

FCC TEST REPORT

FCC ID : S4PBC02ATHE-01

Applicant : **Shenzhen Micah Electronics Corp**
1/F.,Bldg.M6,Middle District, High and New Technique Industrial Garden,
Shenzhen, China

Equipment Under Test (EUT) :

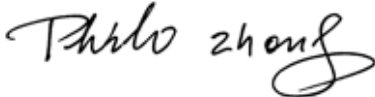
Product description : Bluetoooh

Model No. : BC02ATHE-01

Standards : FCC 15 Paragraph 15.205, Paragraph 15.207, Paragraph 15.209, Paragraph
15.31, Paragraph 15.33, Paragraph 15.35, Paragraph 15.247

Date of Test : April 18, 2005

Test Engineer : Jimmy Lee

Reviewed By : 

PERPARED BY:
Shenzhen Huatongwei International Inspection Co., Ltd
Keji S,12th,Road, Hi-tech Industrial Park, Shenzhen, Guangdong, China

FCC Registration Number: 662850

2 Contents

	Page
1 COVER PAGE.....	1
2 CONTENTS.....	2
3 TEST SUMMARY.....	5
4 GENERAL INFORMATION.....	5
4.1 CLIENT INFORMATION	5
4.2 GENERAL DESCRIPTION OF E.U.T.....	5
4.3 DETAILS OF E.U.T.	5
4.4 DESCRIPTION OF SUPPORT UNITS	5
4.5 STANDARDS APPLICABLE FOR TESTING.....	5
4.6 TEST FACILITY.....	6
4.7 TEST LOCATION.....	6
5 EQUIPMENT USED DURING TEST	7
6 CONDUCTED EMISSION TEST	8
6.1 TEST EQUIPMENT.....	8
6.2 TEST PROCEDURE	8
6.3 CONDUCTED TEST SETUP	9
6.4 EUT OPERATING CONDITION	9
6.5 CONDUCTED EMISSION LIMITS	10
6.6 CONDUCTED EMISSION TEST RESULT	11
6.7 CONDUCTED EMISSIONS TEST DATA	12
7 RADIATION EMISSION TEST.....	13
7.1 TEST EQUIPMENT.....	13
7.2 MEASUREMENT UNCERTAINTY.....	13
7.3 TEST PROCEDURE	13
7.4 RADIATED TEST SETUP.....	14
7.5 SPECTRUM ANALYZER SETUP.....	14
7.6 CORRECTED AMPLITUDE & MARGIN CALCULATION	15
7.7 SUMMARY OF TEST RESULTS.....	15
7.8 EUT OPERATING CONDITION	16
7.9 RADIATED EMISSIONS LIMIT.....	16
7.10 RADIATED EMISSIONS TEST RESULT.....	17
8 MAXIMUM PEAK OUTPUT POWER.....	20
9 HOPPING CHANNEL NUMBER.....	21
10 CARRIER FREQUENCIES SEPARATED.....	22
10.1 LOWER CHANNELS:CARRIER FREQUENCIES SEPARATED	23
10.2 MIDDLE CHANNELS:CARRIER FREQUENCIES SEPARATED.....	23
10.3 UPPER CHANNELS:CARRIER FREQUENCIES SEPARATED	24
11 DWELL TIME.....	25

11.1 TEST PROCEDURE.....25

11.2 TEST RESULTS : PASS.....25

12 BAND EDGE29

12.1 TEST PROCEDURE29

12.2 BAND EDGE29

12.3 BAND EDGE TEST RESULT30

13 PHOTOGRAPHS OF TESTING.....31

13.1 CONDUCTION EMISSION TEST VIEW31

13.2 RADIATION EMISSION TEST VIEW.....32

14 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS33

14.1 EUT - FRONT VIEW33

14.2 EUT - BACK VIEW33

14.3 PCB - COMPONENT VIEW34

14.4 PCB - COMPONENT VIEW(1)34

14.5 PCB - SOLDER VIEW35

15 FCC ID LABEL.....36

3 Test Summary

Test	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission (30MHz to 25GHz)	FCC PART 15: 2003	ANSI C63.4: 1992	Class B	PASS
Conducted Emission (150KHz to 30MHz)	FCC PART 15: 2003	ANSI C63.4: 1992	Class B	PASS

4 General Information

4.1 Client Information

Applicant: **Shenzhen Micah Electronics Corp**
Address of Applicant: 1/F., Bldg.M6, Middle District, High and New Technique
Industrial Garden, Shenzhen, China

4.2 General Description of E.U.T.

Product description: **Bluetooth**
Model No.: **BC02ATHE-01**

4.3 Details of E.U.T.

Power Supply: **AC 120 V/60Hz (Power From AC Adaprot)**

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. The standards used were FCC 15 Paragraph 15.205, Paragraph 15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35, Paragraph 15.247.

4.6 Test Facility

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

- **FCC – Registration No.: 662850**

Shenzhen Huatongwei International Inspection 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 662850, November 17, 2003.

4.7 Test Location

All Emissions tests were performed at:-Shenzhen Huatongwei International Inspection Co., Ltd. at Keji S, 12th, Road, Hi-tech Industrial Park, Shenzhen, Guangdong, China.

5 Equipment Used during Test

Conducted Emission Test						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due date
1	Shielding Room	ETS	8 x 4 x 4 m ³	N0.2	N/A	N/A
2	LISN	Schaffner Chase	MNZ050D11	1421	06-11-2004	05-11-2005
3	EMI Test Receiver	Rohde & Schwarz	ESCS30	100039	18-11-2003	17-11-2004
Radiated Emission Test						
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due date
1	3m Semi- Anechoic Chamber	ETS	N/A	N/A	05-11-2004	04-11-2005
2	EMI Test Receiver	ROHDE & SCHWARZ	ESI 26	100009	05-11.2004	04-11-2005
3	EMI Test Receiver	ROHDE & SCHWARZ	ESCS30	100038	05-11.2004	04-11-2005
4	Spectrum Analyzer	Agilent	E7402A	100047	05-11.2004	04-11-2005
5	EMI Test Software	ROHDE & SCHWARZ	ES-K1	N/A	N/A	N/A
6	Bilog Type Antenna	ETS	2075	2346	02-12-2003	01-12-2004
7	Horn Antenna	ROHDE & SCHWARZ	HF906	1000029	05-11.2004	04-11-2005
8	Ultra-Broadband Antenna	ROHDE & SCHWARZ	HL562	100015	02-12-2003	01-12-2004
Common Used Equipment						
Item	Test Equipment	Manufacturer	Model No.	Series No.	Cal. Date	Due date
1	Temperature, Humidity & Barometer	OREGON SCIENTIFIC	BA-888	EMC0001 to EMC0004	25-07-2004	25-07-2005
2	DMM	FLUKE	73	70681569 or 70671122	23-07-2004	23-07-2005

6 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
Test Date:	April 18, 2005
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

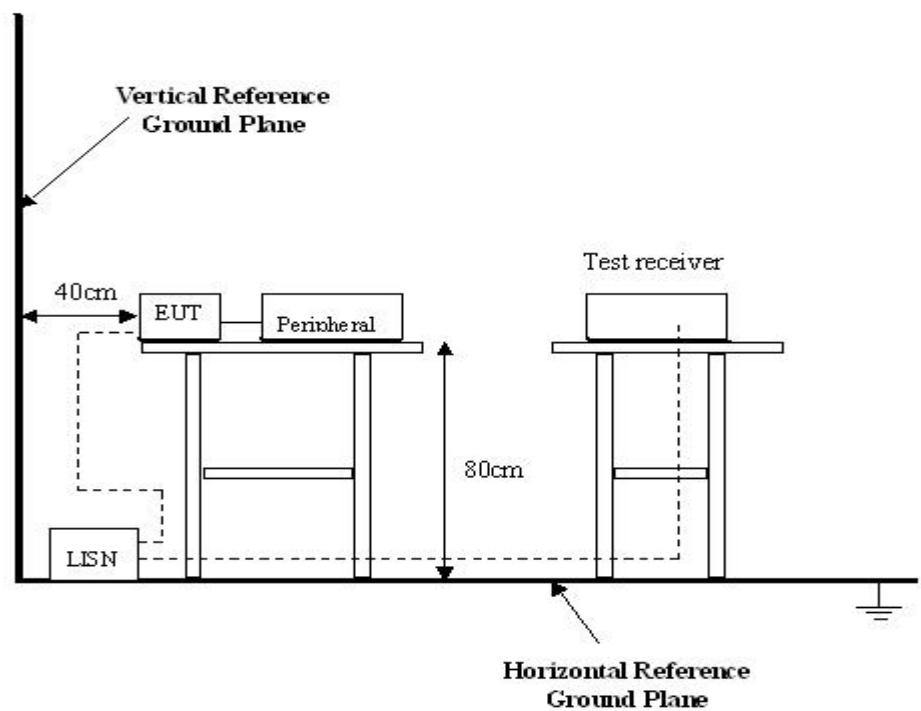
Please refer to Section 5 this report.

6.2 Test Procedure

1. The EUT was tested according to ANSI C63.4. 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

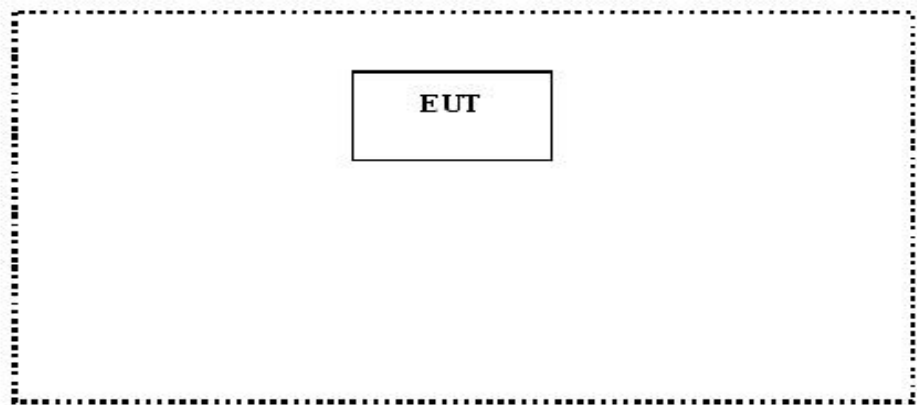
The conducted emission tests were performed using the setup accordance with the ANSI C63.4, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



6.4 EUT Operating Condition

Operating condition is according to ANSI C63.4.

- 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

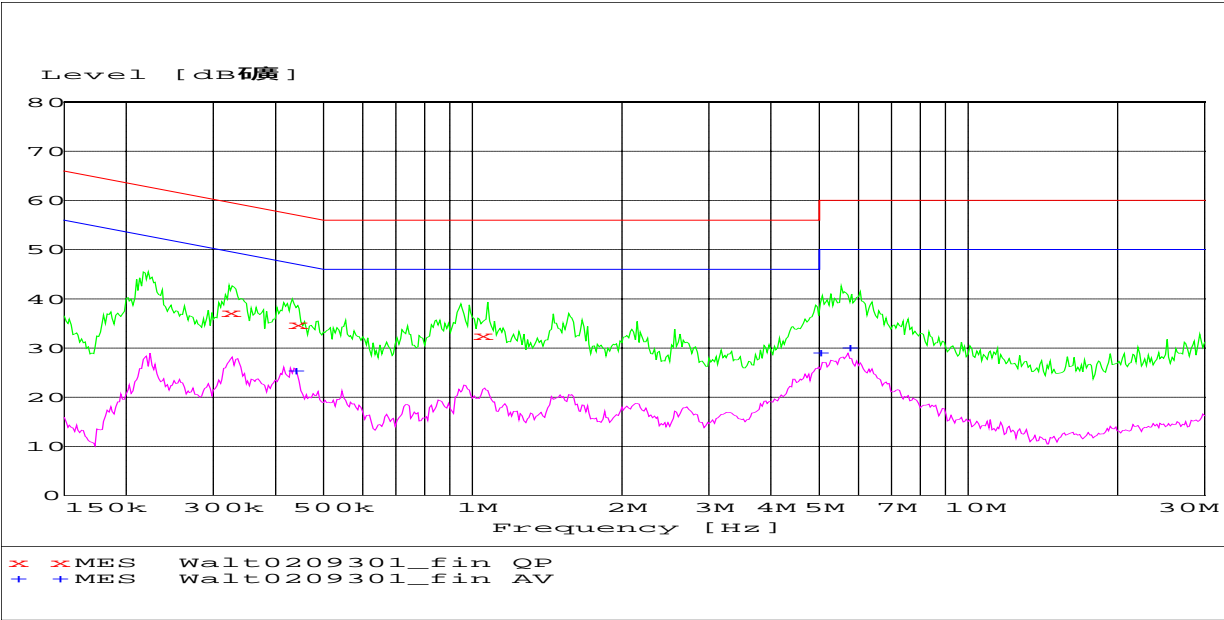
56 dB μ V/m between 0.5MHz & 5MHz

60 dB μ V/m between 5MHz & 30MHz

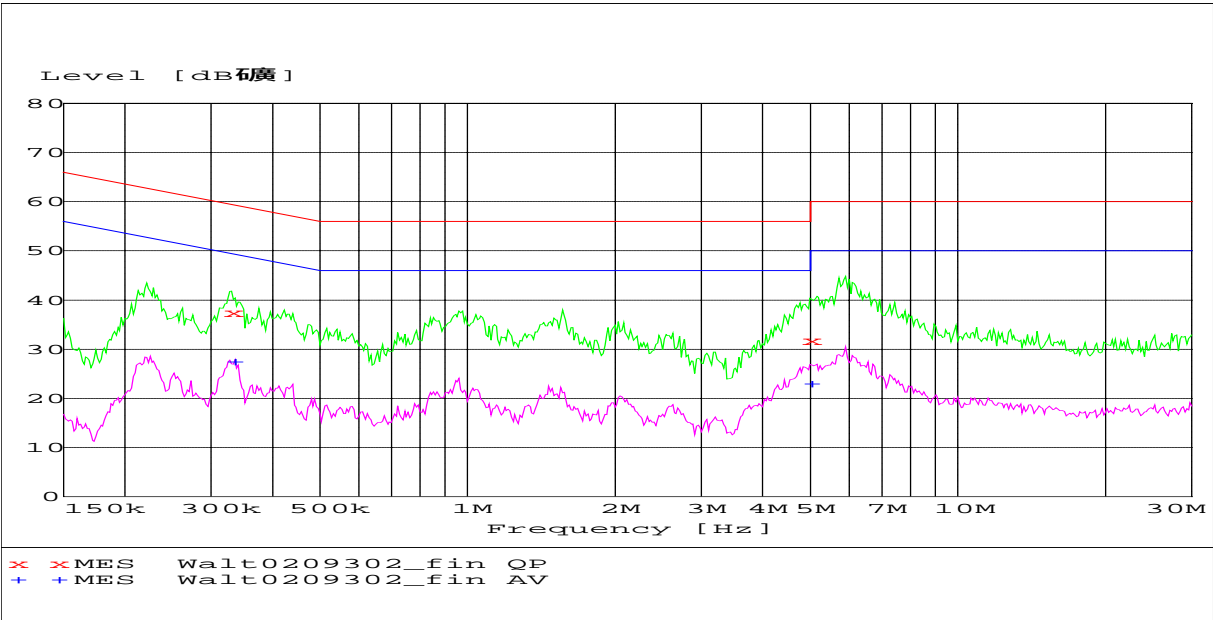
Note: In the above limits, the tighter limit applies at the band edges.

6.6 Conducted Emission Test Result

Live Line:



Neutral Line:



6.7 Conducted Emissions Test Data

Freq. MHz	Line	QP Reading dBuV	Limit dBuV	Margin dB	AV Reading dBuV	Limit dBuV	Margin dB
0.32	Live	37.3	60.0	22.7	25.3	50.0	24.7
1.03	Live	32.6	56.0	23.4	19.3	46.0	26.7
0.33	Neutral	37.4	59.0	22.0	27.5	49.0	21.5
4.99	Neutral	31.8	56.0	24.2	23.0	46.0	23.0

7 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.209 and Paragraph 15.247
Test Method:	Based on ANSI 63.4
Test Date:	April 18, 2005
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.

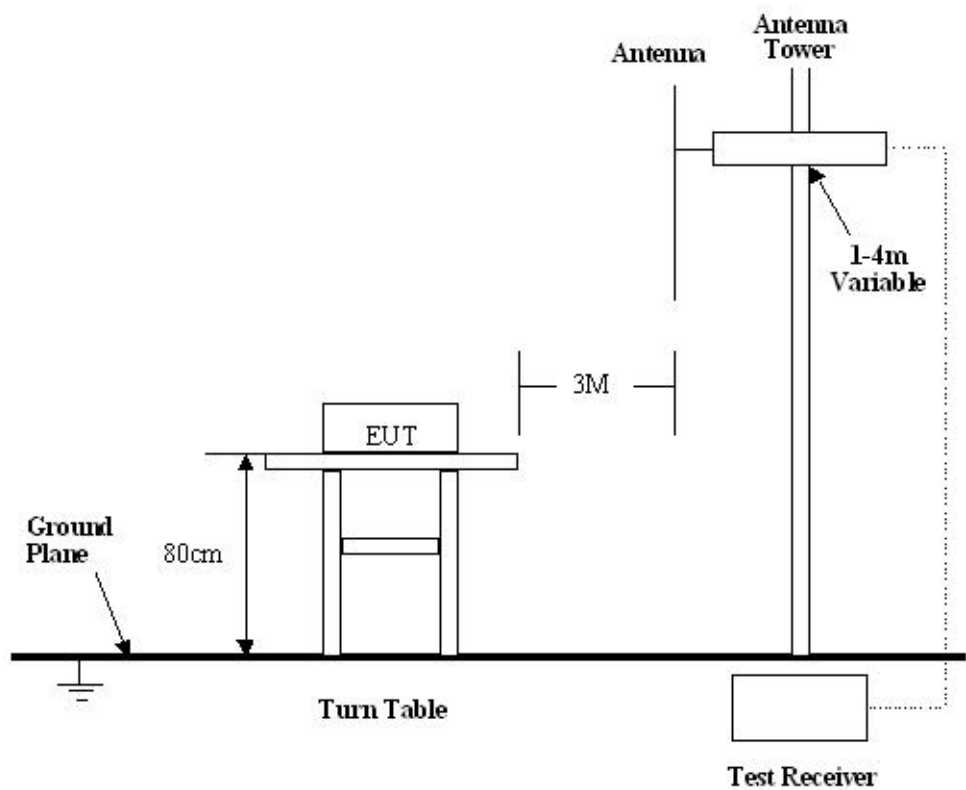
Based on ANSI C63.4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at SZHTW is +4.0 dB.

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, The specification used in this report was the FCC Part15 Paragraph 15.209 and Paragraph 15.247 limits.



7.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.209 and 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 15.209 and 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

A. FCC Part 15 subpart C Paragraph 15.247 Limit

Fundamental Frequency	Field Strength of Fundamental		Field Strength of Harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928MHz	50	94	500	54
2400-2483.5 MHz	50	94	500	54
5725-5875 MHz	50	94	500	54
24.0-24.25GHz	250	108	2500	68

- Note:**
- (1) RF Voltage(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 instrumentaion employing an average detector.Measurement using instrumentation with a peak detector function,corresponding to 20dB above the maximum permitted average limit.
 - (4) 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.

B. Frequencies in restricted band are complied to 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.

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

A. Fundamental Radiated Emission Data

Test Item:	Fundamental Radiated Emission Data
Test Voltage:	AC 120 V/60Hz (Power From AC Adaprot)
Test Mode:	On(Tx Low/Tx Middle/Tx High)
Temperature:	24 °C
Humidity:	52%RH
Test Result:	PASS

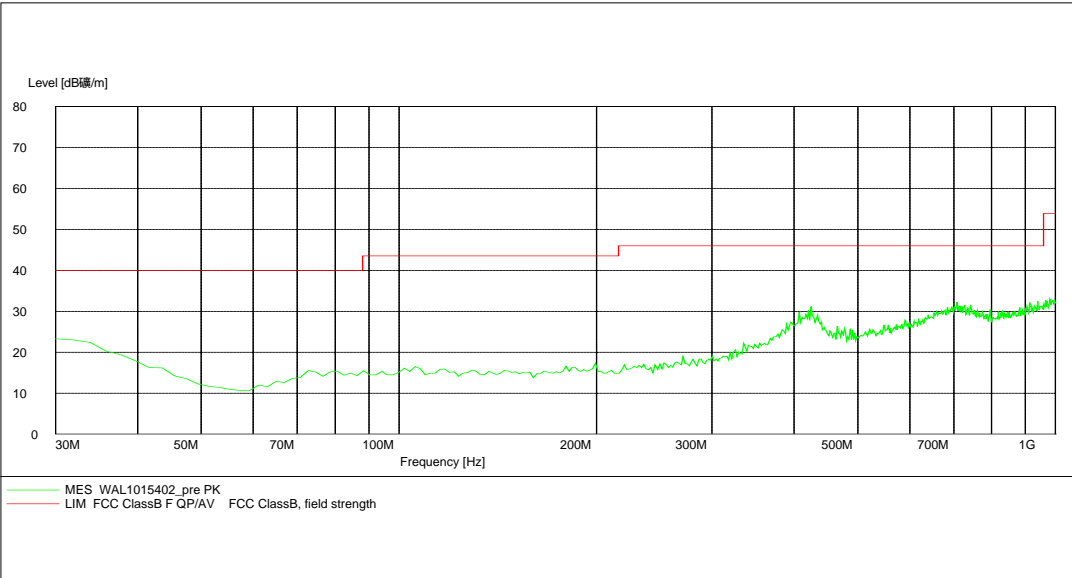
Frequency (MHz)	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency						
2402.657317	Vertical	87.50	94.0	6.50	1.5	90
2402.657317	Horizontal	86.21	94.0	7.79	1.5	90
Middle frequency						
2441.861312	Vertical	88.71	94.0	5.29	1.5	90
2441.861312	Horizontal	87.20	94.0	6.80	1.5	90
High frequency						
2481.629447	Vertical	86.60	94.0	7.40	1.5	90
2481.629447	Horizontal	85.40	94.0	8.60	1.5	90

- Note:**
- (1) Above 1GHz, do a peak and average measurements for all emissions, Limit for peak is 74dBuV/m, According to part 15.35(b) and average is 54dBuV/m.
 - (2) The field strength of fundamental radiation emissions limit for average is 94dBuV/m.
 - (3) General Radiated Emission No significant emissions above the equipment noise floor were detected.
 - (4) Emission Level = Reading Level + Probe Factor + Cable Loss.

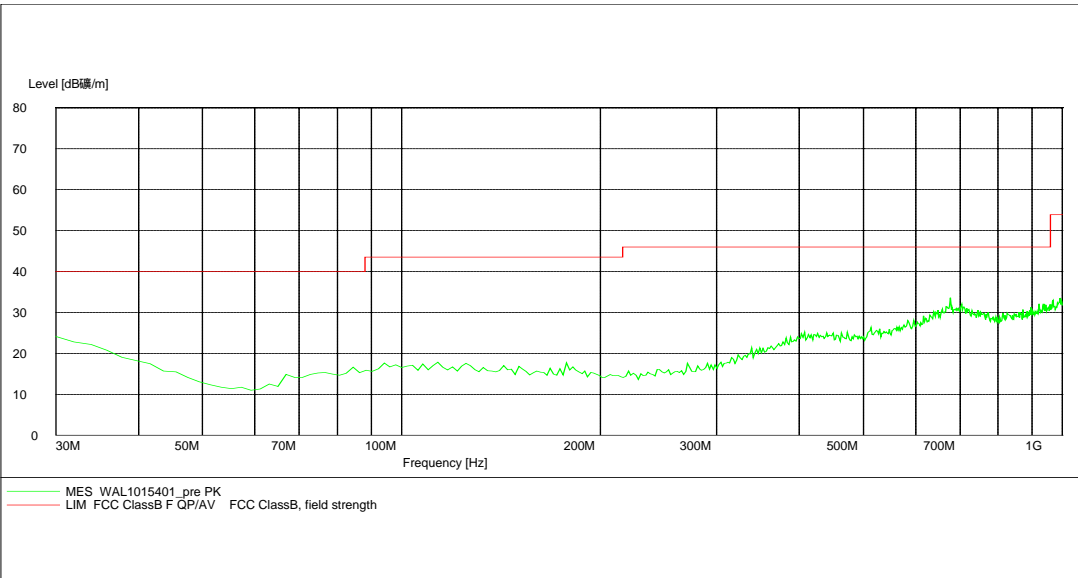
B. General Radiated Emission Data

Test Item: General Radiated Emission Data
Test Voltage: AC 120 V/60Hz (Power From AC Adaprot)
Test Mode: On TX
Temperature: 24 °C
Humidity: 52%RH
Test Result: PASS
Remarks: No significant emissions above the equipment noise floor were detected.

Horizontal:



Vertical:



8 Maximum Peak Output Power

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4
Test Date:	April 18, 2005
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 technique used to find the output power of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP emission levels of the EUT.

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. Steps 1 and 2 were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
4. Calculate the transmitter's peak power using the following equation:

$$\text{Power} = (E \times d)^2 / (30 \times G)$$

Where: E = the measured maximum field strength in V/m.

Set the RBW > 6dB bandwidth of the emission or use a peak power meter.

.G = the numeric gain of the transmitting antenna over an isotropic radiator.

.d = the distance in meters from which the field strength was measured.

.P = the power in watts is the final Maximum Peak Output Power.

Test Result:

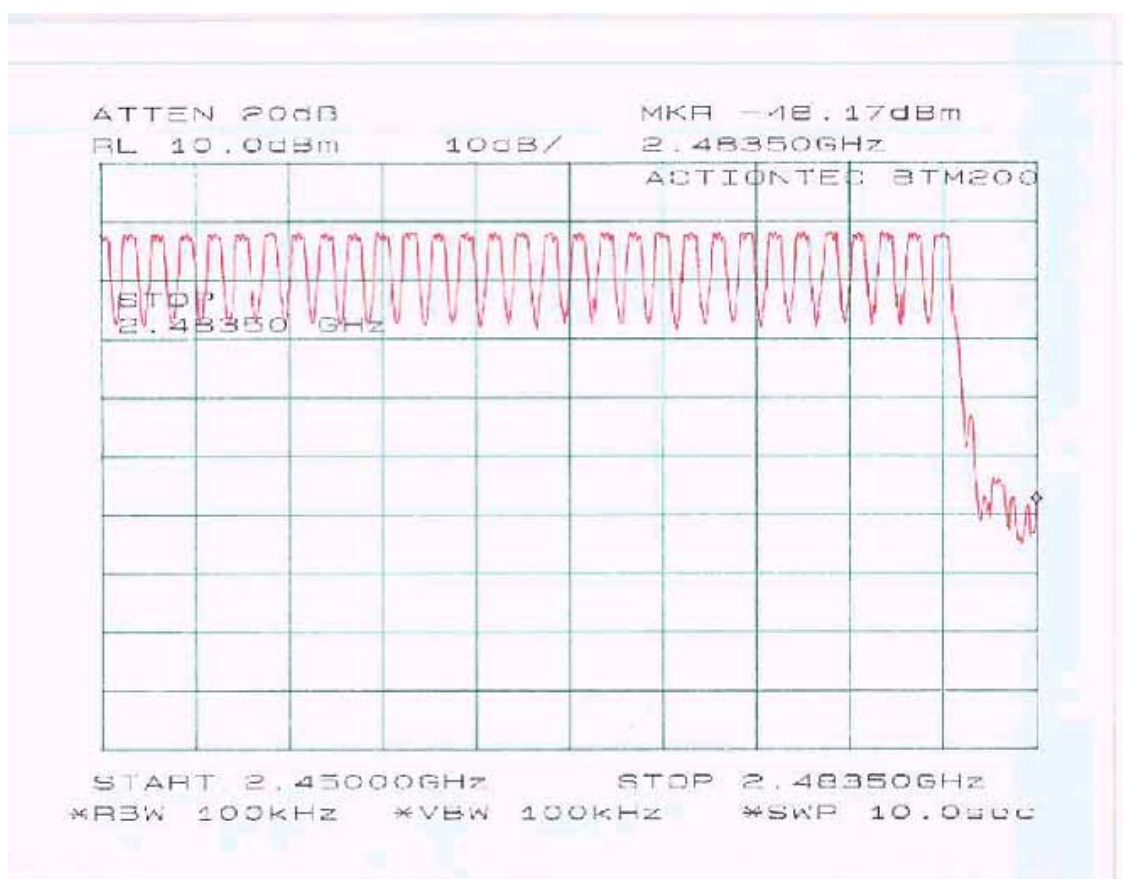
Test Channel	Fundamental Frequency(GHz)	Reading (dBm)	Cable Loss dB	Output Power (dBm)	Limit (dBm)	PASS/FAIL
low	2.402	-9.12	0.2	-8.92	30	PASS
middle	2.441	-9.03	0.2	-8.83	30	PASS
high	2.481	-9.19	0.2	-8.99	30	PASS

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: April 18, 2005
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 50hopping
channels.
Test result: Total channels are 80 channels,channel 0 to 79.
The unit does meet the FCC requirements.

Please refer the graph as below:



10 Carrier Frequencies Separated

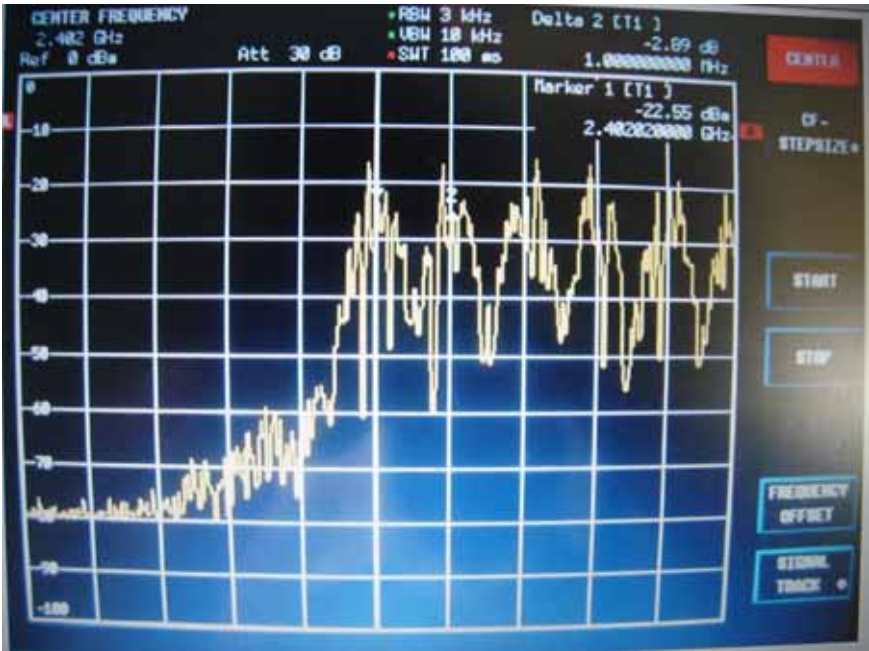
Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.247
Test Date:	April 18, 2005
Test mode:	The EUT work in test mode(Tx) and test it
Requirements:	The bandwidth of the fundamental frequency was measur by spectrum analyser with 3KHz RBW and 10KHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.
Test result:	PASS

Channel Carrier Frequency Separated

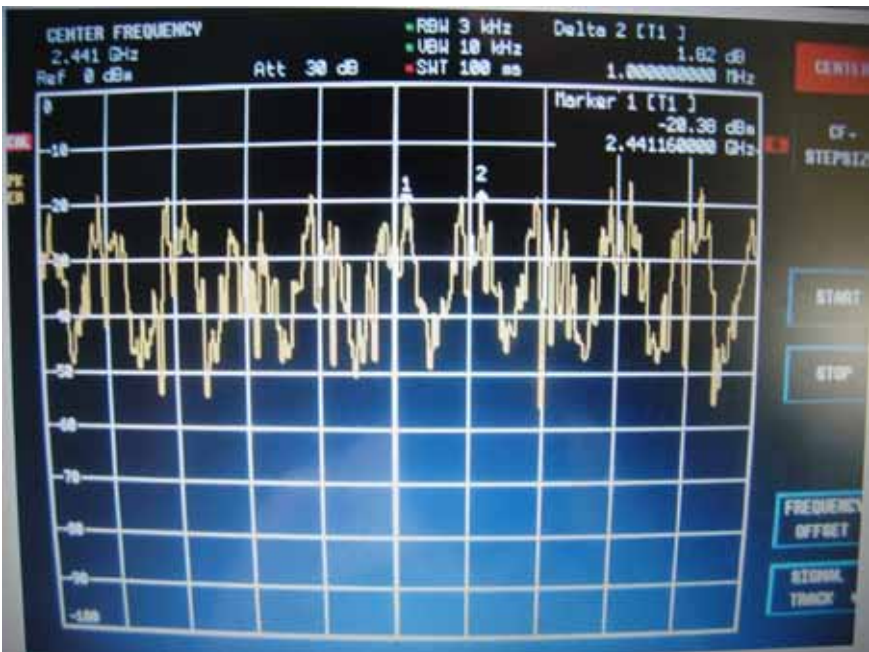
Test Channel	Fundamental Frequency(GHz) Reading (dBm)	Cable Loss dB Output Power (dBm)
Lower Channels (channel 0 and channel 1)	1.0MHz	Pass
Middle Channels (channel 39 and channel 40)	1.0MHz	Pass
Upper Channels (channel 78 and channel 79)	1.0MHz	Pass

The unit does meet the FCC requirements.

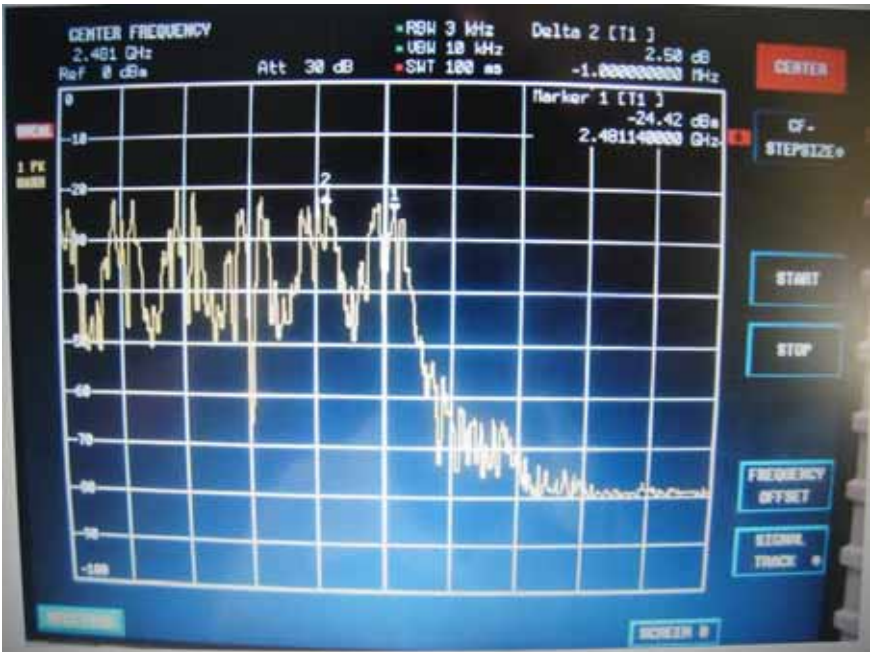
10.1 Lower Channels:Carrier Frequencies Separated



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:	April 18, 2005
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

The test period: $T=0.4 \text{ Second/Channel} * 80 \text{ Channel}=32 \text{ s}$.

1. Channel 0:2.402GHz

The Average Occupany Time= $0.59\text{ms} \times (42/500\text{ms} \times 32\text{s})/80=19.824$

2. Channel 39:2.441GHz

The Average Occupany Time= $0.60\text{ms} \times (42/500\text{ms} \times 32\text{s})/80=20.160$

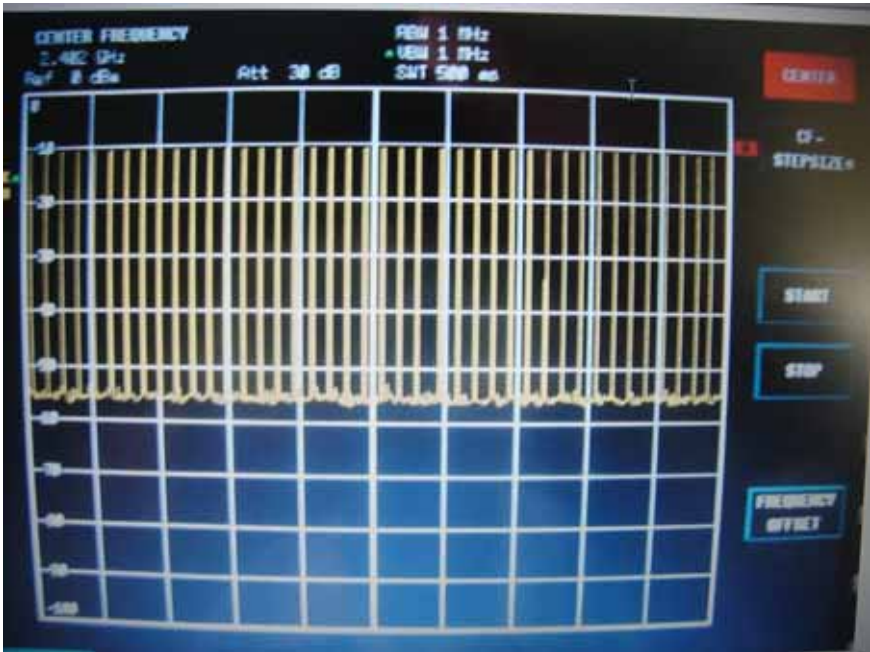
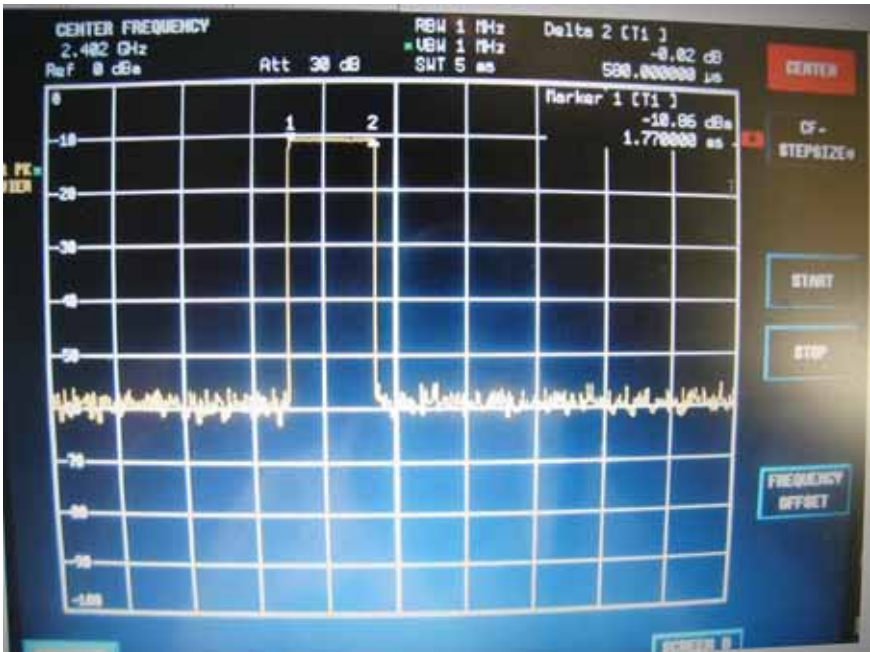
3. Channel 79:2.4835GHz

The Average Occupany Time= $0.58\text{ms} \times (42/500\text{ms} \times 32\text{s})/80=19.488$

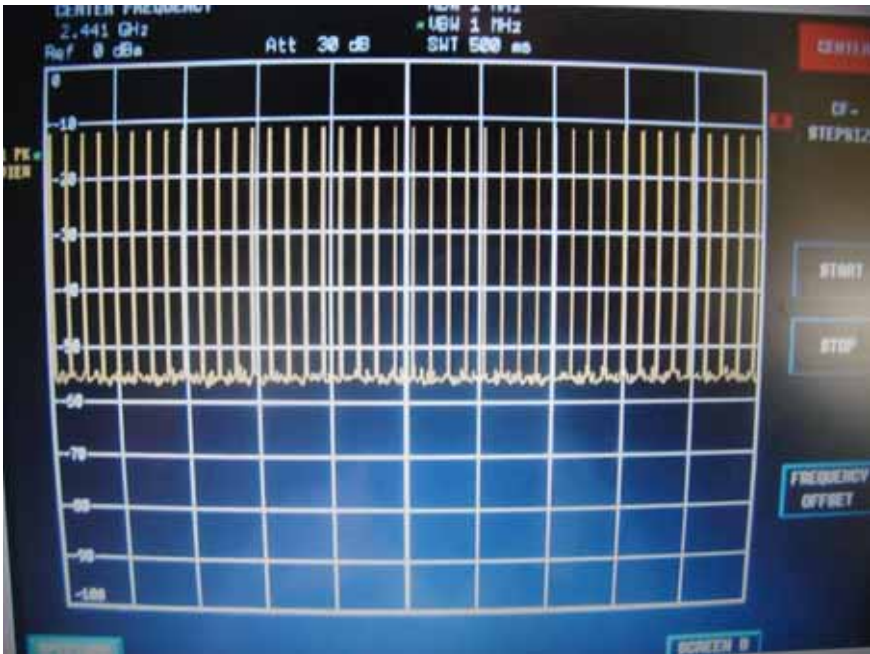
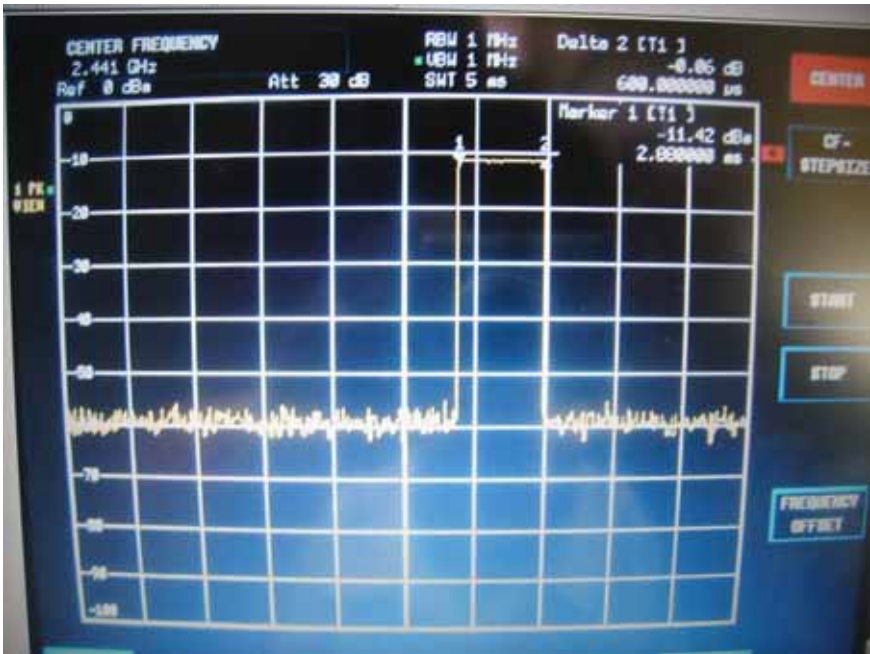
The Results are not be greater than 0.4 seconds.

Please fefer the graph as below:

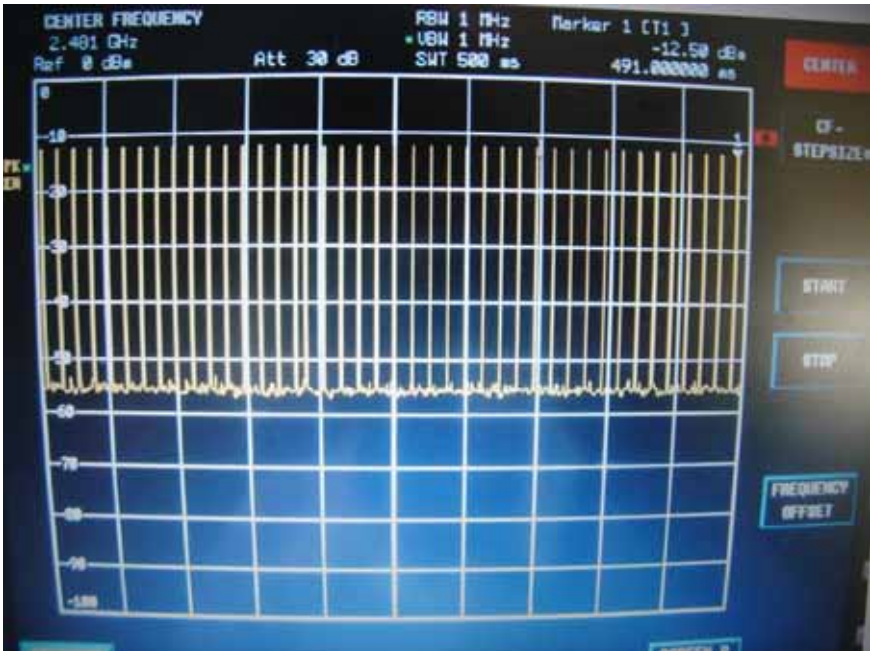
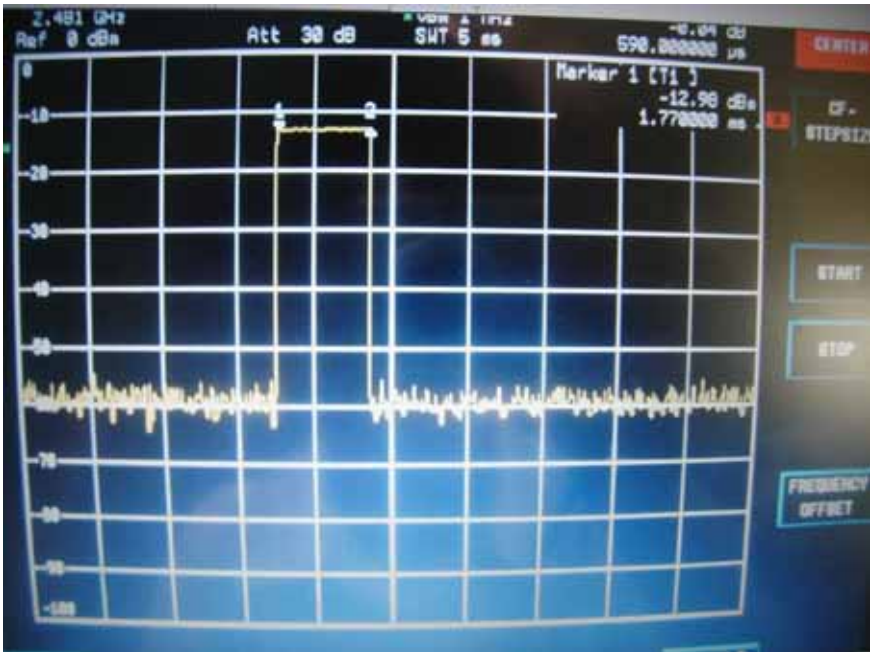
Channel 0: 2.402GHz



Channel 39: 2.441GHz



Channel 79: 2.481GHz



12 Band Edge

Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.247
Test Date:	April 18, 2005
Test mode:	On TX

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.
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 300KHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

12.2 Band Edge

Requirements: FCC 15.247, The emission power at the START and STOP frequencies shall be at least 50dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209.

12.3 Band Edge Test Result



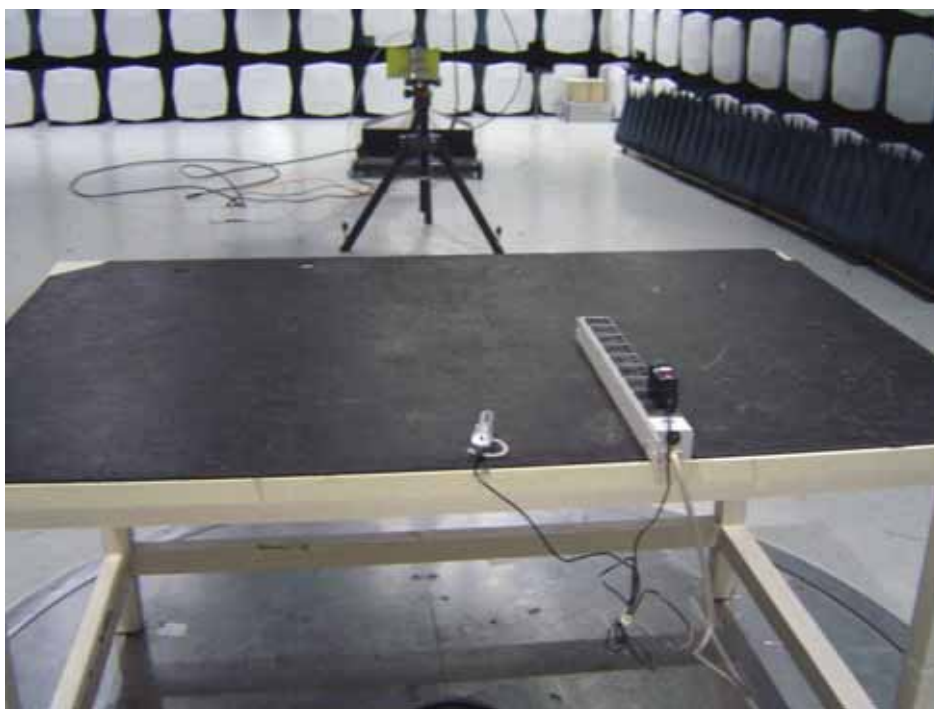
Note: (1) The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.247.

13 Photographs of Testing

13.1 Conduction Emission Test View



13.2 Radiation Emission Test View



14 Photographs - Constructional Details

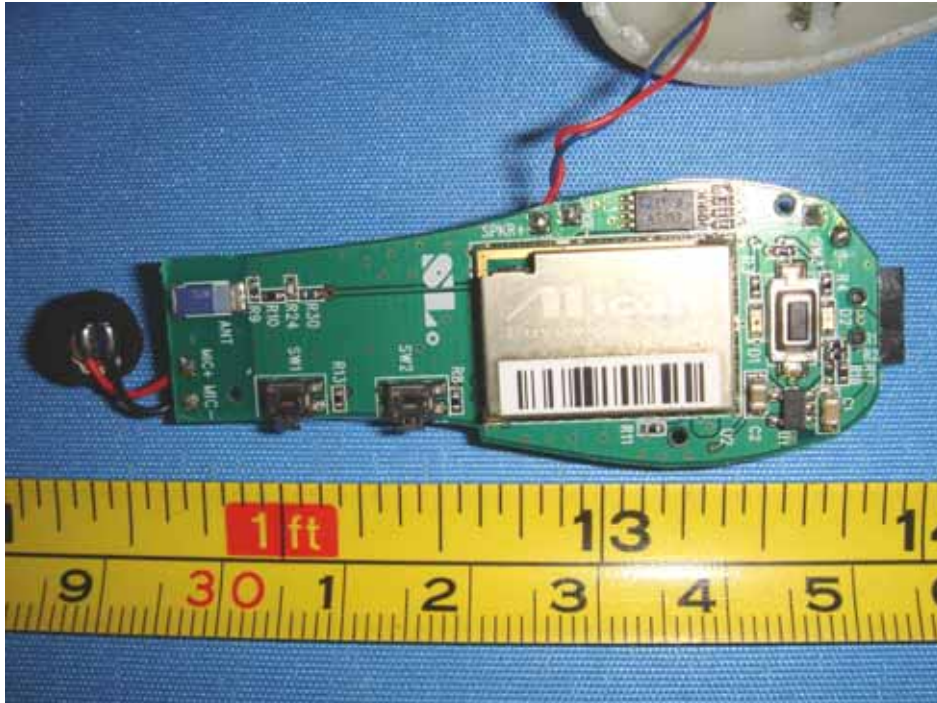
14.1 EUT - Front View



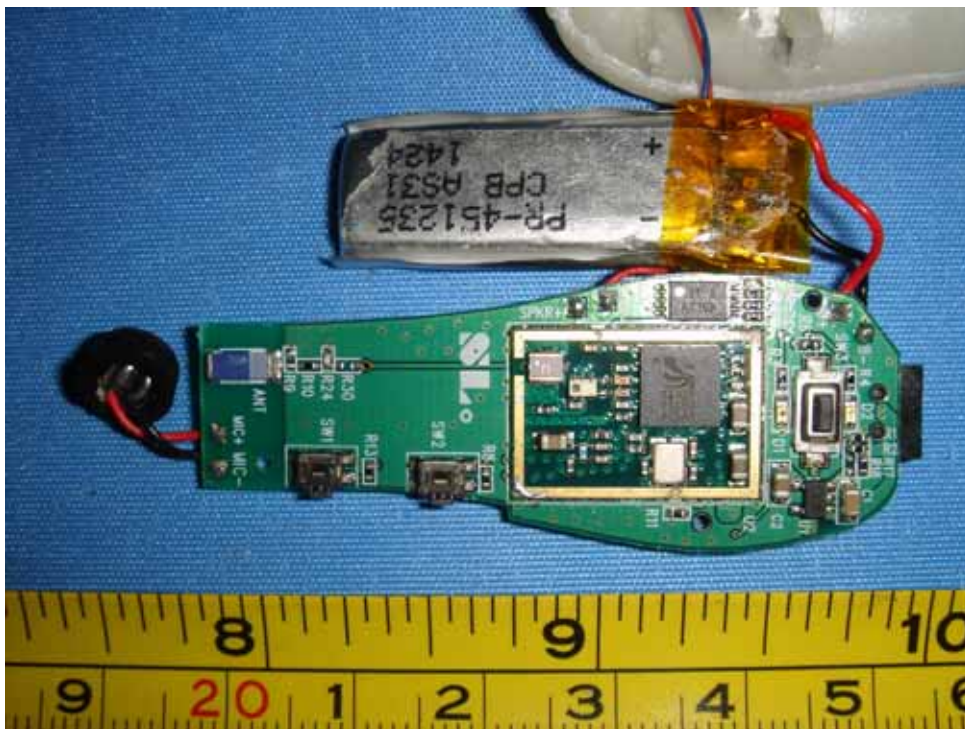
14.2 EUT - Back View



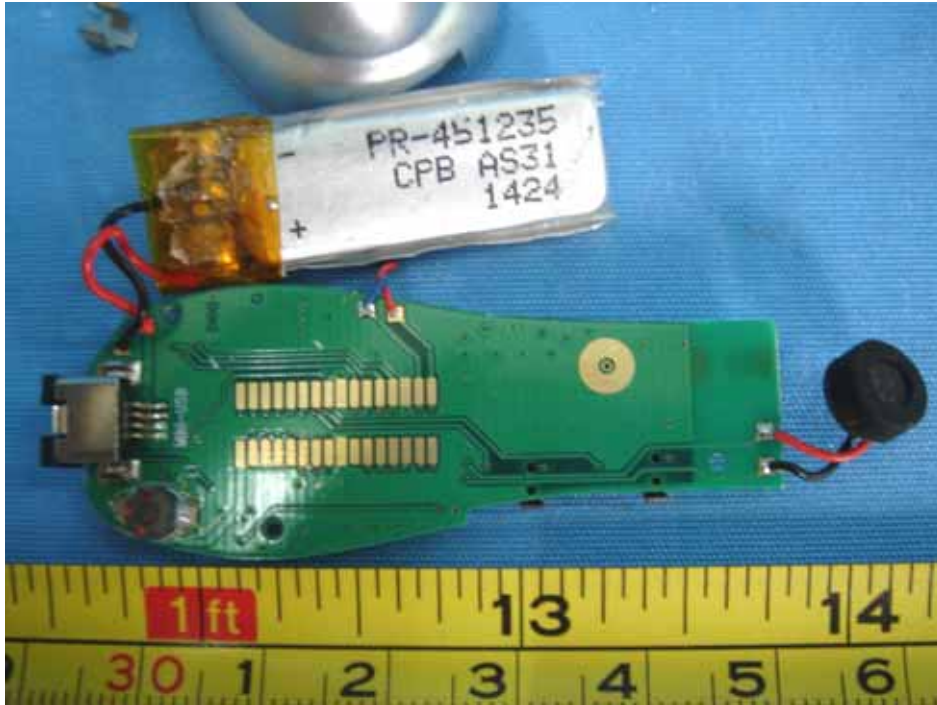
14.3 PCB - Component View



14.4 PCB - Component View(1)



14.5 PCB - Solder View



15 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

