

**FCC PART 15.247**  
**EMI MEASUREMENT AND TEST REPORT**  
For  
**Kingjon Digital Technology Co., Ltd.**

Room 827 , Huanan Dianli Building , No. 2050 , Shennan Mid-road , Shenzhen , China

**FCC ID: S7O0013EF**

April 18, 2005

|                                                                                                                                                                                                                                                     |                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| <b>This Report Concerns:</b><br><input checked="" type="checkbox"/> Original Report                                                                                                                                                                 | <b>Equipment Type:</b><br>Bluetooth USB Dongle |
| <b>Test Engineer:</b> Jandy Su                                                                                                                                   |                                                |
| <b>Report No.:</b> RSZ05040101                                                                                                                                                                                                                      |                                                |
| <b>Test Date:</b> April 10-12, 2005                                                                                                                                                                                                                 |                                                |
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## GENERAL INFORMATION

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### Product Description for Equipment Under Test (EUT)

The Kingjon Digital Technology Co., Ltd.'s product, model number: KJ-B110, LD006, ES-20, KJ-2A, PHX 1116, PHX1117 or the "EUT" as referred to in this report is a Bluetooth USB Dongle. The EUT is measured approximately 5.0 cm L x 2.5cmW x 1.0cmH, rated input voltage: DC 5V.

The series products, model name: KJ-B110, LD006, ES-20, KJ-2A, PHX 1116, PHX1117 have the same circuit diagram, PCB layout, only Appearance is different, so we selected KJ-B110 to test.

*\* The test data gathered are from production sample, serial number: 000KJB1108, provided by the manufacturer.*

### Objective

This Type approval report is prepared on behalf of Kingjon Digital Technology Co., Ltd. in accordance with Part 2, Subpart J, and Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209, and 15.247 rules.

### Related Submittal(s)/Grant(s)

No related submittal(s).

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Lab Corp. (ShenZhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### Test Facility

The Test site used by Bay Area Compliance Lab Corp. (ShenZhen) to collect radiated and conducted emission measurement data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone, ShenZhen, Guangdong 518038, P.R.China.

Test site at Bay Area Compliance Lab Corp. (ShenZhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 04, 2004. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

**Host System Configuration List and Details**

| Manufacturer | Description         | Model          | Serial Number | FCC ID |
|--------------|---------------------|----------------|---------------|--------|
| IBM          | Motherboard         | ES-8176        | F19R0703      | DoC    |
| IBM          | Switch Power Supply | HIPRO-A2307F3T | M4251101720   | DoC    |
| IBM          | Hard Disk 80G       | 24P3783        | W2XROOYJ8     | N/A    |
| ALPS         | 3.5" Floppy         | 06P5226        | W25375957     | DoC    |
| LITE-ON      | CD-ROM              | LTN-486S       | 7819500457-A  | DoC    |
| Conexnt      | Ethernet            | RD01-D270      | 0325-02-1382  | DoC    |

**Local Support Equipment List and Details**

| Manufacturer | Description | Model    | Serial Number | FCC ID   |
|--------------|-------------|----------|---------------|----------|
| IBM          | System PC   | IBM8176  | 99Y5681       | DoC      |
| IBM          | Keyboard    | SK-8815  | 08532907      | DoC      |
| Logitech     | Mouse       | M-SAM83A | HCA33800404   | DoC      |
| IBM          | Monitor     | 6737-66N | 23-P3242      | BEJT17HD |
| HP           | Laser Jet5L | C3941A   | JPTVOB2337    | DoC      |
| SAST         | Modem       | AEM-2100 | 0293          | DoC      |

**External I/O Cable**

| Cable Description                  | Length (M) | From/Port            | To             |
|------------------------------------|------------|----------------------|----------------|
| Shielded Detachable Keyboard Cable | 1.50       | Keyboard Port / Host | Keyboard       |
| Shielded Detachable Mouse Cable    | 1.50       | PS/2 Port / Host     | Mouse          |
| Shielded Detachable Printer Cable  | 1.20       | Parallel Port / Host | Printer        |
| Shielded Detachable Serial Cable   | 1.20       | Serial Port / Host   | Modem          |
| Shielded Detachable VGA Cable      | 1.50       | VGA Port / Host      | Monitor        |
| Shielded Detachable Coaxial Cable  | 1.50       | EUT                  | Spectrum Input |
| Shielded detachable USB Cable      | 1.00       | EUT                  | USA Port       |

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## **SYSTEM TEST CONFIGURATION**

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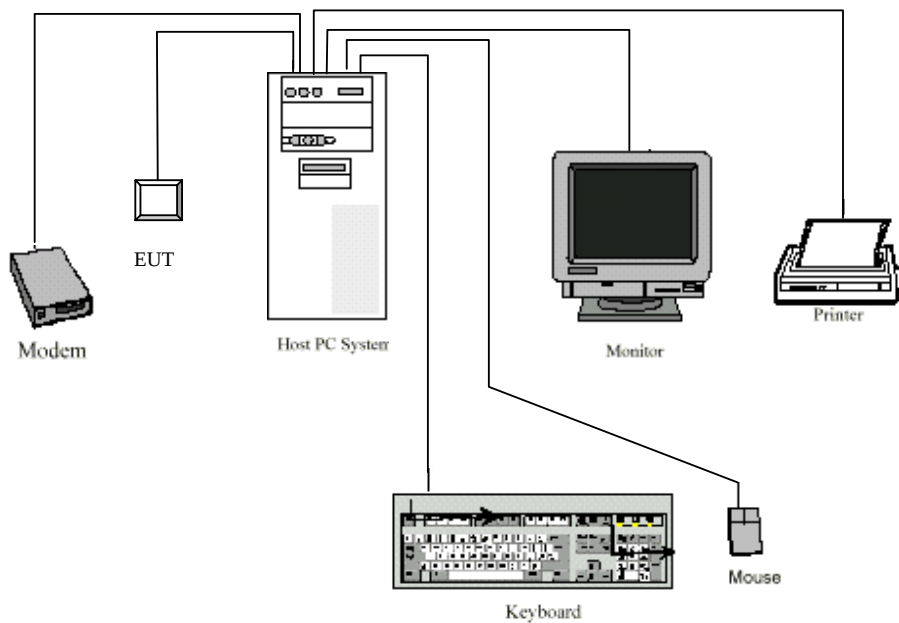
### **Description of Test Configuration**

The system was configured for testing in a typical fashion (as normally used by a typical user).

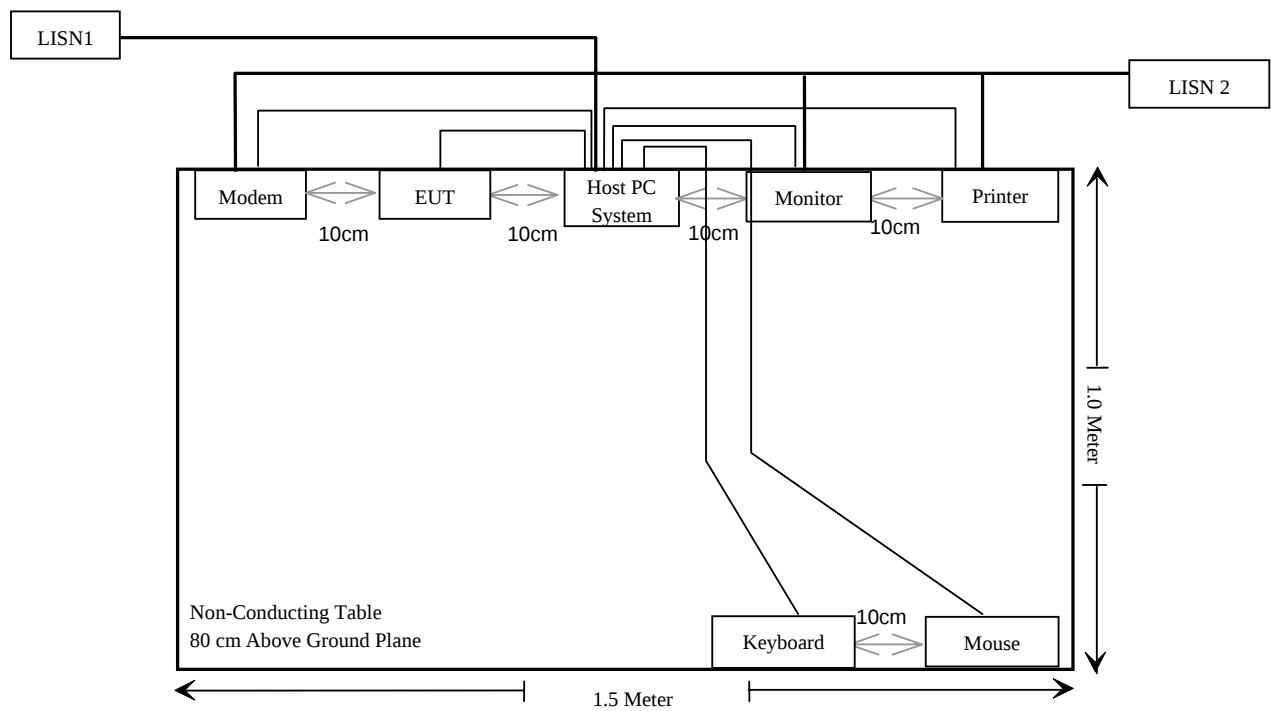
### **Equipment Modifications**

BACL has not done any modification on the EUT.

## Configuration of Test Setup



## Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

| FCC RULES          | DESCRIPTION OF TEST              | RESULT    |
|--------------------|----------------------------------|-----------|
| §15.203            | Antenna Requirement              | Compliant |
| §15.205            | Restricted bands                 | Compliant |
| §15.207 (a)        | Conducted Emission               | Compliant |
| §15.209(a)         | Radiated Emission                | Compliant |
| §15.247(a)(1)      | Channel Separation Test          | Compliant |
| §15.247(a)(1)      | 20dB Bandwidth testing           | Compliant |
| §15.247(a)(1)(iii) | Time of occupancy (Dwell Time)   | Compliant |
| §15.247(a)(1)(iii) | Quantity of hopping channel Test | Compliant |
| §15.247(b)(1)      | Peak Output Power Measurement    | Compliant |
| §15.247(d)         | Band edges testing               | Compliant |

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## **§15.203 - ANTENNA APPLICATION**

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### **Standard Applicable**

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 or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

This product has a permanent antenna, fulfill the requirement of this section.

Test Result: Pass

## Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is  $\pm 2.4$  dB.

The diagram illustrates a test setup for electromagnetic compatibility. On the left, a Vertical Reference Ground Plane is shown. A 40cm distance is marked from this plane to the EUT. The EUT is placed on a stand that is 80cm high. Below the EUT, a LISN is connected to the same stand. The LISN is bonded to the Horizontal Reference Ground Plane. The Test Receiver is connected to the LISN and is also placed on a stand. The Test Receiver is connected to the Horizontal Reference Ground Plane via a cable. The diagram shows the physical layout and the electrical connections between the EUT, LISN, and Test Receiver, and their reference to the ground planes.

The host PC was connected to a 120 VAC/60 Hz power source.

## Test Receiver Setup

The test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the test receiver was set with the following configurations:

| <u>Frequency Range</u> | <u>IFBW</u> |
|------------------------|-------------|
| 150 kHz – 30 MHz       | 9 kHz       |

## Test Equipment List and Details

| Manufacturer    | Description   | Model   | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|---------------|---------|---------------|------------------|----------------------|
| Com-Power       | L.I.S.N.      | LI-200  | 12005         | N/A              | N/A                  |
| Com-Power       | L.I.S.N.      | LI-200  | 12008         | N/A              | N/A                  |
| Rohde & Schwarz | Test Receiver | ESCS30  | 830245/006    | 2005-1-26        | 2006-1-26            |
| Rohde & Schwarz | L.I.S.N.      | ESH2-Z5 | 892107/021    | 2005-2-28        | 2006-2-27            |
| Rohde & Schwarz | Pulse Limiter | ESH3Z2  | DE25985       | 2004-9-1         | 2005-8-31            |

\* Com-Power's LISN were used as the supporting equipment.

\* **Statement of Traceability:** BACL attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

## Test Procedure

During the conducted emission test, the host PC System power cord was connected to the outlet of the first LISN, the host PC and all other support equipment power cords were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest were emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

## Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

High Channel: -17.39 dB at 0.180 MHz in the **Line** conductor mode.  
 Middle Channel: -17.19 dB at 0.180 MHz in the **Line** conductor mode.  
 Low Channel: -17.29 dB at 0.180 MHz in the **Line** conductor mode.

**Test Data****Environmental Conditions**

|                    |           |
|--------------------|-----------|
| Temperature:       | 18 °C     |
| Relative Humidity: | 53 %      |
| ATM Pressure:      | 1015 mbar |

The testing was performed by Jandy Su on 2005-4-11

Test mode: Transmitting & Standby

**High Channel**

| LINE CONDUCTED EMISSIONS |                   |                   |                       | FCC Part 15.207 |              |
|--------------------------|-------------------|-------------------|-----------------------|-----------------|--------------|
| Frequency<br>MHz         | Amplitude<br>dBμV | Detector<br>QP/AV | Phase<br>Line/Neutral | Limit<br>dBμV   | Margin<br>dB |
| 0.180                    | 37.10             | AV                | Line                  | 54.49           | -17.39       |
| 11.080                   | 30.02             | AV                | Neutral               | 50.00           | -19.98       |
| 4.100                    | 25.50             | AV                | Neutral               | 46.00           | -20.50       |
| 10.480                   | 28.15             | AV                | Line                  | 50.00           | -21.85       |
| 0.590                    | 24.13             | AV                | Neutral               | 46.00           | -21.87       |
| 11.080                   | 36.61             | QP                | Neutral               | 60.00           | -23.39       |
| 10.480                   | 35.46             | QP                | Line                  | 60.00           | -24.54       |
| 0.180                    | 39.20             | QP                | Line                  | 64.49           | -25.29       |
| 4.100                    | 30.18             | QP                | Neutral               | 56.00           | -25.82       |
| 6.400                    | 24.03             | AV                | Line                  | 50.00           | -25.97       |
| 6.400                    | 32.77             | QP                | Line                  | 60.00           | -27.23       |
| 0.590                    | 28.56             | QP                | Neutral               | 56.00           | -27.44       |

## Middle Channel

| LINE CONDUCTED EMISSIONS |                         |                   |                       | FCC Part 15.207     |              |
|--------------------------|-------------------------|-------------------|-----------------------|---------------------|--------------|
| Frequency<br>MHz         | Amplitude<br>dB $\mu$ V | Detector<br>QP/AV | Phase<br>Line/Neutral | Limit<br>dB $\mu$ V | Margin<br>dB |
| 0.180                    | 37.30                   | AV                | Line                  | 54.49               | -17.19       |
| 0.600                    | 28.50                   | AV                | Line                  | 46.00               | -17.50       |
| 11.070                   | 30.00                   | AV                | Line                  | 50.00               | -20.00       |
| 3.780                    | 25.70                   | AV                | Neutral               | 46.00               | -20.30       |
| 0.590                    | 25.62                   | AV                | Neutral               | 46.00               | -20.38       |
| 10.500                   | 29.00                   | AV                | Neutral               | 50.00               | -21.00       |
| 3.780                    | 33.10                   | QP                | Neutral               | 56.00               | -22.90       |
| 11.070                   | 35.80                   | QP                | Line                  | 60.00               | -24.20       |
| 0.600                    | 31.70                   | QP                | Line                  | 56.00               | -24.30       |
| 0.590                    | 31.07                   | QP                | Neutral               | 56.00               | -24.93       |
| 0.180                    | 39.20                   | QP                | Line                  | 64.49               | -25.29       |
| 10.500                   | 34.68                   | QP                | Neutral               | 60.00               | -25.32       |

## Low Channel

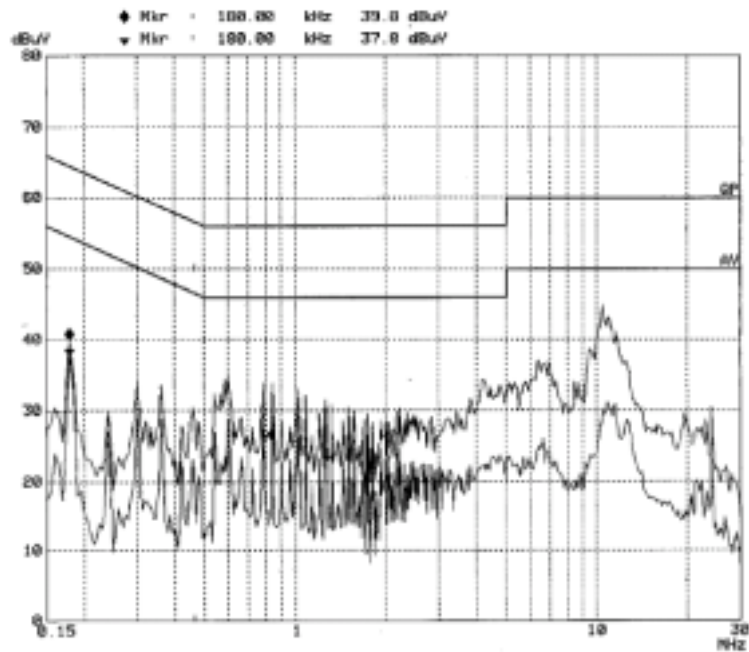
| LINE CONDUCTED EMISSIONS |                         |                   |                       | FCC Part 15.207     |              |
|--------------------------|-------------------------|-------------------|-----------------------|---------------------|--------------|
| Frequency<br>MHz         | Amplitude<br>dB $\mu$ V | Detector<br>QP/AV | Phase<br>Line/Neutral | Limit<br>dB $\mu$ V | Margin<br>dB |
| 0.180                    | 37.20                   | AV                | Line                  | 54.49               | -17.29       |
| 4.400                    | 35.54                   | QP                | Neutral               | 56.00               | -20.46       |
| 4.400                    | 25.30                   | AV                | Neutral               | 46.00               | -20.70       |
| 10.490                   | 38.24                   | QP                | Neutral               | 60.00               | -21.76       |
| 0.590                    | 23.70                   | AV                | Neutral               | 46.00               | -22.30       |
| 10.490                   | 26.10                   | AV                | Neutral               | 50.00               | -23.90       |
| 11.500                   | 25.10                   | AV                | Line                  | 50.00               | -24.90       |
| 0.180                    | 38.90                   | QP                | Line                  | 64.49               | -25.59       |
| 0.590                    | 29.60                   | QP                | Neutral               | 56.00               | -26.40       |
| 4.140                    | 19.26                   | AV                | Line                  | 46.00               | -26.74       |
| 11.500                   | 31.20                   | QP                | Line                  | 60.00               | -28.80       |
| 4.140                    | 25.03                   | QP                | Line                  | 56.00               | -30.97       |

## Plot(s) of Test Data

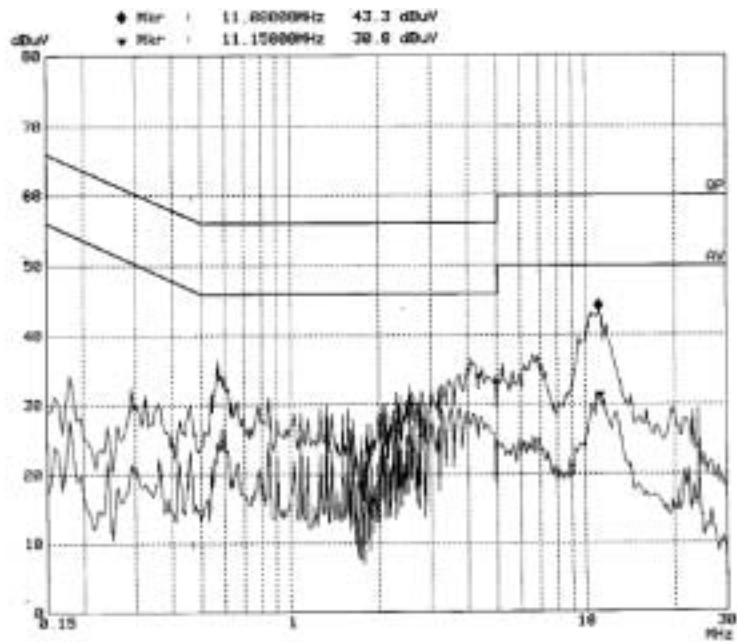
Plot(s) of Test Data is presented hereinafter as reference.

High Channel:

Line:

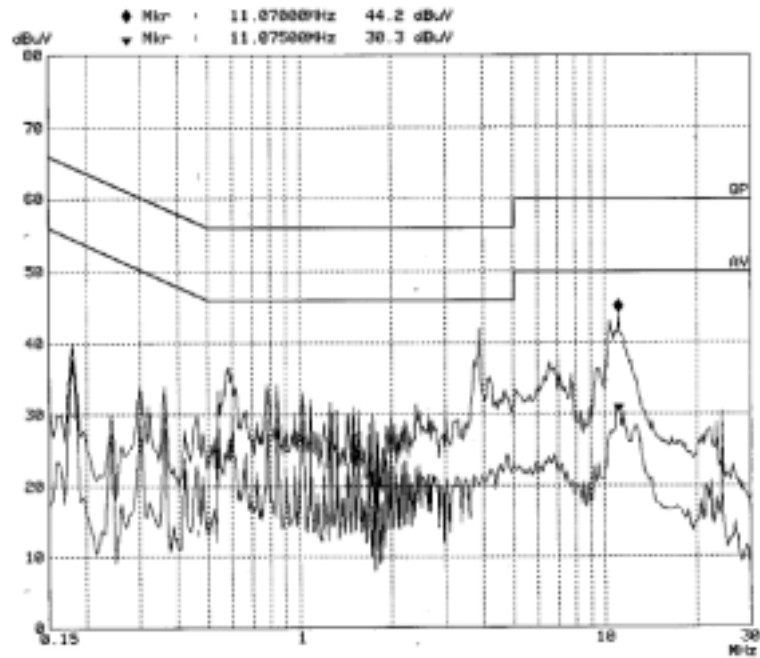


Neutral:

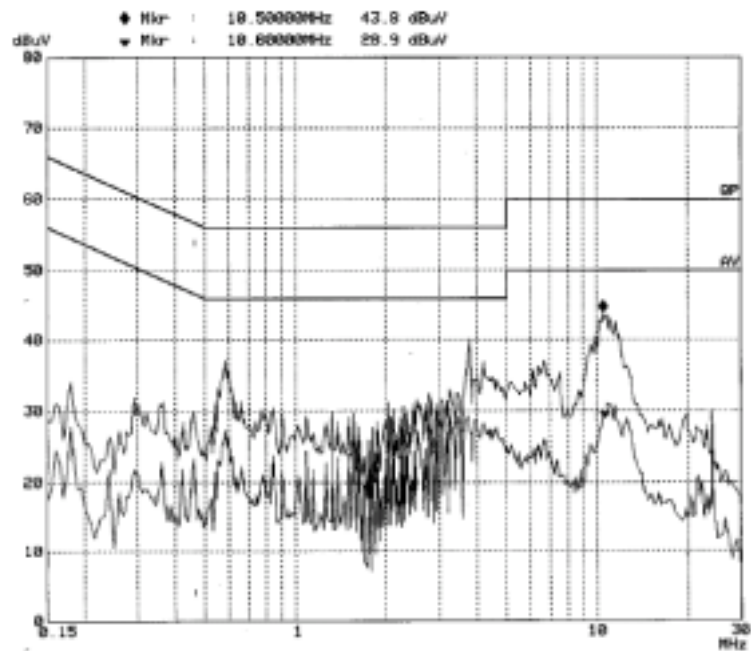


Middle Channel:

Line:

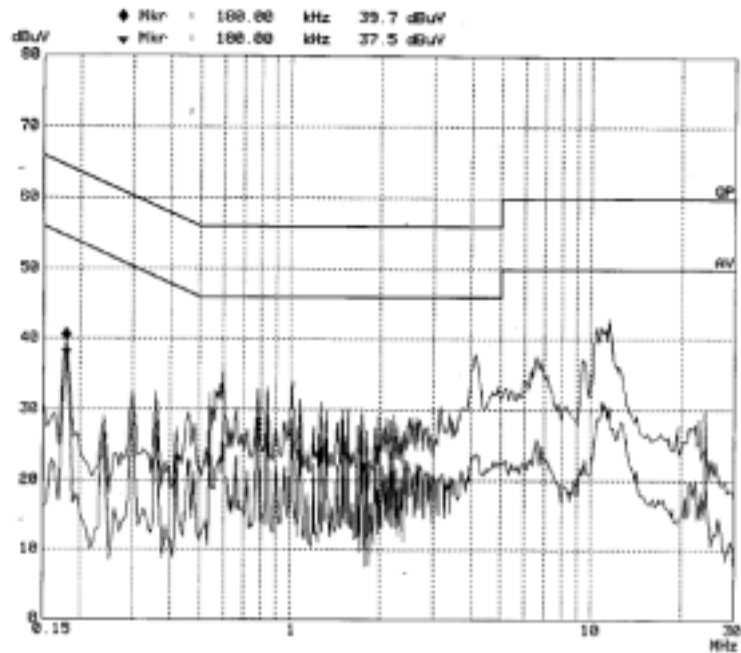


Neutral:

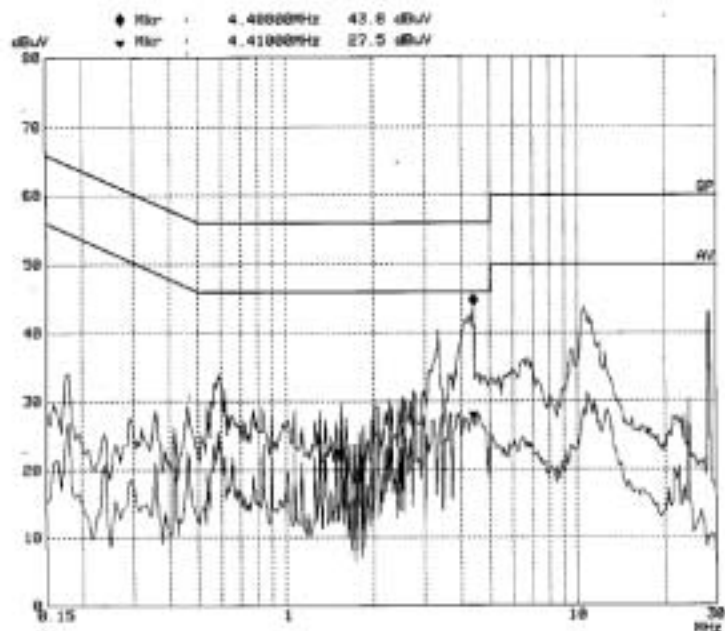


Low Channel:

Line:



Neutral:



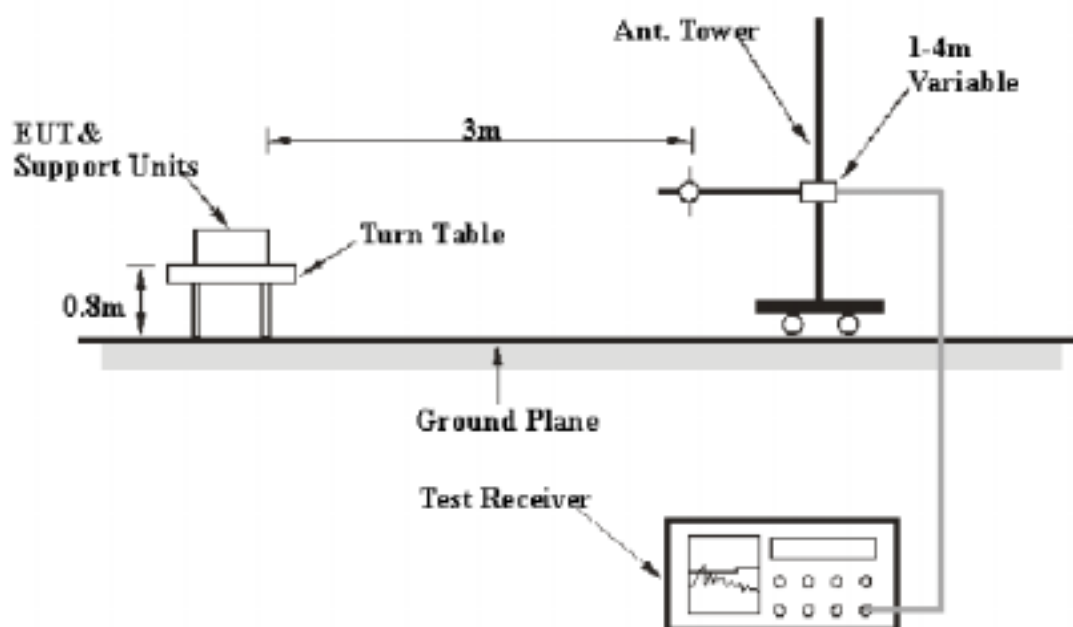
## §15.205& §15.209(a)- RADIATED EMISSION

### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in 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 NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is  $\pm 4.0$  dB.

### EUT Setup



The radiated emission tests were performed in the 3-meter Chamber, using the setup accordance with the ANSI C63.4-2001. The specification used was the FCC 15.209 limits.

### Test Receiver Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the Test Receiver was set with the following configurations:

| <i><b>Frequency Range</b></i> | <i><b>RBW</b></i> | <i><b>Video B/W</b></i> |
|-------------------------------|-------------------|-------------------------|
| 30 – 1000 MHz                 | 100 kHz           | 100 kHz                 |
| 1000 MHz – 25 GHz             | 1 MHz             | 1 MHz                   |

### Test Equipment List and Details

| Manufacturer    | Description       | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-------------------|-------|---------------|------------------|----------------------|
| HP              | Amplifier         | 8447E | 1937A01046    | 2004-9-1         | 2005-8-31            |
| Rohde & Schwarz | Test Receiver     | ESCI  | 100035        | 2004-9-15        | 2005-9-14            |
| Sunol Sciences  | Bilog Antenna     | JB1   | A040904-2     | 2005-4-19        | 2006-4-18            |
| HP              | Amplifier         | 8447D | 2994A09795    | 2004-9-1         | 2005-8-31            |
| Sunol Sciences  | System Controller | SC99V | 033004-1      | N/A              | N/A                  |

\* **Statement of Traceability:** BACL attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the PK&AV detection mode.

### 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:

$$\text{Corr. Ampl.} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

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

### Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.247, with the worst margin reading of:

**Low Channel:** -8.05 dB at 4803.90 MHz in the **horizontal** polarization.  
**Middle Channel:** -6.50 dB at 4881.90 MHz in the **horizontal** polarization.  
**High Channel:** -5.37 dB at 4957.90 MHz in the **horizontal** polarization.

**Test Data****Environmental Conditions**

|                    |           |
|--------------------|-----------|
| Temperature:       | 18 °C     |
| Relative Humidity: | 53 %      |
| ATM Pressure:      | 1015 mbar |

The testing was performed by Jandy Su on 2005-4-11

Test mode: Transmitting & Standby

| Frequency MHz                | Detector  | Meter Reading dBuV | Direction Degree | Height Meter | Polar H / V | Antenna Loss dBuV/m | Cable loss dB | Amplifier dB | Correction Amplitude dBuV | FCC 15.247 Limit | FCC 15.247 Margin |
|------------------------------|-----------|--------------------|------------------|--------------|-------------|---------------------|---------------|--------------|---------------------------|------------------|-------------------|
| Low Channel (1GHz to 24 GHz) |           |                    |                  |              |             |                     |               |              |                           |                  |                   |
| 4803.90                      | AV        | 39.65              | 60               | 1.2          | h           | 34.1                | 5.2           | 33.00        | 45.95                     | 54               | -8.05             |
| 4803.90                      | AV        | 36.32              | 60               | 1.2          | v           | 34.1                | 5.2           | 33.00        | 42.62                     | 54               | -11.38            |
| 7206.00                      | AV        | 31.46              | 270              | 1.0          | h           | 37.4                | 6.1           | 33.50        | 41.46                     | 54               | -12.54            |
| 7206.13                      | AV        | 30.22              | 270              | 1.0          | v           | 37.4                | 6.1           | 33.50        | 40.22                     | 54               | -13.78            |
| 1606.00                      | AV        | 40.28              | 45               | 1.2          | h           | 25.3                | 2.6           | 33.86        | 34.32                     | 54               | -19.68            |
| 1606.00                      | AV        | 38.99              | 45               | 1.2          | v           | 25.3                | 2.6           | 33.86        | 33.03                     | 54               | -20.97            |
| 1203.00                      | AV        | 36.74              | 180              | 1.2          | h           | 27.8                | 3.4           | 35.16        | 32.78                     | 54               | -21.22            |
| 4803.90                      | PK        | 44.24              | 180              | 1.2          | h           | 34.1                | 5.2           | 33.00        | 50.54                     | 74               | -23.46            |
| 1203.00                      | AV        | 33.22              | 180              | 1.2          | v           | 27.8                | 3.4           | 35.16        | 29.26                     | 54               | -24.74            |
| 1301.00                      | AV        | 38.62              | 90               | 1.2          | h           | 23.9                | 2.6           | 36.33        | 28.79                     | 54               | -25.21            |
| 4803.90                      | PK        | 40.60              | 180              | 1.2          | v           | 34.1                | 5.2           | 33.00        | 46.90                     | 74               | -27.10            |
| 7206.00                      | PK        | 35.11              | 45               | 1.0          | h           | 37.4                | 6.1           | 33.50        | 45.11                     | 74               | -28.89            |
| 1732.00                      | AV        | 34.67              | 90               | 1.2          | v           | 23.9                | 2.6           | 36.33        | 24.84                     | 54               | -29.16            |
| 7206.13                      | PK        | 34.50              | 45               | 1.0          | v           | 37.4                | 6.1           | 33.50        | 44.50                     | 74               | -29.50            |
| 1606.00                      | PK        | 46.7               | 60               | 1.0          | h           | 25.3                | 2.6           | 33.86        | 40.74                     | 74               | -33.26            |
| 1606.00                      | PK        | 44.51              | 60               | 1.0          | v           | 25.3                | 2.6           | 33.86        | 38.55                     | 74               | -35.45            |
| 1203.00                      | PK        | 42.13              | 180              | 1.2          | h           | 27.8                | 3.4           | 35.16        | 38.17                     | 74               | -35.83            |
| 1203.00                      | PK        | 39.56              | 180              | 1.2          | v           | 27.8                | 3.4           | 35.16        | 35.60                     | 74               | -38.40            |
| 1301.00                      | PK        | 42.82              | 45               | 1.2          | h           | 23.9                | 2.6           | 36.33        | 32.99                     | 74               | -41.01            |
| 1732.00                      | PK        | 41.84              | 45               | 1.2          | v           | 23.9                | 2.6           | 36.33        | 32.01                     | 74               | -41.99            |
| 2402.01                      | PK (FUND) | 85.38              | 45               | 1.0          | h           | 29.1                | 3.7           | 34.00        | 84.18                     |                  |                   |
| 2402.01                      | AV (FUND) | 83.24              | 45               | 1.0          | h           | 29.1                | 3.7           | 34.00        | 82.04                     |                  |                   |
| 2402.01                      | PK (FUND) | 83.81              | 45               | 1.0          | v           | 29.1                | 3.7           | 34.00        | 82.61                     |                  |                   |
| 2402.01                      | AV (FUND) | 81.27              | 45               | 1.0          | v           | 29.1                | 3.7           | 34.00        | 80.07                     |                  |                   |

Continues

| Middle Channel (1GHz to 24 GHz) |              |       |     |     |   |      |     |       |       |    |        |
|---------------------------------|--------------|-------|-----|-----|---|------|-----|-------|-------|----|--------|
| 4881.90                         | AV           | 41.25 | 60  | 1.2 | h | 34.1 | 5.2 | 33.00 | 47.60 | 54 | -6.50  |
| 4882.00                         | AV           | 40.35 | 60  | 1.2 | v | 34.1 | 5.2 | 33.00 | 46.65 | 54 | -7.35  |
| 7323.27                         | AV           | 31.52 | 270 | 1.0 | h | 37.4 | 6.1 | 33.50 | 41.50 | 54 | -12.50 |
| 7323.33                         | AV           | 30.25 | 270 | 1.0 | v | 37.4 | 6.1 | 33.50 | 40.25 | 54 | -13.75 |
| 1634.00                         | AV           | 41.22 | 45  | 1.2 | h | 25.3 | 2.6 | 33.86 | 35.30 | 54 | -18.70 |
| 4881.90                         | PK           | 48.19 | 180 | 1.2 | h | 34.1 | 5.2 | 33.00 | 54.50 | 74 | -19.50 |
| 1634.00                         | AV           | 39.87 | 45  | 1.2 | v | 25.3 | 2.6 | 33.86 | 33.91 | 54 | -20.09 |
| 4882.00                         | PK           | 46.05 | 180 | 1.2 | v | 34.1 | 5.2 | 33.00 | 52.35 | 74 | -21.65 |
| 1469.00                         | AV           | 35.24 | 180 | 1.2 | h | 27.8 | 3.4 | 35.16 | 31.30 | 54 | -22.70 |
| 1203.00                         | AV           | 35.26 | 180 | 1.2 | v | 27.8 | 3.4 | 35.16 | 31.30 | 54 | -22.70 |
| 1301.00                         | AV           | 36.78 | 90  | 1.2 | h | 23.9 | 2.6 | 36.33 | 27.00 | 54 | -27.10 |
| 1301.00                         | AV           | 36.45 | 90  | 1.2 | v | 23.9 | 2.6 | 36.33 | 26.62 | 54 | -27.38 |
| 7323.27                         | PK           | 36.65 | 45  | 1.0 | h | 37.4 | 6.1 | 33.50 | 46.70 | 74 | -27.40 |
| 7323.33                         | PK           | 34.14 | 45  | 1.0 | v | 37.4 | 6.1 | 33.50 | 44.14 | 74 | -29.86 |
| 1634.00                         | PK           | 47.53 | 60  | 1.0 | h | 25.3 | 2.6 | 33.86 | 41.60 | 74 | -32.40 |
| 1634.00                         | PK           | 44.48 | 60  | 1.0 | v | 25.3 | 2.6 | 33.86 | 38.52 | 74 | -35.48 |
| 1469.00                         | PK           | 40.64 | 180 | 1.2 | h | 27.8 | 3.4 | 35.16 | 36.70 | 74 | -37.30 |
| 1203.00                         | PK           | 40.66 | 180 | 1.2 | v | 27.8 | 3.4 | 35.16 | 36.70 | 74 | -37.30 |
| 1301.00                         | PK           | 42.30 | 45  | 1.2 | v | 23.9 | 2.6 | 36.33 | 32.47 | 74 | -41.53 |
| 1301.00                         | PK           | 41.66 | 45  | 1.2 | h | 23.9 | 2.6 | 36.33 | 31.80 | 74 | -42.20 |
| 2441.01                         | PK<br>(FUND) | 87.10 | 45  | 1.0 | h | 29.1 | 3.7 | 34.00 | 85.90 |    |        |
| 2441.01                         | AV<br>(FUND) | 85.46 | 45  | 1.0 | h | 29.1 | 3.7 | 34.00 | 84.30 |    |        |
| 2441.01                         | PK<br>(FUND) | 86.65 | 45  | 1.0 | v | 29.1 | 3.7 | 34.00 | 85.45 |    |        |
| 2441.01                         | AV<br>(FUND) | 84.15 | 45  | 1.0 | v | 29.1 | 3.7 | 34.00 | 82.95 |    |        |

Continues

| High Channel (1GHz to 24 GHz) |              |       |     |     |   |      |     |       |       |    |        |
|-------------------------------|--------------|-------|-----|-----|---|------|-----|-------|-------|----|--------|
| 4957.90                       | AV           | 42.33 | 60  | 1.2 | h | 34.1 | 5.2 | 33.00 | 48.63 | 54 | -5.37  |
| 4958.05                       | AV           | 38.26 | 60  | 1.2 | v | 34.1 | 5.2 | 33.00 | 44.60 | 54 | -9.40  |
| 7433.81                       | AV           | 32.15 | 270 | 1.0 | h | 37.4 | 6.1 | 33.50 | 42.15 | 54 | -11.85 |
| 7434.11                       | AV           | 29.68 | 270 | 1.0 | v | 37.4 | 6.1 | 33.50 | 39.70 | 54 | -14.30 |
| 4957.90                       | PK           | 51.06 | 180 | 1.2 | h | 34.1 | 5.2 | 33.00 | 57.36 | 74 | -16.64 |
| 4958.05                       | PK           | 45.29 | 180 | 1.2 | v | 34.1 | 5.2 | 33.00 | 51.59 | 74 | -22.41 |
| 1658.00                       | AV           | 36.58 | 45  | 1.2 | h | 25.3 | 2.6 | 33.86 | 30.62 | 54 | -23.38 |
| 1800.00                       | AV           | 30.20 | 180 | 1.2 | h | 27.8 | 3.4 | 35.16 | 26.24 | 54 | -27.76 |
| 7433.81                       | PK           | 36.19 | 45  | 1.0 | h | 37.4 | 6.1 | 33.50 | 46.19 | 74 | -27.81 |
| 1658.00                       | AV           | 31.44 | 45  | 1.2 | v | 25.3 | 2.6 | 33.86 | 25.50 | 54 | -28.50 |
| 7434.11                       | PK           | 35.37 | 45  | 1.0 | v | 37.4 | 6.1 | 33.50 | 45.40 | 74 | -28.60 |
| 1300.00                       | AV           | 26.30 | 180 | 1.2 | v | 27.8 | 3.4 | 35.16 | 22.30 | 54 | -31.70 |
| 1200.00                       | AV           | 30.10 | 90  | 1.2 | h | 23.9 | 2.6 | 36.33 | 20.27 | 54 | -33.73 |
| 1658.00                       | PK           | 45.39 | 60  | 1.0 | h | 25.3 | 2.6 | 33.86 | 39.43 | 74 | -34.57 |
| 1658.00                       | PK           | 43.89 | 60  | 1.0 | v | 25.3 | 2.6 | 33.86 | 37.93 | 74 | -36.07 |
| 1100.00                       | AV           | 25.32 | 90  | 1.2 | v | 23.9 | 2.6 | 36.33 | 15.50 | 54 | -38.50 |
| 1300.00                       | PK           | 37.41 | 180 | 1.2 | v | 27.8 | 3.4 | 35.16 | 33.50 | 74 | -40.60 |
| 1800.00                       | PK           | 33.42 | 180 | 1.2 | h | 27.8 | 3.4 | 35.16 | 29.46 | 74 | -44.54 |
| 1100.00                       | PK           | 38.90 | 45  | 1.2 | v | 23.9 | 2.6 | 36.33 | 29.06 | 74 | -44.94 |
| 1200.00                       | PK           | 33.78 | 45  | 1.2 | h | 23.9 | 2.6 | 36.33 | 23.95 | 74 | -50.05 |
| 2479.01                       | PK<br>(FUND) | 87.09 | 45  | 1.0 | h | 29.1 | 3.7 | 34.00 | 85.89 |    |        |
| 2479.01                       | AV<br>(FUND) | 86.02 | 45  | 1.0 | h | 29.1 | 3.7 | 34.00 | 84.82 |    |        |
| 2479.10                       | PK<br>(FUND) | 86.29 | 45  | 1.0 | v | 29.1 | 3.7 | 34.00 | 85.09 |    |        |
| 2479.10                       | AV<br>(FUND) | 84.52 | 45  | 1.0 | v | 29.1 | 3.7 | 34.00 | 83.30 |    |        |

## §15.247(a)(1)-CHANNEL SEPARATION TEST

### Standard Applicable

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB Bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

### Test Equipment List and Details

| Manufacturer    | Description   | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|---------------|-------|---------------|------------------|----------------------|
| Rohde & Schwarz | Test Receiver | ESCI  | 100035        | 2004-9-15        | 2005-9-14            |

\* **Statement of Traceability:** BACL attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another truce
3. Measure the channel separation.

Limit

FCC Part 15, Subpart C Section 15.247(a)(1). Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz OR THE 20 Db Bandwidth of the hopping channel, whichever is greater.

| FREQUENCY RANGE (MHz) | Limit (kHz) |
|-----------------------|-------------|
| 902-928               | >25kHz      |
| 2400-2483.5           | >25kHz      |
| 5725-5850             | >25kHz      |

### Test Data

#### Environmental Conditions

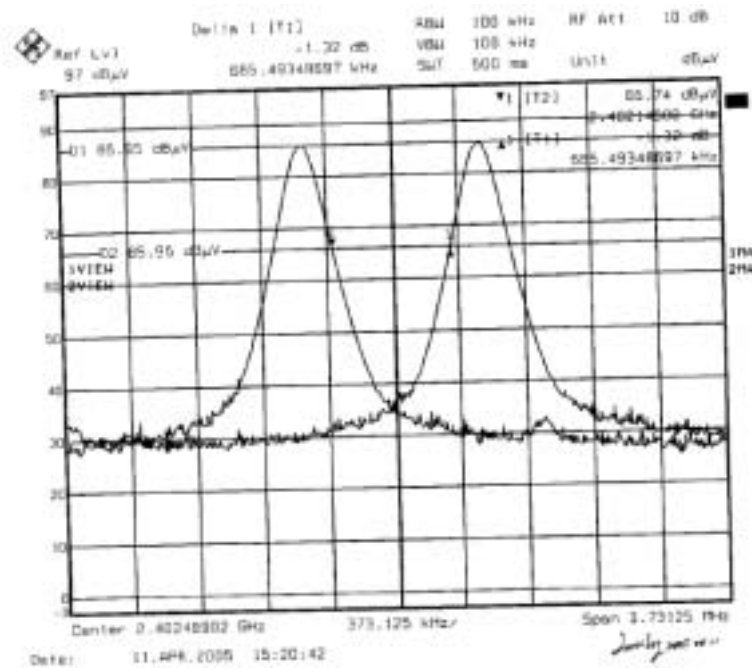
|                    |           |
|--------------------|-----------|
| Temperature:       | 16° C     |
| Relative Humidity: | 85%       |
| ATM Pressure:      | 1016 mbar |

The testing was performed by Jandy Su on 2005-4-12

Test Result: Pass

The result has been complied with the §15.247a(1), see the following plot:

| CHANNEL           | CHANNEL<br>FREQUENCY<br>(MHz) | SEPARATION<br>READ VALUE (kHz) | SEPARATION<br>LIMIT<br>(kHz) |
|-------------------|-------------------------------|--------------------------------|------------------------------|
| Low Channel       | 2402.00                       | 665.49                         | >25                          |
| Adjacency Channel | 2403.00                       |                                | >25                          |



**§15.247(a)(1) 20dB BANDWIDTH TESTING****Standard Applicable**

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB Bandwidth of the hopping channel, whichever is greater.

**Test Equipment List and Details**

| Manufacturer    | Description       | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-------------------|-------|---------------|------------------|----------------------|
| HP              | Amplifier         | 8447D | 2994A09795    | 2004-9-1         | 2005-8-31            |
| Rohde & Schwarz | Test Receiver     | ESCI  | 100028        | 2004-9-6         | 2005-9-5             |
| Sunol Sciences  | Bilog Antenna     | JB1   | A040904-1     | 2004-4-19        | 2005-4-18            |
| Sunol Sciences  | System Controller | SC99V | 033004-1      | N/A              | N/A                  |

\* **Statement of Traceability:** BACL attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

**Test Procedure**

1. Check the calibration of the measuring instrument using a known signal from an external generator.
2. Position the EUT without connection to the tunable table. Turn on the EUT. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

**Test Data****Environmental Conditions**

|                    |          |
|--------------------|----------|
| Temperature:       | 25 ° C   |
| Relative Humidity: | 50%      |
| ATM Pressure:      | 1032mbar |

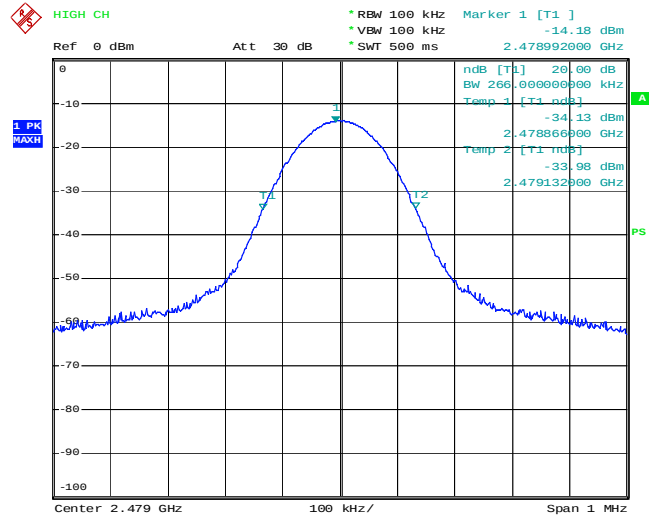
*The testing was performed by Jandy Su on 2005-4-12*

Test Result: Pass

The result has been complied with the §15.247(a)(1), see the following plot:

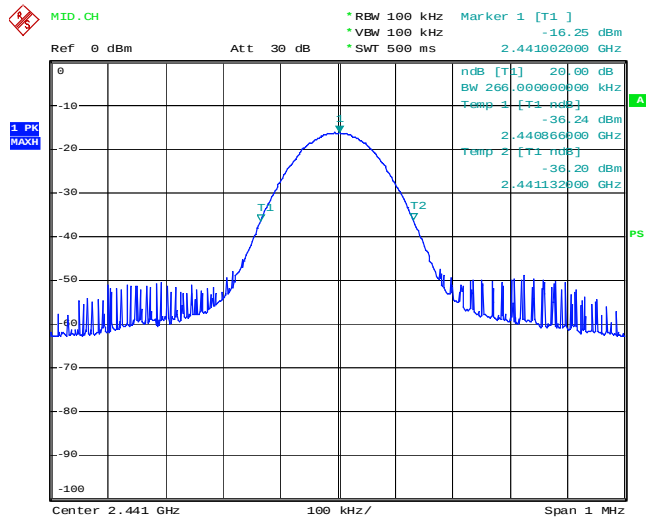
| Channel        | Channel frequency (MHz) | 20dB Bandwidth (KHz) | Limit (KHz) |
|----------------|-------------------------|----------------------|-------------|
| Low channel    | 2402                    | 266.00               | <1000       |
| Middle channel | 2441                    | 266.00               | <1000       |
| High channel   | 2479                    | 266.00               | <1000       |

### High Channel



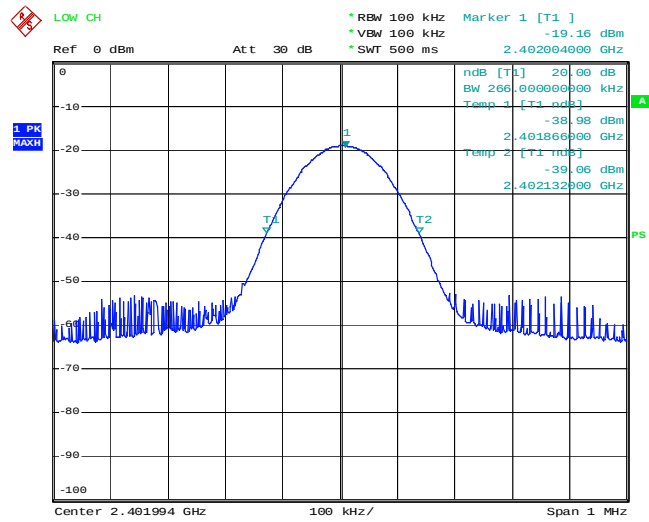
Date: 8.APR.2005 16:20:59

### Middle Channel



XB2317T Time Frequency Stability

## Low Channel



Date: 8.APR.2005 16:17:04

**§15.247(a)(1)(iii)-QUANTITY OF HOPPING CHANNEL TEST****Standard Applicable**

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

**Test Equipment List and Details**

| Manufacturer    | Description   | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|---------------|-------|---------------|------------------|----------------------|
| Rohde & Schwarz | Test Receiver | ESCI  | 100035        | 2004-9-15        | 2005-9-14            |

\* **Statement of Traceability:** BACL attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

**Test Procedure**

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in transmitting mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

Limit

FCC Part 15, Subpart C Section 15.247

| FREQUENCY RANGE (MHz) | Limit (Quantity of Hopping Channel) |                          |                        |                        |
|-----------------------|-------------------------------------|--------------------------|------------------------|------------------------|
|                       | 20 dB bandwidth <250 kHz            | 20 dB bandwidth >250 kHz | 20 dB bandwidth <1 MHz | 20 dB bandwidth >1 MHz |
| 902-928               | 50                                  | 25                       | N/A                    | N/A                    |
| 2400-2483.5           | N/A                                 | N/A                      | 15                     | 15                     |
| 5725-5850             | N/A                                 | N/A                      | 75                     | N/A                    |

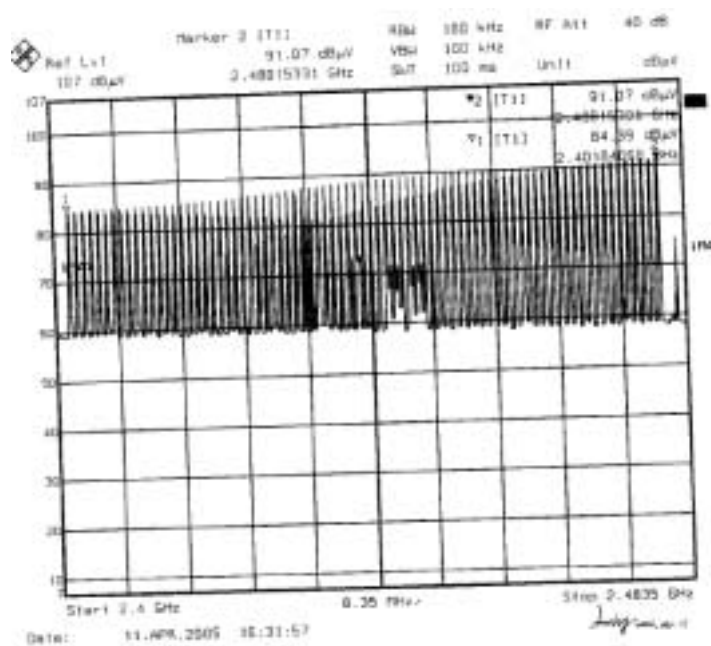
## Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 16° C     |
| Relative Humidity: | 85%       |
| ATM Pressure:      | 1016 mbar |

Test Result: Pass

The frequency hopping systems operating in 2.4~2.4835 GHz band employ 78 nonoverlapping channels.

| HOPPING CHANNEL<br>FREQUENCY RANGE | QUANTITY OF HOPPING<br>CHANNEL READ VALUE | QUANTITY OF HOPPING<br>CHANNEL LIMIT |
|------------------------------------|-------------------------------------------|--------------------------------------|
| 2402 ~ 2480                        | 78                                        | 15                                   |



**§15.247(a)(1)(iii) - TIME OF OCCUPANCY (DWELL TIME)****Standard Applicable**

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

**Test Equipment List and Details**

| Manufacturer    | Description       | Model  | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-------------------|--------|---------------|------------------|----------------------|
| Rohde & Schwarz | Spectrum Analyzer | FSEM30 | 849720/019    | 2004-11-10       | 2005-11-9            |

**\* Statement of Traceability:** BACL attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

**Test Procedure**

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 X channel no.(s), The quantity of False was get from single sweep. In addition, the time of single Pluses was tested.

Limit

FCC Part 15, Subpart C Section 15.247.

| FREQUENCY RANGE<br>(MHz) | LIMIT (ms)                             |                                        |                                       |
|--------------------------|----------------------------------------|----------------------------------------|---------------------------------------|
|                          | 20dB bandwidth<br><250kHz (50 Channel) | 20dB bandwidth<br>>250kHz (50 Channel) | 20dB bandwidth<br><1 MHz (75 Channel) |
| 902-928                  | 400(20s)                               | 400(10s)                               | N/A                                   |
| 2400-2483.5              | N/A                                    | N/A                                    | 400(30s)                              |
| 5725-5850                | N/A                                    | N/A                                    | 400(30s)                              |

**Test Data****Environmental Conditions**

|                    |          |
|--------------------|----------|
| Temperature:       | 25 ° C   |
| Relative Humidity: | 50%      |
| ATM Pressure:      | 1032mbar |

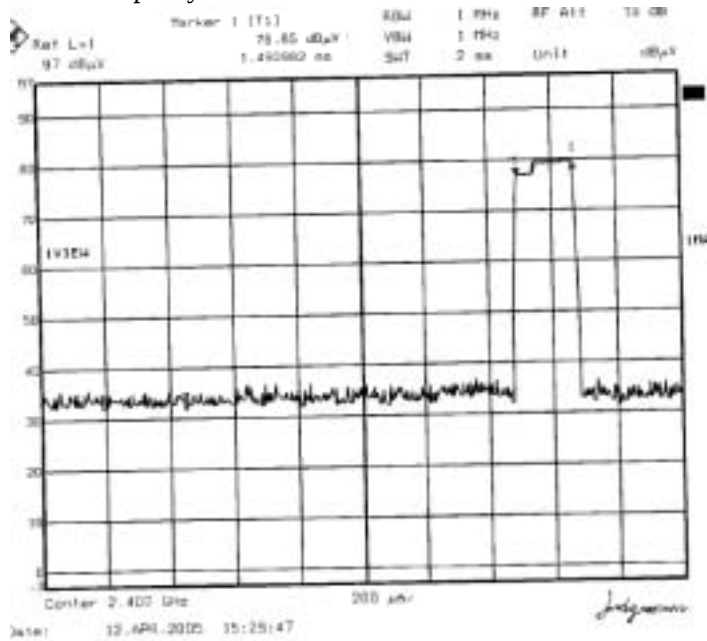
The testing was performed by Jandy Su on 2005-4-12

Test Result: Pass

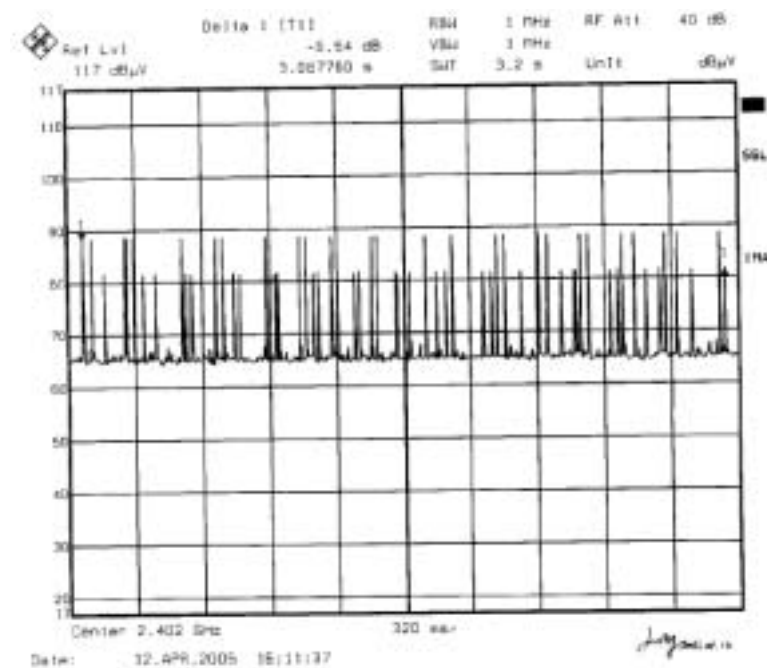
The result has been complied with the §15.247(a)(1)(iii), see the following plot:

| Channel        | Frequency<br>MHz | Pulse Wide<br>m Sec | Quantity Pulse<br>per 3.2 Sec | Dwell Time<br>m Sec | Limit<br>Sec |
|----------------|------------------|---------------------|-------------------------------|---------------------|--------------|
| Low channel    | 2402             | 0.174               | 58                            | 10.09               | 0.4          |
| Middle channel | 2441             | 0.174               | 59                            | 10.27               | 0.4          |
| High channel   | 2479             | 0.180               | 36                            | 6.48                | 0.4          |

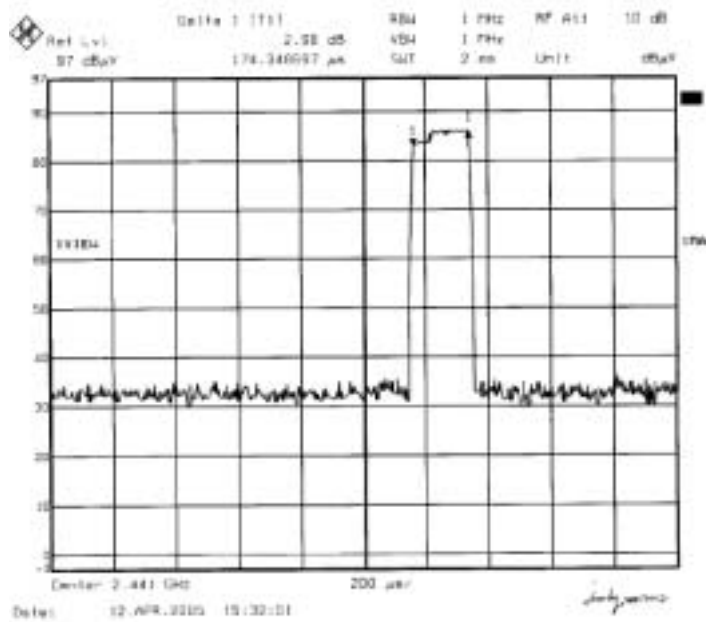
Pulse occupancy time low channel



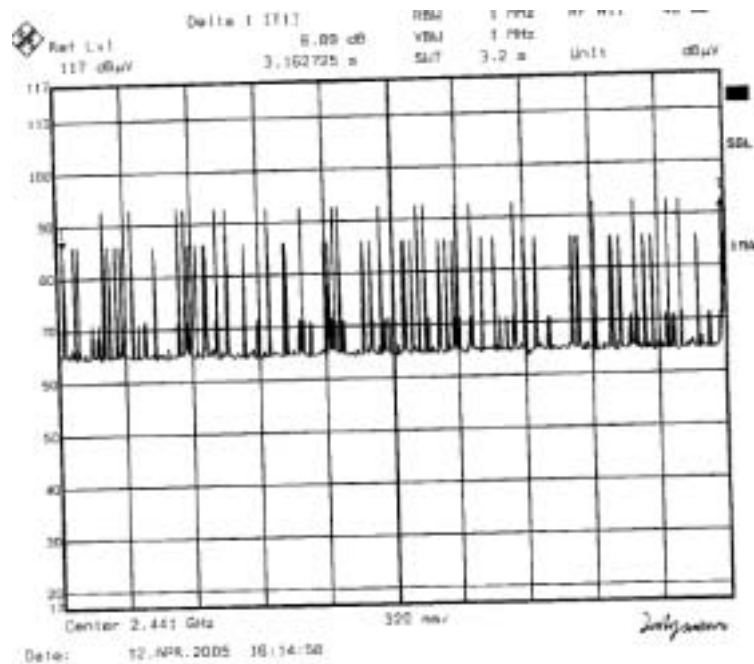
Time of Occupancy (Dwell Time) low channel



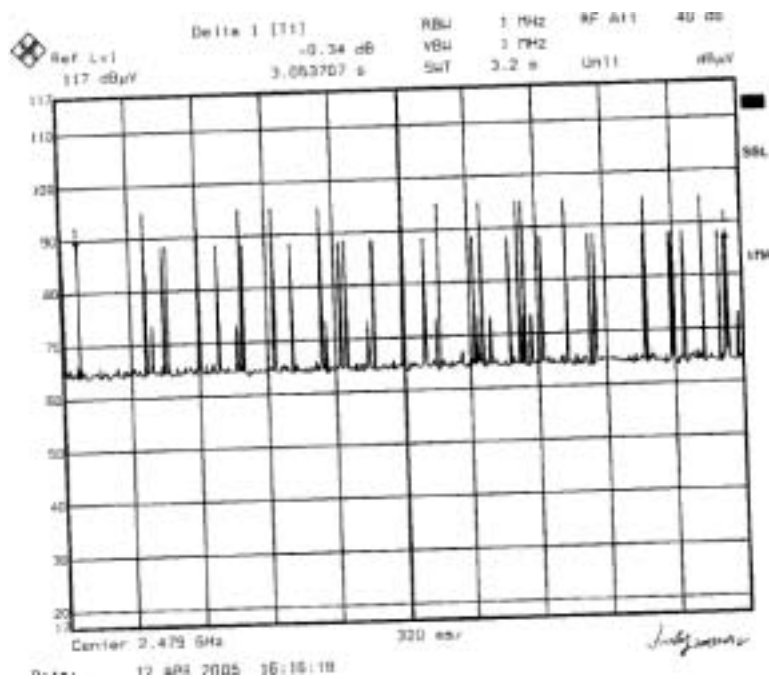
## Pulse occupancy time middle channel



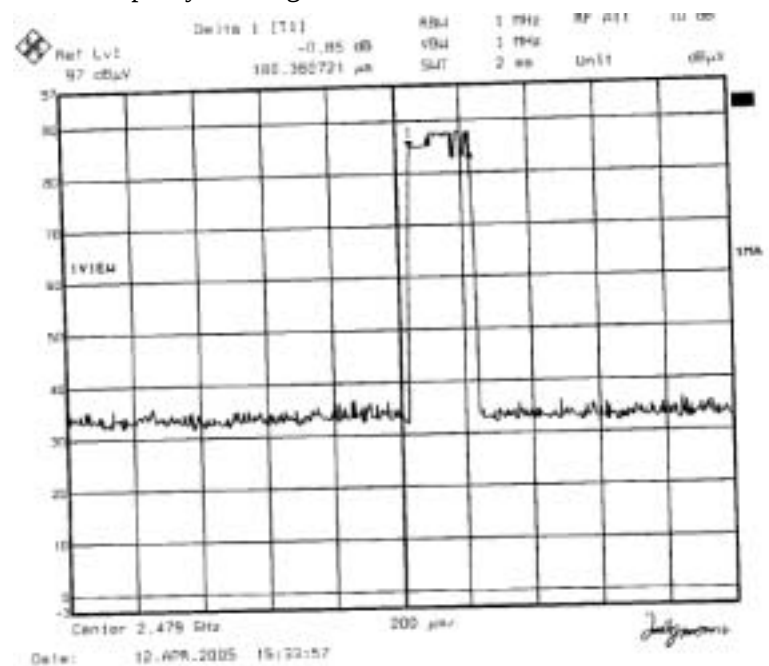
## Time of Occupancy (Dwell Time) middle channel



## Time of Occupancy (Dwell Time) high channel



## Pulse occupancy time high channel



## §15.247(b)(1) - PEAK OUTPUT POWER MEASUREMENT

### Standard Applicable

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(1) For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

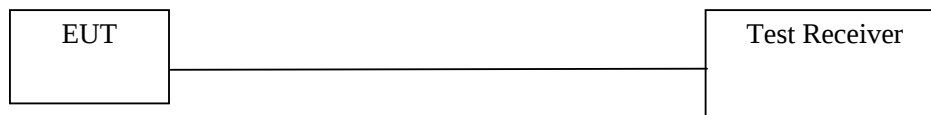
### Test Equipment List and Details

| Manufacturer    | Description   | Model | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|---------------|-------|---------------|------------------|----------------------|
| Rohde & Schwarz | Test Receiver | ESCI  | 100035        | 2004-9-15        | 2005-9-14            |

\* **Statement of Traceability:** **BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the UFL port of EUT to a Peak Power Meter.



### Test Data

#### Environmental Conditions

|                    |           |
|--------------------|-----------|
| Temperature:       | 16° C     |
| Relative Humidity: | 85%       |
| ATM Pressure:      | 1016 mbar |

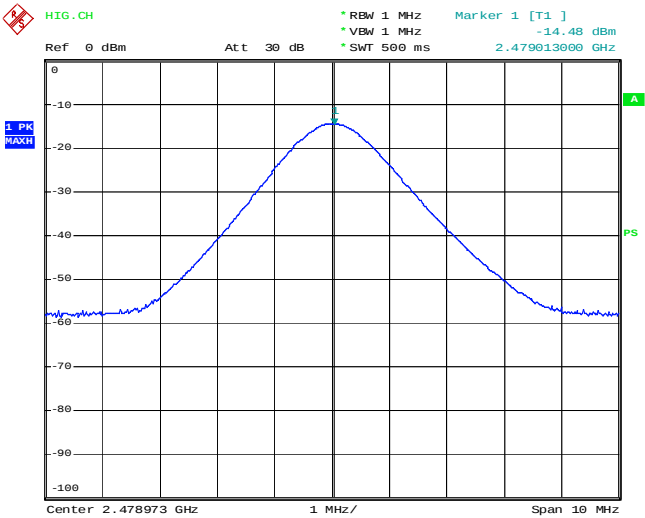
The testing was performed by Jandy Su on 2005-4-12

Test Result: Pass

The result has been complied with the 15.247(b)(1), see the following plot:

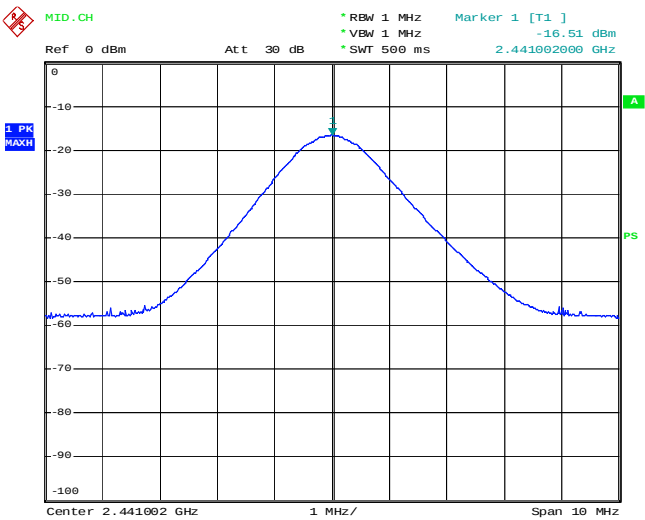
| CHANNLE        | CHANNEL FREQUENCY (MHz) | PEAK POWER OUTPUT (dBm) | PEAK POWER LIMIT (dBm) |
|----------------|-------------------------|-------------------------|------------------------|
| High Channel   | 2479.00                 | -14.48                  | 30                     |
| Middle Channel | 2441.00                 | -16.31                  | 30                     |
| Low Channel    | 2402.00                 | -19.78                  | 30                     |

High Channel



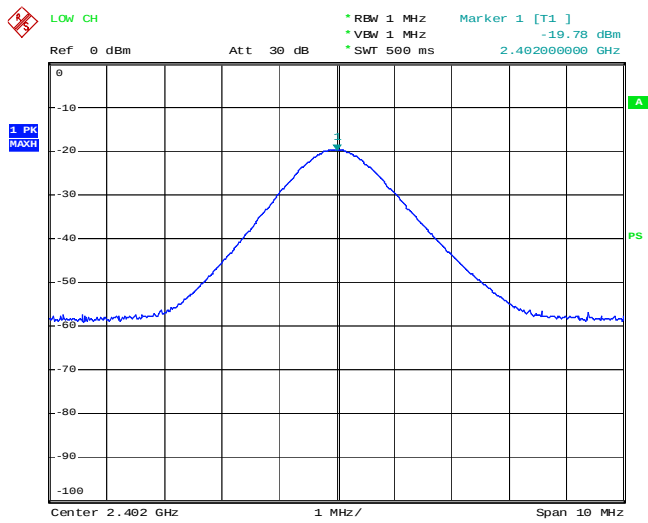
Date: 8.APR.2005 16:10:32

Middle Channel



Date: 8.APR.2005 16:04:23

## Low Channel



Date: 8.APR.2005 16:06:03

## §15.247(d)- BAND EDGES TESTING

### Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### Test Equipment List and Details

| Manufacturer    | Description       | Model   | Serial Number | Calibration Date | Calibration Due Date |
|-----------------|-------------------|---------|---------------|------------------|----------------------|
| HP              | Amplifier         | 8447E   | 1937A01046    | 2004-9-1         | 2005-8-31            |
| Rohde & Schwarz | Test Receiver     | ESCI    | 100035        | 2004-9-15        | 2005-9-14            |
| Sunol Sciences  | Bilog Antenna     | JB1     | A040904-2     | 2004-4-19        | 2005-4-18            |
| Sunol Sciences  | System Controller | SC99V   | 041304-1      | N/A              | N/A                  |
| Thermax         | Coaxial Cable     | RGS-142 | EC004         | 2004-9-1         | 2005-8-31            |
| HP              | Amplifier         | 8447D   | 2994A09795    | 2004-9-1         | 2005-8-31            |
| Rohde & Schwarz | Test Receiver     | ESCI    | 100028        | 2004-9-6         | 2005-9-5             |
| Sunol Sciences  | Bilog Antenna     | JB1     | A040904-1     | 2004-4-19        | 2005-4-18            |
| Sunol Sciences  | System Controller | SC99V   | 033004-1      | N/A              | N/A                  |

\* **Statement of Traceability:** BACL Corp. attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### Test Procedure

1. Check the calibration of the measuring instrument using a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Start 2.4 G Hz, stop 2.4835 GHz, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the frequency edge point amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the edge frequency.

**Environmental Conditions**

|                    |          |
|--------------------|----------|
| Temperature:       | 24 °C    |
| Relative Humidity: | 59%      |
| ATM Pressure:      | 1178mbar |

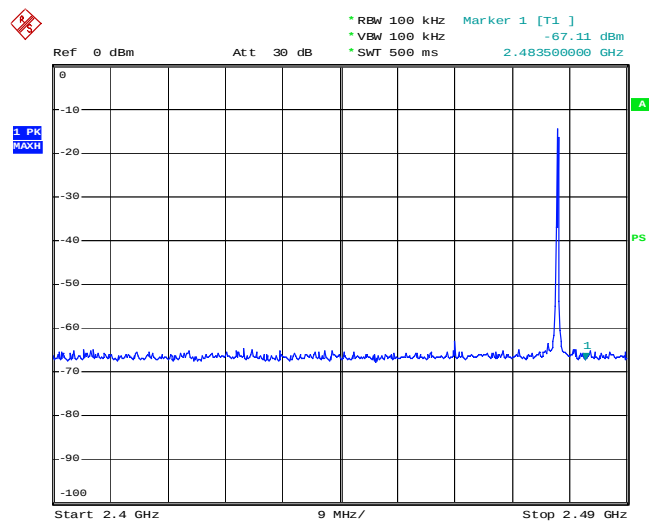
*The testing was performed by Jandy Su on 2005-4-12*

Test Result: Pass

The result has been complied with the 15.247(d), see the following plot:

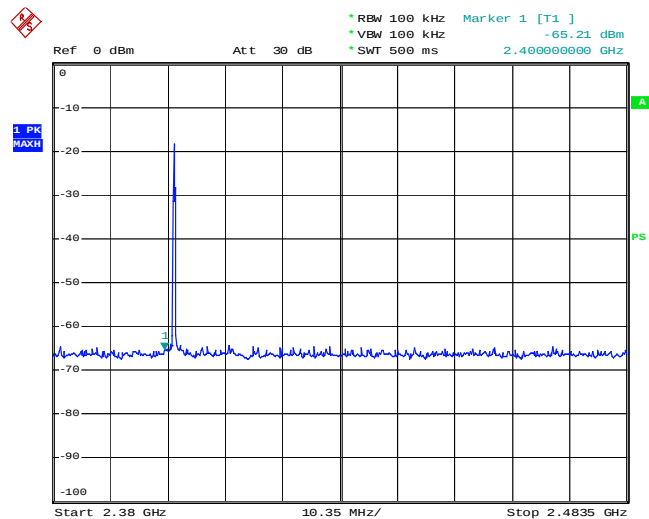
| Frequency<br>MHz | Emission<br>dB $\mu$ V/m | Limit<br>dB $\mu$ V/m |
|------------------|--------------------------|-----------------------|
| 2483.50          | 39.89                    | 54                    |
| 2400.00          | 41.79                    | 54                    |

## High Channel



Date: 8.APR.2005 16:11:42

## Low Channel



Date: 8.APR.2005 16:13:41