

# ***FCC TEST REPORT***

**FCC ID** : SJ8WM90228

**Applicant** : **Shenzhen RDI Electronics & Plastics Co., Ltd.**  
Building C2 Xingtang Industrial Park, East Baishixia, Fuyong, Baoan,  
Shenzhen, PRC

**Equipment Under Test (EUT) :**

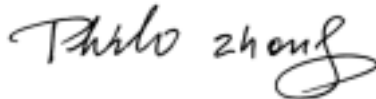
Product description : GB Messenger

Model No. : Wireless Messenger

**Standards** : FCC 15 Paragraph 15.205, Paragraph 15.209, Paragraph 15.31,  
Paragraph 15.33, Paragraph 15.35, Paragraph 15.249

**Date of Test** : December 08, 2004

**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

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### 3 Test Summary

Test	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission (30MHz to 18GHz)	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	N/A

### 4 General Information

#### 4.1 Client Information

Applicant: **Shenzhen RDI Electronics & Plastics Co., Ltd.**  
 Address of Applicant: Building C2 Xingtang Industrial Park, East Baishixia, Fuyong,  
 Baoan, Shenzhen, PRC

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

Product description: GB Messenger  
 Model No.: Wireless Messenger

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

Power Supply: 3.3 VDC (Power From Game Boy Serial Port)

#### 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 GB Messenger. The standards used were FCC 15 Paragraph 15.205, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35, Paragraph 15.249.

#### **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

<b>Conducted Emission Test</b>						
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal. Date</b>	<b>Due date</b>
1	Shielding Room	ETS	8 x 4 x 4 m <sup>3</sup>	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	18-11-2004	17-11-2005
<b>Radiated Emission Test</b>						
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Cal. Date</b>	<b>Due date</b>
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	02-12-2004	01-12-2005
7	Horn Antenna	ROHDE & SCHWARZ	HF906	1000029	05-11.2004	04-11-2005
8	Ultra-Broadband Antenna	ROHDE & SCHWARZ	HL562	100015	02-12-2004	01-12-2005
<b>Common Used Equipment</b>						
<b>Item</b>	<b>Test Equipment</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Series No.</b>	<b>Cal. Date</b>	<b>Due date</b>
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
3	Nintendo	Game boy	AGS-001	XU12232530	N/A	N/A

## 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

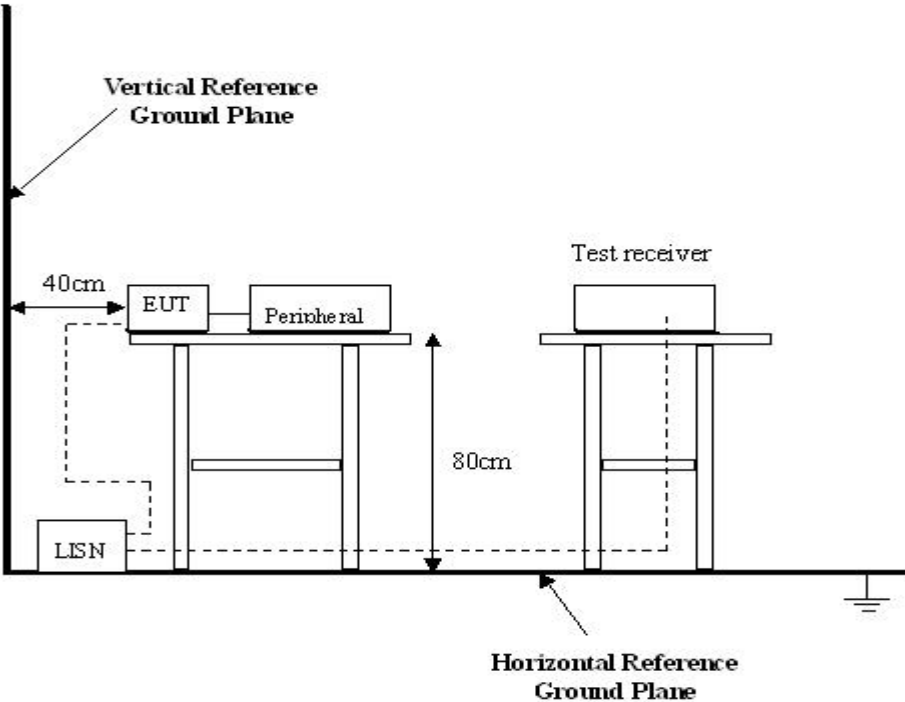
Please refer to Section 5 this report.

### 6.2 Test Procedure

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

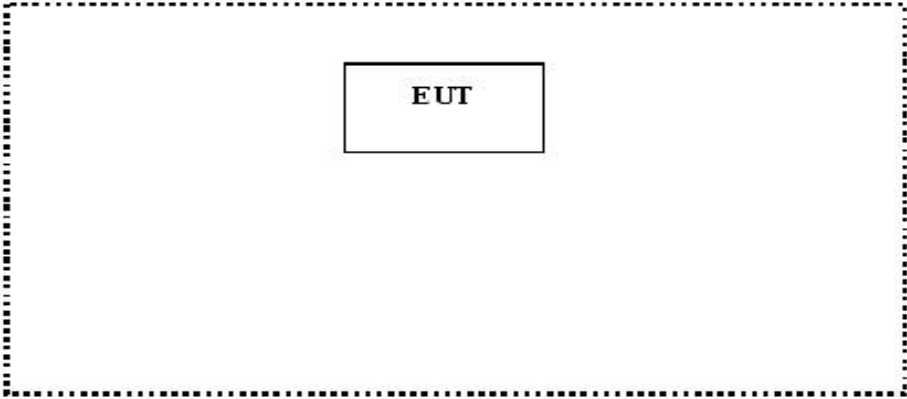
The conducted emission tests were performed using the setup accordance with the ANSI C63.4, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



**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 $\mu$ V/m between 0.15MHz & 0.5MHz

56 dB $\mu$ V/m between 0.5MHz & 5MHz

60 dB $\mu$ 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 15.209 and Paragraph 15.249
Test Method:	Based on FCC Part15 Paragraph 15.33
Test Date:	December 08, 2004
Frequency Range:	30MHz to 18GHz
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.

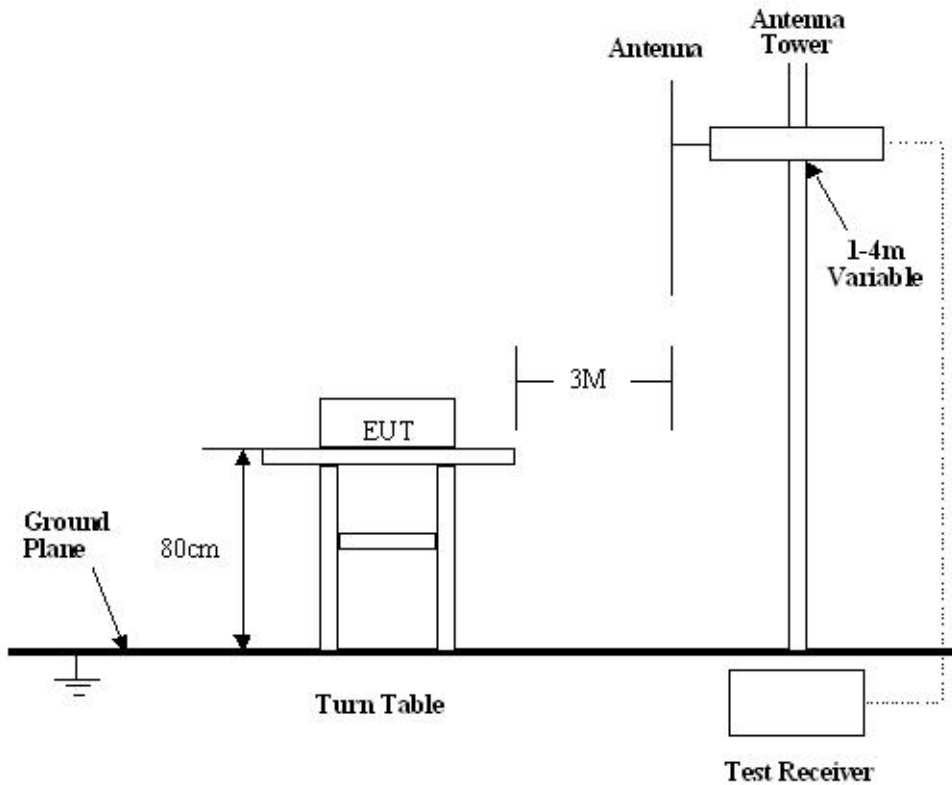
Based on ANSI C63.4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at SZHTW is +4.0 dB.

### 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 $\mu$ 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 15.249 limits.



**7.5 Spectrum Analyzer Setup**

According to FCC Part15 Paragraph 15.209 and Paragraph 15.249 Rules, the system was tested to 18000 MHz.

- Start Frequency .....30 MHz
- Stop Frequency .....18000 MHz
- Sweep Speed Auto
- IF Bandwidth .....100 kHz
- Video Bandwidth .....1 MHz
- Quasi-Peak Adapter Bandwidth .....120 kHz
- Quasi-Peak Adapter Mode.....Normal
- Resolution Bandwidth .....1MHz

## 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 -7dB $\mu$ V means the emission is 7dB $\mu$ V 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 15.249 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 15.249 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

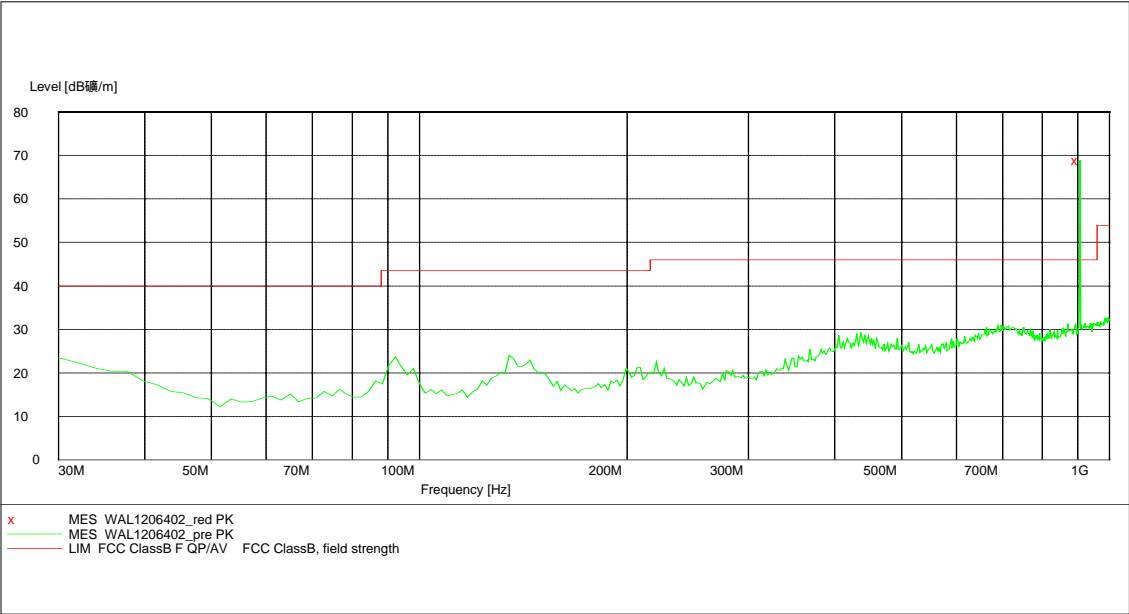
33            20dBuV+10.36dB=30.36dBuV/m @3m

### Radiated Emission Test Data

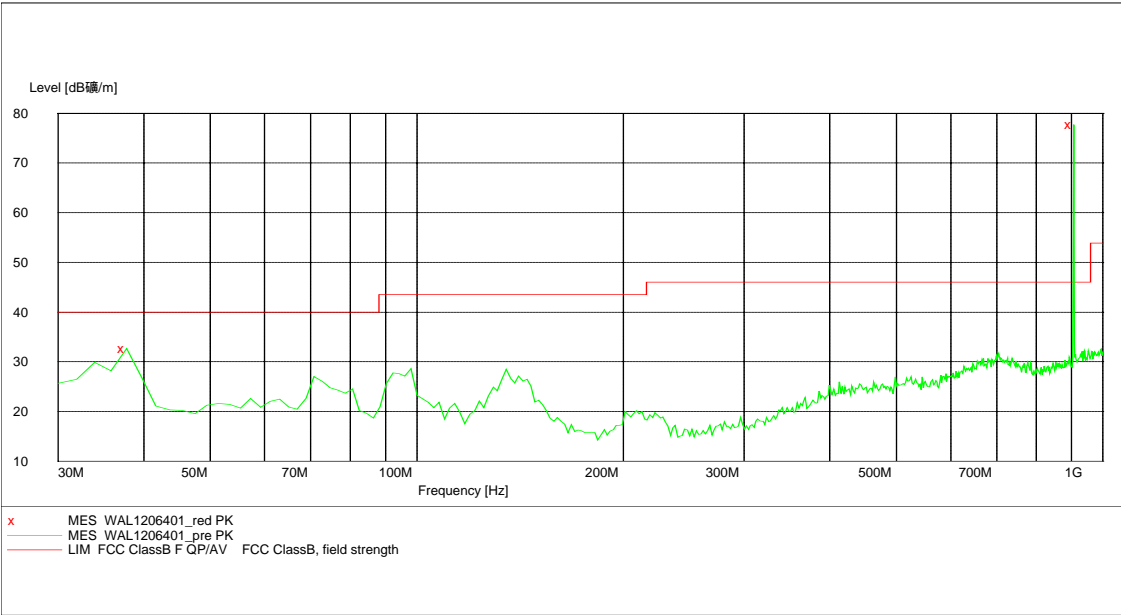
Test Item:	Fundamental Radiated Emission Data
Test Voltage:	DC 3.3V (Power From Game Boy Serial Port)
Test Mode:	On(Tx Low/Tx Middle/Tx High)
Temperature:	24 °C
Humidity:	52%RH
Test Result:	PASS

**Test Mode: Tx/Low**

**Horizontal:**

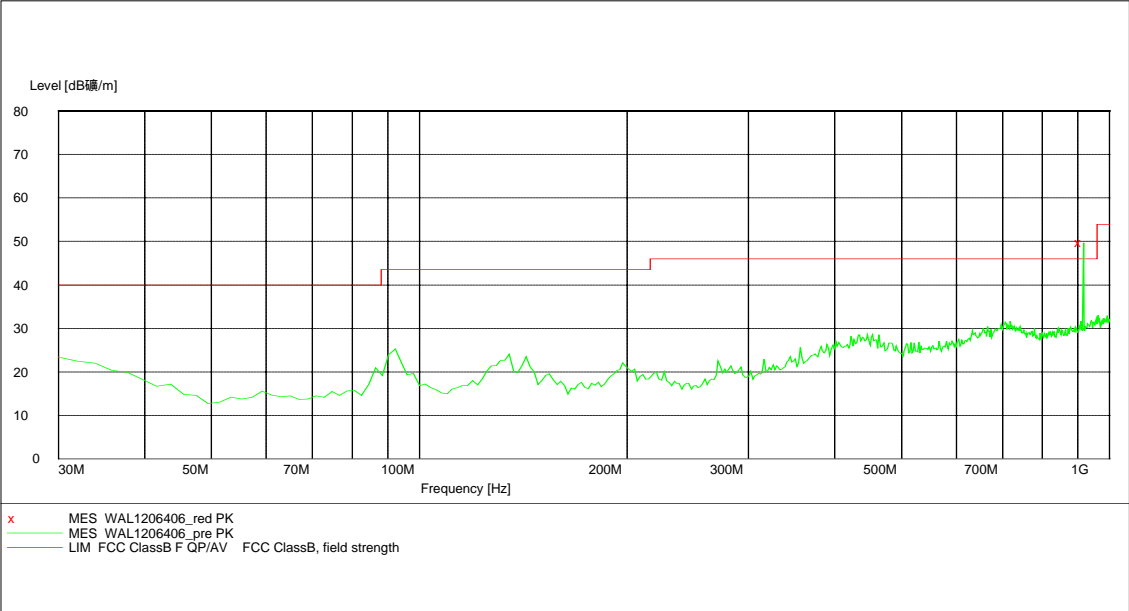


**Vertical:**

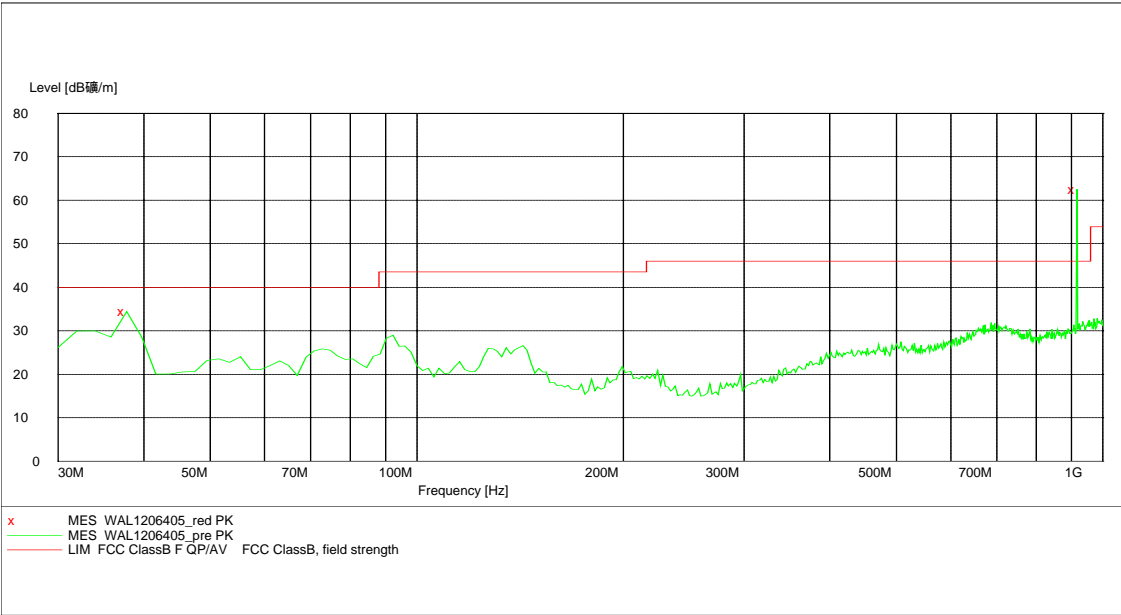


**Test Mode: Tx/Middle**

**Horizontal:**



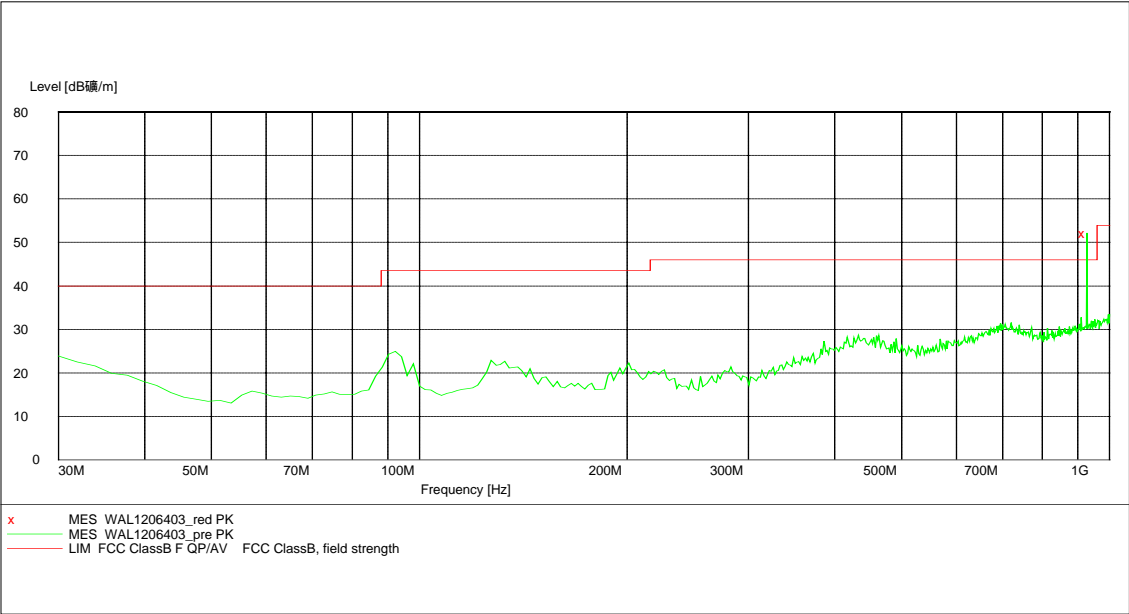
**Vertical:**



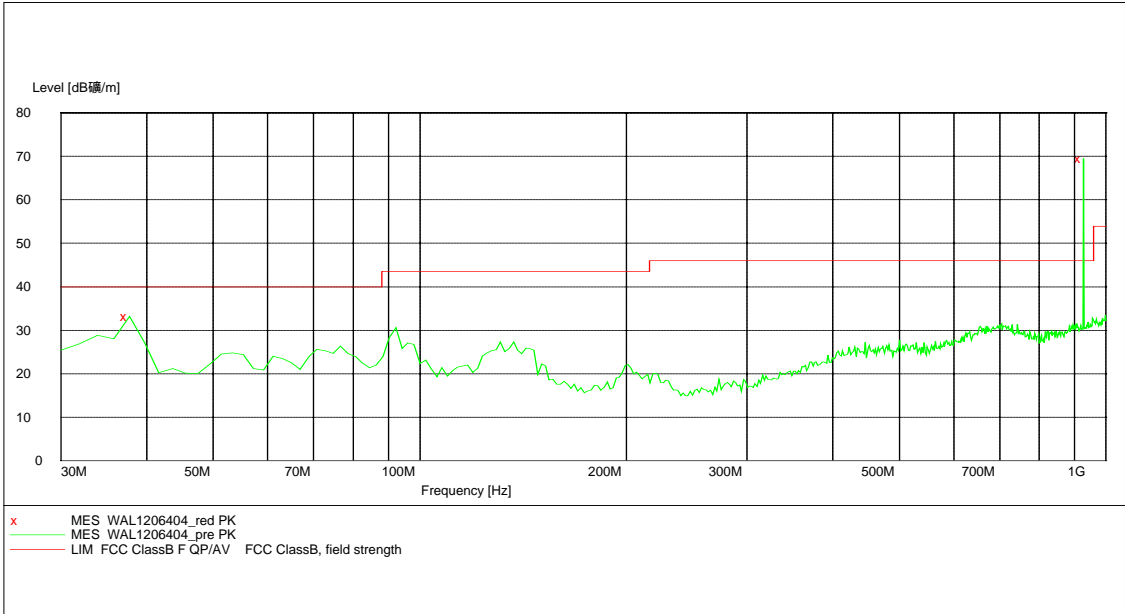


**Test Mode: Tx/High**

**Horizontal:**



**Vertical:**



**30MHZ-18GHZ Radiated Emission Data For Tx/Low**

Frequency (MHz)	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
906.683387	Horizontal	68.85	94.0	25.15	1.5	180
1813.117596	Horizontal	51.21	54.0	2.79	1.0	90
2718.695386	Horizontal	45.36	54.0	8.64	1.0	45
3624.428857	Horizontal	48.68	54.0	5.32	1.0	90
906.683387	Vertical	77.73	94.0	16.27	1.8	270
1813.907615	Vertical	46.38	54.0	7.62	1.0	90
2719.169533	Vertical	42.02	54.0	11.98	1.0	45
3624.885772	Vertical	43.75	54.0	10.25	1.0	90

**30MHZ-18GHZ Radiated Emission Data For Tx/Middle**

Frequency (MHz)	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
916.412826	Horizontal	49.72	94.0	44.28	1.5	180
1832.703406	Horizontal	49.72	54.0	4.28	1.0	90
2748.418848	Horizontal	40.27	54.0	13.73	1.0	45
3664.645223	Horizontal	44.78	54.0	9.22	1.0	180
916.412826	Vertical	62.48	94.0	31.52	2.0	270
1832.703407	Vertical	48.05	54.0	5.95	1.0	60
2784.266577	Vertical	38.32	54.0	15.68	1.0	45
6412.841782	Vertical	40.73	54.0	13.27	1.0	60

**30MHZ-18GHZ Radiated Emission Data For Tx/High**

Frequency (MHz)	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
928.076152	Horizontal	52.2	94.0	41.8	1.5	180
1856.635271	Horizontal	51.32	54.0	2.68	1.0	90
2784.446899	Horizontal	38.35	54.0	15.65	1.0	45
3713.038886	Horizontal	41.74	54.0	12.26	1.0	90
928.076152	Vertical	69.46	94.0	24.54	2.5	270
1856.635271	Vertical	49.66	54.0	4.34	1.0	90
2784.469664	Vertical	41.15	54.0	12.85	1.0	45
3713.889122	Vertical	42.05	54.0	11.95	1.0	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.

## 8 Band Edge

Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.249
Test Date:	December 08, 2004
Test mode:	On(Tx Low/Tx Middle/Tx High)
Temperature:	24 °C
Humidity:	52%RH

### 8.1 Test Procedure

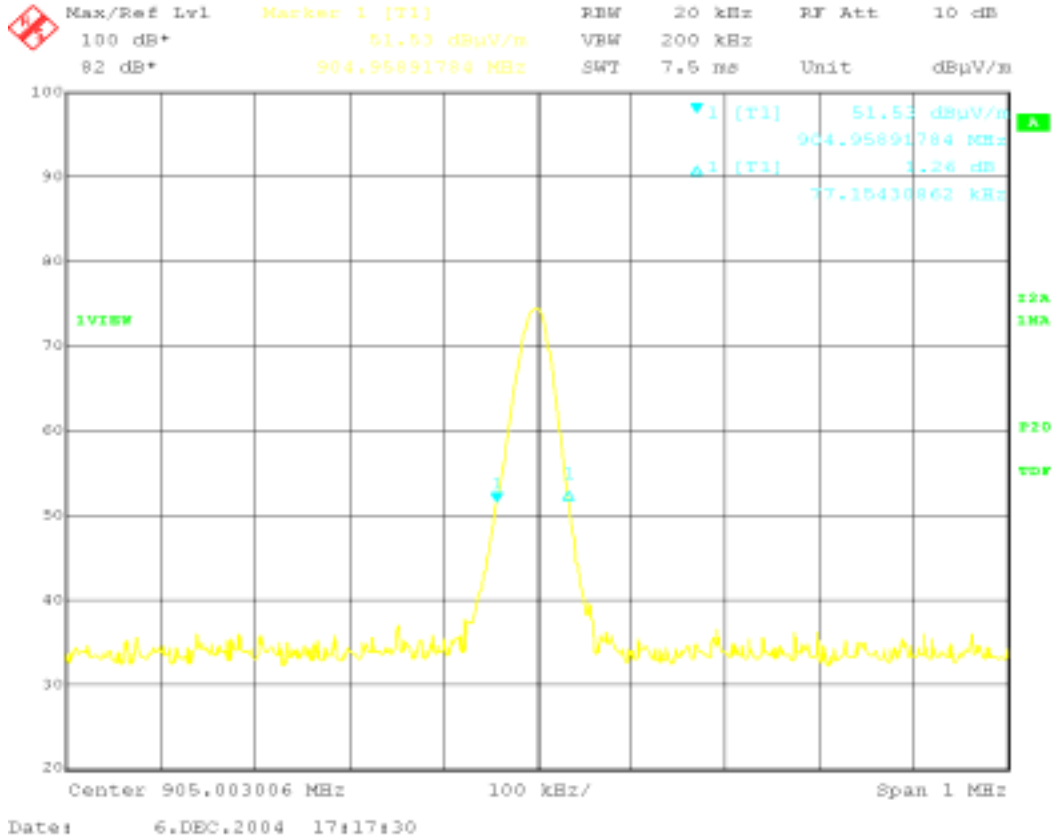
1. The EUT, peripherals were put on the turntable which table size is 1mX1.5m, table high 0.8m. All set up is according to ANSI C63.4.
2. With the EUT's antenna attached,The EUT's radiated emission power was received by the test antenna which was connected to the spectrum analyser with the START and 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 20KHz RBW and 200KHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

### 8.2 Band Edge

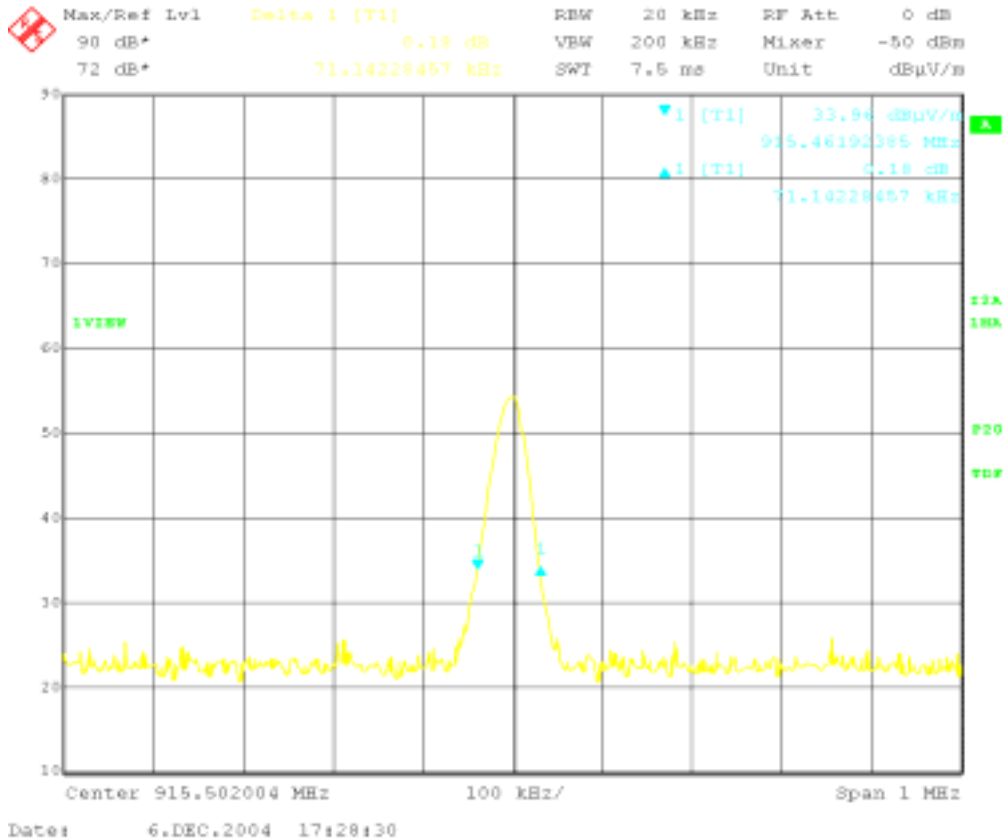
Requirements:FCC 15.249(c),The emission power at the START and STOP frequencies shall be at least 50dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209.

### 8.3 Band Edge Test Result

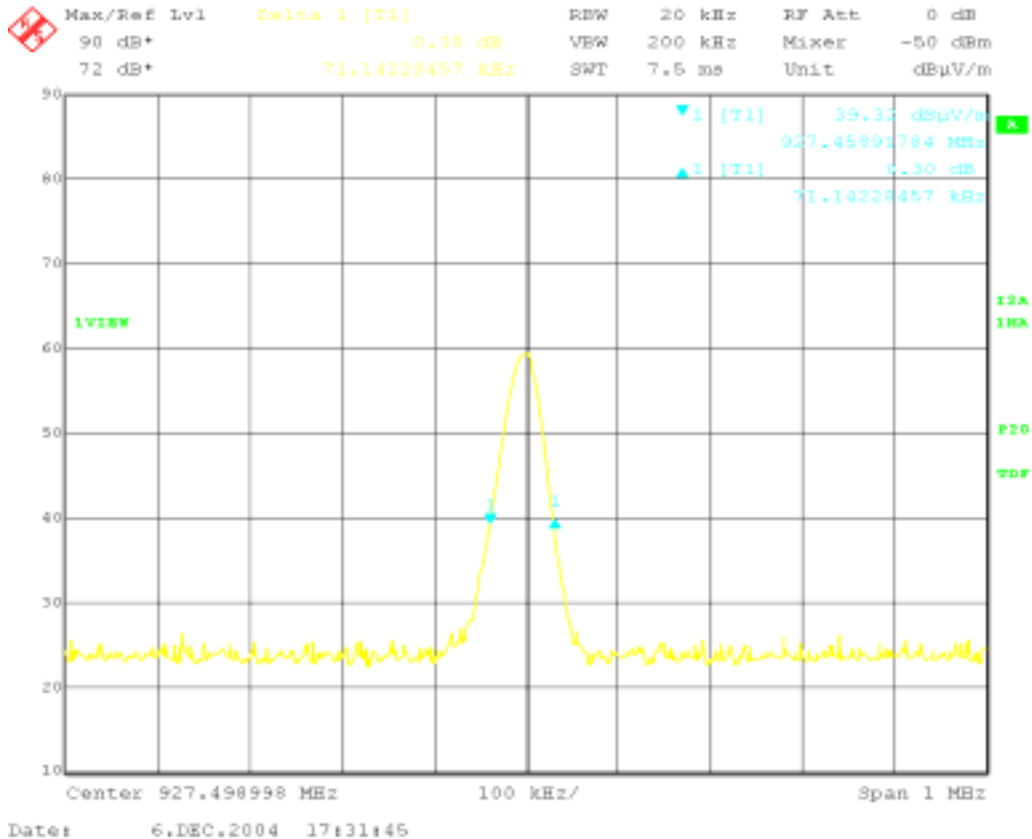
#### TX-LOW



**Tx Middle**



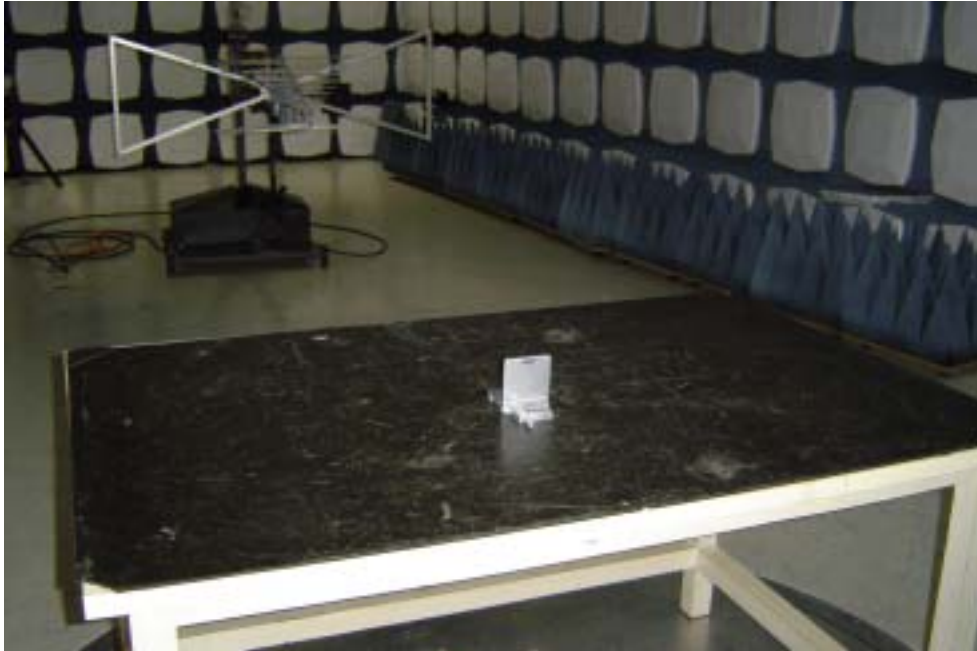
**Tx High**



**Note:** (1) The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.249.

## 9 Photographs of Testing

### 9.1 Radiation Emission Test View





# 10 Photographs - Constructional Details

## 10.1 EUT - Front View



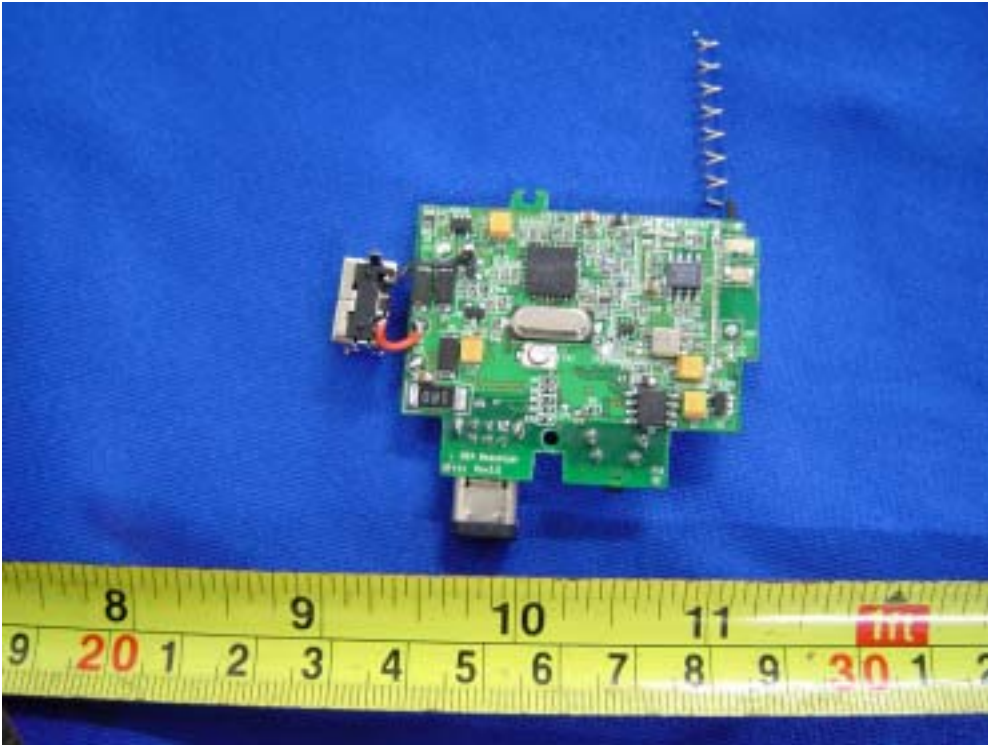
## 10.2 EUT - Back View



10.3 PCB - Component View(1)



10.4 PCB - Component View(2)



**10.5 PCB - Solder View**



### 11 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 accpt 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

