# FCC CFR47 PART 15 SUBPART C
# CERTIFICATION
# TEST REPORT

**FOR**

**802.11b/g WIRELESS ROUTER**

**MODEL NUMBER: WGR614v2**

**BRAND NAME: NETGEAR**

**FCC ID: PY3WGR614V2**

**REPORT NUMBER: 03U1974-1**

**ISSUE DATE: JUNE 12, 2003**

*Prepared for*
**NETGEAR INC.**
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**SANTA CLARA**
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*Prepared by*
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# 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** NETGEAR INC.
4500 GREAT AMERICA PARKWAY
SANTA CLARA, CA 95054, USA

**EUT DESCRIPTION:** 802.11b/g WIRELESS ROUTER

**MODEL:** WGR614v2

**DATE TESTED:** MAY 14 – JUNE 7, 2003

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

Compliance Certification Services, Inc. tested the above equipment in accordance with the 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.

Approved & Released For CCS By:

MIKE HECKROTTE
CHIEF ENGINEER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

NEELESH RAJ
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

# 2. EUT DESCRIPTION

The EUT is an 802.11b/g access point operating in the 2400 to 2483.5 MHz range. It has a peak output power of 26.5 dBm (447 mW) and an antenna gain of 1.8 dBi.

# 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/1992, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

# 4. FACILITIES AND ACCREDITATION

## 4.1. 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.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

## 4.2. 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 | 1300 |
| Japan | VCCI | CISPR 22 Two OATS and one conducted Site | 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 | 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 | ELA-171 |
| Taiwan | BSMI | CNS 13438 | SL2-IN-E-1012 |
| Canada | Industry Canada | RSS210 Low Power Transmitter and Receiver | IC2324 A,B,C, and F |

# 5. CALIBRATION AND UNCERTAINTY

## 5.1. MEASURING INSTRUMENT CALIBRATION

The measurement instruments utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer's recommendations, and are traceable to national standards.

## 5.2. MEASUREMENT UNCERTAINTY

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

| | |
|---|---|
| Radiated Emission, 30 to 200 MHz | +/- 3.3 dB |
| Radiated Emission, 200 to 1000 MHz | +4.5 / -2.9 dB |
| Radiated Emission, 1000 to 2000 MHz | +4.5 / -2.9 dB |
| Power Line Conducted Emission | +/- 2.9 dB |

Uncertainty figures are valid to a confidence level of 95%.

## 5.3. 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 |
| Quasi-Peak Adapter | HP | 85650A | 2521A01038 | 7/16/04 |
| SA Display Section | HP | 85662A | 2314A04793 | 7/16/04 |
| SA RF Section | HP | 85680A | 2314A02604 | 7/16/04 |
| Horn Antenna (1 - 18GHz) | EMCO | 3115 | 6739 | 2/4/04 |
| Antenna, Biconical | Eaton | 94455-1 | 1214 | 3/6/04 |
| Antenna, Log Periodic 200-1000MHz | EMCO | 3146 | 9107-3163 | 3/06/04 |
| Preamplifier | Miteq | NSP10023988 | 646456 | 4/26/04 |
| Spectrum Analyzer | HP | 8564E | 3943A01643 | 7/22/03 |
| High Pass Filter (4.57GHz) | FSY Microwave | FM-4570-9SS | 003 | N.C.R. |
| Spectrum Analyzer | Agilent | E4446A | US42070220 | 03/01/04 |
| Power Meter | Agilent | E4416A | GB41291150 | 08/09/03 |
| Power Sensor | Agilent | E9327A | US40440755 | 08/09/03 |

# 6. 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 | NA | J291200E8019 | Doc |
| Power Adapter | Toshiba | PA3083U-1ACA | 0536906G | Doc |
| USB to RJ45 Converter | Netgear | FA101 | NA | DOC |
| 5V DC power adapter | Switching Adapter | RHC-060200-1 | 0319 | DOC |

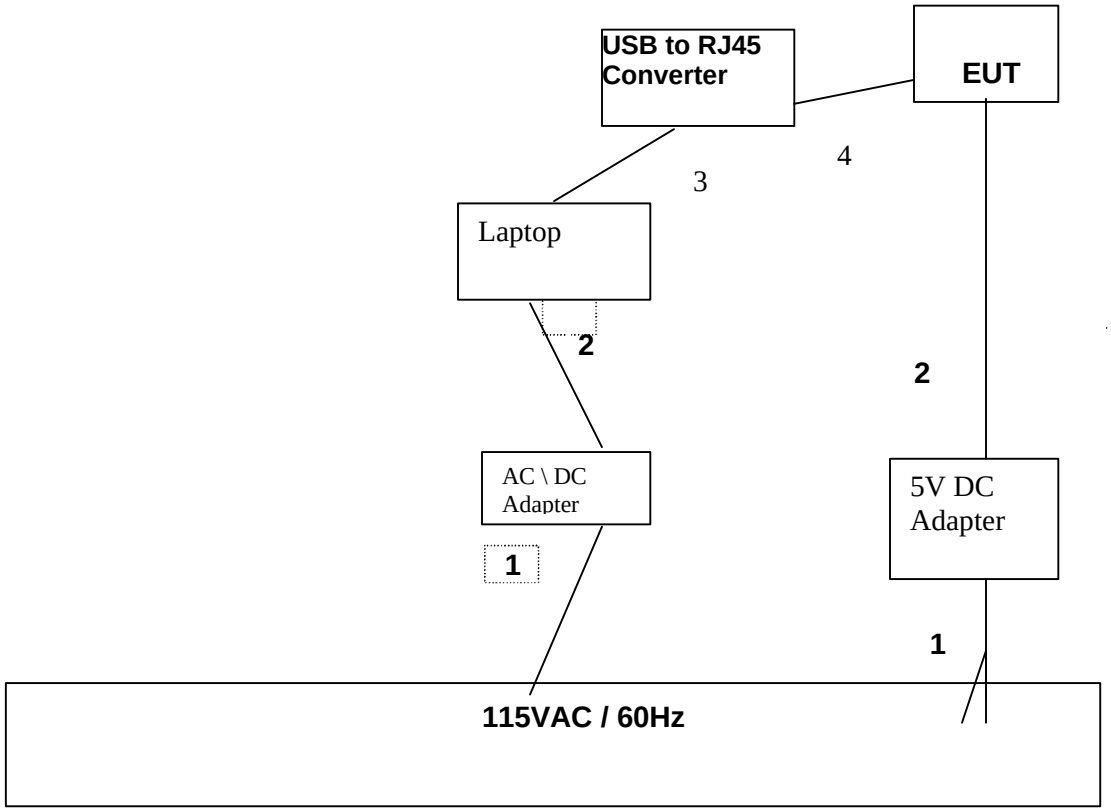
## I/O CABLES

| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks |
|---|---|---|---|---|---|---|
| 1 | AC | 2 | US115V | Un-Shielded | 2m | NA |
| 2 | DC | 2 | DC | Un-Shielded | 2m | Integral with adapter |
| 2 | USB | 1 | USB | Un-Shielded | 2m | NA |
| 4 | RJ45 | 2 | RJ45 | Un-Shielded | 2m | NA |

## TEST SETUP

The EUT was controlled by the laptop via the USB to Ethernet adapter.

**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 |
| Laptop | Toshiba | NA | J291200E8019 | Doc |
| Power Adapter | Toshiba | PA3083U-1ACA | 0536906G | Doc |
| MOUSE | HP | M-S34 | LZB75062022 | DZL211029 |
| PRINTER | HP | 2225C | 2541S41679 | BS46XU2225C |
| USB to RJ45 Converter | Netgear | FA101 | NA | DOC |
| 5V DC power adapter | Switching Adapter | RHC-060200-1 | 0319 | DOC |

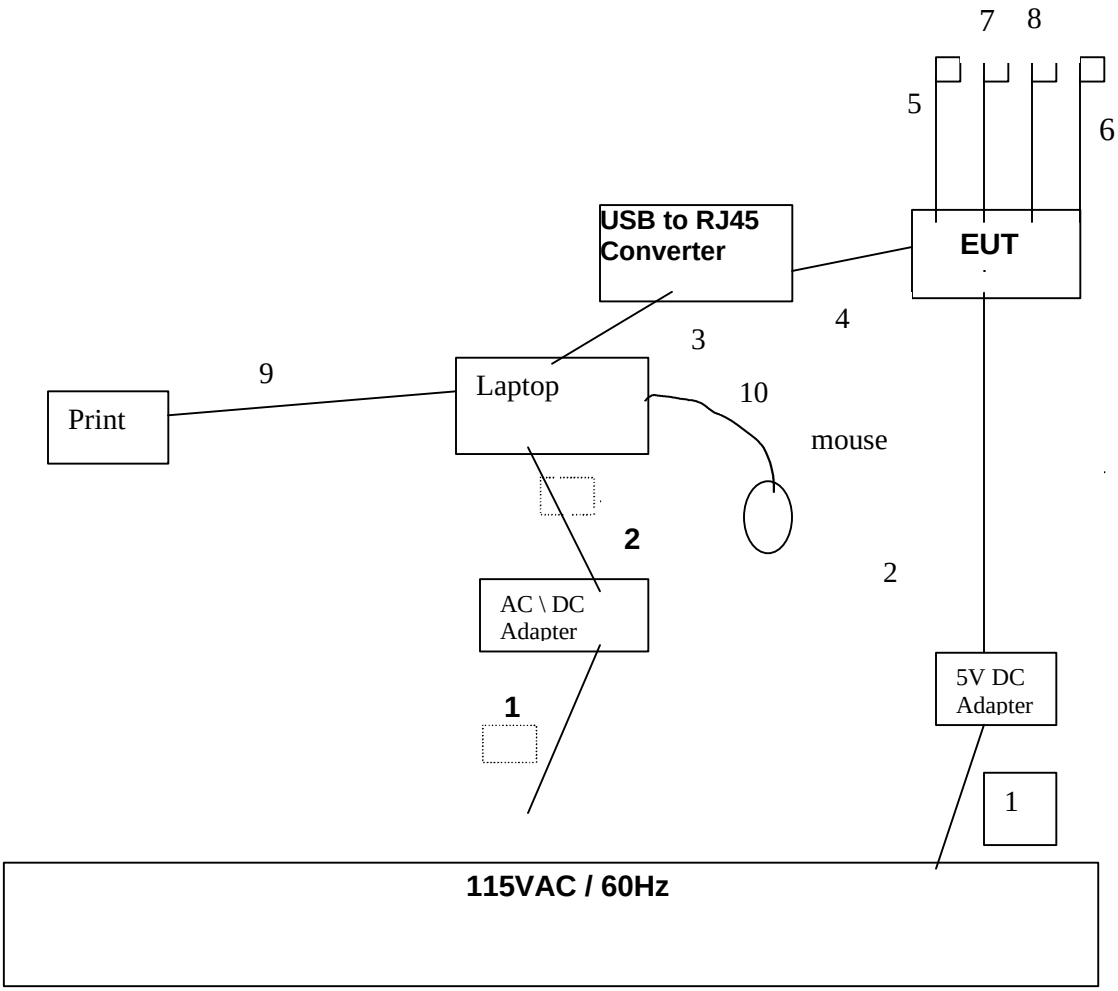
### I/O CABLES

| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks |
|---|---|---|---|---|---|---|
| 1 | AC | 2 | US115V | Un-Shielded | 2m | NA |
| 2 | DC | 2 | DC | Un-Shielded | 2m | Integral with adapter |
| 3 | USB | 1 | USB | Shielded | 2m | NA |
| 4 | RJ45 | 2 | RJ45 | Un-Shielded | 2m | NA |
| 5 | RJ45 | 2 | RJ45 | Un-Shielded | 5m | NA |
| 6 | RJ45 | 2 | RJ45 | Un-Shielded | 5m | NA |
| 7 | RJ45 | 2 | RJ45 | Un-Shielded | 5m | NA |
| 8 | RJ45 | 2 | RJ45 | Un-Shielded | 5m | NA |
| 9 | Parallel | 1 | DB25 | Un-Shielded | 2m | NA |
| 10 | Mouse | 1 | Mini | Shielded | 1m | Integral with mouse |

### TEST SETUP

The EUT was controlled by the laptop via the USB to Ethernet adapter.

**SETUP DIAGRAM FOR DIGITAL DEVICE TESTS**



# 7. APPLICABLE RULES AND TEST RESULTS

## 7.1. 6 dB BANDWIDTH

**LIMIT**

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled.

**RESULTS**

No non-compliance noted:

802.11b Mode

| Channel | Frequency (MHz) | 6 dB Bandwidth (kHz) | Minimum Limit (kHz) | Margin (kHz) |
|---|---|---|---|---|
| Low | 2412 | 11098 | 500 | 10598 |
| Middle | 2437 | 11590 | 500 | 11090 |
| High | 2462 | 12536 | 500 | 12036 |

802.11g Normal Mode

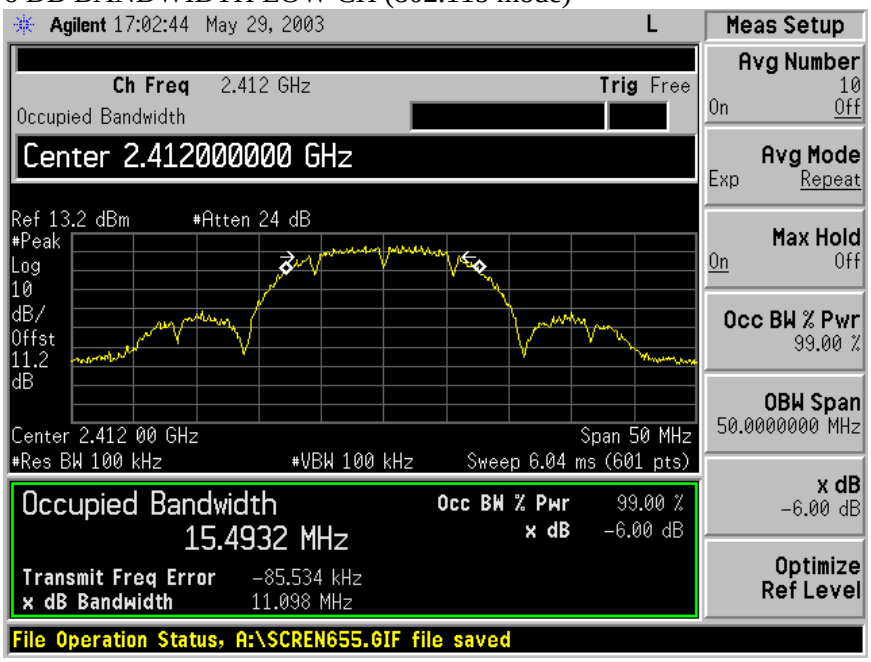
| Channel | Frequency (MHz) | 6 dB Bandwidth (kHz) | Minimum Limit (kHz) | Margin (kHz) |
|---|---|---|---|---|
| Low | 2412 | 16489 | 500 | 15989 |
| Middle | 2437 | 16485 | 500 | 15985 |
| High | 2462 | 16511 | 500 | 16011 |

802.11g Turbo Mode

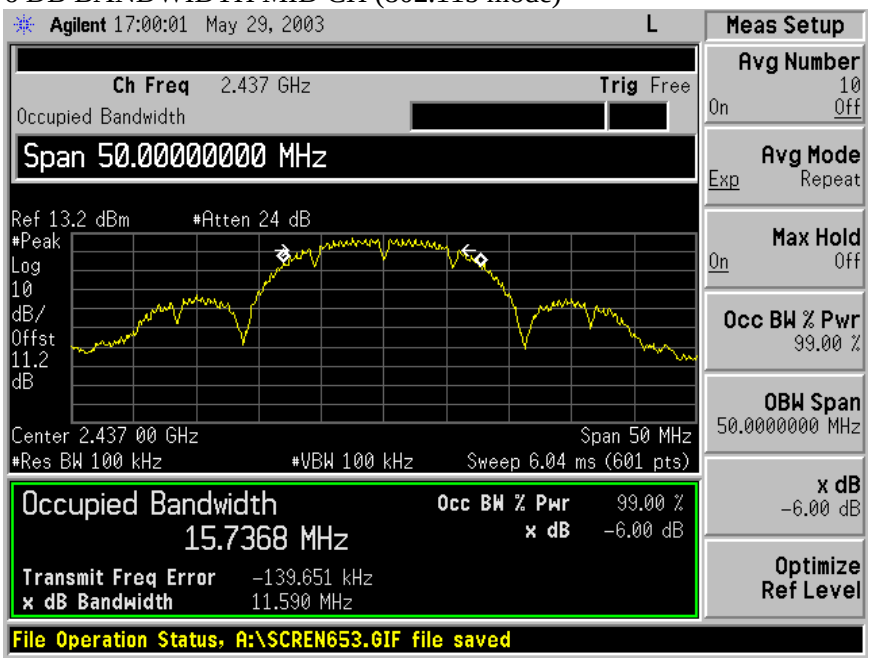
| Channel | Frequency (MHz) | 6 dB Bandwidth (kHz) | Minimum Limit (kHz) | Margin (kHz) |
|---|---|---|---|---|
| Middle | 2437 | 31633 | 500 | 31133 |

## 6 DB BANDWIDTH (802.11b MODE)

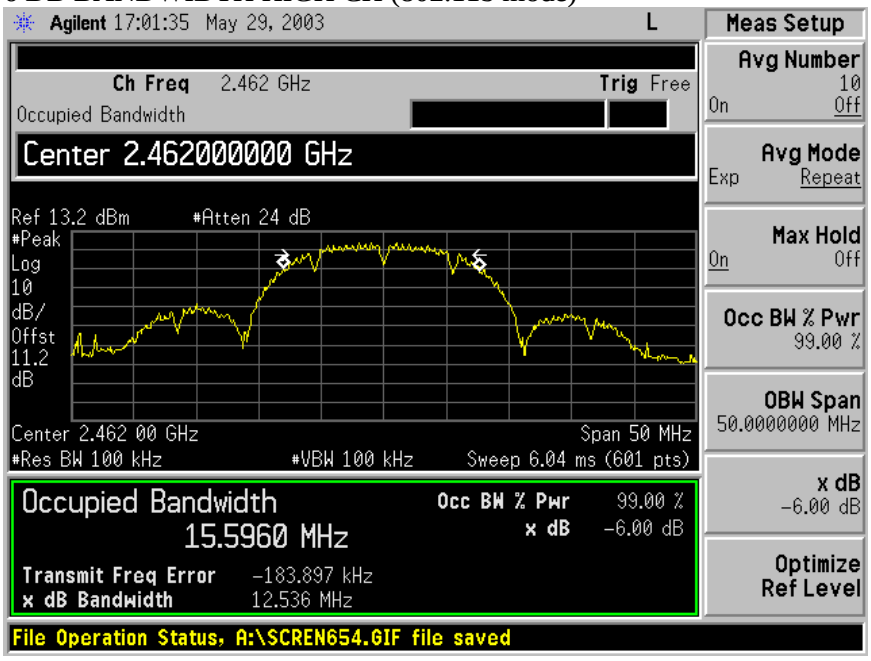
6 DB BANDWIDTH LOW CH (802.11b mode)



6 DB BANDWIDTH MID CH (802.11b mode)

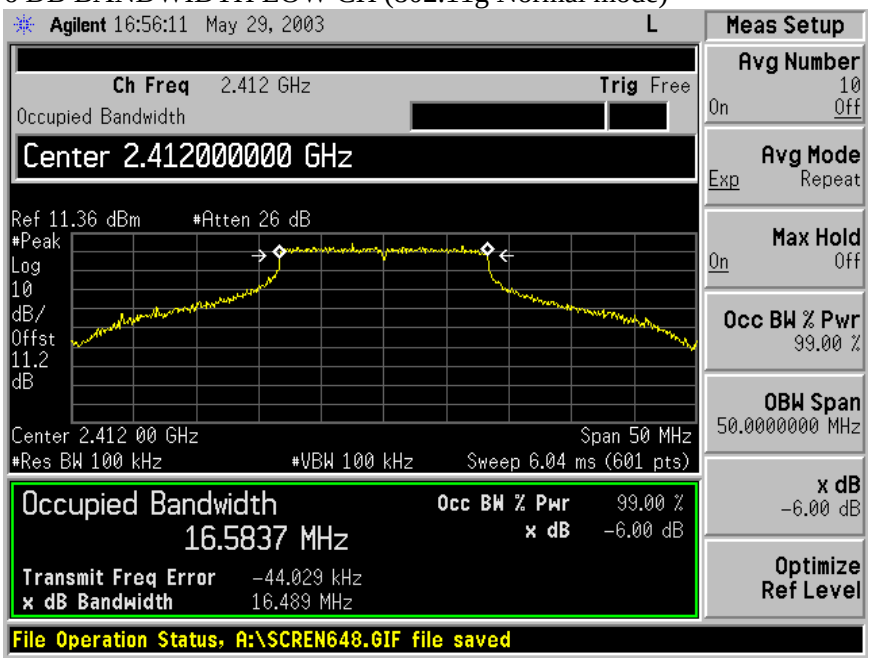


6 DB BANDWIDTH HIGH CH (802.11b mode)

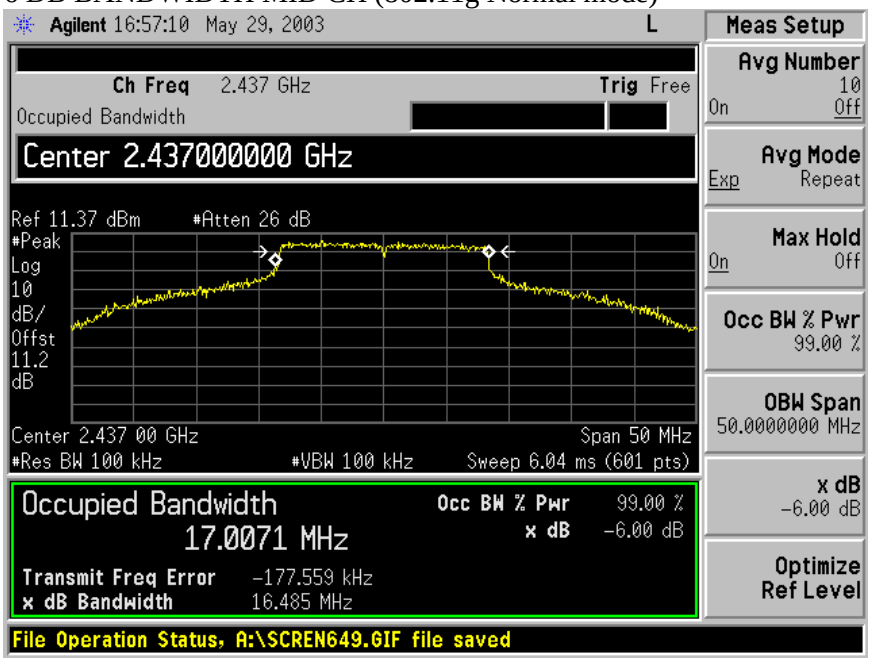


## 6 DB BANDWIDTH (802.11g NORMAL MODE)

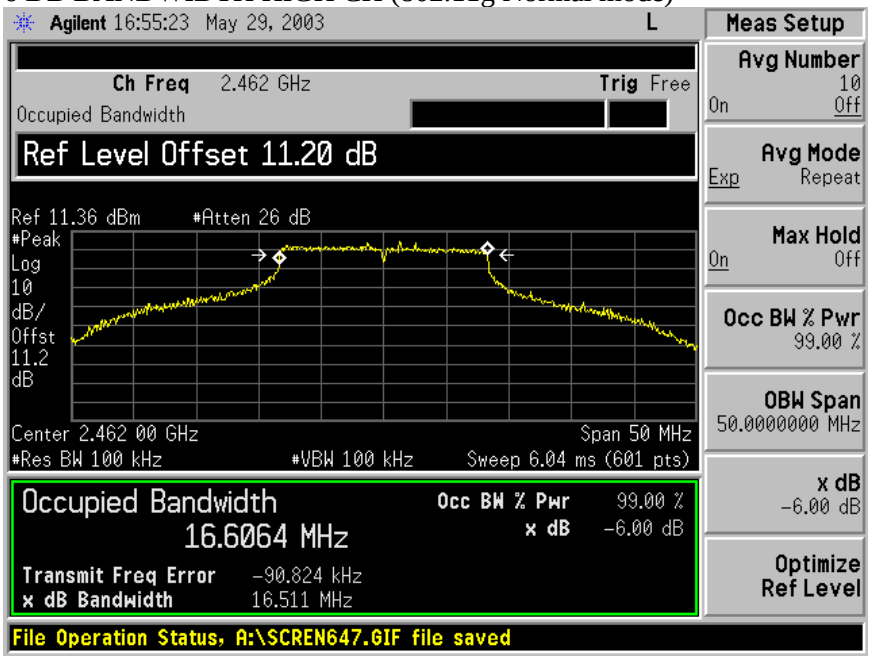
6 DB BANDWIDTH LOW CH (802.11g Normal mode)



6 DB BANDWIDTH MID CH (802.11g Normal mode)

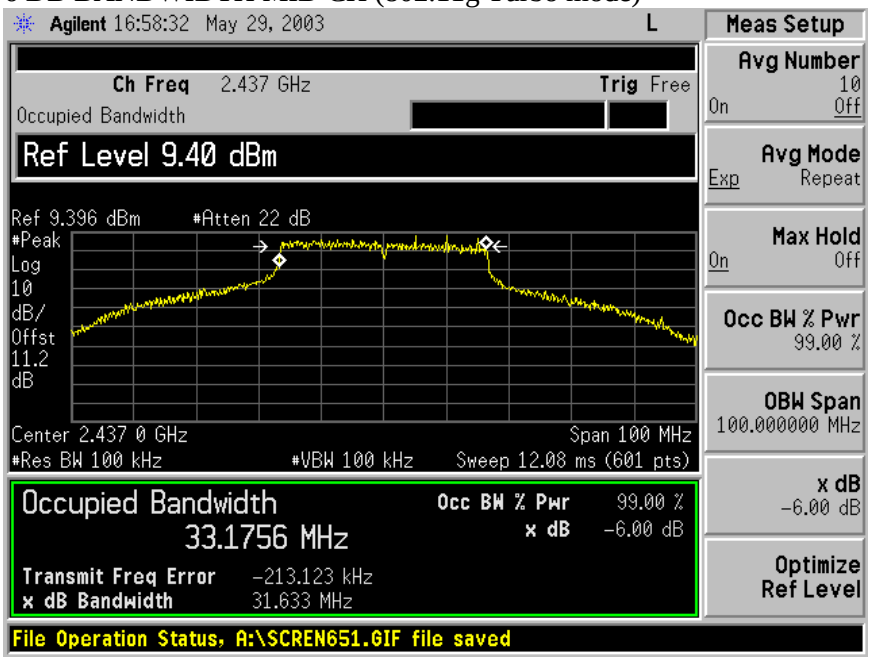


6 DB BANDWIDTH HIGH CH (802.11g Normal mode)



## 6 DB BANDWIDTH (802.11g TURBO MODE)

6 DB BANDWIDTH MID CH (802.11g Turbo mode)



## 7.2. OUTPUT POWER

**PEAK POWER LIMIT**

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

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 1.8 dBi, therefore the limit is 30 dBm.

**AVERAGE POWER LIMIT**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter. The power meter is set to simultaneously read peak power and average power.

## RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.2 dB (including 10 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

| Channel | Frequency (MHz) | Average Power (dBm) | Peak Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| Low | 2412 | 20.4 | 21.8 | 30 | -8.2 |
| Middle | 2437 | 20 | 21.3 | 30 | -8.7 |
| High | 2462 | 20 | 21.4 | 30 | -8.6 |

802.11g Normal Mode

| Channel | Frequency (MHz) | Average Power (dBm) | Peak Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| Low | 2412 | 17.6 | 25 | 30 | -5 |
| Middle | 2437 | 20 | 26.5 | 30 | -3.5 |
| High | 2462 | 17.3 | 24.9 | 30 | -5.1 |

802.11g Turbo Mode

| Channel | Frequency (MHz) | Average Power (dBm) | Peak Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|
| Middle | 2437 | 19.6 | 25 | 30 | -5 |

## 7.3. MAXIMUM PERMISSIBLE EXPOSURE

**LIMITS**

§15.247 (b) (5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See §1.1307(b)(1) of this chapter.

**CALCULATIONS**

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E \wedge 2 / 3770$

where

E = Field Strength in Volts / meter
P = Power in Watts
G = Numeric antenna gain
d = distance in meters
S = Power Density in milliwatts / square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW / cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S} \qquad \text{Equation (1)}$$

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW / cm^2

Equation (1) and the measured peak power is used to calculate the MPE distance.

## LIMITS

S = 1.0 mW / cm^2 from 1.1310 Table 1

## RESULTS

No non-compliance noted:

| Mode | Power Density Limit (mW/cm^2) | Output Power (dBm) | Antenna Gain (dBi) | MPE Distance (cm) |
|---|---|---|---|---|
| 802.11b | 1.0 | 21.80 | 1.80 | 4.27 |
| 802.11g Normal | 1.0 | 26.50 | 1.80 | 7.33 |
| 802.11g Turbo | 1.0 | 25.00 | 1.80 | 6.17 |

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

## 7.4. PEAK POWER SPECTRAL DENSITY

**LIMIT**

§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.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW >= 3KHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

**RESULTS**

No non-compliance noted:

802.11b Mode

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2412 | -1.7 | 8 | -9.7 |
| Middle | 2437 | -2.02 | 8 | -10.02 |
| High | 2462 | -2.36 | 8 | -10.36 |

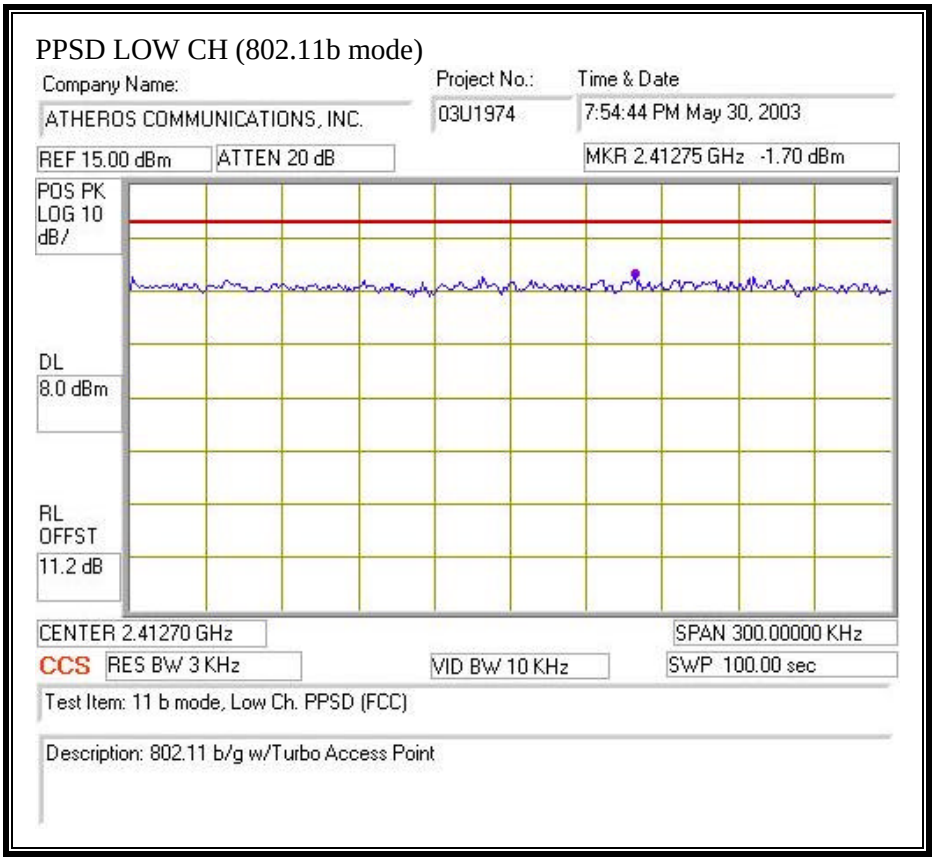
802.11g Normal Mode

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 2412 | 3.12 | 8 | -4.88 |
| Middle | 2437 | 3.88 | 8 | -4.12 |
| High | 2462 | 1.96 | 8 | -6.04 |

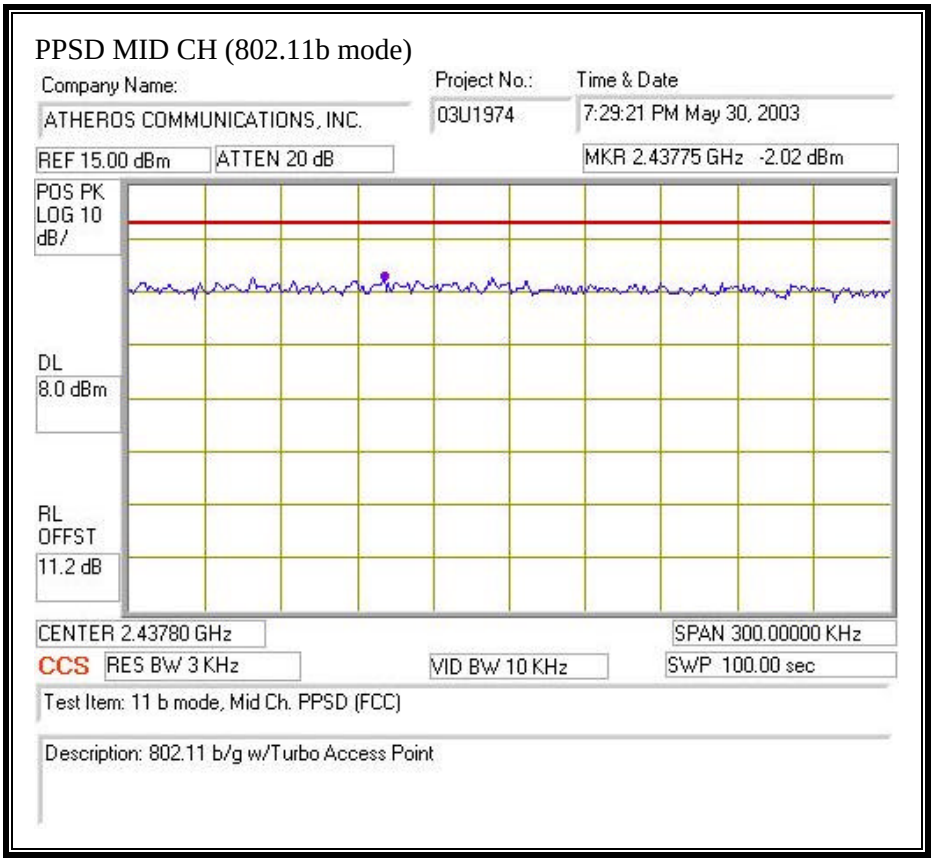
802.11g Turbo Mode

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Middle | 2437 | 5.21 | 8 | -2.79 |

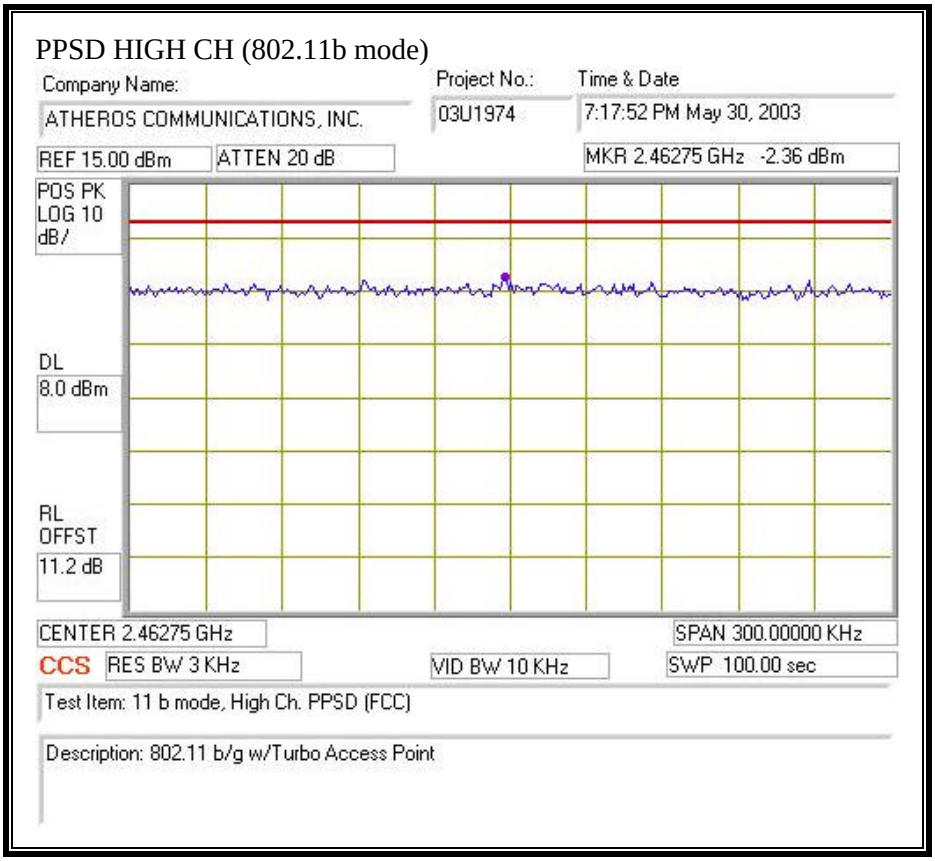
**PEAK POWER SPECTRAL DENSITY (802.11b MODE)**



PPSD MID CH (802.11b mode)

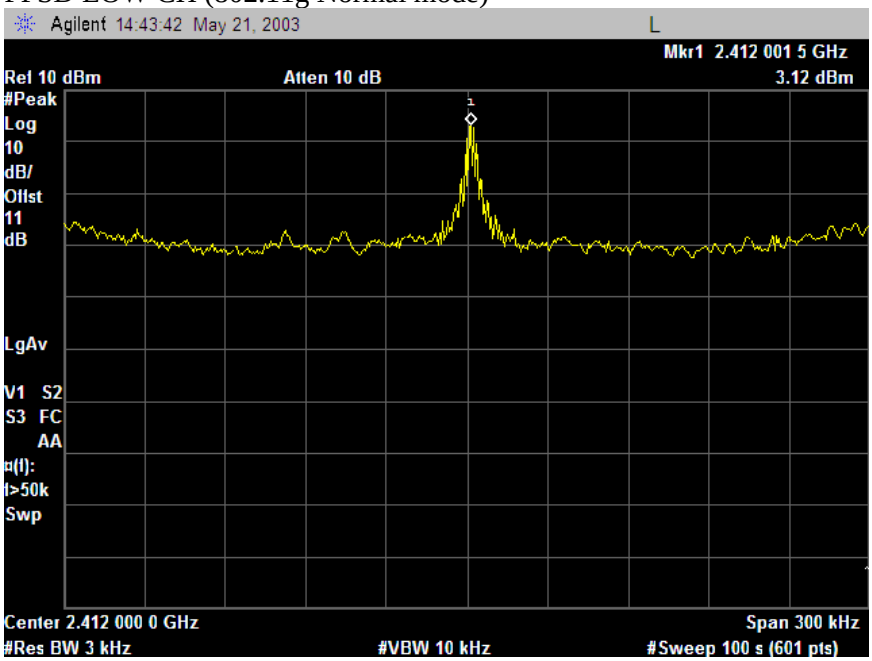


PPSD HIGH CH (802.11b mode)

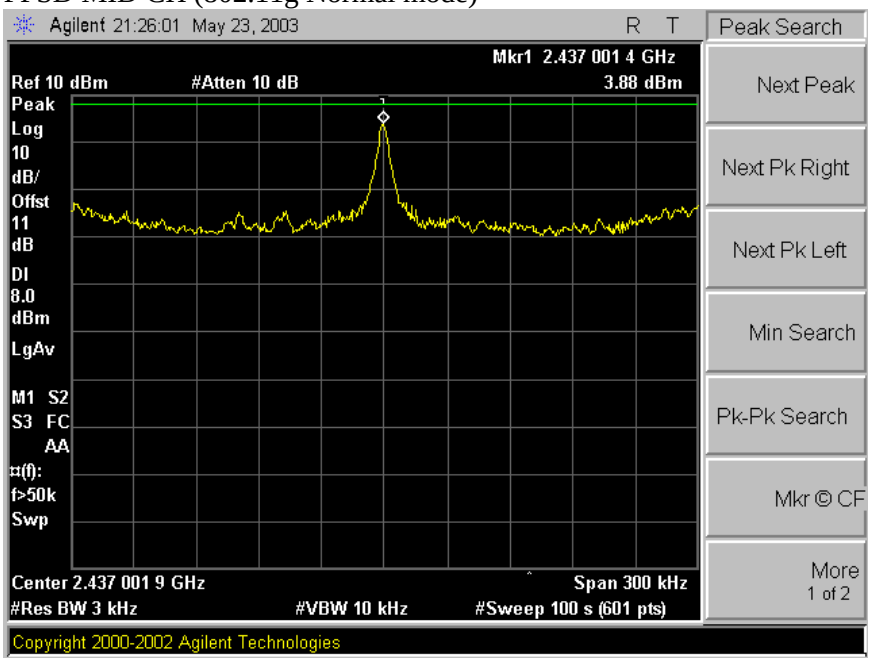


## PEAK POWER SPECTRAL DENSITY (802.11g NORMAL MODE)

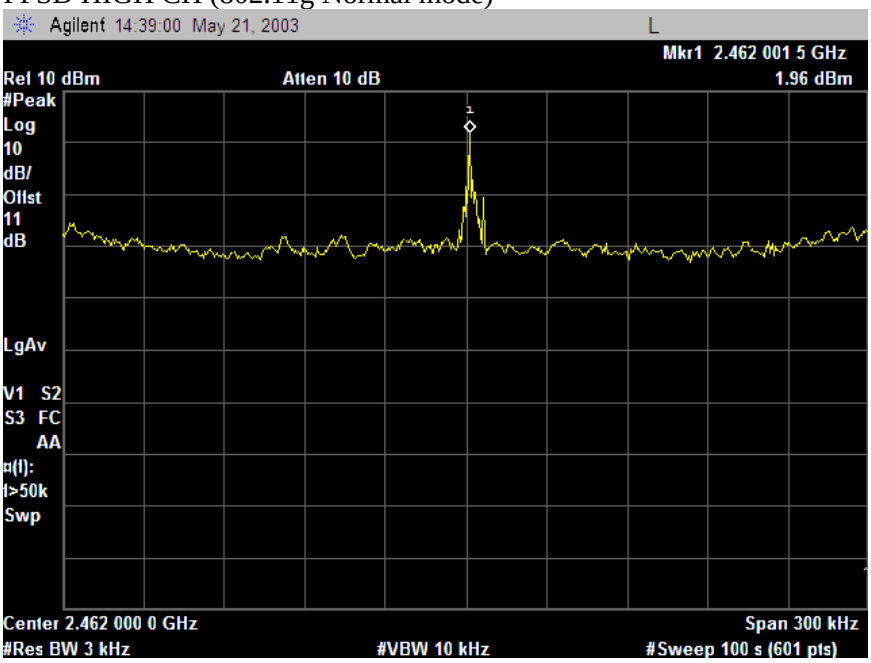
PPSD LOW CH (802.11g Normal mode)



PPSD MID CH (802.11g Normal mode)

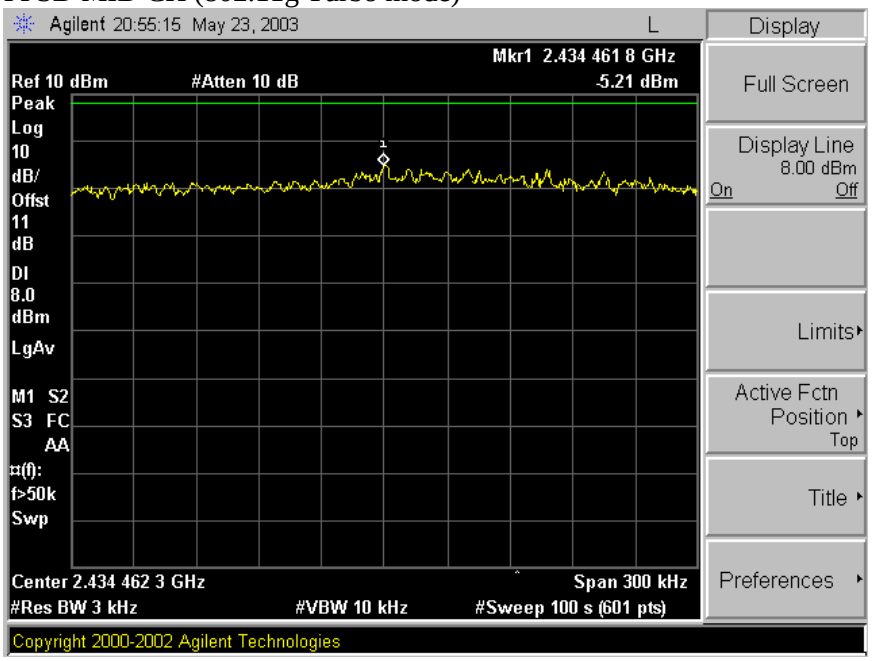


PPSD HIGH CH (802.11g Normal mode)



## PEAK POWER SPECTRAL DENSITY (802.11g TURBO MODE)

PPSD MID CH (802.11g Turbo mode)



## 7.5. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

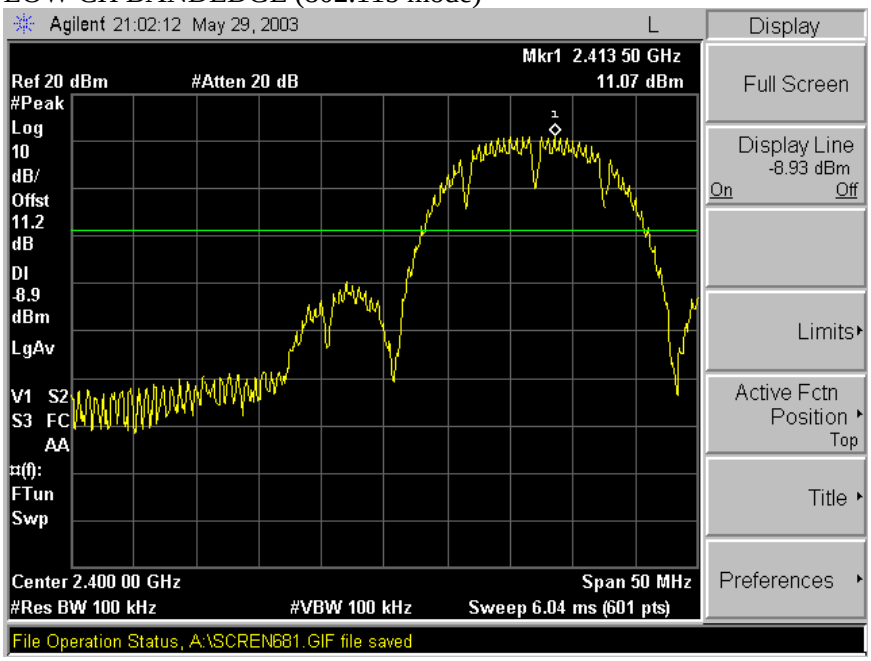
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

**RESULTS**

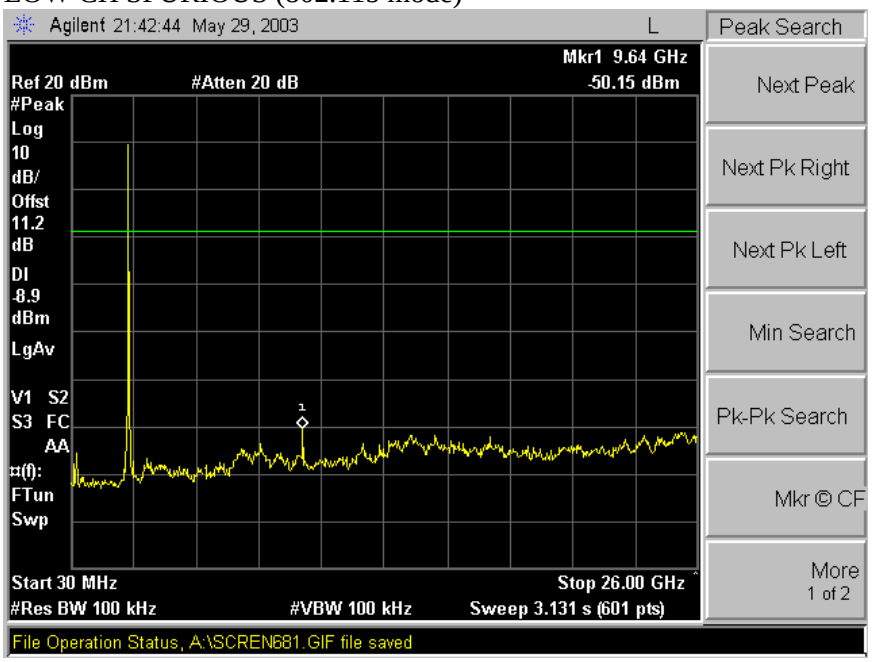
No non-compliance noted:

**SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)**

LOW CH BANDEDGE (802.11b mode)

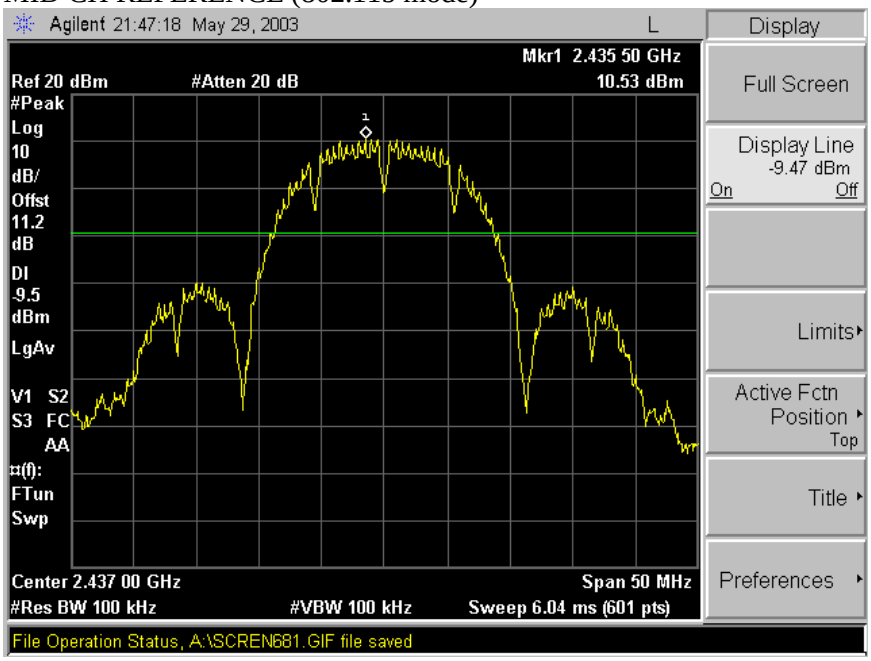


LOW CH SPURIOUS (802.11b mode)

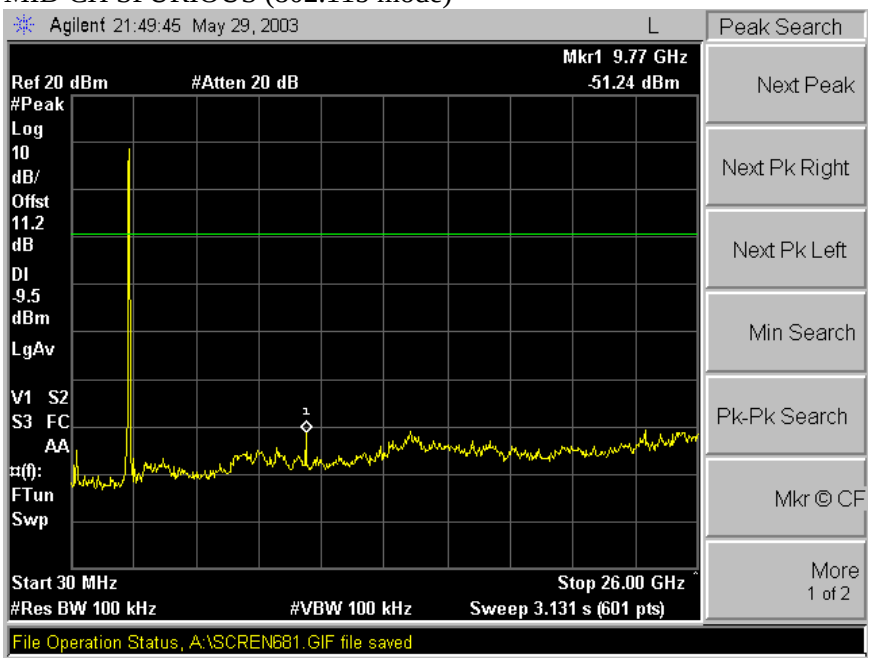


**SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)**

MID CH REFERENCE (802.11b mode)

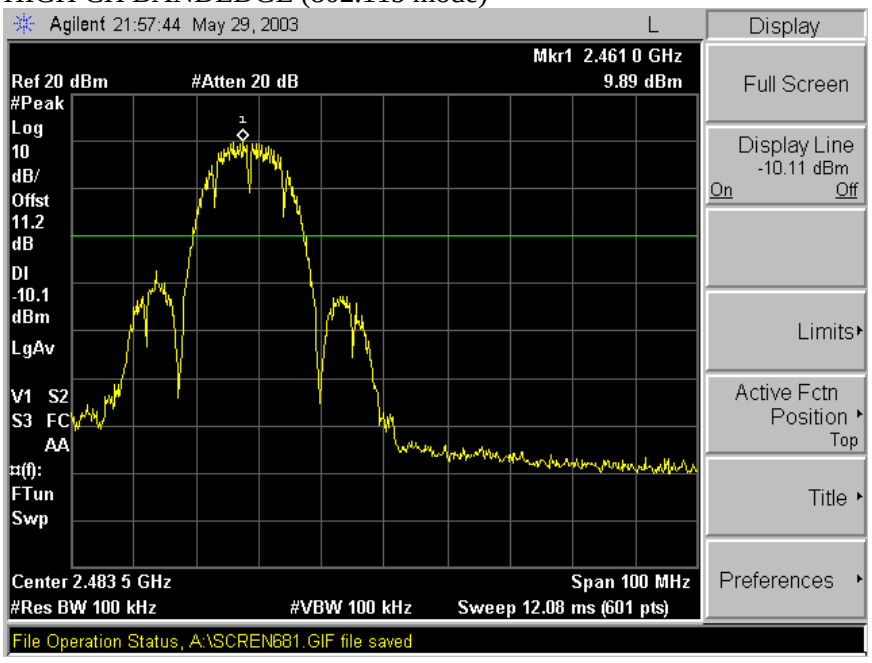


MID CH SPURIOUS (802.11b mode)

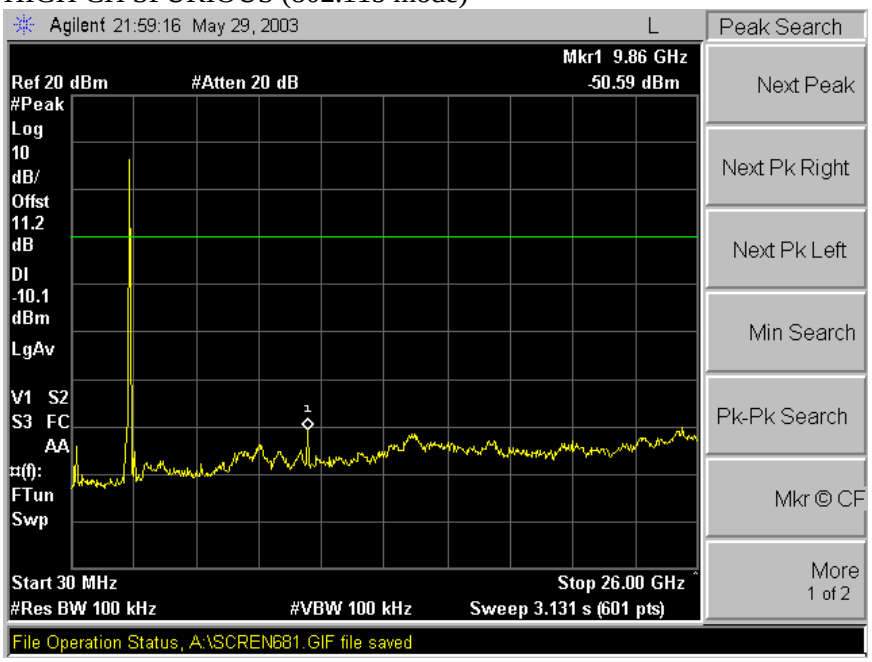


**SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)**

HIGH CH BANDEDGE (802.11b mode)

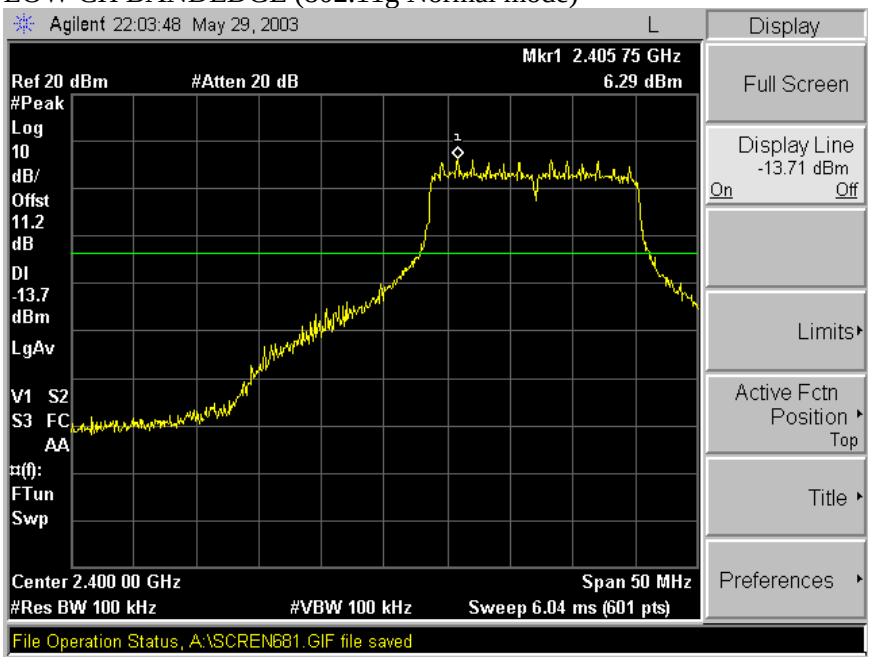


HIGH CH SPURIOUS (802.11b mode)

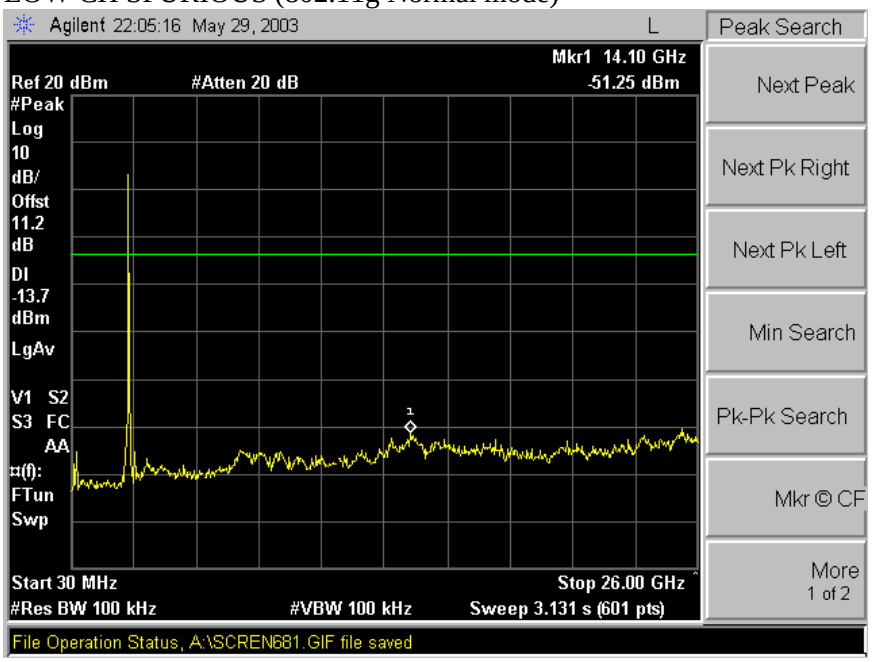


**SPURIOUS EMISSIONS, LOW CHANNEL (802.11g NORMAL MODE)**

LOW CH BANDEDGE (802.11g Normal mode)

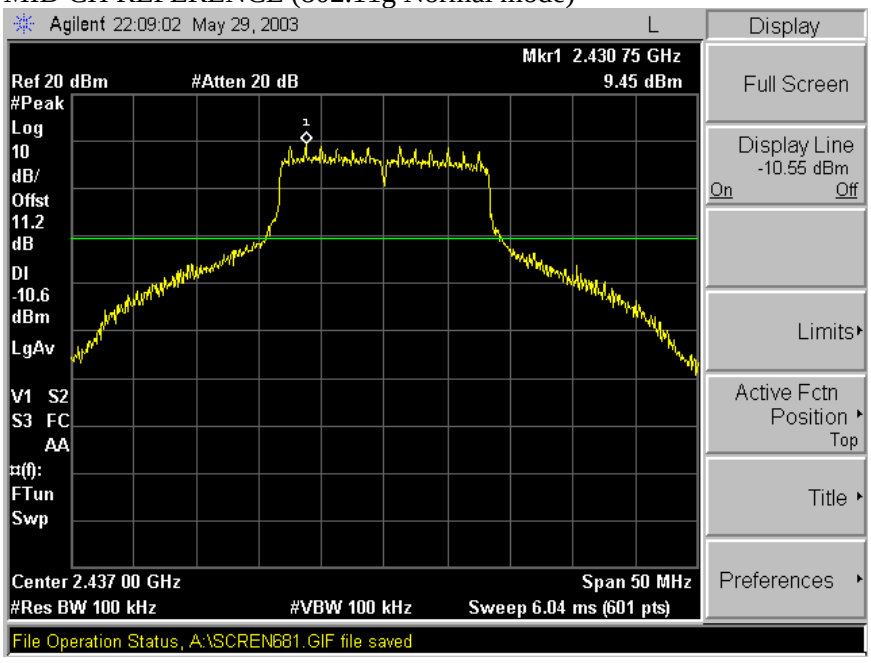


LOW CH SPURIOUS (802.11g Normal mode)

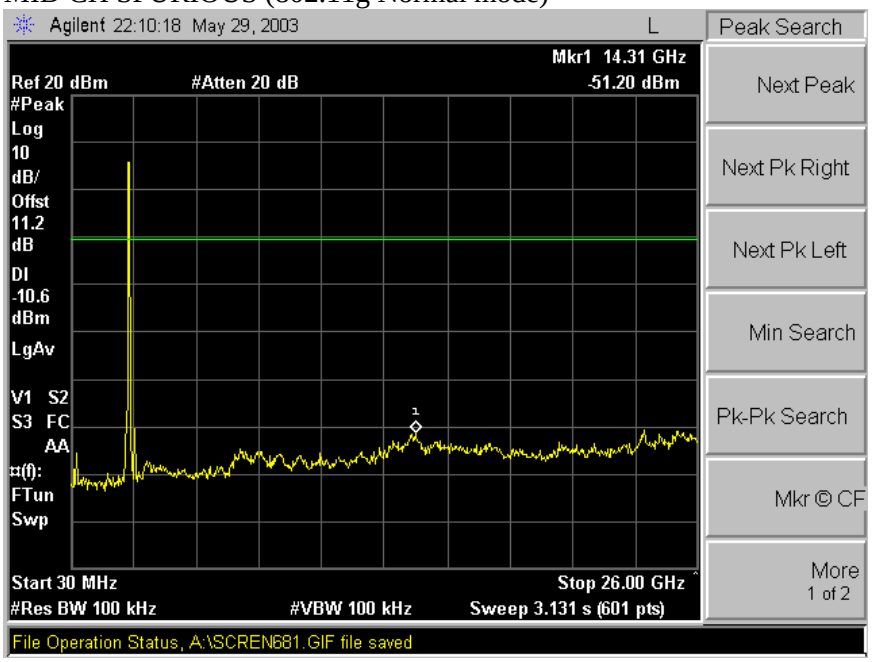


**SPURIOUS EMISSIONS, MID CHANNEL (802.11g NORMAL MODE)**

MID CH REFERENCE (802.11g Normal mode)

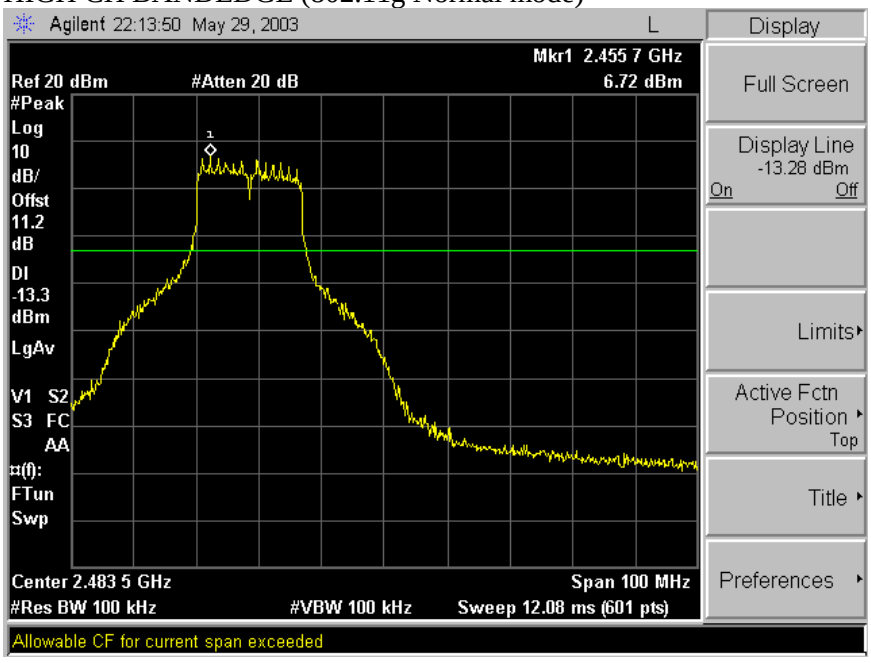


MID CH SPURIOUS (802.11g Normal mode)

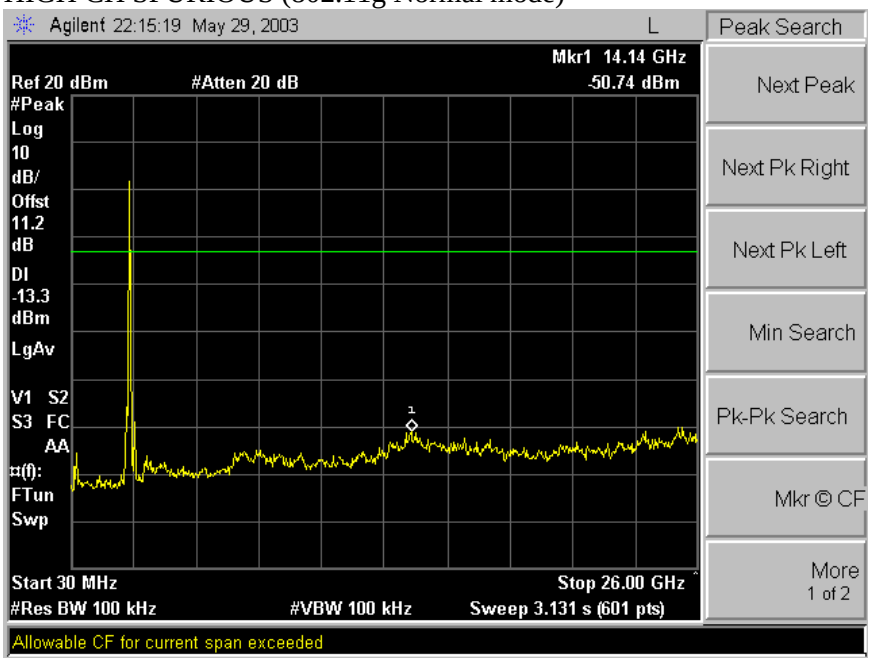


**SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g NORMAL MODE)**

HIGH CH BANDEDGE (802.11g Normal mode)

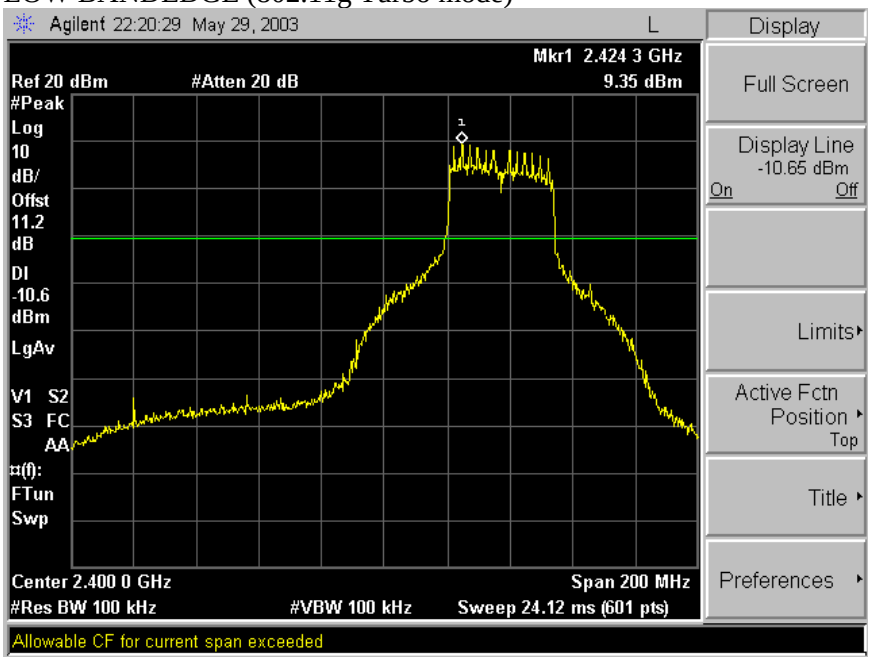


HIGH CH SPURIOUS (802.11g Normal mode)

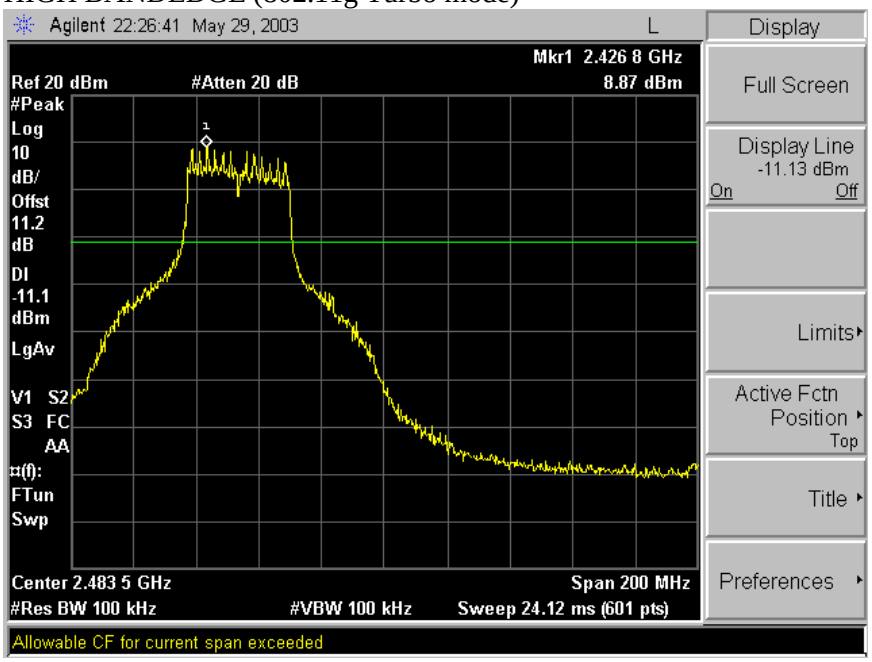


**SPURIOUS EMISSIONS, MID CHANNEL (802.11g TURBO MODE)**

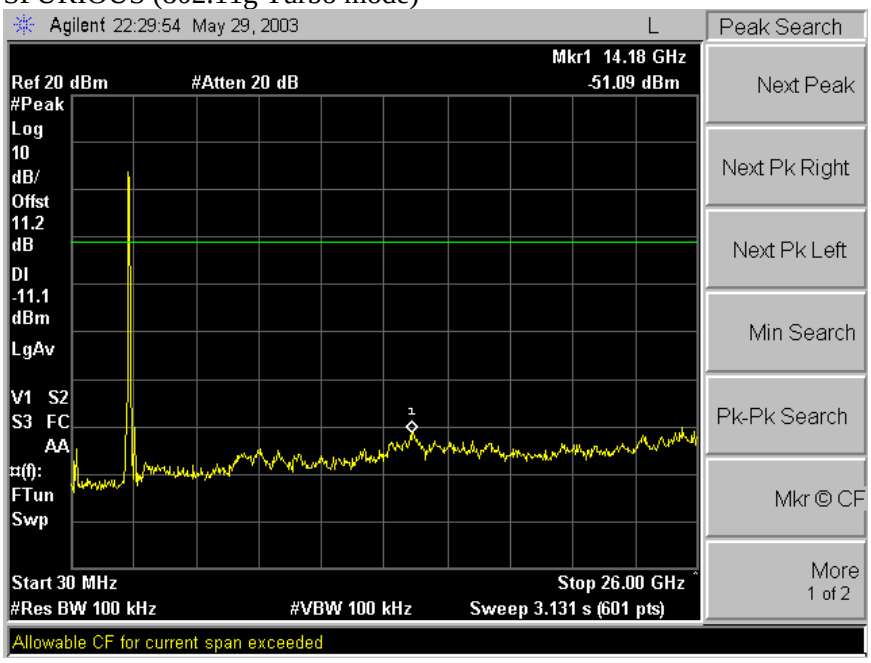
LOW BANDEDGE (802.11g Turbo mode)



HIGH BANDEDGE (802.11g Turbo mode)



SPURIOUS (802.11g Turbo mode)



## 7.6. RADIATED EMISSIONS

**LIMITS**

§15.205 (a) 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 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | ([2]) |
| 13.36 - 13.41 | | | |

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

§15.205 (b) Except as provided in paragraphs (d) and (e), the field 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 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, 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.

§15.209 (a) Except as provided elsewhere in this Subpart, 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) |
|---|---|---|
| 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., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

## TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

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.

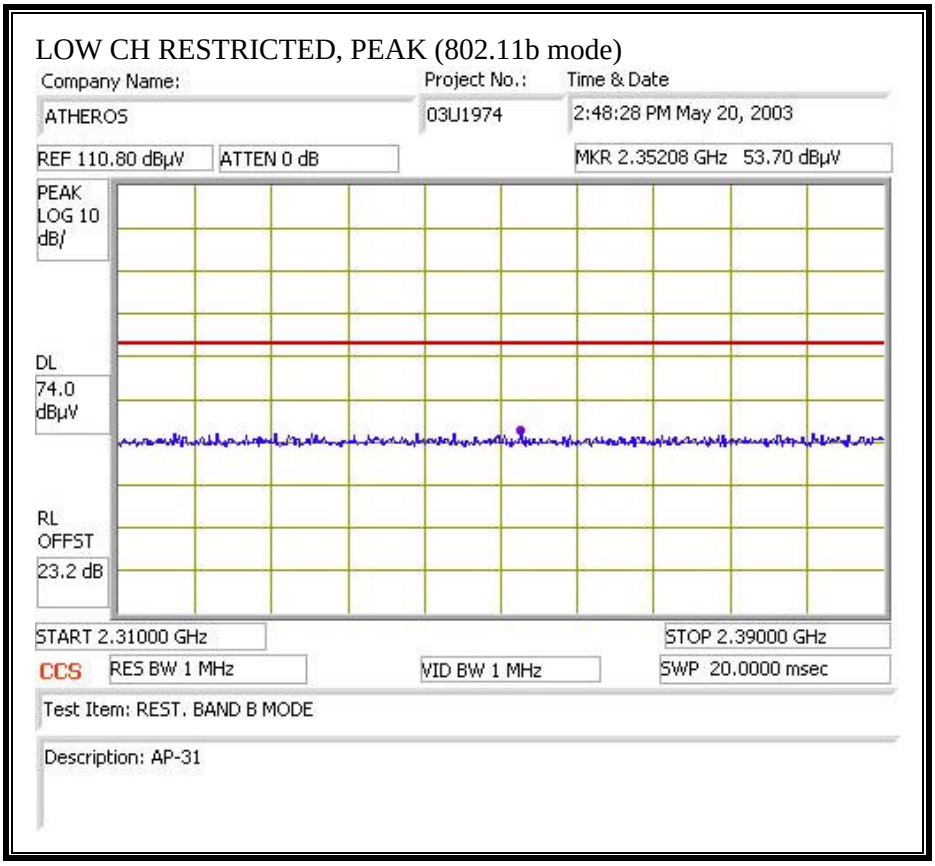
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The 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 emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

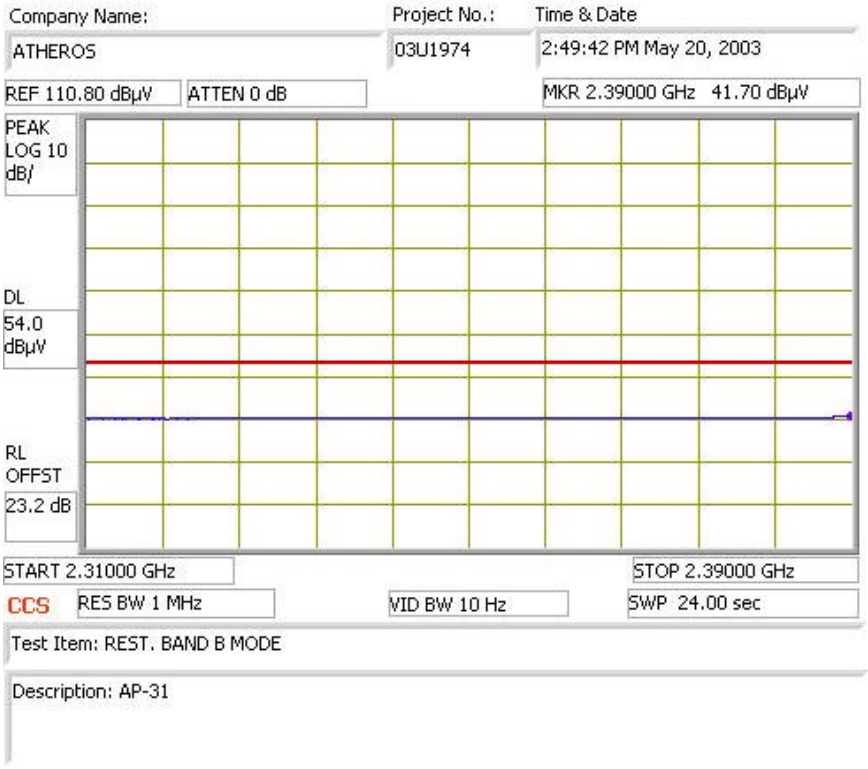
## RESULTS

No non-compliance noted:

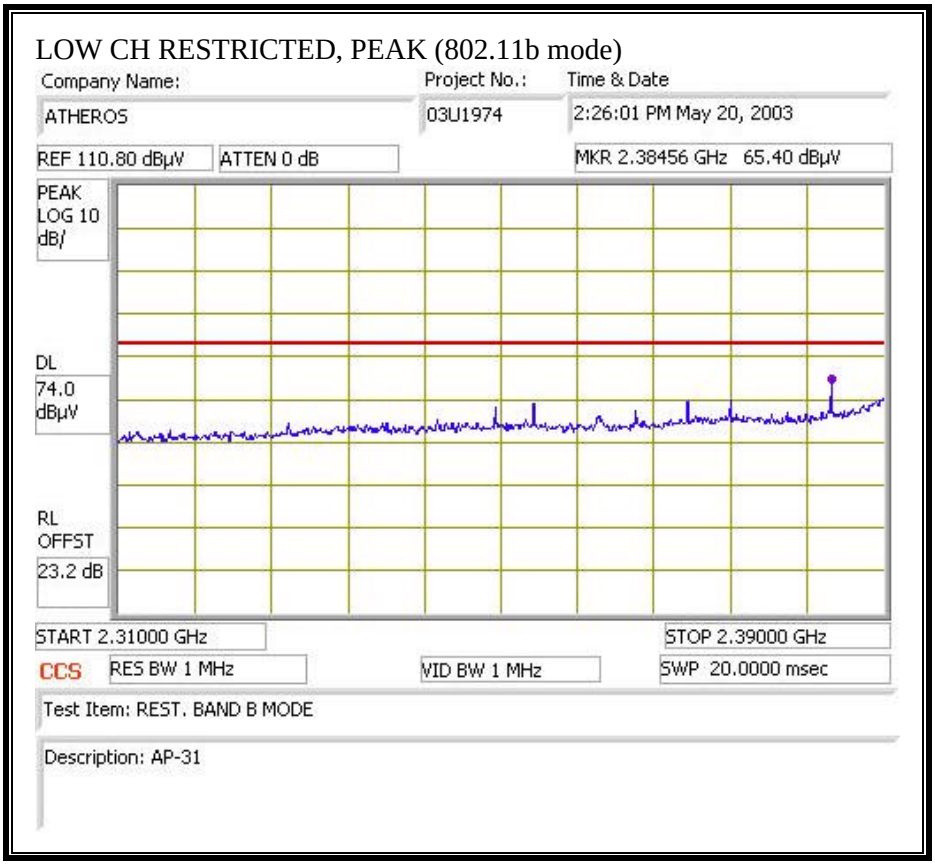
**RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)**



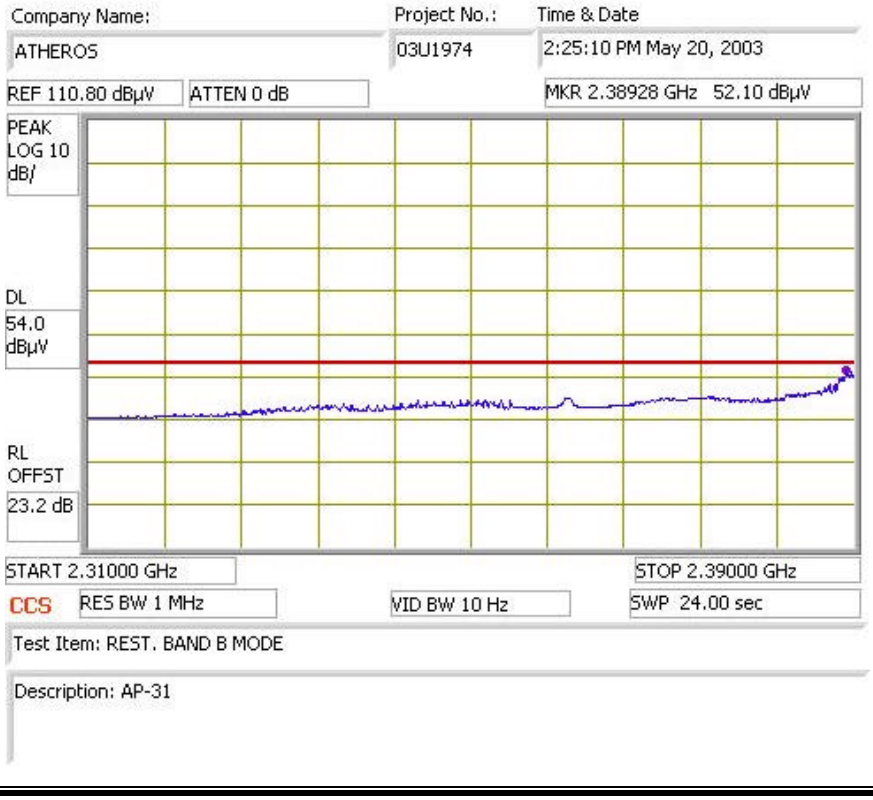
LOW CH RESTRICTED, AVG (802.11b mode)



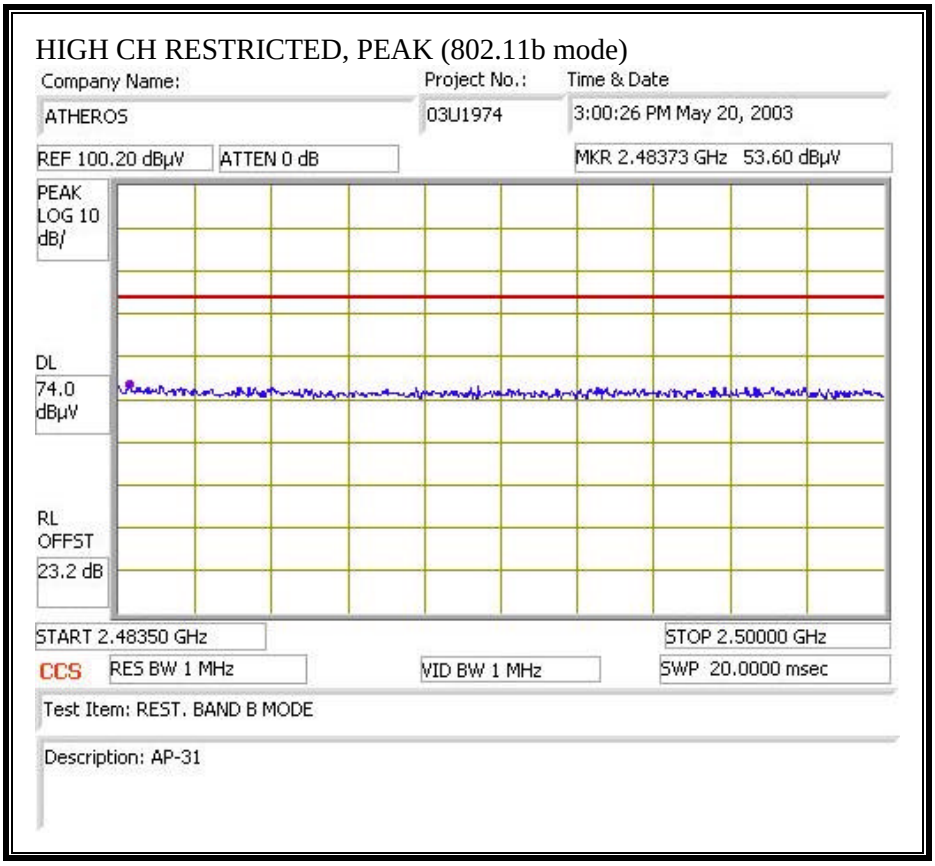
**RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)**



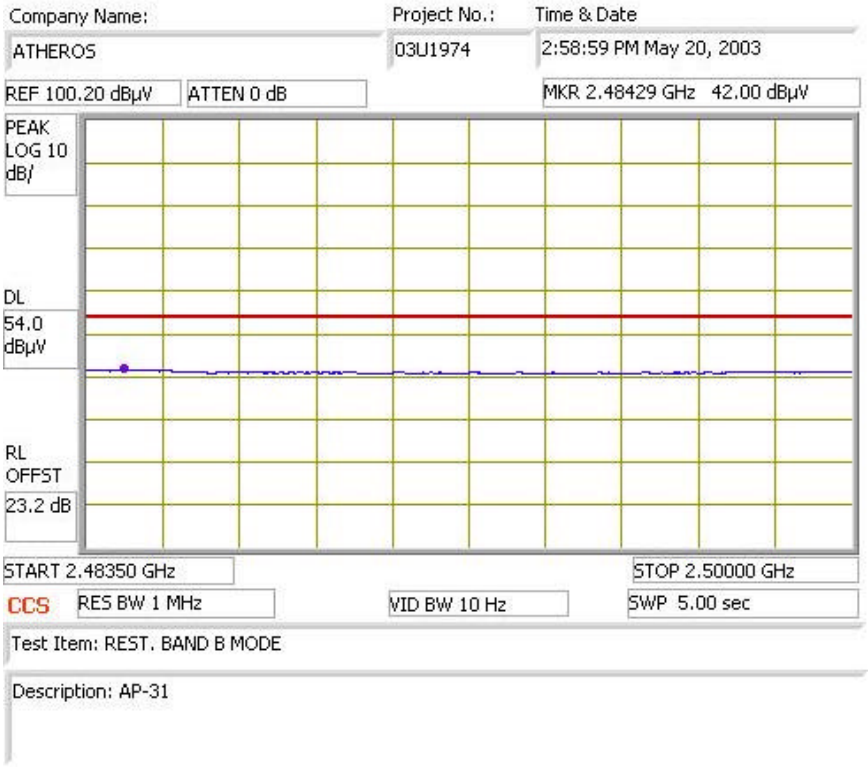
LOW CH RESTRICTED, AVG (802.11b mode)



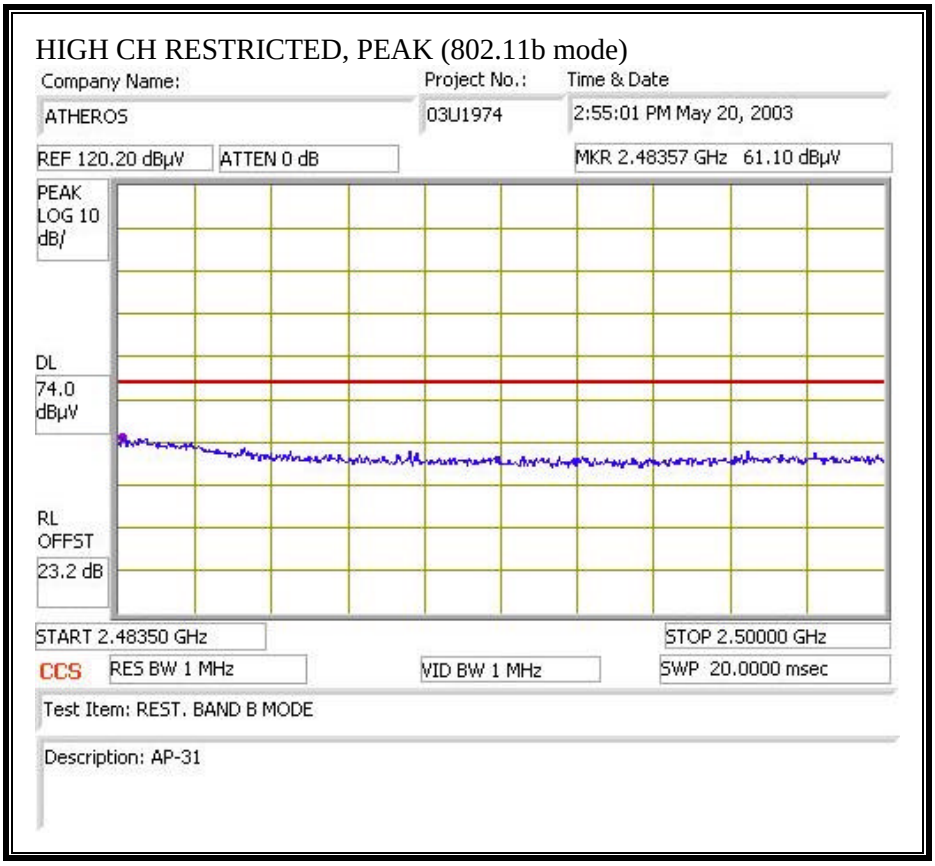
**RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)**



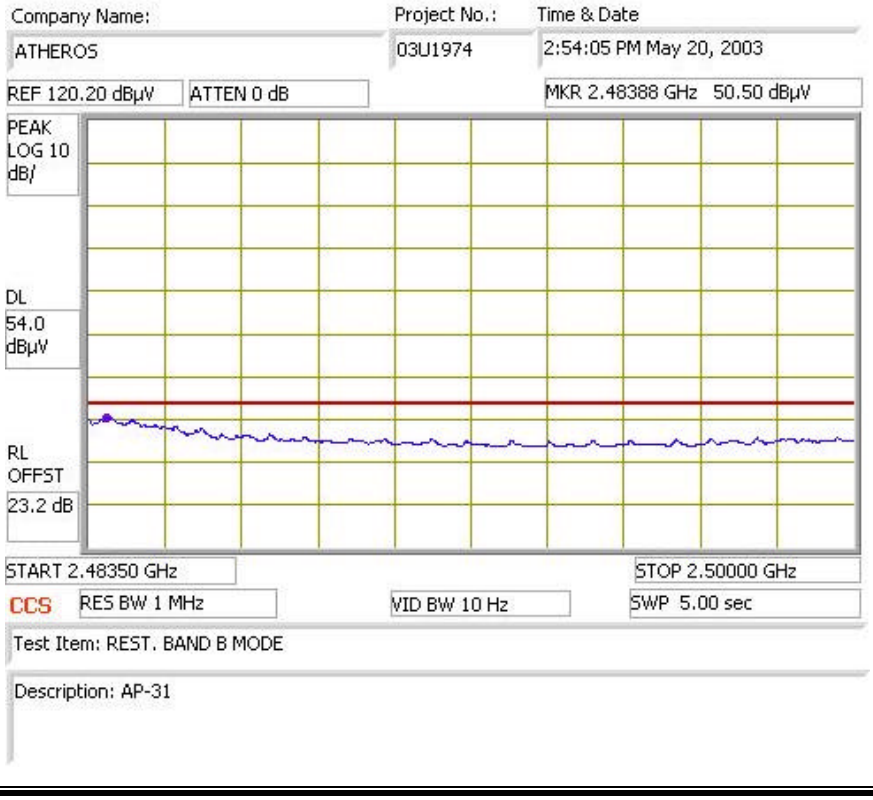
HIGH CH RESTRICTED, AVG (802.11b mode)



**RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)**



HIGH CH RESTRICTED, AVG (802.11b mode)



## HARMONICS AND SPURIOUS EMISSIONS (b MODE, LOW CHANNEL)

05/20/03 **High Frequency Measurement**

**Compliance Certification Services, Morgan Hill Open Field Site**

**Test Engr:** NEELESH RAJ
**Project #:**
**Company:** ATHEROS
**EUT Descrip.:**
**EUT M/N:**
**Test Target:**
**Mode Oper:** B MODE

**Test Equipment:**

| EMCO Horn 1-18GHz | Pre-amplifer 1-26GHz | Spectrum Analyzer | Horn > 18GHz |
|---|---|---|---|
| T60; S/N: 2238 @3m | T86 Miteq 924341 | HP 8566B 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 GHz | Dist feet | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | HPF | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HARMONICS LOW CHANNEL=2412 | | | | | | | | | | | | | |
| 4.824 | 9.8 | 63.8 | 62.1 | 33.1 | 2.9 | -45.6 | 0.0 | 1.0 | 55.2 | 53.5 | 74.0 | 54.0 | -18.8 | -0.5 | V |
| 12.059 | 9.8 | 46.1 | 37.0 | 39.3 | 5.1 | -45.4 | 0.0 | 1.0 | 46.1 | 37.0 | 74.0 | 54.0 | -27.9 | -17.0 | V |
| 4.824 | 9.8 | 59.2 | 57.0 | 33.1 | 2.9 | -45.6 | 0.0 | 1.0 | 50.6 | 48.4 | 74.0 | 54.0 | -23.4 | -5.6 | V |
| 12.059 | 9.8 | 46.3 | 36.9 | 39.3 | 5.1 | -45.4 | 0.0 | 1.0 | 46.3 | 36.9 | 74.0 | 54.0 | -27.7 | -17.1 | H |
| | | | | | | | | 1.0 | | | | | | | H |
| | | | spur | | | | | | | | | | | | |
| 2.688 | 9.8 | 50.0 | 45.6 | 30.1 | 2.1 | -44.0 | 0.0 | 1.0 | 39.1 | 34.7 | 74.0 | 54.0 | -34.9 | -19.3 | V |
| 2.688 | 9.8 | 51.0 | 46.3 | 30.1 | 2.1 | -44.0 | 0.0 | 1.0 | 40.1 | 35.4 | 74.0 | 54.0 | -33.9 | -18.6 | V |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 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 | | |

## HARMONICS AND SPURIOUS EMISSIONS (b MODE, MID CHANNEL)

05/20/03 **High Frequency Measurement**
**Compliance Certification Services, Morgan Hill Open Field Site**

**Test Engr:** NEELESH RAJ
**Project #:**
**Company:** ATHEROS
**EUT Descrip.:**
**EUT M/N:**
**Test Target:**
**Mode Oper:** B MODE

**Test Equipment:**

| EMCO Horn 1-18GHz | Pre-amplifer 1-26GHz | Spectrum Analyzer | Horn > 18GHz |
|---|---|---|---|
| T60; S/N: 2238 @3m | T86 Miteq 924341 | HP 8566B 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 GHz | Dist feet | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | HPF | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HARMONICS MIDDLE CHANNEL=2437 | | | | | | | | | | | | | | |
| 4.875 | 9.8 | 60.8 | 59.0 | 33.1 | 3.0 | -45.6 | 0.0 | 1.0 | 52.2 | 50.4 | 74.0 | 54.0 | -21.8 | -3.6 | V |
| 7.305 | 9.8 | 55.0 | 47.8 | 36.2 | 3.8 | -46.6 | 0.0 | 1.0 | 49.4 | 42.2 | 74.0 | 54.0 | -24.6 | -11.8 | V |
| 12.186 | 9.8 | 46.7 | 36.9 | 39.4 | 5.2 | -45.6 | 0.0 | 1.0 | 46.6 | 36.8 | 74.0 | 54.0 | -27.4 | -17.2 | V |
| 4.875 | 9.8 | 58.7 | 56.7 | 33.1 | 3.0 | -45.6 | 0.0 | 1.0 | 50.1 | 48.1 | 74.0 | 54.0 | -23.9 | -5.9 | H |
| 7.305 | 9.8 | 50.6 | 40.9 | 36.2 | 3.8 | -46.6 | 0.0 | 1.0 | 45.0 | 35.3 | 74.0 | 54.0 | -29.0 | -18.7 | H |
| 12.186 | 9.8 | 47.0 | 37.2 | 39.4 | 5.2 | -45.6 | 0.0 | 1.0 | 46.9 | 37.1 | 74.0 | 54.0 | -27.1 | -16.9 | H |
| | | | | | | | | 1.0 | | | | | | | V |
| | | | spurious | | | | | | | | | | | | |
| 2.688 | 9.8 | 50.5 | 45.7 | 30.1 | 2.1 | -44.0 | 0.0 | 1.0 | 39.6 | 34.9 | 74.0 | 54.0 | -34.4 | -19.1 | V |
| 2.688 | 9.8 | 50.0 | 45.1 | 30.1 | 2.1 | -44.0 | 0.0 | 1.0 | 39.1 | 34.2 | 74.0 | 54.0 | -34.9 | -19.8 | h |

| | | | | | |
|---|---|---|---|---|---|
| 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 | | |