



# FCC TEST REPORT

**REPORT NO.:** RF930419L05

**MODEL NO.:** WL MU 2454 13I (for brand: GLOBAL SUN)

**OEM MODEL NO.:** A02-u-W54 (for brand: Atlantis)

**RECEIVED:** 27 April, 2004

**TESTED:** 20 April ~ 29 April, 2004

**APPLICANT:** GLOBAL SUN TECHNOLOGY INC.

**ADDRESS:** No. 13, Tung Yuan Rd., Jung Li Industrial Park,  
Jung Li City, Tao Yuan Hsien, Taiwan

**ISSUED BY:** Advance Data Technology Corporation

**LAB LOCATION:** No. 19, Hwa Ya 2nd rd., Kueishan, Taoyuan,  
Taiwan, R.O.C.

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## 1 CERTIFICATION

**PRODUCT :** 802.11g WLAN Mini USB Adapter

**MODEL NO.:** WL MU 2454 13I (for brand: GLOBAL SUN)

**OEM MODEL NO.:** A02-u-W54 (for brand: Atlantis)

**APPLICANT :** GLOBAL SUN TECHNOLOGY INC.

**TESTED :** 20 April ~ 29 April, 2004

**TEST ITEM :** Engineering Sample

**STANDARDS :** FCC Part 15, Subpart C (Section 15.247),  
ANSI C63.4-2001

The above equipment has been tested by **Advance Data Technology Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**PREPARED BY:** Stacy Hsieh , **DATE:** 07 May, 2004  
Stacy Hsieh

**APPROVED BY:** Cody Chang , **DATE:** 07 May, 2004  
Cody Chang /  
Supervisor

## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: FCC Part 15, Subpart C |                                                                                         |        |                                                                                    |
|------------------------------------------|-----------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------|
| STANDARD SECTION                         | TEST TYPE AND LIMIT                                                                     | RESULT | REMARK                                                                             |
| 15.207                                   | AC Power Conducted Emission                                                             | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -16.10dB at 0.158MHz.  |
| 15.247(a)(2)                             | Spectrum Bandwidth of a Direct Sequence Spread Spectrum System<br>Limit: min. 500kHz    | PASS   | Meet the requirement of limit.                                                     |
| 15.247(b)                                | Maximum Peak Output Power<br>Limit: max. 30dBm                                          | PASS   | Meet the requirement of limit.                                                     |
| 15.247(c)                                | Transmitter Radiated Emissions<br>Limit: Table 15.209                                   | PASS   | Meet the requirement of limit.<br>Minimum passing margin is -1.52dB at 4824.00MHz. |
| 15.247(d)                                | Power Spectral Density<br>Limit: max. 8dBm                                              | PASS   | Meet the requirement of limit.                                                     |
| 15.247(c)                                | Band Edge Measurement<br>Limit: 20 dB less than the peak value of fundamental frequency | PASS   | Meet the requirement of limit.                                                     |

**NOTE:** The information of measurement uncertainty is available upon the customer's request.

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

|                           |                                                               |
|---------------------------|---------------------------------------------------------------|
| <b>PRODUCT</b>            | 802.11g WLAN Mini USB Adapter                                 |
| <b>MODEL NO</b>           | WL MU 2454 13I (for brand: GLOBAL SUN)                        |
| <b>OEM MODEL NO</b>       | A02-u-W54 (for brand: Atlantis)                               |
| <b>POWER SUPPLY</b>       | 5.0Vdc from host equipment                                    |
| <b>MODULATION TYPE</b>    | BPSK, QPSK, CCK, 16QAM, 64QAM                                 |
| <b>RADIO TECHNOLOGY</b>   | DSSS, OFDM                                                    |
| <b>TRANSFER RATE</b>      | 802.11b: 11/5.5/2/1Mbps<br>802.11g: 54/48/36/24/18/12/9/6Mbps |
| <b>FREQUENCY RANGE</b>    | 2412MHz ~ 2462MHz                                             |
| <b>NUMBER OF CHANNEL</b>  | 11                                                            |
| <b>OUTPUT POWER</b>       | 15.0dBm                                                       |
| <b>ANTENNA TYPE</b>       | PIFA antenna with 0dBi gain<br>Chip antenna with 1dBi gain    |
| <b>DATA CABLE</b>         | 1.9m USB cable shielded without core                          |
| <b>I/O PORTS</b>          | USB                                                           |
| <b>ASSOCIATED DEVICES</b> | NA                                                            |

**NOTE:**

1. The EUT operates in the 2.4GHz frequency spectrum with throughput of up to 54Mbps.
2. Model WL MU 2454 13I, A02-u-W54 are identical as below due to marketing requirement.

| <b>Brand Name</b> | <b>Model Name</b> |
|-------------------|-------------------|
| GLOBAL SUN        | WL MU 2454 13I    |
| Atlantis          | A02-u-W54         |

3. The EUT complies with IEEE 802.11g draft standards and backwards compatible with IEEE 802.11b products.
4. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

### 3.2 DESCRIPTION OF TEST MODES

Eleven channels are provided to this EUT.

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 1       | 2412 MHz  | 7       | 2442 MHz  |
| 2       | 2417 MHz  | 8       | 2447 MHz  |
| 3       | 2422 MHz  | 9       | 2452 MHz  |
| 4       | 2427 MHz  | 10      | 2457 MHz  |
| 5       | 2432 MHz  | 11      | 2462 MHz  |
| 6       | 2437 MHz  |         |           |

**NOTE:**

1. Below 1GHz, the channel 1, 6, and 11 were pre-tested in chamber. The channel 11, the worst case, was chosen for final test.
2. Above 1GHz, the channel 1, 6, and 11 were tested individually.
3. From our experience and technical viewpoint, we have chosen data rates 11Mbps for CCK technique and 6Mbps for OFDM technique, as the worst cases for the test among other data rates.
4. There are two test results presented in the following sections: The test result A is for CCK technique and the test result B is for OFDM technique.
5. There are two antennas in the EUT, PIFA antenna with 0dBi and Chip antenna with 1dBi, The Chip antenna, the worst case, was chosen for final test.

### 3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is an 802.11g WLAN Mini USB Adapter. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C. (15.247)**  
**ANSI C63.4: 2001**

All test items have been performed and recorded as per the above standards.

**NOTE:** The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

### 3.4 DESCRIPTION OF SUPPORT UNITS

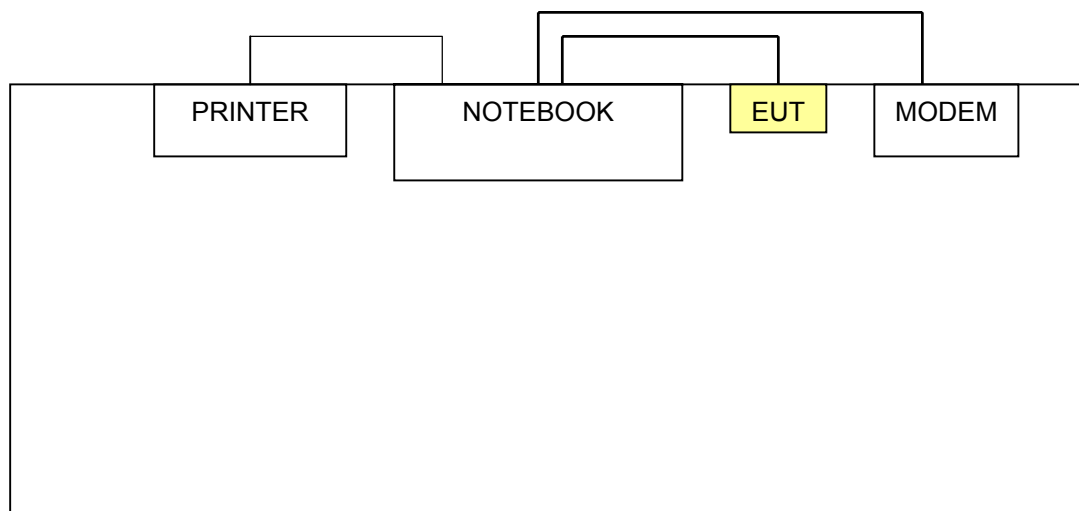
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| NO. | PRODUCT           | BRAND | MODEL NO. | SERIAL NO.  | FCC ID           |
|-----|-------------------|-------|-----------|-------------|------------------|
| 1   | NOTEBOOK COMPUTER | DELL  | PP05L     | 16484462992 | E2K24CLNS        |
| 2   | PRINTER           | EPSON | LQ-300+   | DCGY017076  | FCC DoC Approved |
| 3   | MODEM             | ACEEX | 1414      | 980020536   | IFAXDM1414       |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|-----------------------------------------------------|
| 1   | NA                                                  |
| 2   | 1.2m shielded cable without core                    |
| 3   | 1.2m shielded cable without core                    |

**NOTE:** All power cords of the above support units are non shielded (1.8m).

### 3.5 CONFIGURATION OF SYSTEM UNDER TEST





## 4 TEST TYPES AND RESULTS

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY OF EMISSION (MHz) | CONDUCTED LIMIT (dB $\mu$ V) |          |
|-----------------------------|------------------------------|----------|
|                             | Quasi-peak                   | Average  |
| 0.15-0.5                    | 66 to 56                     | 56 to 46 |
| 0.5-5                       | 56                           | 46       |
| 5-30                        | 60                           | 50       |

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
  2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
  3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

#### 4.1.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER       | MODEL NO.   | SERIAL NO.     | CALIBRATED UNTIL |
|----------------------------------|-------------|----------------|------------------|
| Test Receiver<br>ROHDE & SCHWARZ | ESCS30      | 100288         | Dec. 11, 2004    |
| RF signal cable<br>Woken         | 5D-FB       | Cable-HyC02-01 | Mar. 07, 2005    |
| LISN<br>ROHDE & SCHWARZ          | ESH2-Z5     | 100100         | Mar. 10, 2005    |
| LISN<br>ROHDE & SCHWARZ          | ESH3-Z5     | 100311         | Mar. 04, 2005    |
| Software<br>ADT                  | ADT_Cond_V3 | NA             | NA               |

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. The test was performed in HwaYa Shielded Room 2.



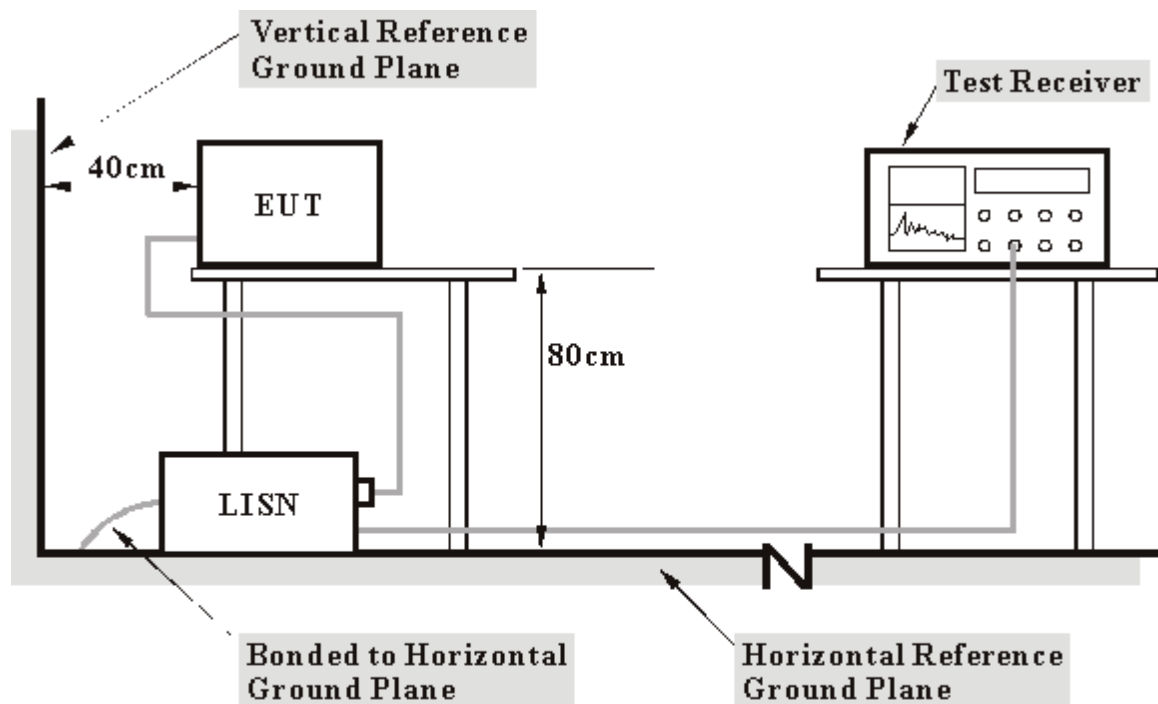
#### 4.1.3 TEST PROCEDURES

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels (Limit -20dB) was not recorded.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation

## 4.1.5 TEST SETUP



- Note:** 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



#### 4.1.6 EUT OPERATING CONDITIONS

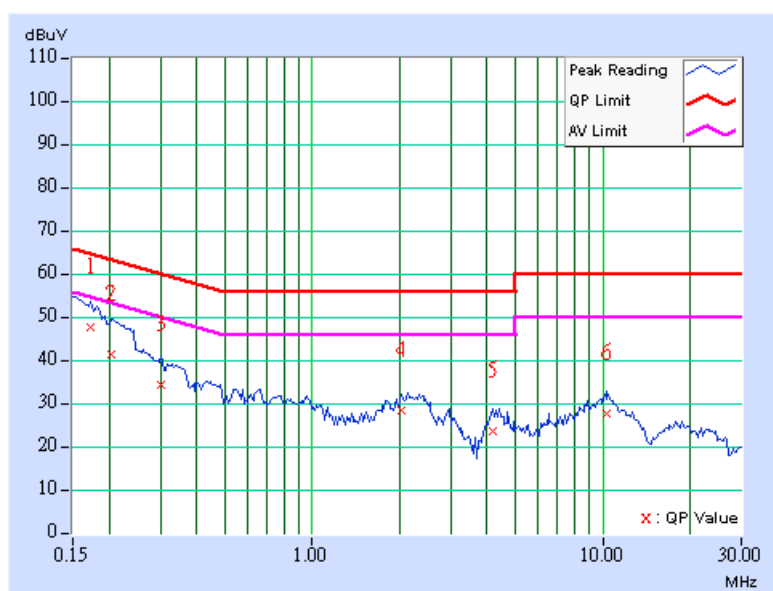
- a. Connected the EUT to a notebook system placed on a testing table.
- b. The notebook system ran a test program (provided by manufacturer) to enable EUT under transmission/receiving condition continuously at specific channel frequency.
- c. The notebook system sent "H" messages to its screen.
- d. The notebook system sent "H" messages to modem.
- e. The notebook system sent "H" messages to printer, and the printer printed them on paper.
- f. Steps c ~ e were repeated.

## 4.1.7 TEST RESULTS

|                                 |                               |                              |                |
|---------------------------------|-------------------------------|------------------------------|----------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                 | WL MU 2454 13I |
| <b>CHANNEL</b>                  | 1                             | <b>6dB BANDWIDTH</b>         | 9 kHz          |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>PHASE</b>                 | Line (L)       |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH, 991 hPa    | <b>TESTED BY:</b> Match Tsui |                |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value |     | Emission Level |     | Limit     |       | Margin |     |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-------|--------|-----|
|    |                |                         | [dB (uV)]     |     | [dB (uV)]      |     | [dB (uV)] |       | (dB)   |     |
|    |                |                         | Q.P.          | AV. | Q.P.           | AV. | Q.P.      | AV.   | Q.P.   | AV. |
| 1  | 0.173          | 0.10                    | 47.32         | -   | 47.42          | -   | 64.79     | 54.79 | -17.37 | -   |
| 2  | 0.205          | 0.10                    | 41.09         | -   | 41.19          | -   | 63.42     | 53.42 | -22.23 | -   |
| 3  | 0.302          | 0.11                    | 34.06         | -   | 34.17          | -   | 60.18     | 50.18 | -26.01 | -   |
| 4  | 2.035          | 0.26                    | 28.13         | -   | 28.39          | -   | 56.00     | 46.00 | -27.61 | -   |
| 5  | 4.180          | 0.32                    | 23.29         | -   | 23.61          | -   | 56.00     | 46.00 | -32.39 | -   |
| 6  | 10.254         | 0.54                    | 27.33         | -   | 27.87          | -   | 60.00     | 50.00 | -32.13 | -   |

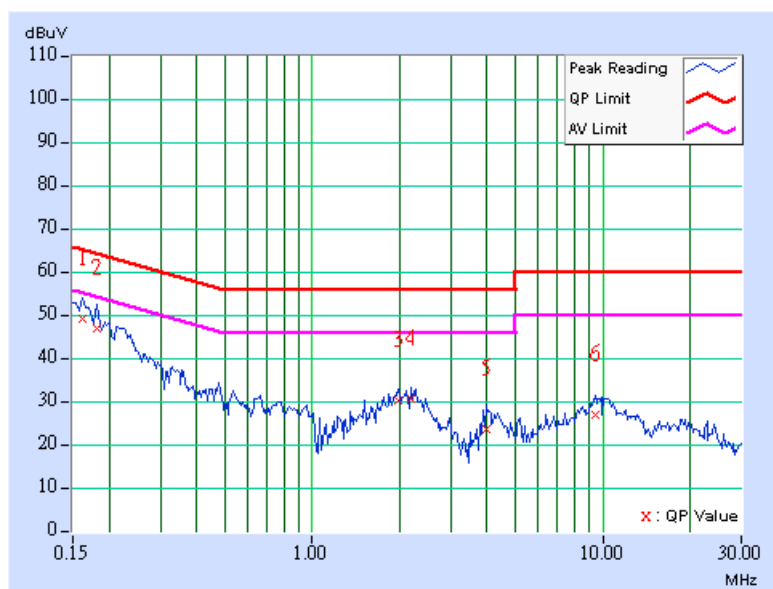
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



|                                 |                               |                              |                |
|---------------------------------|-------------------------------|------------------------------|----------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                 | WL MU 2454 13I |
| <b>CHANNEL</b>                  | 1                             | <b>6dB BANDWIDTH</b>         | 9 kHz          |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>PHASE</b>                 | Neutral (N)    |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH, 991 hPa    | <b>TESTED BY:</b> Match Tsui |                |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value |     | Emission Level |     | Limit     |       | Margin |     |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-------|--------|-----|
|    |                |                         | [dB (uV)]     |     | [dB (uV)]      |     | [dB (uV)] |       | (dB)   |     |
|    |                |                         | Q.P.          | AV. | Q.P.           | AV. | Q.P.      | AV.   | Q.P.   | AV. |
| 1  | 0.162          | 0.10                    | 48.76         | -   | 48.86          | -   | 65.38     | 55.38 | -16.52 | -   |
| 2  | 0.181          | 0.10                    | 46.45         | -   | 46.55          | -   | 64.43     | 54.43 | -17.88 | -   |
| 3  | 1.977          | 0.25                    | 29.74         | -   | 29.99          | -   | 56.00     | 46.00 | -26.01 | -   |
| 4  | 2.191          | 0.26                    | 30.29         | -   | 30.55          | -   | 56.00     | 46.00 | -25.45 | -   |
| 5  | 3.969          | 0.30                    | 23.26         | -   | 23.56          | -   | 56.00     | 46.00 | -32.44 | -   |
| 6  | 9.414          | 0.48                    | 26.56         | -   | 27.04          | -   | 60.00     | 50.00 | -32.96 | -   |

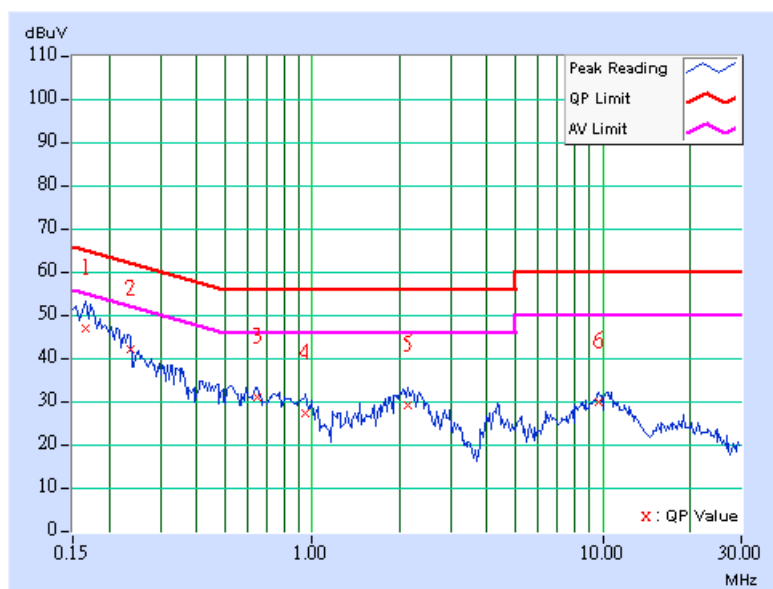
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3. The emission levels of other frequencies were very low against the limit.  
4. Margin value = Emission level - Limit value  
5. Correction factor = Insertion loss + Cable loss  
6. Emission Level = Correction Factor + Reading Value.



|                                 |                               |                              |                |
|---------------------------------|-------------------------------|------------------------------|----------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                 | WL MU 2454 13I |
| <b>CHANNEL</b>                  | 6                             | <b>6dB BANDWIDTH</b>         | 9 kHz          |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>PHASE</b>                 | Line (L)       |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH, 991 hPa    | <b>TESTED BY:</b> Match Tsui |                |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value |     | Emission Level |     | Limit     |       | Margin |     |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-------|--------|-----|
|    |                |                         | [dB (uV)]     |     | [dB (uV)]      |     | [dB (uV)] |       | (dB)   |     |
|    |                |                         | Q.P.          | AV. | Q.P.           | AV. | Q.P.      | AV.   | Q.P.   | AV. |
| 1  | 0.166          | 0.10                    | 46.42         | -   | 46.52          | -   | 65.18     | 55.18 | -18.65 | -   |
| 2  | 0.236          | 0.10                    | 41.88         | -   | 41.98          | -   | 62.24     | 52.24 | -20.26 | -   |
| 3  | 0.650          | 0.17                    | 30.54         | -   | 30.71          | -   | 56.00     | 46.00 | -25.29 | -   |
| 4  | 0.947          | 0.24                    | 26.72         | -   | 26.96          | -   | 56.00     | 46.00 | -29.04 | -   |
| 5  | 2.137          | 0.26                    | 28.76         | -   | 29.02          | -   | 56.00     | 46.00 | -26.98 | -   |
| 6  | 9.656          | 0.52                    | 29.38         | -   | 29.90          | -   | 60.00     | 50.00 | -30.10 | -   |

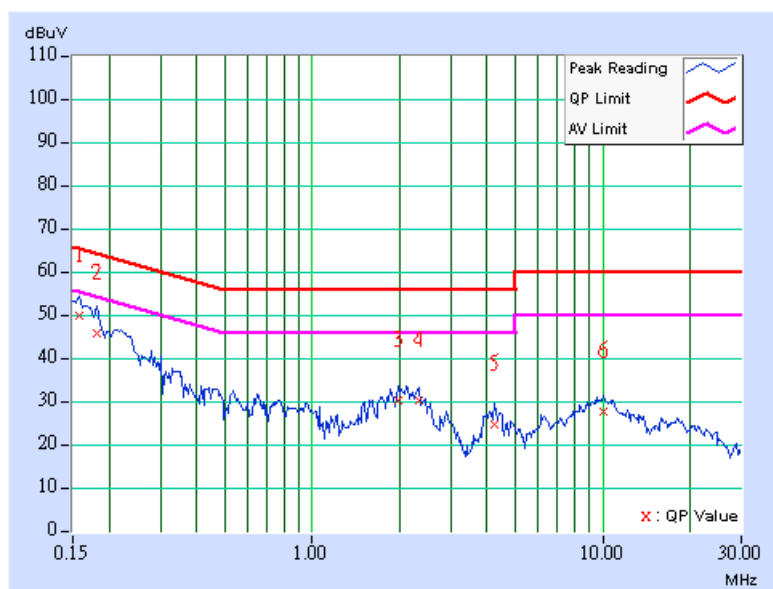
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
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  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



|                                 |                               |                              |                |
|---------------------------------|-------------------------------|------------------------------|----------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                 | WL MU 2454 13I |
| <b>CHANNEL</b>                  | 6                             | <b>6dB BANDWIDTH</b>         | 9 kHz          |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>PHASE</b>                 | Neutral (N)    |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH, 991 hPa    | <b>TESTED BY:</b> Match Tsui |                |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value |     | Emission Level |     | Limit     |       | Margin |     |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-------|--------|-----|
|    |                |                         | [dB (uV)]     |     | [dB (uV)]      |     | [dB (uV)] |       | (dB)   |     |
|    |                |                         | Q.P.          | AV. | Q.P.           | AV. | Q.P.      | AV.   | Q.P.   | AV. |
| 1  | 0.158          | 0.10                    | 49.38         | -   | 49.48          | -   | 65.58     | 55.58 | -16.10 | -   |
| 2  | 0.181          | 0.10                    | 45.34         | -   | 45.44          | -   | 64.43     | 54.43 | -18.99 | -   |
| 3  | 1.973          | 0.25                    | 29.80         | -   | 30.05          | -   | 56.00     | 46.00 | -25.95 | -   |
| 4  | 2.324          | 0.26                    | 29.81         | -   | 30.07          | -   | 56.00     | 46.00 | -25.93 | -   |
| 5  | 4.262          | 0.31                    | 24.34         | -   | 24.65          | -   | 56.00     | 46.00 | -31.35 | -   |
| 6  | 9.996          | 0.49                    | 27.34         | -   | 27.83          | -   | 60.00     | 50.00 | -32.17 | -   |

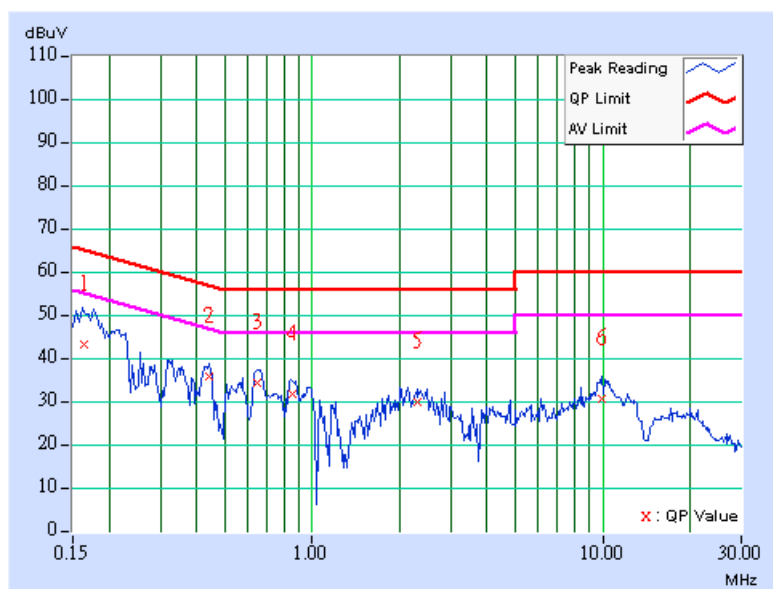
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



|                                 |                               |                              |                |
|---------------------------------|-------------------------------|------------------------------|----------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                 | WL MU 2454 13I |
| <b>CHANNEL</b>                  | 11                            | <b>6dB BANDWIDTH</b>         | 9 kHz          |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>PHASE</b>                 | Line (L)       |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH, 991 hPa    | <b>TESTED BY:</b> Match Tsui |                |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value |     | Emission Level |     | Limit     |       | Margin |     |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-------|--------|-----|
|    |                |                         | [dB (uV)]     |     | [dB (uV)]      |     | [dB (uV)] |       | (dB)   |     |
|    |                |                         | Q.P.          | AV. | Q.P.           | AV. | Q.P.      | AV.   | Q.P.   | AV. |
| 1  | 0.164          | 0.10                    | 42.80         | -   | 42.90          | -   | 65.25     | 55.25 | -22.35 | -   |
| 2  | 0.439          | 0.12                    | 35.35         | -   | 35.47          | -   | 57.08     | 47.08 | -21.61 | -   |
| 3  | 0.650          | 0.17                    | 34.10         | -   | 34.27          | -   | 56.00     | 46.00 | -21.73 | -   |
| 4  | 0.856          | 0.22                    | 31.42         | -   | 31.64          | -   | 56.00     | 46.00 | -24.36 | -   |
| 5  | 2.293          | 0.27                    | 29.44         | -   | 29.71          | -   | 56.00     | 46.00 | -26.29 | -   |
| 6  | 9.977          | 0.53                    | 30.09         | -   | 30.62          | -   | 60.00     | 50.00 | -29.38 | -   |

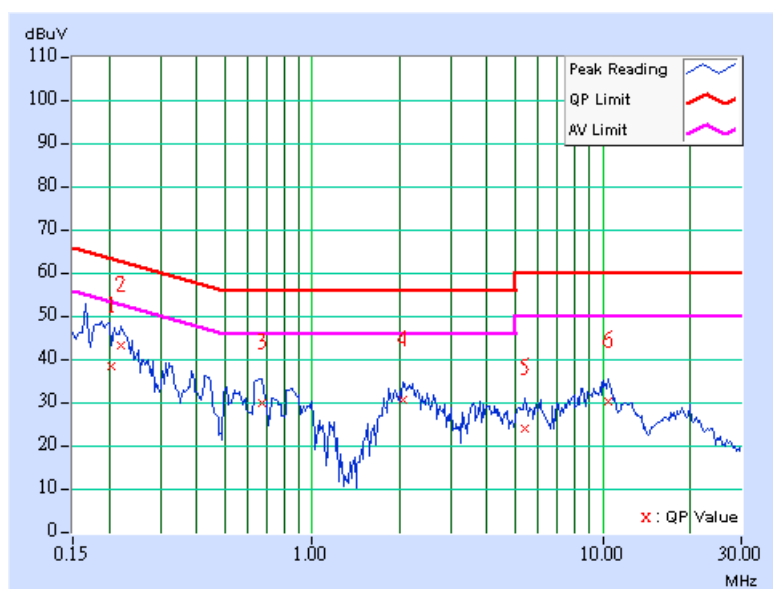
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



|                                 |                               |                              |                |
|---------------------------------|-------------------------------|------------------------------|----------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                 | WL MU 2454 13I |
| <b>CHANNEL</b>                  | 11                            | <b>6dB BANDWIDTH</b>         | 9 kHz          |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>PHASE</b>                 | Netural (N)    |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH, 991 hPa    | <b>TESTED BY:</b> Match Tsui |                |

| No | Freq.<br>[MHz] | Corr.<br>Factor<br>(dB) | Reading Value |     | Emission Level |     | Limit     |       | Margin |     |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-------|--------|-----|
|    |                |                         | [dB (uV)]     |     | [dB (uV)]      |     | [dB (uV)] |       | (dB)   |     |
|    |                |                         | Q.P.          | AV. | Q.P.           | AV. | Q.P.      | AV.   | Q.P.   | AV. |
| 1  | 0.204          | 0.10                    | 37.87         | -   | 37.97          | -   | 63.43     | 53.43 | -25.46 | -   |
| 2  | 0.220          | 0.10                    | 42.82         | -   | 42.92          | -   | 62.81     | 52.81 | -19.89 | -   |
| 3  | 0.673          | 0.17                    | 29.63         | -   | 29.80          | -   | 56.00     | 46.00 | -26.20 | -   |
| 4  | 2.047          | 0.25                    | 30.20         | -   | 30.45          | -   | 56.00     | 46.00 | -25.55 | -   |
| 5  | 5.371          | 0.36                    | 23.56         | -   | 23.92          | -   | 60.00     | 50.00 | -36.08 | -   |
| 6  | 10.418         | 0.50                    | 29.96         | -   | 30.46          | -   | 60.00     | 50.00 | -29.54 | -   |

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



## 4.2 RADIATED EMISSION MEASUREMENT

### 4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

| Frequencies<br>(MHz) | Field strength<br>(microvolts/meter) | Measurement distance<br>(meters) |
|----------------------|--------------------------------------|----------------------------------|
| 0.009-0.490          | 2400/F(kHz)                          | 300                              |
| 0.490-1.705          | 24000/F(kHz)                         | 30                               |
| 1.705-30.0           | 30                                   | 30                               |
| 30-88                | 100                                  | 3                                |
| 88-216               | 150                                  | 3                                |
| 216-960              | 200                                  | 3                                |
| Above 960            | 500                                  | 3                                |

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

## 4.2.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER           | MODEL NO.          | SERIAL NO.   | CALIBRATED UNTIL |
|--------------------------------------|--------------------|--------------|------------------|
| Test Receiver<br>ROHDE & SCHWARZ     | ESIB7              | 100188       | Jan. 13, 2005    |
| Spectrum Analyzer<br>ROHDE & SCHWARZ | FSP40              | 100039       | Dec. 15, 2004    |
| BILOG Antenna<br>SCHWARZBECK         | VULB9168           | 9168-157     | Feb. 03, 2005    |
| HORN Antenna<br>SCHWARZBECK          | BBHA 9120 D        | 9120D-407    | Feb. 03, 2005    |
| HORN Antenna<br>SCHWARZBECK          | BBHA 9170          | BBHA 9170241 | Feb. 23, 2005    |
| Preamplifier<br>Agilent              | 8449B              | 3008A01961   | Jan. 22, 2005    |
| Preamplifier<br>Agilent              | 8447D              | 2944A10629   | Jan. 14, 2005    |
| RF signal cable<br>HUBER+SUHNER      | SUCOFLEX 104       | 218182/4     | Mar. 04, 2005    |
| RF signal cable<br>HUBER+SUHNER      | SUCOFLEX 104       | 218194/4     | Mar. 04, 2005    |
| Software<br>ADT.                     | ADT_Radiated_V5.14 | NA           | NA               |
| Antenna Tower<br>ADT.                | AT100              | AT93021702   | NA               |
| Turn Table<br>ADT.                   | TT100.             | TT93021702   | NA               |
| Controller<br>ADT.                   | SC100.             | SC93021702   | NA               |

- NOTE:**
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. The test was performed in HwaYa Chamber 1.
  3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  4. The IC Site Registration No. is IC4924-2.

#### 4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

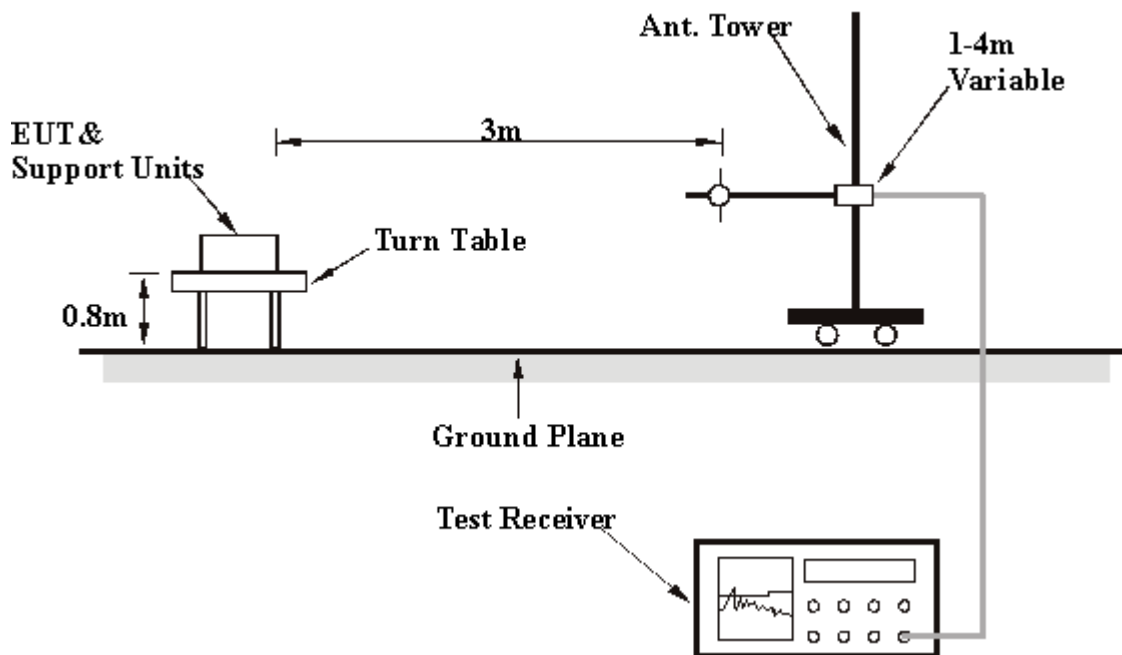
**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### 4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6

## 4.2.7 TEST RESULTS

|                                 |                               |                             |                |
|---------------------------------|-------------------------------|-----------------------------|----------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                | WL MU 2454 13I |
| <b>CHANNEL</b>                  | 11                            | <b>FREQUENCY RANGE</b>      | Below 1000 MHz |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60Hz                 | <b>DETECTOR FUNCTION</b>    | Quasi-Peak     |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH, 991 hPa    | <b>TESTED BY:</b> Steven Lu |                |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |             |                         |                |             |                    |                      |                  |                          |
|-----------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                 | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                   | 119.42      | 33.94 QP                | 43.50          | -9.56       | 3.00 H             | 295                  | 20.97            | 12.97                    |
| 2                                                   | 160.24      | 37.85 QP                | 43.50          | -5.65       | 1.75 H             | 286                  | 22.99            | 14.87                    |
| 3                                                   | 199.12      | 30.94 QP                | 43.50          | -12.56      | 1.25 H             | 43                   | 19.48            | 11.46                    |
| 4                                                   | 239.94      | 40.72 QP                | 46.00          | -5.28       | 1.00 H             | 250                  | 27.65            | 13.08                    |
| 5                                                   | 278.82      | 30.87 QP                | 46.00          | -15.13      | 1.00 H             | 184                  | 16.73            | 14.14                    |
| 6                                                   | 319.64      | 37.03 QP                | 46.00          | -8.97       | 1.00 H             | 193                  | 22.08            | 14.95                    |
| 7                                                   | 335.19      | 34.11 QP                | 46.00          | -11.89      | 1.00 H             | 199                  | 18.80            | 15.31                    |
| 8                                                   | 360.46      | 38.68 QP                | 46.00          | -7.32       | 1.00 H             | 130                  | 22.79            | 15.88                    |
| 9                                                   | 399.34      | 41.32 QP                | 46.00          | -4.68       | 1.00 H             | 217                  | 24.59            | 16.74                    |
| 10                                                  | 440.16      | 34.99 QP                | 46.00          | -11.01      | 1.00 H             | 211                  | 17.18            | 17.81                    |
| 11                                                  | 479.04      | 35.40 QP                | 46.00          | -10.60      | 1.75 H             | 241                  | 16.95            | 18.45                    |
| 12                                                  | 519.86      | 29.17 QP                | 46.00          | -16.83      | 1.75 H             | 250                  | 10.06            | 19.11                    |
| 13                                                  | 640.38      | 30.44 QP                | 46.00          | -15.56      | 1.25 H             | 166                  | 8.89             | 21.55                    |
| 14                                                  | 731.74      | 32.83 QP                | 46.00          | -13.17      | 1.75 H             | 253                  | 9.75             | 23.08                    |
| 15                                                  | 961.12      | 33.01 QP                | 54.00          | -20.99      | 1.25 H             | 217                  | 7.34             | 25.68                    |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

|                                 |                               |                             |                |
|---------------------------------|-------------------------------|-----------------------------|----------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                | WL MU 2454 13I |
| <b>CHANNEL</b>                  | 11                            | <b>FREQUENCY RANGE</b>      | Below 1000 MHz |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>DETECTOR FUNCTION</b>    | Quasi-Peak     |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH, 991 hPa    | <b>TESTED BY:</b> Steven Lu |                |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b> |             |                         |                |             |                    |                      |                  |                          |
|--------------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                          | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                            | 53.33       | 32.99 QP                | 40.00          | -7.01       | 1.00 V             | 298                  | 18.62            | 14.37                    |
| 2                                                            | 119.42      | 31.70 QP                | 43.50          | -11.80      | 1.00 V             | 88                   | 18.73            | 12.97                    |
| 3                                                            | 142.75      | 28.88 QP                | 43.50          | -14.62      | 1.25 V             | 58                   | 14.40            | 14.48                    |
| 4                                                            | 239.94      | 34.25 QP                | 46.00          | -11.75      | 2.00 V             | 205                  | 21.18            | 13.08                    |
| 5                                                            | 249.66      | 30.53 QP                | 46.00          | -15.47      | 2.00 V             | 346                  | 17.31            | 13.22                    |
| 6                                                            | 286.59      | 30.03 QP                | 46.00          | -15.97      | 1.50 V             | 187                  | 15.73            | 14.29                    |
| 7                                                            | 319.64      | 32.60 QP                | 46.00          | -13.40      | 1.25 V             | 181                  | 17.65            | 14.95                    |
| 8                                                            | 360.46      | 34.87 QP                | 46.00          | -11.13      | 1.25 V             | 157                  | 18.99            | 15.88                    |
| 9                                                            | 399.34      | 39.66 QP                | 46.00          | -6.34       | 1.25 V             | 163                  | 22.93            | 16.74                    |
| 10                                                           | 440.16      | 32.78 QP                | 46.00          | -13.22      | 1.25 V             | 214                  | 14.97            | 17.81                    |
| 11                                                           | 479.04      | 35.45 QP                | 46.00          | -10.55      | 1.00 V             | 199                  | 16.99            | 18.45                    |
| 12                                                           | 519.86      | 32.25 QP                | 46.00          | -13.75      | 1.00 V             | 196                  | 13.14            | 19.11                    |
| 13                                                           | 733.69      | 29.22 QP                | 46.00          | -16.78      | 1.25 V             | 298                  | 6.09             | 23.13                    |
| 14                                                           | 961.12      | 32.55 QP                | 54.00          | -21.45      | 1.75 V             | 193                  | 6.87             | 25.68                    |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

## 4.2.8 TEST RESULTS (A)

|                                 |                               |                             |                           |
|---------------------------------|-------------------------------|-----------------------------|---------------------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                | WL MU 2454 13I            |
| <b>CHANNEL</b>                  | 1                             | <b>FREQUENCY RANGE</b>      | 1~25 GHz                  |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>DETECTOR FUNCTION</b>    | Peak (PK)<br>Average (AV) |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH,<br>991 hPa | <b>TESTED BY:</b> Steven Lu |                           |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |             |                         |                |             |                    |                      |                  |                          |
|-----------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                 | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                   | 2390.00     | 53.67 PK                | 74.00          | -20.33      | 1.10 H             | 356                  | 21.91            | 31.76                    |
| 1                                                   | 2390.00     | 45.75 AV                | 54.00          | -8.25       | 1.10 H             | 356                  | 13.99            | 31.76                    |
| 2                                                   | *2412.00    | 109.68 PK               |                |             | 1.10 H             | 356                  | 77.82            | 31.86                    |
| 2                                                   | *2412.00    | 101.76 AV               |                |             | 1.10 H             | 356                  | 69.90            | 31.86                    |
| 3                                                   | 4824.00     | 56.26 PK                | 74.00          | -17.74      | 1.18 H             | 120                  | 17.55            | 38.71                    |
| 3                                                   | 4824.00     | 49.81 AV                | 54.00          | -4.19       | 1.18 H             | 120                  | 11.10            | 38.71                    |
| 4                                                   | 9648.00     | 56.36 PK                | 74.00          | -17.64      | 1.10 H             | 312                  | 9.15             | 47.21                    |
| 4                                                   | 9648.00     | 44.36 AV                | 54.00          | -9.64       | 1.10 H             | 312                  | -2.85            | 47.21                    |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |             |                         |                |             |                    |                      |                  |                          |
|---------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                               | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                 | 2390.00     | 45.65 PK                | 74.00          | -28.35      | 1.03 V             | 287                  | 13.89            | 31.76                    |
| 2                                                 | *2412.00    | 101.66 PK               |                |             | 1.03 V             | 287                  | 69.80            | 31.86                    |
| 2                                                 | *2412.00    | 93.39 AV                |                |             | 1.03 V             | 287                  | 61.53            | 31.86                    |
| 3                                                 | 4824.00     | 57.66 PK                | 74.00          | -16.34      | 1.00 V             | 262                  | 18.95            | 38.71                    |
| 3                                                 | 4824.00     | 52.48 AV                | 54.00          | -1.52       | 1.00 V             | 262                  | 13.77            | 38.71                    |
| 4                                                 | 9648.00     | 57.21 PK                | 74.00          | -16.79      | 1.44 V             | 92                   | 10.00            | 47.21                    |
| 4                                                 | 9648.00     | 45.36 AV                | 54.00          | -8.64       | 1.44 V             | 92                   | -1.85            | 47.21                    |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* ”: Fundamental frequency.



|                                 |                               |                             |                           |
|---------------------------------|-------------------------------|-----------------------------|---------------------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                | WL MU 2454 13I            |
| <b>CHANNEL</b>                  | 6                             | <b>FREQUENCY RANGE</b>      | 1~25 GHz                  |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>DETECTOR FUNCTION</b>    | Peak (PK)<br>Average (AV) |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH,<br>991 hPa | <b>TESTED BY:</b> Steven Lu |                           |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b> |             |                         |                |             |                    |                      |                  |                          |
|----------------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                            | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                              | *2437.00    | 110.78 PK               |                |             | 1.10 H             | 17                   | 78.76            | 32.02                    |
| 1                                                              | *2437.00    | 102.95 AV               |                |             | 1.10 H             | 17                   | 70.93            | 32.02                    |
| 2                                                              | 4874.00     | 56.87 PK                | 74.00          | -17.13      | 1.48 H             | 166                  | 18.14            | 38.73                    |
| 2                                                              | 4874.00     | 50.72 AV                | 54.00          | -3.28       | 1.48 H             | 166                  | 11.99            | 38.73                    |
| 3                                                              | 9748.00     | 57.32 PK                | 74.00          | -16.68      | 1.00 H             | 175                  | 10.15            | 47.17                    |
| 3                                                              | 9748.00     | 45.39 AV                | 54.00          | -8.61       | 1.00 H             | 175                  | -1.78            | 47.17                    |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b> |             |                         |                |             |                    |                      |                  |                          |
|--------------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                          | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                            | *2437.00    | 99.86 PK                |                |             | 1.13 V             | 270                  | 67.84            | 32.02                    |
| 1                                                            | *2437.00    | 91.81 AV                |                |             | 1.13 V             | 270                  | 59.79            | 32.02                    |
| 2                                                            | 4874.00     | 55.23 PK                | 74.00          | -18.77      | 1.08 V             | 164                  | 16.50            | 38.73                    |
| 2                                                            | 4874.00     | 49.50 AV                | 54.00          | -4.50       | 1.08 V             | 164                  | 10.77            | 38.73                    |
| 3                                                            | 9748.00     | 58.39 PK                | 74.00          | -15.61      | 1.00 V             | 147                  | 11.22            | 47.17                    |
| 3                                                            | 9748.00     | 47.32 AV                | 54.00          | -6.68       | 1.00 V             | 147                  | 0.15             | 47.17                    |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* ”: Fundamental frequency.

|                                 |                               |                             |                           |
|---------------------------------|-------------------------------|-----------------------------|---------------------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                | WL MU 2454 13I            |
| <b>CHANNEL</b>                  | 11                            | <b>FREQUENCY RANGE</b>      | 1~25 GHz                  |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>DETECTOR FUNCTION</b>    | Peak (PK)<br>Average (AV) |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH,<br>991 hPa | <b>TESTED BY:</b> Steven Lu |                           |

#### ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1   | *2462.00    | 108.93 PK               |                |             | 1.07 H             | 28                   | 76.76            | 32.17                    |
| 1   | *2462.00    | 101.20 AV               |                |             | 1.07 H             | 28                   | 69.03            | 32.17                    |
| 2   | 2483.50     | 53.68 PK                | 74.00          | -20.32      | 1.07 H             | 28                   | 21.38            | 32.30                    |
| 2   | 2483.50     | 45.95 AV                | 54.00          | -8.05       | 1.07 H             | 28                   | 13.65            | 32.30                    |
| 3   | 4924.00     | 55.22 PK                | 74.00          | -18.78      | 1.40 H             | 322                  | 16.50            | 38.72                    |
| 3   | 4924.00     | 48.43 AV                | 54.00          | -5.57       | 1.40 H             | 322                  | 9.71             | 38.72                    |
| 4   | 9848.00     | 57.42 PK                | 74.00          | -16.58      | 1.32 H             | 72                   | 10.25            | 47.17                    |
| 4   | 9848.00     | 45.69 AV                | 54.00          | -8.31       | 1.32 H             | 72                   | -1.48            | 47.17                    |

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

| No. | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
|-----|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| 1   | *2463.00    | 99.95 PK                |                |             | 1.68 V             | 163                  | 67.77            | 32.18                    |
| 1   | *2463.00    | 90.80 AV                |                |             | 1.68 V             | 163                  | 58.62            | 32.18                    |
| 2   | 2483.50     | 44.70 PK                | 74.00          | -29.30      | 1.68 V             | 163                  | 12.40            | 32.30                    |
| 3   | 4924.00     | 55.39 PK                | 74.00          | -18.61      | 1.22 V             | 48                   | 16.67            | 38.72                    |
| 3   | 4924.00     | 50.62 AV                | 54.00          | -3.38       | 1.22 V             | 48                   | 11.90            | 38.72                    |
| 4   | 9848.00     | 58.28 PK                | 74.00          | -15.72      | 1.36 V             | 340                  | 11.11            | 47.17                    |
| 4   | 9848.00     | 45.59 AV                | 54.00          | -8.41       | 1.36 V             | 340                  | -1.58            | 47.17                    |

#### REMARKS:

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* ”: Fundamental frequency.

## 4.2.9 TEST RESULTS (B)

|                                 |                               |                             |                           |
|---------------------------------|-------------------------------|-----------------------------|---------------------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                | WL MU 2454 13I            |
| <b>CHANNEL</b>                  | 1                             | <b>FREQUENCY RANGE</b>      | 1~25 GHz                  |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>DETECTOR FUNCTION</b>    | Peak (PK)<br>Average (AV) |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH,<br>991 hPa | <b>TESTED BY:</b> Steven Lu |                           |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |             |                         |                |             |                    |                      |                  |                          |
|-----------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                 | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                   | 2390.00     | 60.80 PK                | 74.00          | -13.20      | 1.36 H             | 54                   | 29.04            | 31.76                    |
| 1                                                   | 2390.00     | 50.95 AV                | 54.00          | -3.05       | 1.36 H             | 54                   | 19.19            | 31.76                    |
| 2                                                   | *2412.00    | 105.99 PK               |                |             | 1.36 H             | 54                   | 74.13            | 31.86                    |
| 2                                                   | *2412.00    | 96.14 AV                |                |             | 1.36 H             | 54                   | 64.28            | 31.86                    |
| 3                                                   | 4824.00     | 55.21 PK                | 74.00          | -18.79      | 1.10 H             | 177                  | 16.50            | 38.71                    |
| 3                                                   | 4824.00     | 50.32 AV                | 54.00          | -3.68       | 1.10 H             | 177                  | 11.61            | 38.71                    |
| 4                                                   | 9648.00     | 57.62 PK                | 74.00          | -16.38      | 1.48 H             | 154                  | 10.41            | 47.21                    |
| 4                                                   | 9648.00     | 45.32 AV                | 54.00          | -8.68       | 1.48 H             | 154                  | -1.89            | 47.21                    |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M |             |                         |                |             |                    |                      |                  |                          |
|---------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                               | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                 | 2390.00     | 54.12 PK                | 74.00          | -19.88      | 1.04 V             | 70                   | 22.36            | 31.76                    |
| 1                                                 | 2390.00     | 44.21 AV                | 54.00          | -9.79       | 1.04 V             | 70                   | 12.45            | 31.76                    |
| 2                                                 | *2412.00    | 99.31 PK                |                |             | 1.04 V             | 70                   | 67.45            | 31.86                    |
| 2                                                 | *2412.00    | 89.40 AV                |                |             | 1.04 V             | 70                   | 57.54            | 31.86                    |
| 3                                                 | 4924.00     | 53.24 PK                | 74.00          | -20.76      | 1.36 V             | 176                  | 14.52            | 38.72                    |
| 3                                                 | 4924.00     | 48.24 AV                | 54.00          | -5.76       | 1.36 V             | 176                  | 9.52             | 38.72                    |
| 4                                                 | 9648.00     | 58.43 PK                | 74.00          | -15.57      | 1.00 V             | 215                  | 11.22            | 47.21                    |
| 4                                                 | 9648.00     | 45.32 AV                | 54.00          | -8.68       | 1.00 V             | 215                  | -1.89            | 47.21                    |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* ”: Fundamental frequency.



|                                 |                               |                             |                           |
|---------------------------------|-------------------------------|-----------------------------|---------------------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                | WL MU 2454 13I            |
| <b>CHANNEL</b>                  | 6                             | <b>FREQUENCY RANGE</b>      | 1~25 GHz                  |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>DETECTOR FUNCTION</b>    | Peak (PK)<br>Average (AV) |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH,<br>991 hPa | <b>TESTED BY:</b> Steven Lu |                           |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b> |             |                         |                |             |                    |                      |                  |                          |
|----------------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                            | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                              | *2437.00    | 109.07 PK               |                |             | 1.12 H             | 2                    | 77.05            | 32.02                    |
| 1                                                              | *2437.00    | 99.13 AV                |                |             | 1.12 H             | 2                    | 67.11            | 32.02                    |
| 2                                                              | 4874.00     | 55.08 PK                | 74.00          | -18.92      | 1.18 H             | 134                  | 16.35            | 38.73                    |
| 2                                                              | 4874.00     | 49.56 AV                | 54.00          | -4.44       | 1.18 H             | 134                  | 10.83            | 38.73                    |
| 3                                                              | 9748.00     | 57.37 PK                | 74.00          | -16.63      | 1.29 H             | 208                  | 10.20            | 47.17                    |
| 3                                                              | 9748.00     | 44.58 AV                | 54.00          | -9.42       | 1.29 H             | 208                  | -2.59            | 47.17                    |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b> |             |                         |                |             |                    |                      |                  |                          |
|--------------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                          | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                            | *2437.00    | 99.39 PK                |                |             | 1.22 V             | 244                  | 67.37            | 32.02                    |
| 1                                                            | *2437.00    | 89.66 AV                |                |             | 1.22 V             | 244                  | 57.64            | 32.02                    |
| 2                                                            | 4874.00     | 58.33 PK                | 74.00          | -15.67      | 1.00 V             | 263                  | 19.60            | 38.73                    |
| 2                                                            | 4874.00     | 52.23 AV                | 54.00          | -1.77       | 1.00 V             | 263                  | 13.50            | 38.73                    |
| 3                                                            | 9748.00     | 57.27 PK                | 74.00          | -16.73      | 1.62 V             | 166                  | 10.10            | 47.17                    |
| 3                                                            | 9748.00     | 45.18 AV                | 54.00          | -8.82       | 1.62 V             | 166                  | -1.99            | 47.17                    |

**REMARKS:**

1. Emission level (dBuV/m)= Raw Value (dBuV) + Correction Factor (dB).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* ”: Fundamental frequency.



|                                 |                               |                             |                           |
|---------------------------------|-------------------------------|-----------------------------|---------------------------|
| <b>EUT</b>                      | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                | WL MU 2454 13I            |
| <b>CHANNEL</b>                  | 11                            | <b>FREQUENCY RANGE</b>      | 1~25 GHz                  |
| <b>INPUT POWER (SYSTEM)</b>     | 120 Vac, 60 Hz                | <b>DETECTOR FUNCTION</b>    | Peak (PK)<br>Average (AV) |
| <b>ENVIRONMENTAL CONDITIONS</b> | 20 deg. C, 60% RH,<br>991 hPa | <b>TESTED BY:</b> Steven Lu |                           |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b> |             |                         |                |             |                    |                      |                  |                          |
|----------------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                            | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                              | *2462.00    | 106.12 PK               |                |             | 1.35 H             | 42                   | 73.95            | 32.17                    |
| 1                                                              | *2462.00    | 95.98 AV                |                |             | 1.35 H             | 42                   | 63.81            | 32.17                    |
| 2                                                              | 2483.50     | 60.78 PK                | 74.00          | -13.22      | 1.35 H             | 42                   | 28.48            | 32.30                    |
| 2                                                              | 2483.50     | 50.62 AV                | 54.00          | -3.38       | 1.35 H             | 42                   | 18.32            | 32.30                    |
| 3                                                              | 4924.00     | 54.24 PK                | 74.00          | -19.76      | 1.10 H             | 177                  | 15.52            | 38.72                    |
| 3                                                              | 4924.00     | 49.53 AV                | 54.00          | -4.47       | 1.10 H             | 177                  | 10.81            | 38.72                    |
| 4                                                              | 9848.00     | 57.93 PK                | 74.00          | -16.07      | 1.00 H             | 161                  | 10.76            | 47.17                    |
| 4                                                              | 9848.00     | 43.90 AV                | 54.00          | -10.10      | 1.00 H             | 161                  | -3.27            | 47.17                    |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b> |             |                         |                |             |                    |                      |                  |                          |
|--------------------------------------------------------------|-------------|-------------------------|----------------|-------------|--------------------|----------------------|------------------|--------------------------|
| No.                                                          | Freq. (MHz) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Correction Factor (dB/m) |
| 1                                                            | *2462.00    | 97.51 PK                |                |             | 1.19 V             | 243                  | 65.34            | 32.17                    |
| 1                                                            | *2462.00    | 87.99 AV                |                |             | 1.19 V             | 243                  | 55.82            | 32.17                    |
| 2                                                            | 2483.50     | 52.17 PK                | 74.00          | -21.83      | 1.19 V             | 243                  | 19.87            | 32.30                    |
| 2                                                            | 2483.50     | 42.65 AV                | 54.00          | -11.35      | 1.19 V             | 243                  | 10.35            | 32.30                    |
| 3                                                            | 4924.00     | 54.49 PK                | 74.00          | -19.51      | 1.23 V             | 47                   | 15.77            | 38.72                    |
| 3                                                            | 4924.00     | 49.99 AV                | 54.00          | -4.01       | 1.23 V             | 47                   | 11.27            | 38.72                    |
| 4                                                            | 9848.00     | 58.26 PK                | 74.00          | -15.74      | 1.21 V             | 254                  | 11.09            | 47.17                    |
| 4                                                            | 9848.00     | 44.22 AV                | 54.00          | -9.78       | 1.21 V             | 254                  | -2.95            | 47.17                    |

**REMARKS:**

1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB).
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ \* ” : Fundamental frequency.



### 4.3 6dB BANDWIDTH MEASUREMENT

#### 4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5MHz.

#### 4.3.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED UNTIL |
|----------------------------|-----------|------------|------------------|
| SPECTRUM ANALYZER          | FSEK30    | 100049     | AUG. 12, 2004    |

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

#### 4.3.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100kHz RBW and 100kHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.3.5 TEST SETUP



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

#### 4.3.6 EUT OPERATING CONDITIONS

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

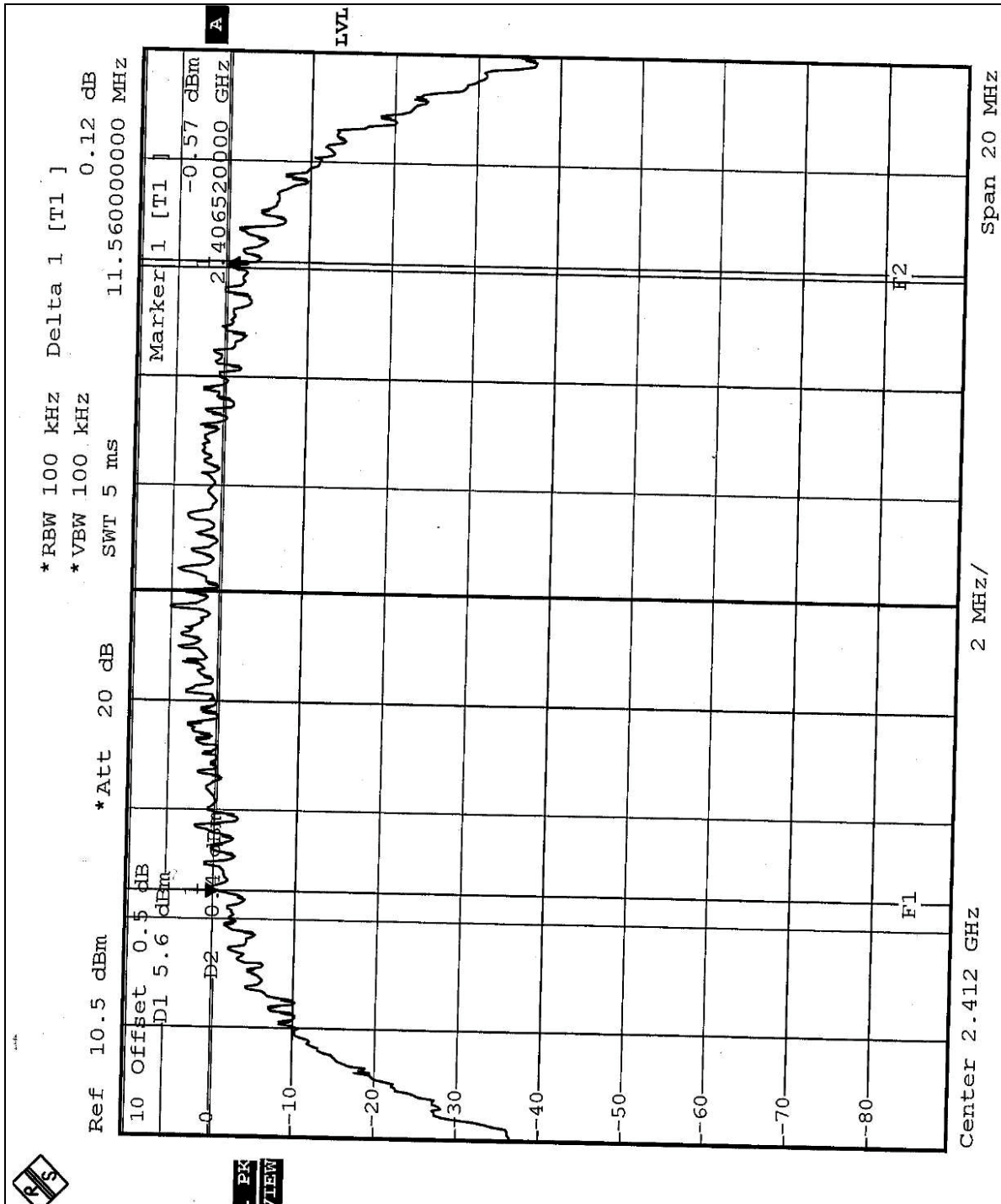


## 4.3.7 TEST RESULTS (A)

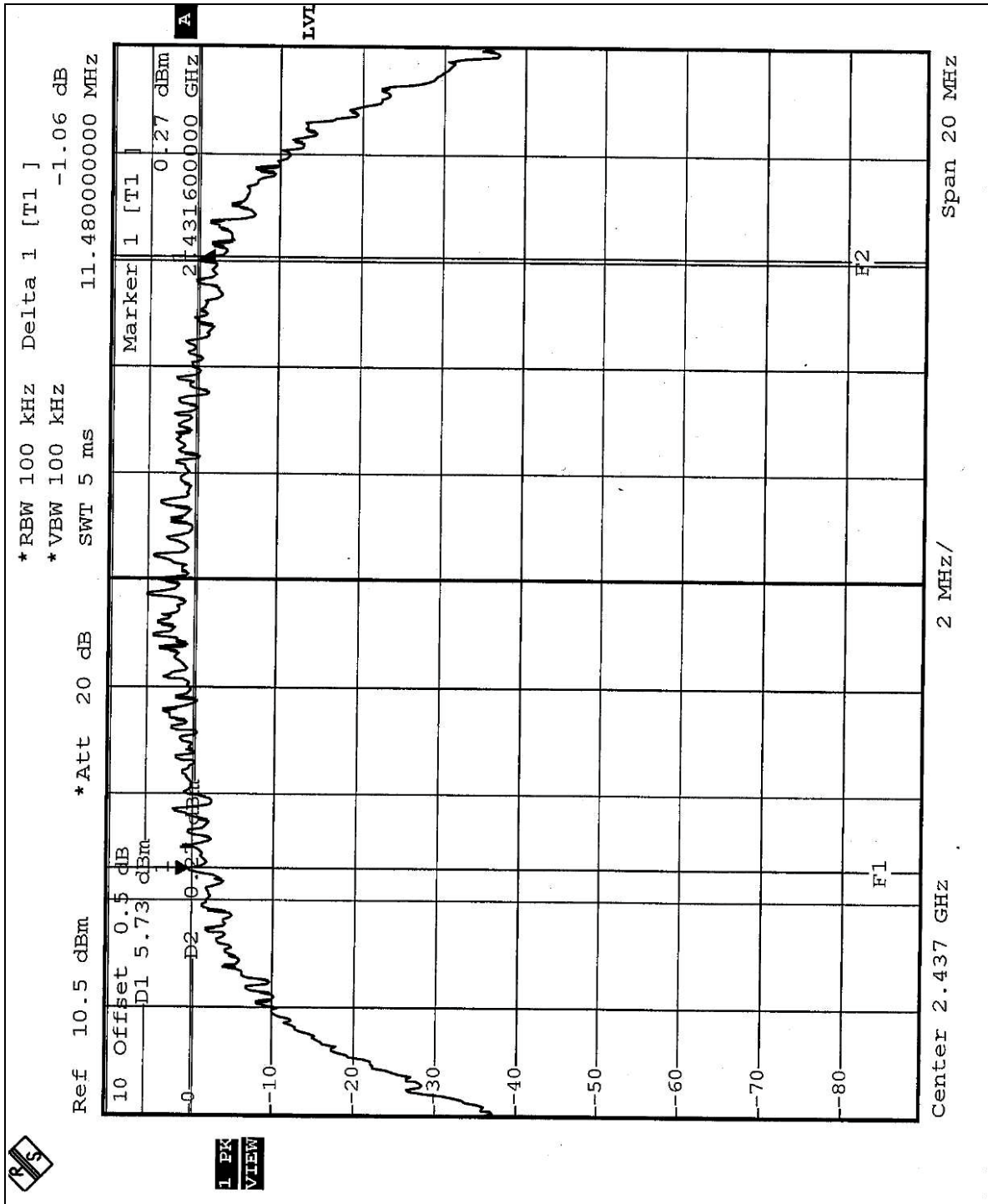
|                             |                               |                                 |                            |
|-----------------------------|-------------------------------|---------------------------------|----------------------------|
| <b>EUT</b>                  | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                    | WL MU 2454 13I             |
| <b>INPUT POWER (SYSTEM)</b> | 120 Vac, 60 Hz                | <b>ENVIRONMENTAL CONDITIONS</b> | 21 deg. C, 62% RH, 991 hPa |
| <b>TESTED BY</b>            | Steven Lu                     |                                 |                            |

| <b>CHANNEL</b> | <b>CHANNEL FREQUENCY (MHz)</b> | <b>6dB BANDWIDTH (MHz)</b> | <b>MINIMUM LIMIT (MHz)</b> | <b>PASS/FAIL</b> |
|----------------|--------------------------------|----------------------------|----------------------------|------------------|
| 1              | 2412                           | 11.56                      | 0.5                        | PASS             |
| 6              | 2437                           | 11.48                      | 0.5                        | PASS             |
| 11             | 2462                           | 11.48                      | 0.5                        | PAS S            |

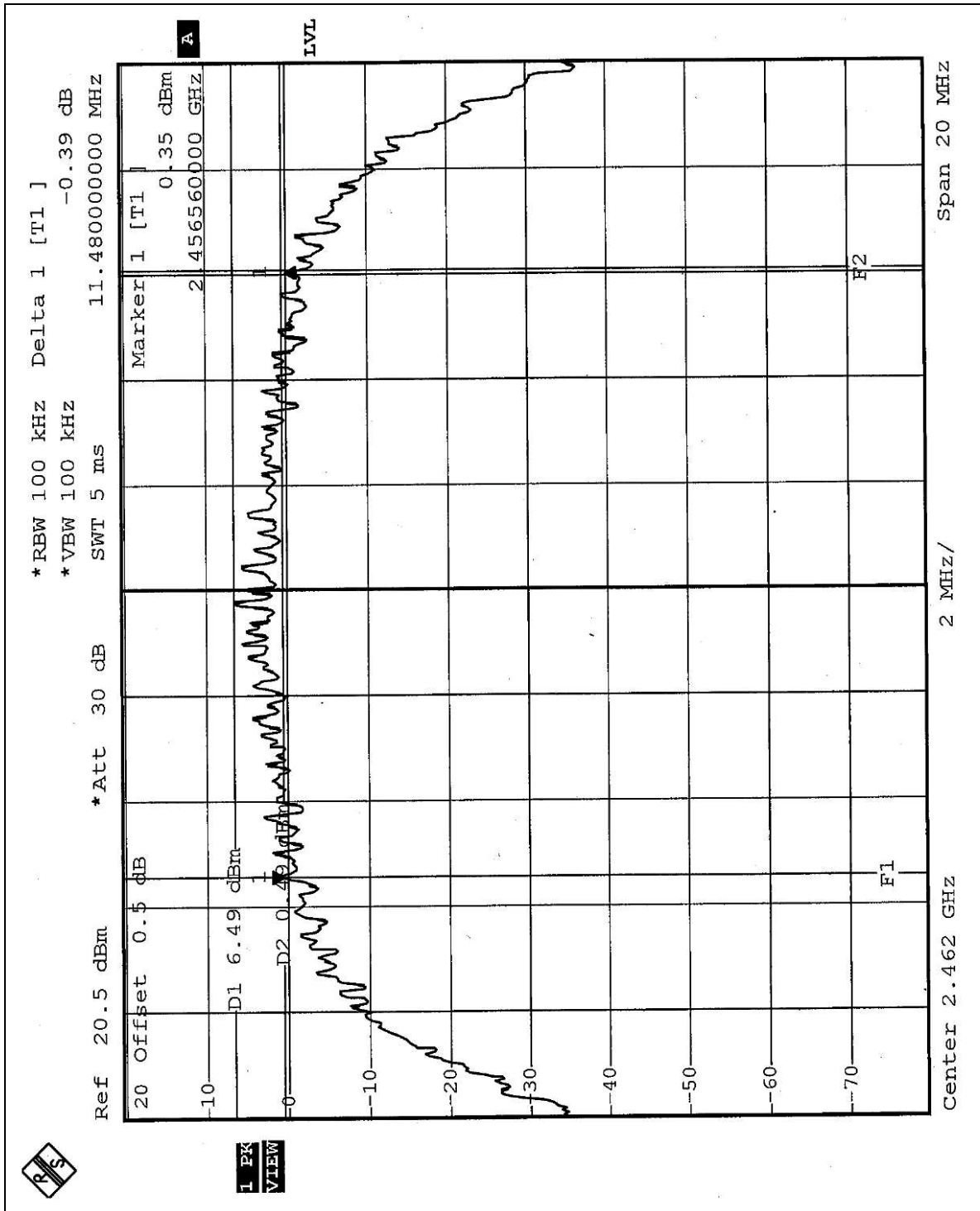
CH1



CH6



CH11

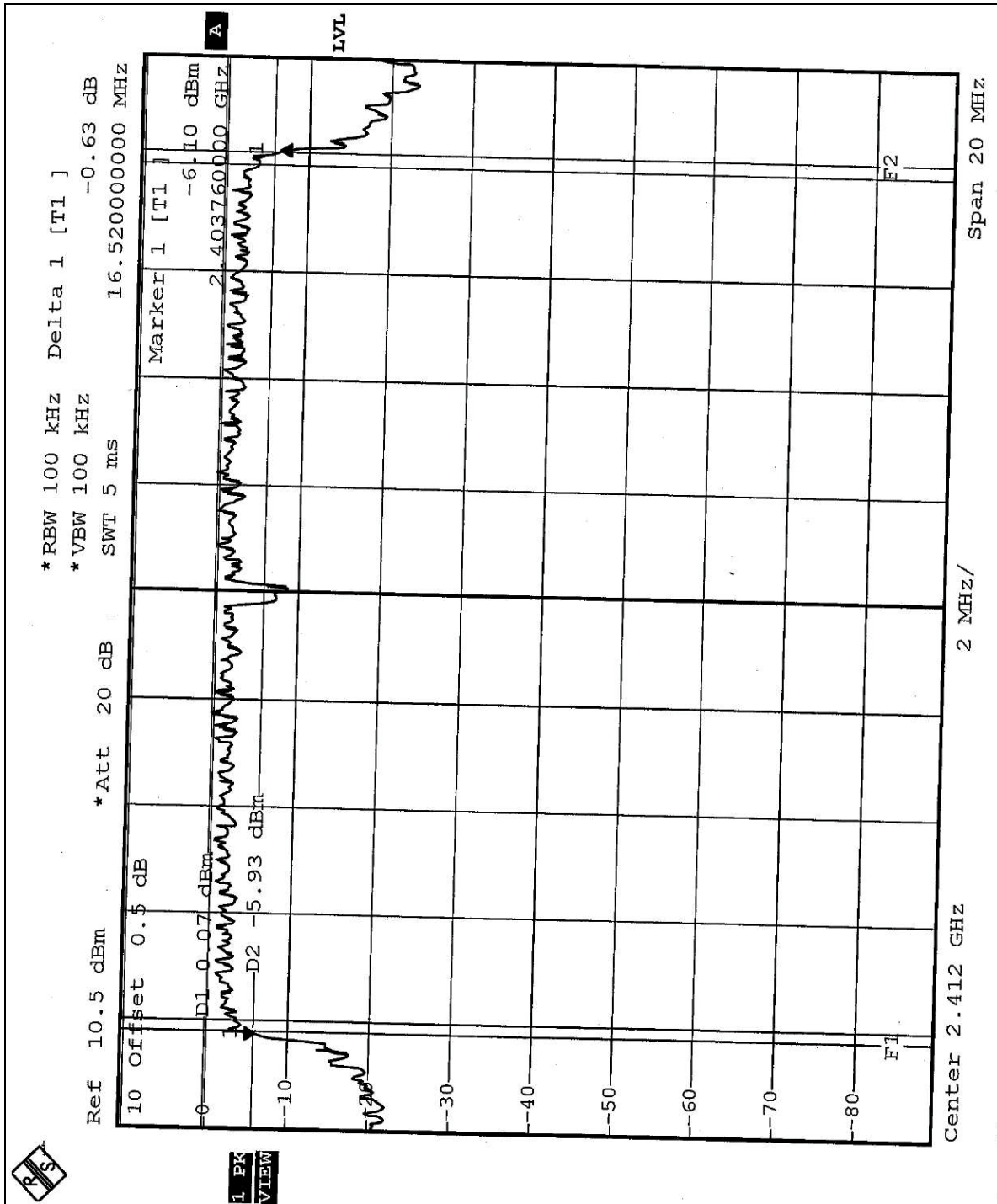


## 4.3.8 TEST RESULTS (B)

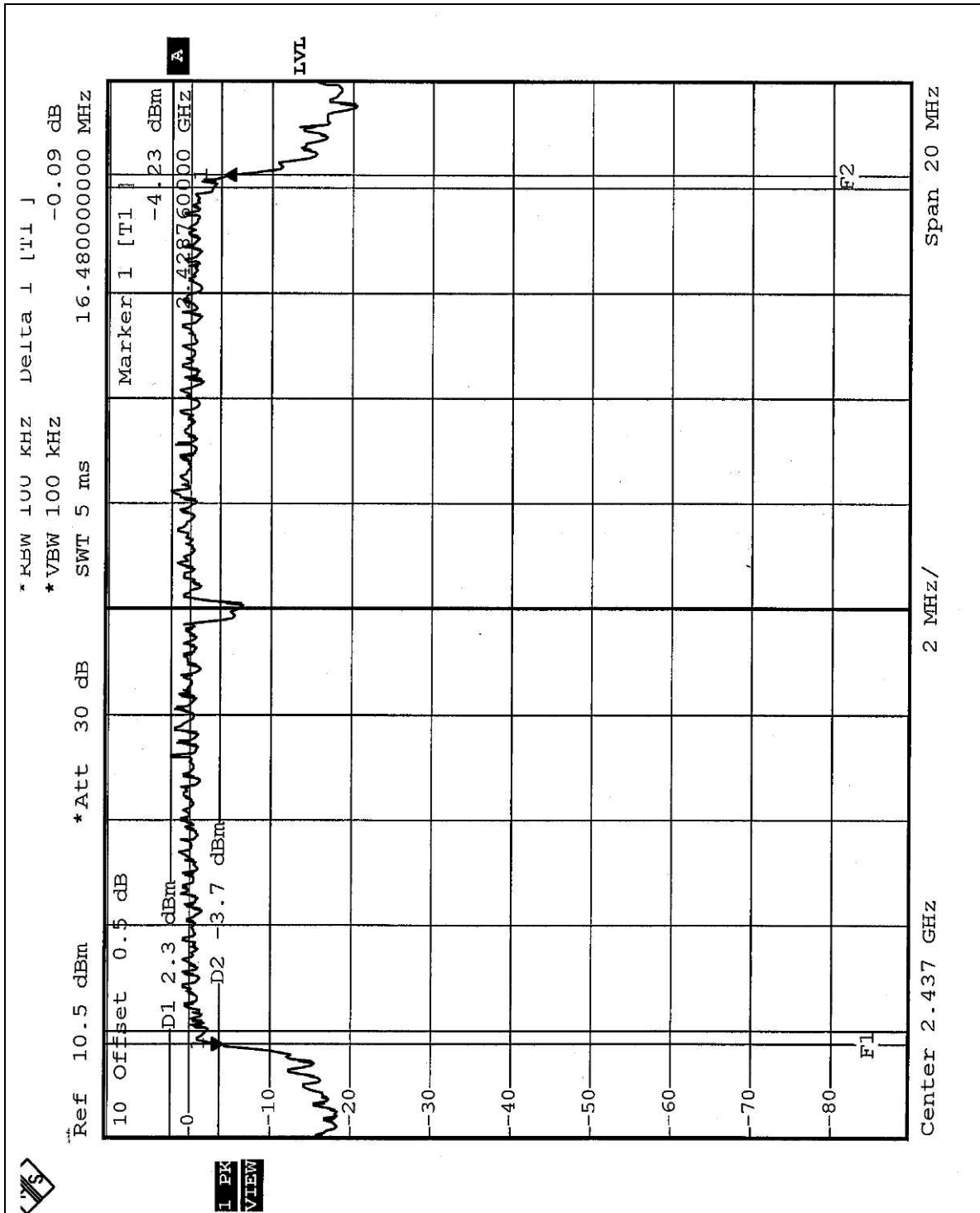
|                             |                               |                                 |                            |
|-----------------------------|-------------------------------|---------------------------------|----------------------------|
| <b>EUT</b>                  | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                    | WL MU 2454 13I             |
| <b>INPUT POWER (SYSTEM)</b> | 120 Vac, 60 Hz                | <b>ENVIRONMENTAL CONDITIONS</b> | 21 deg. C, 62% RH, 991 hPa |
| <b>TESTED BY</b>            | Steve Lu                      |                                 |                            |

| <b>CHANNEL</b> | <b>CHANNEL FREQUENCY (MHz)</b> | <b>6 dB BANDWIDTH (MHz)</b> | <b>MINIMUM LIMIT (MHz)</b> | <b>PASS/FAIL</b> |
|----------------|--------------------------------|-----------------------------|----------------------------|------------------|
| 1              | 2412                           | 16.52                       | 0.5                        | PASS             |
| 6              | 2437                           | 16.48                       | 0.5                        | PASS             |
| 11             | 2462                           | 16.56                       | 0.5                        | PASS             |

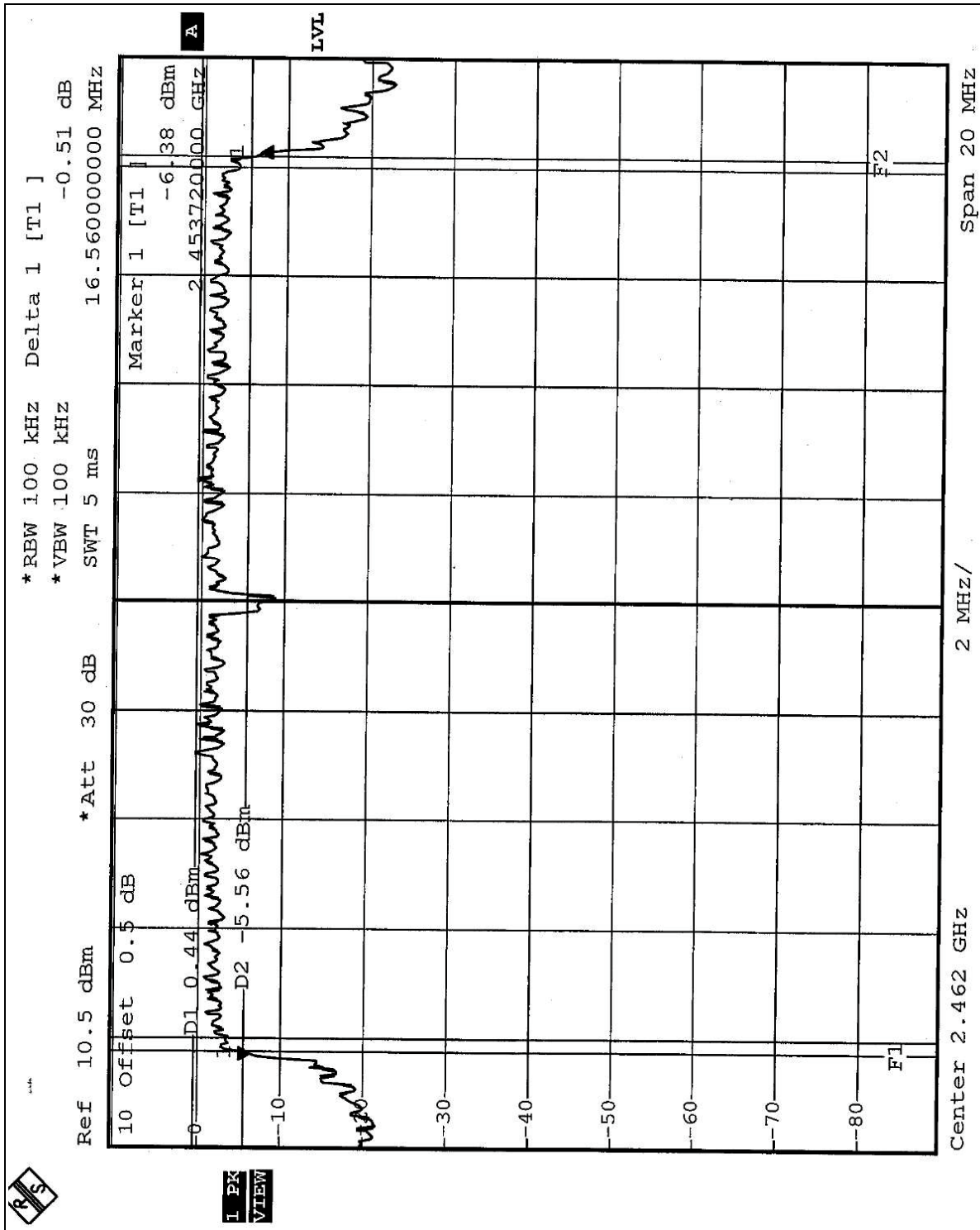
CH1



CH6



CH11



#### 4.4 MAXIMUM PEAK OUTPUT POWER

##### 4.4.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Measurement is 30dBm.

##### 4.4.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED UNTIL |
|----------------------------|-----------|------------|------------------|
| R&S SPECTRUM ANALYZER      | FSEK30    | 100049     | Aug. 12, 2004    |
| R&S SIGNAL GENERATOR       | SMP04     | 100011     | May 28, 2004     |
| TEKTRONIX OSCILLOSCOPE     | TDS 220   | C019167    | Feb. 01, 2005    |
| NARDA DETECTOR             | 4503A     | FSCM99899  | NA               |

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

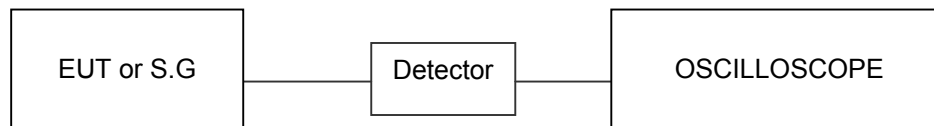
##### 4.4.3 TEST PROCEDURES

1. A detector was used on the output port of the EUT. An oscilloscope was used to read the response of the detector.
2. Replaced the EUT by the signal generator. The center frequency of the S.G. was adjusted to the center frequency of the measured channel.
3. Adjusted the power to have the same reading on oscilloscope. Record the power level.

##### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.4.5 TEST SETUP



#### 4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6



## 4.4.7 TEST RESULTS (A)

|                             |                               |                                 |                            |
|-----------------------------|-------------------------------|---------------------------------|----------------------------|
| <b>EUT</b>                  | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                    | WL MU 2454 13I             |
| <b>INPUT POWER (SYSTEM)</b> | 120 Vac, 60 Hz                | <b>ENVIRONMENTAL CONDITIONS</b> | 21 deg. C, 62% RH, 991 hPa |
| <b>TESTED BY</b>            | Steven Lu                     |                                 |                            |

| <b>CHANNEL</b> | <b>CHANNEL FREQUENCY (MHz)</b> | <b>PEAK POWER OUTPUT (dBm)</b> | <b>PEAK POWER LIMIT (dBm)</b> | <b>PASS/FAIL</b> |
|----------------|--------------------------------|--------------------------------|-------------------------------|------------------|
| 1              | 2412                           | 15.00                          | 30                            | PASS             |
| 6              | 2437                           | 15.00                          | 30                            | PASS             |
| 11             | 2462                           | 15.00                          | 30                            | PASS             |

## 4.4.8 TEST RESULTS (B)

|                             |                               |                                 |                            |
|-----------------------------|-------------------------------|---------------------------------|----------------------------|
| <b>EUT</b>                  | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                    | WL MU 2454 13I             |
| <b>INPUT POWER (SYSTEM)</b> | 120 Vac, 60 Hz                | <b>ENVIRONMENTAL CONDITIONS</b> | 21 deg. C, 62% RH, 991 hPa |
| <b>TESTED BY</b>            | Steven Lu                     |                                 |                            |

| <b>CHANNEL</b> | <b>CHANNEL FREQUENCY (MHz)</b> | <b>PEAK POWER OUTPUT (dBm)</b> | <b>PEAK POWER LIMIT (dBm)</b> | <b>PASS/FAIL</b> |
|----------------|--------------------------------|--------------------------------|-------------------------------|------------------|
| 1              | 2412                           | 14.20                          | 30                            | PASS             |
| 6              | 2437                           | 14.70                          | 30                            | PASS             |
| 11             | 2462                           | 14.70                          | 30                            | PASS             |

## 4.5 POWER SPECTRAL DENSITY MEASUREMENT

### 4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

### 4.5.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED UNTIL |
|----------------------------|-----------|------------|------------------|
| SPECTRUM ANALYZER          | FSEK30    | 100049     | Aug. 12, 2004    |

**NOTE:** The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

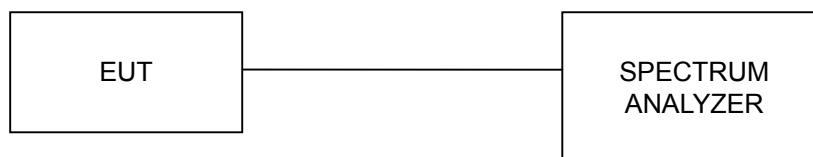
#### 4.5.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 30 kHz VBW, set sweep time=span/3kHz. The power spectral density was measured and recorded. The sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

#### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.5.5 TEST SETUP



#### 4.5.6 EUT OPERATING CONDITIONS

Same as 4.3.6

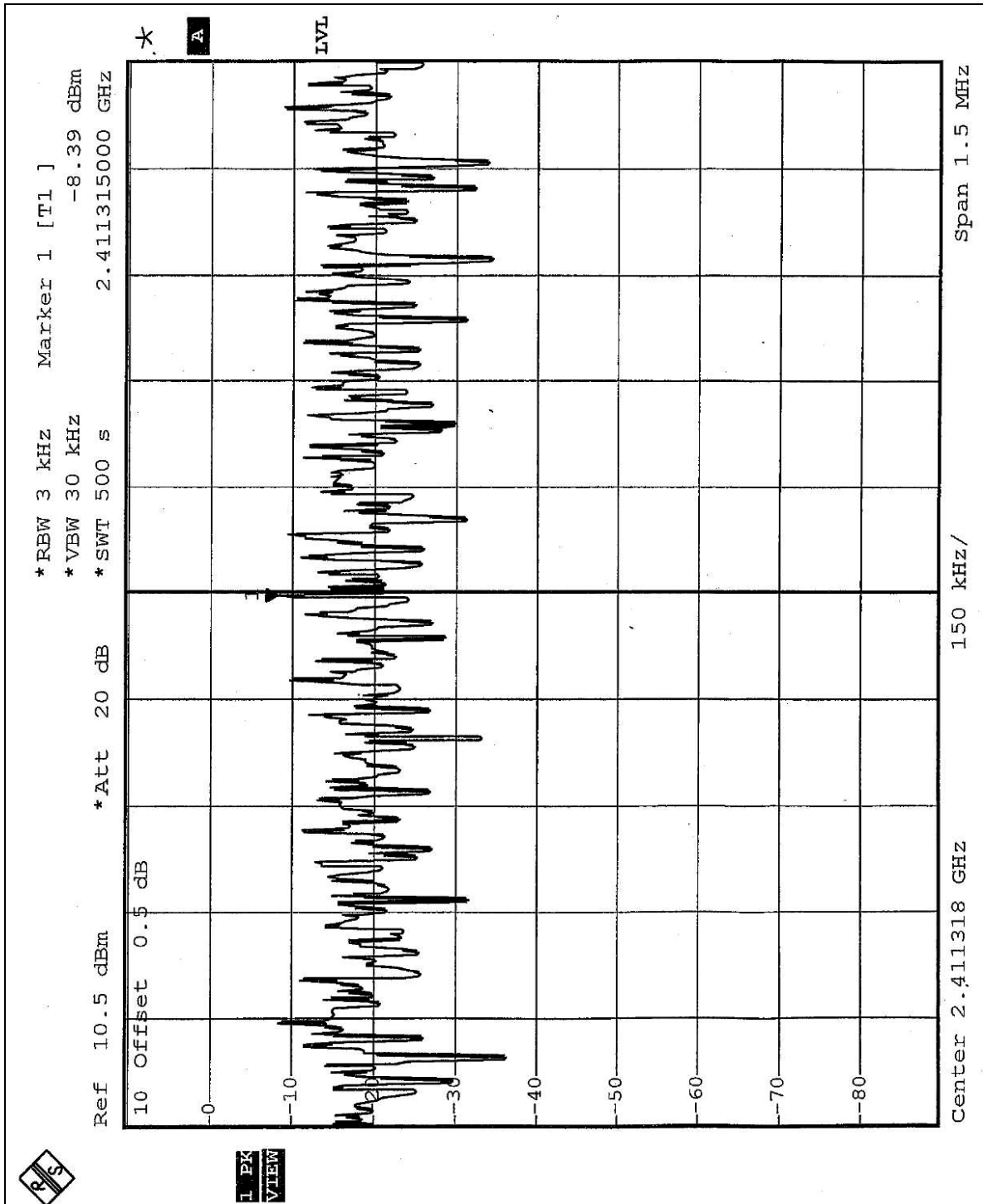


## 4.5.7 TEST RESULTS (A)

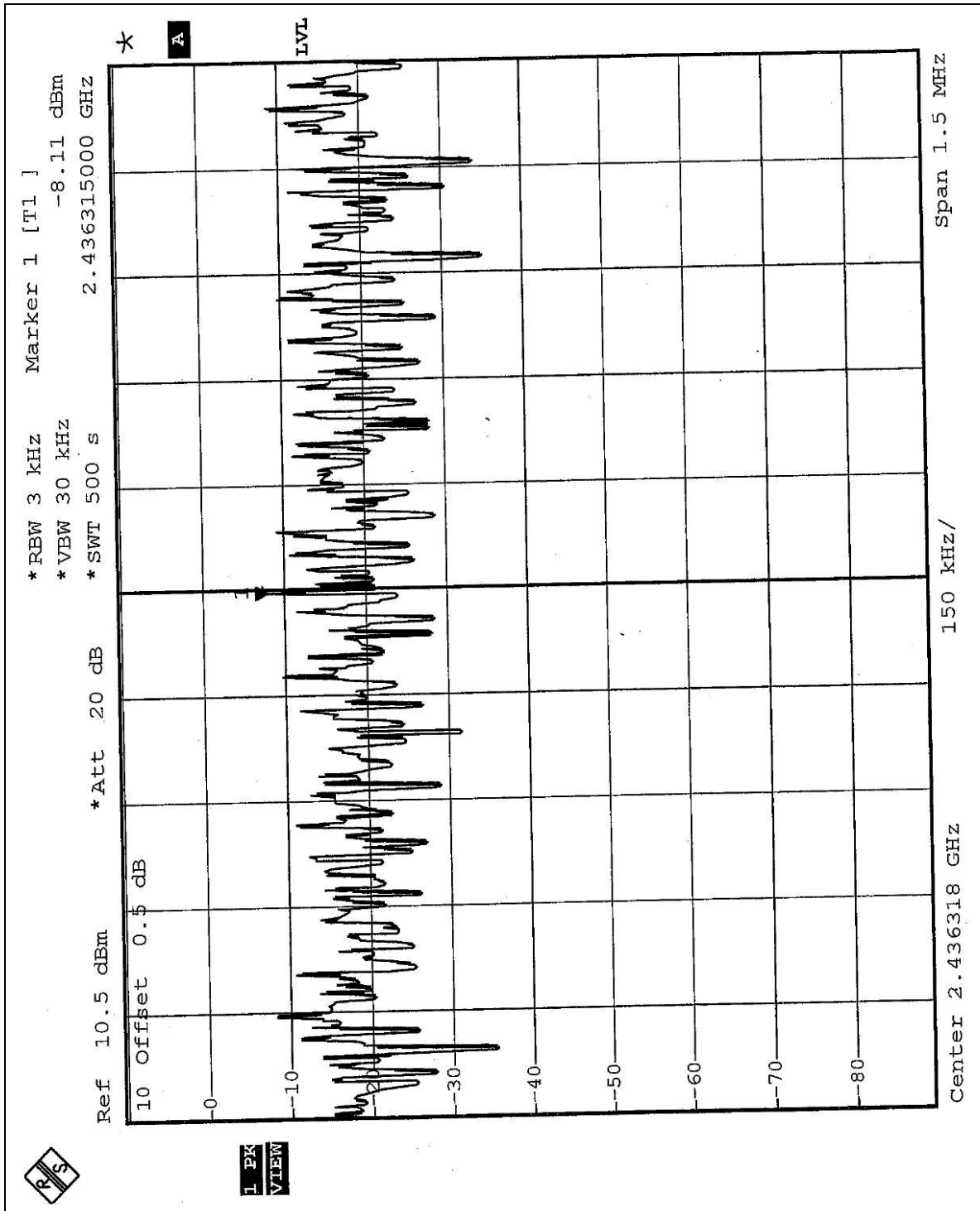
|                             |                               |                                 |                            |
|-----------------------------|-------------------------------|---------------------------------|----------------------------|
| <b>EUT</b>                  | 802.11g WLAN Mini USB Adapter | <b>MODEL</b>                    | WL MU 2454 13I             |
| <b>INPUT POWER (SYSTEM)</b> | 120 Vac, 60 Hz                | <b>ENVIRONMENTAL CONDITIONS</b> | 24 deg. C, 65% RH, 991 hPa |
| <b>TESTED BY</b>            | Steven Lu                     |                                 |                            |

| <b>CHANNEL NUMBER</b> | <b>CHANNEL FREQUENCY (MHz )</b> | <b>RF POWER LEVEL IN 3KHz BW (dBm)</b> | <b>MAXIMUM LIMIT (dBm)</b> | <b>PASS/FAIL</b> |
|-----------------------|---------------------------------|----------------------------------------|----------------------------|------------------|
| 1                     | 2412                            | -8.39                                  | 8                          | PASS             |
| 6                     | 2437                            | -8.11                                  | 8                          | PASS             |
| 11                    | 2462                            | -8.12                                  | 8                          | PASS             |

CH1



CH6



CH11

