

# ***FCC TEST REPORT***

**FCC ID** : SJ8-M370M.

**Applicant** : RDI Technology (Shenzhen) Co., Ltd

**Address of Applicant** : Building C1 Xingtang Industrial Park, East Baishixia,  
Fuyong, Baoan, Shenzhen, PRC.

**Equipment Under Test (EUT) :**

Product description : Digital Wireless Monitor

Model No. : M370M

Frequency Range : 2406MHz to 2476MHz

**Standards** : FCC 15 Paragraph 15.247

**Date of Test** : May 09,2011

**Test Engineer** : (Olic huang) *Olic huang*

**Reviewed By** : (Philo zhong) *Philo zhong*

PERPARED BY:

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### 3 Test Summary

Test Items	Test Requirement	Test Method	Limit / Severity	Result
Maximum peak output power	FCC Part 15:2008	ANSI C63.4: 2003	20dBm	PASS
Restricted Band	FCC Part 15:2008	ANSI C63.4: 2003	Note	PASS
Dwell time	FCC Part 15:2008	ANSI C63.4: 2003	Maximum:0.4 s	PASS
Channel separation	FCC Part 15:2008	ANSI C63.4: 2003	Channel separation at least 1MHz	PASS
Hopping channel No.	FCC Part 15:2008	ANSI C63.4: 2003	As the test data	PASS
20-dB Bandwidth	FCC Part 15:2008	ANSI C63.4: 2003	Note	PASS
RF Exposure Test	FCC Part 15:2008	ANSI C63.4: 2003	Note	PASS
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	FCC Part 15:2008	ANSI C63.4: 2003	N/A	PASS
Radiation Emission, 30MHz to 25GHz	FCC Part 15:2008	ANSI C63.4: 2003	N/A	PASS

**Note :** denote that for more details of the EUT , please refer to the relating test items as below .

**Remark :** the methods of measurement in all the test items were according to the FCC Public Notice DA 00-705 .

## 4 General Information

### 4.1 Client Information

Applicant: RDI Technology (Shenzhen) Co., Ltd  
Address of Applicant: Building C1 Xingtang Industrial Park, East Baishixia,  
Fuyong, Baoan, Shenzhen, PRC.

Manufacturer: RDI Technology (Shenzhen) Co., Ltd  
Address of Manufacturer: Building C1 Xingtang Industrial Park, East Baishixia,  
Fuyong, Baoan, Shenzhen, PRC..

### 4.2 General Description of E.U.T.

Product description: Digital Wireless Monitor  
Model No.: M370M

### 4.3 Details of E.U.T.

Power Supply: Adapter Input: AC 100-240V ~50/60Hz, 0.5A  
Output: DC 5.0V, 1.0A

### 4.4 Description of Support Units

The EUT has been tested as an independent unit.

### 4.5 Standards Applicable for Testing

The customer requested FCC tests for a Digital Wireless Monitor. The standards used were FCC 15 Paragraph 15.247, Paragraph 15.205, Paragraph 15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

#### 4.6 Test Facility

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

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) Co., Ltd. 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 880581, June 24, 2008.

- **IC – Registration No.: IC 7760A**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration IC7760A, Aug.03,2010.

#### 4.7 Test Location

All Emissions tests were performed at:-

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen 518105, Guangdong, China.

**Remark :** All the test results of the peripherals were conformed to the Fcc Verification requirements.

**4.8 Equipment Used during Test**

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY451149 43	W2008001	9k-26.5GHz	Aug- 03-10	Aug- 02-11	Wws200 81596	±1dB
Trilog Broadband Antenne 30-3000 MHz	SCHWARZB ECK MESS- ELEKTROM/ VULB9163	336	W2008002	30-3000 MHz	Aug- 03-10	Aug- 02-11		±1dB
Broad-band Horn Antenna	SCHWARZB ECK MESS- ELEKTROM/ BBHA 9120D(1201)	667	W2008003	1-18GHz	Aug- 03-10	Aug- 02-11		f< 10 GHz: ±1dB 10GHz<f< 18 GHz: ±1.5dB
Broadband Preamplifier	SCHWARZB ECK MESS- ELEKTROM/ BBV 9718	9718-148	W2008004	0.5-18GHz	Aug- 03-10	Aug- 02-11		±1.2dB
10m Coaxial Cable with N-male Connectors usable up to 25GHz,	SCHWARZB ECK MESS- ELEKTROM/ AK 9515 H	-	-	-	Aug- 03-10	Aug- 02-11		-
10m 50 Ohm Coaxial Cable with N-plug, individual length, usable up to 3(5)GHz, Connector	SCHWARZB ECK MESS- ELEKTROM/ AK 9513				Aug- 03-10	Aug- 02-11		
Positioning Controller	C&C LAB/ CC-C-IF				N/A	N/A		
Color Monitor	SUNSPO/ SP- 14C				N/A	N/A		
Test Receiver	ROHDE&SC HWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug- 03-10	Aug- 02-11	Wws200 80942	±1dB
EMI Receiver	Beijingkehuan	KH3931		9k-1GHz	Aug- 03-10	Aug- 02-11		
Two-Line V-Network	ROHDE&SC HWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug- 03-10	Aug- 02-11	Wws200 80941	±10%

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
Absorbing Clamp	ROHDE&SC HWARZ/ MDS-21	100205	W2005003	impedance50 $\Omega$ loss : 17 dB	Aug- 03-10	Aug- 02-11	Wws200 80943	$\pm 1$ dB
10m 50 Ohm Coaxial Cable with N-plug, individual length, usable up to 3(5)GHz, Connectors	SCHWARZB ECK MESS- ELEKTROM/ AK 9514				Aug- 03-10	Aug- 02-11		
Digital Power Analyzer	Em Test AG/Switzerla nd/ DPA 500	V07451 03095	W2008012	Power: 2000VA Vol-range: 0- 300V Freq_range: 10-80Hz	Aug- 03-10	Aug- 02-11	Wwd200 81185	Voltage distinguish:0 .025% Power_freq distinguish:0 .02Hz
Power Source	Em Test AG/Switzerla nd/ ACS 500	V07451 03096	W2008013	Vol-range: 0- 300V Power_freq: 10-80Hz				
Electrostatic Discharge Simulator	Em Test AG/Switzerla nd/DITO	V07451 03094	W2008005	Contact discharge: 500V-10KV Air diacharge: 500V-16.5KV	Aug- 03-10	Aug- 02-11	Wwc200 82400	7.5A current will be changed in $V_m=1.5V$
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Fraq-range: 9K-1GHz RF voltage: - 60 dBm- +10dBm	Aug- 03-10	Aug- 02-11	Wws200 81890	Power_freq distinguish0. 1Hz RFelectricity distinguish 0.1 B
CDN M- Type	TESEQ GmbH/ CDN M016	25112	W2008009	Voltage correct factor 9.5 dB	Aug- 03-10	Aug- 02-11	Wwc200 82396	150K- 80MHz: $\pm 1$ dB 80- 230MHz:-2- +3dB
EM-Clamp	TESEQ GmbH/ KEMZ 801	25453	W2008010	Freq_range: 0.15-1000 MHz	Aug- 03-10	Aug- 02-11	Wwc200 82397	0.3-400 MHz: $\pm 4$ dB Other freq: $\pm 5$ dB
Attenuator 6dB	TESEQ GmbH/ ATN6050	25365			Aug- 03-10	Aug- 02-11	Wws200 81597	



Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
All Modules Generator	SCHAFFNER /6150	34579	W2008006	voltage:200V-4.4KV Pulse current: 100A-2.2KA	Aug-03-10	Aug-02-11	Wwc20082401	voltage: ±10% Pulse current: ±10%
Capacitive Coupling Clamp	SCHAFFNER / CDN 8014	25311			Aug-03-10	Aug-02-11	Wwc20082398	-
Signal and Data Line Coupling Network	SCHAFFNER / CDN 117	25627	W2008011	1.2/50μS	Aug-03-10	Aug-02-11	Wwc20082399	-
AC Power Supply	TONGYUN/ DTDGC-4				Aug-03-10	Aug-02-11	Wws20080944	-
Exposure Level Tester ELT-400	Narda Safety TEST Solutions/2304/03	M-0155	w2008022	Test freq range: 1—400kHz	Aug-03-10	Aug-02-11	Wwd20081191	Test uncertainty: 1—120kHz:±1.83%, 120 kHz-400 kHz: ±4.06%
Magnetic Field Probe 100cm <sup>2</sup>	Narda Safety TEST Solutions/2300/90.10	M-1070	w2008021	Test freq range: 1—400kHz				Test uncertainty: 1Hz-10Hz: ±16.2%, 10Hz - 120kHz:±2.2%, 120 kHz-400 kHz: ±4.7%
Active Loop Antenna 10kHz-30MHz	Beijing Dazhi / ZN30900A	-	-	10kHz-30MHz	Aug-03-10	Aug-02-11		±1dB

## 5 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
Test Date:	May 09,2011
Frequency Range:	150kHz to 30MHz
Class:	Class B
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

### 5.1 Test Equipment

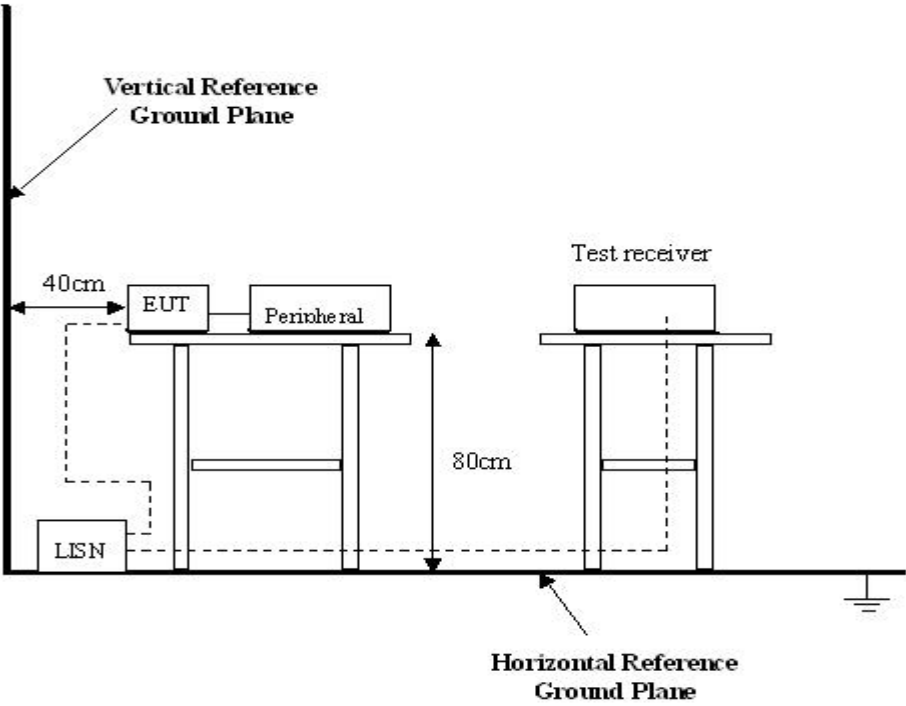
Please refer to Section 5 this report.

### 5.2 Test Procedure

1. The EUT was connected to LISN and placed on a table.
2. The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.
3. 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.

**5.3 Conducted Test Setup**

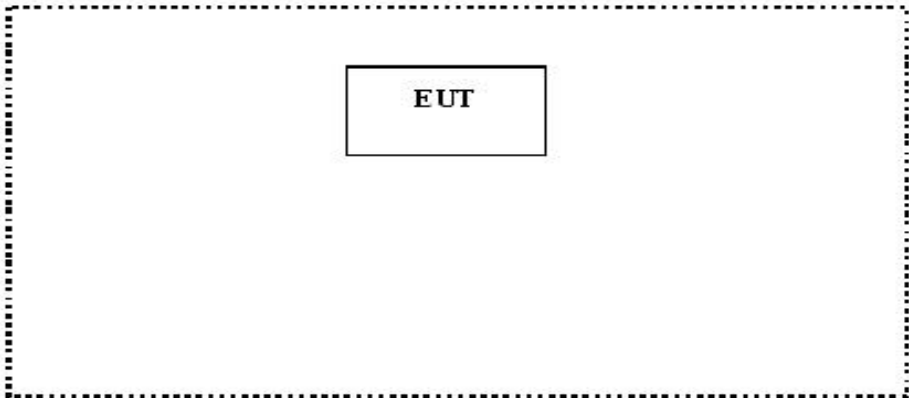
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



**5.4 EUT Operating Condition**

Operating condition is according to ANSI C63.4:2003.

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



**5.5 Conducted Emission Limits**

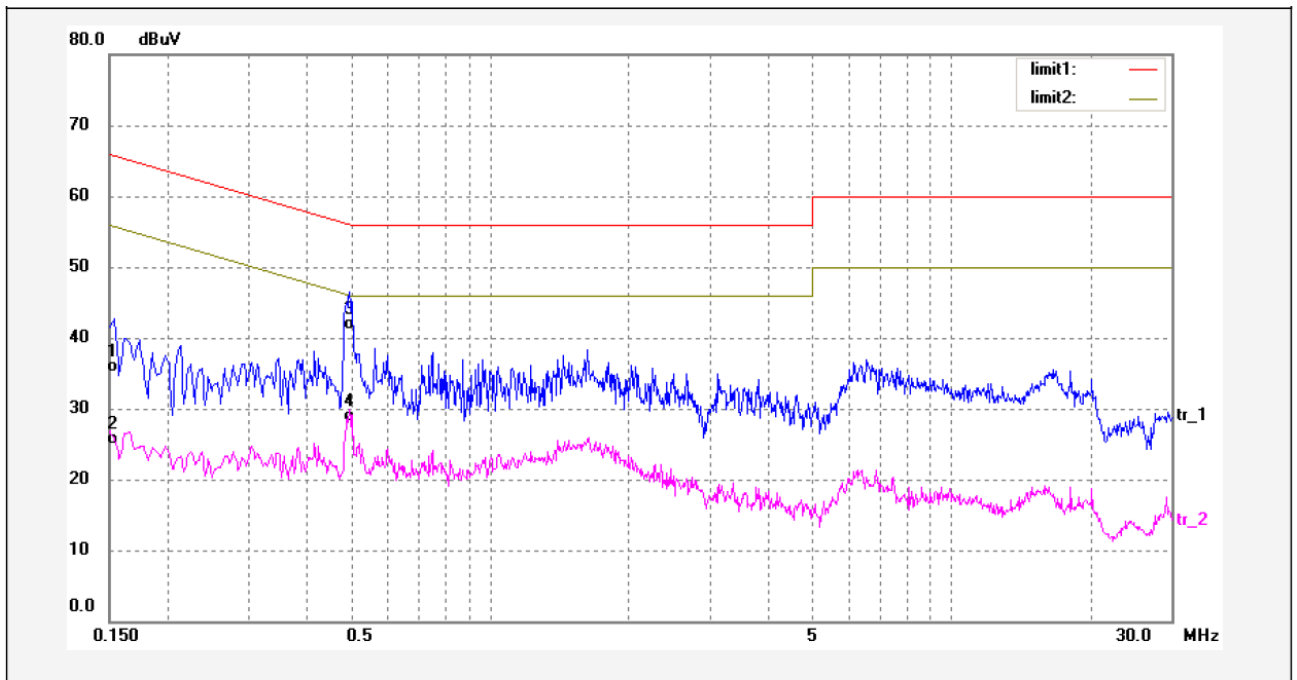
- 66-56 dBμV between 0.15MHz & 0.5MHz
- 56 dBμV between 0.5MHz & 5MHz
- 60 dBμV between 5MHz & 30MHz

**Note:** In the above limits, the tighter limit applies at the band edges.

**5.6 Conducted Emission Test Data**

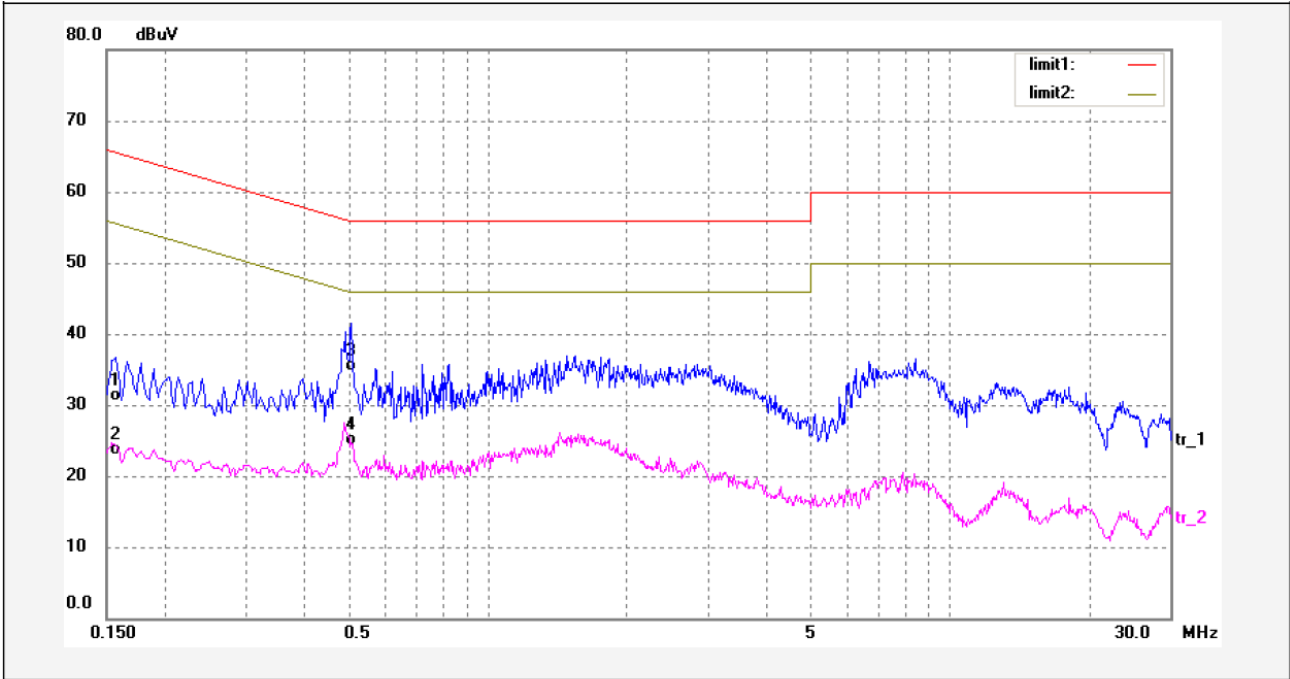
Remark: the EUT was tested the modes: wireless normal link and AV/OUT mode, SD mode and USB R/W mode, and the worse case was the wireless normal link. so the data show was the wireless normal link mode only.

Live Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	24.53	10.64	35.17	65.78	-30.61	QP	
2	0.1539	14.19	10.64	24.83	55.78	-30.95	AVG	
3	0.4980	29.22	11.79	41.01	56.03	-15.02	QP	
4	0.4980	16.40	11.79	28.19	46.03	-17.84	AVG	

Neutral Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	19.93	10.61	30.54	65.56	-35.02	QP	
2	0.1580	12.34	10.61	22.95	55.56	-32.61	AVG	
3	0.5100	22.90	11.76	34.66	56.00	-21.34	QP	
4	0.5100	12.52	11.76	24.28	46.00	-21.72	AVG	

### 5.7 Conducted Emission Test Setup View



## 6 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2003
Test Date:	May 09,2011
Frequency Range:	30MHz to 25GHz
Measurement Distance:	3m
Detector:	Peak for pre-scan (120kHz resolution bandwidth) Quasi-Peak if maximised peak within 6dB of limit

### 6.1 Test Equipment

Please refer to Section 5 this report.

### 6.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

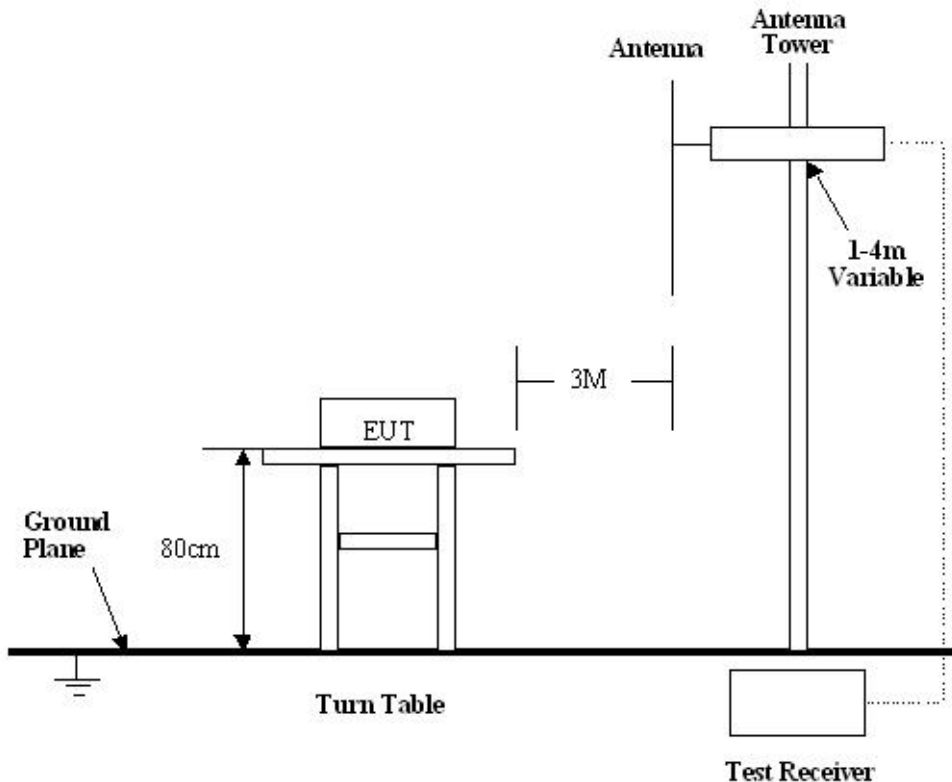
Based on ANSI C63.4:2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at WALTEK SERVICES EMC Lab is +/-5.03 dB.

### 6.3 Test Procedure

1. The adapter was used in the equipment under test for radiated emissions test.
2. The radiation emission should be tested under the X position. So the data shown was the X position only.
3. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
4. All data was recorded in the peak and average detection mode.
5. The EUT was under working mode during the final qualification test and the configuration was used to represent the worst case results.

**6.4 Radiated Test Setup**

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.209 limits and Paragraph 15.247 limits.



**6.5 Spectrum Analyzer Setup**

According to FCC Part15 Paragraph 15.247 Rules, the system was tested to 25000 MHz. Below 1GHz

- Start Frequency .....30 MHz
- Stop Frequency .....1000 MHz
- Sweep Speed Auto
- IF Bandwidth.....120 kHz
- Video Bandwidth .....100KHz
- Quasi-Peak Adapter Bandwidth .....120 kHz
- Quasi-Peak Adapter Mode.....Normal
- Resolution Bandwidth .....100KHz



Above 1GHz

Start Frequency .....	1000 MHz
Stop Frequency .....	25000MHz
Sweep Speed	Auto
IF Bandwidth.....	120 kHz
Video Bandwidth .....	1MHz
Quasi-Peak Adapter Bandwidth .....	120 kHz
Quasi-Peak Adapter Mode.....	Normal
Resolution Bandwidth .....	1MHz

**6.6 Corrected Amplitude & Margin Calculation**

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBµV means the emission is 7dBµV below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Class B Limit}$$

**6.7 Summary of Test Results**

According to the data in section 7.11, the EUT complied with the FCC Part15 Paragraph 15.247 standards.

### 6.8 EUT Operating Condition

The same as section 6.4 of this report.

Let the EUT work in test mode and test it.

### 6.9 Radiated Emissions Limit on Paragraph 15.209

Frequency(MHZ)	Distance(m)	Field strength(dBuV/m)
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.
  - (4) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
  - (5) Above 1GHz, mark a Peak and average measurements for all emissions, Limit for peak is 74dBuV/m, According to Part 15.35(b) and average is 54BuV/m.

## 6.10 Radiated Emissions Test Result

Formula of conversion factors:the field strength at 3m was established by adding  
The meter reading of the spectrum analyzer (which is set to read in units of dBuV/m)  
To the antenna correction factor supplied by the antenna manufacturer. The antenna  
Correction factors are stated in terms of dB.The gain of the pressletor was accounted  
For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33            20dBuV+10.36dB=30.36dBuV/m @3m

## 6.11 Radiated Emission Data

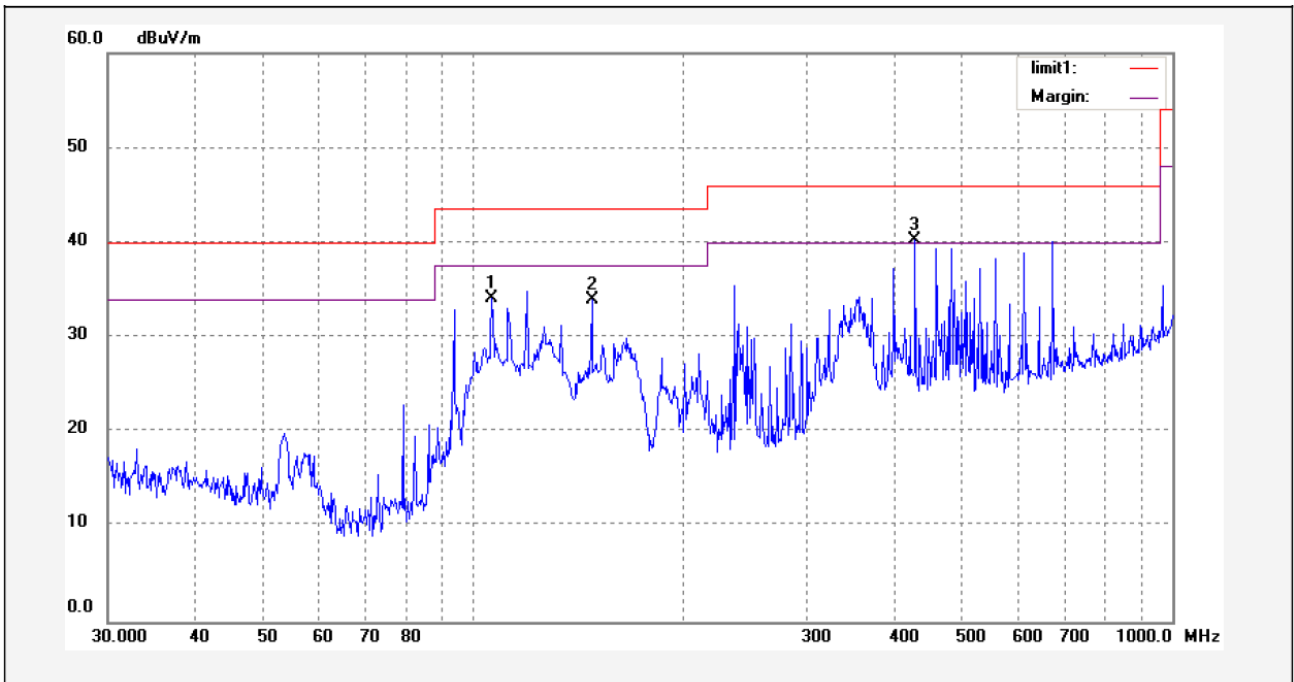
A. Test Item:	Radiated Emission Data
Test Voltage:	AC 120V
Test Mode:	CRX and CTX On
Temperature:	25.5 °C
Humidity:	51%RH
Test Result:	PASS

**6.11.1 Test mode: continuously receive mode.**

Remark: the EUT was pretested at the high,middle and low channel, and the worse case was the low Channel,so the data show was the low channel only.

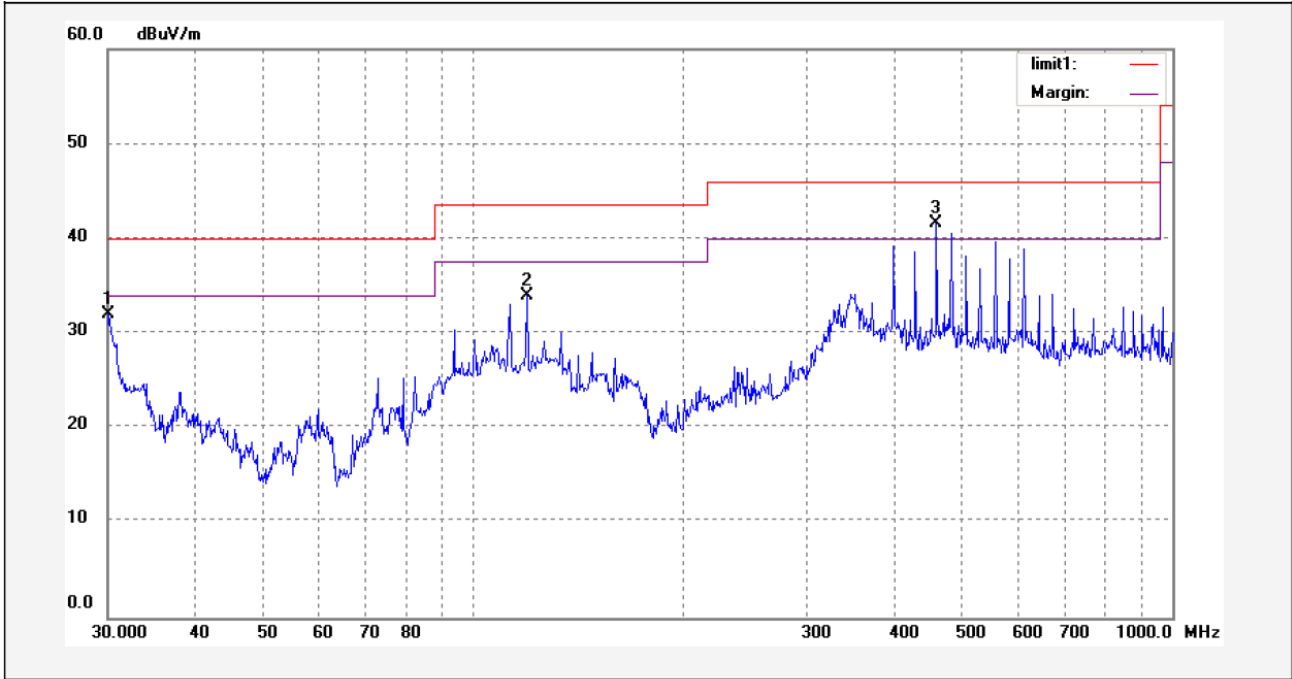
Test frequency : 30-1000MHz radiation test data:

Vertical



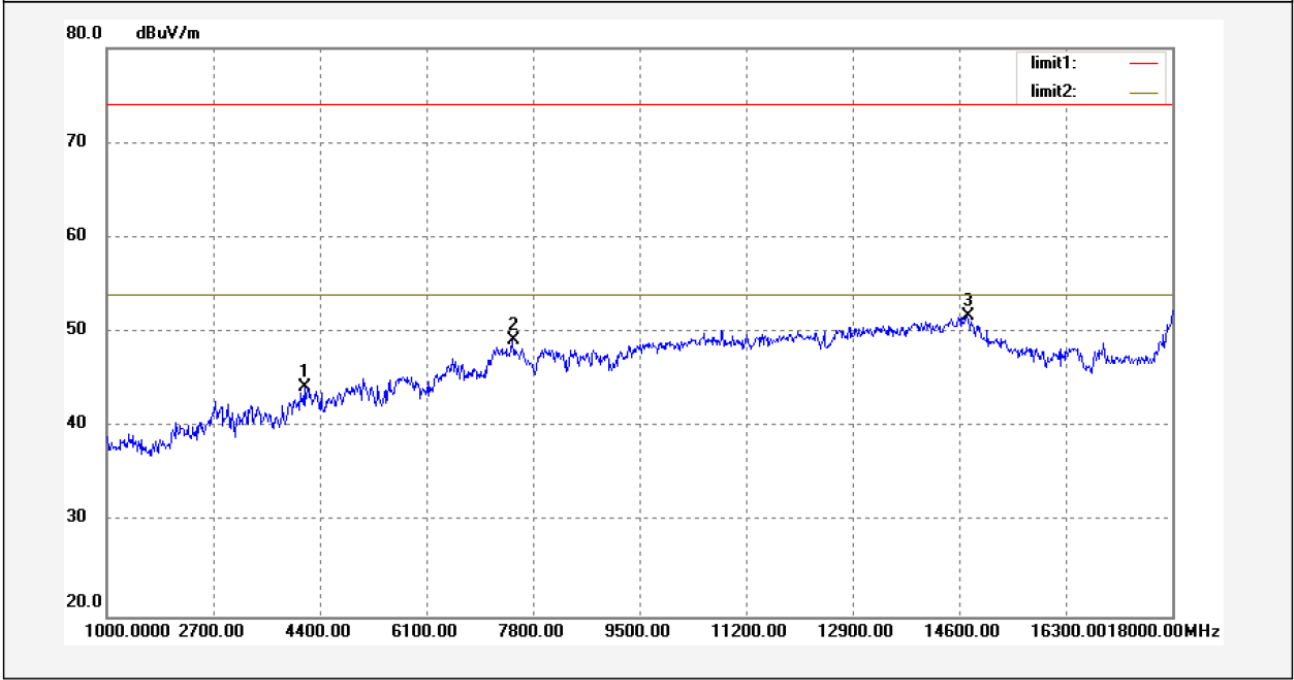
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	106.2810	20.84	13.30	34.14	43.50	-9.36	peak	
2	147.8745	20.11	13.85	33.96	43.50	-9.54	peak	
3	428.7959	18.68	21.65	40.33	46.00	-5.67	peak	

Horizontal



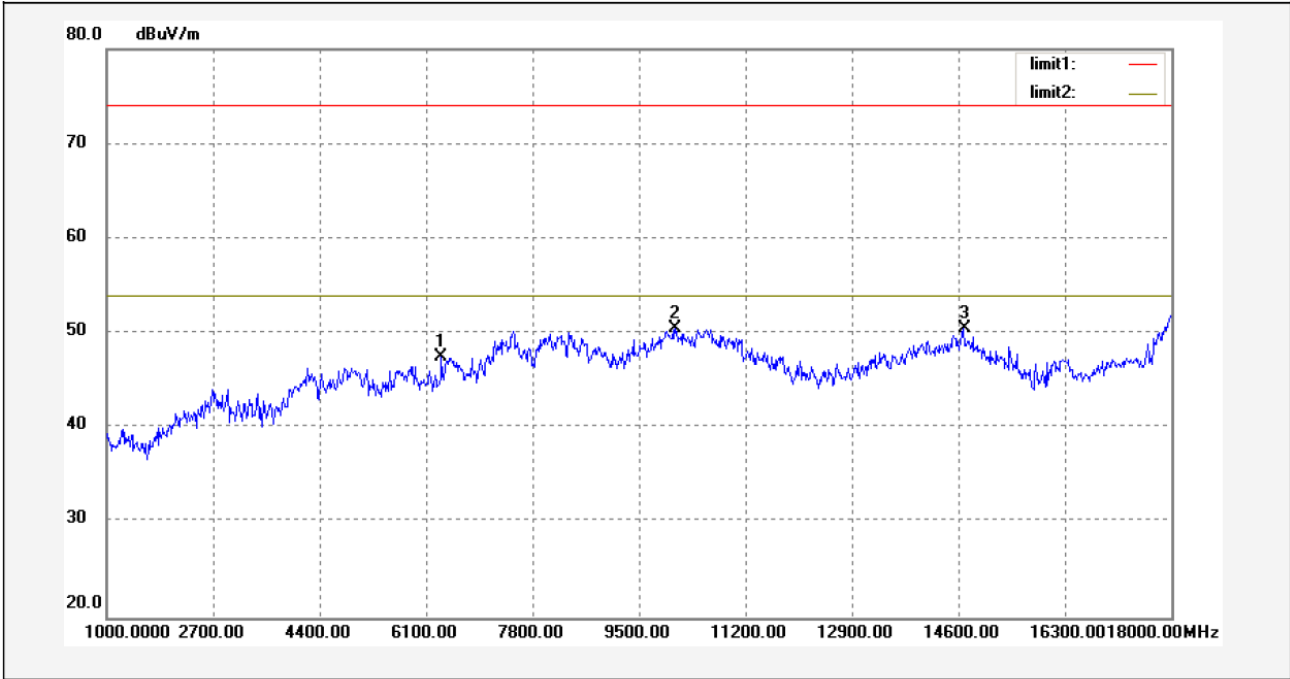
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.1051	15.49	16.49	31.98	40.00	-8.02	peak	
2	119.3469	21.17	12.75	33.92	43.50	-9.58	peak	
3	460.0122	19.88	21.80	41.68	46.00	-4.32	peak	

Test frequency: Above 1GHz radiation test data:  
Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4151.302	41.37	2.87	44.24	74.00	-29.76	peak	
2	7472.946	36.03	13.07	49.10	74.00	-24.90	peak	
3	14729.459	28.54	23.26	51.80	74.00	-22.20	peak	

Horizontal



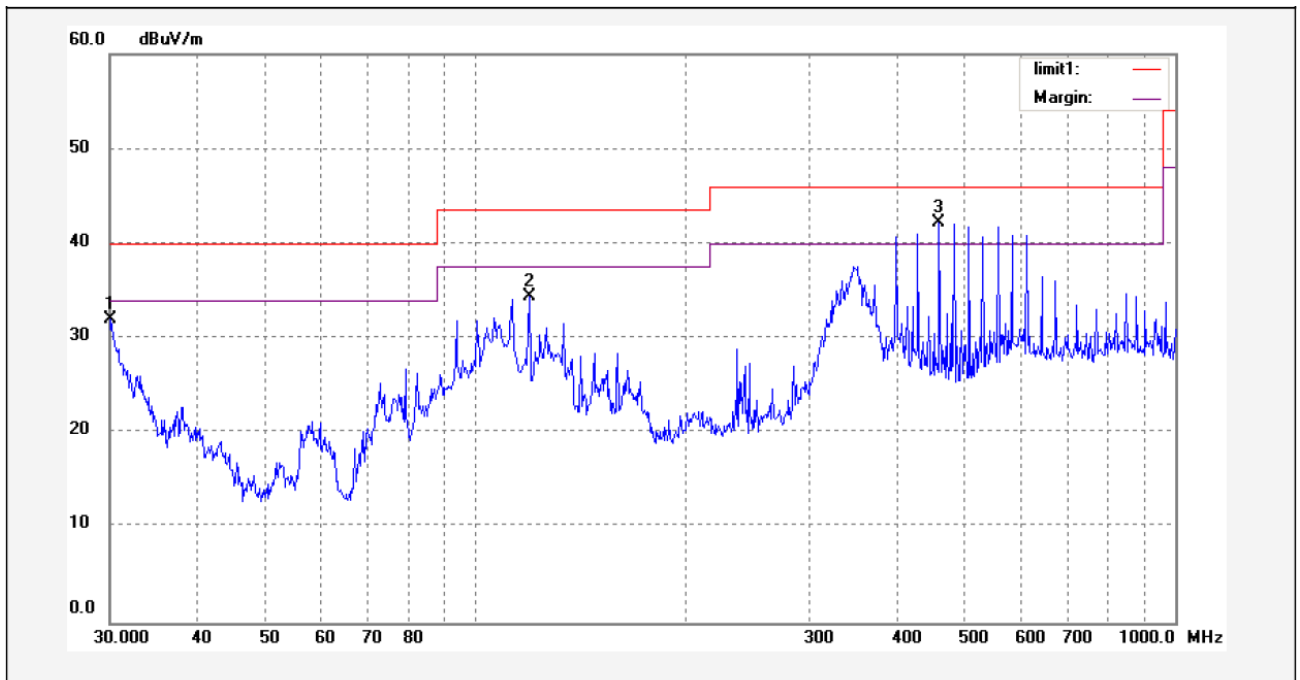
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	6348.697	35.64	11.82	47.46	74.00	-26.54	peak	
2	10079.158	29.88	20.58	50.46	74.00	-23.54	peak	
3	14678.357	27.23	23.25	50.48	74.00	-23.52	peak	

**6.11.2 Test mode: continuously transmit mode.**

Remark: the EUT was tested in the modes:wireless normal link and AV/OUT mode,SD mode,USB R/W mode and continuously transmit(CTX) mode,and the worse case was the CTX mode.so the data show was the CTX mode only. the EUT was pretested at the high,middle and low channel, and the worse case was the low Channel,so the data show was the low channel only.

Test frequency : 30-1000MHz radiation test data:

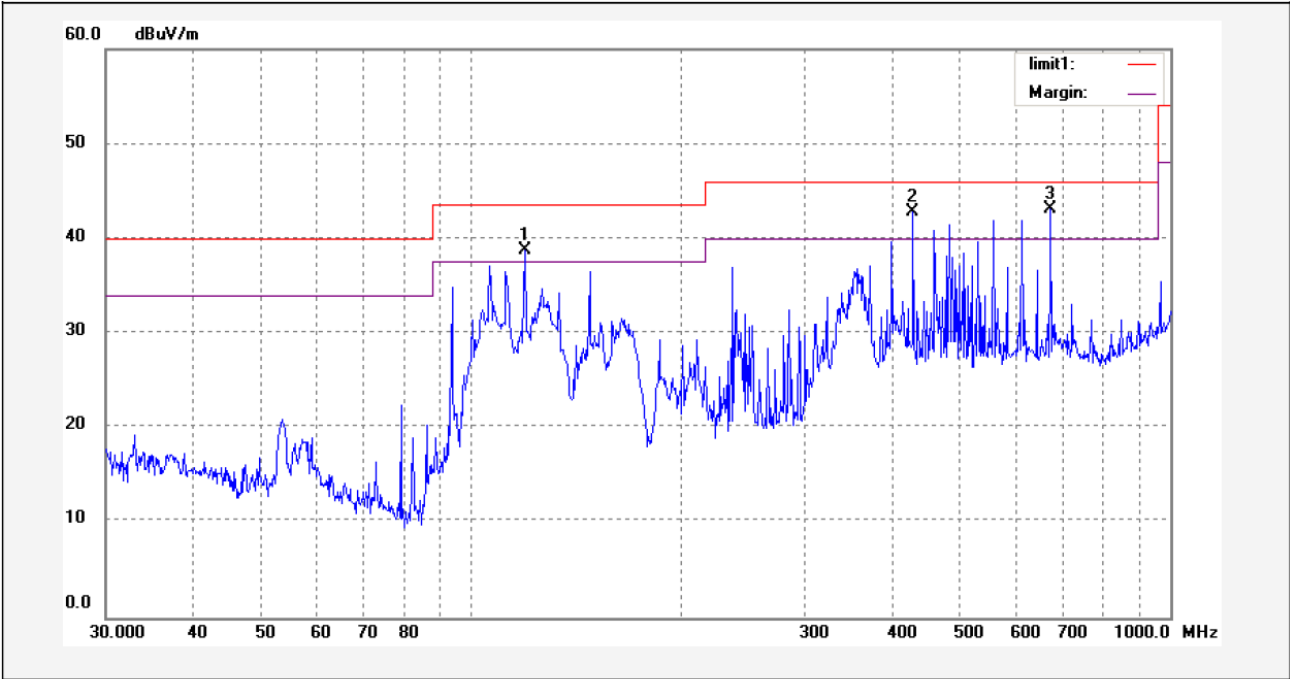
Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.1051	15.49	16.49	31.98	40.00	-8.02	peak	
2	119.3469	21.67	12.75	34.42	43.50	-9.08	peak	
3	460.0122	20.38	21.80	42.18	46.00	-3.82	peak	



Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	119.3469	26.06	12.79	38.85	43.50	-4.65	peak	
2	428.7959	21.18	21.65	42.83	46.00	-3.17	peak	
3	674.6766	18.37	24.79	43.16	46.00	-2.84	peak	

Test frequency : Above 1000MHz radiation Fundamental and Harmonic test data:

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2406	AV	Vertical	92.36		(Fund.)	1.0	50
4812	AV	Vertical	37.96	54.00	16.04	1.1	150
7218	AV	Vertical	35.36	54.00	18.64	1.1	120
9624	AV	Vertical	32.26	54.00	21.74	1.1	220
12030	AV	Vertical	31.55	54.00	22.45	1.1	10
14436	AV	Vertical	30.12	54.00	23.88	1.0	150
16842	AV	Vertical	30.61	54.00	23.39	1.1	100
19248	AV	Vertical	30.13	54.00	23.87	1.0	160
21654	AV	Vertical	30.24	54.00	23.76	1.1	110
24060	AV	Vertical	28.21	54.00	25.79	1.1	130
2406	AV	Horizontal	90.99		(Fund.)	1.1	60
4812	AV	Horizontal	36.39	54.00	17.61	1.0	60
7218	AV	Horizontal	35.22	54.00	18.78	1.0	160
9624	AV	Horizontal	32.34	54.00	21.66	1.1	10
12030	AV	Horizontal	33.00	54.00	21.00	1.1	160
14436	AV	Horizontal	32.42	54.00	21.58	1.0	90
16842	AV	Horizontal	31.17	54.00	22.83	1.2	10
19248	AV	Horizontal	30.30	54.00	23.70	1.0	10
21654	AV	Horizontal	32.77	54.00	21.23	1.1	90
24060	AV	Horizontal	30.22	54.00	23.78	1.1	30
2406	PK	Vertical	105.69		(Fund.)	1.0	90
4812	PK	Vertical	46.36	74.00	27.64	1.0	160
7218	PK	Vertical	42.33	74.00	31.67	1.1	190
9624	PK	Vertical	39.65	74.00	34.35	1.0	10
12030	PK	Vertical	35.56	74.00	38.44	1.1	50
14436	PK	Vertical	34.45	74.00	39.55	1.2	50
16842	PK	Vertical	33.54	74.00	40.46	1.0	45
19248	PK	Vertical	33.00	74.00	41.00	1.1	20
21654	PK	Vertical	31.52	74.00	42.48	1.0	160

24060	PK	Vertical	30.21	74.00	43.99	1.0	10
2406	PK	Horizontal	100.36		(Fund.)	1.0	40
4812	PK	Horizontal	45.36	74.00	28.64	1.2	10
7218	PK	Horizontal	42.33	74.00	31.67	1.1	60
9624	PK	Horizontal	39.65	74.00	35.35	1.0	30
12030	PK	Horizontal	35.52	74.00	38.48	1.0	20
14436	PK	Horizontal	35.26	74.00	38.74	1.1	10
16842	PK	Horizontal	33.66	74.00	30.34	1.0	10
19248	PK	Horizontal	32.41	74.00	41.59	1.1	30
21654	PK	Horizontal	31.55	74.00	42.45	1.1	10
24060	PK	Horizontal	29.89	74.00	44.11	1.0	40
Middle frequency							
2442	AV	Vertical	91.88		(Fund.)	1.1	10
4884	AV	Vertical	36.32	54.00	17.68	1.1	20
7326	AV	Vertical	36.31	54.00	17.69	1.0	40
9768	AV	Vertical	34.55	54.00	19.45	1.0	20
12210	AV	Vertical	33.21	54.00	20.79	1.1	20
14652	AV	Vertical	32.01	54.00	21.99	1.2	120
17094	AV	Vertical	31.22	54.00	22.78	1.0	30
19536	AV	Vertical	30.25	54.00	23.75	1.1	10
21978	AV	Vertical	30.23	54.00	23.77	1.1	70
24420	AV	Vertical	29.97	54.00	25.03	1.1	90
2442	AV	Horizontal	89.54		(Fund.)	1.1	50
4884	AV	Horizontal	35.69	54.00	18.31	1.0	160
7326	AV	Horizontal	34.13	54.00	19.87	1.0	10
9768	AV	Horizontal	33.52	54.00	20.48	1.1	40
12210	AV	Horizontal	31.10	54.00	22.90	1.2	80
14652	AV	Horizontal	30.25	54.00	23.75	1.1	180
17094	AV	Horizontal	29.25	54.00	24.75	1.1	40
19536	AV	Horizontal	28.36	54.00	25.64	1.0	90
21978	AV	Horizontal	29.36	54.00	24.64	1.1	150
24420	AV	Horizontal	28.65	54.00	25.35	1.1	40
2442	PK	Vertical	104.68		(Fund.)	1.0	110
4884	PK	Vertical	46.96	74.00	27.04	1.1	90

7326	PK	Vertical	43.66	74.00	30.34	1.0	100
9768	PK	Vertical	38.99	74.00	35.01	1.1	10
12210	PK	Vertical	36.98	74.00	37.02	1.0	40
14652	PK	Vertical	36.10	74.00	38.90	1.2	90
17094	PK	Vertical	32.03	74.00	41.97	1.0	80
19536	PK	Vertical	31.25	74.00	43.75	1.0	120
21978	PK	Vertical	30.85	74.00	43.15	1.0	45
24420	PK	Vertical	30.25	74.00	43.75	1.0	120
2442	PK	Horizontal	101.23		(Fund.)	1.0	10
4884	PK	Horizontal	45.63	74.00	28.37	1.1	70
7326	PK	Horizontal	42.66	74.00	31.34	1.1	90
9768	PK	Horizontal	41.25	74.00	32.75	1.0	160
12210	PK	Horizontal	39.36	74.00	34.64	1.4	10
14652	PK	Horizontal	37.44	74.00	36.56	1.2	40
17094	PK	Horizontal	34.47	74.00	39.53	1.2	10
19536	PK	Horizontal	38.54	74.00	35.46	1.0	40
21978	PK	Horizontal	34.21	74.00	39.79	1.1	40
24420	PK	Horizontal	30.33	74.00	43.67	1.1	150
High frequency							
2476	AV	Vertical	94.58		(Fund.)	1.0	50
4952	AV	Vertical	38.99	54.00	15.01	1.2	100
7428	AV	Vertical	36.55	54.00	17.45	1.0	60
9904	AV	Vertical	33.85	54.00	20.15	1.1	160
12380	AV	Vertical	31.25	54.00	22.75	1.0	90
14856	AV	Vertical	31.01	54.00	22.99	1.0	120
17332	AV	Vertical	31.00	54.00	24.00	1.1	50
19808	AV	Vertical	30.67	54.00	23.33	1.0	180
22284	AV	Vertical	29.63	54.00	24.34	1.0	120
24760	AV	Vertical	28.69	54.00	25.31	1.1	135
2476	AV	Horizontal	90.63		(Fund.)	1.1	120
4952	AV	Horizontal	37.89	54.00	16.11	1.2	150
7428	AV	Horizontal	36.21	54.00	17.79	1.1	120
9904	AV	Horizontal	34.25	54.00	19.75	1.2	180
12380	AV	Horizontal	32.02	54.00	21.98	1.1	45

14856	AV	Horizontal	31.25	54.00	22.75	1.0	120
17332	AV	Horizontal	30.74	54.00	23.26	1.1	80
19808	AV	Horizontal	32.01	54.00	21.99	1.1	80
22284	AV	Horizontal	31.53	54.00	22.47	1.0	60
24760	AV	Horizontal	30.87	54.00	23.13	1.0	90
2476	PK	Vertical	105.85		(Fund.)	1.1	80
4952	PK	Vertical	48.98	74.00	25.02	1.1	130
7428	PK	Vertical	46.31	74.00	28.69	1.0	160
9904	PK	Vertical	42.36	74.00	36.58	1.1	150
12380	PK	Vertical	40.36	74.00	33.64	1.1	90
14856	PK	Vertical	36.98	74.00	37.02	1.1	460
17332	PK	Vertical	33.21	74.00	40.79	1.0	90
19808	PK	Vertical	33.00	74.00	44.00	1.1	120
22284	PK	Vertical	32.02	74.00	41.98	1.0	140
24760	PK	Vertical	30.12	74.00	43.88	1.0	135
2476	PK	Horizontal	93.25		(Fund.)	1.1	40
4952	PK	Horizontal	46.87	74.00	27.13	1.0	90
7428	PK	Horizontal	42.36	74.00	31.64	1.1	20
9904	PK	Horizontal	38.96	74.00	35.04	1.0	50
12380	PK	Horizontal	37.25	74.00	36.75	1.0	70
14856	PK	Horizontal	35.62	74.00	38.38	1.0	80
17332	PK	Horizontal	33.35	74.00	40.65	1.1	70
19808	PK	Horizontal	33.01	74.00	40.99	1.1	40
22284	PK	Horizontal	32.22	74.00	41.78	1.1	20
24760	PK	Horizontal	31.02	74.00	42.98	1.1	50

## 7 Antenna Requirement

According to the FCC Part 15 Paragraph 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. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product has a permanent antenna, fulfill the requirement of this section.

## 8 Maximum Peak Output Power

Test Requirement: FCC Part15 Paragraph 15.247  
 Test Method: Based on ANSI 63.4:2003  
 Test Date: May 09,2011  
 Test mode: Compliance test in the worse case: Tx Lower/Tx Middle/Tx Upper  
 Requirements: Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 0.125W

### Test procedure:

The following test procedure as below:

The transmitter output (antenna port) was connected to the spectrum analyzer.EUT and its simulators are placed on a table, let EUT working in test mode,then test it.

The bandwidth of the fundamental frequency was measured with the spectrum analyser using 100kHz RBW and 100kHz VBW.

**Test Result:** The unit does meet the FCC requirements.

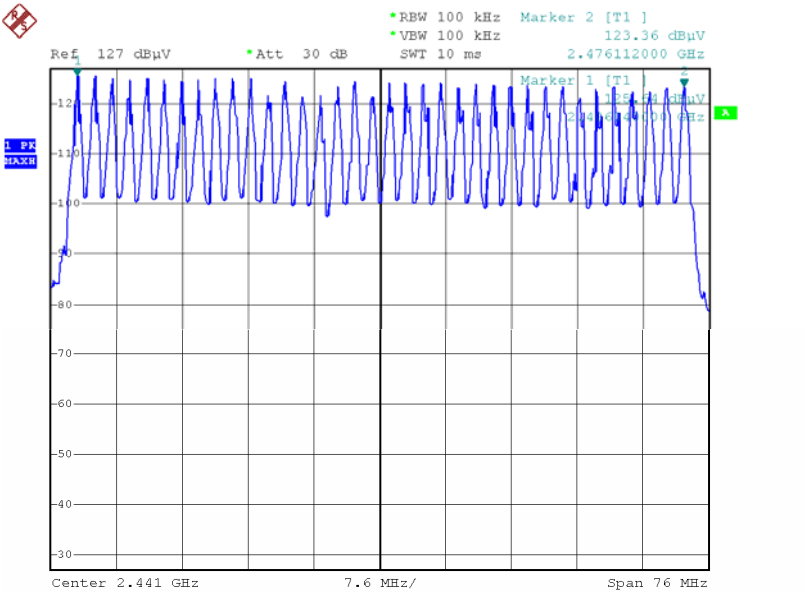
Test Channel	Fundamental Frequency(MHz)	Output Power (mW)	Limit (W)	Power output level
Lower	2406	33.14	0.125	conducted
Middle	2442	33.14	0.125	conducted
Upper	2476	33.69	0.125	conducted

**Note:** The EUT uses 36 channels ,and according to 47 CFR Part 15 Subpart C Section 15.247 (b),the the maximum allowable power for this device is 0.125W.

### 9 Hopping Channel Number

Test Requirement: FCC Part15 C  
 Test Method: Based on FCC Part15 Paragraph 15.247  
 Test Date: May 09,2011  
 Test mode: The EUT work in test mode(Tx) and test it  
 Requirements: Regulation 15.247(b) For frequency hopping systems operating  
 In the 2400-2483.5MHz band employing at least 15 hopping  
 channels.  
 Test result: The total number of channels would be 36 channels.  
 The unit does meet the FCC requirements.

Please refer the graph as below:



## 10 Frequency Separated

The requirements in this clause are only applicable to equipment using frequency hopping spread spectrum (FHSS) modulation.

### Channel Separated

Definition: A hopping channel is any of the centre frequencies defined within the hopping sequence of a FHSS system.

Limit: Non-adaptive frequency hopping system shall make use of non-overlapping channels separated by the channel bandwidth as measured at 20dB below peak power.

The hopping channels defined within a hopping sequence shall be at least 1MHz apart(channel separation)

Operating Environment:

Temperature: 25.50 °C

Humidity: 51 % RH

Barometric Pressure: 1012 mbar

EUT Operation Condition:

The EUT was programmed to be in continuously transmitting mode.

Test Result: PASS

Test Channel	Channel Separation	PASS/FAIL
Lower Channels	2MHz	Pass
Middle Channels	2MHz	Pass
Upper Channels	2MHz	Pass

Please refer to the below photos for more details



Lower Channel



Middle Channel



Upper Channel



## 11 Dwell time

The dwell time is the time spent at a particular frequency during any single hop.

Limit: the maximum dwell time shall be less than 0.4s.

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Barometric Pressure: 1012 mbar

EUT Operation Condition:

The EUT was programmed to be in continuously transmitting mode.

### 11.2 Test Procedure

The EUT output antenna port was connected to the spectrum analyzer. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz, and the frequency span to zero span, measure the maximum time duration of one single pulse. So, the Dwell Time can be calculated as follows:

$$T = T_{\text{on-time}} * N_{\text{times}} / 1S * 0.4 * 36 \leq 0.4S.$$

### 11.3 Test Result: PASS

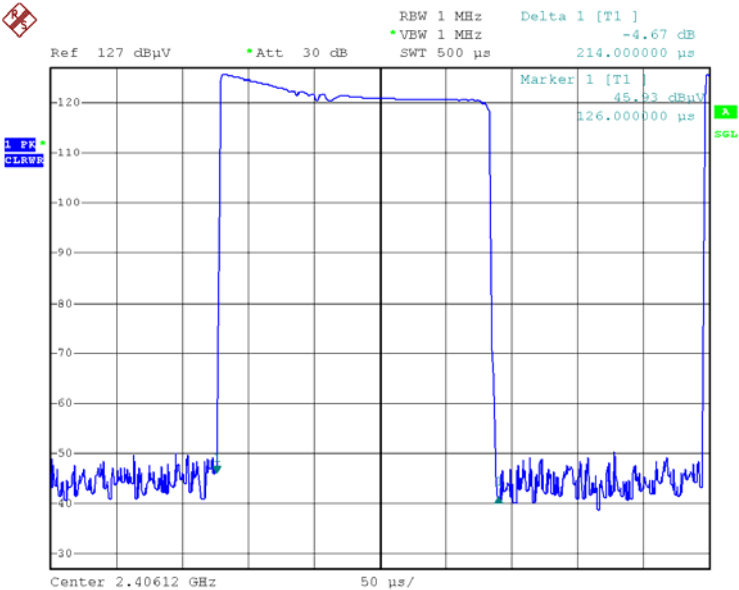
Please refer to the below photos for more details.

**Channel 2406MHz**

Dwell time of each occupation in this channel as follows:  
 $0.000214 * 600 / 1S * 0.4 * 36 = 0.1849 < 0.4S$

**Test Result: PASS**

The Results are not be greater than 0.4 seconds.

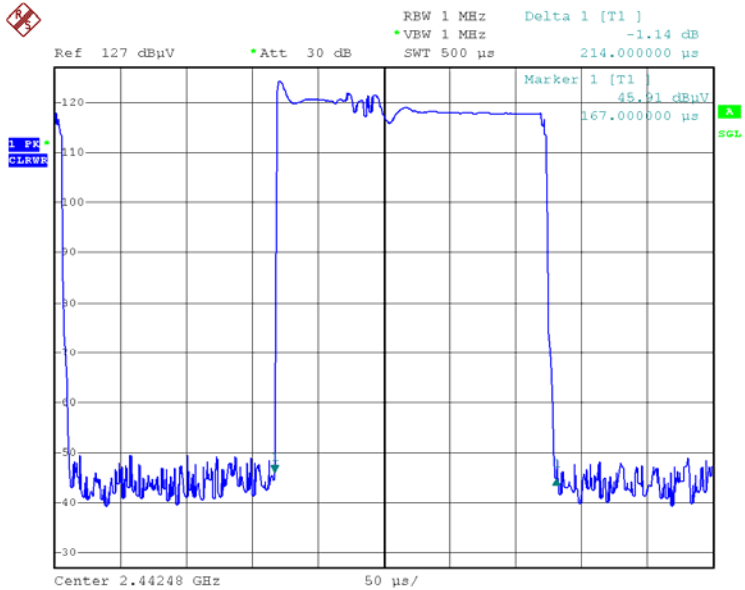


**Channel 2442MHz**

Dwell time of each occupation in this channel as follows:  
 $0.000214 * 600 / 1S * 0.4 * 36 = 0.1849 < 0.4S$

**Test Result: PASS**

The Results are not be greater than 0.4 seconds.



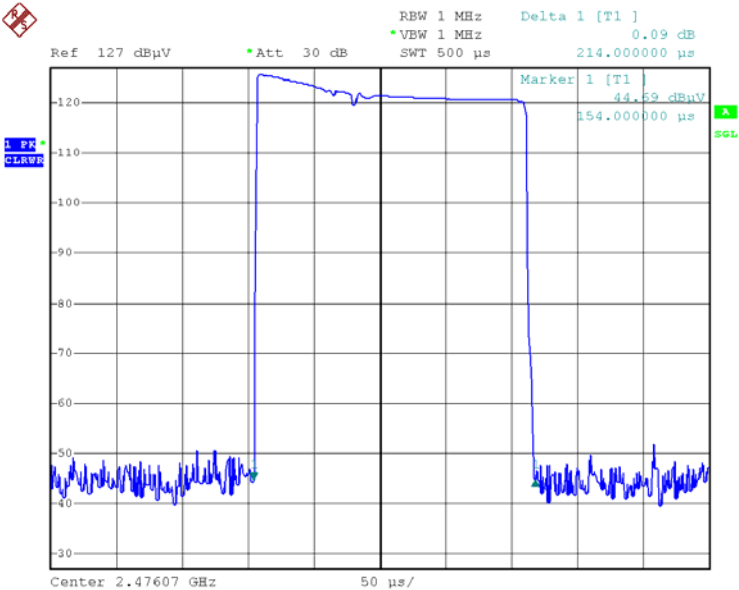
**Channel 2476MHz**

Dwell time of each occupation in this channel as follows:

$$0.000214 \times 600 / 1S \times 0.4 \times 36 = 0.1849 < 0.4S$$

**Test Result: PASS**

The Results are not be greater than 0.4 seconds.



## 12 20-dB Bandwidth

Test Requirement: FCC Part15 C  
 Test Method: Based on FCC Part15 Paragraph 15.247  
 Test Date: May 09,2011  
 Test mode: The EUT work in test mode(Tx) and test it

### Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 100KHz RBW and 100KHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

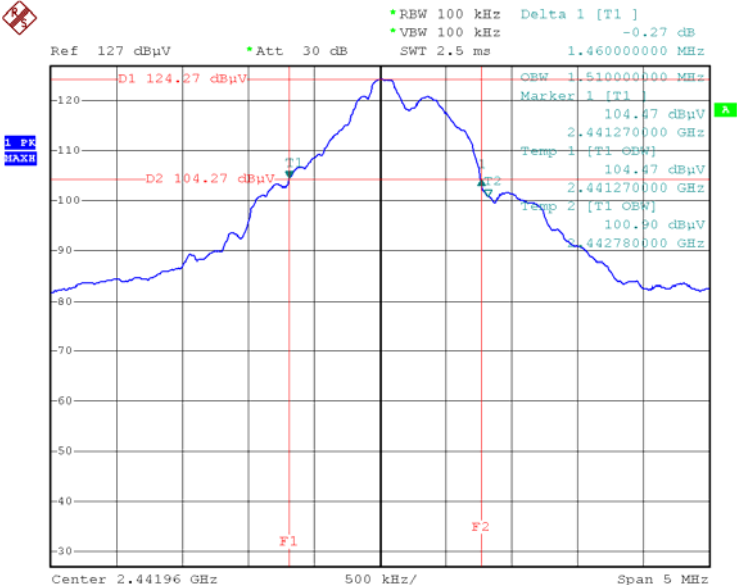
### Test Result

Please refer the graph as below:

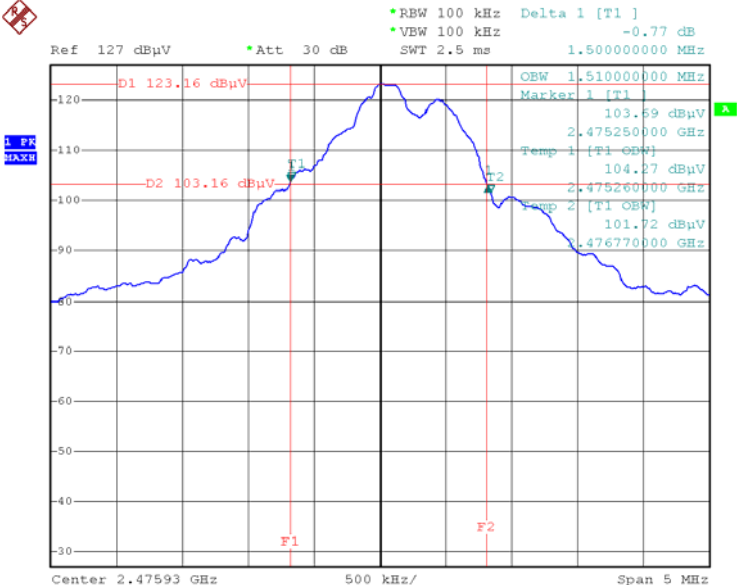
#### Lower Channel 2406MHz



Middle Channel 2442MHz



Upper Channel 2476MHz





### **13 Radiated spurious emissions into adjacent restricted band**

Test Requirement:	FCC Part15 Paragraph 15.205
Test Method:	Based on FCC Part 15 Paragraph 15.247
Test Date:	May 09,2011
Requirements:	The EUT work in test mode(Tx) and test it

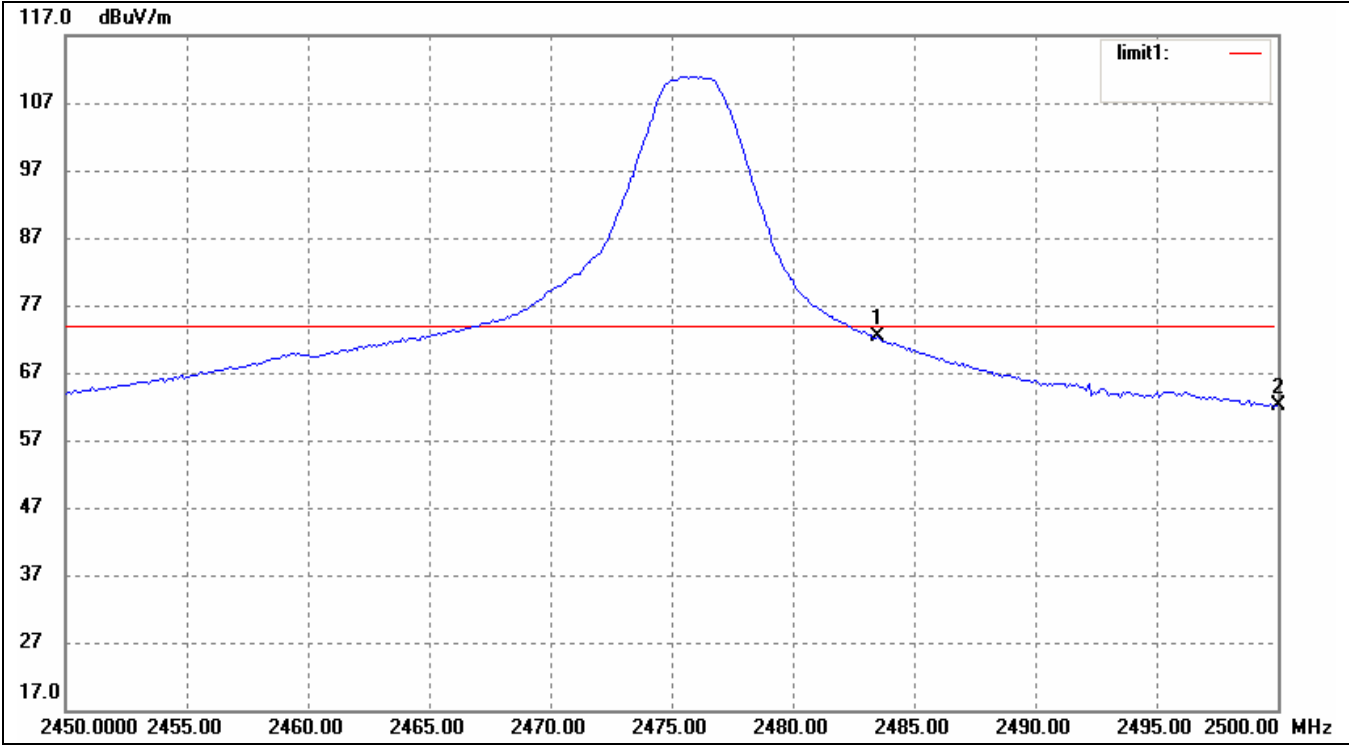
#### **Requiments:**

emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions,The provisions in section 15.35 apply to these measurements.

#### **Test procedure:**

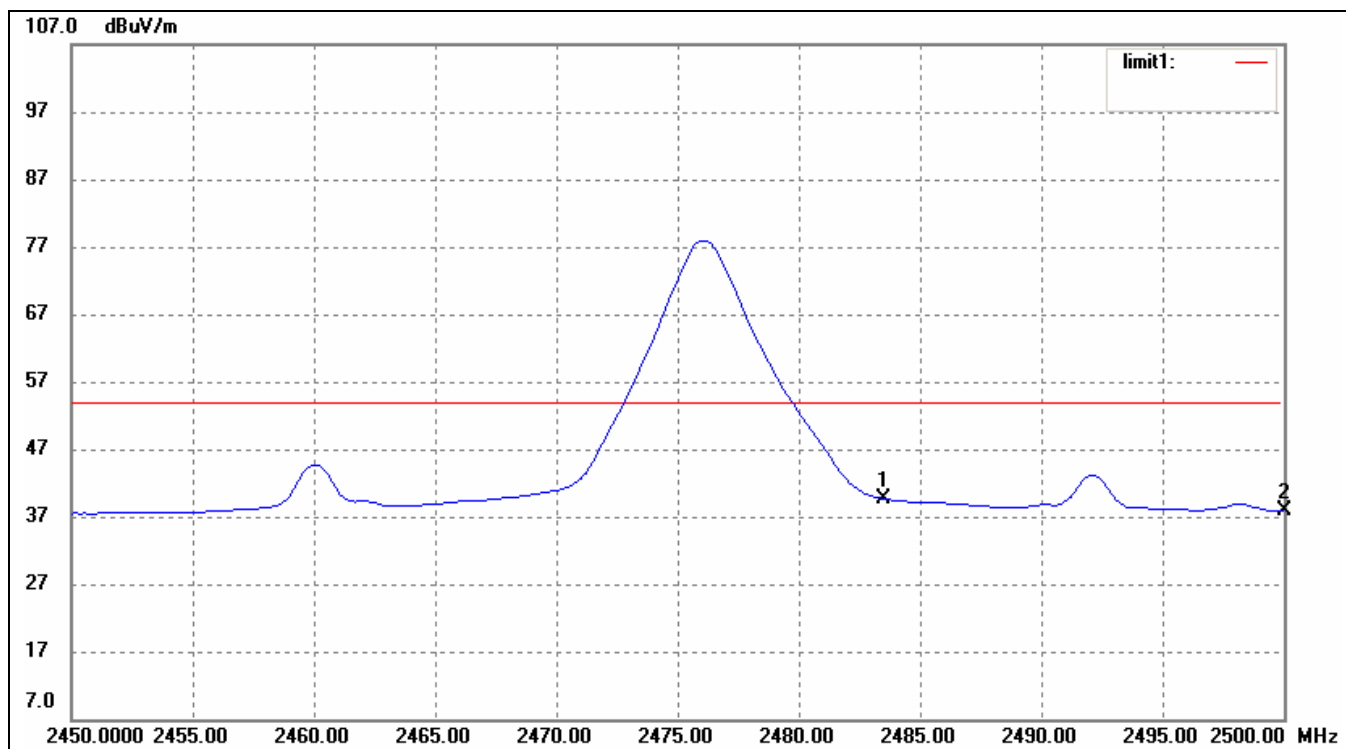
An in band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4-2003 and FCC Rules.The procedure was repeated with an average detector and a plot made.The calculated field strength in the adjacent restricted band is presented below.

**Upper bandedge/ restricted band (Peak Value)**



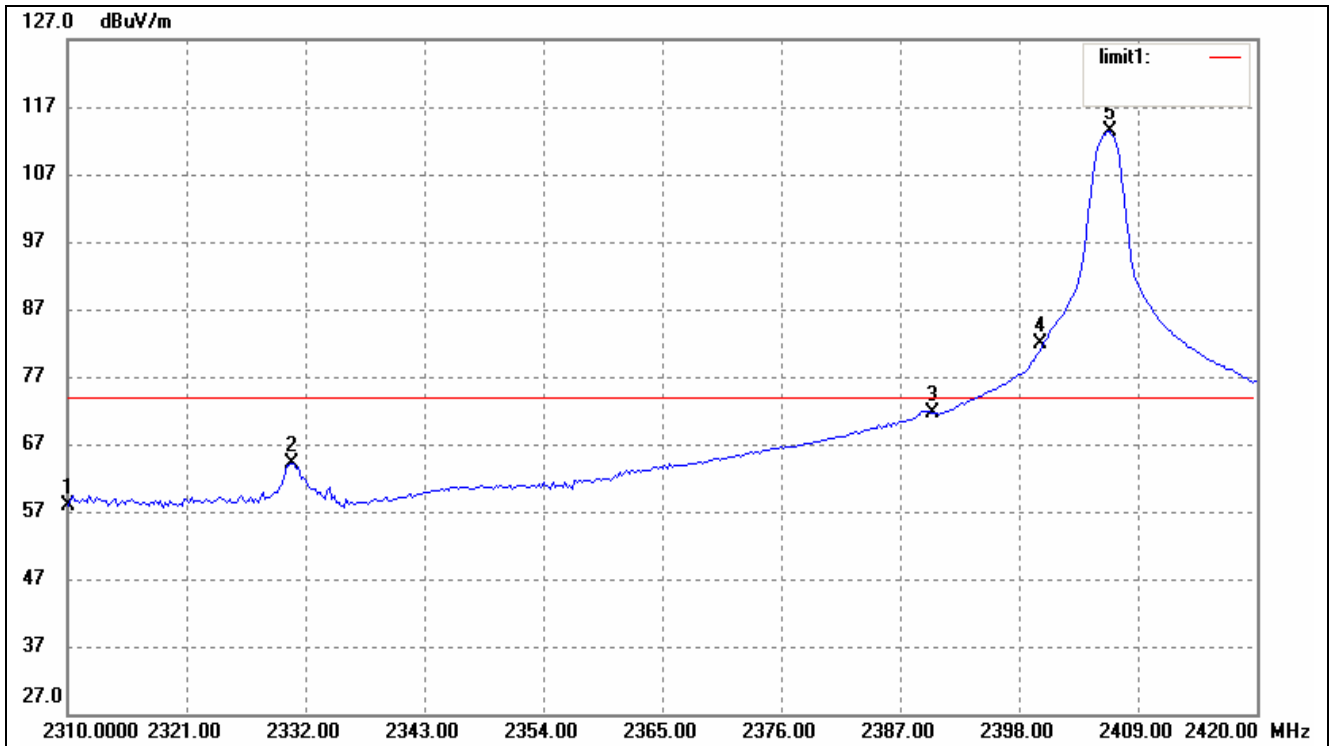
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	2483.500	79.43	-7.13	72.30	74.00	-1.70			peak
2	2500.000	69.18	-7.08	62.10	74.00	-11.90			peak

**Upper bandedge/ restricted band (Average Value)**



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	2483.500	46.80	-7.13	39.67	54.00	-14.33			AV
2	2500.000	44.88	-7.08	37.80	54.00	-16.20			AV

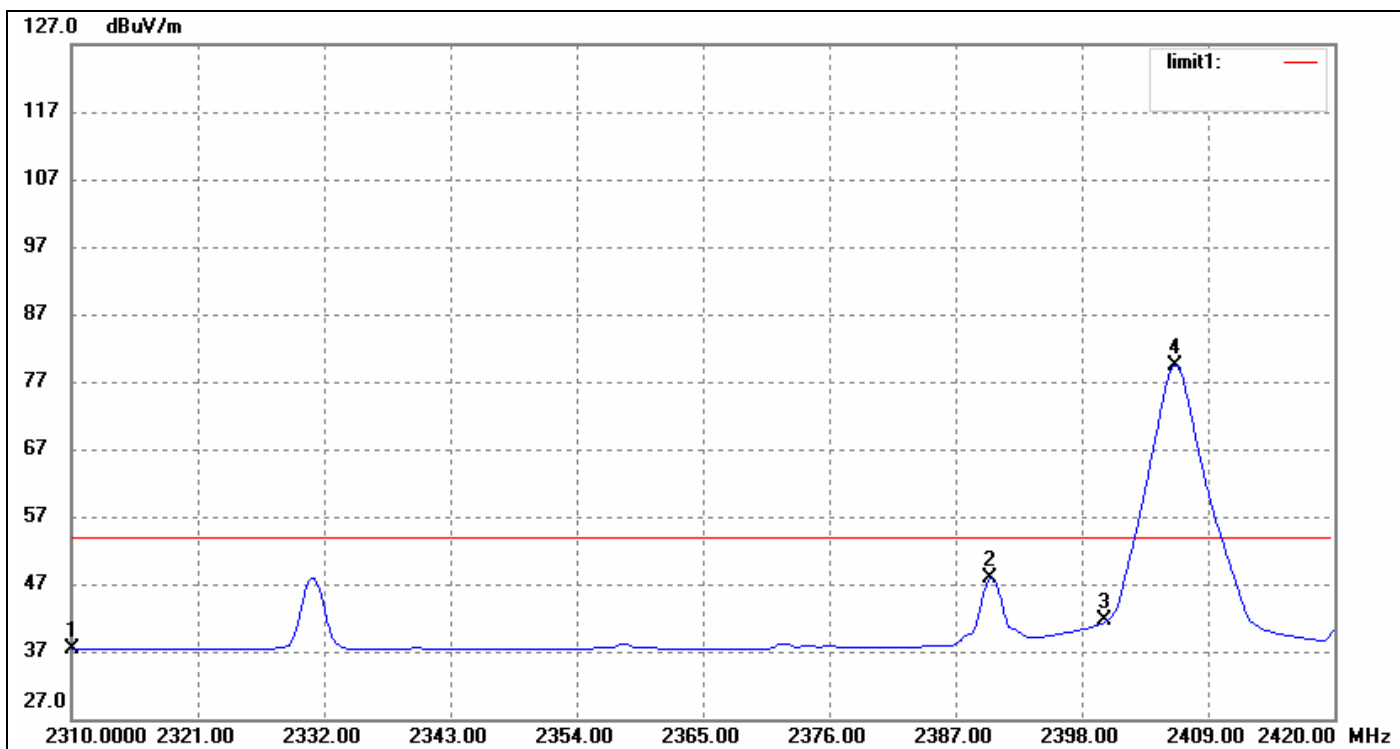
**Lower Bandedge/ Restricted Band (Peak Value)**



No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	2310.000	65.38	-7.51	57.87	74.00	-16.13			peak
2	2330.680	71.62	-7.47	64.15	74.00	-9.85			peak
3	2390.000	78.99	-7.34	71.65	74.00	-2.35			peak
4	2400.000	89.31	-7.31	82.00	93.28	-11.28			peak
5	2406.360	120.58	-7.30	113.28	Fund.	-----			peak

Remark: the limit of mark3 is the Fund.-20 dB, and the Fund. Is 113.28dBuV/m, so the limit of the mark 3 is 93.28 dBuV/m.

**Lower Bandedge/ Restricted Band (Average Value)**



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	2310.000	44.84	-7.51	37.33	54.00	-16.67			Av
2	2390.000	55.12	-7.34	47.78	54.00	-6.22			Av
3	2400.000	48.95	-7.31	41.64	54.00	-12.36			Av
4	2406.140	86.75	-7.30	79.45	Fund.	----			Av

## 14 RF Exposure Test

Test Requirement:	FCC Part 2 Subpart J
Test Method:	Based on FCC Part 15 Paragraph 15.247
Test Date:	May 09,2011
Requirements:	The EUT work in test mode(Tx) and test it

### Requiments:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

### The procedures / limit

#### (A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

#### (B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; \*Plane-wave equivalent power density

**MPE Calculation Method**

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

**E** = Electric field (V/m)

**P** = Peak RF output power (W)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

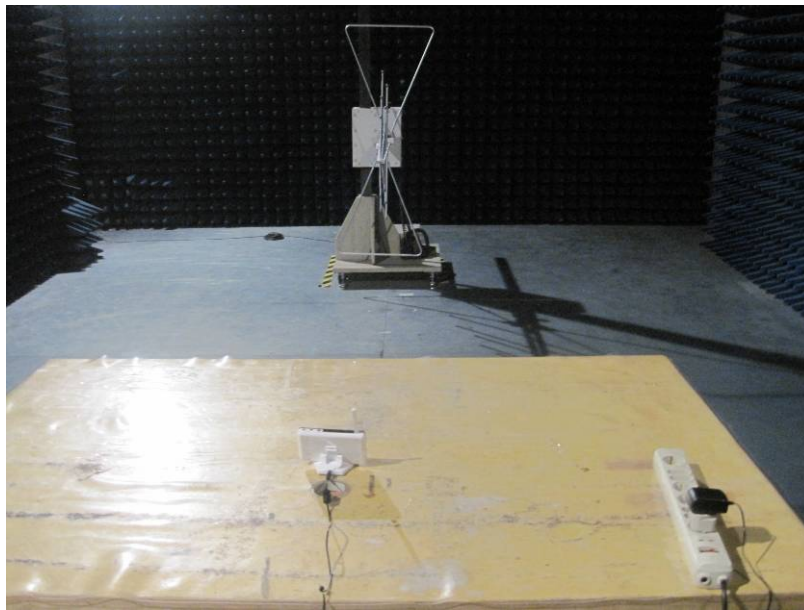
$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

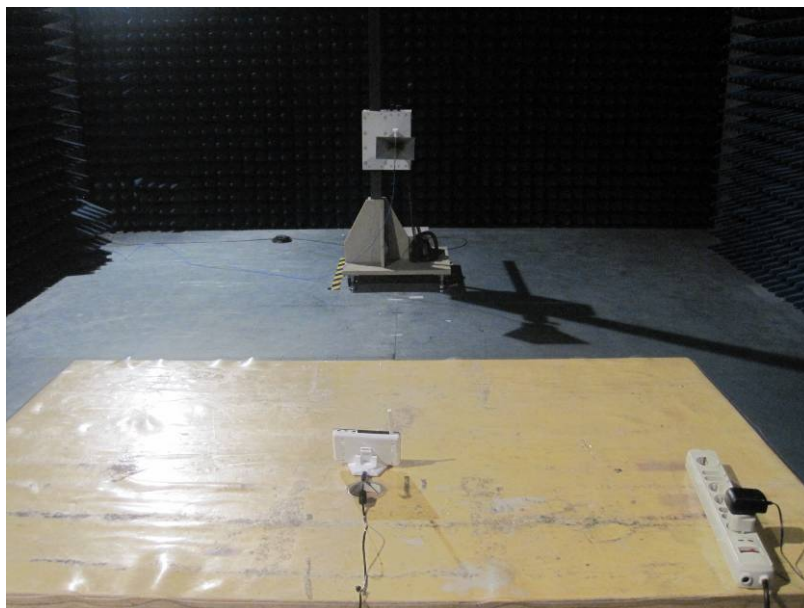
Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm2)	Limit of Power Density (S) (mW/cm2)	Test Result
-2.39	0.577	15.20	33.14	0.003804	1	Complies
-2.39	0.577	15.20	33.14	0.003804	1	Complies
-2.39	0.577	15.28	33.69	0.003867	1	Complies

## 15 Photographs of Test Setup for CRX and CTX

### Radiation Emission Test View For 30MHz-1000MHz



### Radiation Emission Test View For 1GHz-25GHz





## 16 Photographs - Constructional Details

### 16.1 EUT - Appearance View



### 16.2 EUT - Front View



**16.3 EUT - Back View**



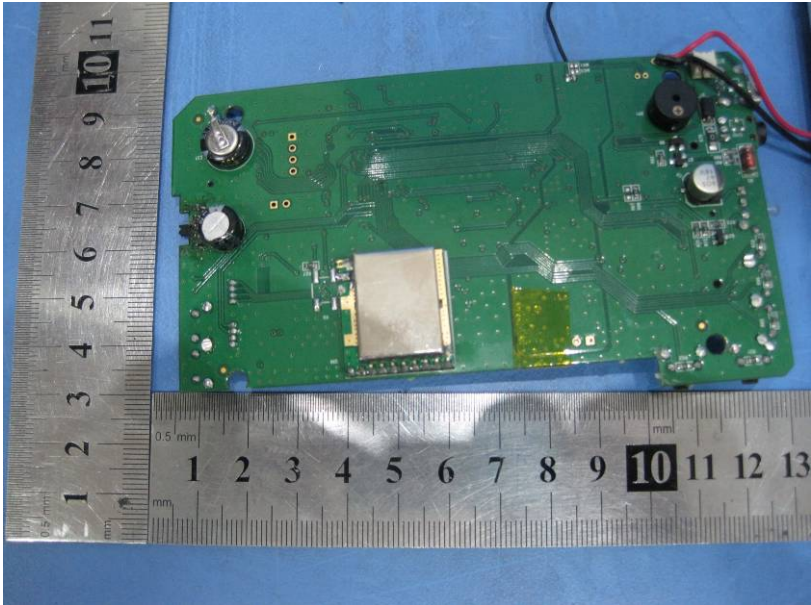
**16.4 EUT – Open View**



16.5 PCB 1 -Front View

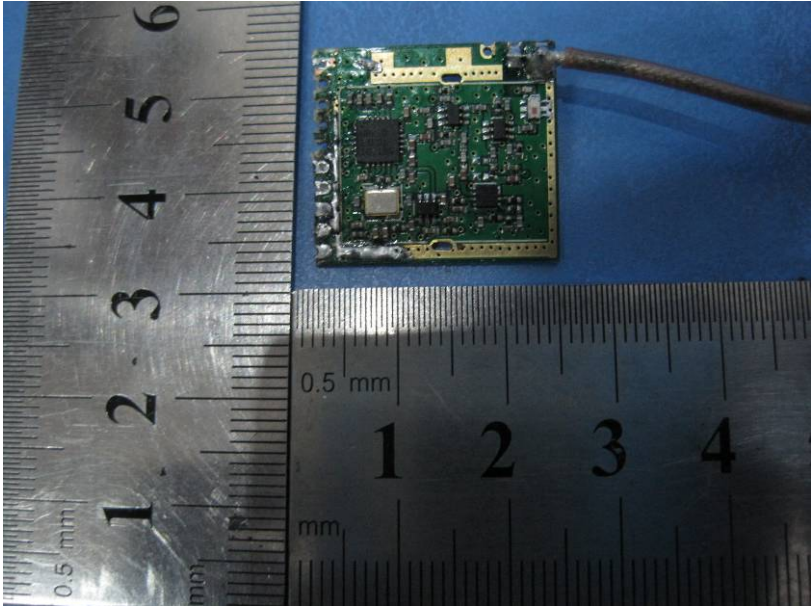


16.6 PCB 1 - Back View

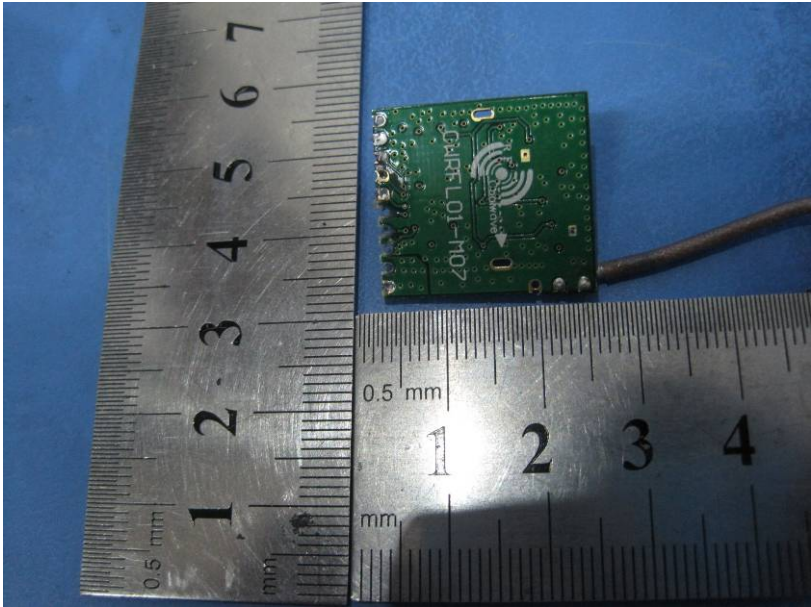




16.7 PCB 2 -Front View



16.8 PCB 2-Back View



## FCC ID Label

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. 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.

Proposed Label Location on EUT  
EUT Top View/ proposed FCC Label Location

