

Test Report

for

Electromagnetic Interference

of

E.U.T.: Wireless Handset (Handset Remote Unit)

Trade Name: LOGITECH

Model Number: 8701

Prepared for

LOGITECH INC.

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Prepared by

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3. This test data is traceable to National or International Standards.

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Certification of Compliance

Applicant : LOGITECH INC.
Manufacturer : HONOR TONE LTD
EUT Description : Wireless Handset (Handset Remote Unit)
Model No. : 8701
Serial No. : N/A
Tested Power Supply : 3.6 Vdc
Date of Final Test : June. 27, 2001

Measurement Procedures and Standards Used :

- CFR 47, Part 15
- ANSI C63.4: 1992

The device described above was tested by Interocean EMC Technology Corporation to determine the maximum emission levels emanated from the device and severity levels of the device endure and its performance criterion. The measurement results are contained in this test report and Interocean EMC Technology Corp assumes full responsibility for the accuracy and completeness of these measurements. This report shows the EUT is technically compliant with the Part 15 subpart C and ANSI C63.4 official requirements. This report applies to the above sample only and shall not be reproduced in part without written approval of Interocean EMC Technology Corporation.

Report Issued: 2001.06.27

Test Engineer: Jacky Yeh
Jacky Yeh

Checked: Tomy Hu
Tomy Hu

Approved: Kent J.K. Hsu
Kent J.K. Hsu

1 General Information

1.1 Description of Equipment Under Test

Equipment Under Test : Wireless Handset (Handset Remote Unit)
Model Number : 8701
Serial Number : N/A
Type of Sample Tested : Proto-type, Pre-production, Mass Production
Applicant : LOGITECH INC.
6505 KAISER DR FREMONT, CA 94555, USA
Manufacturer : HONOR TONE LTD
Tung Mun Industrial Zone, Dan Shuizhen, Dongguan, Hui Yang Hsien,
Guangdong 516211, China
Power Supply : 3.6 Vdc, 600mA, NiMH rechargeable battery
Data Cable : N/A
Date of Receipt of Sample : May. 10, 2001
Date of Test : May. 10 ~ June. 27, 2000
Description of E.U.T. : The EUT is wireless Handset for audio signal. It's transferred audio signal to Handset remote. And the Handset remote also can transfer audio signal to base unit via microphone.

There are 10 free channels store in the EEPROM of the base and Handset remote unit. The channel frequency description as following:

Channel	Base Unit (MHz)	Handset Remote Unit (MHz)
1	902.20	924.80
2	902.50	925.10
3	902.80	925.40
4	903.10	925.70
5	903.40	926.00
6	903.70	926.30
7	904.00	926.60
8	904.30	926.90
9	904.60	927.20
10	904.90	927.50

1.2 Tested Supporting System Detail

1.2.1 Earphone with Microphone

Model Number	:	N/A
Serial Number	:	N/A
EMC Approved	:	N/A
Manufacturer	:	N/A

1.3 Test Facility

Site Description : OATS 1 OATS 2

Name of Firm : Intercean EMC Technology Corp.

Site Location : No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang, Taipei County, Taiwan, R.O.C.

Site Filing : Federal Communication Commissions – USA
Registration No.: 96399
 Voluntary Control Council for Interference by Information Technology Equipment (VCCI) – Japan
Registration No. (Conducted Room): C-1094
Registration No. (OATS 1): R-1040
Registration No. (OATS 2): R-1041

Site Accreditation : Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C.
Accreditation No.:
SL2-IN-E-0026 for CNS13438 / CISPR22
SL2-A1-E-0026 for CNS13783-1 / CISPR14
 National Voluntary Laboratory Accreditation Program (NVLAP) - USA
Lab Code: 200458-0
 NEMKO
ELA 181

1.3.1 Test Methodology

Both conducted and Radiated Emission Measurement was performed according to the procedures in ANSI C63.4-1992 and Part 15 subpart C. Radiated Emission Measurement was performed at 3 meters distance from antenna to EUT.

1.3.2 Measurement Uncertainty

The uncertainty is calculated in accordance with NAMAS document NIS 81.

Conducted Uncertainty $U_c = \pm 2.96\text{dB}$.

Radiated Uncertainty $U_c = \pm 3.67\text{dB}$.

2 Power Line Conducted Emission Measurement

The EUT is powered by battery. Thus do not need to perform the Power Line Conducted Emission Measurement.

3 Radiated Emission Measurement

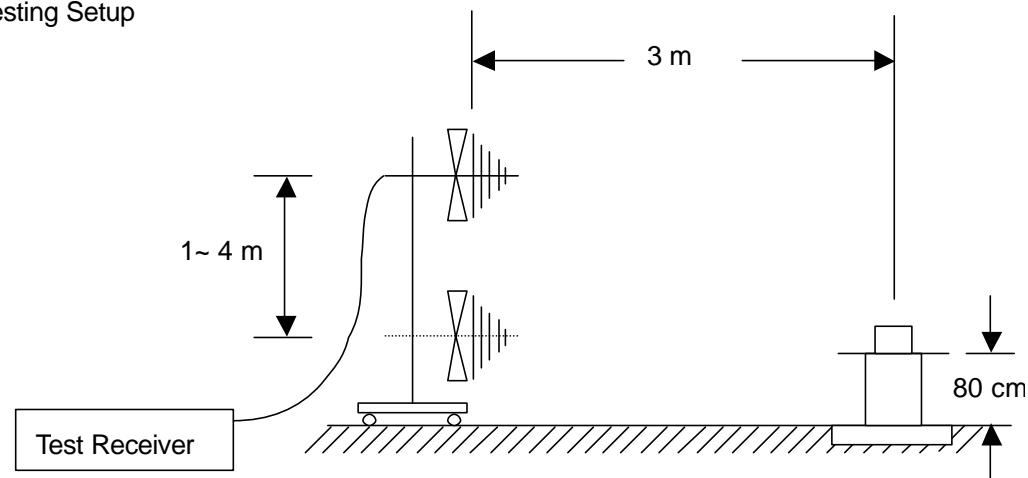
3.1 Instrument (OATS 1)

Instrument	Manufacturer	Model	Serial No.	Last Calibration
EMI Test Receiver	Rohde & Schwarz	ESI 07	830154/002	2000/07/28
Bi-Log Antenna	Schaffner	CBL6112B	2610	2000/06/28
Pre-Amplifier	Schaffner	CPA9231A	3351	2000/11/13
RF Cable	IETC	CBL01	N/A	2000/10/11
Horn Antenna	Com-Power	AH-118	10081	2000/09/15
Pre-Amplifier	Agilent Technologies	8449B	3008A01434	2000/09/19
RF Cable	Insulated Wire	NPS-2251-7880-NPR	CBL06	2000/10/19

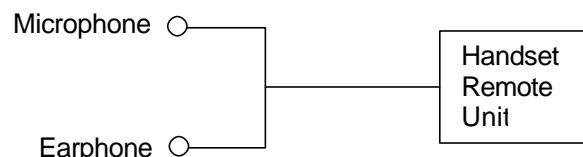
Note: All instrument upon which need to calibrated are with calibration period of 1 year.

3.2 Block Diagram of Test Configuration

Configuration of Testing Setup



Configuration of EUT Setup



3.3 Radiated Limit

FCC Part 15 (30~1000 MHz)

Frequency (MHz)	<input type="checkbox"/> Class A (10m)		<input checked="" type="checkbox"/> Class B (3m)	
	Field Strength (uV/m)	Quasi-Peak (dBuV/m)	Field Strength (uV/m)	Quasi-Peak (dBuV/m)
30 ~ 88	90	39.08	100	40.00
88 ~ 216	150	43.52	150	43.52
216 ~ 960	210	46.44	200	46.02
960 above	300	49.54	500	53.98

FCC Part 15 (Section 15.249)

Frequency (MHz)	Fundamental		Harmonics	
	mv/m	dBuV/m	uV/m	dBuV/m
902~928	50	93.98	500	53.98

3.4 Instrument configuration

- 3.4.1 The EMI test receiver frequency range set from 30 MHz to 1000 MHz.
- 3.4.2 The EMI test receiver bandwidth set at 120 kHz.
- 3.4.3 The EMI test receiver detector set as Quasi-Peak (Q.P.).
- 3.4.4 The Spectrum frequency range set to fundamental and harmonics.

3.5 Measured Mode

- 3.5.1 The test mode for final as following:

Mode 1: Transmit

3.6 Configuration of Measurement

- 3.6.1 The EUT was place on a non-conductive table whose total height equaled 80cm. The turntable can rotate 360 degree to determine the position of the maximum emission level.
- 3.6.2 The EUT was set 10 meters away from the receiving antenna that was mounted on a non-conductive mast. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level.
- 3.6.3 The initial testing identified the frequency that has the highest disturbance relative to the limit while operating the EUT in typical modes of operation and cable positions in a test setup representative of typical system configuration.
- 3.6.4 The identification of the frequency of highest emission with respect to the limit was found by investigating emissions at a number of significant frequencies. The probable frequency of maximum emission had been found and that the associated cable and EUT configuration and mode of operation had been identified.

3.7 Configuration of EUT

- 3.7.1 Setup the EUT and simulators as shown section 3.2.
- 3.7.2 Press “Test Mode” bottom and Turn on the power of Handset Remote Unit.
- 3.7.3 As the Handset Remote Unit goes into test mode, the default channel is channel one. And used

“Volume +” and “Volume -” button to sequence selects all of the channels.

3.8 Test Result

PASS.

The final tests data as shown on following page.

Radiated Emission Measurement Data

Date of Tested	: May 18, 2001	Polarization	: Horizontal
Temperature	: 26	Humidity	: 80%
Tested Mode	: Transmit		

Frequency (MHz)	Factor (dB)	Meter Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV/m)	Margin (dB)
30.000	-25.24	49.14	23.90	40.00	-16.10
39.700	-21.10	43.83	22.73	40.00	-17.27
59.100	-15.24	34.81	19.57	40.00	-20.43
127.000	-16.69	39.74	23.05	43.52	-20.47
158.525	-9.58	32.09	22.51	43.52	-21.01
170.650	-10.95	32.46	21.51	43.52	-22.01
364.650	-5.55	33.19	27.64	46.02	-18.38
653.225	-2.43	32.90	30.47	46.02	-15.55
912.700	-6.68	46.67	39.99	46.02	-6.03
924.803 +	-4.56	91.18	86.62	93.98	-7.36
932.100	-3.85	34.38	30.53	46.02	-15.49
1849.600 *	0.85	41.03	41.88	93.98	-52.10
2774.400 *	3.62	21.78	25.40	93.98	-68.58
3699.200 *	4.77	11.51	16.28	93.98	-77.70
4624.000 *	6.16	9.94	16.10	93.98	-77.88

Remark:

- 1 All readings are Quasi-Peak values.
- 2 "+" Means Fundamental Frequency.
- 3 "*" Means Peak values. Peak = Average + 20 dB.
- 4 Factor = Antenna Factor + Cable Loss – Pre-amplifier

Radiated Emission Measurement Data

Date of Tested	: May 18, 2001	Polarization	: Vertical
Temperature	: 26	Humidity	: 80%
Tested Mode	: Transmit		

Frequency (MHz)	Factor (dB)	Meter Reading (dBuV)	Emission Level (dBuV)	Limits (dBuV/m)	Margin (dB)
30.000	-20.12	44.38	24.26	40.00	-15.74
59.100	-15.48	41.10	25.62	40.00	-14.38
80.925	-20.52	41.92	21.40	40.00	-18.60
110.025	-16.65	37.94	21.29	43.52	-22.23
127.000	-14.11	38.58	24.47	43.52	-19.05
471.350	-0.01	32.01	32.00	46.02	-14.02
912.700	-5.21	44.69	39.48	46.02	-6.54
924.803 +	-4.24	91.01	86.77	93.98	-7.21
932.100	-3.29	36.61	33.32	46.02	-12.70
1849.600 *	0.85	43.53	44.38	93.98	-49.60
2774.400 *	3.62	27.35	30.97	93.98	-63.01
3699.200 *	4.77	11.66	16.43	93.98	-77.55
4624.000 *	6.16	10.03	16.19	93.98	-77.79

Remark:

- 1 All readings are Quasi-Peak values.
- 2 “+” Means Fundamental Frequency.
- 3 “*” Means Peak values. Peak = Average + 20 dB.
- 4 Factor = Antenna Factor + Cable Loss – Pre-amplifier

4 Frequency Measurements

4.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Last Calibration
EMI Test Receiver	Rohde & Schwarz	ESI 07	830154/002	2000/07/28
Temperature Chamber	KATO	SSE47BLA	N/A	2000/08/23
DC Power Supply	GW	GPC-3030DQ	A641046	2000/1015

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

4.2 Measurement Operating Frequency

- 4.2.1 Test Condition: Temperature: 24 .
- 4.2.2 Supplied the EUT with 120Vac.
- 4.2.3 The EUT frequency ranges over 1MHz, so operate on top frequency (924.80MHz) and bottom frequency (927.50MHz) in during test.
- 4.2.4 Turn the EUT on and measure the EUT operating frequency at the start-up, and two, five, and ten minutes after startup.
- 4.2.5 Result:

Timing	924.80 MHz	927.50 MHz
Start-Up	924.80216	927.50215
2 min.	924.80217	927.50220
5 min.	924.80252	927.50224
10 min.	924.80231	927.50226

4.3 Measurement Frequency Stability vs. Temperature

- 4.3.1 Set the environmental temperature test chamber to temperature of 20 .
- 4.3.2 Supplied the EUT with 120Vac.
- 4.3.3 The EUT frequency ranges over 1MHz, so operate on top frequency (924.80MHz) and bottom frequency (927.50MHz) in during test.
- 4.3.4 Turn the environmental temperature test chamber on and wait the temperature of the chamber to stabilize.
- 4.3.5 While maintaining a constant temperature inside the environmental chamber, turn the EUT on and measure the EUT operating frequency at the start-up, and two, five, and ten minutes after startup.
- 4.3.6 Result:

Timing	924.80 MHz	927.50 MHz
Start-Up	924.80234	927.50226
2 min.	924.80226	927.50233
5 min.	924.80231	927.50228
10 min.	924.80276	927.50243

4.4 Measurement Frequency Stability vs. Voltage

- 4.4.1 Set the environmental temperature test chamber to temperature of 20 .

4.4.2 Supplied the EUT with 3.06 & 4.14 Vdc.

4.4.3 The EUT frequency ranges over 1MHz, so operate on top frequency (924.80MHz) and bottom frequency (927.50MHz) in during test.

4.4.4 Turn the environmental temperature test chamber on and wait the temperature of the chamber to stabilize.

4.4.5 While maintaining a constant temperature inside the environmental chamber, turn the EUT on and measure the EUT operating frequency at the start-up, and two, five, and ten minutes after startup.

4.4.6 Result:

Timing	924.80 MHz		927.50 MHz	
	3.06 Vdc	4.14Vdc	3.06 Vdc	4.14Vdc
Start-Up	924.80152	924.80274	927.50182	927.50226
2 min.	924.80183	924.80267	927.50189	927.50232
5 min.	924.80134	924.80296	927.50156	927.50224
10 min.	924.80131	924.80272	927.50192	927.50228

5 Occupied Bandwidth Measurements

5.1 Instrument

Instrument	Manufacturer	Model	Serial No.	Last Calibration
EMI Test Receiver	Rohde & Schwarz	ESI 07	830154/002	2000/07/28

Note: All instrument upon which need to calibrated are with calibration period of 1 year.

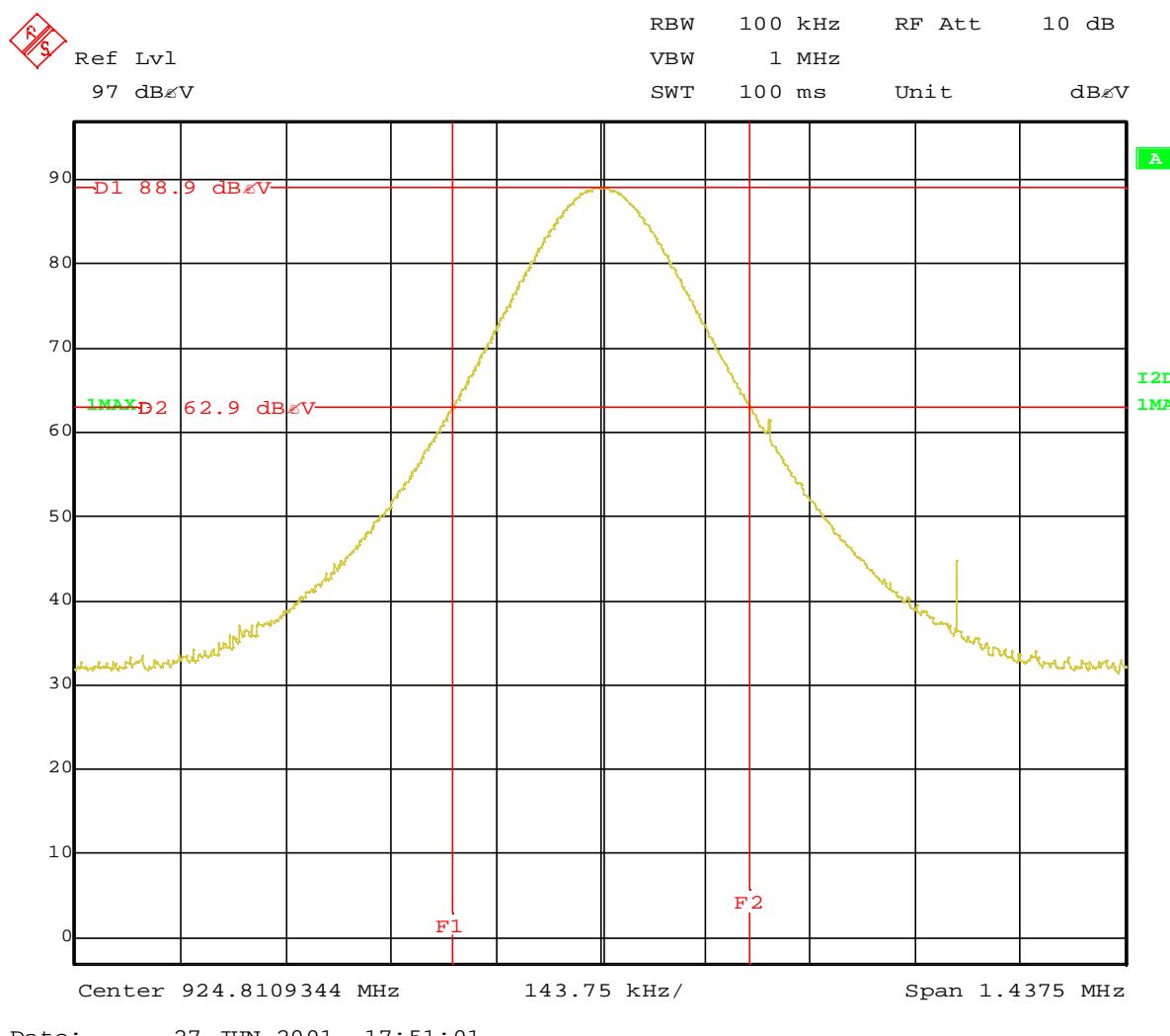
5.2 Instrument configuration

5.2.1 The EMI test receiver resolution bandwidth set at 100 kHz.

5.3 Result

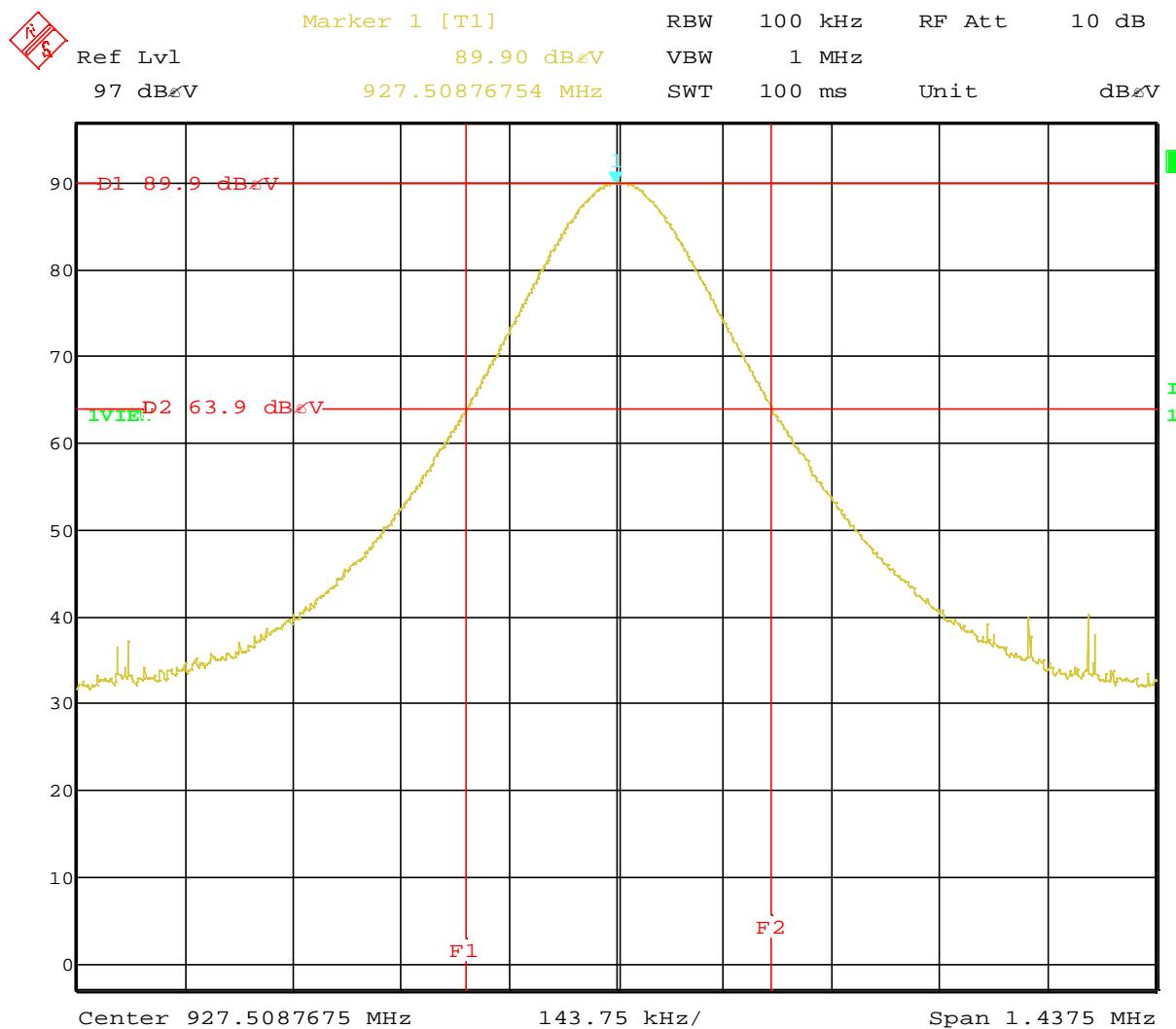
5.3.1 Channel 1

Frequency: 924.80 MHz, Occupied Bandwidth: 408.07 kHz



5.3.2 Channel 10

Frequency: 927.50 MHz, Occupied Bandwidth: 408.07 kHz



Date: 27.JUN.2001 17:56:10

6 Photographs of Measurement

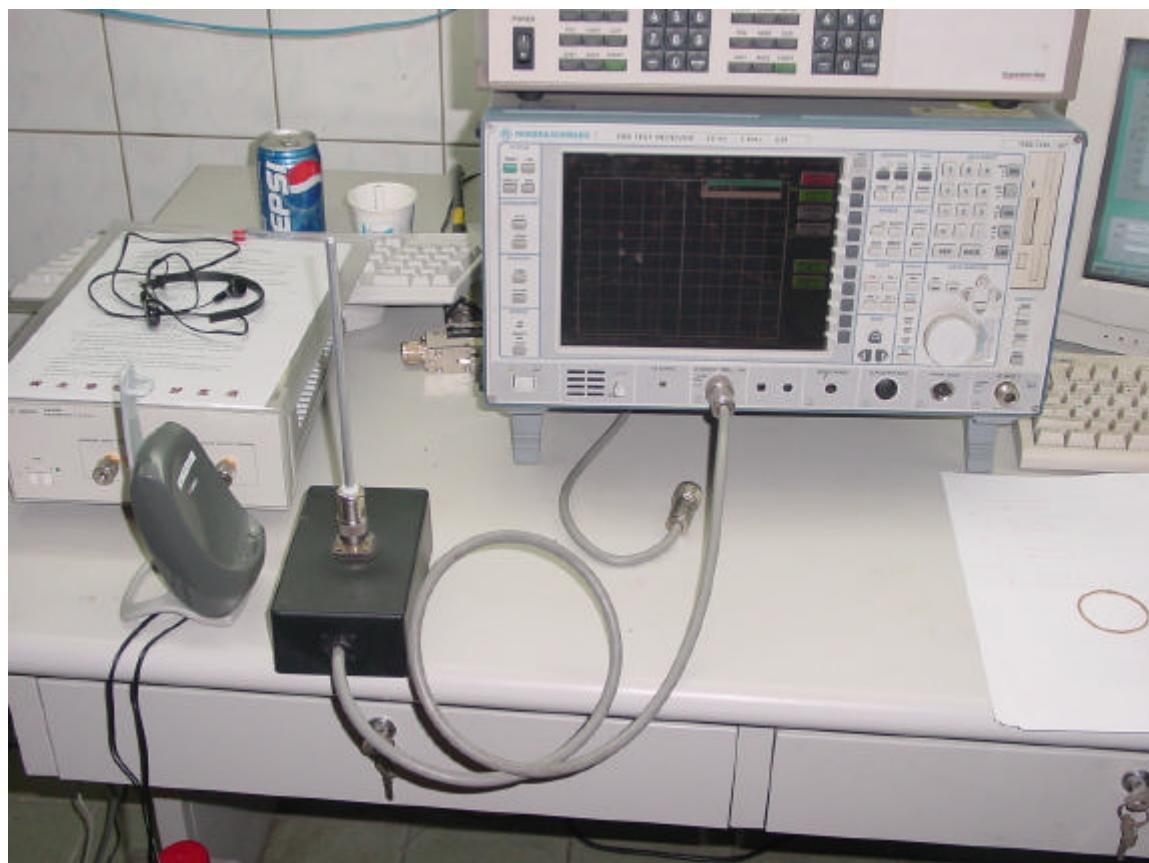
6.1 Radiated Emission Measurement



Radiated (30~1000MHz)



Radiated (1000MHz above)



Occupied Bandwidth



Temperature test chamber

7 Photographs of EUT



Front View of Appearance



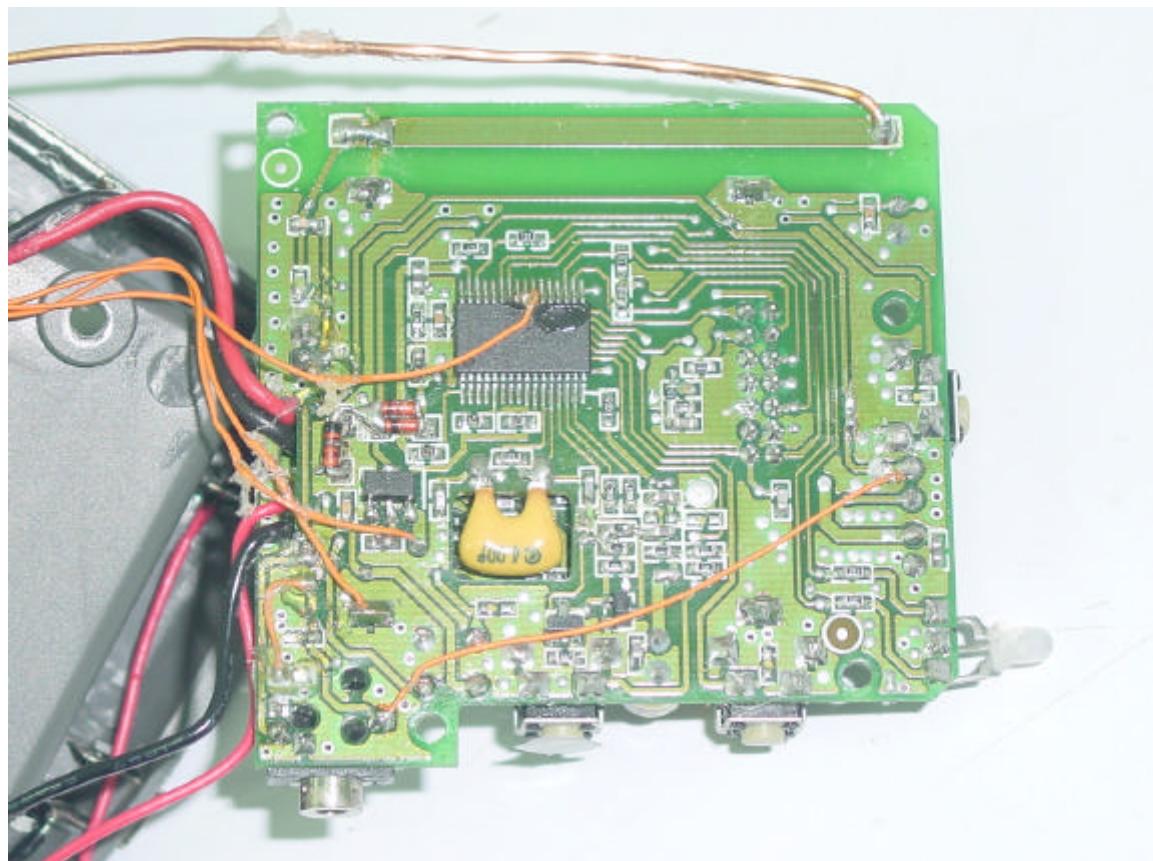
Rear View of Appearance



Open Case



PCB (RF Module & Component Side)



PCB (Solder Side)