# *FCC TEST REPORT*

**FCC ID** : **UIRVRFM9**

**Applicant** : **HongKong HuiKe Technology Limited**
**Address** : Flat A,18/F, kingwell Commercial Tower,173 Lockhart Road,Wenchai, HongKong

**Equipment Under Test (EUT) :**

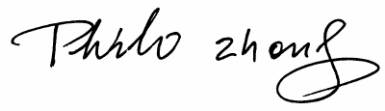
Product : FM Modulator

Model No. : VRFM9

**Standards** : FCC 15 Subpart C Paragraph 15.239

**Date of Test** : October 31, 2006

**Test Engineer** : **Tiger Su**

**Reviewed By** : 

PERPARED BY:
**Waltek Services (Shenzhen) Co., Ltd.**
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# 2 Contents

# 3 Test Summary

| Test | Test Requirement | Test Method | Class / Severity | Result |
|---|---|---|---|---|
| Radiated Emission (30MHz to 1GHz) | FCC PART 15: 2003 | ANSI C63.4: 2003 | Class B | PASS |
| Conducted Emission (150KHz to 30MHz) | FCC PART 15: 2003 | ANSI C63.4: 2003 | Class B | N/A |

# 4 General Information

## 4.1 Client Information

| | |
|---|---|
| Applicant: | **HongKong HuiKe Technology Limited** |
| Address: | Flat A,18/F, kingwell Commercial Tower,173 Lockhart Road,Wenchai, HongKong |
| Manufacturer: | **ShenZhen HuiKe Technology Co., Ltd.** |
| Address: | Building 702, Bagua -3th Road, Futian, ShenZhen, China |

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

| | |
|---|---|
| Product description: | FM Modulator |
| Model No.: | VRFM9 |

## 4.3 Details of E.U.T.

| | |
|---|---|
| Power Supply: | DC 12 V |

## 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 FM Modulator. The standards used were FCC 15 Paragraph 15.209 and Paragraph 15.239.

## 4.6 Test Facility

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

- **FCC – Registration No.: 556682**

  SGS-CSTC Standards Technical Services Co., Ltd ShenZhen Branch EMC Lab, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 556682, August 04, 2005.

## 4.7 Test Location

All Emissions testswere performed at:-

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

# 5 Equipment Used during Test

| Equipment | Brand Name | Model | Cal. Int Months | Last Cal. Date |
|---|---|---|---|---|
| **3m Anechoic chamber** | | | | |
| EMC Analyzer | Agilent | E7402A | 12 | 2006-08-30 |
| EMI Test Receiver | R&S | ESS | 12 | 2006-08-30 |
| Pre Amplifier | Anritsu | MH648A | 12 | 2006-08-30 |
| Bilog Antenna | SCHAFFNER | CBL6111C | 12 | 2009-08-30 |
| Loop Antenna | R&S | 6108 | 12 | 2006-08-30 |
| Horn Antenna | ETS.LINDGERN | GH14-H052 | 12 | 2006-08-30 |
| AM/FM Stereo Signal Generator | Panasonic | VP-8122A | 12 | 2006-08-30 |
| Signal Generator | R&S | SMG | 12 | 2006-08-30 |
| RF Selector | TOYO | NS4901A | N/A | N/A |
| Turn Disc | HD | DS4150S | N/A | N/A |
| Antenna Mast | HD | MA2400 | N/A | N/A |
| **EMI Shielded Room** | | | | |
| Spectrum analyzer | ADVANTEST | R3261C | 12 | 2006-08-30 |
| EMI Test Receiver | R&S | ESS | 12 | 2006-08-30 |
| Pre Amplifier | Anritsu | MH648A | 12 | 2006-08-30 |
| LISN | R&S | ENV216 | 12 | 2006-08-30 |
| Absorbing Clamp | R&S | MDS-21 | 12 | 2006-08-30 |
| Distortion Meter | MEGURO | MAK-6578A | 12 | 2006-08-30 |
| AM/FM Stereo Signal Generator | Panasonic | VP-8122A | 12 | 2006-08-30 |
| Oscilloscope | LEADER | LS1020 | 12 | 2006-08-30 |
| Function Generator | National | VP-7422A | 12 | 2006-08-30 |
| Signal Generator | R&S | SMG | 12 | 2006-08-30 |
| RF Selector | TOYO | NS4000 | N/A | N/A |
| Remote Controller | TOYO | MAC | N/A | N/A |

# 6 Conducted Emission Test

| | |
|---|---|
| Product Name: | FM Modulator |
| 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)<br>Quasi-Peak & Average if maximised peak within 6dB of Average Limit |

## 6.1 Test Equipment

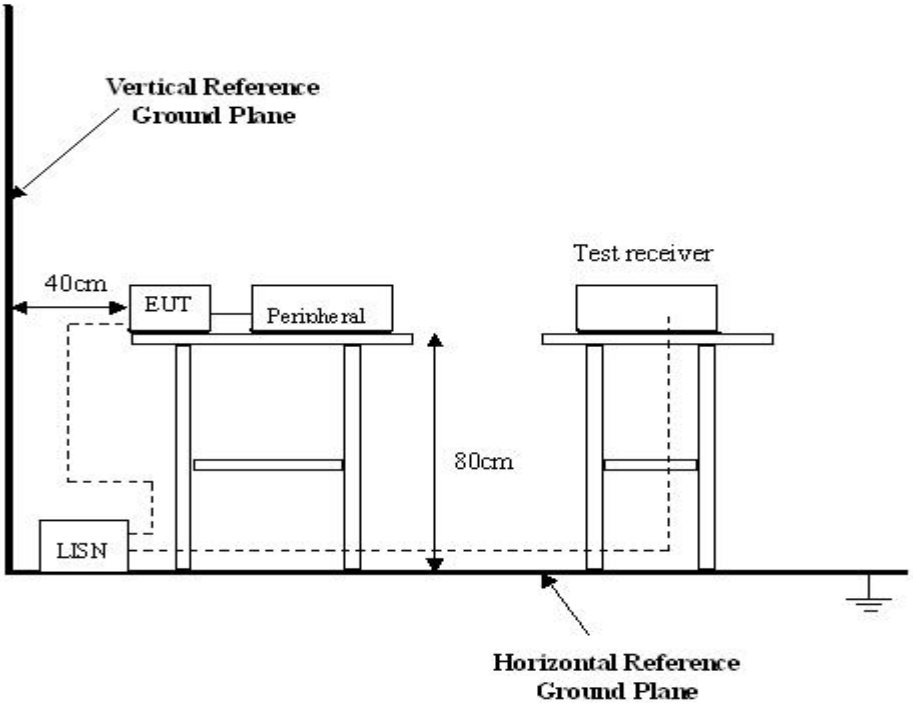
Please refer to Section 5 this report.

## 6.2 Test Procedure

1. The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.
2. The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

## 6.3 Conducted Test Setup

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



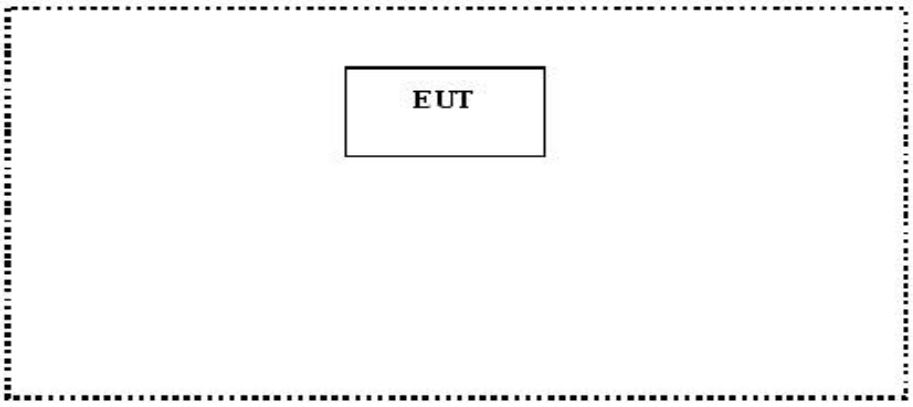

## 6.4 EUT Operating Condition

Operating condition is according to ANSI C63.4:2003.

A. Setup the EUT and simulators as shown on follow.

B. Enable RF signal and confirm EUT active.

C. Modulate output capacity of EUT up to specification.



## 6.5 Conducted Emission Limits

66-56 dBμV/m between 0.15MHz & 0.5MHz
56 dBμV/m between 0.5MHz & 5MHz
60 dBμV/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

| | |
|---|---|
| Product Name: | FM Modulator |
| Test Requirement: | FCC Part15 Paragraph 15.239 |
| Test Method: | Based on ANSI C63.4:2003 |
| Test Date: | October 31, 2006 |
| Frequency Range: | 30MHz to 1GHz |
| Measurement Distance: | 3m |
| Detector: | Peak for pre-scan (120kHz resolution bandwidth) |
| | Quasi-Peak if maximised peak within 6dB of limit |

## 7.1 Test Equipment

Please refer to Section 5 this report.

## 7.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

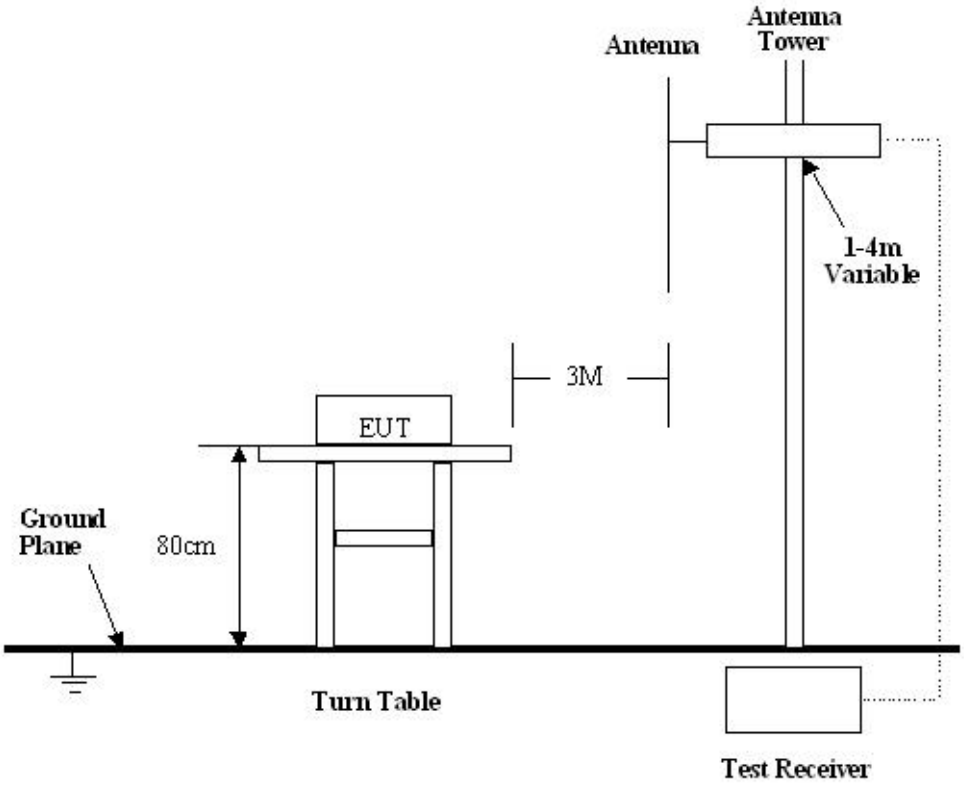
Based on ANSI C63.4:2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at SGS EMC Laboratory is +4.0 dB.

## 7.3 Test Procedure

1. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
2. 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 dBμV of specification limits), and are distinguished with a "Qp" in the data table.
3. The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.
4. The market sample is tested for low frequency testing at 88.1 MHz and high frequency testing at 107.9 MHz. The tested sample at 98.00 MHz is only used for middle frequency testing and will not be selling in the market.

## 7.4 Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.209 and Paragraph 15.239 limits.




## 7.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.239 Rules, the system was tested to 1000 MHz.

Start Frequency.....30 MHz
Stop Frequency.....1000 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:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - 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:

Margin = Corr. Ampl. – 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 15.239 standards.

## 7.8 EUT Operating Condition

Same as section 6.4 of this report. Compliance test was performed test in the transmitter operation Mode.

## 7.9 Radiated Emissions Limit

### A. FCC Part 15 subpart C Paragraph 15.239 Limit

| Fundamental Frequency(MHZ) | Field Strength of Fundamental | |
|---|---|---|
| | uV/m | dBuV/m |
| 88-108 | 250 | 48 |

**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.

### 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.

As shown in 15.35(b),for frequencies above 1000MHz,the field strength limits are based on average detector,however,the peak field strength of any emission shall not exceed the maximum permitted average limits,specified above by more than 20dB under any condition of modulation.

## 7.10 Radiated Emissions Test Result

Formula of conversion factors:the field strength at 3m was egtablished by adding
The meter reading of the spectrum analyer (which is set to read in units of dBuV)
To the antenna correction factor supplied by the antenna manufacturer. The antenna
Correction factors are stared 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: Radiated Emission Test Data

Test Voltage: DC 12V

Test Mode: ON TX

Temperature: 24 °C

Humidity: 52%RH

Test Result: PASS

| Frequency (MHz) | Antenna Polarization | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Turntable Angle (°C) |
|---|---|---|---|---|---|---|
| Low Frequency | | | | | | |
| 88.10 | Horizontal | 44.3 | 48.0 | 3.7 | 1.8 | 270 |
| 176.2 | Horizontal | 38.1 | 46.0 | 7.9 | 1.5 | 90 |
| 264.3 | Horizontal | 30.2 | 46.0 | 15.8 | 1.0 | 45 |
| 352.4 | Horizontal | 37.5 | 46.0 | 8.5 | 1.8 | 180 |
| 88.10 | Vertical | 43.7 | 48.0 | 4.3 | 1.5 | 90 |
| 176.2 | Vertical | 37.2 | 46.0 | 8.8 | 2.0 | 270 |
| 264.3 | Vertical | 31.3 | 46.0 | 14.7 | 1.5 | 45 |
| 352.4 | Vertical | 35.0 | 46.0 | 11.0 | 1.0 | 180 |
| Middle Frequency | | | | | | |
| 98.0 | Horizontal | 42.9 | 48.0 | 5.1 | 1.5 | 90 |
| 196.0 | Horizontal | 39.0 | 46.0 | 7.0 | 1.0 | 45 |
| 294.0 | Horizontal | 36.1 | 46.0 | 9.9 | 1.8 | 180 |
| 98.0 | Vertical | 43.4 | 48.0 | 4.6 | 2.0 | 270 |
| 196.0 | Vertical | 34.6 | 46.0 | 11.4 | 1.5 | 45 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 294.0 | Vertical | 33.1 | 46.0 | 12.9 | 1.0 | 180 |
| High Frequency | | | | | | |
| 107.9 | Horizontal | 42.9 | 48.0 | 5.1 | 1.5 | 90 |
| 215.8 | Horizontal | 33.0 | 46.0 | 13.0 | 1.0 | 45 |
| 232.7 | Horizontal | 30.9 | 46.0 | 15.1 | 1.8 | 180 |
| 107.9 | Vertical | 42.7 | 48.0 | 5.3 | 2.0 | 270 |
| 215.8 | Vertical | 33.3 | 46.0 | 12.7 | 1.5 | 45 |
| 232.7 | Vertical | 31.5 | 46.0 | 14.5 | 1.0 | 180 |

**Note:** (1) All Reading Levels below 1GHz are Quasi-Peak, above are peak and average value.

(2) Emission Level = Reading Level + Probe Factor + Cable Loss.

# 8 Band Edge

## 8.1 Test Equipment

Please refer to Section 5 this report.

## 8.2 Test Procedure

1.The EUT, peripherals were put on the turntable which table size is 1mX1.5m, table high 0.8m. All set up is according to ANSI C63.4:2003.

2. The antenna high were varied from 1m to 4m high to find the maximum emission for each frequency.

3. The bandwidth of the fundamental frequency was measure by spectrum analyser with 10kHz RBW and 10kHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

4.The market sample is tested for low frequency testing at 88.1 MHz and high frequency testing at 107.9 MHz. The tested sample at 98.00 MHz is only used for middle frequency testing and will not be selling in the market.

5. Minimum standard:

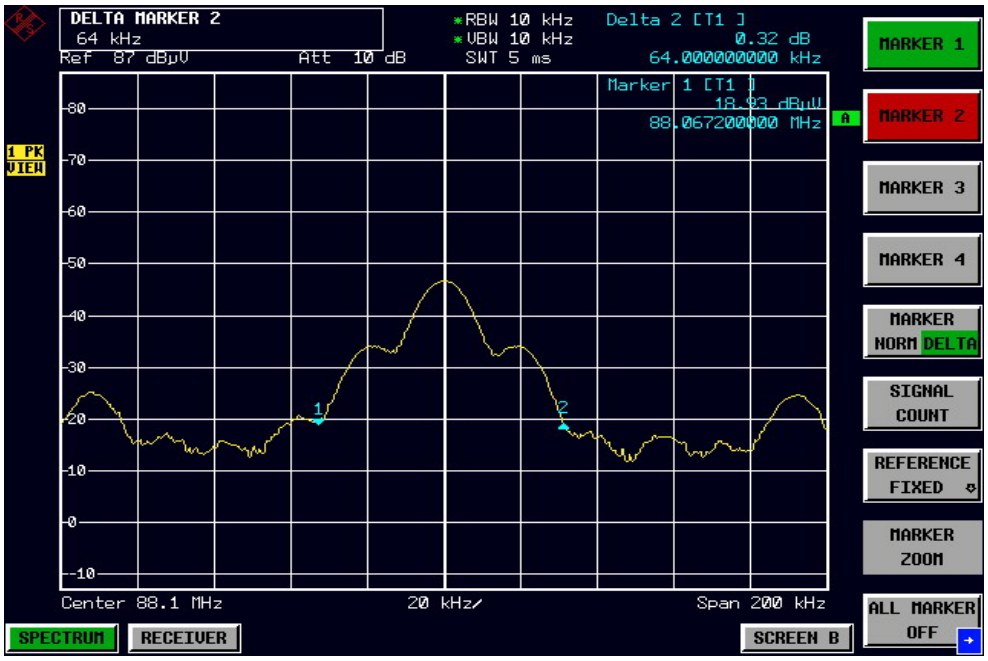
| | |
|---|---|
| Occupied Bandwidth | <200KHz |

## 8.3 Band Edge Test Result

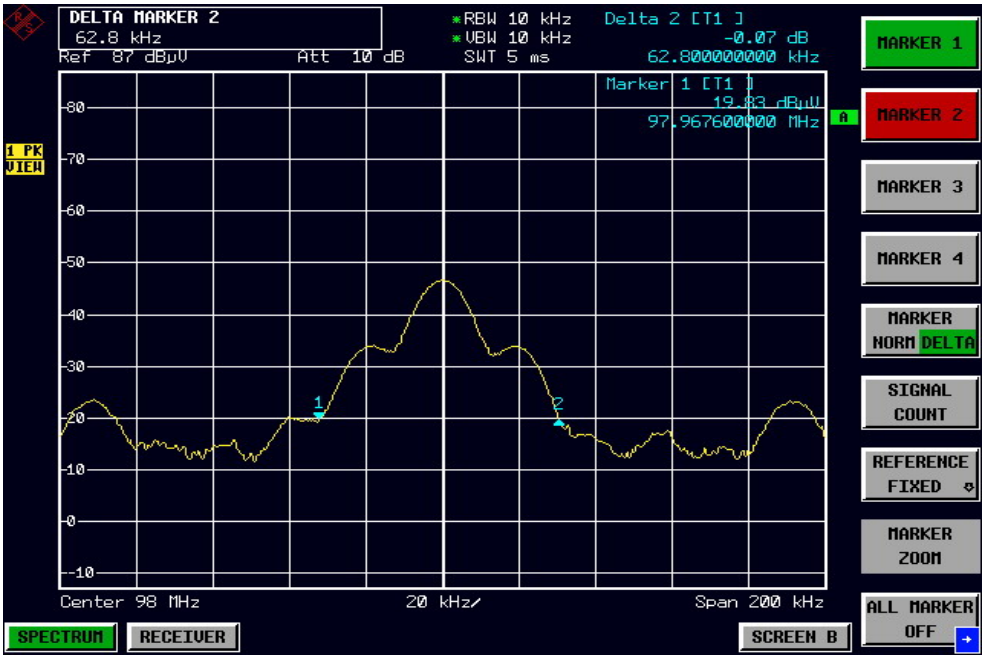
| | |
|---|---|
| Product Name: | FM Modulator |
| Test Item: | Band Edge Test |
| Test Voltage: | DC 12V |
| Test Mode: | TX ON |
| Temperature: | 24 °C |
| Humidity: | 52%RH |

### 8.3.1 The EUT Modulated With Insert USB Dongle

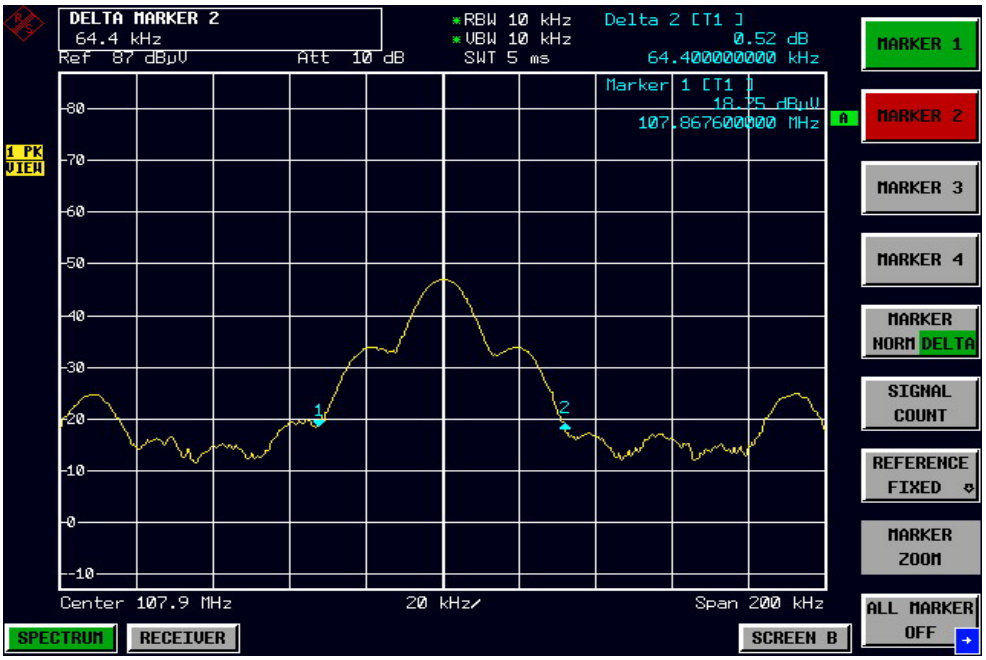
**88.1 MHz**



**98 MHz**

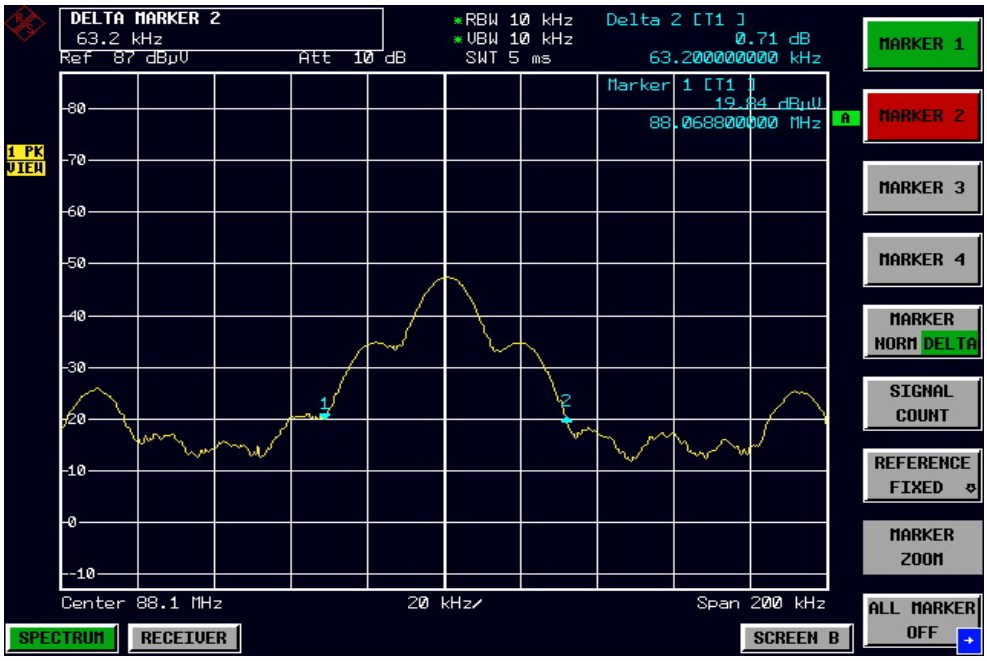



**107.9 MHz**

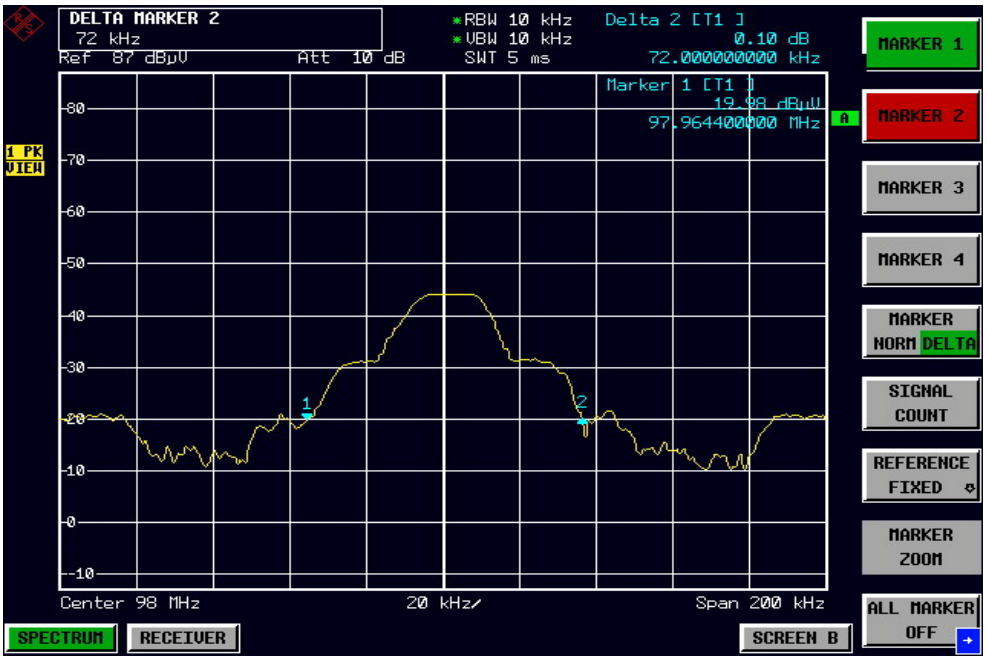


8.3.2 The EUT Modulated With Audio Signal

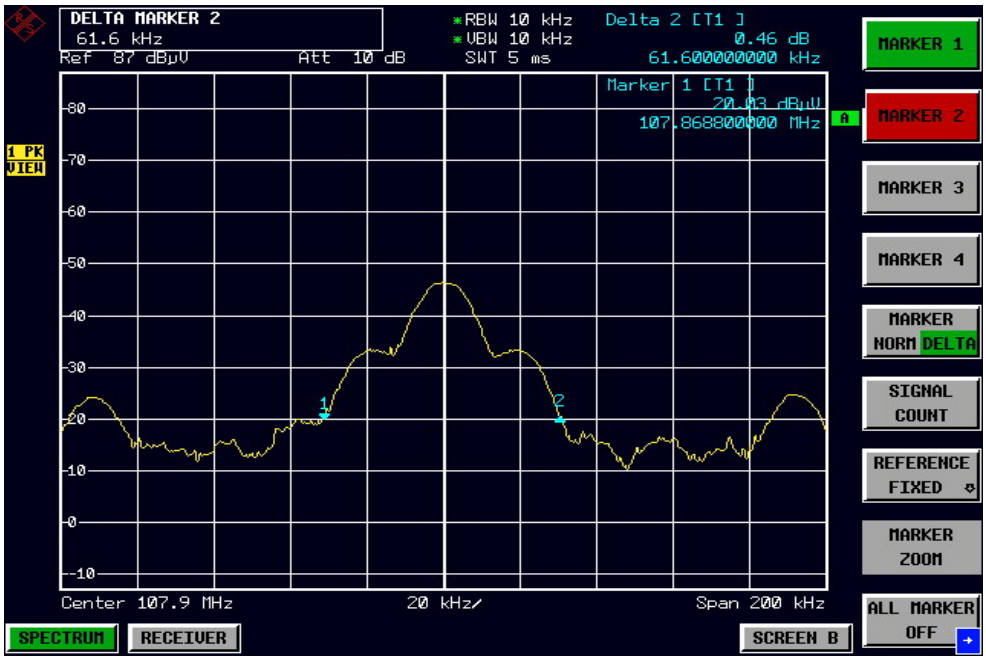
**88.1 MHz**




**98 MHz**



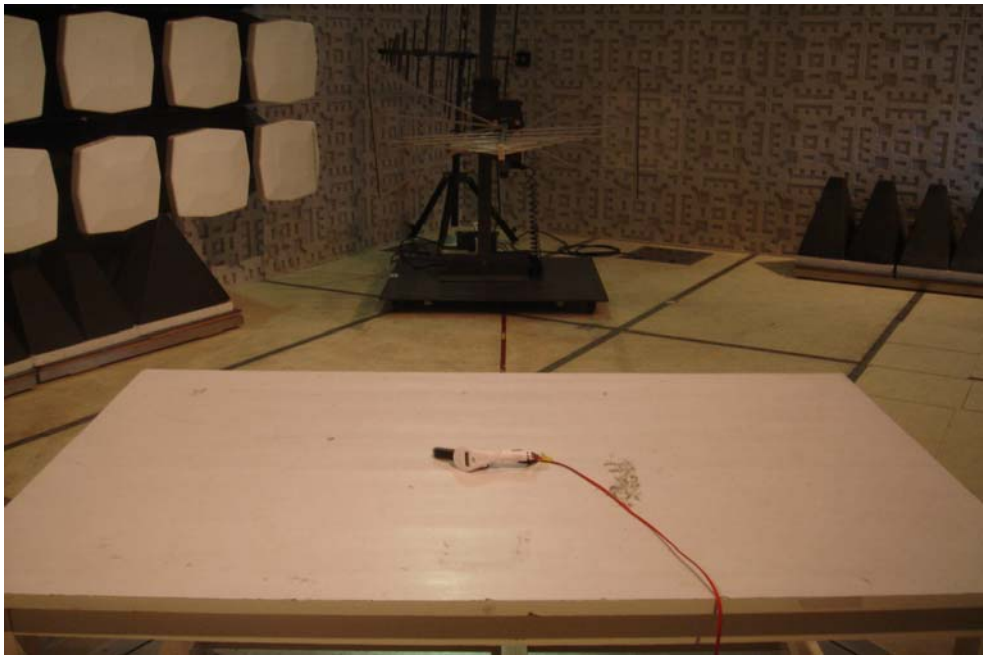
**107.9 MHz**




**Note:** (1) The Low, Middle and the high frequency occupied bandwidth does meet the FCC rules.

# 9 Photographs of Testing

## 9.1 Radiation Emission Test View

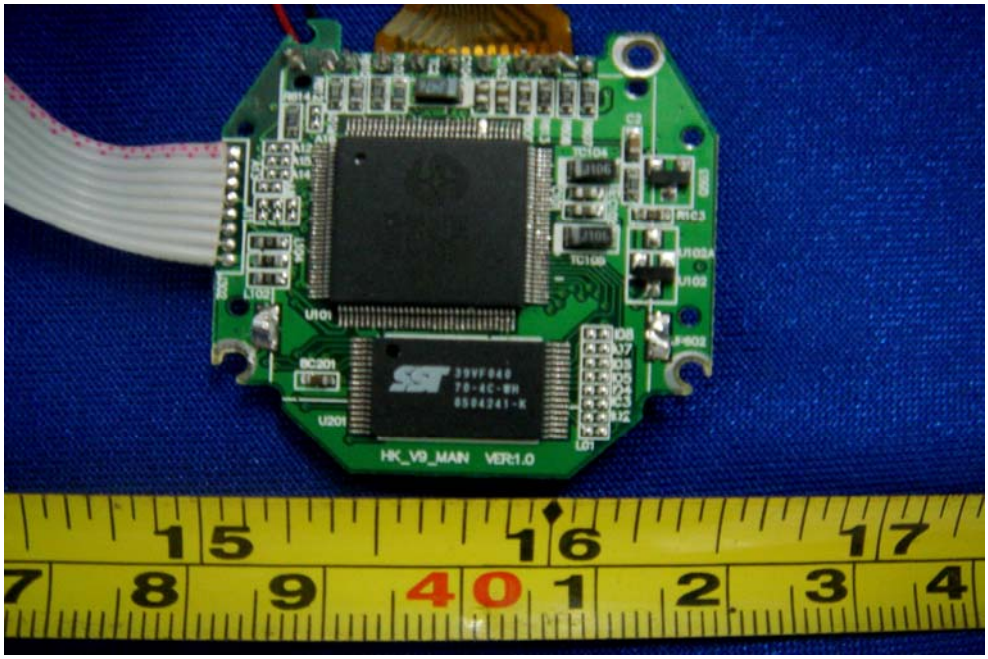


# 10 Photographs - Constructional Details

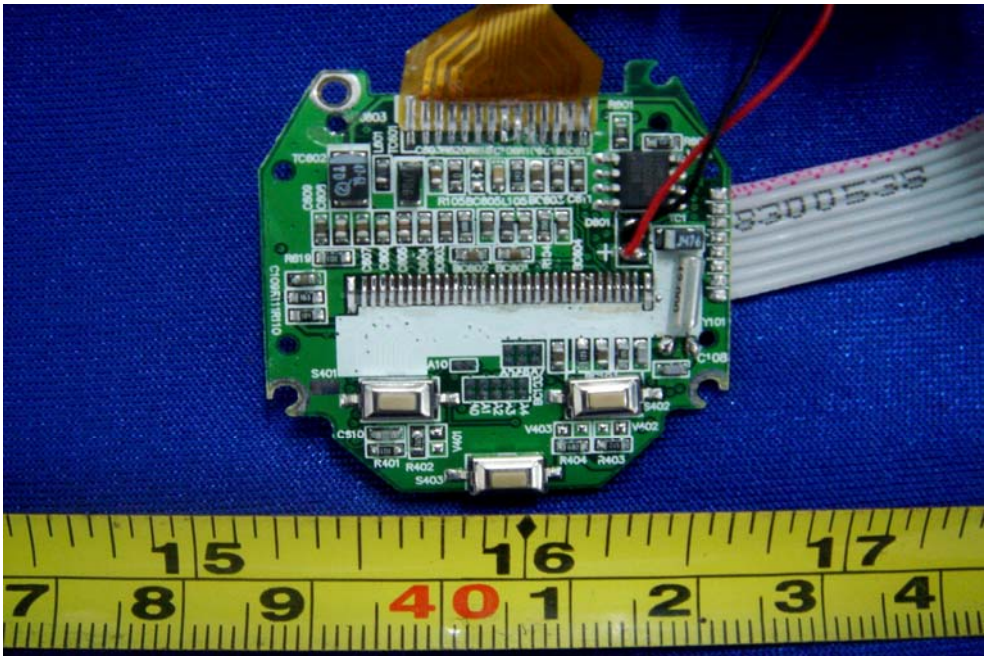
## 10.1 EUT - Front View

## 10.2 EUT - Back View

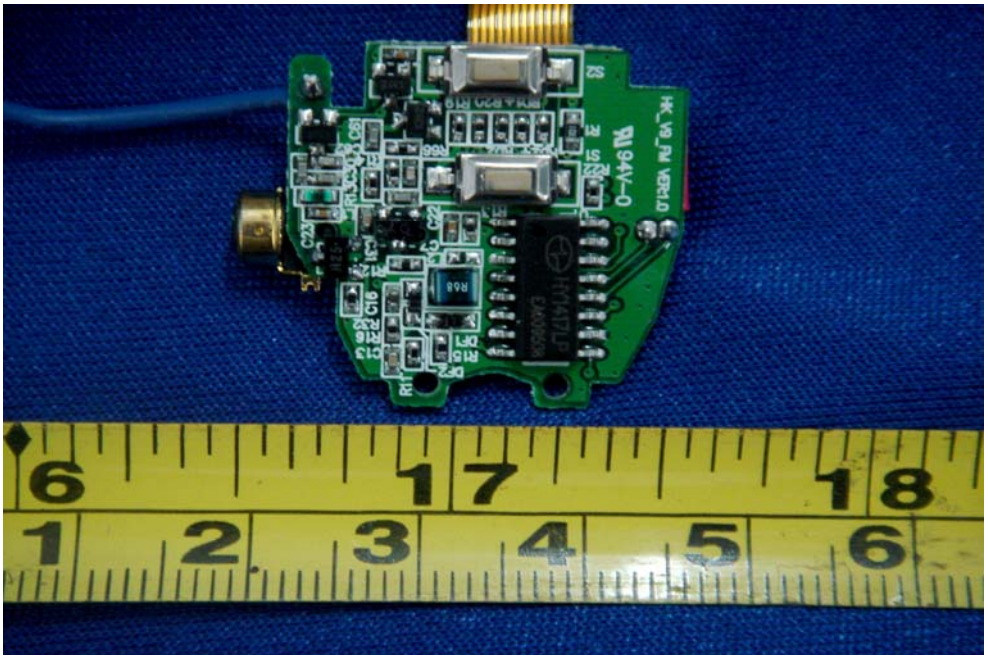
### 10.3 PCB1-Front View



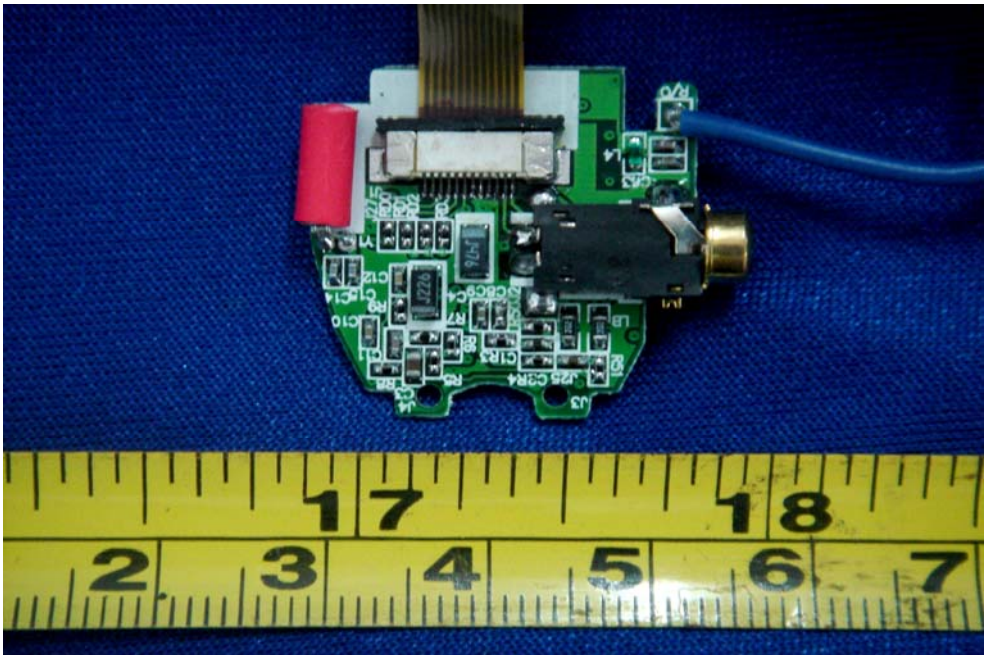

### 10.4 PCB1-Back View



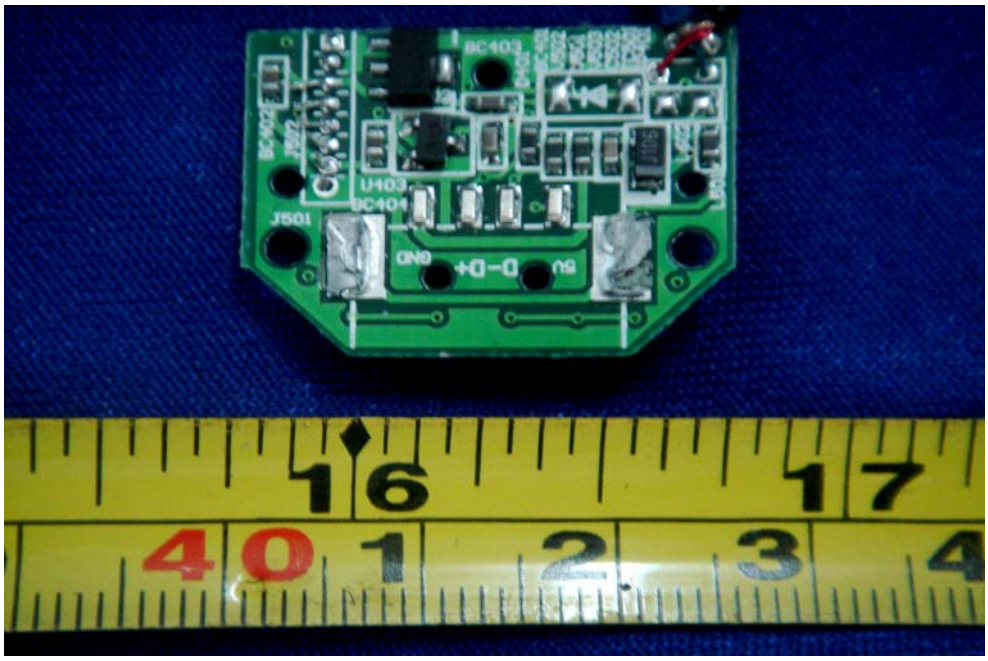
### 10.5 PCB2-Front View



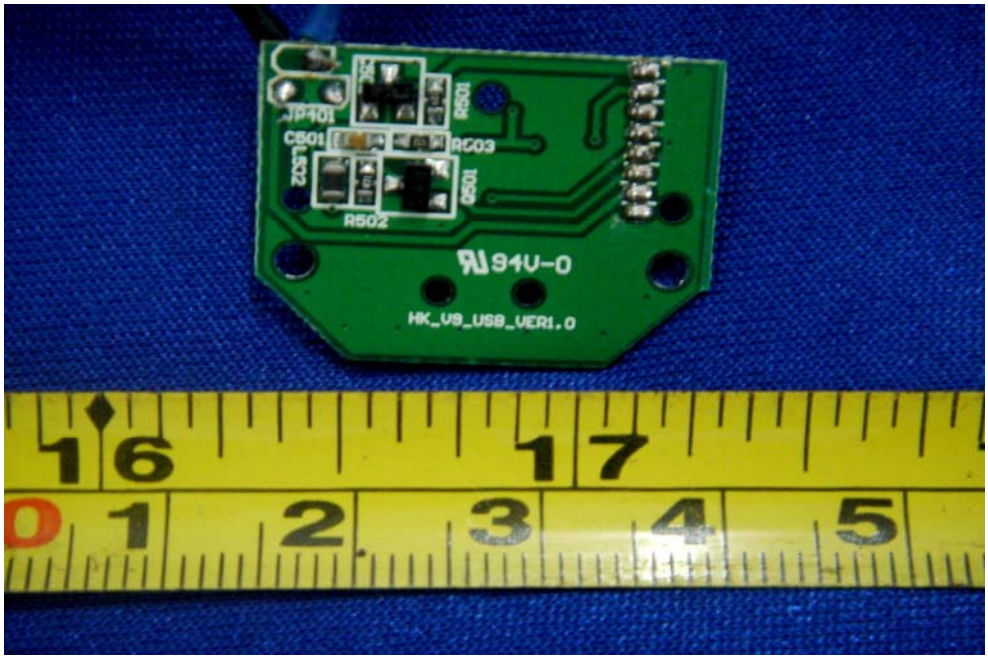
### 10.6 PCB2-Back View



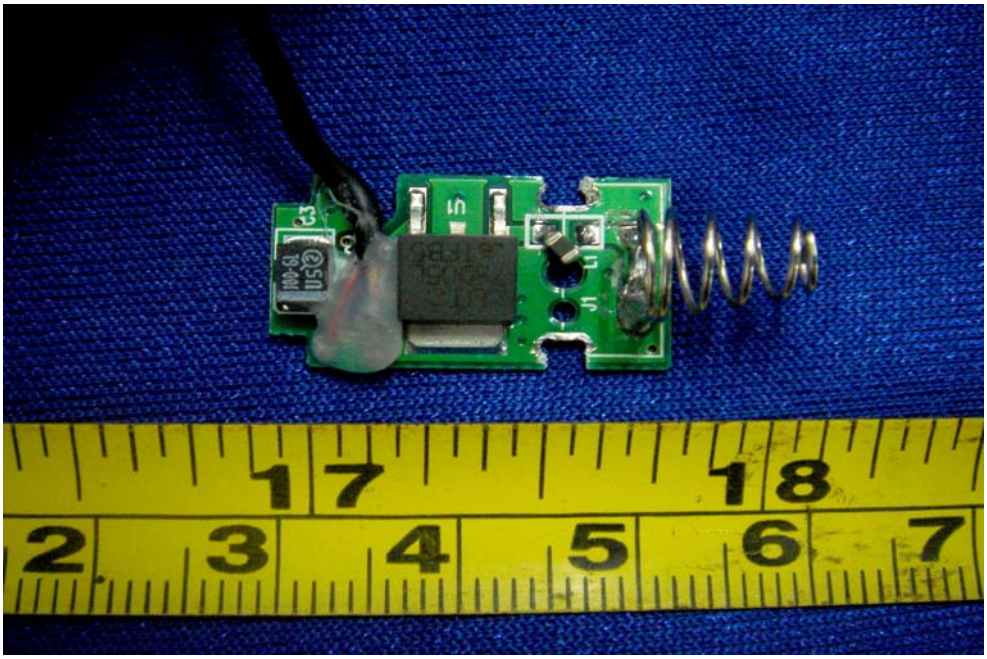
## 10.7 PCB3-Front View



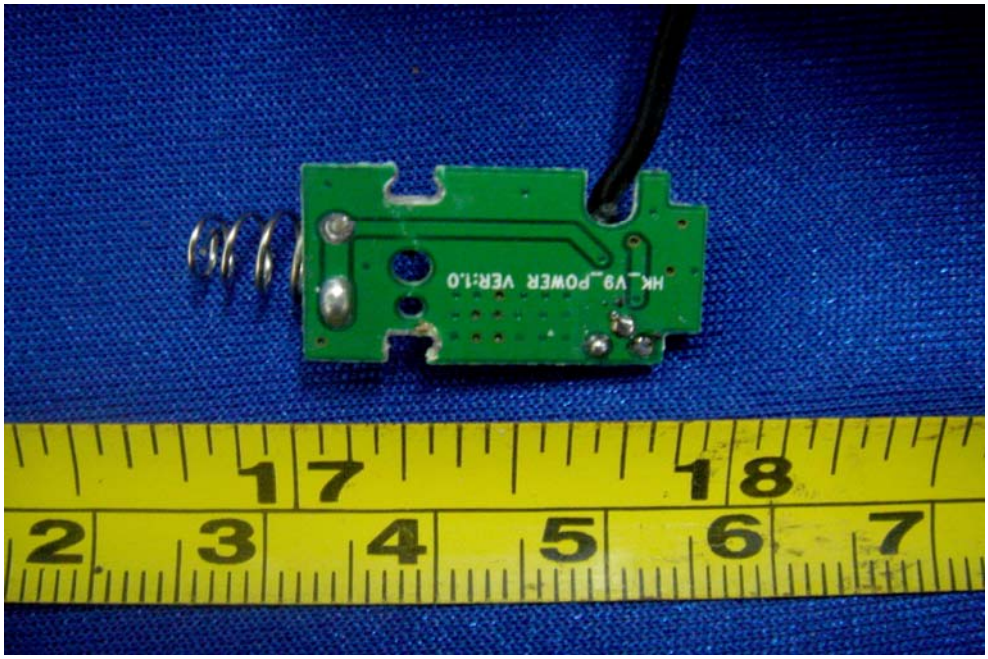

## 10.8 PCB3-Back View



### 10.9 PCB4-Front View



### 10.10 PCB4-Back 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 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