# FCC PART 15

# EMI MEASUREMENT AND TEST REPORT

For

## WESTELL Technologies Inc.

750 North Commons Drive
Aurora, IL 60504

**FCC ID: CH8327WXX-6**

2004-02-09

| **This Report Concerns:** | **Equipment Type:** |
|---|---|
| ☒ Original Report | 802.11b/g Wireless ADSL 4-port Ethernet/USB Router |

| | |
|---|---|
| **Test Engineer:** | Ming Jing / |
| **Report No.:** | R04011910 |
| **Test Date:** | 2004-01-24 |
| **Reviewed By:** | Ling Zhang / |
| **Prepared By:** | Bay Area Compliance Laboratory Corporation (BACL)<br>230 Commercial Street<br>Sunnyvale, CA 94085<br>Tel: (408) 732-9162<br>Fax: (408) 732 9164 |

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# GENERAL INFORMATION

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

The *WESTELL Technologies Inc. 's*, model: *A90-327WXX-06,* or the "EUT" as referred to in this report is an 802.11b/g Wireless ADSL 4-port Ethernet/USB Router which is measured approximately 8.1"L x 6.8"W x 7.5"H.

The EUT utilized the Aztech power adapter, M/N: SY-0901.

** The test data gathered are from a production sample, S/N: 00300A10540C, provided by the manufacturer.*

**Objective**

This type approval report is prepared on behalf of *WESTELL Technologies Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A , B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for Output Power, Antenna Requirements, 6 dB Bandwidth, power spectral density, 100 kHz Bandwidth of Band Edges Measurement, Out of Band Emission, Spurious Emission, Conducted and Spurious Radiated Emission.

**Related Submittal(s)/Grant(s)**

No Related Submittals.

**Test Methodology**

All measurements contained in this report were conducted with ANSI C63.4-2001, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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

**Test Facility**

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2001.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The scope of the accreditation covers the FCC Method – 47 CFR Part – Digital Devices, CISPER 22: 1997: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment test methods.

**Support Equipment List and Details**

| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| Wien Sonic | Monitor | G655 | N/A | N/A |
| HP | Computer | 6745C | N/A | N/A |
| Dell | Keyboard | N/A | CN-09C487-38840-22R-1274 | N/A |
| Dell | Mouse | N/A | 8783844-7 | N/A |
| HP | Printer | Thinkjet 2225C+ | N/A | N/A |
| Everex | Modem | Evercom 24E | N/A | N/A |

**External I/O Cabling List and Details**

| Cable Description | Length (M) | Port/From | To |
|---|---|---|---|
| Shielded KB Cable | 1.6 | KB Port / PC | Keyboard |
| Shielded Cable | 1.5 | Mouse Port/ PC | Mouse |
| RJ 15 Cable | 1.5 | DSL Port / EUT | EVEREX Modem |
| Shielded Printer Cable | 2 | Parallel / PC | HP Printer |
| Shielded Video Cable | 1.8 | VGA / PC | Monitor |
| Ethernet Cable | 1.0 | Ethernet Port / PC | RJ45 Port / EUT |

# SYSTEM TEST CONFIGURATION

### Justification

The host system was configured for testing according to ANSI C63.4-2001.

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

### EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the system components. The test software, provided by the customer, is started the Windows terminal program under the Windows 98/2000/ME/XP operating system.

Once loaded, set the Tx channel to low, mid and high for testing.

### Special Accessories

As shown in following test block diagram, all interface cables used for compliance testing are shielded. The host PC and the peripherals featured shielded metal connectors.

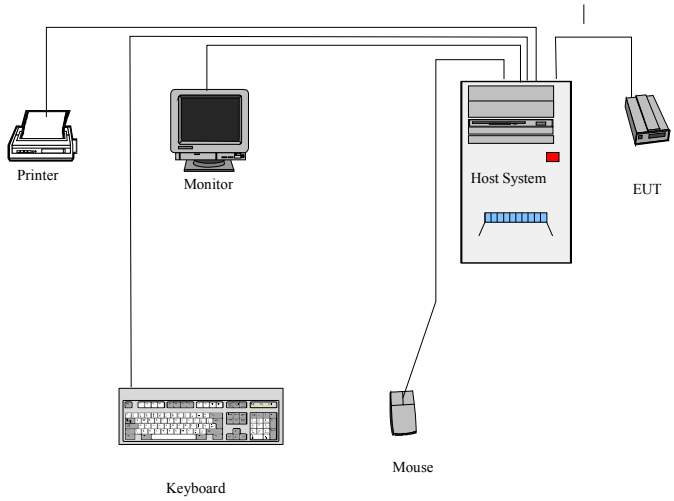
### Schematics / Block Diagram

Please refer to Appendix A.

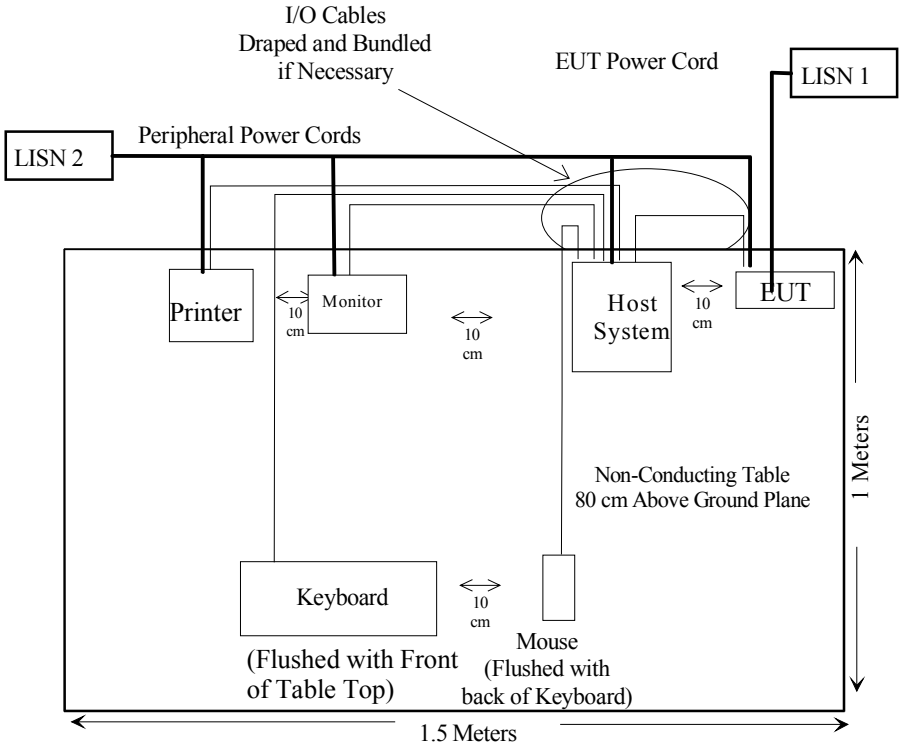
### Equipment Modifications

No modifications were made to the EUT.

## Configuration of Test System




## Test Setup Block Diagram



# SUMMARY OF TEST RESULTS

Results reported relate only to the product tested, serial number: 00300A10540C.

| FCC RULES | DESCRIPTION OF TEST | RESULT |
|---|---|---|
| §2.1091 | RF Exposure | Pass |
| §15.203 | Antenna Requirement | Pass |
| § 15.207 (a) | Conducted Emissions | Pass |
| §15.209 (a) | Spurious Emission | Pass |
| §15.247 (a)(2) | 6 dB Bandwidth | Pass |
| §15.247 (b)(3) | Maximum Peak Output Power | Pass |
| § 15.247 (c) | 100 kHz Bandwidth of Frequency Band Edge | Pass |
| §15.247 (d) | Peak Power Spectral Density | Pass |
| §15.205 | Restricted Band | Pass |

# §15.203 - ANTENNA REQUIREMENT

**Standard Applicable**

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to § 15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Refer to statement below for compliance.

"The antenna for this device is a unique antenna which has a reversed SMA connector. Please refer to the antenna specification for details".

# §15.207(a) - CONDUCTED EMISSIONS

**Measurement Uncertainty**

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

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

**EUT Setup**

The measurement was performed in the shield room, using the same setup per ANSI C63.4-2001 measurement procedure. The specification used was FCC 15 Subpart B limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

**Spectrum Analyzer Setup**

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

**Test Equipment List and Details**

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Rohde & Schwarz | Artificial LISN | ESH2-Z5 | 871884/039 | 2003-03-28 |
| Rohde & Schwarz | EMI Test Receiver | ESCS30 | 100176 | 2003-05-06 |

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

**Test Procedure**

During the conducted emission test, the power cord of the host system was connected to the auxiliary outlet of the first LISN.

Maximizing procedure was performed on the six (6) highest emissions of each modes tested to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings were only performed when an emission was found to be marginal (within -4 dBμV of specification limits). Quasi-peak readings are distinguished with a "**Qp**".

**Summary of Test Results**

According to the recorded data in following table, the EUT complies with the FCC Conducted margin for a Class B device, with the *worst* margin reading of:

-10.9 dB at 0.150 in the Neutral mode

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 12° C |
| Relative Humidity: | 48% |
| ATM Pressure: | 1100 mbar |

**Conducted Emissions Test Data**

| LINE CONDUCTED EMISSIONS | | | | FCC PART 15 CLASS B | |
|---|---|---|---|---|---|
| Frequency MHz | Amplitude dBμV | Detector Qp/Ave/Peak | Phase Line/Neutral | Limit dBμV | Margin dB |
| 0.150 | 55.1 | QP | Neutral | 66 | -10.9 |
| 9.300 | 38.5 | AVG | Neutral | 50 | -11.5 |
| 0.150 | 54.3 | QP | Line | 66 | -11.7 |
| 8.100 | 37.6 | AVG | Line | 50 | -12.4 |
| 7.100 | 47.2 | QP | Neutral | 60 | -12.8 |
| 6.300 | 44.7 | QP | Line | 60 | -15.3 |
| 1.760 | 31.3 | QP | Neutral | 56 | -24.7 |
| 2.040 | 25.9 | QP | Line | 56 | -30.1 |
| 0.150 | 24.9 | AVG | Line | 56 | -31.1 |
| 0.150 | 24.7 | AVG | Neutral | 56 | -31.3 |
| 1.740 | 13.9 | AVG | Neutral | 46 | -32.1 |
| 2.050 | 8.0 | AVG | Line | 46 | -38.0 |

**Plot of Conducted Emissions Test Data**

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

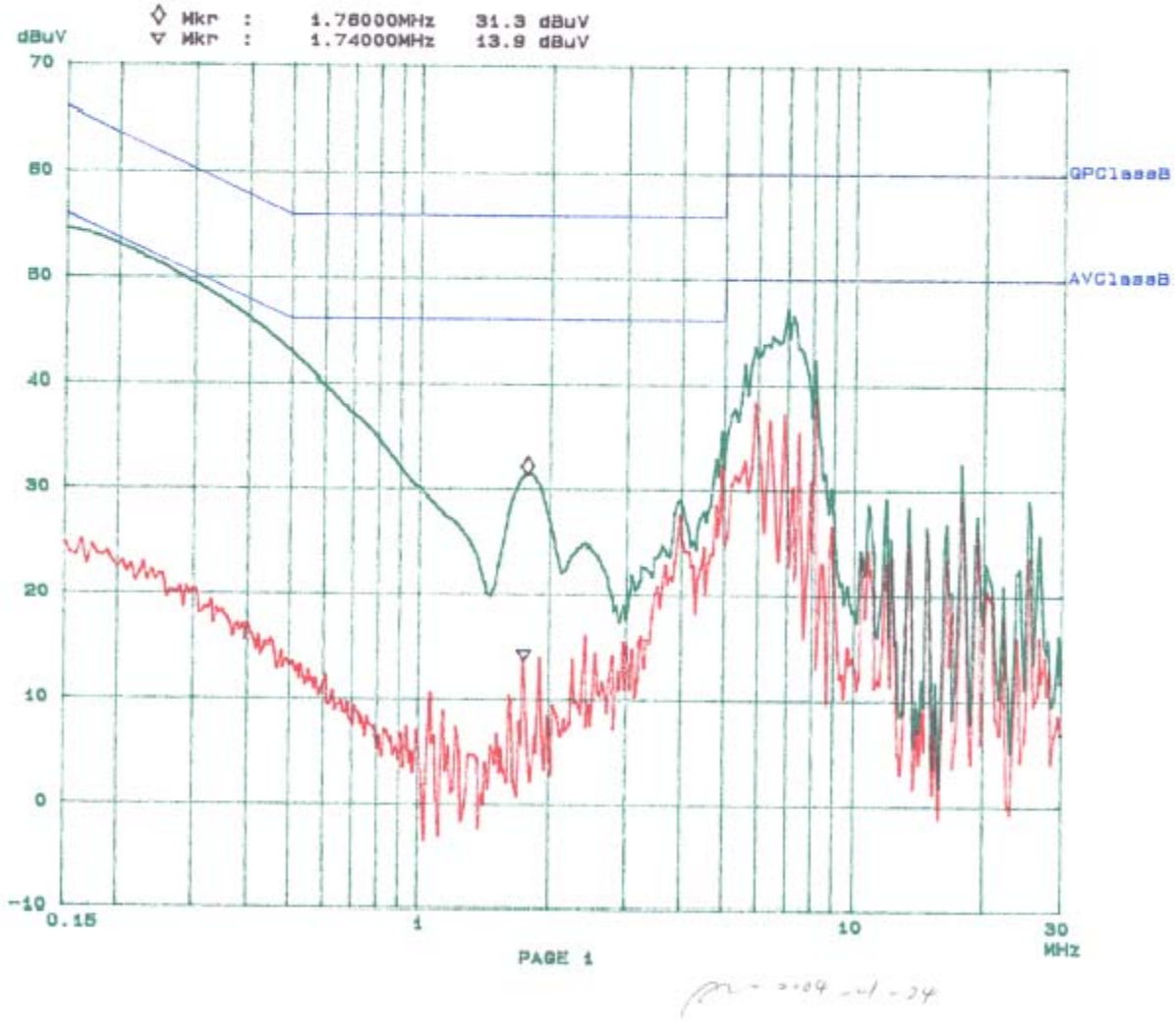
Bay Area Compliance Laboratory Corp 25. Jan 04 14:31
CISPR CLASS B

EUT: DBL600EW
Manuf: AZ Tech
Op Cond: Normal
Operator: Ming
Comment: N
File name: NMBAS600.RES

Scan Settings (3 Ranges)

| Frequencies | | | Receiver Settings | | | | |
|---|---|---|---|---|---|---|---|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp |
| 150k | 1M | 5k | 9k | QP+AV | 20ms | 10dBLN | OFF |
| 1M | 5M | 10k | 9k | QP+AV | 1ms | 10dBLN | OFF |
| 5M | 30M | 100k | 9k | QP+AV | 1ms | 10dBLN | OFF |

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB



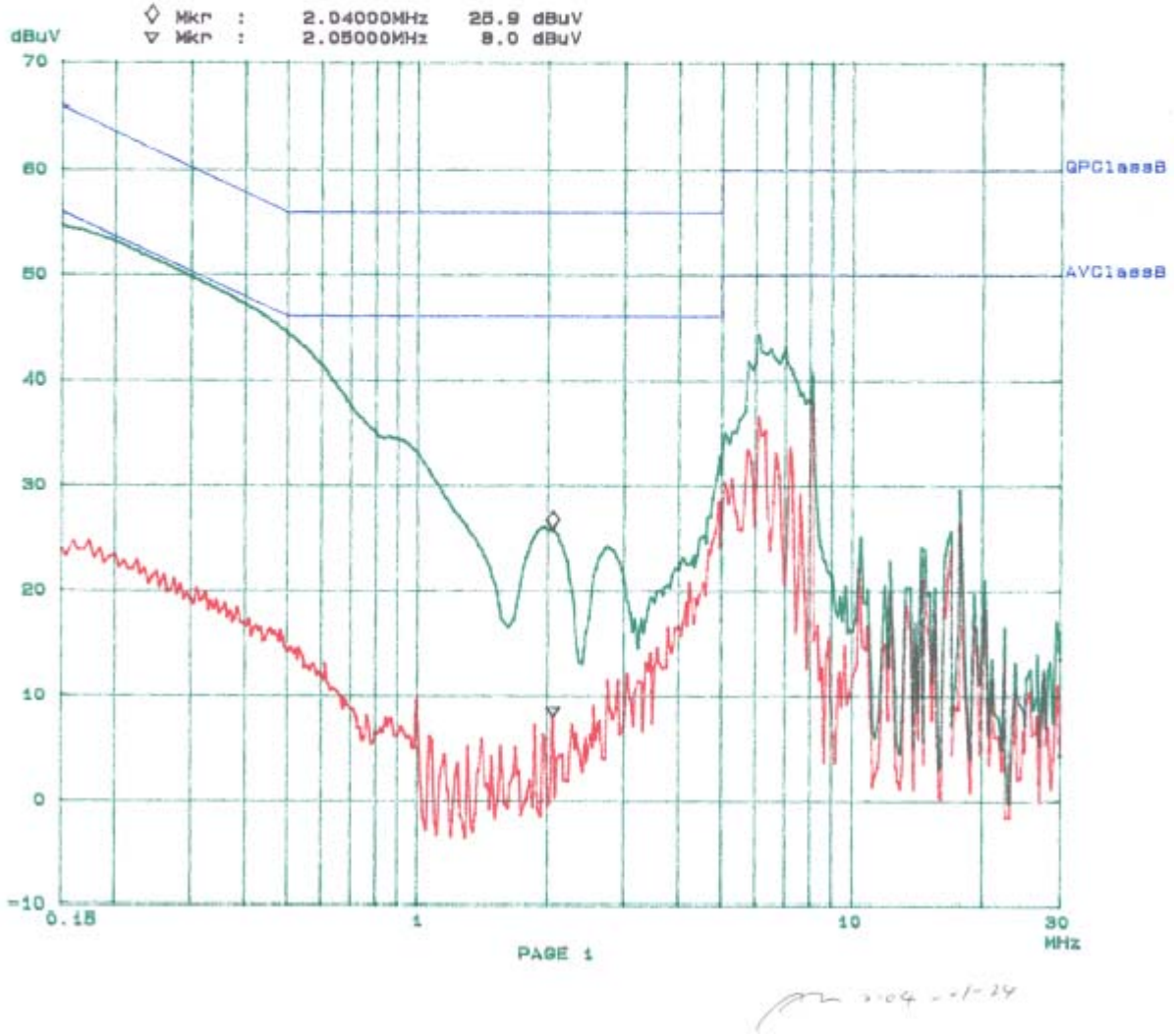
Bay Area Compliance Laboratory Corp 25. Jan 04 14:55
CISPR CLASS B

EUT: DSL600EW
Manuf: AZ Tech
Op Cond: Normal
Operator: Hing
Comment: L
File name: NWBAS600.RES

Scan Settings (3 Ranges)

| Frequencies | | | Receiver Settings | | | | |
|---|---|---|---|---|---|---|---|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp |
| 150k | 1M | 5k | 9k | QP+AV | 20ms | 10dBLN | OFF |
| 1M | 5M | 10k | 9k | QP+AV | 1ms | 10dBLN | OFF |
| 5M | 30M | 100k | 9k | QP+AV | 1ms | 10dBLN | OFF |

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 25
Acc Margin: 6dB

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2004-01-24

# §15.209(a) - SPURIOUS EMISSION

**Standard Applicable**

According to §15.209 (a), except as provided elsewhere in the subpart of 15.209, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241

**Measurement Procedure**

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on a bench without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

**Equipment Lists**

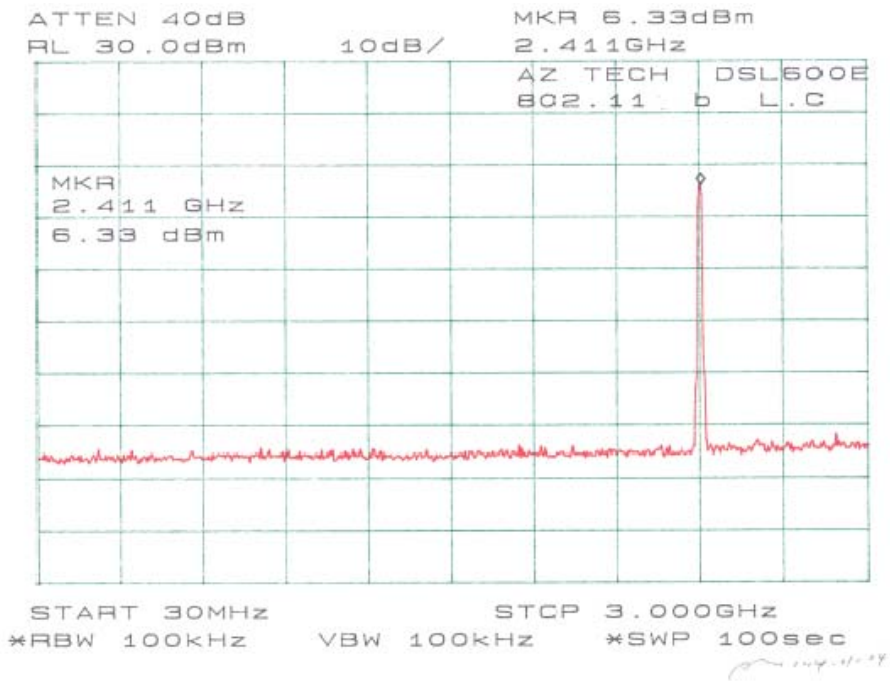
| Manufacturer | Model No. | Description | Calibration Date |
|---|---|---|---|
| HP | 8565EC | Spectrum Analyzer | 2003-06-30 |

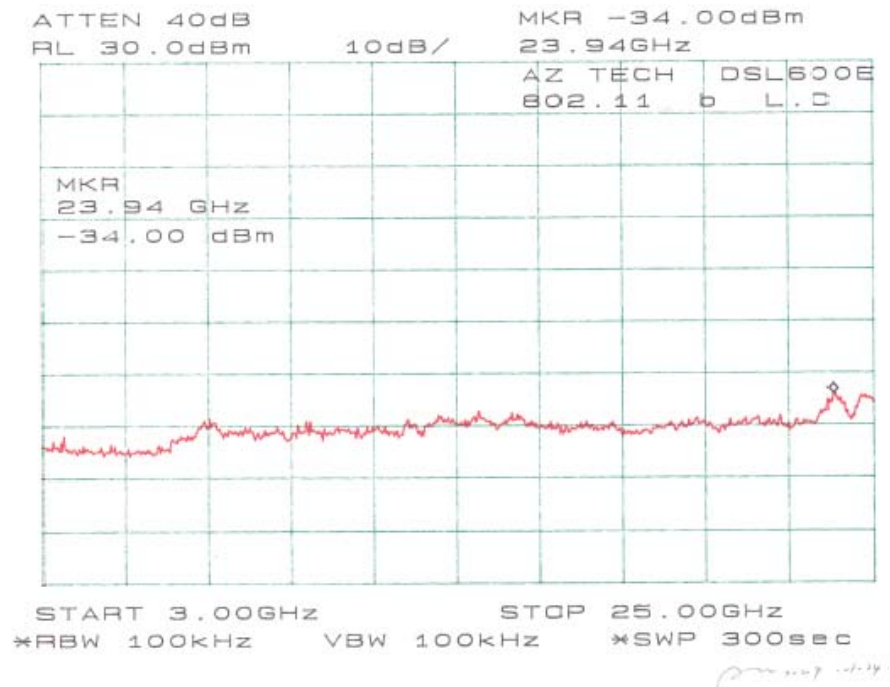
**Measurement Result**

Please refer to following pages for plots of spurious emission.

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 12° C |
| Relative Humidity: | 48% |
| ATM Pressure: | 1100 mbar |


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 6.33dBm
2.411GHz
AZ TECH DSL600E
802.11 b L.C
MKR
2.411 GHz
6.33 dBm
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec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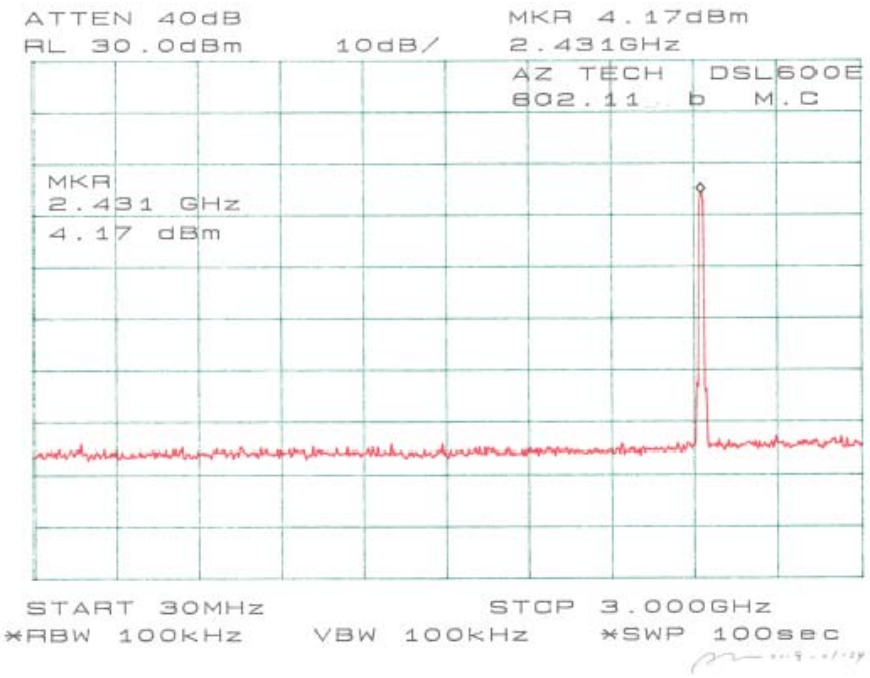
10dB/
MKR -34.00dBm
23.94GHz
AZ TECH DSL600E
802.11 b L.C
MKR
23.94 GHz
-34.00 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec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RL 30.0dBm
10dB/
MKR 4.17dBm
2.431GHz
AZ TECH DSL600E
802.11 b M.C
MKR
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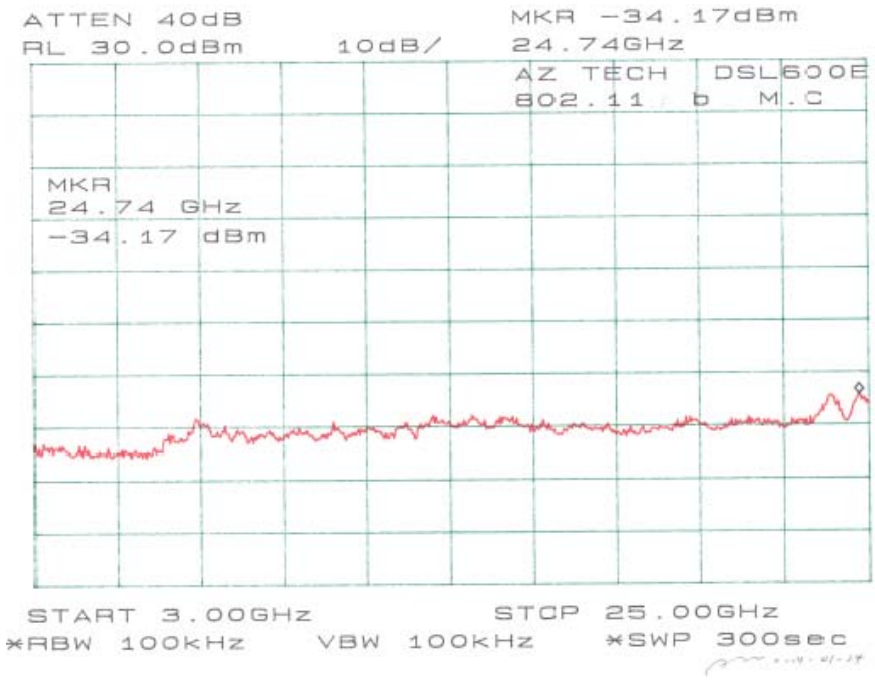
4.17 dBm
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec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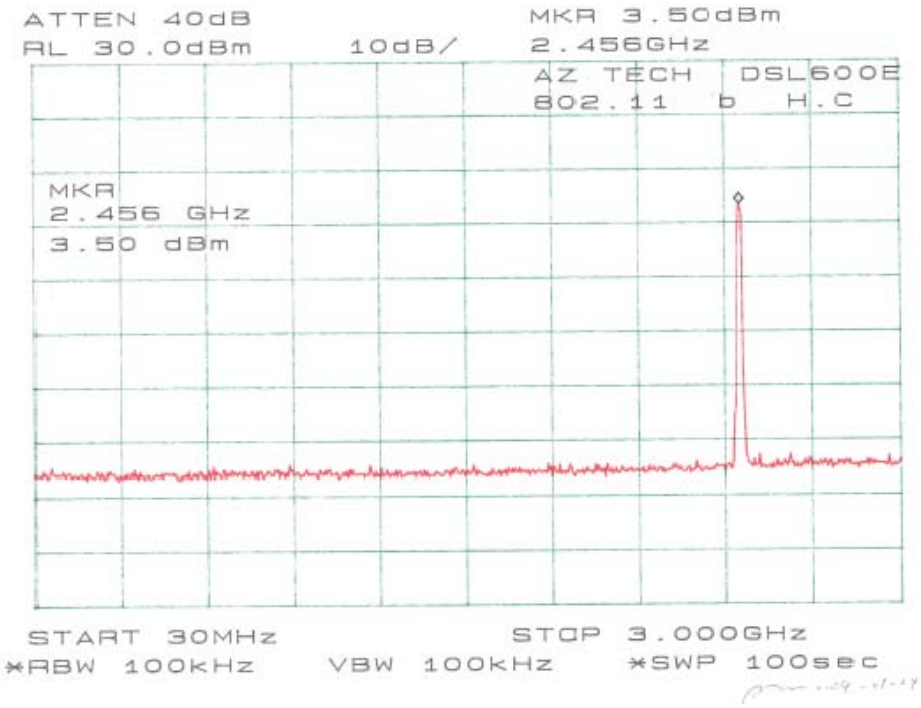
10dB/
MKR -34.17dBm
24.74GHz
AZ TECH DSL600E
802.11 b M.C
MKR
24.74 GHz
-34.17 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec


ATTEN 40dB
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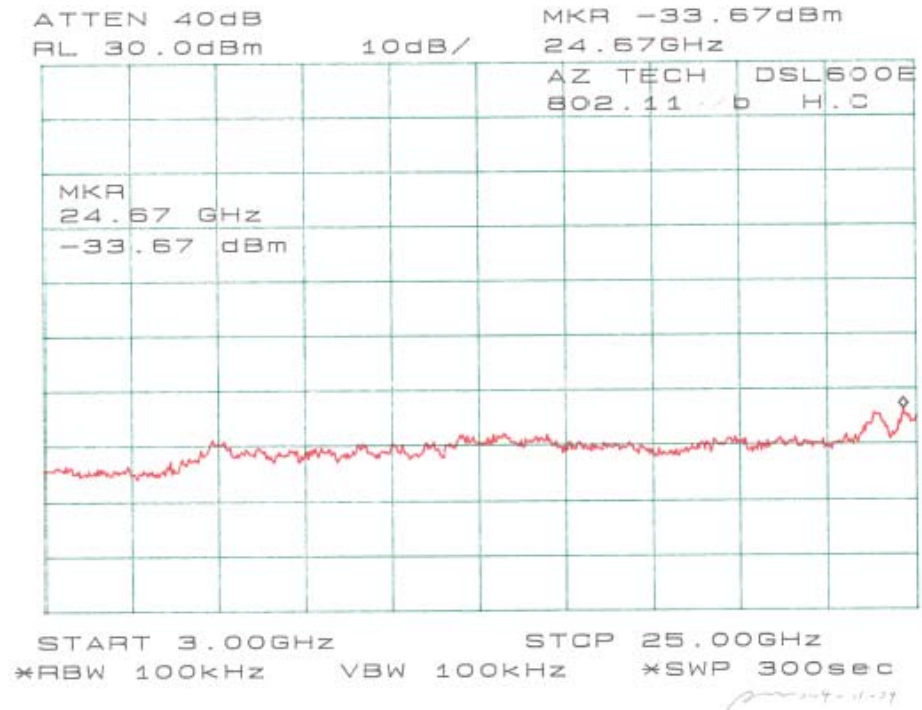
10dB/
MKR 3.50dBm
2.456GHz
AZ TECH DSL600E
802.11 b H.C
MKR
2.456 GHz
3.50 dBm
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec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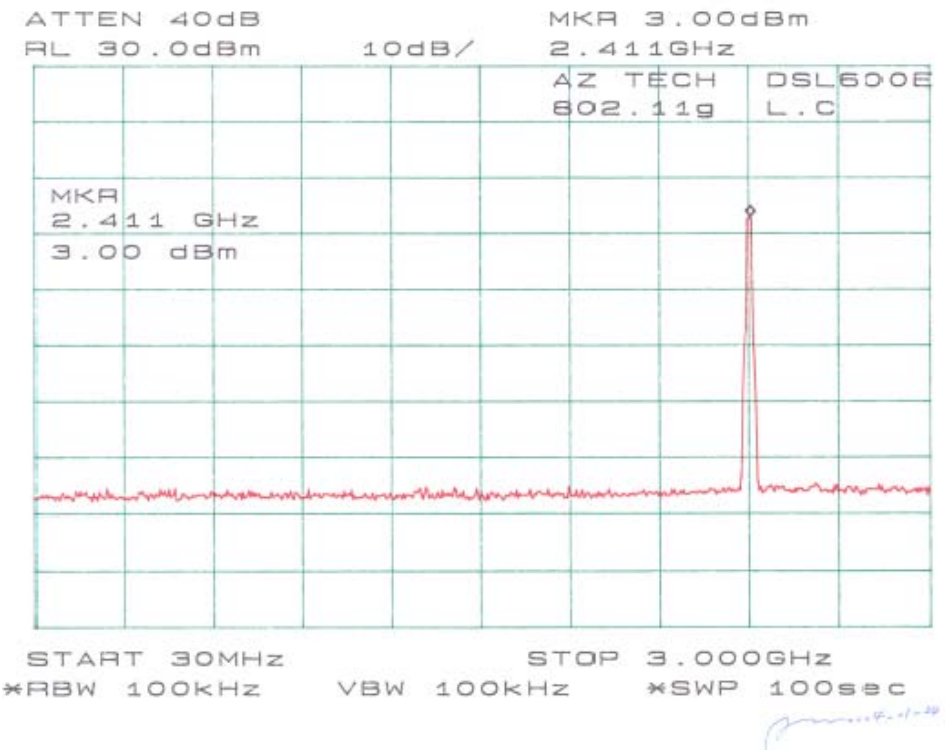
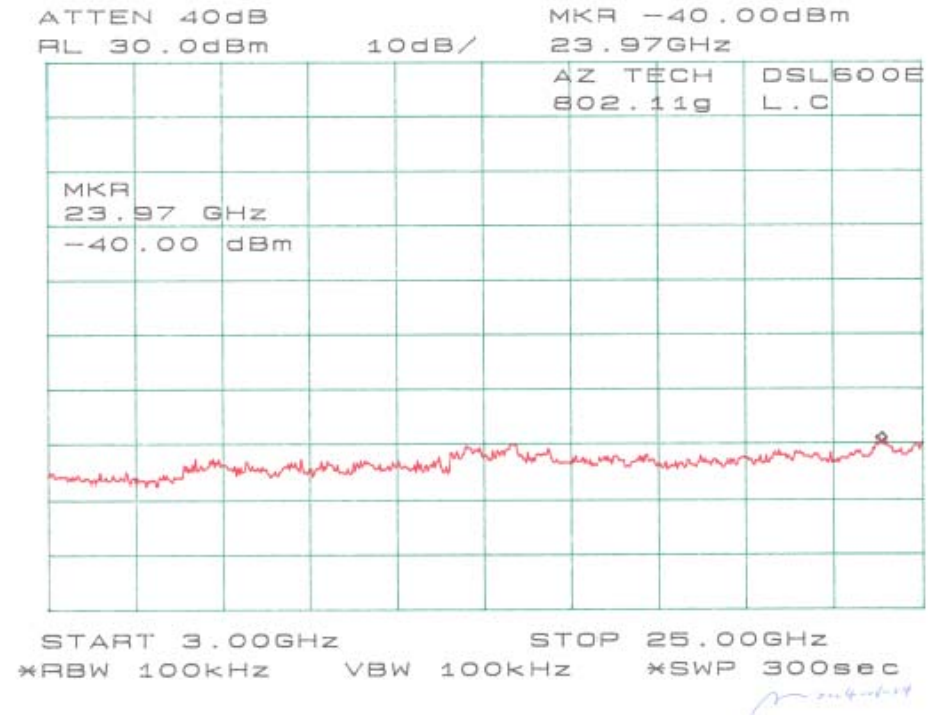
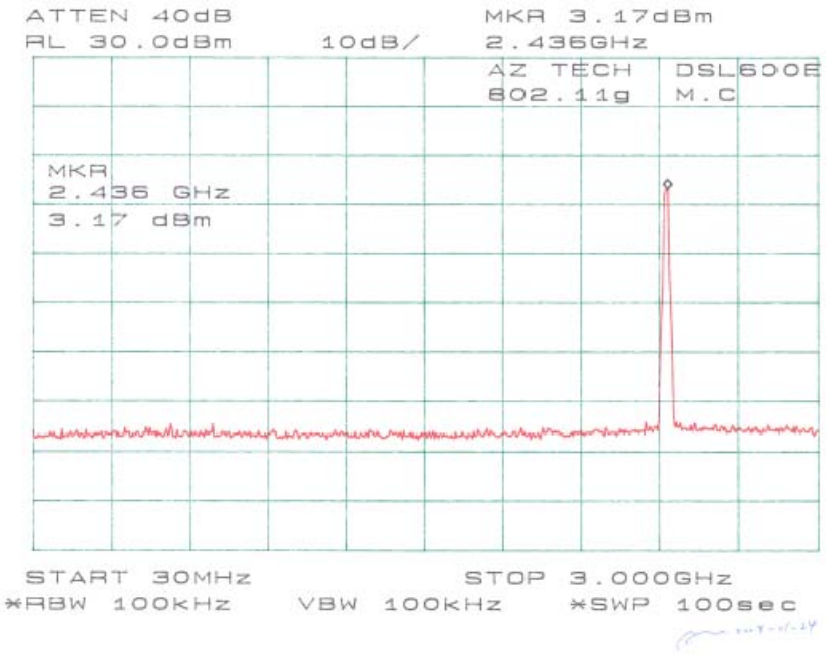
10dB/
MKR -33.67dBm
24.67GHz
AZ TECH DSL600E
802.11 b H.C
MKR
24.67 GHz
-33.67 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 3.00dBm
2.411GHz
AZ TECH DSL600E
802.11g L.C
MKR
2.411 GHz
3.00 dBm
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -40.00dBm
23.97GHz
AZ TECH DSL600E
802.11g L.C
MKR
23.97 GHz
-40.00 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec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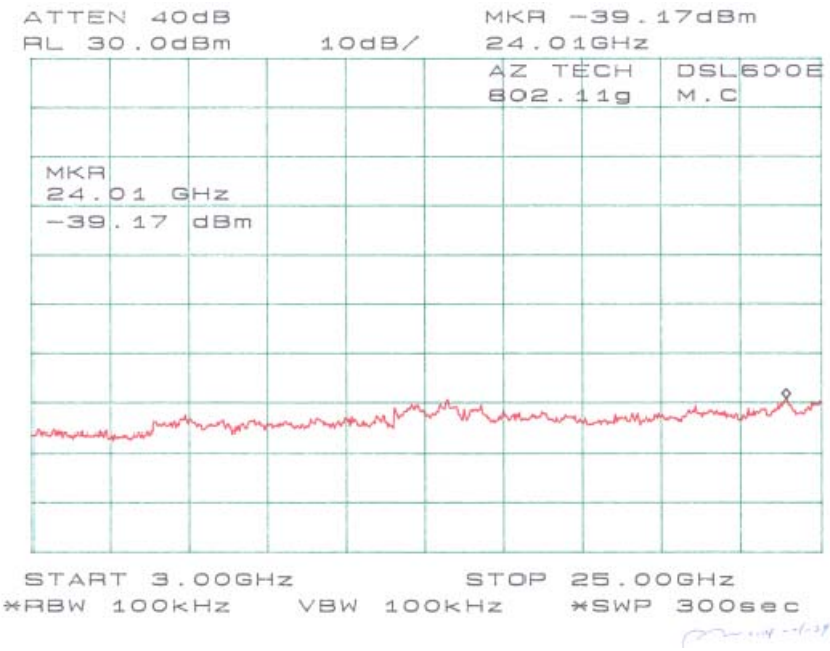
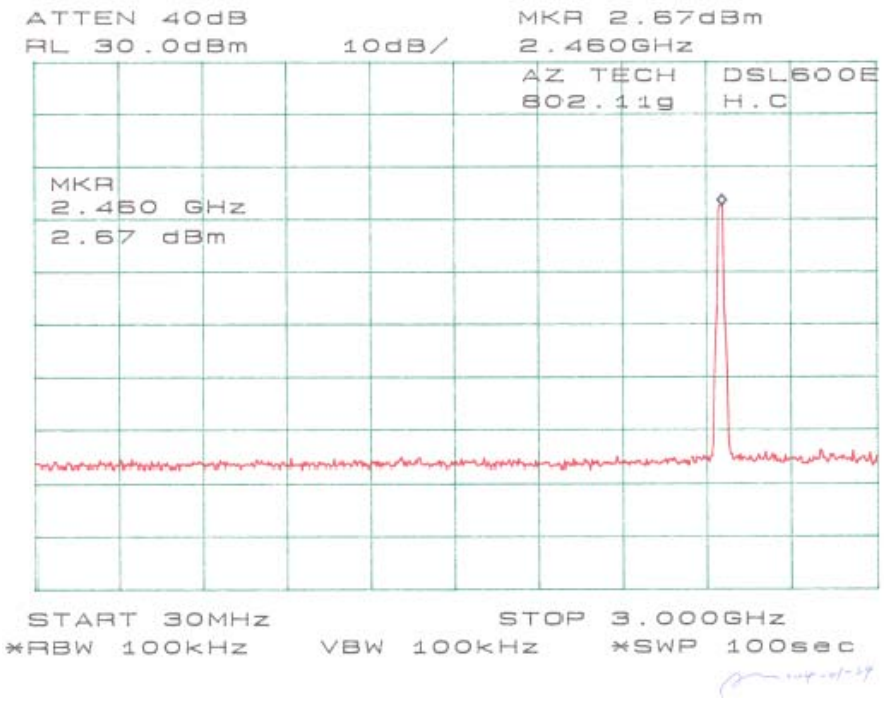
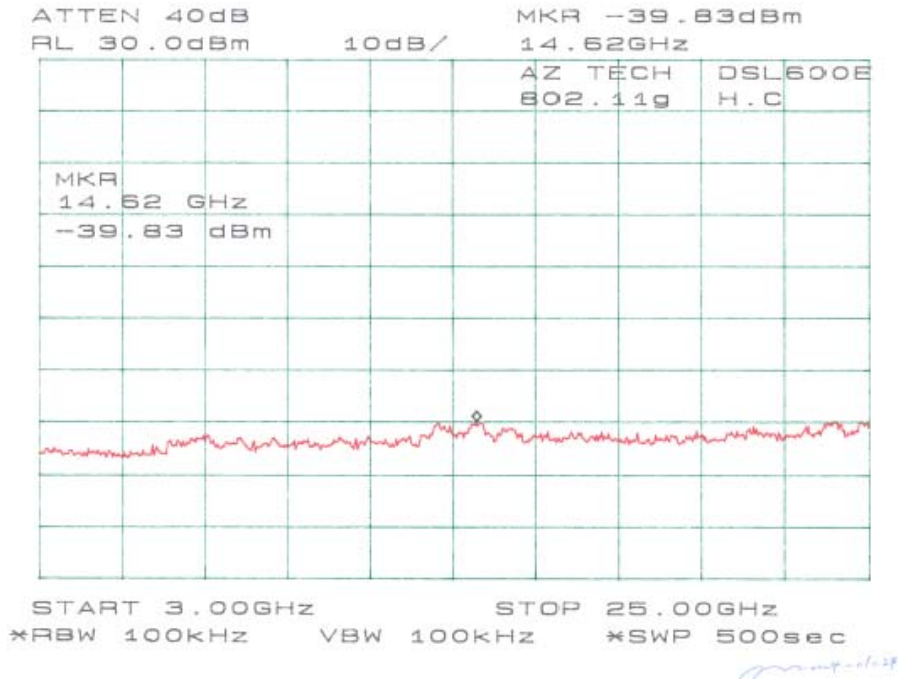
10dB/
MKR 3.17dBm
2.436GHz
AZ TECH
802.11g
DSL600E
M.C
MKR
2.436 GHz
3.17 dBm
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -39.17dBm
24.01GHz
AZ TECH
802.11g
DSL600E
M.C
MKR
24.01 GHz
-39.17 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 2.67dBm
2.460GHz
AZ TECH
802.11g
DSL600E
H.C
MKR
2.450 GHz
2.67 dBm
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -39.83dBm
14.62GHz
AZ TECH
802.11g
DSL600E
H.C
MKR
14.62 GHz
-39.83 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 500sec

# §15.209(f) - SPURIOUS RADIATED EMISSION

**Measurement Uncertainty**

All measurements involve certain levels of uncertainties. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

According to §15.205, except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 – 0.110 | 16.42 – 16.423 | 399.9 – 410 | 4.5 – 5.15 |
| [1]0.495 – 0.505 | 16.69475 – 16.69525 | 608 – 614 | 5.35 – 5.46 |
| 2.1735 – 2.1905 | 16.80425 – 16.80475 | 960 – 1240 | 7.25 – 7.75 |
| 4.125 – 4.128 | 25.5 – 25.67 | 1300 – 1427 | 8.025 – 8.5 |
| 4.17725 – 4.17775 | 37.5 – 38.25 | 1435 – 1626.5 | 9.0 – 9.2 |
| 4.20725 – 4.20775 | 73 – 74.6 | 1645.5 – 1646.5 | 9.3 – 9.5 |
| 6.215 – 6.218 | 74.8 – 75.2 | 1660 – 1710 | 10.6 – 12.7 |
| 6.26775 – 6.26825 | 108 – 121.94 | 1718.8 – 1722.2 | 13.25 – 13.4 |
| 6.31175 – 6.31225 | 123 – 138 | 2200 – 2300 | 14.47 – 14.5 |
| 8.291 – 8.294 | 149.9 – 150.05 | 2310 – 2390 | 15.35 – 16.2 |
| 8.362 – 8.366 | 156.52475 – 156.52525 | 2483.5 – 2500 | 17.7 – 21.4 |
| 8.37625 – 8.38675 | 156.7 – 156.9 | 2655 – 2900 | 22.01 – 23.12 |
| 8.41425 – 8.41475 | 162.0125 – 167.17 | 3260 – 3267 | 23.6 – 24.0 |
| 12.29 – 12.293 | 167.72 – 173.2 | 3332 – 3339 | 31.2 – 31.8 |
| 12.51975 – 12.57725 | 240 – 285 | 3345.8 – 3358 | 36.43 – 36.5 |
| 13.36 – 13.41 | 322 – 335.4 | 3600 – 4400 | ([2]) |

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510MHz
[2] Above 38.6

Except as provided in paragraph (d) and (e), the filed strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

According to §15.209, the device shall meet radiated emission general requirements.

Except for Class A device, the filed strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency of Emission (MHz) | Field Strength (Microvolts/meter) | dB (dBμV/meter) |
|---|---|---|
| 30 - 88 | 100 | 40 |
| 88 - 216 | 150 | 43.5 |
| 216 - 960 | 200 | 46 |
| Above 960 | 500 | 54 |

**EUT Setup**

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

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

**Spectrum Analyzer Setup**

According to FCC Rules, 47 CFR, Section 15.33, the frequency was investigated from 30 to 2500 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

| *Frequency Range* | *RBW* | *Video B/W* |
|---|---|---|
| Below 30MHz | 10kHz | 10kHz |
| 30 – 1000MHz | 100kHz | 100kHz |
| Above 1000MHz | 1MHz | 1MHz |

**Test Equipment List and Details**

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| HP | Spectrum Analyzer | 8568B | 2601A02165 | 2003-07-03 |
| HP | Amplifier | 8447E | 2944A10187 | 2003-09-23 |
| HP | Quasi-Peak Adapter | 85650A | 3019A05393 | 2003-06-13 |
| EMCO | Biconical Antenna | 3110B | 9309-1165 | 2003-10-11 |
| EMCO | Log Periodic Antenna | 3146 | 2101 | 2003-10-11 |

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

**Test Procedure**

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

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

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -4 dBμV of specification limits), and are distinguished with a "**Qp**" in the data table.

**Corrected Amplitude & Margin Calculation**

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

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

Margin = Corr. Ampl. - FCC 15.209 Limit

**Summary of Test Results**

According to the data in section 12.7, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207 and 15.247, and had the worst margin of:

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 12° C |
| Relative Humidity: | 48% |
| ATM Pressure: | 1100 mbar |

***802.11b data:***

**-5.6 dB** at **2390.00 MHz** in the **Vertical** polarization, Low Channel

**-9.5 dB** at **4874.00 MHz** in the **Vertical** polarization, Middle Channel

**-9.8 dB** at **4924.00 MHz** in the **Vertical** polarization, High Channel

**-10.1 dB** at **77.28 MHz** in the **Horizontal** polarization, Unwanted Emission

***802.11g data:***

**-4.3 dB** at **2390.00 MHz** in the **Vertical** polarization, Low Channel

**-8.5 dB** at **1250.00 MHz** in the **Vertical** polarization, Middle Channel

**-9.9 dB** at **4924.00 MHz** in the **Vertical** polarization, High Channel

**-10.3 dB** at **77.28 MHz** in the **Horizontal** polarization, Unwanted Emission

**Radiated Emission Test Result for 802.11b**

| INDICATED | | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTED AMPLITUDE | FCC 15 SUBPART C | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency MHz | Ampl. dBμV/m | Comments | Angle Degree | Height Meter | Polar H/ V | Antenna dBμV/m | Cable DB | Amp. DB | Corr. Ampl. dBμV/m | Limit dBμV/m | Margin dB |
| Low Channel, 1-25GHz | | | | | | | | | | | |
| 2412.00 | 111.2 | Fund/Peak | 90 | 1.8 | v | 28.1 | 3.4 | 35.2 | 107.5 | | |
| 2412.00 | 97.7 | Fund/Peak | 90 | 1.5 | h | 28.1 | 3.4 | 35.2 | 94.0 | | |
| 2412.00 | 106.4 | Fund/Ave | 90 | 1.8 | v | 28.1 | 3.4 | 35.2 | 102.7 | | |
| 2412.00 | 93.1 | Fund/Ave | 90 | 1.5 | h | 28.1 | 3.4 | 35.2 | 89.4 | | |
| 2390.00 | 52.1 | Ave | 270 | 1.5 | v | 28.1 | 3.4 | 35.1 | 48.5 | 54 | -5.6 |
| 4824.00 | 40.3 | Ave | 30 | 1.8 | v | 32.5 | 4.9 | 33.0 | 44.7 | 54 | -9.3 |
| 4824.00 | 38.2 | Ave | 110 | 1.5 | h | 32.5 | 4.9 | 33.0 | 42.6 | 54 | -11.4 |
| 2390.00 | 45.2 | Ave | 310 | 1.5 | h | 28.1 | 3.4 | 35.1 | 41.6 | 54 | -12.5 |
| 2390.00 | 56.7 | Peak | 270 | 1.5 | v | 28.1 | 3.4 | 35.1 | 53.1 | 74 | -21.0 |
| 4824.00 | 44.9 | Peak | 30 | 1.8 | v | 32.5 | 4.9 | 33.0 | 49.3 | 74 | -24.7 |
| 4824.00 | 42.5 | Peak | 110 | 1.5 | h | 32.5 | 4.9 | 33.0 | 46.9 | 74 | -27.1 |
| 2390.00 | 49.3 | Peak | 310 | 1.5 | h | 28.1 | 3.4 | 35.1 | 45.7 | 74 | -28.4 |
| Middle Channel, 1-25GHz | | | | | | | | | | | |
| 2437.00 | 109.6 | Fund/Peak | 30 | 1.8 | v | 28.1 | 3.4 | 35.2 | 105.9 | | |
| 2437.00 | 97.5 | Fund/Peak | 230 | 1.2 | h | 28.1 | 3.4 | 35.2 | 93.8 | | |
| 2437.00 | 105.3 | Fund/Ave | 30 | 1.8 | v | 28.1 | 3.4 | 35.2 | 101.6 | | |
| 2437.00 | 93.2 | Fund/Ave | 230 | 1.2 | h | 28.1 | 3.4 | 35.2 | 89.5 | | |
| 4874.00 | 40.1 | Ave | 90 | 1.5 | v | 32.5 | 4.9 | 33.0 | 44.5 | 54 | -9.5 |
| 1250.00 | 52.1 | Ave | 0 | 1.2 | v | 23.7 | 4.2 | 36.1 | 43.9 | 54 | -10.1 |
| 4874.00 | 37.9 | Ave | 15 | 1.2 | h | 32.5 | 4.9 | 33.0 | 42.3 | 54 | -11.7 |
| 1250.00 | 49.8 | Ave | 180 | 1.5 | h | 23.7 | 4.2 | 36.1 | 41.6 | 54 | -12.4 |
| 4874.00 | 44.6 | Peak | 90 | 1.5 | v | 32.5 | 4.9 | 33.0 | 49.0 | 74 | -25.0 |
| 4874.00 | 42.3 | Peak | 15 | 1.2 | h | 32.5 | 4.9 | 33.0 | 46.7 | 74 | -27.3 |
| 1250.00 | 54.6 | Peak | 0 | 1.2 | v | 23.7 | 4.2 | 36.1 | 46.4 | 74 | -27.6 |
| 1250.00 | 52.3 | Peak | 180 | 1.5 | h | 23.7 | 4.2 | 36.1 | 44.1 | 74 | -29.9 |

| High Channel, 1-25GHz | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2462.00 | 109.1 | Fund/Peak | 270 | 1.6 | v | 28.1 | 3.4 | 35.2 | 105.4 | | |
| 2462.00 | 97.2 | Fund/Peak | 210 | 1.5 | h | 28.1 | 3.4 | 35.2 | 93.5 | | |
| 2462.00 | 104.5 | Fund/Ave | 270 | 1.6 | v | 28.1 | 3.4 | 35.2 | 100.8 | | |
| 2462.00 | 92.6 | Fund/Ave | 210 | 1.5 | h | 28.1 | 3.4 | 35.2 | 88.9 | | |
| 4924.00 | 39.8 | Ave | 60 | 1.2 | v | 32.5 | 4.9 | 33.0 | 44.2 | 54 | -9.8 |
| 1784.50 | 52.3 | Ave | 230 | 1.6 | v | 25.3 | 2.6 | 36.1 | 44.1 | 54 | -9.9 |
| 4924.00 | 37.6 | Ave | 30 | 1.5 | h | 32.5 | 4.9 | 33.0 | 42.0 | 54 | -12.0 |
| 1784.50 | 46.8 | Ave | 290 | 1.8 | h | 25.3 | 2.6 | 36.1 | 38.6 | 54 | -15.4 |
| 4924.00 | 44.3 | Peak | 60 | 1.2 | v | 32.5 | 4.9 | 33.0 | 48.7 | 74 | -25.3 |
| 1784.50 | 56.8 | Peak | 230 | 1.6 | v | 25.3 | 2.6 | 36.1 | 48.6 | 74 | -25.4 |
| 4924.00 | 42.1 | Peak | 30 | 1.5 | h | 32.5 | 4.9 | 33.0 | 46.5 | 74 | -27.5 |
| 1784.50 | 51.2 | Peak | 290 | 1.8 | h | 25.3 | 2.6 | 36.1 | 43.0 | 74 | -31.0 |

| Indicated | | | Table | Antenna | | Correction Factor | | | FCC 15 Subpart B | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Ampl. | Direction | Height | Polar | Antenna | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin |
| MHz | dBμV/m | Degree | Meter | H/V | dBμV/m | dBμV/m | dB | dBμV/m | dBμV/m | dB |
| 77.28 | 48.1 | 180 | 1.5 | h | 9.4 | 1.2 | 28.7 | 29.9 | 40 | -10.1 |
| 480.53 | 42.2 | 310 | 1.8 | v | 18.3 | 3.1 | 28.7 | 34.9 | 46 | -11.1 |
| 172.82 | 45.6 | 90 | 1.5 | v | 13.0 | 1.9 | 28.5 | 32.0 | 43.5 | -11.5 |
| 129.33 | 46.7 | 15 | 1.2 | h | 11.9 | 1.6 | 28.5 | 31.6 | 43.5 | -11.9 |
| 210.95 | 43.4 | 130 | 1.6 | h | 11.9 | 2.2 | 28.2 | 29.3 | 43.5 | -14.2 |
| 227.01 | 40.5 | 270 | 1.2 | v | 11.8 | 2.2 | 28.2 | 26.3 | 46 | -19.7 |

FUND = Fundamental
AVG = average

**Radiated Emission Test Result for 802.11g**

| INDICATED | | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTED AMPLITUDE | FCC 15 SUBPART C | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency MHz | Ampl. dBμV/m | Comments | Angle Degree | Height Meter | Polar H/ V | Antenna dBμV/m | Cable DB | Amp. DB | Corr. Ampl. dBμV/m | Limit dBμV/m | Margin dB |
| Low Channel, 1-25GHz | | | | | | | | | | | |
| 2412.00 | 111.3 | Fund/Peak | 60 | 1.6 | v | 28.1 | 3.4 | 35.2 | 107.6 | | |
| 2412.00 | 97.6 | Fund/Peak | 90 | 1.5 | h | 28.1 | 3.4 | 35.2 | 93.9 | | |
| 2412.00 | 106.5 | Fund/Ave | 60 | 1.6 | v | 28.1 | 3.4 | 35.2 | 102.8 | | |
| 2412.00 | 93.2 | Fund/Ave | 90 | 1.5 | h | 28.1 | 3.4 | 35.2 | 89.5 | | |
| 2390.00 | 53.4 | Ave | 290 | 1.5 | v | 28.1 | 3.4 | 35.1 | 49.8 | 54 | -4.3 |
| 4824.00 | 40.2 | Ave | 180 | 1.8 | v | 32.5 | 4.9 | 33.0 | 44.6 | 54 | -9.4 |
| 4824.00 | 38.1 | Ave | 110 | 1.5 | h | 32.5 | 4.9 | 33.0 | 42.5 | 54 | -11.5 |
| 2390.00 | 45.6 | Ave | 310 | 1.2 | h | 28.1 | 3.4 | 35.1 | 42.0 | 54 | -12.1 |
| 2390.00 | 57.1 | Peak | 290 | 1.5 | v | 28.1 | 3.4 | 35.1 | 53.5 | 74 | -20.6 |
| 4824.00 | 44.8 | Peak | 180 | 1.8 | v | 32.5 | 4.9 | 33.0 | 49.2 | 74 | -24.8 |
| 4824.00 | 42.6 | Peak | 110 | 1.5 | h | 32.5 | 4.9 | 33.0 | 47.0 | 74 | -27.0 |
| 2390.00 | 49.8 | Peak | 310 | 1.2 | h | 28.1 | 3.4 | 35.1 | 46.2 | 74 | -27.9 |
| Middle Channel, 1-25GHz | | | | | | | | | | | |
| 2437.00 | 109.7 | Fund/Peak | 0 | 1.6 | v | 28.1 | 3.4 | 35.2 | 106.0 | | |
| 2437.00 | 97.6 | Fund/Peak | 90 | 1.2 | h | 28.1 | 3.4 | 35.2 | 93.9 | | |
| 2437.00 | 105.5 | Fund/Ave | 0 | 1.6 | v | 28.1 | 3.4 | 35.2 | 101.8 | | |
| 2437.00 | 93.4 | Fund/Ave | 90 | 1.2 | h | 28.1 | 3.4 | 35.2 | 89.7 | | |
| 1250.00 | 53.7 | Ave | 0 | 1.2 | v | 23.7 | 4.2 | 36.1 | 45.5 | 54 | -8.5 |
| 4874.00 | 40.2 | Ave | 310 | 1.5 | v | 32.5 | 4.9 | 33.0 | 44.6 | 54 | -9.4 |
| 4874.00 | 37.8 | Ave | 60 | 1.2 | h | 32.5 | 4.9 | 33.0 | 42.2 | 54 | -11.8 |
| 1250.00 | 49.9 | Ave | 180 | 1.5 | h | 23.7 | 4.2 | 36.1 | 41.7 | 54 | -12.3 |
| 4874.00 | 44.7 | Peak | 310 | 1.5 | v | 32.5 | 4.9 | 33.0 | 49.1 | 74 | -24.9 |
| 1250.00 | 55.9 | Peak | 15 | 1.2 | v | 23.7 | 4.2 | 36.1 | 47.7 | 74 | -26.3 |
| 4874.00 | 42.5 | Peak | 60 | 1.2 | h | 32.5 | 4.9 | 33.0 | 46.9 | 74 | -27.1 |
| 1250.00 | 53.1 | Peak | 180 | 1.5 | h | 23.7 | 4.2 | 36.1 | 44.9 | 74 | -29.1 |

| High Channel, 1-25GHz | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2462.00 | 109.3 | Fund/Peak | 290 | 1.6 | v | 28.1 | 3.4 | 35.2 | 105.6 | | |
| 2462.00 | 97.1 | Fund/Peak | 210 | 1.5 | h | 28.1 | 3.4 | 35.2 | 93.4 | | |
| 2462.00 | 104.6 | Fund/Ave | 290 | 1.6 | v | 28.1 | 3.4 | 35.2 | 100.9 | | |
| 2462.00 | 92.5 | Fund/Ave | 210 | 1.5 | h | 28.1 | 3.4 | 35.2 | 88.8 | | |
| 4924.00 | 39.7 | Ave | 110 | 1.2 | v | 32.5 | 4.9 | 33.0 | 44.1 | 54 | -9.9 |
| 1784.50 | 52.3 | Ave | 230 | 1.6 | v | 25.3 | 2.6 | 36.1 | 44.1 | 54 | -9.9 |
| 4924.00 | 37.5 | Ave | 30 | 1.5 | h | 32.5 | 4.9 | 33.0 | 41.9 | 54 | -12.1 |
| 1784.50 | 46.7 | Ave | 290 | 1.8 | h | 25.3 | 2.6 | 36.1 | 38.5 | 54 | -15.5 |
| 4924.00 | 44.2 | Peak | 110 | 1.2 | v | 32.5 | 4.9 | 33.0 | 48.6 | 74 | -25.4 |
| 1784.50 | 56.6 | Peak | 210 | 1.6 | v | 25.3 | 2.6 | 36.1 | 48.4 | 74 | -25.6 |
| 4924.00 | 42.3 | Peak | 30 | 1.5 | h | 32.5 | 4.9 | 33.0 | 46.7 | 74 | -27.3 |
| 1784.50 | 51.1 | Peak | 270 | 1.5 | h | 25.3 | 2.6 | 36.1 | 42.9 | 74 | -31.1 |

| Indicated | | | Table | Antenna | | Correction Factor | | | FCC 15 Subpart B | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Ampl. | Direction | Height | Polar | Antenna | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin |
| MHz | dBμV/m | Degree | Meter | H/V | dBμV/m | dBμV/m | dB | dBμV/m | dBμV/m | dB |
| 77.28 | 47.9 | 160 | 1.2 | h | 9.4 | 1.2 | 28.7 | 29.7 | 40 | -10.3 |
| 129.33 | 46.5 | 0 | 1.5 | h | 11.9 | 1.6 | 28.5 | 31.4 | 43.5 | -12.1 |
| 172.82 | 45.1 | 110 | 1.5 | v | 13.0 | 1.9 | 28.5 | 31.5 | 43.5 | -12.0 |
| 210.95 | 43.6 | 90 | 1.6 | h | 11.9 | 2.2 | 28.2 | 29.5 | 43.5 | -14.0 |
| 227.01 | 40.3 | 290 | 1.2 | v | 11.8 | 2.2 | 28.2 | 26.1 | 46 | -19.9 |
| 480.53 | 42.1 | 330 | 1.8 | v | 18.3 | 3.1 | 28.7 | 34.8 | 46 | -11.2 |

FUND = Fundamental
AVG = average

# §15.247(a)(2) – 6 DB BANDWIDTH

**Standard Applicable**

According to §15.247(a)(2), for digital modulation technicques, the minimum 6dB bandwidth shall be at least 500 kHz.

**Measurement Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth. (6 dB bandwidth for DTS)
4. Repeat above procedures until all frequencies measured were complete.

**Equipment Lists**

| Manufacturer | Model No. | Description | Calibration Date |
|---|---|---|---|
| HP | 8565EC | Spectrum Analyzer | 2003-06-30 |

**Measurement Result**

**Environmental Conditions**

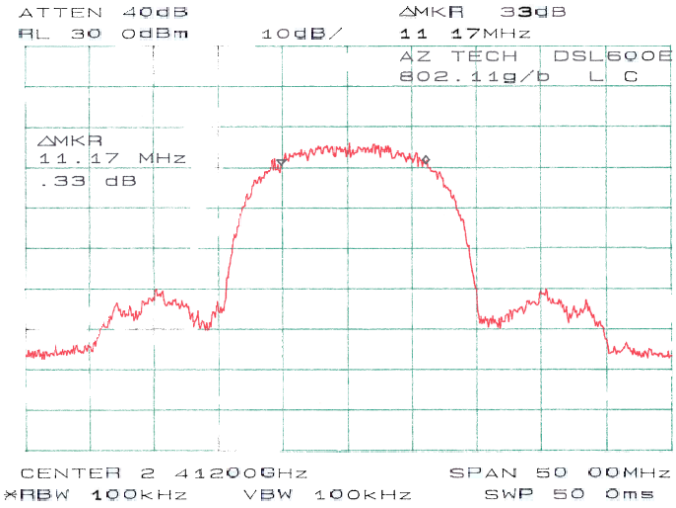
| | |
|---|---|
| Temperature: | 12° C |
| Relative Humidity: | 48% |
| ATM Pressure: | 1100 mbar |

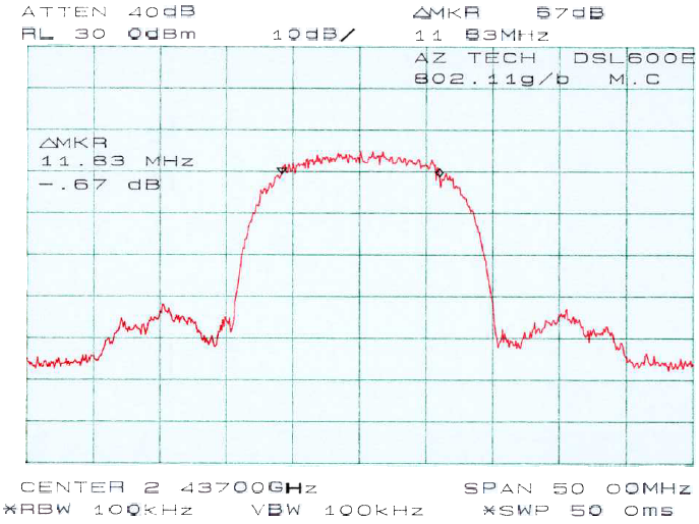
**Test Result for 802.11b (15.247)**

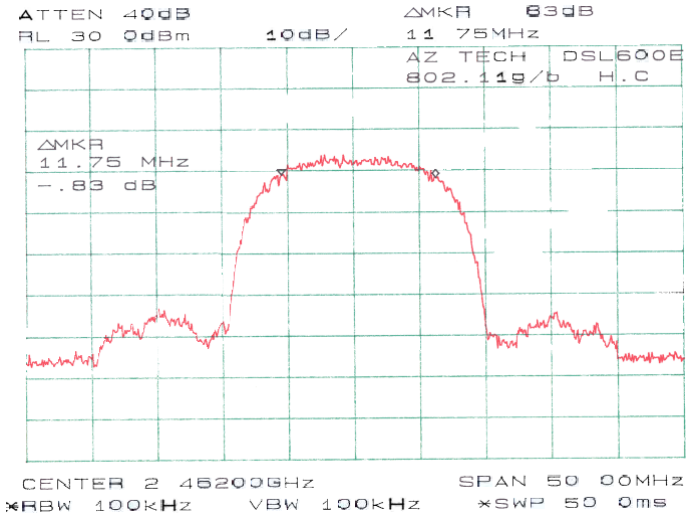
| Channel | Frequency (MHz) | Measured (MHz) | Measured (kHz) | Standard (kHz) | Result |
|---|---|---|---|---|---|
| Low | 2412 | 11.17 | 11170 | ≥ 500 | Pass |
| Mid | 2437 | 11.83 | 11830 | ≥ 500 | Pass |
| High | 2462 | 11.75 | 11750 | ≥ 500 | Pass |

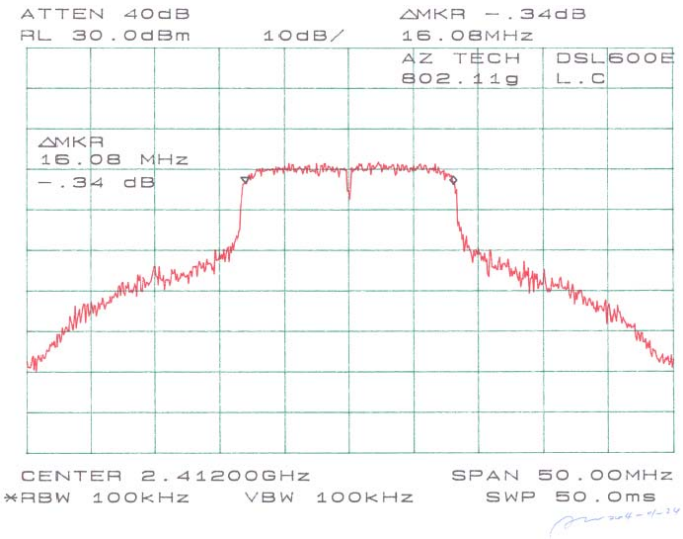
**Test Result for 802.11g (15.247)**

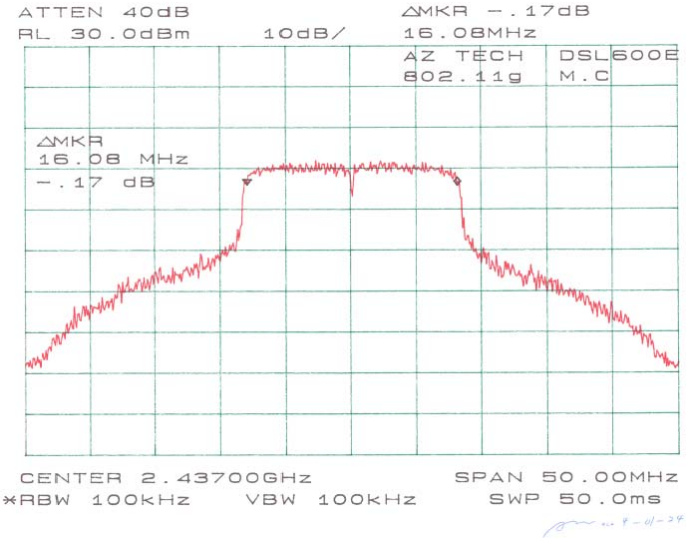
| Channel | Frequency (MHz) | Measured (MHz) | Measured (kHz) | Standard (kHz) | Result |
|---|---|---|---|---|---|
| Low | 2412 | 16.08 | 16080 | ≥ 500 | Pass |
| Mid | 2437 | 16.08 | 16080 | ≥ 500 | Pass |
| High | 2462 | 16.33 | 16330 | ≥ 500 | Pass |

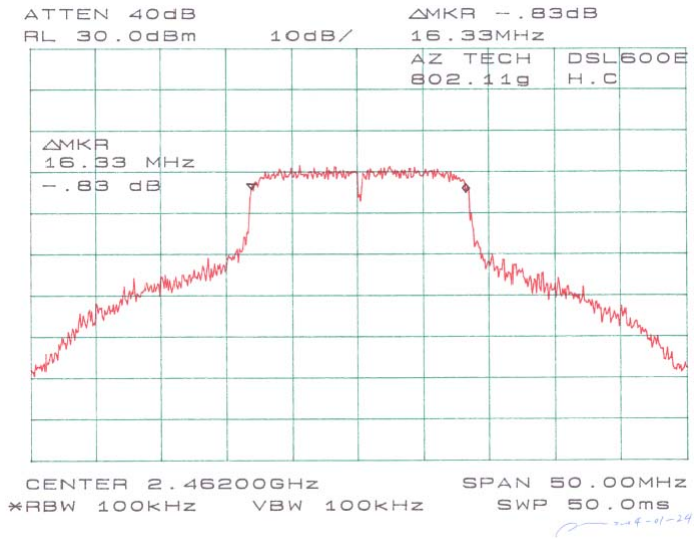

ATTEN 40dB
RL 30 0dBm
10dB/
ΔMKR 33dB
11 17MHz
AZ TECH DSL600E
802.11g/b L C
ΔMKR
11.17 MHz
.33 dB
CENTER 2 412000GHz
SPAN 50 00MHz
*RBW 100kHz
VBW 100kHz
SWP 50 0ms


ATTEN 40dB
RL 30 0dBm
10dB/
ΔMKR 57dB
11 83MHz
AZ TECH DSL600E
802.11g/b M.C
ΔMKR
11.83 MHz
-.67 dB
CENTER 2 437000GHz
SPAN 50 00MHz
*RBW 100kHz
VBW 100kHz
*SWP 50 0ms


ATTEN 40dB
RL 30 0dBm
10dB/
ΔMKR 83dB
11 75MHz
AZ TECH DSL600E
802.11g/b H.C
ΔMKR
11.75 MHz
-.83 dB
CENTER 2 462000GHz
SPAN 50 00MHz
*RBW 100kHz
VBW 100kHz
*SWP 50 0ms


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -.34dB
16.08MHz
AZ TECH 802.11g
DSL600E L.C
ΔMKR
16.08 MHz
-.34 dB
CENTER 2.41200GHz
SPAN 50.00MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -.17dB
16.08MHz
AZ TECH 802.11g
DSL600E M.C
ΔMKR
16.08 MHz
-.17 dB
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -.83dB
16.33MHz
AZ TECH 802.11g
DSL600E H.C
ΔMKR
16.33 MHz
-.83 dB
CENTER 2.46200GHz
SPAN 50.00MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

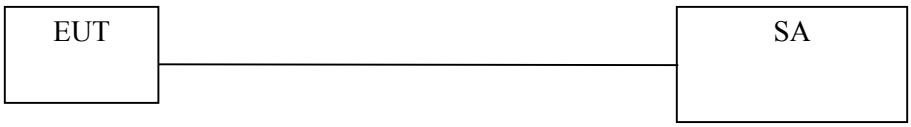
# §15.247(b)(3) - PEAK OUTPUT POWER MEASUREMENT

**Standard Applicable**

According to §15.247(b) (3), for systems using digital modulation in 2400-2483.5 MHz: 1 Watt

**Measurement Procedure**

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.




**Equipment Lists**

| Manufacturer | Model No. | Description | Calibration Date |
|---|---|---|---|
| HP | 8565EC | Spectrum Analyzer | 2003-06-30 |

**Measurement Result**

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 12° C |
| Relative Humidity: | 48% |
| ATM Pressure: | 1100 mbar |

**Output Power (15.247) for 802.11b**

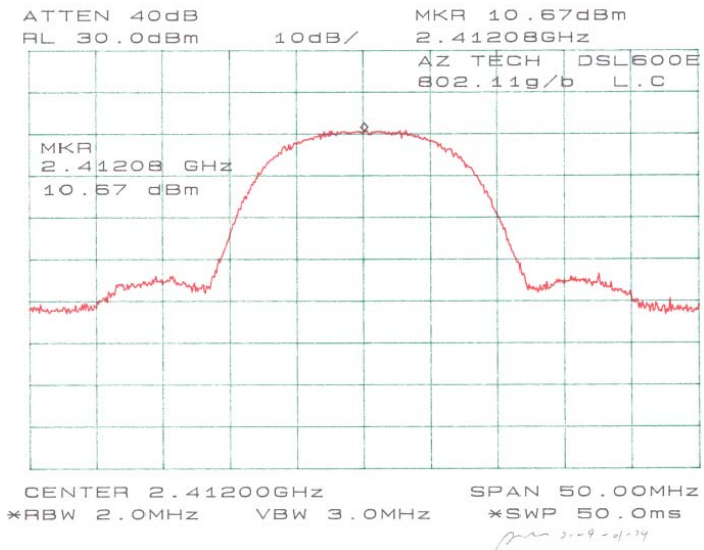
| Channel | Frequency (MHz) | RF Power (dBm) | Correction Factor (dB) | Corrected RF Power (dBm) | Corrected RF Power (W) | Limit |
|---|---|---|---|---|---|---|
| Low (Ch1) | 2412 | 10.67 | 7.6 | 18.27 | 0.067 | 1W (30dBm) |
| Mid (Ch7) | 2437 | 10.50 | 7.6 | 18.10 | 0.065 | 1W (30dBm) |
| High (Ch11) | 2462 | 10.17 | 7.6 | 17.77 | 0.060 | 1W (30dBm) |

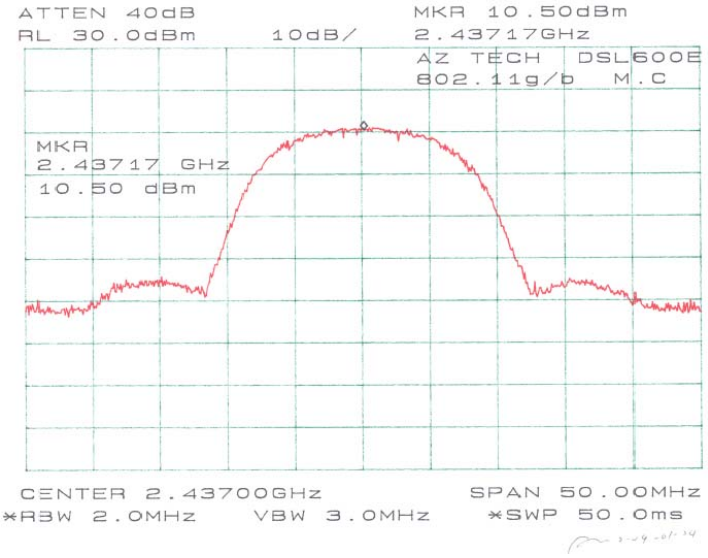
Note: Correction Factor = $10\text{Log}(BW_{6dB}/RBW) = 10\text{Log}(11.5/2) = 7.6$ dB

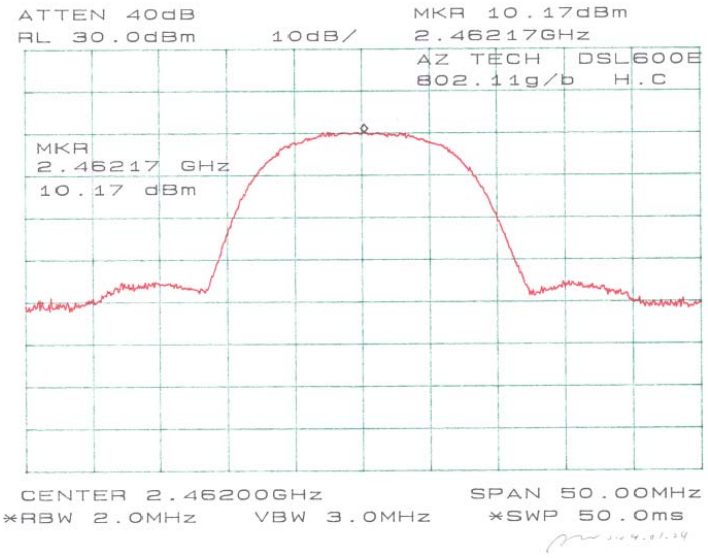
**Output Power (15.247) for 802.11g**

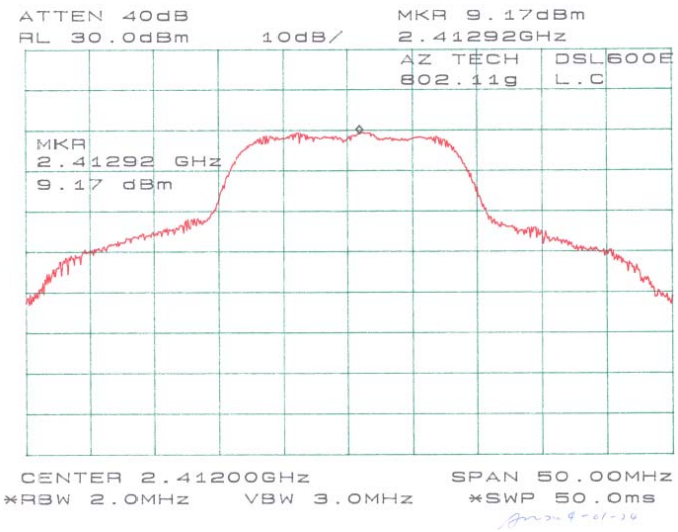
| Channel | Frequency (MHz) | RF Power (dBm) | Correction Factor (dB) | Corrected RF Power (dBm) | Corrected RF Power (W) | Limit |
|---|---|---|---|---|---|---|
| Low (Ch1) | 2412 | 9.17 | 9.03 | 18.20 | 0.066 | 1W (30dBm) |
| Mid (Ch7) | 2437 | 9.00 | 9.03 | 18.03 | 0.064 | 1W (30dBm) |
| High (Ch11) | 2462 | 8.83 | 9.03 | 17.86 | 0.061 | 1W (30dBm) |

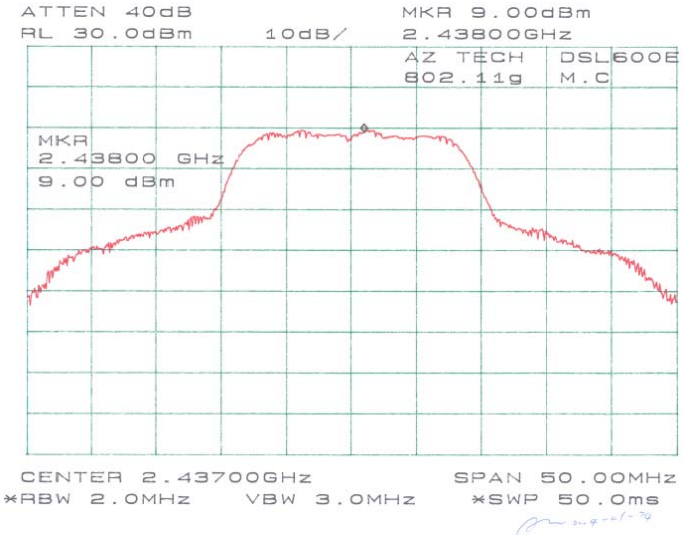
Note: Correction Factor = $10\text{Log}(BW_{6dB}/RBW) = 10\text{Log}(16/2) = 9.03$ dB

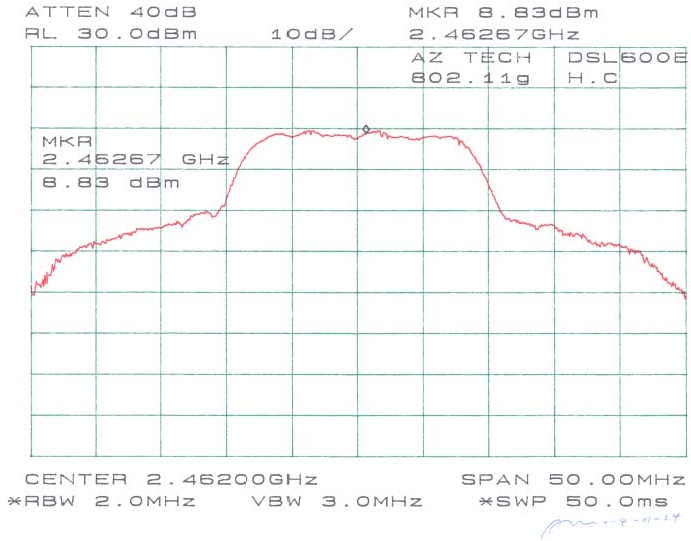

ATTEN 40dB
RL 30.0dBm
10dB/
MKR 10.67dBm
2.41208GHz
AZ TECH DSL600E
802.11g/b L.C
MKR
2.41208 GHz
10.67 dBm
CENTER 2.41200GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 10.50dBm
2.43717GHz
AZ TECH DSL600E
802.11g/b M.C
MKR
2.43717 GHz
10.50 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 10.17dBm
2.46217GHz
AZ TECH DSL600E
802.11g/b H.C
MKR
2.46217 GHz
10.17 dBm
CENTER 2.46200GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 9.17dBm
2.41292GHz
AZ TECH
802.11g
DSL600E
L.C
MKR
2.41292 GHz
9.17 dBm
CENTER 2.41200GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 9.00dBm
2.43800GHz
AZ TECH
802.11g
DSL600E
M.C
MKR
2.43800 GHz
9.00 dBm
CENTER 2.43700GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 8.83dBm
2.46267GHz
AZ TECH
802.11g
DSL600E
H.C
MKR
2.46267 GHz
8.83 dBm
CENTER 2.46200GHz
SPAN 50.00MHz
*RBW 2.0MHz
VBW 3.0MHz
*SWP 50.0ms

# §15.247(c) - 100 KHZ BANDWIDTH OF BAND EDGES

**Standard Applicable**

According to §15.247(c), in *any* 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) see §15.205(c)).

**Measurement Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

**Equipment Lists**

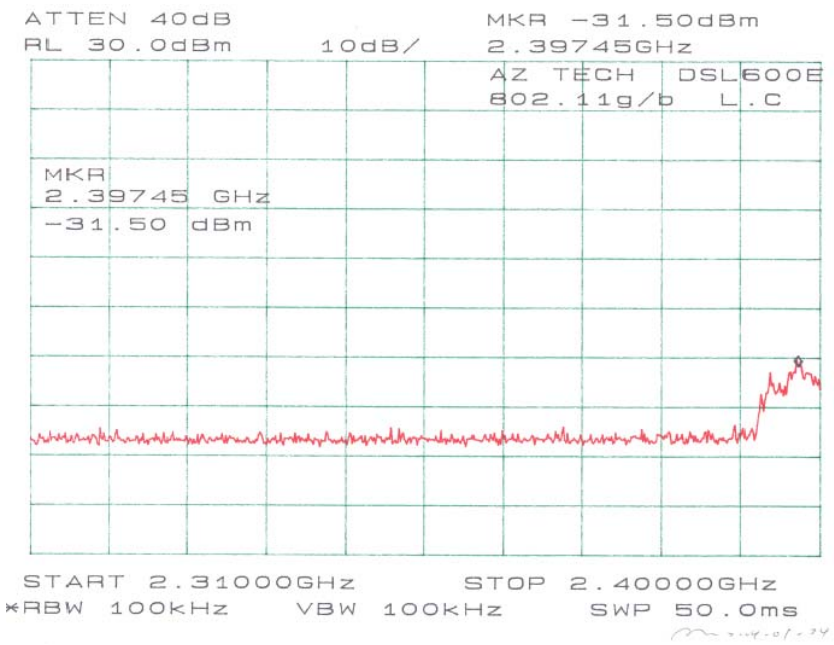
| Manufacturer | Model No. | Description | Calibration Date |
|---|---|---|---|
| HP | 8565EC | Spectrum Analyzer | 2003-06-30 |

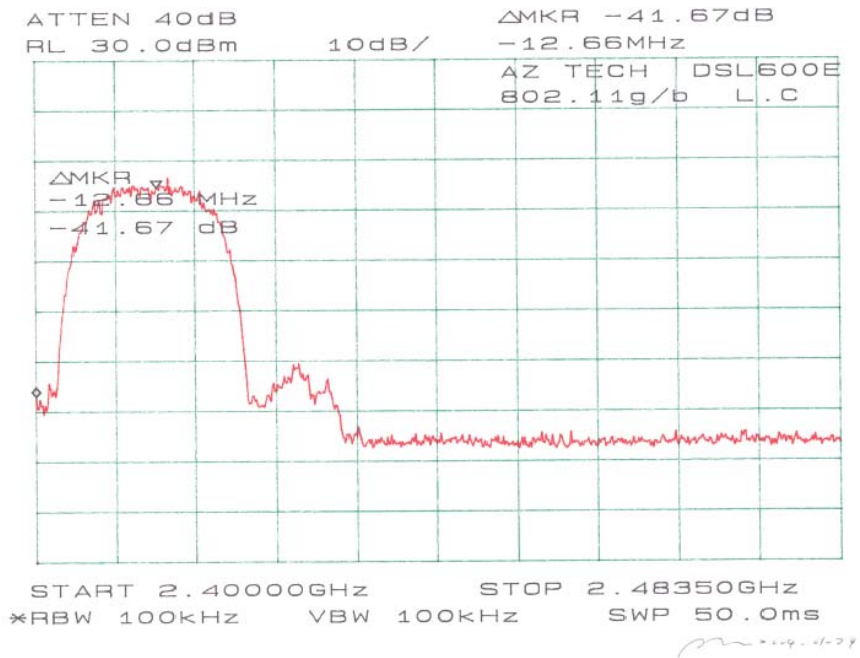
**Measure Results**

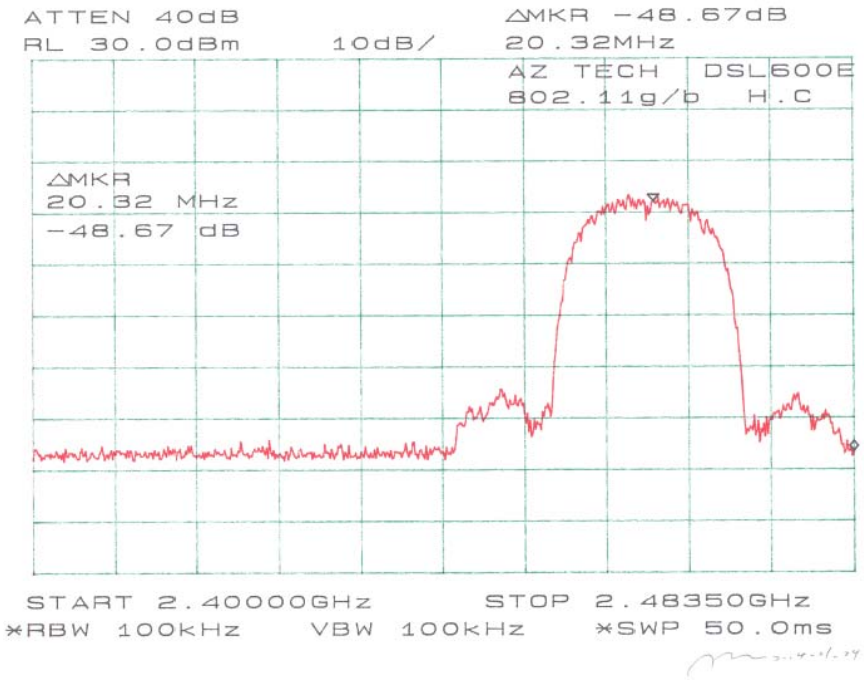
**Environmental Conditions**

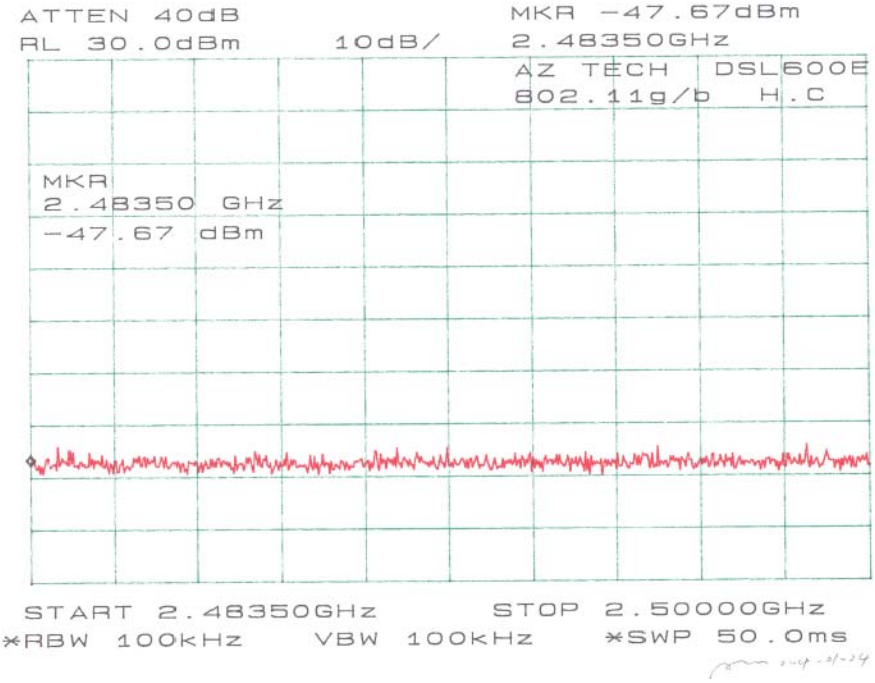
| | |
|---|---|
| Temperature: | 12° C |
| Relative Humidity: | 48% |
| ATM Pressure: | 1100 mbar |

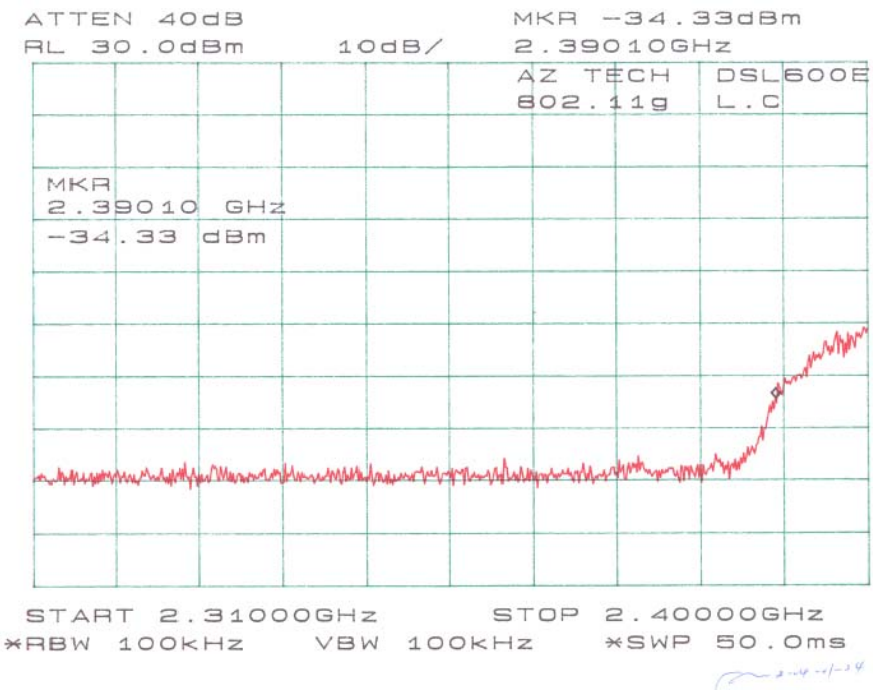
Please refer to following pages for plots of band edge.

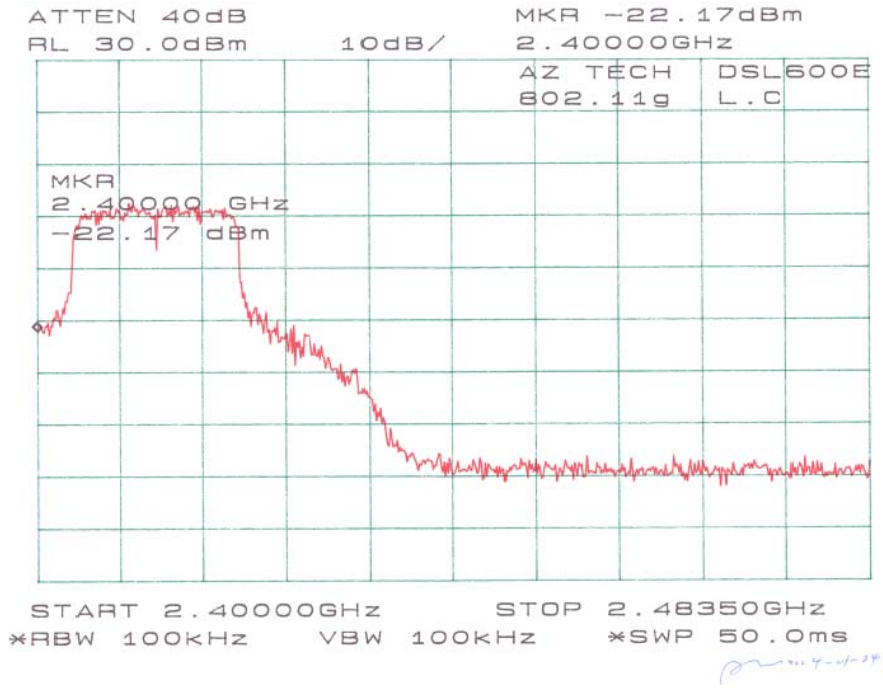

ATTEN 40dB
RL 30.0dBm
10dB/
MKR -31.50dBm
2.39745GHz
AZ TECH DSL600E
802.11g/b L.C
MKR
2.39745 GHz
-31.50 dBm
START 2.31000GHz
STOP 2.40000GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

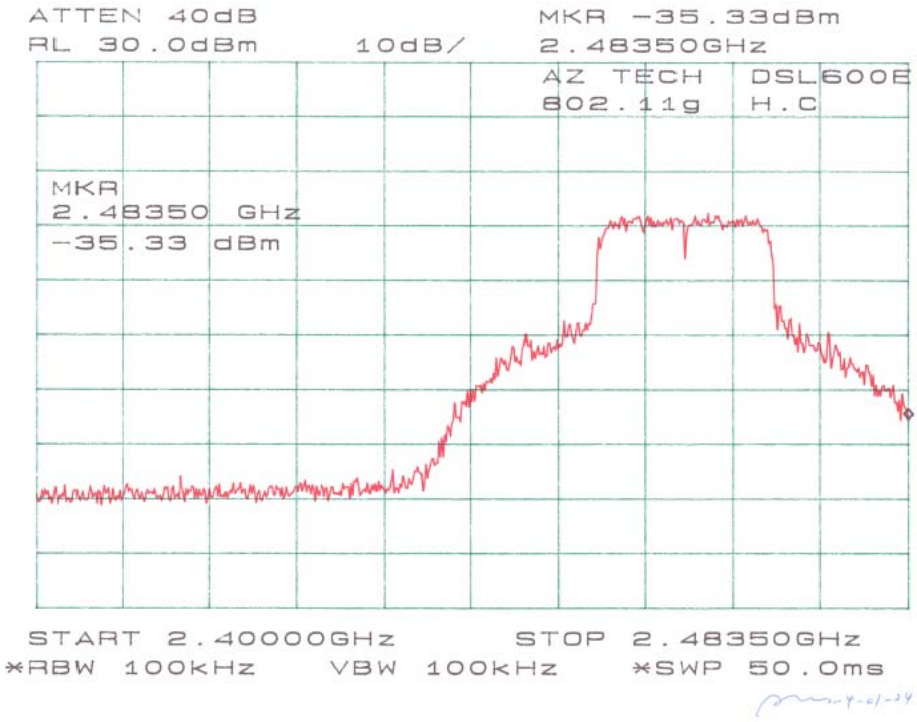

ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -41.67dB
-12.66MHz
AZ TECH DSL600E
802.11g/b L.C
ΔMKR
-12.66 MHz
-41.67 dB
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

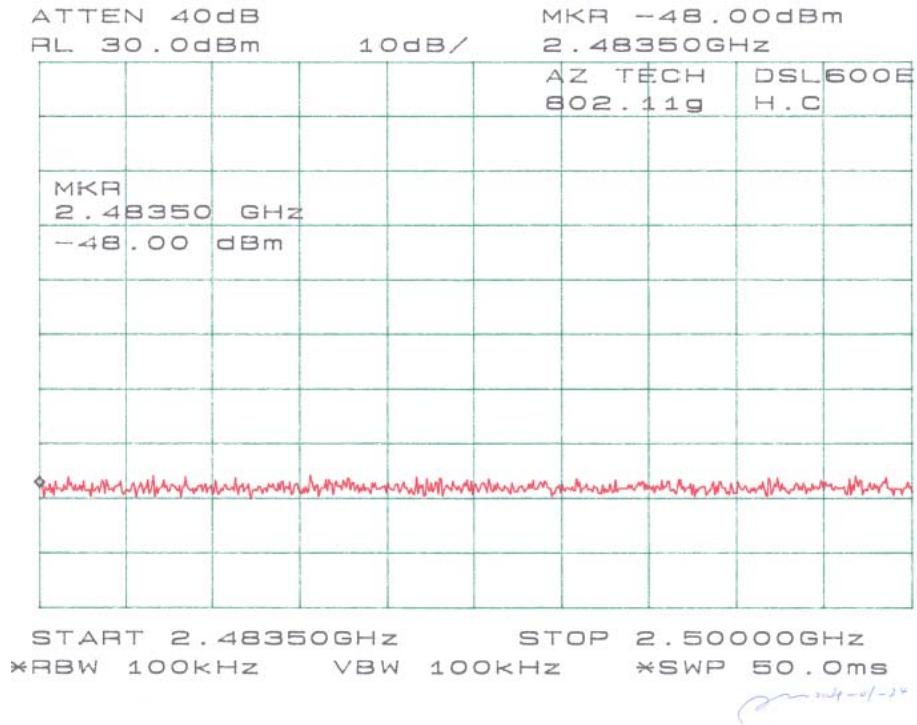

ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -48.67dB
20.32MHz
AZ TECH DSL600E
802.11g/b H.C
ΔMKR
20.32 MHz
-48.67 dB
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -47.67dBm
2.48350GHz
AZ TECH DSL600E
802.11g/b H.C
MKR
2.48350 GHz
-47.67 dBm
START 2.48350GHz
STOP 2.50000GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -34.33dBm
2.39010GHz
AZ TECH
802.11g
DSL600E
L.C
MKR
2.39010 GHz
-34.33 dBm
START 2.31000GHz
STOP 2.40000GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -22.17dBm
2.40000GHz
AZ TECH
802.11g
DSL600E
L.C
MKR
2.40000 GHz
-22.17 dBm
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -35.33dBm
2.48350GHz
AZ TECH DSL600E
802.11g H.C
MKR
2.48350 GHz
-35.33 dBm
START 2.40000GHz
STOP 2.48350GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -48.00dBm
2.48350GHz
AZ TECH DSL600E
802.11g H.C
MKR
2.48350 GHz
-48.00 dBm
START 2.48350GHz
STOP 2.50000GHz
*RBW 100kHz
VBW 100kHz
*SWP 50.0ms

# §15.247(d) - POWER SPECTRAL DENSITY

**Standard Applicable**

According to §15.247 (d), for direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

**Measurement Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 6MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value. (DTS)
4. Adjust the center frequency of SA on any frequency be measured and set SA to 50MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value. (UNII)
5. Repeat above procedures until all frequencies measured were complete.

**Equipment Lists**

| Manufacturer | Model No. | Description | Calibration Date |
|---|---|---|---|
| HP | 8565EC | Spectrum Analyzer | 2003-01-22 |

## Measurement Results

### Environmental Conditions

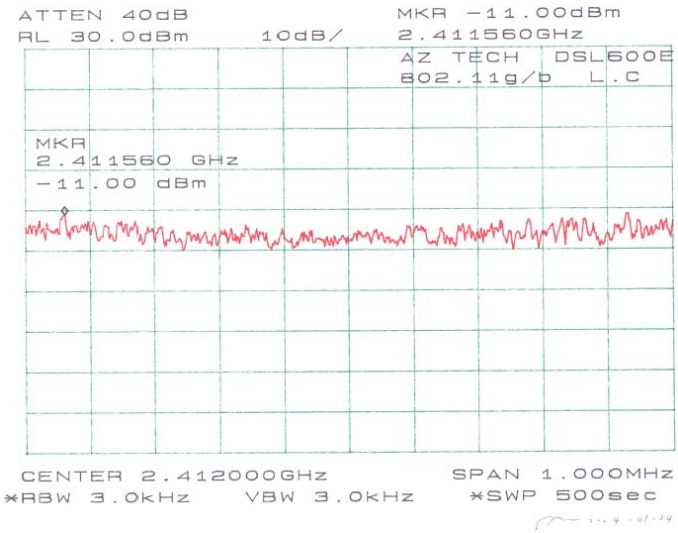
| | |
|---|---|
| Temperature: | 12° C |
| Relative Humidity: | 48% |
| ATM Pressure: | 1100 mbar |

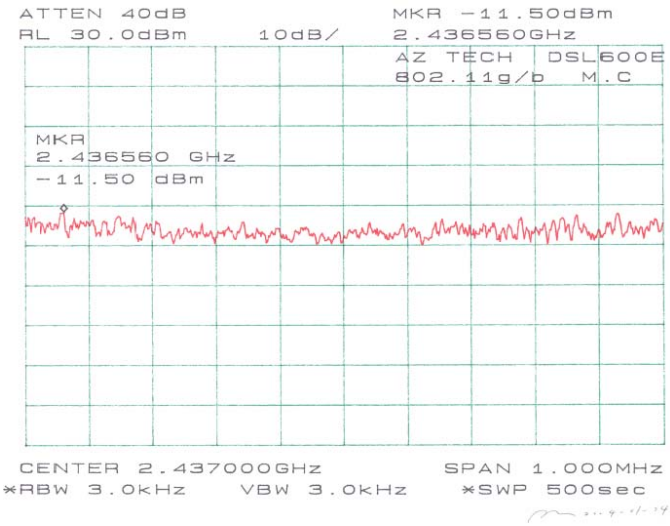
### Test Result for 802.11b (15.247)

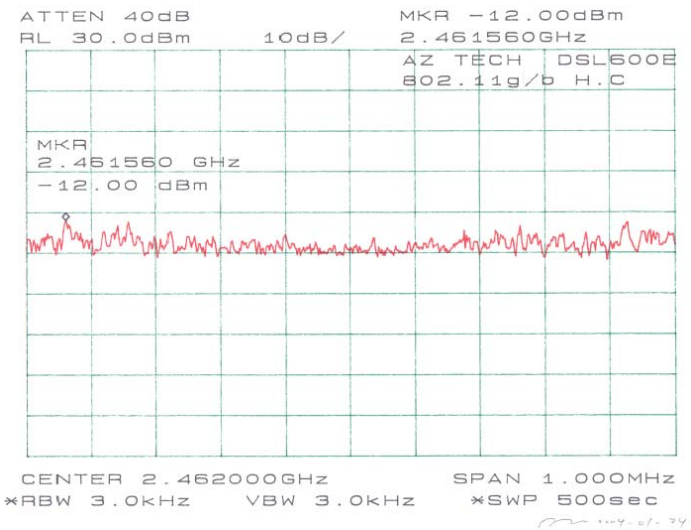
| Channel | Frequency (MHz) | Peak Power Spectral Density (dBm) | Standard (dBm) | Result |
|---|---|---|---|---|
| Low | 2412 | -11.00 | ≤ 8 | Pass |
| Mid | 2437 | -11.50 | ≤ 8 | Pass |
| High | 2462 | -12.00 | ≤ 8 | Pass |

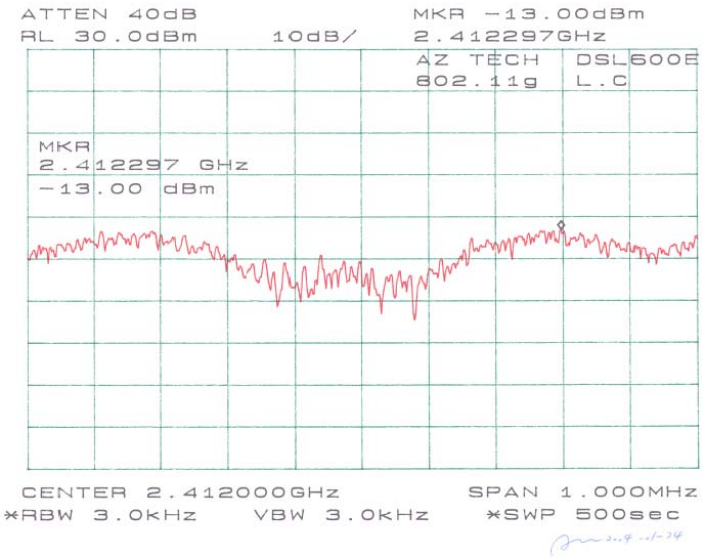
### Test Result for 802.11g (15.247)

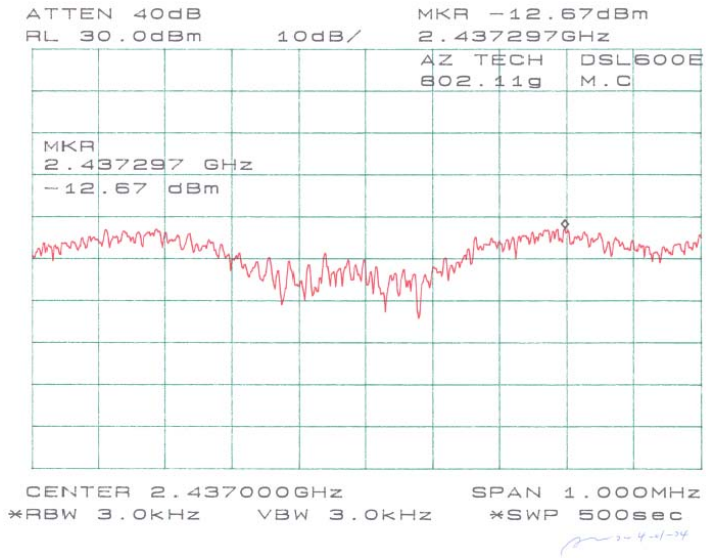
| Channel | Frequency (MHz) | Peak Power Spectral Density (dBm) | Standard (dBm) | Result |
|---|---|---|---|---|
| Low | 2412 | -13.00 | ≤ 8 | Pass |
| Mid | 2437 | -12.67 | ≤ 8 | Pass |
| High | 2462 | -12.83 | ≤ 8 | Pass |

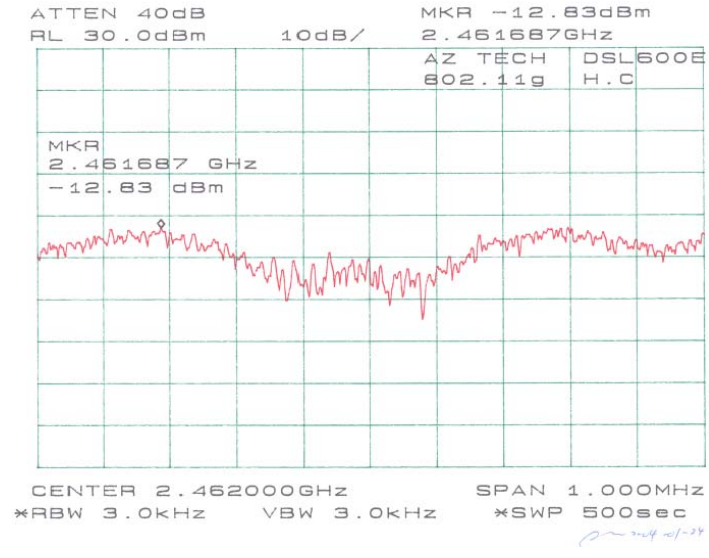

ATTEN 40dB
RL 30.0dBm
10dB/
MKR -11.00dBm
2.411560GHz
AZ TECH DSL600E
802.11g/b L.C
MKR
2.411560 GHz
-11.00 dBm
CENTER 2.412000GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -11.50dBm
2.436560GHz
AZ TECH DSL600E
802.11g/b M.C
MKR
2.436560 GHz
-11.50 dBm
CENTER 2.437000GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -12.00dBm
2.461560GHz
AZ TECH DSL600E
802.11g/b H.C
MKR
2.461560 GHz
-12.00 dBm
CENTER 2.462000GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -13.00dBm
2.412297GHz
AZ TECH
802.11g
DSL600E
L.C
MKR
2.412297 GHz
-13.00 dBm
CENTER 2.412000GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -12.67dBm
2.437297GHz
AZ TECH
802.11g
DSL600E
M.C
MKR
2.437297 GHz
-12.67 dBm
CENTER 2.437000GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -12.83dBm
2.461687GHz
AZ TECH
802.11g
DSL600E
H.C
MKR
2.461687 GHz
-12.83 dBm
CENTER 2.462000GHz
SPAN 1.000MHz
*RBW 3.0kHz
VBW 3.0kHz
*SWP 500sec