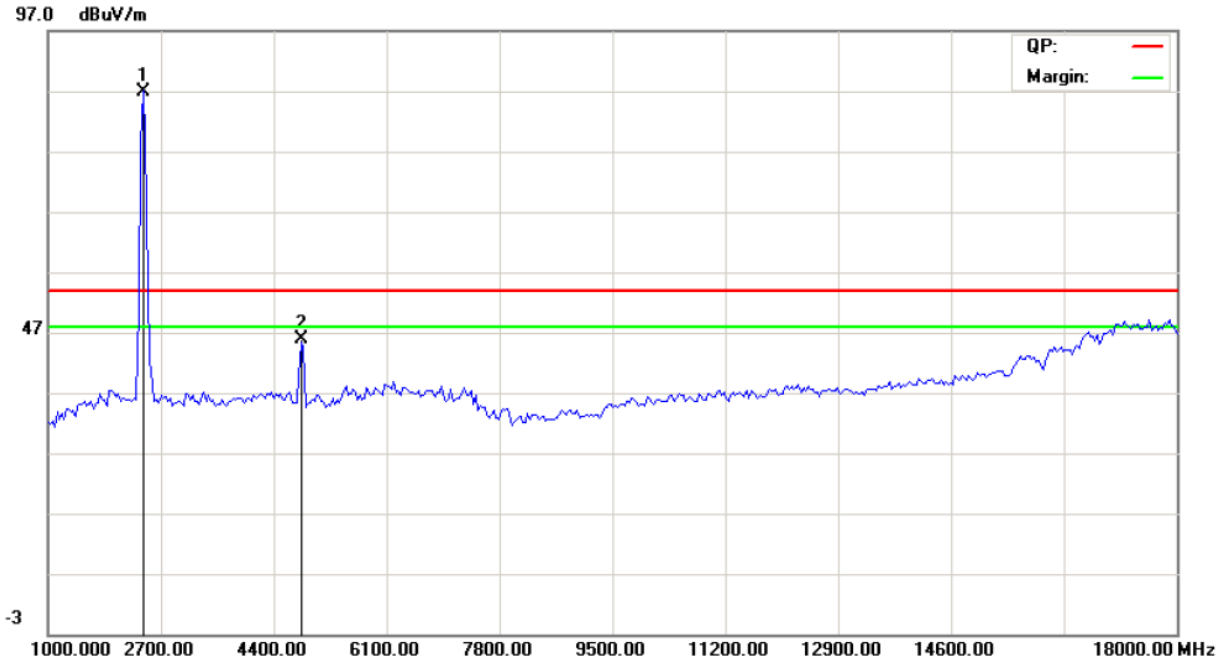
5) If the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

6) It is the floor noise from 18-25GHz, which is deemed to comply with the requirement of the rule.

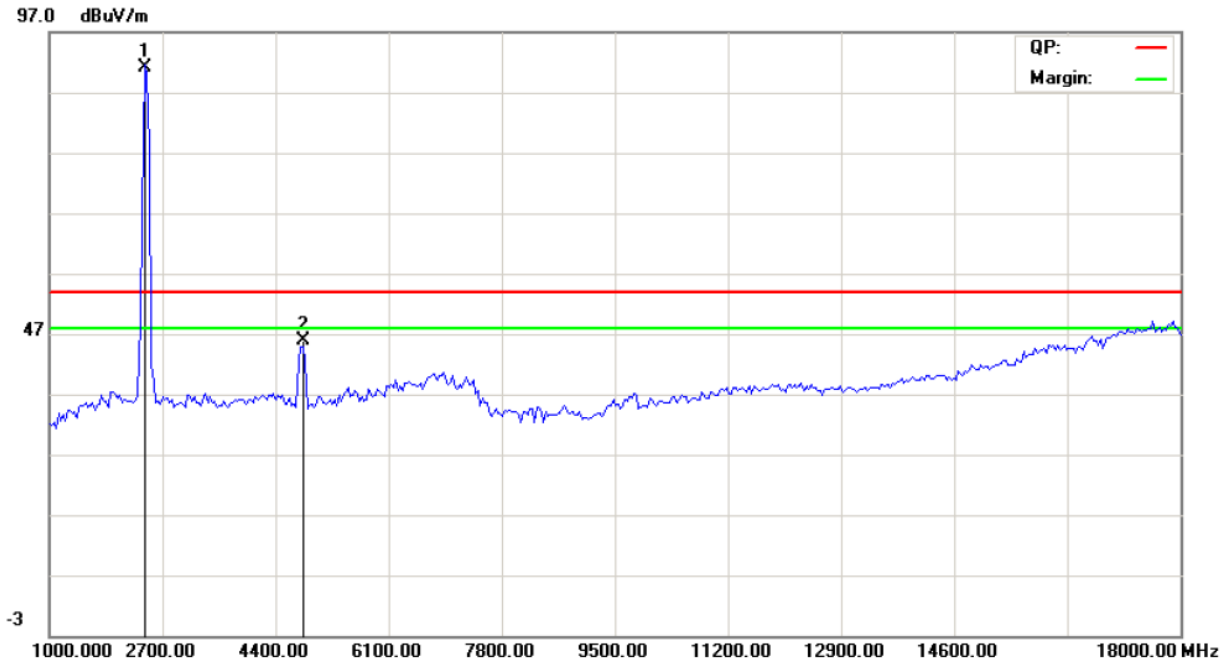
Please refer to the following diagram for individual

Low Channel: 2403 MHz

H



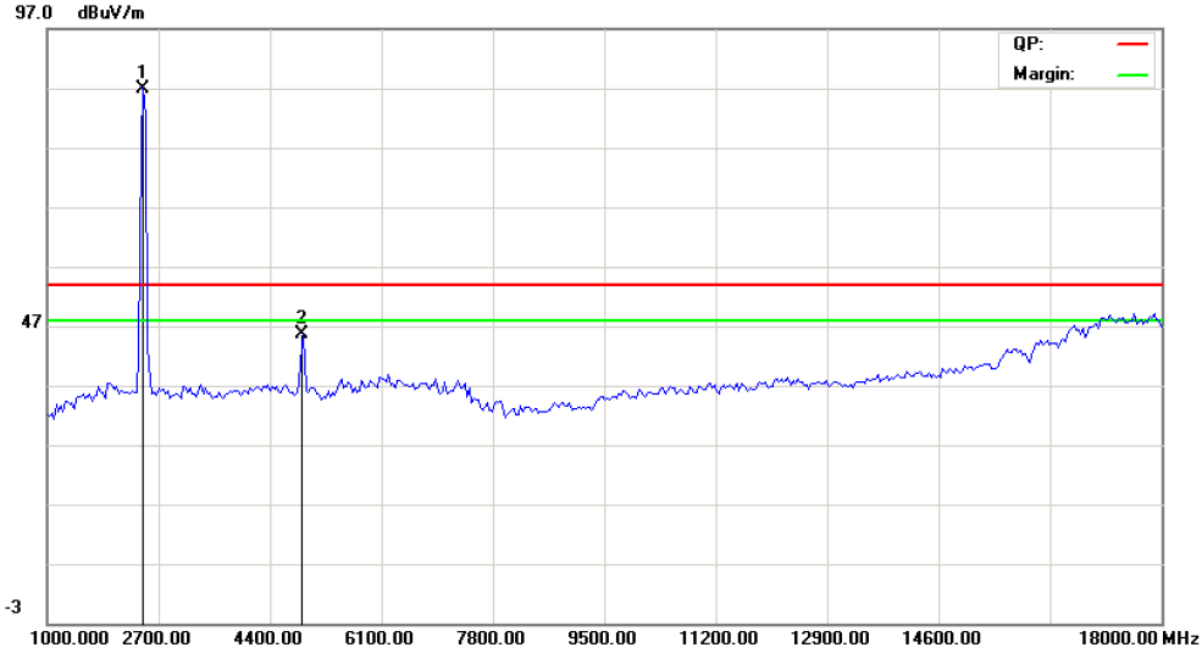
V



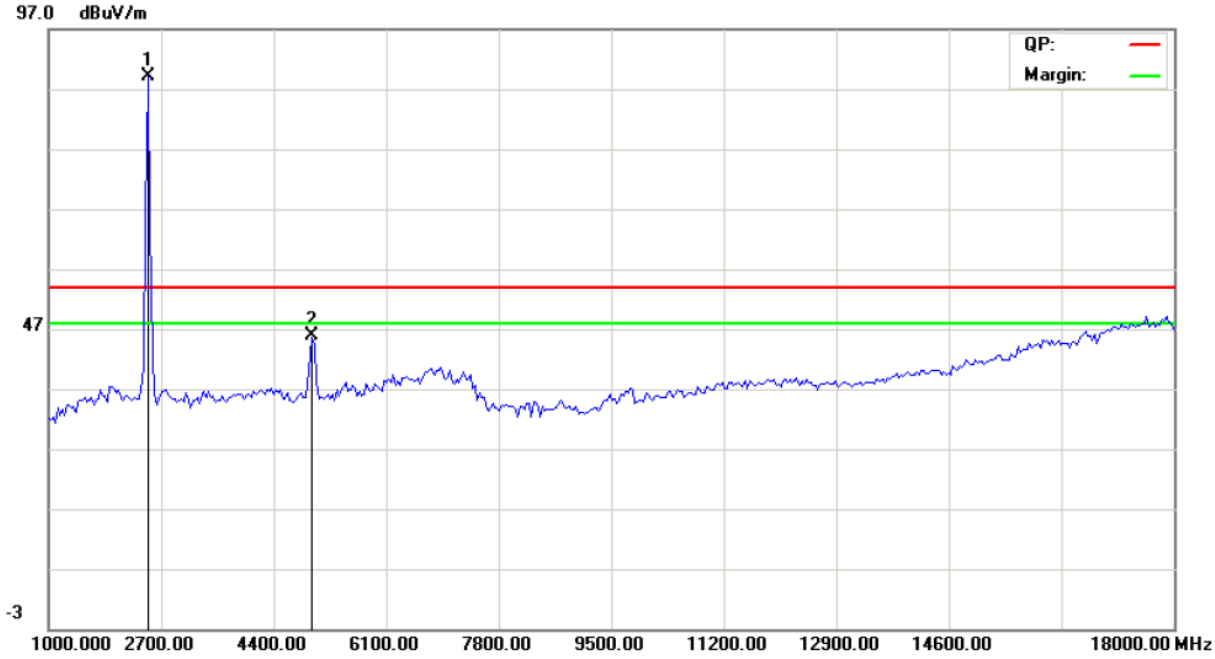
Please refer to following diagram for individual

Middle Channel: 2441 MHz

H



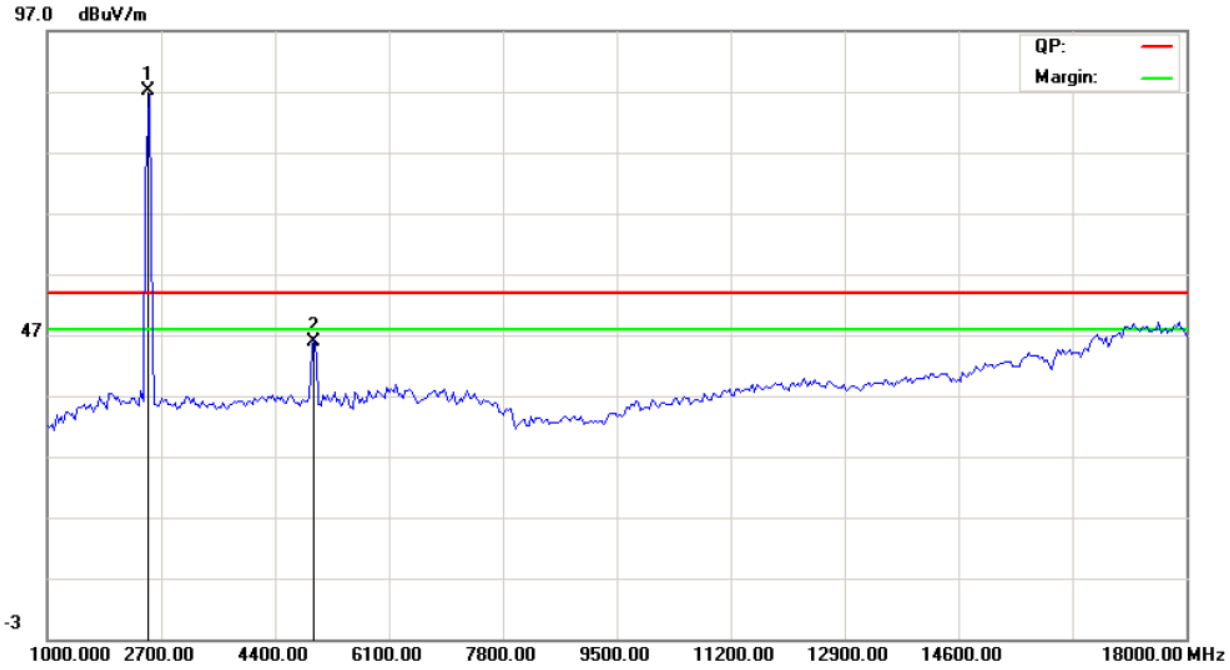
V



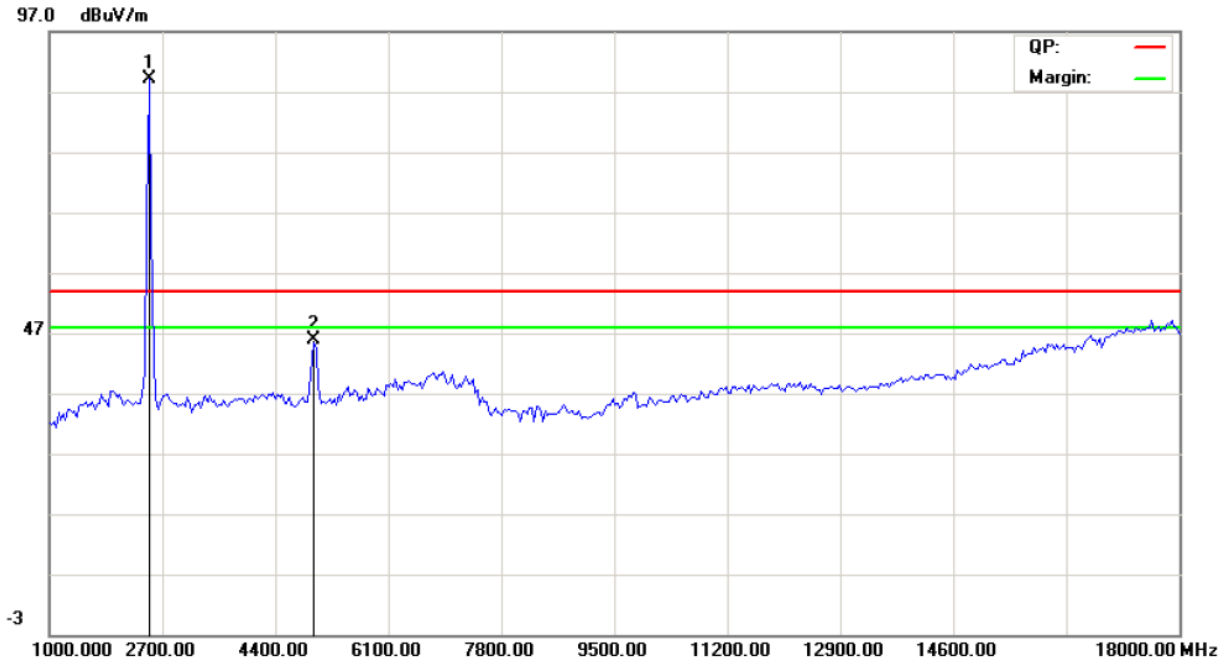
Please refer to following diagram for individual

High Channel: 2479 MHz

H



V

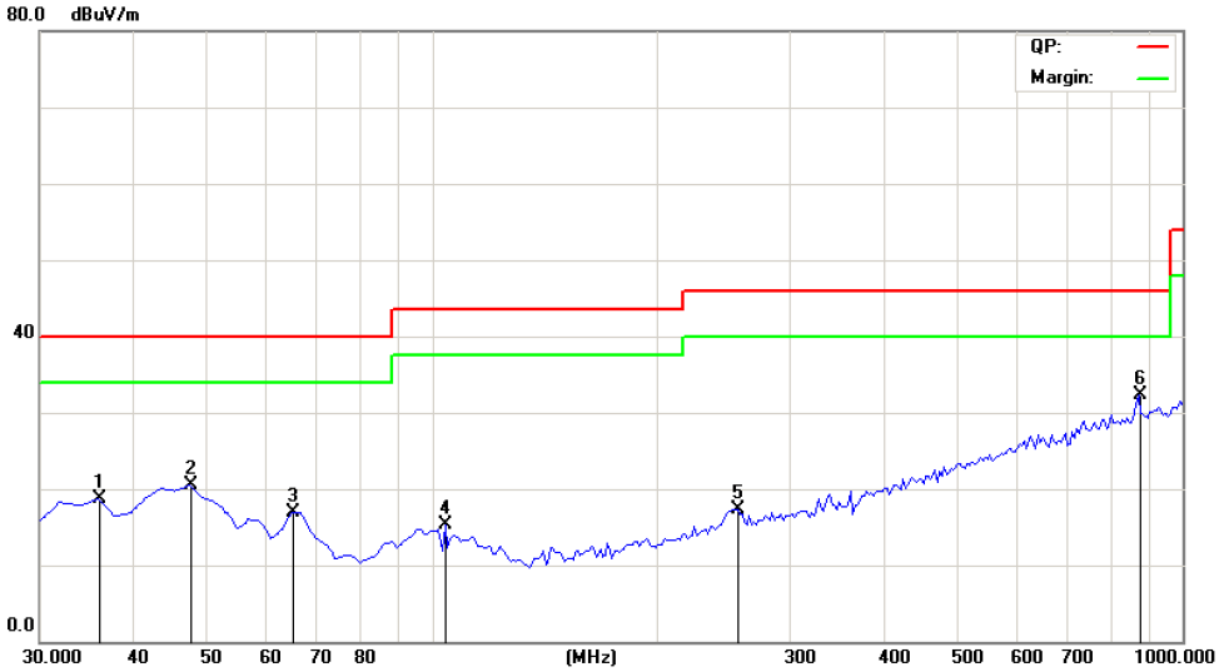


B. **General Radiated Emissions Data**

Radiated Emission In Horizontal (30MHz----1000MHz)

Please refer to following diagram for individual

Low channel: 2403 MHz

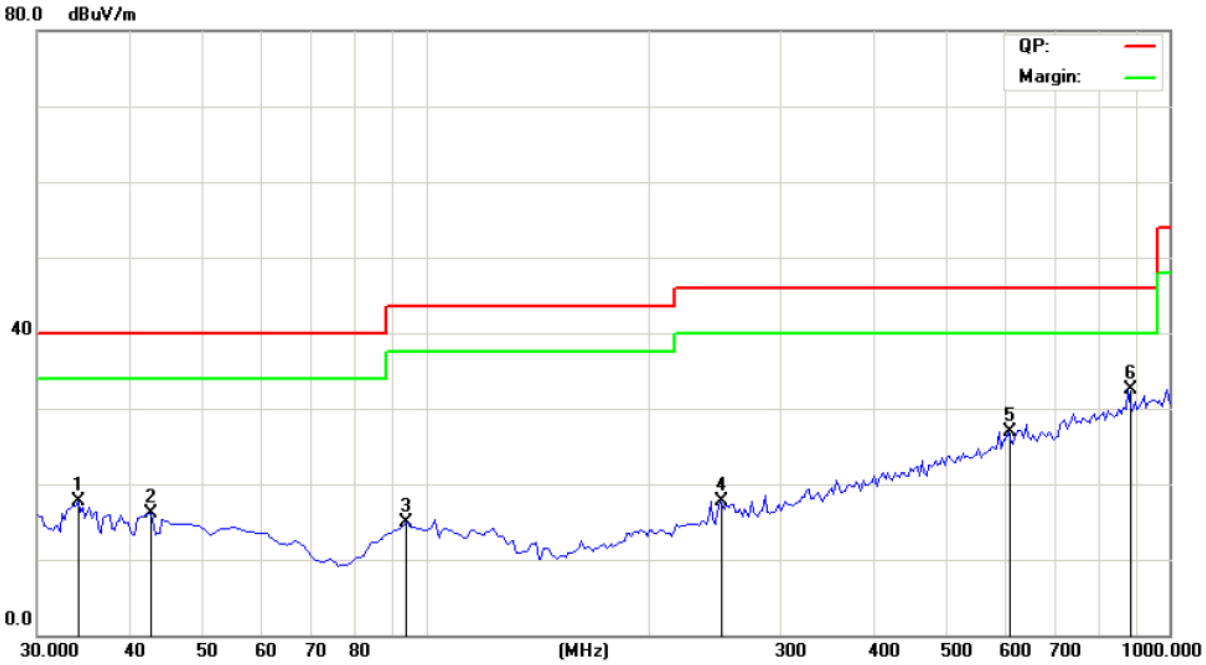


Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
35.831	18.76	H	40.00
47.495	20.47	H	40.00
64.995	16.98	H	40.00
104.064	15.27	H	43.50
255.491	17.45	H	46.00
879.479	32.33	H	46.00

Radiated Emission In Vertical (30MHz----1000MHz)

Please refer to following diagram for individual

Low channel: 2403 MHz

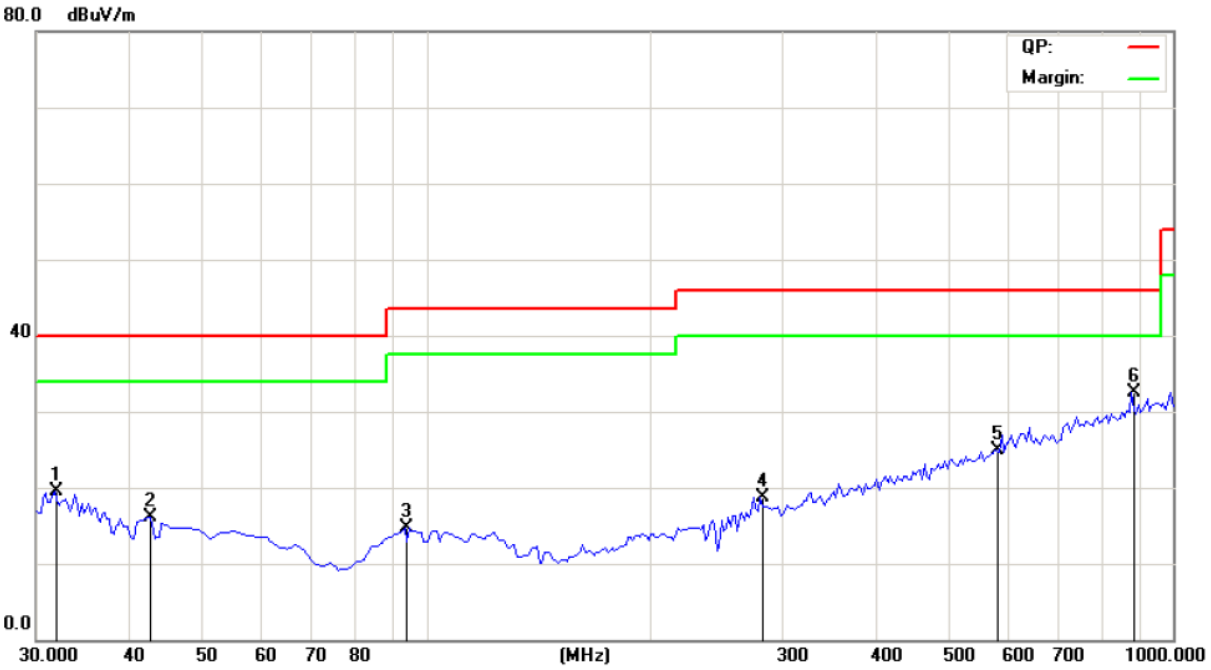


Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
34.045	17.79	V	40.00
42.629	16.16	V	40.00
94.313	14.84	V	43.50
249.659	17.65	V	46.00
609.278	26.85	V	46.00
883.366	32.41	V	46.00

Radiated Emission In Horizontal (30MHz----1000MHz)

Please refer to following diagram for individual

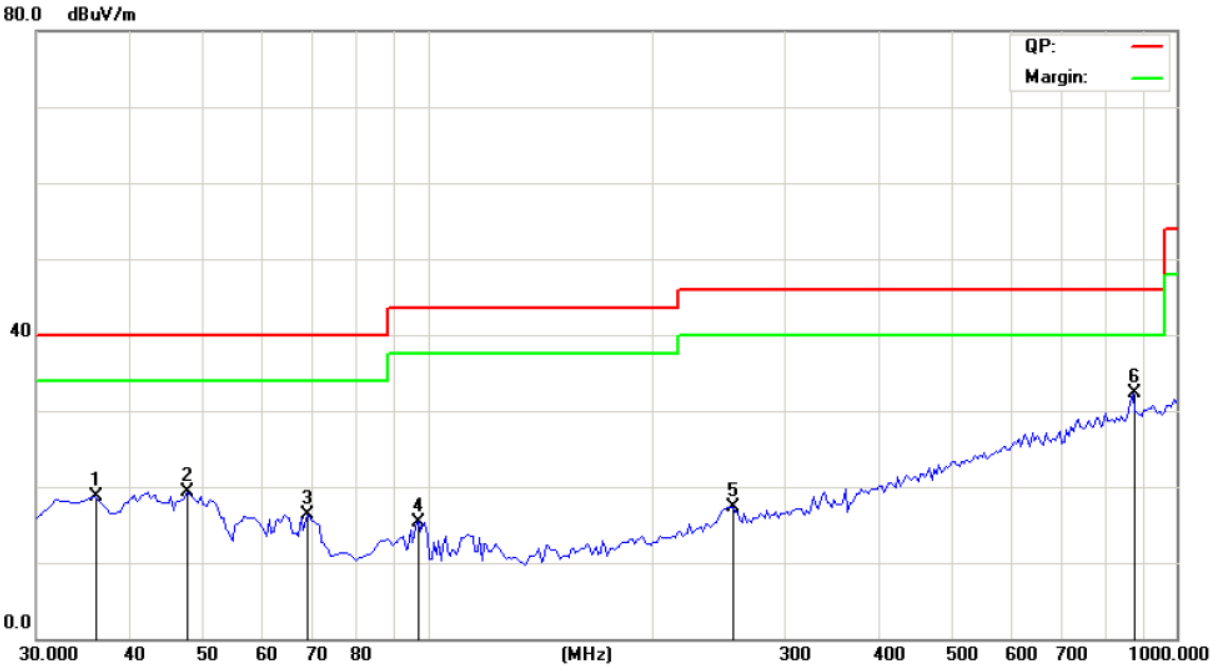
Middle channel: 2441 MHz



Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
31.943	19.59	H	40.00
42.629	16.16	H	40.00
94.148	14.76	H	43.50
280.761	18.62	H	46.00
582.064	24.88	H	46.00
883.366	32.41	H	46.00

Radiated Emission In Vertical (30MHz----1000MHz)

Please refer to following diagram for individual
Middle channel: 2441 MHz

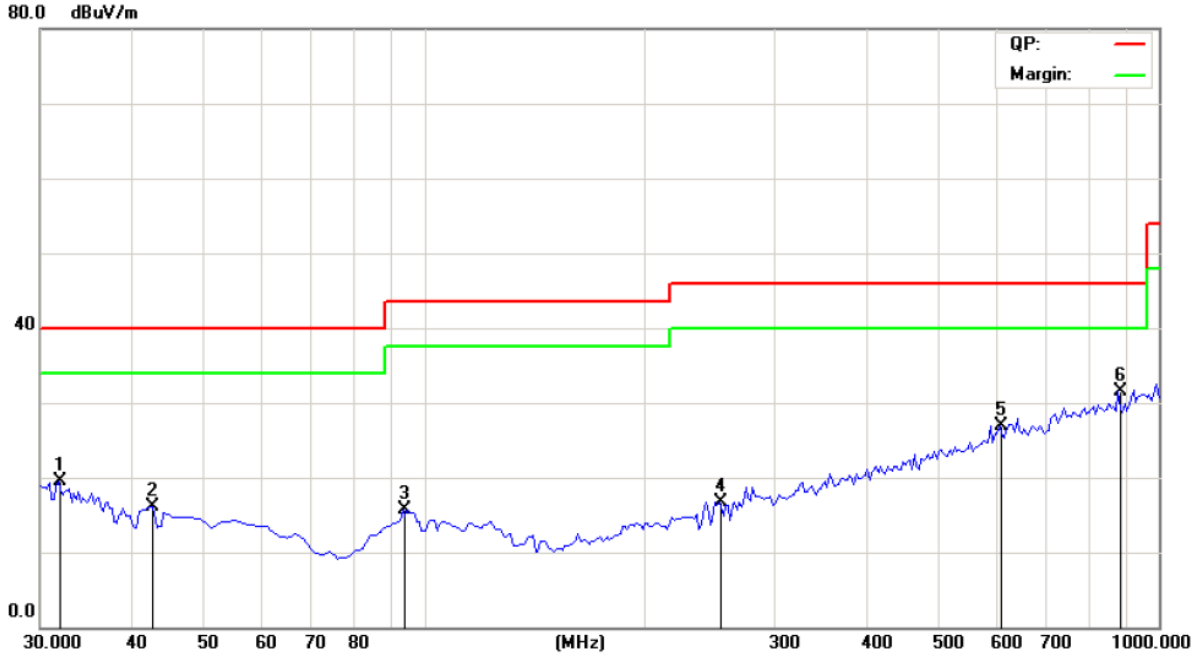


Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
35.831	18.76	V	40.00
47.702	19.36	V	40.00
69.229	16.35	V	40.00
97.002	15.44	V	43.50
255.491	17.43	V	46.00
879.479	32.33	V	46.00

Radiated Emission In Horizontal (30MHz----1000MHz)

Please refer to following diagram for individual

High channel: 2479 MHz

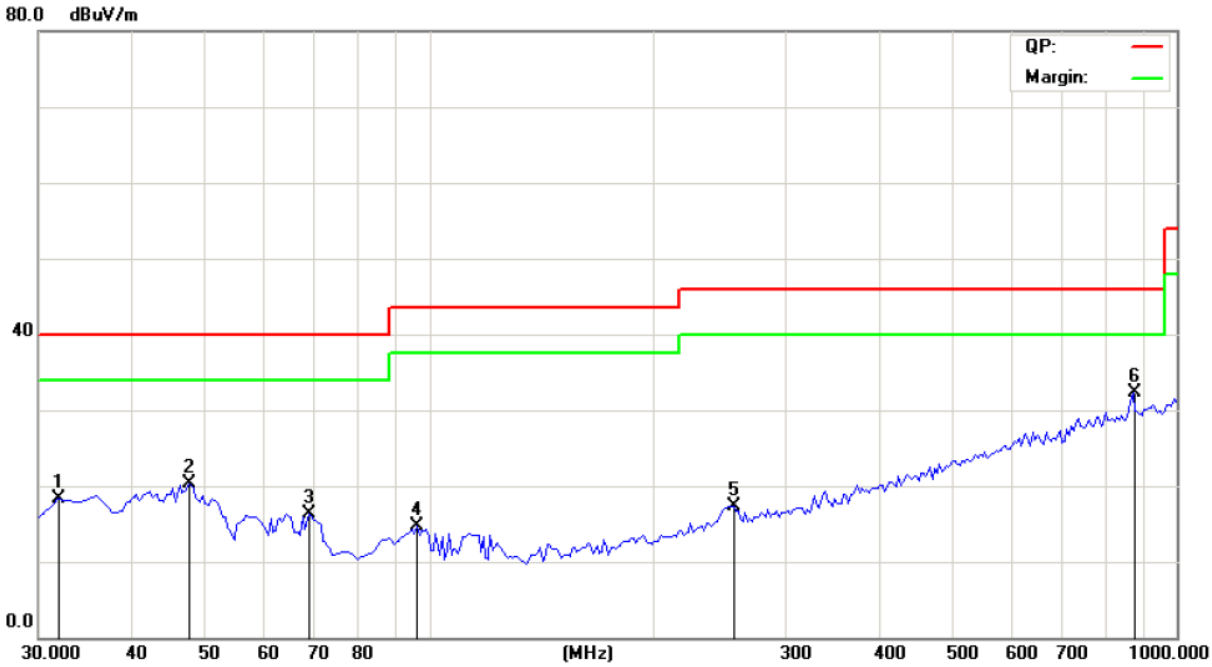


Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
31.943	19.59	H	40.00
42.629	16.16	H	40.00
94.148	15.76	H	43.50
253.547	16.74	H	46.00
609.278	26.85	H	46.00
883.366	31.41	H	46.00

Radiated Emission In Vertical (30MHz----1000MHz)

Please refer to following diagram for individual

High channel: 2479 MHz

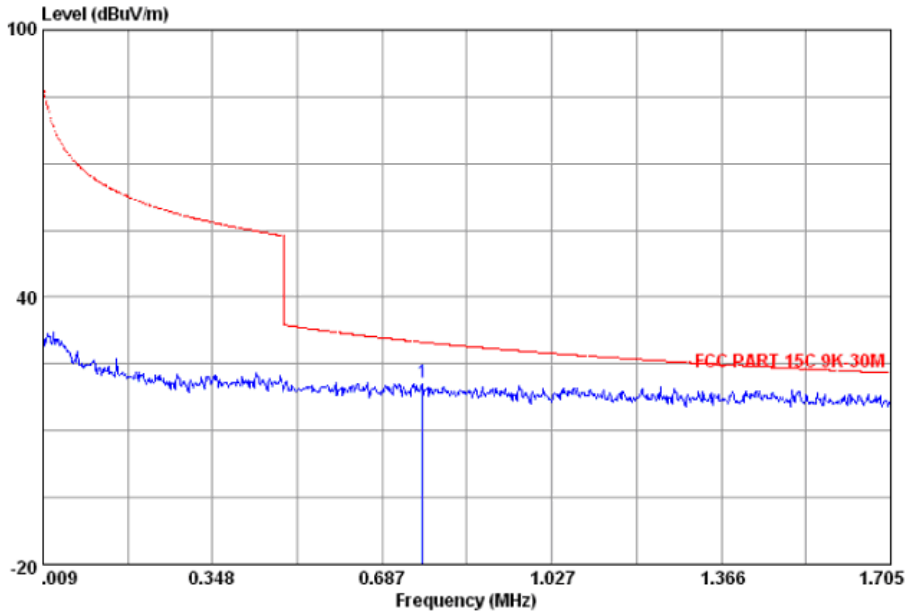


Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
31.943	18.25	V	40.00
47.702	20.35	V	40.00
69.229	16.34	V	40.00
96.323	14.67	V	43.50
255.491	17.43	V	46.00
879.479	32.33	V	46.00

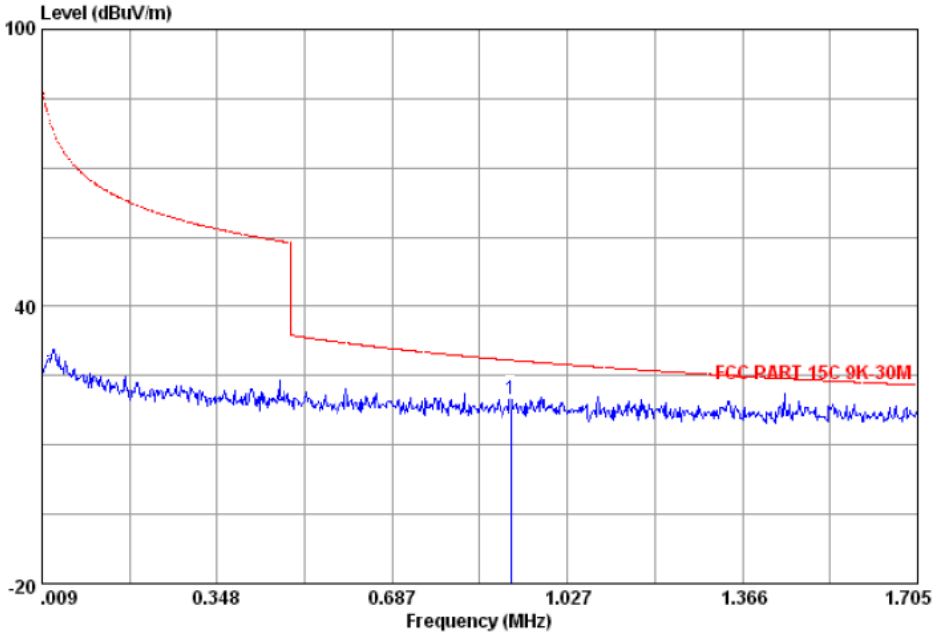
C Radiated Emission (9 kHz----30 MHz)

Please refer to following diagram for individual

low channel: 2403 MHz for 9 kHz-1.705 MHz Vertical

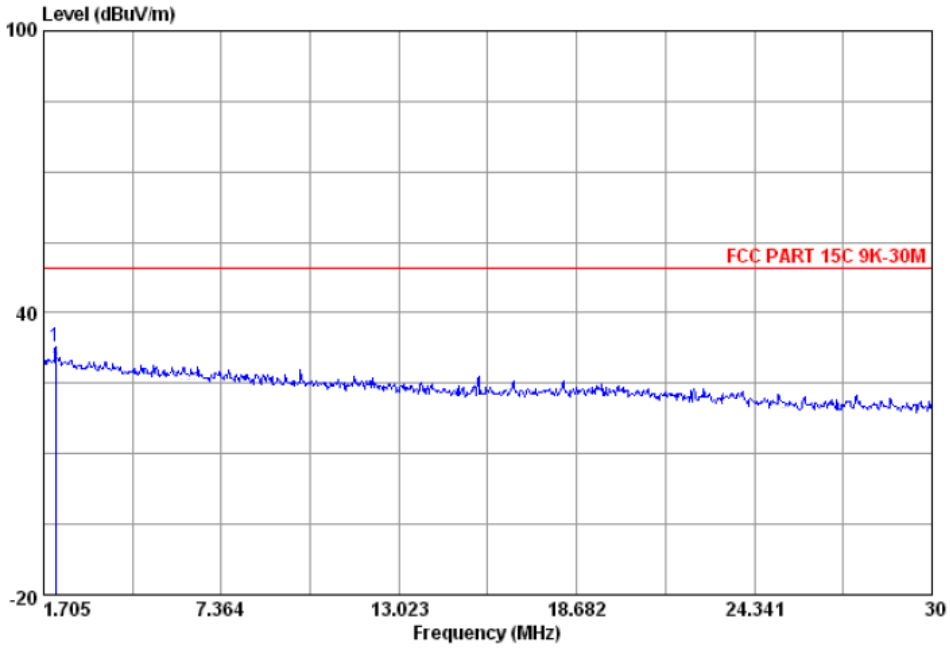


low channel: 2403 MHz for 9 kHz-1.705 MHz Horizontal

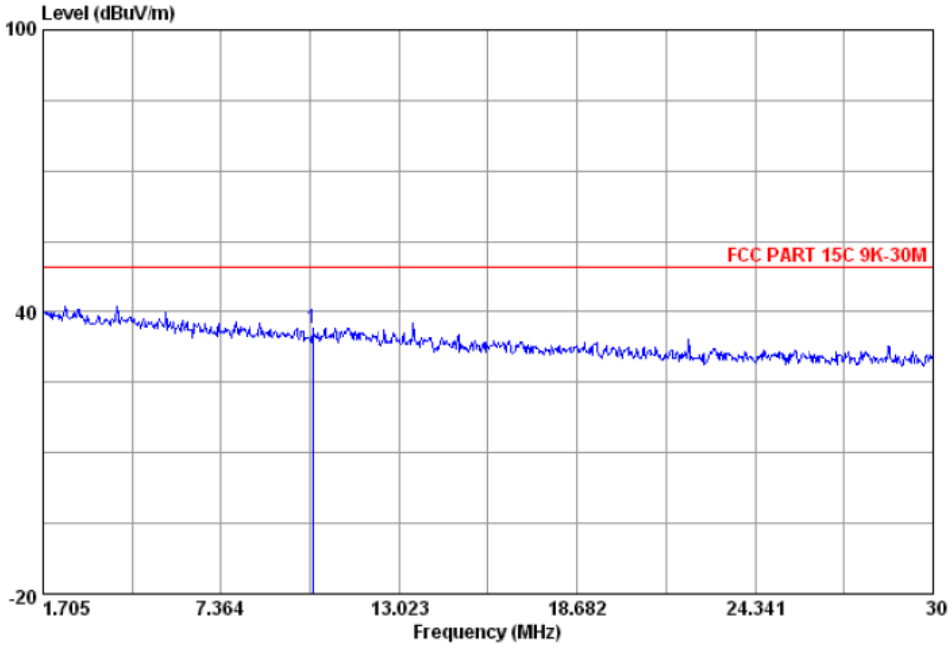


Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
0.7769	20.11	V	29.79
0.9136	20.03	H	28.39
--	--	V	--
--	--	H	--

low channel: 2403 MHz for 1.705 MHz-30 MHz Vertical



low channel: 2403 MHz 1.705 MHz-30 MHz Horizontal



Frequency (MHz)	Level@3m (dB μ V/m)	Antenna Polarity	Limit@3m (dB μ V/m)
2.0587	32.69	V	49.54
10.2783	36.54	H	49.54
--	--	V	--
--	--	H	--

Note: Measurements were conducted in all three channels (high, middle, low), and the worst case (low channel) was submitted only.

7. Band Edge

7.1 Test Method and test Procedure:

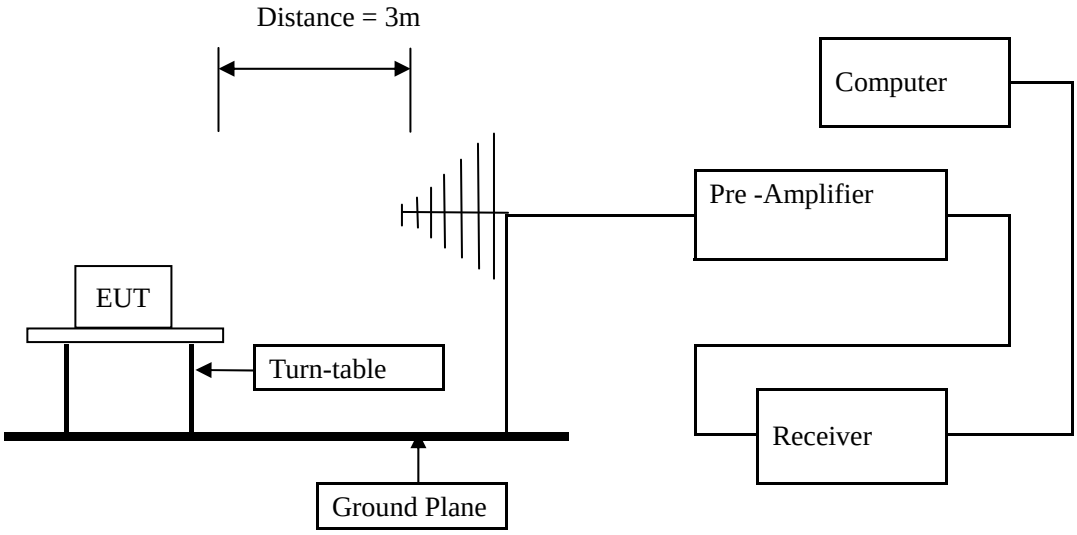
(1) The EUT was tested according to ANSI C63.10 –2009. The radiated test was performed at Timeway Laboratory. This site is on file with the FCC laboratory division, Registration No.899988

(2) Set Spectrum as RBW=VBW=1MHz and Peak detector used

(3) The antenna height is varied from 1 m to 4 m to find the maximum emission for the frequency measured.

(4) The antenna polarization: Vertical polarization and Horizontal polarization.

7. 2 Radiated Test Setup



For the actual test configuration , please refer to the related items – Photos of Testing

7.3 Band Edge Limit

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 Section 15.209, whichever is the lesser attenuation.

7.4 Test Equipment

Please refer to the Section 2

7.5 Test Produce

1) The EUT is placed on a turntable, which is 0.8m above the ground plane and worked at highest radiated power.

2) The turntable was rotated for 360 degrees to determine the position of maximum emission level.

3) EUT is set 3m away from the antenna, which is varied from 1m to 4m to find out the highest emission.

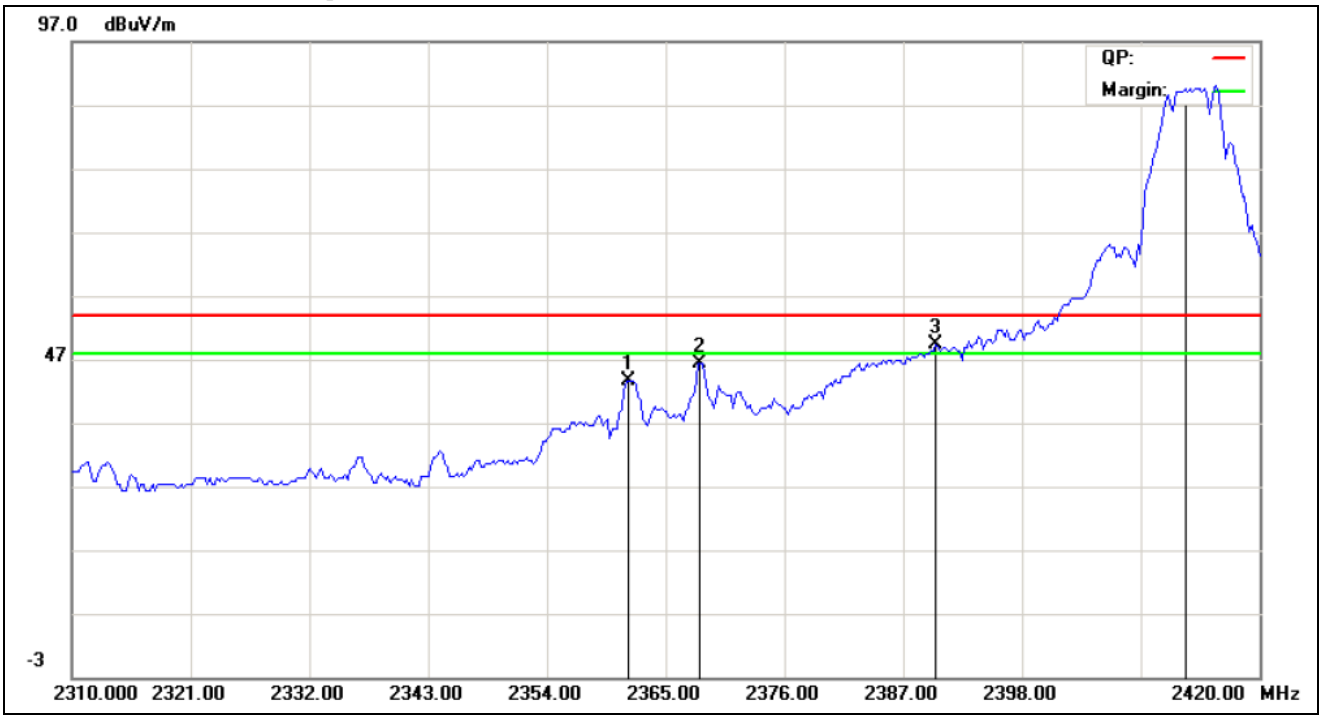
4) Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

(a) PEAK: RBW=VBW=1MHz, PK detector, Sweep=AUTO

(b) AVERAGE: RBW=1MHz / VBW=10Hz / PK detector Sweep=AUTO

7.6 Test Result

Low channel in Horizontal polarization



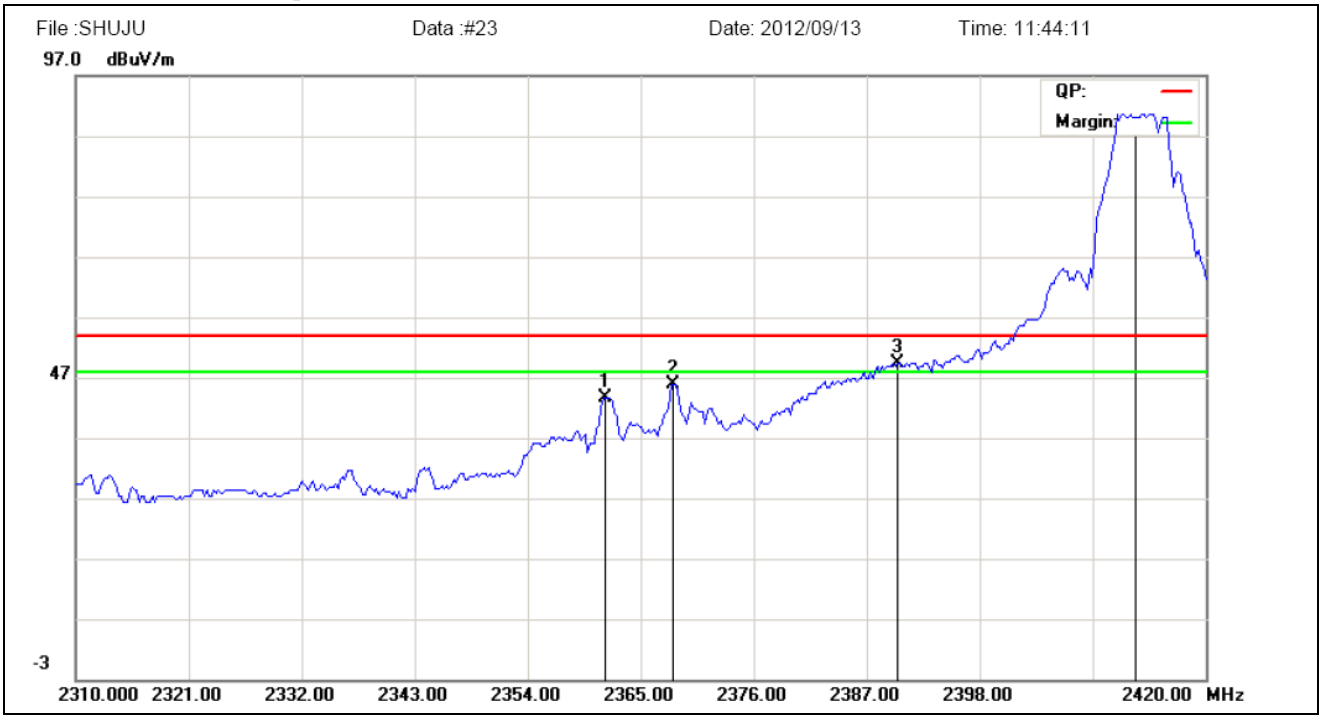
Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2361.363	43.73	Peak	74.00
2368.196	46.29	Peak	74.00
2390.000	49.47	Peak	74.00
2413.166	89.61	Peak	114.00

Note: 1. Emission Level = Reading Level + Antenna Factor + Cable Loss.

2. Margin= Limit – Emission Level

3. According to section 15.35(b), the peak limit is 20dB higher than the average limit

Low channel in Vertical polarization



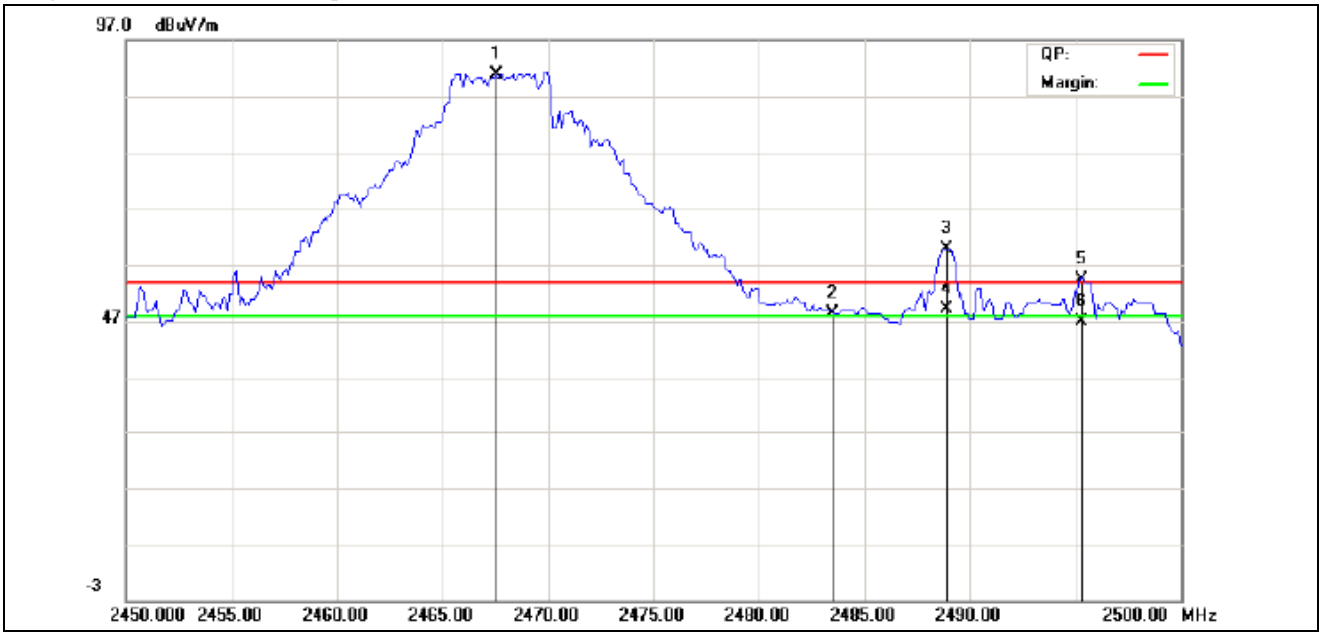
Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2361.363	43.73	Peak	74.00
2368.196	45.79	Peak	74.00
2390.000	49.47	Peak	74.00
2412.946	90.61	Peak	114.00

Note: 1. Emission Level = Reading Level + Antenna Factor + Cable Loss.

2. Margin= Limit – Emission Level

3. According to section 15.35(b), the peak limit is 20dB higher than the average limit

High channel in Horizontal polarization



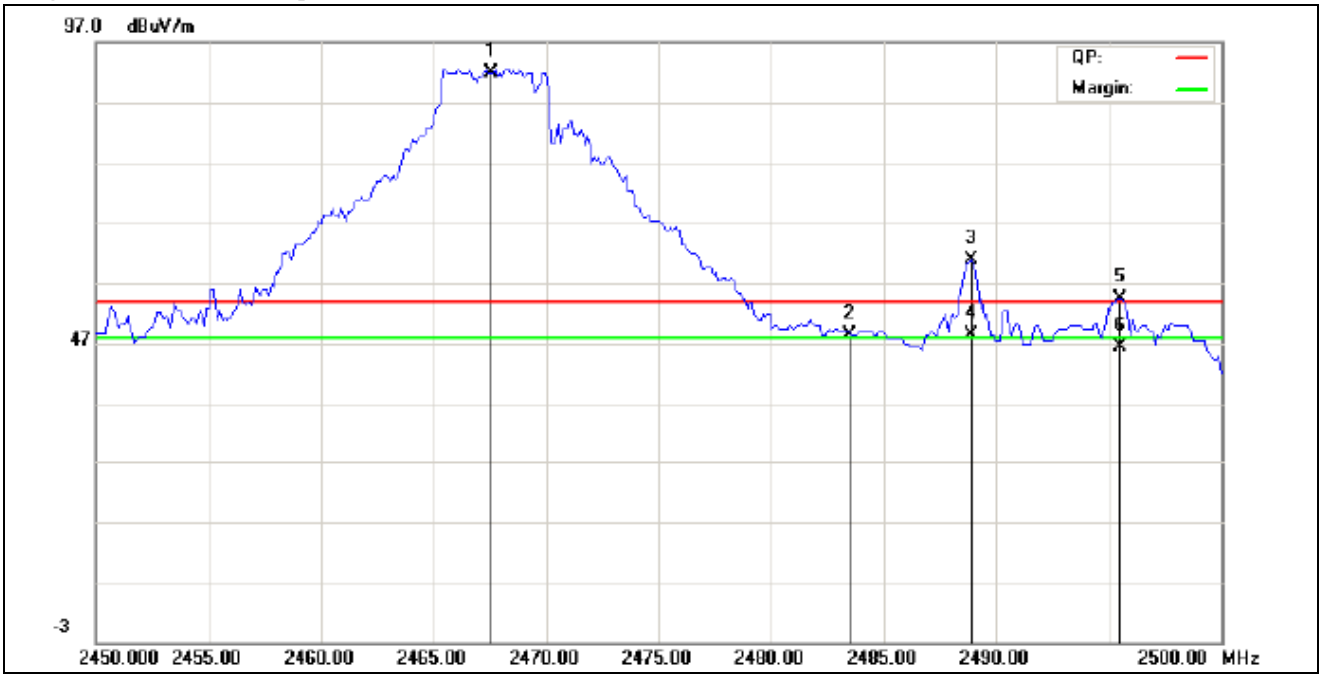
Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2467.635	92.43	peak	114.00
2483.500	48.25	peak	74.00
2488.778	59.57	peak	74.00
2488.778	49.11	AV	54.00
2495.291	54.35	peak	74.00
2495.291	46.90	AV	54.00

Note: 1. Emission Level = Reading Level + Antenna Factor + Cable Loss.

2. Margin= Limit – Emission Level

3. According to section 15.35(b), the peak limit is 20dB higher than the average limit

High channel in Vertical polarization



Frequency (MHz)	Level@3m (dB μ V/m)	Detector	Limit@3m (dB μ V/m)
2467.635	92.14	peak	114.00
2483.500	48.57	peak	74.00
2488.878	61.28	peak	74.00
2488.878	48.33	AV	54.00
2495.391	54.40	peak	74.00
2495.391	46.40	AV	54.00

Note: 1. Emission Level = Reading Level + Antenna Factor + Cable Loss.

2. Margin= Limit – Emission Level

3. According to section 15.35(b), the peak limit is 20dB higher than the average limit

8.0 Antenna Requirement

Applicable Standard

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.

A PCB printed antenna was used and the maximum Gain of the antenna is 2dBi.
Test Result: Pass

9.0 20dB Bandwidth Measurement

9.1 Test Equipment

Please refer to the Section 2

9.2 Test specification:

Environmental conditions: Temperature 23° C Humidity: 50% Atmospheric pressure: 103kPa

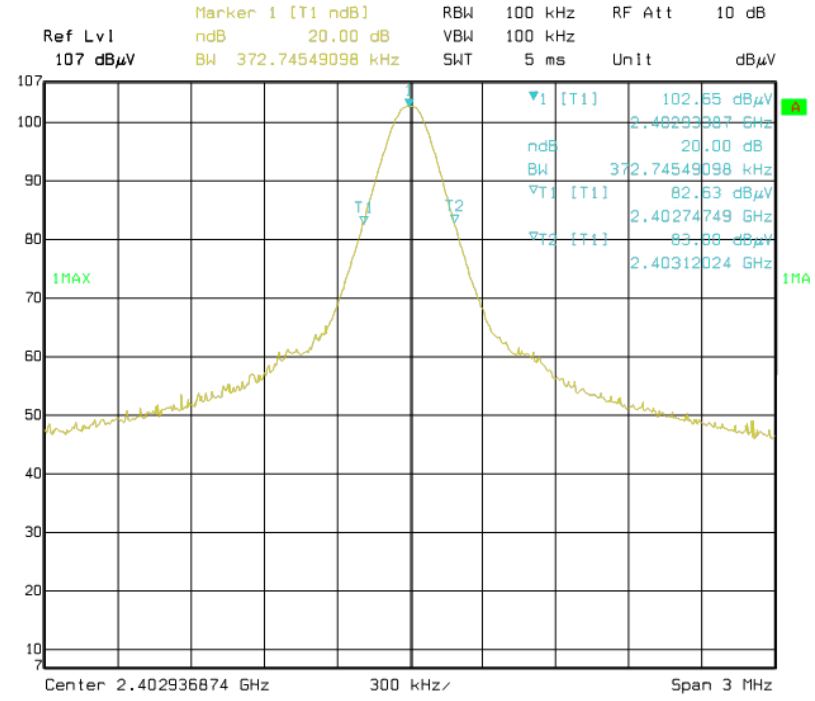
9.3 Limit

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 the20 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.

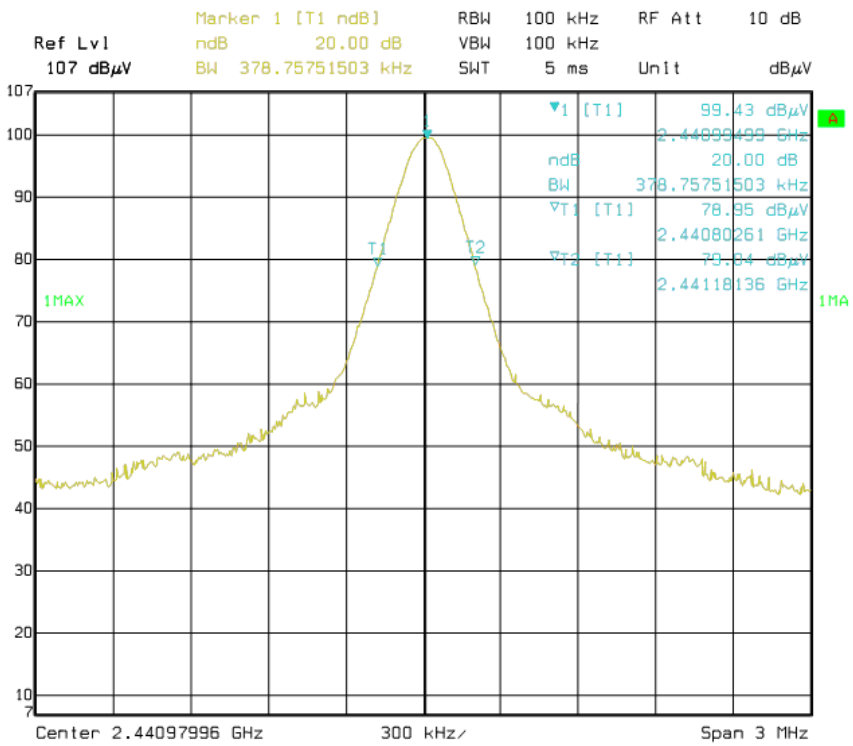
9.4 Test Result:

Channel number	20dB Bandwidth (kHz)	Limit (kHz)	Conclusion
(Low)	372.74	---	PASS
(Middle)	378.76	---	PASS
(High)	378.76	---	PASS

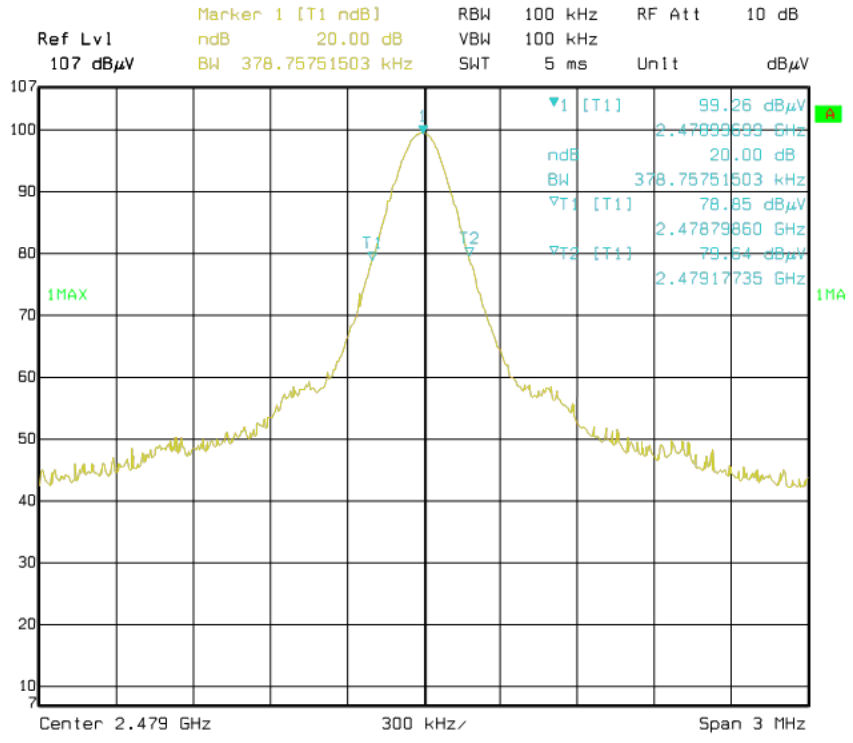
Low channel：2403 MHz



Middle channel



High channel



10.0 FCC ID Label

FCC ID: ZX3WS5406

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:

11.0 Photos of testing

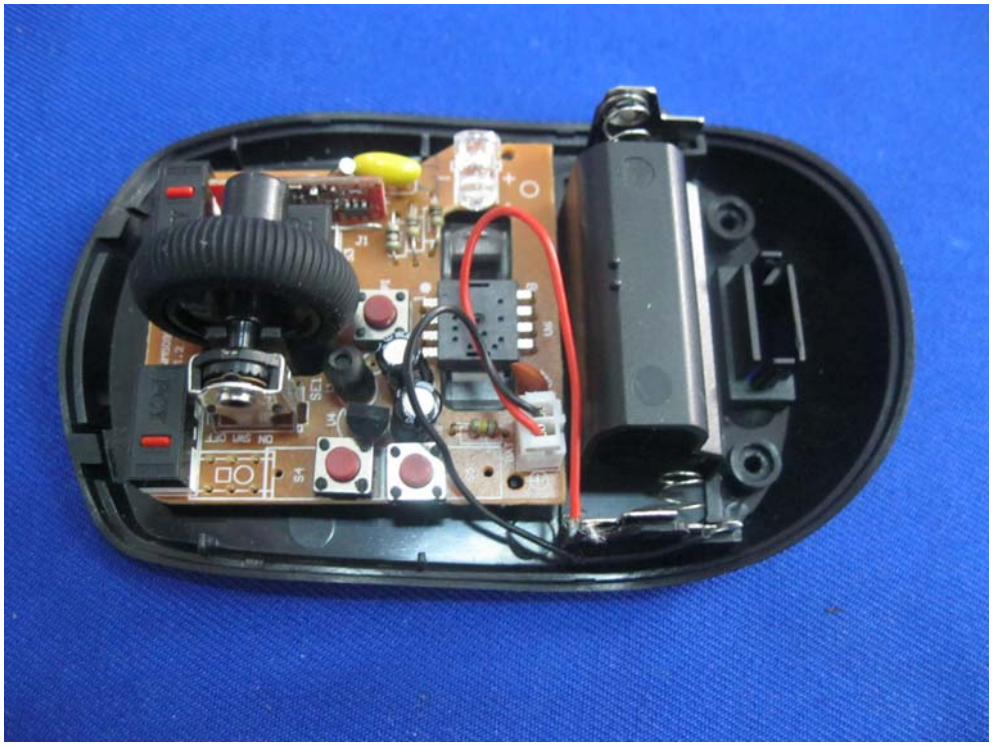
11.1 Conducted test View-- N/A

11.2 Radiated emission test view

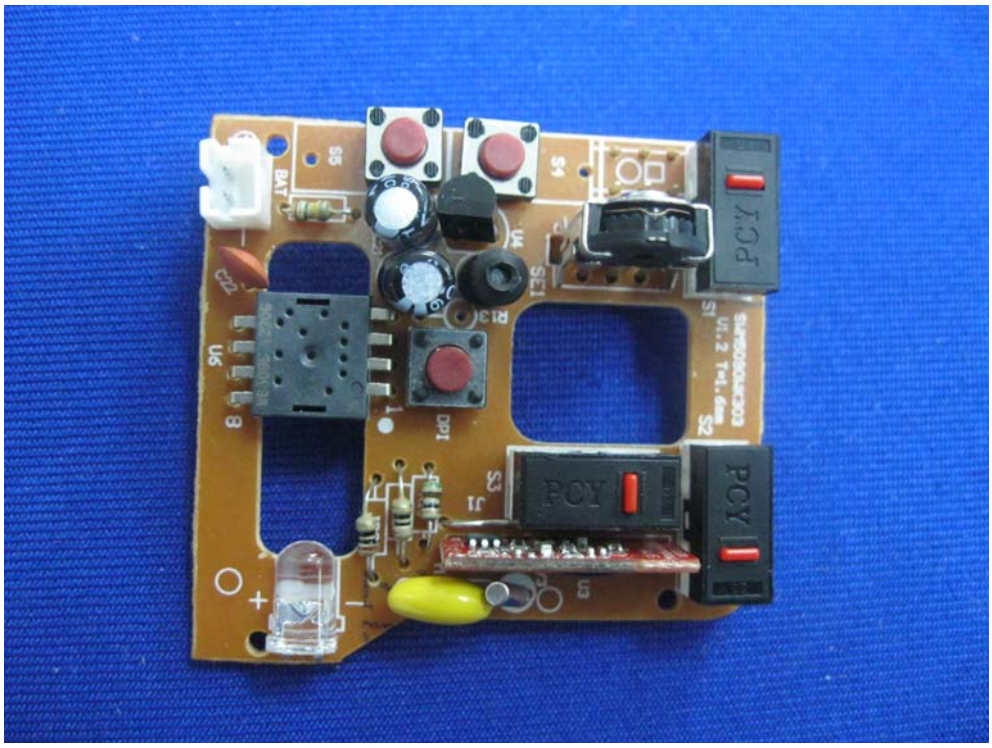
12 Photos for the EUT

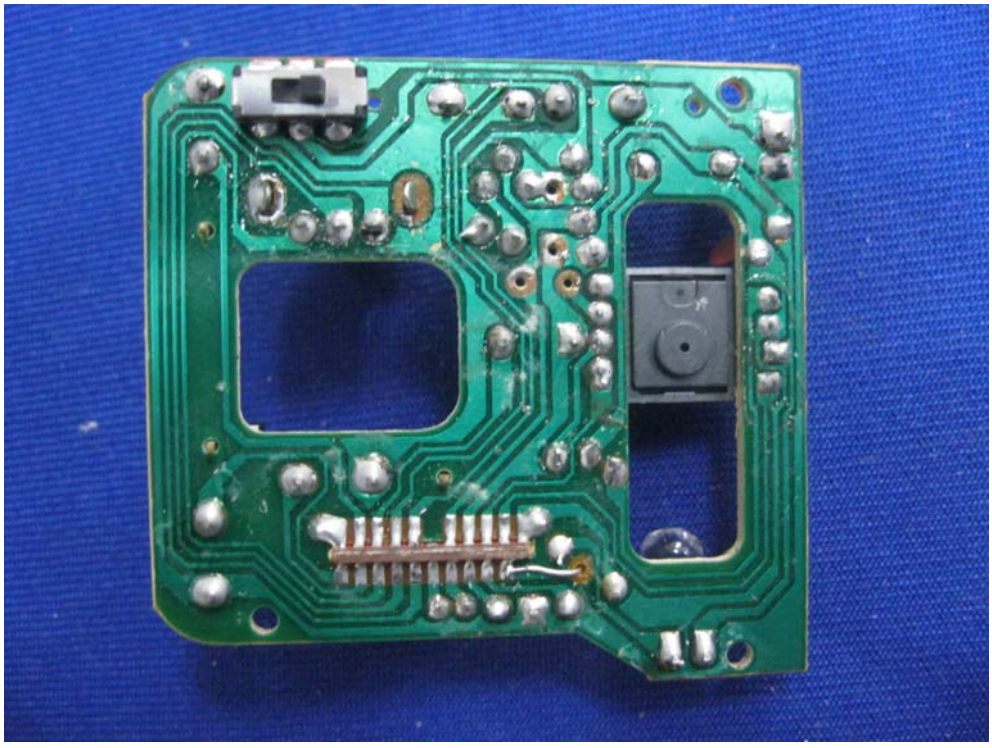
Outside View of the EUT

Inside View of the EUT

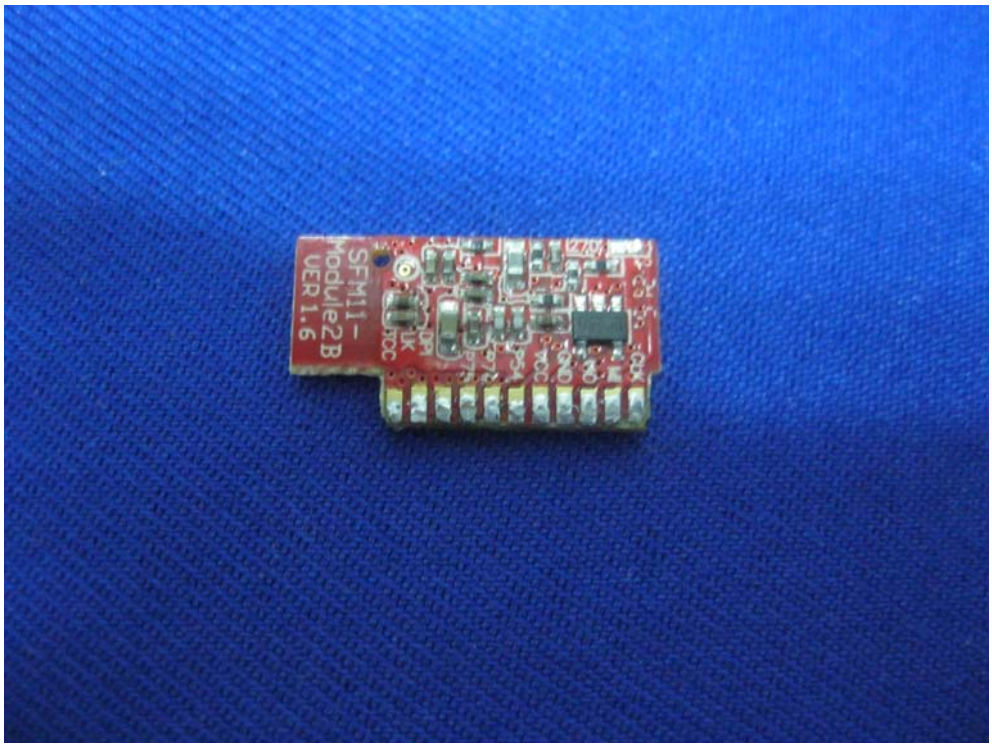


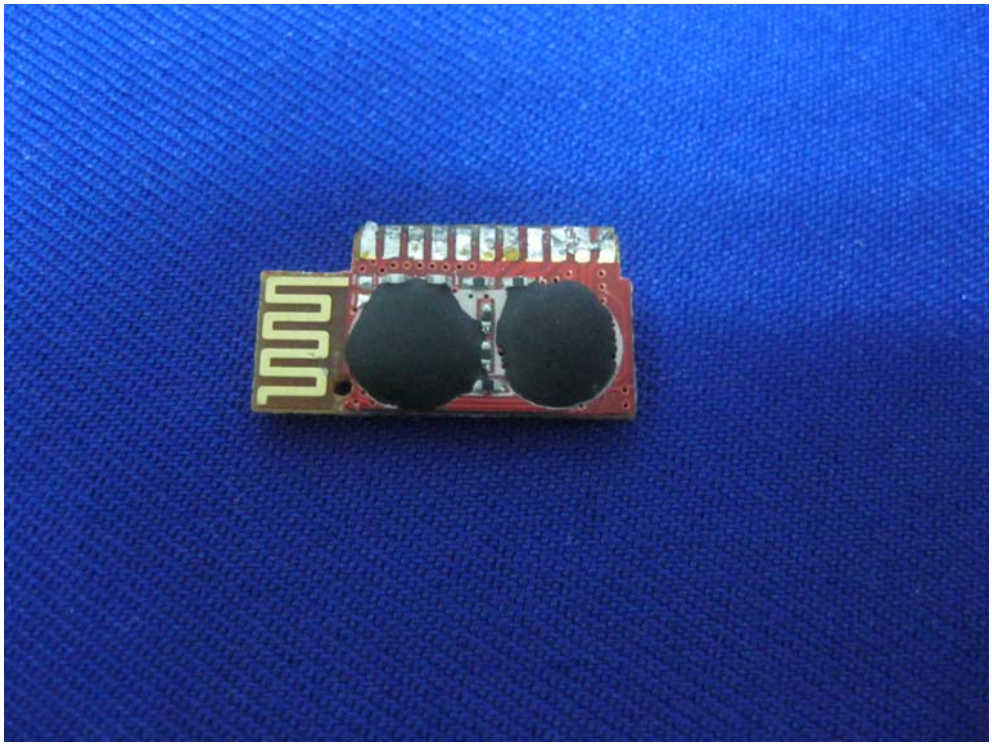
Inside View of the EUT





Inside View of the EUT





--End of the report--