



**Spectrum Research & Testing Lab., Inc.**  
No. 101-10, Ling 8,  
Shan-Tong Li, Chung-Li  
City, Taoyuan, Taiwan

## TEST REPORT

Reference No.:B05070701  
Report No.:FCCA04010502-03  
FCC ID: S9ZTBW102UB  
Page:1 of 45  
Issued Date: July 12, 2005

Product Name: High Power Bluetooth USB Adapter  
Model Number: TBW-102UB(CLASS I)  
Applicant: TRENDware International Inc.  
3135 Kashiwa Street, Torrance, CA 90505 USA  
Date of Receipt: Oct. 28, 2004  
Finished date of Test: Nov. 18, 2004  
Applicable Standards: 47 CFR Part 15, Subpart C  
ANSI C63.4:2003

We, **Spectrum Research & Testing Laboratory Inc.**, hereby certify that one sample of the above was tested in our laboratory with positive results according to the above-mentioned standards. The records in the report are an accurate account of the results. Details of the results are given in the subsequent pages of this report.

Checked By : \_\_\_\_\_ , Date: \_\_\_\_\_  
( Hugo Yeh )

Approved By : \_\_\_\_\_ , Date: \_\_\_\_\_  
( Johnson Ho, Director )



Lab Code: 200099-0



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### **1. DOCUMENT POLICY AND TEST STATEMENT**

#### **1.1 DOCUMENT POLICY**

- The report shall not be reproduced except in full, without the written approval of SRT Lab, Inc.

#### **1.2 TEST STATEMENT**

- The test results in the report apply only to the unit tested by SRT Lab.
- There was no deviation from the requirements of test standards during the test.
- AC power source, 120 VAC/60 Hz, was used during the test.

#### **1.3 EUT MODIFICATION**

- No modification in SRT Lab.



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## 2. DESCRIPTION OF EUT AND TEST MODE

### 2.1 GENERAL DESCRIPTION OF EUT

|                                 |                                  |
|---------------------------------|----------------------------------|
| <b>PRODUCT</b>                  | High Power Bluetooth USB Adapter |
| <b>MODEL NO.</b>                | TBW-102UB(CLASS I)               |
| <b>POWER SUPPLY</b>             | 5Vdc Computer USB supply         |
| <b>CABLE</b>                    | N/A                              |
| <b>I/O PORT</b>                 | N/A                              |
| <b>FREQUENCY BAND</b>           | 2400~2483.5MHz                   |
| <b>CARRIER FREQUENCY</b>        | CH0: 2402MHz~CH78: 2480MHz       |
| <b>NUMBER OF CHANNEL</b>        | 79                               |
| <b>CHANNEL SPACING</b>          | 1 MHz                            |
| <b>RATED RF OUTPUT POWER</b>    | 1 mW (0dBm)                      |
| <b>I.F. &amp; L.O.</b>          | IF=1MHz, LO=RF-IF                |
| <b>MODULATION TYPE</b>          | GFSK                             |
| <b>BIT RATE OF TRANSMISSION</b> | 1Mbps                            |
| <b>ANTENNA TYPE</b>             | Printed antenna                  |
| <b>ANTENNA GAIN</b>             | 0 dBi                            |

#### NOTE :

For more detailed information, please refer to the EUT's specification or user's manual provided by manufacturer.



## 2.2 DESCRIPTION OF SUPPORT UNIT

The transmitter part of EUT was tested with a PC system and configured by the requirement of ANSI C63.4. All interface ports were connected to the appropriate support units via specific cables. The support units and cables are listed below.

| NO | DEVICE              | BRAND | MODEL #      | FCC ID/DOC | CABLE  |
|----|---------------------|-------|--------------|------------|--|
| 1  | NOTEBOOK            | DELL  | PP01L        | DOC        | 1.5m unshielded power cord                                 |
| 2  | PRINTER             | EPSON | STYLUS C20SX | DOC        | 1.5m unshielded power cord<br>1.2m shielded data cable     |
| 3  | MODEM               | ACEEX | DM-1414      | DOC        | 1.5m unshielded DC power cable<br>1.2m shielded data cable |
| 4  | BLUETOOTH HEADPHONE | AIR2U | 13909        | DOC        | N/A  |

**NOTE :** For the actual test configuration, please refer to the photos of testing.

## 2.3 DESCRIPTION OF TEST MODE

This EUT is a FHSS system, we use BlueTest to control the EUT with RS232, Let EUT hopping on and transmit at every channel with highest power, Only output power use conducted method, others are using radiated method. After Sirfdemo330R1 send the command to EUT, it can be removed, and the EUT keep hopping.79 channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

| Channel | Frequency(MHz) |
|---------|----------------|
| 0       | 2402           |
| 39      | 2441           |
| 78      | 2480           |

**NOTE :**

1. Below 1 GHz, the channel 0, 39 and 78 were pre-tested in chamber. The channel 78, worst case one, was chosen for conducted and radiated emission test.
2. Above 1 GHz, the channel 0, 39 and 78 were tested individually.

## 3. DESCRIPTION OF APPLIED STANDARDS

The EUT is a kind of wireless product and to be connected with a PC system for normal use. According to the specifications provided by the applicant, it must comply with the requirements of the following standards:

47 CFR Part 15, Subpart C

ANSI C63.4: 2003

Public DA00-705 (March 2000)

All tests have been performed and recorded as the above standards.



## 4 TECHNICAL CHARACTERISTICS TEST

### 4.1 CHANNEL SEPARATION TEST

#### 4.1.1 LIMIT

FCC Part15, 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     |

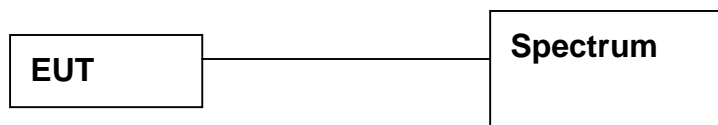
#### 4.1.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test :

| EQUIPMENT/<br>FACILITIES | SPECIFICATIONS | MANUFACTURER       | MODEL#/<br>SERIAL#  | DUE DATE OF CAL. &<br>CAL. CENTER |
|--------------------------|----------------|--------------------|---------------------|-----------------------------------|
| SPECTRUM                 | 9kHz-7GHz      | ROHDE &<br>SCHWARZ | FSP7/<br>839511/010 | MAR. 2005<br>ETC                  |

**NOTE:** The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

#### 4.1.3 TEST SET-UP



The EUT was connected to a spectrum through a 50 RF cable.

#### 4.1.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

#### 4.1.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.



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### 4.1.6 TEST RESULT

Temperature: 26°C Humidity: 55%RH  
Spectrum Detector: PK Tested by: Peter Tsai  
Test Result: PASS

| CHANNEL NUMBER | CHANNEL FREQUENCY (MHz) | SEPARATION READ VALUE (kHz) | MINIMUM LIMIT (kHz) |
|----------------|-------------------------|-----------------------------|---------------------|
| 0              | 2402                    | 1000.000                    | 896                 |
| 39             | 2441                    | 1000.000                    | 884                 |
| 78             | 2480                    | 1000.000                    | 916                 |



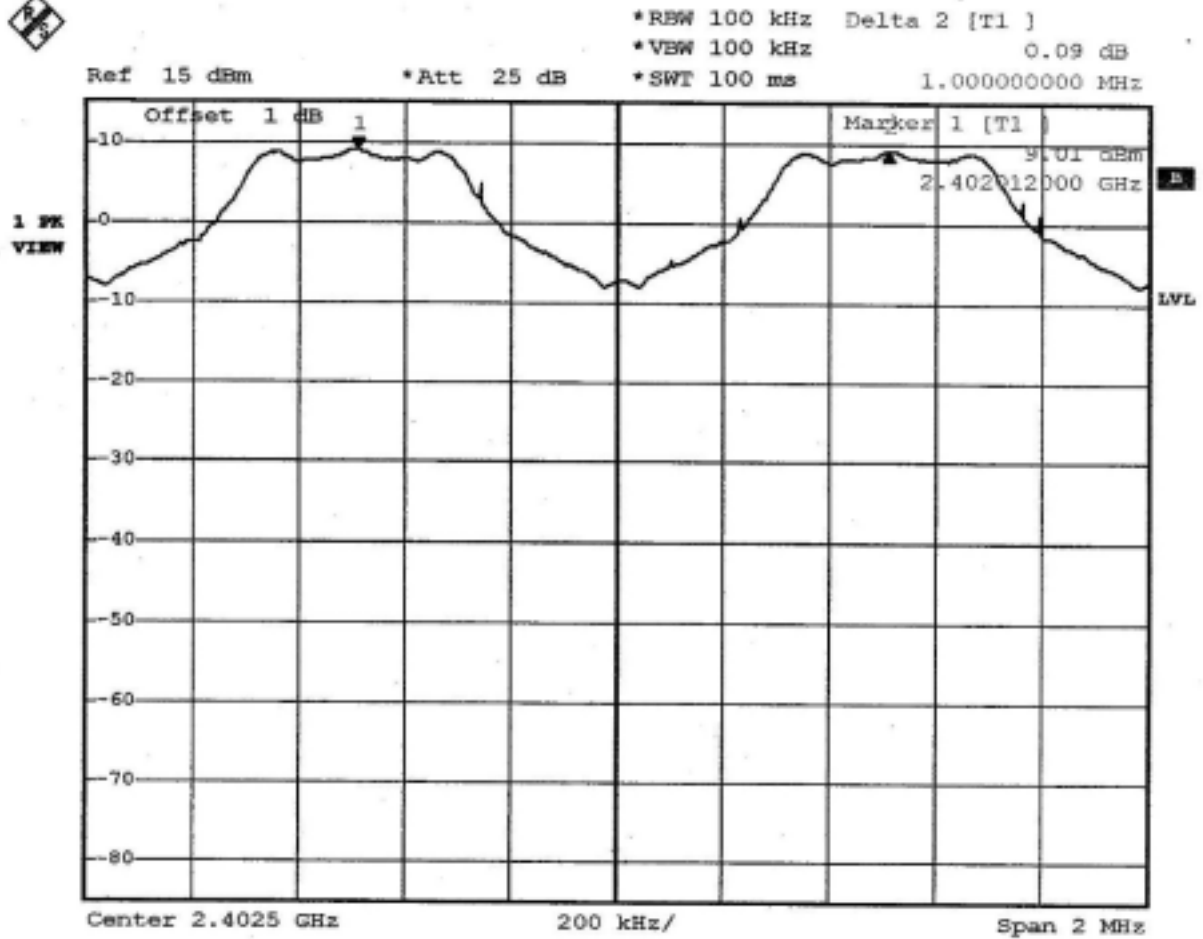


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CH0:



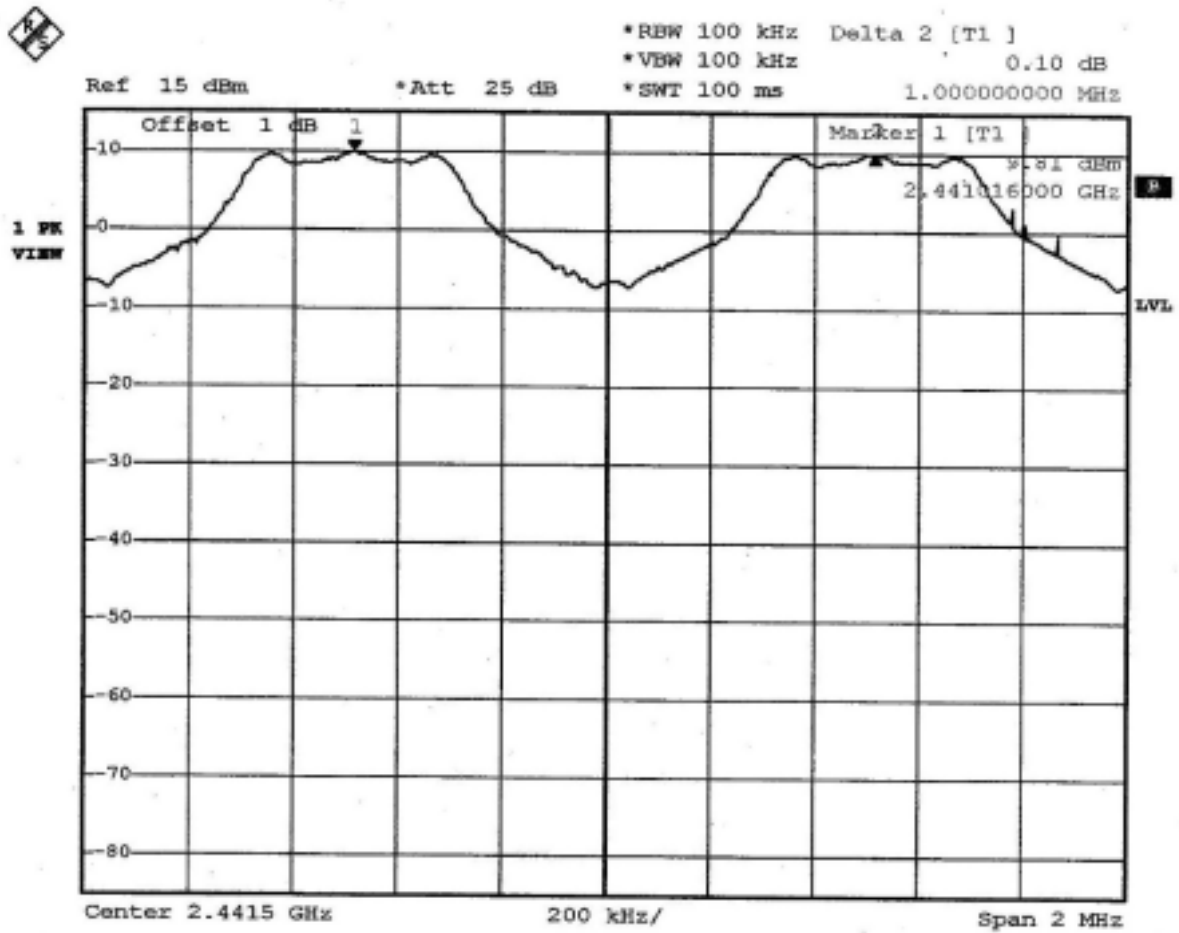


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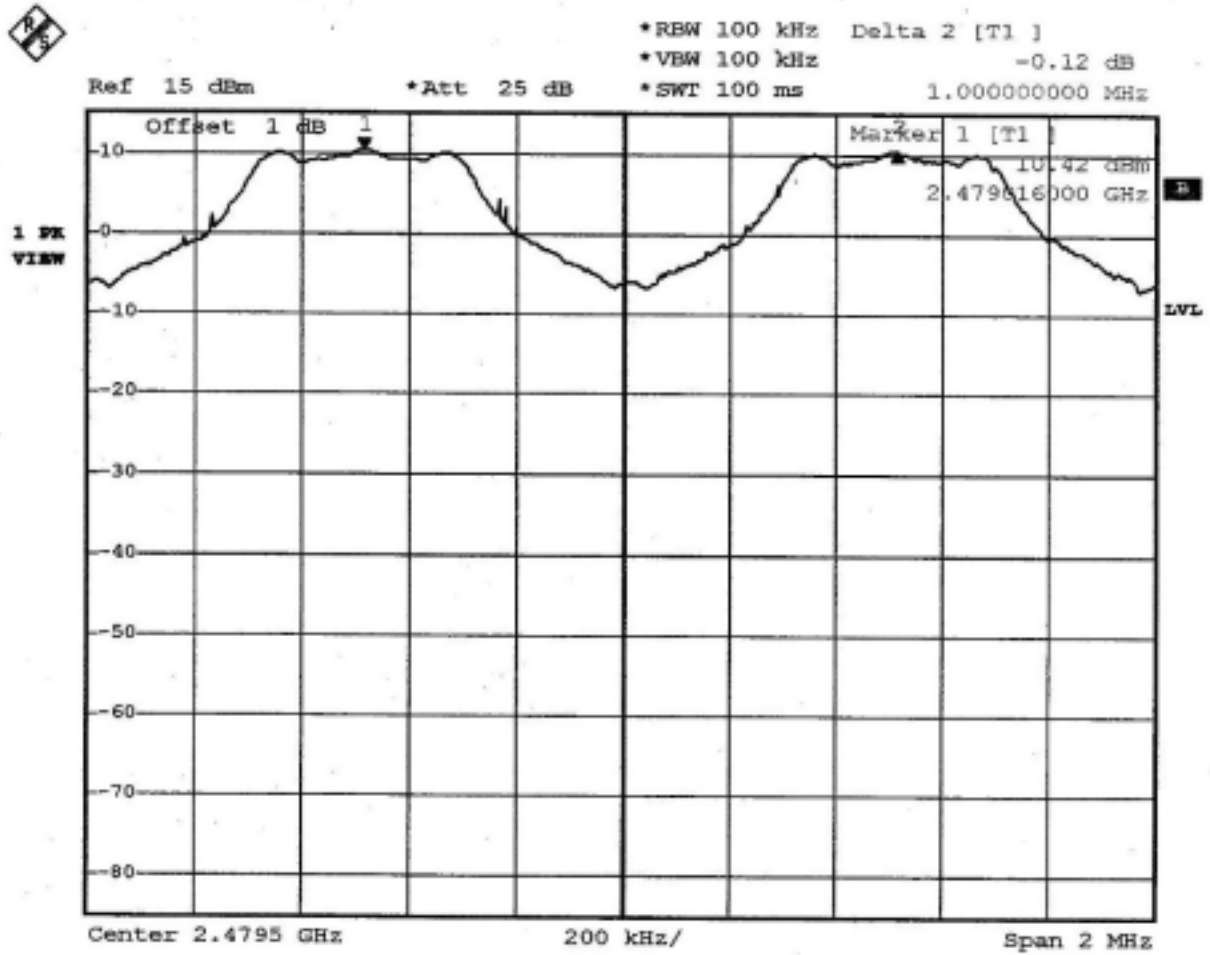


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## 4.2 20dB Bandwidth

### 4.2.1 LIMIT

| FREQUENCY Range (MHz) | Quantity of Hopping Channel | Limit(kHz) |      |       |       |
|-----------------------|-----------------------------|------------|------|-------|-------|
|                       |                             | 50         | 25   | 15    | 75    |
| 902-928               |                             | <250       | >250 | NA    | NA    |
| 2400-2483.5           |                             | NA         | NA   | >1000 | <1000 |

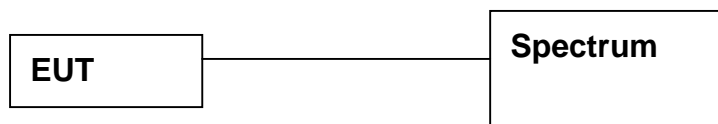
### 4.2.2 TEST EQUIPMENT

The following test equipment was used during the test:

| EQUIPMENT/ FACILITIES | SPECIFICATIONS | MANUFACTURER    | MODEL#/ SERIAL#     | DUE DATE OF CAL. & CAL. CENTER |
|-----------------------|----------------|-----------------|---------------------|--------------------------------|
| SPECTRUM              | 9kHz-7GHz      | ROHDE & SCHWARZ | FSP7/<br>839511/010 | MAR. 2005<br>ETC               |

**NOTE:** The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.2.3 TEST SET-UP



The EUT was connected to a spectrum through a 50 Ω RF cable.

### 4.2.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

### 4.2.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.



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## 4.2.6 TEST RESULT

Temperature: 26°C Humidity: 55%RH  
Spectrum Detector: PK Tested by: Peter Tsai  
Test Result: PASS

| CHANNEL NUMBER | CHANNEL FREQUENCY (MHz) | 20dB DOWN BW (kHz) |
|----------------|-------------------------|--------------------|
| 0              | 2402                    | 896                |
| 39             | 2441                    | 884                |
| 78             | 2480                    | 916                |



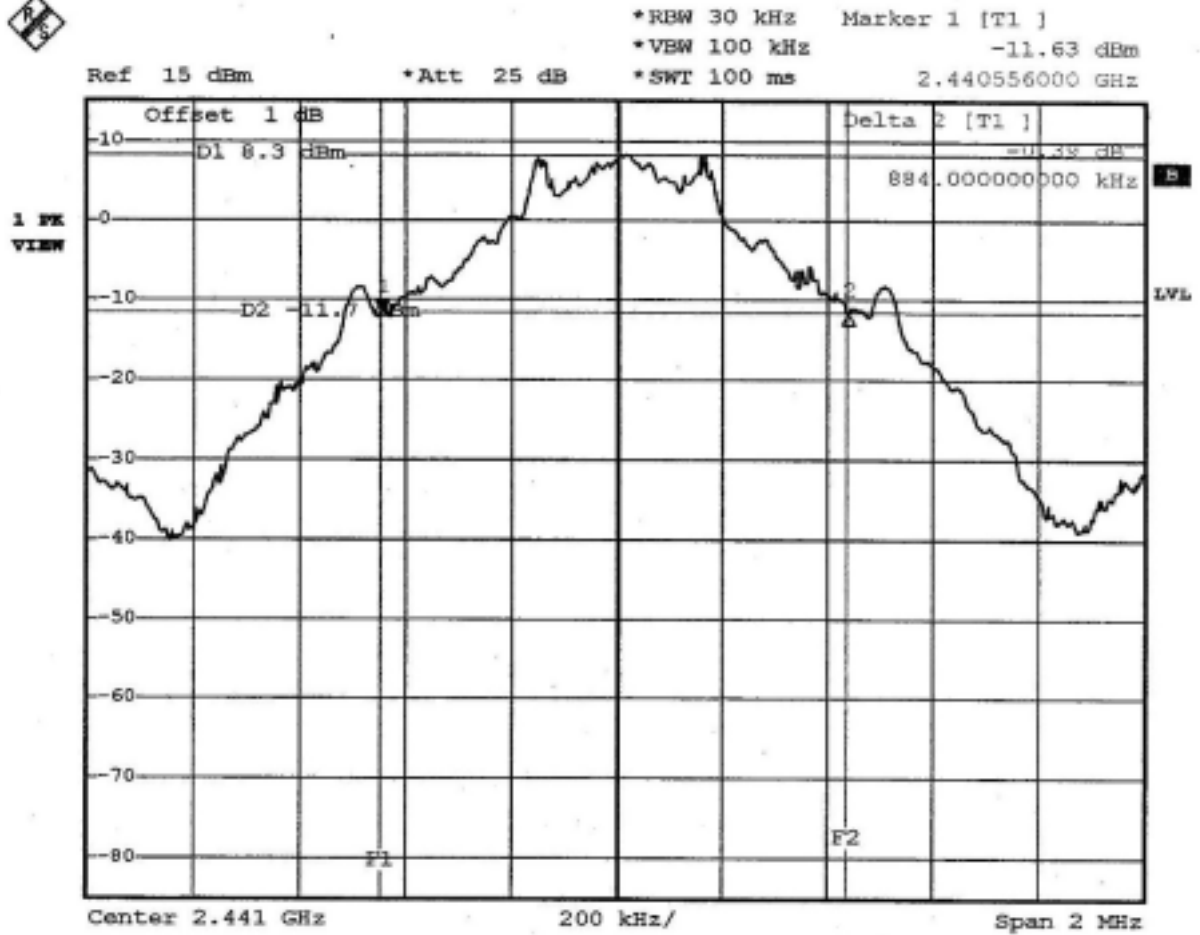


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### 4.3 QUANTITY OF HOPPING CHANNEL TEST

#### 4.3.1 LIMIT

FCC Part15, Subpart C Section 15.247.

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

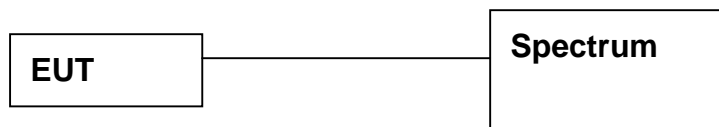
#### 4.3.2 TEST EQUIPMENT

The following test equipment was used during the test:

| EQUIPMENT/FACILITIES | SPECIFICATIONS | MANUFACTURER    | MODEL#/SERIAL#      | DUE DATE OF CAL. & CAL. CENTER |
|----------------------|----------------|-----------------|---------------------|--------------------------------|
| SPECTRUM             | 9kHz-7GHz      | ROHDE & SCHWARZ | FSP7/<br>839511/010 | MAR. 2005<br>ETC               |

**NOTE:** The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

#### 4.3.3 TEST SET-UP



The EUT was connected to a spectrum through a 50 RF cable.

#### 4.3.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

#### 4.3.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.



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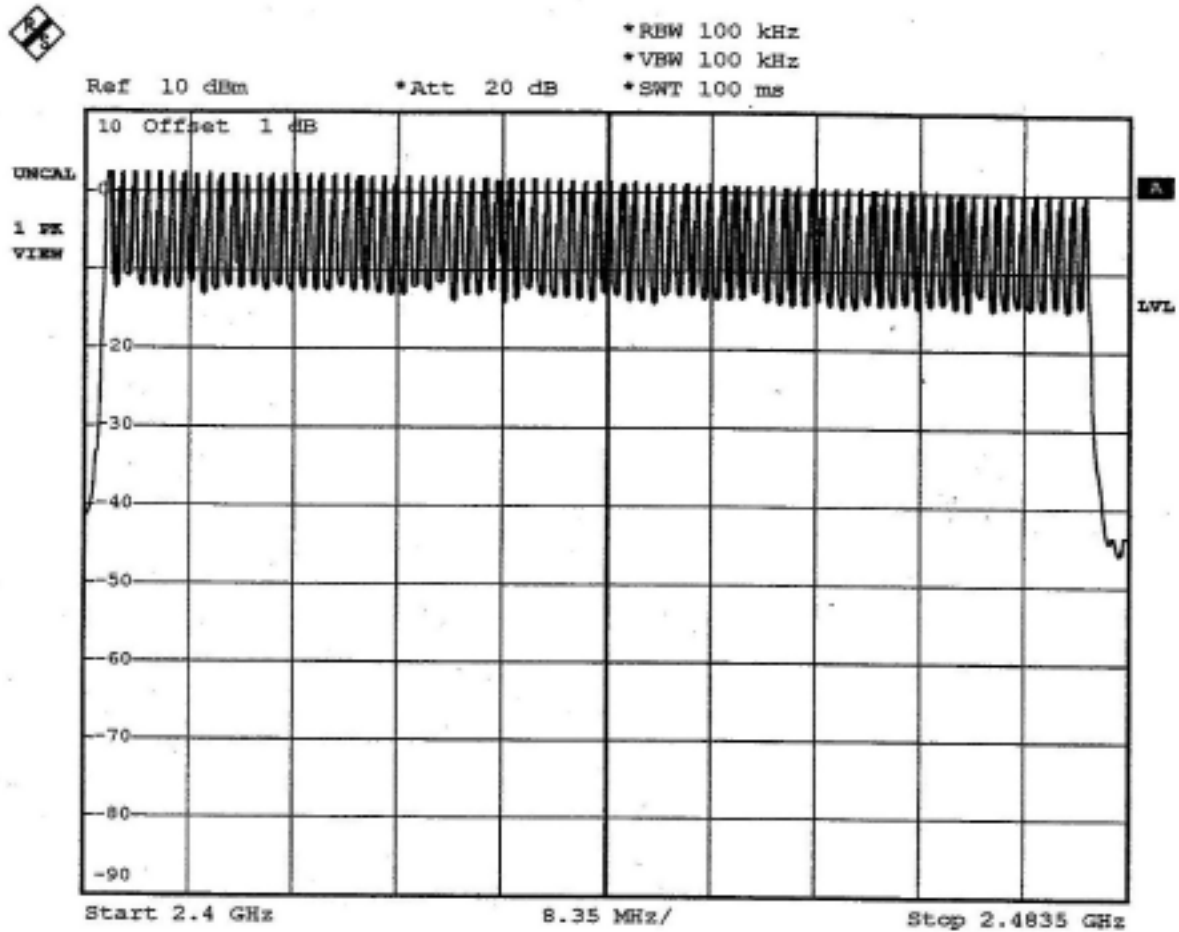
Reference No.:B05070701  
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### 4.3.6 TEST RESULT

Temperature: 26°C Humidity: 55%RH  
 Spectrum Detector: PK Tested by: Peter Tsai  
 Test Result: PASS

| HOPPING CHANNEL FREQUENCY RANGE | QUANTITY OF HOPPING CHANNEL READ VALUE | QUANTITY OF HOPPING CHANNEL LIMIT |
|---------------------------------|--|-----------------------------------|
| 2402~2480                       | 79                                     | 75                                |

CH0-CH78





## 4.4 Time of occupancy (Dwell Time)

### 4.4.1 LIMIT

FCC Part15, Subpart C Section 15.247.

| FREQUENCY RANGE (MHz) | LIMIT (ms)                        |                                   |                                 |
|-----------------------|-----------------------------------|-----------------------------------|---------------------------------|
|                       | 20dB bandwidth <250kHz(50Channel) | 20dB bandwidth >250kHz(25Channel) | 20dB bandwidth <1MHz(75Channel) |
| 902-928               | 400(20s)                          | 400(10s)                          | NA                              |
| 2400-2483.5           | NA                                | NA                                | 400(30s)                        |
| 5725-5850             | NA                                | NA                                | 400(30s)                        |

**NOTE:** The “()” is all channel’s average time of occupancy.

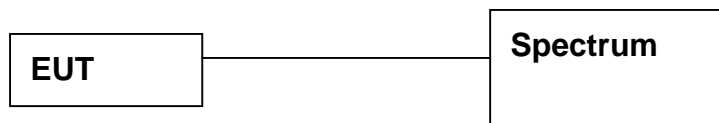
### 4.4.2 TEST EQUIPMENT

The following test equipment was used during the test:

| EQUIPMENT/ FACILITIES | SPECIFICATIONS | MANUFACTURER    | MODEL#/ SERIAL#     | DUE DATE OF CAL. & CAL. CENTER |
|-----------------------|----------------|-----------------|---------------------|--------------------------------|
| SPECTRUM              | 9kHz-7GHz      | ROHDE & SCHWARZ | FSP7/<br>839511/010 | MAR. 2005<br>ETC               |

**NOTE:** The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.4.3 TEST SET-UP



The EUT was connected to a spectrum through a 50 RF cable.

### 4.4.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.

### 4.4.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.



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### 4.4.6 TEST RESULT

Temperature: 26°C

Humidity: 55%RH

Spectrum Detector: PK

Tested by: Peter Tsai

Test Result: PASS

| CHANNEL NUMBER | CHANNEL FREQUENCY (MHz) | Pulse Time (μs) | Burts (in 1 sec.) | Time of occupancy (Dwell Time) (ms) | Average time of occupancy LIMIT (ms) |
|----------------|-------------------------|-----------------|-------------------|-------------------------------------|--------------------------------------|
| 0              | 2402.00                 | 388             | 20                | 232.8                               | 400                                  |
| 39             | 2441.00                 | 388             | 20                | 232.8                               | 400                                  |
| 78             | 2480.00                 | 388             | 20                | 232.8                               | 400                                  |

Note:

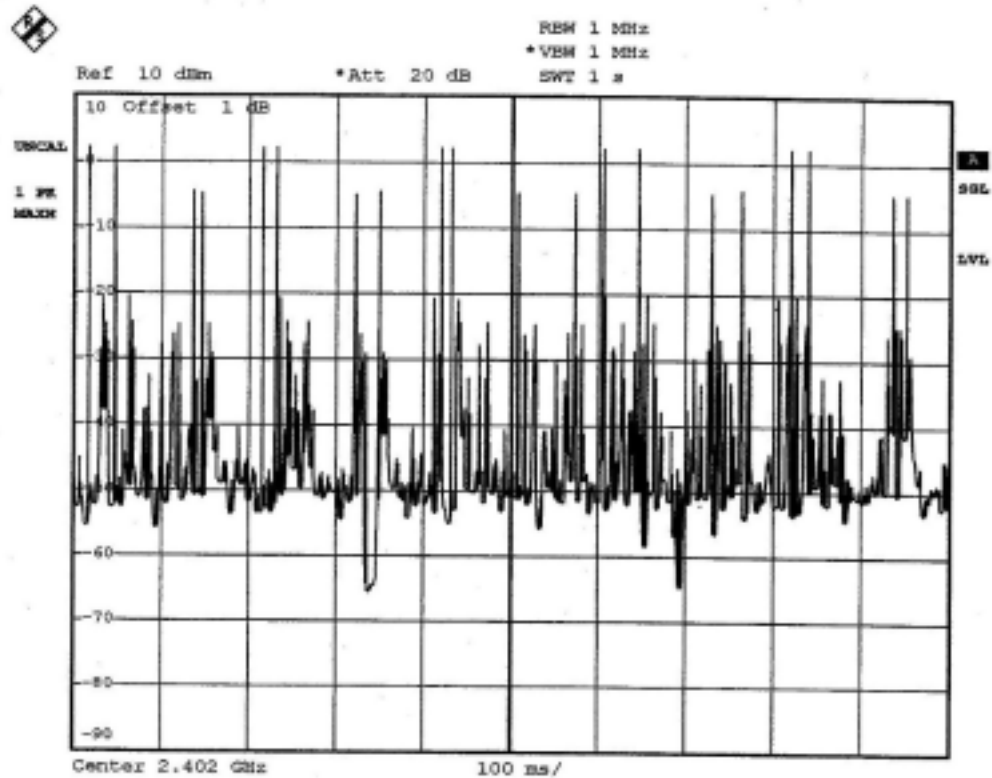
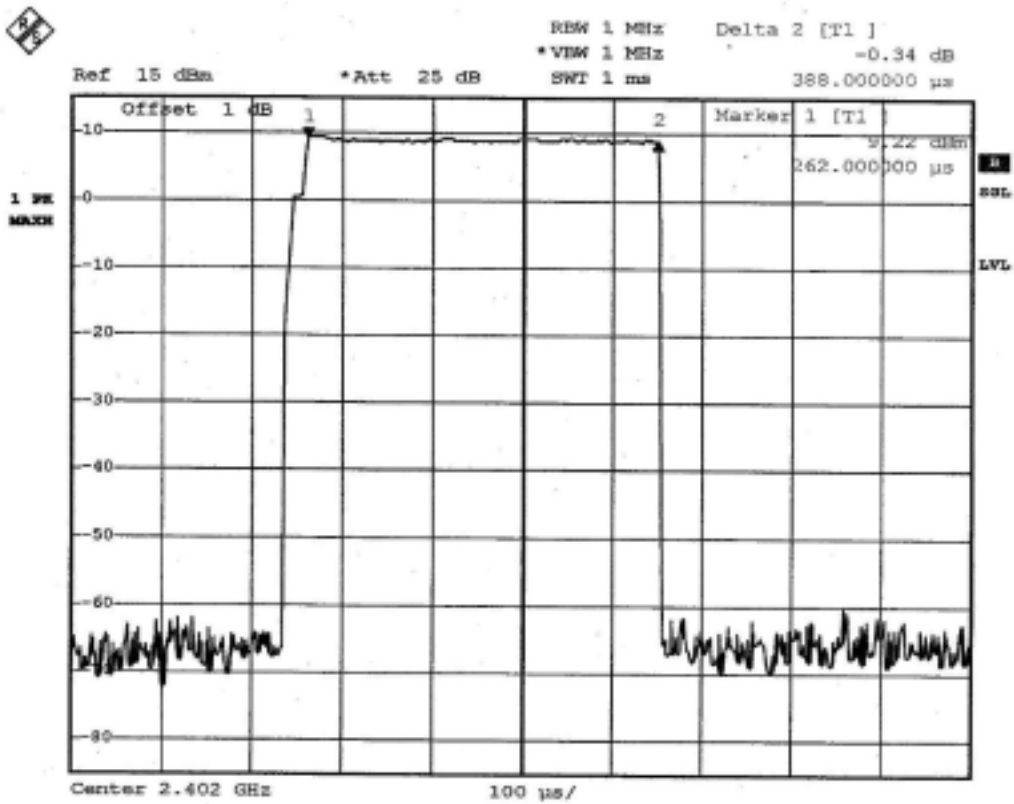
Dwell Time:

Pulse Time\*Burts\*20\*30



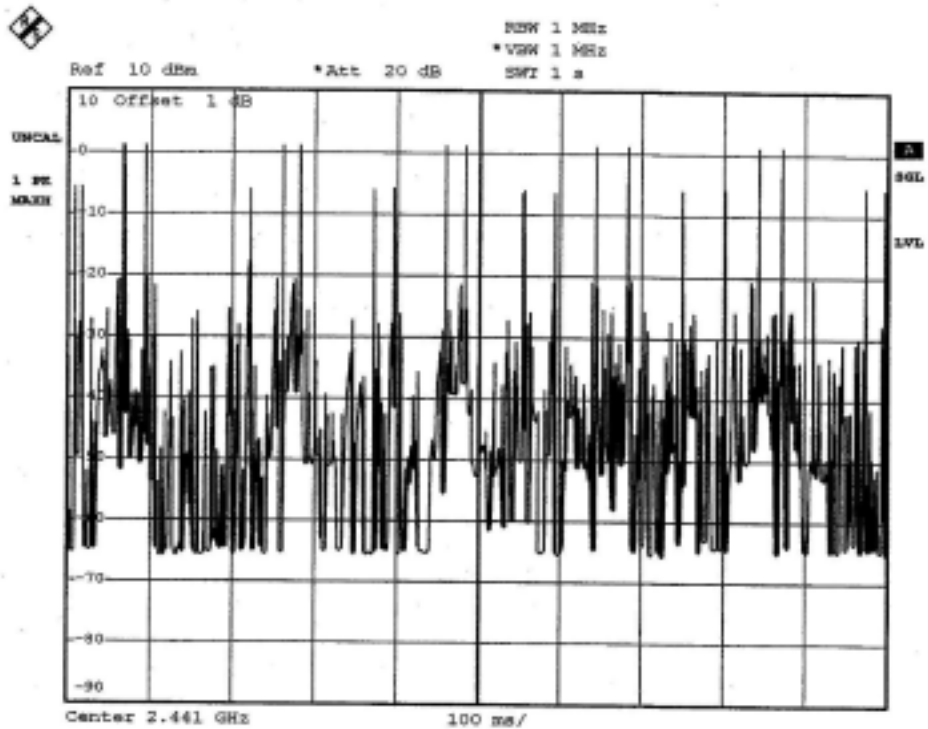
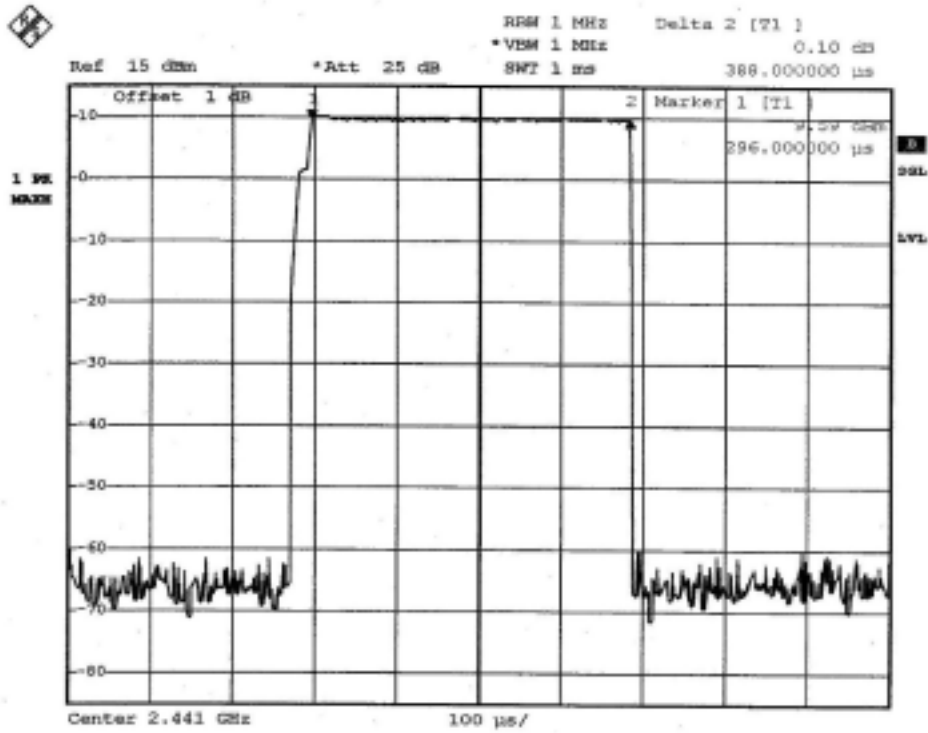
# TEST REPORT

CH0:





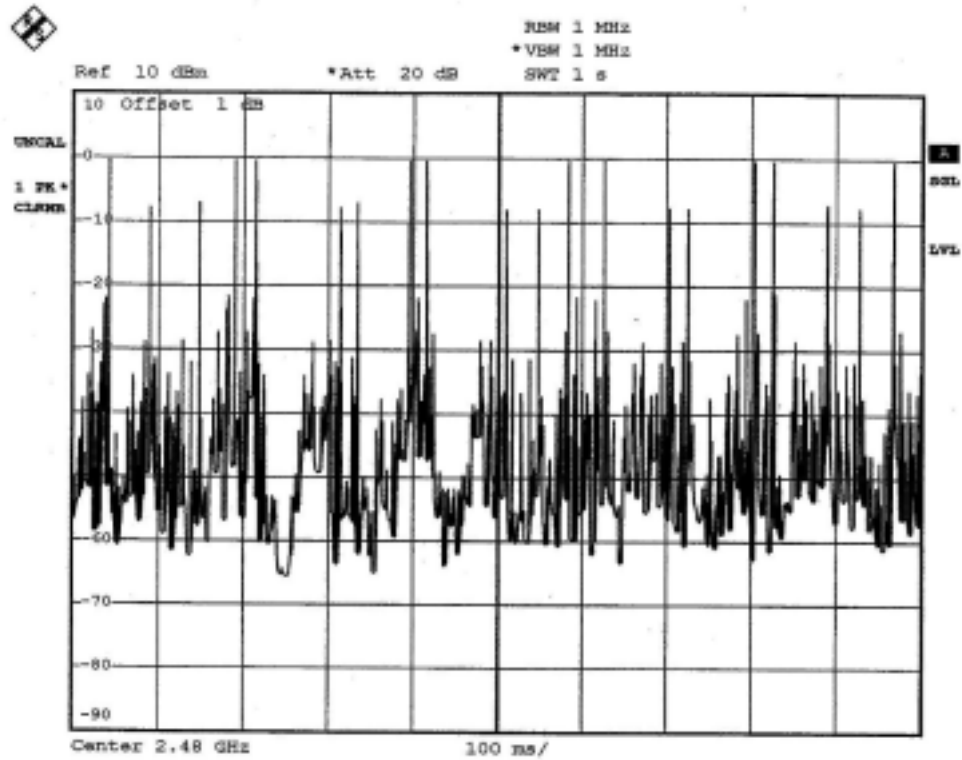
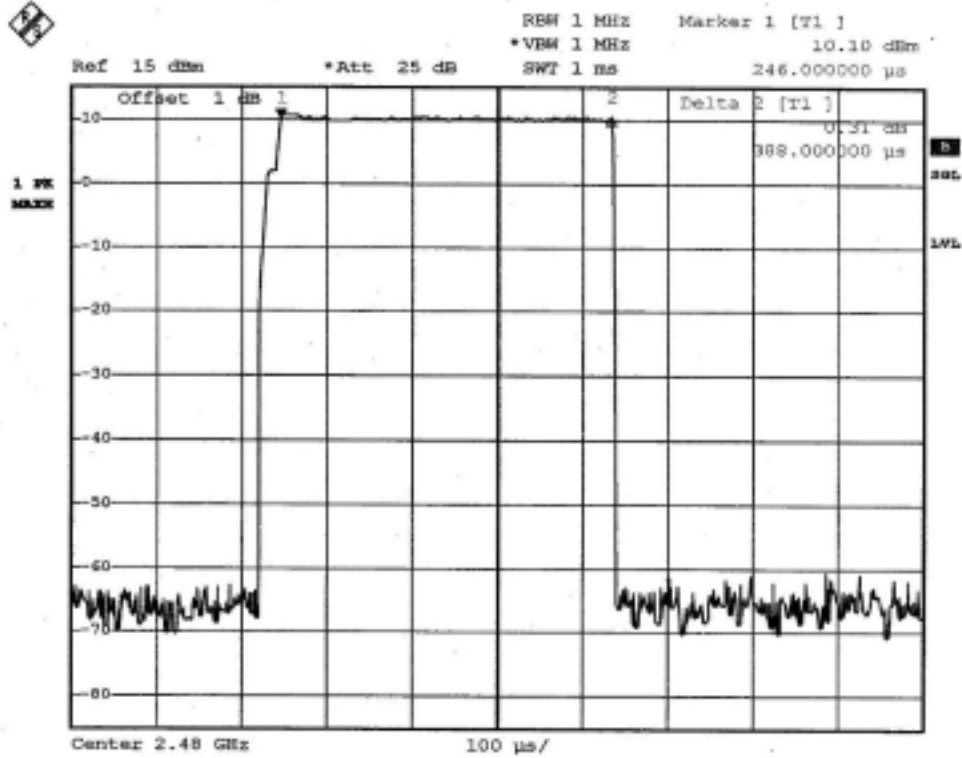
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## 4.5 PEAK POWER TEST

### 4.5.1 LIMIT

FCC Part15, Subpart C Section 15.247.

| FREQUENCY RANGE (MHz) | LIMIT(W)                    |          |              |              |          |
|-----------------------|-----------------------------|----------|--------------|--------------|----------|
|                       | Quantity of Hopping Channel | 50       | 25           | 15           | 75       |
| 902-928               |                             | 1(30dBm) | 0.125(21dBm) | NA           | NA       |
| 2400-2483.5           |                             | NA       | NA           | 0.125(21dBm) | 1(30dBm) |
| 5725-5850             |                             | NA       | NA           | NA           | 1(30dBm) |

### 4.5.2 TEST EQUIPMENT

The following test equipment was used during the test :

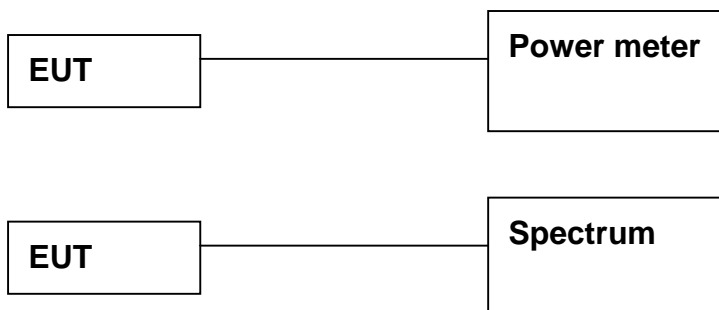
| EQUIPMENT/FACILITIES | SPECIFICATIONS                  | MANUFACTURER    | MODEL#/SERIAL#      | DUE DATE OF CAL. & CAL. CENTER |
|----------------------|---------------------------------|-----------------|---------------------|--------------------------------|
| SPECTRUM             | 9kHz-7GHz                       | ROHDE & SCHWARZ | FSP7/<br>839511/010 | MAR. 2005<br>ETC               |
| POWER METER          | N/A                             | BOONTON         | 4232A/<br>29001     | MAY 2005<br>ETC                |
| POWER SENSOR         | DC-18GHz<br>0.3 μ W-100mW<br>50 | BOONTON         | 51011-EMC/<br>31184 | JUN. 2005<br>ETC               |

**NOTE:** The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.





### 4.5.3 TEST SET-UP



The EUT was connected to a spectrum through a 50 RF cable.

### 4.5.4 TEST PROCEDURE

The EUT was operating in hopping mode or could control its channel.  
Printed out the test result from the spectrum by hard copy function.  
Recorded the read value of the power meter.

### 4.5.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

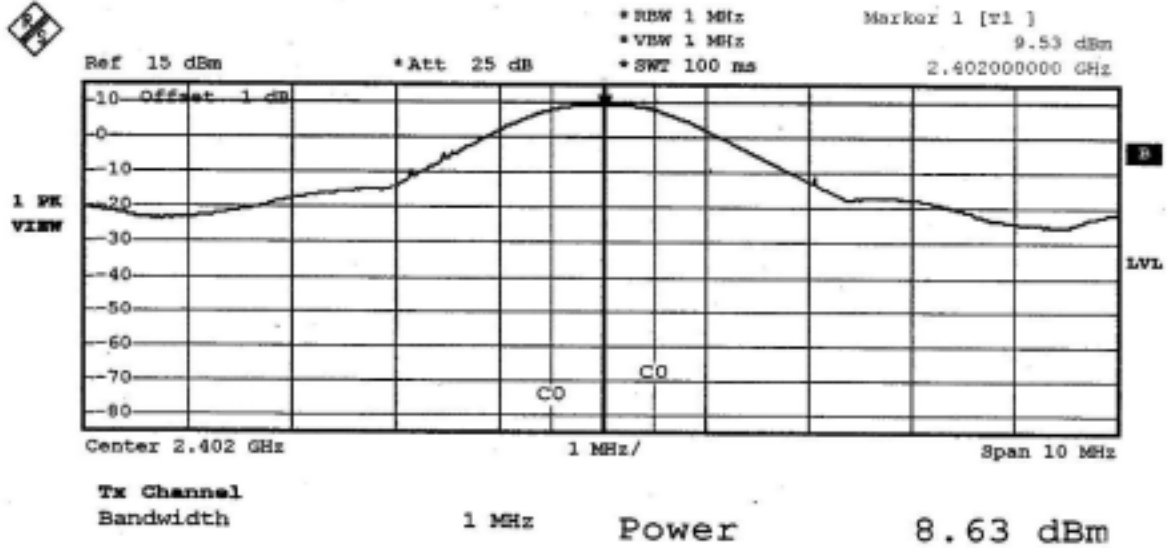
### 4.5.6 TEST RESULT

Temperature: 26°C Humidity: 55%RH  
Spectrum Detector: PK Tested by: Peter Tsai  
Test Result: PASS

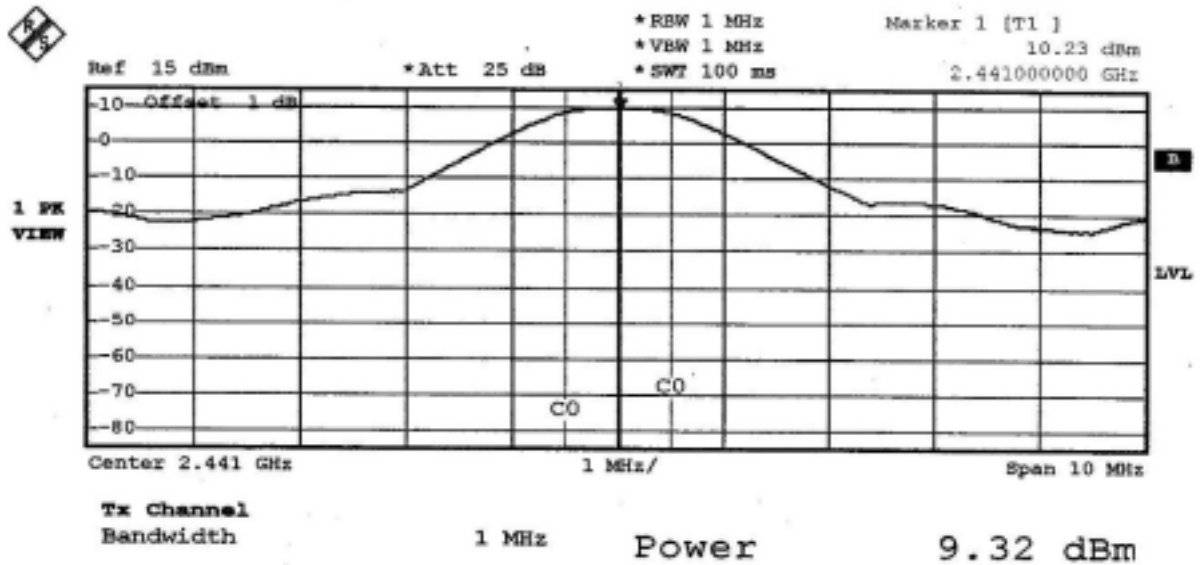
| CHANNEL NUMBER | CHANNEL FREQUENCY (MHz) | PEAK POWER OUTPUT (dBm) | PEAK POWER LIMIT (dBm) |
|----------------|-------------------------|-------------------------|------------------------|
| 0              | 2402.0000               | 8.63                    | 30                     |
| 39             | 2441.0000               | 9.32                    | 30                     |
| 78             | 2480.0000               | 9.86                    | 30                     |



CH0:



CH39:



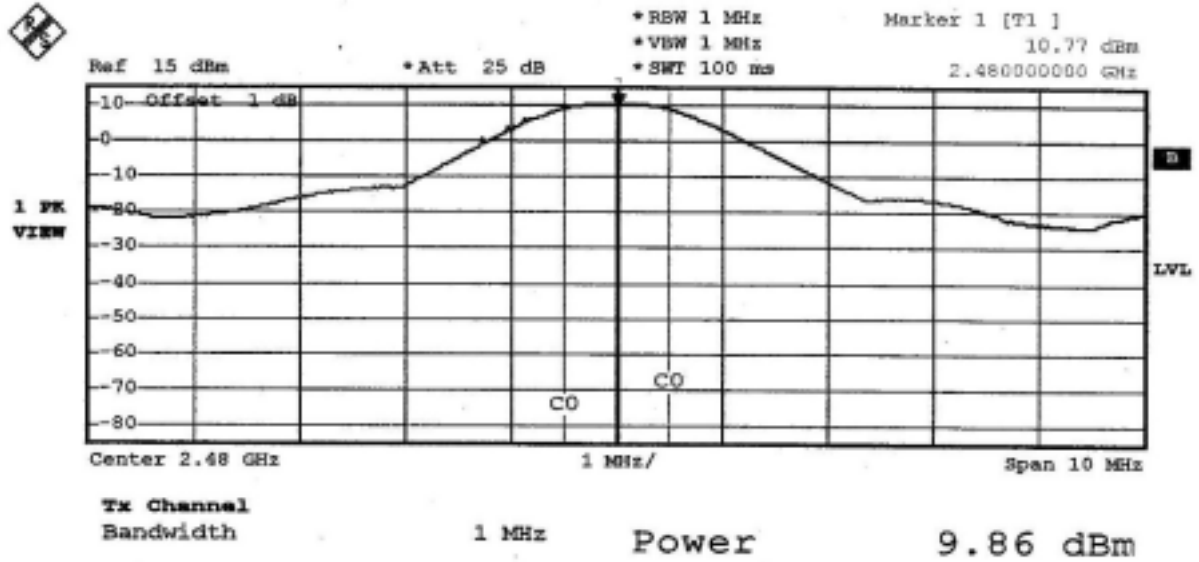


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CH78:





## 4.6 BAND EDGE TEST

### 4.6.1 LIMIT

FCC Part15, Subpart C Section 15.247. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

| OPERATING FREQUENCY RANGE (MHz) | SPURIOUS EMISSION FREQUENCY (MHz) | LIMIT                              |                        |
|---------------------------------|-----------------------------------|------------------------------------|------------------------|
|                                 |                                   | Peak power ration to emission(dBc) | Emission level(dBuV/m) |
| 902-928                         | <902                              | >20                                | NA                     |
|                                 | >928                              | >20                                | NA                     |
|                                 | 960-1240                          | NA                                 | 54                     |
| 2400-2483.5                     | <2400                             | >20                                | NA                     |
|                                 | >2483.5-2500                      | NA                                 | 54                     |
| 5725-5850                       | <5350-5460                        | NA                                 | 54                     |
|                                 | <5725                             | >20                                | NA                     |
|                                 | >5850                             | >20                                | NA                     |



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### 4.6.2 TEST EQUIPMENT

The following test equipment was used during the test :

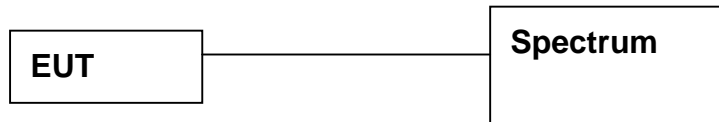
| EQUIPMENT/<br>FACILITIES | SPECIFICATIONS            | MANUFACTURER       | MODEL#/<br>SERIAL#    | DUE DATE OF CAL. &<br>CAL. CENTER |
|--------------------------|---------------------------|--------------------|-----------------------|-----------------------------------|
| SPECTRUM                 | 9kHz-7GHz                 | ROHDE &<br>SCHWARZ | FSP7/<br>839511/010   | MAR. 2005<br>ETC                  |
| EMI TEST<br>RECEIVER     | 9 kHz TO 2750<br>MHz      | ROHDE &<br>SCHWARZ | ESCS30/<br>830245/012 | OCT. 2005<br>ETC                  |
| SPECTRUM                 | 9KHz-26.5GHz              | HP                 | 8953E/<br>3710A03220  | MAY 2005<br>ETC                   |
| PRE-AMPLIFIER            | 1GHz-26.5GHz<br>Gain:30dB | HP                 | 8449B/<br>3008A01019  | DEC. 2004<br>ETC                  |
| BI-LOG<br>ANTENNA        | 25 MHz TO<br>2 GHz        | EMCO               | 3142/<br>9701-1124    | APR. 2005<br>SRT                  |
| HORN ANTENNA             | 1GHz to 18GHz             | EMCO               | 3115/<br>9602-4681    | NOV. 2004<br>ETC                  |
| OATS                     | 3 - 10 M<br>measurement   | SRT                | SRT-1                 | APR. 2005<br>SRT                  |

**NOTE:** The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.



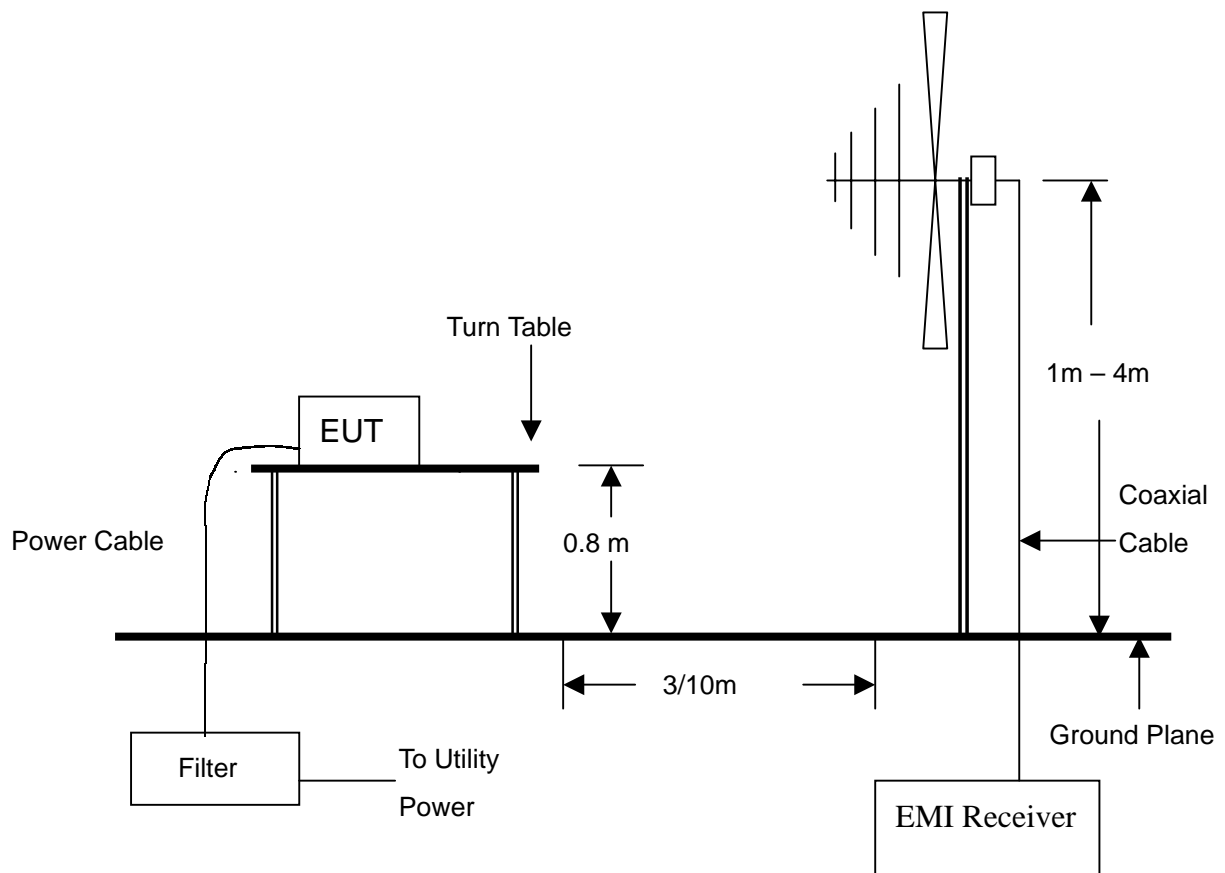
## 4.6.3 TEST SET-UP

### FOR RF CONDUCTED TEST (dBc)



The EUT was connected to the spectrum through a 50 Ω RF cable.

### FOR RADIATED EMISSION TEST



#### NOTE :

1. The EUT system was put on a wooden table with 0.8m heights above a ground plane.
2. For the actual test configuration, please refer to the photos of testing.



#### 4.6.4 TEST PROCEDURE

1. The EUT was operating in hopping mode or could be controlled its channel.  
Printed out the test result from the spectrum by hard copy function.
2. The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22.  
The measurements were made at an open area test site with 10 meter measurement distance under 1 GHz and with 3m distance above 1GHz. The frequency spectrum measured started from 30 MHz. Under 1 GHz. All readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver. Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak and average values with 1 MHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

#### 4.6.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

#### 4.6.6 TEST RESULT

Temperature: 26°C Humidity: 55%RH  
Spectrum Detector: PK & AV Tested by: Peter Tsai  
Test Result: PASS

##### 1. Conducted test

| Frequency (MHz) | PEAK POWER OUTPUT (dBm) | Emission read Value(dBm) | Result of Band edge (dBc) | Band edge LIMIT (dBc) |
|-----------------|-------------------------|--------------------------|---------------------------|-----------------------|
| <2400           | 9.05                    | -31.19                   | 40.24                     | >20dBc                |
| >2483.5         | 9.87                    | -33.91                   | 43.78                     | >20dBc                |

##### 2. Radiated emission test

| Frequency (MHz) | Antenna polarization (H/V) | Reading (dBuV) |      | Emission (dBuV/m) |      | Band edge Limit (dBuV/m) |      |
|-----------------|----------------------------|----------------|------|-------------------|------|--------------------------|------|
|                 |                            | PK             | AV   | PK                | AV   | PK                       | AV   |
| <2400           | H                          | 48.8           | 43.2 | 44.3              | 38.7 | 74.0                     | 54.0 |
| >2483.5         | H                          | 71.5           | 43.7 | 67.5              | 39.7 | 74.0                     | 54.0 |





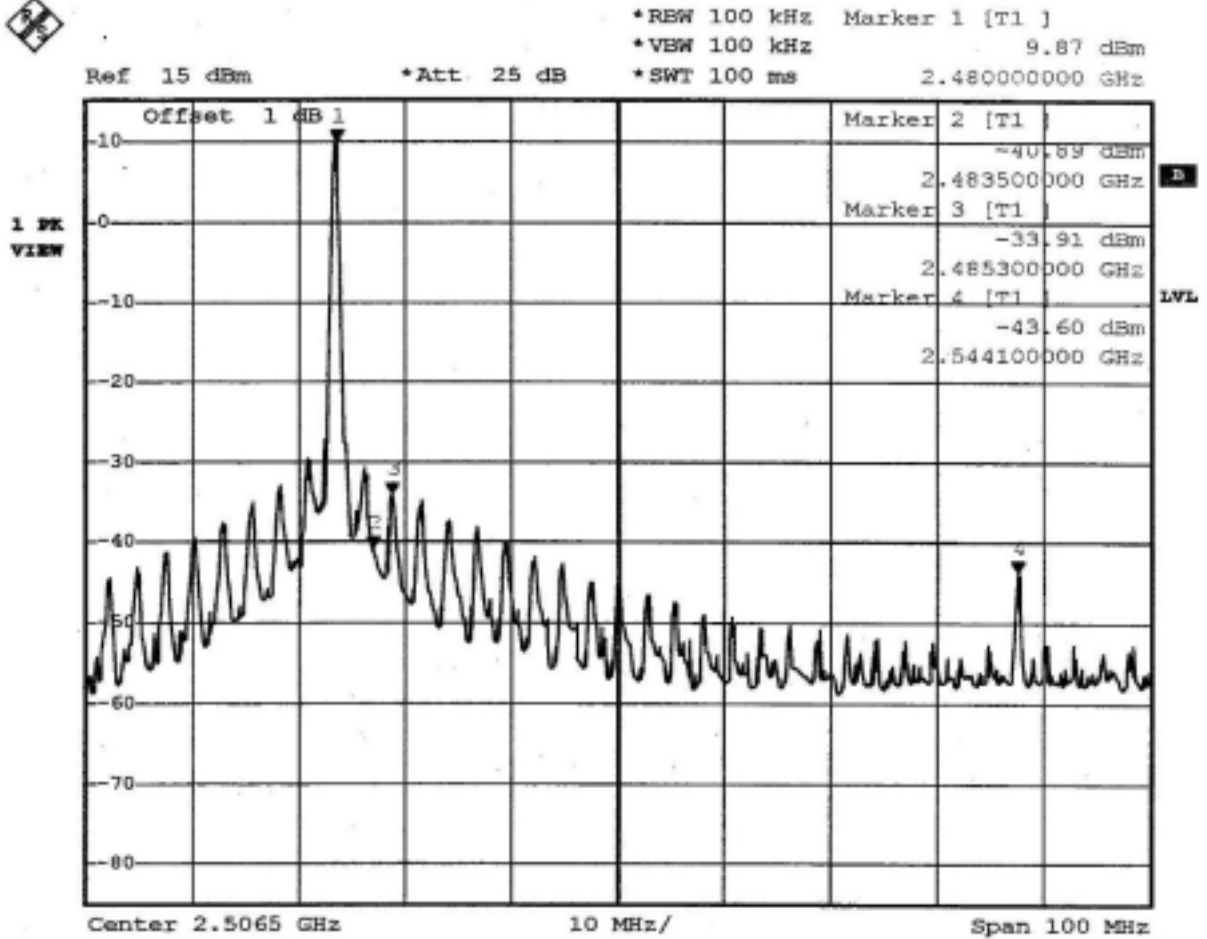


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>2483.5MHz





## 4.7 SPURIOUS RADIATED EMISSION TEST

### 4.7.1 LIMIT

FCC Part15, Subpart C Section 15.209 limit of radiated emission for frequency below1000MHz. The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| FREQUENCY (MHz) | DISTANCE (m) | FIELD STRENGTH (dB $\mu$ V/m) |
|-----------------|--------------|-------------------------------|
| 30 - 88         | 3            | 40.0                          |
| 88 - 216        | 3            | 43.5                          |
| 216 - 960       | 3            | 46.0                          |
| ABOVE 960       | 3            | 54.0                          |

- NOTE** :
1. In the emission tables above , the tighter limit applies at the band edges.
  2. Distance refers to the distance between measuring instrument , antenna , and the closest point of any part of the device or system.

FCC Part 15, Section15.35(b) limit of radiated emission for frequency above 1000 MHz

| FREQUENCY (MHz) | Class A (dBuV/m) (at 3m) |         | Class B (dBuV/m) (at 3m) |         |
|-----------------|--------------------------|---------|--------------------------|---------|
|                 | PEAK                     | AVERAGE | PEAK                     | AVERAGE |
| Above 1000      | 80.0                     | 60.0    | 74.0                     | 54.0    |

FCC Part 15, Subpart C Section 15.249. The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

| FUNDAMENTAL FREQUENCY (MHz) | FIELD STRENGTH OF FUNDAMENTAL (dBuV/m) (at 3m) |         | FIELD STRENGTH OF HARMONICS (dBuV/m) (at 3m) |         |
|-----------------------------|--|---------|--|---------|
|                             | PEAK   | AVERAGE | PEAK   | AVERAGE |
| 902-928                     | 114  | 94      | 74.0   | 54.0    |
| 2400-2483.5                 | 114  | 94      | 74.0   | 54.0    |
| 5725-5875                   | 114  | 94      | 74.0   | 54.0    |
| 24000-24250                 | 128  | 108     | 88.0   | 68.0    |



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### 4.7.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test :

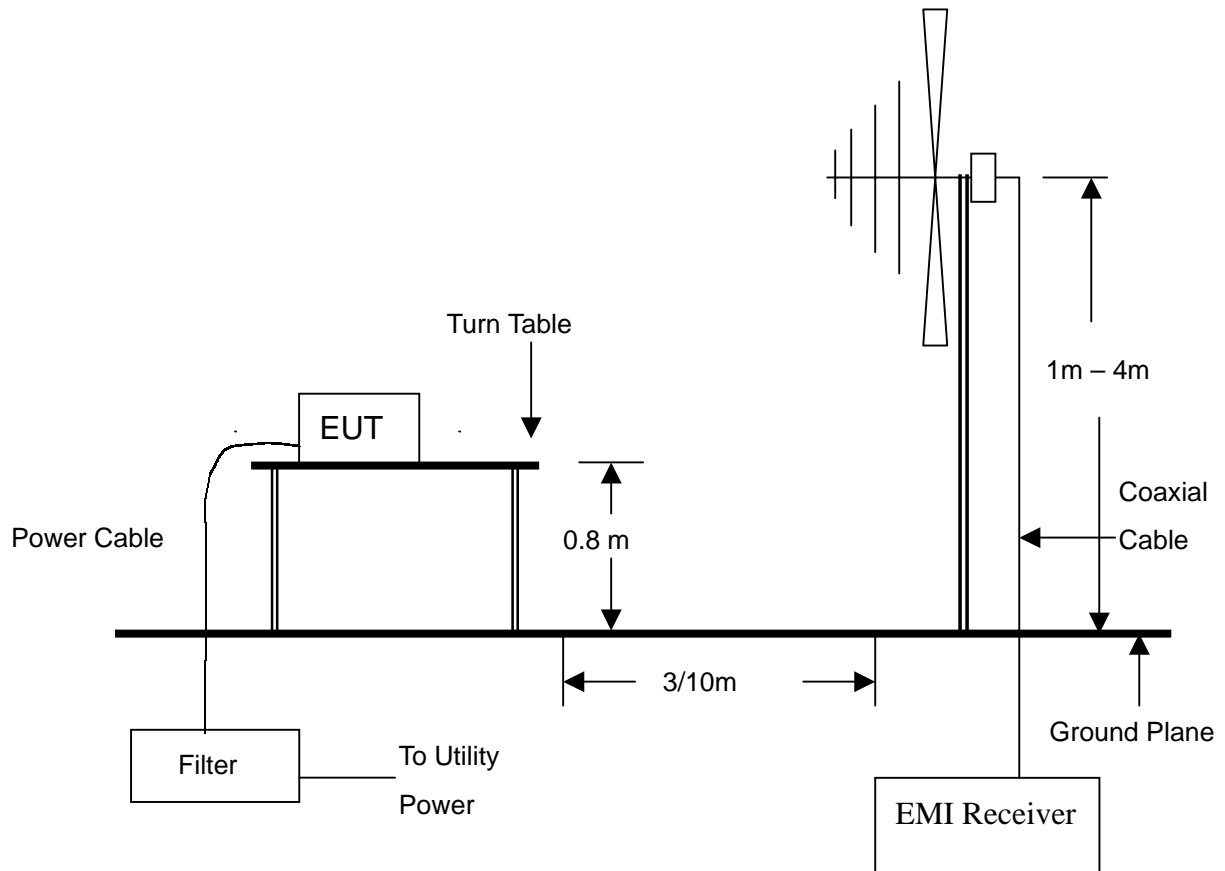
| EQUIPMENT/<br>FACILITIES | SPECIFICATIONS          | MANUFACTURER       | MODEL#/<br>SERIAL#      | DUE DATE OF CAL. &<br>CAL. CENTER |
|--------------------------|-------------------------|--------------------|-------------------------|-----------------------------------|
| EMI TEST<br>RECEIVER     | 20 kHz TO<br>1 GHz      | ROHDE &<br>SCHWARZ | ESVS30/<br>841977/003   | SEP. 2005<br>ETC                  |
| BI-LOG<br>ANTENNA        | 25 MHz TO<br>2 GHz      | EMCO               | 3142/<br>9701-1124      | APR. 2005<br>SRT                  |
| OATS                     | 3 – 10 M<br>MEASUREMENT | SRT                | SRT-1                   | APR. 2005<br>SRT                  |
| COAXIAL<br>CABLE         | 25M                     | SUNCITY            | J400/<br>25M            | AUG. 2005<br>SRT                  |
| FILTER                   | 2 LINE, 30A             | FIL.COIL           | FC-943/<br>869          | N/A                               |
| FREQUENCY<br>CONVERTER   | N/A                     | APC                | AFC-2KBB/<br>F100030031 | AUG. 2005<br>SRT                  |

#### NOTE:

1. The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.
2. The Open Area Test Site (SRT-1) is registered by FCC with No. 90957 and VCCI with No. R-1081.
3. The Open Area Test Site (SRT-2) is registered by FCC with No. 98458 and VCCI with No. R-1168.



## 4.7.3 TEST SET-UP



### NOTE :

1. The EUT system was put on a wooden table with 0.8m heights above a ground plane.
2. For the actual test configuration, please refer to the photos of testing.



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### **4.7.4 TEST PROCEDURE**

The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22. The measurements were made at an open area test site with 10 meter measurement distance under 1 GHz and with 3m distance above 1GHz. The frequency spectrum measured started from 30 MHz. Under 1 GHz. All readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver. Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak and average values with 1 MHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

### **4.7.5 EUT OPERATING CONDITION**

Same as section 4.1.5 of this report.



## 4.7.6 TEST RESULT

|                    |               |                    |       |
|--------------------|---------------|--------------------|-------|
| Temperature:       | 20°C          | Humidity:          | 54%RH |
| Frequency Range:   | 30 – 1000 MHz | Test mode:         | RX    |
| Receiver Detector: | Q.P. or AV.   | Measured Distance: | 3m    |
| Tested by:         | Peter Tsai    |                    |       |

Antenna Polarization : Horizontal

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Reading Data (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | EL(m) | AZ(°) |
|-----------------|-----------------|-----------------------|---------------------|-------------------------|----------------|-------------|-------|-------|
| 64.5340         | 0.82            | 8.42                  | 19.4                | 28.6                    | 40.0           | -11.4       | 183.2 | 3.111 |
| 132.8210        | 1.10            | 8.24                  | 18.2                | 27.5                    | 43.5           | -16.0       | 284.6 | 1.527 |
| 232.7340        | 1.42            | 11.90                 | 17.9                | 31.2                    | 46.0           | -14.8       | 56.0  | 1.824 |
| 398.1420        | 1.94            | 16.27                 | 15.8                | 34.0                    | 46.0           | -12.0       | 251.6 | 1.254 |
| 662.4610        | 2.49            | 20.95                 | 12.4                | 35.8                    | 46.0           | -10.2       | 294.1 | 2.541 |
| 931.8200        | 2.96            | 23.80                 | 11.7                | 38.5                    | 46.0           | -7.5        | 157.0 | 1.581 |

Antenna Polarization : Vertical

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Reading Data (dBμV) | Emission Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | EL(m) | AZ(°) |
|-----------------|-----------------|-----------------------|---------------------|-------------------------|----------------|-------------|-------|-------|
| 64.5440         | 0.82            | 8.42                  | 21.1                | 30.3                    | 40.0           | -9.7        | 258.4 | 2.741 |
| 132.8210        | 1.10            | 8.24                  | 20.2                | 29.5                    | 43.5           | -14.0       | 56.8  | 1.258 |
| 232.7330        | 1.42            | 11.90                 | 15.3                | 28.6                    | 46.0           | -17.4       | 158.5 | 3.244 |
| 398.1410        | 1.94            | 16.27                 | 17.5                | 35.7                    | 46.0           | -10.3       | 280.3 | 2.014 |
| 662.4610        | 2.49            | 20.95                 | 8.1                 | 31.5                    | 46.0           | -14.5       | 281.6 | 2.412 |
| 929.2250        | 2.95            | 23.80                 | 10.2                | 37.0                    | 46.0           | -9.0        | 164.5 | 1.671 |

- NOTE :**
1. Measurement uncertainty is less than +/-2dB
  2. "": Measurement does not apply for this frequency.
  3. Emission Level = Reading Value + Ant. Factor + Cable Loss
  4. The field strength of other emission frequencies were very low against the limit.



|                    |                   |                    |              |
|--------------------|-------------------|--------------------|--------------|
| Temperature:       | <u>22°C</u>       | Humidity:          | <u>56%RH</u> |
| Ferquency Range:   | <u>1 – 25 GHz</u> | Test mode:         | <u>Ch0</u>   |
| Receiver Detector: | <u>PK. or AV.</u> | Measured Distance: | <u>3m</u>    |
| Tested by:         | <u>Peter Tsai</u> |                    |              |

Antenna Polarization : Horizontal

| Freq./MHz  | Cable Loss (dB) | Ant. Fact. (dB) | Reading (dBuV) |      | Emission (dBuV/m) |      | Limit Line (dBuV/m) |      | Margin (dBuV/m) |       | AZ (o) | EL (m) |
|------------|-----------------|-----------------|----------------|------|-------------------|------|---------------------|------|-----------------|-------|--------|--------|
|            |                 |                 | PK             | AV   | PK                | AV   | PK                  | AV   | PK              | AV    |        |        |
| 2402.00(F) | -32.16          | 28.00           | 101.3          | 59.4 | 97.2              | 55.2 | N/A                 | N/A  | N/A             | N/A   | 81.6   | 1.012  |
| 2497.60    | -32.16          | 28.19           | 55.0           | 36.4 | 51.1              | 32.4 | 74.0                | 54.0 | -22.9           | -21.6 | 48.6   | 1.031  |
| 2333.90    | -32.35          | 27.87           | 48.8           | 43.2 | 44.3              | 38.7 | 74.0                | 54.0 | -29.7           | -15.3 | 77.5   | 1.103  |
| 2563.30    | -31.88          | 28.55           | 52.3           | 43.2 | 48.9              | 39.9 | 74.0                | 54.0 | -25.1           | -14.1 | 74.9   | 1.117  |
| 4804.00    | -30.47          | 33.64           | 42.8           | *    | 46.0              | *    | 74.0                | 54.0 | -28.0           | *     | 194.3  | 1.671  |
| 7206.00    | -28.90          | 36.26           | 41.7           | *    | 49.1              | *    | 74.0                | 54.0 | -24.9           | *     | 273.2  | 1.374  |

Antenna Polarization : Vertical

| Freq/MHz   | Cable Loss (dB) | Ant. Fact. (dB) | Reading (dBuV) |      | Emission (dBuV/m) |      | Limit Line (dBuV/m) |      | Margin (dBuV/m) |       | AZ (o) | EL (m) |
|------------|-----------------|-----------------|----------------|------|-------------------|------|---------------------|------|-----------------|-------|--------|--------|
|            |                 |                 | PK             | AV   | PK                | AV   | PK                  | AV   | PK              | AV    |        |        |
| 2402.00(F) | -32.16          | 28.54           | 98.6           | 55.9 | 95.0              | 52.3 | N/A                 | N/A  | N/A             | N/A   | 330.7  | 1.047  |
| 2497.60    | -32.16          | 28.19           | 54.1           | 37.2 | 50.1              | 33.2 | 74.0                | 54.0 | -23.9           | -20.8 | 327.4  | 1.103  |
| 2531.40    | -31.94          | 28.37           | 55.8           | 38.4 | 52.2              | 34.8 | 74.0                | 54.0 | -21.8           | -19.2 | 336.2  | 1.041  |
| 2332.00    | -32.35          | 27.86           | 47.0           | *    | 42.5              | *    | 74.0                | 54.0 | -31.5           | *     | 263.1  | 1.118  |
| 4804.00    | -30.47          | 33.64           | 42.3           | *    | 45.5              | *    | 74.0                | 54.0 | -28.5           | *     | 183.1  | 1.231  |
| 7206.00    | -28.90          | 36.26           | 43.4           | *    | 50.7              | *    | 74.0                | 54.0 | -23.3           | *     | 234.1  | 1.663  |

- NOTE :**
1. Measurement uncertainty is less than +/-2dB
  2. "\*": Measurement does not apply for this frequency.
  3. Emission Level = Reading Value + Ant. Factor + Cable Loss
  4. The field strength of other emission frequencies were very low against the limit.
  - 5.(F):The field stregh of fundamental frequency.



|                    |                   |                    |              |
|--------------------|-------------------|--------------------|--------------|
| Temperature:       | <u>22°C</u>       | Humidity:          | <u>56%RH</u> |
| Ferquency Range:   | <u>1 – 25 GHz</u> | Test mode:         | <u>Ch39</u>  |
| Receiver Detector: | <u>PK. or AV.</u> | Measured Distance: | <u>3m</u>    |
| Tested by:         | <u>Peter Tsai</u> |                    |              |

Antenna Polarization : Horizontal

| Freq./MHz  | Cable Loss (dB) | Ant. Fact. (dB) | Reading (dBuV) |      | Emission (dBuV/m) |      | Limit Line (dBuV/m) |      | Margin (dBuV/m) |       | AZ (o) | EL (m) |
|------------|-----------------|-----------------|----------------|------|-------------------|------|---------------------|------|-----------------|-------|--------|--------|
|            |                 |                 | PK             | AV   | PK                | AV   | PK                  | AV   | PK              | AV    |        |        |
| 2441.00(F) | -32.23          | 28.08           | 101.7          | 58.7 | 97.5              | 54.6 | N/A                 | N/A  | N/A             | N/A   | 339.4  | 2.013  |
| 2506.00    | -32.12          | 28.23           | 59.9           | 39.7 | 56.0              | 35.8 | 74.0                | 54.0 | -18.0           | -18.2 | 327.8  | 1.793  |
| 2377.90    | -32.25          | 27.95           | 48.8           | *    | 44.5              | *    | 74.0                | 54.0 | -29.5           | *     | 341.3  | 1.831  |
| 2561.60    | -31.87          | 28.54           | 51.5           | 33.4 | 48.2              | 30.1 | 74.0                | 54.0 | -25.8           | -23.9 | 297.1  | 1.327  |
| 4882.00    | -30.26          | 33.71           | 42.0           | *    | 45.5              | *    | 74.0                | 54.0 | -28.5           | *     | 136.7  | 1.113  |
| 7323.00    | -29.04          | 36.36           | 42.9           | *    | 50.2              | *    | 74.0                | 54.0 | -23.8           | *     | 259.1  | 1.226  |

Antenna Polarization : Vertical

| Freq./MHz  | Cable Loss (dB) | Ant. Fact. (dB) | Reading (dBuV) |      | Emission (dBuV/m) |      | Limit Line (dBuV/m) |      | Margin (dBuV/m) |       | AZ (o) | EL (m) |
|------------|-----------------|-----------------|----------------|------|-------------------|------|---------------------|------|-----------------|-------|--------|--------|
|            |                 |                 | PK             | AV   | PK                | AV   | PK                  | AV   | PK              | AV    |        |        |
| 2441.00(F) | -32.23          | 28.62           | 100.4          | 56.8 | 96.8              | 53.2 | N/A                 | N/A  | N/A             | N/A   | 337.1  | 1.108  |
| 2377.50    | -32.25          | 27.95           | 50.5           | 37.8 | 46.2              | 33.5 | 74.0                | 54.0 | -27.8           | -20.5 | 341.1  | 1.113  |
| 2496.50    | -32.17          | 28.19           | 53.8           | 40.4 | 49.8              | 36.4 | 74.0                | 54.0 | -24.2           | -17.6 | 323.2  | 1.008  |
| 2506.00    | -32.12          | 28.23           | 58.7           | 41.3 | 54.8              | 37.4 | 74.0                | 54.0 | -19.2           | -16.6 | 336.4  | 1.213  |
| 4882.00    | -30.26          | 33.71           | 41.5           | *    | 44.9              | *    | 74.0                | 54.0 | -29.1           | *     | 83.3   | 1.764  |
| 7323.00    | -29.04          | 36.36           | 42.7           | *    | 50.0              | *    | 74.0                | 54.0 | -24.0           | *     | 151.3  | 1.347  |

- NOTE :**
1. Measurement uncertainty is less than +/-2dB
  2. "\*": Measurement does not apply for this frequency.
  3. Emission Level = Reading Value + Ant. Factor + Cable Loss
  4. The field strength of other emission frequencies were very low against the limit.
  - 5.(F):The field strength of fundamental frequency.





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|                    |                   |                    |              |
|--------------------|-------------------|--------------------|--------------|
| Temperature:       | <u>22°C</u>       | Humidity:          | <u>56%RH</u> |
| Ferquency Range:   | <u>1 – 25GHz</u>  | Test mode:         | <u>Ch78</u>  |
| Receiver Detector: | <u>PK. or AV.</u> | Measured Distance: | <u>3m</u>    |
| Tested by:         | <u>Peter Tsai</u> |                    |              |

Antenna Polarization : Horizontal

| Freq./MHz  | Cable Loss (dB) | Ant. Fact. (dB) | Reading (dBuV) |      | Emission (dBuV/m) |      | Limit Line (dBuV/m) |      | Margin (dBuV/m) |       | AZ (o) | EL (m) |
|------------|-----------------|-----------------|----------------|------|-------------------|------|---------------------|------|-----------------|-------|--------|--------|
|            |                 |                 | PK             | AV   | PK                | AV   | PK                  | AV   | PK              | AV    |        |        |
| 2480.00(F) | -32.19          | 28.16           | 106.2          | 60.7 | 102.2             | 56.7 | N/A                 | N/A  | N/A             | N/A   | 54.5   | 1.371  |
| 2416.90    | -32.19          | 28.03           | 56.7           | 39.6 | 52.5              | 35.4 | 74.0                | 54.0 | -21.5           | -18.6 | 61.3   | 1.283  |
| 2513.10    | -32.07          | 28.27           | 63.6           | 39.1 | 59.8              | 35.3 | 74.0                | 54.0 | -14.2           | -18.7 | 56.1   | 1.437  |
| 2483.50    | -32.19          | 28.17           | 71.5           | 43.7 | 67.5              | 39.7 | 74.0                | 54.0 | -6.5            | -14.3 | 55.4   | 1.293  |
| 4960.00    | -30.26          | 33.77           | 47.2           | *    | 50.7              | *    | 74.0                | 54.0 | -23.3           | *     | 73.1   | 1.938  |
| 7440.00    | -28.95          | 36.45           | 42.5           | *    | 50.0              | *    | 74.0                | 54.0 | -24.0           | *     | 213.2  | 2.034  |

Antenna Polarization : Vertical

| Freq./MHz  | Cable Loss (dB) | Ant. Fact. (dB) | Reading (dBuV) |      | Emission (dBuV/m) |      | Limit Line (dBuV/m) |      | Margin (dBuV/m) |       | AZ (o) | EL (m) |
|------------|-----------------|-----------------|----------------|------|-------------------|------|---------------------|------|-----------------|-------|--------|--------|
|            |                 |                 | PK             | AV   | PK                | AV   | PK                  | AV   | PK              | AV    |        |        |
| 2480.00(F) | -32.19          | 28.73           | 103.1          | 54.3 | 99.6              | 50.8 | N/A                 | N/A  | N/A             | N/A   | 336.6  | 1.106  |
| 2416.50    | -32.19          | 28.03           | 55.1           | 40.6 | 51.0              | 36.4 | 74.0                | 54.0 | -23.0           | -17.6 | 323.1  | 1.113  |
| 2512.50    | -32.08          | 28.27           | 58.2           | 41.7 | 54.4              | 37.9 | 74.0                | 54.0 | -19.6           | -16.1 | 283.7  | 1.212  |
| 2483.50    | -32.19          | 28.17           | 70.8           | 46.8 | 66.8              | 42.8 | 74.0                | 54.0 | -7.2            | -11.2 | 303.2  | 1.108  |
| 4960.00    | -30.26          | 33.77           | 46.8           | *    | 50.3              | *    | 74.0                | 54.0 | -23.7           | *     | 43.13  | 1.011  |
| 7440.00    | -28.95          | 36.45           | 43.0           | *    | 50.5              | *    | 74.0                | 54.0 | -23.5           | *     | 267.3  | 1.673  |

- NOTE :**
1. Measurement uncertainty is less than +/- 2dB
  2. "\*": Measurement does not apply for this frequency.
  3. Emission Level = Reading Value + Ant. Factor + Cable Loss
  4. The field strength of other emission frequencies were very low against the limit.
  - 5.(F):The field strength of fundamental frequency.



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### **5. Antenna application**

#### **5.1 Antenna requirement**

The EUT's antenna is met the requirement of FCC part15C section15.203 and 15.204.

FCC part15C section15.247 requirement:

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

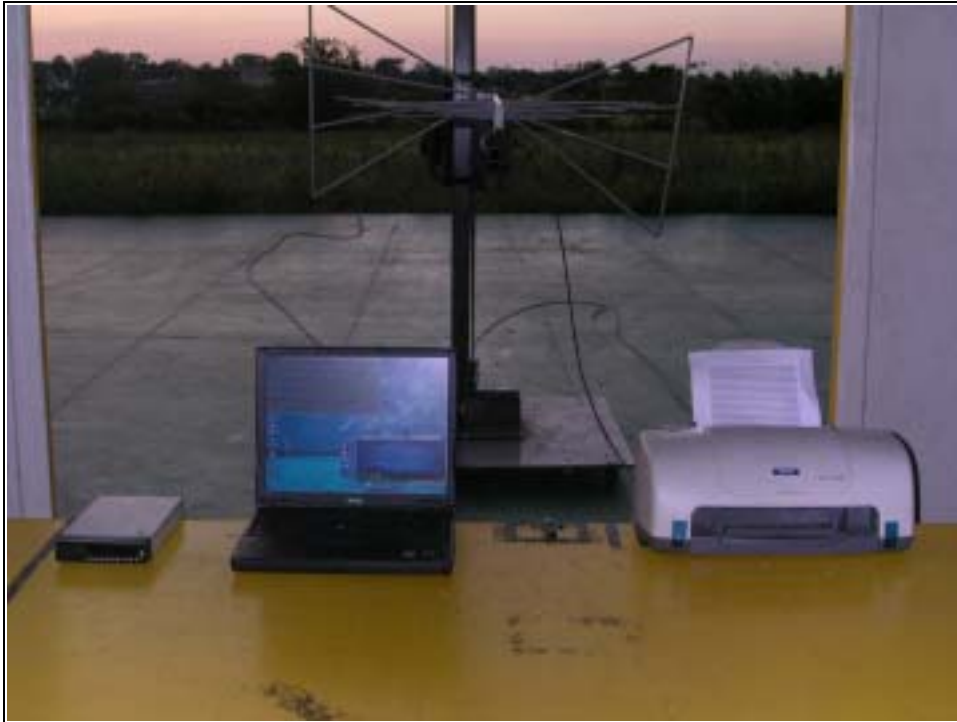
#### **5.2 Result**

The EUT's antenna used a dipole antenna and integrated on PCB. The antenna's gain is 0dBi and meets the requirement.



## 6. PHOTOS OF TESTING

- Radiated test(RX)



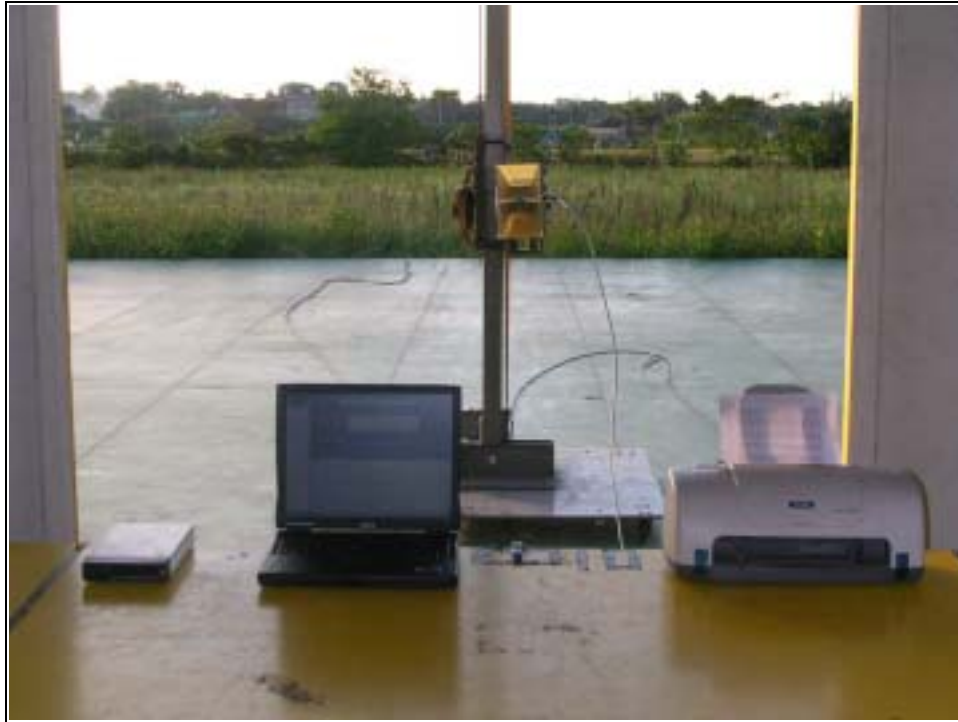


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- Radiated test(TX)





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### 7. TERMS OF ABRIVATION

|          |  |
|----------|--|
| AV.      | Average detection                            |
| AZ(°)    | Turn table azimuth                           |
| Correct. | Correction                                   |
| EL(m)    | Antenna height (meter)                       |
| EUT      | Equipment Under Test                         |
| Horiz.   | Horizontal direction                         |
| LISN     | Line Impedance Stabilization Network         |
| NSA      | Normalized Site Attenuation                  |
| Q.P.     | Quasi-peak detection                         |
| SRT Lab  | Spectrum Research & Testing Laboratory, Inc. |
| Vert.    | Vertical direction                           |