

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT  
INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 90 REQUIREMENTS**

*OF*

**TWO-WAY RADIO**

**MODEL No.: PT6200**

**BRAND NAME: N/A**

**FCC ID: Q5EPT620001**

**REPORT NO: TRE06030004**

**ISSUE DATE: March 31, 2006**

*Prepared for*

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## VERIFICATION OF COMPLIANCE

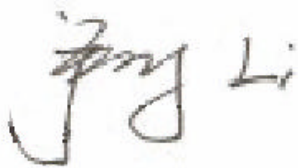
|                      |   |
|----------------------|---|
| Applicant:           | KIRISUN ELECTRONICS (SHENZHEN) CO.,LTD.<br>6/F.,Bldg.H2,East Industrial Zone of Overseas Chinese<br>Town,Nanshan Dist.,Shenzhen P.R.China |
| Product Description: | FM Handheld Transceiver   |
| Brand Name:          | N/A   |
| Model Number:        | PT6200  |
| Serial Number:       | N/A   |
| File Number:         | TRE06030004   |
| Date of Test:        | March 20,2006 ~ March 30,2006   |

### We hereby certify that:

The above equipment was tested by SHENZHEN HUATONGWEI INTERNATIONAL INSPECTION CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 90.

The test results of this report relate only to the tested sample identified in this report.

*Approved By*



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**Jimmy Li /Executive Manager**  
**SHENZHEN HUA TONG WEI**  
**INTERNATIONAL INSPECTION CO., LTD**

*Reviewed By*



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**Tracy Qi / Test Engineer**  
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**INTERNATIONAL INSPECTION CO., LTD**

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## 1. GENERAL INFORMATION

### 1.1 PRODUCT DESCRIPTION

The Kirisun Electronics (Shenzhen) Co., Ltd.'s Model: PT6200 or the "EUT" as referred to in this report is an FM Handheld Transceiver, which measures approximately 56mmL x 120mmW x 35mmH.

\* The test data gathered are from typical production samples provided by the manufacturer.

A major technical descriptions of EUT is described as following:

B). Modulation: FM

C). Maximum Transmitter Power: 5W

D). Output power Modification: Fixed can't be changed

E). Antenna Designation: Detachable

F). Power Supply: DC 7.2 V by battery

G). Operating Frequency Range

Frequency Range: 136.205 ~ 173.915M

### 1.2 RELATED SUBMITTAL(S) / GRANT(S)

This submittal(s) (test report) is intended for FCC ID: Q5EPT620001 filing to comply with the FCC Part 90 requirements

### 1.3 TEST METHODOLOGY

The radiated emission testing was performed according to the procedures of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, and 2.1055.

### 1.4 TEST FACILITY

The fully anechoic chamber test site and conducted measurement facility used to collect the radiated data is located on the address of SHENZHEN HUATONGWEI INTERNATIONAL INSPECTION CO., LTD Huatongwei Building, Keji Rd. 12 S., High-tech Park, Nanshan District, Shenzhen, Guangdong, P.R.China

The fully anechoic chamber Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003 and CISPR 22/EN 55022 requirements.

### 1.5 SPECIAL ACCESSORIES

Not available for this EUT intended for grant.

### 1.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

### 1.7 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making

measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

## **1.8 LABORATORY ACCREDITATIONS AND LISTINGS**

### **NEMKO-Aut. No.: ELA125**

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10.

### **CNAL-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed and proved to be in compliance with CNAL/AC01: 2003 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 1999 General Requirements) for the Competence of Testing and Calibration Laboratories.

### **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.

### **VCCI**

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) and Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-1920 and

C-2067 respectively. Date of Registration: July 28, 2004. Valid time is until November 16, 2006. The Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-175 respectively. Date of Registration: July 28, 2004. Valid time is until July 27, 2007.

## 2. SYSTEM TEST CONFIGURATION

### 2.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT EXERCISE

The Transmitter was operated in the normal operating mode. the TX frequency was fixed which was for the purpose of the measurements.

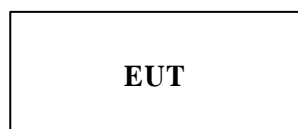
### 2.3 GENERAL TECHNICAL REQUIREMENTS AND SUMMARY OF TEST RESULTS

**The EUT has been tested according to the following specifications:**

| Standard                              | Test Type   | Result | Notes  |
|---------------------------------------|---|--------|--|
| FCC Part 15, Paragraph 15.107         | AC Line Conducted Emission                            | N/A    | Owing to the DC operation of EUT, this test item is not performed. |
| FCC 2.1046 & 90.205(h)                | RF Output Power                                       | PASS   | Complies   |
| FCC 2.1047 & 90.207 & 90.210(b)       | Modulation Characteristics                            | PASS   | Complies   |
| FCC 2.1049 & 90.209(b)(5) & 90.210(b) | Occupied Bandwidth                                    | PASS   | Complies   |
| FCC 2.1053 & 90.210(b)                | Radiated Spurious Emission                            | PASS   | Complies.  |
| FCC 2.1051 & 90.210(b)                | Spurious Emission on Antenna Port                     | PASS   | Complies.  |
| FCC 2.1055 & 90.213                   | Frequency Stability<br>Vs. Temperature<br>Vs. Voltage | PASS   | Complies.  |
| FCC Section 90.214                    | Transient Frequency Behavior                          | PASS   | Complies.  |

### 2.4 CONFIGUARATION OF TESTED SYSTEM

**Fig. 2-1 Configuration of Tested System**



### **3. DESCRIPTION OF TEST MODES**

The EUT (Two-way Radio) has been tested under normal operating condition. Three channels are chosen for testing.



## 4. CONDUCTED EMISSION TEST

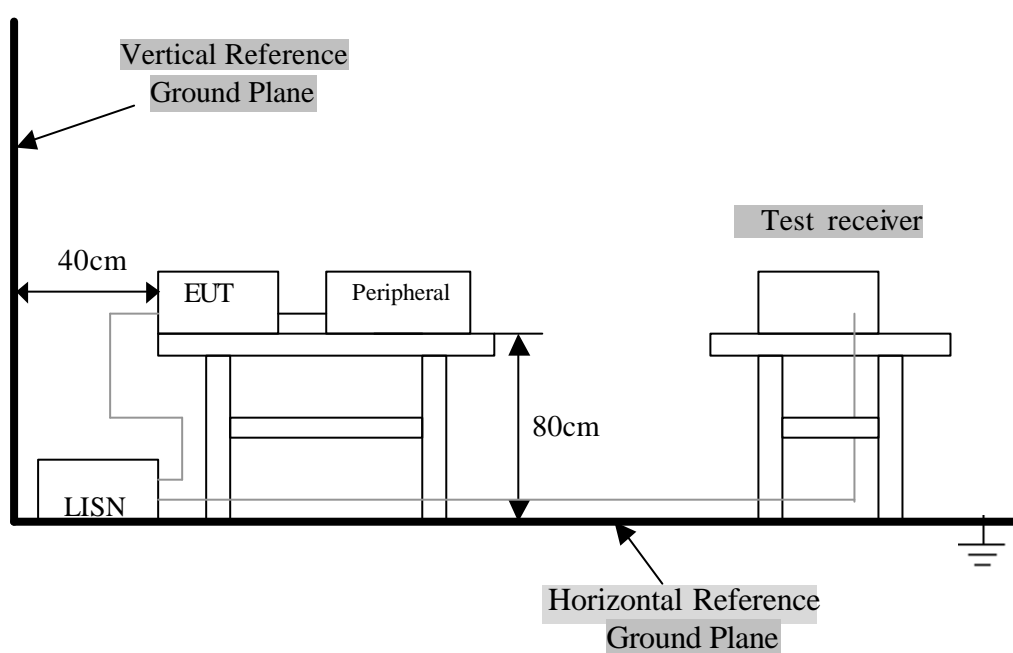
### 4.1 MEASUREMENT PROCEDURE

The EUT was tested according to ANSI C63.4 - 2003. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 uHenry as specified by section 5.1 of ANSI C63.4 - 2003. cables and peripherals were moved to find the maximum emission levels for each frequency.

**Note: The EUT will not be operated during charging the battery with the power adapter.**

### 4.2 TEST SETUP BLOCK DIAGRAM

(block diagram of configuration)



For the actual test configuration, Please refer to the related items – Photos of Testing.

#### 4.3 TEST EQUIPMENT USED:

| Conducted Emission Test Site # 3 |                 |              |               |           |          |
|----------------------------------|-----------------|--------------|---------------|-----------|----------|
| EQUIPMENT TYPE                   | MFR             | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| EMI TEST RECEIVER                | ROHDE & SCHWARZ | ESCS30       | 100038        | 2005/11   | 2006/11  |
| ARTIFICIAL MAINS                 | ROHDE & SCHWARZ | ESH2-Z5      | 100028        | 2005/11   | 2006/11  |
| PULSE LIMITER                    | ROHDE & SCHWARZ | ESHSZ2       | 100044        | 2005/11   | 2006/11  |
| EMI TEST SOFTWARE                | ROHDE & SCHWARZ | ES-K1 V1.71  | N/A           | N/A       | 2006/11  |

#### 4.4 CONDUCTED POWER LINE EMISSION LIMITS

| FCC Part 15 Paragraph 15.107 (dBuV) |               |               |
|-------------------------------------|---------------|---------------|
| Frequency Range (MHz)               | Class A QP/AV | Class B QP/AV |
| 0.15 – 0.5                          | 79/66         | 66-56/56-46   |
| 0.5 – 5.0                           | 73/60         | 56/46         |
| 5.0 - 30                            | 73/60         | 60/50         |

**NOTE** : In the above table, the tighter limit applies at the band edges.

#### 4.5 TEST RESULTS

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

## 5. OCCUPIED BANDWIDTH

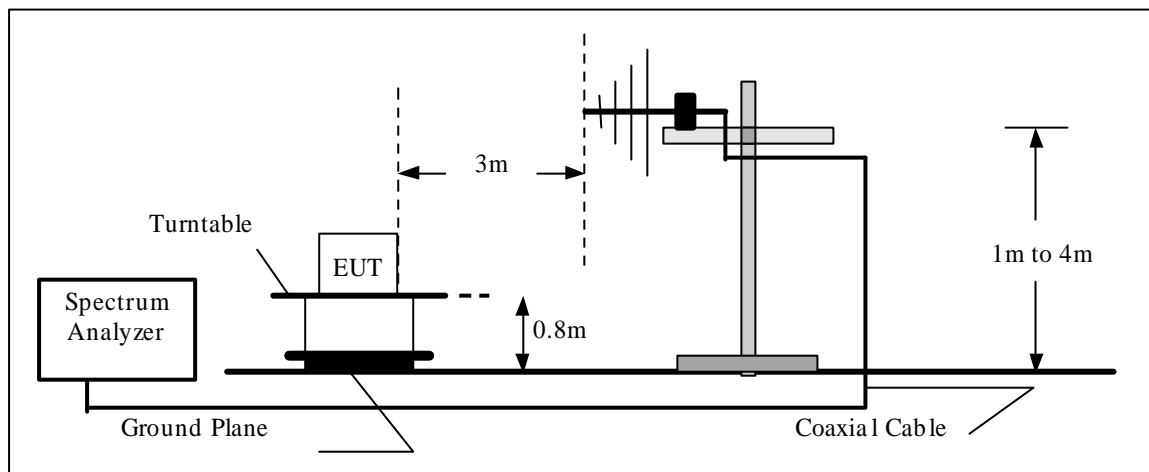
### 5.1 PROVISIONS APPLICABLE

According to FCC Part 90 Section 90.209: The authorized bandwidth shall be 12.5 KHz.

### 5.2 MEASUREMENT PROCEDURE

- 1). The EUT was placed on a turn table which is 0.8m above ground plane.
- 2). Set EUT as normal operation
- 3). Set SPA Center Frequency = fundamental frequency, RBW=1001Hz,VBW= 1KHz,span =100KHz.

### 5.3 TEST SETUP BLOCK DIAGRAM



#### 5.4 MEASUREMENT EQUIPMENT USED:

| 3/5 Anechoic Chamber Radiation Test Site # 4 |                 |              |               |           |          |
|--|-----------------|--------------|---------------|-----------|----------|
| EQUIPMENT TYPE                               | MFR             | MODEL NUMBER | SERIAL NUMBER | LAST CAL. | CAL DUE. |
| ULTRA-BROADBAND ANTENNA                      | ROHDE & SCHWARZ | HL562        | 100015        | 2005/11   | 2006/11  |
| EMI TEST RECEIVER                            | ROHDE & SCHWARZ | ESI 26       | 100009        | 2005/11   | 2006/11  |
| RF TEST PANEL                                | ROHDE & SCHWARZ | TS / RSP     | 335015/ 0017  | N/A       | N/A      |
| TURNTABLE                                    | ETS             | 2088         | 2149          | N/A       | N/A      |
| ANTENNA MAST                                 | ETS             | 2075         | 2346          | N/A       | N/A      |
| EMI TEST SOFTWARE                            | ROHDE & SCHWARZ | ES-K1 V1.71  | NA            | 2005/11   | 2006/11  |

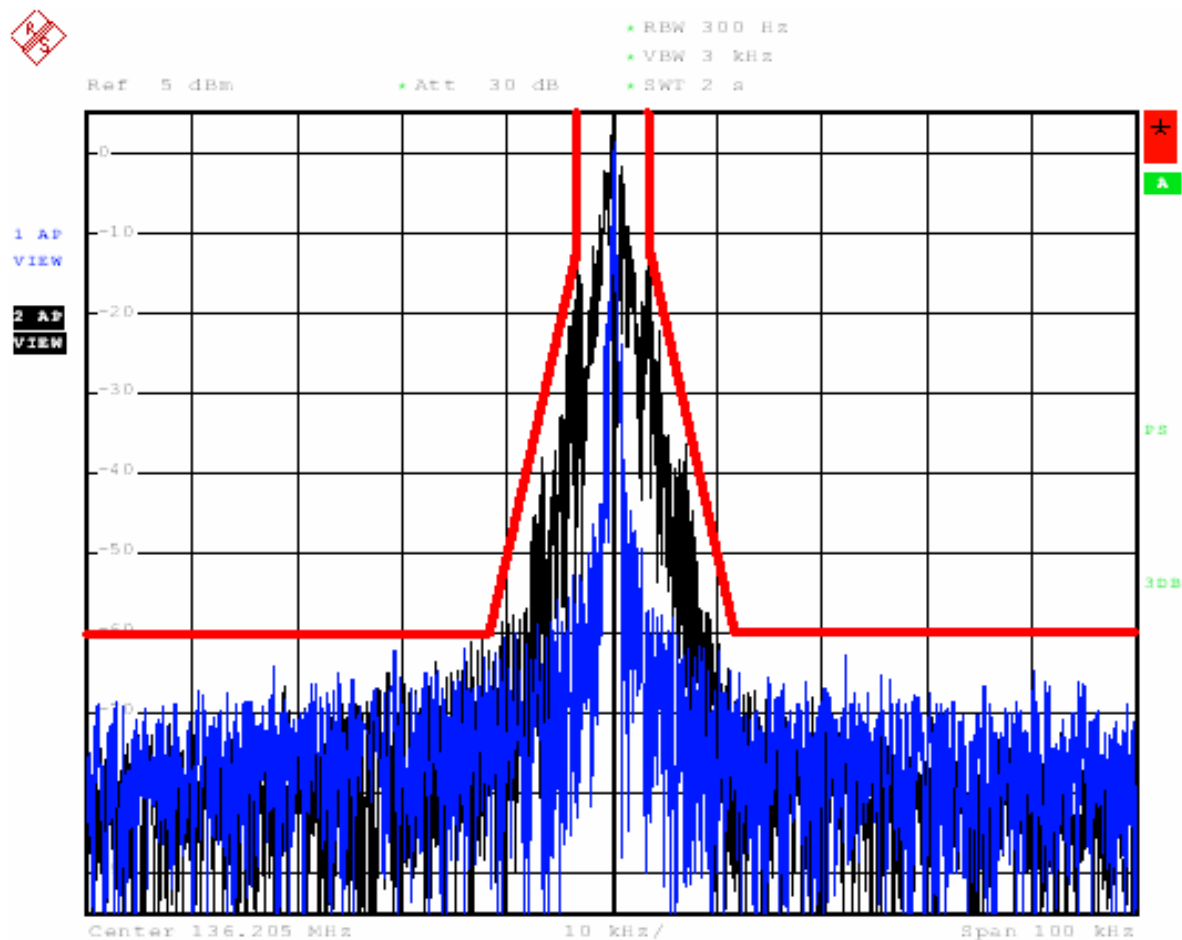
#### 5.5 TEST RESULTS:

Referred as the attached plot hereinafter

Note: The blue curve represents unmodulated signal.

The black curve represents modulated signal.

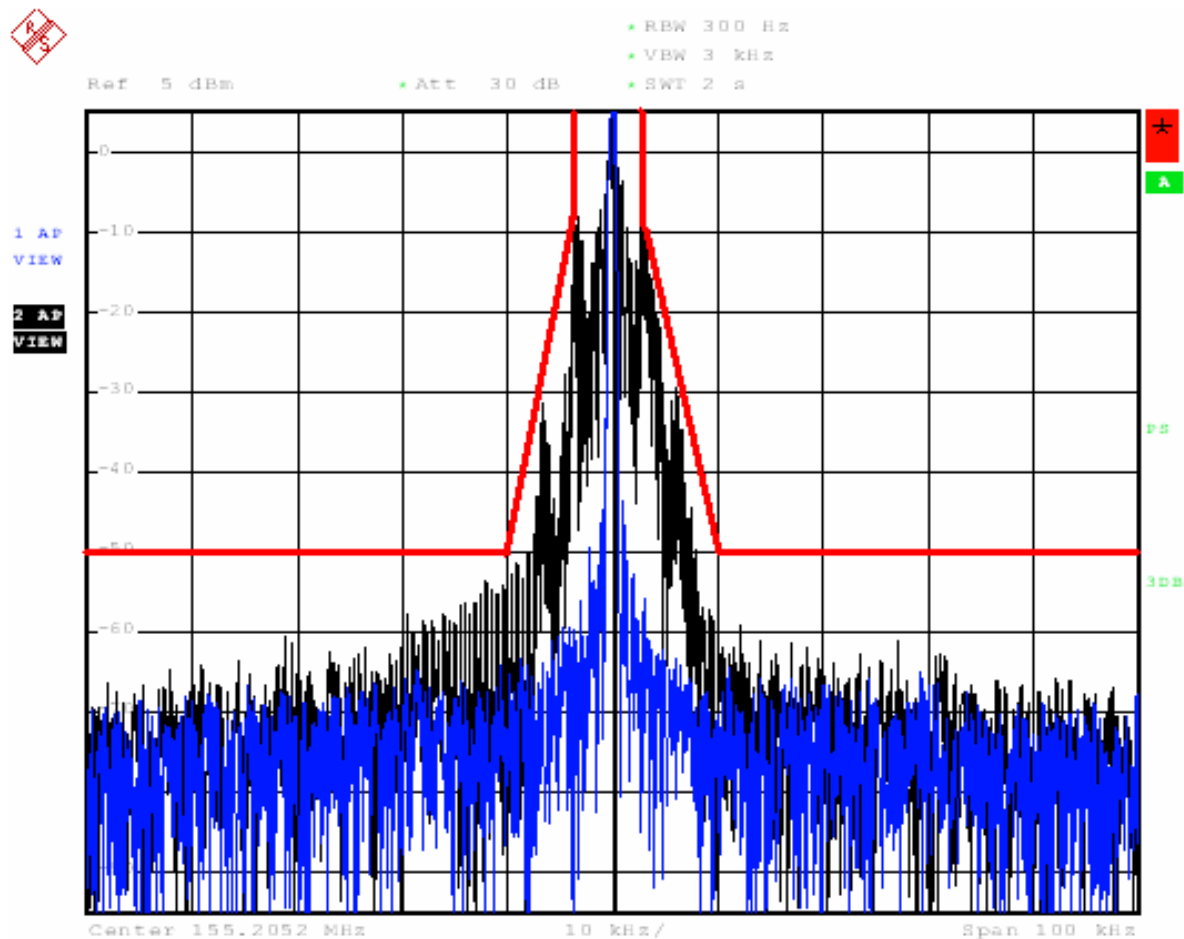
### Occupied Bandwidth of CH 01



Date: 17.MAY.2006 15:26:36

12.5 kHz Channel Spacing, 136 MHz, 2500 Hz Audio Modulation Only

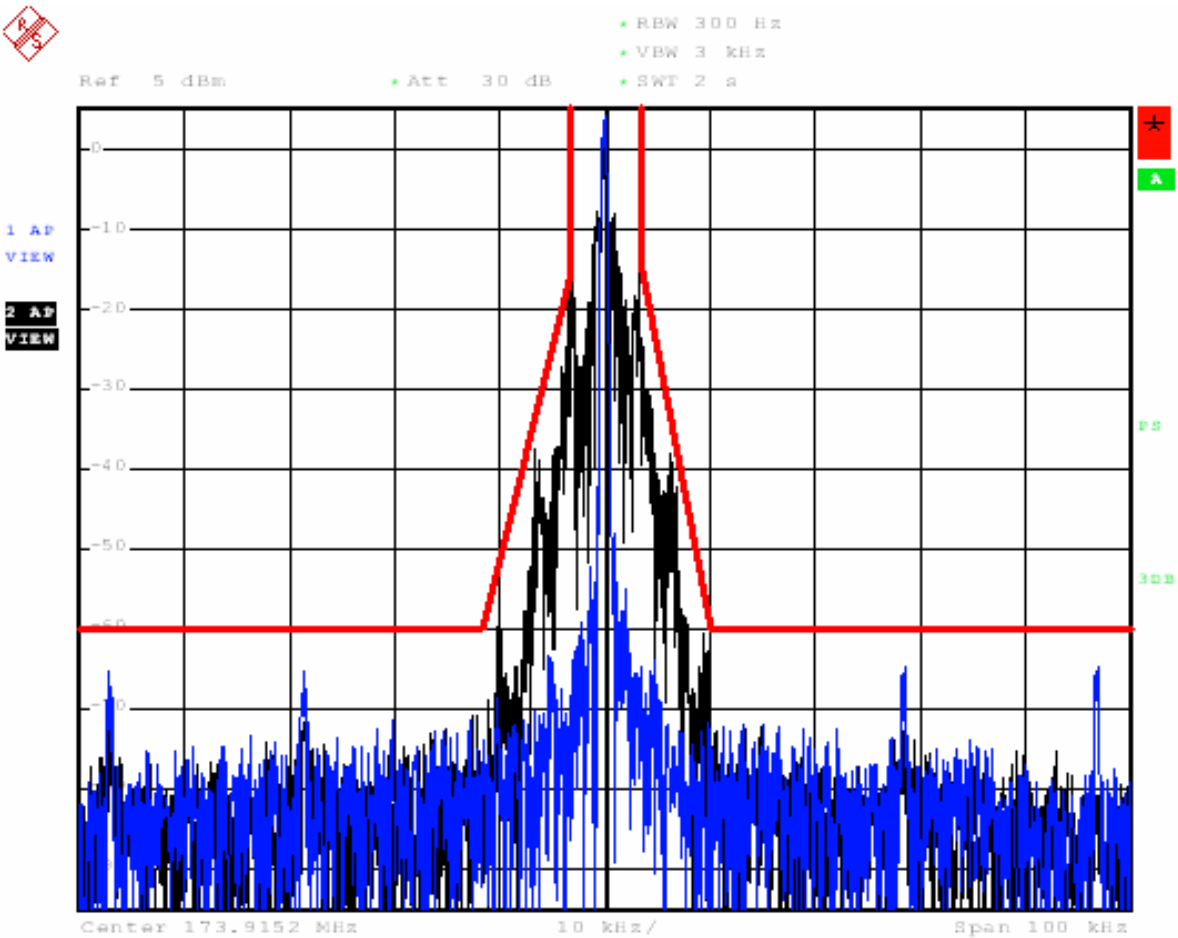
### Occupied Bandwidth of CH02



Date: 17.MAY.2006 16:25:55

12.5 kHz Channel Spacing, 155 MHz, 2500 Hz Audio Modulation Only

Occupied Bandwidth of CH 03



Date: 17.MAY.2006 16:29:01

12.5 kHz Channel Spacing, 174 MHz, 2500 Hz Audio Modulation Only

## 6. RADIATED SPURIOUS EMISSION

### 6.1 PROVISIONS APPLICABLE

According to Section 90.210, the power of each unwanted emission shall be less than Transmitted Power as specified below for transmitters designed to operate with 12.5 KHz channel bandwidth:

- 1). On any frequency removed from the center of the authorized bandwidth  $f_0$  to 5.625 KHz removed from  $f_0$ : Zero dB
- 2). On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in KHz)  $f_0$  of more than 5.625 KHz but no more than 12.5 KHz: At least 7.27dB
- 3). On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in KHz)  $f_0$  of more than 12.5 KHz: At least  $50 + 10 \log(P)$  dB or 70 dB, whichever ever is lesser attenuation.

### 6.2 MEASUREMENT PROCEDURE

- 1). On a test site, the EUT shall be placed on a turntable, and in the position closest to the normal use as declared by the user.
- 2). The test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the transmitter.
- 3). The output of the antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- 4). The transmitter shall be switched on; if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- 5). The test antenna shall be raised and lowered through the specified range of height until the measuring receiver detects a maximum signal level.
- 6). The transmitter shall then be rotated through  $360^\circ$  in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- 7). The test antenna shall be raised and lowered again through the specified range of height until the measuring receiver detects a maximum signal level.
- 8). The maximum signal level detected by the measuring receiver shall be noted.
- 9). The measurement shall be repeated with the test antenna set to horizontal polarization.
- 10). Replace the antenna with a proper Antenna (substitution antenna).
- 11). The substitution antenna shall be oriented for vertical polarization and, if necessary, the length of the substitution antenna shall be adjusted to correspond to the frequency of transmitting.
- 12). The substitution antenna shall be connected to a calibrated signal generator.
- 13). If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- 14). The test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.



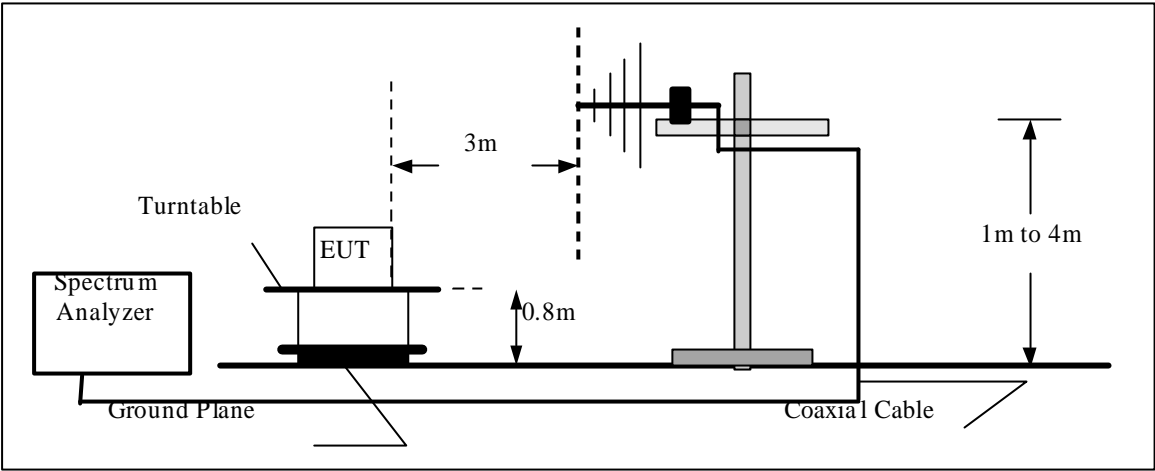
15). The input signal to substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.

16). The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.

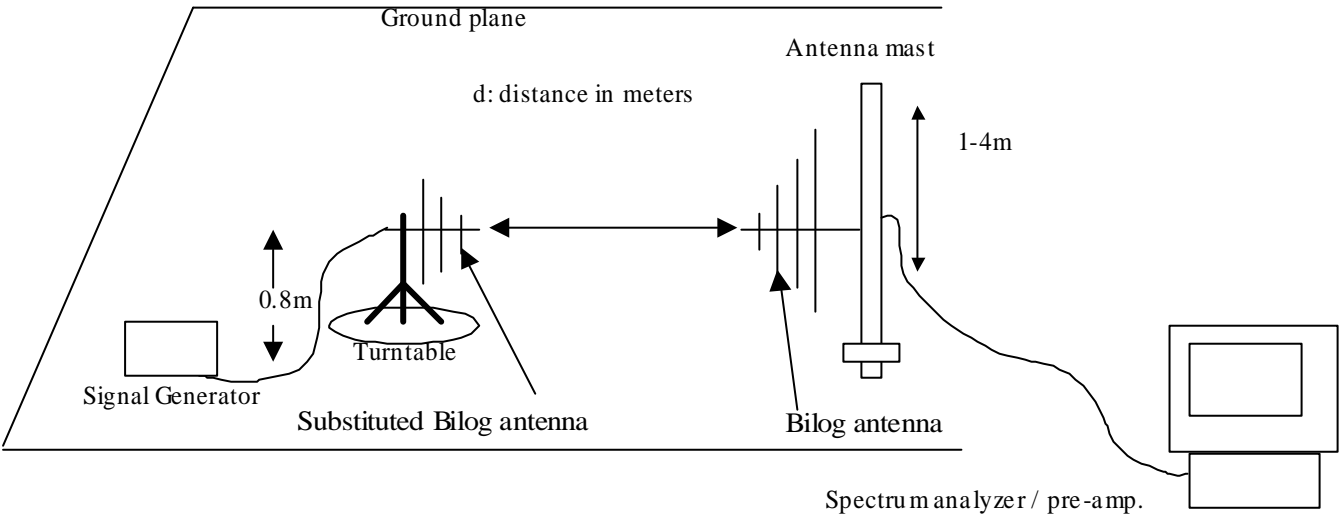
17). The measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization

6.3 TEST SETUP BLOCK DIAGRAM

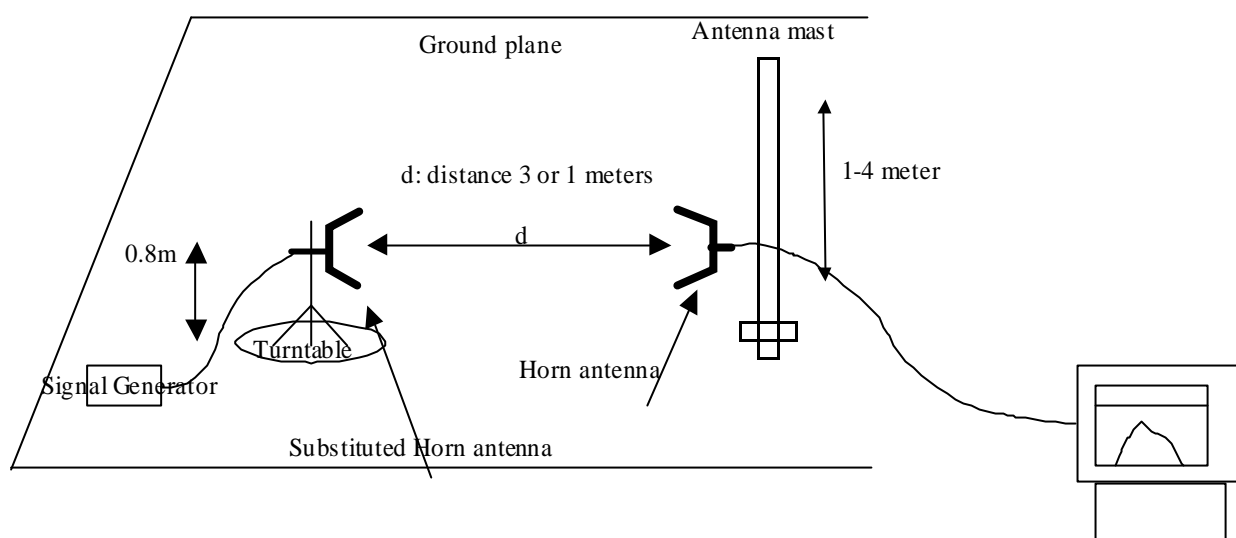
(block diagram of configuration)



Radiation below 1GHz



## Radiation above 1GHz



## 6.4 MEASUREMENT EQUIPMENT USED:

| Radiated Emission Test Site # 4 |                 |             |               |                 |
|---------------------------------|-----------------|-------------|---------------|-----------------|
| Name of Equipment               | Manufacturer    | Model       | Serial Number | Calibration Due |
| ULTRA-BROADBAND ANTENNA         | ROHDE & SCHWARZ | HL562       | 100015        | 11/14/2006      |
| EMI TEST RECEIVER               | ROHDE & SCHWARZ | ESI 26      | 100009        | 11/12/2006      |
| RF TEST PANEL                   | ROHDE & SCHWARZ | TS / RSP    | 335015/ 0017  | N/A             |
| TURNTABLE                       | ETS             | 2088        | 2149          | N/A             |
| ANTENNA MAST                    | ETS             | 2075        | 2346          | N/A             |
| EMI TEST SOFTWARE               | ROHDE & SCHWARZ | ES-K1 V1.71 | N/A           | 11/12/2006      |

## 6.5 TEST RESULTS:

FCC Part 22.359, 74.462, 80.211 and 90.210 (25 kHz bandwidth only):

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

Low:  $43 + 10 \log (\text{Pwatts}) = 43 + 10 \log (3.98) = 49.0 \text{ dB}$

Middle:  $43 + 10 \log (\text{Pwatts}) = 43 + 10 \log (4.59) = 49.6 \text{ dB}$

High:  $43 + 10 \log (\text{Pwatts}) = 43 + 10 \log (4.78) = 49.8 \text{ dB}$

FCC Part 90.210 (12.5 kHz Bandwidth only):

On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz at least:

Low:  $50 + 10 \log (\text{Pwatts}) = 50 + 10 \log (3.98) = 56.0 \text{ dB}$

Middle:  $50 + 10 \log (\text{Pwatts}) = 50 + 10 \log (4.59) = 56.6 \text{ dB}$

High:  $50 + 10 \log (\text{Pwatts}) = 50 + 10 \log (4.78) = 56.8 \text{ dB}$

Note: In general, the worse case attenuation requirement shown above was applied.

Product : FM Handheld Transceiver

Test Item : Radiated Spurious Emission

Test Voltage: DC 7.2V (External Power Supply)

Test Result: **PASS**

Test Mode : CH1-136MHz

Temperature : 25

Humidity : 56%RH

### Channel 01

Channel Spacing 12.5KHz

| Frequency (MHz) | FCC Maximum Limit | HORIZ / VERT | Level in dBm | Margin |
|-----------------|-------------------|--------------|--------------|--------|
| 271.998         | -20               | V            | -68.25       | -48.25 |
| 271.998         | -20               | H            | -55.51       | -35.51 |
| 407.997         | -20               | V            | -52.43       | -32.43 |
| 407.997         | -20               | H            | -51.51       | -31.51 |
| 543.996         | -20               | V            | -53.70       | -33.70 |
| 543.996         | -20               | H            | -58.06       | -38.06 |
| 679.995         | -20               | V            | -39.54       | -19.54 |
| 679.995         | -20               | H            | -44.15       | -24.15 |
| 815.994         | -20               | V            | -44.36       | -24.36 |
| 815.994         | -20               | H            | -51.36       | -31.36 |
| 951.993         | -20               | V            | -50.67       | -30.67 |
| 951.993         | -20               | H            | -51.08       | -31.08 |

Product : FM Handheld Transceiver  
Test Item : Radiated Spurious Emission  
Test Voltage: DC 7.2V (External Power Supply)  
Test Result: **PASS**

Test Mode : CH1-155MHz  
Temperature : 25  
Humidity : 56%RH

### **Channel 02**

Channel Spacing 12.5KHz

| Frequency (MHz) | FCC Maximum Limit | HORIZ/ VERT | Level in dBm | Margin |
|-----------------|-------------------|-------------|--------------|--------|
| 309.998         | -20               | V           | -46.37       | -26.37 |
| 309.998         | -20               | H           | -46.73       | -26.73 |
| 464.997         | -20               | V           | -60.42       | -40.42 |
| 464.997         | -20               | H           | -52.59       | -32.59 |
| 619.996         | -20               | V           | -51.41       | -31.41 |
| 619.996         | -20               | H           | -49.42       | -29.42 |
| 774.995         | -20               | V           | -50.87       | -30.87 |
| 774.995         | -20               | H           | -47.18       | -27.18 |
| 929.994         | -20               | V           | -62.93       | -42.93 |
| 929.994         | -20               | H           | -63.52       | -43.52 |

Product : FM Handheld Transceiver  
Test Item : Radiated Spurious Emission  
Test Voltage: DC 7.2V (External Power Supply)  
Test Result: **PASS**

Test Mode : CH1-174MHz  
Temperature : 25  
Humidity : 56%RH

### **Channel 03**

Channel Spacing 12.5KHz

| Frequency (MHz) | FCC Maximum Limit | HORIZ / VERT | Level in dBm | Margin |
|-----------------|-------------------|--------------|--------------|--------|
| 347.998         | -20               | V            | -41.25       | -21.25 |
| 347.998         | -20               | H            | -50.63       | -30.63 |
| 521.997         | -20               | V            | -60.25       | -40.25 |
| 521.997         | -20               | H            | -56.83       | -36.83 |
| 695.996         | -20               | V            | -50.34       | -30.34 |
| 695.996         | -20               | H            | -49.28       | -29.28 |
| 869.995         | -20               | V            | -52.48       | -32.48 |
| 869.995         | -20               | H            | -48.78       | -28.78 |
| 1043.994        | -20               | V            | -51.48       | -31.48 |
| -               |                   | H            | -            |        |

## 7. SPURIOUS EMISSION ON ANTENNA PORT

### 7.1 PROVISIONS APPLICABLE

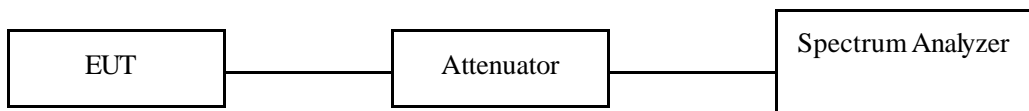
The same as Section 6.1.

### 7.2 MEASUREMENT PROCEDURE

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set to 100 kHz. Sufficient scans were taken to show any out of band emission up to 10th. Harmonic for the lower, the middle and the highest frequency range. RBW 100kHz, VBW 100kHz, SPAN 1.9GHz, attenuation was set totally to 72.88dB, therefore in result no spurious emission to see anymore.

The audio input was set to 0 to get the unmodulated carrier, the resulting picture is print out for channel 1, 2 and 3.

### 7.3 TEST SETUP BLOCK DIAGRAM



### 7.4 TEST RESULTS:

FCC Part 22.359, 74.462, 80.211 and 90.210 (25 kHz bandwidth only):

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

Low:  $43 + 10 \log (P_{\text{watts}}) = 43 + 10 \log (3.98) = 49.0 \text{ dB}$

Middle:  $43 + 10 \log (P_{\text{watts}}) = 43 + 10 \log (4.59) = 49.6 \text{ dB}$

High:  $43 + 10 \log (P_{\text{watts}}) = 43 + 10 \log (4.78) = 49.8 \text{ dB}$

FCC Part 90.210 (12.5 kHz Bandwidth only):

On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz at least:

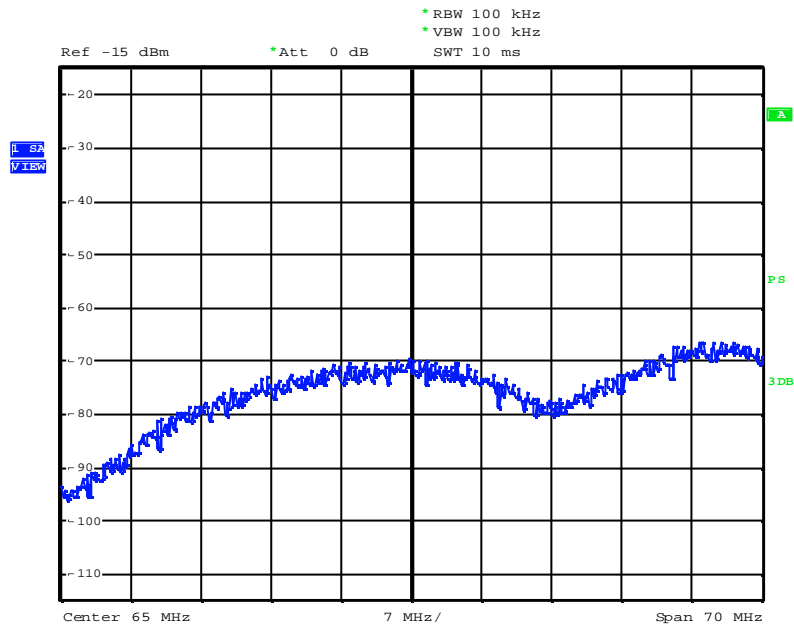
Low:  $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (3.98) = 56.0 \text{ dB}$

Middle:  $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (4.59) = 56.6 \text{ dB}$

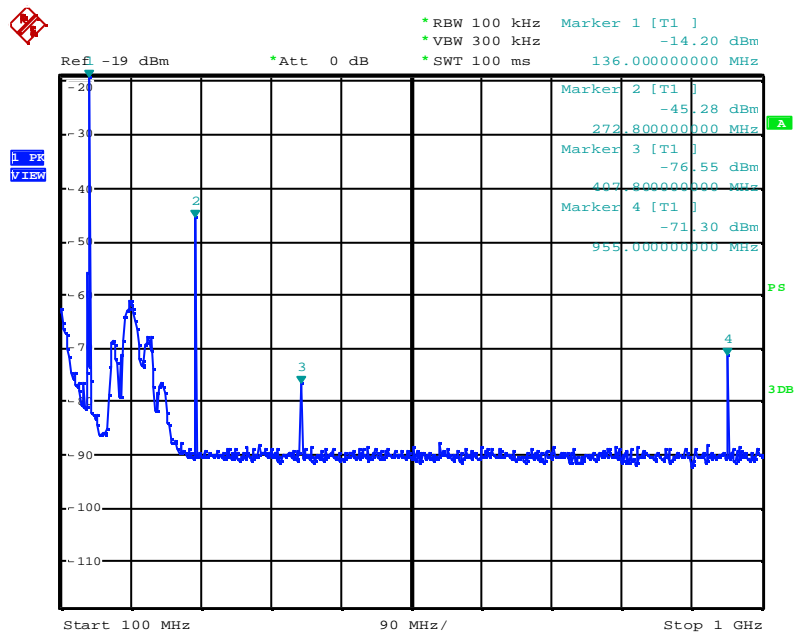
High:  $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (4.78) = 56.8 \text{ dB}$

Note: In general, the worse case attenuation requirement shown above was applied.

Product : FM Handheld Transceiver Test Mode : CH1-136MHz  
Test Item : Spurious Emission on Antenna Port Temperature : 25  
Test Voltage : DC 7.2V (External Power Supply) Humidity : 56%RH  
Test Result : **PASS**

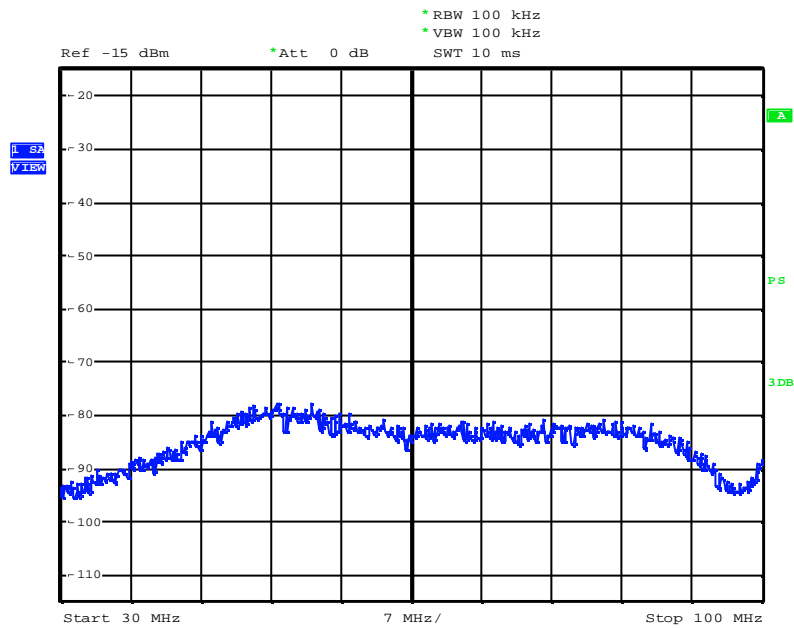


Date: 11.MAY.2006 10:15:59

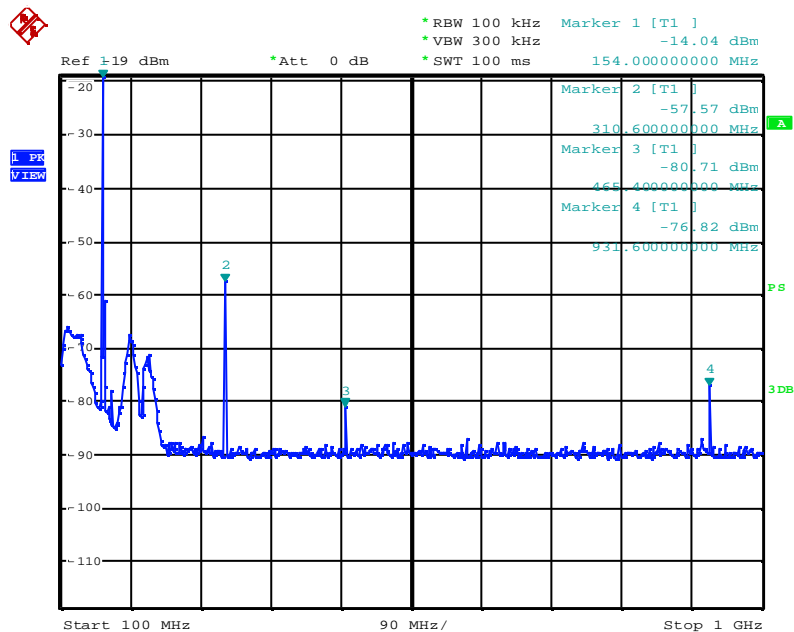


Date: 21.APR.2006 15:08:06

Product : FM Handheld Transceiver Test Mode : CH1-155MHz  
Test Item : Spurious Emission on Antenna Port Temperature : 25  
Test Voltage : DC 7.2V (External Power Supply) Humidity : 56%RH  
Test Result : **PASS**



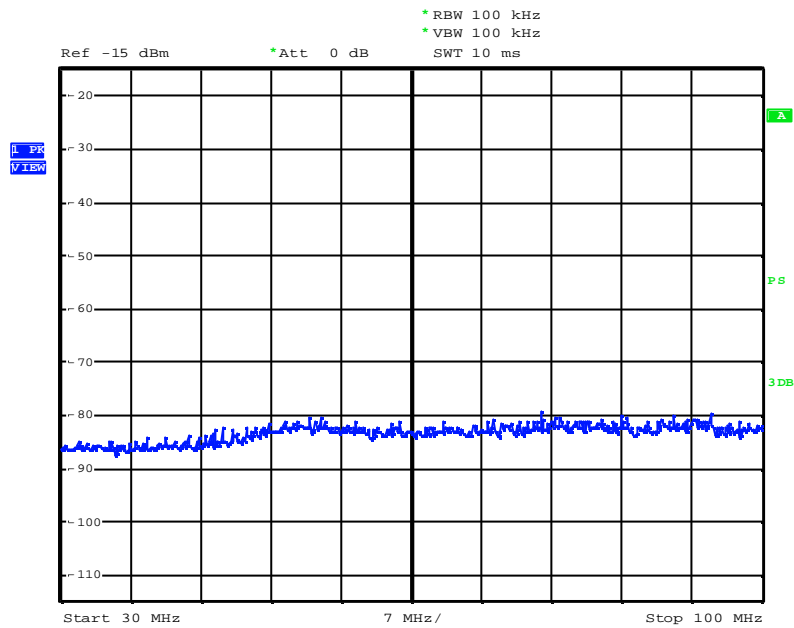
Date: 11.MAY.2006 10:17:39



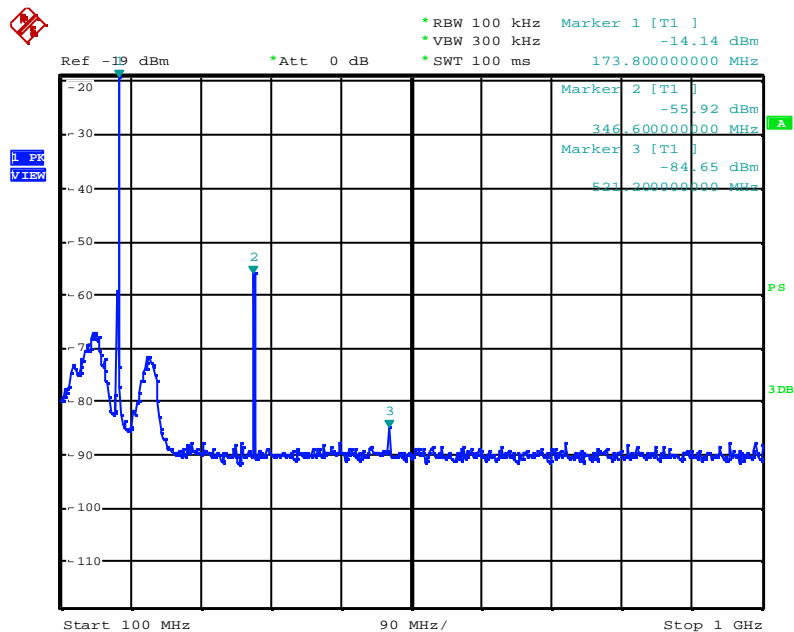
Date: 21.APR.2006 15:07:08



Product : FM Handheld Transceiver Test Mode : CH1-174MHz  
Test Item : Spurious Emission on Antenna Port Temperature : 25  
Test Voltage : DC 7.2V (External Power Supply) Humidity : 56%RH  
Test Result : **PASS**



Date: 11.MAY.2006 10:20:04



Date: 21.APR.2006 15:05:51

## 8. MODULATION CHARACTERISTICS

### 8.1 PROVISIONS APPLICABLE

According to CFR47 section 2.1047(a), for Voice Modulation Communication Equipment, the frequency response of the audio modulation circuit over a range of 100 to 5000Hz shall be measured.

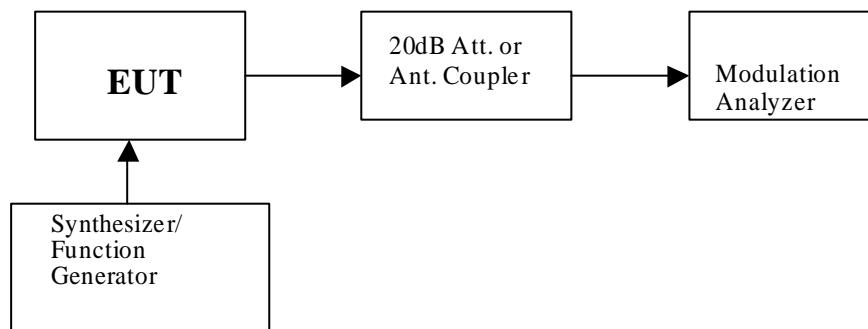
### 8.2 MEASUREMENT METHOD

#### 8.2.1 Modulation Limit

- 1). Configure the EUT as shown in figure 1, adjust the audio input for 60% of rated system deviation at 1KHz using this level as a reference (0dB) and vary the input level from -20 to +20dB. Record the frequency deviation obtained as a function of the input level.
- 2). Repeat step 1 with input frequency changing to 300, 1004, and 2500Hz in sequence.

#### 8.2.2 Audio Frequency Response

- 1). Configure the EUT as shown in figure 1.
- 2). Adjust the audio input for 20% of rated system deviation at 1 KHz using this level as a reference (0dB).
- 3). Vary the Audio frequency from 100 Hz to 10 KHz and record the frequency deviation.
- 4) Audio Frequency Response =  $20\log_{10} (\text{Deviation of test frequency} / \text{Deviation of 1KHz reference})$ .

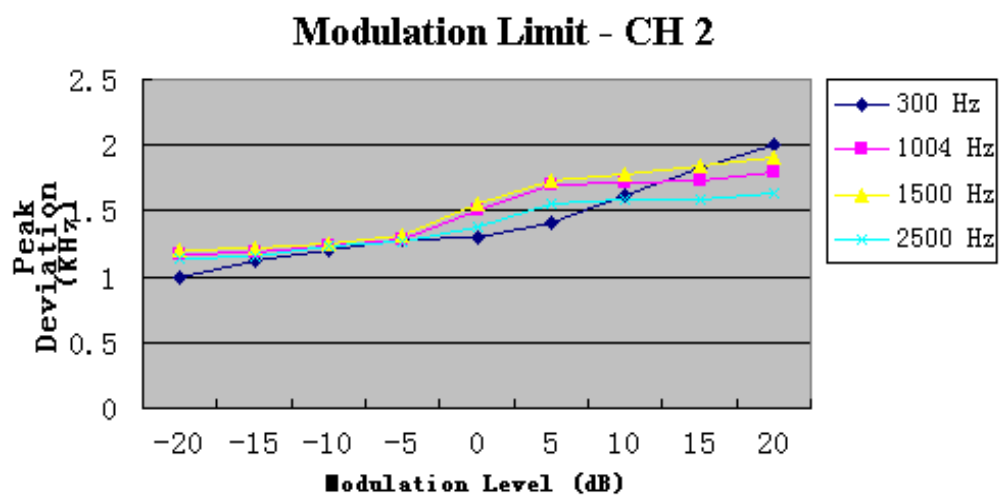
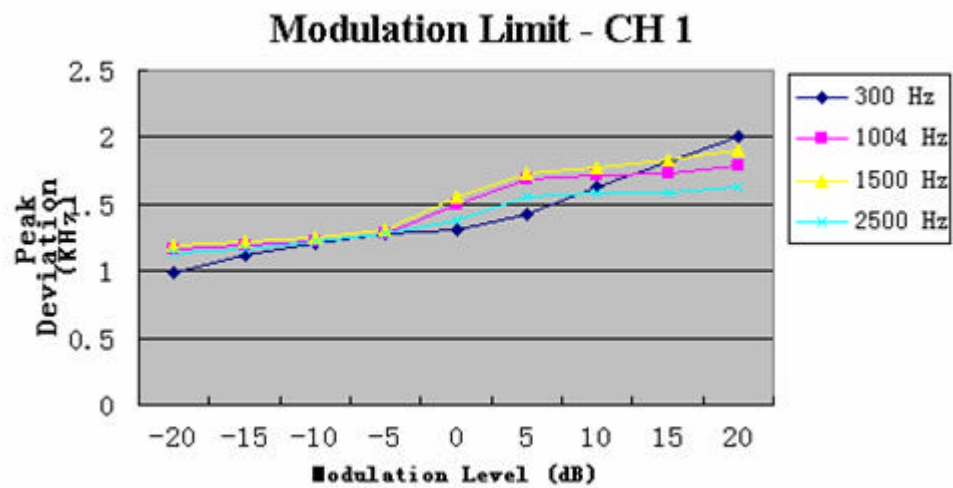


### 8.3 MEASUREMENT EQUIPMENT USED:

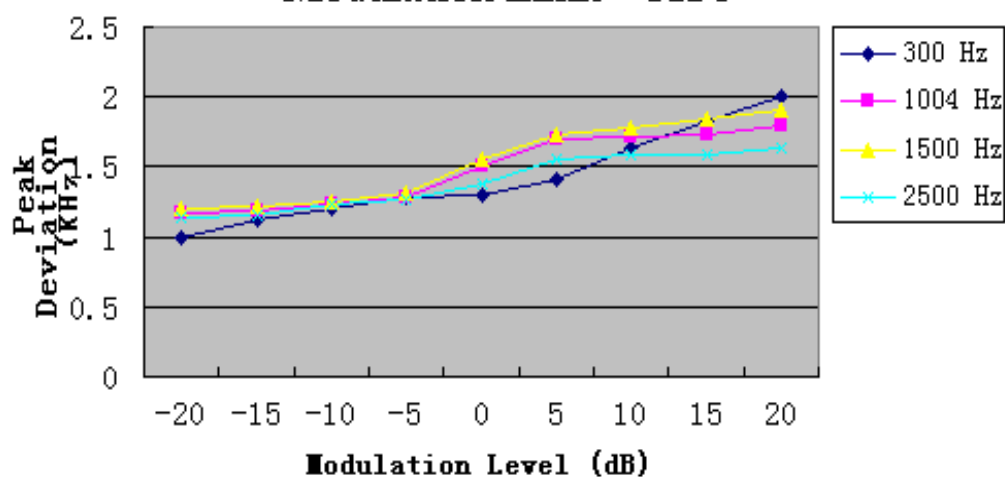
| Name of Equipment   | Manufacturer  | Model | Serial Number | Calibration Due |
|---------------------|---------------|-------|---------------|-----------------|
| Modulation Analyzer | HP            | 8901B | 3104A03367    | 07/08/2006      |
| Signal Generator    | Rohde&Schwarz | SMT03 | 100059        | 02/01/2007      |

### 8.4 TEST RESULTS:

a). Modulation Limit:



### Modulation Limit - CH 3



### Channel 01

| Modulation Level (dB) | Peak Freq. Deviation At 300 Hz (KHz) | Peak Freq. Deviation At 1004 Hz (KHz) | Peak Freq. Deviation At 1500 Hz (KHz) | Peak Freq. Deviation At 2500 Hz (KHz) |
|-----------------------|--------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| -20                   | 0.990                                | 1.163                                 | 1.192                                 | 1.130                                 |
| -15                   | 1.114                                | 1.189                                 | 1.221                                 | 1.162                                 |
| -10                   | 1.203                                | 1.225                                 | 1.246                                 | 1.227                                 |
| -5                    | 1.281                                | 1.281                                 | 1.314                                 | 1.275                                 |
| 0                     | 1.302                                | 1.500                                 | 1.558                                 | 1.372                                 |
| +5                    | 1.418                                | 1.691                                 | 1.726                                 | 1.555                                 |
| +10                   | 1.627                                | 1.820                                 | 1.905                                 | 1.678                                 |
| +15                   | 1.823                                | 1.934                                 | 2.032                                 | 1.826                                 |
| +20                   | 2.005                                | 2.108                                 | 2.191                                 | 2.038                                 |

### Channel 02

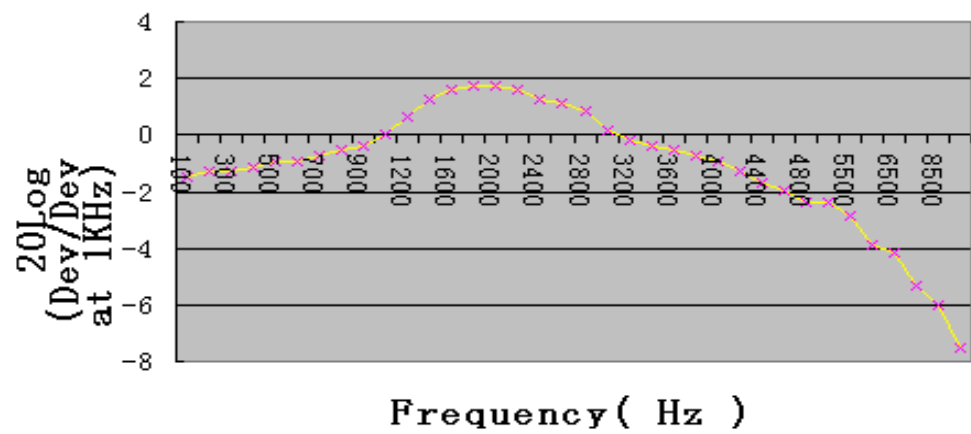
| <b>Modulation Level (dB)</b> | <b>Peak Freq. Deviation At 300 Hz (KHz)</b> | <b>Peak Freq. Deviation At 1004 Hz (KHz)</b> | <b>Peak Freq. Deviation At 1500 Hz (KHz)</b> | <b>Peak Freq. Deviation At 2500 Hz (KHz)</b> |
|------------------------------|---|--|--|--|
| -20                          | 0.992                                       | 1.164  | 1.193  | 1.131  |
| -15                          | 1.115                                       | 1.190  | 1.223  | 1.161  |
| -10                          | 1.202                                       | 1.227  | 1.248  | 1.228  |
| -5                           | 1.280                                       | 1.282  | 1.311  | 1.274  |
| 0                            | 1.303                                       | 1.500  | 1.557  | 1.374  |
| +5                           | 1.416                                       | 1.692  | 1.728  | 1.556  |
| +10                          | 1.625                                       | 1.822  | 1.902  | 1.679  |
| +15                          | 1.824                                       | 1.933  | 2.037  | 1.825  |
| +20                          | 2.001                                       | 2.109  | 2.194  | 2.035  |

### Channel 03

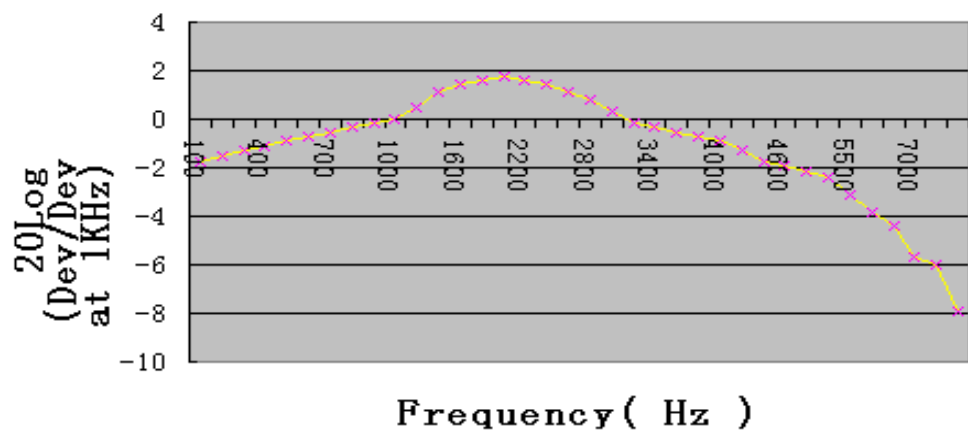
| <b>Modulation Level (dB)</b> | <b>Peak Freq. Deviation At 300 Hz (KHz)</b> | <b>Peak Freq. Deviation At 1004 Hz (KHz)</b> | <b>Peak Freq. Deviation At 1500 Hz (KHz)</b> | <b>Peak Freq. Deviation At 2500 Hz (KHz)</b> |
|------------------------------|---|--|--|--|
| -20                          | 0.991                                       | 1.161  | 1.190  | 1.135  |
| -15                          | 1.116                                       | 1.194  | 1.225  | 1.163  |
| -10                          | 1.205                                       | 1.225  | 1.244  | 1.227  |
| -5                           | 1.283                                       | 1.286  | 1.315  | 1.276  |
| 0                            | 1.300                                       | 1.500  | 1.553  | 1.372  |
| +5                           | 1.413                                       | 1.697  | 1.729  | 1.553  |
| +10                          | 1.628                                       | 1.820  | 1.904  | 1.676  |
| +15                          | 1.829                                       | 1.931  | 2.035  | 1.827  |
| +20                          | 2.006                                       | 2.112  | 2.197  | 2.038  |

b). Audio Frequency Response:

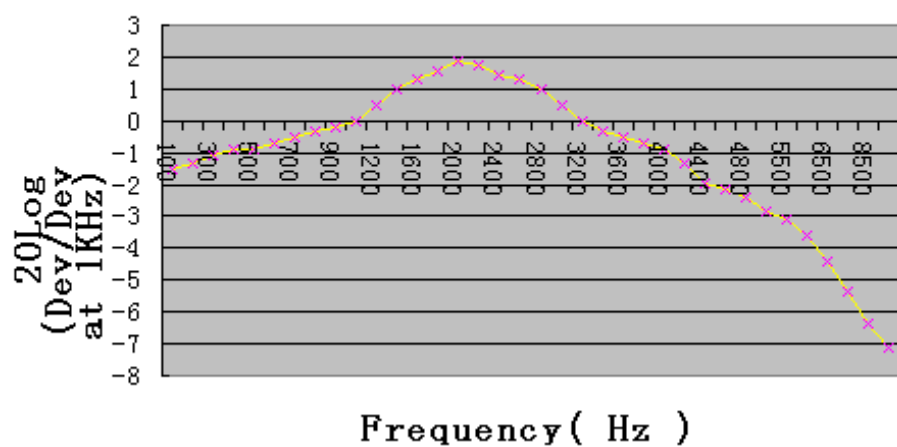
Audio Frequency Response - CH 01



Audio Frequency Response - CH 02



Audio Frequency Response - CH 03



**Channel 01**

| Frequency (Hz) | Deviation (KHz) |
|----------------|-----------------|
| 100            | 0.42            |
| 200            | 0.43            |
| 300            | 0.43            |
| 400            | 0.44            |
| 500            | 0.45            |
| 600            | 0.45            |
| 700            | 0.46            |
| 800            | 0.47            |
| 900            | 0.48            |
| 1000           | 0.50            |
| 1200           | 0.54            |
| 1400           | 0.58            |
| 1600           | 0.60            |
| 1800           | 0.61            |
| 2000           | 0.61            |
| 2200           | 0.60            |
| 2400           | 0.58            |
| 2600           | 0.57            |
| 2800           | 0.55            |
| 3000           | 0.51            |
| 3200           | 0.49            |
| 3400           | 0.48            |
| 3600           | 0.47            |
| 3800           | 0.46            |
| 4000           | 0.45            |
| 4200           | 0.43            |
| 4400           | 0.41            |
| 4600           | 0.40            |
| 4800           | 0.38            |
| 5000           | 0.38            |
| 5500           | 0.36            |
| 6000           | 0.32            |
| 6500           | 0.31            |
| 7000           | 0.27            |
| 8500           | 0.25            |
| 10000          | 0.21            |

**Channel 02**

| Frequency (Hz) | Deviation (KHz) |
|----------------|-----------------|
| 100            | 0.41            |
| 200            | 0.42            |
| 300            | 0.43            |
| 400            | 0.44            |
| 500            | 0.45            |
| 600            | 0.46            |
| 700            | 0.47            |
| 800            | 0.48            |
| 900            | 0.49            |
| 1000           | 0.50            |
| 1200           | 0.53            |
| 1400           | 0.57            |
| 1600           | 0.59            |
| 1800           | 0.60            |
| 2000           | 0.61            |
| 2200           | 0.60            |
| 2400           | 0.59            |
| 2600           | 0.57            |
| 2800           | 0.55            |
| 3000           | 0.52            |
| 3200           | 0.49            |
| 3400           | 0.48            |
| 3600           | 0.47            |
| 3800           | 0.46            |
| 4000           | 0.45            |
| 4200           | 0.43            |
| 4400           | 0.41            |
| 4600           | 0.40            |
| 4800           | 0.39            |
| 5000           | 0.38            |
| 5500           | 0.35            |
| 6000           | 0.32            |
| 6500           | 0.30            |
| 7000           | 0.26            |
| 8500           | 0.25            |
| 10000          | 0.20            |



**Channel 03**

| Frequency (Hz) | Deviation (KHz) |
|----------------|-----------------|
| 100            | 0.42            |
| 200            | 0.43            |
| 300            | 0.44            |
| 400            | 0.45            |
| 500            | 0.45            |
| 600            | 0.46            |
| 700            | 0.47            |
| 800            | 0.48            |
| 900            | 0.49            |
| 1000           | 0.50            |
| 1200           | 0.53            |
| 1400           | 0.56            |
| 1600           | 0.58            |
| 1800           | 0.60            |
| 2000           | 0.62            |
| 2200           | 0.61            |
| 2400           | 0.59            |
| 2600           | 0.58            |
| 2800           | 0.56            |
| 3000           | 0.53            |
| 3200           | 0.50            |
| 3400           | 0.48            |
| 3600           | 0.47            |
| 3800           | 0.46            |
| 4000           | 0.45            |
| 4200           | 0.43            |
| 4400           | 0.40            |
| 4600           | 0.39            |
| 4800           | 0.38            |
| 5000           | 0.36            |
| 5500           | 0.35            |
| 6000           | 0.33            |
| 6500           | 0.30            |
| 7000           | 0.27            |
| 8500           | 0.24            |
| 10000          | 0.22            |

## 9. FREQUENCY STABILITY MEASUREMENT

### 9.1 PROVISIONS APPLICABLE

According to § 90.213, for operating band within 150-174MHz and output power > 2 watts, the frequency stability limit is 5 ppm.

### 9.2 MEASUREMENT PROCEDURE

The EUT was set in the climate chamber and connected to an external DC power supply. The RF output was directly connected to Spectrum Analyzer ESI 26. The coupling loss of the additional cables was recorded and taken in account for all the measurements. After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to an DC powersupply and the voltage was adjusted in the required ranges. The result was recorded.

### 9.3 TEST SETUP BLOCK DIAGRAM

(setup block diagram of configuration)

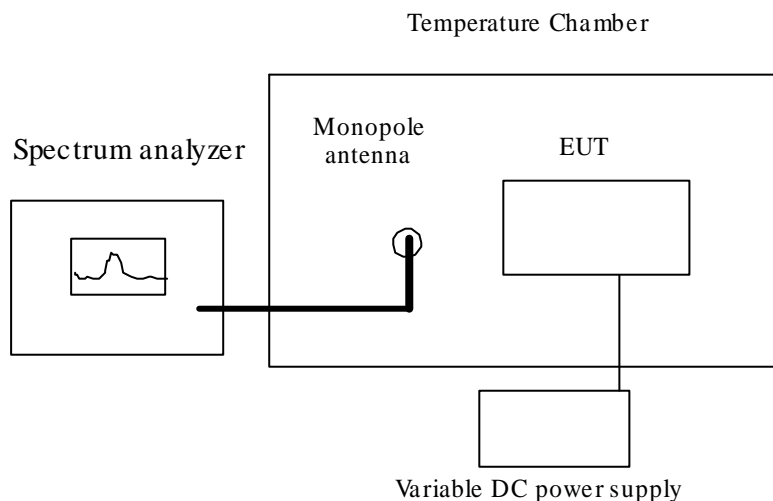


Figure 1

#### 9.4 MEASUREMENT EQUIPMENT USED:

| Name of Equipment | Manufacturer  | Model   | Serial Number | Calibration Due |
|-------------------|---------------|---------|---------------|-----------------|
| Receiver          | Rohde&Schwarz | ESIB26  | 100009        | 11/05/2006      |
| Signal Generator  | Rohde&Schwarz | SMT03   | 100059        | 02/01/2007      |
| Climate Chamber   | ESPEC         | EL-10KA | 05107008      | 01/31/2007      |
| Monopole Antenna  | N/A           | N/A     | N/A           | N/A             |

#### 9.5 TEST RESULTS:

a. Frequency stability versus input voltage (battery operation end point voltage is 6.0 V)

| Channel | Reference Frequency (MHz) | Frequency Measured at end point voltage | Frequency Deviation (%) | Limit (%) |
|---------|---------------------------|---|-------------------------|-----------|
| 01      | 136.02500                 | 136.02481                               | -0.000140               | 0.0005    |
| 02      | 155.02500                 | 155.02485                               | -0.000097               | 0.0005    |
| 03      | 173.91500                 | 173.91482                               | -0.000010               | 0.0005    |

b. Frequency stability versus ambient temperature

#### Channel 01

| Reference Frequency: 136.02500 MHz |                   |  | Limit: 0.0005% |
|------------------------------------|-------------------|--|----------------|
| Environment Temperature ( )        | Power Supply (DC) | Frequency deviation measured with time Elapse (10 minutes) |                |
|                                    |                   | (MHz)  | %              |
| 50                                 | 7.2V              | 136.024910   | -0.00007       |
| 40                                 | 7.2V              | 136.024930   | -0.00005       |
| 30                                 | 7.2V              | 136.024960   | -0.00003       |
| 20                                 | 7.2V              | 136.024980   | -0.00002       |
| 10                                 | 7.2V              | 136.024970   | -0.00002       |
| 0                                  | 7.2V              | 136.024950   | -0.00004       |
| -10                                | 7.2V              | 136.024940   | -0.00005       |
| -20                                | 7.2V              | 136.024920   | -0.00006       |
| -30                                | 7.2V              | 136.024900   | -0.00007       |

### Channel 02

| Reference Frequency: 155.02500 MHz |                      |   | Limit: 0.0005% |
|------------------------------------|----------------------|---|----------------|
| Environment Temperature<br>( )     | Power Supply<br>(DC) | Frequency deviation measured with time<br>Elapse (10 minutes) |                |
|                                    |                      | (MHz)   | %              |
| 50                                 | 7.2V                 | 155.024960  | -0.00003       |
| 40                                 | 7.2V                 | 155.024980  | -0.000013      |
| 30                                 | 7.2V                 | 155.024990  | -0.000006      |
| 20                                 | 7.2V                 | 155.025010  | 0.000007       |
| 10                                 | 7.2V                 | 155.024990  | -0.000006      |
| 0                                  | 7.2V                 | 155.024950  | -0.00003       |
| -10                                | 7.2V                 | 155.024940  | -0.00004       |
| -20                                | 7.2V                 | 155.024930  | -0.00005       |
| -30                                | 7.2V                 | 155.024910  | -0.00006       |

### Channel 03

| Reference Frequency: 173.91500 MHz |                      |   | Limit: 0.0005% |
|------------------------------------|----------------------|---|----------------|
| Environment Temperature<br>( )     | Power Supply<br>(DC) | Frequency deviation measured with time<br>Elapse (10 minutes) |                |
|                                    |                      | (MHz)   | %              |
| 50                                 | 7.2V                 | 173.914950  | -0.00003       |
| 40                                 | 7.2V                 | 173.914970  | -0.00002       |
| 30                                 | 7.2V                 | 173.914980  | -0.00001       |
| 20                                 | 7.2V                 | 173.914990  | -0.000006      |
| 10                                 | 7.2V                 | 173.914980  | -0.00001       |
| 0                                  | 7.2V                 | 173.914950  | -0.00003       |
| -10                                | 7.2V                 | 173.914930  | -0.00004       |
| -20                                | 7.2V                 | 173.914910  | -0.00005       |
| -30                                | 7.2V                 | 173.914890  | -0.00006       |

## 10 CONDUCTED OUTPUT POWER

### 10.1 PROVISIONS APPLICABLE

Per FCC  $\ll$  2.1046 and  $\ll$  90.205: Maximum ERP is dependent upon the station's antenna HAAT and required service area.

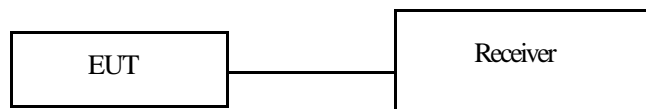
### 10.2 TEST PROCEDURE

Measurements shall be made to establish the radio frequency power delivered by the transmitter the standard output termination. The power output shall be monitored and recorded and no adjustment shall be made to the transmitter after the test has begun, except as noted below:

If the power output is adjustable, measurements shall be made for the highest and lowest power levels.

Measurement with Spectrum Analyzer ESI 26 conducted, external power supply with 7.2V stabilized supply voltage.

### 10.3 TEST SETUP BLOCK DIAGRAM



The EUT was directly connected to a RF Communication Test Set.

### 10.4 MEASUREMENT EQUIPMENT USED:

| Open Area Test Site |                 |           |            |            |            |
|---------------------|-----------------|-----------|------------|------------|------------|
| EQUIPMENT TYPE      | MFR             | MODEL NO. | SERIAL NO. | LAST CAL.  | CAL DUE    |
| Receiver            | ROHDE & SCHWARZ | ESI 26    | 100009     | 11/04/2005 | 11/05/2006 |
| Attenuator          | R&S             | ESH3-22   | 100449     | 11/04/2005 | 11/05/2006 |

### 10.5 TEST RESULTS:

Product : FM Handheld Transceiver Test Mode : CH1-136MHz  
Test Item : RF Output Power Temperature : 25  
Test Voltage : DC 7.2V (External Power Supply) Humidity : 56% RH  
Test Result : **PASS**

#### CH1

| Freq. (MHz) | Measurement (dBm/Watt) | FCC Limit (Watt) |
|-------------|------------------------|------------------|
| 135.999     | 36.31/4.28             | Varies           |

Product : FM Handheld Transceiver      Test Mode : CH2-155MHz  
Test Item : RF Output Power      Temperature : 25  
Test Voltage : DC 7.2V (External Power Supply)      Humidity : 56%RH  
Test Result : **PASS**

**CH2**

| Freq.<br>(MHz) | Measurement<br>(dBm/Watt) | FCC Limit<br>(Watt) |
|----------------|---------------------------|---------------------|
| 155.999        | 36.45/4.42                | Varies              |

Product : FM Handheld Transceiver      Test Mode : CH3-174MHz  
Test Item : RF Output Power      Temperature : 25  
Test Voltage : DC 7.2V (External Power Supply)      Humidity : 56%RH  
Test Result : **PASS**

**CH3**

| Freq.<br>(MHz) | Measurement<br>(dBm/Watt) | FCC Limit<br>(Watt) |
|----------------|---------------------------|---------------------|
| 173.999        | 36.91/4.91                | Varies              |

## 11. TRANSMITTER FREQUENCY BEHAVIOR

### 11.1 PROVISIONS APPLICABLE

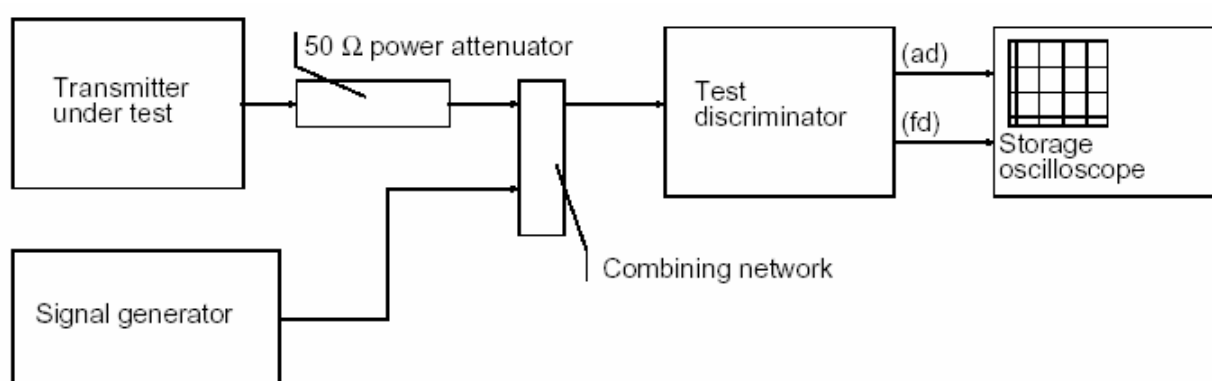
Section 90.214

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### 11.2 TEST METHOD

TIA/EIA-603 2.2.19

### 11.3 TEST SETUP BLOCK DIAGRAM

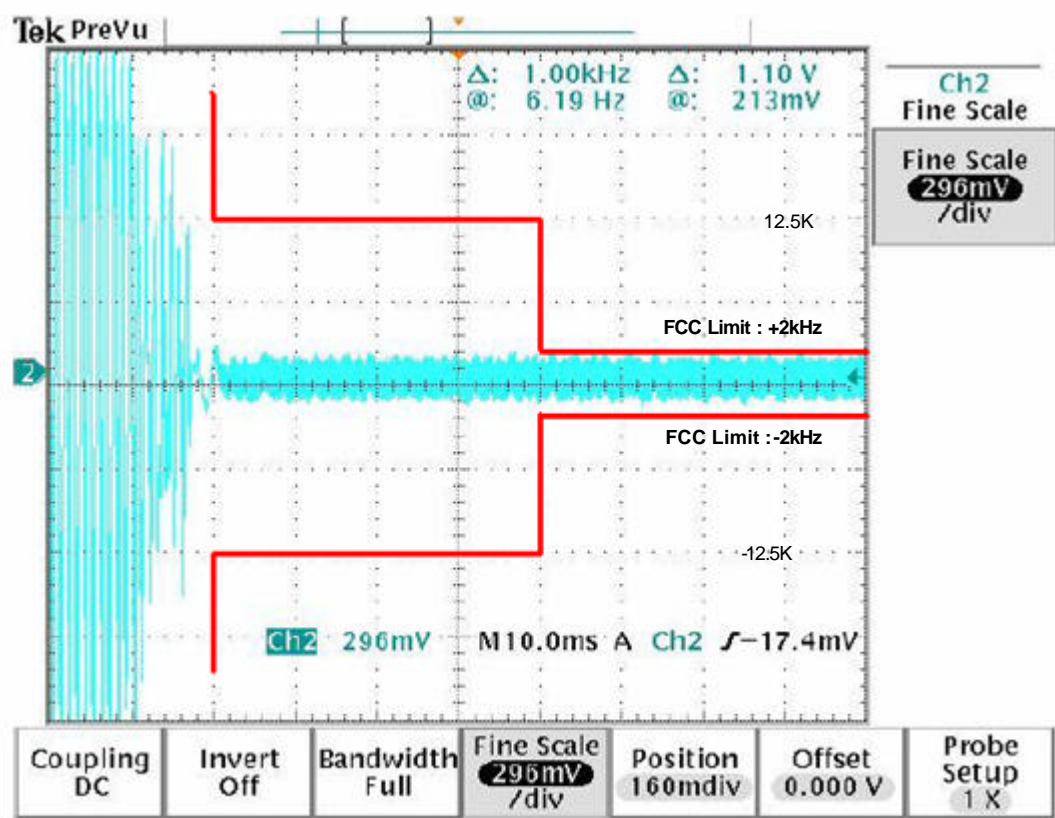


### 11.4 MEASUREMENT EQUIPMENT USED:

| Name of Equipment    | Manufacturer  | Model   | Serial Number | Calibration Due |
|----------------------|---------------|---------|---------------|-----------------|
| Signal Generator     | Rohde&Schwarz | SMT03   | 100059        | 02/01/2007      |
| Storage Oscilloscope | Tektronix     | TDS3052 | B017447       | 06/28/2006      |

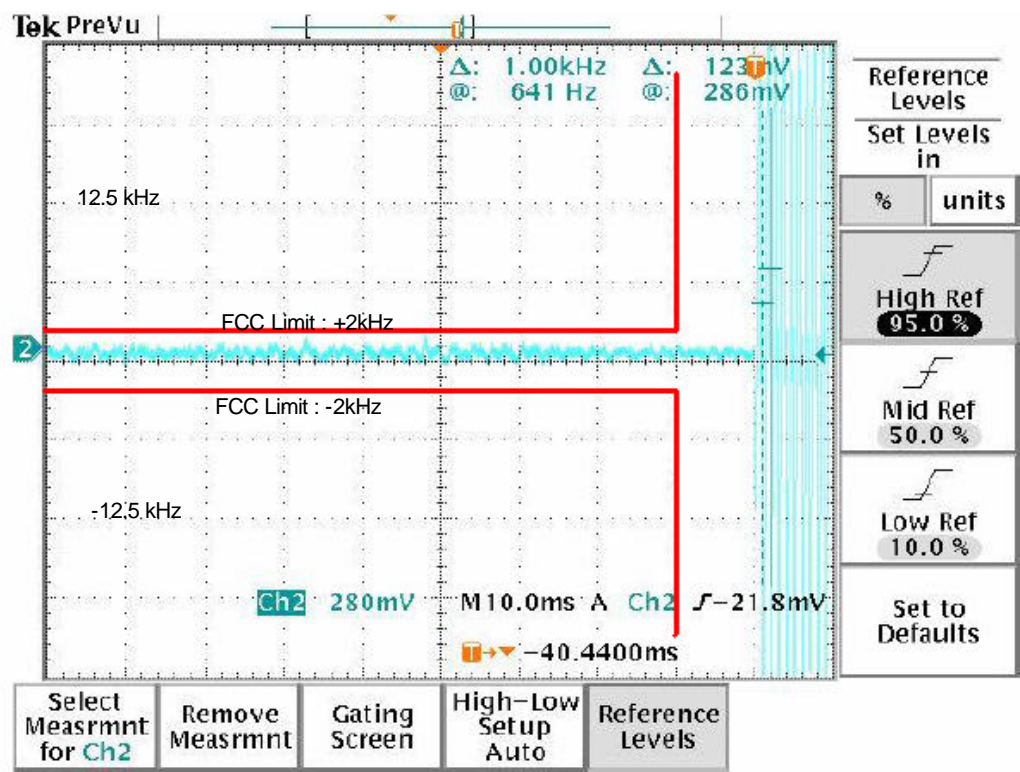
### 11.5 TEST RESULTS:

Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation-----Off – On





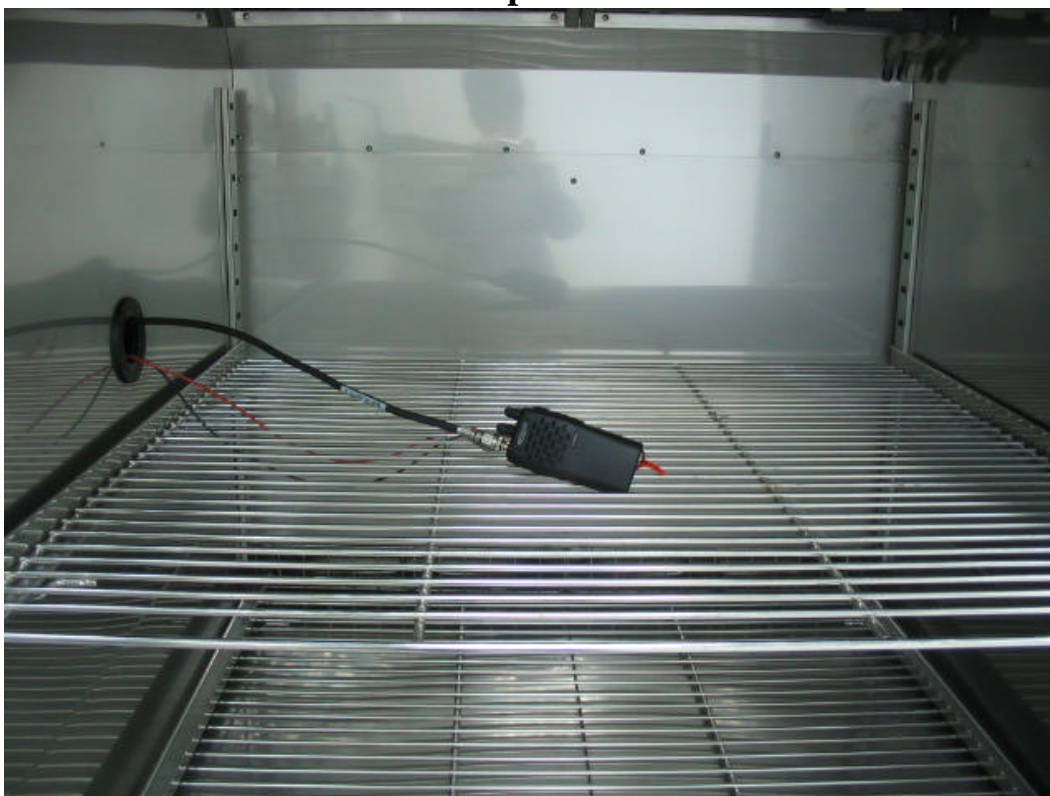
Transmitter Frequency Behaviour @ 12.5 KHz Channel Separation-----On - Off



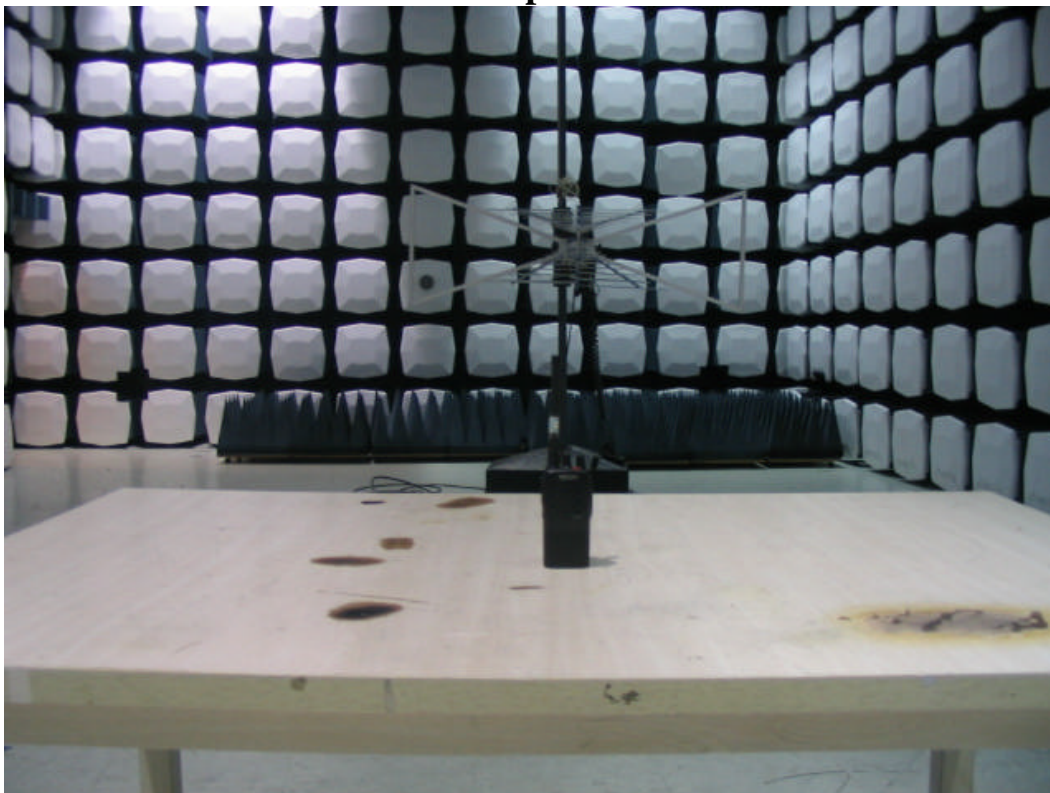
## **APPENDIX 1**

### **PHOTOGRAPHS OF TEST SETUP**

**Test Setup Photo-1**



**Test Setup Photo-2**



## **APPENDIX 2**

### **PHOTOGRAPHS OF EUT**

### **Top view of EUT**



### **Bottom view of EUT**





**Right view of EUT**



**Left view of EUT**



### **Front view of EUT**



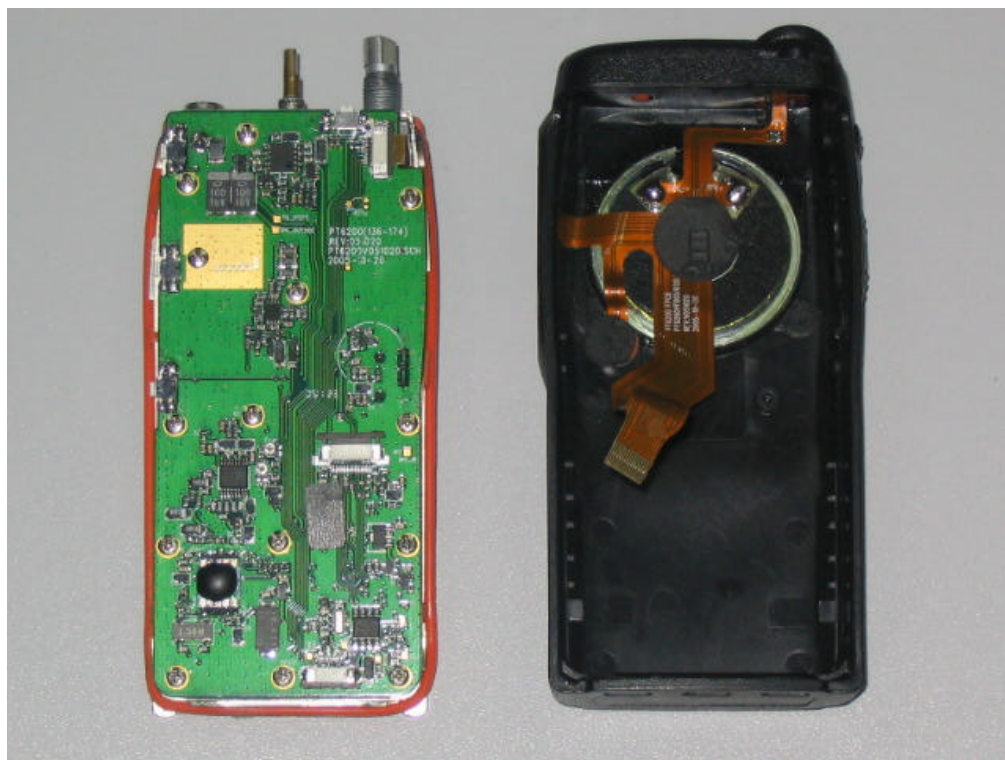
### **Back view of EUT**



### Detached view of EUT-1

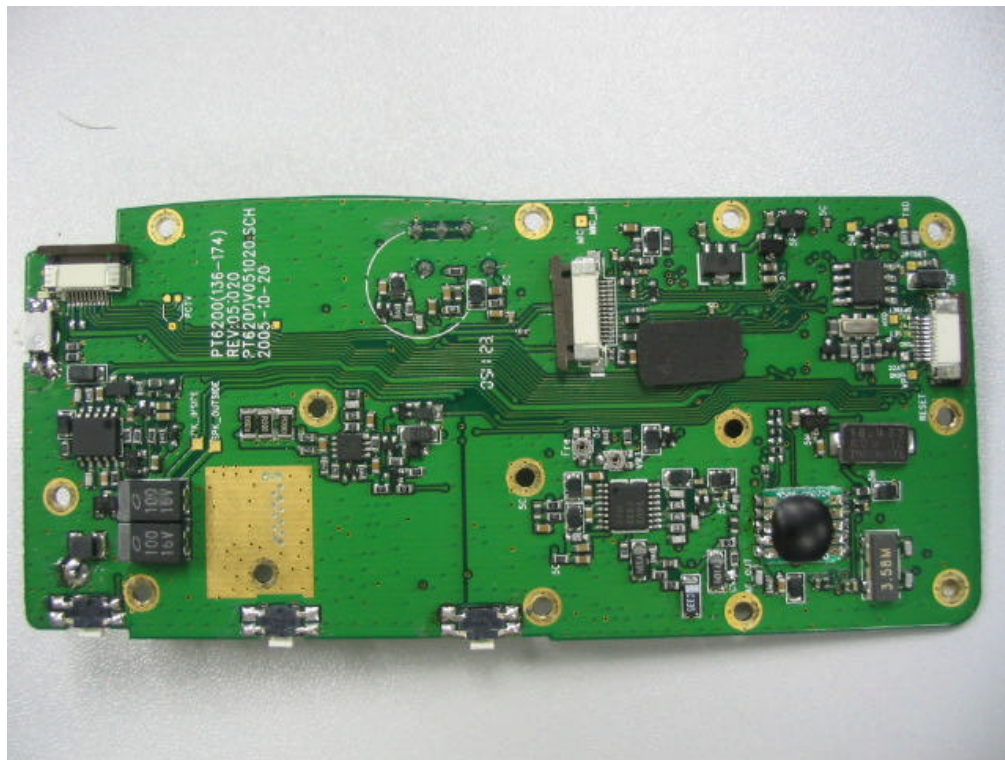


### Detached view of EUT-2





### Detached view of EUT-3



### Detached view of EUT-4

