

**FCC CFR47 PART 15 SUBPART E  
CERTIFICATION**



**TEST REPORT ADDENDUM  
FOR**

**802.11a/b CARDBUS INSTALLED IN TOSHIBA LAPTOP**

**MODEL NUMBER: WLC221-D4 / BCP3483U**

**BRAND NAME: ASKEY**

**FCC ID: H8NWLC221-D4**

**REPORT NUMBER: 02T1639-2**

**ISSUE DATE: MARCH 7, 2003**

*Prepared for*  
**ASKEY COMPUTER CORP.  
10F, NO. 119, CHIENKANG RD.  
CHUNG-HO, TAIPEI  
TAIWAN, R.O.C.**

*Prepared by*  
**COMPLIANCE CERTIFICATION SERVICES  
561F MONTEREY ROAD,  
MORGAN HILL, CA 95037, USA  
TEL: (408) 463-0885  
FAX: (408) 463-0888**

## TABLE OF CONTENTS

|                                                   |           |
|---------------------------------------------------|-----------|
| <b>1. TEST RESULT CERTIFICATION .....</b>         | <b>3</b>  |
| <b>2. TEST METHODOLOGY.....</b>                   | <b>4</b>  |
| <b>3. FACILITIES AND ACCREDITATION.....</b>       | <b>4</b>  |
| 3.1. FACILITIES AND EQUIPMENT .....               | 4         |
| 3.2. LABORATORY ACCREDITATIONS AND LISTINGS ..... | 4         |
| 3.3. TABLE OF ACCREDITATIONS AND LISTINGS .....   | 5         |
| <b>4. CALIBRATION AND UNCERTAINTY .....</b>       | <b>6</b>  |
| 4.1. MEASURING INSTRUMENT CALIBRATION .....       | 6         |
| 4.2. MEASUREMENT UNCERTAINTY.....                 | 6         |
| 4.3. TEST AND MEASUREMENT EQUIPMENT.....          | 7         |
| <b>5. SETUP OF EQUIPMENT UNDER TEST.....</b>      | <b>8</b>  |
| <b>6. LIMITS, PROCEDURES AND RESULTS .....</b>    | <b>12</b> |
| 6.1. RADIATED SPURIOUS EMISSIONS .....            | 12        |
| 6.2. AC POWERLINE CONDUCTED EMISSIONS.....        | 36        |
| 6.3. SETUP PHOTOS .....                           | 38        |

## 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** ASKEY COMPUTER CORP.  
10F, NO. 119, CHIENKANG RD.  
CHUNG-HO, TAIPEI, TAIWAN, R.O.C.

**EUT DESCRIPTION:** 802.11A/B CARDBUS INSTALLED IN TOSHIBA LAPTOP

**MODEL NAME:** WLC221-D4 / BCP3483U

**DATE TESTED:** FEBRUARY 27 – MARCH 3, 2003

| APPLICABLE STANDARDS  |                         |
|-----------------------|-------------------------|
| STANDARD              | TEST RESULTS            |
| FCC PART 15 SUBPART E | NO NON-COMPLIANCE NOTED |

Compliance Certification Services, Inc. tested the above equipment in accordance with the radiated and conducted emissions requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

**Note:** The 5.2 GHz bands is applicable to this report; other bands of operation (2.4 and 5.8 GHz) are documented in a separate report

Approved & Released For CCS By:

Tested By:



---

MIKE HECKROTTE  
CHIEF ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

---

FRANK IBRAHIM  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

Conducted and radiated testing were performed according to the procedures documented on chapter 13 of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, and 15.407.

## 3. FACILITIES AND ACCREDITATION

### 3.1. FACILITIES AND EQUIPMENT

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

Receiving equipment (i.e., receiver, analyzer, quasi-peak adapter, pre-selector) and LISNs conform to CISPR specifications for "Radio Interference Measuring Apparatus and Measurement Methods," Publication 16.

### 3.2. LABORATORY ACCREDITATIONS AND LISTINGS

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT (1300F2)).

### 3.3. TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency          | Scope of Accreditation                                                                                                                                                                                                          | Logo                                                                                                         |
|---------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| USA     | FCC             | 3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements                                                                                                                                                          | <br>1300                  |
| Japan   | VCCI            | CISPR 22 Two OATS and one conducted Site                                                                                                                                                                                        | <br>R-1014, R-619, C-640  |
| Norway  | NEMKO           | EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1 | <br>ELA 117               |
| Norway  | NEMKO           | EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC                                                                                                           | <br>ELA-171               |
| Taiwan  | BSMI            | CNS 13438                                                                                                                                                                                                                       | <br>SL2-IN-E-1012        |
| Canada  | Industry Canada | RSS210 Low Power Transmitter and Receiver                                                                                                                                                                                       | <br>IC2324 A,B,C, and F |

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

| Radiated Emission             |             |
|-------------------------------|-------------|
| 30MHz – 200 MHz               | +/- 3.3dB   |
| 200MHz – 1000MHz              | +4.5/-2.9dB |
| 1000MHz – 2000MHz             | +4.6/-2.2dB |
| Power Line Conducted Emission |             |
| 150kHz – 30MHz                | +/-2.9      |

Any results falling within the above values are deemed to be marginal.

### 4.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

| TEST AND MEASUREMENT EQUIPMENT LIST |               |             |               |                      |
|-------------------------------------|---------------|-------------|---------------|----------------------|
| Name of Equipment                   | Manufacturer  | Model       | Serial Number | Calibration Due Date |
| Spectrum Analyzer                   | HP            | 8566B       | 3014A06685    | 6/1/03               |
| Spectrum Display                    | HP            | 85662A      | 2152A03066    | 6/1/03               |
| Quasi-Peak Detector                 | HP            | 85650A      | 3145A01654    | 6/1/03               |
| Preamplifier                        | HP            | 8447D       | 2944A06833    | 8/22/03              |
| Log Periodic Antenna                | EMCO          | 3146        | 9107-3163     | 3/30/03              |
| Biconical Antenna                   | Eaton         | 94455-1     | 1197          | 3/30/03              |
| Preamplifier (1 - 26.5GHz)          | Miteq         | NSP10023988 | 646456        | 4/26/03              |
| Horn Antenna (1 - 18GHz)            | EMCO          | 3115        | 6717          | 2/4/04               |
| Horn Antenna (18 – 26.5GHz)         | ARA           | MWH 1826/B  | 1013          | 11/7/03              |
| High Pass Filter (4.57GHz)          | FSY Microwave | FM-4570-9SS | 003           | N.C.R.               |
| Harmonic Mixer                      | HP            | 11970A      | 3008A04190    | 10/14/05             |
| Spectrum Analyzer                   | HP            | E4404B      | ID 963805     | 3/25/03              |

## 5. SETUP OF EQUIPMENT UNDER TEST

### SETUP INFORMATION FOR TRANSMITTER TESTS

#### SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST |                      |                    |               |        |
|-----------------------------------|----------------------|--------------------|---------------|--------|
| Device Type                       | Manufacturer         | Model              | Serial Number | FCC ID |
| Laptop                            | Toshiba              | Satellite Pro 6100 | 12062458J     | DoC    |
| AC Adapter                        | Lishin International | LSE9802A2060       | 010810241A1   | N/A    |

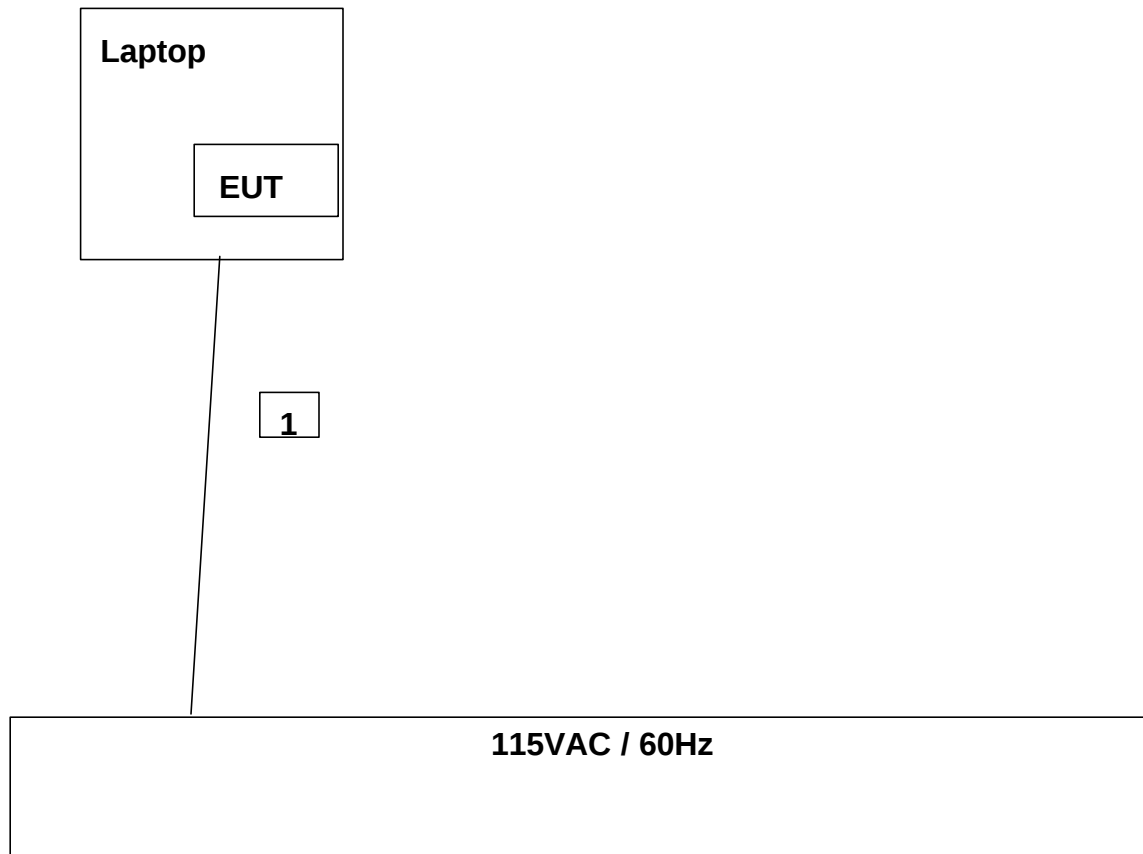
#### I/O CABLES

| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks                                    |
|-----------|------|----------------------|----------------|------------|--------------|--------------------------------------------|
| 1         | AC   | 1                    | US115          | Unshielded | 2 m          | Laptop cable is integrated with AC Adapter |

#### TEST SETUP

The EUT is installed in the laptop computer.

**SETUP DIAGRAM FOR TRANSMITTER TESTS**



## **SETUP INFORMATION FOR DIGITAL DEVICE TESTS**

### **SUPPORT EQUIPMENT**

| PERIPHERAL SUPPORT EQUIPMENT LIST |                      |                    |               |               |
|-----------------------------------|----------------------|--------------------|---------------|---------------|
| Device Type                       | Manufacturer         | Model              | Serial Number | FCC ID        |
| MODEM                             | ACEEX                | 1414               | 9013538       | IFAXDM1414    |
| PRINTER                           | HP                   | 2225C              | 2541S41679    | BS46XU2225C   |
| PS/2 MOUSE                        | PACKARD BELL         | FDM-611            | FWMC55039667  | F4Z4K3FDM-612 |
| Laptop                            | Toshiba              | Satellite Pro 6100 | 12062458J     | DoC           |
| AC Adapter                        | Lishin International | LSE9802A2060       | 010810241A1   | N/A           |

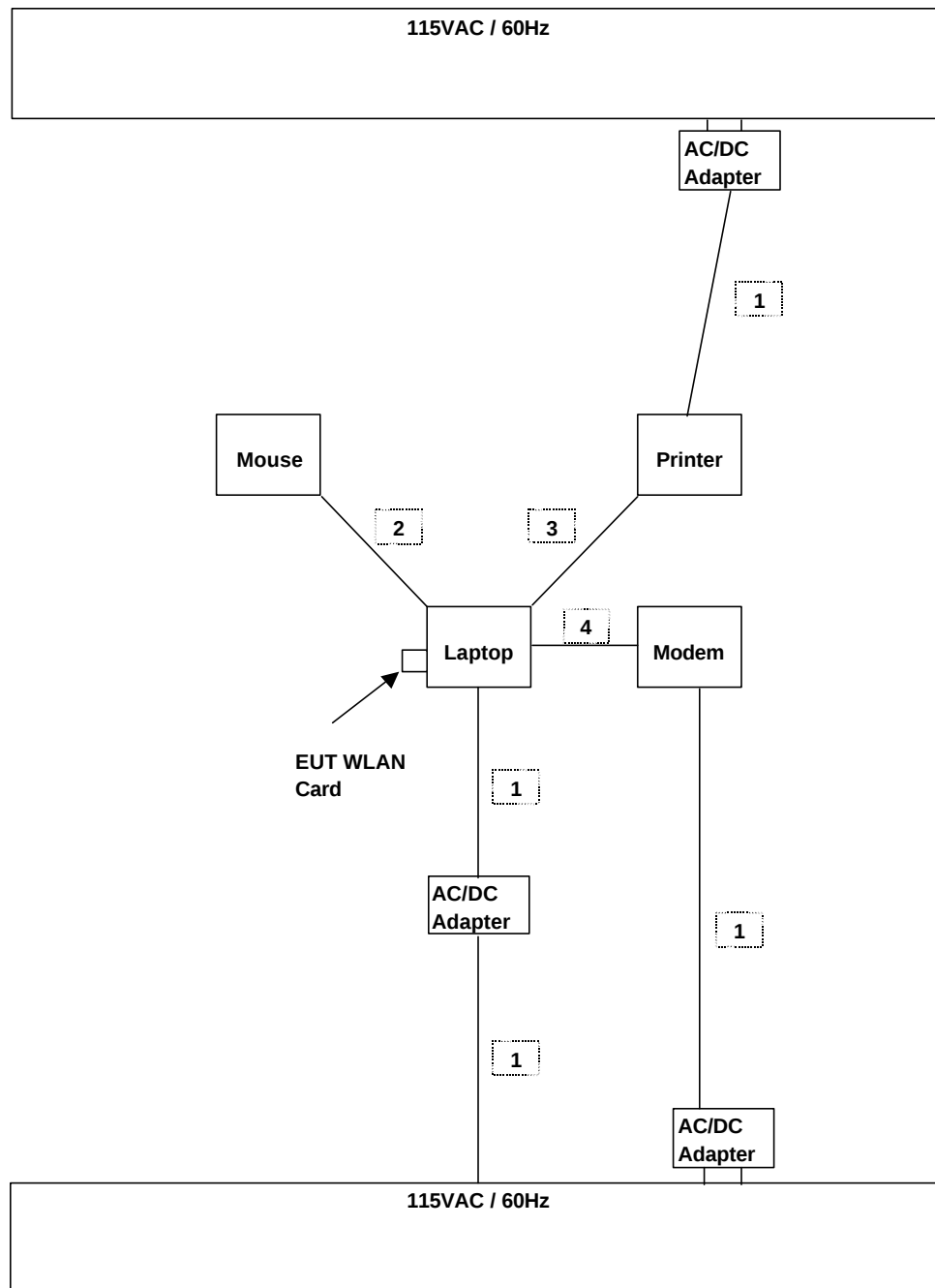
### **I/O CABLES**

| Cable No. | Port     | # of Identical Ports | Connector Type | Cable Type  | Cable Length | Remarks                                    |
|-----------|----------|----------------------|----------------|-------------|--------------|--------------------------------------------|
| 1         | AC       | 3                    | US 115V        | Un-shielded | 2m           | Laptop cable is integrated with AC Adapter |
| 2         | USB      | 1                    | USB            | Un-shielded | 2m           |                                            |
| 3         | Parallel | 1                    | DB25           | Shielded    | 2m           |                                            |
| 4         | Serial   | 1                    | DB9            | Shielded    | 2m           |                                            |

### **TEST SETUP**

The EUT is installed in the laptop computer.

**SETUP DIAGRAM FOR DIGITAL DEVICES**



## 6. LIMITS, PROCEDURES AND RESULTS

### 6.1. RADIATED SPURIOUS EMISSIONS

#### TEST SETUP

The EUT is placed on the wooden table. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4/1992.

The EUT is set to transmit in a continuous mode.

#### TEST PROCEDURE

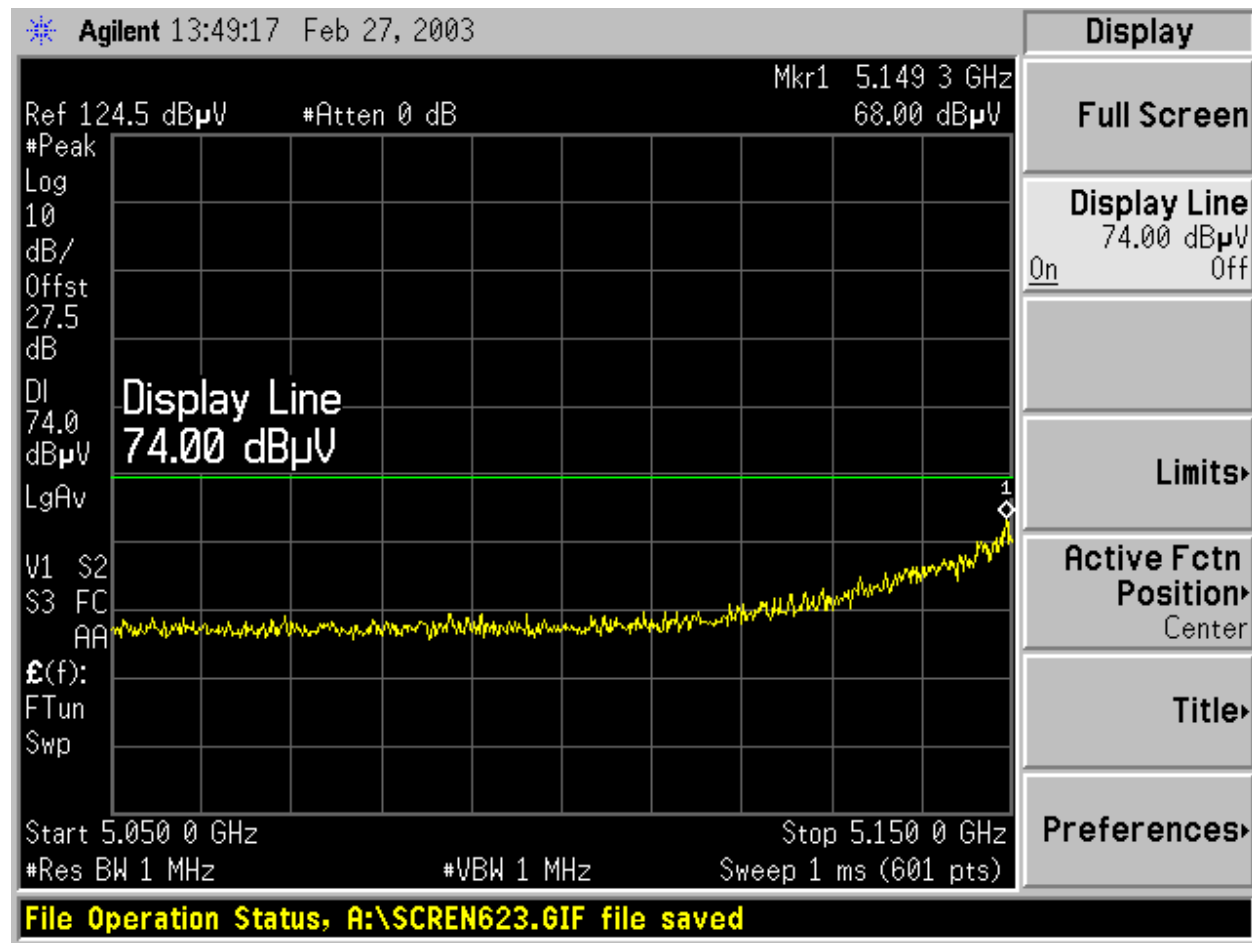
For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz, the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

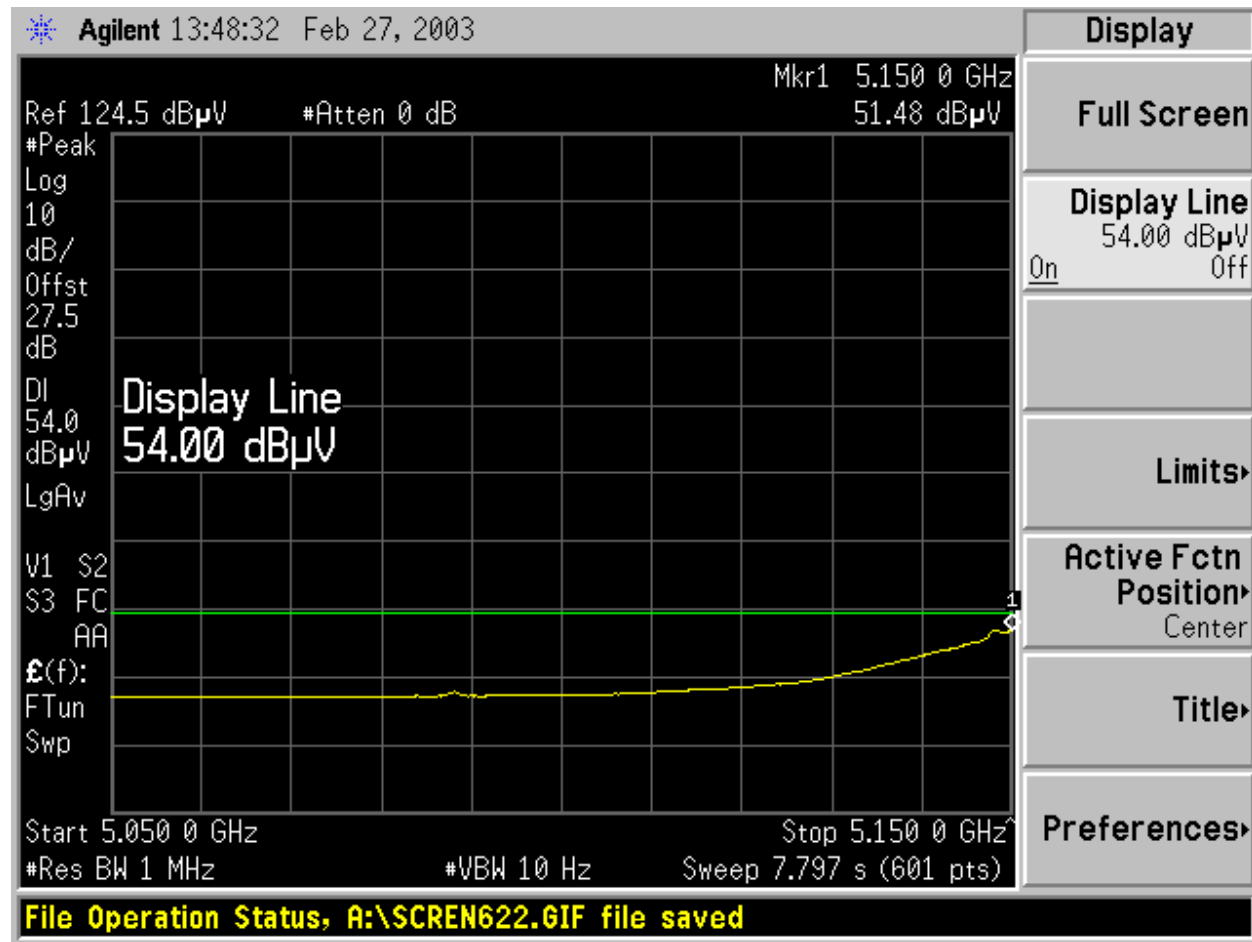
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The frequency span is set small enough to easily differentiate between broadcast stations, intermittent ambient signals and EUT emissions. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the suspected signal. Measurements were made with the antenna polarized in both the vertical and the horizontal positions.

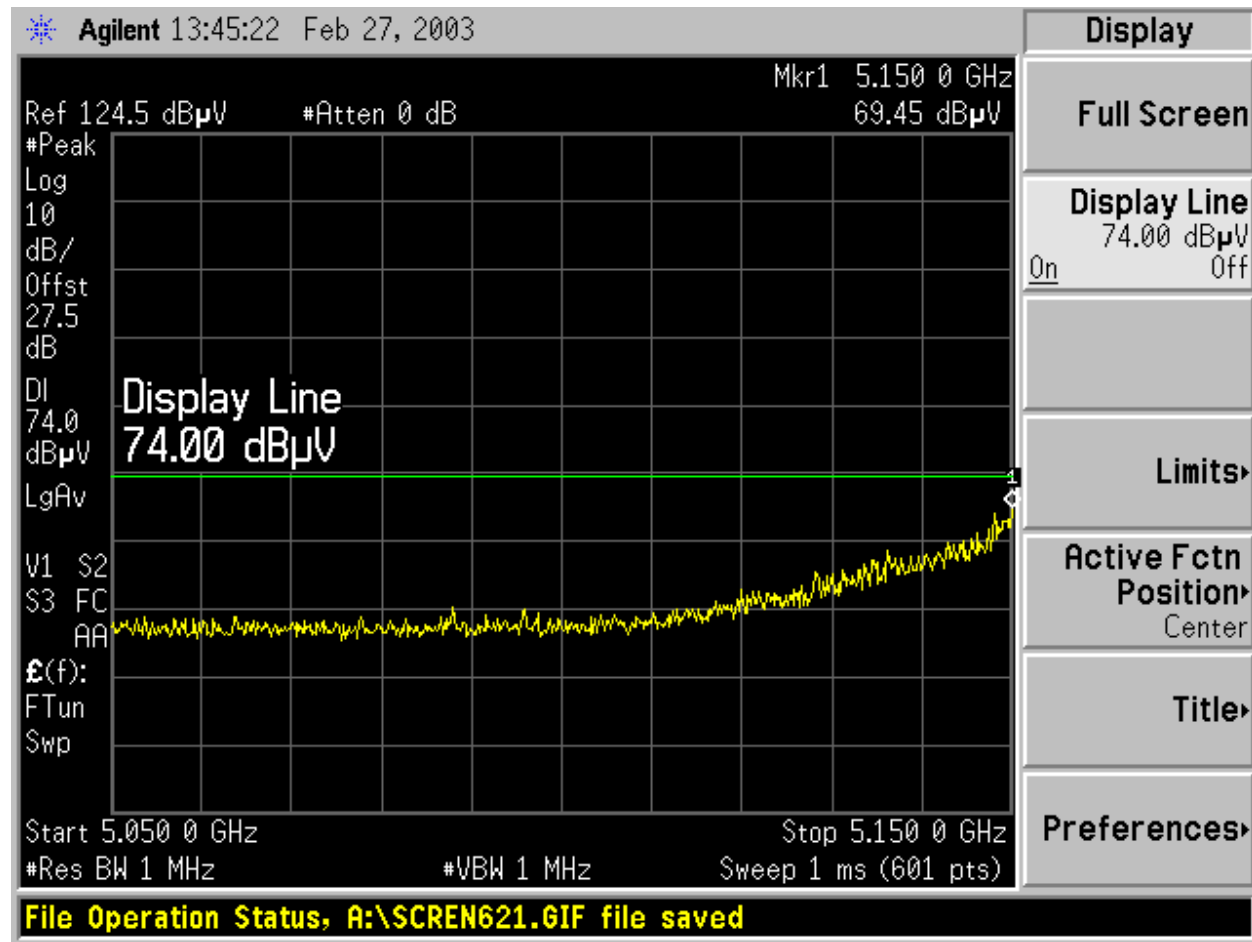
**ADJACENT RESTRICTED BAND (Fund = 5.18GHz, NORMAL MODE, HORIZONTAL, PEAK)**



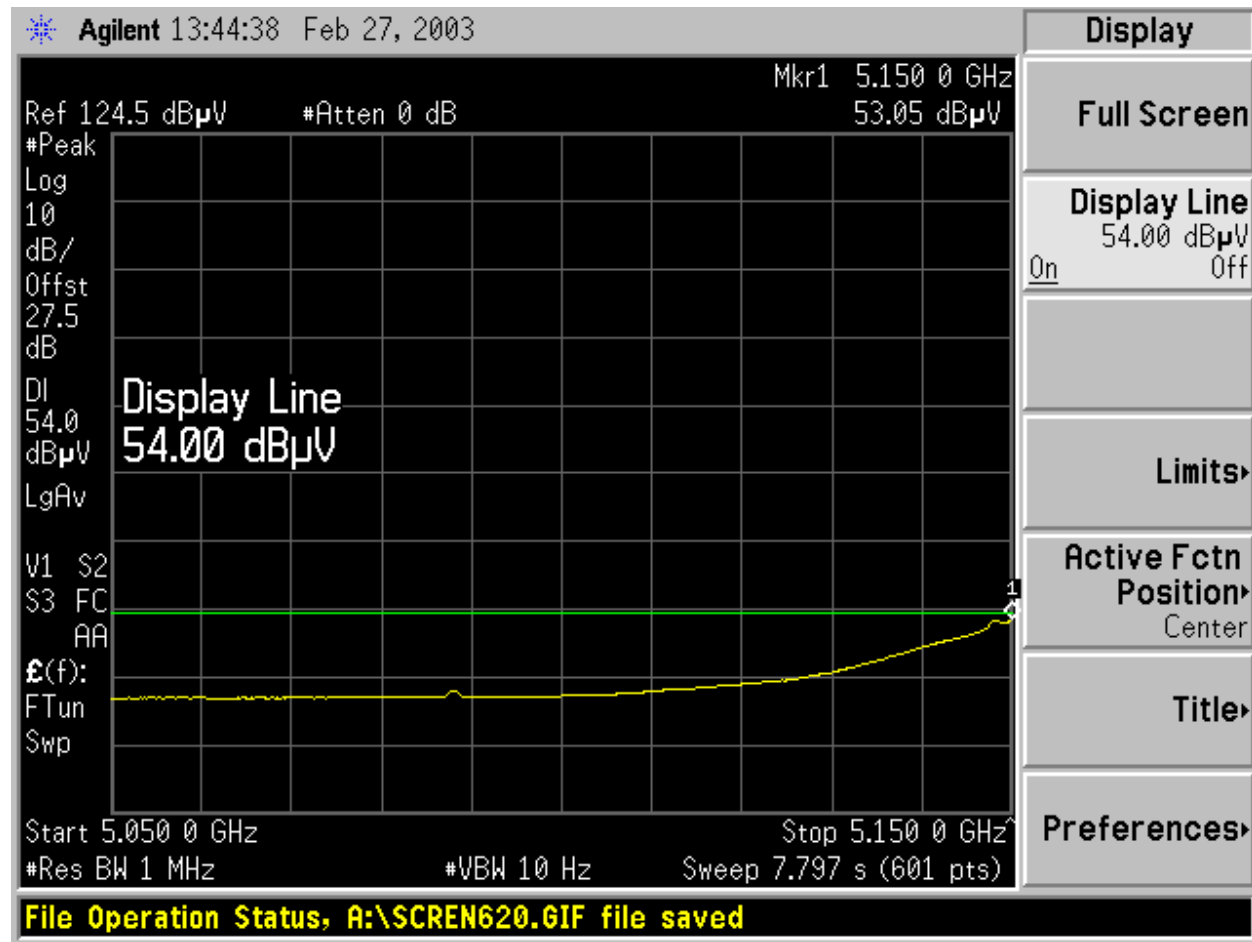
**ADJACENT RESTRICTED BAND (Fund = 5.18GHz, NORMAL MODE, HORIZONTAL, AVERAGE)**



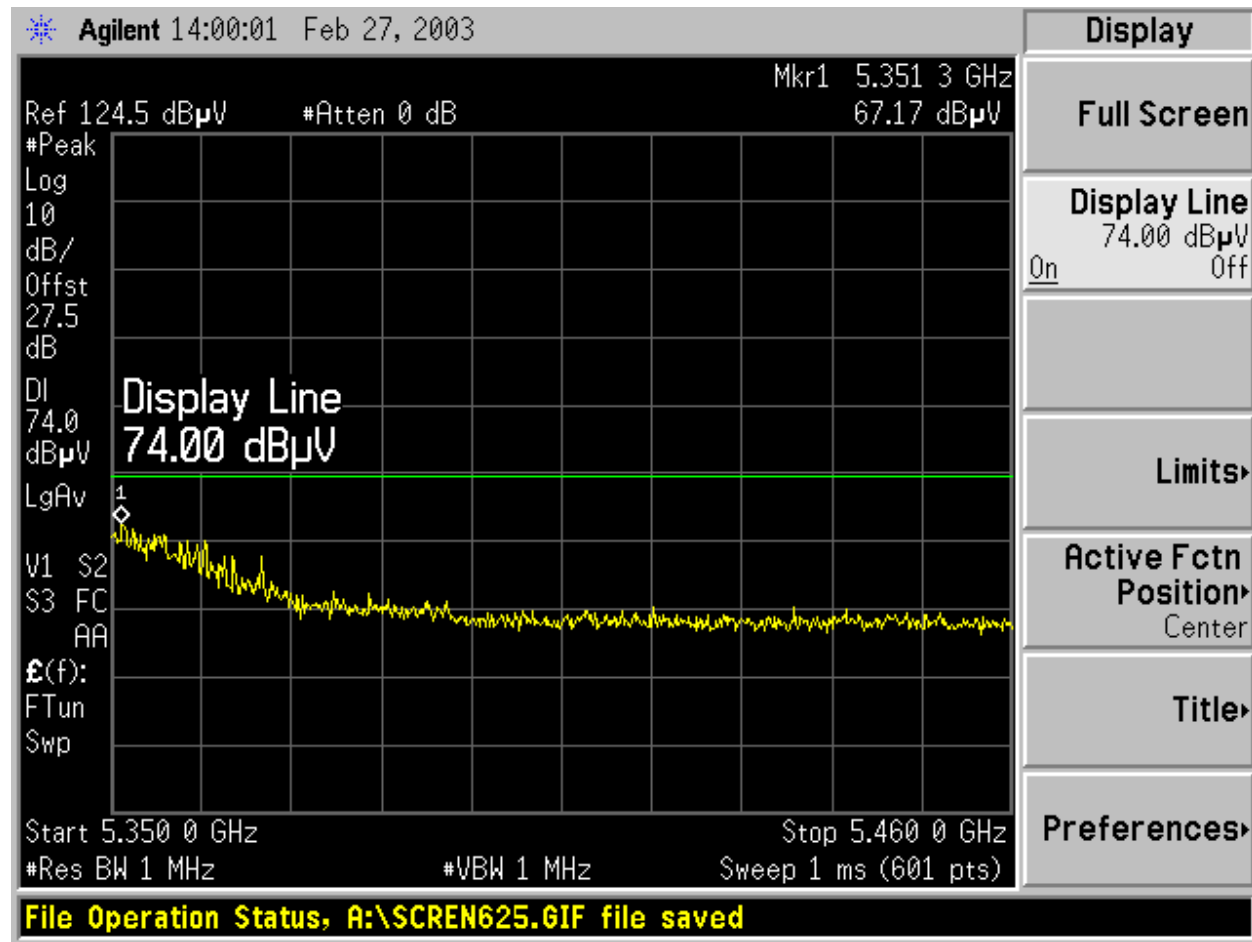
**ADJACENT RESTRICTED BAND (Fund = 5.18GHz, NORMAL MODE, VERTICAL, PEAK)**



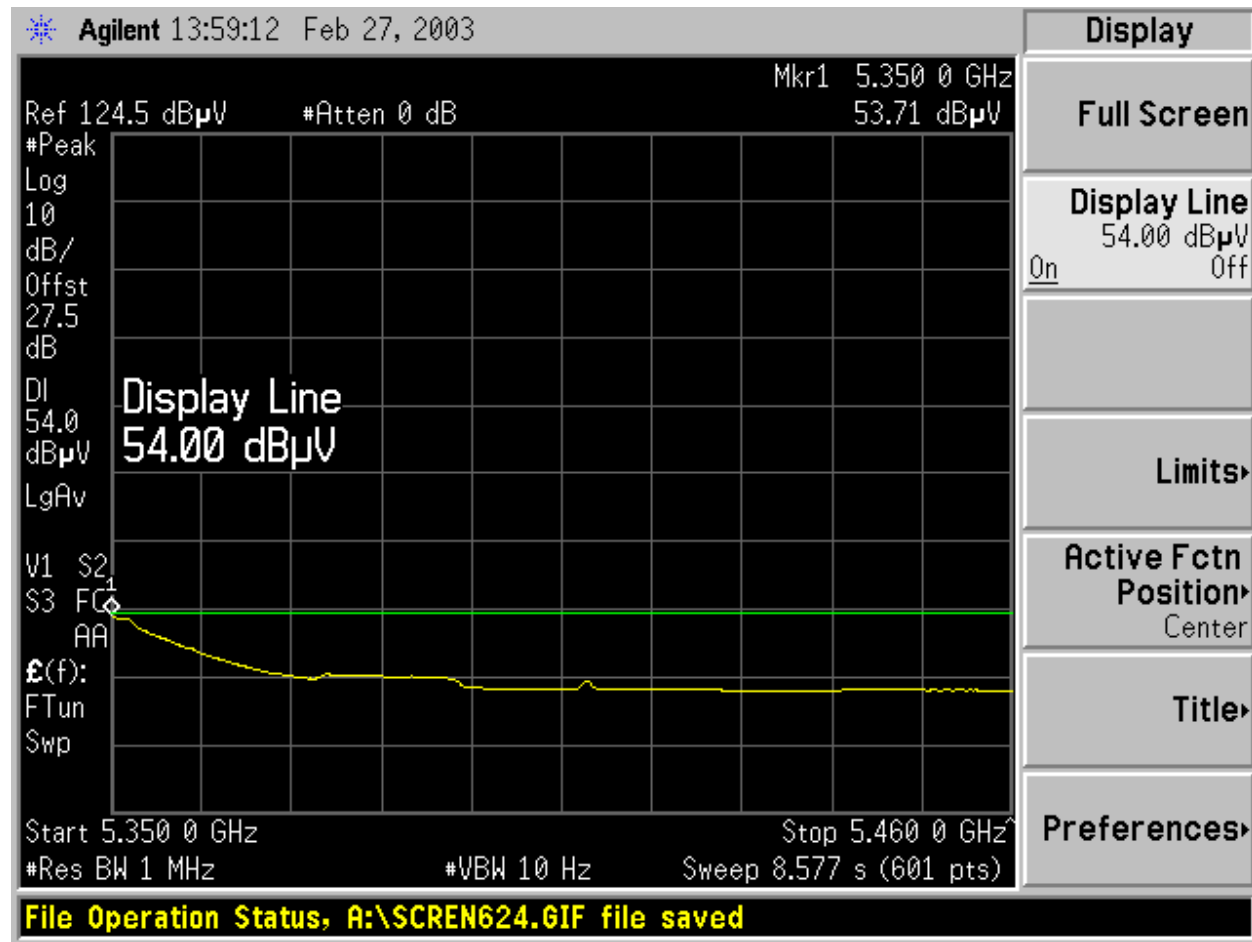
**ADJACENT RESTRICTED BAND (Fund = 5.18GHz, NORMAL MODE, VERTICAL, AVERAGE)**



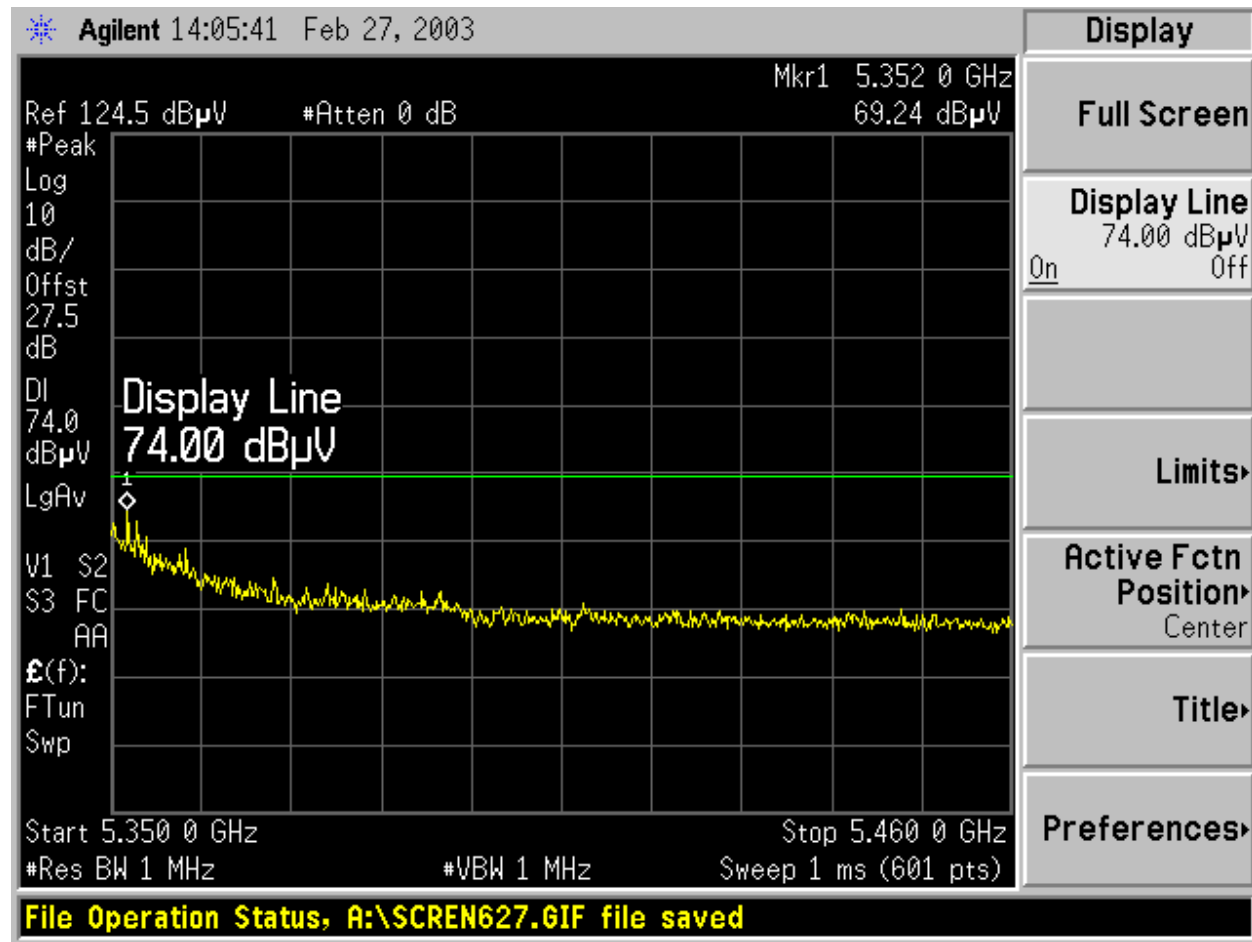
**ADJACENT RESTRICTED BAND (Fund = 5.32GHz, NORMAL MODE, HORIZONTAL, PEAK)**



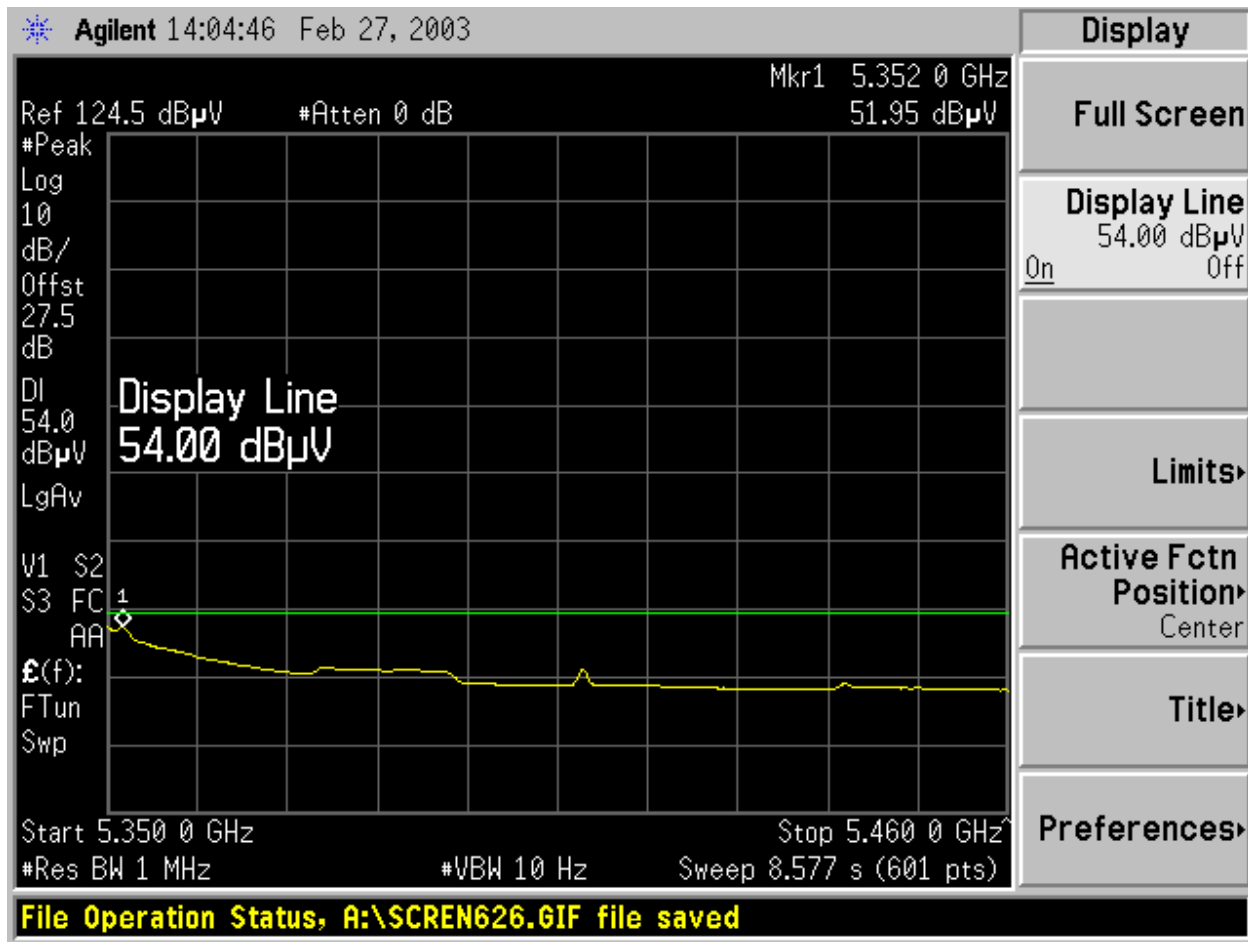
**ADJACENT RESTRICTED BAND (Fund = 5.32GHz, NORMAL MODE, HORIZONTAL, AVERAGE)**



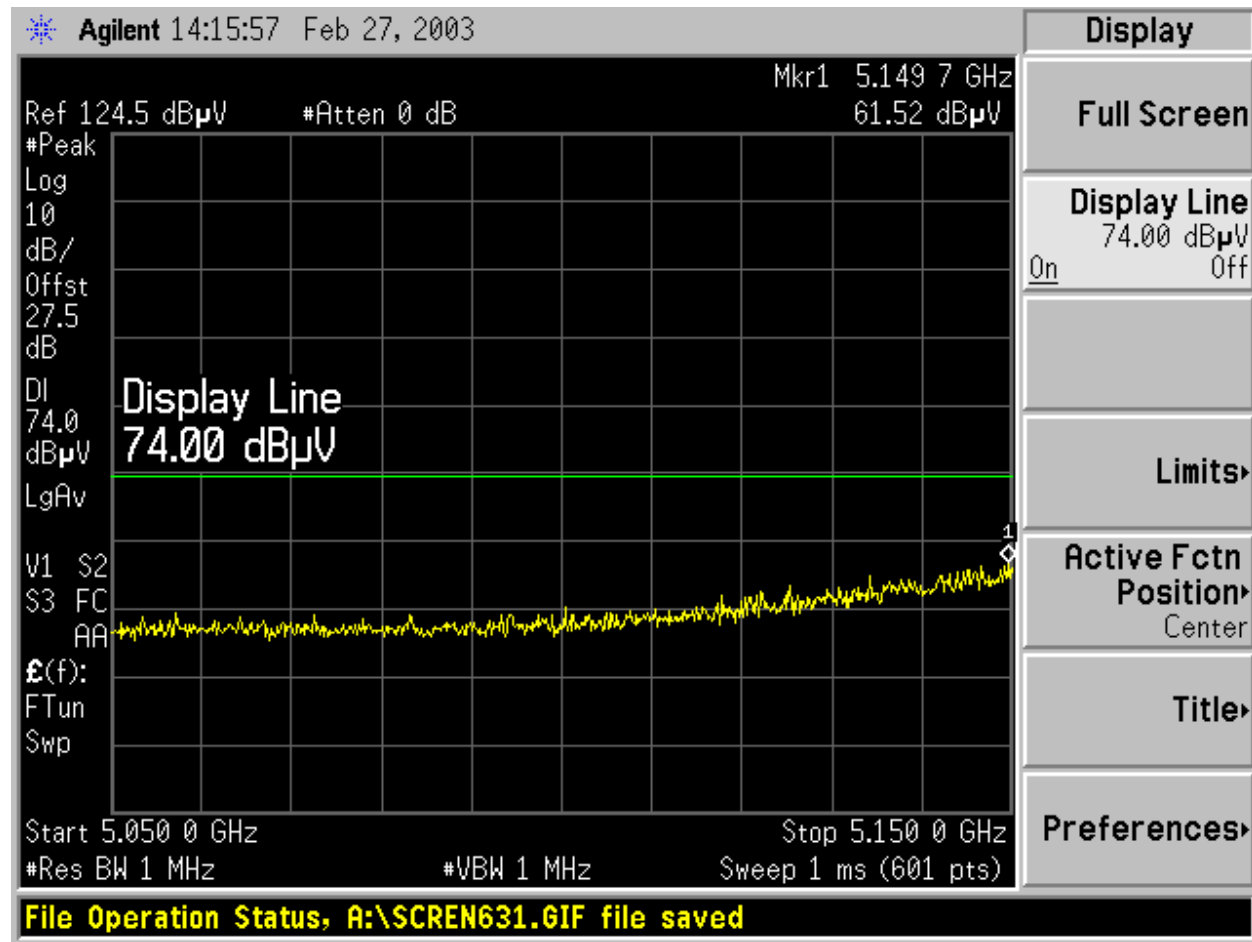
**ADJACENT RESTRICTED BAND (Fund = 5.32GHz, NORMAL MODE, VERTICAL, PEAK)**



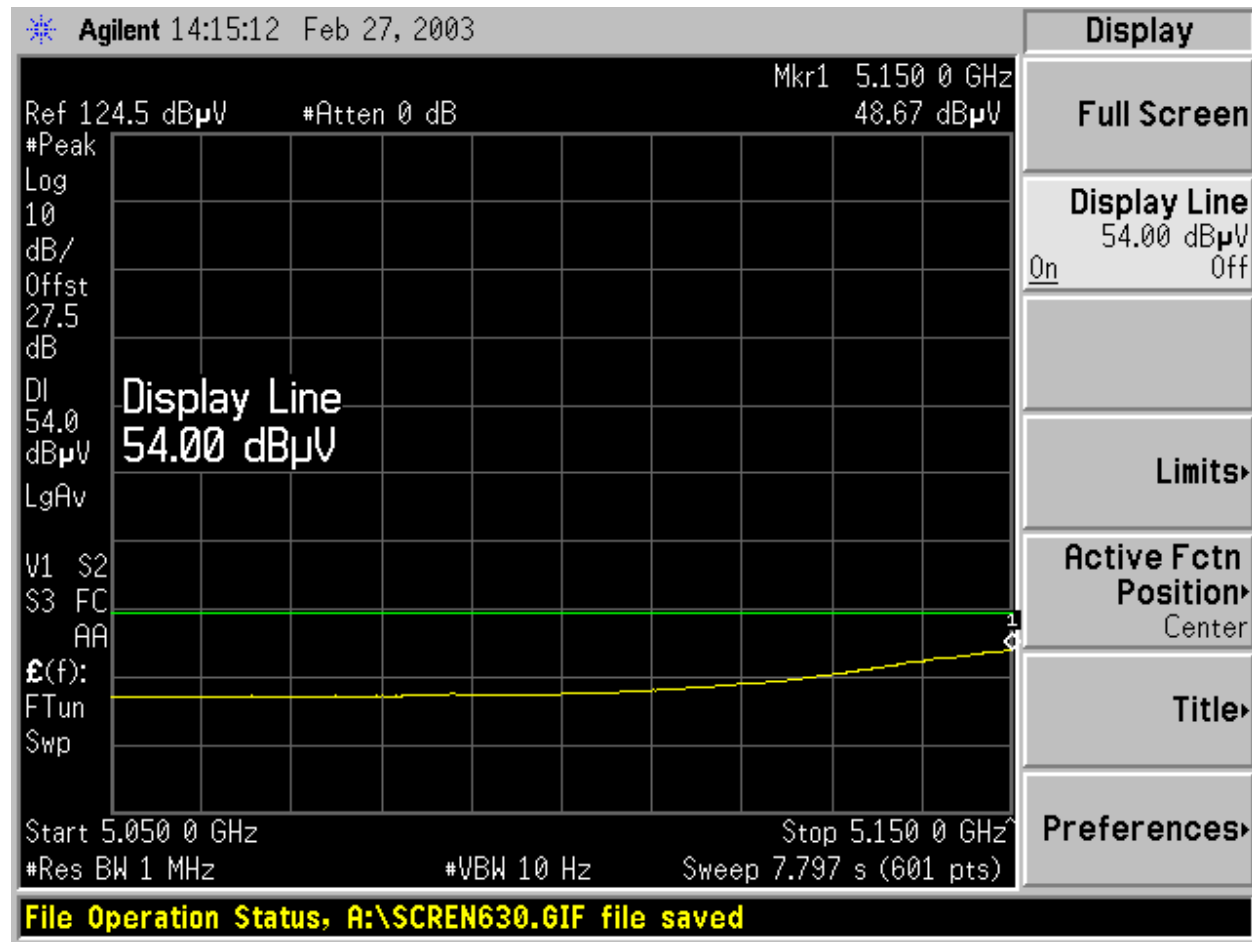
**ADJACENT RESTRICTED BAND (Fund = 5.32GHz, NORMAL MODE, VERTICAL, AVERAGE)**



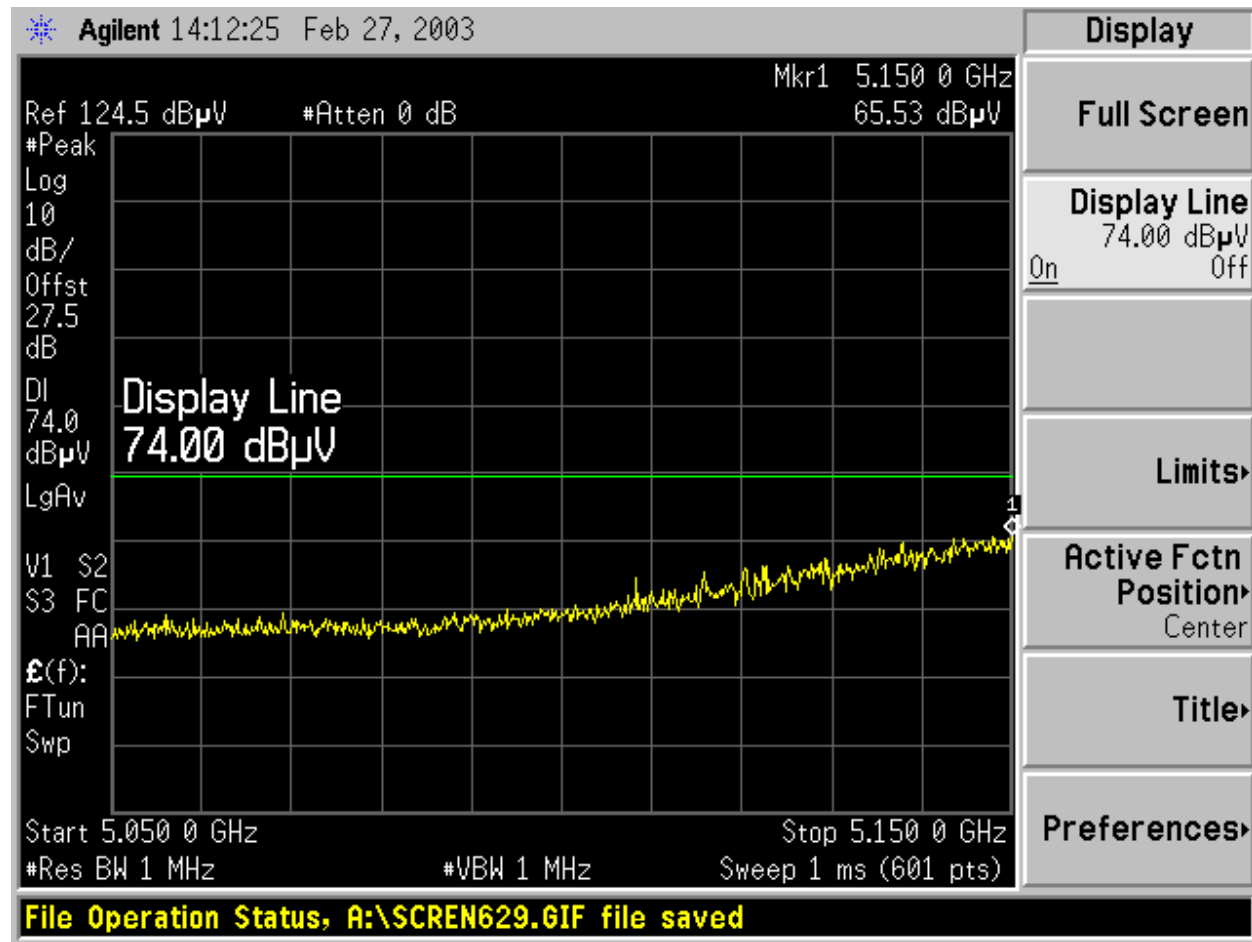
**ADJACENT RESTRICTED BAND (Fund = 5.21GHz, TURBO MODE, HORIZONTAL, PEAK)**



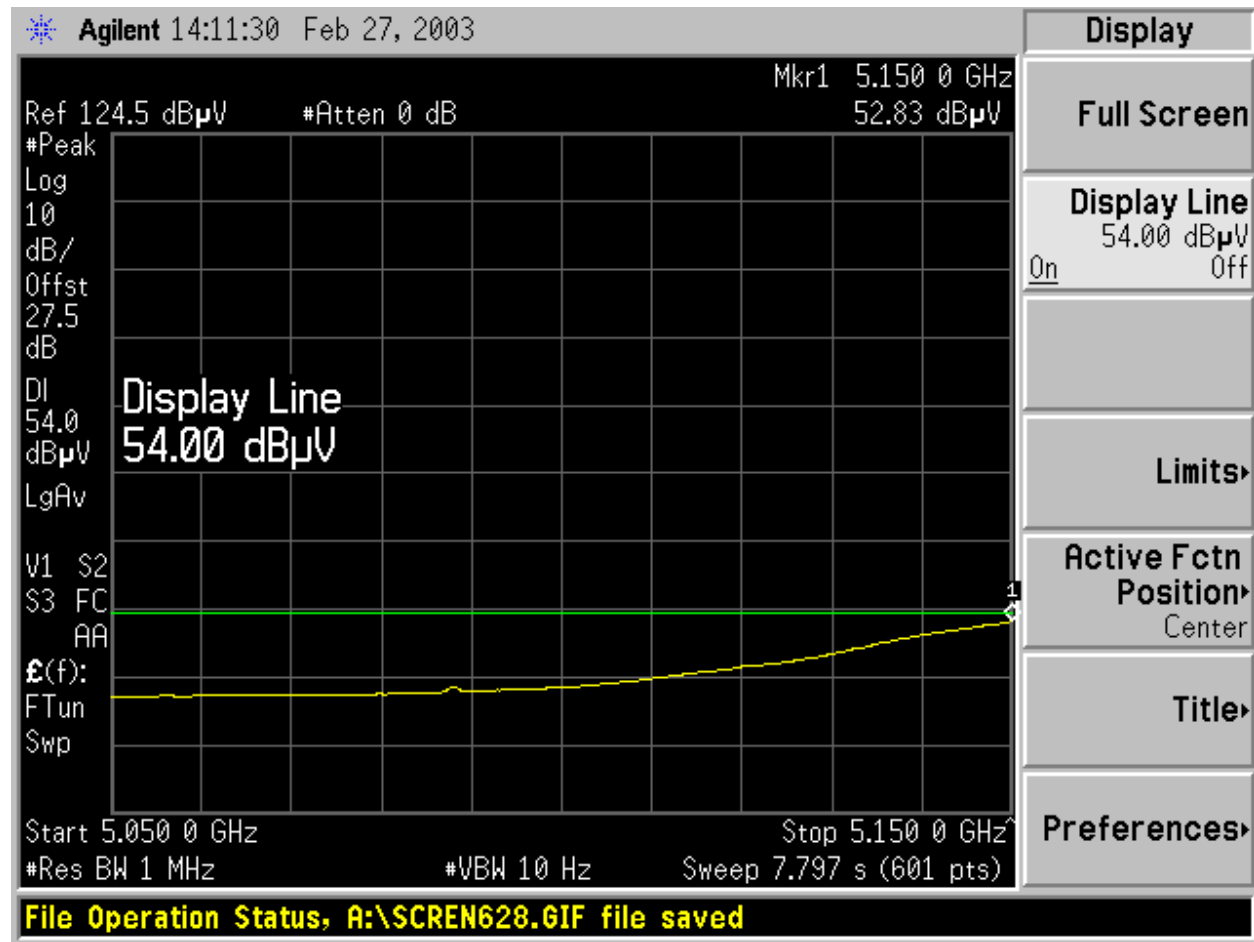
**ADJACENT RESTRICTED BAND (Fund = 5.21GHz, TURBO MODE, HORIZONTAL, AVERAGE)**



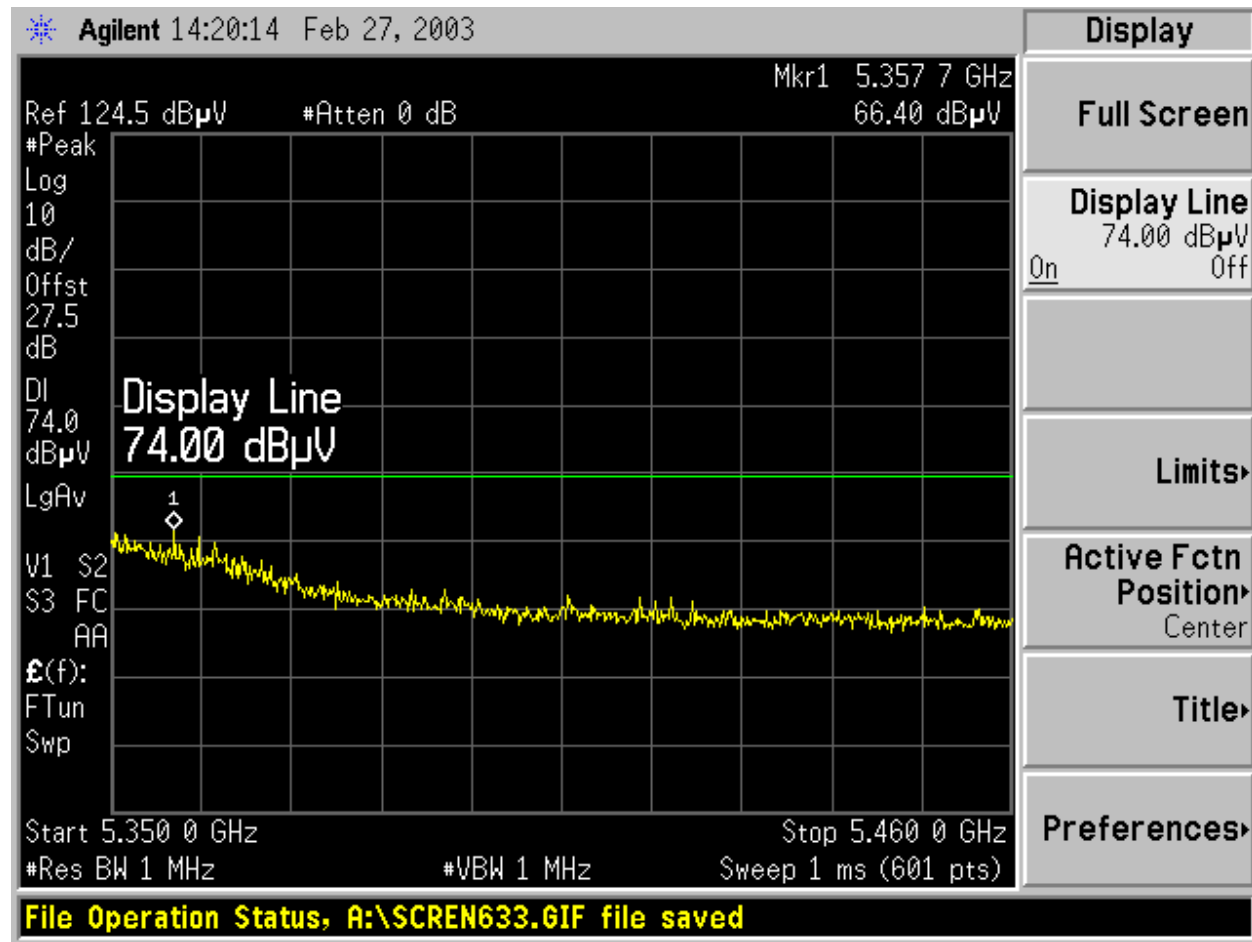
**ADJACENT RESTRICTED BAND (Fund = 5.21GHz, TURBO MODE, VERTICAL, PEAK)**



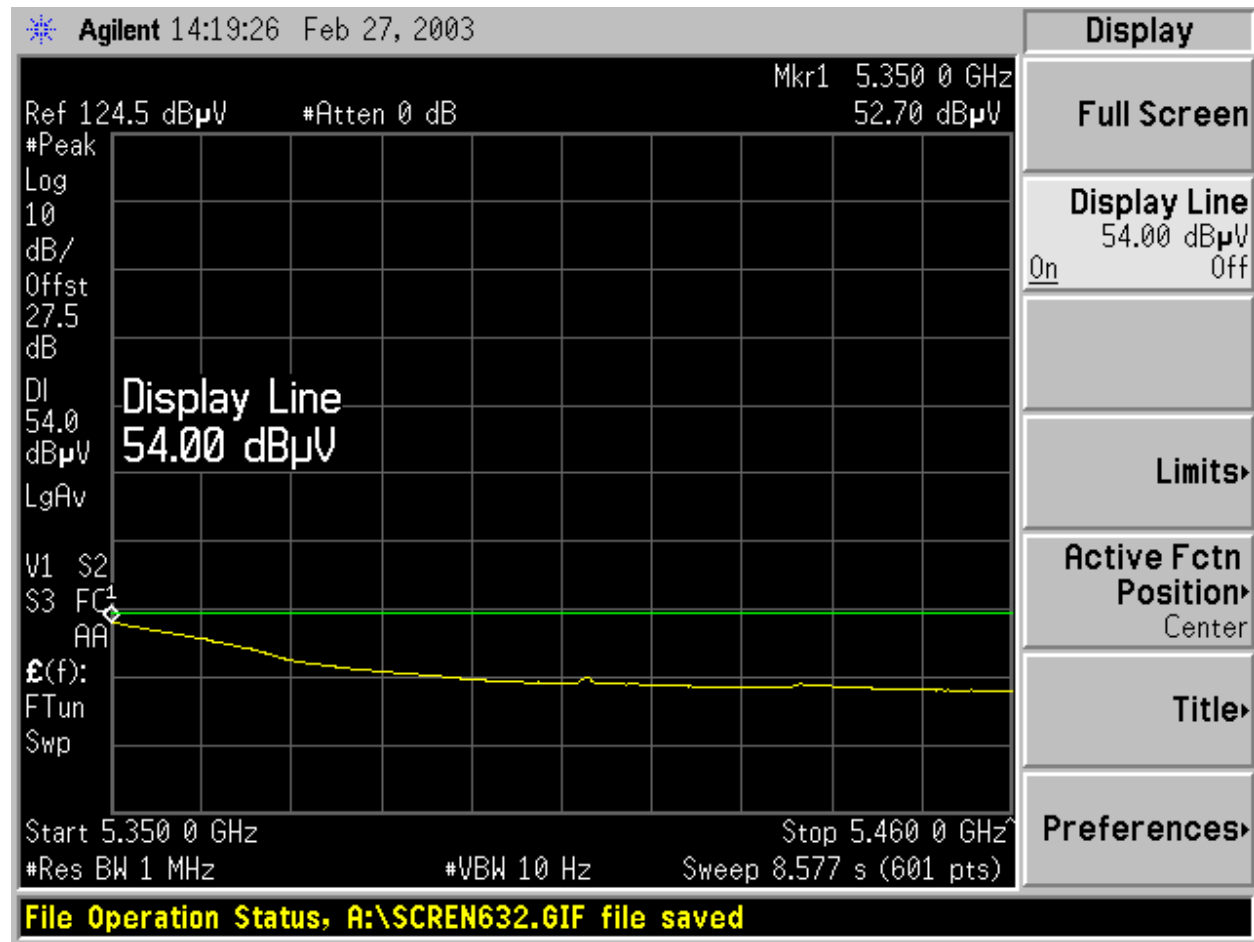
**ADJACENT RESTRICTED BAND (Fund = 5.21GHz, TURBO MODE, VERTICAL, AVERAGE)**



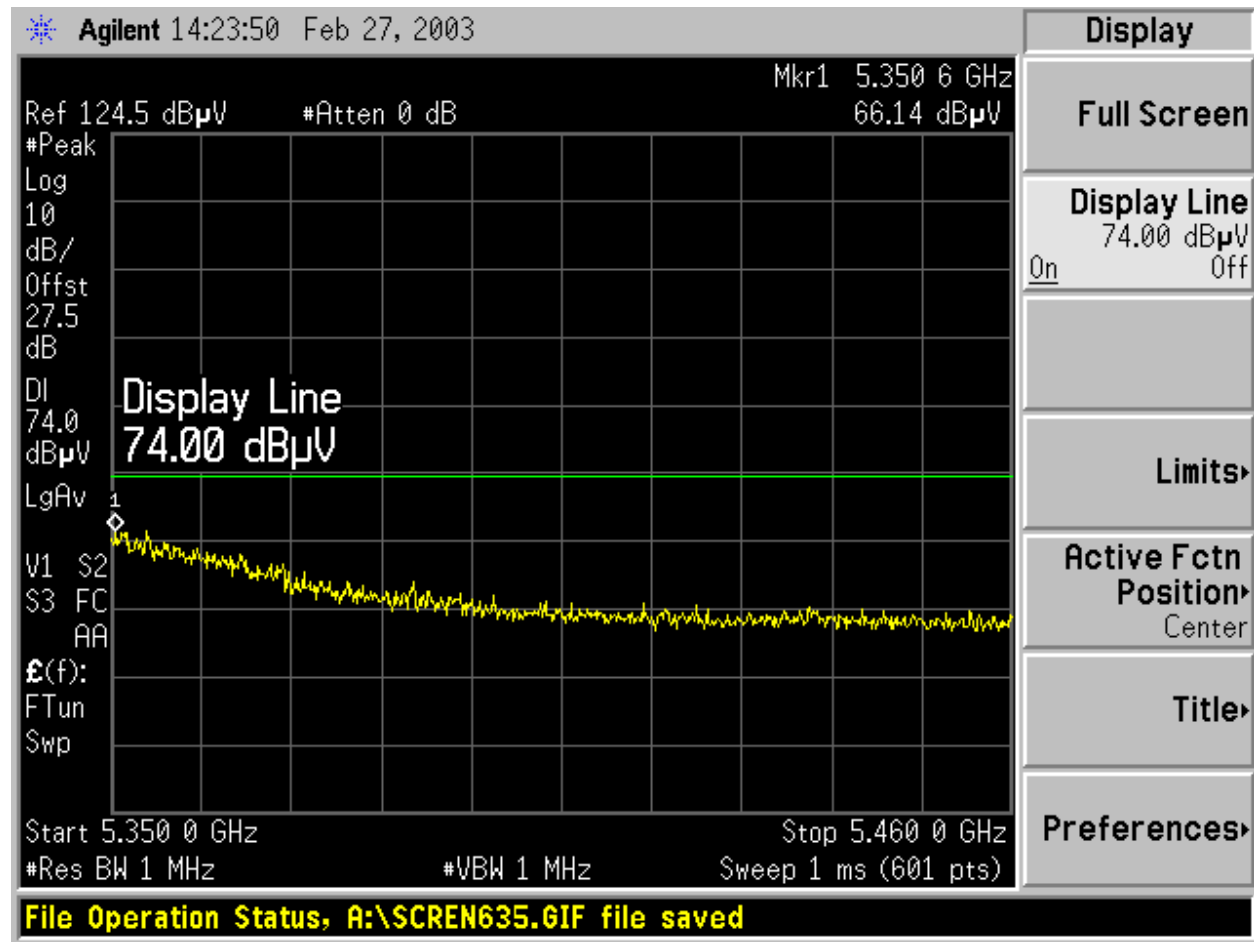
**ADJACENT RESTRICTED BAND (Fund = 5.29GHz, TURBO MODE, HORIZONTAL, PEAK)**



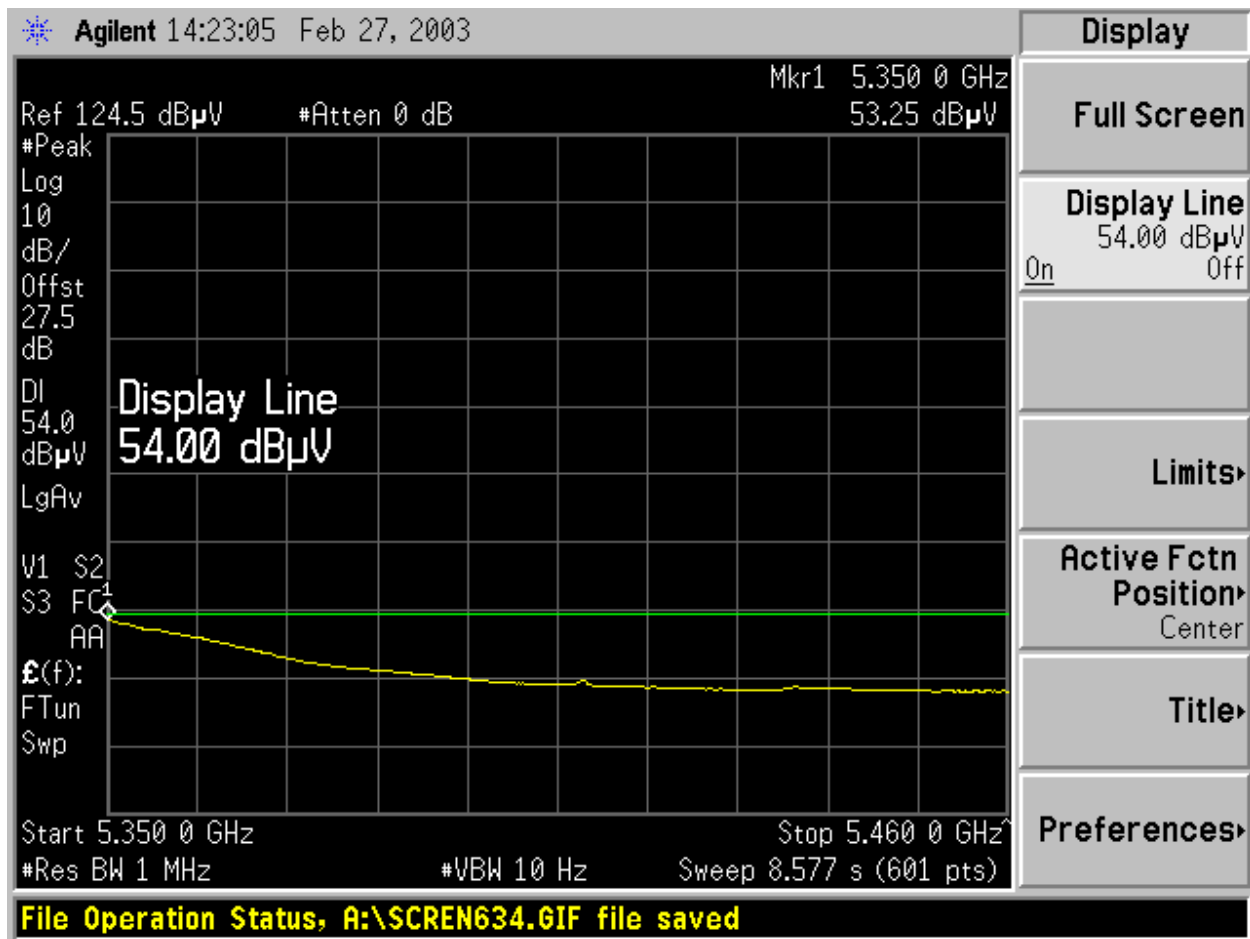
**ADJACENT RESTRICTED BAND (Fund = 5.29GHz, TURBO MODE, HORIZONTAL, AVERAGE)**



**ADJACENT RESTRICTED BAND (Fund = 5.29GHz, TURBO MODE, VERTICAL, PEAK)**



**ADJACENT RESTRICTED BAND (Fund = 5.29GHz, TURBO MODE, VERTICAL, AVERAGE)**



## HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.18GHz, NORMAL)

03/03/03    **High Frequency Measurement**  
**Compliance Certification Services, Morgan Hill Open Field Site**

**Test Engr:** Frank Ibrahim  
**Project #:** 02T1639-1  
**Company:** Askey Computer Corporation  
**EUT Descrip.:** 802.11 a/b Dual Band Card Bus in Toshiba laptop  
**EUT M/N:** WLC221-D4, BCP3483U  
**Test Target:** FCC 15.407  
**Mode Oper:** EUT transmitting at Low Channel (5.18GHz), Normal Mode, ART =12.5

**Test Equipment:**

|                   |                       |                   |                             |
|-------------------|-----------------------|-------------------|-----------------------------|
| EMCO Horn 1-18GHz | Pre-amplifier 1-26GHz | Spectrum Analyzer | Horn > 18GHz                |
| T72; S/N: 6739    | Miteu NSP2600-44      | 8593EM Analyzer   | T87; ARA 18-26GHz; S/N:1049 |

Hi Frequency Cables

☐ (2 ft)    ☐ (2 ~ 3 ft)    ☐ (4 ~ 6 ft)    ☐ (12 ft)

**Peak Measurements:**  
1 MHz Resolution Bandwidth  
1MHz Video Bandwidth

**Average Measurements:**  
1 MHz Resolution Bandwidth  
10Hz Video Bandwidth

| f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dist<br>feet          | Read Pk<br>dBuV | Read Avg.<br>dBuV              | AF<br>dB/m | CL<br>dB                     | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes           |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------|--------------------------------|------------|------------------------------|-----------|--------------|-----|----------------|---------------|------------------|-------------------|--------------|---------------|-----------------|---|-----------------------|-----|-------------|---------|------------------------------|--|------|---------------------|--------|------------------------------|--------|---------------------------|--|------|------------------|-----|------------------------------|---------|--------------------------|--|----|----------------|------|--------------------------------|--------|-----------------------|--|----|------------|-----|------------------|--|--|--|
| 15.540                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 45.8            | 32.3                           | 39.2       | 6.2                          | -38.6     | 0.0          | 1.0 | 53.6           | 40.1          | 74.0             | 54.0              | -20.4        | -13.9         | V, 3rd Harmonic |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| 15.540                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 45.3            | 32.2                           | 39.2       | 6.2                          | -38.6     | 0.0          | 1.0 | 53.1           | 40.0          | 74.0             | 54.0              | -20.9        | -14.0         | H, 3rd Harmonic |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| <table><tr><td>f</td><td>Measurement Frequency</td><td>Amp</td><td>Preamp Gain</td><td>Avg Lim</td><td colspan="2">Average Field Strength Limit</td></tr><tr><td>Dist</td><td>Distance to Antenna</td><td>D Corr</td><td>Distance Correct to 3 meters</td><td>Pk Lim</td><td colspan="2">Peak Field Strength Limit</td></tr><tr><td>Read</td><td>Analyzer Reading</td><td>Avg</td><td>Average Field Strength @ 3 m</td><td>Avg Mar</td><td colspan="2">Margin vs. Average Limit</td></tr><tr><td>AF</td><td>Antenna Factor</td><td>Peak</td><td>Calculated Peak Field Strength</td><td>Pk Mar</td><td colspan="2">Margin vs. Peak Limit</td></tr><tr><td>CL</td><td>Cable Loss</td><td>HPF</td><td>High Pass Filter</td><td></td><td colspan="2"></td></tr></table> |                       |                 |                                |            |                              |           |              |     |                |               |                  |                   |              |               |                 | f | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit |  | Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim | Peak Field Strength Limit |  | Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | Avg Mar | Margin vs. Average Limit |  | AF | Antenna Factor | Peak | Calculated Peak Field Strength | Pk Mar | Margin vs. Peak Limit |  | CL | Cable Loss | HPF | High Pass Filter |  |  |  |
| f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement Frequency | Amp             | Preamp Gain                    | Avg Lim    | Average Field Strength Limit |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Dist                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Distance to Antenna   | D Corr          | Distance Correct to 3 meters   | Pk Lim     | Peak Field Strength Limit    |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Read                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Analyzer Reading      | Avg             | Average Field Strength @ 3 m   | Avg Mar    | Margin vs. Average Limit     |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| AF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Antenna Factor        | Peak            | Calculated Peak Field Strength | Pk Mar     | Margin vs. Peak Limit        |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| CL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cable Loss            | HPF             | High Pass Filter               |            |                              |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |

**Note:** No other spurious or harmonic signals were found above the system noise floor.

## HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.26GHz, NORMAL)

03/03/03    **High Frequency Measurement**  
**Compliance Certification Services, Morgan Hill Open Field Site**

**Test Engr:** Frank Ibrahim  
**Project #:** 02T1639-1  
**Company:** Askey Computer Corporation  
**EUT Descrip.:** 802.11 a/b Dual Band Card Bus in Toshiba laptop  
**EUT M/N:** WLC221-D4, BCP3483U  
**Test Target:** FCC 15.407  
**Mode Oper:** EUT transmitting at Mid Channel (5.26GHz), Normal Mode, ART =15.0

**Test Equipment:**

|                   |                       |                   |                             |
|-------------------|-----------------------|-------------------|-----------------------------|
| EMCO Horn 1-18GHz | Pre-amplifier 1-26GHz | Spectrum Analyzer | Horn > 18GHz                |
| T72: S/N: 6739    | Miteo NSP2600-44      | 8593EM Analyzer   | T87: ARA 18-26GHz; S/N:1049 |

Hi Frequency Cables

|                                 |                                     |                                     |                                  |
|---------------------------------|-------------------------------------|-------------------------------------|----------------------------------|
| <input type="checkbox"/> (2 ft) | <input type="checkbox"/> (2 ~ 3 ft) | <input type="checkbox"/> (4 ~ 6 ft) | <input type="checkbox"/> (12 ft) |
|---------------------------------|-------------------------------------|-------------------------------------|----------------------------------|

**Peak Measurements:** 1 MHz Resolution Bandwidth  
1MHz Video Bandwidth

**Average Measurements:** 1 MHz Resolution Bandwidth  
10Hz Video Bandwidth

| f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dist<br>feet          | Read Pk<br>dBuV | Read Avg.<br>dBuV              | AF<br>dB/m | CL<br>dB                     | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes           |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------|--------------------------------|------------|------------------------------|-----------|--------------|-----|----------------|---------------|------------------|-------------------|--------------|---------------|-----------------|---|-----------------------|-----|-------------|---------|------------------------------|--|------|---------------------|--------|------------------------------|--------|---------------------------|--|------|------------------|-----|------------------------------|---------|--------------------------|--|----|----------------|------|--------------------------------|--------|-----------------------|--|----|------------|-----|------------------|--|--|--|
| 15.780                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 47.7            | 33.8                           | 38.8       | 6.3                          | -38.6     | 0.0          | 1.0 | 55.1           | 41.2          | 74.0             | 54.0              | -18.9        | -12.8         | V, 3rd Harmonic |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| 15.780                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 42.6            | 30.8                           | 38.8       | 6.3                          | -38.6     | 0.0          | 1.0 | 50.0           | 38.2          | 74.0             | 54.0              | -24.0        | -15.8         | H, 3rd Harmonic |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| <table><tr><td>f</td><td>Measurement Frequency</td><td>Amp</td><td>Preamp Gain</td><td>Avg Lim</td><td colspan="2">Average Field Strength Limit</td></tr><tr><td>Dist</td><td>Distance to Antenna</td><td>D Corr</td><td>Distance Correct to 3 meters</td><td>Pk Lim</td><td colspan="2">Peak Field Strength Limit</td></tr><tr><td>Read</td><td>Analyzer Reading</td><td>Avg</td><td>Average Field Strength @ 3 m</td><td>Avg Mar</td><td colspan="2">Margin vs. Average Limit</td></tr><tr><td>AF</td><td>Antenna Factor</td><td>Peak</td><td>Calculated Peak Field Strength</td><td>Pk Mar</td><td colspan="2">Margin vs. Peak Limit</td></tr><tr><td>CL</td><td>Cable Loss</td><td>HPF</td><td>High Pass Filter</td><td></td><td colspan="2"></td></tr></table> |                       |                 |                                |            |                              |           |              |     |                |               |                  |                   |              |               |                 | f | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit |  | Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim | Peak Field Strength Limit |  | Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | Avg Mar | Margin vs. Average Limit |  | AF | Antenna Factor | Peak | Calculated Peak Field Strength | Pk Mar | Margin vs. Peak Limit |  | CL | Cable Loss | HPF | High Pass Filter |  |  |  |
| f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement Frequency | Amp             | Preamp Gain                    | Avg Lim    | Average Field Strength Limit |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Dist                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Distance to Antenna   | D Corr          | Distance Correct to 3 meters   | Pk Lim     | Peak Field Strength Limit    |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Read                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Analyzer Reading      | Avg             | Average Field Strength @ 3 m   | Avg Mar    | Margin vs. Average Limit     |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| AF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Antenna Factor        | Peak            | Calculated Peak Field Strength | Pk Mar     | Margin vs. Peak Limit        |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| CL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cable Loss            | HPF             | High Pass Filter               |            |                              |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |

**Note:** No other spurious or harmonic signals were found above the system noise floor.

## HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.32GHz, NORMAL)

03/03/03    **High Frequency Measurement**  
Compliance Certification Services, Morgan Hill Open Field Site

**Test Engr:** Frank Ibrahim  
**Project #:** 02T1639-1  
**Company:** Askey Computer Corporation  
**EUT Descrip.:** 802.11 a/b Dual Band Card Bus in Toshiba laptop  
**EUT M/N:** WLC221-D4, BCP3483U  
**Test Target:** FCC 15.407  
**Mode Oper:** EUT transmitting at High Channel (5.32GHz), Normal Mode, ART =12.5

**Test Equipment:**

|                   |                       |                   |                             |
|-------------------|-----------------------|-------------------|-----------------------------|
| EMCO Horn 1-18GHz | Pre-amplifier 1-26GHz | Spectrum Analyzer | Horn > 18GHz                |
| T72: S/N: 6739    | Miteo NSP2600-44      | 8593EM Analyzer   | T87: ARA 18-26GHz; S/N:1049 |

Hi Frequency Cables

|                                 |                                     |                                     |                                  |
|---------------------------------|-------------------------------------|-------------------------------------|----------------------------------|
| <input type="checkbox"/> (2 ft) | <input type="checkbox"/> (2 ~ 3 ft) | <input type="checkbox"/> (4 ~ 6 ft) | <input type="checkbox"/> (12 ft) |
|---------------------------------|-------------------------------------|-------------------------------------|----------------------------------|

**Peak Measurements:** 1 MHz Resolution Bandwidth  
1MHz Video Bandwidth

**Average Measurements:** 1 MHz Resolution Bandwidth  
10Hz Video Bandwidth

| f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dist<br>feet          | Read Pk<br>dBuV | Read Avg.<br>dBuV              | AF<br>dB/m | CL<br>dB                     | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes           |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------|--------------------------------|------------|------------------------------|-----------|--------------|-----|----------------|---------------|------------------|-------------------|--------------|---------------|-----------------|---|-----------------------|-----|-------------|---------|------------------------------|--|------|---------------------|--------|------------------------------|--------|---------------------------|--|------|------------------|-----|------------------------------|---------|--------------------------|--|----|----------------|------|--------------------------------|--------|-----------------------|--|----|------------|-----|------------------|--|--|--|
| 10.640                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 44.3            | 30.0                           | 38.8       | 5.0                          | -35.6     | 0.0          | 1.0 | 53.4           | 39.1          | 74.0             | 54.0              | -20.6        | -14.9         | V, 2nd Harmonic |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| 10.640                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 50.8            | 36.1                           | 38.8       | 5.0                          | -35.6     | 0.0          | 1.0 | 59.9           | 45.2          | 74.0             | 54.0              | -14.1        | -8.8          | H, 2nd Harmonic |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| <table><tr><td>f</td><td>Measurement Frequency</td><td>Amp</td><td>Preamp Gain</td><td>Avg Lim</td><td colspan="2">Average Field Strength Limit</td></tr><tr><td>Dist</td><td>Distance to Antenna</td><td>D Corr</td><td>Distance Correct to 3 meters</td><td>Pk Lim</td><td colspan="2">Peak Field Strength Limit</td></tr><tr><td>Read</td><td>Analyzer Reading</td><td>Avg</td><td>Average Field Strength @ 3 m</td><td>Avg Mar</td><td colspan="2">Margin vs. Average Limit</td></tr><tr><td>AF</td><td>Antenna Factor</td><td>Peak</td><td>Calculated Peak Field Strength</td><td>Pk Mar</td><td colspan="2">Margin vs. Peak Limit</td></tr><tr><td>CL</td><td>Cable Loss</td><td>HPF</td><td>High Pass Filter</td><td></td><td colspan="2"></td></tr></table> |                       |                 |                                |            |                              |           |              |     |                |               |                  |                   |              |               |                 | f | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit |  | Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim | Peak Field Strength Limit |  | Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | Avg Mar | Margin vs. Average Limit |  | AF | Antenna Factor | Peak | Calculated Peak Field Strength | Pk Mar | Margin vs. Peak Limit |  | CL | Cable Loss | HPF | High Pass Filter |  |  |  |
| f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement Frequency | Amp             | Preamp Gain                    | Avg Lim    | Average Field Strength Limit |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Dist                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Distance to Antenna   | D Corr          | Distance Correct to 3 meters   | Pk Lim     | Peak Field Strength Limit    |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Read                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Analyzer Reading      | Avg             | Average Field Strength @ 3 m   | Avg Mar    | Margin vs. Average Limit     |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| AF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Antenna Factor        | Peak            | Calculated Peak Field Strength | Pk Mar     | Margin vs. Peak Limit        |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| CL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cable Loss            | HPF             | High Pass Filter               |            |                              |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |

**Note:** No other spurious or harmonic signals were found above the system noise floor.

## HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.21GHz, TURBO)

03/03/03    **High Frequency Measurement**  
Compliance Certification Services, Morgan Hill Open Field Site

**Test Engr:** Frank Ibrahim  
**Project #:** 02T1639-1  
**Company:** Askey Computer Corporation  
**EUT Descrip.:** 802.11 a/b Dual Band Card Bus in Toshiba laptop  
**EUT M/N:** WLC221-D4, BCP3483U  
**Test Target:** FCC 15.407  
**Mode Oper:** EUT transmitting at Low Channel (5.21GHz), Turbo Mode, ART =15.0

### Test Equipment

|                   |                       |                   |                             |
|-------------------|-----------------------|-------------------|-----------------------------|
| EMCO Horn 1-18GHz | Pre-amplifier 1-26GHz | Spectrum Analyzer | Horn > 18GHz                |
| T72: S/N: 6739    | Miteo NSP2600-44      | 8593EM Analyzer   | T87: ARA 18-26GHz; S/N:1049 |

Hi Frequency Cables

☐ (2 ft)   ☐ (2 ~ 3 ft)   ☐ (4 ~ 6 ft)   ☐ (12 ft)

**Peak Measurements:** 1 MHz Resolution Bandwidth  
1MHz Video Bandwidth

**Average Measurements:** 1 MHz Resolution Bandwidth  
10Hz Video Bandwidth

| f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dist<br>feet          | Read Pk<br>dBuV | Read Avg.<br>dBuV              | AF<br>dB/m | CL<br>dB                     | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes           |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------|--------------------------------|------------|------------------------------|-----------|--------------|-----|----------------|---------------|------------------|-------------------|--------------|---------------|-----------------|---|-----------------------|-----|-------------|---------|------------------------------|--|------|---------------------|--------|------------------------------|--------|---------------------------|--|------|------------------|-----|------------------------------|---------|--------------------------|--|----|----------------|------|--------------------------------|--------|-----------------------|--|----|------------|-----|------------------|--|--|--|
| 15.630                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 50.6            | 36.3                           | 39.1       | 6.2                          | -38.6     | 0.0          | 1.0 | 58.2           | 43.9          | 74.0             | 54.0              | -15.8        | -10.1         | V, 3rd Harmonic |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| 15.630                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 43.0            | 30.8                           | 39.1       | 6.2                          | -38.6     | 0.0          | 1.0 | 50.6           | 38.4          | 74.0             | 54.0              | -23.4        | -15.6         | H, Noise Floor  |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| <table><tr><td>f</td><td>Measurement Frequency</td><td>Amp</td><td>Preamp Gain</td><td>Avg Lim</td><td colspan="2">Average Field Strength Limit</td></tr><tr><td>Dist</td><td>Distance to Antenna</td><td>D Corr</td><td>Distance Correct to 3 meters</td><td>Pk Lim</td><td colspan="2">Peak Field Strength Limit</td></tr><tr><td>Read</td><td>Analyzer Reading</td><td>Avg</td><td>Average Field Strength @ 3 m</td><td>Avg Mar</td><td colspan="2">Margin vs. Average Limit</td></tr><tr><td>AF</td><td>Antenna Factor</td><td>Peak</td><td>Calculated Peak Field Strength</td><td>Pk Mar</td><td colspan="2">Margin vs. Peak Limit</td></tr><tr><td>CL</td><td>Cable Loss</td><td>HPF</td><td>High Pass Filter</td><td></td><td colspan="2"></td></tr></table> |                       |                 |                                |            |                              |           |              |     |                |               |                  |                   |              |               |                 | f | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit |  | Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim | Peak Field Strength Limit |  | Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | Avg Mar | Margin vs. Average Limit |  | AF | Antenna Factor | Peak | Calculated Peak Field Strength | Pk Mar | Margin vs. Peak Limit |  | CL | Cable Loss | HPF | High Pass Filter |  |  |  |
| f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement Frequency | Amp             | Preamp Gain                    | Avg Lim    | Average Field Strength Limit |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Dist                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Distance to Antenna   | D Corr          | Distance Correct to 3 meters   | Pk Lim     | Peak Field Strength Limit    |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Read                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Analyzer Reading      | Avg             | Average Field Strength @ 3 m   | Avg Mar    | Margin vs. Average Limit     |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| AF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Antenna Factor        | Peak            | Calculated Peak Field Strength | Pk Mar     | Margin vs. Peak Limit        |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| CL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cable Loss            | HPF             | High Pass Filter               |            |                              |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |

**Note:** No other spurious or harmonic signals were found above the system noise floor.

## HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.25GHz, TURBO)

03/03/03    **High Frequency Measurement**  
Compliance Certification Services, Morgan Hill Open Field Site

**Test Engr:** Frank Ibrahim  
**Project #:** 02T1639-1  
**Company:** Askey Computer Corporation  
**EUT Descrip.:** 802.11 a/b Dual Band Card Bus in Toshiba laptop  
**EUT M/N:** WLC221-D4, BCP3483U  
**Test Target:** FCC 15.407  
**Mode Oper:** EUT transmitting at Mid Channel (5.25GHz), Turbo Mode, ART =15.0

### Test Equipment

|                   |                       |                   |                             |
|-------------------|-----------------------|-------------------|-----------------------------|
| EMCO Horn 1-18GHz | Pre-amplifier 1-26GHz | Spectrum Analyzer | Horn > 18GHz                |
| T72: S/N: 6739    | Miteo NSP2600-44      | 8593EM Analyzer   | T87: ARA 18-26GHz; S/N:1049 |

Hi Frequency Cables

☐ (2 ft)   ☐ (2 ~ 3 ft)   ☐ (4 ~ 6 ft)   ☐ (12 ft)

**Peak Measurements:**    **Average Measurements:**  
1 MHz Resolution Bandwidth    1 MHz Resolution Bandwidth  
1MHz Video Bandwidth    10Hz Video Bandwidth

| f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dist<br>feet          | Read Pk<br>dBuV | Read Avg.<br>dBuV              | AF<br>dB/m | CL<br>dB                     | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes           |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------|--------------------------------|------------|------------------------------|-----------|--------------|-----|----------------|---------------|------------------|-------------------|--------------|---------------|-----------------|---|-----------------------|-----|-------------|---------|------------------------------|--|------|---------------------|--------|------------------------------|--------|---------------------------|--|------|------------------|-----|------------------------------|---------|--------------------------|--|----|----------------|------|--------------------------------|--------|-----------------------|--|----|------------|-----|------------------|--|--|--|
| 15.750                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 47.8            | 33.4                           | 38.9       | 6.3                          | -38.6     | 0.0          | 1.0 | 55.3           | 40.9          | 74.0             | 54.0              | -18.7        | -13.1         | V, 3rd Harmonic |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| 15.750                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 43.0            | 31.0                           | 38.9       | 6.3                          | -38.6     | 0.0          | 1.0 | 50.5           | 38.5          | 74.0             | 54.0              | -23.5        | -15.5         | H, Noise Floor  |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| <table><tr><td>f</td><td>Measurement Frequency</td><td>Amp</td><td>Preamp Gain</td><td>Avg Lim</td><td colspan="2">Average Field Strength Limit</td></tr><tr><td>Dist</td><td>Distance to Antenna</td><td>D Corr</td><td>Distance Correct to 3 meters</td><td>Pk Lim</td><td colspan="2">Peak Field Strength Limit</td></tr><tr><td>Read</td><td>Analyzer Reading</td><td>Avg</td><td>Average Field Strength @ 3 m</td><td>Avg Mar</td><td colspan="2">Margin vs. Average Limit</td></tr><tr><td>AF</td><td>Antenna Factor</td><td>Peak</td><td>Calculated Peak Field Strength</td><td>Pk Mar</td><td colspan="2">Margin vs. Peak Limit</td></tr><tr><td>CL</td><td>Cable Loss</td><td>HPF</td><td>High Pass Filter</td><td></td><td colspan="2"></td></tr></table> |                       |                 |                                |            |                              |           |              |     |                |               |                  |                   |              |               |                 | f | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit |  | Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim | Peak Field Strength Limit |  | Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | Avg Mar | Margin vs. Average Limit |  | AF | Antenna Factor | Peak | Calculated Peak Field Strength | Pk Mar | Margin vs. Peak Limit |  | CL | Cable Loss | HPF | High Pass Filter |  |  |  |
| f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement Frequency | Amp             | Preamp Gain                    | Avg Lim    | Average Field Strength Limit |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Dist                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Distance to Antenna   | D Corr          | Distance Correct to 3 meters   | Pk Lim     | Peak Field Strength Limit    |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Read                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Analyzer Reading      | Avg             | Average Field Strength @ 3 m   | Avg Mar    | Margin vs. Average Limit     |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| AF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Antenna Factor        | Peak            | Calculated Peak Field Strength | Pk Mar     | Margin vs. Peak Limit        |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| CL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cable Loss            | HPF             | High Pass Filter               |            |                              |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |

**Note:**    No other spurious or harmonic signals were found above the system noise floor.

## HARMONIC AND SPURIOUS RADIATED EMISSIONS (5.29GHz, TURBO)

03/03/03    **High Frequency Measurement**  
Compliance Certification Services, Morgan Hill Open Field Site

**Test Engr:** Frank Ibrahim  
**Project #:** 02T1639-1  
**Company:** Askey Computer Corporation  
**EUT Descrip.:** 802.11 a/b Dual Band Card Bus in Toshiba laptop  
**EUT M/N:** WLC221-D4, BCP3483U  
**Test Target:** FCC 15.407  
**Mode Oper:** EUT transmitting at High Channel (5.29GHz), Turbo Mode, ART =15.0

### Test Equipment

|                   |                       |                   |                             |
|-------------------|-----------------------|-------------------|-----------------------------|
| EMCO Horn 1-18GHz | Pre-amplifier 1-26GHz | Spectrum Analyzer | Horn > 18GHz                |
| T72: S/N: 6739    | Miteo NSP2600-44      | 8593EM Analyzer   | T87: ARA 18-26GHz; S/N:1049 |

Hi Frequency Cables

☐ (2 ft)   ☐ (2 ~ 3 ft)   ☐ (4 ~ 6 ft)   ☐ (12 ft)

**Peak Measurements:** 1 MHz Resolution Bandwidth  
1MHz Video Bandwidth

**Average Measurements:** 1 MHz Resolution Bandwidth  
10Hz Video Bandwidth

| f<br>GHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dist<br>feet          | Read Pk<br>dBuV | Read Avg.<br>dBuV              | AF<br>dB/m | CL<br>dB                     | Amp<br>dB | D Corr<br>dB | HPF | Peak<br>dBuV/m | Avg<br>dBuV/m | Pk Lim<br>dBuV/m | Avg Lim<br>dBuV/m | Pk Mar<br>dB | Avg Mar<br>dB | Notes           |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------|--------------------------------|------------|------------------------------|-----------|--------------|-----|----------------|---------------|------------------|-------------------|--------------|---------------|-----------------|---|-----------------------|-----|-------------|---------|------------------------------|--|------|---------------------|--------|------------------------------|--------|---------------------------|--|------|------------------|-----|------------------------------|---------|--------------------------|--|----|----------------|------|--------------------------------|--------|-----------------------|--|----|------------|-----|------------------|--|--|--|
| 15.870                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 42.3            | 32.1                           | 38.7       | 6.3                          | -38.6     | 0.0          | 1.0 | 49.6           | 39.4          | 74.0             | 54.0              | -24.4        | -14.6         | V, 3rd Harmonic |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| 15.870                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 9.8                   | 41.8            | 31.5                           | 38.7       | 6.3                          | -38.6     | 0.0          | 1.0 | 49.1           | 38.8          | 74.0             | 54.0              | -24.9        | -15.2         | H, Noise Floor  |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| <table><tr><td>f</td><td>Measurement Frequency</td><td>Amp</td><td>Preamp Gain</td><td>Avg Lim</td><td colspan="2">Average Field Strength Limit</td></tr><tr><td>Dist</td><td>Distance to Antenna</td><td>D Corr</td><td>Distance Correct to 3 meters</td><td>Pk Lim</td><td colspan="2">Peak Field Strength Limit</td></tr><tr><td>Read</td><td>Analyzer Reading</td><td>Avg</td><td>Average Field Strength @ 3 m</td><td>Avg Mar</td><td colspan="2">Margin vs. Average Limit</td></tr><tr><td>AF</td><td>Antenna Factor</td><td>Peak</td><td>Calculated Peak Field Strength</td><td>Pk Mar</td><td colspan="2">Margin vs. Peak Limit</td></tr><tr><td>CL</td><td>Cable Loss</td><td>HPF</td><td>High Pass Filter</td><td></td><td colspan="2"></td></tr></table> |                       |                 |                                |            |                              |           |              |     |                |               |                  |                   |              |               |                 | f | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit |  | Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim | Peak Field Strength Limit |  | Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | Avg Mar | Margin vs. Average Limit |  | AF | Antenna Factor | Peak | Calculated Peak Field Strength | Pk Mar | Margin vs. Peak Limit |  | CL | Cable Loss | HPF | High Pass Filter |  |  |  |
| f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Measurement Frequency | Amp             | Preamp Gain                    | Avg Lim    | Average Field Strength Limit |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Dist                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Distance to Antenna   | D Corr          | Distance Correct to 3 meters   | Pk Lim     | Peak Field Strength Limit    |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| Read                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Analyzer Reading      | Avg             | Average Field Strength @ 3 m   | Avg Mar    | Margin vs. Average Limit     |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| AF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Antenna Factor        | Peak            | Calculated Peak Field Strength | Pk Mar     | Margin vs. Peak Limit        |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |
| CL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cable Loss            | HPF             | High Pass Filter               |            |                              |           |              |     |                |               |                  |                   |              |               |                 |   |                       |     |             |         |                              |  |      |                     |        |                              |        |                           |  |      |                  |     |                              |         |                          |  |    |                |      |                                |        |                       |  |    |            |     |                  |  |  |  |

**Note:** No other spurious or harmonic signals were found above the system noise floor.

# DIGITAL DEVICE RADIATED EMISSIONS

|                                                                                                                                                                                                                                                                                  |  |                                                                                                                                       |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                                                                                 |  | <b>Project #:</b> 02T1639-1<br><b>Report #:</b> 030228B1<br><b>Date &amp; Time:</b> 02/28/03 9:40PM<br><b>Test Engr:</b> Thanh Nguyen |  |
| FCC, VCCI, CISPR, CE, AUSTEL, NZ<br>UL, CSA, TUV, BSMI, DHHS, NVLAP<br><br>561F MONTEREY ROAD, SAN JOSE, CA 95037-9001<br>PHONE: (408) 463-0885 FAX: (408) 463-0888                                                                                                              |  |                                                                                                                                       |  |
| <b>Company:</b> Askey Computer Corporation<br><b>EUT Description:</b> 801.11a/b WLAN Card. Model : WLC221-D4. BCP3843U<br><b>Test Configuration :</b> EUT in Toshiba LapTop . Modem, Printer, Mouse.<br><b>Type of Test:</b> FCC Part 15 Class B<br><b>Mode of Operation:</b> TX |  | <div style="text-align: right;"> <a href="#">&lt;&lt; Main Sheet</a> </div>                                                           |  |

| Freq.   | Reading | AF    | Closs | Pre-amp | Level    | Limit | Margin | Pol   | Az     | Height  | Mark    |
|---------|---------|-------|-------|---------|----------|-------|--------|-------|--------|---------|---------|
| (MHz)   | (dBuV)  | (dB)  | (dB)  | (dB)    | (dBuV/m) | FCC_B | (dB)   | (H/V) | (Deg)  | (Meter) | (P/Q/A) |
| 356.34  | 48.10   | 14.59 | 4.63  | 28.25   | 39.07    | 46.00 | -6.93  | 3mV   | 270.00 | 1.00    | P       |
| 38.93   | 44.00   | 13.69 | 1.64  | 28.50   | 30.83    | 40.00 | -9.17  | 3mV   | 180.00 | 1.00    | P       |
| 330.00  | 44.90   | 13.83 | 4.44  | 28.09   | 35.07    | 46.00 | -10.93 | 3mH   | 0.00   | 1.00    | P       |
| 288.01  | 45.40   | 12.77 | 4.12  | 27.91   | 34.37    | 46.00 | -11.63 | 3mH   | 270.00 | 1.00    | P       |
| 307.22  | 44.70   | 13.17 | 4.26  | 27.95   | 34.19    | 46.00 | -11.81 | 3mH   | 270.00 | 1.00    | P       |
| 243.63  | 44.60   | 11.72 | 3.80  | 27.98   | 32.14    | 46.00 | -13.86 | 3mV   | 90.00  | 1.00    | P       |
| 6 Worst | Data    |       |       |         |          |       |        |       |        |         |         |

## 6.2. AC POWERLINE CONDUCTED EMISSIONS

### TEST SETUP

The EUT is placed on a wooden table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane on the floor.

The EUT is set to transmit in a continuous mode.

### TEST PROCEDURE

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

### RESULTS

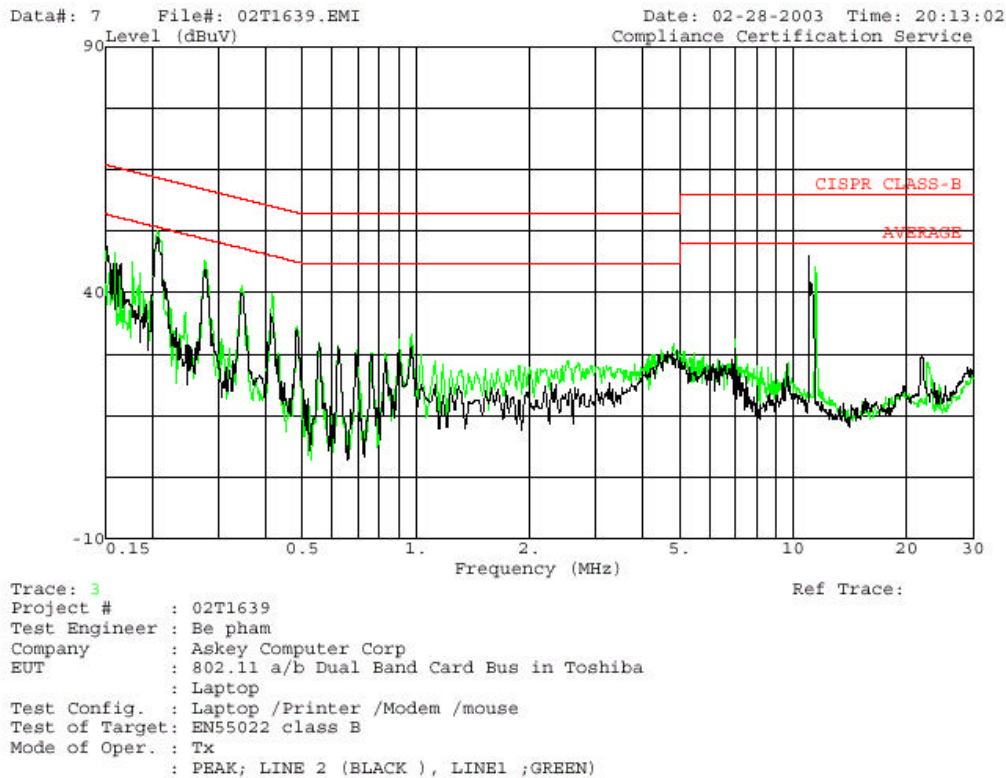
No non-compliance noted:

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) |           |           |           |       |       |       |         |         |         |
|----------------------------------------|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq.                                  | Reading   |           |           | Closs | Limit | EN_B  | Margin  |         | Remark  |
| (MHz)                                  | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB)  | QP    | AV    | QP (dB) | AV (dB) | L1 / L2 |
| 0.21                                   | 52.70     | --        | --        | 0.00  | 64.40 | 54.40 | -11.70  | -1.70   | L1      |
| 0.28                                   | 46.06     | --        | --        | 0.00  | 62.37 | 52.37 | -16.31  | -6.31   | L1      |
| 11.44                                  | 45.18     | --        | --        | 0.00  | 60.00 | 50.00 | -14.82  | -4.82   | L1      |
| 0.21                                   | 51.32     | --        | --        | 0.00  | 64.40 | 54.40 | -13.08  | -3.08   | L2      |
| 0.28                                   | 44.30     | --        | --        | 0.00  | 62.37 | 52.37 | -18.07  | -8.07   | L2      |
| 11.02                                  | 47.48     | --        | --        | 0.00  | 60.00 | 50.00 | -12.52  | -2.52   | L2      |
| 6 Worst Data                           |           |           |           |       |       |       |         |         |         |

EUT installed in Toshiba laptop



561F Monterey Road,  
San Jose, CA 95037 USA  
Tel: (408) 463-0885  
Fax: (408) 463-0888



### 6.3. SETUP PHOTOS

#### Radiated Emissions, freq > 1GHz



### Radiated Emissions, freq < 1GHz



### Power Line Conducted Emissions



**END OF REPORT**