

FCC TEST REPORT

FCC ID : RR7BTCK-006

Applicant : **GREAT WELL ELECTRONIC LTD.**
The Third Industrial Area, 518110, Guanlan Town, Shenzhen City, China

Equipment Under Test (EUT) :

Product description : Bluetooth Carkit (BTCK006)

Model No. : GW-BTCK-006, VRBT200V

Standards : FCC 15 Paragraph 15.247

Date of Test : July 31, 2006

Test Engineer : Tiger Su

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3 Test Summary

| Test | Test Requirement | Test Method | Class / Severity | Result |
|---|-------------------|------------------|------------------|--------|
| Radiated Emission (30MHz to 25GHz) | 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:

Address of Applicant:

GREAT WELL ELECTRONIC LTD.

The Third Industrial Area, 518110, Guanlan Town, Shenzhen City, China

4.2 General Description of E.U.T.

Product description: Bluetooth Carkit (BTCK006)
Model No.: GW-BTCK-006, VRBT200V

4.3 Details of E.U.T.

Power Supply: 3.7VDC Battery

4.4 Description of Support Units

The EUT has been tested as an independent unit.

4.5 Standards Applicable for Testing

The customer requested FCC tests for a Bluetooth Carkit(BTCK006). The standards used were FCC 15 Paragraph 15.247, Paragraph 15.205, Paragraph 15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

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.

4.7 Test Location

All Emissions tests were 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 | 2005-08 |
| EMI Test Receiver | R&S | ESS | 12 | 2005-08 |
| Pre Amplifier | Anritsu | MH648A | 12 | 2005-08 |
| Bilog Antenna | SCHAFFNER | CBL6111C | 12 | 2005-08 |
| Loop Antenna | R&S | 6108 | 12 | 2005-08 |
| Horn Antenna | ETS.LINDGERN | GH14-H052 | 12 | 2005-08 |
| AM/FM Stereo Signal Generator | Panasonic | VP-8122A | 12 | 2005-08 |
| Signal Generator | R&S | SMG | 12 | 2005-08 |
| RF Selector | TOYO | NS4901A | - | - |
| Turn Disc | HD | DS4150S | - | - |
| Antenna Mast | HD | MA2400 | - | - |
| EMI Shielded Room | | | | |
| Spectrum analyzer | ADVANTEST | R3261C | 12 | 2005-08 |
| EMI Test Receiver | R&S | ESS | 12 | 2005-08 |
| Pre Amplifier | Anritsu | MH648A | 12 | 2005-08 |
| LISN | Kyoritsu | KNW-403D | 12 | 2005-08 |
| Absorbing Clamp | R&S | MDS-21 | 12 | 2005-08 |
| Distortion Meter | MEGURO | MAK-6578A | 12 | 2005-08 |
| AM/FM Stereo Signal Generator | Panasonic | VP-8122A | 12 | 2005-08 |
| Oscilloscope | LEADER | LS1020 | 12 | 2005-08 |
| Function Generator | National | VP-7422A | 12 | 2005-08 |
| Signal Generator | R&S | SMG | 12 | 2005-08 |
| RF Selector | TOYO | NS4000 | - | - |
| Remote Controller | TOYO | MAC | - | - |

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

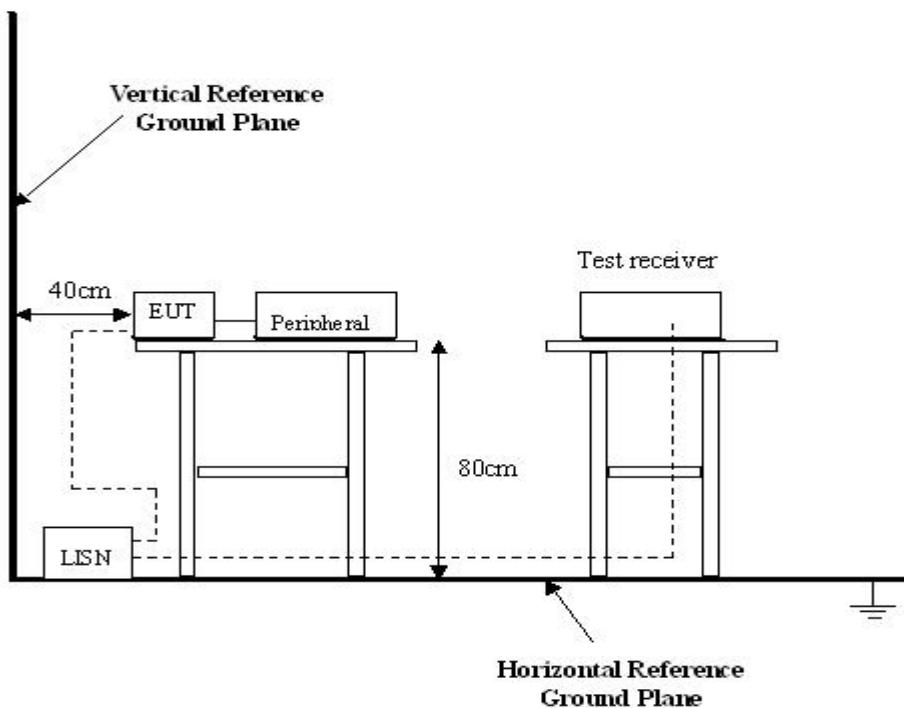
Please refer to Section 5 this report.

6.2 Test Procedure

1. The EUT was tested according to ANSI C63.4:2003. 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

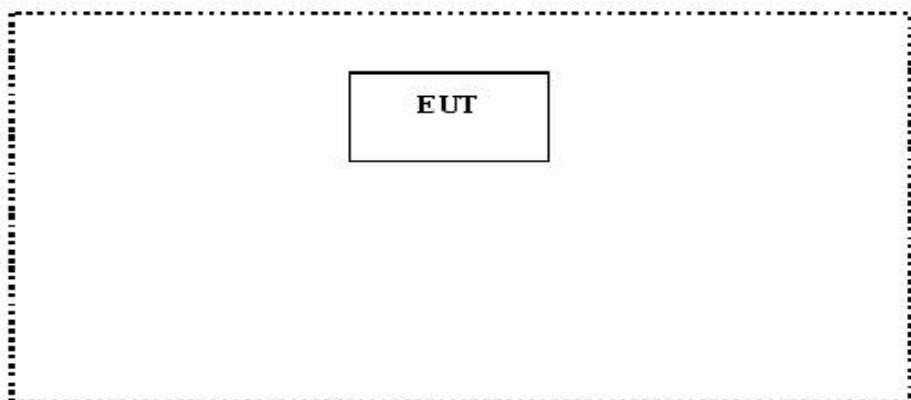
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



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 dB μ V/m between 0.15MHz & 0.5MHz

56 dB μ V/m between 0.5MHz & 5MHz

60 dB μ V/m between 5MHz & 30MHz

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

6.6 Conducted Emission Test Result

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

7 Radiation Emission Test

| | |
|-----------------------|---|
| Test Requirement: | FCC Part15 Paragraph 15.247 |
| Test Method: | Based on ANSI 63.4:2003 |
| Test Date: | July 31, 2006 |
| Frequency Range: | 30MHz to 25GHz |
| Measurement Distance: | 3m |
| Detector: | Peak for pre-scan (120kHz resolution bandwidth) Quasi-Peak if maximised peak within 6dB of limit |

7.1 Test Equipment

Please refer to Section 5 this report.

7.2 Measurement Uncertainty

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

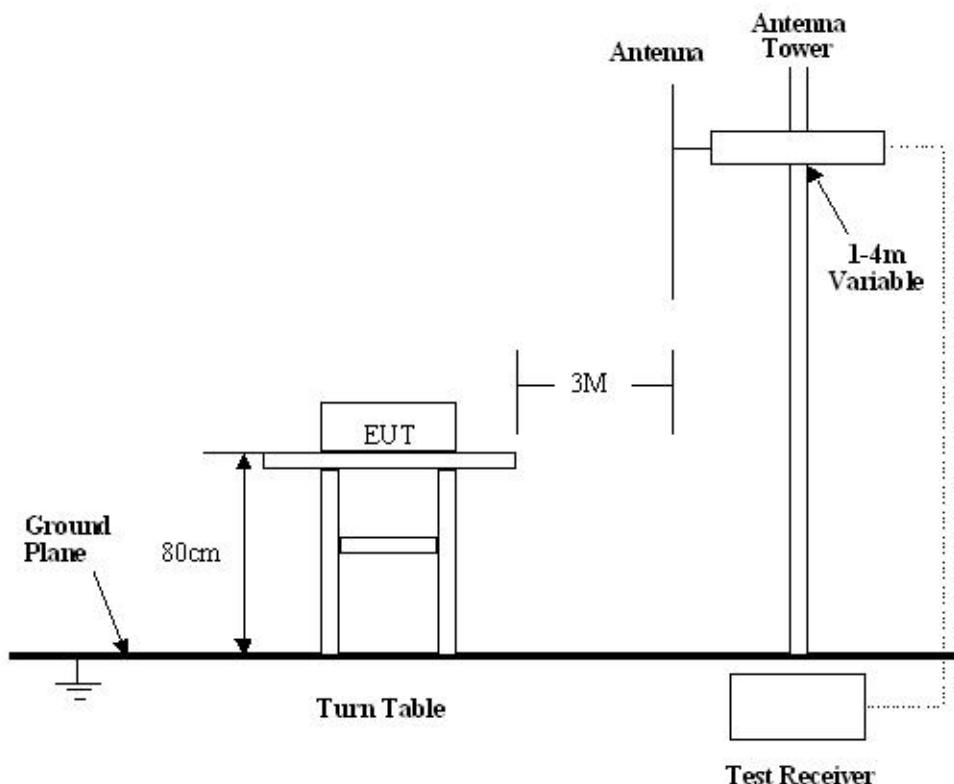
Based on ANSI C63.4:2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at SGS EMC Lab is +4.0 dB.

7.3 Test Procedure

1. For the radiated emissions test, since the EUT does not have a power source, there was no connection to AC outlets.
2. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
3. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB μ V of specification limits), and are distinguished with a "Qp" in the data table.
4. The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.

7.4 Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.209 limits and Paragraph 15.247 limits.



7.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.247 Rules, the system was tested to 25000 MHz.

| | |
|------------------------------------|-----------|
| Start Frequency | 30 MHz |
| Stop Frequency | 25000 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 $-7\text{dB}\mu\text{V}$ means the emission is $7\text{dB}\mu\text{V}$ 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 15.247 standards.

7.8 EUT Operating Condition

Same as section 6.4 of this report.

Let the EUT work in test mode(Tx Low/Tx Middle/Tx High) and test it.

7.9 Radiated Emissions Limit 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.
- (4) 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.
- (5) Above 1GHz,do a Peak and average measurements for all emissions,Limit for peak is 74dBuvV/m,According to Part15.35(b) and average is 54BuvV/m.

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 analyser (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 preselector was accounted For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

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

7.11 Radiated Emission Data

| | | | | | | | |
|---------------|------------------------------|--|--|--|--|--|--|
| Test Item: | Radiated Emission Data | | | | | | |
| Test Voltage: | 3.7 VDC | | | | | | |
| Test Mode: | On(Tx Low/Tx Middle/Tx High) | | | | | | |
| Temperature: | 24 °C | | | | | | |
| Humidity: | 52%RH | | | | | | |
| Test Result: | PASS | | | | | | |

Remarks: 30-1000MHz radiation test no significant emissions above the equipment noise floor were detected.

| Frequency(MHz) | Detector | Antenna Polarization | Emission Level (dBuV/m) | FCC 15 Subpart C Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Turntable Angle (°) |
|-----------------|----------|----------------------|-------------------------|---------------------------------|-------------|--------------------|-----------------------|
| Low frequency | | | | | | | |
| 2402.00 | AV | Vertical | 76.56 | | (Fund.) | 1.5 | 90 |
| 4804.00 | AV | Vertical | 44.13 | 54.00 | 9.87 | 1.5 | 90 |
| 7206.00 | AV | Vertical | 41.66 | 54.00 | 12.34 | 1.8 | 45 |
| 2402.00 | AV | Horizontal | 77.21 | | (Fund.) | 1.5 | 270 |
| 4804.00 | AV | Horizontal | 43.28 | 54.00 | 10.72 | 1.6 | 90 |
| 7206.00 | AV | Horizontal | 43.87 | 54.00 | 10.13 | 1.5 | 90 |
| 2402.00 | PK | Vertical | 80.66 | | (Fund.) | 1.5 | 90 |
| 4804.00 | PK | Vertical | 47.81 | 74.00 | 26.19 | 1.5 | 180 |
| 7206.00 | PK | Vertical | 45.85 | 74.00 | 28.15 | 1.8 | 45 |
| 2402.00 | PK | Horizontal | 79.63 | | (Fund.) | 1.5 | 230 |
| 4804.00 | PK | Horizontal | 47.29 | 74.00 | 26.71 | 1.6 | 60 |
| 7206.00 | PK | Horizontal | 47.13 | 74.00 | 26.87 | 1.5 | 180 |

| Middle frequency | | | | | | | |
|------------------|----|------------|-------|-------|---------|-----|-----|
| 2441.00 | AV | Vertical | 77.84 | | (Fund.) | 1.5 | 90 |
| 4882.00 | AV | Vertical | 46.54 | 54.00 | 7.46 | 1.5 | 90 |
| 7323.00 | AV | Vertical | 41.34 | 54.00 | 12.66 | 1.6 | 60 |
| 2441.00 | AV | Horizontal | 79.56 | | (Fund.) | 1.5 | 45 |
| 4882.00 | AV | Horizontal | 45.92 | 54.00 | 8.08 | 1.5 | 250 |
| 7323.00 | AV | Horizontal | 39.29 | 54.00 | 14.71 | 1.8 | 60 |
| 2441.00 | PK | Vertical | 81.52 | | (Fund.) | 1.5 | 45 |
| 4882.00 | PK | Vertical | 51.16 | 74.00 | 22.84 | 1.5 | 80 |
| 7323.00 | PK | Vertical | 44.89 | 74.00 | 29.11 | 1.5 | 230 |
| 2441.00 | PK | Horizontal | 82.41 | | (Fund.) | 1.5 | 180 |
| 4882.00 | PK | Horizontal | 48.59 | 74.00 | 25.41 | 1.8 | 60 |
| 7323.00 | PK | Horizontal | 43.23 | 74.00 | 30.77 | 1.5 | 90 |
| High frequency | | | | | | | |
| 2480.00 | AV | Vertical | 78.65 | | (Fund.) | 1.5 | 120 |
| 4960.00 | AV | Vertical | 42.56 | 54.00 | 11.44 | 1.5 | 60 |
| 7440.00 | AV | Vertical | 40.94 | 54.00 | 13.06 | 1.5 | 80 |
| 2480.00 | AV | Horizontal | 78.72 | | (Fund.) | 1.5 | 120 |
| 4960.00 | AV | Horizontal | 43.67 | 54.00 | 10.33 | 1.5 | 45 |
| 7440.00 | AV | Horizontal | 39.69 | 54.00 | 14.31 | 1.5 | 210 |
| 2480.00 | PK | Vertical | 81.45 | | (Fund.) | 1.5 | 80 |
| 4960.00 | PK | Vertical | 46.63 | 74.00 | 27.37 | 1.5 | 270 |
| 7440.00 | PK | Vertical | 43.12 | 74.00 | 30.88 | 1.5 | 90 |
| 2480.00 | PK | Horizontal | 80.59 | | (Fund.) | 1.5 | 45 |
| 4960.00 | PK | Horizontal | 47.88 | 74.00 | 26.12 | 1.5 | 250 |
| 7440.00 | PK | Horizontal | 44.57 | 74.00 | 29.43 | 1.5 | 60 |

8 Maximum Peak Output Power

Test Requirement: FCC Part15 Paragraph 15.247
Test Method: Based on ANSI 63.4:2003
Test Date: July 31, 2006
Test mode: Compliance test in the worse case: Tx Low/Tx Middle/Tx High
Requirements: Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 1W(30dBm)

Test procedure:

The following test procedure as below:

1. The EUT was powered ON and placed on a table in the chamer.The antenna of the transmitter was extended to its maximum length.
2. The fundamental frequency of the transmitter was maximized on the test receiver display by raising and lowering the receive antenna and by rotating the turntable.After the fundamental emission was maximized,afield strength measurement was made.
3. The device under test has an integral antenna and the power was measured on a radiated basis.

Test Result:

| Test Channel | Fundamental Frequency(GHz) | Output Power (mW) | Limit (W) | Power output level |
|--------------|----------------------------|-------------------|-----------|--------------------|
| low | 2.402 | 2.52 | 1 | EIRP |
| middle | 2.441 | 2.57 | 1 | EIRP |
| high | 2.480 | 2.55 | 1 | EIRP |

Test Results:The unit does meet the FCC requirements.

9 Hopping Channel Number

Test Requirement: FCC Part15 C

Test Method: Based on FCC Part15 Paragraph 15.247

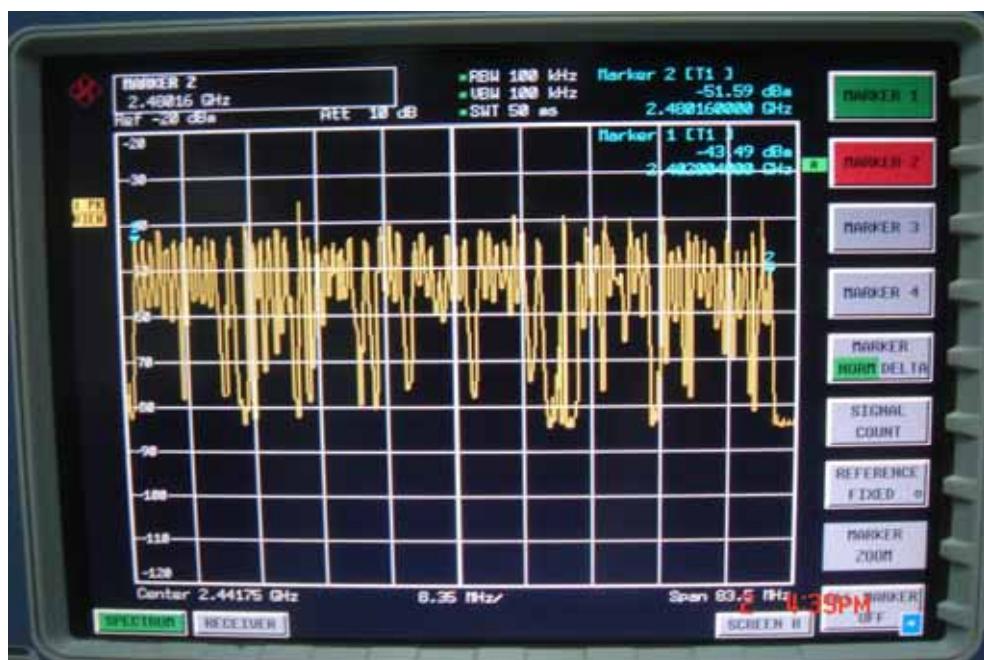
Test Date: July 31, 2006

Test mode: The EUT work in test mode(Tx) and test it

Requirements: Regulation 15.247(a) For frequency hopping systems operating In the 2400-2483.5MHz band employing at least 75hopping channels.

Test result: The total number of channels would be 79 channels.
The unit does meet the FCC requirements.

Please refer the graph as below:



10 Carrier Frequencies Separated

Test Requirement: FCC Part15 C
Test Method: Based on FCC Part15 Paragraph 15.247
Test Date: July 31, 2006
Test mode: The EUT work in test mode(Tx) and test it
Requirements: The bandwidth of the fundamental frequency was measur by spectrum analyser with 100KHz RBW and 100KHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.
Test result: PASS

Channel Carrier Frequency Separated

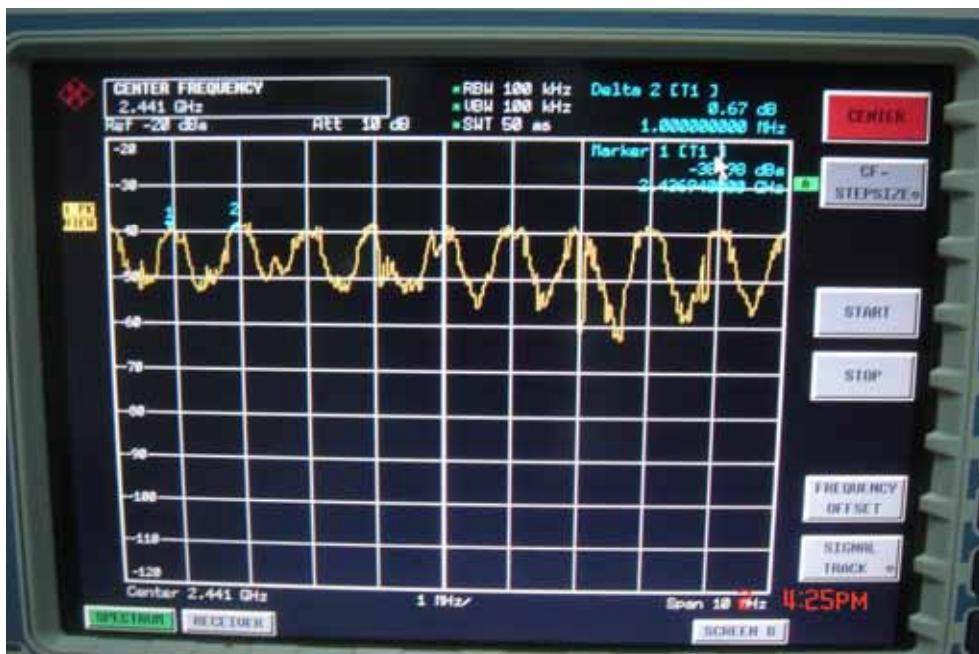
| Test Channel | Carrier Frequencies Separated | PASS/FAIL |
|---|-------------------------------|-----------|
| Lower Channels (channel 1 and channel 2) | 1MHz | Pass |
| Lower Channels (channel 39 and channel 40) | 1MHz | Pass |
| Lower Channels (channel 78 and channel 79) | 1MHz | Pass |

The unit does meet the FCC requirements.

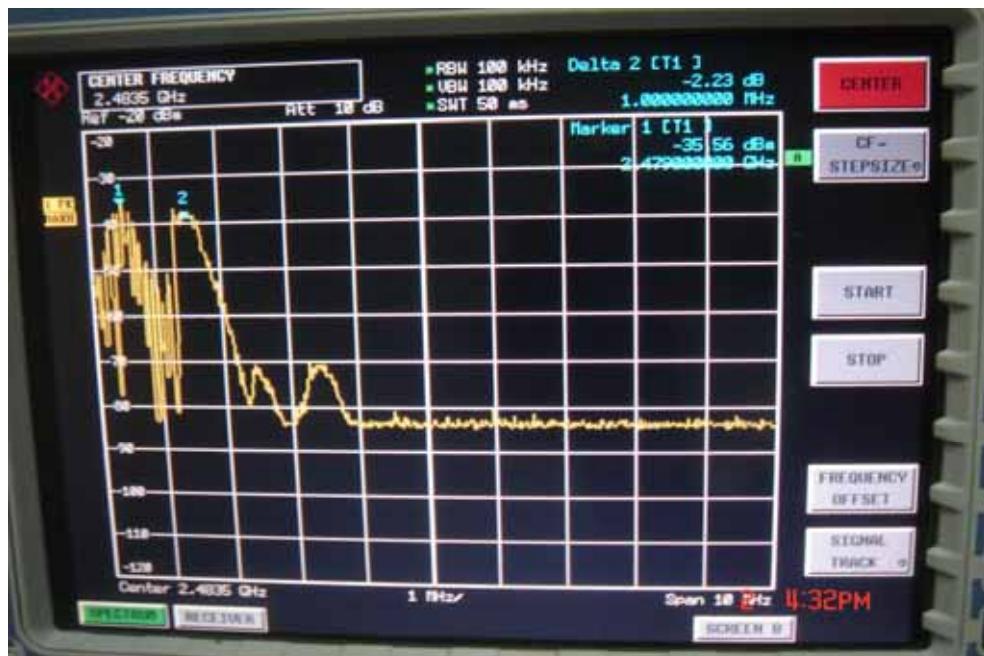
10.1 Lower Channels:Carrier Frequencies Separated



10.2 Middle Channels:Carrier Frequencies Separated



10.3 Upper Channels:Carrier Frequencies Separated



11 Dwell Time

| | |
|-------------------|---|
| Test Requirement: | FCC Part15 C |
| Test Method: | Based on FCC Part15 Paragraph 15.247 |
| Test Date: | July 31, 2006 |
| Test mode: | The EUT work in test mode(Tx) and test it |

Requirements: 15.247 a(1)(iii)Frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

11.1 Test procedure

EUT and its simulators are placed on a turn table, the EUT and let it work normally, let EUT working in test mode, then test it.

The bandwidth of the fundamental frequency was measured with the spectrum analyser using 1MHz RBW and 1MHz VBW, set sweep time: 1.7 ms. Span: 0Hz.

11.2 Test Results : PASS

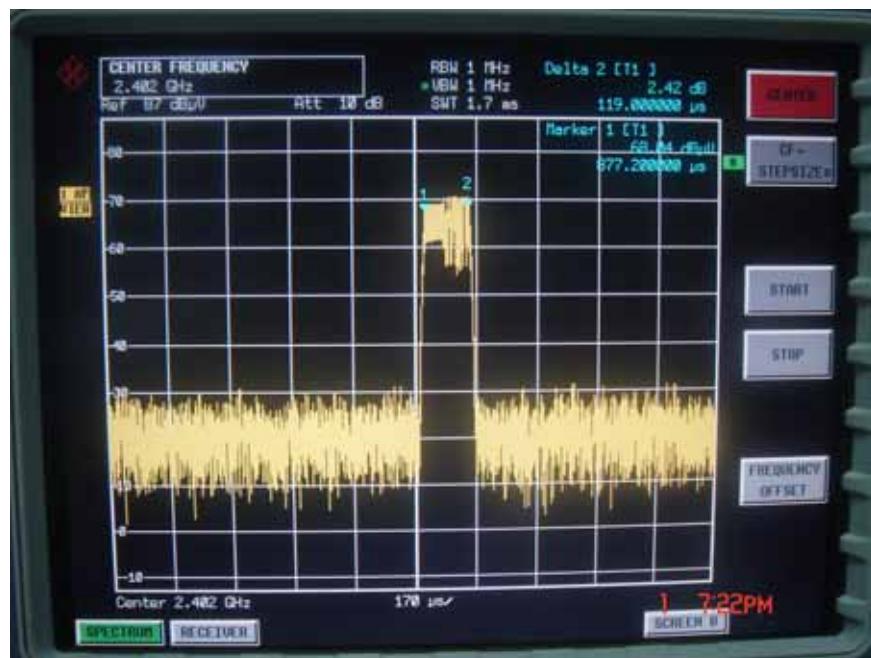
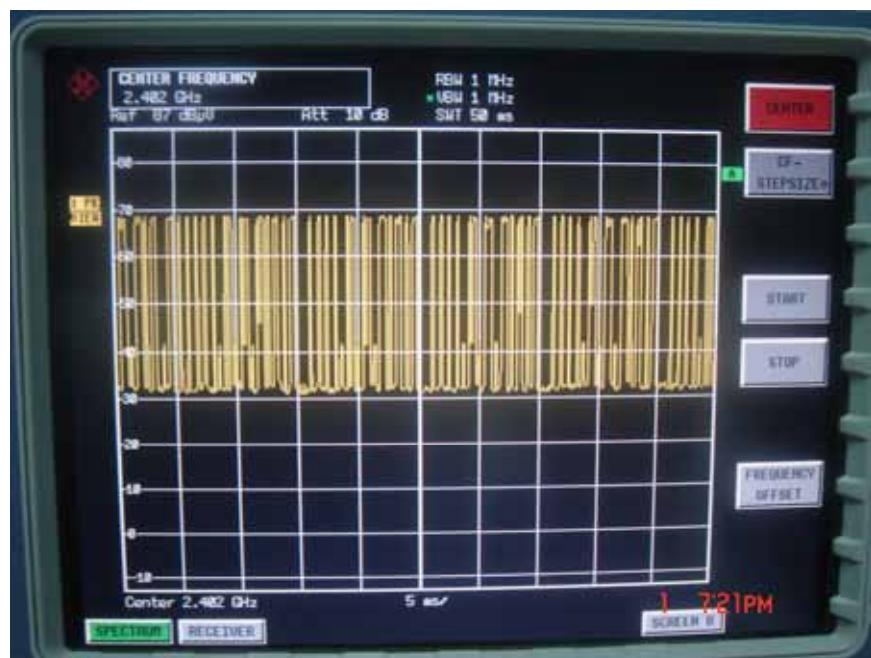
Sample calculation: In normal operation, there are 5 transmissions per 50ms. Therefore, the dwell time for each channel is:

- 1.Low Channel: $0.119\text{ms} \times (42/50\text{ms} \times 32\text{s})/80 = 0.039984 \text{ s} < 0.4 \text{ s}$
- 2.Middle Channel: $0.119\text{ms} \times (42/50\text{ms} \times 32\text{s})/80 = 0.039984 \text{ s} < 0.4 \text{ s}$
- 3.High Channel: $0.119\text{ms} \times (42/50\text{ms} \times 32\text{s})/80 = 0.039984 \text{ s} < 0.4 \text{ s}$

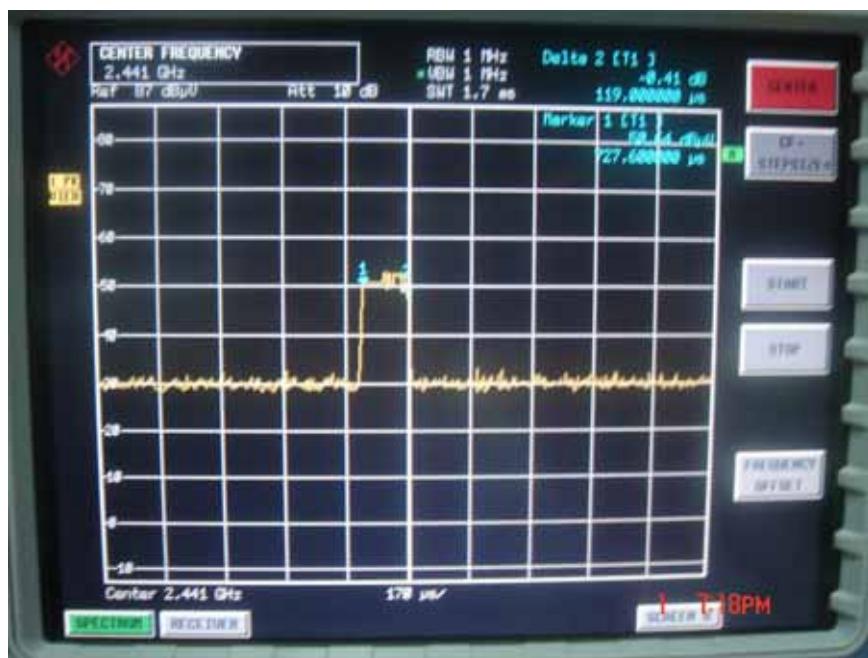
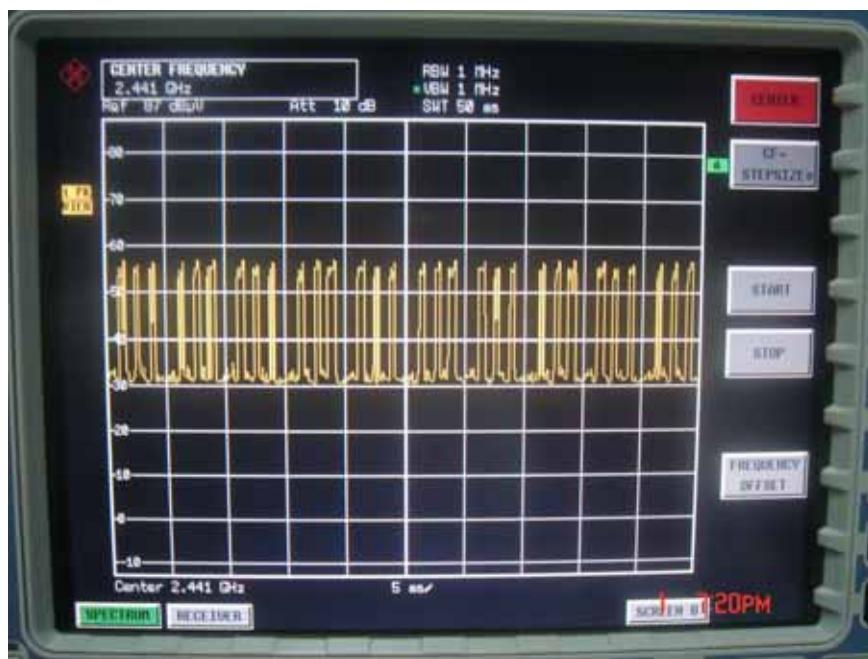
The Results are not be greater than 0.4 seconds.

Please refer the graph as below:

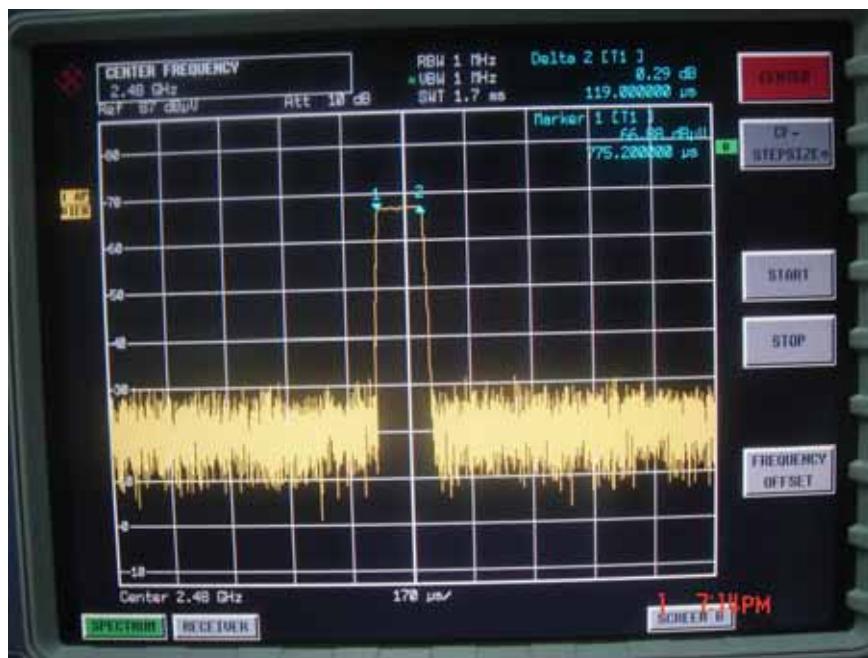
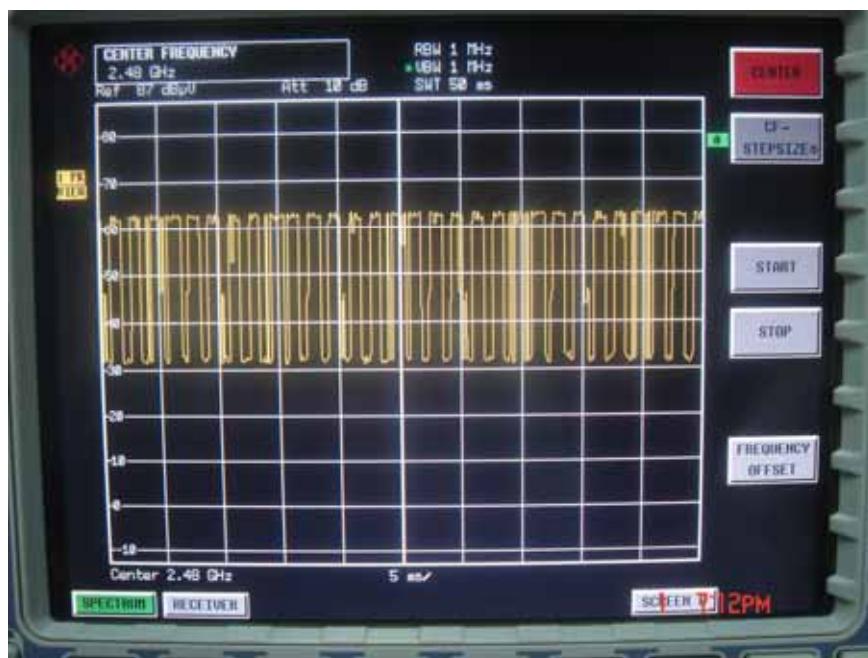
Channel 0: 2.402GHz



Channel 39: 2.441GHz



Channel 79: 2.480GHz



12 20-dB Bandwidth

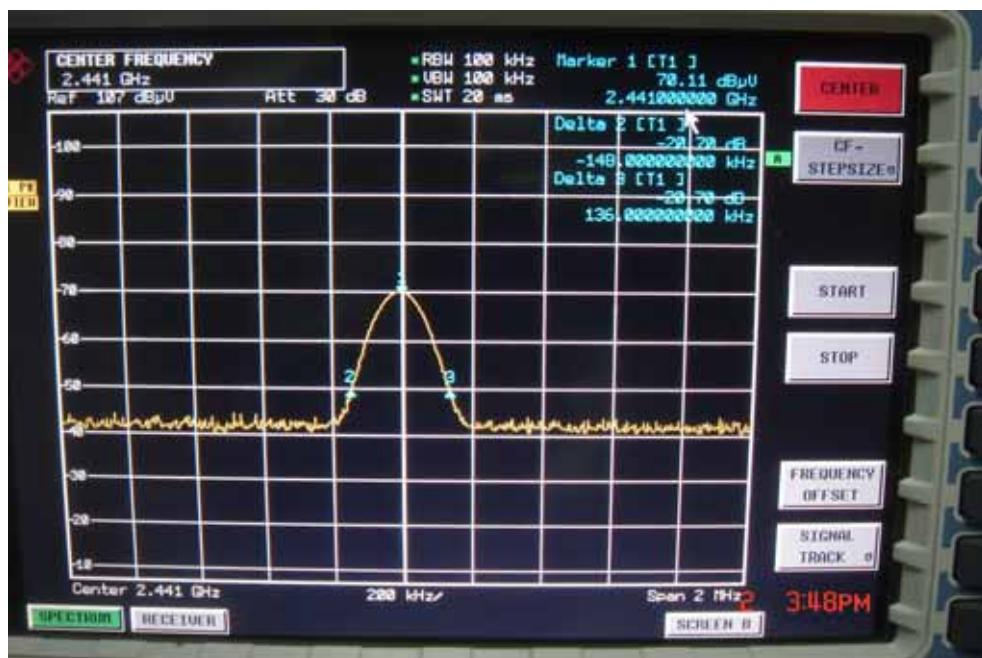
| | |
|-------------------|---|
| Test Requirement: | FCC Part15 C |
| Test Method: | Based on FCC Part15 Paragraph 15.247 |
| Test Date: | July 31, 2006 |
| Test mode: | The EUT work in test mode(Tx) and test it |

12.1 Test Procedure

1. The EUT, peripherals were put on the turntable which table size is 1mX1.5m, table high 0.8m. All set up is according to ANSI C63.4:2003.
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 height were varied from 1m to 4m high to find the maximum emission for each frequency.
4. The bandwidth of the fundamental frequency was measured by spectrum analyser with 100KHz RBW and 100KHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

12.2 Test Result

Please refer the graph as below:



13 Radiated spurious emissions into adjacent restricted band

Test Requirement: FCC Part15 Paragraph 15.205

Test Method: Based on FCC Part 15 Paragraph 15.247

Test Date: July 31, 2006

Requirements: The EUT work in test mode(Tx) and test it

Requirements:emissions that fall in the restricted bands(15.205).These emissions must be less than or equal to 500uV/m(54 dBuV/m)

Test procedure:An in band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4-2003 and FCC Rules.The procedure was repeated with an average detector and a plot made.The calculated field strength in the adjacent restricted band is presented below.

lower bandedge/ restricted band (peak value)



From plot, Reading is 44.43dBuV/m with TDS has been calculated Peak meets the average value(54 dBuV/m).

Upper bandedge and restricted band (peak value)



From plot, Reading is 34.26dBuV/m with TDS has been calculated Peak meets the average value(54 dBuV/m)

14 Photographs of Testing

14.1 Radiation Emission Test View For 30MHz-1000MHz



14.2 Radiation Emission Test View For 1GHz-25GHz



15 Photographs - Constructional Details

15.1 EUT - Front View



15.2 EUT - Back View



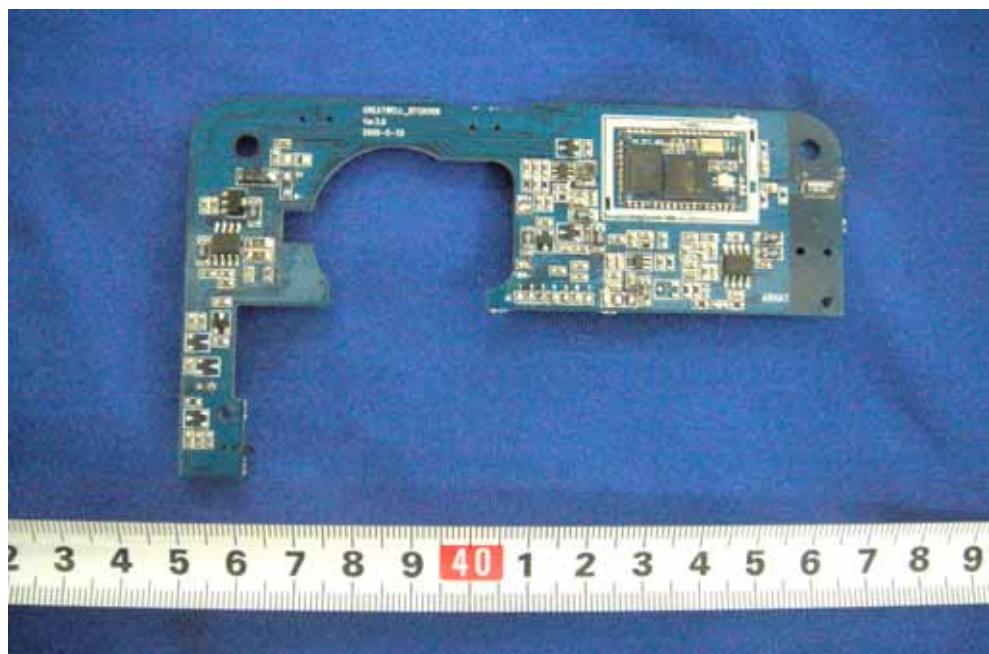
15.3 Adapter - Front View



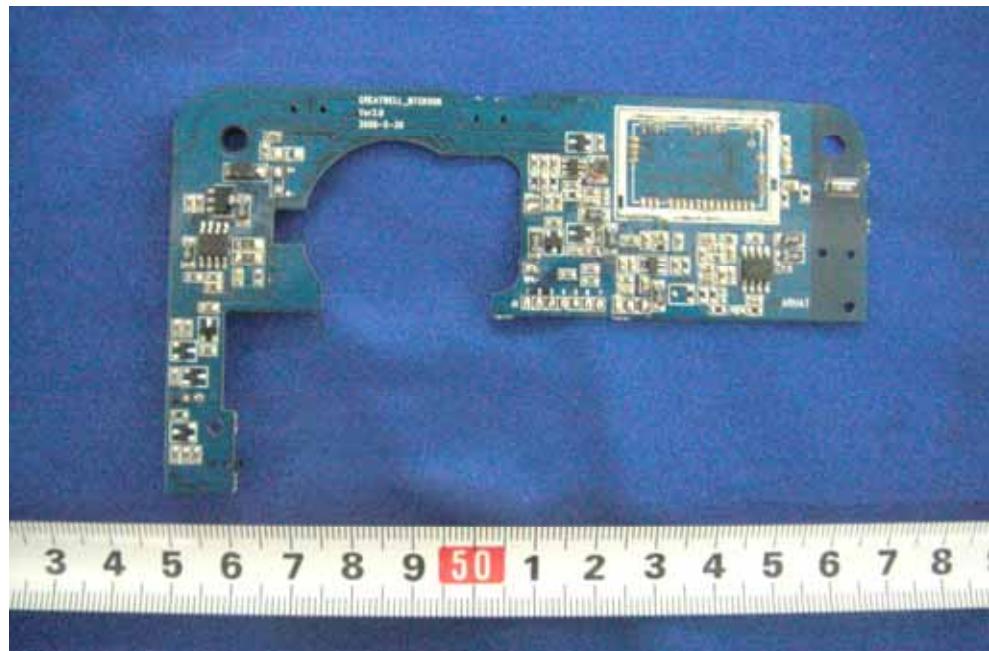
15.4 Adapter - Back View



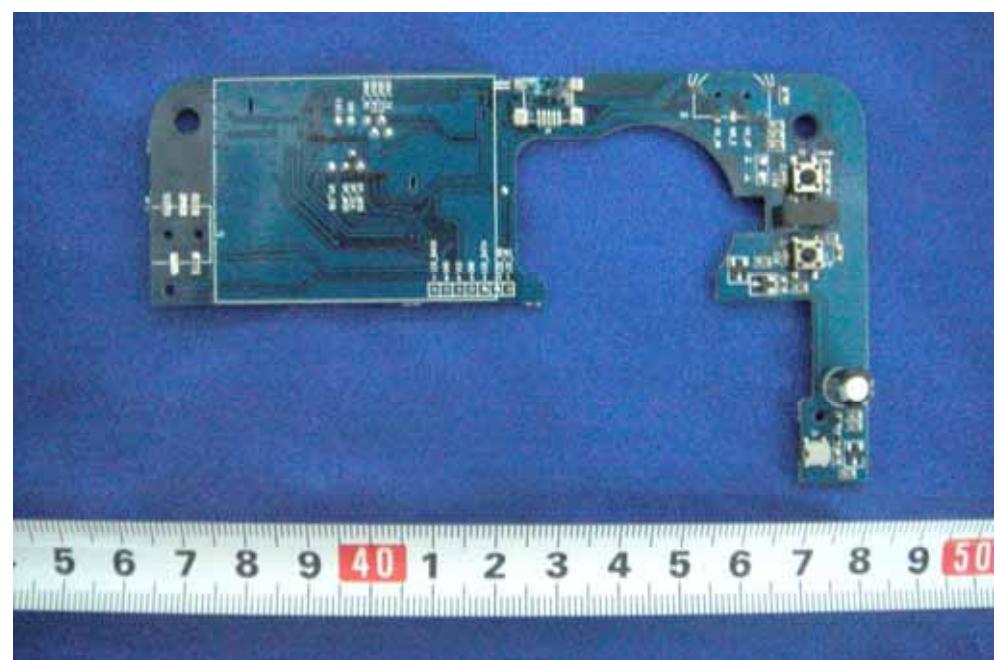
15.5 PCB - Solder View



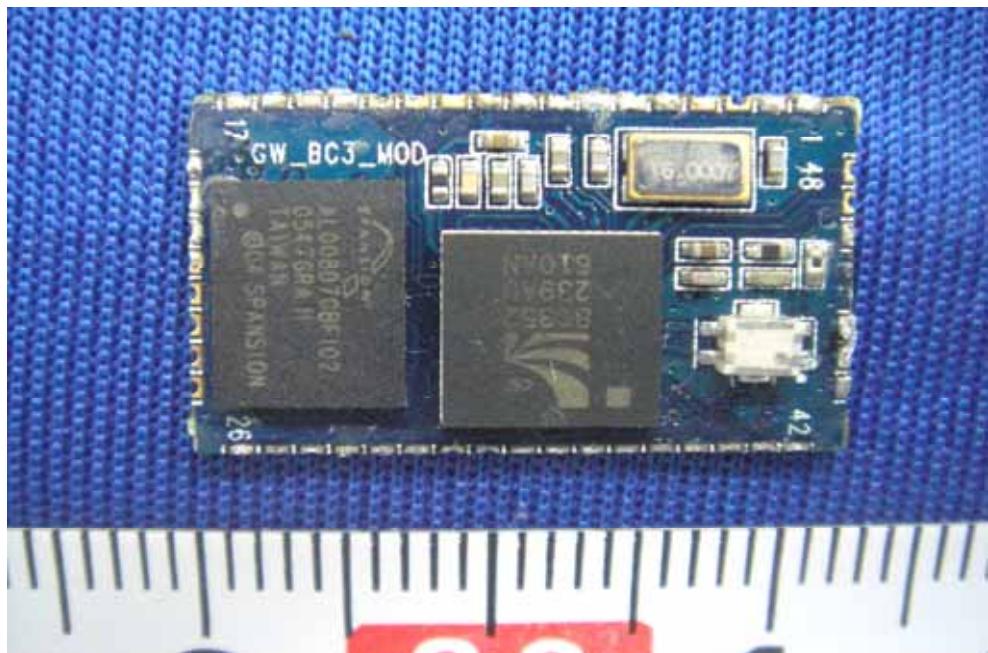
15.6 PCB 1- Front View



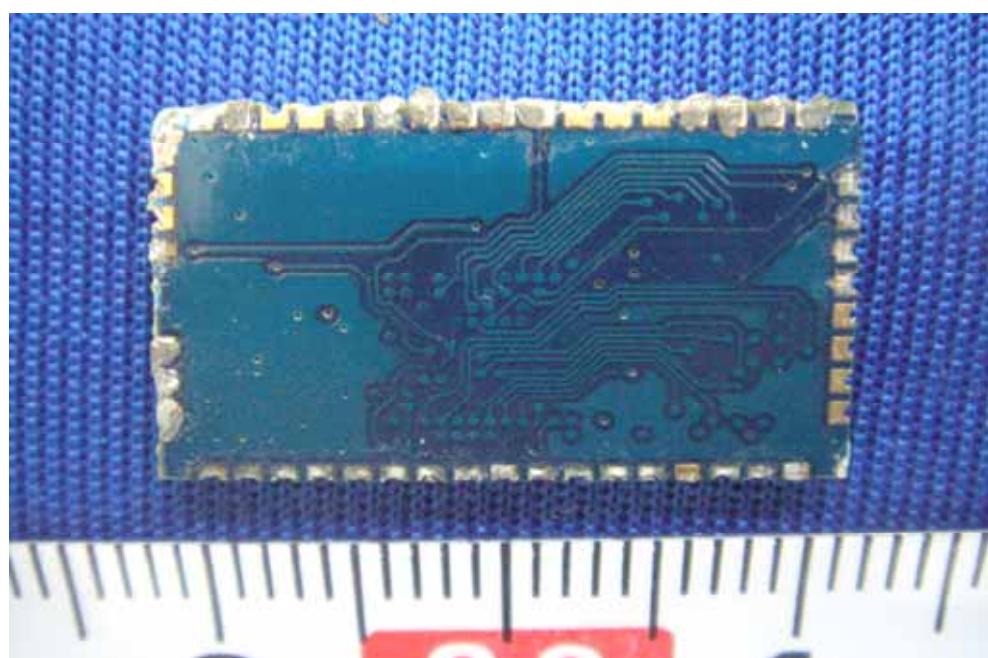
15.7 PCB 1- Back View



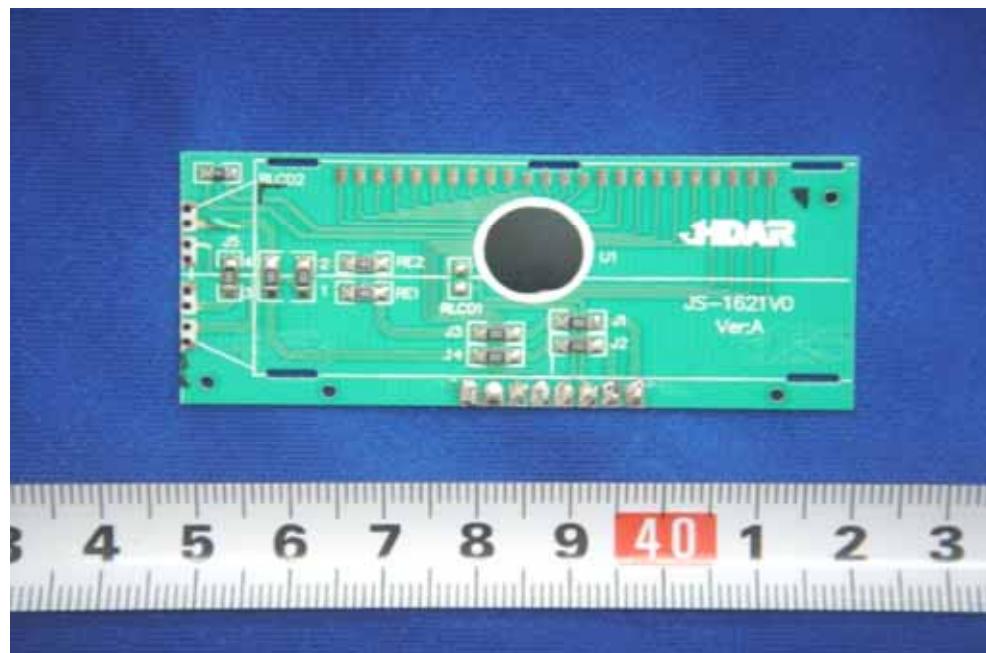
15.8 PCB 2- Front View



15.9 PCB 2- Back View



15.10 PCB 3- Front View



15.11 PCB 3- Back View



15.12 Battery- Front View



15.13 Battery- Back View



16 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

