

FCC TEST REPORT

REPORT NO.: SE08FCI176R-2

MODEL NO.: HAC-UBee

LISTED MODELS: N/A

RECEIVED: Aug 19, 2008

TESTED: Aug 19, 2008 to Aug 21, 2008

APPLICANT: Shenzhen HAC Telecom Technology Co., Ltd.

ADDRESS: 1903, Tower A of Haisong Bldg, 9th Tairan Road, Chegongmiao, Futian,
Shenzhen, China.

ISSUED BY: SHENZHEN SETEK TECHNOLOGY CO., LTD.

LAB LOCATION: 2/F,A3 Bldg, East Industry Zone, Overseas Chinese Town,
Shenzhen,China

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SHENZHEN SETEK TECHNOLOGY CO., LTD.

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Prepared for : Shenzhen HAC Telecom Technology Co., Ltd.

Address : 1903, Tower A of Haisong Bldg, 9th Tairan Road, Chegongmiao, Futian, Shenzhen, China.

Product : Zigbee module

Model No(s). : HAC-UBee

Trademark : N/A


Test Standard : FCC Part 15 Paragraph 15.249

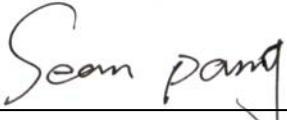
Prepared by : SHENZHEN SETEK TECHNOLOGY CO., LTD.

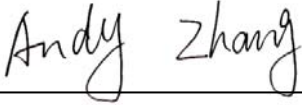
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Approved by : 
(Manager)

Report Number : SE08FCI176R-2

Date of Test : Aug 19, 2008 to Aug 21, 2008

Date of Report : Aug 22, 2008

The device described above is tested by SHENZHEN SETEK TECHNOLOGY CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. This report applies to above tested sample only and shall not be reproduced in part without written approval of SHENZHEN SETEK TECHNOLOGY CO., LTD.

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1. GENERAL INFORMATION

1.1 Description of Device (EUT)

| | |
|------------------------|---|
| Applicant | : Shenzhen HAC Telecom Technology Co., Ltd. |
| Address | : 1903, Tower A of Haisong Bldg, 9 th Tairan Road, Chegongmiao, Futian, Shenzhen, China. |
| Manufacturer | : Shenzhen HAC Telecom Technology Co., Ltd. |
| Address | : 1903, Tower A of Haisong Bldg, 9 th Tairan Road, Chegongmiao, Futian, Shenzhen, China. |
| EUT | : Zigbee module |
| Model Number(s) | : HAC-UBee |
| Description of EUT | : Zigbee module |
| Description of Antenna | : Reverse-Polarity SMA Antenna, gain:2.15dbi |
| Power Supply | : DC 3.3 -6.0V from the test jig |
| Operation Frequency | : 2405 MHz ~ 2480 MHz |
| Number of Channels | : 16 |
| Type of Modulation | : QPSK |
| Output Power Class | : Class 2 |
| Received | : Aug 19, 2008 |
| Date of Test | : Aug 19, 2008 to Aug 21, 2008 |

1.2. 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 | PASS |

1.3. Description of Support Device

The EUT has been tested as an independent unit.

1.4. Standards Applicable for Testing

The customer requested FCC tests for a Zigbee module. The standards used were FCC 15 Paragraph 15.249, Paragraph 15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

1.5. List of Measuring Equipments Used

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|------|--------------------------------|-----------------|-------------|------------|-------------|---------------|
| 1. | Spectrum Analyzer | Agilent | E4408B | MY44210575 | May 29,2008 | 1 Year |
| 2. | Test Receiver | Rohde & Schwarz | ESIB26 | 100234 | May 29,2008 | 1 Year |
| 3. | Bilog Antenna | Schwarzbeck | VULB9163 | 142 | May 29,2008 | 1 Year |
| 4. | Loop Antenna | EMCO | 6502 | 00042960 | May 29,2008 | 1 Year |
| 5. | 50 Coaxial Switch | Anritsu Corp | MP59B | 6100237248 | May 29,2008 | 1 Year |
| 6. | Cable | Schwarzbeck | AK9513(1m) | CR RX2 | May 29,2008 | 1 Year |
| 7. | Cable | Schwarzbeck | AK9513(10m) | AC RX1 | May 29,2008 | 1 Year |
| 8. | Cable | Rosenberger | N/A(6m) | CR RX1 | May 29,2008 | 1 Year |
| 9. | Cable | Rosenberger | N/A(10m) | FP2RX2 | May 29,2008 | 1 Year |
| 9. | DC Power Filter | MPE | 23872C | N/A | May 29,2008 | 1 Year |
| 10. | Single Phase Power Line Filter | MPE | 23332C | N/A | May 29,2008 | 1 Year |
| 11. | 3 Phase Power Line Filter | MPE | 23333C | N/A | May 29,2008 | 1 Year |
| 12. | Signal Generator | HP | 8648A | 3625U00573 | May 29,2008 | 1 Year |
| 13. | Test Receiver | Rohde & Schwarz | ESCS30 | 100350 | May 29,2008 | 1 Year |
| 14. | L.I.S.N. | Rohde & Schwarz | ESH2-Z5 | 834549/005 | May 29,2008 | 1 Year |
| 15. | Pulse Limiter | Rohde & Schwarz | ESH3-Z2 | 100006 | May 29,2008 | 1 Year |
| 16. | RF Cable | FUJIKURA | RG-55/U | LISN Cable | May 29,2008 | 1 Year |
| 17. | Spectrum Analyzer | Agilent | E4446A | MY43360126 | May 29,2008 | 1 Year |
| 18. | Spectrum Analyzer | Agilent | E7405A | US41160416 | May 29,2008 | 1 Year |

1.6. Test Facility

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

FCC – Registration No.: 966959

SHENZHEN SETEK TECHNOLOGY CO., LTD, the EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission.

1.7. Measurement Uncertainty

Radiation Uncertainty : $U_r = \pm 3.84\text{dB}$

Conduction Uncertainty : $U_c = \pm 2.72\text{dB}$

2 Conducted Emission Test

| | |
|-------------------|---|
| Product Name: | Zigbee module |
| Test Requirement: | FCC Part15 Paragraph 15.207 |
| Test Method: | Based on FCC Part15 Paragraph 15.207 |
| Test Date: | Aug 19, 2008 |
| Frequency Range: | 150 kHz to 30MHz |
| Class: | Class B |
| Detector: | Peak for pre-scan (9 kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit |

2.1. Test Equipment

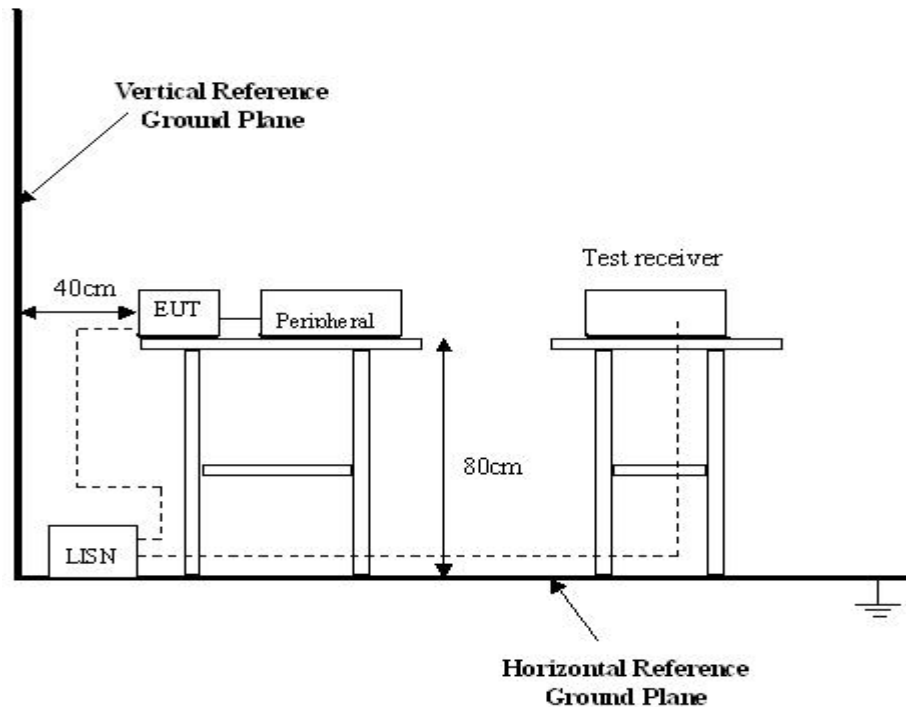
Please refer to Section 1.5. this report.

2.2. 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.

2.3. Conducted Test Setup

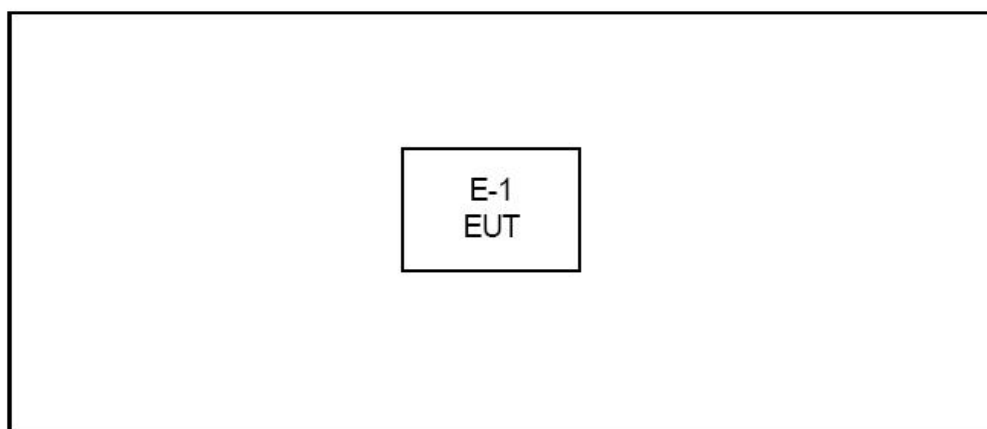
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



2.4. 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.



2.5. Conducted Emission Limits

66-56 dBuV/m between 0.15MHz & 0.5MHz

56 dBuV/m between 0.5MHz & 5MHz

60 dBuV/m between 5MHz & 30MHz

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

2.6. Test Result

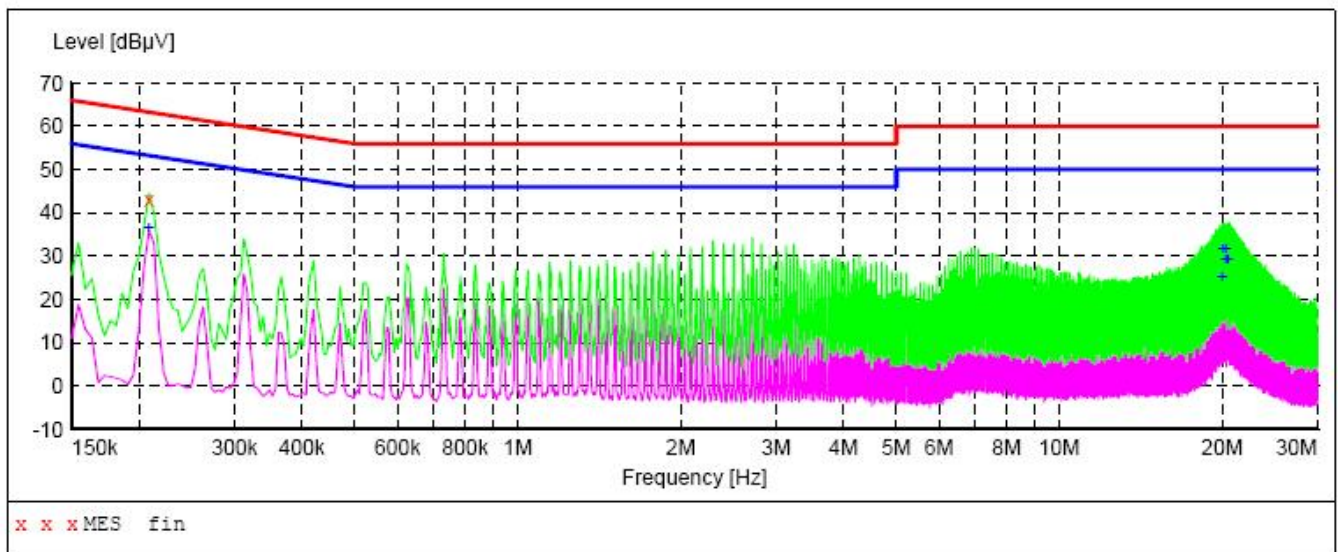
See the following pages

Voltage Mains Test FCC PART15 B

EUT: Zigbee module M/N:HAC-UBee
 Manufacturer: Shenzhen HAC Telecom Technology Co.,Ltd.
 Operating Condition: NORMAL WORKING
 Test Site: SHIELDED ROOM
 Operator: SAM
 Test Specification: AC 120V/60Hz
 Comment:
 Start of Test:

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT:**

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Detector | Line | PE |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.208500 | 43.00 | 10.1 | 63 | 20.3 | QP | N | GND |

MEASUREMENT RESULT:

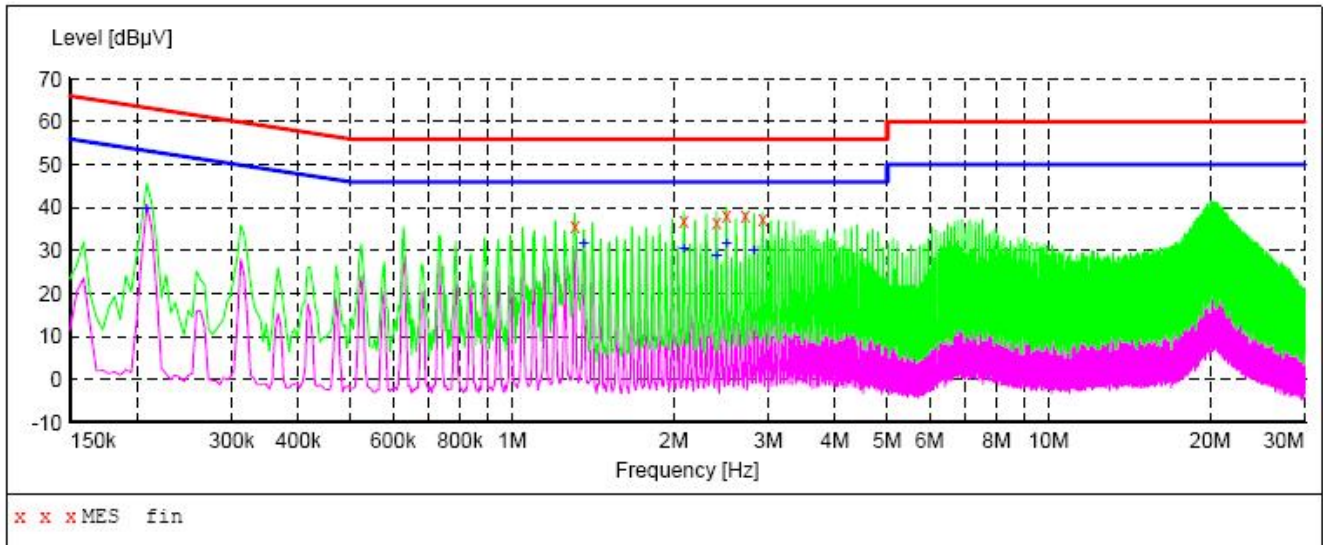
| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Detector | Line | PE |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.208500 | 36.40 | 10.1 | 53 | 16.9 | AV | N | GND |
| 19.995000 | 25.10 | 11.1 | 50 | 24.9 | AV | N | GND |
| 20.103000 | 31.60 | 11.1 | 50 | 18.4 | AV | N | GND |
| 20.310000 | 29.40 | 11.1 | 50 | 20.6 | AV | N | GND |
| 20.314500 | 31.80 | 11.1 | 50 | 18.2 | AV | N | GND |
| 20.521500 | 29.10 | 11.0 | 50 | 20.9 | AV | N | GND |

Voltage Mains Test FCC PART15 B

EUT: Zigbee module M/N:HAC-UBee
 Manufacturer: Shenzhen HAC Telecom Technology Co.,LTD.
 Operating Condition: NORMAL WORKING
 Test Site: SHIELDED ROOM
 Operator: SAM
 Test Specification: AC 120V/60Hz
 Comment:
 Start of Test:

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT:**

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Detector | Line | PE |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 1.311000 | 35.70 | 10.2 | 56 | 20.3 | QP | L1 | GND |
| 2.094000 | 37.00 | 10.2 | 56 | 19.0 | QP | L1 | GND |
| 2.404500 | 36.60 | 10.2 | 56 | 19.4 | QP | L1 | GND |
| 2.512500 | 38.10 | 10.2 | 56 | 17.9 | QP | L1 | GND |
| 2.719500 | 38.00 | 10.2 | 56 | 18.0 | QP | L1 | GND |
| 2.931000 | 37.30 | 10.2 | 56 | 18.7 | QP | L1 | GND |

MEASUREMENT RESULT:

| Frequency MHz | Level dBμV | Transd dB | Limit dBμV | Margin dB | Detector | Line | PE |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.208500 | 39.80 | 10.1 | 53 | 13.5 | AV | L1 | GND |
| 1.360500 | 31.70 | 10.2 | 46 | 14.3 | AV | L1 | GND |
| 2.094000 | 30.60 | 10.2 | 46 | 15.4 | AV | L1 | GND |
| 2.409000 | 28.80 | 10.2 | 46 | 17.2 | AV | L1 | GND |
| 2.512500 | 31.50 | 10.2 | 46 | 14.5 | AV | L1 | GND |
| 2.827500 | 30.00 | 10.2 | 46 | 16.0 | AV | L1 | GND |

3 Radiation Emission Test

| | |
|-----------------------|---|
| Product Name: | Zigbee module |
| Test Requirement: | FCC Part15 Paragraph 15.249 |
| Test Method: | Based on FCC Part15 Paragraph 15.31 and Paragraph 15.33 |
| Test Date: | Aug 20, 2008 |
| 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 |

3.1. Test Equipment

Please refer to Section 1.5. this report.

3.2. 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 centre variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

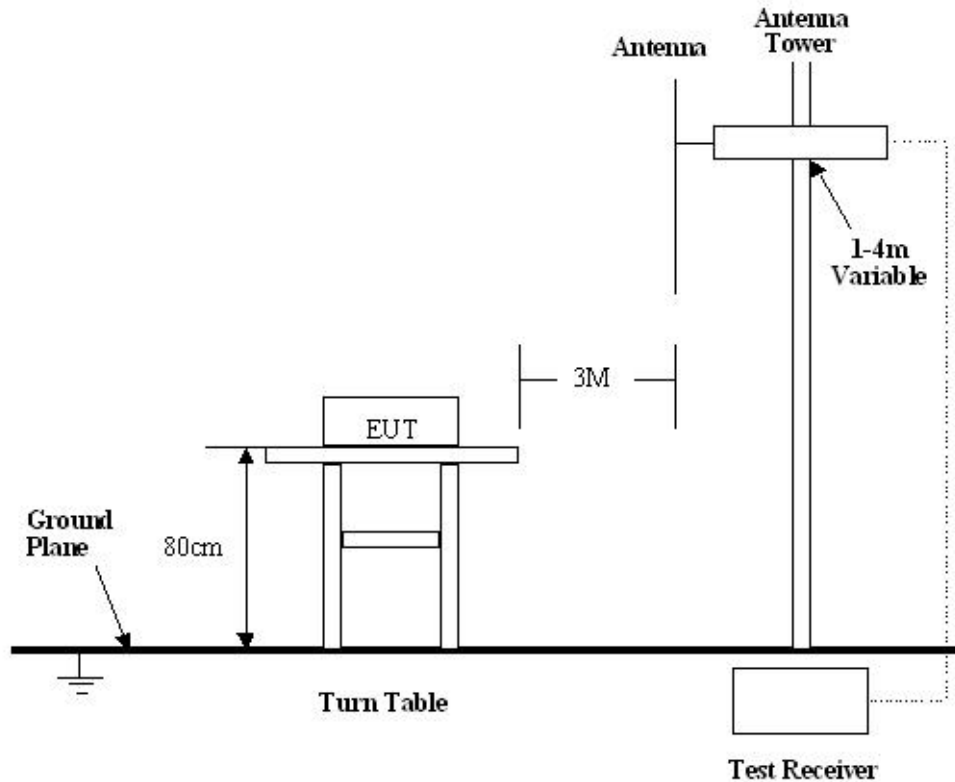
Based on ANSI C63.4: 2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at EMC Lab is ± 3.84 dB.

3.3. 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.
3. The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.
4. According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product has a Reverse-Polarity SMA Antenna, fulfill the requirement of this section.

3.4. 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 15.249 and Paragraph 15.209 limits.



3.5. Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.249 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 |

3.6. 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 -7dBuV means the emission is 7dBuV below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Class B Limit}$$

3.7. Summary of Test Results

According to the data in section 7.10, the EUT complied with the FCC Part15 Paragraph 15.249 standards.

3.8. EUT Operating Condition

Same as section 6.4 of this report.

3.9. Radiated Emissions Limit

A. FCC Part 15 subpart C Paragraph 15.249 Limit

| Fundamental Frequency | Field Strength of Fundamental | | Field Strength of Harmonics | |
|-----------------------|-------------------------------|--------|-----------------------------|--------|
| | mV/m | dBuV/m | uV/m | dBuV/m |
| 902-928MHz | 50 | 94 | 500 | 54 |
| 2400-2483.5 MHz | 50 | 94 | 500 | 54 |
| 5725-5875 MHz | 50 | 94 | 500 | 54 |
| 24.0-24.25GHz | 250 | 108 | 2500 | 68 |

- Note:**
- (1) RF Voltage(dBuV)=20 log RF Voltage(uV)
 - (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
 - (3)The emission limit in this paragraph is based on measurement instrumentaion employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
 - (4) Limit fundamental is 94dBuV/m@3m(AV)and114dBuV/m@3m(PK)
Limit field strength of harmonics: 54 dBuV/m@3m(AV)and74dBuV/m@3m(PK)

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.

3.10. Radiated Emissions Test Result

Formula of conversion factors: the field strength at 3m was established by adding The meter reading of the spectrum analyzer (which is set to read in units of dBuV) To the antenna correction factor supplied by the antenna manufacturer. The antenna Correction factors are stored 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 Voltage: DC 3.3V by the test jig

Test Mode: TX On

Temperature: 24 °C

Humidity: 52%RH

Test Result: PASS

Remarks: No further spurious emission found between lowest internal generated/used frequency to 30 MHz

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 ($^{\circ}$) |
|---------------------|----------|-------------------------|-------------------------------|---------------------------------------|----------------|--------------------------|--------------------------------------|
| Low frequency | | | | | | | |
| 2405.0 | AV | Vertical | 85.65 | 94.00 | 8.35 | 1.0 | 100 |
| 4810.0 | AV | Vertical | 43.17 | 54.00 | 10.83 | 1.5 | 60 |
| 7215.0 | AV | Vertical | 44.26 | 54.00 | 9.74 | 1.2 | 45 |
| 9620.0 | AV | Vertical | 45.59 | 54.00 | 8.41 | 1.0 | 90 |
| 12025.0 | AV | Vertical | 42.68 | 54.00 | 11.32 | 1.5 | 60 |
| 14430.0 | AV | Vertical | 45.77 | 54.00 | 8.23 | 1.2 | 100 |
| 16835.0 | AV | Vertical | 44.12 | 54.00 | 9.88 | 1.8 | 120 |
| 19240.0 | AV | Vertical | 43.38 | 54.00 | 10.62 | 1.2 | 60 |
| 21645.0 | AV | Vertical | 44.82 | 54.00 | 9.18 | 1.5 | 90 |
| 24050.0 | AV | Vertical | 42.20 | 54.00 | 11.80 | 1.0 | 120 |
| 2405.0 | AV | Horizontal | 81.11 | 94.00 | 12.89 | 1.5 | 270 |
| 4810.0 | AV | Horizontal | 43.59 | 54.00 | 10.41 | 1.6 | 180 |
| 7215.0 | AV | Horizontal | 44.22 | 54.00 | 9.78 | 1.5 | 120 |
| 9620.0 | AV | Horizontal | 45.62 | 54.00 | 8.38 | 1.6 | 200 |
| 12025.0 | AV | Horizontal | 45.66 | 54.00 | 8.34 | 1.5 | 100 |
| 14430.0 | AV | Horizontal | 45.57 | 54.00 | 8.43 | 1.2 | 270 |
| 16835.0 | AV | Horizontal | 45.10 | 54.00 | 8.90 | 1.8 | 180 |
| 19240.0 | AV | Horizontal | 46.22 | 54.00 | 7.78 | 1.0 | 90 |
| 21645.0 | AV | Horizontal | 46.77 | 54.00 | 7.23 | 1.5 | 60 |
| 24050.0 | AV | Horizontal | 46.10 | 54.00 | 7.90 | 1.2 | 100 |
| 2405.0 | PK | Vertical | 86.44 | 114.00 | 27.56 | 1.5 | 45 |
| 4810.0 | PK | Vertical | 48.88 | 74.00 | 25.12 | 1.5 | 120 |
| 7215.0 | PK | Vertical | 48.90 | 74.00 | 25.10 | 1.8 | 60 |
| 9620.0 | PK | Vertical | 49.11 | 74.00 | 24.89 | 1.0 | 270 |
| 12025.0 | PK | Vertical | 49.54 | 74.00 | 24.46 | 1.2 | 180 |
| 14430.0 | PK | Vertical | 49.62 | 74.00 | 24.38 | 1.5 | 60 |
| 16835.0 | PK | Vertical | 50.57 | 74.00 | 23.43 | 1.8 | 100 |
| 19240.0 | PK | Vertical | 50.83 | 74.00 | 23.17 | 1.2 | 120 |
| 21645.0 | PK | Vertical | 51.30 | 74.00 | 22.70 | 1.8 | 100 |
| 24050.0 | PK | Vertical | 51.65 | 74.00 | 22.35 | 1.0 | 90 |
| 2405.0 | PK | Horizontal | 88.15 | 114.00 | 25.85 | 1.5 | 120 |
| 4810.0 | PK | Horizontal | 48.72 | 74.00 | 25.28 | 1.6 | 180 |
| 7215.0 | PK | Horizontal | 48.85 | 74.00 | 25.15 | 1.5 | 120 |
| 9620.0 | PK | Horizontal | 49.03 | 74.00 | 24.97 | 1.6 | 90 |

| | | | | | | | |
|------------------|----|------------|-------|--------|-------|-----|-----|
| 12025.0 | PK | Horizontal | 49.44 | 74.00 | 24.56 | 1.8 | 180 |
| 14430.0 | PK | Horizontal | 49.59 | 74.00 | 24.41 | 1.2 | 120 |
| 16835.0 | PK | Horizontal | 49.17 | 74.00 | 24.83 | 1.5 | 100 |
| 19240.0 | PK | Horizontal | 50.33 | 74.00 | 23.67 | 1.0 | 45 |
| 21645.0 | PK | Horizontal | 51.26 | 74.00 | 22.74 | 1.5 | 60 |
| 24050.0 | PK | Horizontal | 51.57 | 74.00 | 22.43 | 1.0 | 90 |
| Middle frequency | | | | | | | |
| 2445.00 | AV | Vertical | 81.89 | 94.00 | 12.11 | 1.5 | 60 |
| 4890.00 | AV | Vertical | 44.41 | 54.00 | 9.59 | 1.5 | 45 |
| 7335.00 | AV | Vertical | 44.73 | 54.00 | 9.27 | 1.6 | 90 |
| 9780.00 | AV | Vertical | 45.15 | 54.00 | 8.85 | 1.5 | 180 |
| 12225.00 | AV | Vertical | 45.65 | 54.00 | 8.35 | 1.2 | 120 |
| 14670.00 | AV | Vertical | 46.12 | 54.00 | 7.88 | 1.0 | 100 |
| 17115.00 | AV | Vertical | 46.75 | 54.00 | 7.25 | 1.5 | 90 |
| 19560.00 | AV | Vertical | 46.81 | 54.00 | 7.19 | 1.8 | 45 |
| 22005.00 | AV | Vertical | 47.77 | 54.00 | 6.23 | 1.2 | 60 |
| 24450.00 | AV | Vertical | 47.82 | 54.00 | 6.18 | 1.6 | 120 |
| 2445.00 | AV | Horizontal | 71.76 | 94.00 | 22.24 | 1.5 | 60 |
| 4890.00 | AV | Horizontal | 44.11 | 54.00 | 6.89 | 1.5 | 180 |
| 7335.00 | AV | Horizontal | 44.23 | 54.00 | 9.89 | 1.8 | 120 |
| 9780.00 | AV | Horizontal | 45.06 | 54.00 | 8.94 | 1.2 | 90 |
| 12225.00 | AV | Horizontal | 45.57 | 54.00 | 8.43 | 1.5 | 60 |
| 14670.00 | AV | Horizontal | 45.59 | 54.00 | 8.41 | 1.0 | 100 |
| 17115.00 | AV | Horizontal | 46.44 | 54.00 | 7.56 | 1.5 | 90 |
| 19560.00 | AV | Horizontal | 46.70 | 54.00 | 7.30 | 1.8 | 120 |
| 22005.00 | AV | Horizontal | 47.66 | 54.00 | 6.34 | 1.5 | 180 |
| 24450.00 | AV | Horizontal | 47.71 | 54.00 | 6.29 | 1.8 | 270 |
| 2445.00 | PK | Vertical | 87.67 | 114.00 | 26.33 | 1.5 | 90 |
| 4890.00 | PK | Vertical | 50.51 | 74.00 | 22.49 | 1.5 | 60 |
| 7335.00 | PK | Vertical | 50.77 | 74.00 | 23.23 | 1.5 | 120 |
| 9780.00 | PK | Vertical | 51.32 | 74.00 | 22.68 | 1.2 | 270 |
| 12225.00 | PK | Vertical | 51.46 | 74.00 | 22.54 | 1.8 | 100 |
| 14670.00 | PK | Vertical | 52.25 | 74.00 | 21.75 | 1.5 | 180 |
| 17115.00 | PK | Vertical | 52.77 | 74.00 | 21.23 | 1.2 | 90 |
| 19560.00 | PK | Vertical | 52.98 | 74.00 | 21.02 | 1.8 | 45 |
| 22005.00 | PK | Vertical | 53.26 | 74.00 | 20.74 | 1.2 | 100 |
| 24450.00 | PK | Vertical | 53.44 | 74.00 | 20.56 | 1.0 | 90 |

| | | | | | | | |
|----------|----|------------|-------|--------|-------|-----|-----|
| 2445.00 | PK | Horizontal | 88.55 | 114.00 | 25.45 | 1.5 | 180 |
| 4890.00 | PK | Horizontal | 49.99 | 74.00 | 24.01 | 1.8 | 90 |
| 7335.00 | PK | Horizontal | 50.52 | 74.00 | 23.48 | 1.5 | 120 |
| 9780.00 | PK | Horizontal | 51.17 | 74.00 | 22.83 | 1.5 | 100 |
| 12225.00 | PK | Horizontal | 51.22 | 74.00 | 22.78 | 1.8 | 45 |
| 14670.00 | PK | Horizontal | 52.28 | 74.00 | 21.72 | 1.5 | 90 |
| 17115.00 | PK | Horizontal | 51.59 | 74.00 | 22.41 | 1.5 | 180 |
| 19560.00 | PK | Horizontal | 52.15 | 74.00 | 21.85 | 1.6 | 120 |
| 22005.00 | PK | Horizontal | 53.13 | 74.00 | 20.87 | 1.2 | 270 |
| 24450.00 | PK | Horizontal | 53.41 | 74.00 | 20.59 | 1.0 | 180 |

| High frequency | | | | | | | |
|----------------|----|------------|-------|--------|-------|-----|-----|
| 2480.00 | AV | Vertical | 80.47 | 94.00 | 13.53 | 1.5 | 120 |
| 4960.00 | AV | Vertical | 44.23 | 54.00 | 9.77 | 1.5 | 90 |
| 7440.00 | AV | Vertical | 44.49 | 54.00 | 9.51 | 1.5 | 45 |
| 9920.00 | AV | Vertical | 45.23 | 54.00 | 8.77 | 1.5 | 100 |
| 12400.00 | AV | Vertical | 45.65 | 54.00 | 8.35 | 1.2 | 180 |
| 14880.00 | AV | Vertical | 46.18 | 54.00 | 7.82 | 1.6 | 120 |
| 17360.00 | AV | Vertical | 46.65 | 54.00 | 7.35 | 1.8 | 45 |
| 19840.00 | AV | Vertical | 46.88 | 54.00 | 7.12 | 1.2 | 60 |
| 22320.00 | AV | Vertical | 47.20 | 54.00 | 6.80 | 1.5 | 90 |
| 24800.00 | AV | Vertical | 47.63 | 54.00 | 6.37 | 1.8 | 100 |
| 2480.00 | AV | Horizontal | 80.66 | 94.00 | 13.34 | 1.5 | 180 |
| 4960.00 | AV | Horizontal | 44.11 | 54.00 | 9.89 | 1.5 | 60 |
| 7440.00 | AV | Horizontal | 44.26 | 54.00 | 9.74 | 1.5 | 120 |
| 9920.00 | AV | Horizontal | 45.19 | 54.00 | 8.81 | 1.8 | 270 |
| 12400.00 | AV | Horizontal | 45.42 | 54.00 | 8.58 | 1.2 | 180 |
| 14880.00 | AV | Horizontal | 45.88 | 54.00 | 8.12 | 1.6 | 90 |
| 17360.00 | AV | Horizontal | 46.41 | 54.00 | 7.59 | 1.8 | 120 |
| 19840.00 | AV | Horizontal | 46.57 | 54.00 | 7.43 | 1.5 | 100 |
| 22320.00 | AV | Horizontal | 46.18 | 54.00 | 7.82 | 1.2 | 45 |
| 24800.00 | AV | Horizontal | 47.52 | 54.00 | 6.48 | 1.6 | 90 |
| 2480.00 | PK | Vertical | 85.21 | 114.00 | 28.79 | 1.5 | 180 |
| 4960.00 | PK | Vertical | 49.59 | 74.00 | 24.41 | 1.5 | 270 |
| 7440.00 | PK | Vertical | 50.11 | 74.00 | 23.89 | 1.5 | 45 |
| 9920.00 | PK | Vertical | 50.27 | 74.00 | 23.73 | 1.2 | 90 |
| 12400.00 | PK | Vertical | 50.85 | 74.00 | 23.15 | 1.6 | 180 |
| 14880.00 | PK | Vertical | 51.12 | 74.00 | 22.88 | 1.8 | 60 |

| | | | | | | | |
|----------|----|------------|-------|--------|-------|-----|-----|
| 17360.00 | PK | Vertical | 52.26 | 74.00 | 21.74 | 1.5 | 90 |
| 19840.00 | PK | Vertical | 52.58 | 74.00 | 21.42 | 1.2 | 180 |
| 22320.00 | PK | Vertical | 52.77 | 74.00 | 21.23 | 1.0 | 270 |
| 24800.00 | PK | Vertical | 53.39 | 74.00 | 20.61 | 1.2 | 90 |
| 2480.00 | PK | Horizontal | 86.72 | 114.00 | 27.28 | 1.5 | 60 |
| 4960.00 | PK | Horizontal | 49.42 | 74.00 | 24.58 | 1.5 | 120 |
| 7440.00 | PK | Horizontal | 50.03 | 74.00 | 23.97 | 1.5 | 180 |
| 9920.00 | PK | Horizontal | 50.21 | 74.00 | 23.79 | 1.2 | 90 |
| 12400.00 | PK | Horizontal | 50.42 | 74.00 | 23.58 | 1.0 | 270 |
| 14880.00 | PK | Horizontal | 51.08 | 74.00 | 22.92 | 1.2 | 120 |
| 17360.00 | PK | Horizontal | 52.15 | 74.00 | 21.85 | 1.5 | 90 |
| 19840.00 | PK | Horizontal | 52.46 | 74.00 | 21.54 | 1.8 | 60 |
| 22320.00 | PK | Horizontal | 52.68 | 74.00 | 21.32 | 1.3 | 180 |
| 24800.00 | PK | Horizontal | 53.25 | 74.00 | 20.75 | 1.6 | 100 |

Note: Above 1GHz,do a Peak and Average measurements for all emissions:
Limit fundamental is 94dBuV/m@3m(AV)and114dBuV/m@3m(PK)
Limit field strength of harmonics: 54 dBuV/m@3m(AV)and74dBuV/m@3m(PK)

4 Band Edge

4.1. Test Equipment

Please refer to Section 1.5. this report.

4.2. Test Procedure

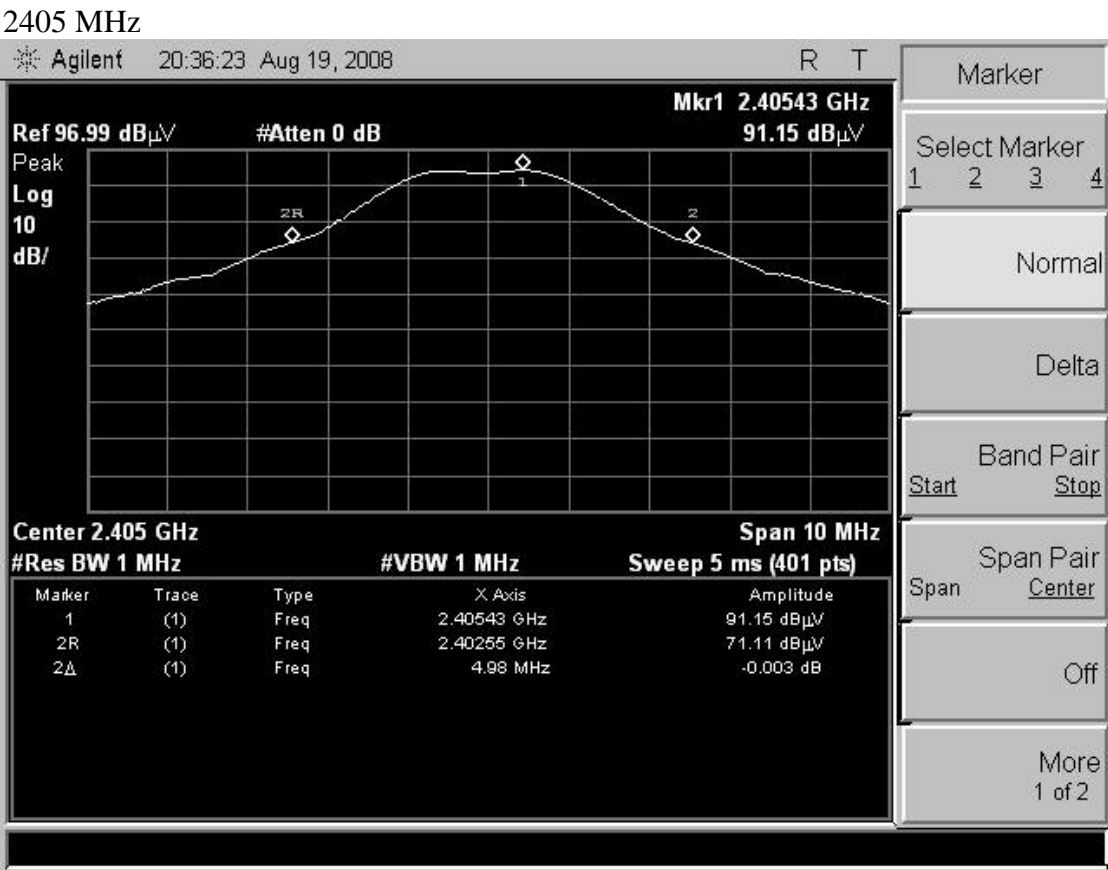
1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below:



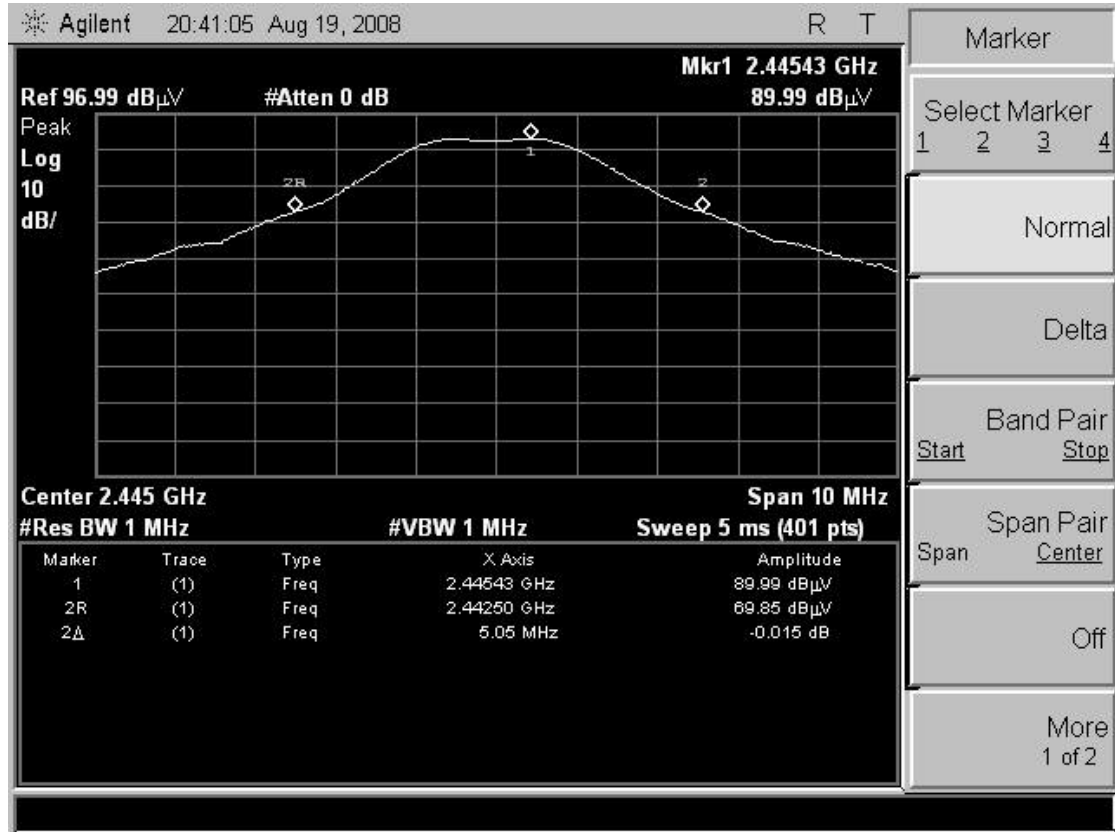
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 1MHz RBW and 1MHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

4.3. 20db Bandwidth Test Result

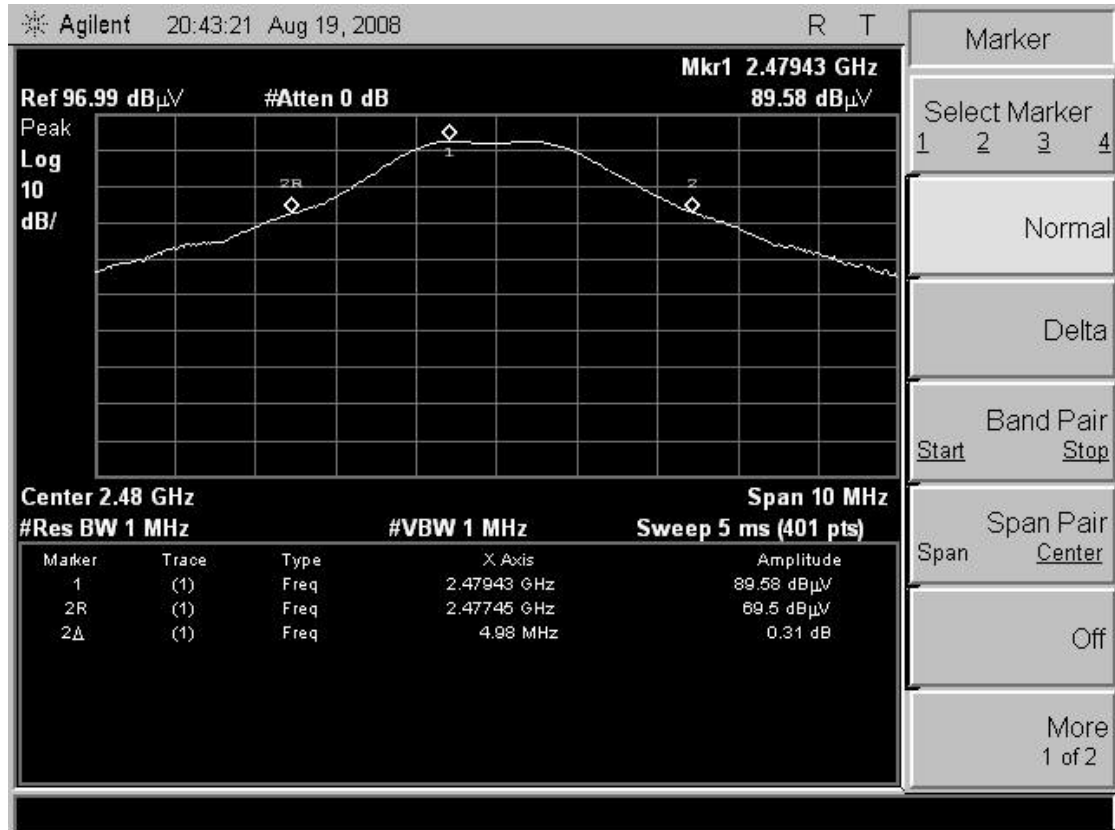
Product Name: Zigbee module
Test Item: 20db Band Edge Test
Test Voltage: DC 3.3V by the test jig
Mode: TX On
Temperature: 24 °C
Humidity: 52%RH



2445 MHz



2480 MHz

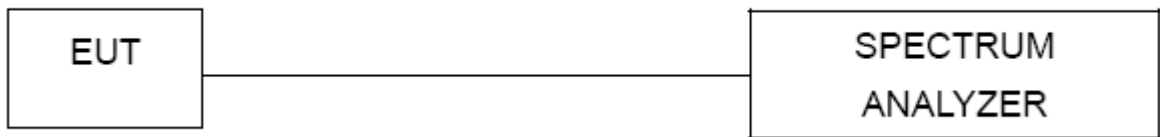


4.4. Test Equipment

Please refer to Section 1.5. this report.

4.5. Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below:



2. Emissions radiated outside of the specified frequency bands was measure by spectrum analyser with 100KHz RBW and 100KHz VBW..

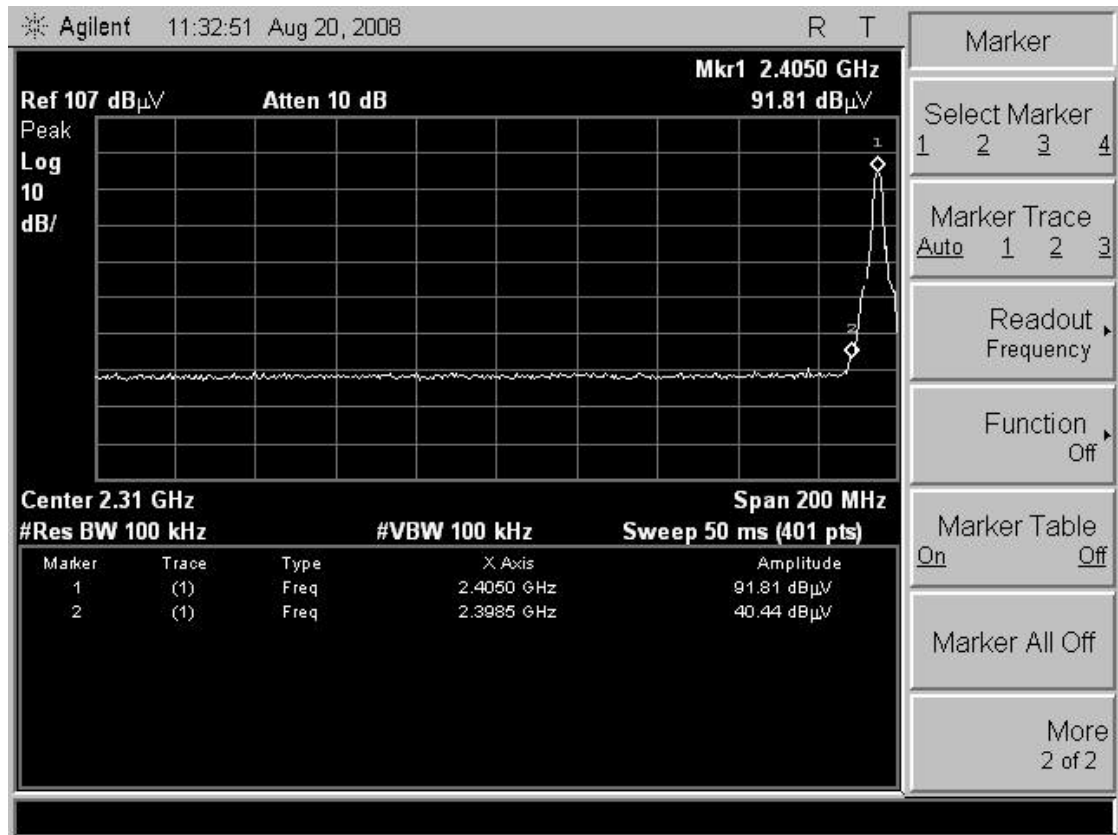
4.6. Applied Procedures/Limit

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

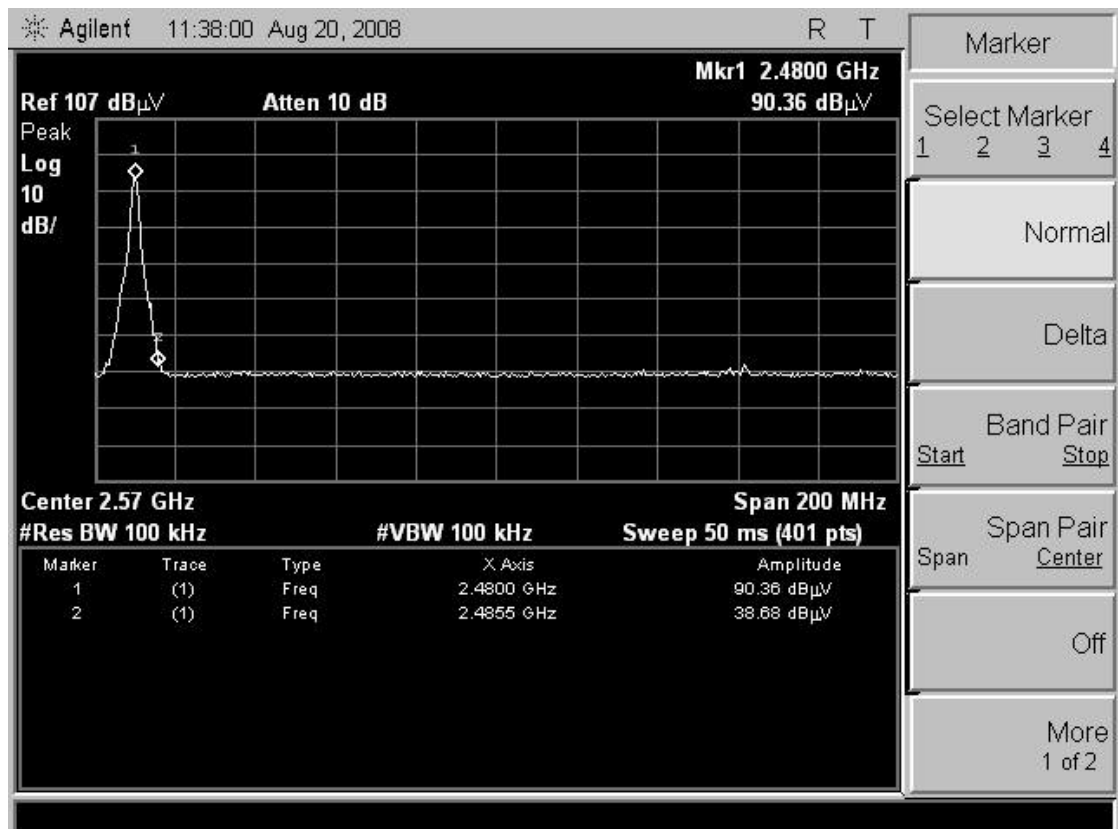
4.7. Band Edge Test Result

| | |
|---------------|---|
| Product Name: | Zigbee module |
| Test Item: | Emissions radiated outside of the specified frequency bands |
| Test Voltage: | DC 3.3V by the Test jig |
| Test Mode: | TX On |
| Temperature: | 24 °C |
| Humidity: | 52%RH |

2405 MHz



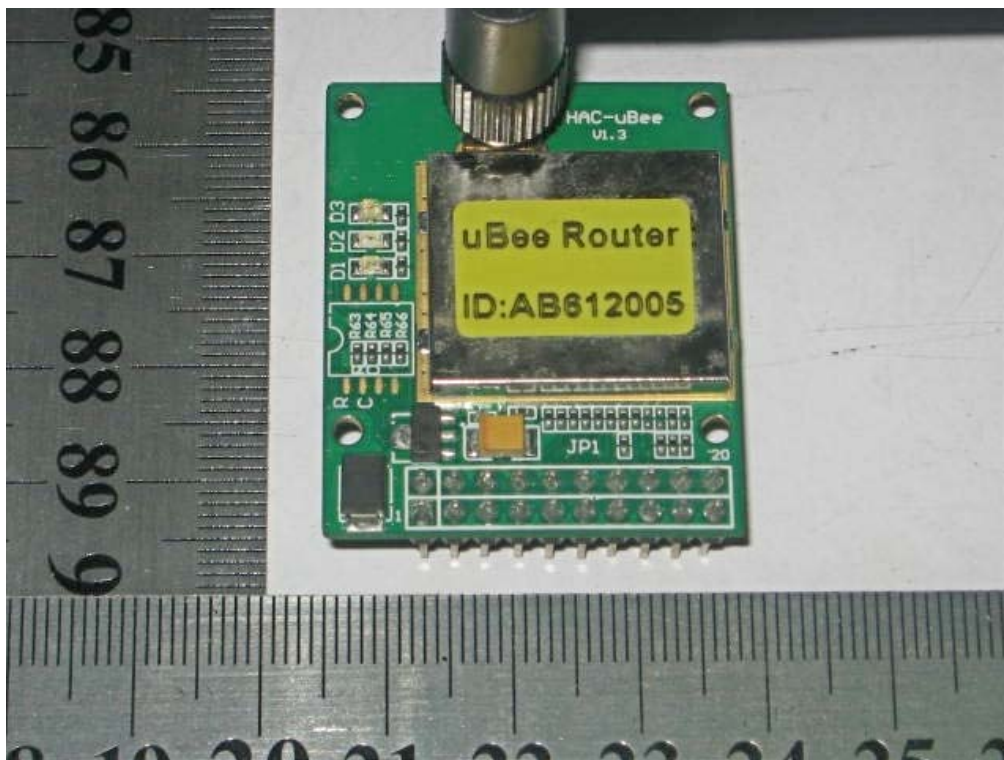
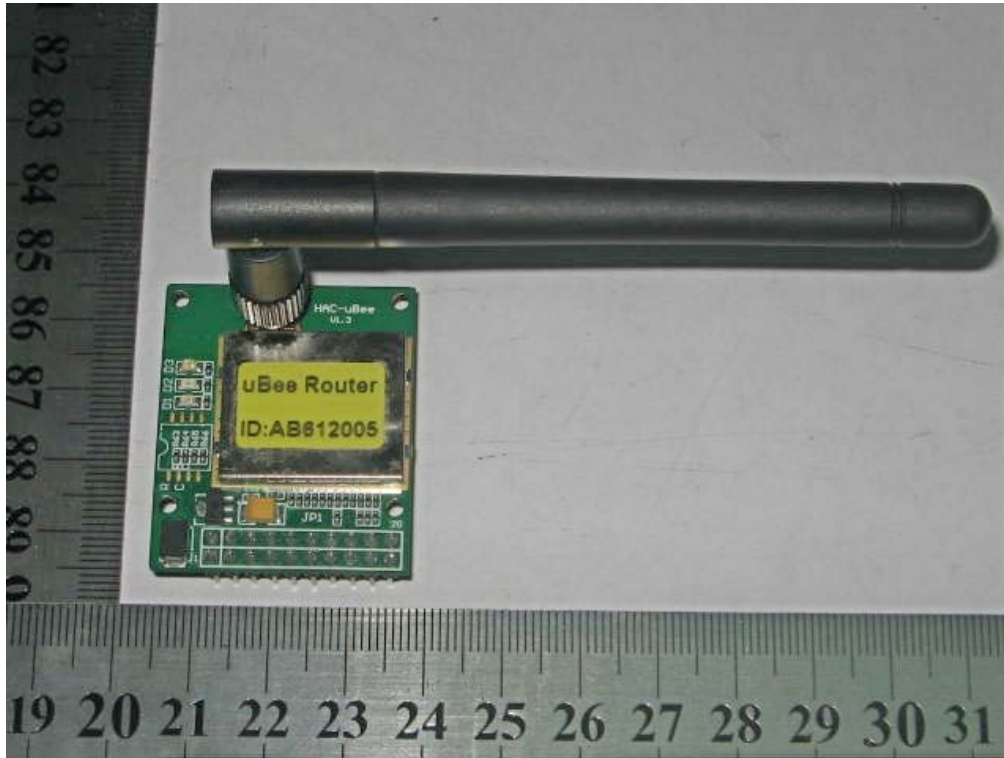
2480 MHz

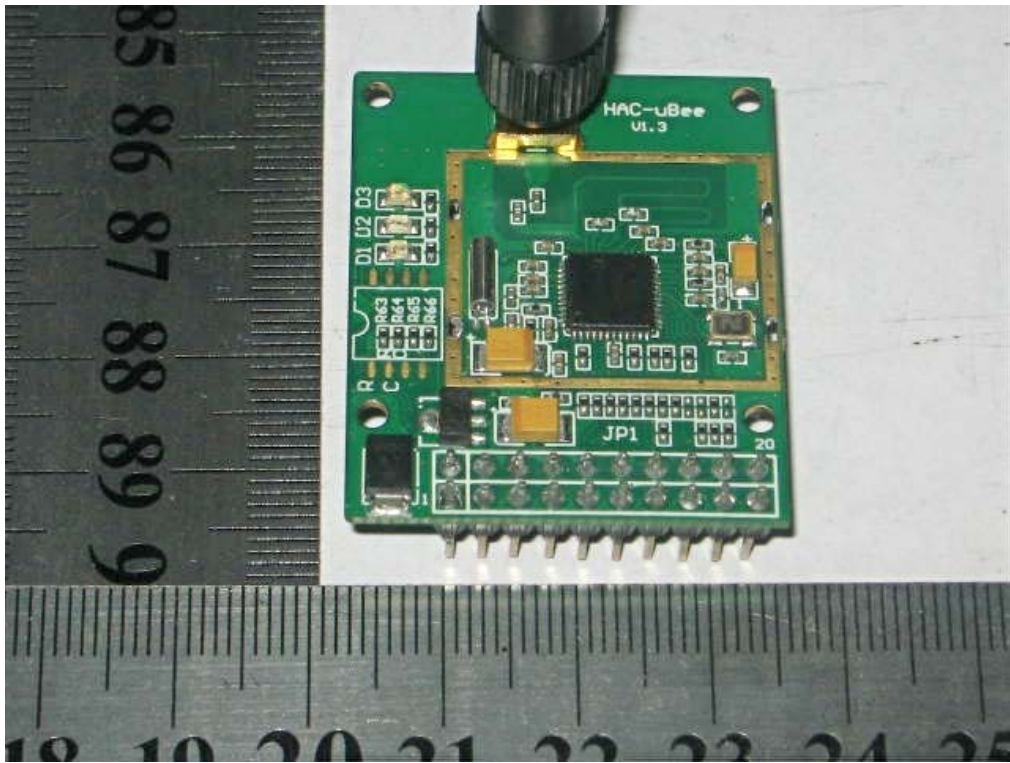


5 Photographs of Test setup



6 Photographs of EUT

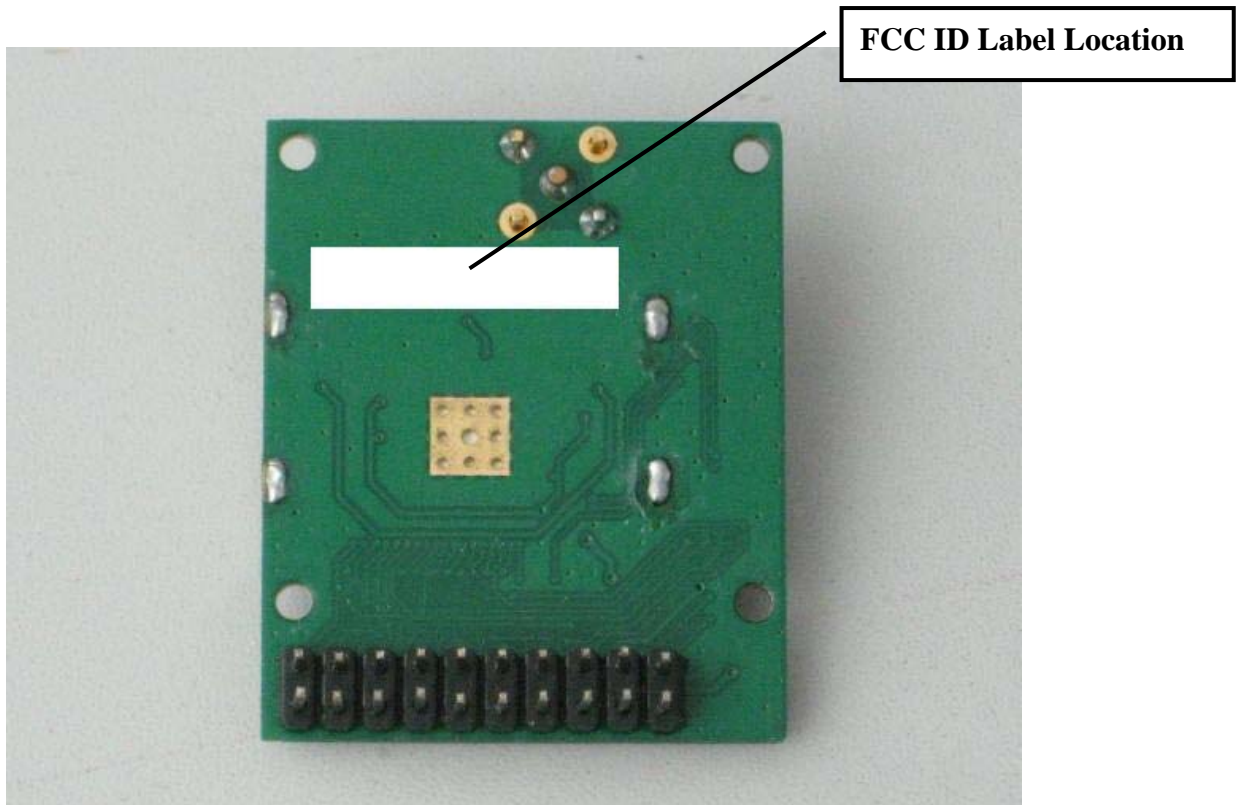




7 FCC ID Label

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.



END of Report