

FCC TEST REPORT

FCC ID : RR7BTCK-005

Applicant : **GREAT WELL ELECTRONIC LTD.**
The Third Industrial Area, 518110, Guanlan Town, Shenzhen City, China

Equipment Under Test (EUT) :

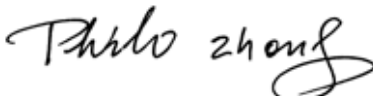
Product description : Bluetooth headset

Model No. : GW-BTCK-005, VRBT100P

Standards : FCC 15 Subpart C Paragraph 15.247

Date of Test : August 8, 2006

Test Engineer : Tiger Su

Reviewed By : 

PERPARED BY:

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3 Test Summary

Test	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission (30MHz to 25GHz)	FCC PART 15: 2003	ANSI C63.4: 2003	Class B	PASS
Conducted Emission (150KHz to 30MHz)	FCC PART 15: 2003	ANSI C63.4: 2003	Class B	N/A

4 General Information

4.1 Client Information

Applicant: **GREAT WELL ELECTRONIC LTD.**
Address of Applicant: The Third Industrial Area, 518110, Guanlan Town, Shenzhen City, China

4.2 General Description of E.U.T.

Product description: Bluetooth headset
Model No.: GW-BTCK-005, VRBT100P

4.3 Details of E.U.T.

Power Supply: 12 VDC

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 Bluetooth headset. 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.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd ShenZhen Branch EMC Lab, 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 556682.

4.7 Test Location

All Emissions tests were performed at:-

No.1 Workshop,M-10,Middle Section, Science &Technology Park,ShenZhen,China 518057.

5 Equipment Used during Test

Equipment	Brand Name	Model	Cal. Int Months	Last Cal. Date
3m Anechoic chamber				
EMC Analyzer	Agilent	E7402A	12	2005-08-30
EMI Test Receiver	R&S	ESS	12	2005-08-30
Pre Amplifier	Anritsu	MH648A	12	2005-08-30
Bilog Antenna	SCHAFFNER	CBL6111C	12	2005-08-30
Loop Antenna	R&S	6108	12	2005-08-30
Horn Antenna	ETS.LINDGERN	GH14-H052	12	2005-08-30
AM/FM Stereo Signal Generator	Panasonic	VP-8122A	12	2005-08-30
Signal Generator	R&S	SMG	12	2005-08-30
RF Selector	TOYO	NS4901A	-	-
Turn Disc	HD	DS4150S	-	-
Antenna Mast	HD	MA2400	-	-
EMI Shielded Room				
Spectrum analyzer	ADVANTEST	R3261C	12	2005-08-30
EMI Test Receiver	R&S	ESS	12	2005-08-30
Pre Amplifier	Anritsu	MH648A	12	2005-08-30
LISN	Kyoritsu	KNW-403D	12	2005-08-30
Absorbing Clamp	R&S	MDS-21	12	2005-08-30
Distortion Meter	MEGURO	MAK-6578A	12	2005-08-30
AM/FM Stereo Signal Generator	Panasonic	VP-8122A	12	2005-08-30
Oscilloscope	LEADER	LS1020	12	2005-08-30
Function Generator	National	VP-7422A	12	2005-08-30
Signal Generator	R&S	SMG	12	2005-08-30
RF Selector	TOYO	NS4000	-	-
Remote Controller	TOYO	MAC	-	-

6 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
Test Date:
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

6.1 Test Equipment

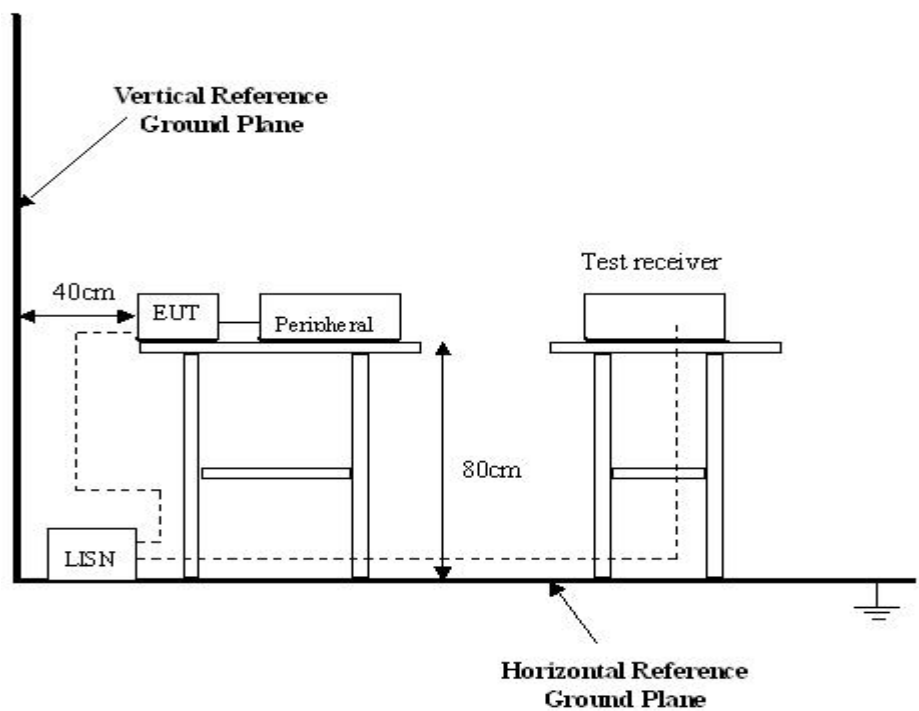
Please refer to Section 5 this report.

6.2 Test Procedure

1. The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.
2. 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.

6.3 Conducted Test Setup

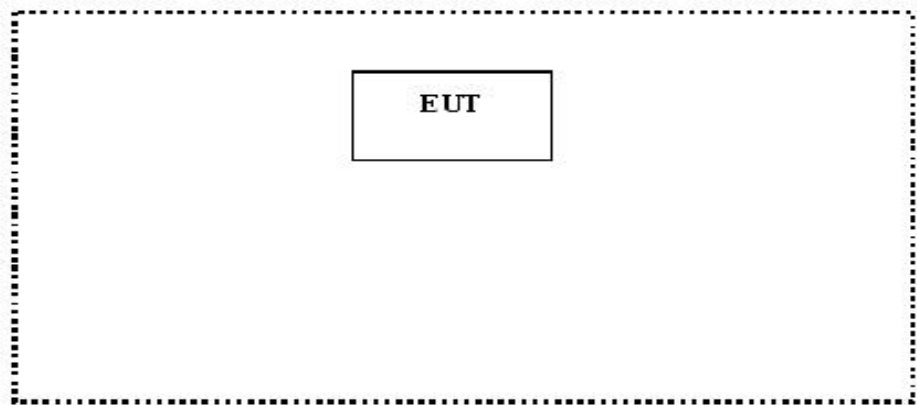
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



6.4 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.



6.5 Conducted Emission Limits

66-56 dB μ V/m between 0.15MHz & 0.5MHz

56 dB μ V/m between 0.5MHz & 5MHz

60 dB μ V/m between 5MHz & 30MHz

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

6.6 Conducted Emission Test Result

Owing to the DC operation of EUT, this test is not performed.

7 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2003
Test Date:	August 8, 2006
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

7.1 Test Equipment

Please refer to Section 5 this report.

7.2 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.

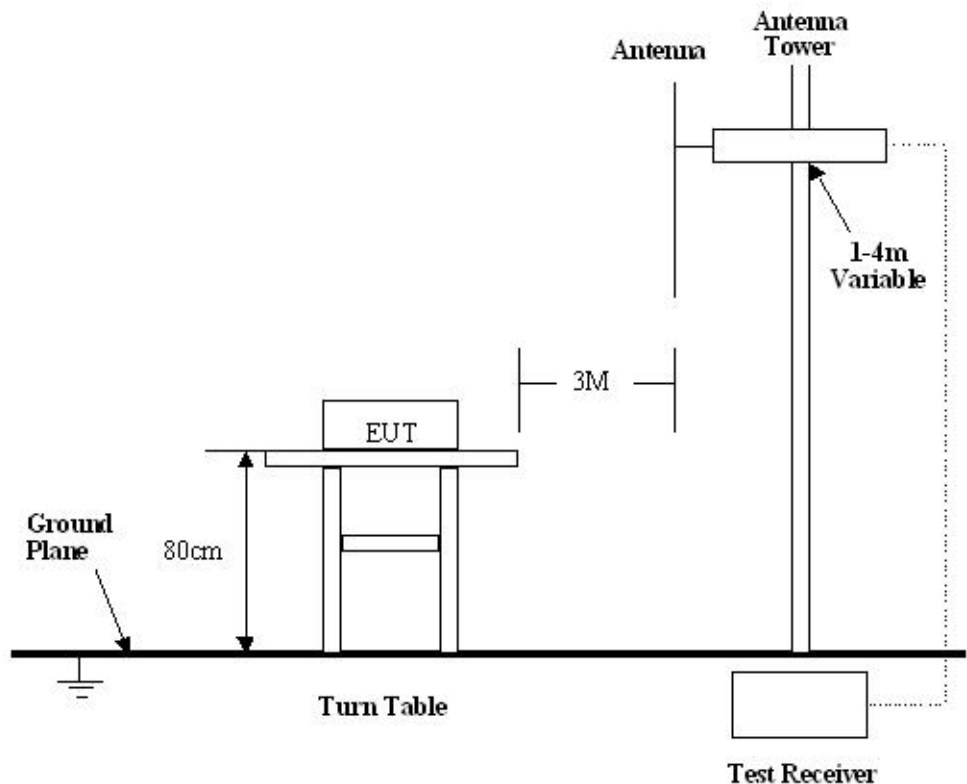
Based on ANSI C63.4:2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at SGS EMC Lab is +4.0 dB.

7.3 Test Procedure

1. For the radiated emissions test, since the EUT does not have a power source, there was no connection to AC outlets.
2. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
3. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB μ V of specification limits), and are distinguished with a "Qp" in the data table.
4. The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.

7.4 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.



7.5 Spectrum Analyzer Setup

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

- Start Frequency30 MHz
- Stop Frequency25000 MHz
- Sweep Speed Auto
- IF Bandwidth100 kHz
- Video Bandwidth1 MHz
- Quasi-Peak Adapter Bandwidth120 kHz
- Quasi-Peak Adapter Mode.....Normal
- Resolution Bandwidth1MHz

7.6 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:

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

7.7 Summary of Test Results

According to the data in section 7.10, the EUT complied with the FCC Part15 Paragraph 15.247 standards.

7.8 EUT Operating Condition

Same as section 6.4 of this report.

Let the EUT work in test mode(Tx Low/Tx Middle/Tx High) and test it.

7.9 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) $\text{RF Voltage(dBuV)} = 20 \log \text{RF Voltage(uV)}$
 - (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 instrumentaion employing an average detector.Measurement using instrumentation with a peak detector function,corresponding to 20dB above the maximum permitted average limit.
 - (5)Above 1GHz,do a Peak and average measurements for all emissions,Limit for peak is 74dBuV/m,According to Part15.35(b) and average is 54BuvV/m.

7.10 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)
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

7.11 Radiated Emission Data

Test Item: Radiated Emission Data
Test Voltage: 12 VDC
Test Mode: TX On(Tx Low/Tx Middle/Tx High)
Temperature: 24 °C
Humidity: 52%RH
Test Result: PASS

Remarks: 30-1000MHz radiation test no significant emissions above the equipment noise floor were detected.

Frequency(MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2402.00	AV	Vertical	76.56		(Fund.)	1.5	90
4804.00	AV	Vertical	48.13	54.00	5.87	1.5	90
7206.00	AV	Vertical	41.66	54.00	12.34	1.8	45
2402.00	AV	Horizontal	77.21		(Fund.)	1.5	270
4804.00	AV	Horizontal	47.28	54.00	6.72	1.6	90
7206.00	AV	Horizontal	43.87	54.00	10.13	1.5	90
2402.00	PK	Vertical	80.66		(Fund.)	1.5	90
4804.00	PK	Vertical	50.81	74.00	23.19	1.5	180
7206.00	PK	Vertical	45.85	74.00	28.15	1.8	45
2402.00	PK	Horizontal	79.63		(Fund.)	1.5	230
4804.00	PK	Horizontal	49.29	74.00	24.71	1.6	60
7206.00	PK	Horizontal	47.13	74.00	26.87	1.5	180

Middle frequency							
2441.00	AV	Vertical	77.84		(Fund.)	1.5	90
4882.00	AV	Vertical	49.54	54.00	4.46	1.5	90
7323.00	AV	Vertical	42.34	54.00	11.66	1.6	60
2441.00	AV	Horizontal	79.56		(Fund.)	1.5	45
4882.00	AV	Horizontal	48.92	54.00	5.08	1.5	250
7323.00	AV	Horizontal	38.29	54.00	15.71	1.8	60
2441.00	PK	Vertical	81.52		(Fund.)	1.5	45
4882.00	PK	Vertical	50.80	74.00	23.20	1.5	80
7323.00	PK	Vertical	46.90	74.00	30.10	1.5	230
2441.00	PK	Horizontal	79.41		(Fund.)	1.5	180
4882.00	PK	Horizontal	50.59	74.00	23.41	1.8	60
7323.00	PK	Horizontal	47.19	74.00	26.81	1.5	90
High frequency							
2480.00	AV	Vertical	77.65		(Fund.)	1.5	120
4960.00	AV	Vertical	47.65	54.00	6.35	1.5	60
7440.00	AV	Vertical	39.85	54.00	14.15	1.5	80
2480.00	AV	Horizontal	77.72		(Fund.)	1.5	120
4960.00	AV	Horizontal	47.67	54.00	6.33	1.5	45
7440.00	AV	Horizontal	40.51	54.00	13.49	1.5	210
2480.00	PK	Vertical	80.66		(Fund.)	1.5	80
4960.00	PK	Vertical	50.72	74.00	23.28	1.5	270
7440.00	PK	Vertical	45.12	74.00	28.88	1.5	90
2480.00	PK	Horizontal	79.67		(Fund.)	1.5	45
4960.00	PK	Horizontal	51.11	74.00	22.89	1.5	250
7440.00	PK	Horizontal	46.75	74.00	27.25	1.5	60

8 Maximum Peak Output Power

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2003
Test Date:	August 8, 2006
Test mode:	Compliance test in the worse case: Tx Low/Tx Middle/Tx High
Requirements:	Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 1W(30dBm)

Test procedure:

The following test procedure as below:

1. The EUT was powered ON and placed on a table in the chamber. The antenna of the transmitter was extended to its maximum length.
2. The fundamental frequency of the transmitter was maximized on the test receiver display by raising and lowering the receive antenna and by rotating the turntable. After the fundamental emission was maximized, a field strength measurement was made.
3. The device under test has an integral antenna and the power was measured on a radiated basis.

Test Result:

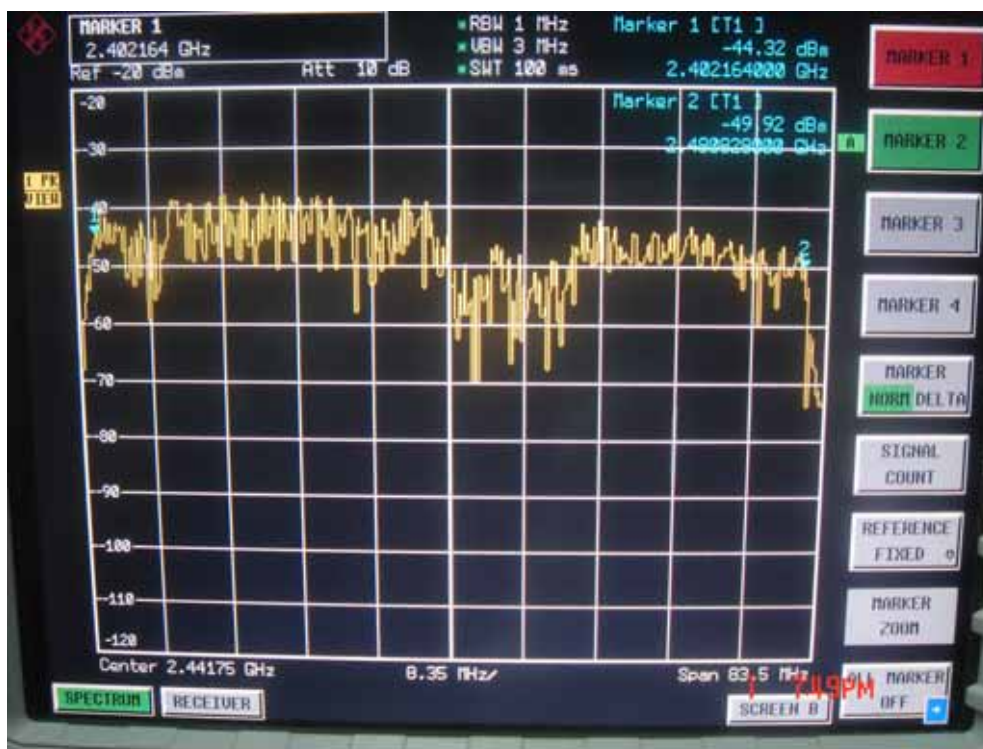
Test Channel	Fundamental Frequency(GHz)	Output Power (mW)	Limit (W)	Power output level
low	2.402	2.52	1	EIRP
middle	2.441	2.55	1	EIRP
high	2.480	2.57	1	EIRP

Test Results: The unit does meet the FCC requirements.

9 Hopping Channel Number

Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.247
Test Date:	August 8, 2006
Test mode:	The EUT work in test mode(Tx) and test it
Requirements:	Regulation 15.247(a) For frequency hopping systems operating In the 2400-2483.5MHz band employing at least 75hopping channels.
Test result:	The total number of channels would be 79 channels. The unit does meet the FCC requirements.

Please refer the graph as below:



10 Carrier Frequencies Separated

Test Requirement: FCC Part15 C

Test Method: Based on FCC Part15 Paragraph 15.247

Test Date: August 8, 2006

Test mode: The EUT work in test mode(Tx) and test it

Requirements: The bandwidth of the fundamental frequency was measur 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 minus 20dB.

Test result: PASS

Channel Carrier Frequency Separated

Test Channel	Carrier Frequencies Separated	PASS/FAIL
Lower Channels (channel 1 and channel 2)	1MHz	Pass
Lower Channels (channel 39 and channel 40)	1MHz	Pass
Lower Channels (channel 78 and channel 79)	1MHz	Pass

The unit does meet the FCC requirements.

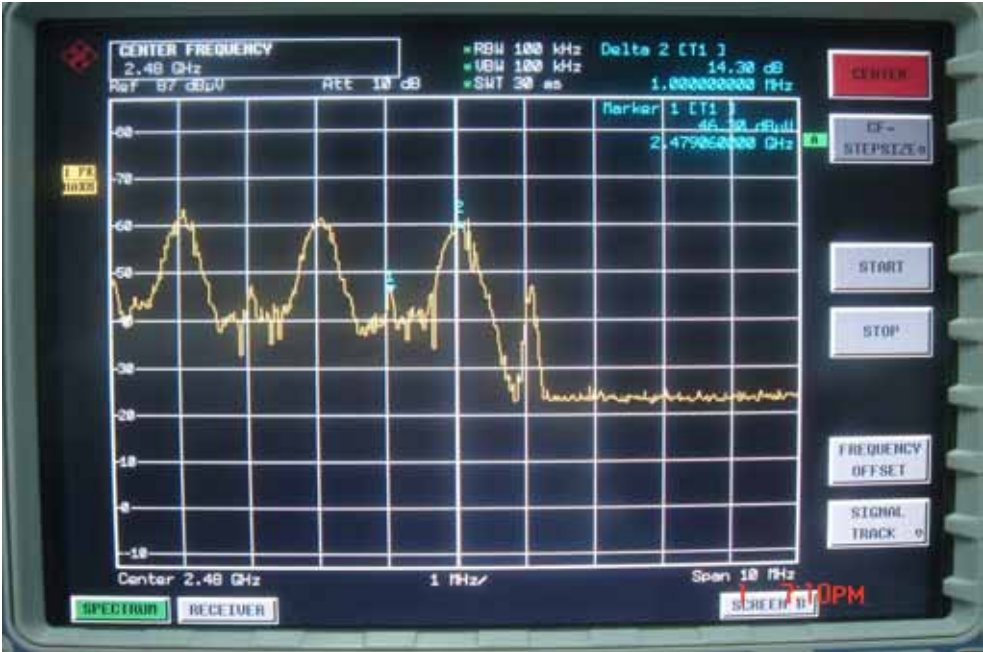
10.1 Lower Channels:Carrier Frequencies Separated



10.2 Middle Channels:Carrier Frequencies Separated



10.3 Upper Channels:Carrier Frequencies Separated



11 Dwell Time

Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.247
Test Date:	August 8, 2006
Test mode:	The EUT work in test mode(Tx) and test it

Requirements: 15.247 a(1)(iii)Frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 non-overlapping channels.The average time of occupancy on any channel shall not greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

11.1 Test procedure

EUT and its simulators are placed on a turn table, the EUT and let it work normally, let EUT working in test mode,then test it.

The bandwidth of the fundamental frequency was measured with the spectrum analyser using 1MHz RBW and 1MHz VBW,set sweep time:5 ms.Span:0Hz.

11.2 Test Results : PASS

Sample calculation: In normal operation, there are 5 transmissions per 50ms. Therefore, the dwell time for each channel is:

1.Low Channel: $0.59\text{ms} \times (42/50\text{ms} \times 32\text{s})/80 = 0.19824 \text{ s} < 0.4 \text{ s}$

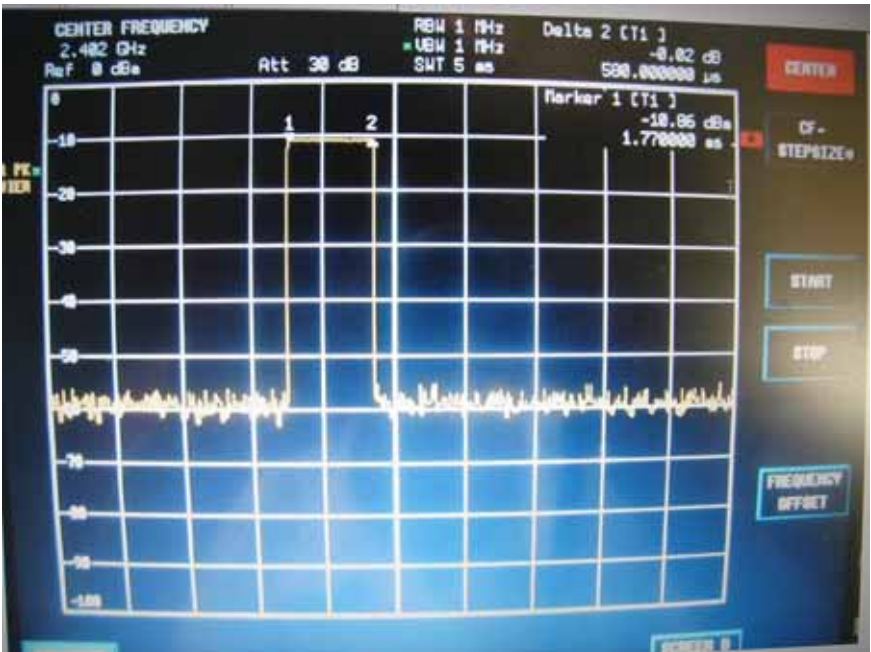
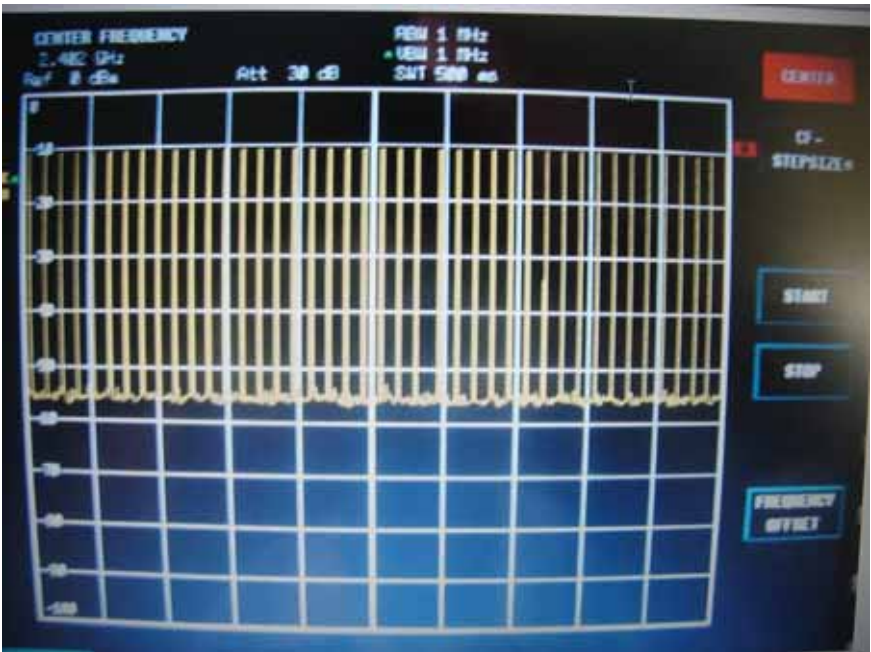
2.Middle Channel: $0.60\text{ms} \times (42/50\text{ms} \times 32\text{s})/80 = 0.2016 \text{ s} < 0.4 \text{ s}$

3.High Channel: $0.58\text{ms} \times (42/50\text{ms} \times 32\text{s})/80 = 0.19488 \text{ s} < 0.4 \text{ s}$

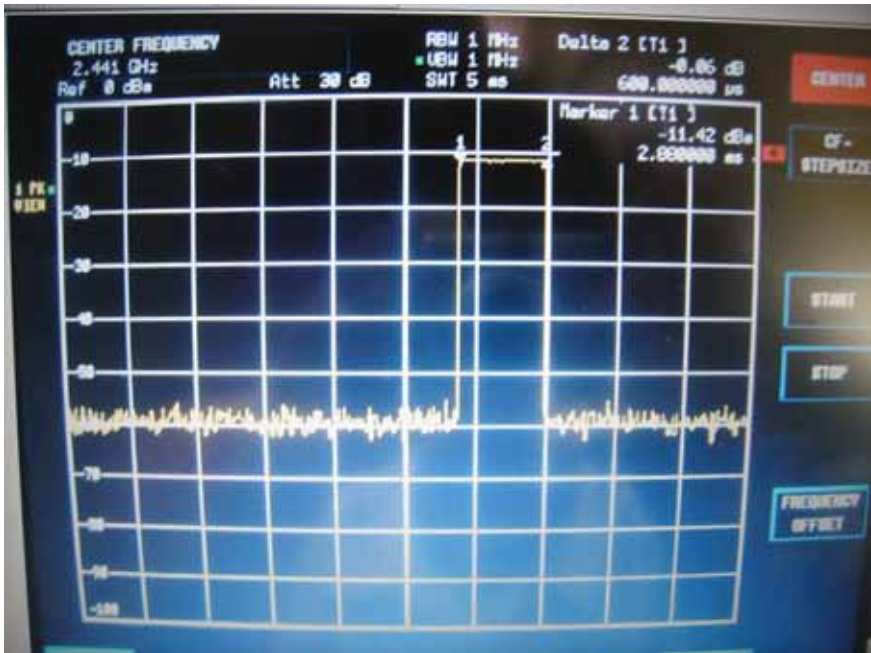
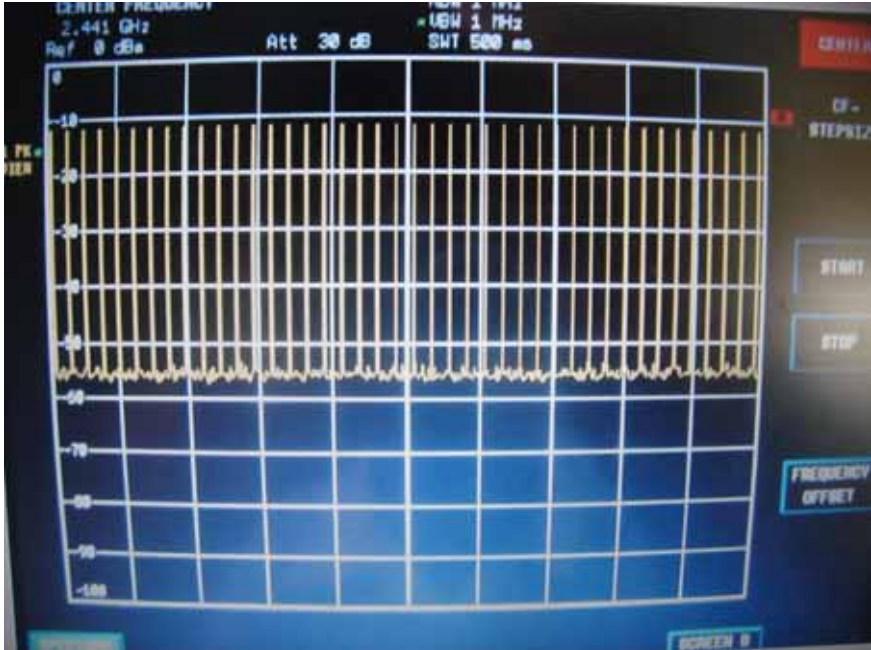
The Results are not be greater than 0.4 seconds.

Please refer the graph as below:

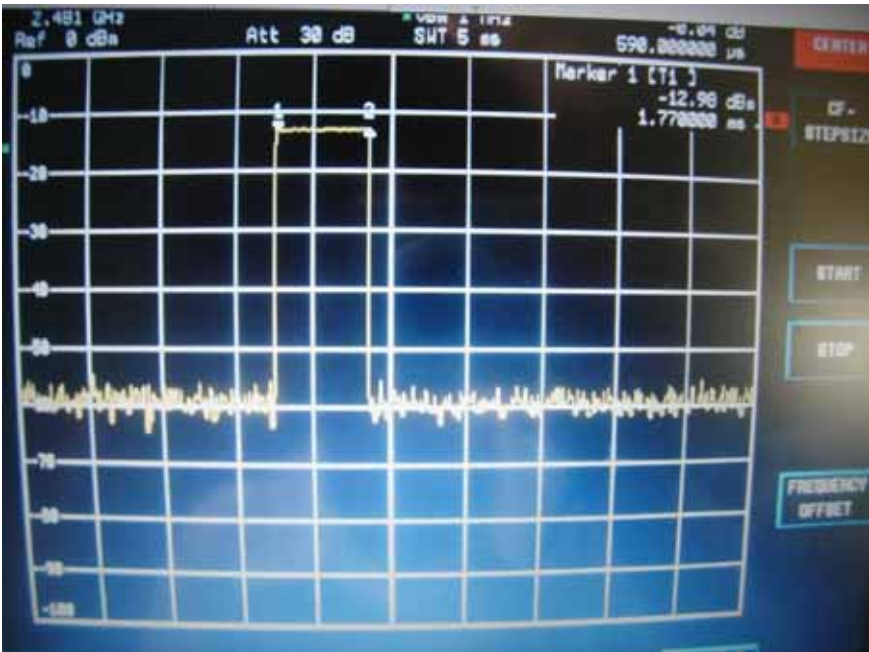
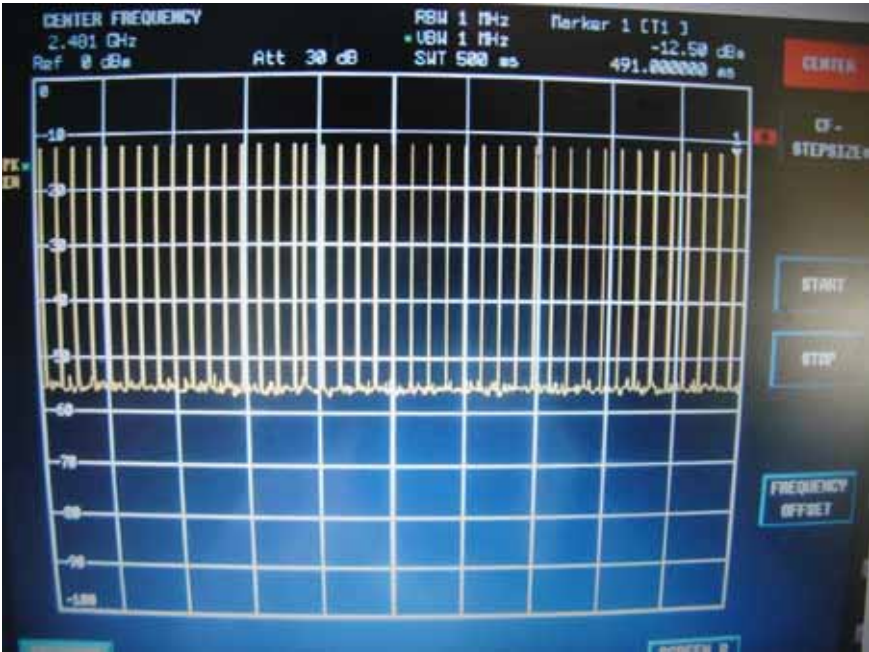
Channel 0: 2.402GHz



Channel 39: 2.441GHz



Channel 79: 2.480GHz



12 20-dB Bandwith

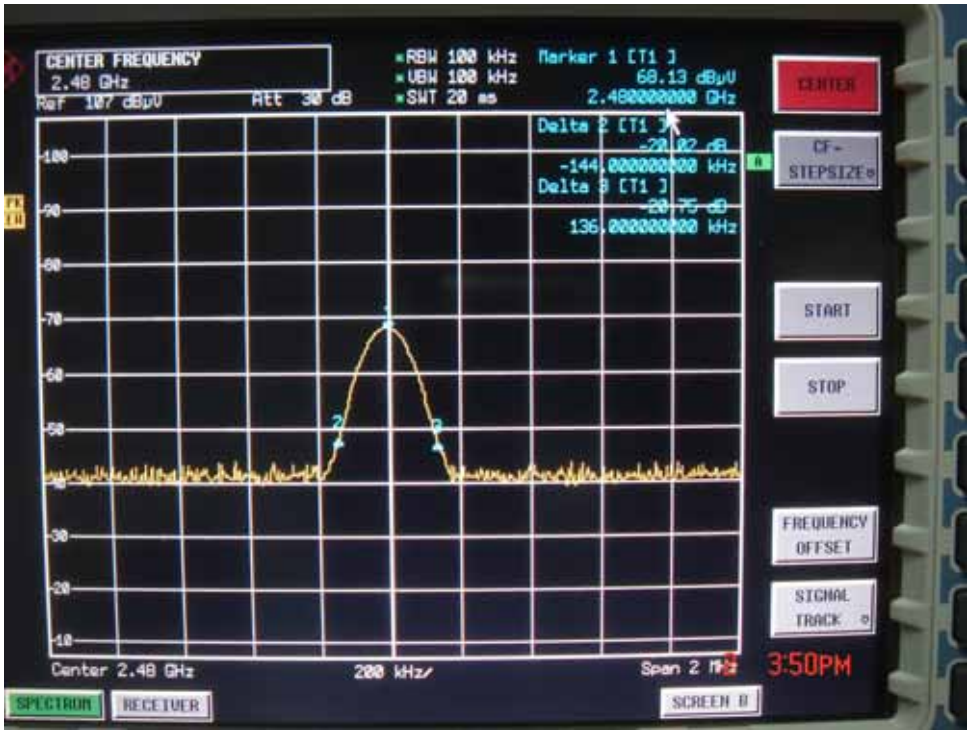
Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.247
Test Date:	August 8, 2006
Test mode:	The EUT work in test mode(Tx) and test it

12.1 Test Procedure

1. The EUT, peripherals were put on the turntable which table size is 1mX1.5m, table high 0.8m. All set up is according to ANSI C63.4:2003.
2. With the EUT's antenna attached, The EUT's radiated emission power was received by the test antenna which was connected to the spectrum analyser with the START and STOP frequencies set to the EUT's operation band. Measurements were made at 3 meters.
3. The antenna high were varied from 1m to 4m high to find the maximum emission for each frequency.
4. 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.

12.2 Test Result

Please refer the graph as below:



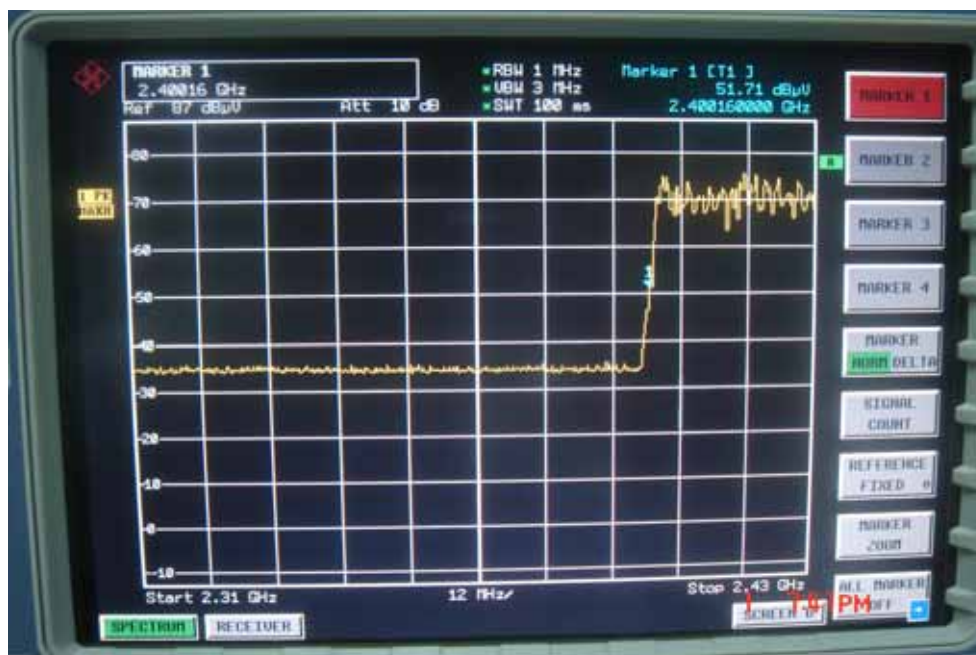
13 Radiated spurious emissions into adjacent restricted band

Test Requirement:	FCC Part15 Paragraph 15.205
Test Method:	Based on FCC Part 15 Paragraph 15.247
Test Date:	August 8, 2006
Requirements:	The EUT work in test mode(Tx) and test it

Requiments:emissions that fall in the restricted bands(15.205).These emissions must be less that or equal to 500uV/m(54 dBuV/m)

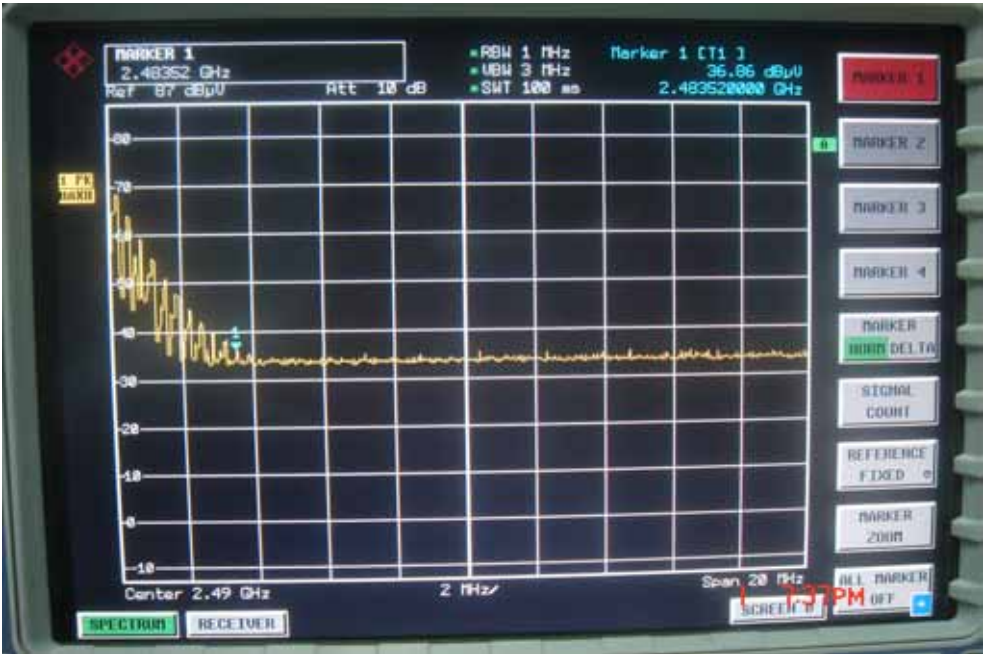
Test procedure:An in band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4-2003 and FCC Rules.The procedure was repeated with an average detector and a plot made.The calculated field strength in the adjacent restricted band is presented below.

lower bandedge/ restricted band (peak value)



From plot, Reading is 51.71dBuV/m with TDS has been calculated Peak meets the average value(54 dBuV/m).

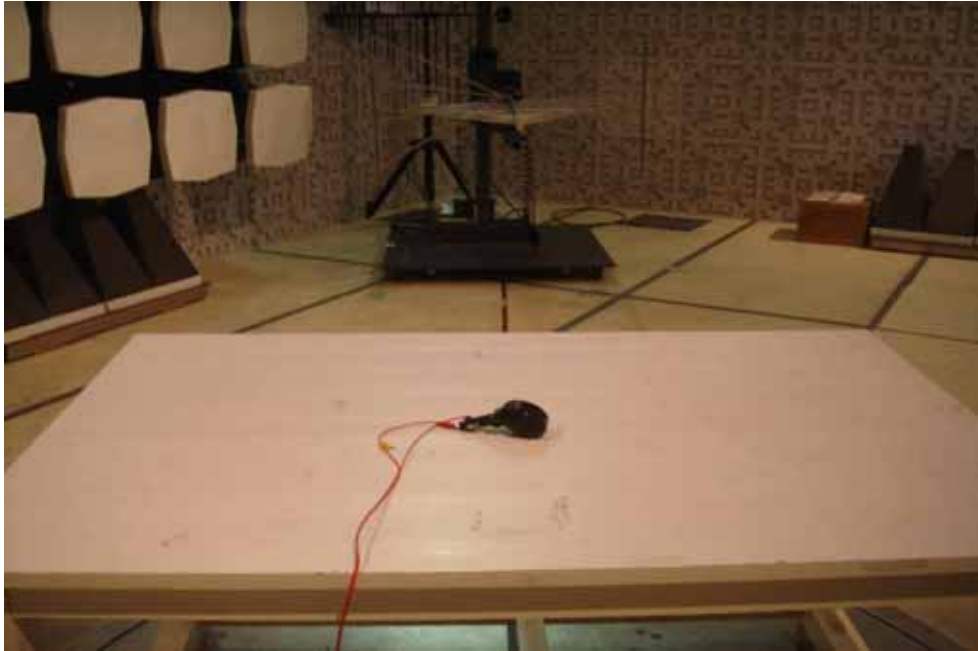
Upper bandedge and restricted band (peak value)



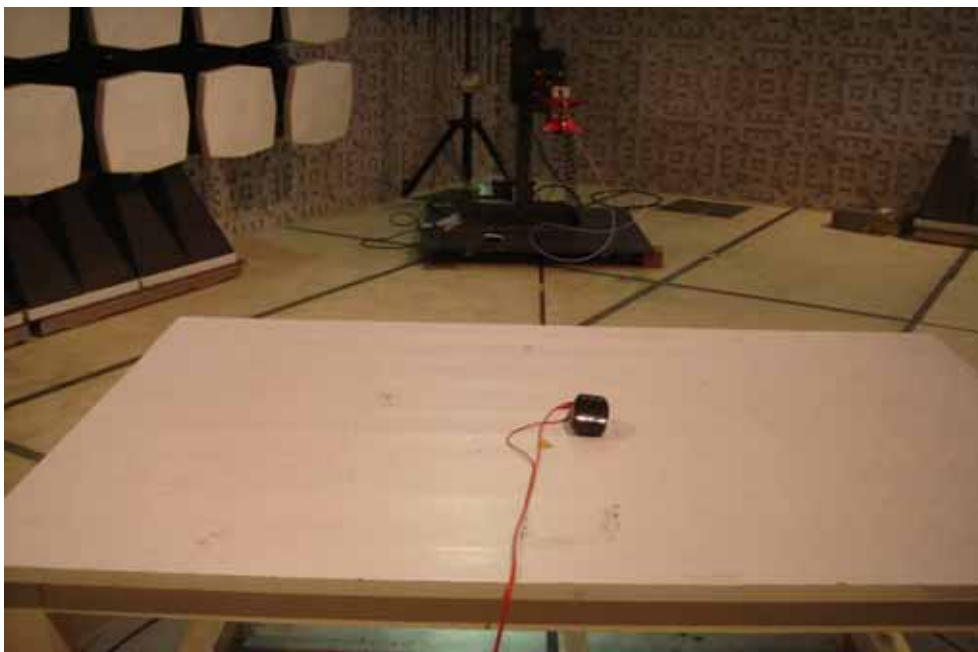
From plot, Reading is 36.86dBuV/m with TDS has been calculated Peak meets the average value(54 dBuV/m)

14 Photographs of Testing

14.1 Radiation Emission Test View For 30MHz-1000MHz



14.2 Radiation Emission Test View For 1GHz-25GHz



15 Photographs - Constructional Details

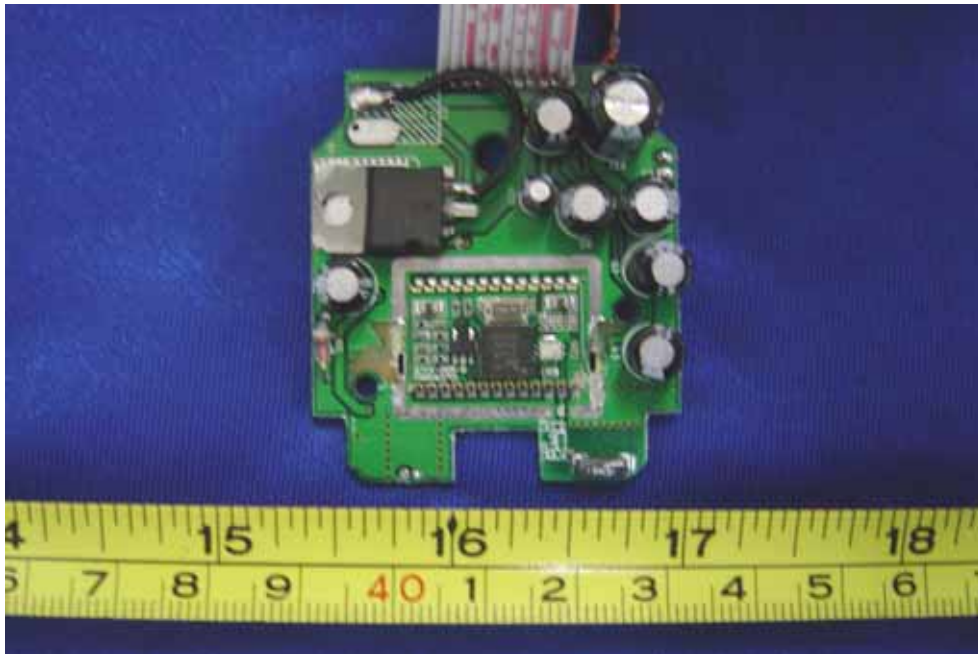
15.1 EUT - Front View



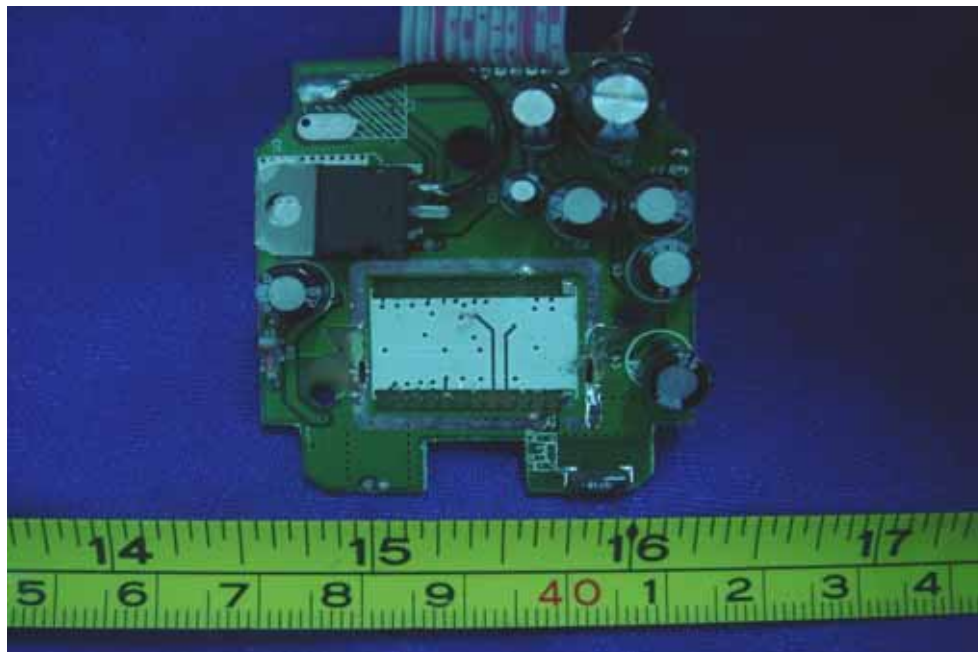
15.2 EUT - Back View



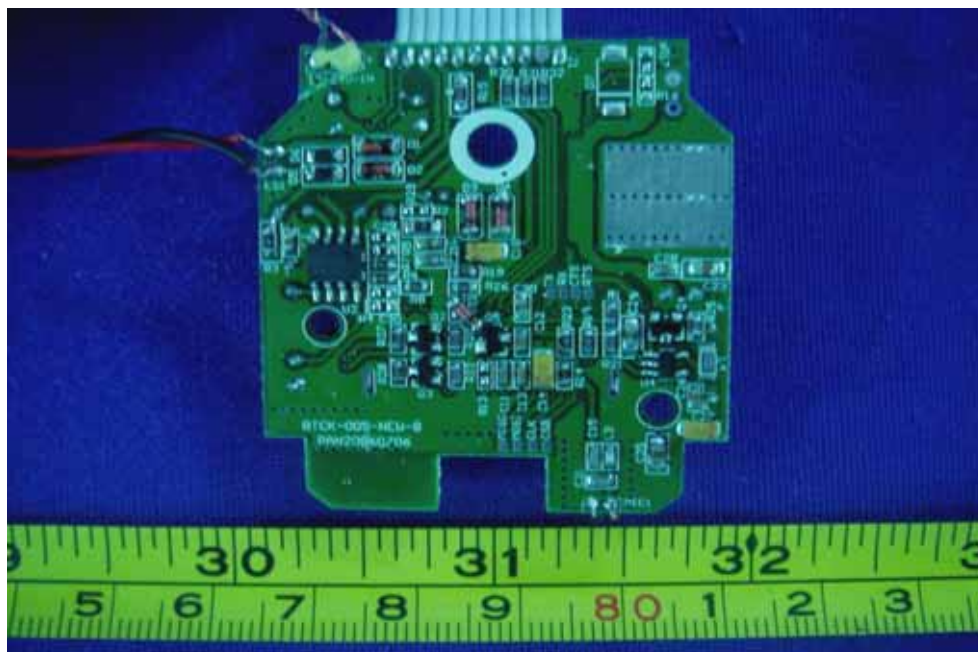
15.3 PCB - Solder View



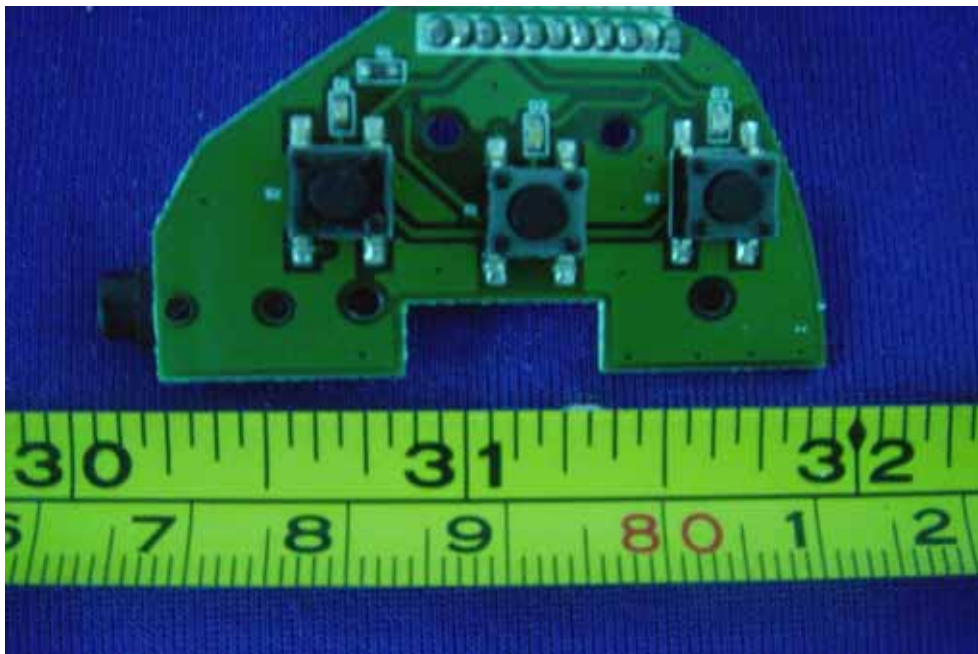
15.4 PCB1 – Front View



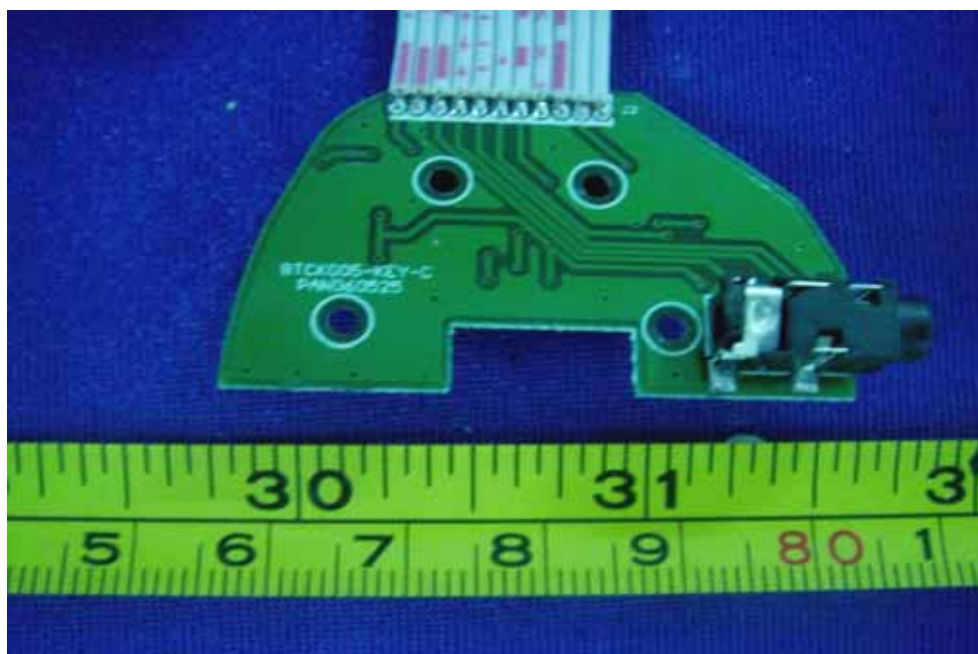
15.5 PCB 1- Back View



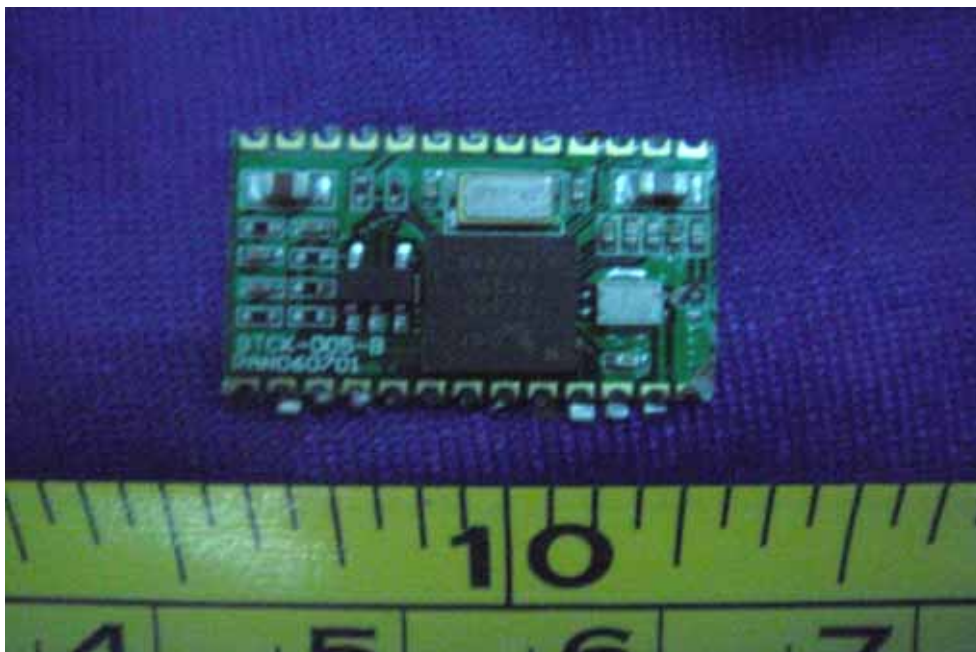
15.6 PCB 2- Front View



15.7 PCB 2- Back View



15.8 PCB 3- Front View



15.9 PCB 3- Back View



16 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 Bottom View/proposed FCC Mark Location

