# FCC Part 15
# Test Report

for the

# Apple Airport Extreme and Bluetooth 2.0+EDR Module

Model # A1126
Apple Computer, Inc.

March 31, 2005

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# 1 Test Report Summary

**Bluetooth 2.0+EDR**

| Specification | Test or Requirement | Result | Comment |
|---|---|---|---|
| N/A – For reporting purposes only | 99% Bandwidth and 20 dB Bandwidth | N/A | Section 7.1 |
| CFR 15.247(a)(1) | Hopping Frequency Separation | Pass | Section 7.2 |
| CFR 15.247(a)(1)(iii) | Number of Hopping Channels | Pass | Section 7.3 |
| CFR 15.247(b)(1)(iii) | Average Time of Occupancy | Pass | Section 7.4 |
| CFR 15.247(b)(1)<br>CFR 15.247(b)(4) | Output Power | Pass | Section 7.5 |
| N/A – For reporting purposes only | Average Power | N/A | Section 7.6 |
| CFR 15.247(d)<br>CFR 15.247(f) | Power Spectral Density | Pass | Section 7.7 |
| CFR 15.247(c) | Conducted Spurious Emissions | Pass | Section 7.8 |
| CFR 15.205(a)<br>CFR 15.209(a) | Radiated Emissions | Pass | Section 7.9 |
| CFR 15.207(a) | AC Power Line Conducted Emissions | Pass | Section 7.10 |

1 Test Report Summary - continued

**802.11b/g**

| Specification | Test or Requirement | Result | Comment |
|---|---|---|---|
| N/A – For reporting purposes only | 99% Bandwidth and 6 dB Bandwidth | Pass | Section 8.1 |
| CFR 15.247(b)(1)<br>CFR 15.247(b)(4) | Output Power | Pass | Section 8.2 |
| CFR 15.247(d)<br>CFR 15.247(f) | Peak Power Spectral Density | Pass | Section 8.4 |
| CFR 15.247(c) | -20 dBc Conducted Spurious Emissions | Pass | Section 8.5 |
| CFR 15.205(a)<br>CFR 15.209(a) | Radiated Emissions | Pass | Section 8.6 |
| CFR 15.207(a) | AC Power Line Conducted Emissions | Pass | Section 8.7 |

## 2 EUT Description

The Apple Airport Extreme and Bluetooth 2.0+EDR module, model number A1126, operates in the 2.4 GHz unlicensed Industrial, Scientific and Medical band and uses Frequency Hopping Spread Spectrum and 802.11b/g. Technical Information on the Apple Airport Extreme and Bluetooth 2.0+EDR Module is provided in the table below.

| Apple Airport Extreme and Bluetooth 2.0+EDR Module Information | |
|---|---|
| Product | Transceiver |
| Trade Name | Airport Extreme and Bluetooth 2.0+EDR |
| Model Number | A1126 |
| Power Supply | 3.3V DC Power Supply |
| Frequency Range | 2402-2480 MHz and 2412-2462 |
| Modulation Technique | FHSS and OFDM |
| Emission Designator | 866KF1D and 16M6F7D |
| Output Power (802.11 Peak) | 25.25 dBm |
| Output Power (Bluetooth) | 3.74 dBm |

Antenna Information

| Antenna Model Number | Maximum Gain (dBi) |
|---|---|
| 613-6024 | +2.62 |

# 3 Test Methodology

The tests documented in this report were performed in accordance with ANSI C63.4-2003 and FCC CFR 47 Part 2 and Part 15c.

# 4 Facilities and Accreditation

## 4.1 Facilities and Equipment

The ac power line and RF conducted emissions measurements were performed at the Apple Computer, Inc. facility located at 20650 Valley Green Drive, Cupertino, California 95014. The radiated emissions measurements were performed at the Apple Computer, Inc. Evelyn 1, 10 meter semi-anechoic chamber located at 123 East Evelyn Ave., Mountain View, California 94041. Both of these facilities are constructed in conformance with the requirements of 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 Laboratory Accreditation

The test facilities at Apple Computer, Inc. used to perform radiated and conducted emissions measurements are accredited by National Voluntary Laboratory Accreditation Program to perform Electromagnetic Interference tests according to FCC Part 15 and CISPR 22. Apple Computer, Inc. NVLAP Lab Code is 200071-0 and is effective through September 30, 2005. The Apple Computer, Inc. Evelyn 1 10 meter Semi-anechoic chamber is currently listed with the FCC. The FCC Registration Number is 90450 and is effective through Jan 5, 2007.

No part of this report may be used to claim or endorsement by NVLAP or any agency of the US Government.

# 5 Calibration and Uncertainty

## 5.1 Measurement 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

The Apple measurement uncertainty policy, available upon request under Apple File Number EMC20, ensures uncertainty has been calculated using the proper procedure. Apple will use this measurement uncertainty knowledge in determining the pass / fail criteria from the test data. The measurement uncertainty has been determined to be the following:

Conducted Emissions = +/- 2.3 dB
Radiated Emissions = +/- 4.1 dB

## 5.3 Test Equipment

The following test equipment was used.

| Description | Manufacturer | Model No. | Identification No. | Last Cal | Next Cal |
|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | ESIB 40 | 100105 | Oct 2004 | Oct 2005 |
| Spectrum Analyzer | R&S | ESCI | 1166.5950.03 | July 2004 | July 2005 |
| Spectrum Analyzer | HP | 4403B | MY41140805 | May 2004 | May 2005 |
| Receiver | R & S | ESCS 30 | 1102.4500.30 | Jan 2005 | Jan 2006 |
| Antenna | Sunol | JB1 | A122302-1 | Jan 2005 | Jan 2006 |
| Antenna | Sunol | JB1 | A122302-2 | Jan 2005 | Jan 2006 |
| Amplifier | Amplifier Research | AR | Amp 16 | Nov 2004 | Nov 2005 |
| Amplifier | Amplifier Research | AR | Amp 17 | Nov 2004 | Nov 2005 |
| Amplifier | HP | 8449 | 3008A00713 | March, 2004 | March 2005 |
| Horn Antenna | EMCO | 3117 | 34197 | March 2004 | March 2009 |
| Horn Antenna | EMCO | 3160-09 | 011269-0041264 | Sept 2001 | Sept 2006 |
| Power Meter | Boonton | 4532 | 165201 | May 2004 | May 2005 |
| Power Meter Sensor | Boonton | 57318 | 3890 | May 2004 | May 2005 |

# 6 Setup of Equipment Under Test

EUT Support Equipment

| Peripheral Support Equipment | | | | |
|---|---|---|---|---|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Desktop Computer | Apple | G5 | SG85013NWSPA7 | DoC |
| 4 GB USB iPod | Apple | A1051 | JQ437FPBPFW | DoC |
| 4 GB Firewire iPod | Apple | A1051 | JQ437GJBPFW | DoC |
| 20 GB iPod | Apple | A1059 | JQ436JMXP59 | DoC |
| Headphones/Mic | Andy-May | AM-333 | N/A | N/A |
| USB Keyboard | Apple | A1048 | KY44003MGQL3B | DoC |
| USB Mouse | Apple | A31 | VJ302009EN38A | DoC |
| Airport Express | Apple | A1084 | HS5028SOQVO | BCGA1084 |

EUT I/O Cables

| I/O Cable List | | | | |
|---|---|---|---|---|
| Port | Manufacturer | Shielded? | Ferrite? | Length |
| USB iPod | Apple | Yes | No | 1.0 meters |
| Ethernet | CMG | Yes | No | 2.2 meters |
| Fiber Optic for Airport | Apple | No | No | 2 meters |
| Fiber Optic | Creative | No | No | 5 meters |
| Firewire | Apple | Yes | No | 1 meter |
| Headphones / Mic | Andy May | No | No | 2.5 meters |
| USB Keyboard / Mouse | Apple | Yes | No | 0.8 meters |

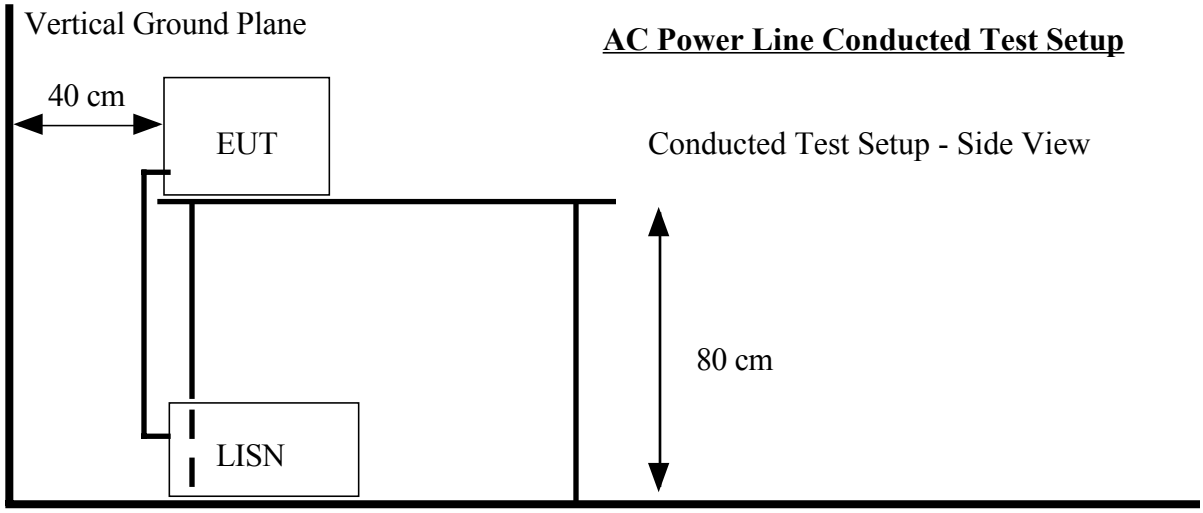
EUT Operating Conditions

All of the equipment and cables were placed in the worst-case configuration to maximize the emissions during the tests. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

For scans below 1 GHz, the EUT transceiver and all the host system I/O ports were filled. The EUT was activated by using special test software which put the EUT into a continuous transmit mode. Each of the low, mid and high channels was activate at full power and the EUT continuously transmitted at the active channel.

Test Setup Block Diagrams

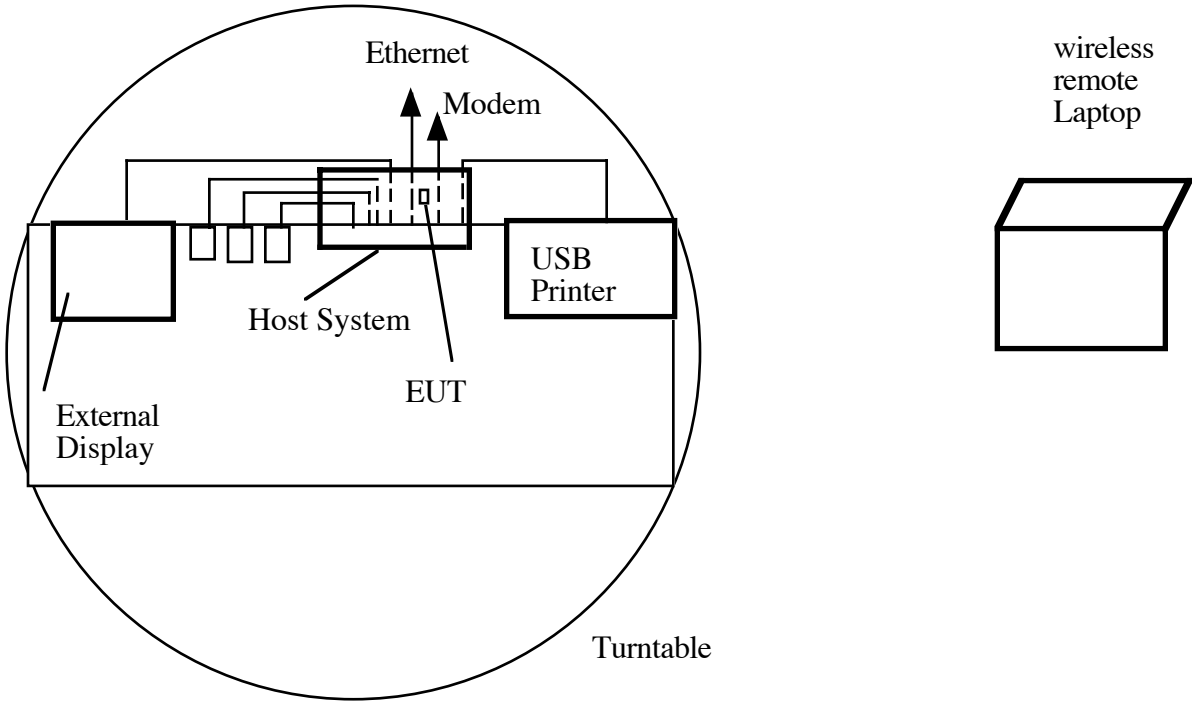
For AC Power Line conducted and RF Radiated Emissions, the EUT was placed on a nonmetallic table, 80 cm above the metallic ground-plane. The EUT and peripherals were powered from a filtered ac mains supply. Since the EUT power comes from the USB connection to the host, ac power line emissions were measured from the host computer.



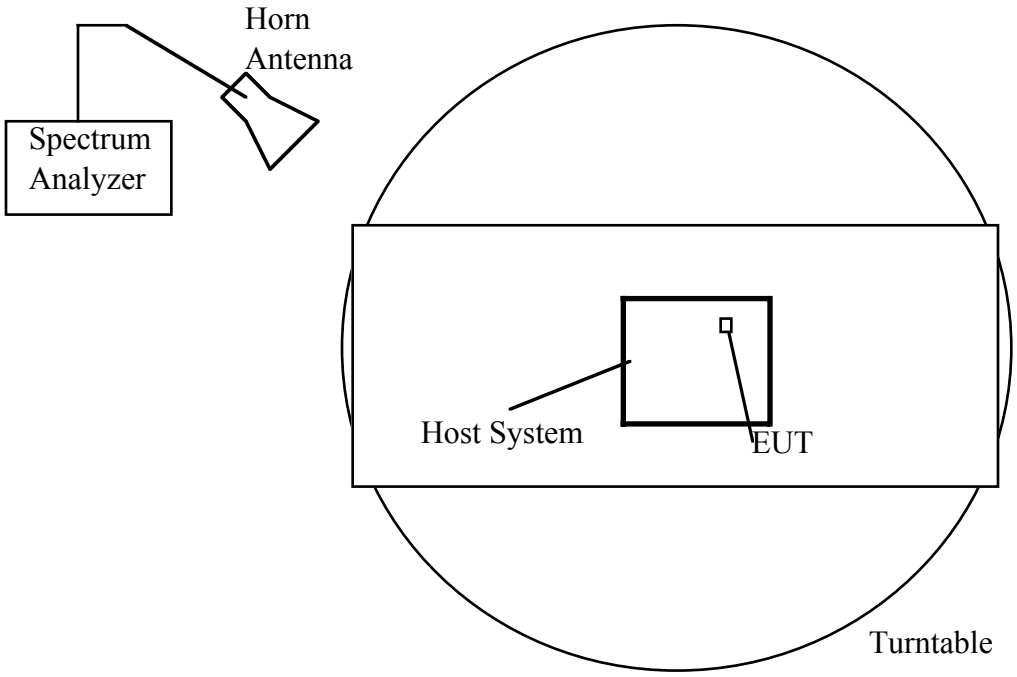

**AC Power Line Conducted Test Setup**

Conducted Test Setup - Side View

**RF Radiated Emissions Test Setup Below 1 GHz**



**RF Radiated Emissions Test Setup Above 1 GHz**



# 7 Applicable Limits and Test Results

## 7.1 99% Bandwidth and 20 dB Bandwidth

Limit

None; for reporting purposes only

99% Test Procedure

The transmitter is connected to a spectrum analyzer and set to continuously transmit. The Spectrum Analyzer has a 99% Bandwidth Function built-in. The resolution Bandwidth is set to 10 kHz and the Video Bandwidth is set to 30 kHz.

99% Bandwidth Results

| Channel | Frequency - (MHz) | 99% Bandwidth (kHz) |
|---|---|---|
| Low | 2402 | 864.7 |
| Mid | 2441 | 864.8 |
| High | 2480 | 871.5 |

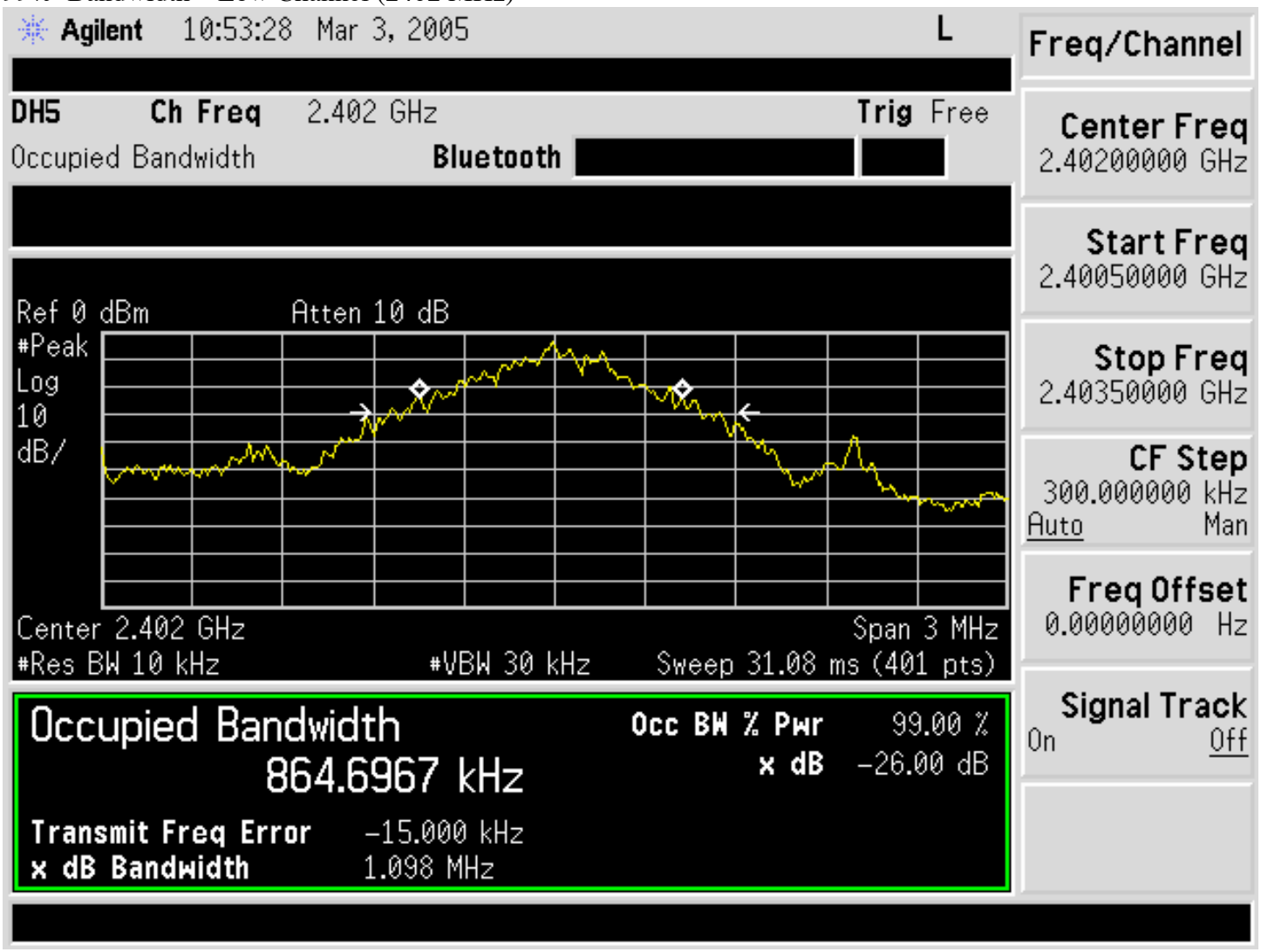
20 dB Test Procedure

The transmitter is connected to a spectrum analyzer and set to continuously transmit. The resolution Bandwidth is set to 10 kHz and the Video Bandwidth is set to 10 kHz.

20 dB Results

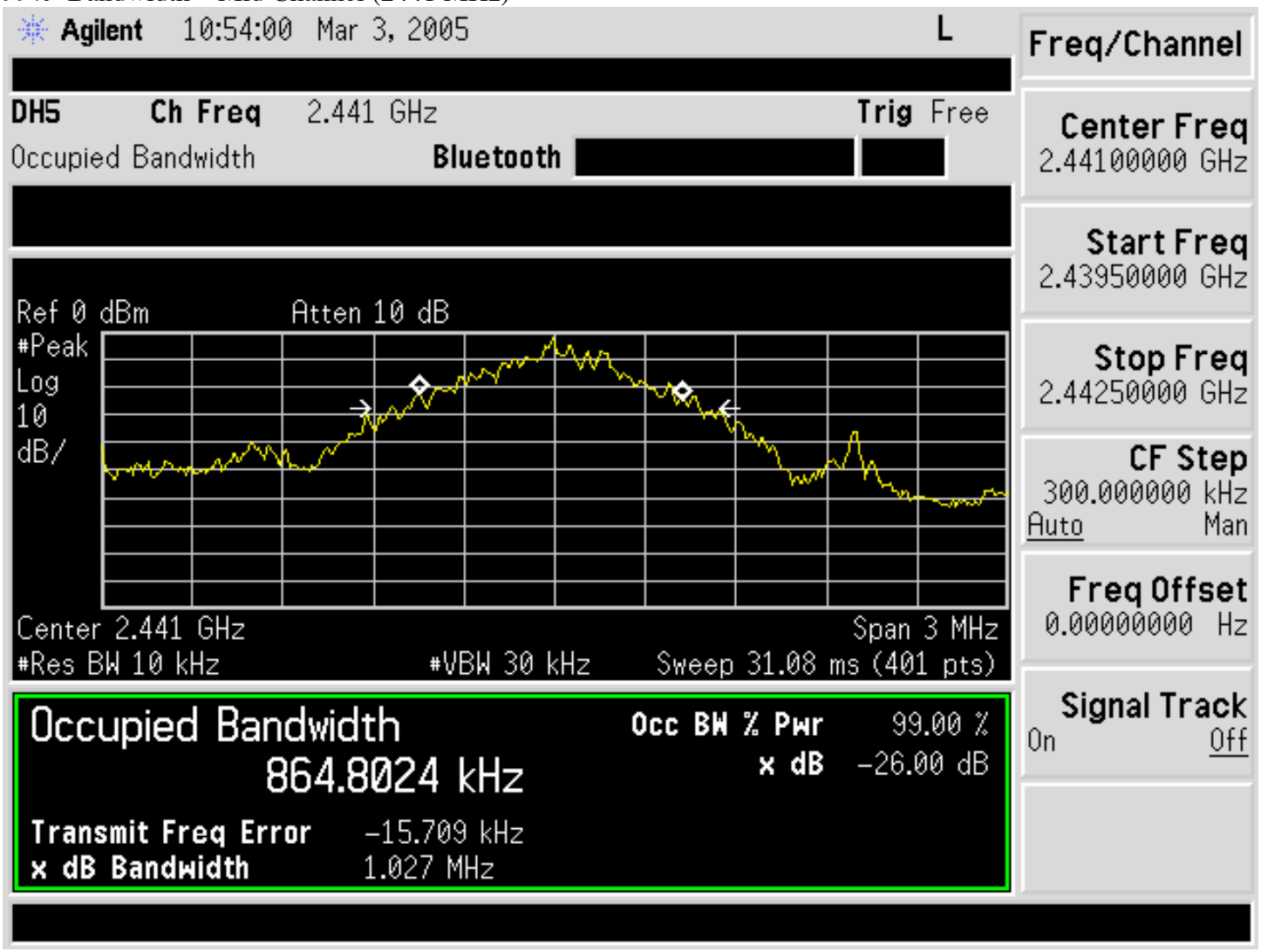
| Channel | Frequency - (MHz) | 20 dB Bandwidth (kHz) |
|---|---|---|
| Low | 2402 | 875 |
| Mid | 2441 | 910 |
| High | 2480 | 875 |

99% Bandwidth – Low Channel (2402 MHz)



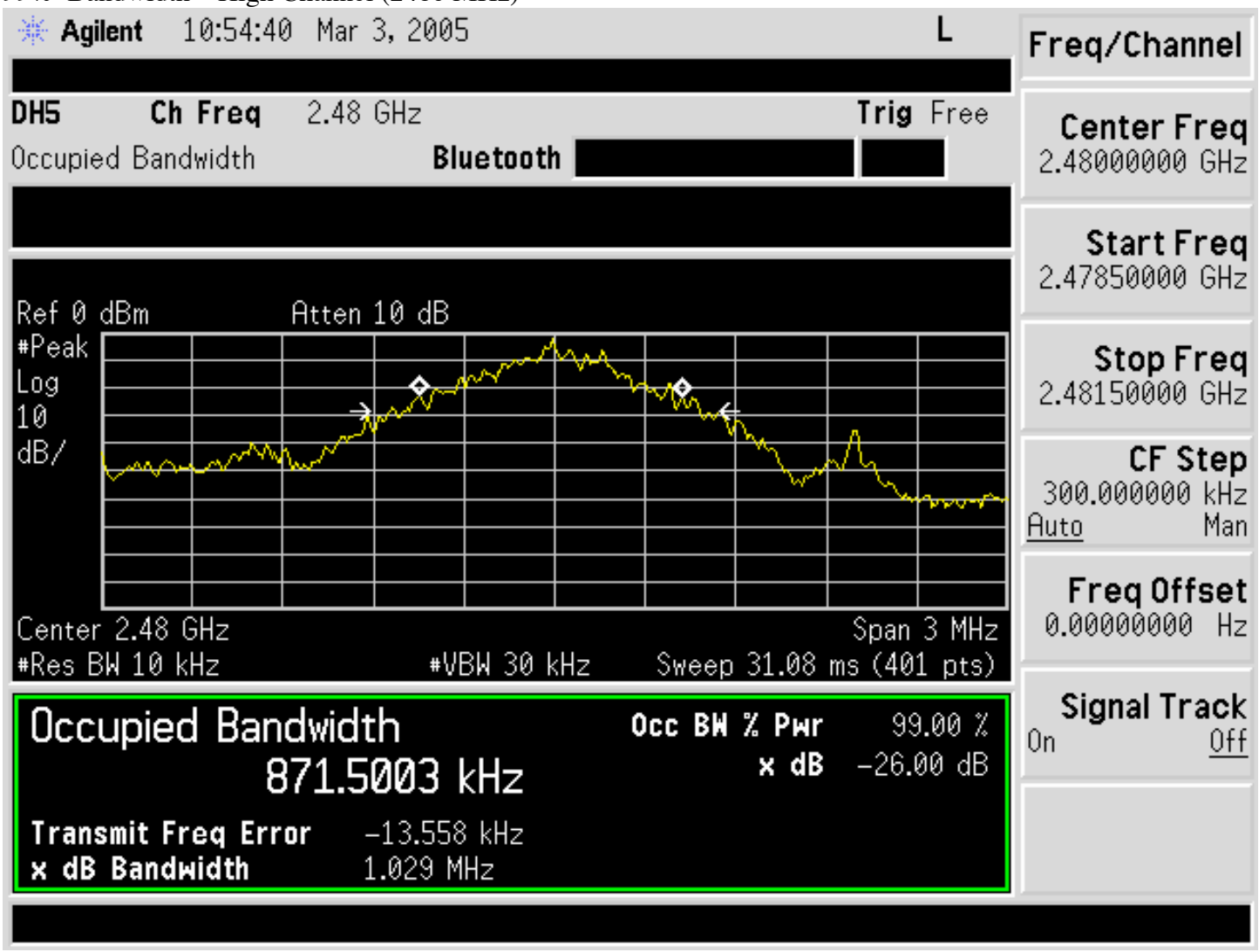

Date of Test: March 3, 2005

99% Bandwidth – Mid Channel (2441 MHz)



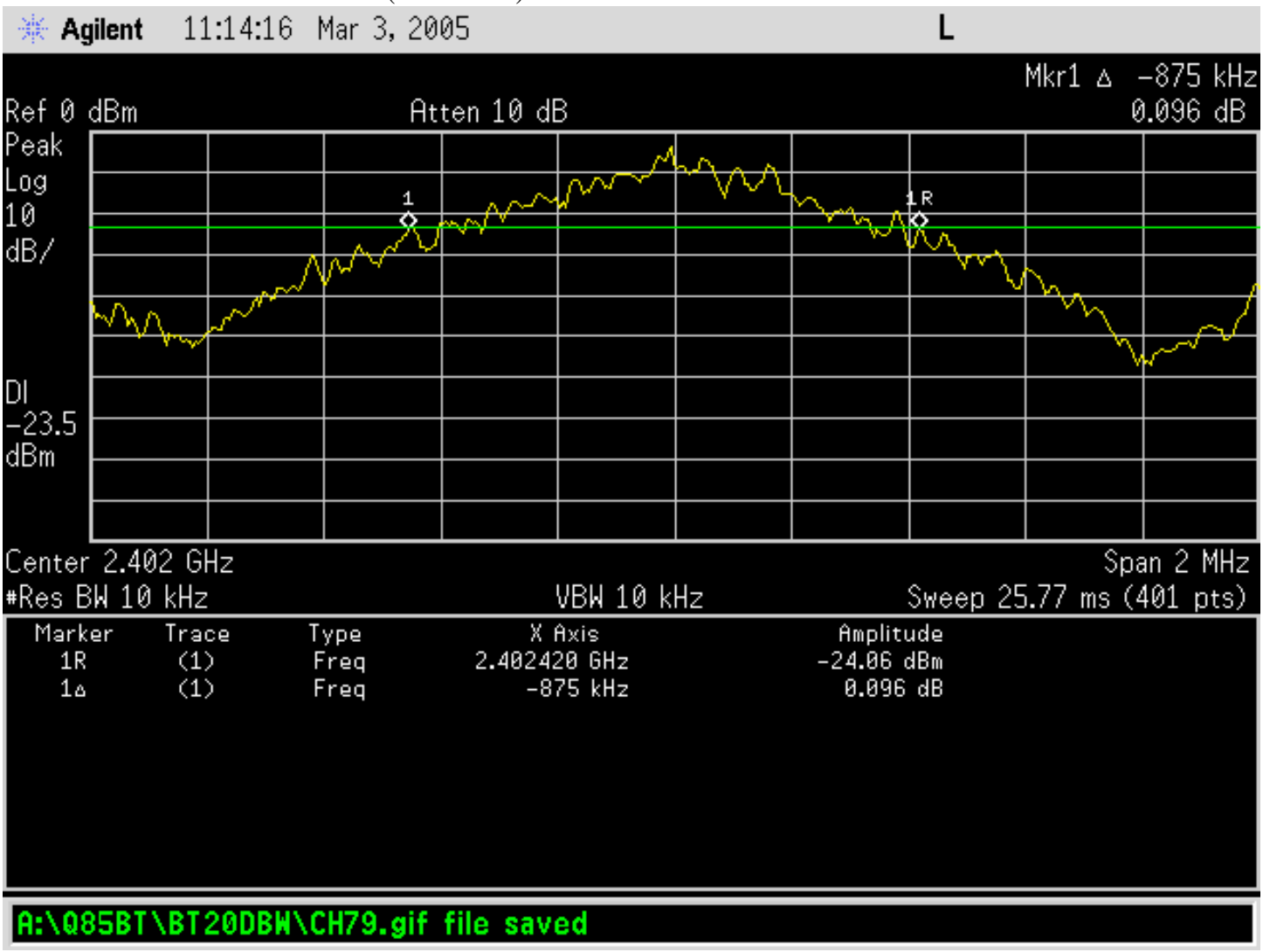

Date of Test: March 3, 2005

99% Bandwidth – High Channel (2480 MHz)



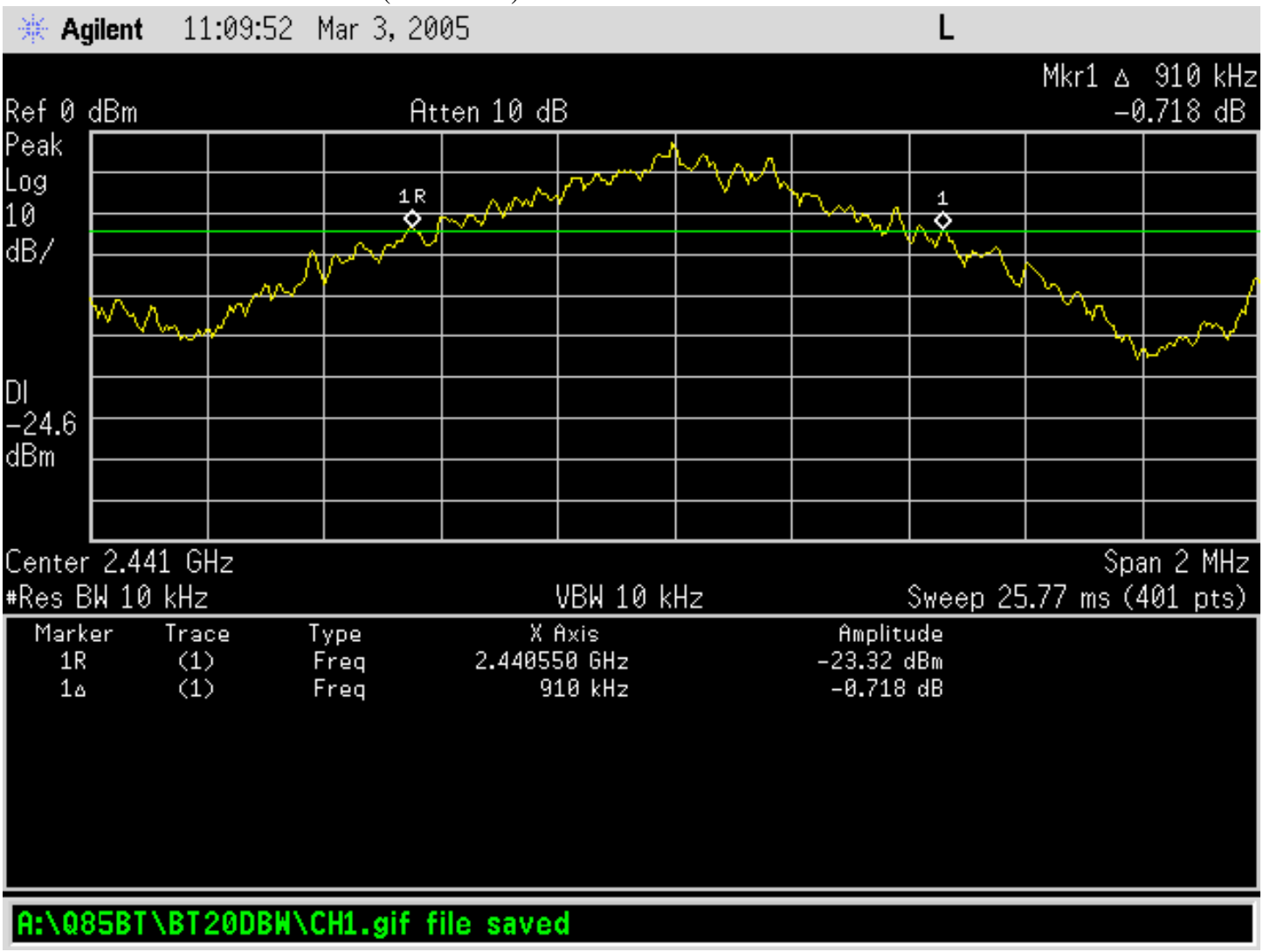

Date of Test: March 3, 2005

20 dB Bandwidth – Low Channel (2402 MHz)




Date of Test: March 3, 2005

20 dB Bandwidth – Mid Channel (2441 MHz)

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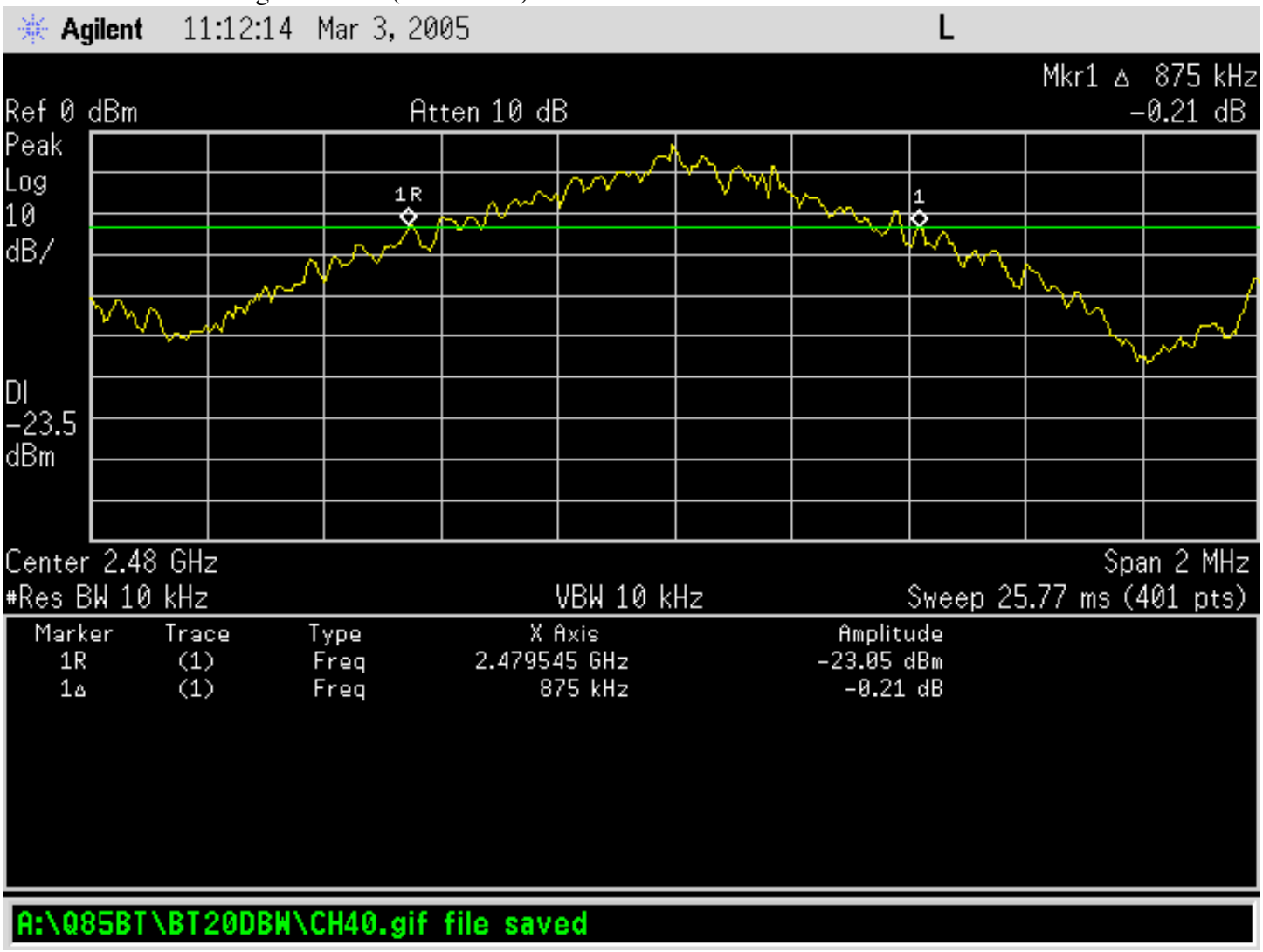
20 dB Bandwidth – High Channel (2480 MHz)




Date of Test: March 3, 2005

## 7.2 Hopping Frequency Separation

Limit

Frequency Hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB Bandwidth of the hopping channel, whichever is greater.

Test Procedure

The Apple Airport Extreme and Bluetooth 2.0+EDR Module was placed in continuous transmit mode while hopping over all 79 channels. The transmitter output is connected to a spectrum analyzer RF input. The bandwidth of the spectrum analyzer is set to 30 kHz.

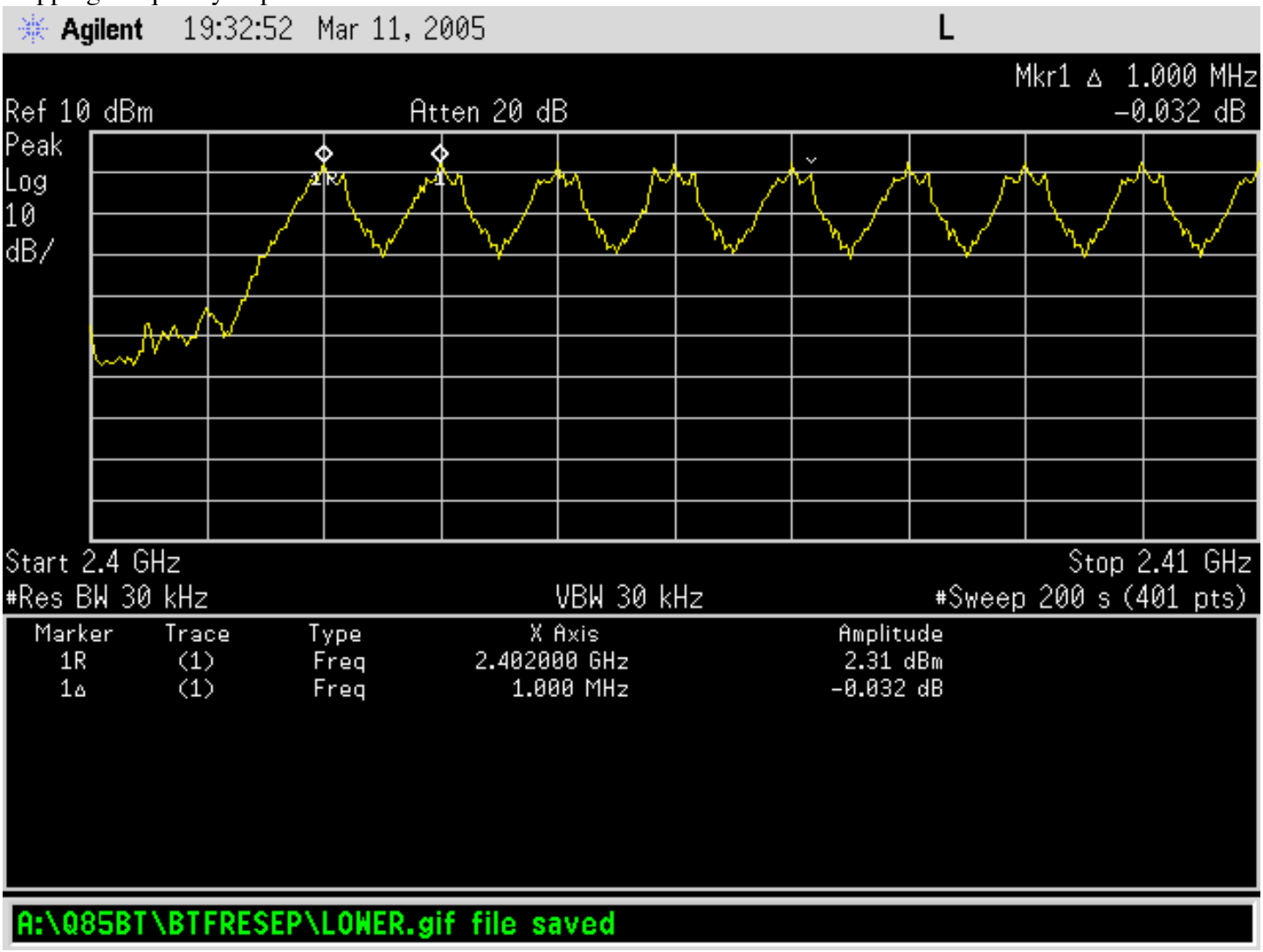
Test Results

Based on the results of this report, no non-compliance was found.

Hopping Frequency Separation Instrument Settings:

| Reference Level | Attenuation | Resolution BW | Video Bandwidth | Span | Sweep Time |
|---|---|---|---|---|---|
| 10 dBm | 10 dB | 30 kHz | 30 kHz | 10 MHz | 200 Seconds |

Hopping Frequency Separation – Lower Channels




Date of Test: March 11 2005

| Channels | Frequencies (MHz) | Marker 1 (MHz) | Marker 2 (MHz) | Channel Separation (MHz) |
|---|---|---|---|---|
| 1 and 2 | 2402, 2403 | 2402 | 2403 | 1 MHz |

## 7.3 Number of Hopping Channels

Limit

Frequency Hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Procedure

The Apple Airport Extreme and Bluetooth 2.0+EDR Module was placed in continuous transmit mode while hopping over all 79 channels. The transmitter output is connected to a spectrum analyzer RF input. A total of 4 adjacent spans were measured from 2400 to 2480. These scans were combined into a single graph to reveal a total of 79 channels.

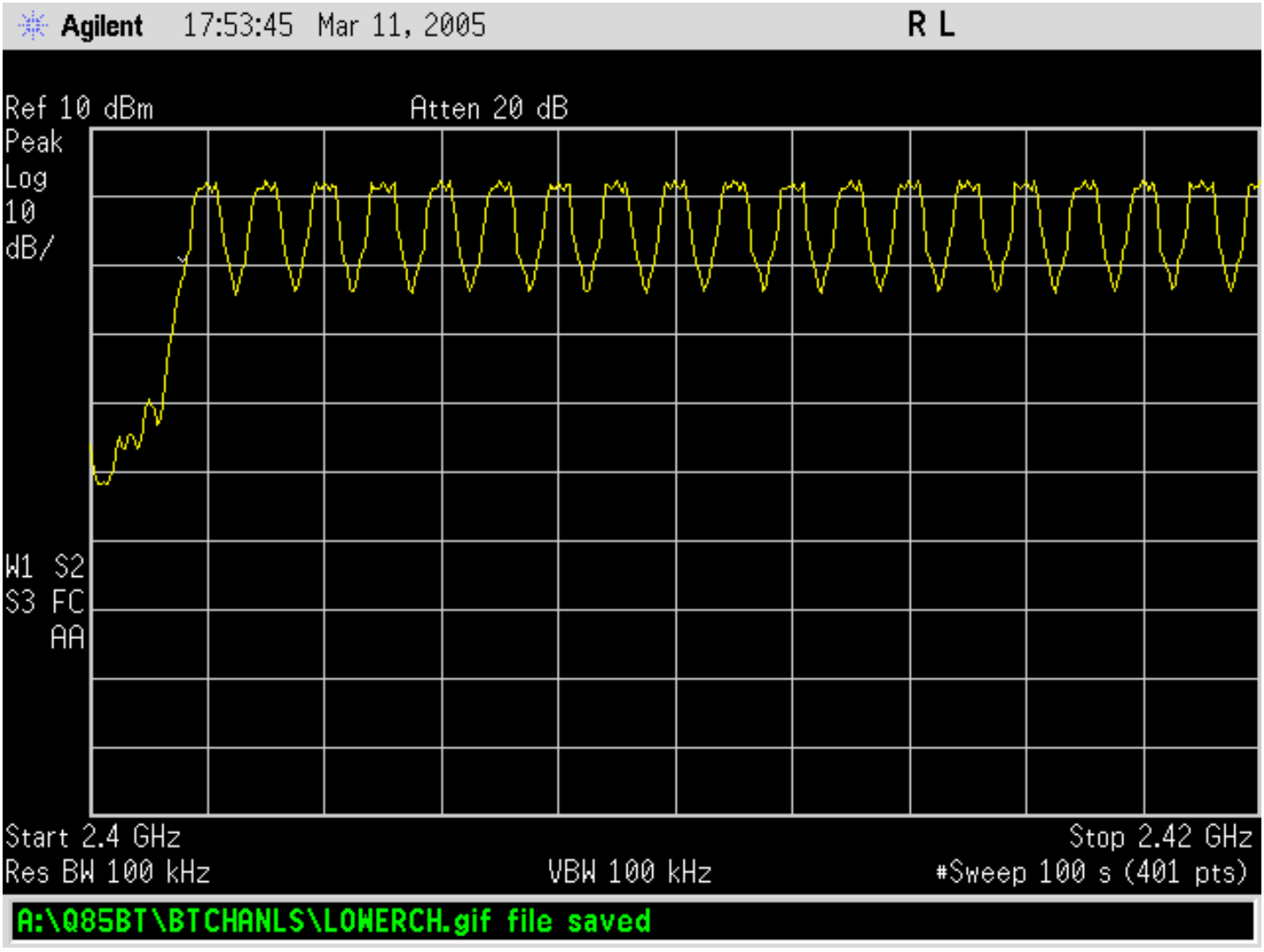
Test Results

79 Hopping Channels were observed. Based on the results of this report, no non-compliance was found.

Number of Hopping Channels - Instrument Settings:

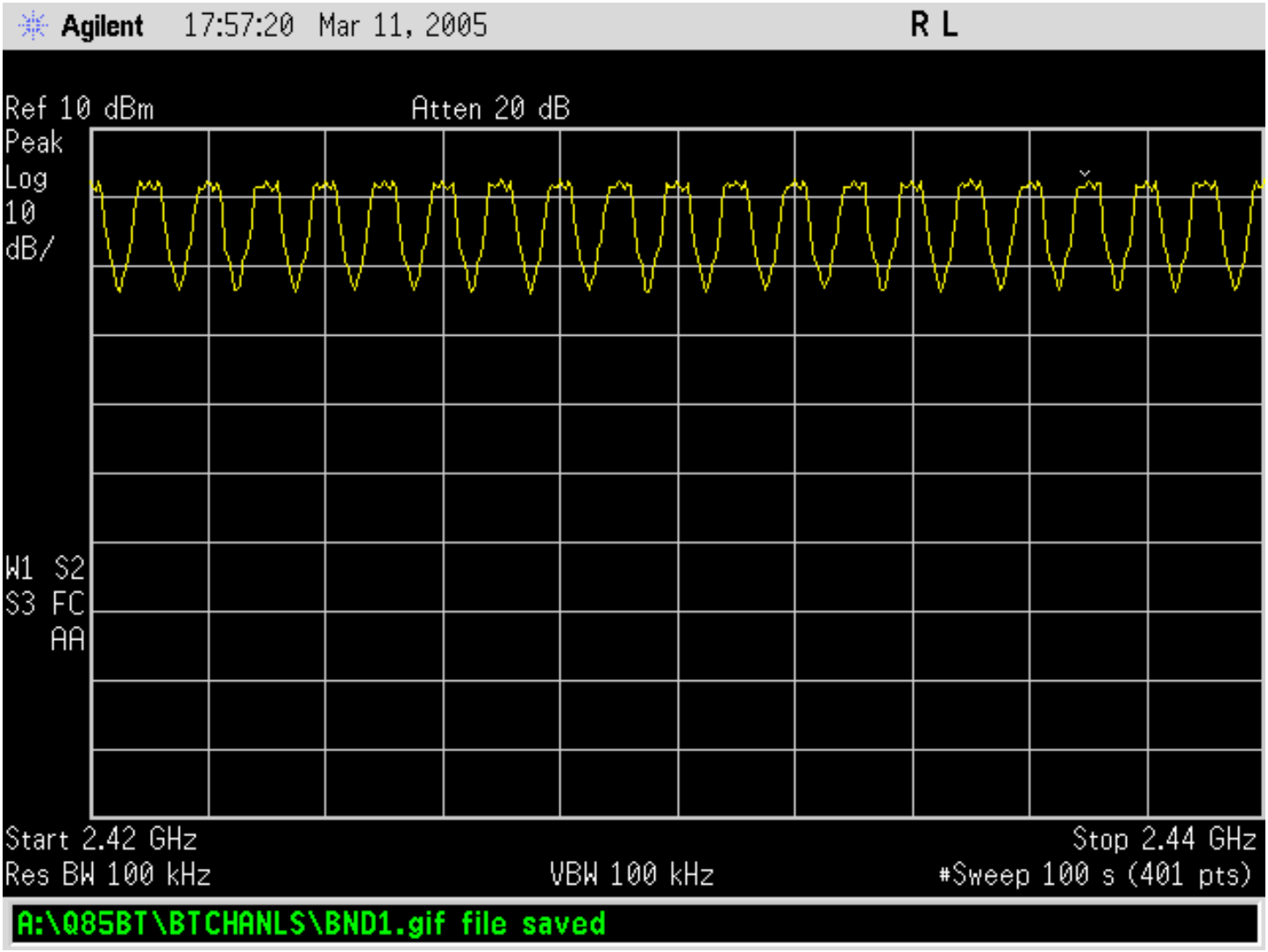
| Reference Level | Attenuation | Resolution BW | Video Bandwidth | Span | Sweep Time |
|---|---|---|---|---|---|
| 10 dBm | 20 dB | 100 kHz | 100 kHz | 20 MHz | 100 Seconds |

Channels from 2400 – 2420 MHz



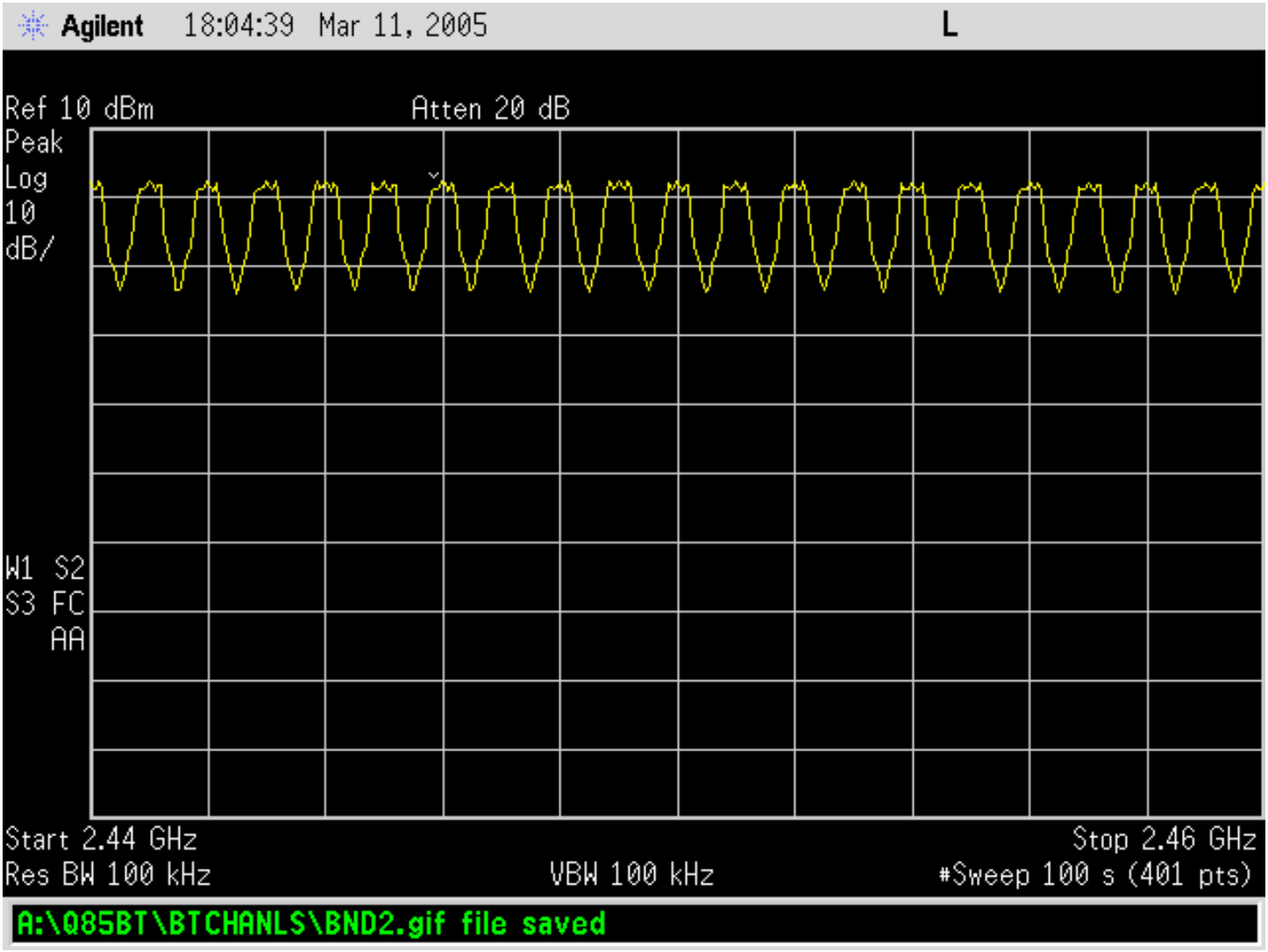

Date of Test: March 11, 2005

Channels from 2420 – 2440 MHz



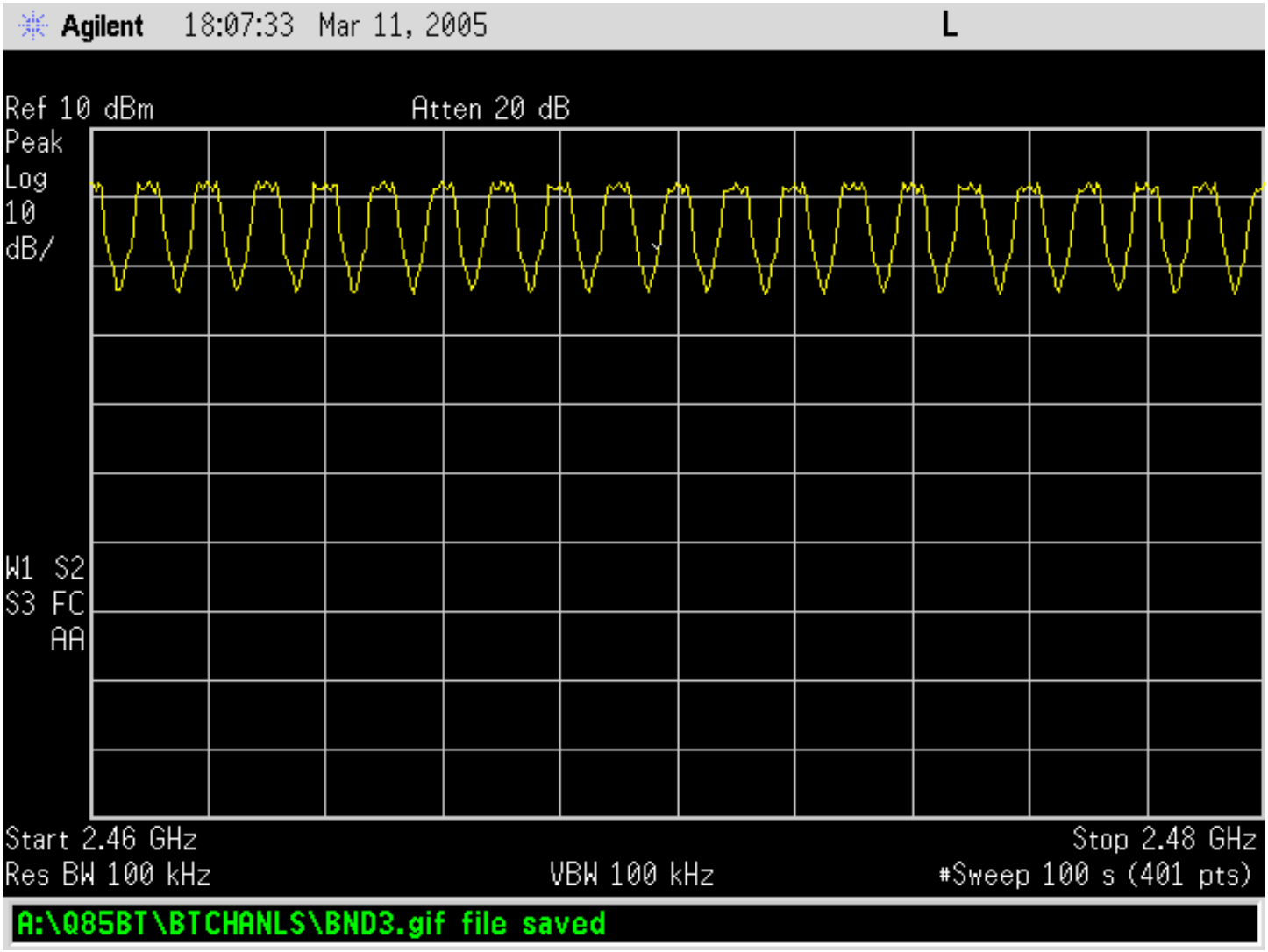

Date of Test: March 11, 2005

Channels from 2440 – 2460 MHz




Date of Test: March 11, 2005

Channels from 2460 – 2480 MHz

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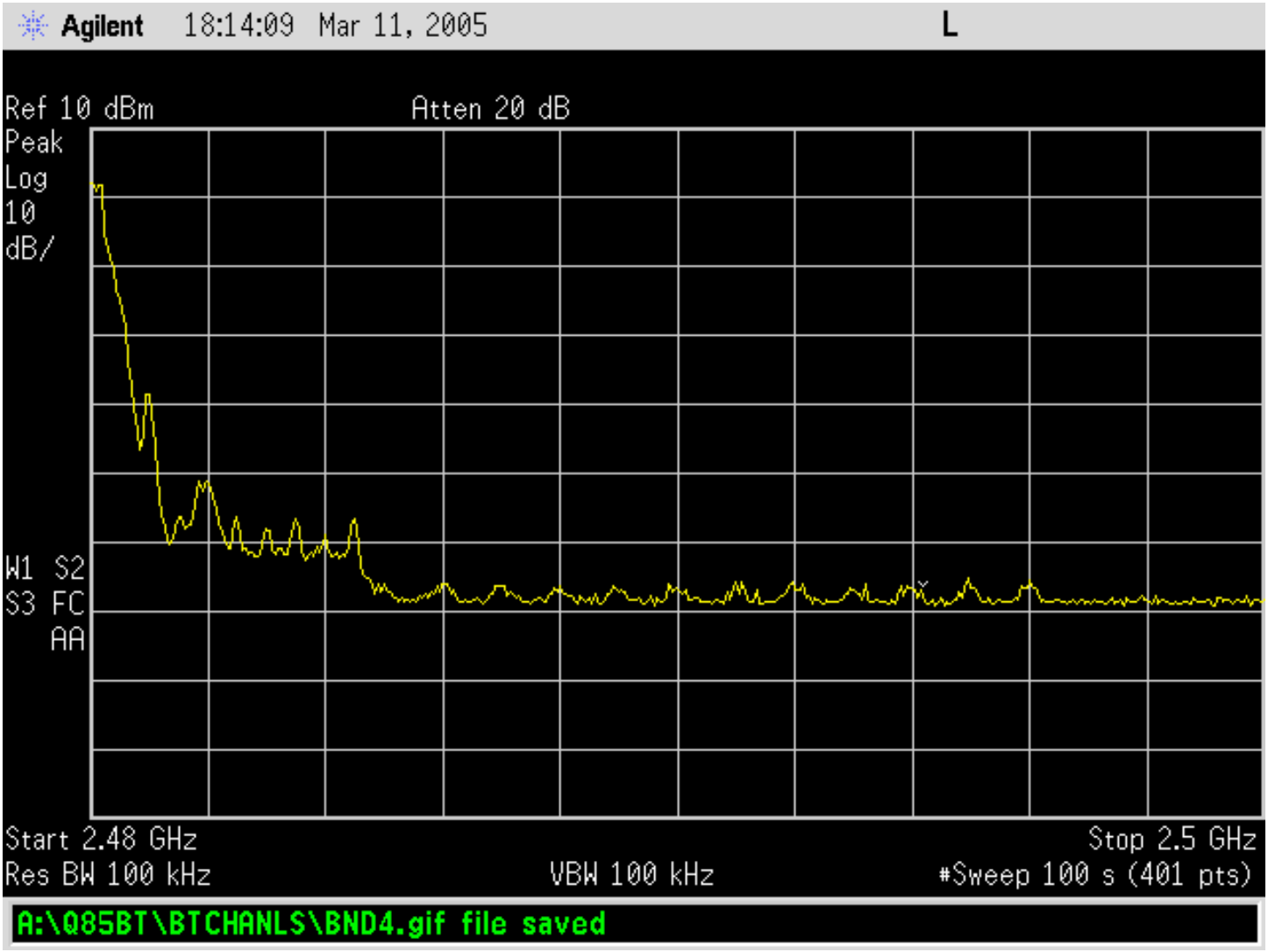
Channels from 2480 – 2500 MHz




Date of Test: March 11, 2005

## 7.4 Average Time of Occupancy

Limit

Frequency Hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Procedure

The Apple Airport Extreme and Bluetooth 2.0+EDR Module was placed in continuous transmit mode while hopping over all 79 channels. The transmitter output is connected to a spectrum analyzer RF input. The width of a single channel is measured in a fast scan of 4 mS sweep time. The number of pulses in a 3.16 second period are counted and multiplied by 10.

The average occupancy time in the specified 31.6 second period (79 channels x 0.4 S = 31.6) is equal to

10 x (number of pulses in 3.16 s) x pulse width.

Test Results

Based on the results of this report, no non-compliance was found.

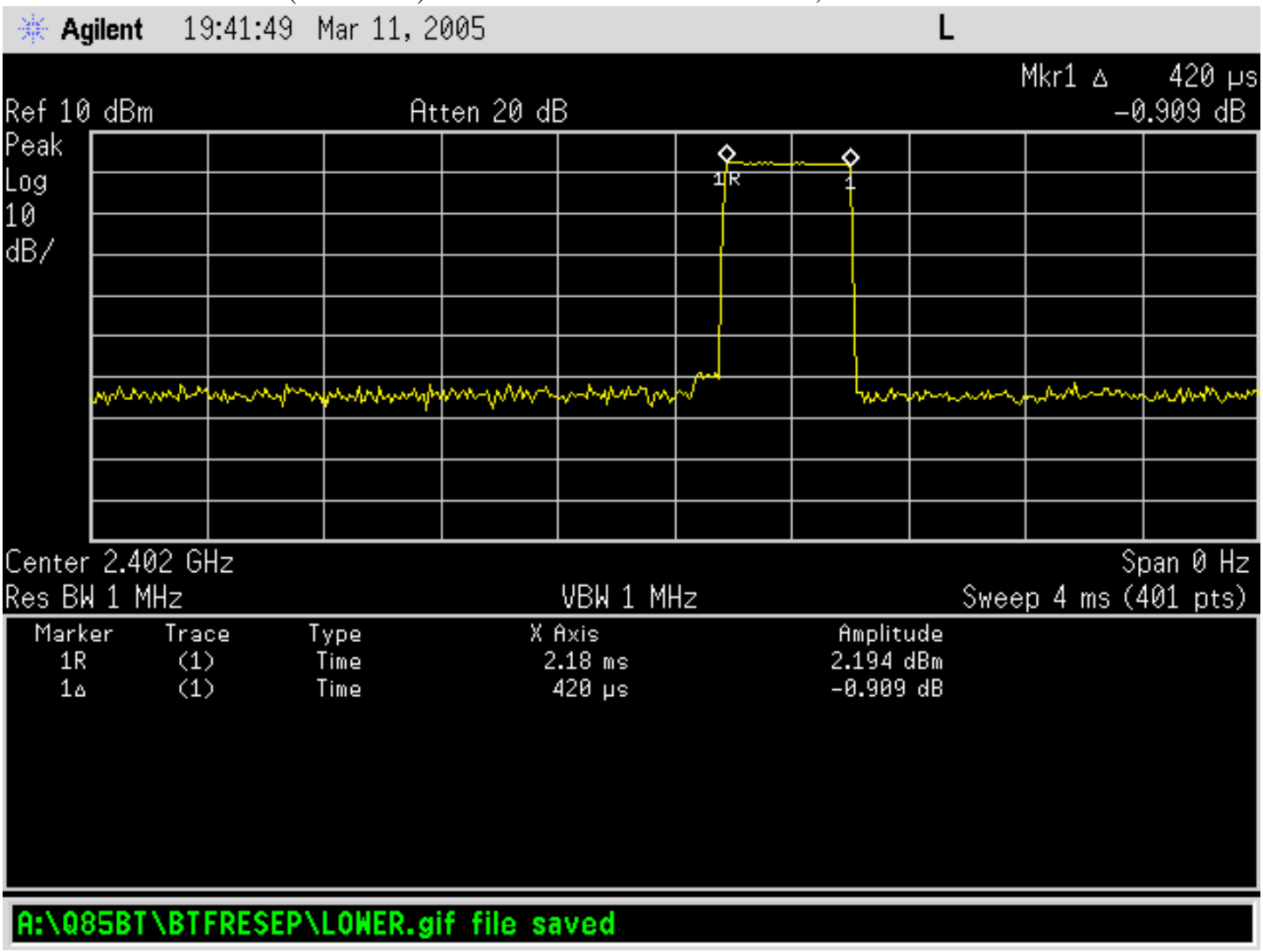
Average Time of Occupancy - Instrument Settings:

| Reference Level | Attenuation | Resolution BW | Video Bandwidth | Span | Sweep Time |
|---|---|---|---|---|---|
| 10 dBm | 20 dB | 1 MHz | 1 MHz | 0 Hz | 0.004 Seconds or 3.16 Seconds |

Pulse Width (DH1) = 420 uS
Number of Pulses in 3.16 Seconds = 32
Number of Pulses in 31.6 Seconds = 320
Average Time of occupancy = 320 x 420 uS = 134 mS

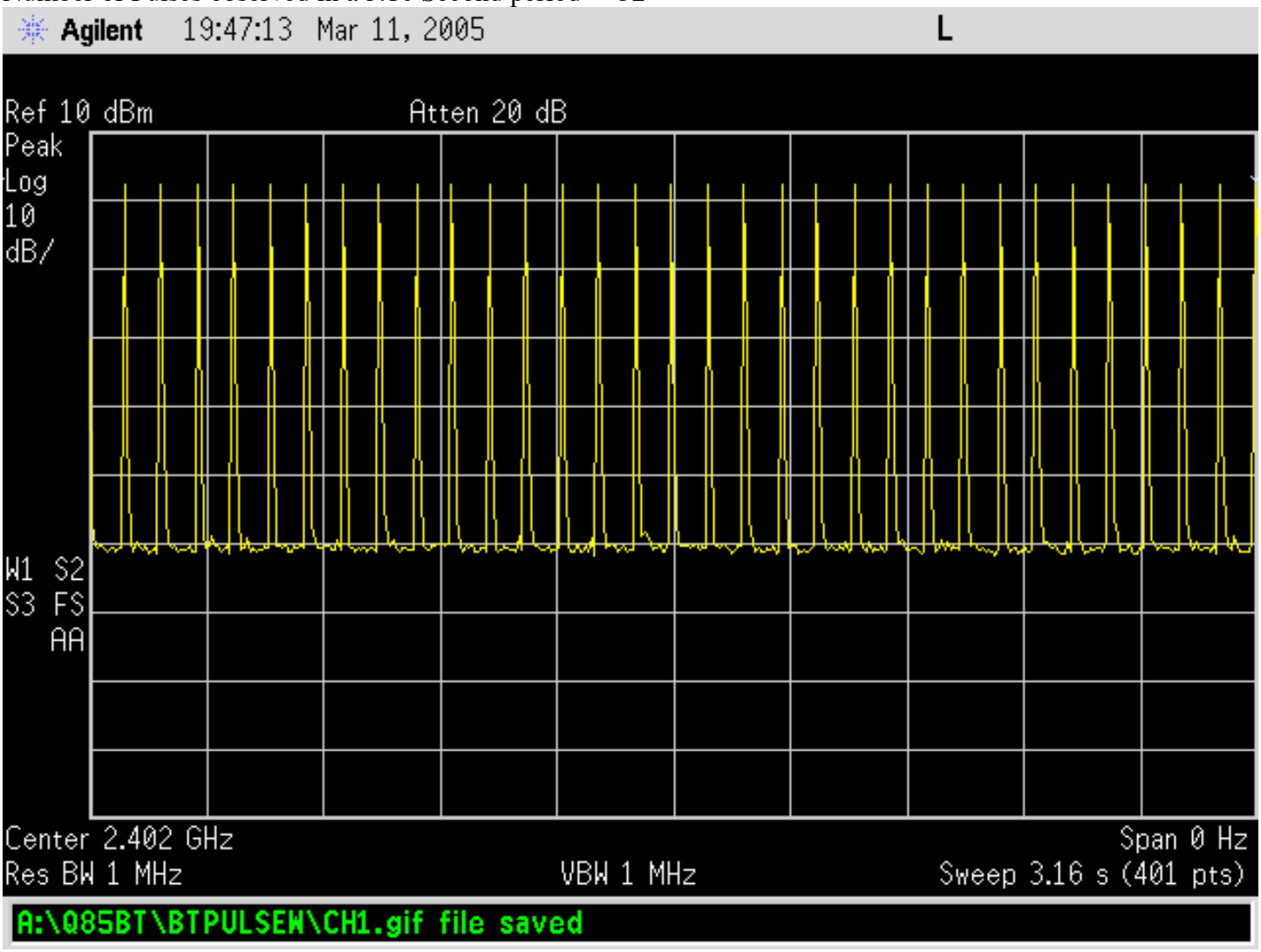
| Average Time of Occupancy (Seconds) | Limit (Seconds) | Margin (Seconds) |
|---|---|---|
| 0.134 | 0.4 | 0.266 |

Pulse Width – Channel 1 (2402 MHz) Horizontal scale set to 4 mSecond, Pulse Width = 420 uS




Date of Test: March 11, 2005

Number of Pulses on Channel 1 (2402 MHz) with a 0 Hz Span. Horizontal Scale set to 3.16 Seconds. The Number of Pulses observed in a 3.16 Second period = 32




Date of Test: March 11, 2005

## 7.5 Output Power

Limit

The output power is not to exceed 1.0 Watt and the EIRP not to exceed 6 dBW if the hop set uses 50 or more frequencies; not to exceed 0.25 watt and the EIRP not to exceed 0 dBW if the hop set uses less than 50 frequencies.

The maximum antenna gain for the Apple Airport Extreme and Bluetooth 2.0+EDR Module is 2.62 dBi and it uses 79 hopping frequencies therefore the limit is 30 dBm.

Test Setup

The transmitter is connected to a peak power meter and set to continuously transmit.

Maximum Peak Output Power Test Results
Based on the results of this report, no non-compliance were found.

| Channel | Frequency (MHz) | Peak Power (dBm) | Limit (dBm) |
|---|---|---|---|
| Low | 2402 | 3.38 | 30 |
| Mid | 2441 | 3.71 | 30 |
| High | 2480 | 3.74 | 30 |

Date of Test: March 9, 2005

## 7.6 Average Power

Average Power Limit
None; for reporting purposes only

Test Procedure
The transmitter is connected to an average power meter and set to transmit continuously.

Average Power Test Results

| Channel | Frequency (MHz) | Average Power (dBm) |
|---|---|---|
| Low | 2402 | 1.51 |
| Mid | 2441 | 1.82 |
| High | 2480 | 1.85 |

Date of Test: March 9, 2005

## 7.7 Power Spectral Density

Limit

The transmitter power spectral density (into the antenna) shall not be greater than 8 dBm in any 3 kHz band.

Test Procedure

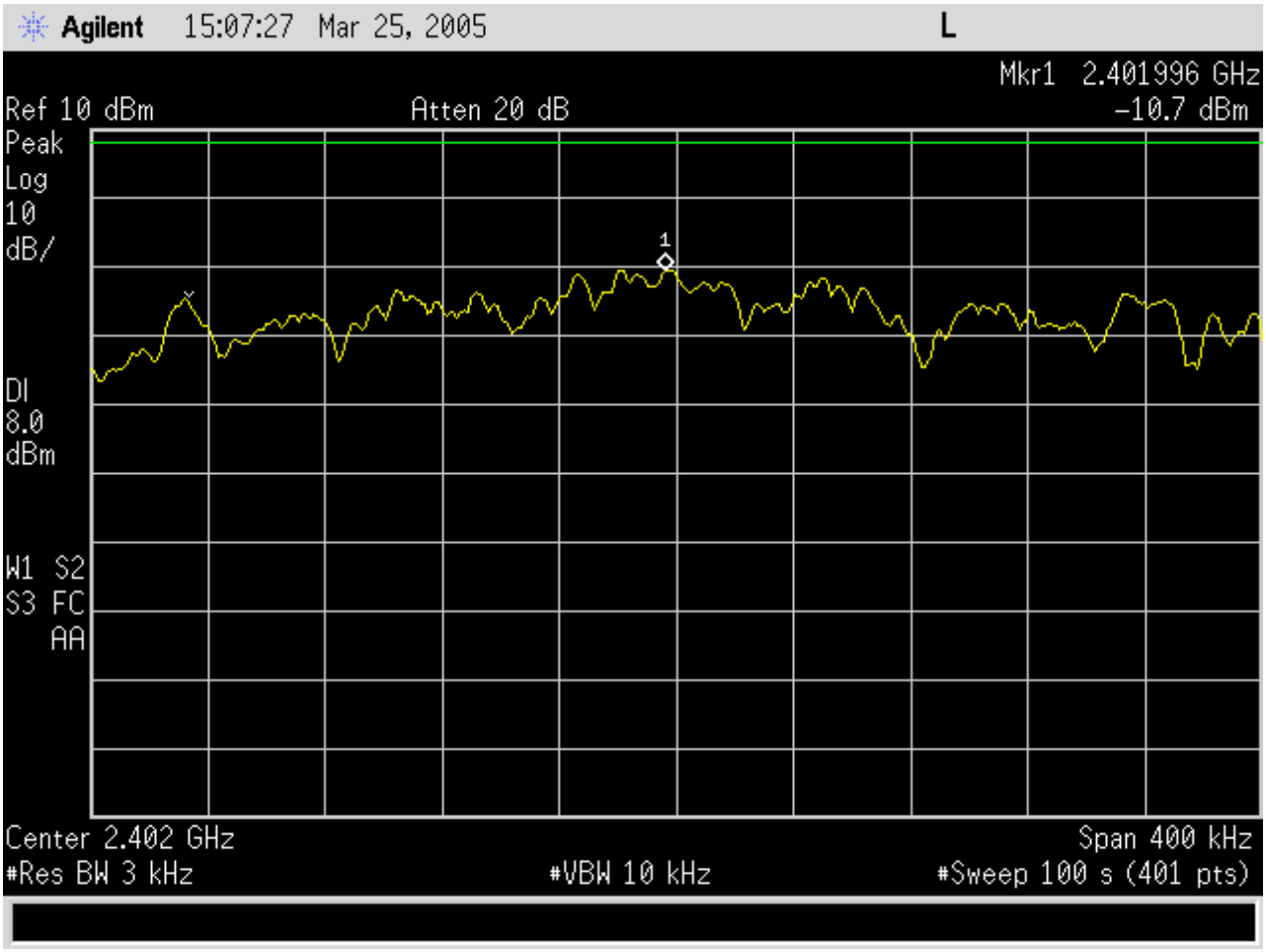
The transmitter output was connected to a spectrum analyzer. The maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW = 10 kHz and the span = 400 kHz with a sweep time of 100 Seconds. This process was repeated for the low, middle and high channels..

Power Spectral Density Test Results

Based on the results of this report, no non-compliance was found.

| Channel | Frequency (MHz) | Peak Power Spectral Density (dBm) | Limit (dBm) |
|---|---|---|---|
| Low | 2402 | -10.7 | 8 |
| Mid | 2441 | -10.6 | 8 |
| High | 2480 | -11.25 | 8 |

Power Spectral Density Channel 1 (2402 MHz)

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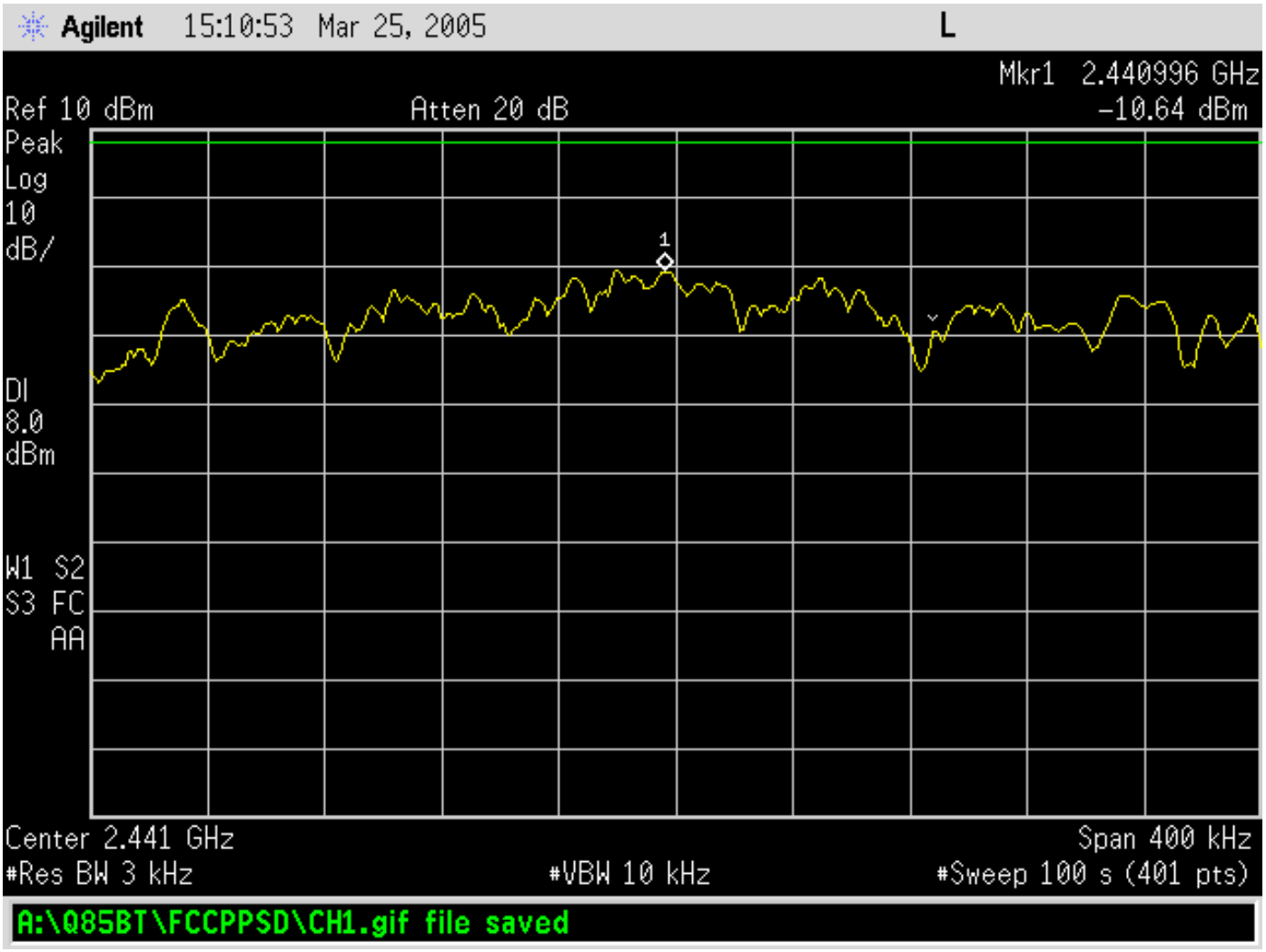
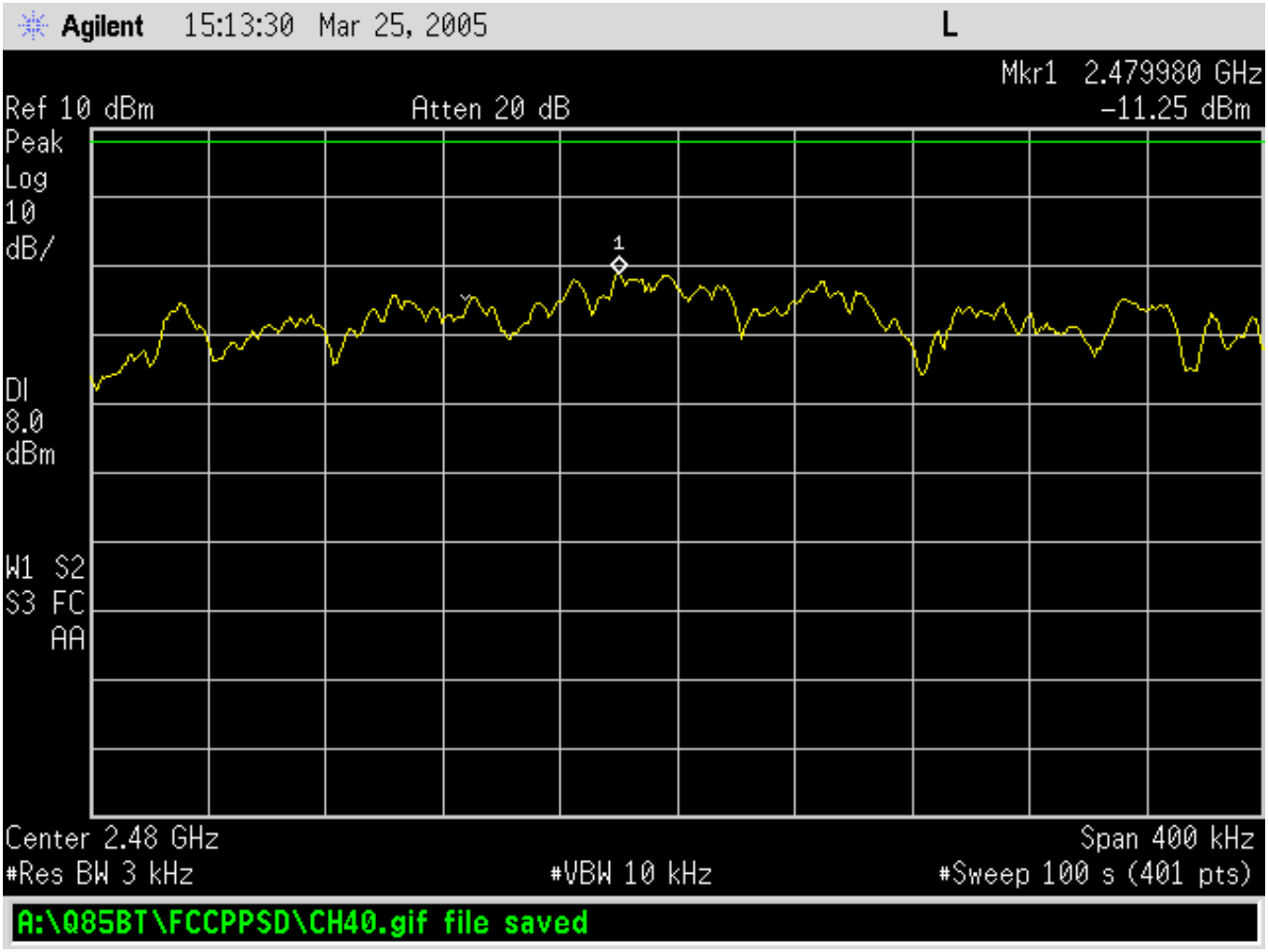
Power Spectral Density Channel 40 (2441 MHz)




Date of Test: March 25, 2006

Power Spectral Density Channel 79 (2480 MHz)




Date of Test: March 25, 2005

## 7.8 Conducted Spurious Emissions

Limit

In any 100 kHz bandwidth outside the frequency band in which the 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 hand that contains the highest level of desired power.

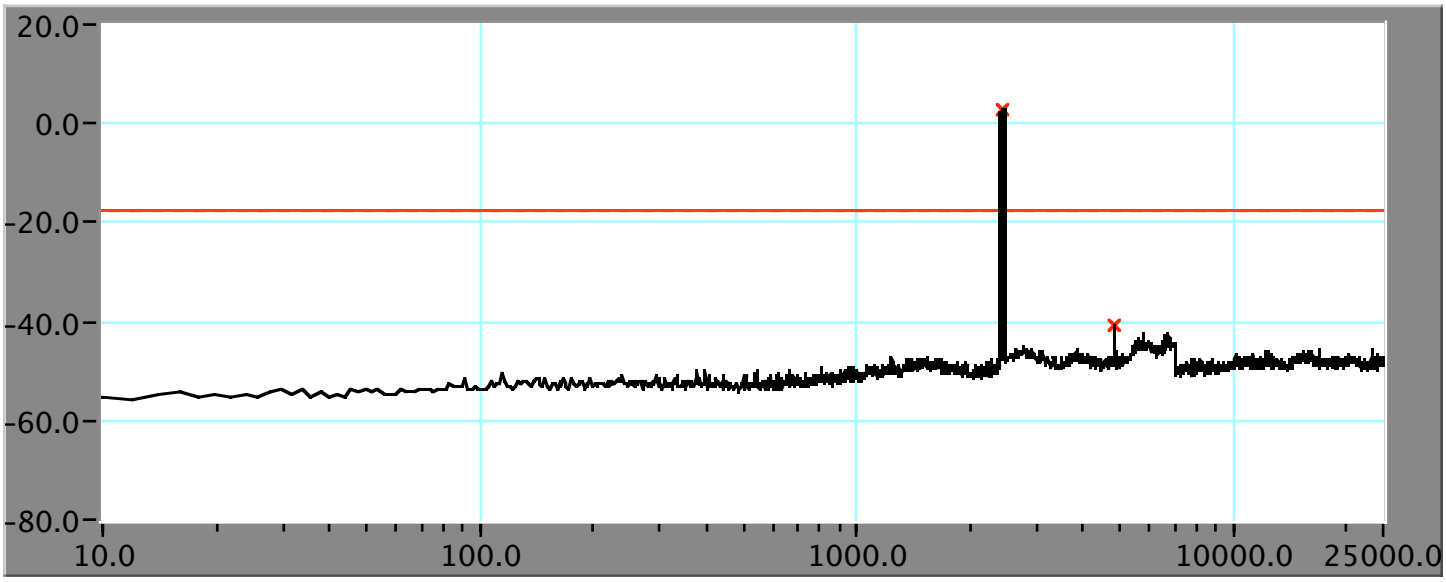
Test Procedure

The transmitter is set to continuously transmit and 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 spectrum from 30 MHz to 25 GHz is investigated when transmitting on the low, mid and highest channels with hopping disabled. In addition, the lower and upper band edge with hopping enabled is also investigated.

Test Results

Based on the results of this report, no non-compliance was found.

-20 dBc Conducted Spurious Emissions - Hopping Enabled




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2459 | 2.6 | N/A |
| 4837 | -40.8 | -17.4 |

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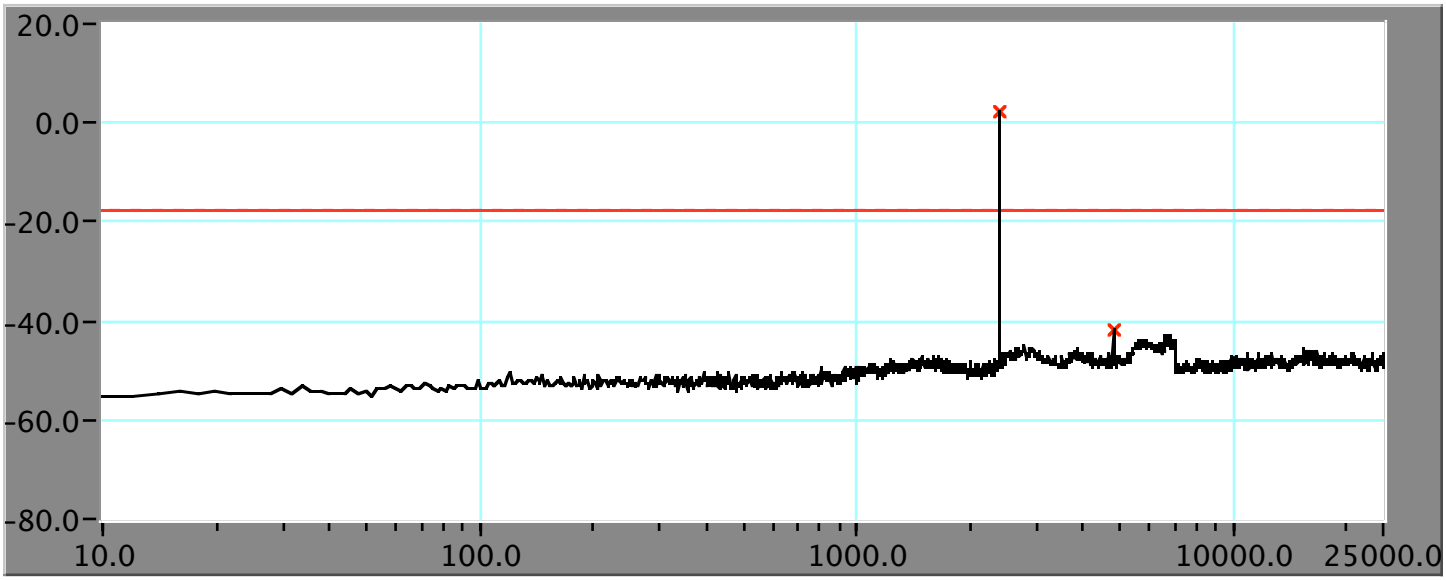
-20 dBc Conducted Spurious Emissions Low Channel (2402 MHz)




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2402 | 2.3 | N/A |
| 4804 | -41.8 | -17.4 |

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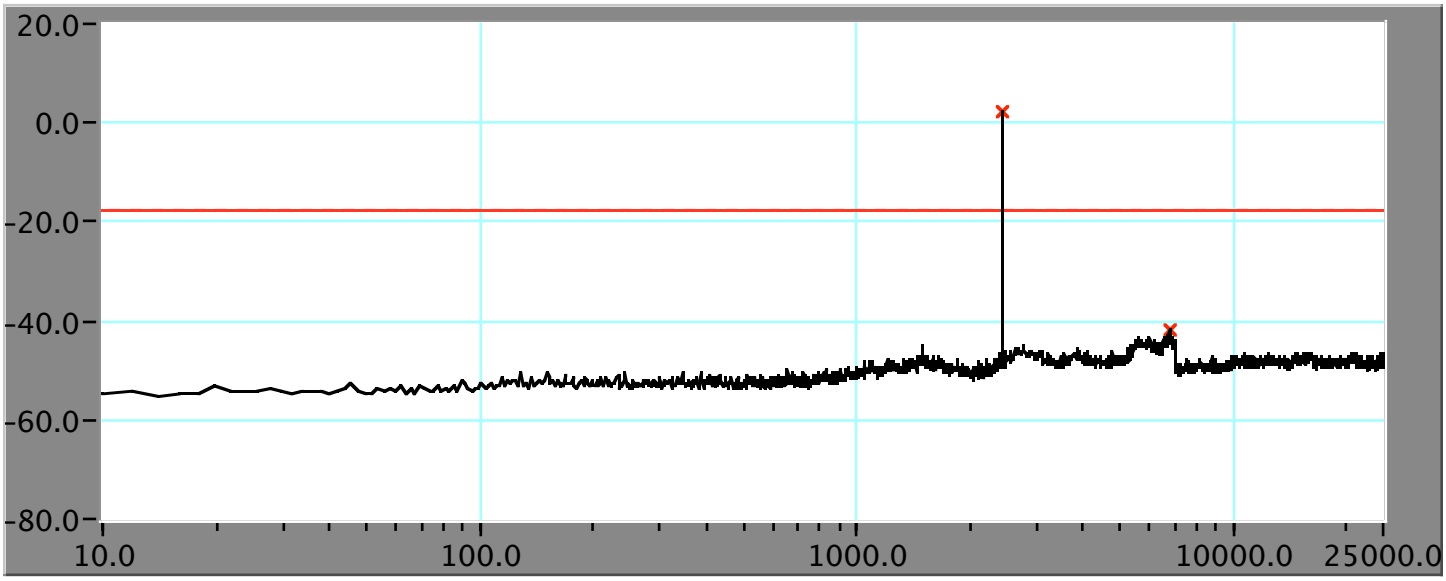
-20 dBc Conducted Spurious Emissions High Channel (2480 MHz)




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2480 | 2.2 | N/A |
| 6755 | -41.7 | -17.4 |

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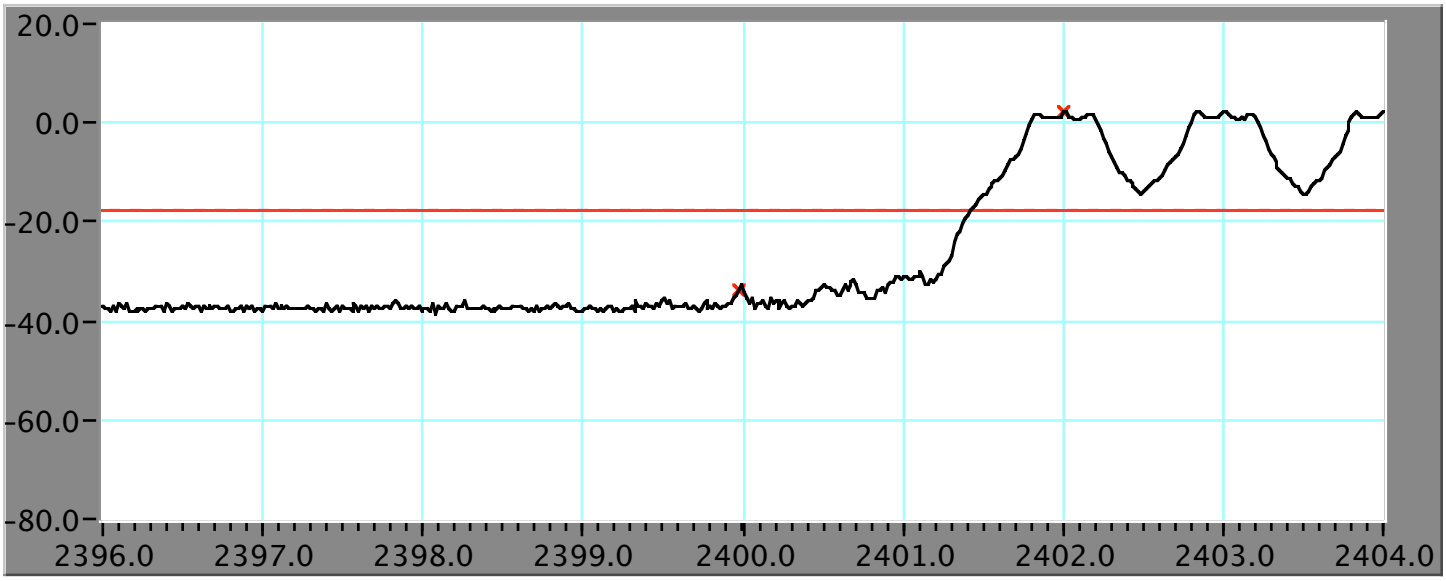
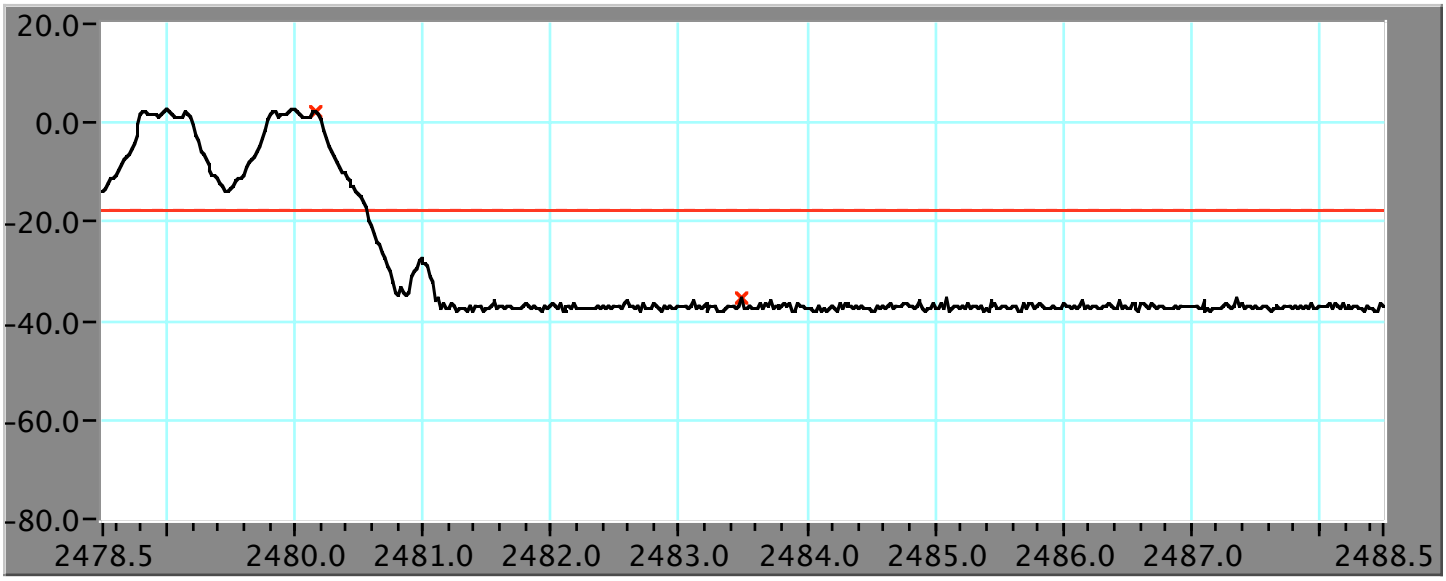
-20 dBc Conducted Spurious Emissions – Hopping Enabled, Lower Bandedge




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2400 | -33.8 | 2.3 dBm -20 dB = -17.7 dBm |

Date of Test: March 11, 2005

-20 dBc Conducted Spurious Emissions – Hopping Enabled, Upper Bandedge




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2483.5 | -35.6 | 2.2 dBm -20 = -17.8 dBm |

Date of Test: March 11, 2005

7.9 Radiated Emissions

7.9.1 Transmitter Radiated Spurious Emissions

**Limits**

| 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 | 2690 - 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

(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.

Test Procedure

Emission measurements were performed at the Apple Computer Evelyn 1, semi-anechoic chamber located at 123 East Evelyn Avenue, Mountain View, California. The EUT was placed on a nonmetallic table, 80 cm above the metallic ground-plane. The EUT and peripherals were powered from a filtered main supply.

The frequency spectrum from 30 MHz to 25 GHz was scanned and the emission levels maximized at each frequency. The antenna was varied in height and the system was rotated 360 degrees while scanning for maximum emission amplitudes. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

For Peak Detection measurements below 1 GHz, the RBW is set to 120 kHz and the VBW is set to 300 kHz. For Quasi-Peak detection measurements, 120 kHz bandwidths were used. Peak detection was used unless otherwise noted as Quasi-Peak. For peak measurements above 1 GHz, the RBW is set to 1 MHz and the VBW is set to 1 MHz. For Average measurements the RBW is set to 1 MHz and the VBW is set to 10 Hz. Radiated Emission measurements below 1 GHz were performed at an EUT to antenna distance of 3 meters and measurements above 1 GHz were performed at an EUT to antenna distance of 1 meter.

Radiated emissions measurements were performed with the transmitter set to continuously transmit using the low, mid and highest channel using maximum transmit power.

- low (channel 1) - 2.402 GHz
- mid (channel 40) - 2.441 GHz
- high (channel 80) - 2.480 GHz

Two sets of Radiated Emissions measurements from 30 MHz to 25 GHz were performed using two unique antennas. The module was tested outside of an enclosure when testing with Antenna MODEL 613-5956 and the module was installed in a host system when testing with Antenna A1067.

Test Results

Based on the results of this report, no non-compliance was found.

7.9.2 Transmitter Radiated Spurious Emissions above 1 GHz

Restricted Bands

The adjacent restricted bands at the lower and upper edges of the 2.4 GHz ISM band were scanned for the maximum radiated emissions with the transmitter set to continuously transmit at the corresponding lowest and highest channels.

The actual frequency range of the adjacent restricted bands is from 2310 MHz to 2390 MHz and from 2483.5 MHz to 2500 MHz. However, for testing purposes, the scanned range was extended to allow maximizing on the intentional transmitter emissions.

Restricted Bands Instrument Settings

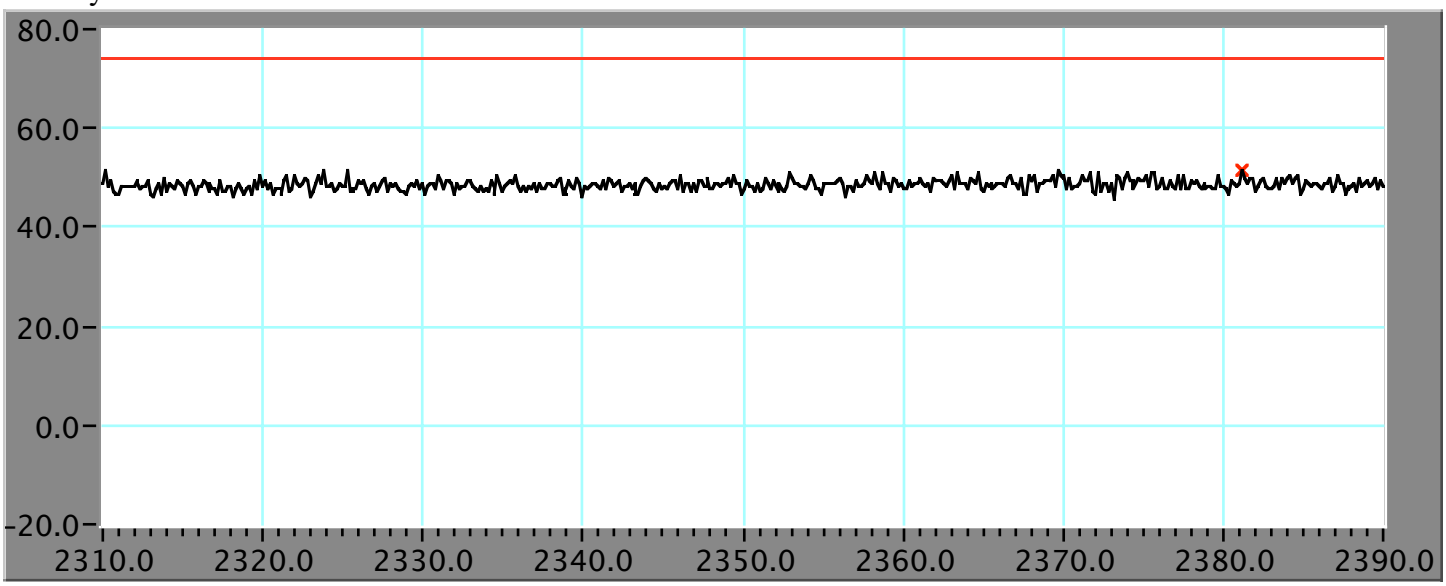
Peak Measurement Instrument Settings

| Frequency Range | Reference Level | Attenuation | Resolution BW | Video BW | Sweep Rate |
|---|---|---|---|---|---|
| 2310-2390 MHz | 80 dBuV/m | 10 dB | 1 MHz | 1 MHz | 5 mS |
| 2482-2500 MHz | 80 dBuV/m | 10 dB | 1 MHz | 1 MHz | 5 mS |

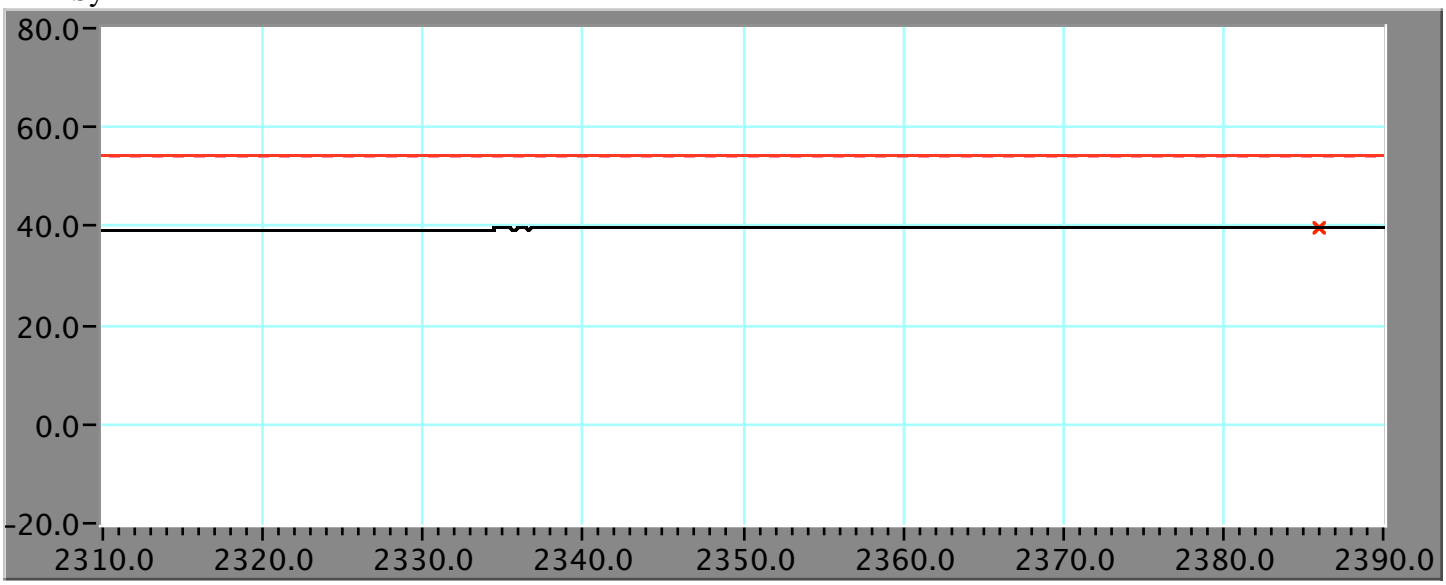
Average Measurement Instrument Settings

| Frequency Range | Reference Level | Attenuation | Resolution BW | Video BW | Sweep Rate |
|---|---|---|---|---|---|
| 2310-2390 MHz | 80 dBuV/m | 10 dB | 1 MHz | 10 Hz | 22.5 Seconds |
| 2482-2500 MHz | 80 dBuV/m | 10 dB | 1 MHz | 10 Hz | 6.4 Seconds |

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.402 GHz), Peak Detection
Host System #1



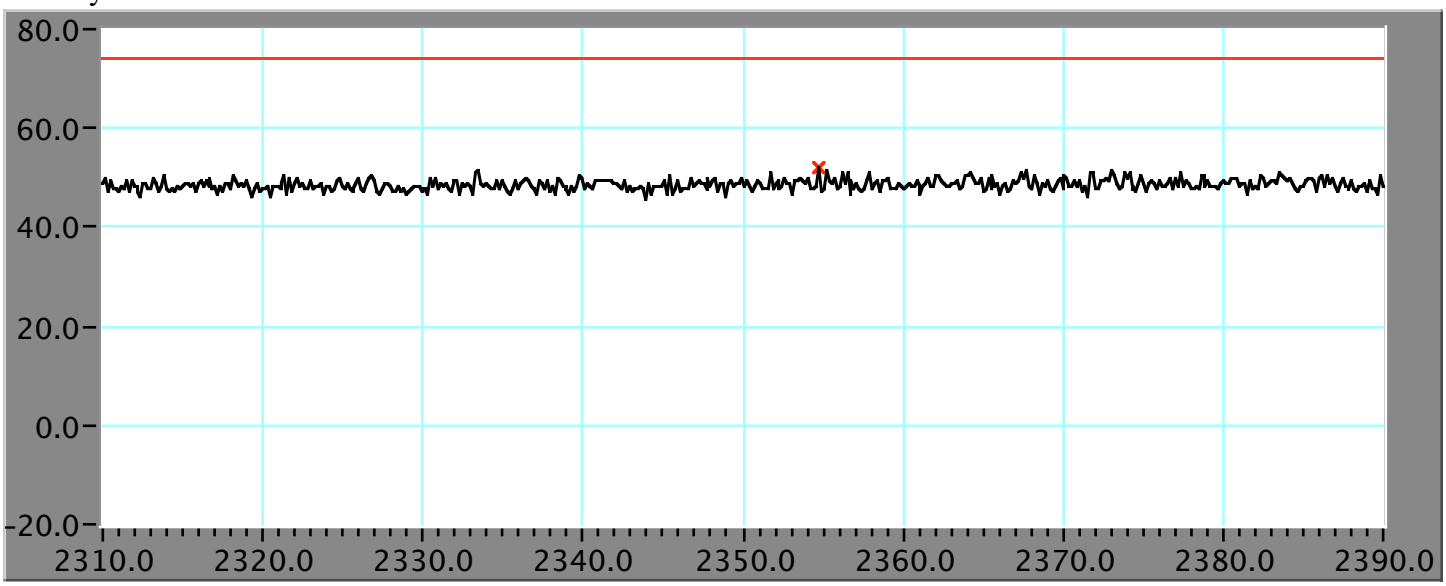

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.402 GHz), Average Detection
Host System #1



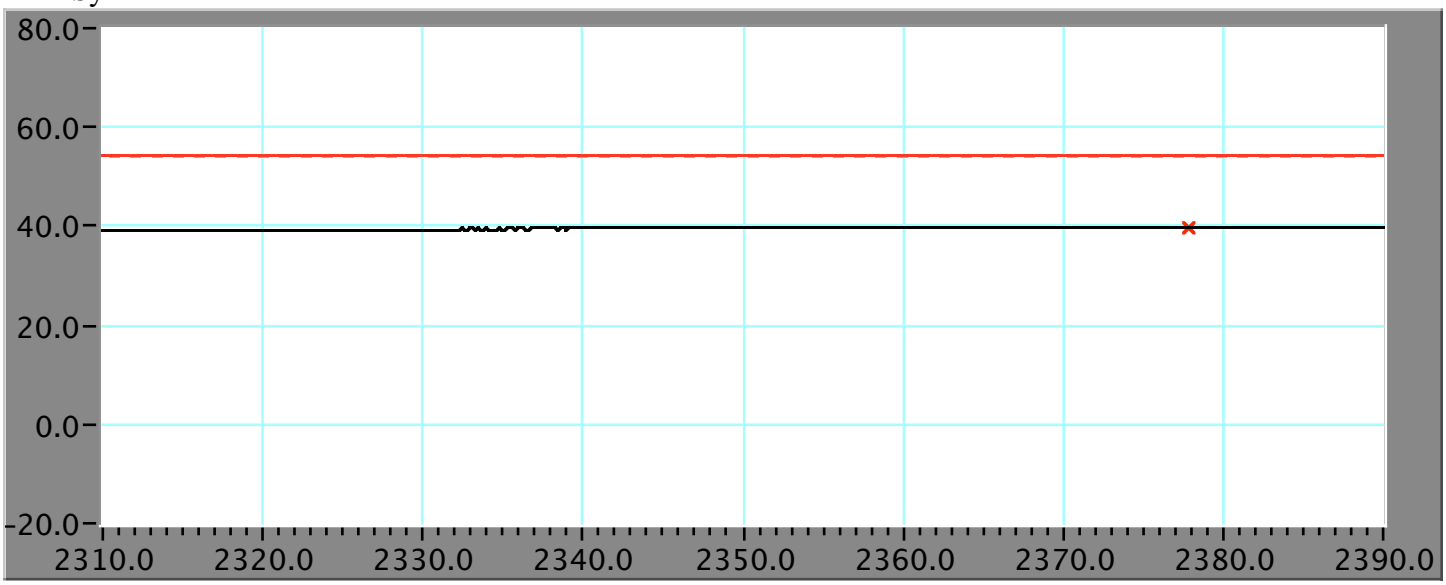

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2381.18 | 51.7 | 74 | -22.3 | 24.91 | 32.28 | 3.97 | 9.5 |
| 2386 | 39.8 | 54 | -14.2 | 13.01 | 32.29 | 4.3 | 9.5 |

Date of Test: March 4, 2005

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.402 GHz), Peak Detection
Host System #1



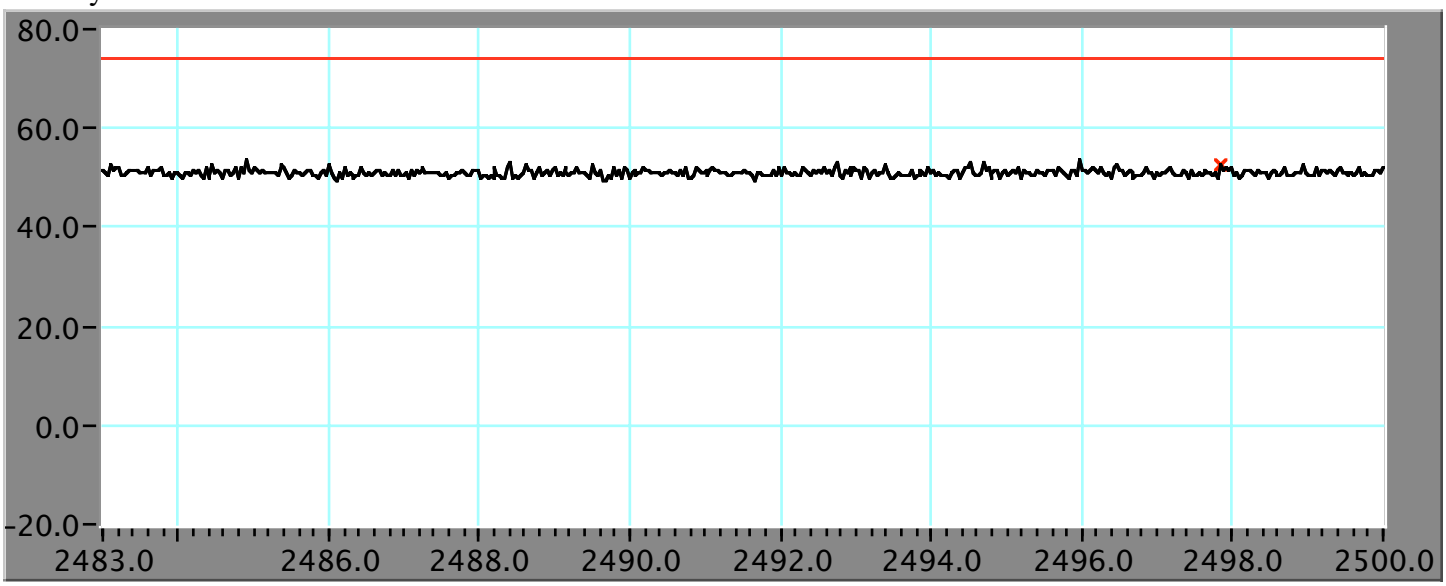

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.402 GHz), Average Detection
Host System #1



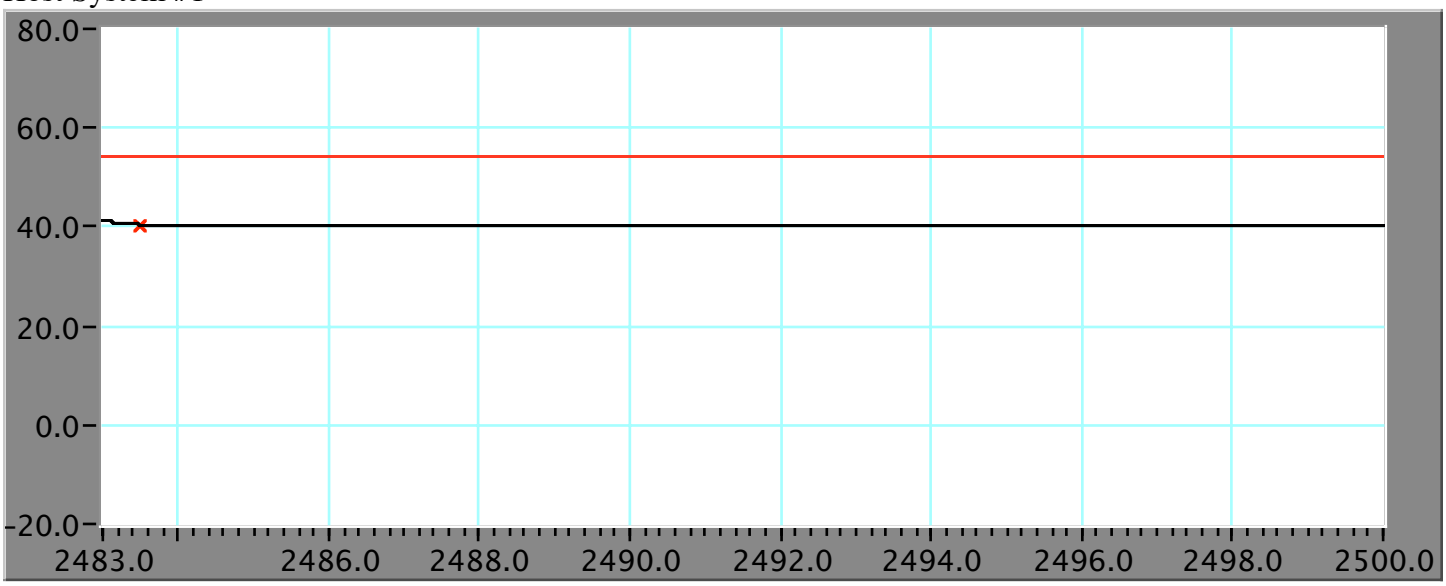

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2354.73 | 52 | 74 | -22 | 25.32 | 32.25 | 3.96 | 9.5 |
| 2377.82 | 39.8 | 54 | -14.2 | 13.08 | 32.28 | 3.97 | 9.5 |

Date of Test: March 4, 2005

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 79 (2.480 GHz), Peak Detection
Host System #1



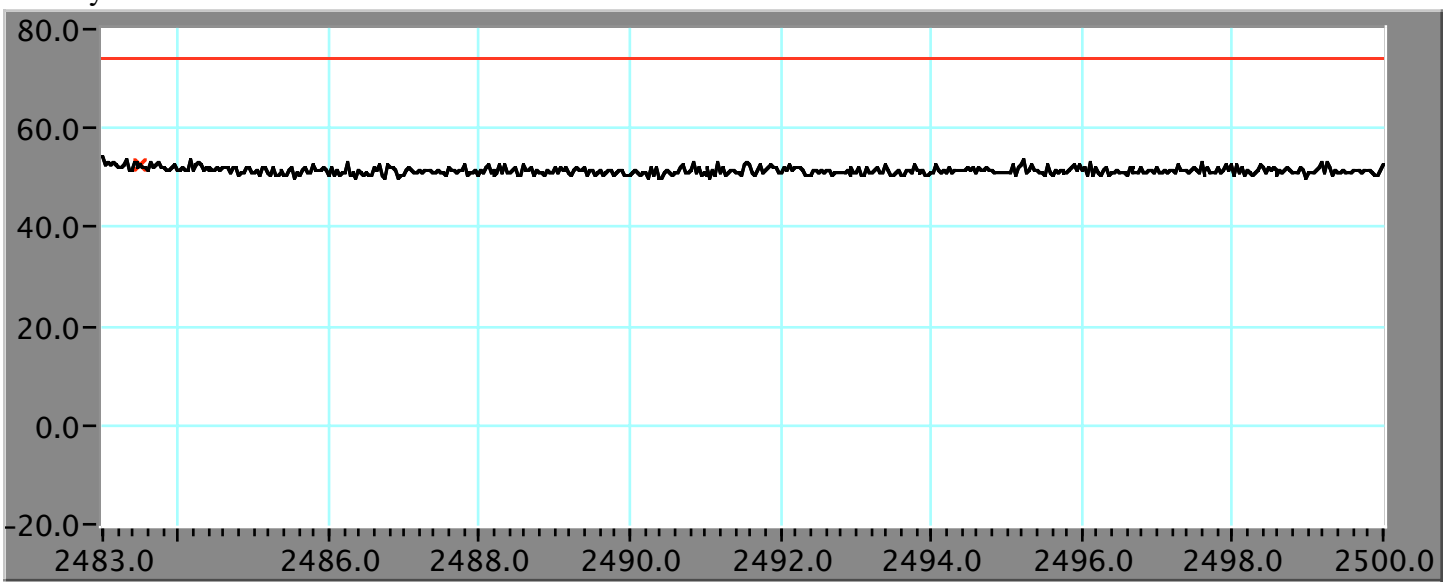

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 79 (2.480 GHz), Average Detection
Host System #1



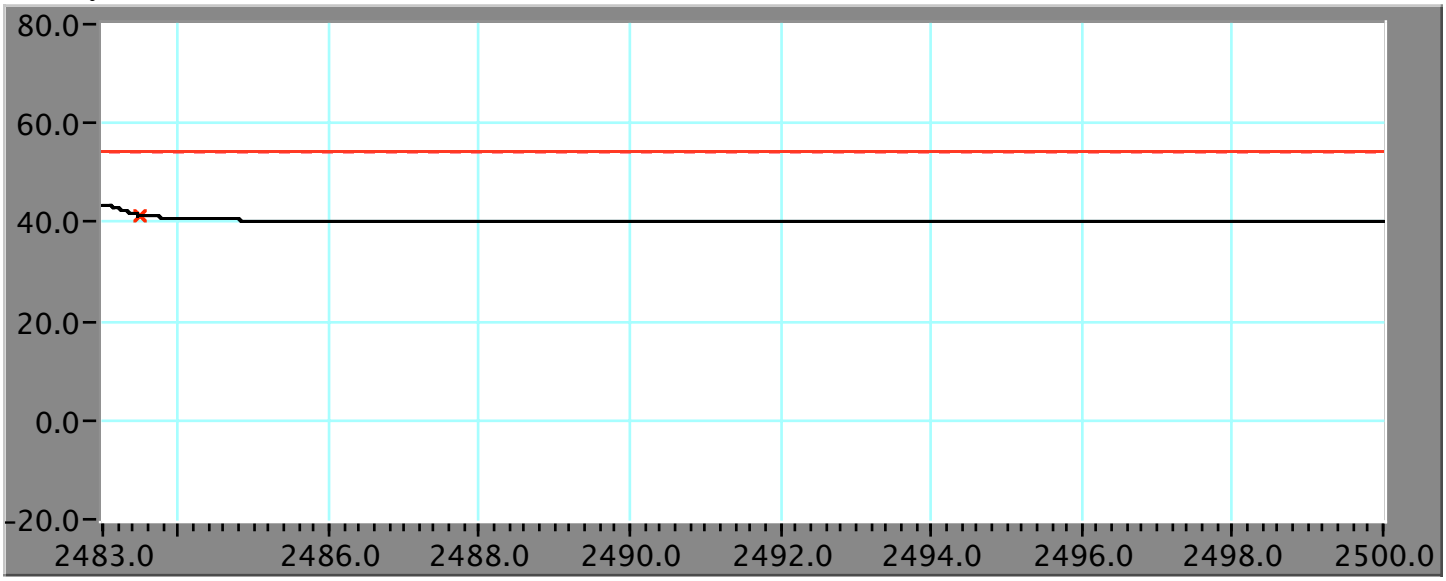

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2497.85 | 52.5 | 74 | -21.5 | 25.52 | 32.4 | 4.1 | 9.5 |
| 2483.5 | 40.4 | 54 | -13.6 | 13.48 | 32.38 | 4.08 | 9.5 |

Date of Test: March 4, 2005

2483.5 MHz - 2500 MHz Restricted Band - Horizontal, channel 79 (2.480 GHz), Peak Detection
Host System #1



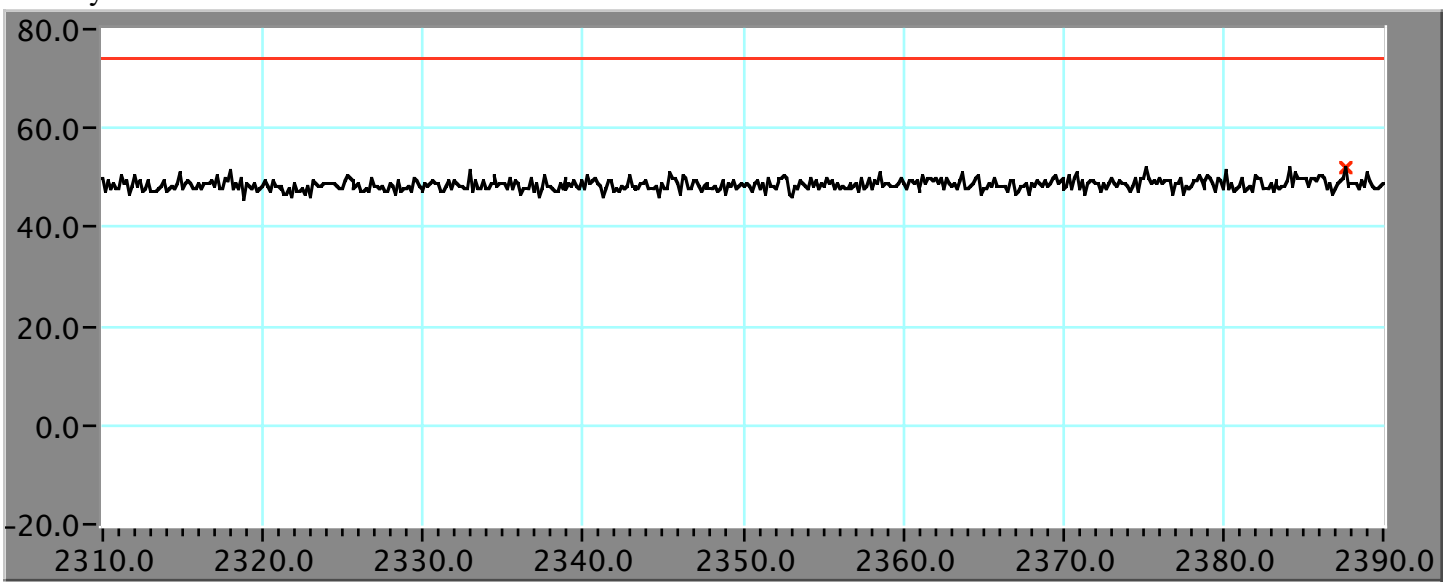

2483.5 MHz - 2500 MHz Restricted Band - Horizontal, channel 79 (2.480 GHz), Average Detection
Host System #1



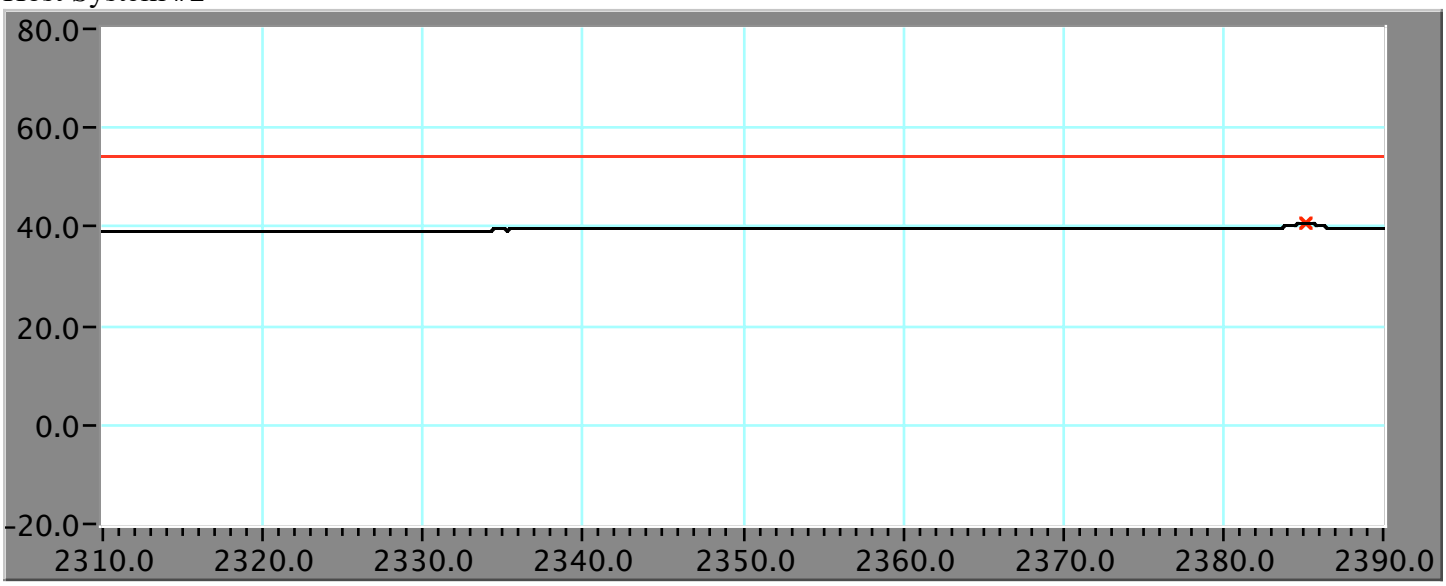

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2483.5 | 52.8 | 74 | -21.2 | 25.83 | 32.38 | 4.08 | 9.5 |
| 2483.5 | 41.5 | 54 | -12.5 | 14.52 | 32.38 | 4.08 | 9.5 |

Date of Test: March 4, 2005

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.402 GHz), Peak Detection
Host System #2



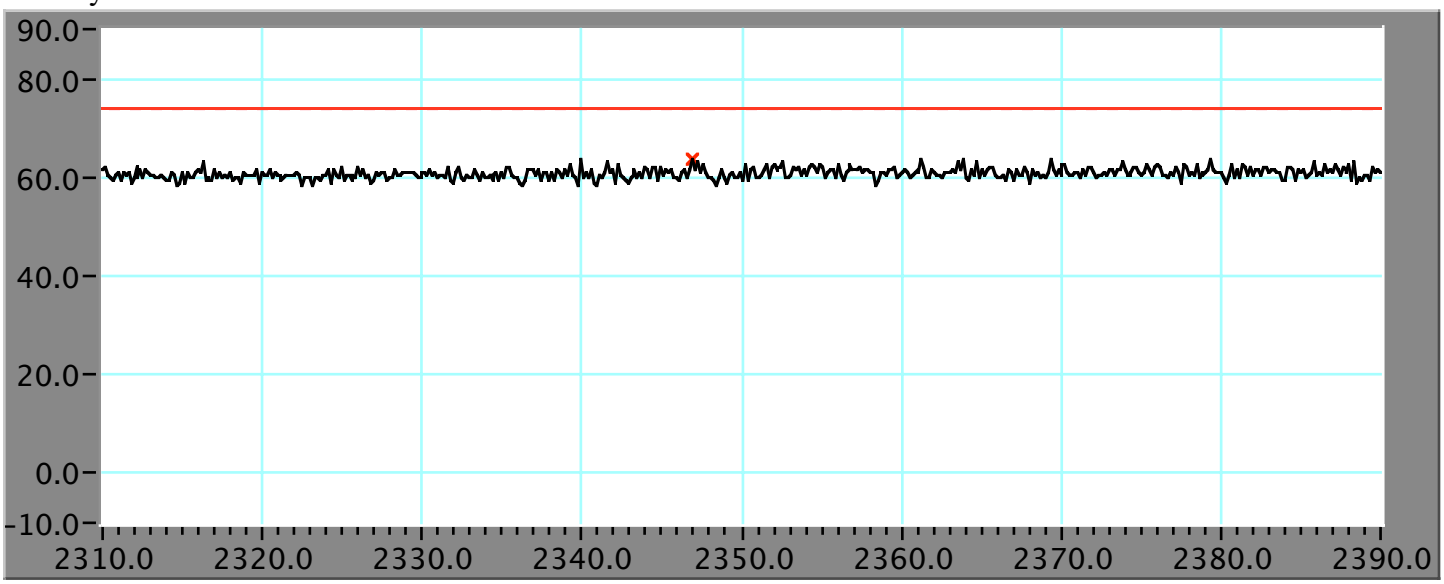

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.402 GHz), Average Detection
Host System #2



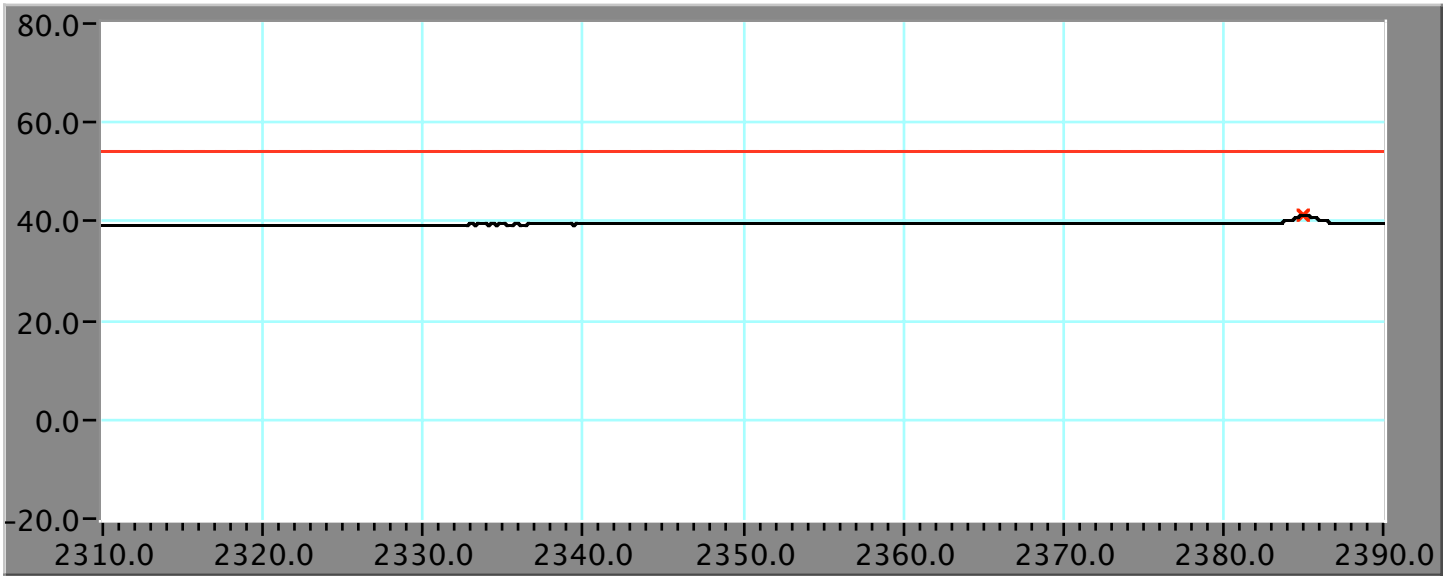

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2387.6 | 52 | 74 | -22 | 25.25 | 32.29 | 3.98 | 9.5 |
| 2385.19 | 40.7 | 54 | -13.3 | 13.93 | 32.29 | 3.98 | 9.5 |

Date of Test: March 4, 2005

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.402 GHz), Peak Detection
Host System #2



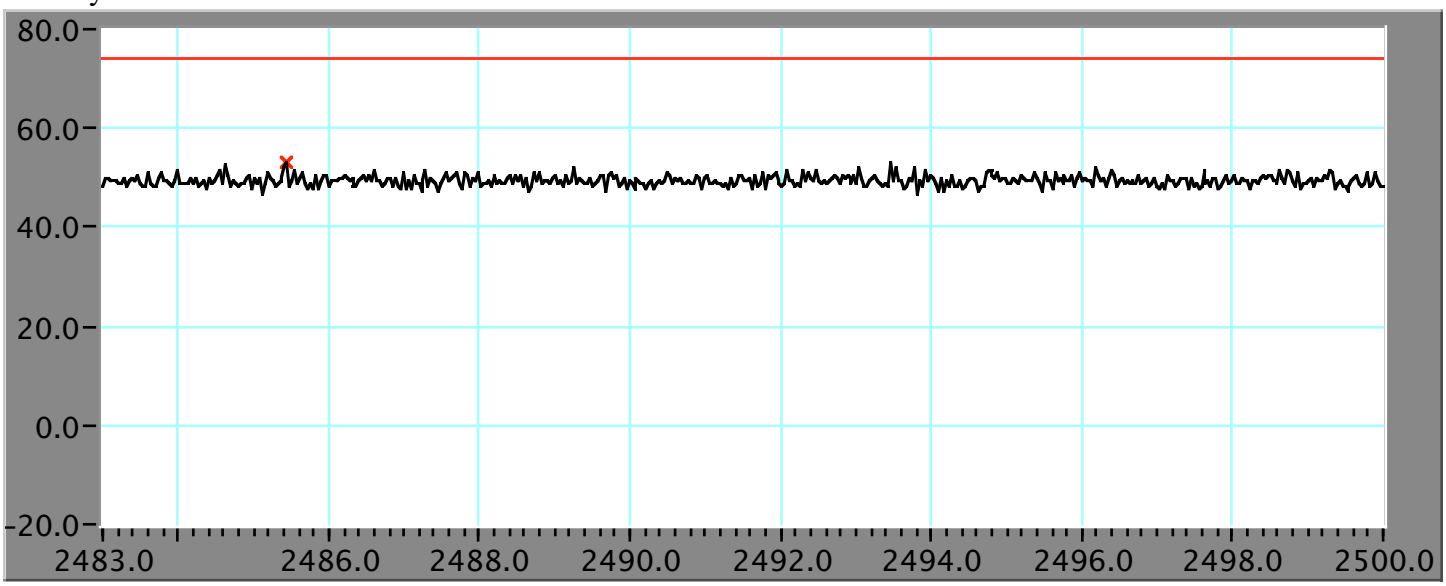

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.402 GHz), Average Detection
Host System #2



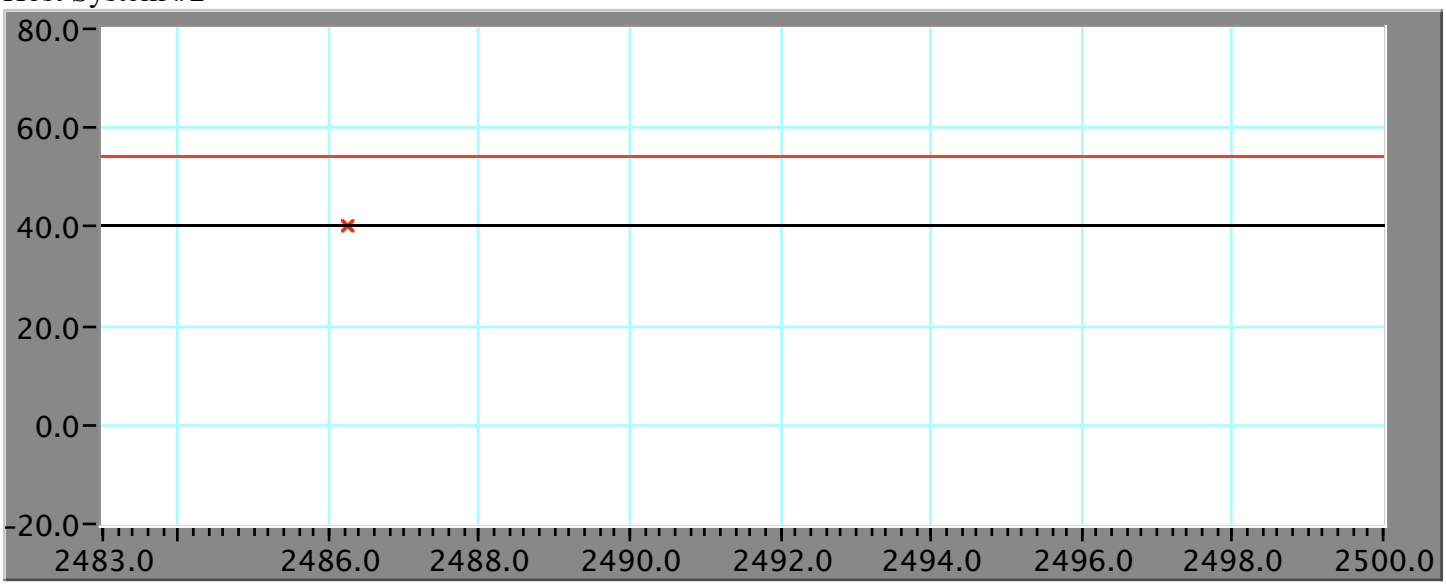

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2346.9 | 63.9 | 74 | -10.1 | 36.90 | 32.25 | 4.24 | 9.5 |
| 2385.03 | 41.1 | 54 | -12.9 | 14.37 | 32.29 | 3.98 | 9.5 |

Date of Test: March 4, 2005

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 79 (2.480 GHz), Peak Detection
Host System #2



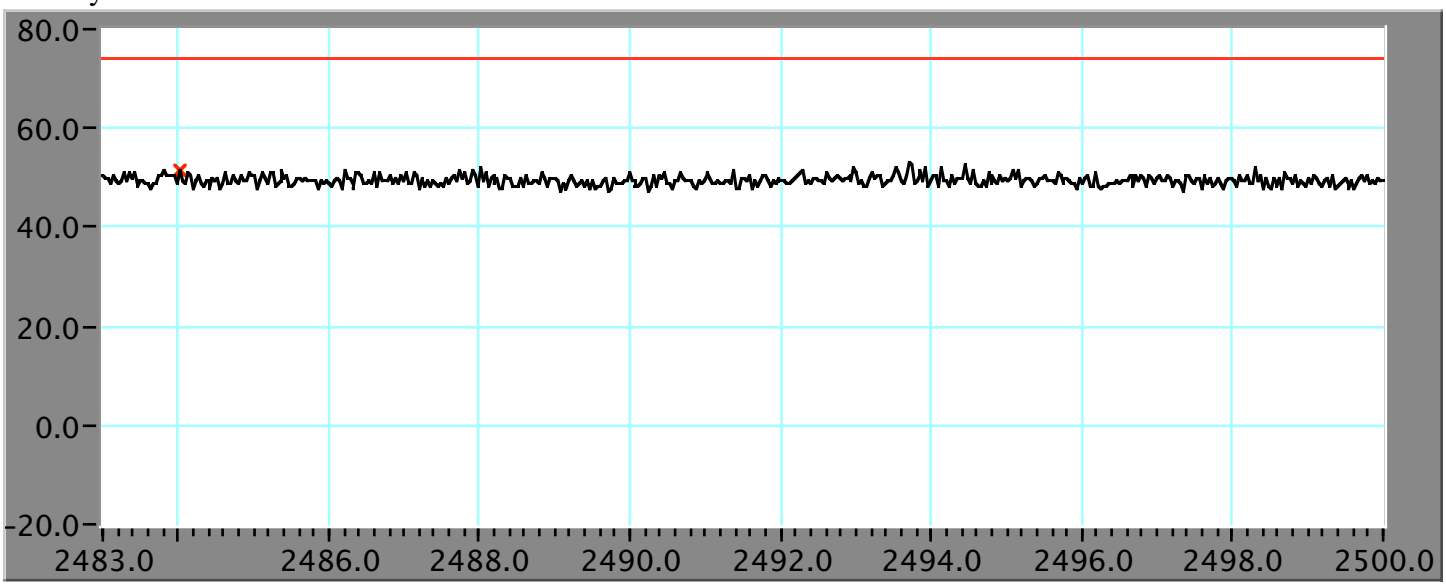

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 79 (2.480 GHz), Average Detection
Host System #2



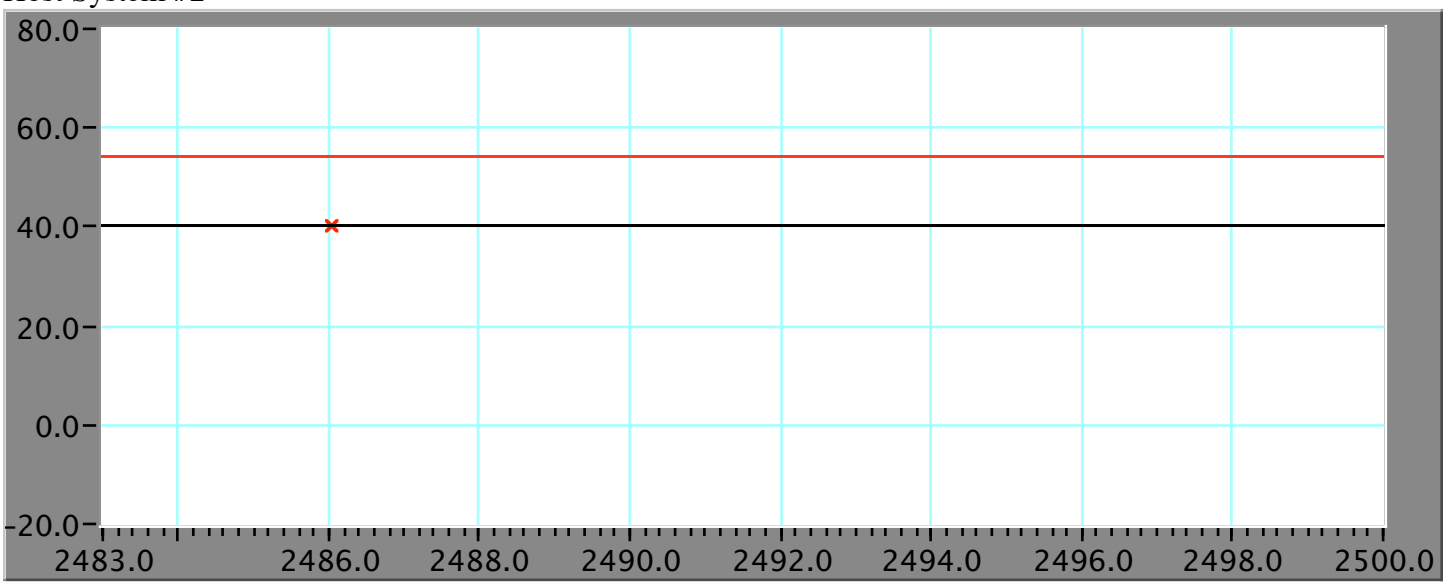

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2485.45 | 52.9 | 74 | -21.1 | 25.91 | 32.39 | 4.08 | 9.5 |
| 2486.24 | 40.2 | 54 | -13.8 | 13.24 | 32.39 | 4.09 | 9.5 |

Date of Test: March 4, 2005

2483.5 MHz - 2500 MHz Restricted Band - Horizontal, channel 79 (2.480 GHz), Peak Detection
Host System #2




2483.5 MHz - 2500 MHz Restricted Band - Horizontal, channel 79 (2.480 GHz), Average Detection
Host System #2



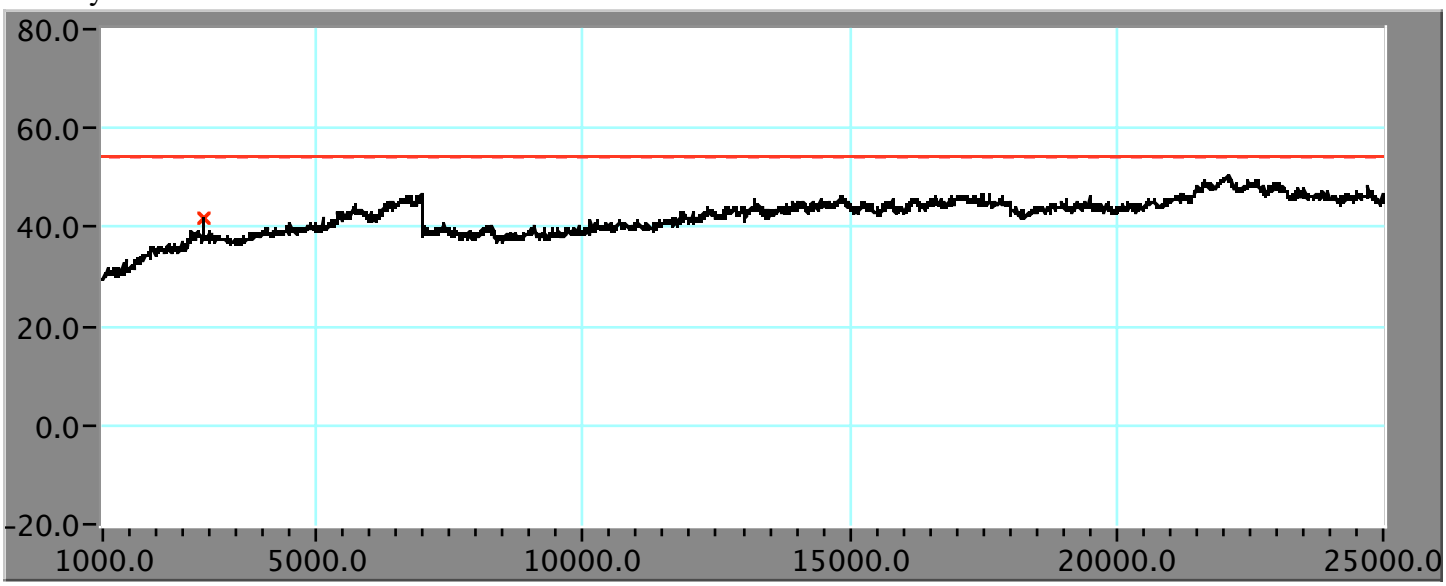

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2484 | 51.5 | 74 | -22.5 | 24.53 | 32.38 | 4.08 | 9.5 |
| 2486 | 40.2 | 54 | -13.8 | 13.24 | 32.39 | 4.08 | 9.5 |

Date of Test: February 25, 2005

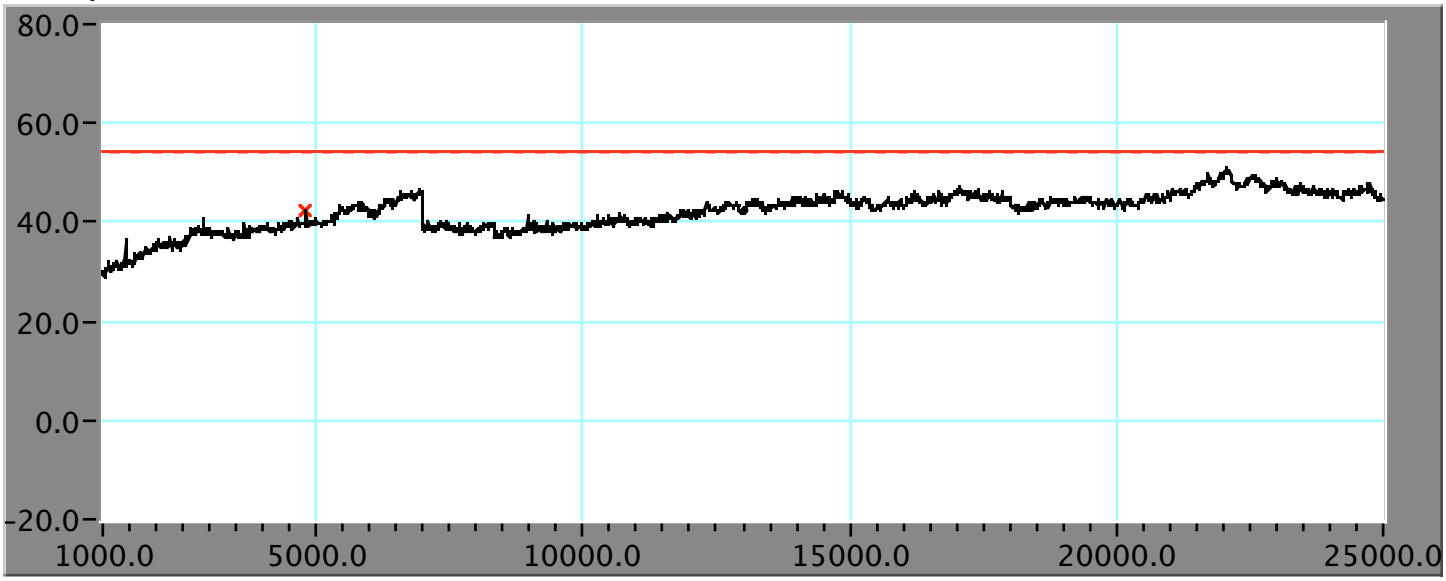
Spurious Radiated Emissions above 1 GHz

Radiated Emissions scans from 1 to 25 GHz for the low, mid and high channels were performed to demonstrate compliance with all of the restricted bands. Radiated emissions data for two host systems are presented.

Vertical, channel 1 (2.402 GHz)
Host System #1



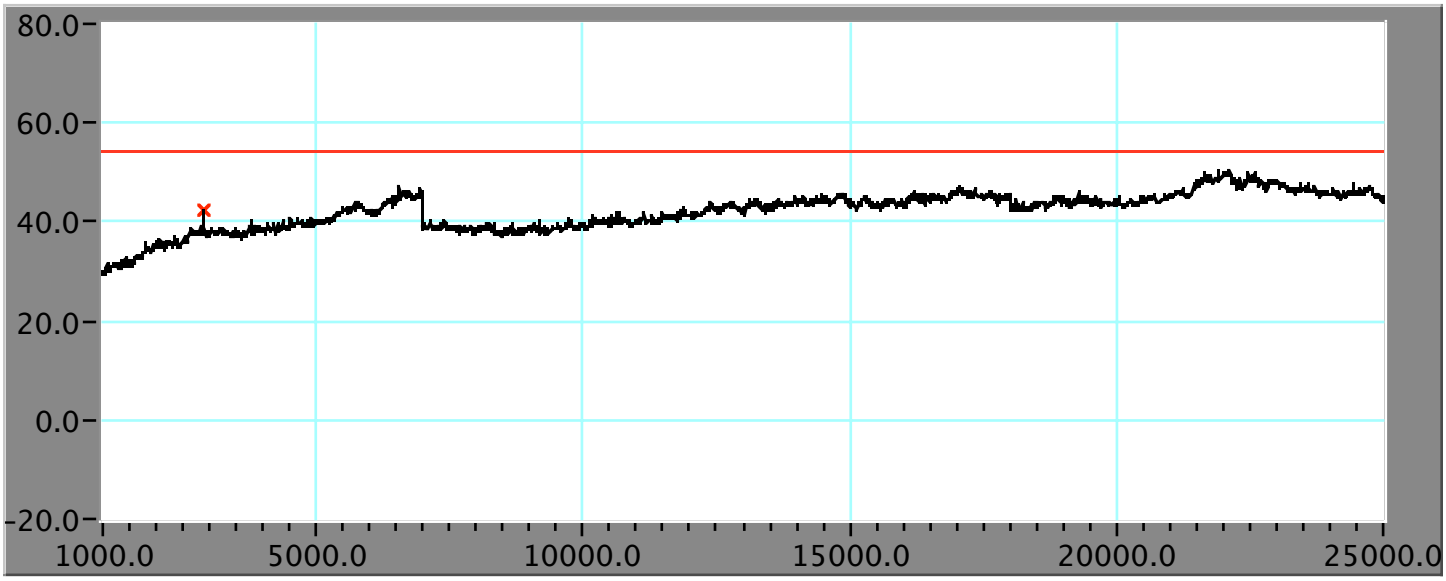

Horizontal, channel 1 (2.402 GHz)
Host System #1



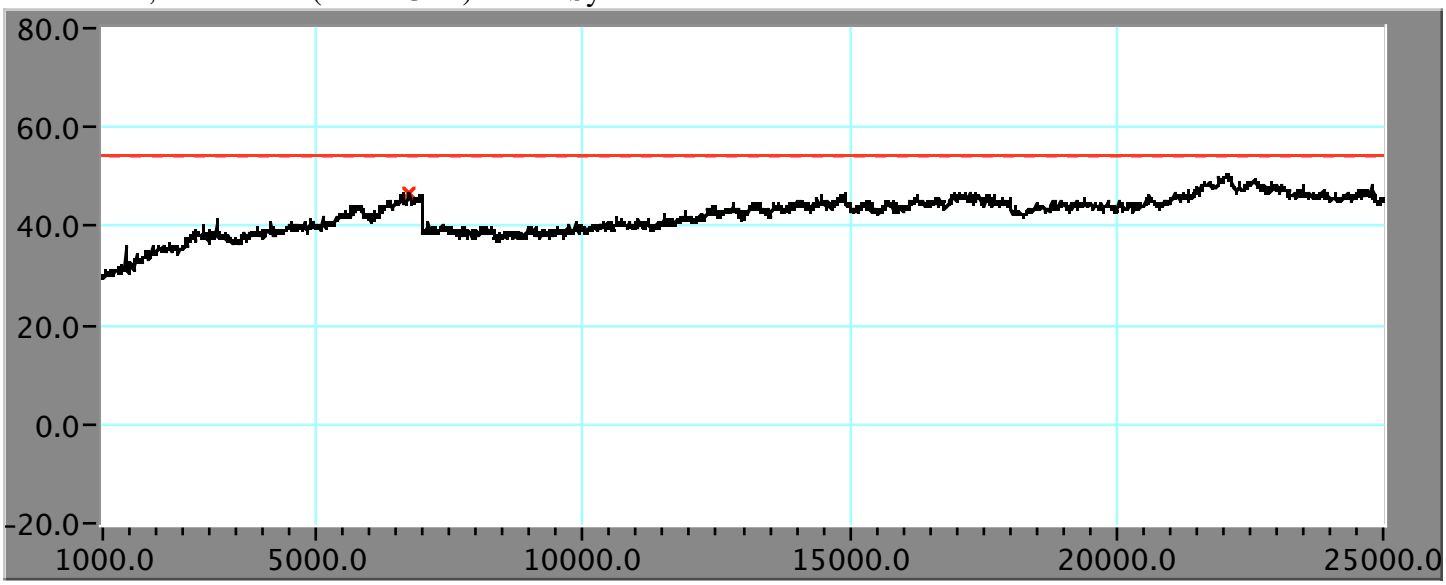

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2887.78 | 42.1 V | 54 | -11.9 | 50.59 | 33.18 | 2.09 | 43.79 |
| 4811.6 | 42.3 H | 54 | -11.7 | 48.88 | 34.79 | 2.09 | 44.17 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical , channel 40 (2.441 GHz) - Host System #1



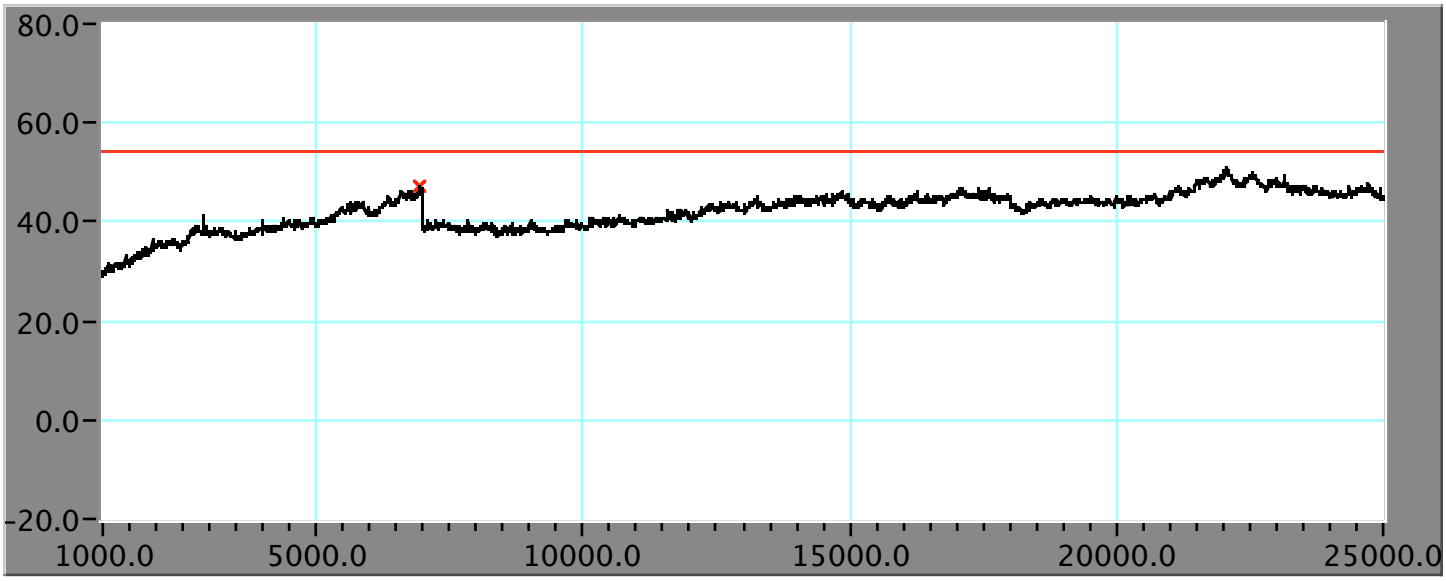

Horizontal , channel 40 (2.441 GHz) - Host System #1



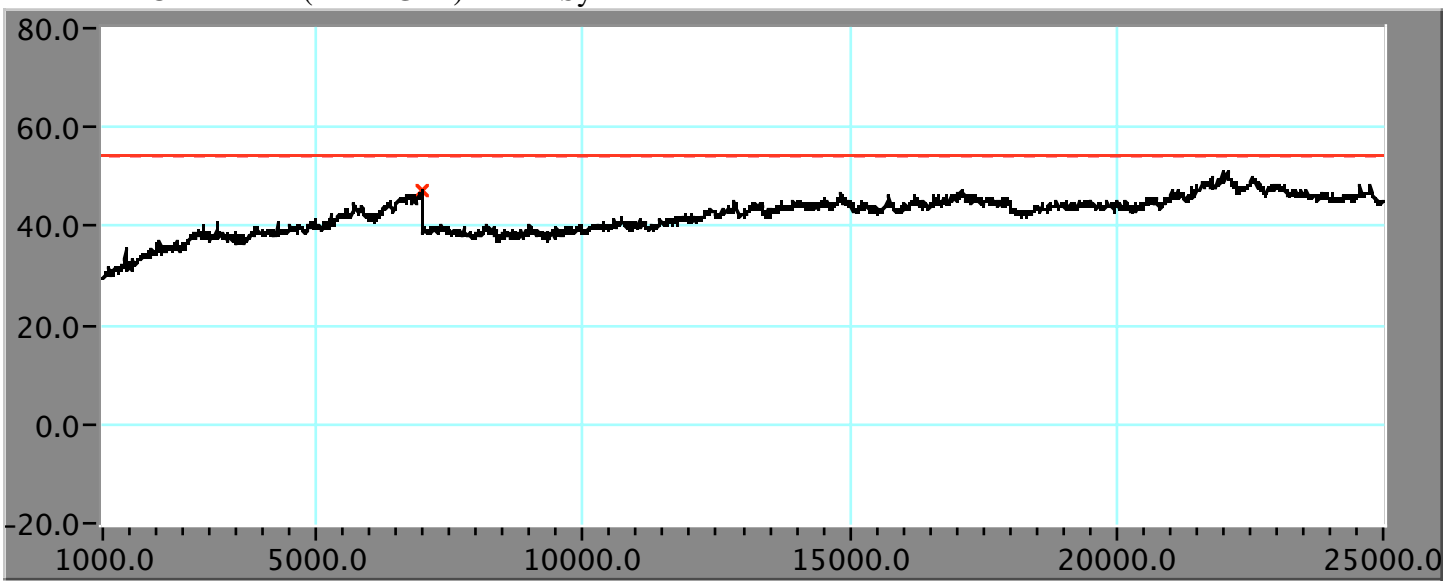

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2887.78 | 42.3 V | 54 | -11.7 | 50.79 | 33.18 | 2.09 | 43.79 |
| 6759.52 | 46.6 H | 54 | -7.4 | 51.21 | 36.1 | 3.51 | 44.19 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical Channel 79 (2.480 GHz) - Host System #1



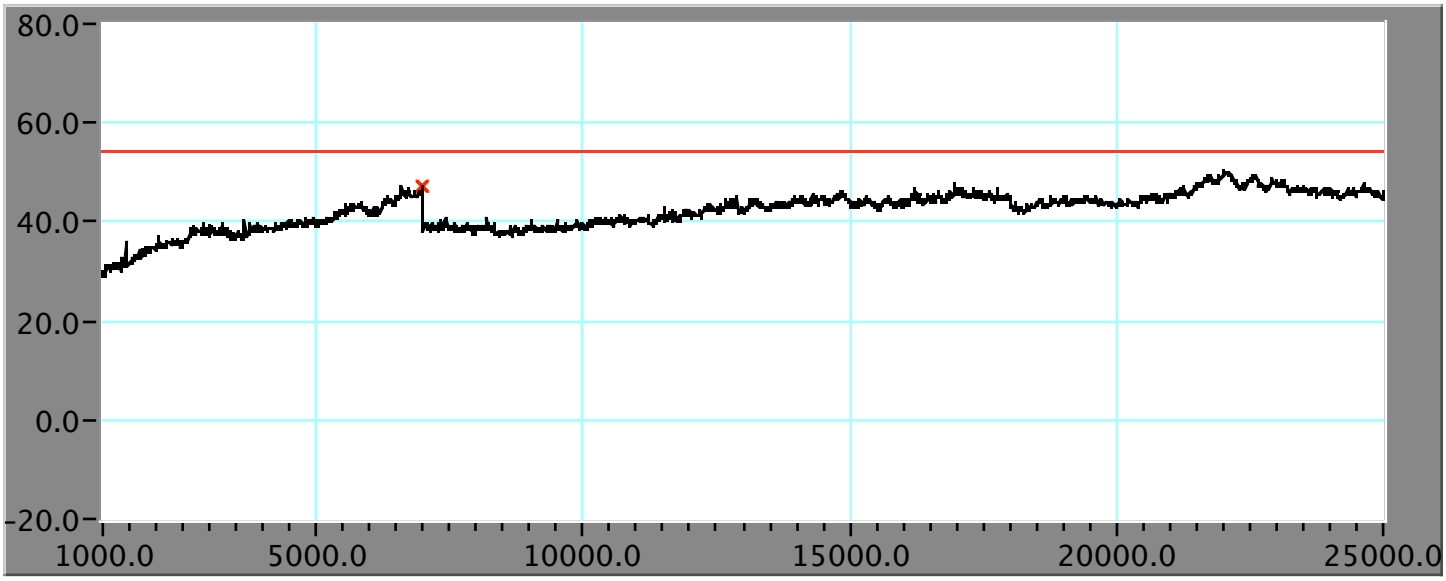

Horizontal Channel 79 (2.480 GHz) - Host System #1



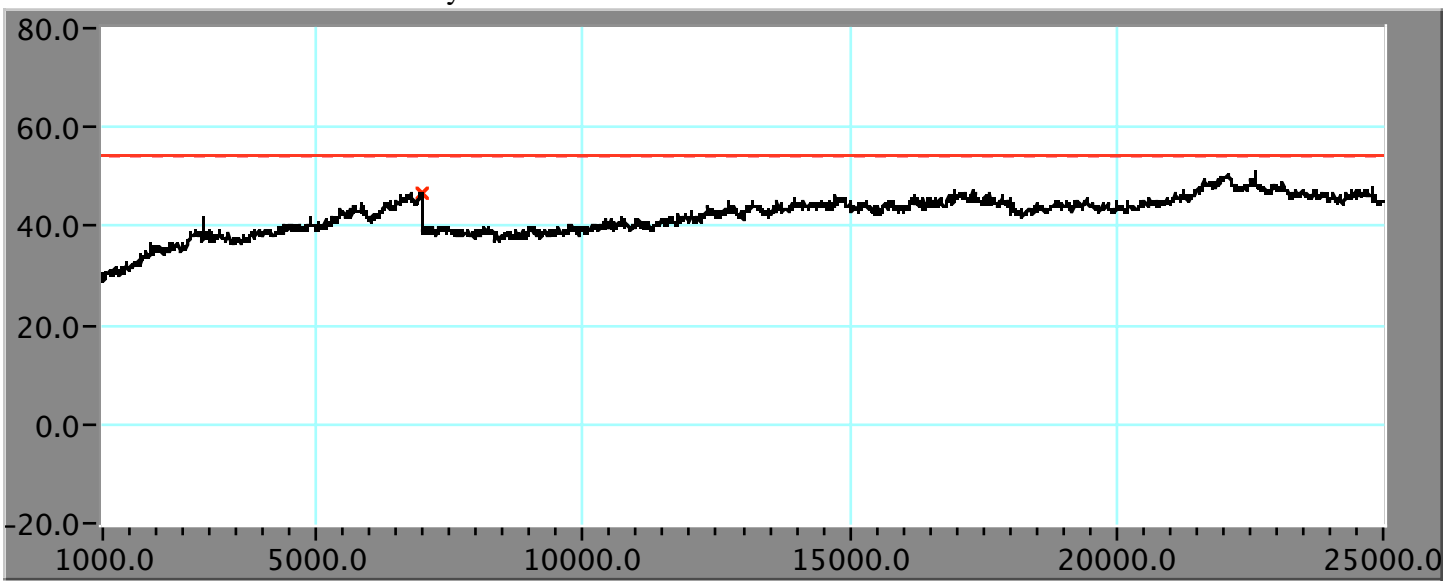

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 6927.86 | 47.1 V | 54 | -6.9 | 51.47 | 36.17 | 3.57 | 44.17 |
| 7000 | 47.1 H | 54 | -6.9 | 51.57 | 36.2 | 3.6 | 44.24 |

Date of Test: March 4, 2005

Vertical Receive Mode - Host System #1



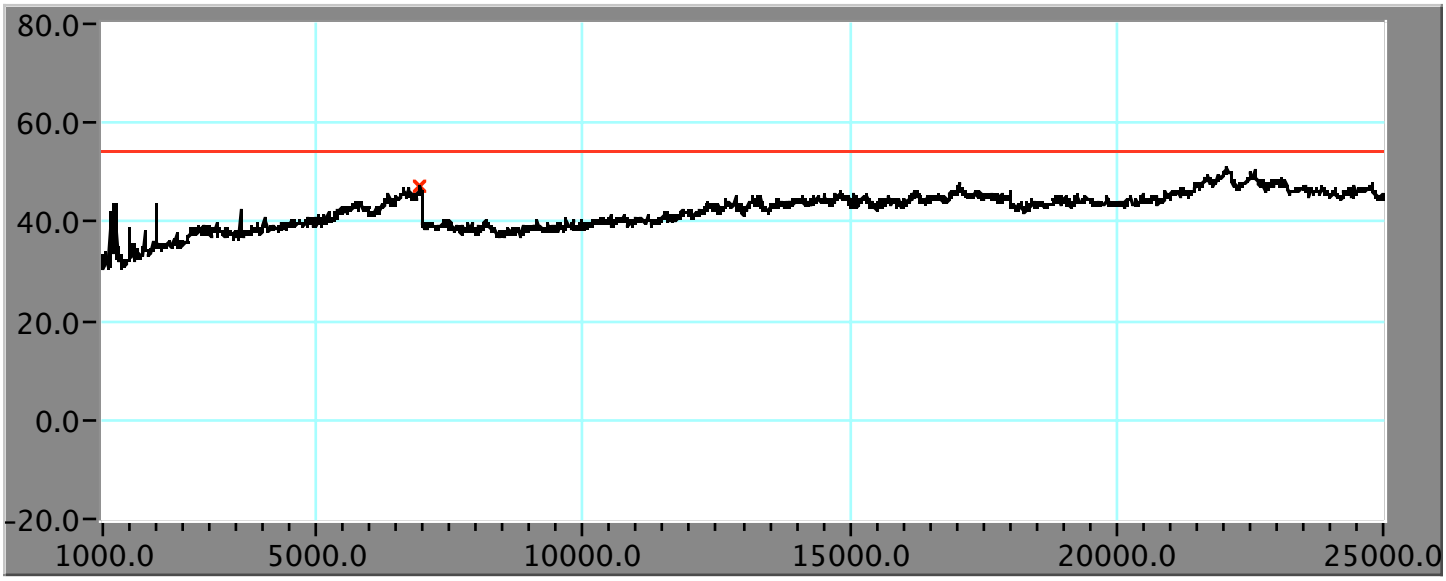

Horizontal Receive Mode - Host System #1



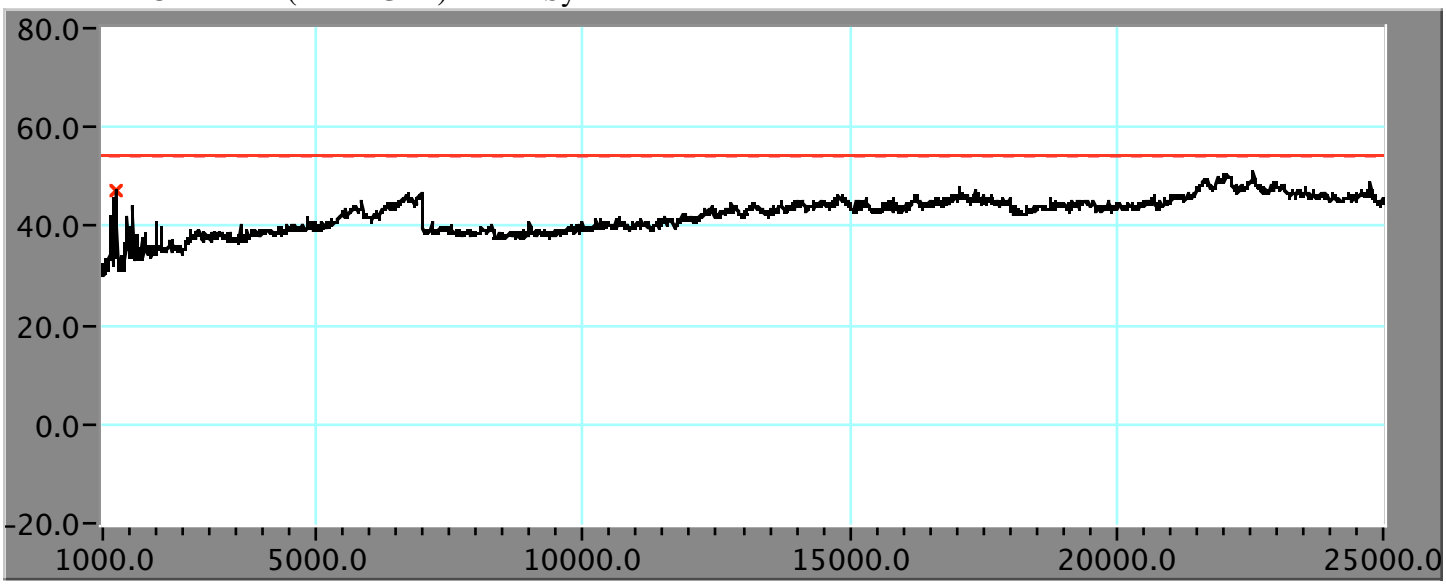

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 6963 | 46.8 V | 54 | -7.2 | 51.25 | 36.19 | 3.59 | 44.2 |
| 6988 | 47.2 H | 54 | -6.9 | 51.62 | 36.2 | 3.6 | 44.22 |

Date of Test: March 4, 2005

Vertical Channel 1 (2.402 GHz) - Host System #2



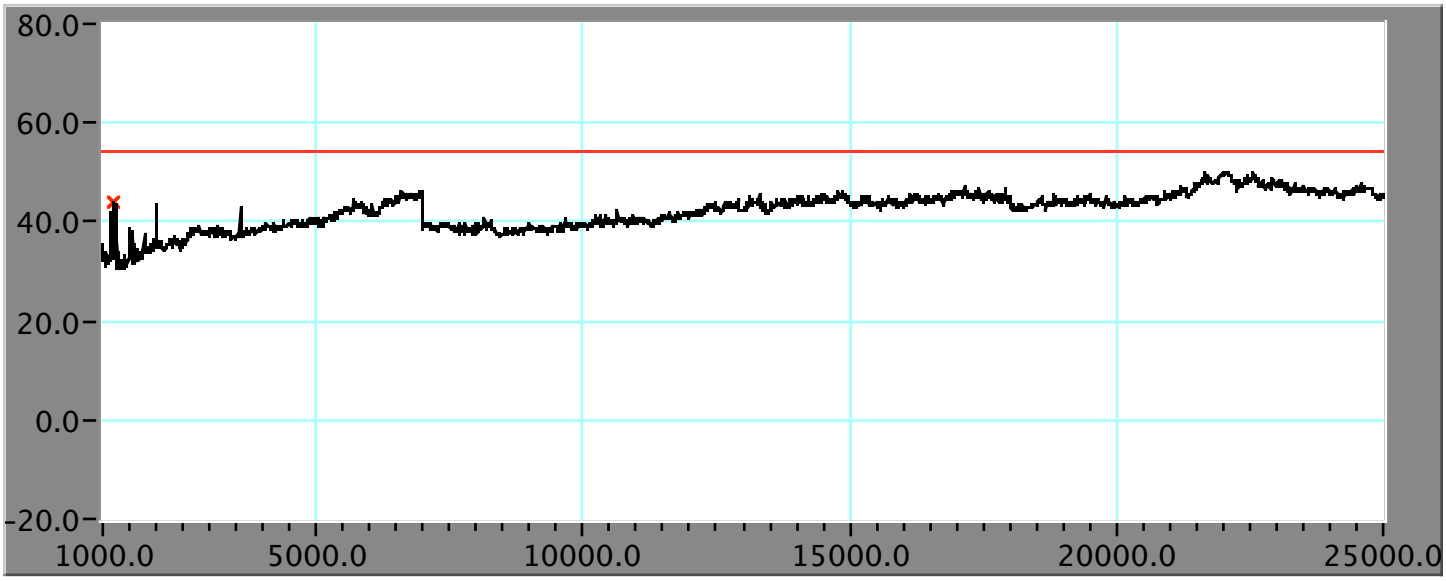

Horizontal Channel 1 (2.402 GHz) - Host System #2



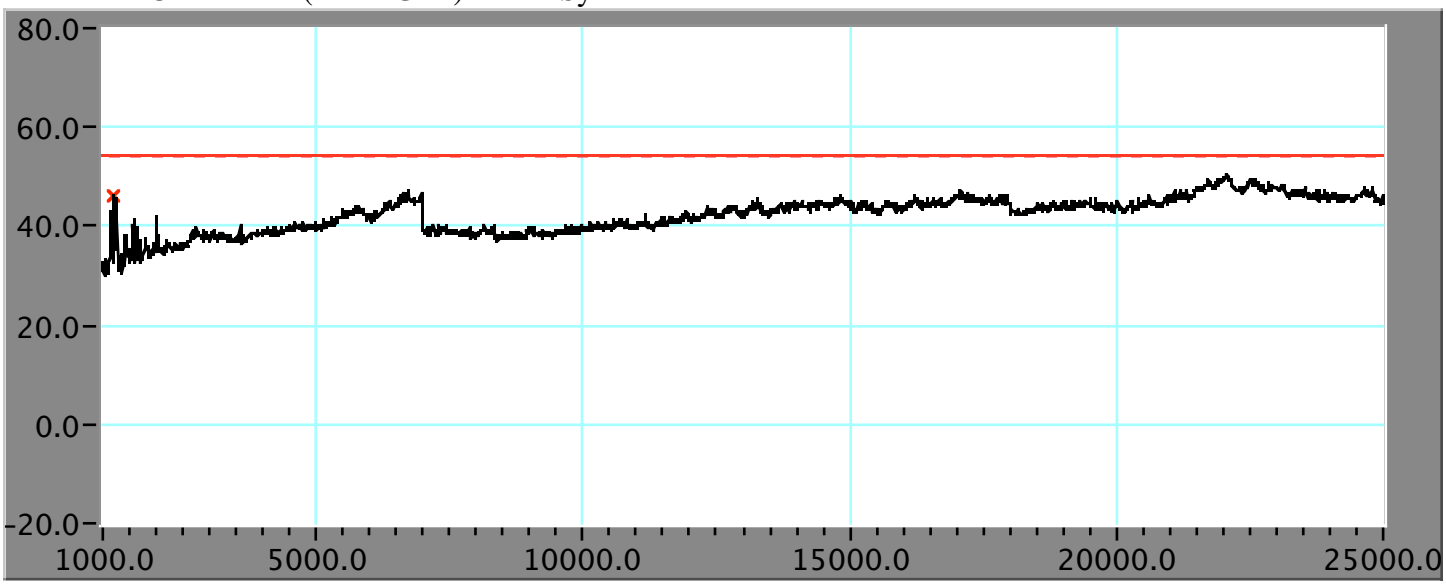

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 6951.9 | 47 V | 54 | -7 | 51.46 | 36.18 | 3.58 | 44.19 |
| 1228.46 | 47.3 H | 54 | -6.7 | 62.77 | 27.72 | 0.93 | 44.1 |

Date of Test: March 4, 2005

Vertical Channel 40 (2.441 GHz) - Host System #2



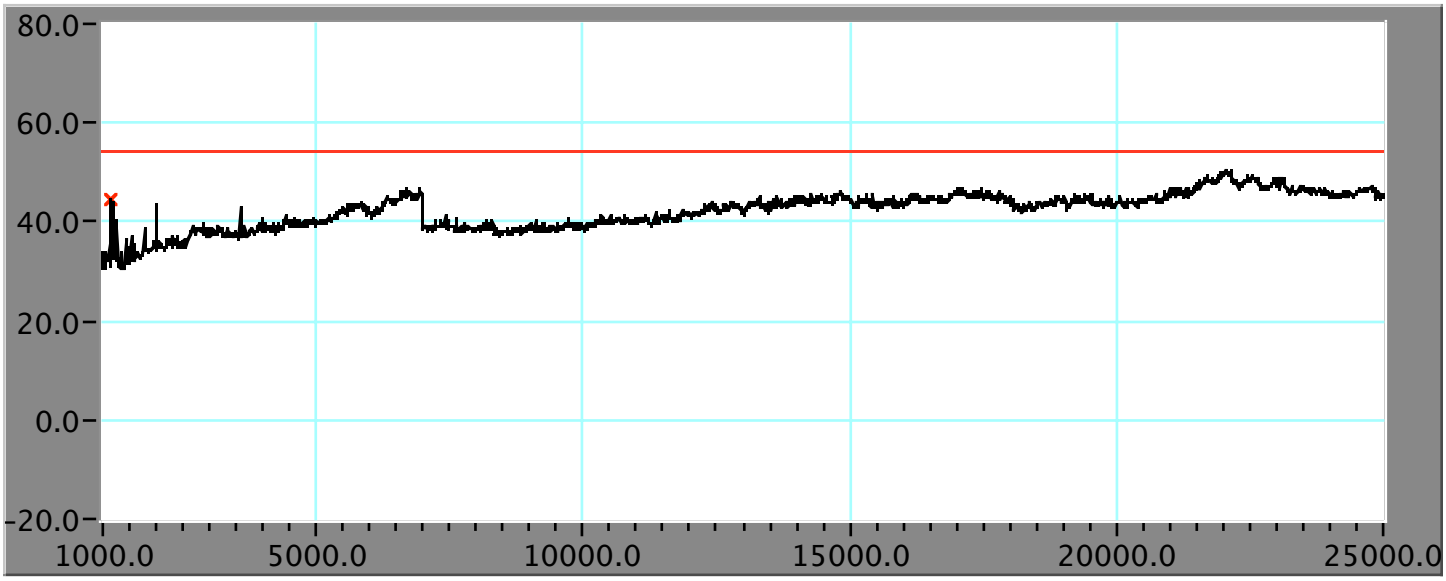

Horizontal Channel 40 (2.441 GHz) - Host System #2



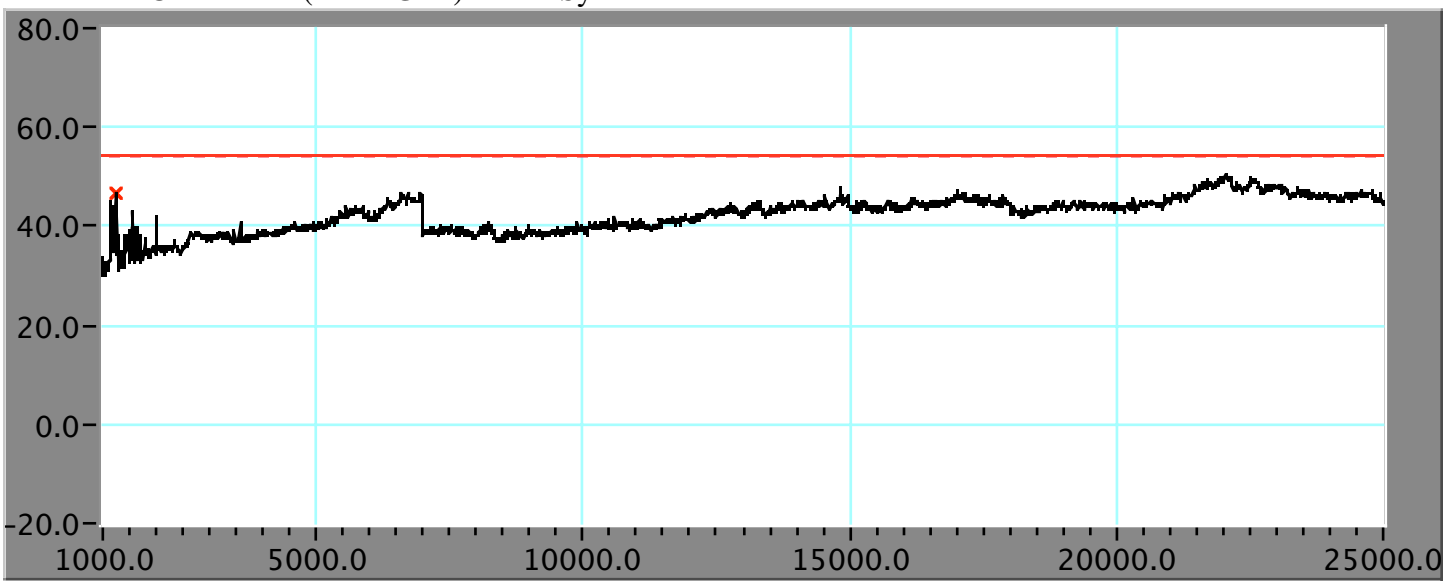

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 1192.38 | 43.8 V | 54 | -10.2 | 59.35 | 27.67 | 0.89 | 44.11 |
| 1192.38 | 46.2 H | 54 | -7.8 | 61.78 | 27.67 | 0.89 | 44.11 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical Channel 79 (2.480 GHz) - Host System #2



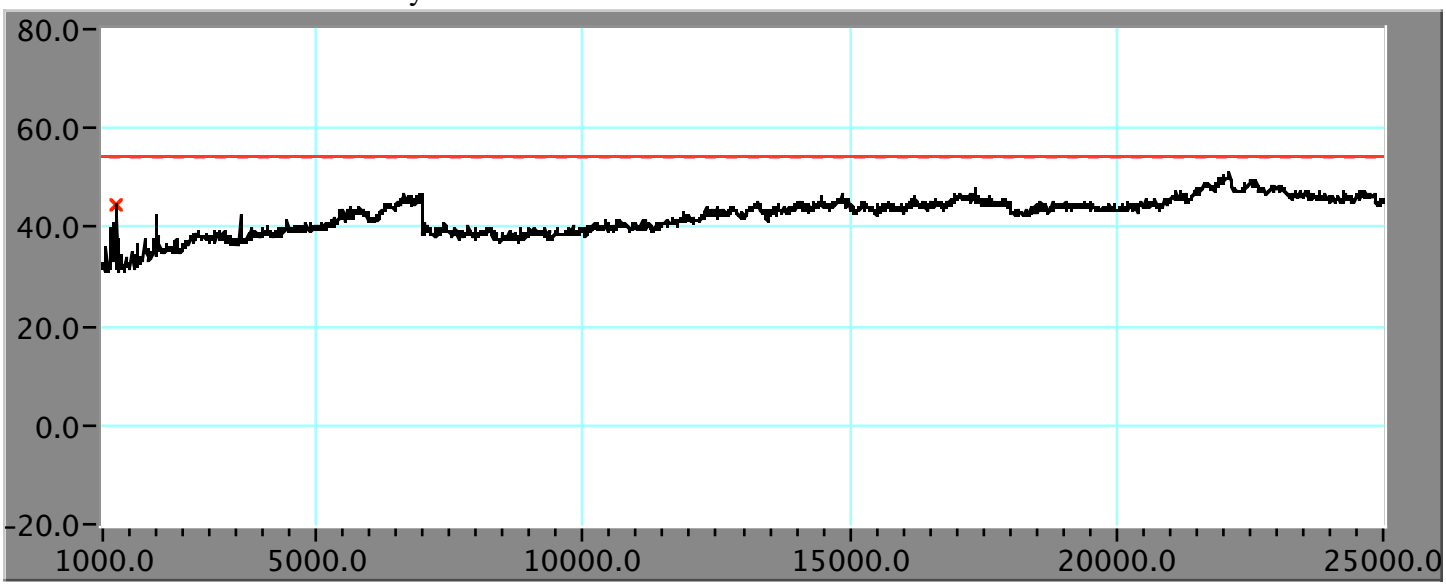

Horizontal Channel 79 (2.480 GHz) - Host System #2



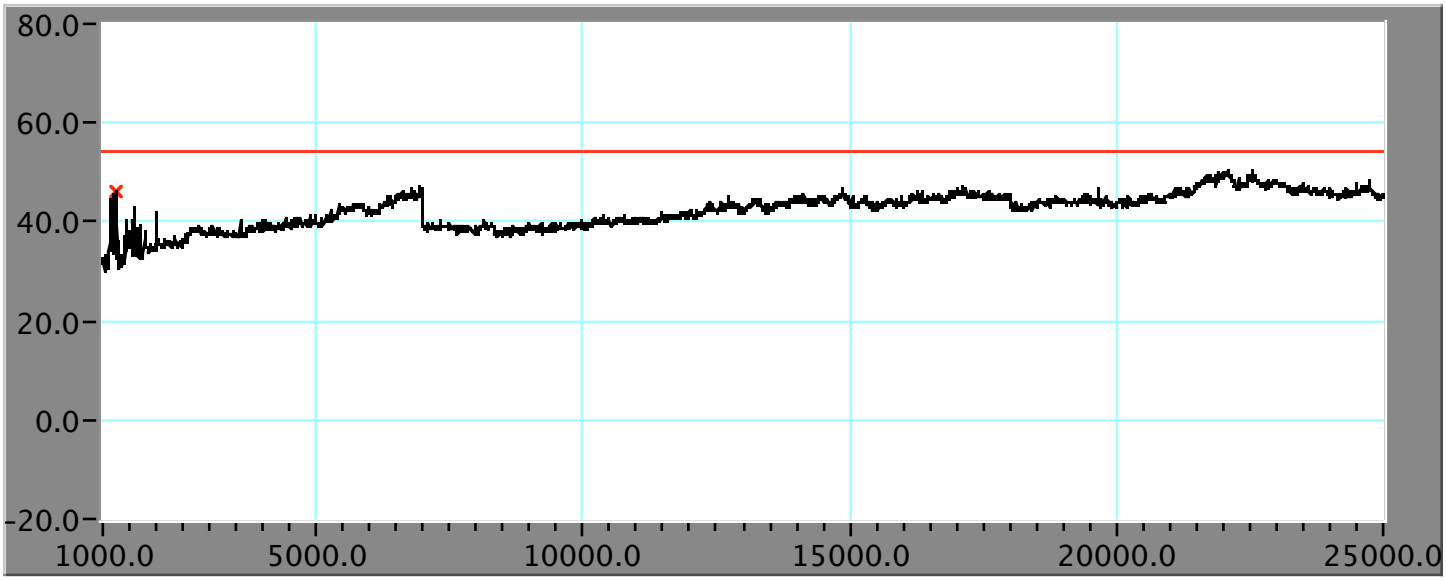

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 1168.34 | 44.8 V | 54 | -9.2 | 60.49 | 27.64 | 0.87 | 44.22 |
| 1228.46 | 46.8 H | 54 | -7.2 | 62.22 | 27.72 | 0.93 | 44.1 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical Receive Mode - Host System #2




Horizontal Receive Mode - Host System #2




| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 1264.53 | 44.7 V | 54 | -9.3 | 60 | 27.77 | 0.96 | 44.06 |
| 1228.46 | 46 H | 54 | -8 | 61.45 | 27.72 | 0.93 | 44.1 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

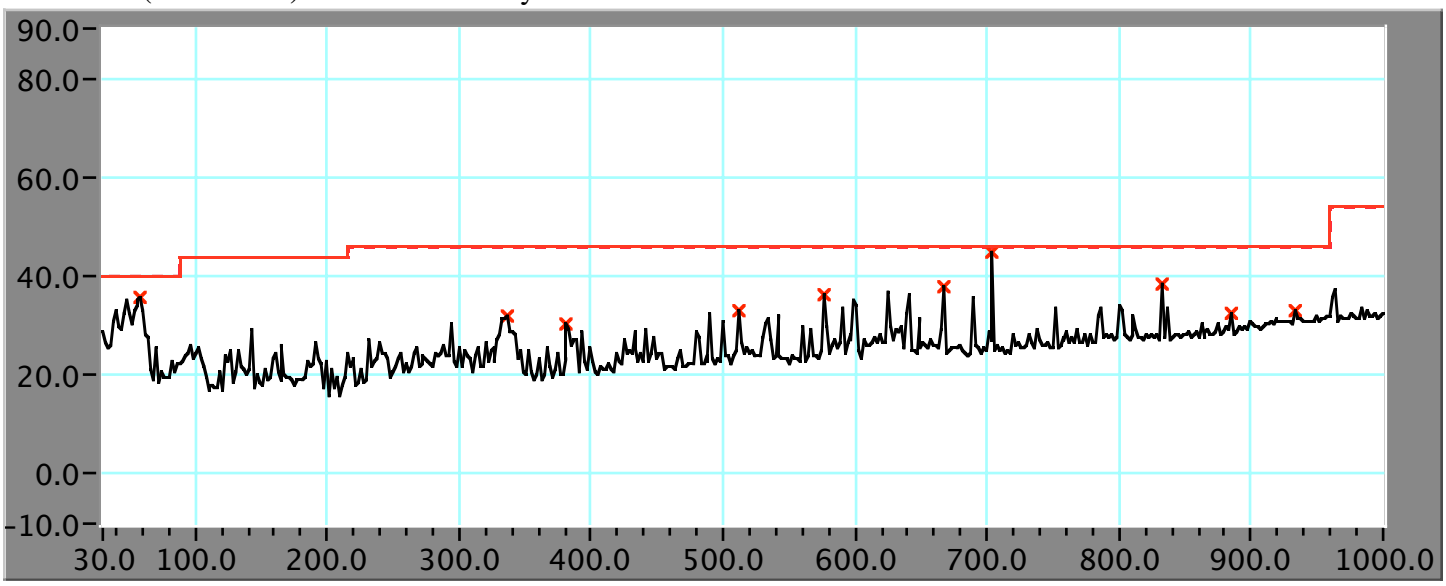
Radiated Emissions less than 1 GHz Instrument Settings:

| Instrument Settings | | | | |
|---|---|---|---|---|
| Frequency Range | Reference Level | Attenuation | Resolution BW | Video BW |
| 30 MHz - 1 GHz | 70 dBuV | 10 | 100 kHz | 100 kHz |

Radiated emissions measurements from 30 MHz - 1 GHz were performed with the transmitter set to low, mid and high channels. Two host systems were tested. In each of these cases, the results were similar regardless of the channel. Only the data from the scans with channel 1 transmitting is presented with each of the two host systems.

Radiated Emissions less than 1 GHz

Channel 1 (2402 MHz) Vertical - Host System #1

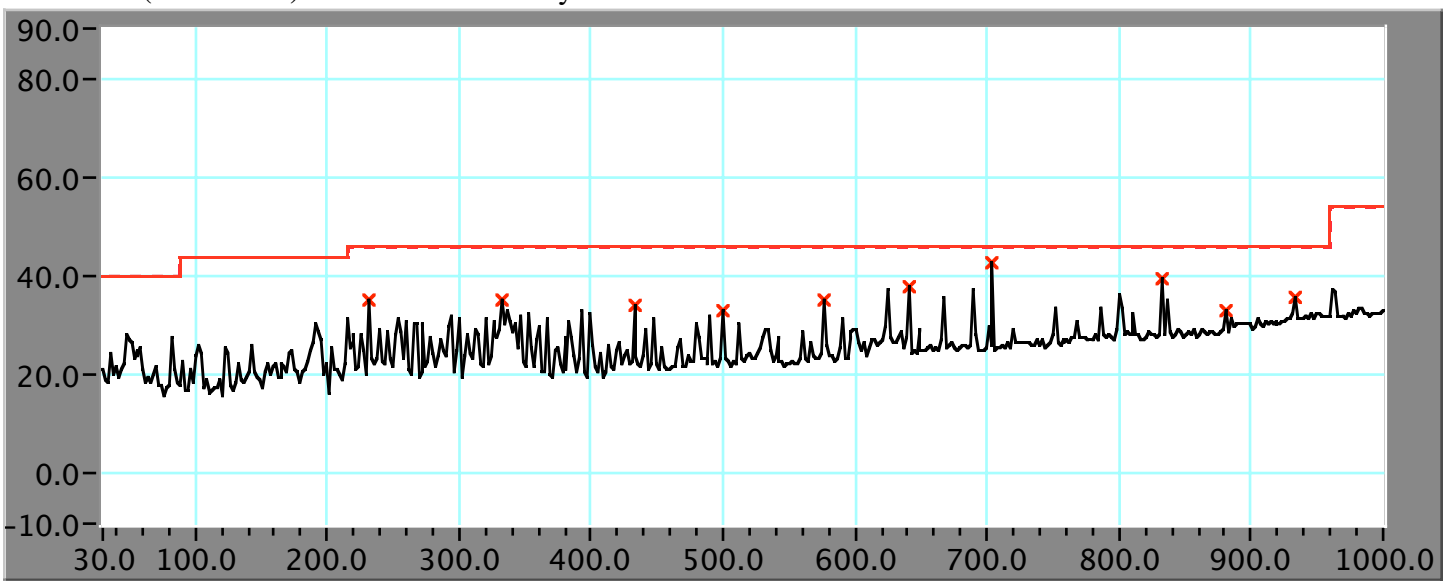



| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 59.16 | 35.4 | 40.0 | -4.6 | 57.79 | 7.60 | 1.84 | 31.78 |
| 337.13 | 32.1 | 46.0 | -13.9 | 44.64 | 14.33 | 4.23 | 31.08 |
| 381.84 | 30.3 | 46.0 | -15.7 | 41.35 | 15.60 | 4.62 | 31.25 |
| 512.08 | 32.8 | 46.0 | -13.2 | 41.37 | 17.70 | 5.53 | 31.79 |
| 576.23 | 36.2 | 46.0 | -9.8 | 43.62 | 18.70 | 5.89 | 32.04 |
| 667.60 | 37.9 | 46.0 | -8.1 | 44.28 | 19.73 | 6.48 | 32.56 |
| 704.53 | 44.7 | 46.0 | -1.3 | 50.62 | 19.90 | 6.71 | 32.56 |
| 832.83 | 38.4 | 46.0 | -7.6 | 42.22 | 21.30 | 7.63 | 32.74 |
| 885.31 | 32.3 | 46.0 | -13.7 | 35.01 | 21.92 | 8.01 | 32.60 |
| 933.91 | 33.2 | 46.0 | -12.8 | 35.22 | 22.30 | 8.44 | 32.73 |
| | | | | | | | |
| | | | | | | | |

Date of Test: March 3, 2005

Radiated Emissions less than 1 GHz

Channel 1 (2402 MHz) Horizontal - Host System #1




| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 232.16 | 35.0 | 46.0 | -11.0 | 50.90 | 11.87 | 3.48 | 31.20 |
| 333.25 | 35.3 | 46.0 | -10.7 | 47.70 | 14.40 | 4.21 | 31.03 |
| 432.38 | 33.8 | 46.0 | -12.2 | 43.21 | 16.90 | 4.97 | 31.26 |
| 500.42 | 32.8 | 46.0 | -13.2 | 41.32 | 18.10 | 5.41 | 32.05 |
| 576.23 | 34.9 | 46.0 | -11.1 | 41.96 | 19.12 | 5.89 | 32.04 |
| 640.38 | 37.7 | 46.0 | -8.3 | 43.98 | 19.66 | 6.32 | 32.25 |
| 704.53 | 42.8 | 46.0 | -3.2 | 48.17 | 20.50 | 6.71 | 32.56 |
| 832.83 | 39.3 | 46.0 | -6.7 | 42.49 | 21.90 | 7.63 | 32.74 |
| 881.42 | 33.2 | 46.0 | -12.8 | 35.54 | 22.10 | 8.05 | 32.53 |
| 933.91 | 35.6 | 46.0 | -10.4 | 37.04 | 22.82 | 8.44 | 32.73 |
| | | | | | | | |
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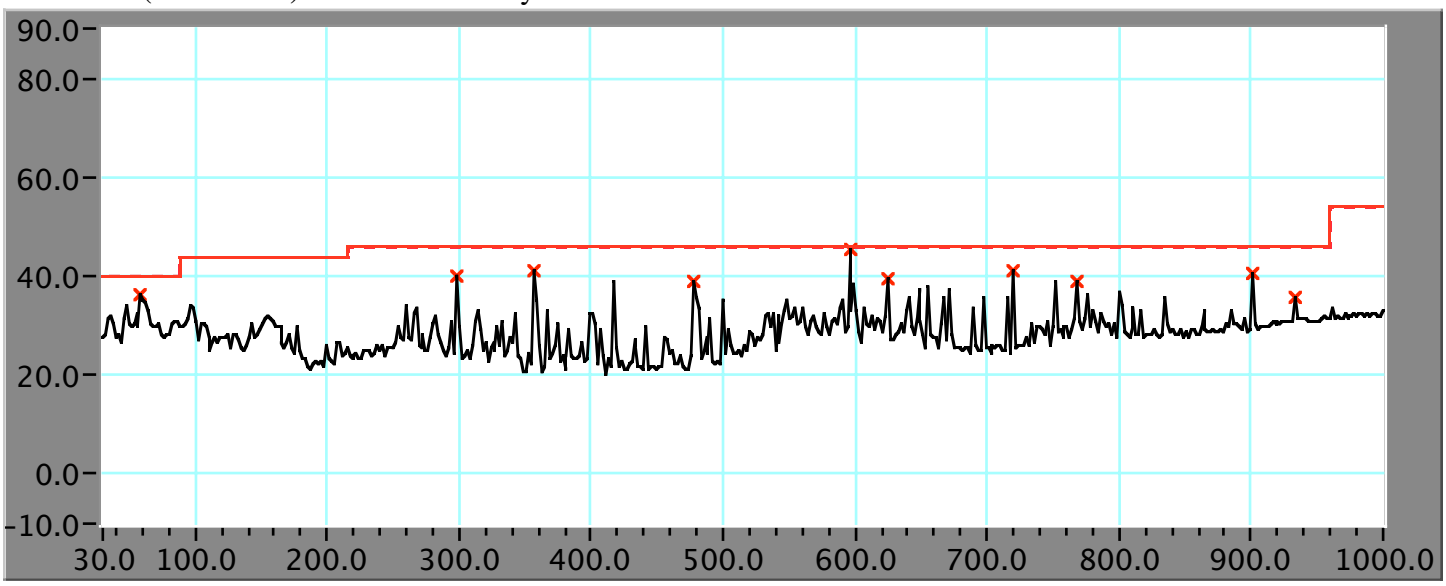
Date of Test: March 3, 2005

Radiated Emissions less than 1 GHz

Channel 1 (2402 MHz) Vertical - Host System #2




| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 59.16 | 36.2 | 40.0 | -3.8 | 58.59 | 7.60 | 1.84 | 31.78 |
| 298.26 | 39.8 | 46.0 | -6.2 | 53.37 | 13.51 | 3.95 | 31.04 |
| 356.57 | 40.9 | 46.0 | -5.1 | 52.82 | 14.89 | 4.41 | 31.22 |
| 477.09 | 38.8 | 46.0 | -7.2 | 47.82 | 17.39 | 5.29 | 31.69 |
| 595.67 | 45.4 | 46.0 | -0.6 | 53.05 | 18.52 | 6.03 | 32.18 |
| 624.83 | 39.7 | 46.0 | -6.3 | 46.40 | 19.30 | 6.23 | 32.26 |
| 720.08 | 41.2 | 46.0 | -4.8 | 46.57 | 20.37 | 6.82 | 32.59 |
| 768.68 | 38.9 | 46.0 | -7.1 | 43.54 | 21.00 | 7.20 | 32.83 |
| 900.86 | 40.3 | 46.0 | -5.7 | 42.42 | 22.20 | 8.14 | 32.48 |
| 933.91 | 35.7 | 46.0 | -10.3 | 37.69 | 22.30 | 8.44 | 32.73 |
| | | | | | | | |
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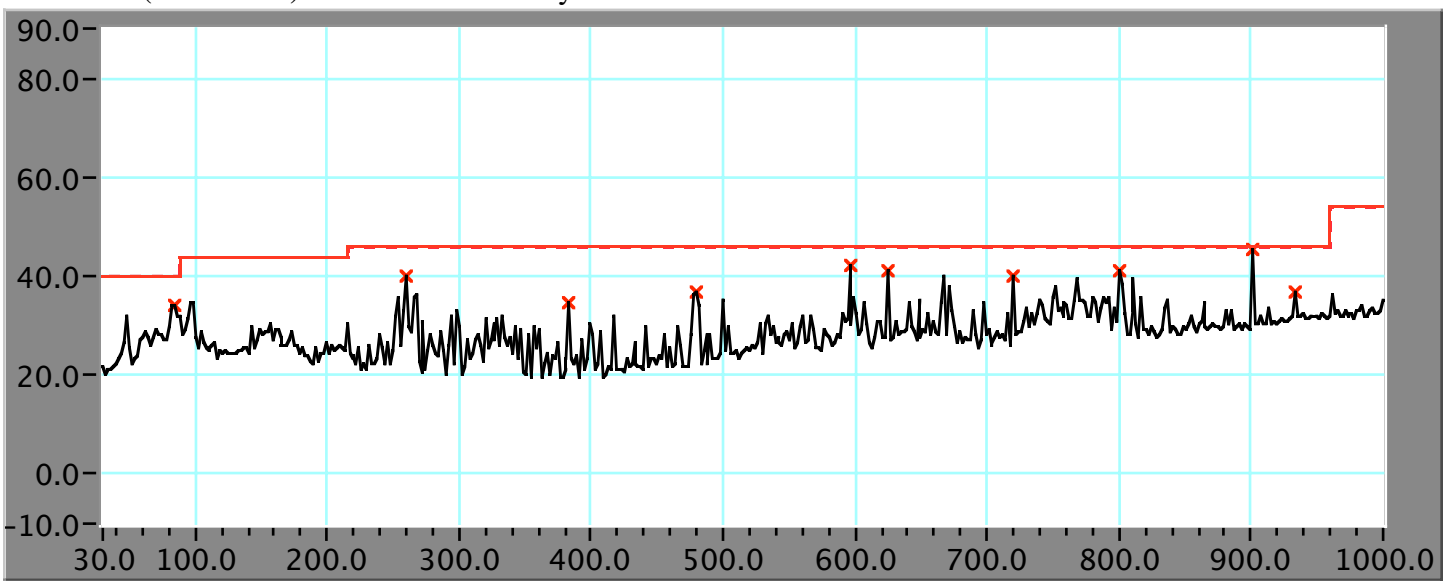
Date of Test: March 3, 2005

Radiated Emissions less than 1 GHz

Channel 1 (2402 MHz) Horizontal - Host System #2




| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 84.43 | 34.2 | 40.0 | -5.8 | 55.42 | 8.23 | 2.18 | 31.61 |
| 259.38 | 40.0 | 46.0 | -6.0 | 55.21 | 12.40 | 3.68 | 31.32 |
| 383.79 | 34.4 | 46.0 | -11.6 | 45.49 | 15.60 | 4.63 | 31.36 |
| 479.04 | 37.0 | 46.0 | -9.0 | 45.78 | 17.67 | 5.30 | 31.71 |
| 595.67 | 42.0 | 46.0 | -4.0 | 48.94 | 19.22 | 6.03 | 32.18 |
| 624.83 | 40.8 | 46.0 | -5.2 | 47.64 | 19.20 | 6.23 | 32.26 |
| 720.08 | 39.9 | 46.0 | -6.1 | 45.25 | 20.47 | 6.82 | 32.59 |
| 799.78 | 40.9 | 46.0 | -5.1 | 44.68 | 21.38 | 7.38 | 32.57 |
| 900.86 | 45.4 | 46.0 | -0.6 | 47.19 | 22.53 | 8.14 | 32.48 |
| 933.91 | 36.9 | 46.0 | -9.1 | 38.33 | 22.82 | 8.44 | 32.73 |
| | | | | | | | |
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Date of Test: March 3, 2005

## 7.10 AC Power Line

Limit

The emissions from the ac power line must conform to the limits specified in CFR 15.205.

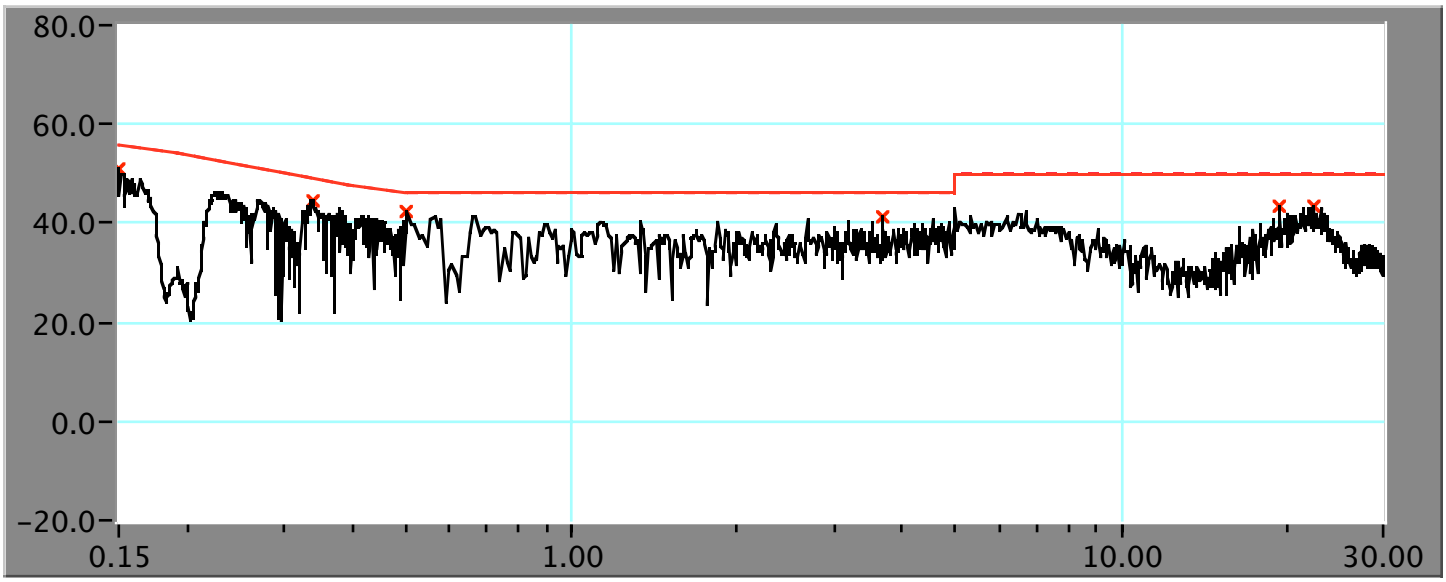
Test Procedure

The EUT is a 3.3 Volt DC device. However, it can be powered from a host system which does have an ac adapter. The power line measurements were performed at the ac power terminals of the host system. The transmitter was set to continuously transmit. Pre-scans were performed with the transmitter set to low, mid and high channels as well as hopping over 79 channels. In each of these cases, no difference in the ac power line conducted emission levels was detected. The data shown is with the transmitter set to continuously transmit on the low channel.

AC Power Line Results

Based on the results in this report, no non-compliance was found.

Line 1 – Peak Detection




| Frequency | Level | Limit | Delta | Raw Data | LISN | Cable | All Factors |
|---|---|---|---|---|---|---|---|
| MHz | dBuV | dBuV | dB | dBuV | dB | dB | dB |
| 0.150 | 51.1 | 56.0 | -4.9 | 49.44 | 1.56 | 0.06 | -1.62 |
| 0.338 | 44.7 | 49.2 | -4.6 | 44.09 | 0.55 | 0.05 | -0.60 |
| 0.500 | 42.3 | 46.0 | -3.7 | 41.98 | 0.31 | 0.05 | -0.36 |
| 3.695 | 41.1 | 46.0 | -4.9 | 40.75 | 0.13 | 0.17 | -0.30 |
| 19.450 | 43.5 | 50.0 | -6.5 | 42.37 | 0.76 | 0.35 | -1.11 |
| 22.500 | 43.5 | 50.0 | -6.5 | 42.24 | 0.87 | 0.35 | -1.22 |
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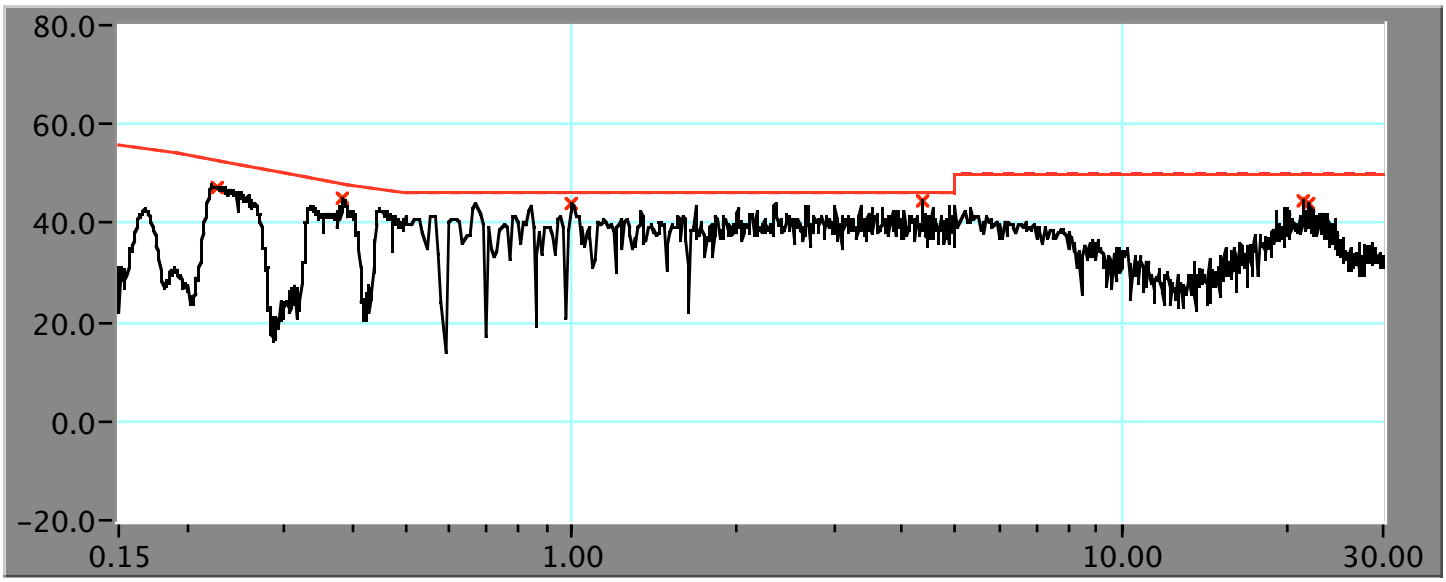
Date of Test: March 11, 2005

Line 2 Peak Detection (except where otherwise noted)




| Frequency | Level | Limit | Delta | Raw Data | LISN | Cable | All Factors |
|---|---|---|---|---|---|---|---|
| MHz | dBuV | dBuV | dB | dBuV | dB | dB | dB |
| 0.227 | 47.4 | 52.6 | -5.1 | 46.39 | 0.93 | 0.10 | -1.03 |
| 0.384 | 44.8 | 48.2 | -3.4 | 44.33 | 0.42 | 0.05 | -0.47 |
| 1.004 | 44.2 | 46.0 | -1.8 | 44.03 | 0.15 | 0.05 | -0.20 |
| 4.370 | 44.3 | 46.0 | -1.7 | 43.99 | 0.14 | 0.17 | -0.31 |
| 21.450 | 44.5 | 50.0 | -5.5 | 43.35 | 0.79 | 0.40 | -1.18 |
| 22.050 | 44.1 | 50.0 | -5.9 | 42.86 | 0.81 | 0.38 | -1.20 |
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Date of Test: March 11, 2005

# 8 Applicable Limits and Test Results for 802.11b/g

## 8.1 99% Bandwidth and 6 dB Bandwidth

**Limit**

The Minimum 6 dB bandwidth shall be greater than 500 kHz. The 99% Bandwidth is for reporting purposes only.

99% Test Procedure

The transmitter is connected to a spectrum analyzer and set to continuously transmit. The Agilent E4403 Spectrum Analyzer has a 99% Bandwidth Function built-in. The RBW is set to 1 to 3% of the 99% BW and the VBW is set to at least 3 times the RBW (RBW = 300 kHz, VBW = 1000 kHz) and the span is set to 25 MHz. The Spectrum Analyzer 99% Bandwidth built-in function is enabled. This is done by selecting the Meas Button and selecting Occupied BW.

99% Bandwidth Results

| Channel - Mode | Frequency - (MHz) | 99% Bandwidth (MHz) |
|---|---|---|
| Low - 802.11b | 2412 | 12.6 |
| Mid - 802.11b | 2437 | 12.95 |
| High - 802.11b | 2462 | 12.61 |
| Low - 802.11g | 2412 | 16.58 |
| Mid - 802.11g | 2437 | 16.54 |
| High - 802.11g | 2462 | 16.55 |

Date of Test: March 9, 2005

6 dB Bandwidth Test Procedure

The transmitter is connected to a spectrum analyzer and set to continuously transmit. The Agilent E4403 Spectrum Analyzer has a 6 dB Bandwidth Function built-in. The RBW is set to 300 kHz, the VBW is set to 1000 kHz and the span is set to 25 MHz. The Spectrum Analyzer 6 dB Bandwidth built-in function is enabled. This is done by selecting the Meas Setup Button and selecting x dB and typing in 6 -dB.

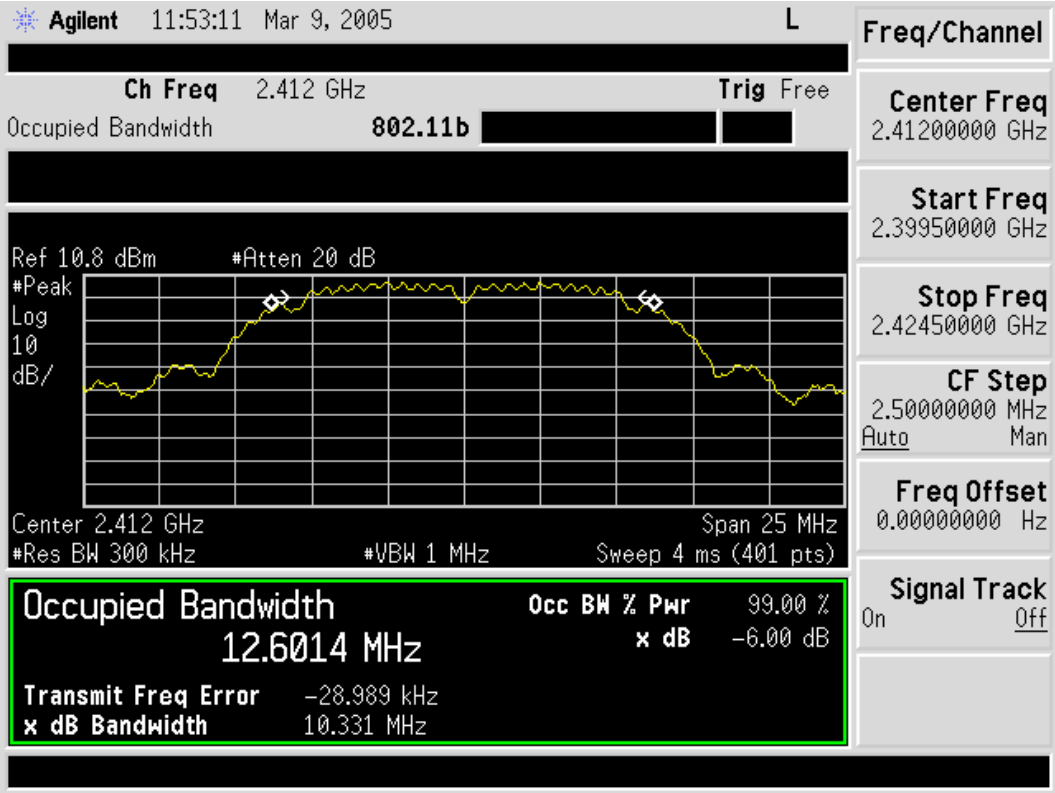
6 dB Results

Based on the results of this report, no non-compliance was found.

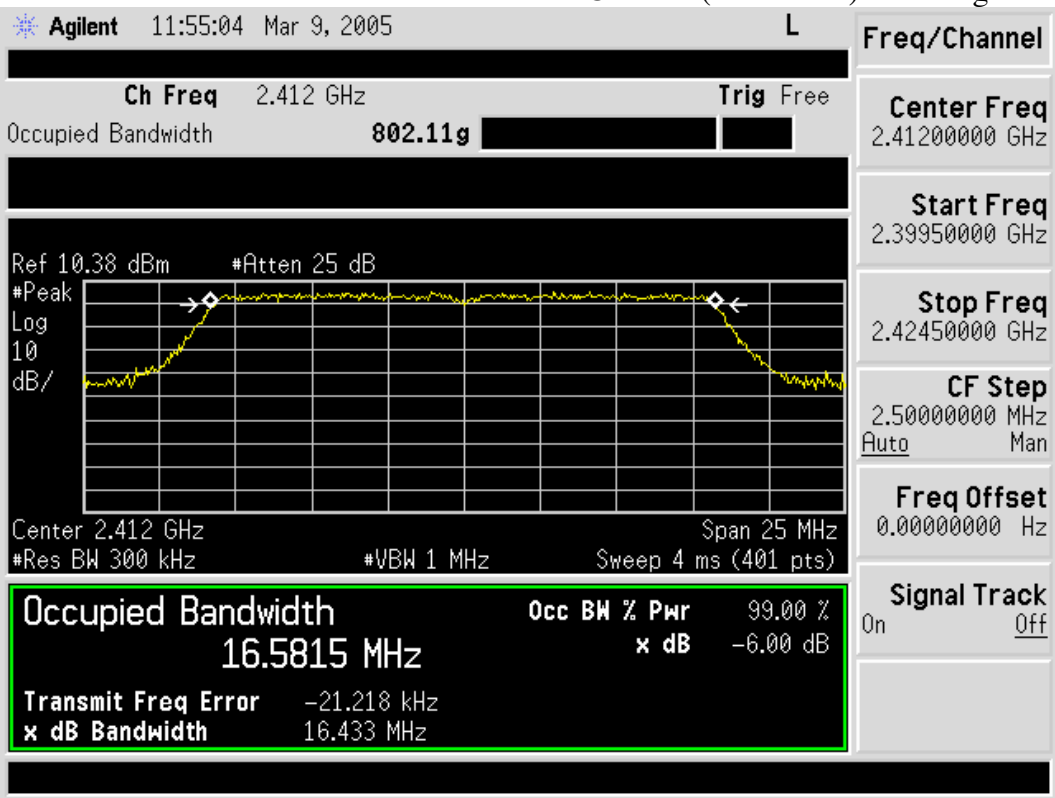
| Channel - Mode | Frequency - (MHz) | 6 dB Bandwidth MHz) |
|---|---|---|
| Low - 802.11b | 2412 | 10.33 |
| Mid - 802.11b | 2437 | 10.34 |
| High - 802.11b | 2462 | 10.31 |
| Low - 802.11g | 2412 | 16.43 |
| Mid - 802.11g | 2437 | 16.51 |
| High - 802.11g | 2462 | 16.54 |

Date of Test: March 9, 2005

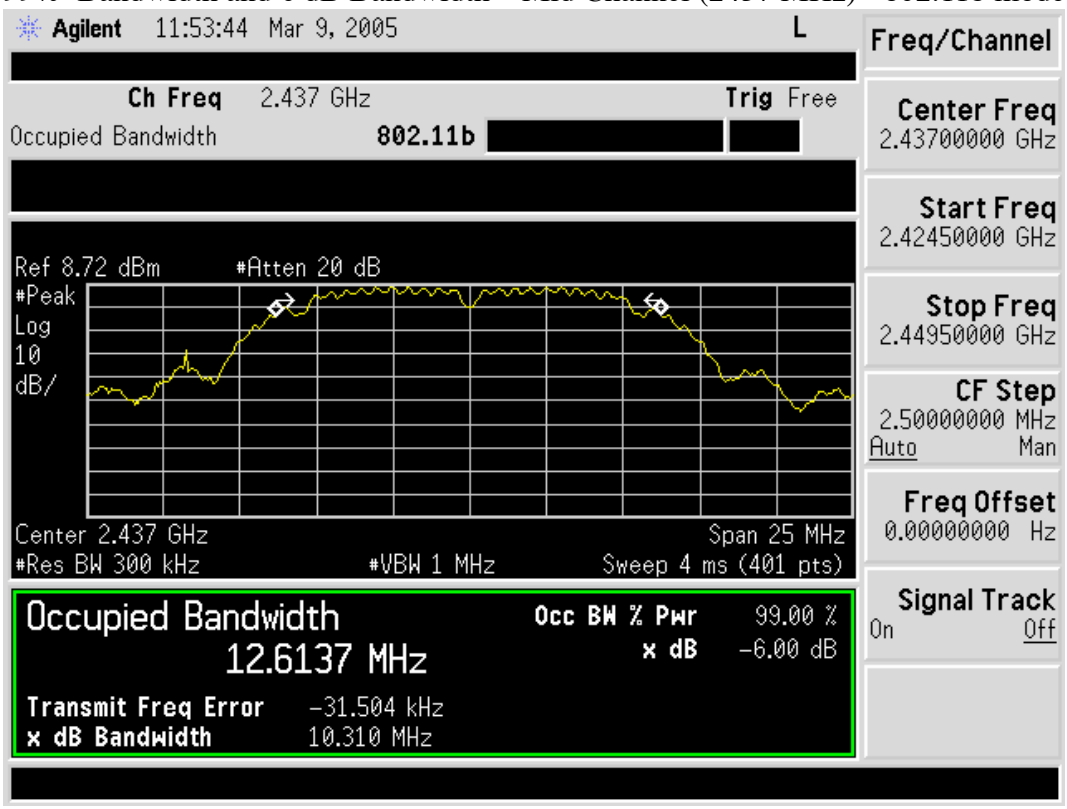
99% Bandwidth and 6 dB Bandwidth – Low Channel (2412 MHz) - 802.11b mode



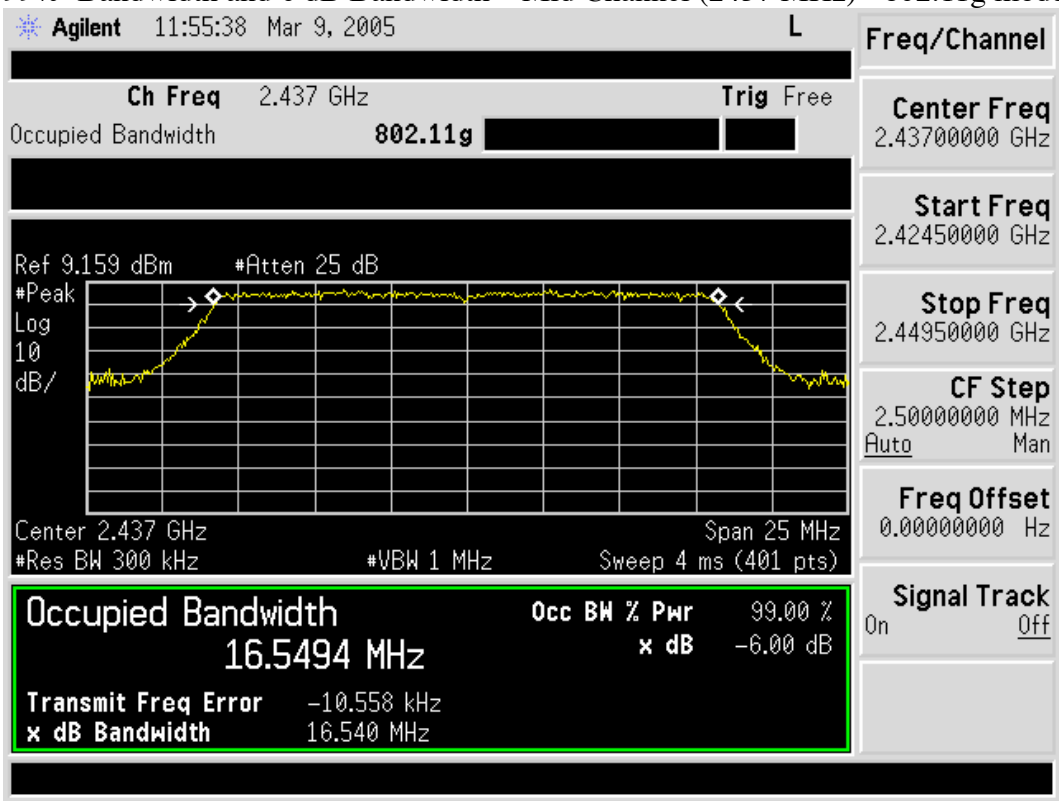

99% Bandwidth and 6 dB Bandwidth – Low Channel (2412 MHz) - 802.11g mode



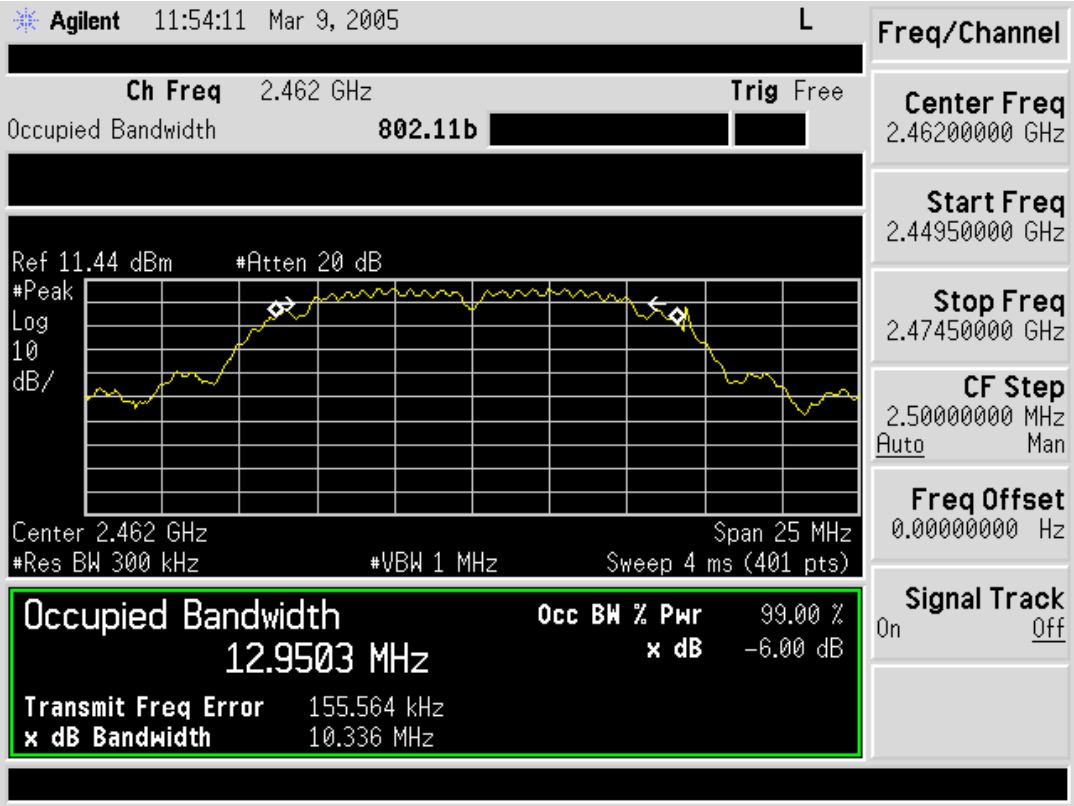
99% Bandwidth and 6 dB Bandwidth – Mid Channel (2437 MHz) - 802.11b mode



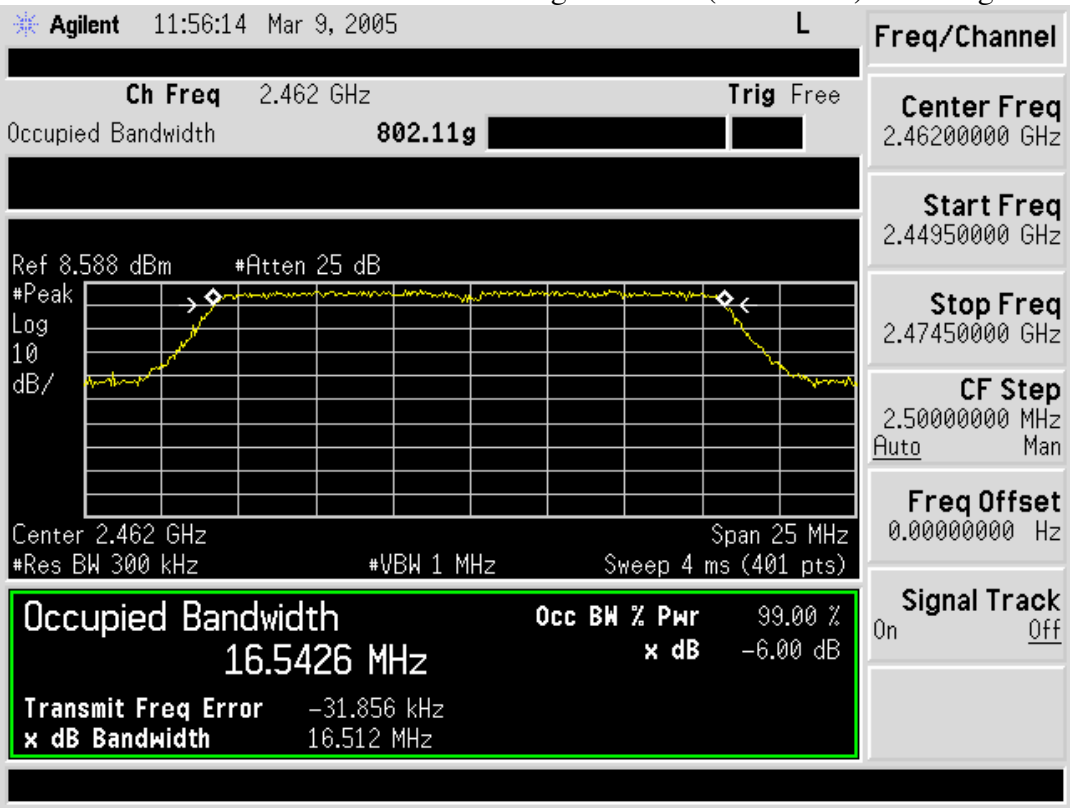

99% Bandwidth and 6 dB Bandwidth – Mid Channel (2437 MHz) - 802.11g mode



99% Bandwidth and 6 dB Bandwidth – High Channel (2462 MHz) - 802.11b mode




99% Bandwidth and 6 dB Bandwidth – High Channel (2462 MHz) - 802.11g mode



## 8.2 Maximum Peak Output Power

Limit

The maximum Peak Output Power for systems using digital modulation and employing an antenna with a gain not greater than 6 dBi shall not exceed 1 Watt (30 dBm).

Test Setup

The transmitter is connected to a peak power meter and set to continuously transmit.

Test Results
Based on the results of this report, no non-compliance were found.

| Channel - Mode | Frequency (MHz) | Peak Power (dBm) | Limit (dBm) |
|---|---|---|---|
| Low - 802.11b | 2412 | 21.2 | 30 |
| Mid - 802.11b | 2437 | 21.07 | 30 |
| High - 802.11b | 2462 | 21.14 | 30 |
| Low - 802.11g | 2412 | 25.05 | 30 |
| Mid - 802.11g | 2437 | 25.25 | 30 |
| High - 802.11g | 2462 | 24.85 | 30 |

Date of Test: March 23, 2005

## 8.3 Average Power

Limit

None; for reporting purposes only.

Test Setup

The transmitter is connected to an average power meter and set to continuously transmit.

| Channel - Mode | Frequency (MHz) | Average Power (dBm) |
|---|---|---|
| Low - 802.11b | 2412 | 17.19 |
| Mid - 802.11b | 2437 | 17.0 |
| High - 802.11b | 2462 | 16.82 |
| Low - 802.11g | 2412 | 15.26 |
| Mid - 802.11g | 2437 | 15.3 |
| High - 802.11g | 2462 | 15.47 |

Date of Test: March 23, 2005

## 8.4 Power Spectral Density

**Limit**

The power spectral density shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

**Test Procedure**

The transmitter output was 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 = 10 kHz. Pre-scans were performed to locate the frequency range containing the highest emission and then final scans were performed.

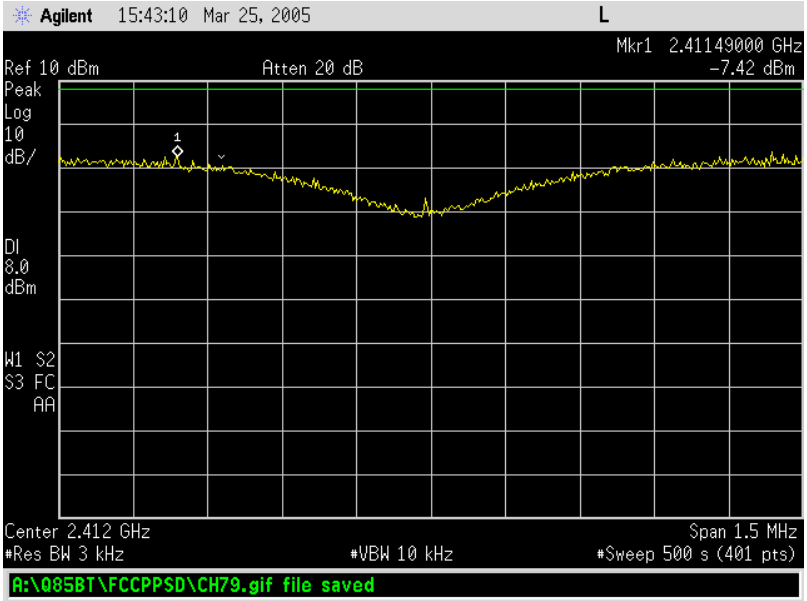
For the final scans, the sweep time = span / 3 kHz. This process was performed for both 802.11b mode and 802.11g mode.

Test Results
Based on the results of this report, no non-compliance were found. The final values are listed in the table below.

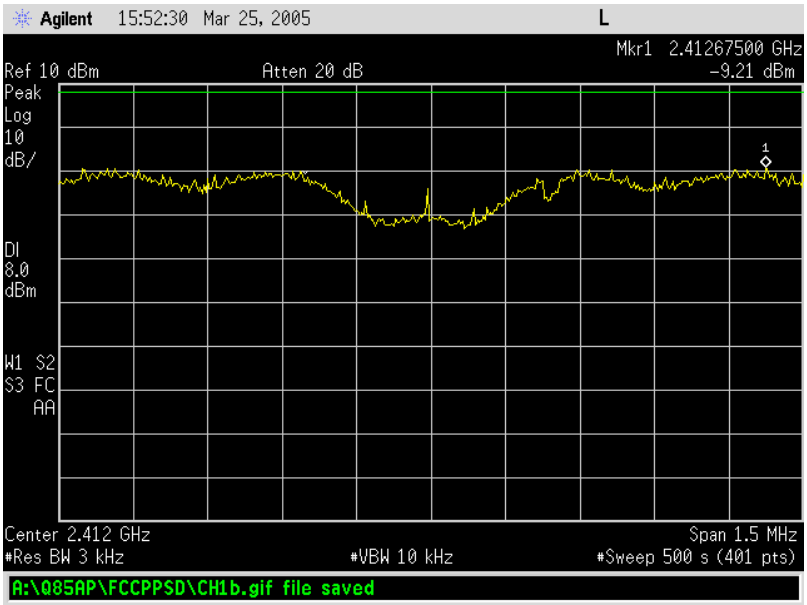
| Channel - Mode | Frequency (MHz) | PSD (dBm) | Limit (dBm) |
|---|---|---|---|
| Low - 802.11b | 2412 | -7.42 | 8 |
| Mid - 802.11b | 2437 | -7.3 | 8 |
| High - 802.11b | 2462 | -6.45 | 8 |
| Low - 802.11g | 2412 | -9.21 | 8 |
| Mid - 802.11g | 2437 | -8.9 | 8 |
| High - 802.11g | 2462 | -9 | 8 |

Date of Test: February 16, 2005

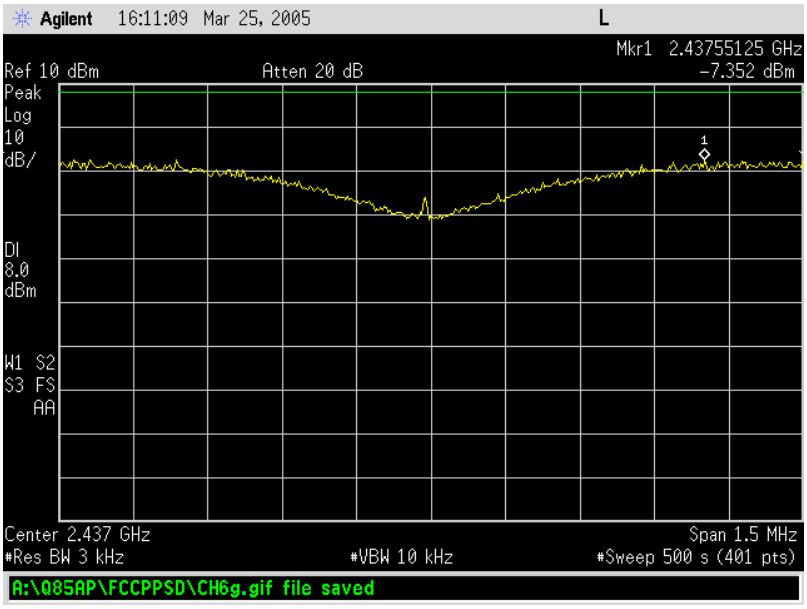
Power Spectral Density – Low Channel (2412 MHz) - 802.11b mode



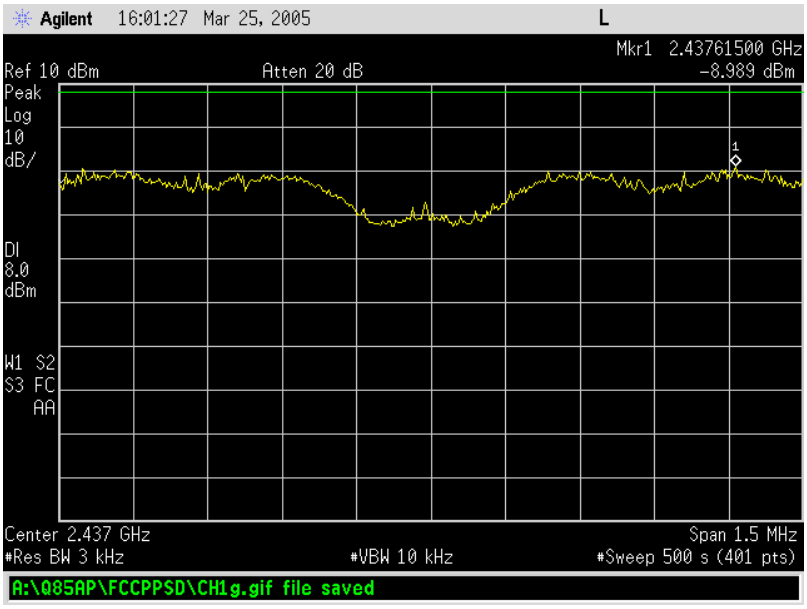

Power Spectral Density – Mid Channel (2412 MHz) - 802.11g mode



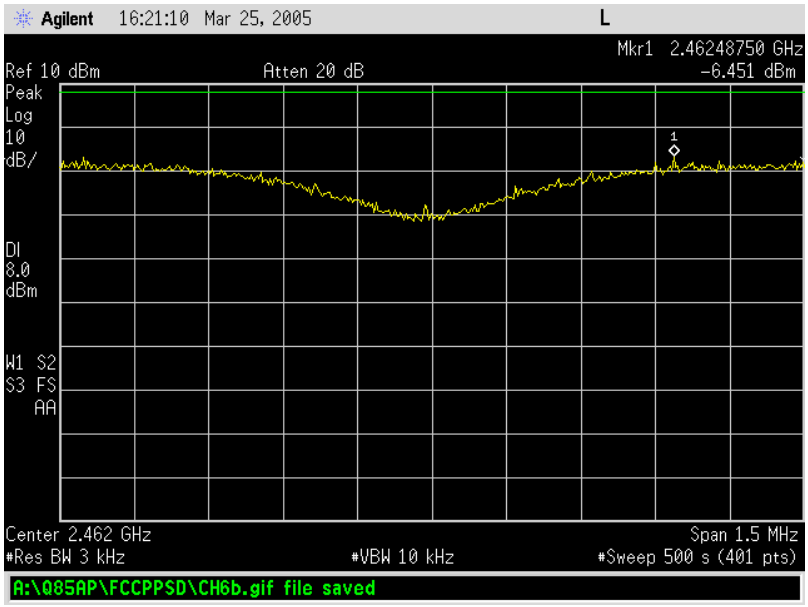
Power Spectral Density – Mid Channel (2437 MHz) - 802.11b mode



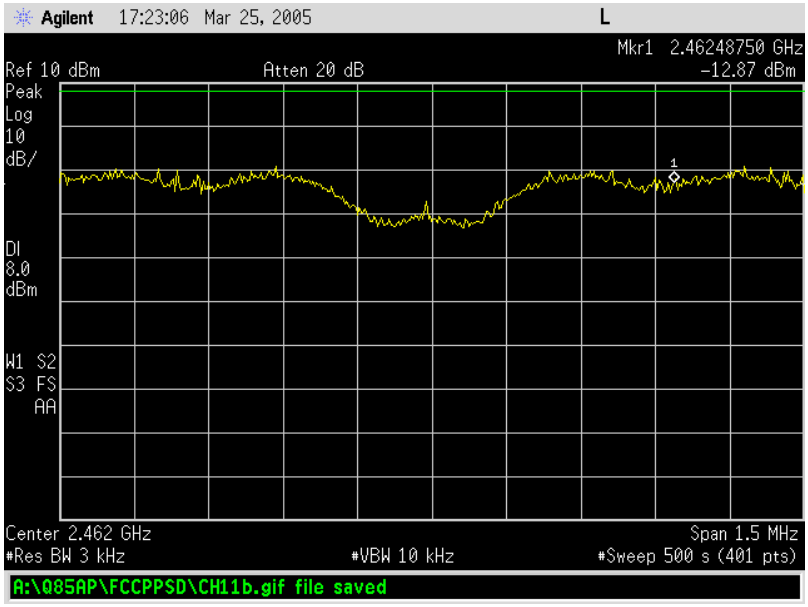

Power Spectral Density – Mid Channel (2437 MHz) - 802.11g mode



Power Spectral Density – High Channel (2462 MHz) - 802.11b mode




Power Spectral Density –High Channel (2462 MHz) - 802.11g mode



## 8.5 -20 dBc Conducted Spurious Emissions

Limit

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 desired power, based on either an RF conducted or a radiated measurement.

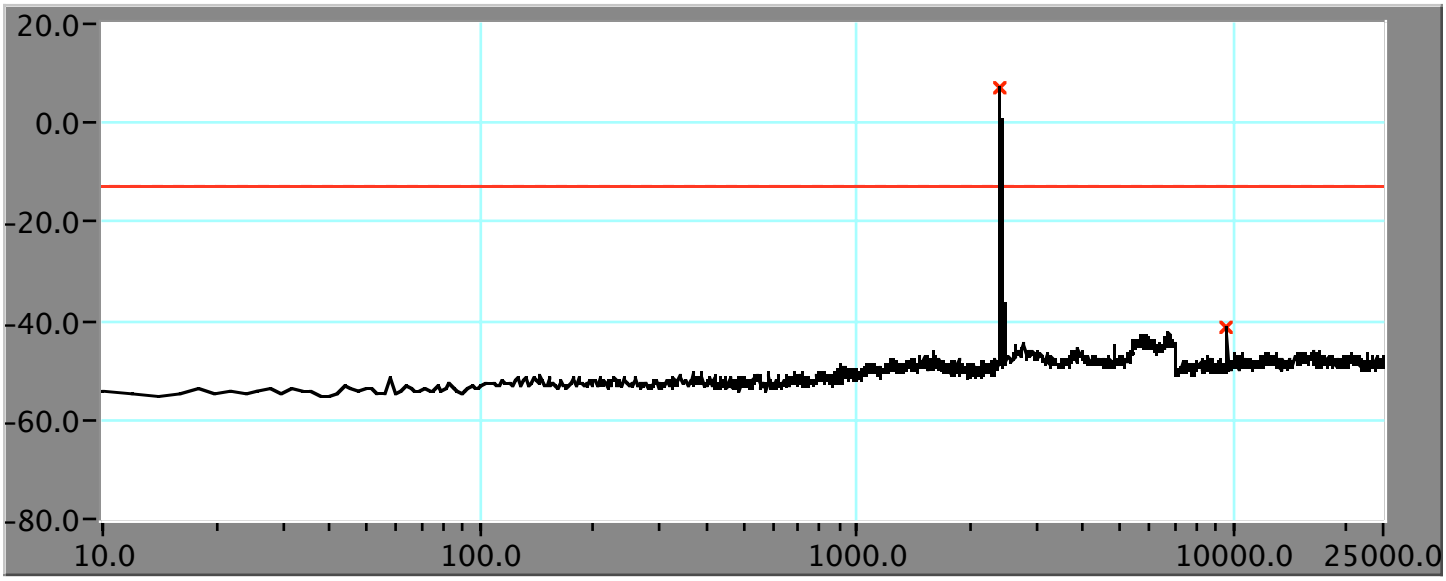
Test Procedure

The transmitter is set to continuously transmit and 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 spectrum from 30 MHz to 25 GHz is investigated when transmitting on the low, mid and high channels for 802.11b and 802.11g mode.

Test Results
Based on the results of this report, no non-compliance were found.

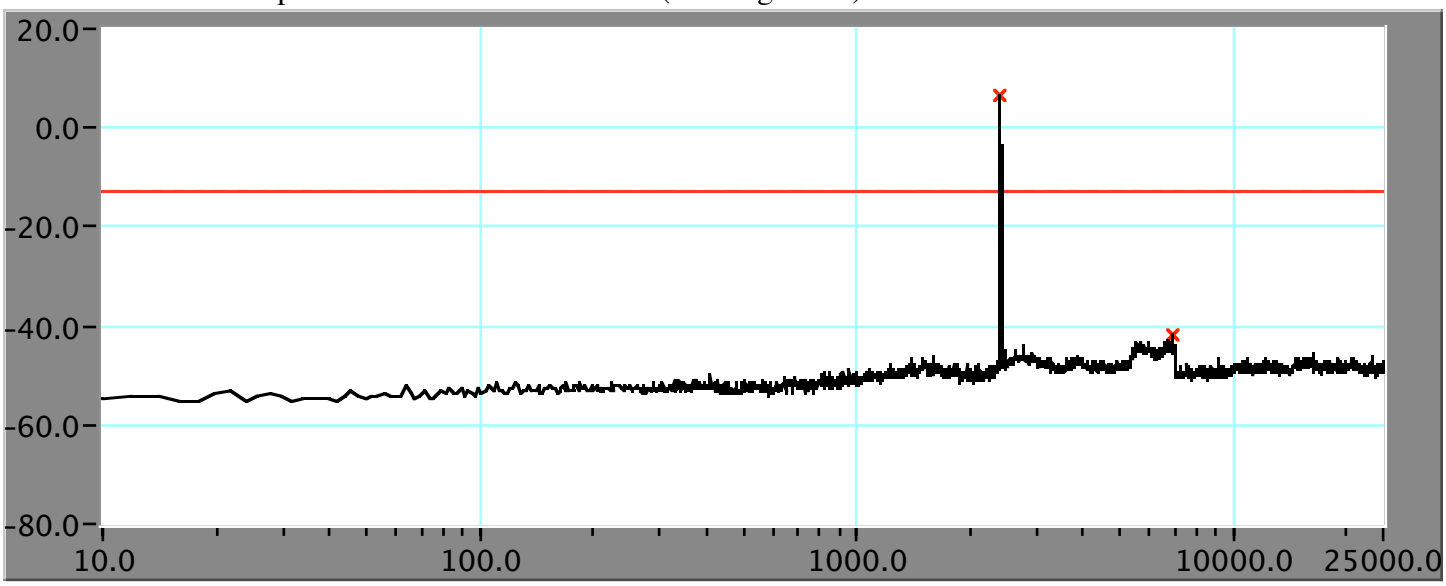
Date of Test: March 9, 2005

-20 dBc Conducted Spurious Emissions Channel 1 (802.11b mode)




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2412 | 7 | N/A |
| 9648 | -41.2 | -13 |

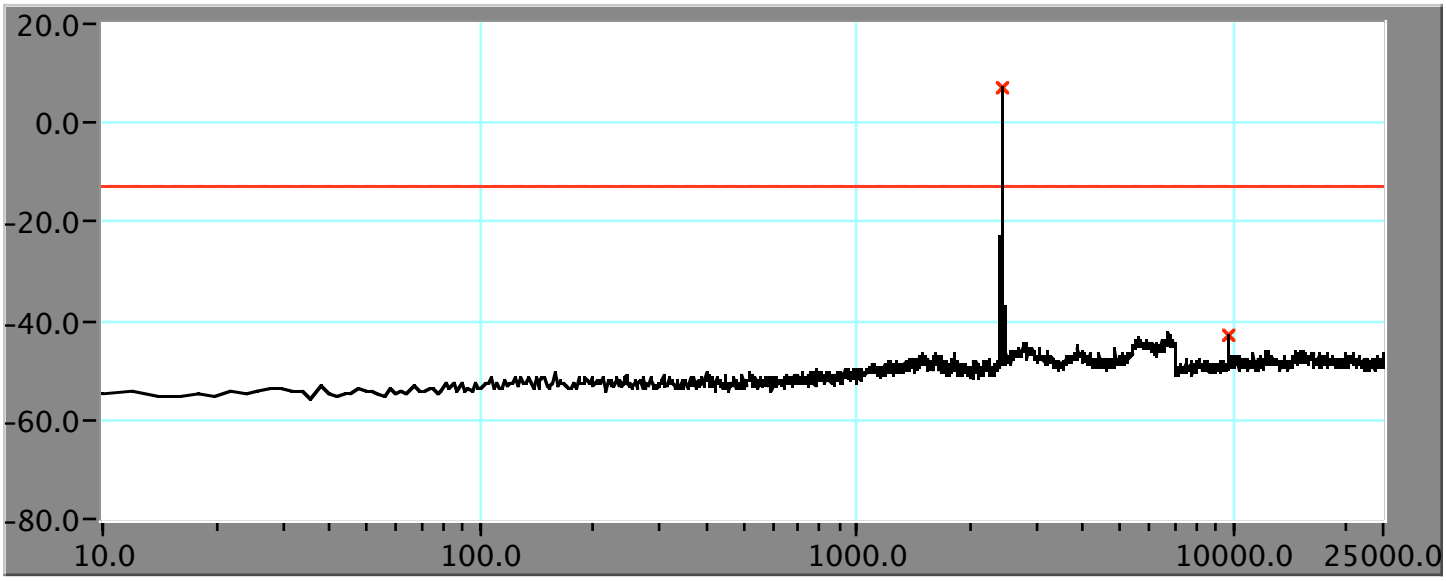
-20 dBc Conducted Spurious Emissions Channel 1 (802.11g mode)




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2412 | 6.8 | N/A |
| 9648 | -42 | -13.2 |

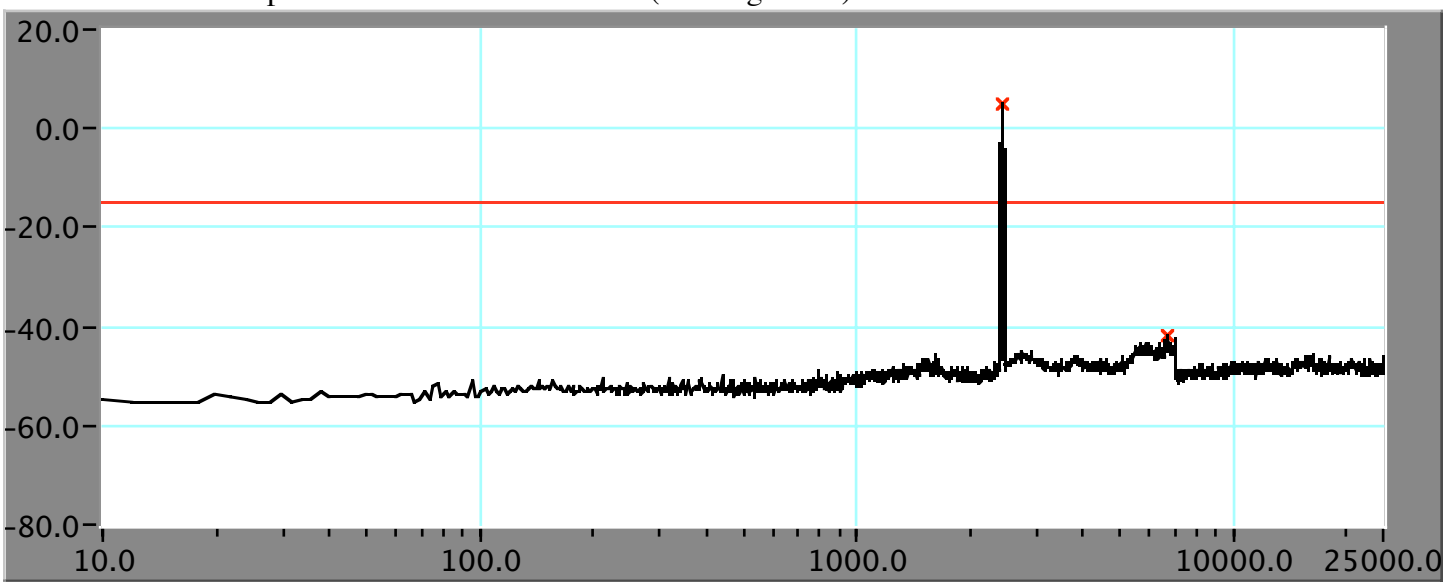
Date of Test: March 9, 2005

-20 dBc Conducted Spurious Emissions Channel 6 (802.11b mode)




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2437 | 7 | N/A |
| 9748 | -43 | -13 |

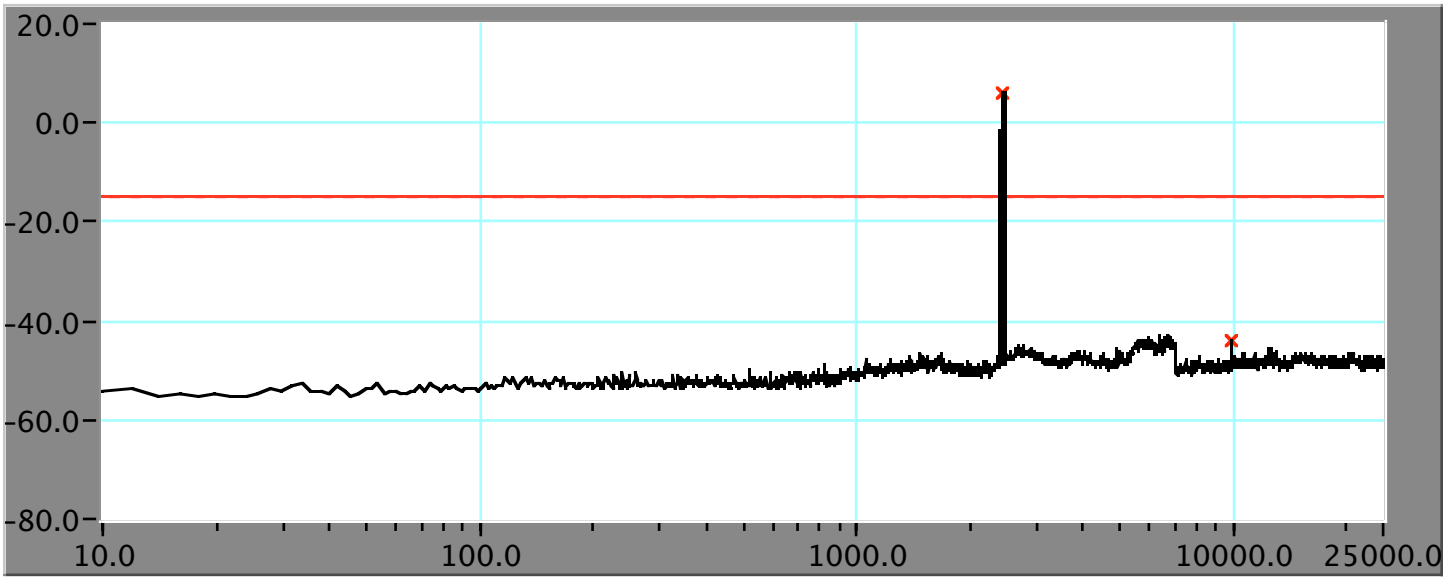
20 dBc Conducted Spurious Emissions Channel 6 (802.11g mode)




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2437 | 5 | N/A |
| 9748 | -41.9 | -13 |

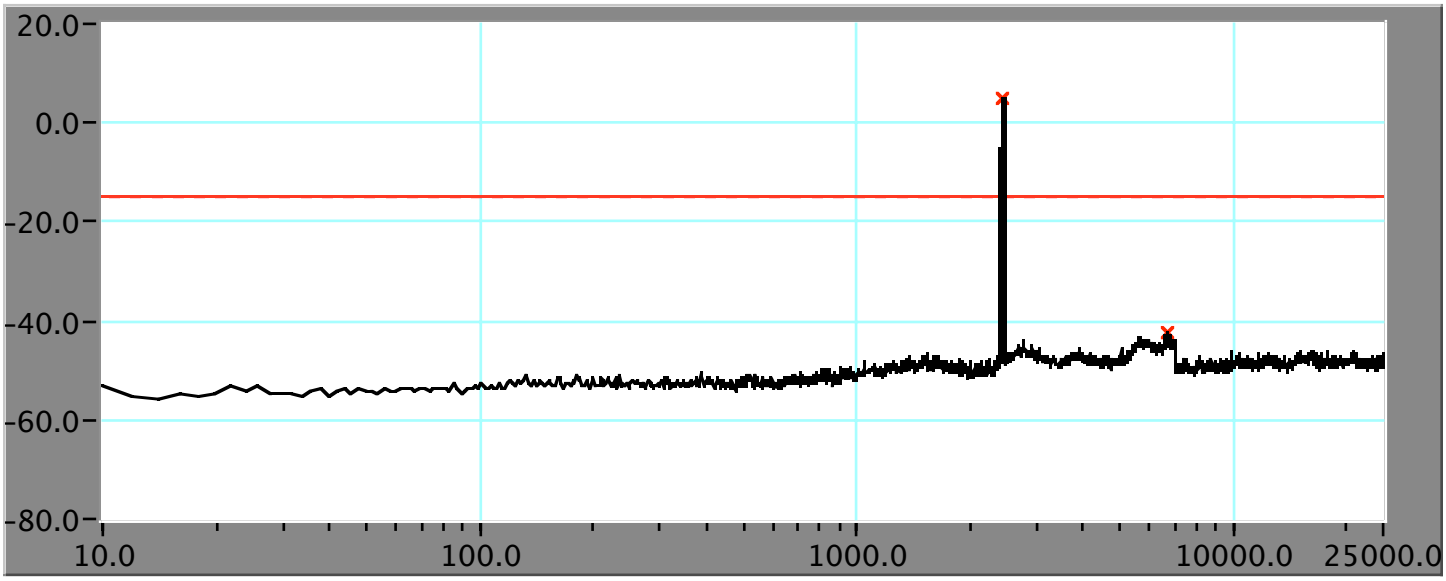
Date of Test: March 9, 2005

20 dBc Conducted Spurious Emissions Channel 11 (802.11b mode)




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2462 | 6.1 | N/A |
| 9848 | -44.1 | -13.9 |

20 dBc Conducted Spurious Emissions Channel 11 (802.11g mode)




| Frequency - MHz | Level - dBm | Limit - dBm |
|---|---|---|
| 2462 | 5 | N/A |
| 6737 | -42.4 | -13 |

Date of Test: March 9, 2005

## 8.6 Radiated Emissions

### 8.6.1 Transmitter Radiated Spurious Emissions

Limits

RSS-210 Section 6.3
(a) Fundamental components of modulation of LPDs shall not fall within the restricted bands of Table 2.
(b) Unwanted emissions in this Standard include out-of-band products of modulation, carrier harmonics and spurious emissions.
(c) Except as provided in 6.2.2(L2), 6.2.2(o) and 6.2.2(q1), unwanted emissions falling into restricted bands of Table 2 shall meet Tables 3 and 7 limits. It should also be noted that unwanted emissions falling in non-restricted bands do not need to be suppressed to a level lower than the Table 3 and 7 limits.

Test Procedure

Emission measurements were performed at the Apple Computer Evelyn 1, semi-anechoic chamber located at 123 East Evelyn Avenue, Mountain View, California. The EUT was placed on a nonmetallic table, 80 cm above the metallic ground-plane. The EUT and peripherals were powered from a filtered main supply.

The frequency spectrum from 30 MHz to 25 GHz was scanned and the emission levels maximized at each frequency. The antenna was varied in height and the system was rotated 360 degrees while scanning for maximum emission amplitudes. This procedure was performed for both horizontal and vertical polarization of the receiving antenna. For Peak Detection measurements below 1 GHz, the RBW is set to 100 kHz and the VBW is set to 100 kHz. For Quasi-Peak detection measurements, 120 kHz bandwidths were used. Peak detection was used unless otherwise noted as Quasi-Peak. For peak measurements above 1 GHz, the RBW is set to 1 MHz and the VBW is set to 1 MHz. For Average measurements the RBW is set to 1 MHz and the VBW is set to 10 Hz. Radiated Emission measurements below 1 GHz were performed at an EUT to antenna distance of 3 meters and measurements above 1 GHz were performed at an EUT to antenna distance of 1 meter.

Radiated emissions measurements were performed with the transmitter set to continuously transmit using the low, mid and highest channel using maximum transmit power.

- low (channel 1) - 2.412 GHz
- mid (channel 6) - 2.437 GHz
- high (channel 11) - 2.462 GHz

Two sets of Radiated Emissions measurements from 30 MHz to 25 GHz were performed using two different host systems that utilize the same antennas. The module was tested inside the host system enclosure in each case.

Test Results
Based on the results of this report, no non-compliance was found.

8.6.2 Transmitter Radiated Spurious Emissions above 1 GHz

Restricted Bands

The adjacent restricted bands at the lower and upper edges of the 2.4 GHz ISM band were scanned for the maximum radiated emissions with the transmitter set to continuously transmit at the corresponding lowest and highest channels.

Restricted Bands Instrument Settings

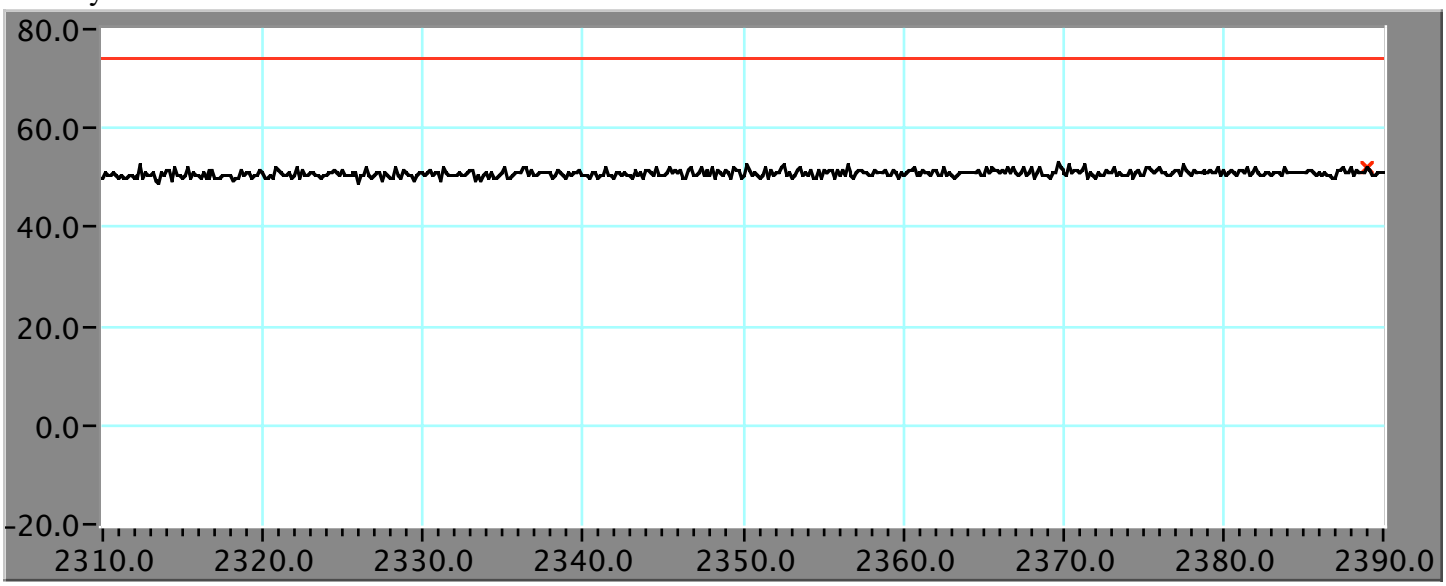
Peak Measurement Instrument Settings

| Frequency Range | Reference Level | Attenuation | Resolution BW | Video BW | Sweep Rate |
|---|---|---|---|---|---|
| 2310-2390 MHz | 80 dBuV/m | 10 dB | 1 MHz | 1 MHz | 5 mS |
| 2483-2500 MHz | 80 dBuV/m | 10 dB | 1 MHz | 1 MHz | 5 mS |

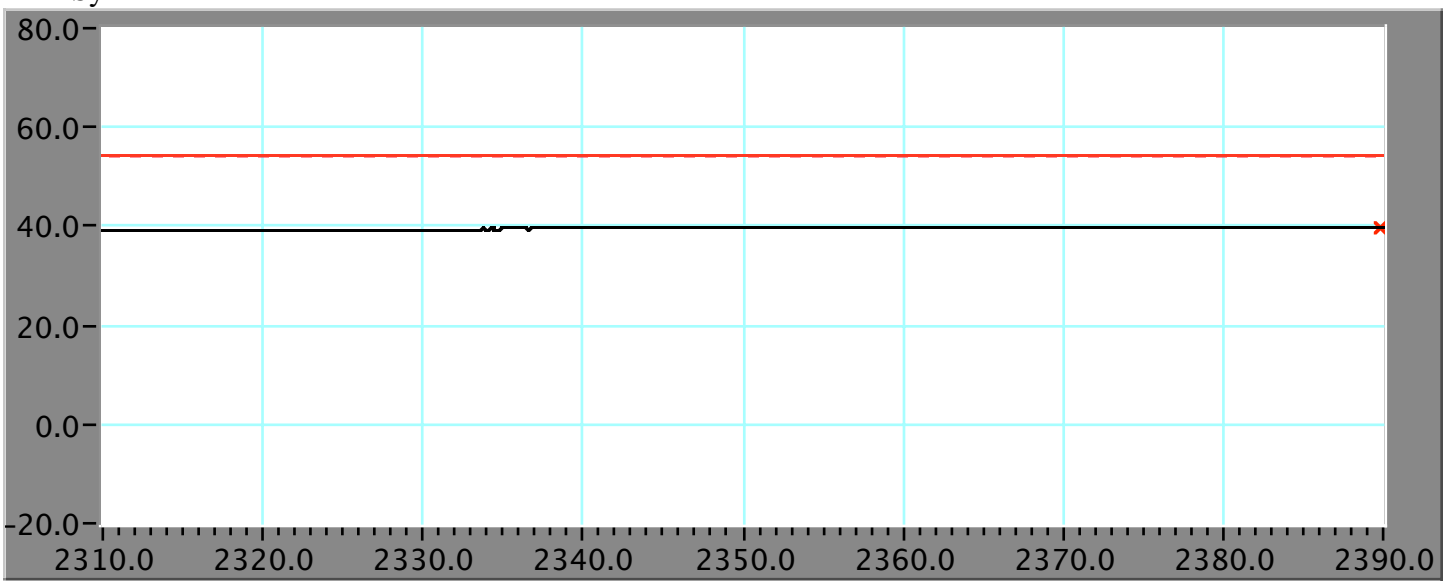
Average Measurement Instrument Settings

| Frequency Range | Reference Level | Attenuation | Resolution BW | Video BW | Sweep Rate |
|---|---|---|---|---|---|
| 2310-2390 MHz | 80 dBuV/m | 10 dB | 1 MHz | 10 Hz | 22.5 Seconds |
| 2483-2500 MHz | 80 dBuV/m | 10 dB | 1 MHz | 10 Hz | 6.4 Seconds |

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Peak Detection - 802.11b
Host System #1



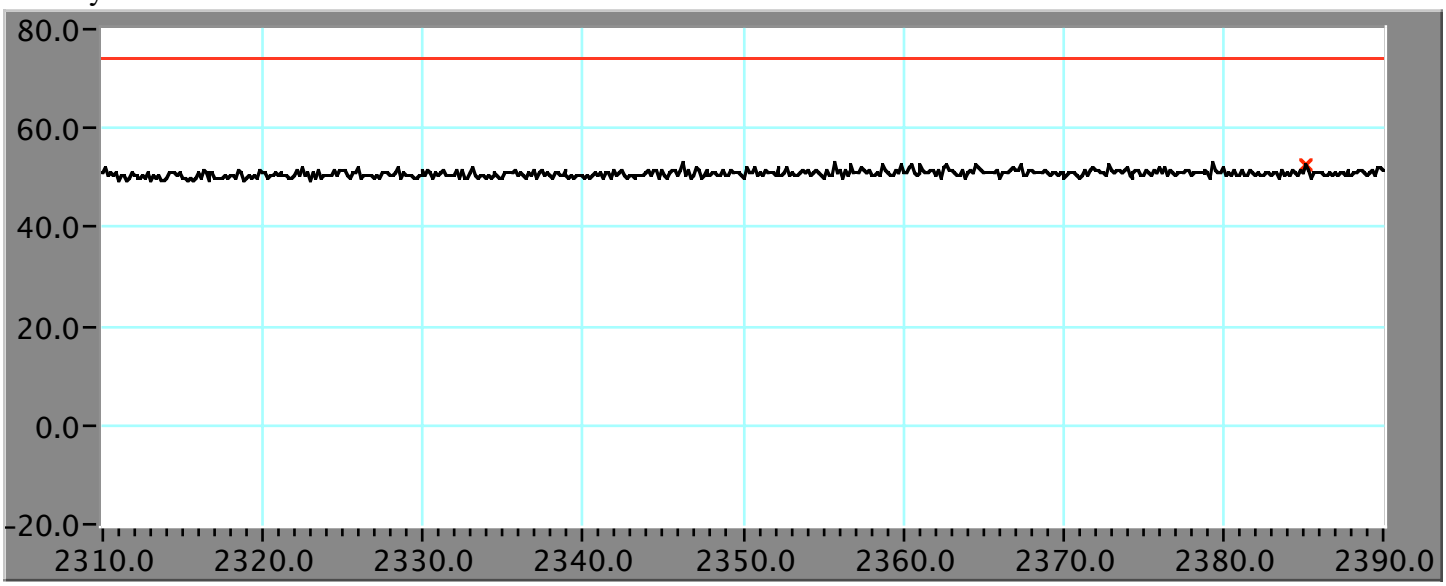

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Average Detection - 802.11b
Host System #1



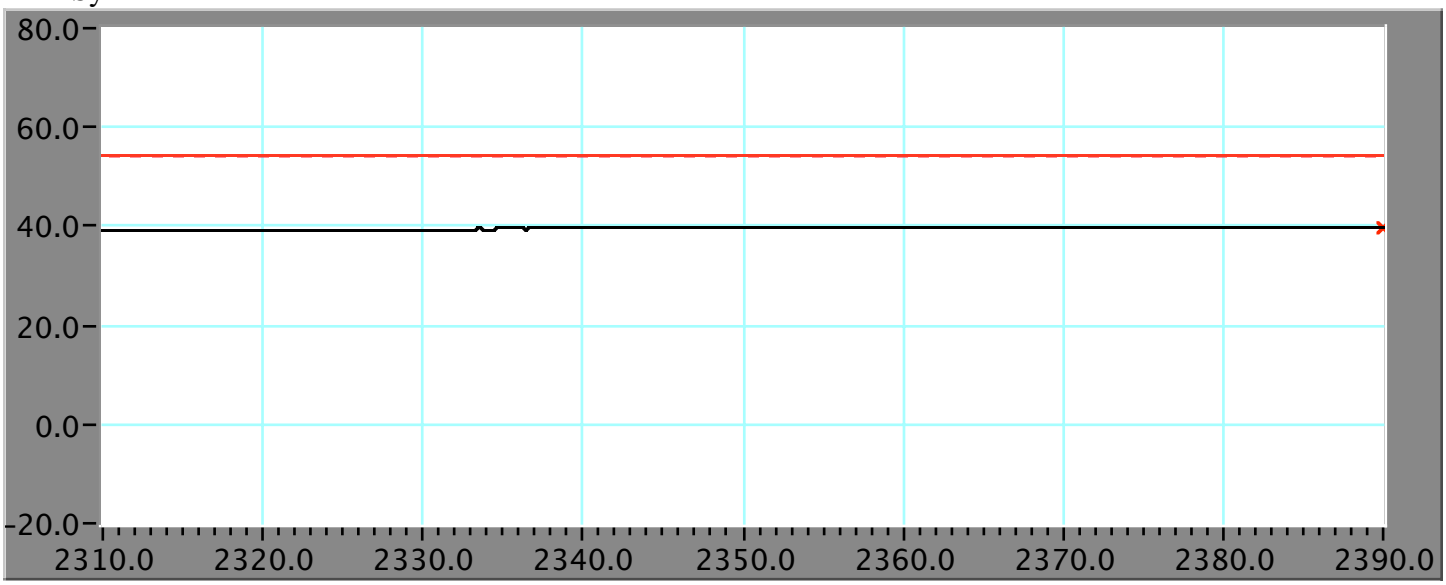

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2389 | 52.3 | 74 | -21.5 | 25.51 | 32.29 | 3.98 | 9.5 |
| 2389.8 | 39.8 | 54 | -14.2 | 13.02 | 32.29 | 3.98 | 9.5 |

Date of Test: March 4, 2005

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Peak Detection - 802.11g
Host System #1



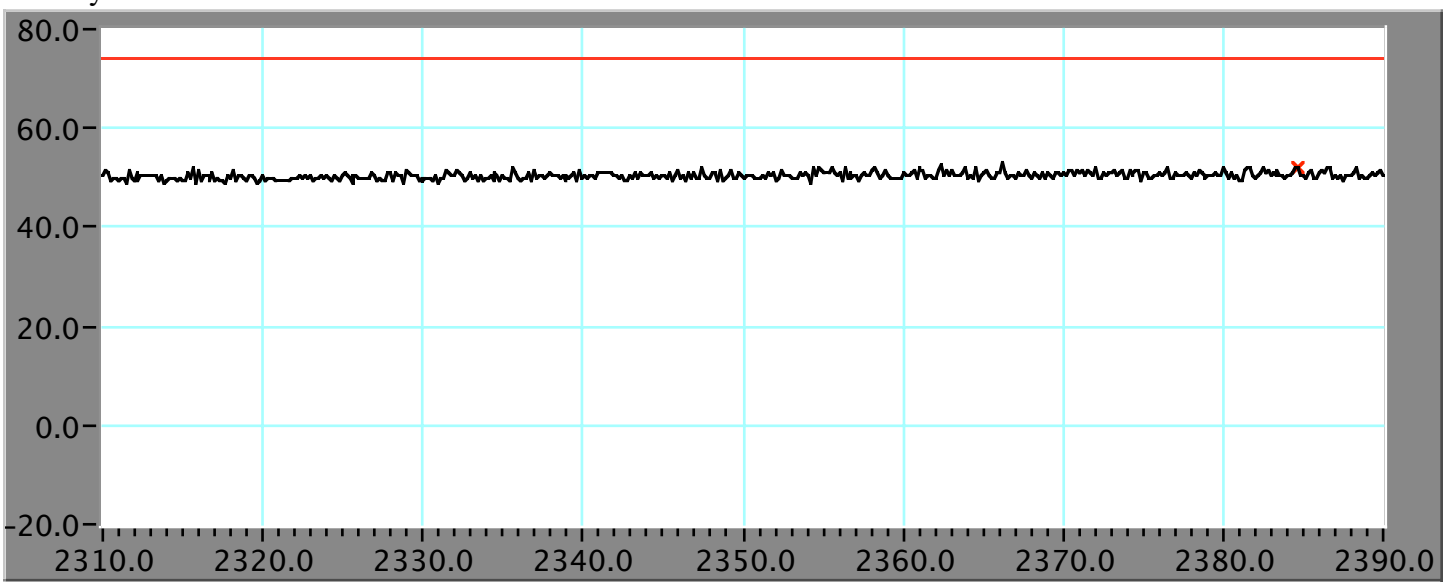

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Average Detection - 802.11g
Host System #1



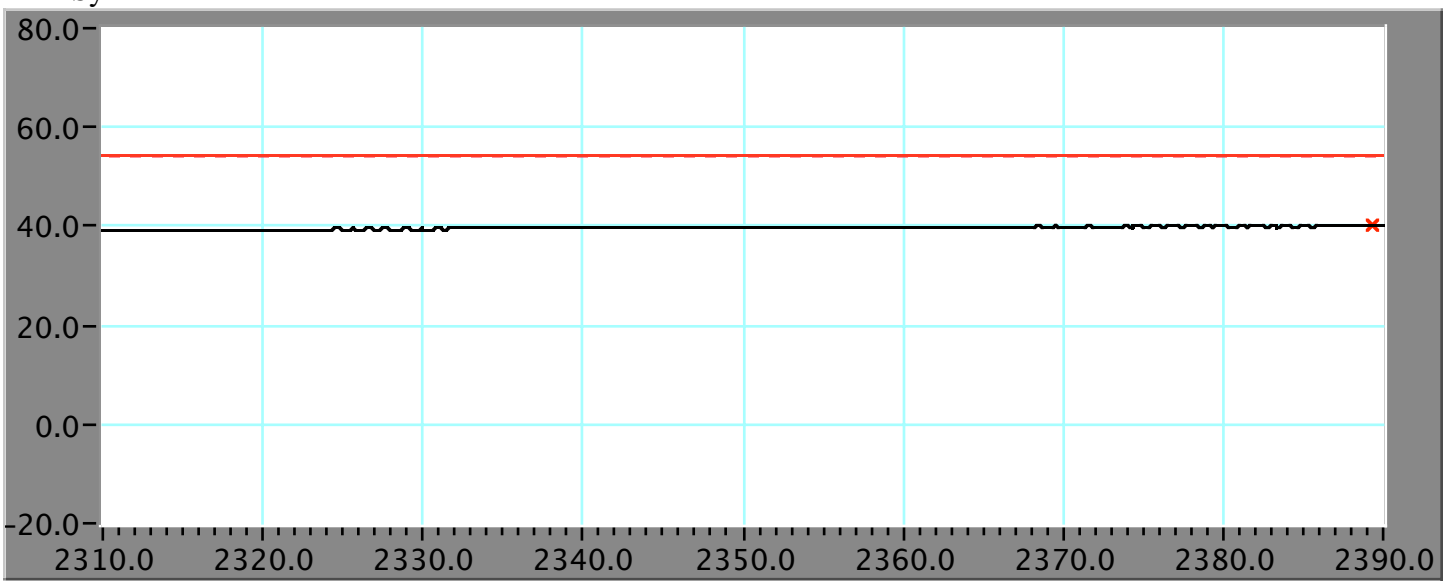

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2385 | 52.8 | 74 | -21.2 | 25.99 | 32.29 | 3.98 | 9.5 |
| 2390 | 39.8 | 54 | -14.2 | 13.02 | 32.29 | 3.98 | 9.5 |

Date of Test: March 4, 2005

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.412 GHz), Peak Detection - 802.11g
Host System #1



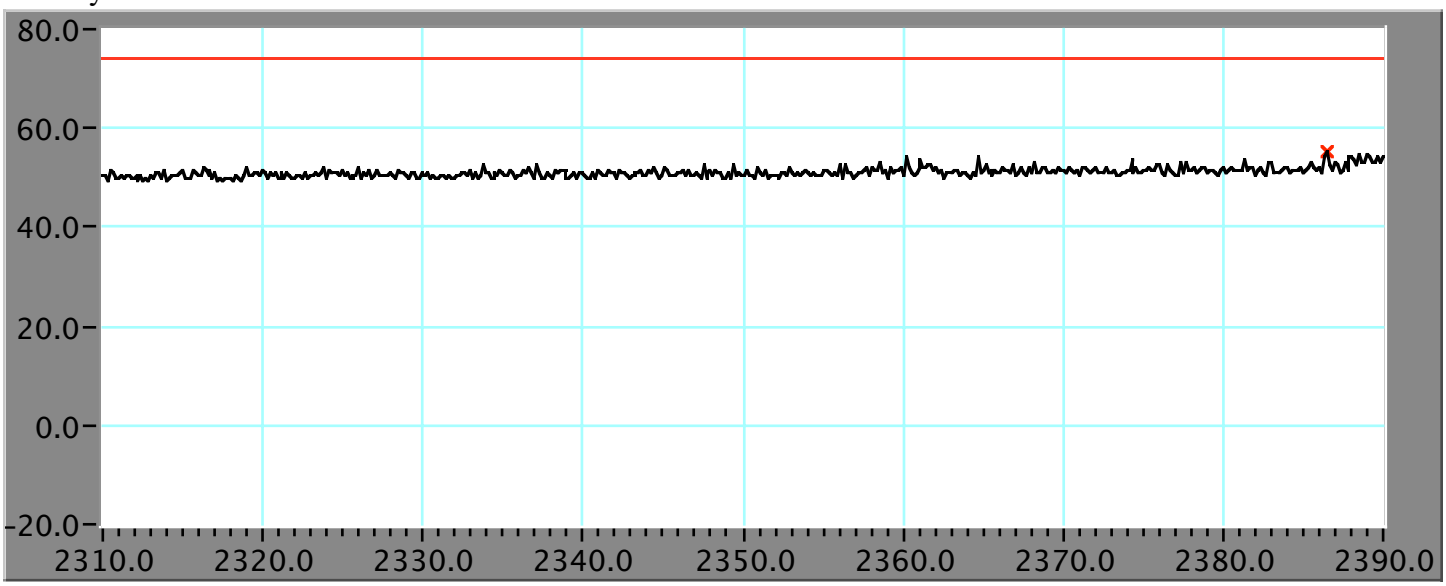

2310 MHz - 2390 MHz Restricted Band - Horizontal channel 1 (2.412 GHz), Average Detection - 802.11g
Host System #1



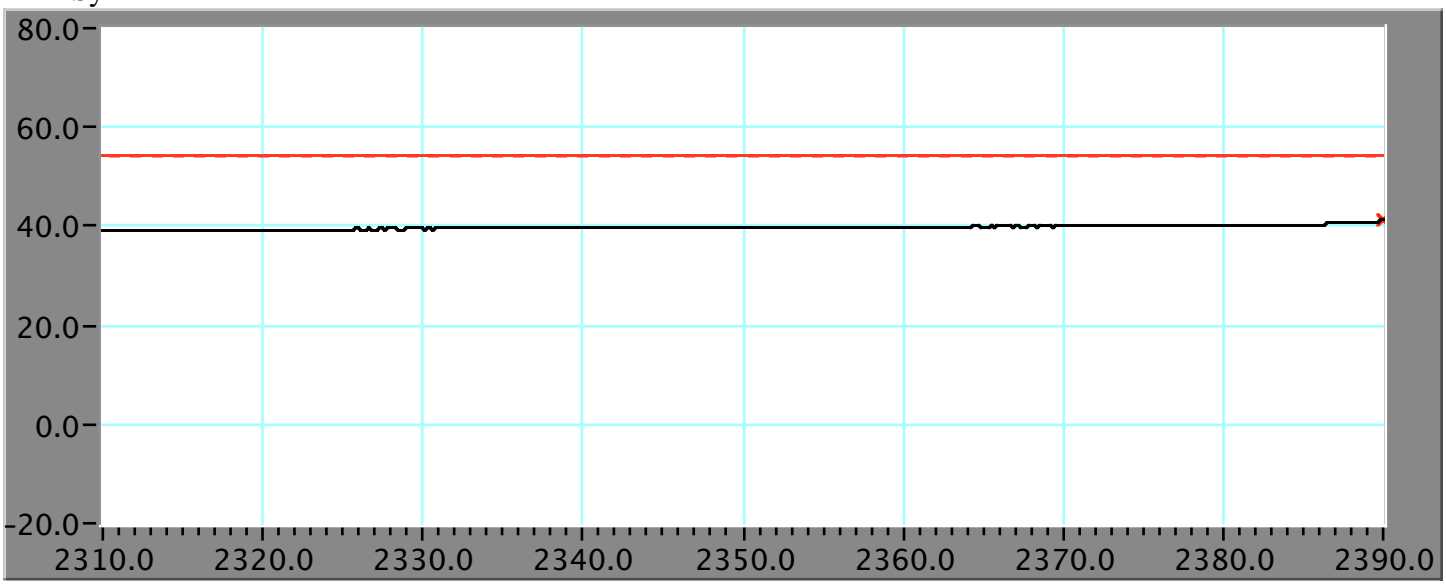

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2384.7 | 52.2 | 74 | -21.8 | 25.46 | 32.28 | 3.98 | 9.5 |
| 2389.36 | 40.2 | 54 | -13.8 | 13.42 | 32.29 | 3.98 | 9.5 |

Date of Test: March 4, 2005

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.412 GHz), Peak Detection - 802.11g
Host System #1



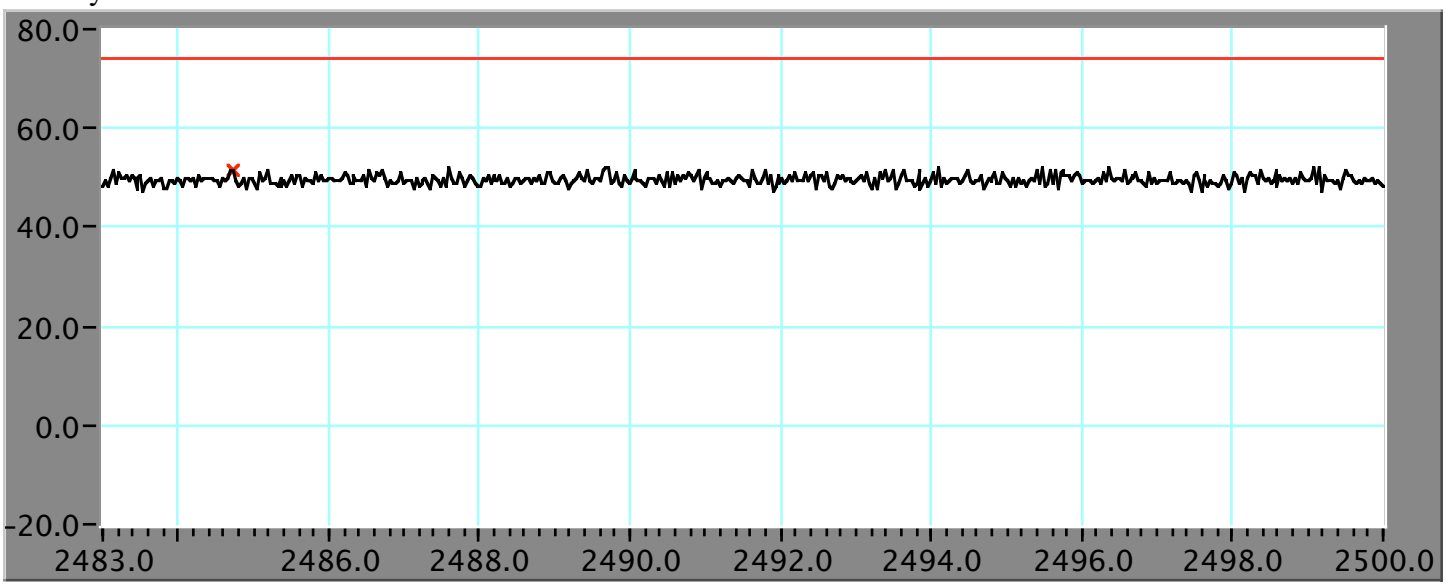

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.412 GHz), Average Detection - 802.11g
Host System #1



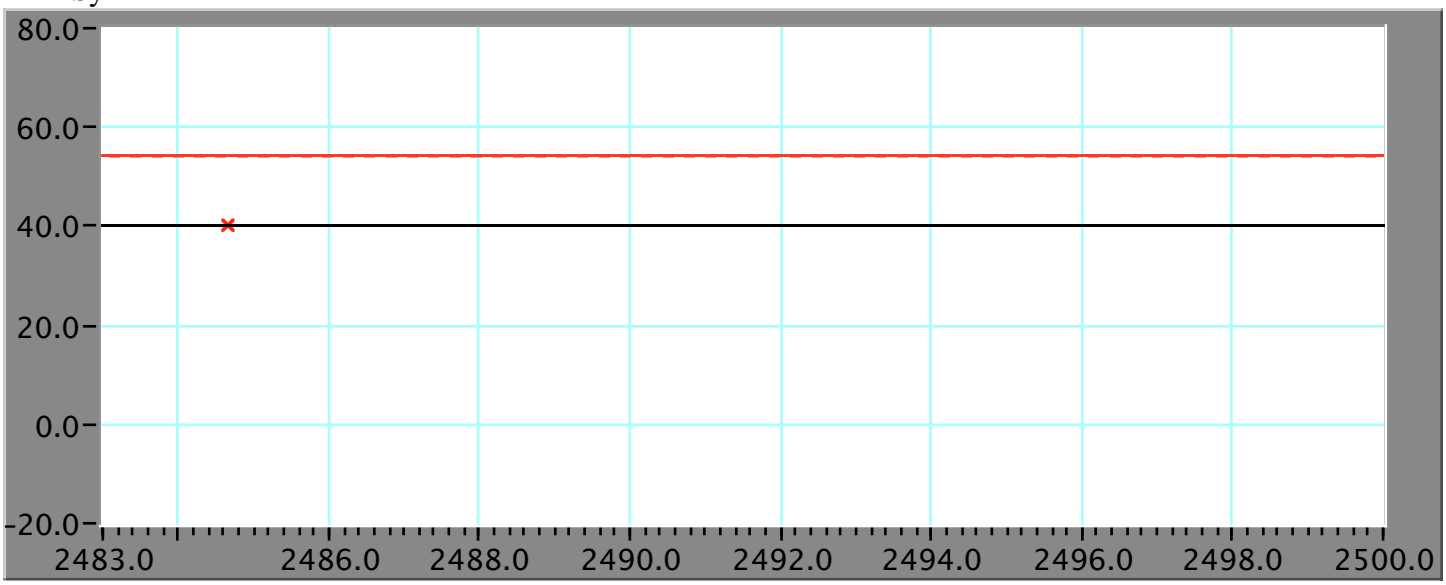

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2389 | 55 | 74 | -19 | 28.27 | 32.29 | 3.98 | 9.5 |
| 2390 | 41.2 | 54 | -12.8 | 14.4 | 32.29 | 3.98 | 9.5 |

Date of Test: March 4, 2005

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Peak Detection - 802.11b
Host System #1



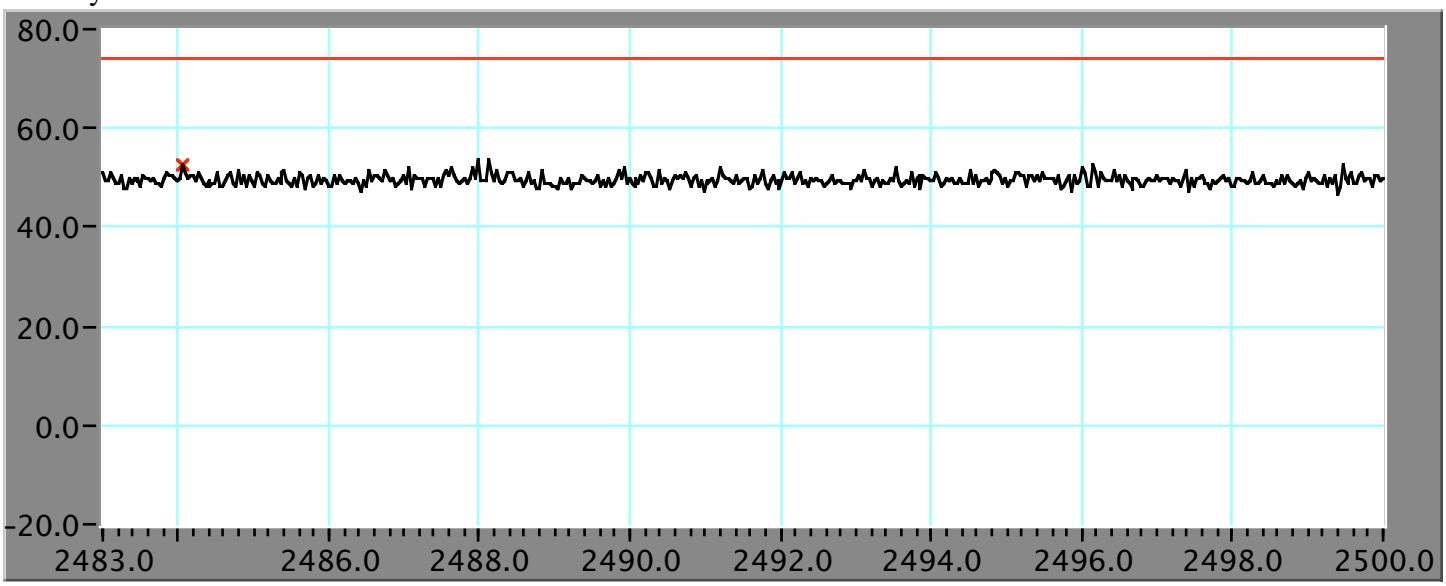

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Average Detection - 802.11b
Host System #1



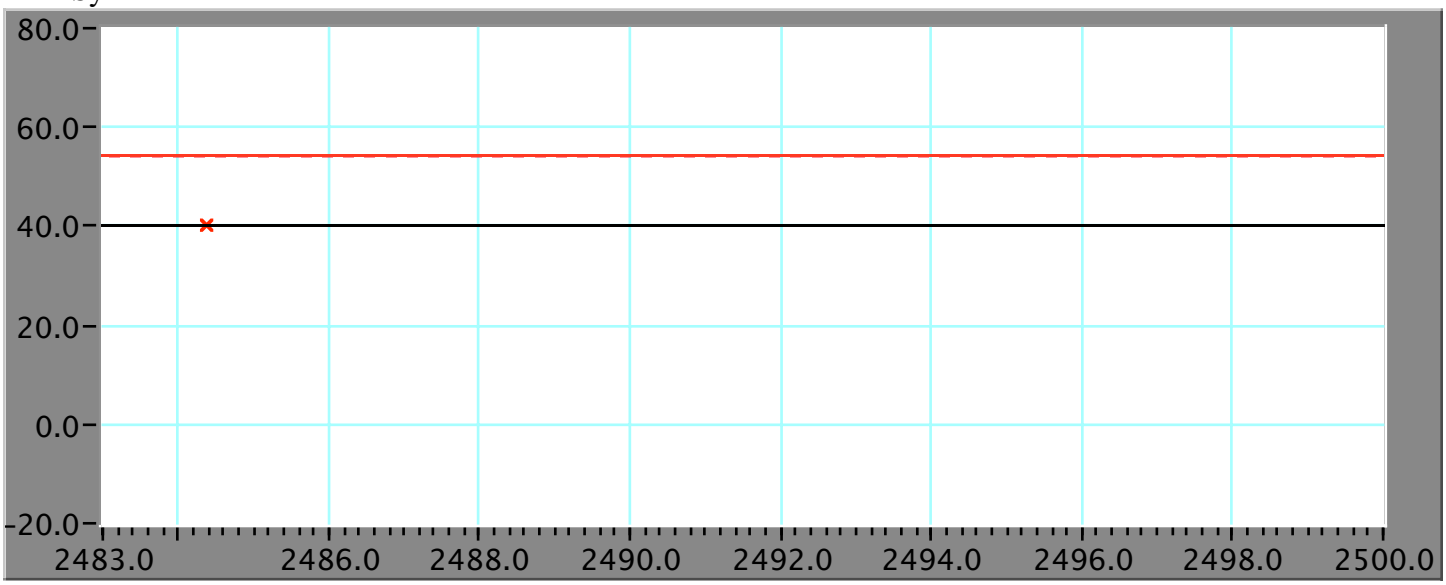

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2484.74 | 51.6 | 74 | -22.4 | 24.63 | 32.38 | 4.08 | 9.5 |
| 2484.67 | 40.2 | 54 | -13.8 | 13.25 | 32.38 | 4.08 | 9.5 |

Date of Test: March 4, 2005

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Peak Detection - 802.11g
Host System #1



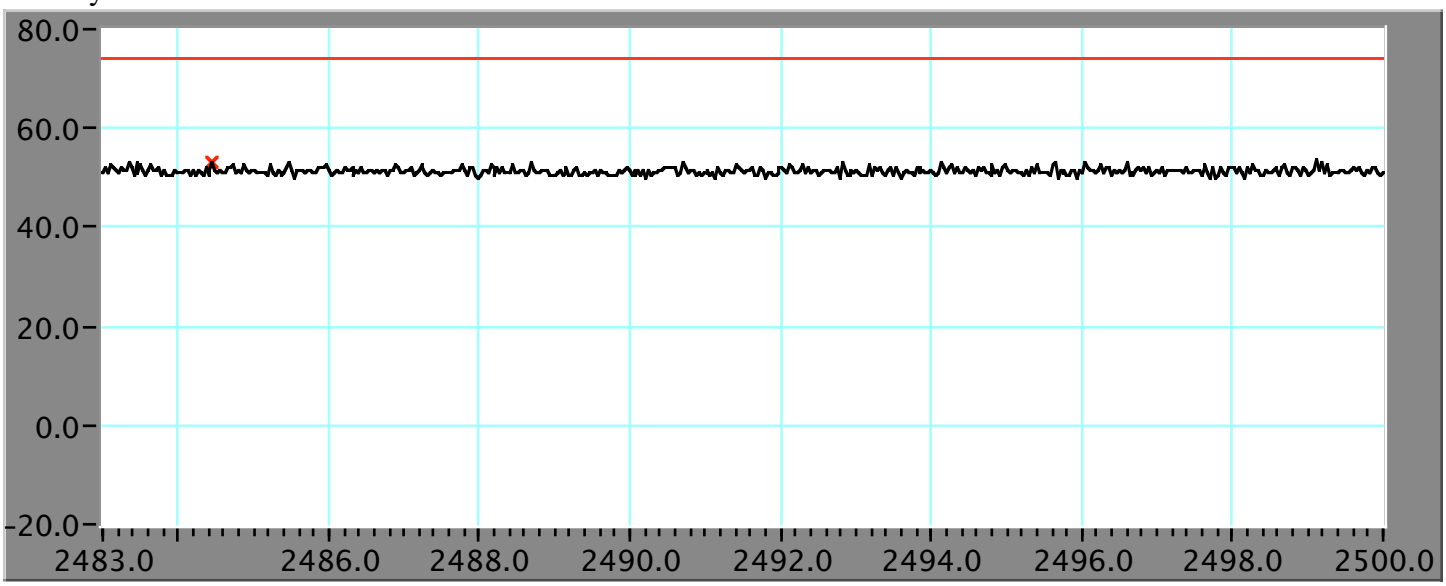

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Average Detection - 802.11g
Host System #1



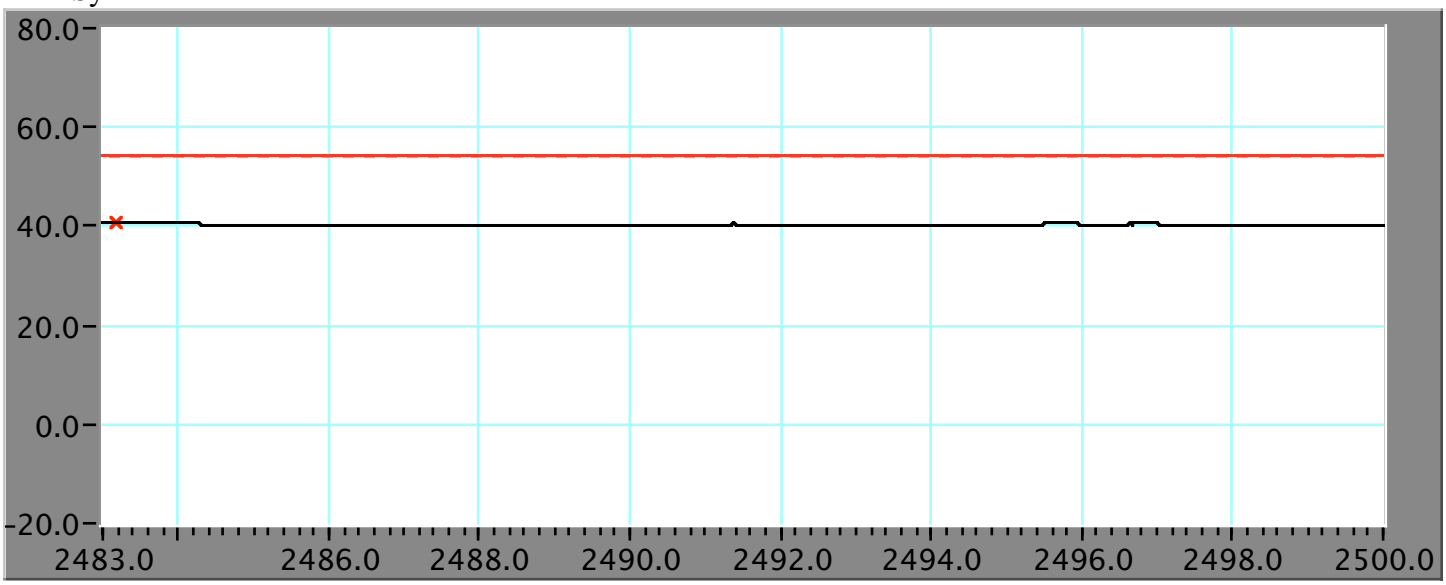

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2484 | 52.3 | 74 | -21.7 | 25.38 | 32.38 | 4.08 | 9.5 |
| 2484.36 | 40.3 | 54 | -13.7 | 13.3 | 32.38 | 4.08 | 9.5 |

Date of Test: March 4, 2005

2483.5 MHz - 2500 MHz Restricted Band - Horizontal channel 11 (2.462 GHz), Peak Detection - 802.11b
Host System #1



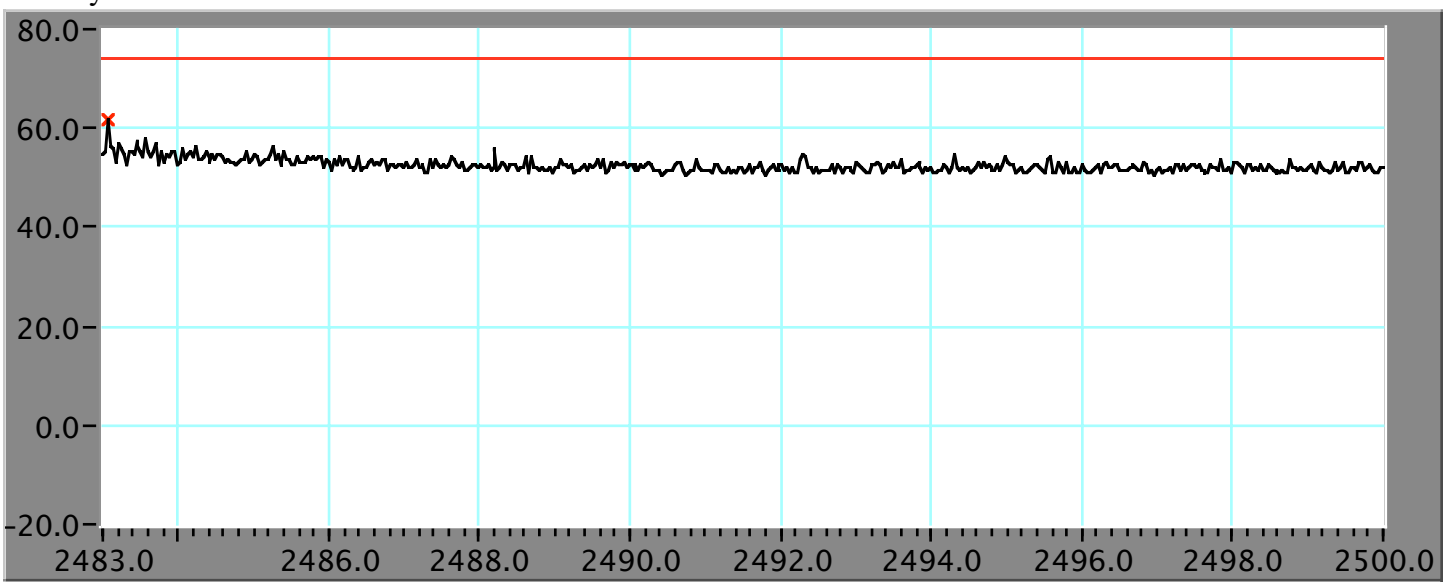

2483.5 MHz - 2500 MHz Restricted Band - Horizontal channel 11 (2.462 GHz), Average Detection - 802.11b
Host System #1



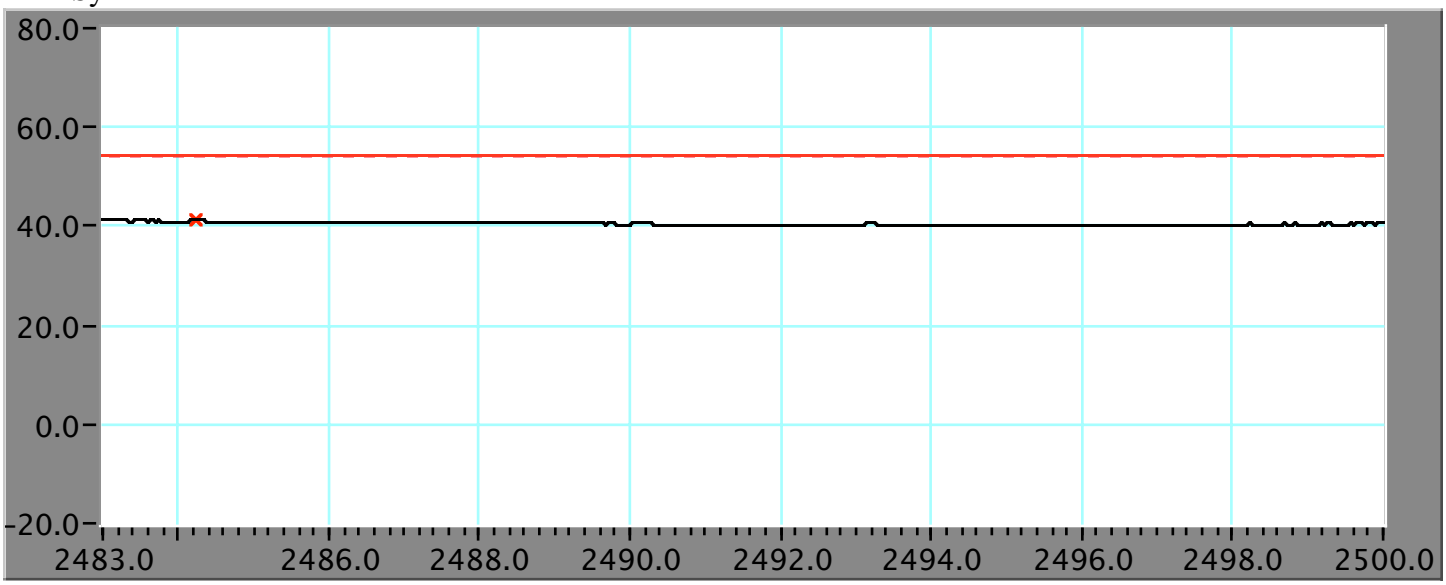

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2484.46 | 53.4 | 74 | -20.6 | 26.4 | 32.38 | 4.08 | 9.5 |
| 2483.5 | 40.8 | 54 | -13.2 | 13.87 | 32.38 | 4.08 | 9.5 |

Date of Test: March 4, 2005

2483.5 MHz - 2500 MHz Restricted Band - Horizontal, channel 11 (2.462 GHz), Peak Detection - 802.11g
Host System #1



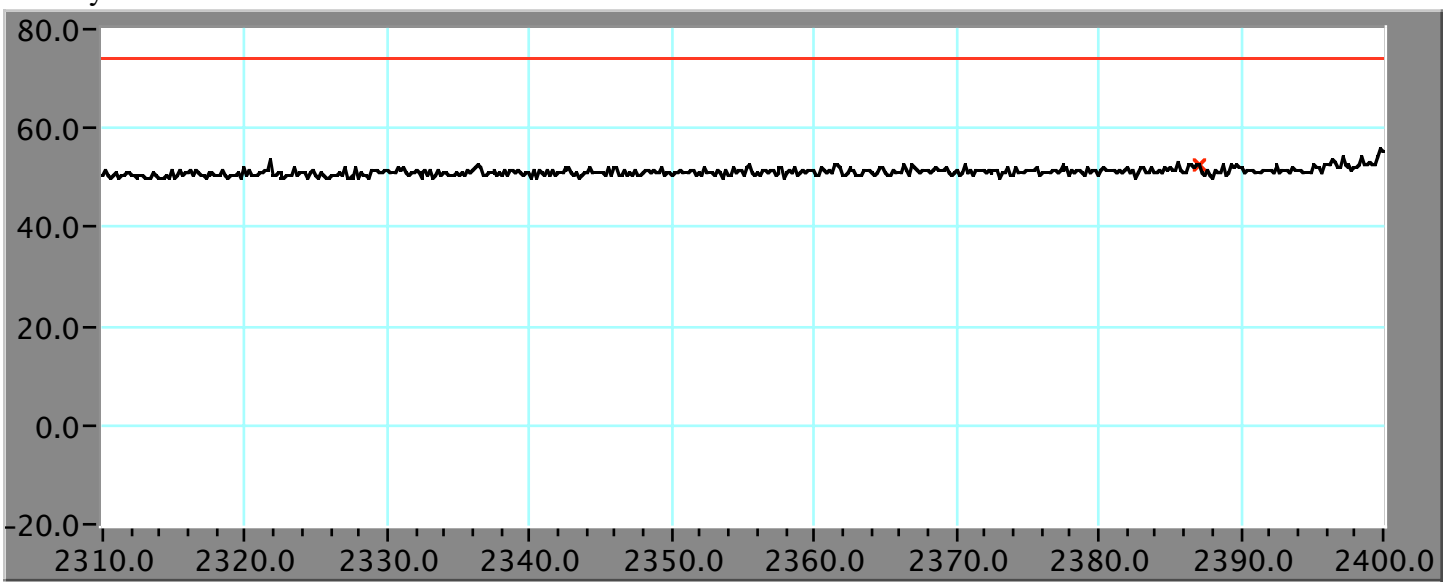

2483.5 MHz - 2500 MHz Restricted Band - Horizontal, channel 11 (2.462 GHz), Average Detection - 802.11g
Host System #1



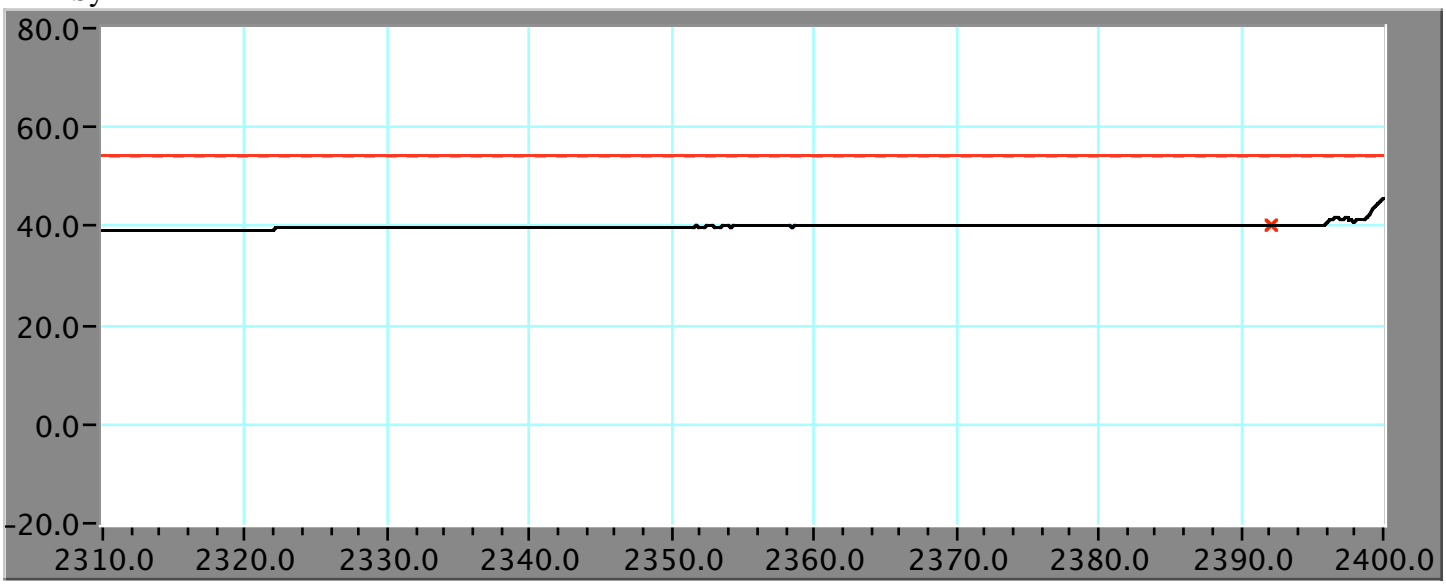

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2483.5 | 61.6 | 74 | -12.4 | 34.66 | 32.38 | 4.08 | 9.5 |
| 2484.23 | 3941.3.8 | 54 | -12.7 | 14.36 | 32.38 | 4.08 | 9.5 |

Date of Test: March 4, 2005

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Peak Detection - 802.11b
Host System #2



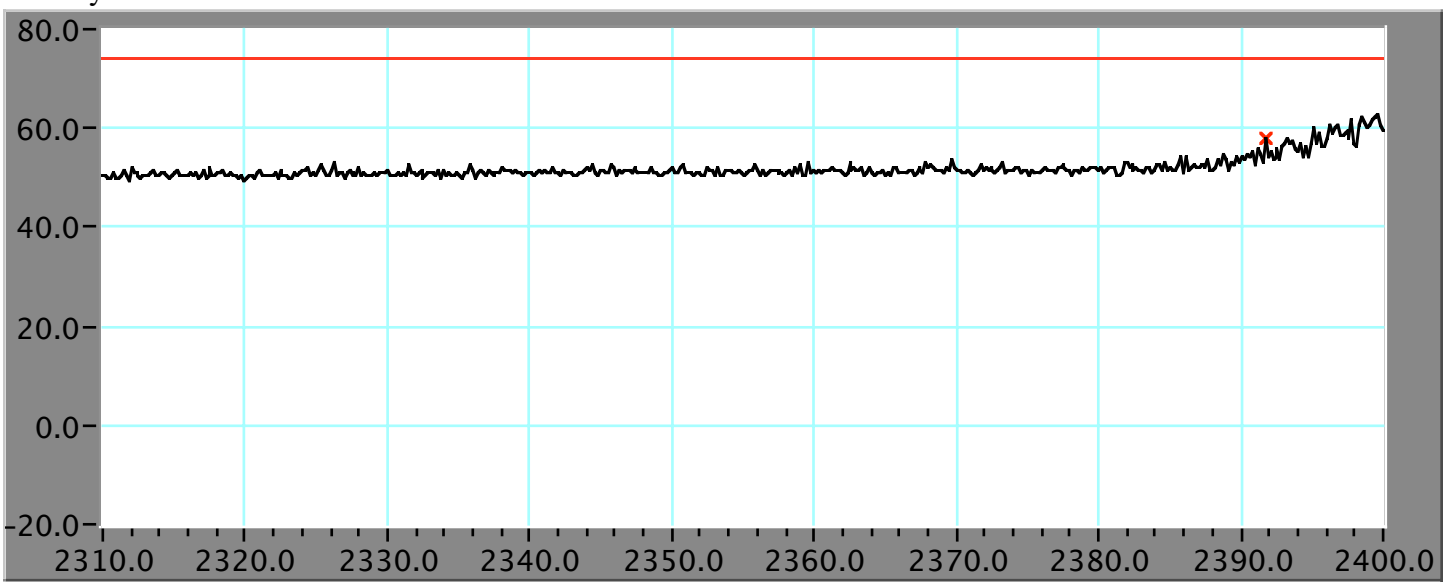

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Average Detection - 802.11b
Host System #2



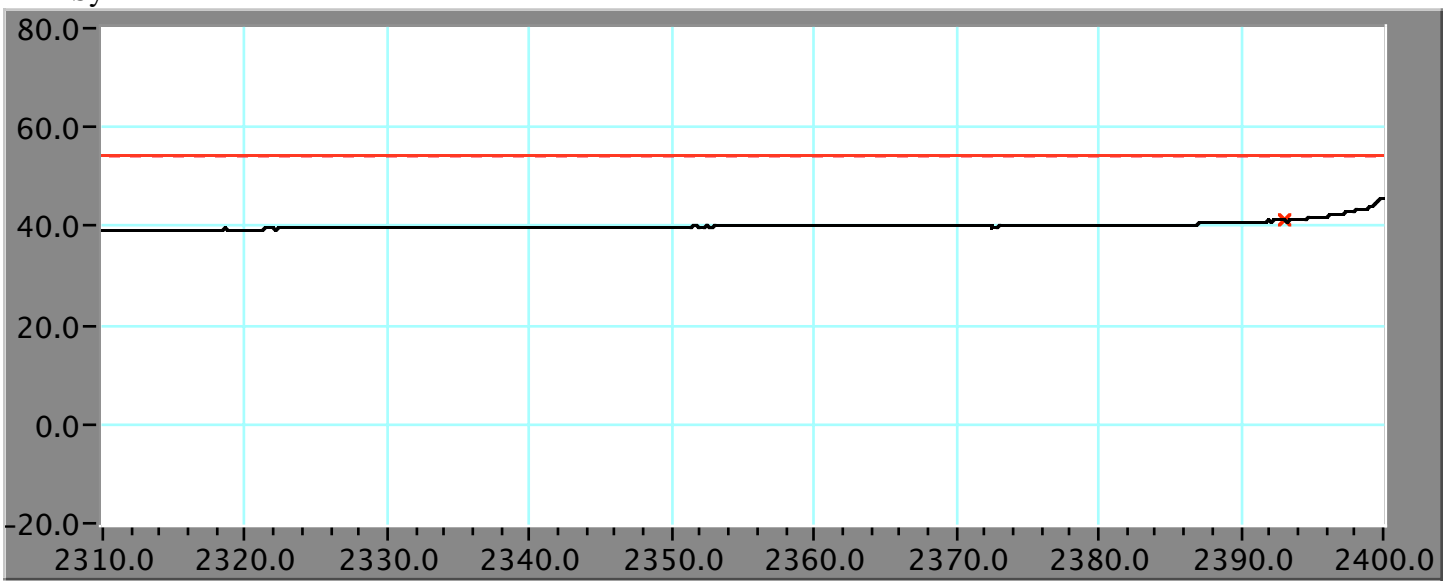

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2387 | 52.8 | 74 | -21.2 | 26.06 | 32.29 | 3.98 | 9.5 |
| 2392 | 40.4 | 54 | -13.6 | 13.61 | 32.29 | 3.98 | 9.5 |

Date of Test: February 11, 2005

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Peak Detection - 802.11g
Host System #2



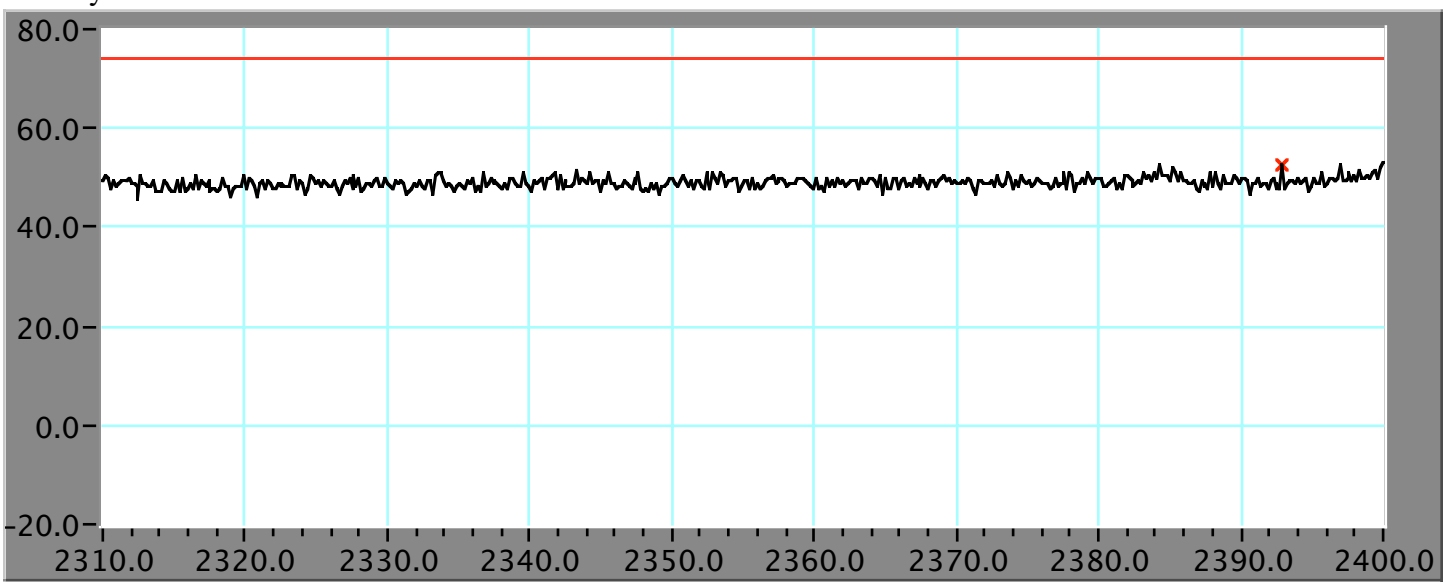

2310 MHz - 2390 MHz Restricted Band - Vertical, channel 1 (2.412 GHz), Average Detection - 802.11g
Host System #2



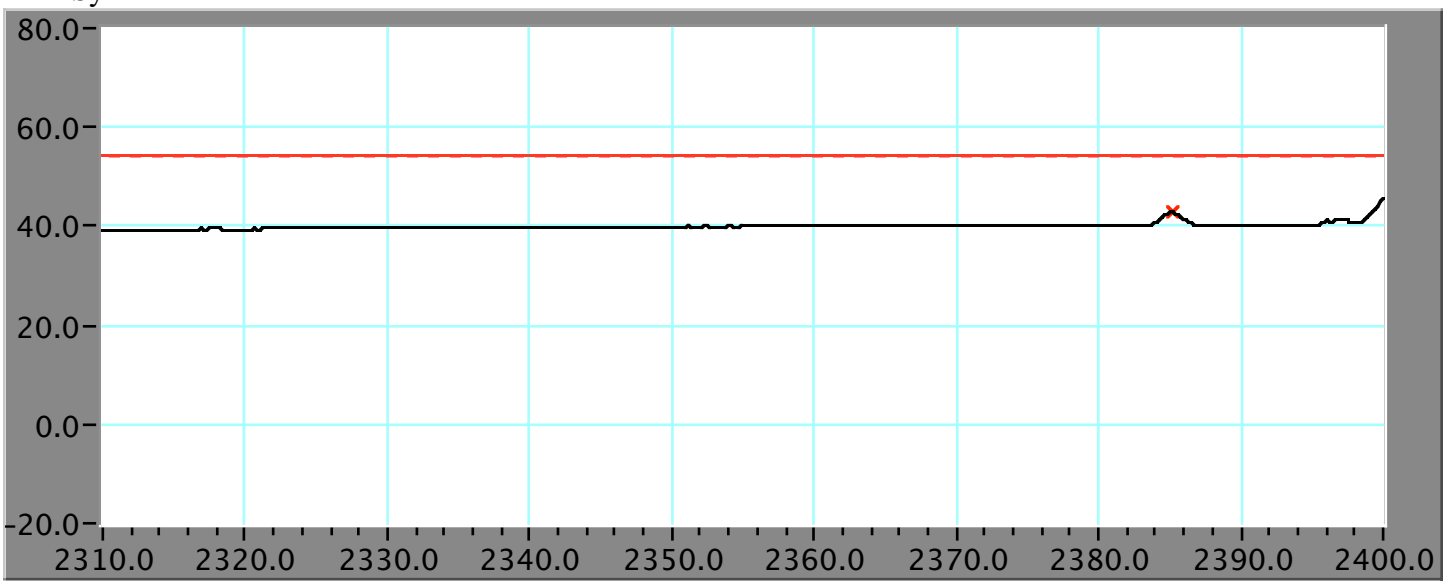

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2391.7 | 57.9 | 74 | -16.1 | 31.11 | 32.29 | 3.98 | 9.5 |
| 2393 | 41.2 | 54 | 12.8 | 14.38 | 32.29 | 3.98 | 9.5 |

Date of Test: February 11 2005

2310 MHz - 2390 MHz Restricted Band - Horizontal channel 1 (2.412 GHz), Peak Detection - 802.11b
Host System #2



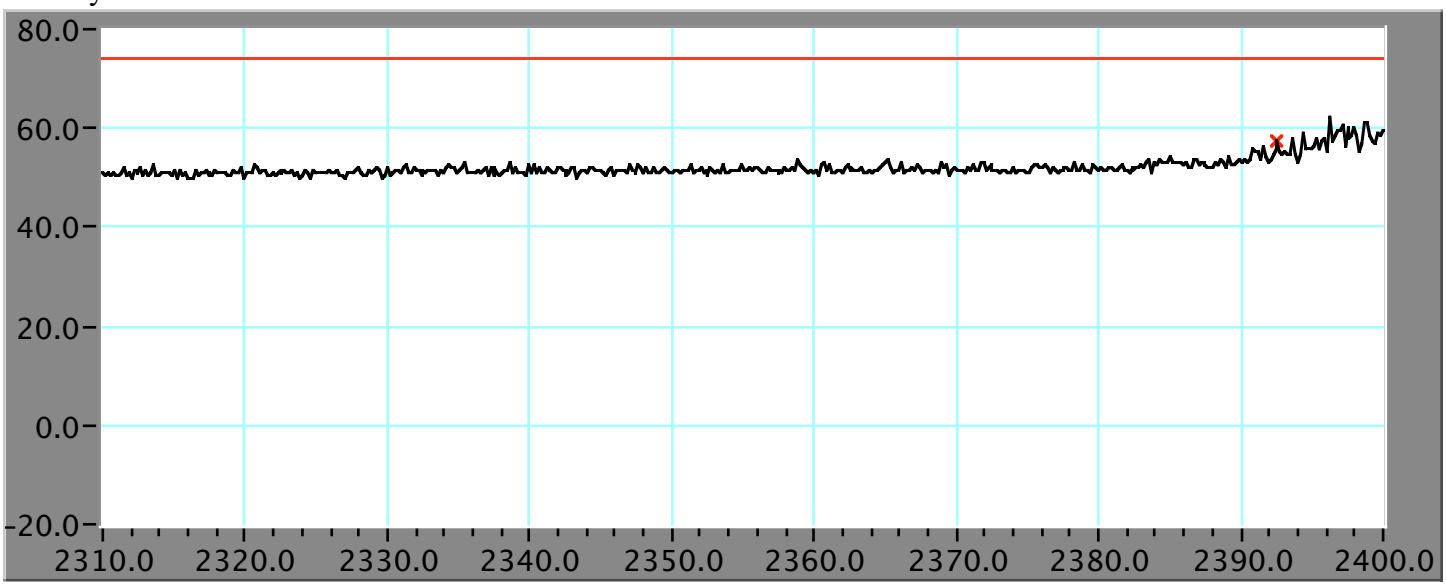

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.412 GHz), Average Detection - 802.11b
Host System #2



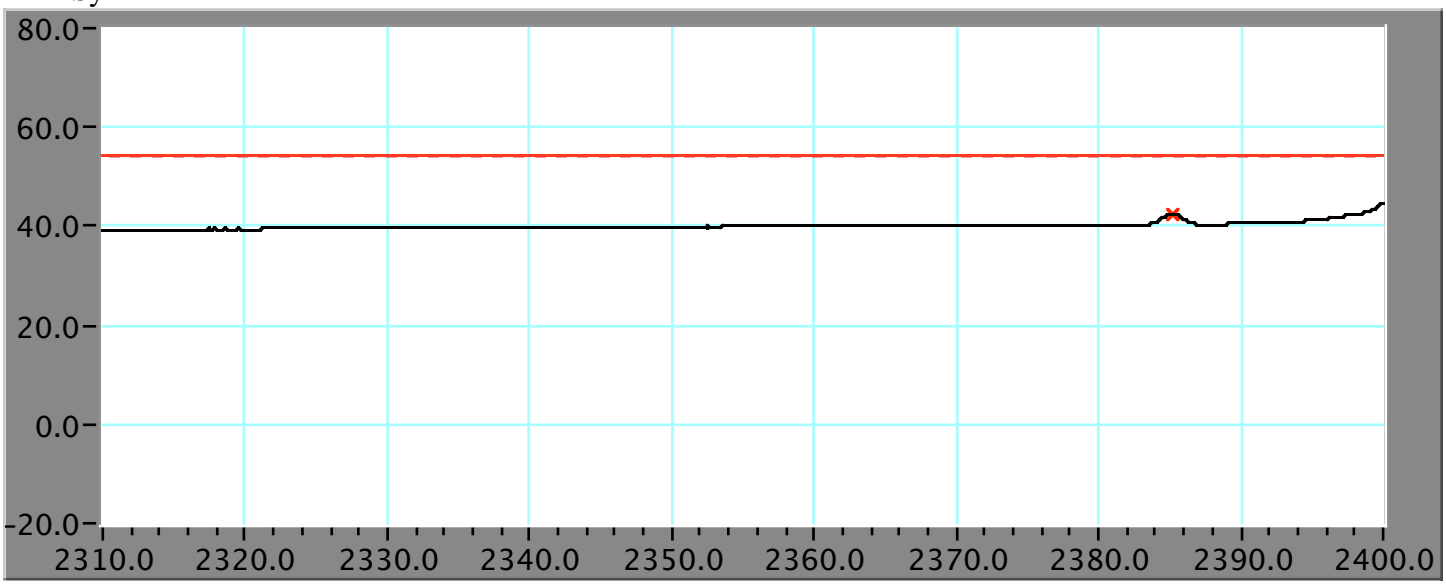

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2393 | 52.4 | 74 | -21.6 | 25.6 | 32.29 | 3.98 | 9.5 |
| 2389.8 | 39.8 | 54 | -14.2 | 13.02 | 32.29 | 3.98 | 9.5 |

Date of Test: February11, 2005

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.412 GHz), Peak Detection - 802.11g
Host System #2



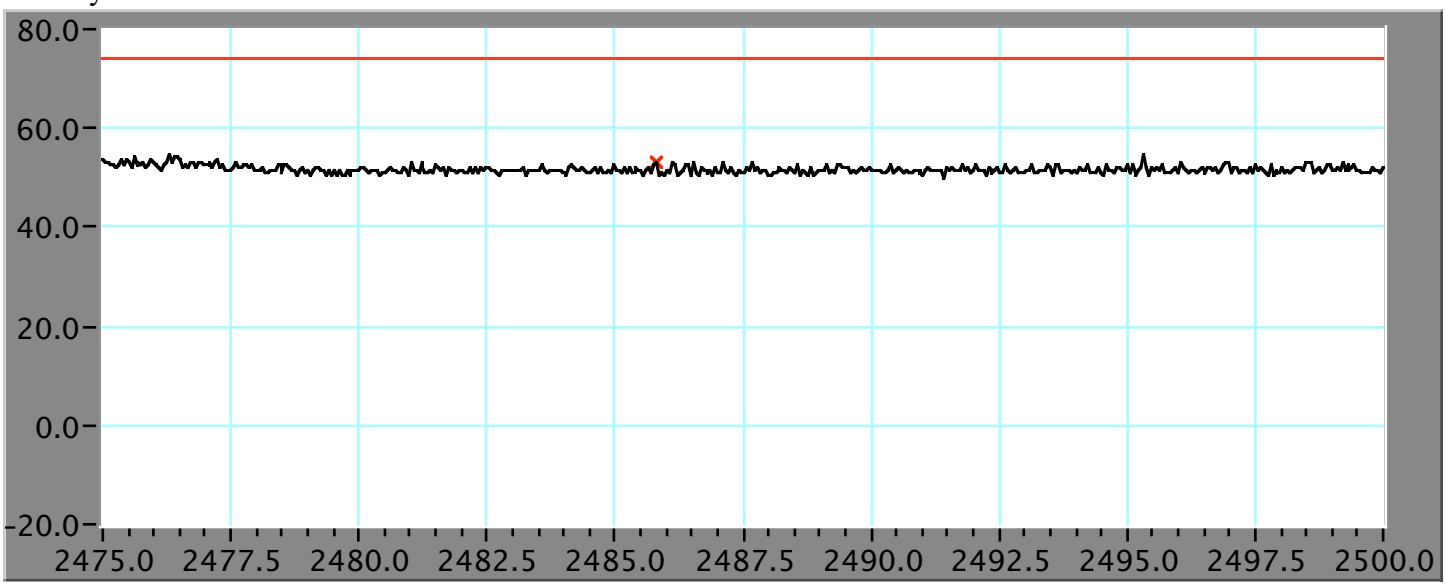

2310 MHz - 2390 MHz Restricted Band - Horizontal, channel 1 (2.412 GHz), Average Detection - 802.11g
Host System #2



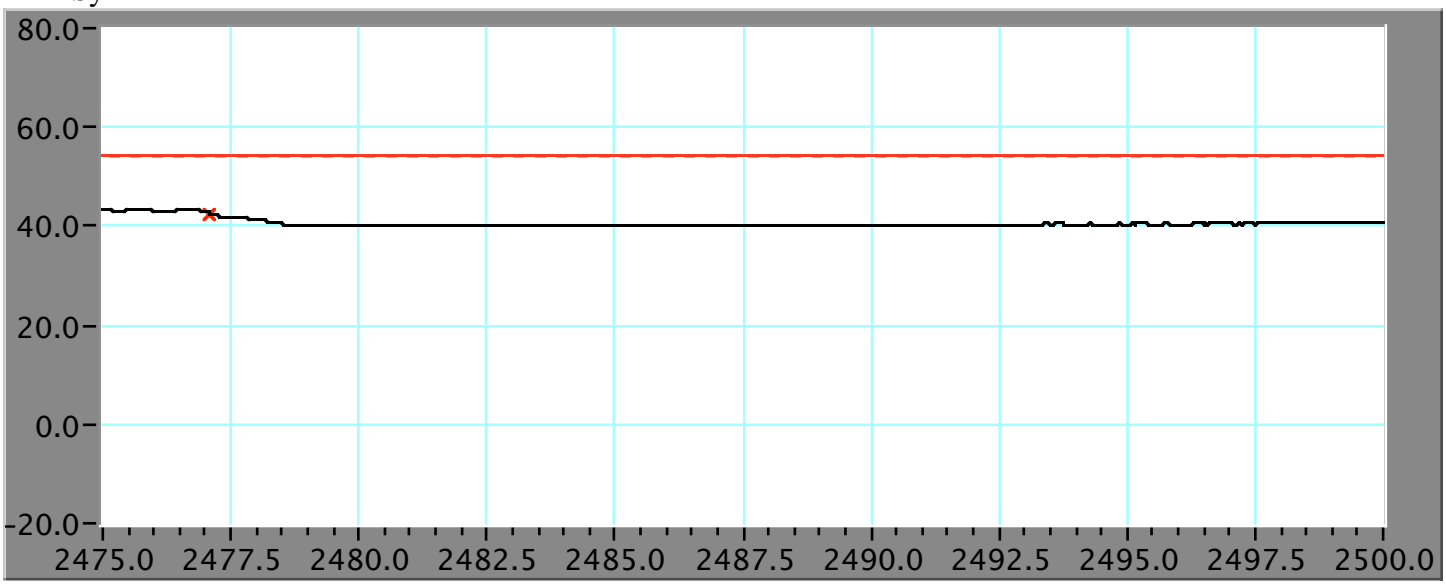

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2392.6 | 57.4 | 74 | -16.6 | 30.63 | 32.29 | 3.98 | 9.5 |
| 2385.2 | 42.5 | 54 | -11.5 | 15.78 | 32.29 | 3.98 | 9.5 |

Date of Test: February 11, 2005

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Peak Detection - 802.11b
Host System #2



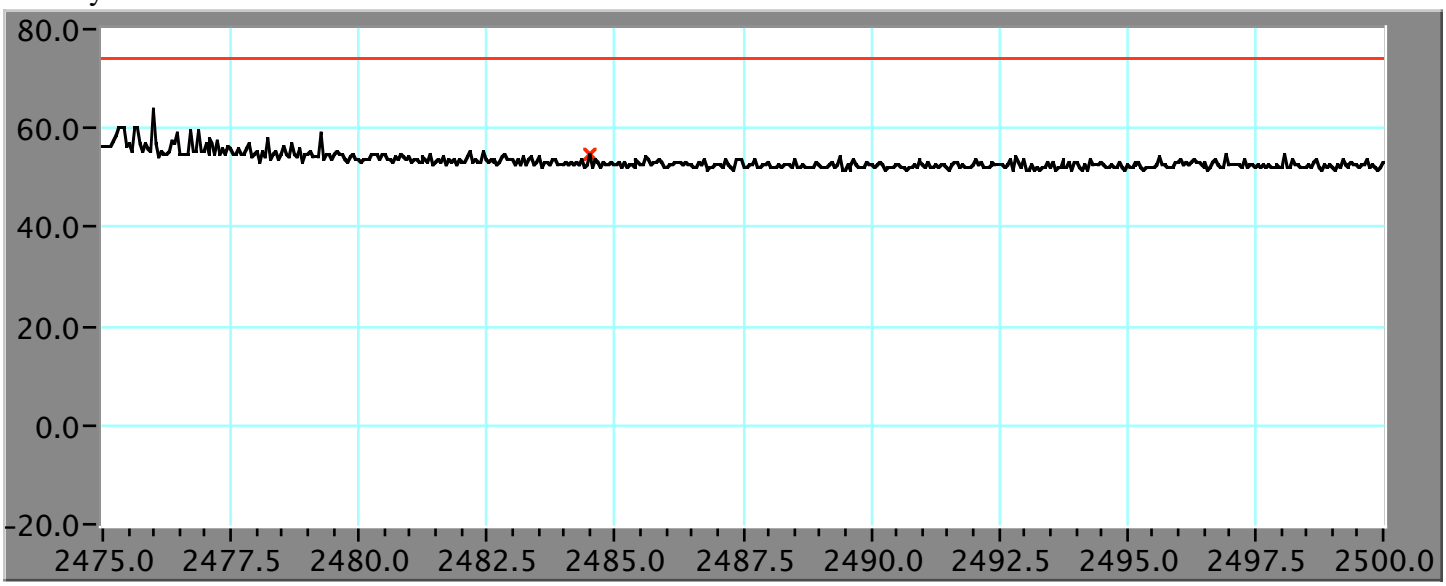

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Average Detection - 802.11b
Host System #2



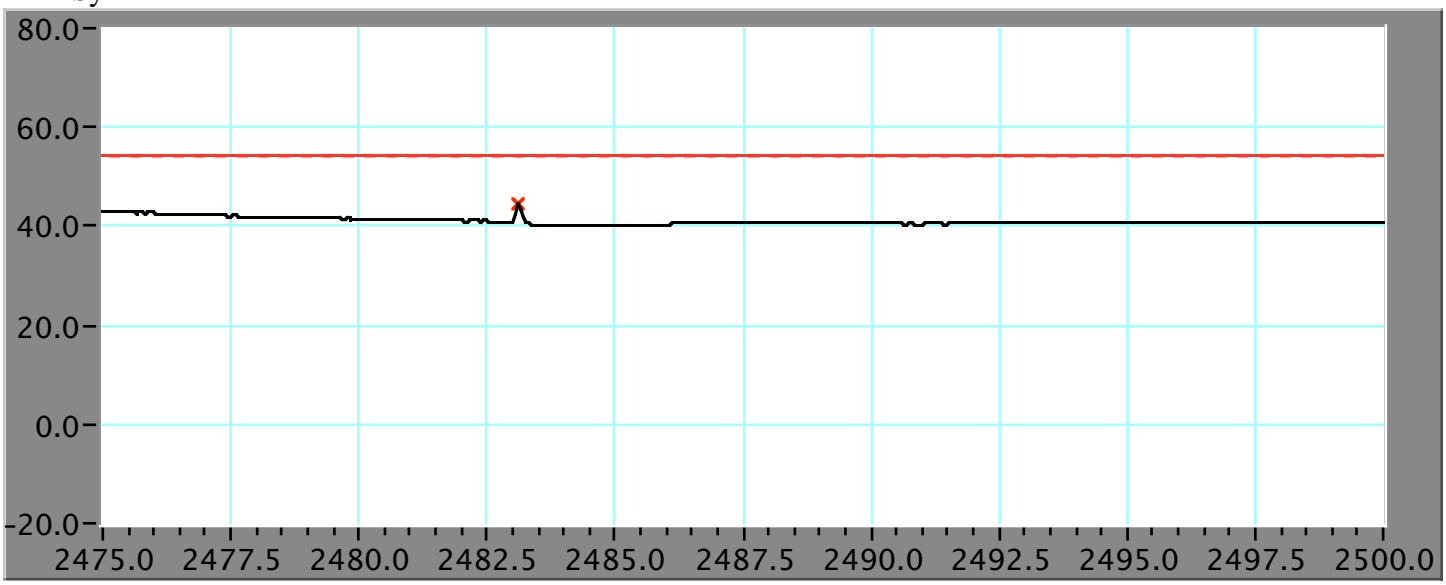

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2485.8 | 53.3 | 74 | -20.7 | 26.3 | 32.39 | 4.08 | 9.5 |
| 2477.1 | 42.6 | 54 | -11.4 | 15.64 | 32.38 | 4.08 | 9.5 |

Date of Test: February 11, 2005

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Peak Detection - 802.11g
Host System #2



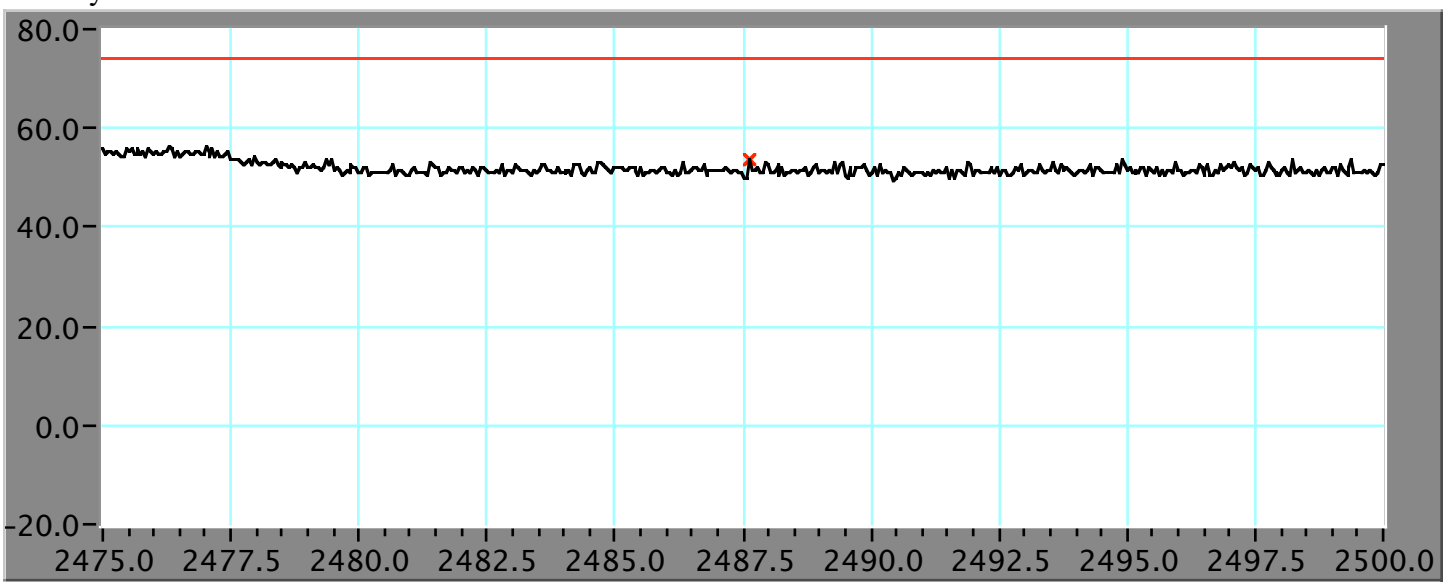

2483.5 MHz - 2500 MHz Restricted Band - Vertical, channel 11 (2.462 GHz), Average Detection - 802.11g
Host System #2



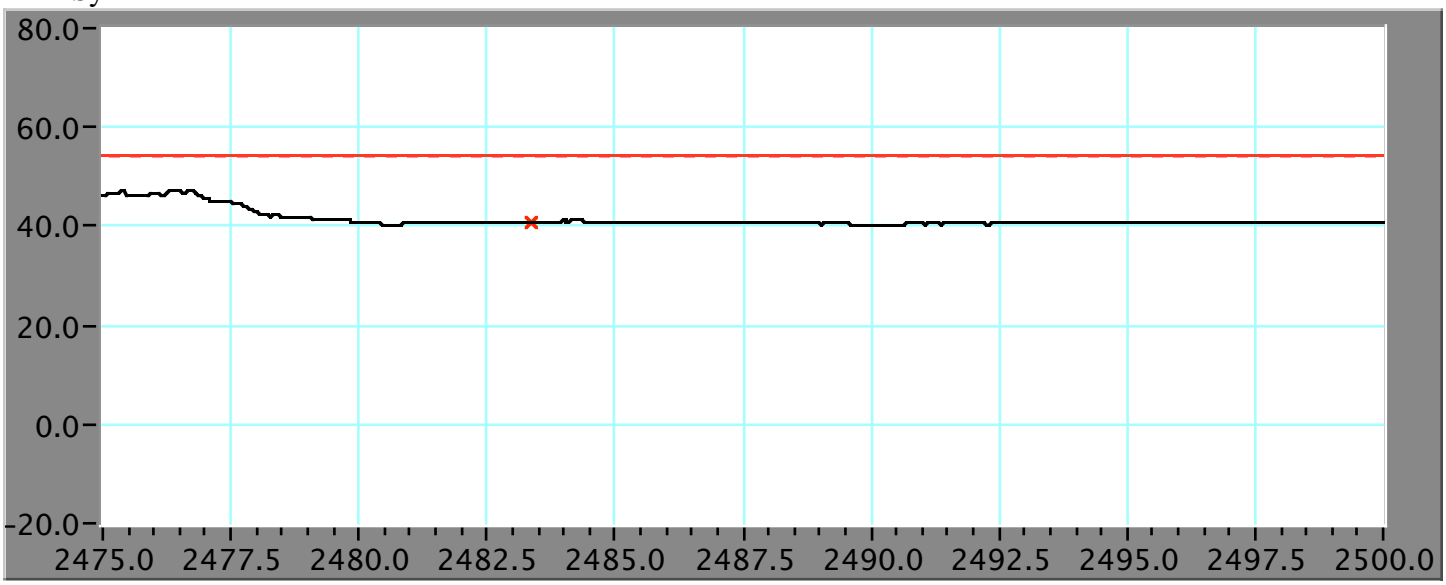

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2484.5 | 54.7 | 74 | -19.3 | 27.77 | 32.38 | 4.08 | 9.5 |
| 2483.1 | 44.4 | 54 | -9.6 | 17.46 | 32.38 | 4.08 | 9.5 |

Date of Test: February 11, 2005

2483.5 MHz - 2500 MHz Restricted Band - Horizontal channel 11 (2.462 GHz), Peak Detection - 802.11b
Host System #2



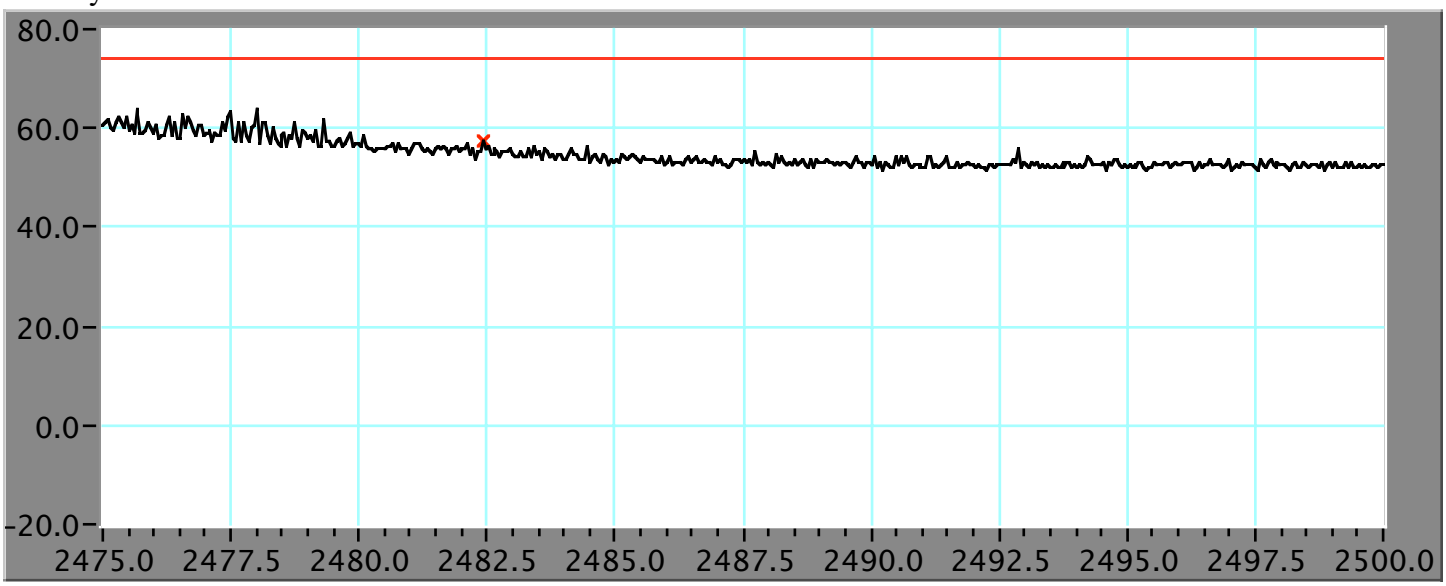

2483.5 MHz - 2500 MHz Restricted Band - Horizontal channel 11 (2.462 GHz), Average Detection - 802.11b
Host System #2



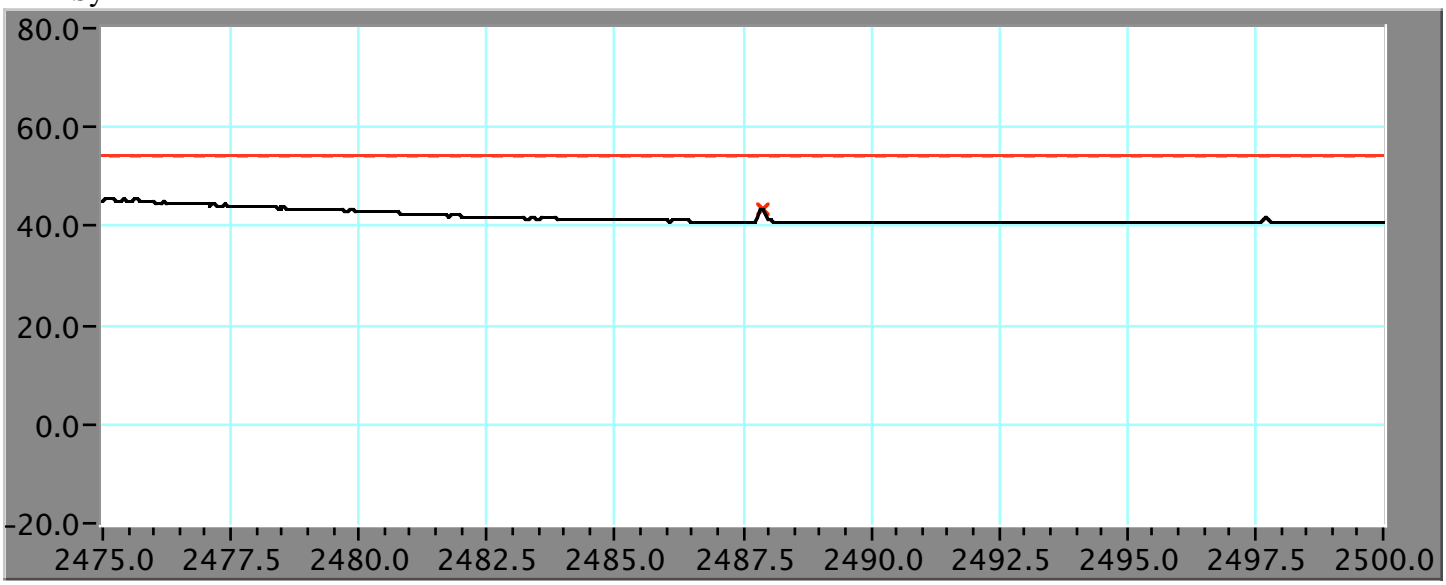

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2487.6 | 53.9 | 74 | -20.1 | 26.89 | 32.39 | 4.08 | 9.5 |
| 2483.37 | 40.7 | 54 | -13.3 | 13.72 | 38 | 4.08 | 9.5 |

Date of Test: February 11, 2005

2483.5 MHz - 2500 MHz Restricted Band - Horizontal, channel 11 (2.462 GHz), Peak Detection - 802.11g
Host System #2




2483.5 MHz - 2500 MHz Restricted Band - Horizontal channel 11 (2.462 GHz), Average Detection - 802.11g
Host System #2



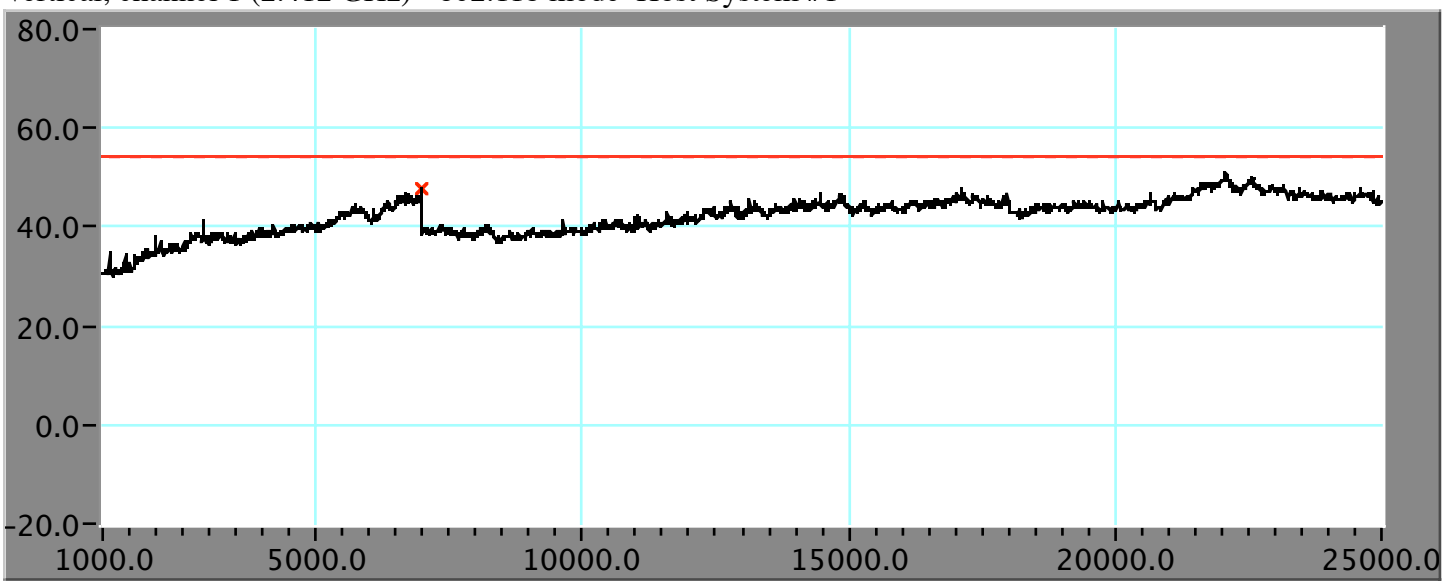

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 2482.4 | 57.3 | 74 | -16.7 | 30.33 | 32.38 | 4.08 | 9.5 |
| 2487.88 | 39.43 | 54 | -10.4 | 16.65 | 32.39 | 4.08 | 9.5 |

Date of Test: February 11, 2005

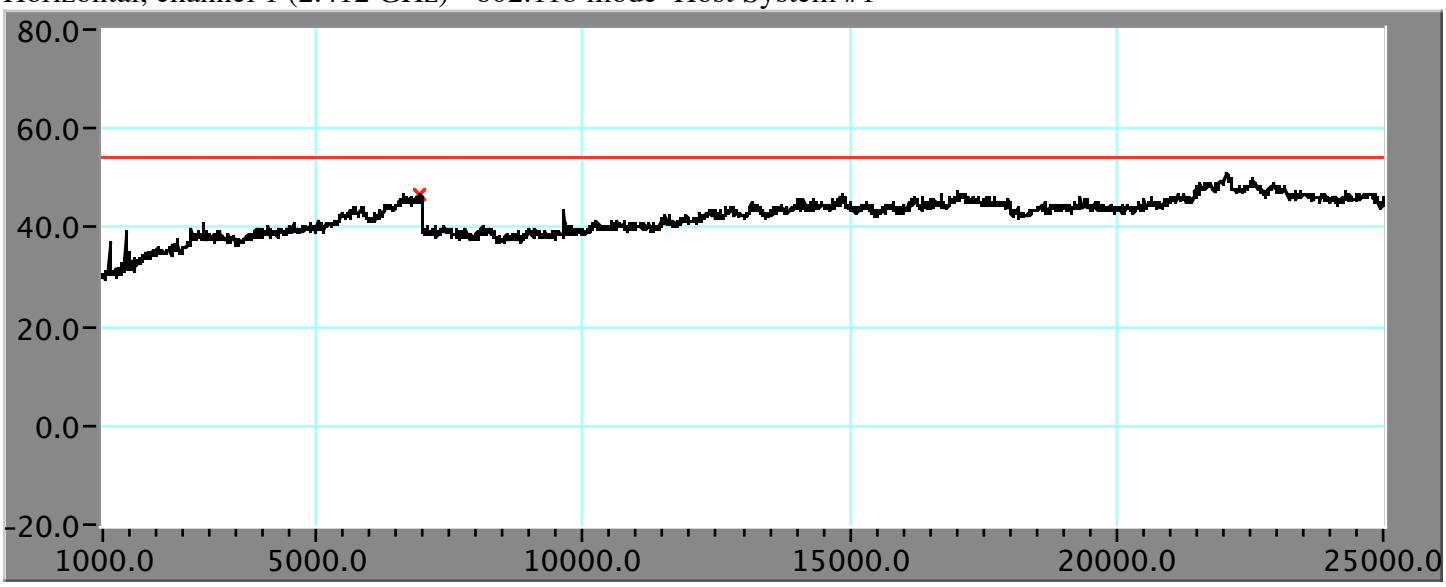
Spurious Radiated Emissions above 1 GHz

Radiated Emissions scans from 1 to 25 GHz for the low, mid and high channels were performed to demonstrate compliance with all of the restricted bands in RSS 210 Section 6.3. Radiated emissions data for two host systems are presented.

Vertical, channel 1 (2.412 GHz) - 802.11b mode  Host System #1



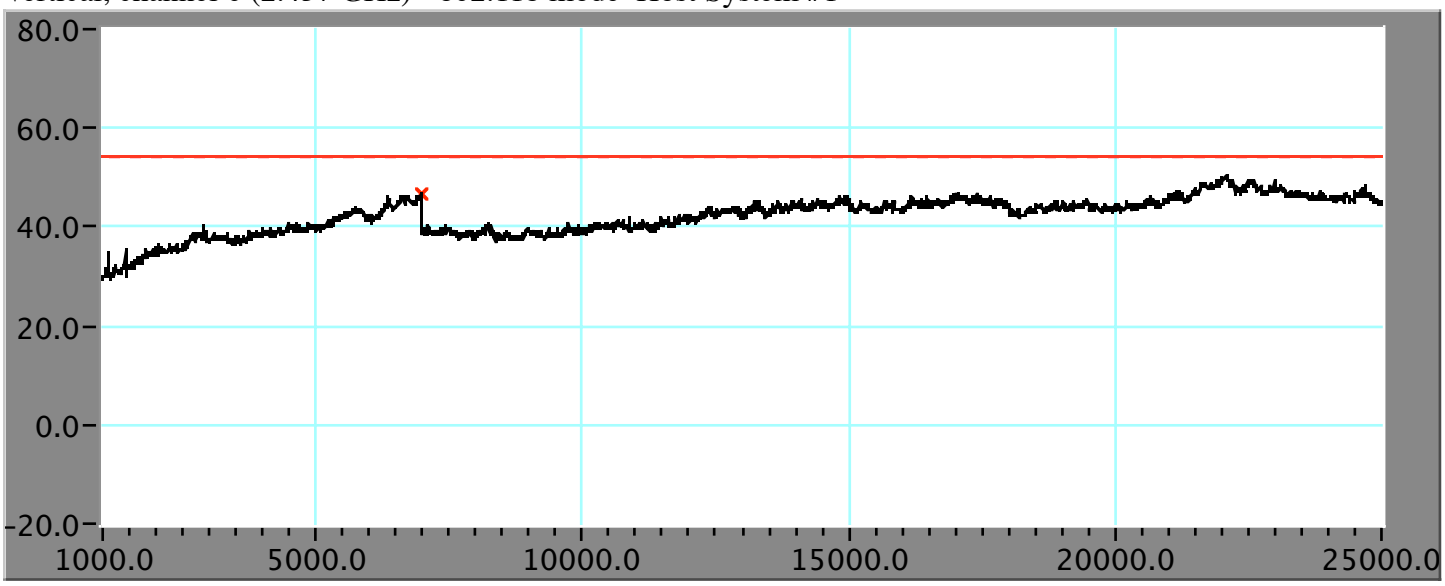

Horizontal, channel 1 (2.412 GHz) - 802.11b mode  Host System #1



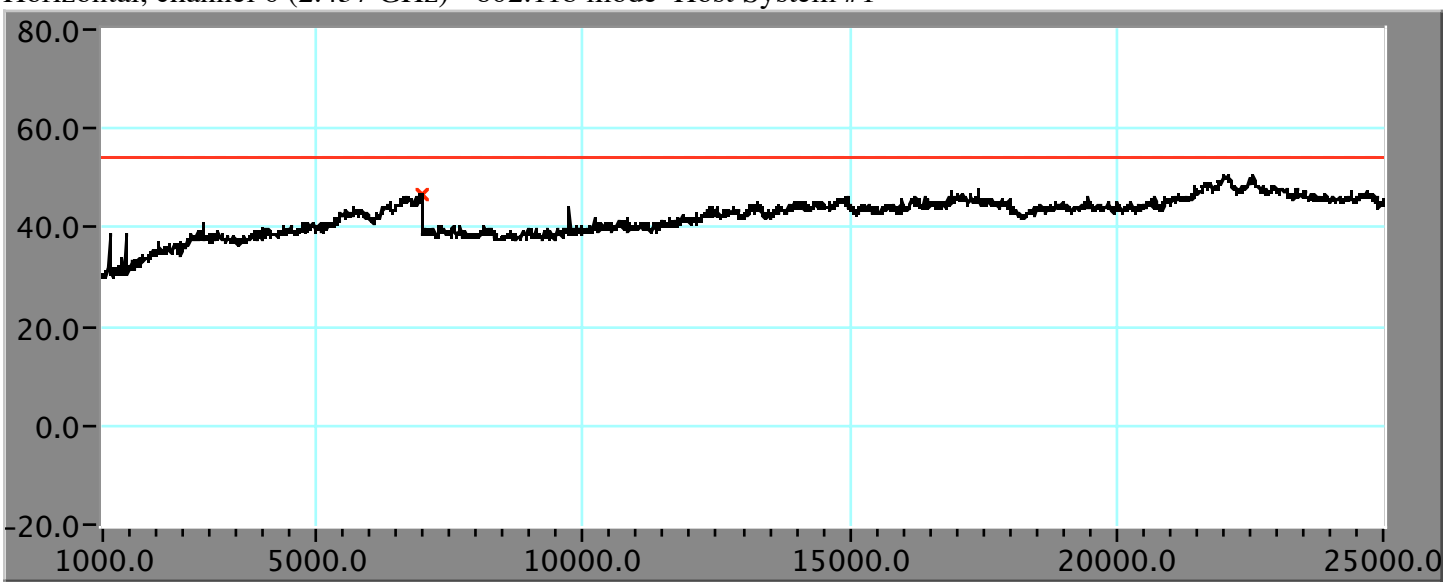

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 6988 | 47.6 V | 54 | -6.4 | 52 | 36.2 | 3.6 | 44.55 |
| 6951.9 | 46.7 H | 54 | -7.3 | 51.1 | 36.18 | 3.58 | 44.09 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 6 (2.437 GHz) - 802.11b mode  Host System #1



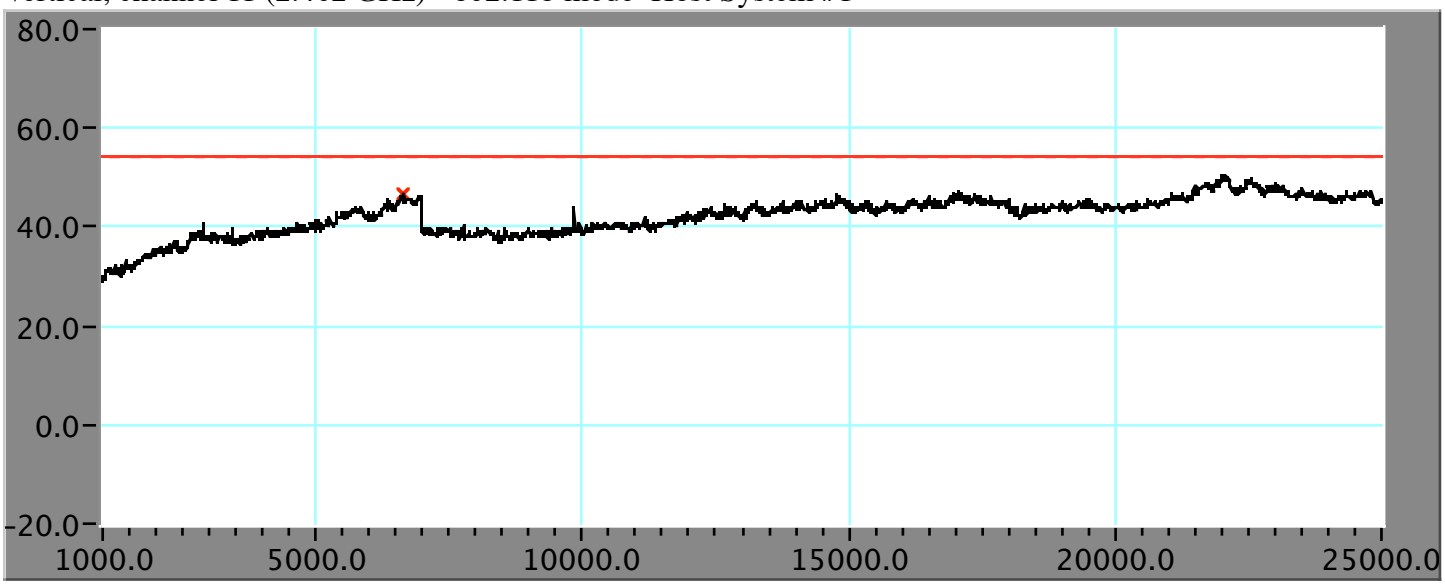

Horizontal, channel 6 (2.437 GHz) - 802.11b mode  Host System #1



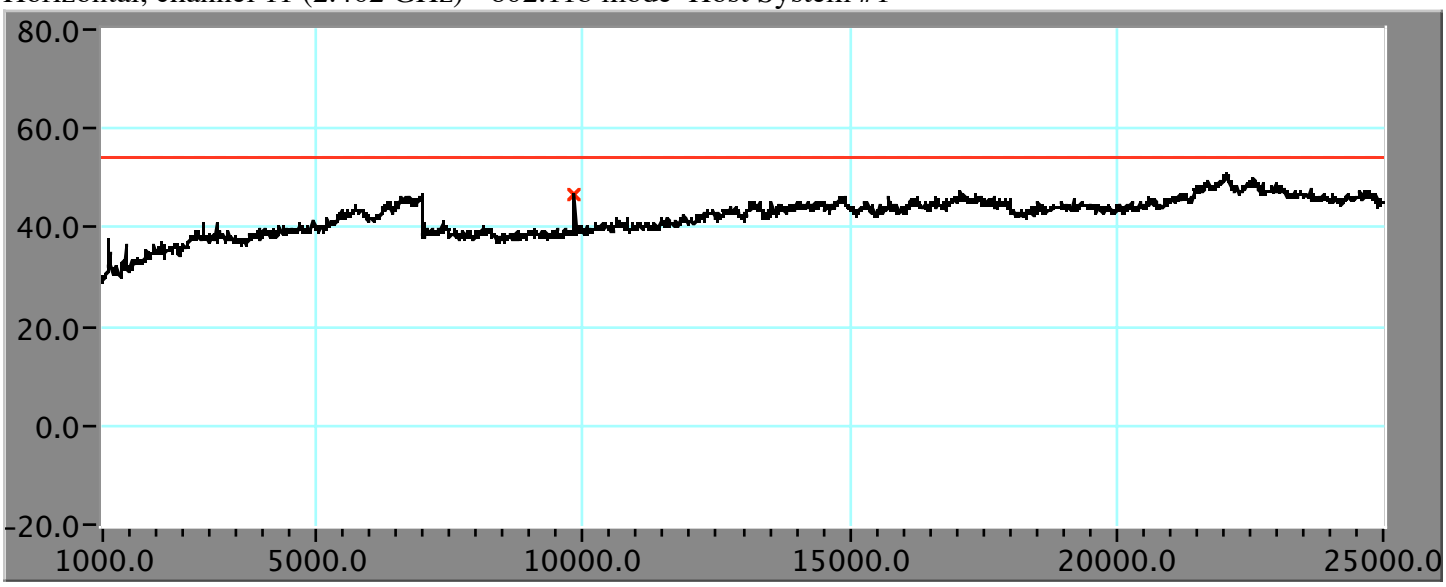

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 6963.9 | 46.7 V | 54 | -7.3 | 51.16 | 36.19 | 3.59 | 44.2 |
| 6963.9 | 46.8 H | 54 | -7.2 | 51.23 | 36.19 | 3.598 | 44.2 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 11 (2.462 GHz) - 802.11b mode  Host System #1



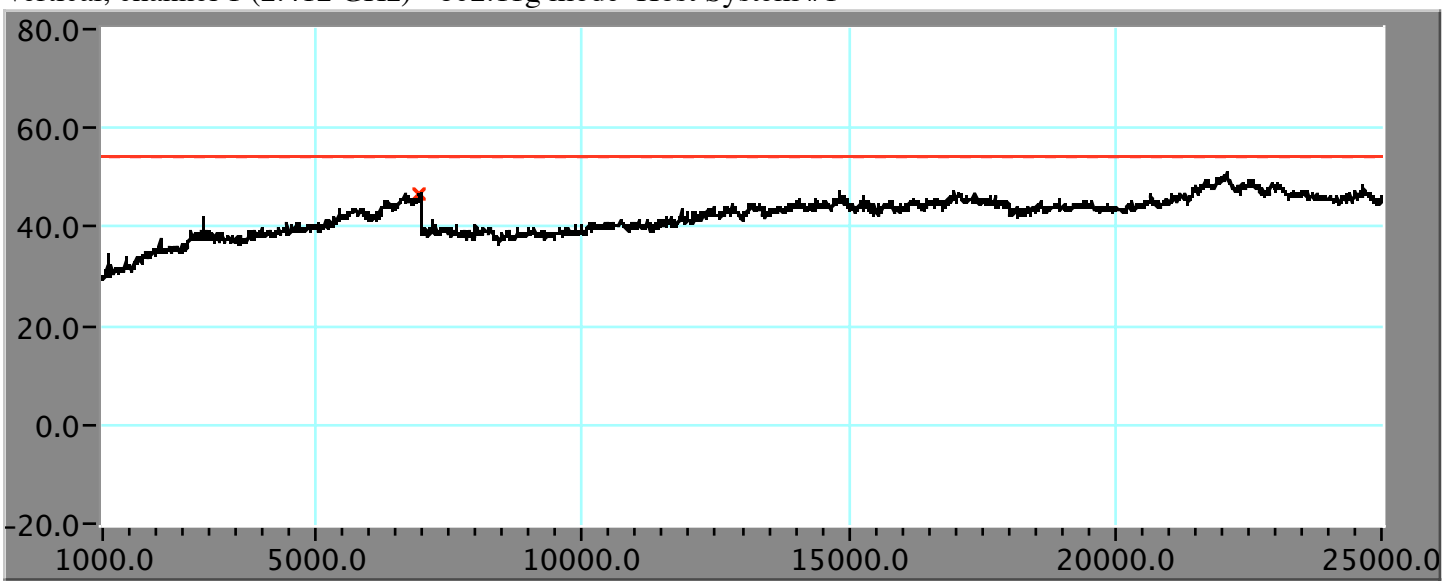

Horizontal, channel 11 (2.462 GHz) - 802.11b mode  Host System #1



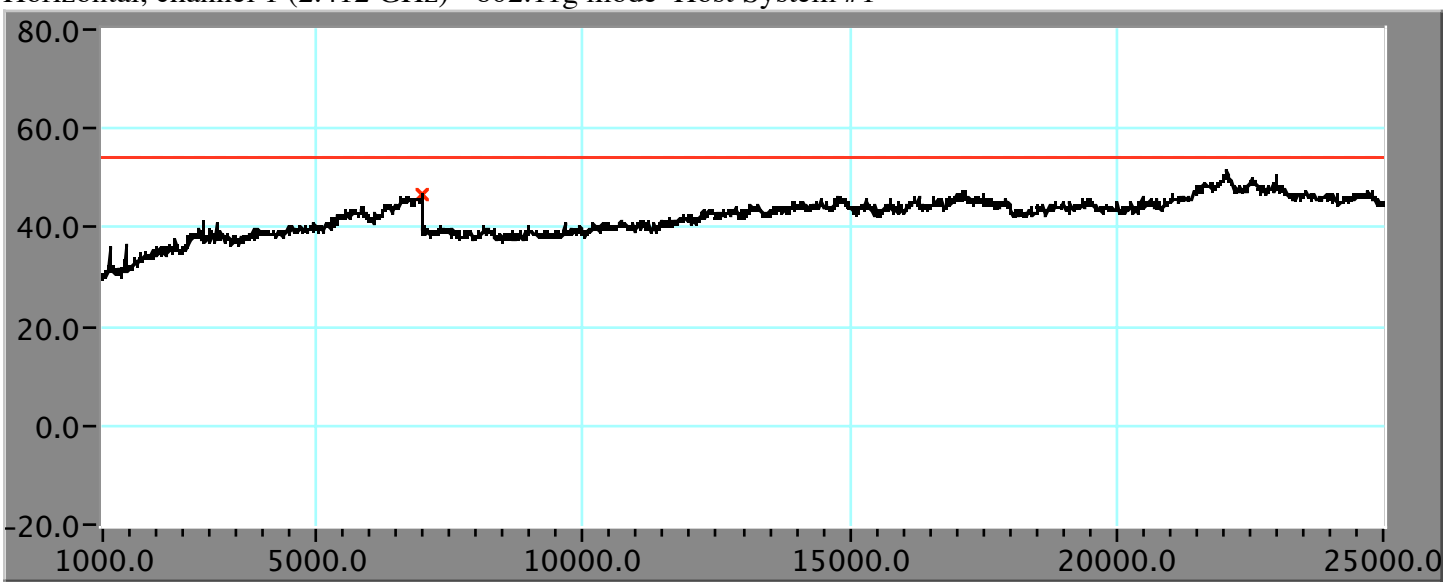

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 6651.3 | 46.6 V | 54 | -7.4 | 51.27 | 36.06 | 3.47 | 44.21 |
| 9849.7 | 46.8 H | 54 | -7.2 | 50.22 | 37.71 | 4.11 | 45.23 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 1 (2.412 GHz) - 802.11g mode  Host System #1



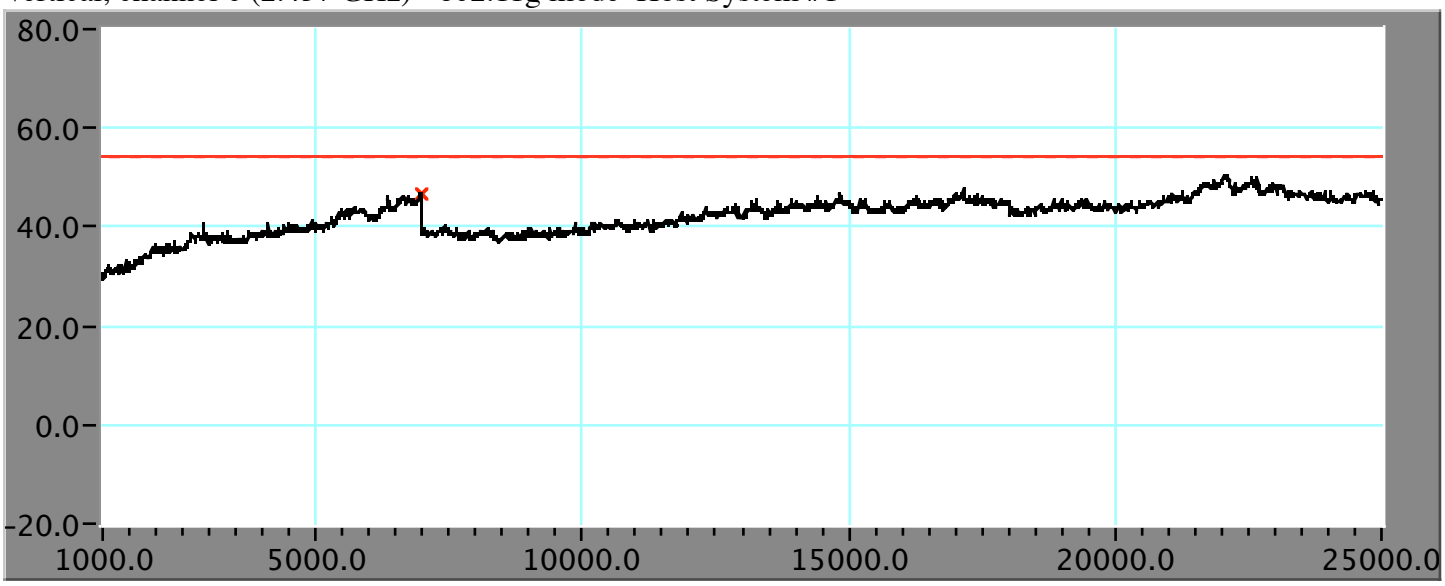

Horizontal, channel 1 (2.412 GHz) - 802.11g mode  Host System #1



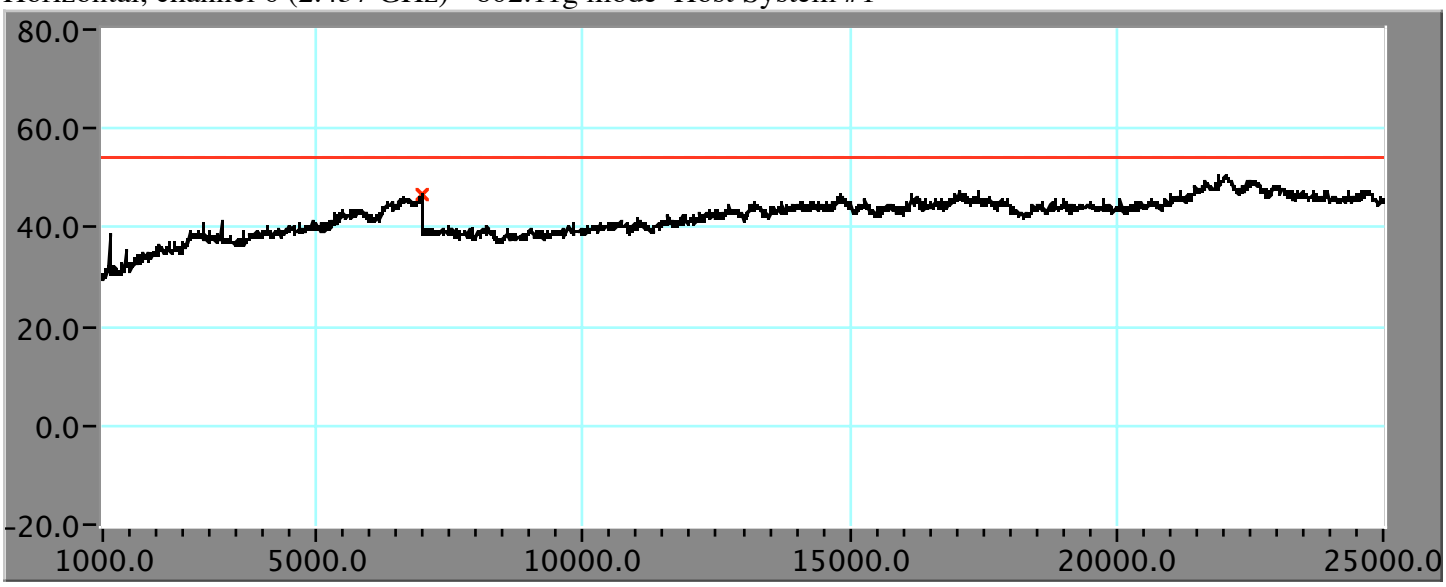

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 6951.9 | 46.8V | 54 | -7.2 | 51.21 | 36.18 | 3.58 | 44.55 |
| 7000 | 46.8 H | 54 | -7.2 | 51.2 | 36.2 | 3.6 | 44.09 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 6 (2.437 GHz) - 802.11g mode  Host System #1



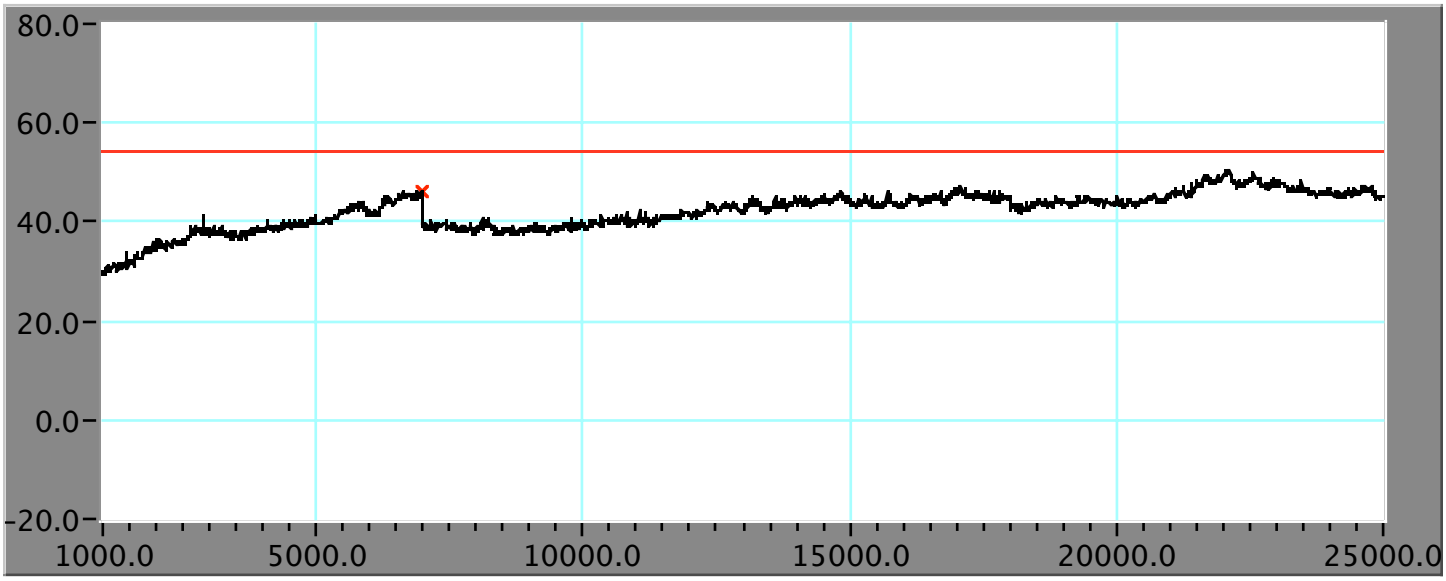

Horizontal, channel 6 (2.437 GHz) - 802.11g mode  Host System #1



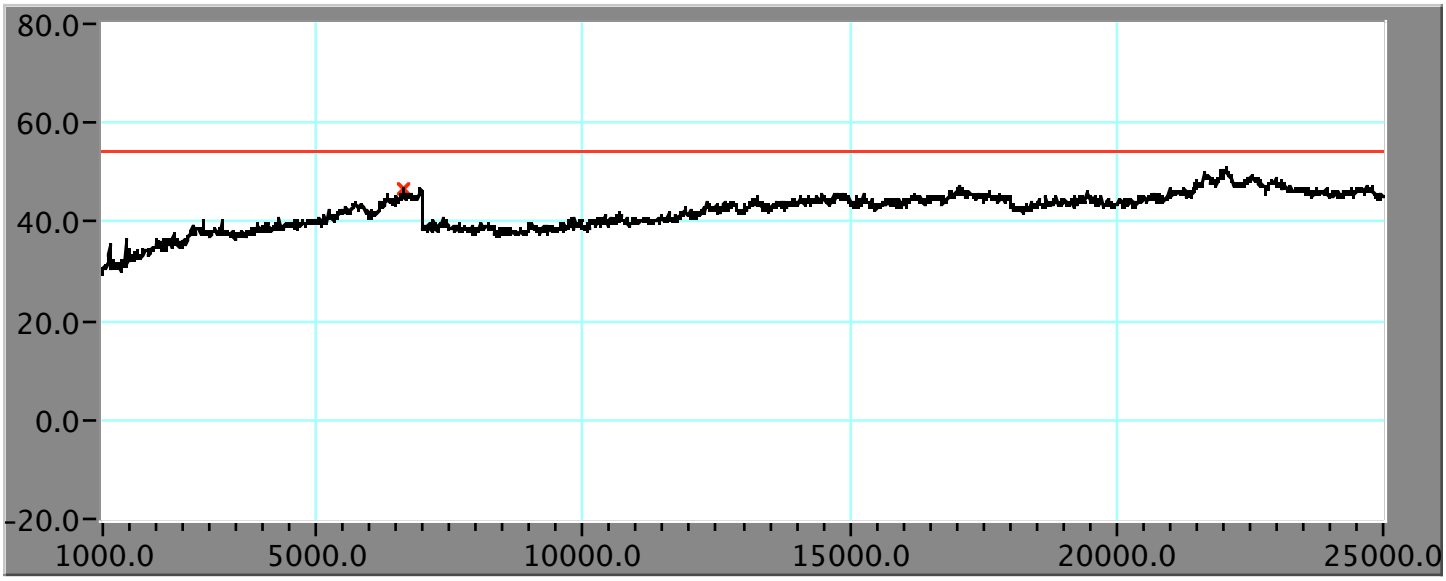

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 6975.9 | 46.7 V | 54 | -7.3 | 51.08 | 36.219 | 3.59 | 44.21 |
| 6988 | 46.6H | 54 | -7.4 | 51.01 | 36.2 | 3.6 | 44.22 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 11 (2.462 GHz) - 802.11b mode Host System #1



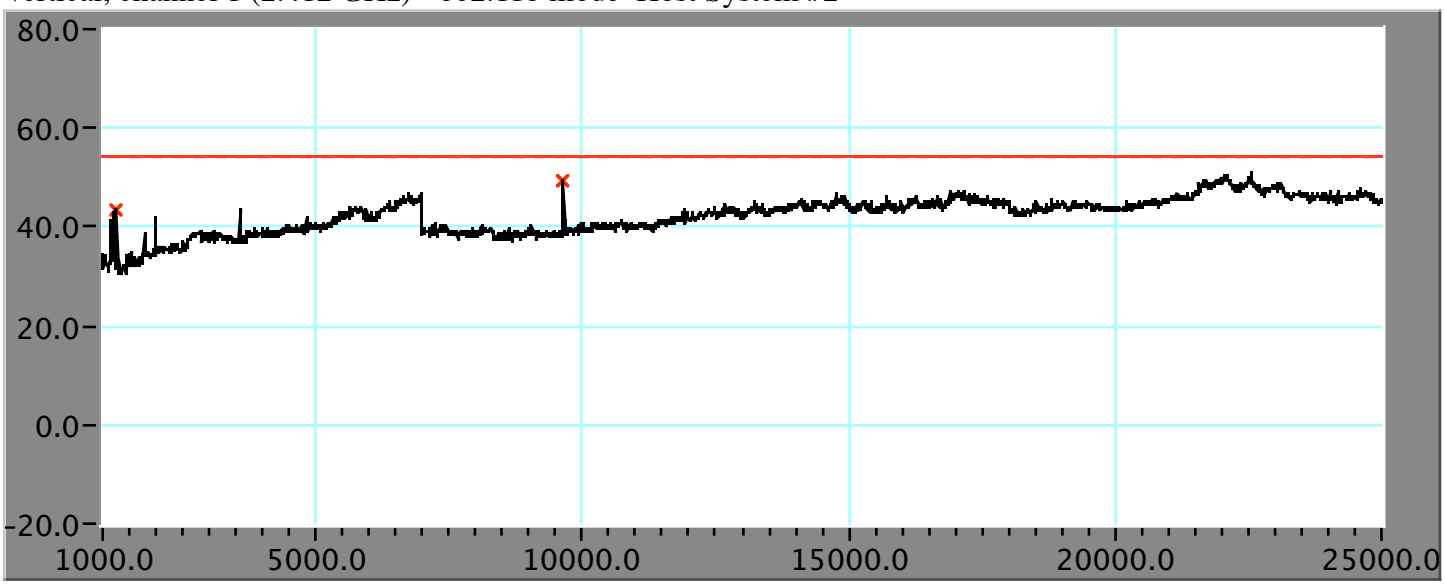

Horizontal, channel 11 (2.462 GHz) - 802.11b mode Host System #1



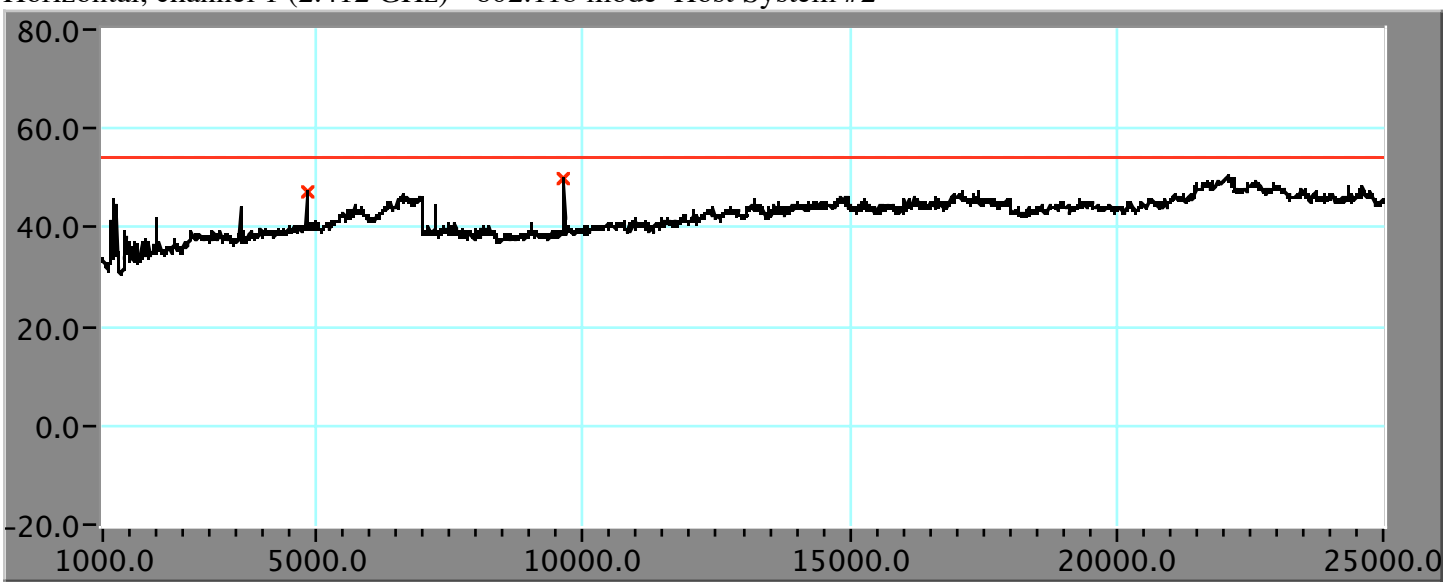

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 6963.93 | 46.2 V | 54 | -7.8 | 50.59 | 36.19 | 3.59 | 44.2 |
| 6627.25 | 46.6 H | 54 | -7.4 | 51.29 | 36.05 | 3.46 | 44.21 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 1 (2.412 GHz) - 802.11b mode  Host System #2



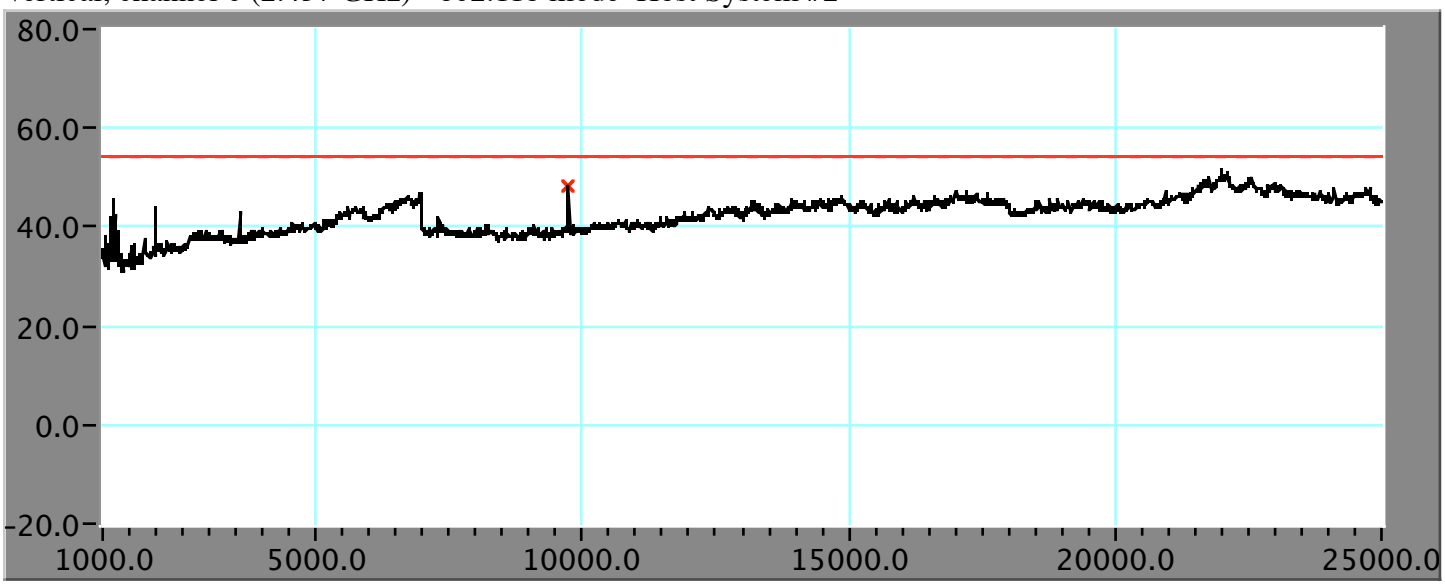

Horizontal, channel 1 (2.412 GHz) - 802.11b mode  Host System #2



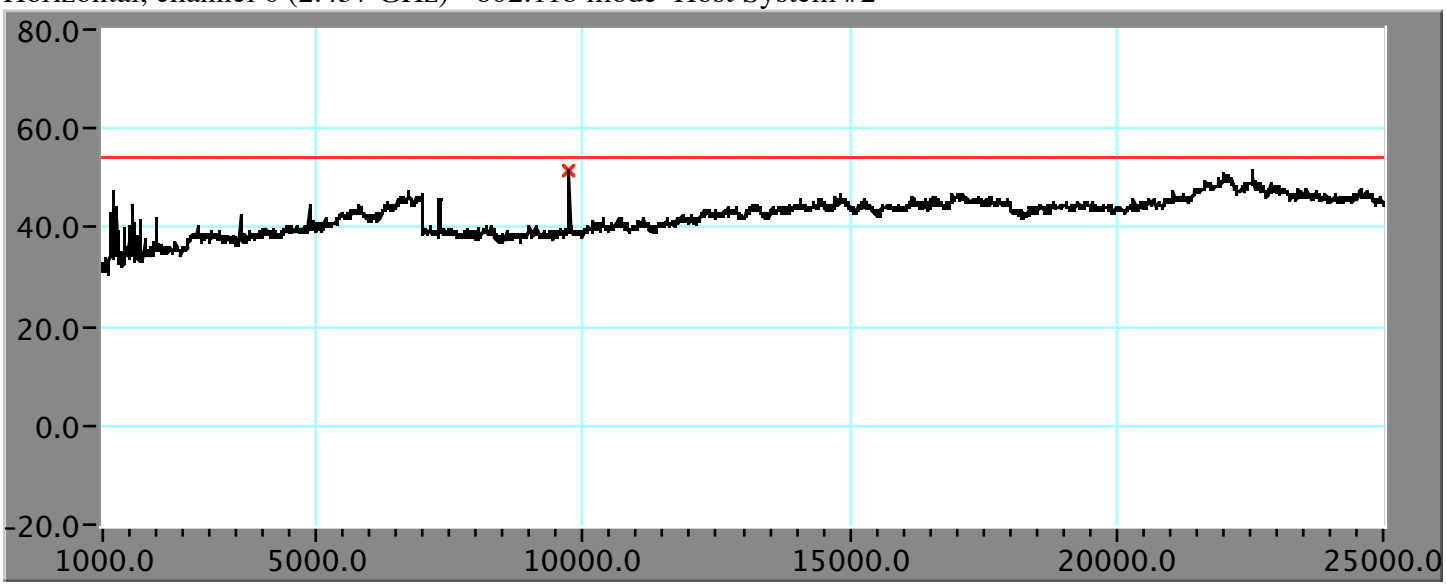

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 1264.53 | 43.5 V | 54 | -10.5 | 58.82 | 27.77 | 0.96 | 44.06 |
| 9645.29 | 49.6 V | 54 | -4.4 | 53.18 | 37.59 | 4.02 | 45.18 |
| 4823.65 | 47.2 H | 54 | -6.8 | 53.77 | 34.79 | 2.81 | 44.16 |
| 9645.29 | 49.8 H | 54 | -4.2 | 53.39 | 37.59 | 4.02 | 45.18 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 6 (2.437 GHz) - 802.11b mode  Host System #2



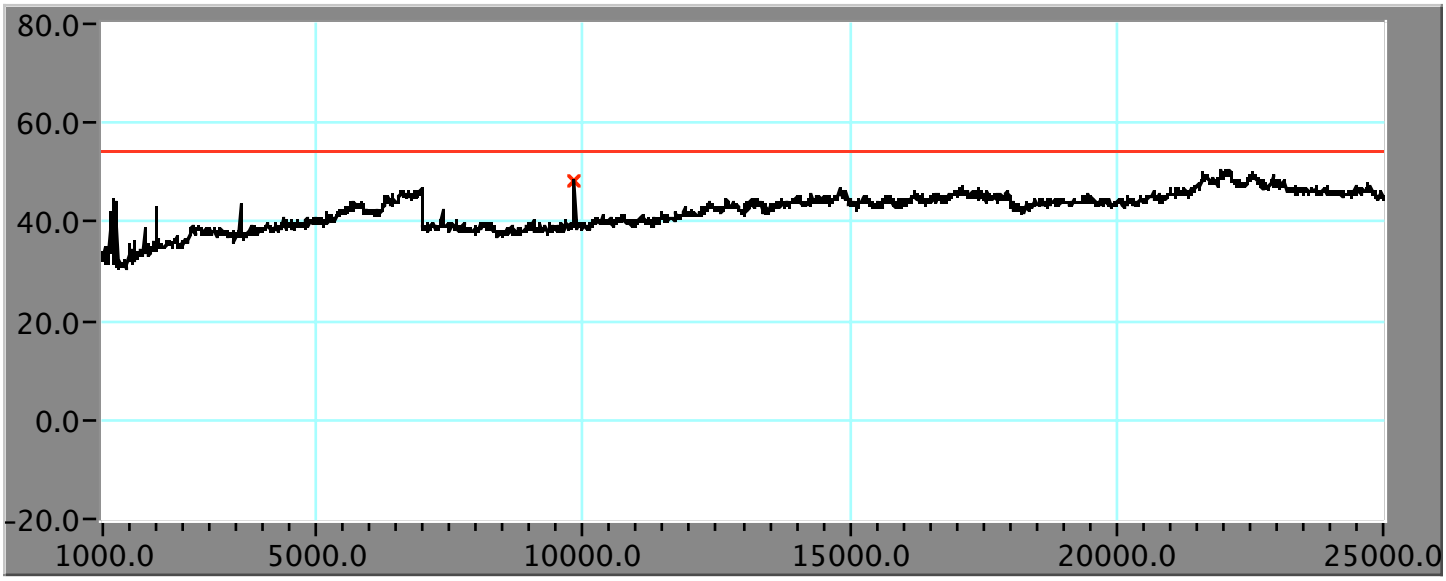

Horizontal, channel 6 (2.437 GHz) - 802.11b mode  Host System #2



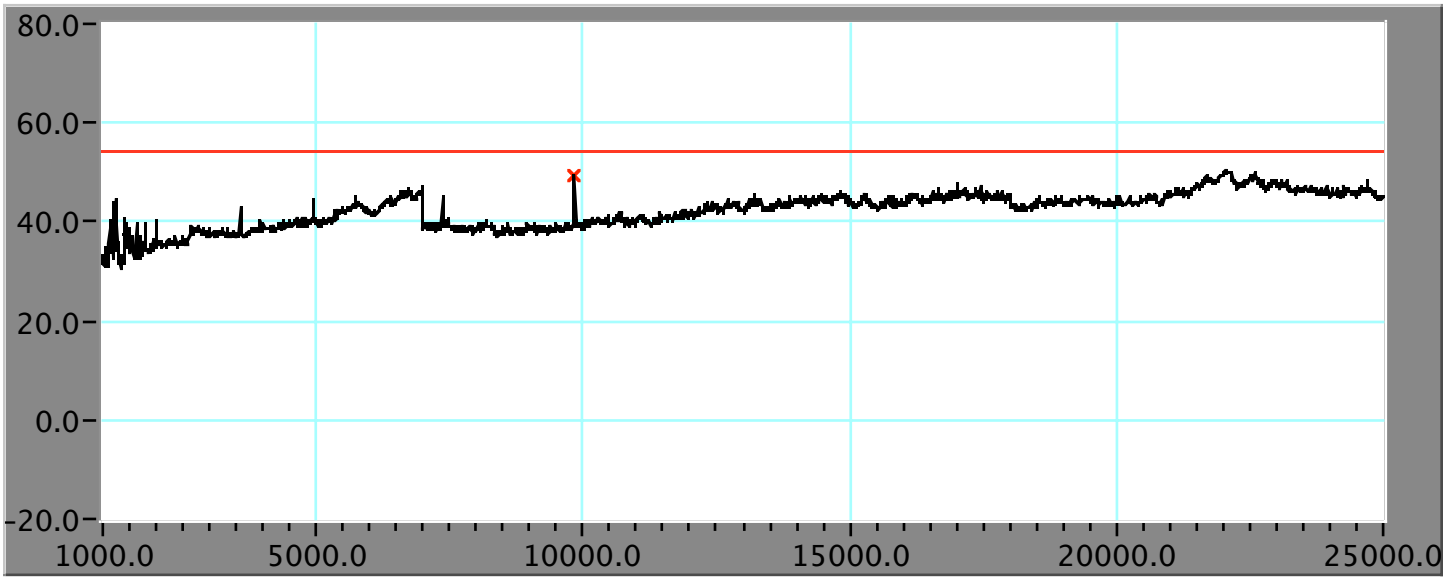

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 9753.51 | 48.2 V | 54 | -5.8 | 51.68 | 37.65 | 4.07 | 44.22 |
| 9753.51 | 51.3 H | 54 | -2.7 | 54.8 | 37.65 | 4.07 | 45.22 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 11 (2.462 GHz) - 802.11b mode  Host System #2



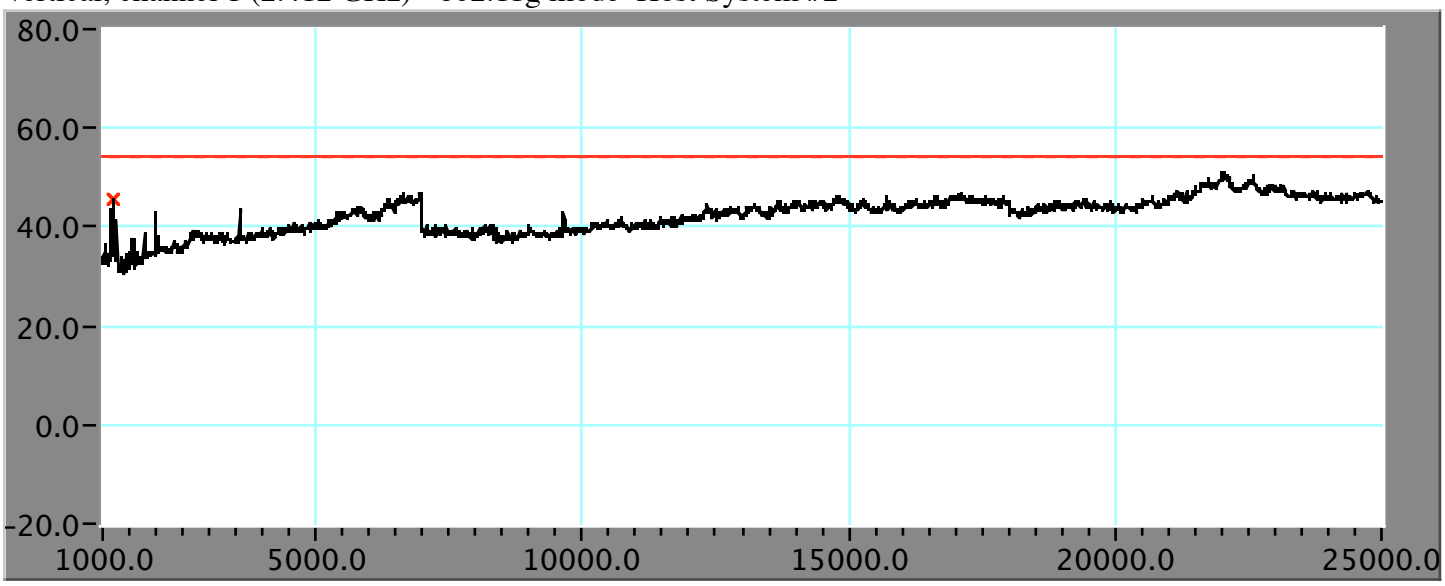

Horizontal, channel 11 (2.462 GHz) - 802.11b mode  Host System #2



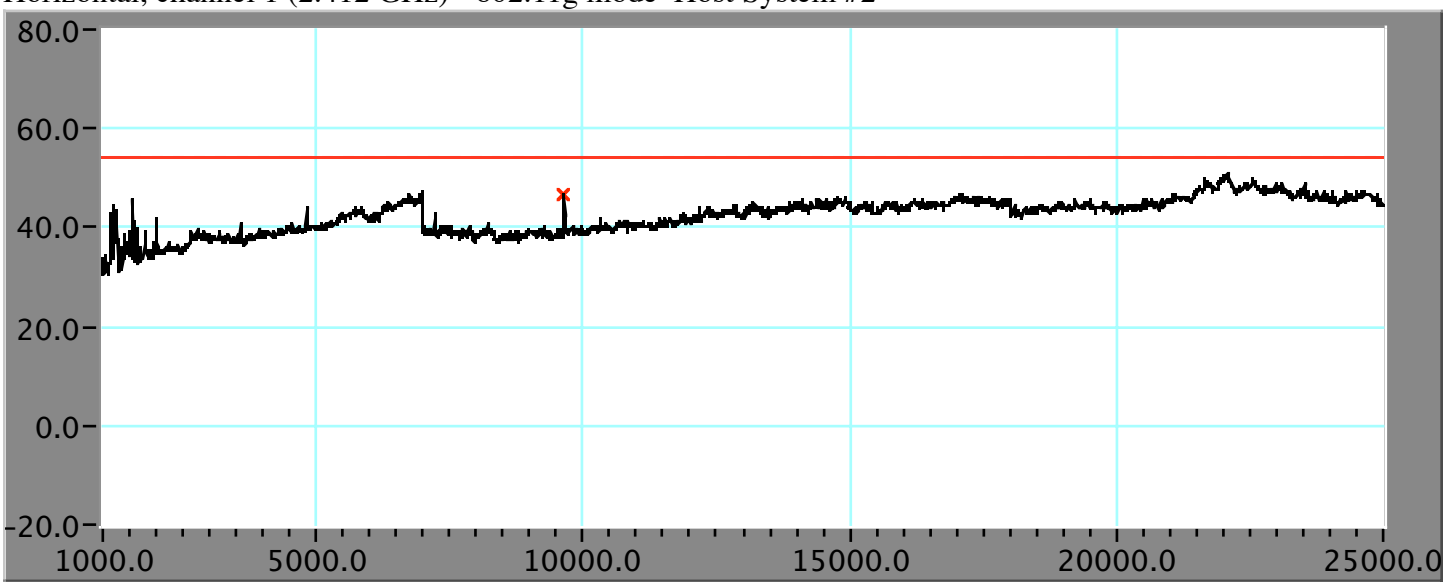

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 9849.7 | 48.1V | 54 | -5.9 | 51.47 | 37.71 | 4.11 | 45.23 |
| 9849.7 | 49.5 H | 54 | -4.5 | 52.87 | 37.71 | 4.11 | 45.23 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 1 (2.412 GHz) - 802.11g mode  Host System #2



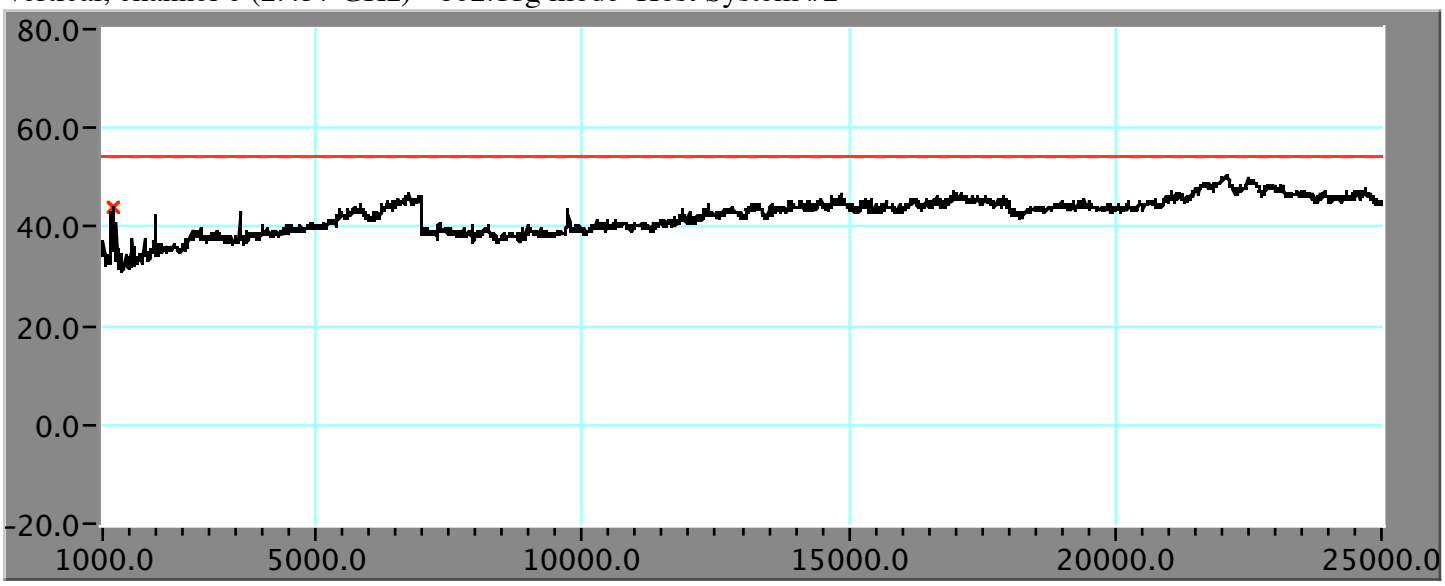

Horizontal, channel 1 (2.412 GHz) - 802.11g mode  Host System #2



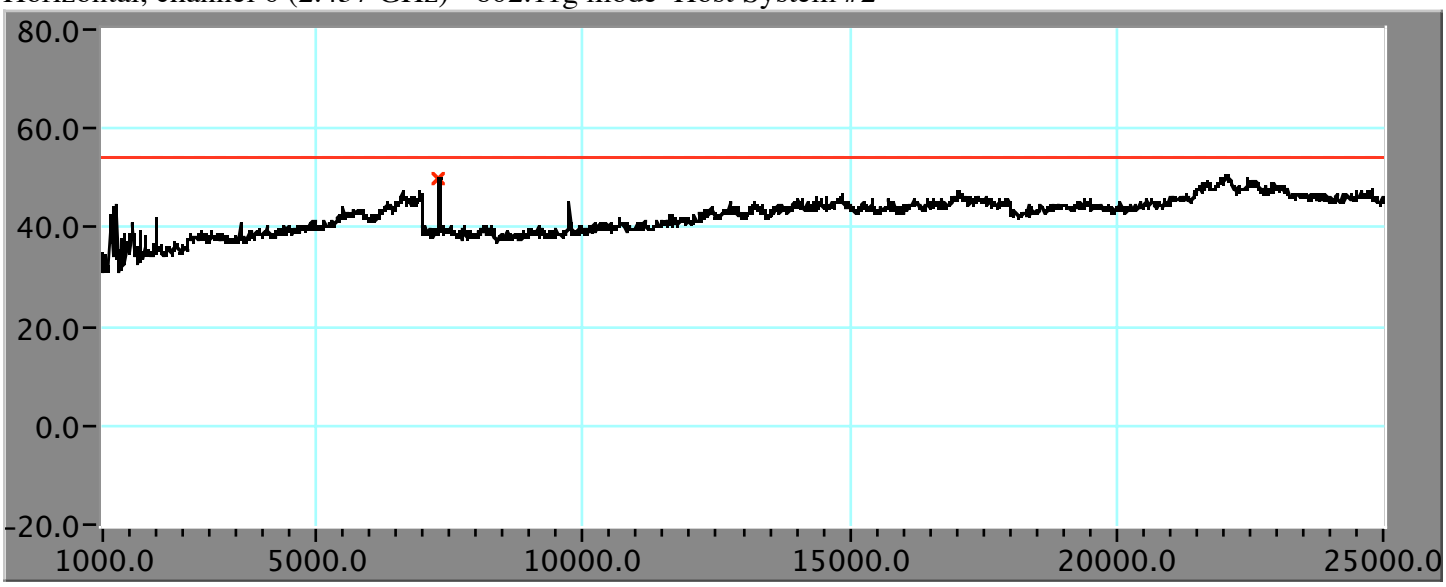

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 1192.38 | 45.8 V | 54 | -8.2 | 61.32 | 27.67 | 0.89 | 44.11 |
| 9645.29 | 46.8 H | 54 | -7.2 | 50.36 | 37.59 | 4.02 | 45.18 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 6 (2.437 GHz) - 802.11g mode  Host System #2



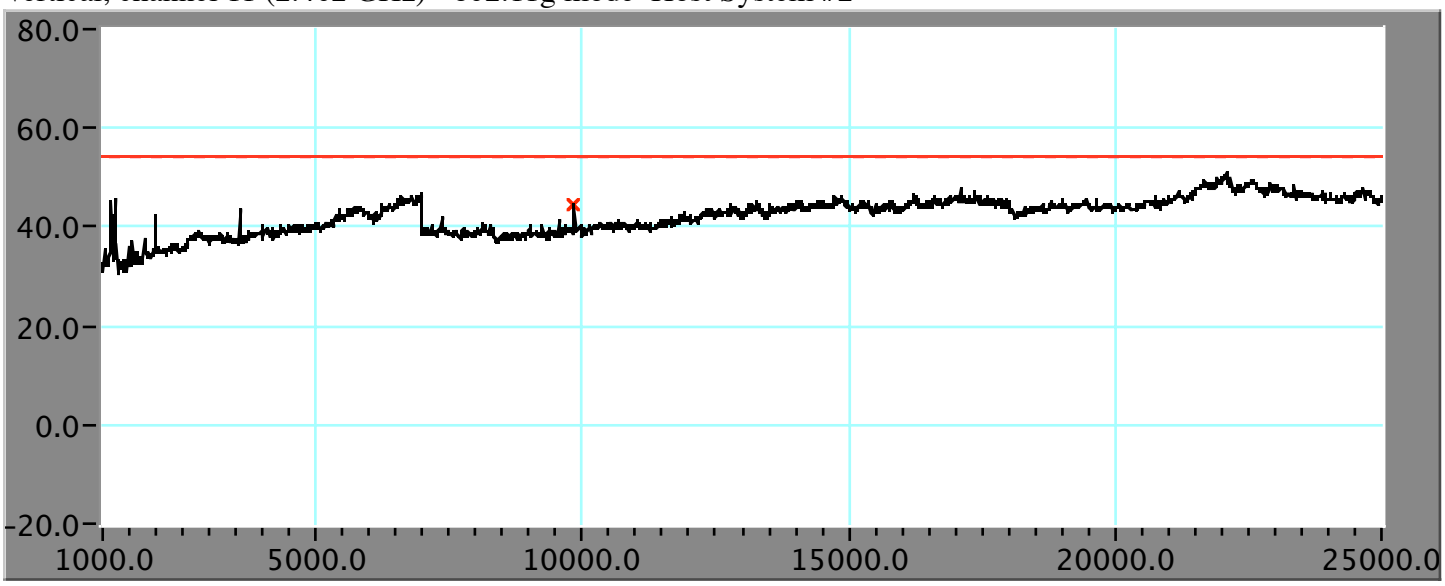

Horizontal, channel 6 (2.437 GHz) - 802.11g mode  Host System #2



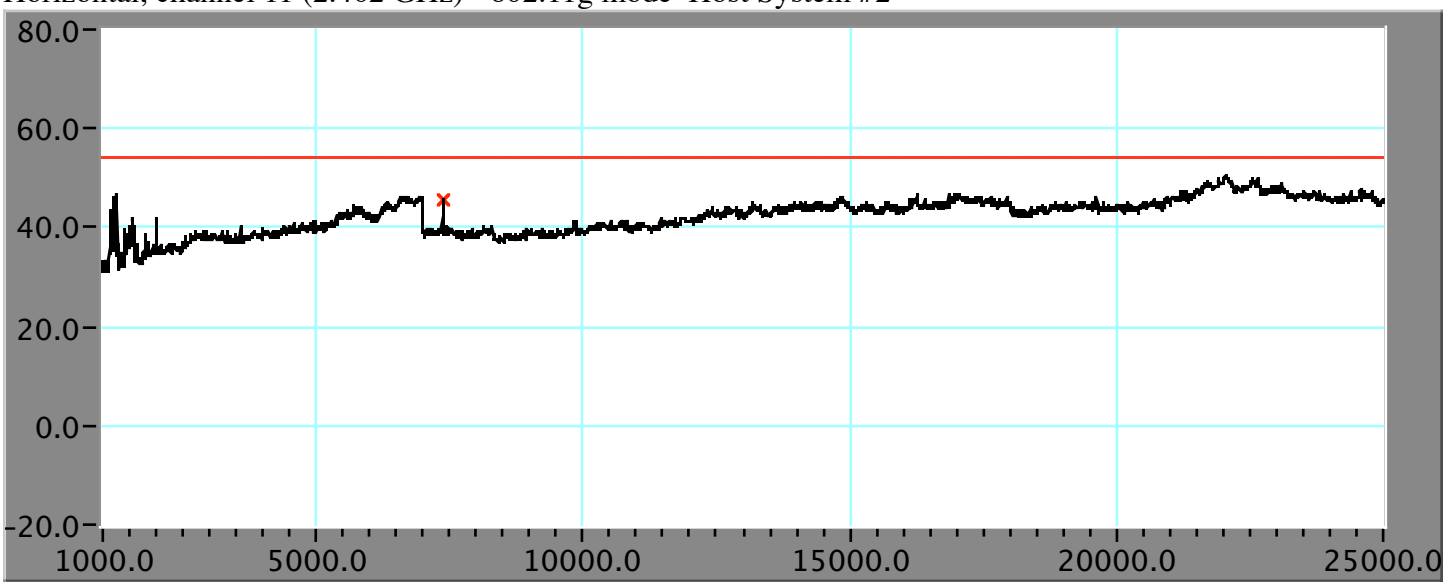

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 1192.38 | 44.1 V | 54 | -9.9 | 59.63 | 27.67 | 0.89 | 44.11 |
| 7300.6 | 50 H | 54 | -4 | 54.64 | 36.08 | 3.65 | 44.42 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical, channel 11 (2.462 GHz) - 802.11g mode  Host System #2



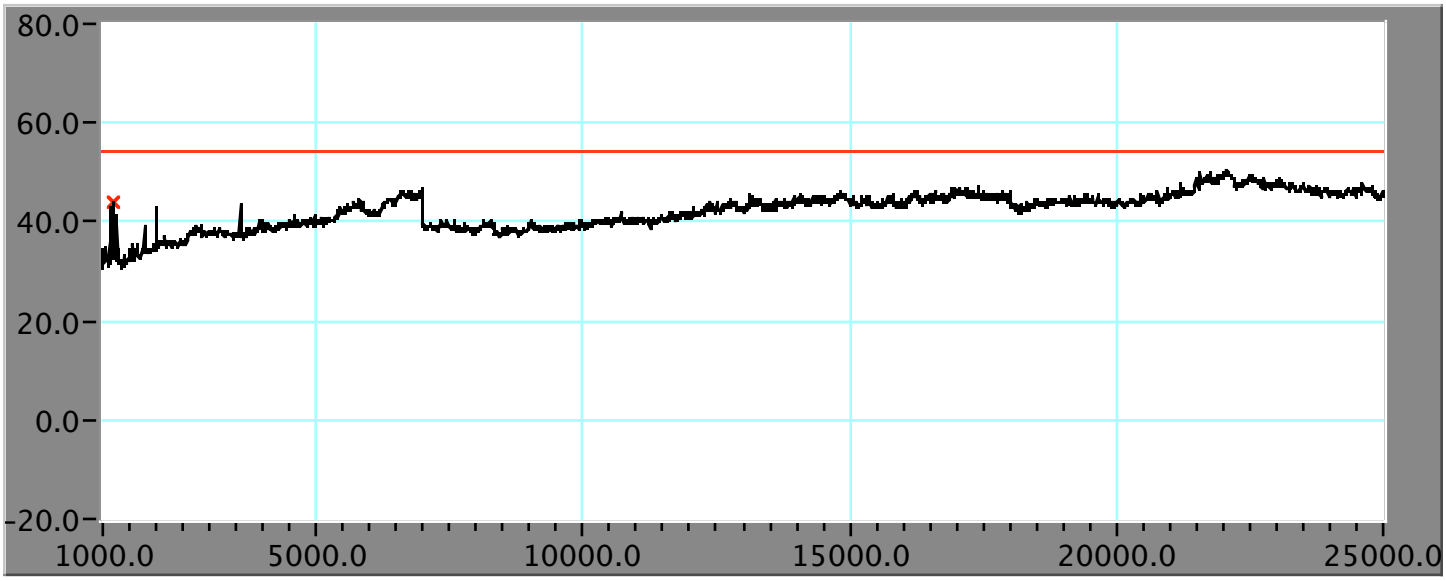

Horizontal, channel 11 (2.462 GHz) - 802.11g mode  Host System #2



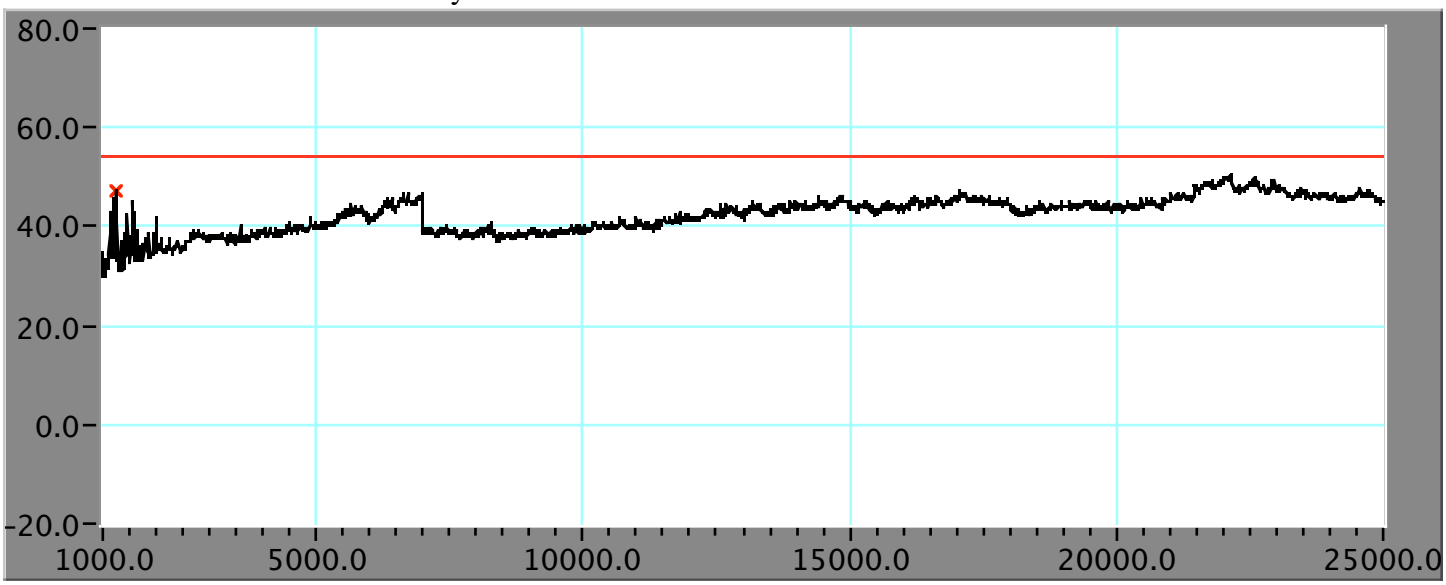

| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 9849.7 | 44.6 V | 54 | -9.4 | 47.97 | 37.71 | 4.11 | 45.23 |
| 7384.77 | 45.5 H | 54 | -8.5 | 50.26 | 36.05 | 3.66 | 44.46 |

All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Vertical - Receive mode  Host System #2




Horizontal - Receive mode  Host System #2




| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 1192.38 | 43.7 V | 54 | -10.3 | 59.28 | 27.67 | 0.89 | 44.11 |
| 1228.46 | 47.1 H | 54 | -6.9 | 62.55 | 27.72 | 0.93 | 44.1 |

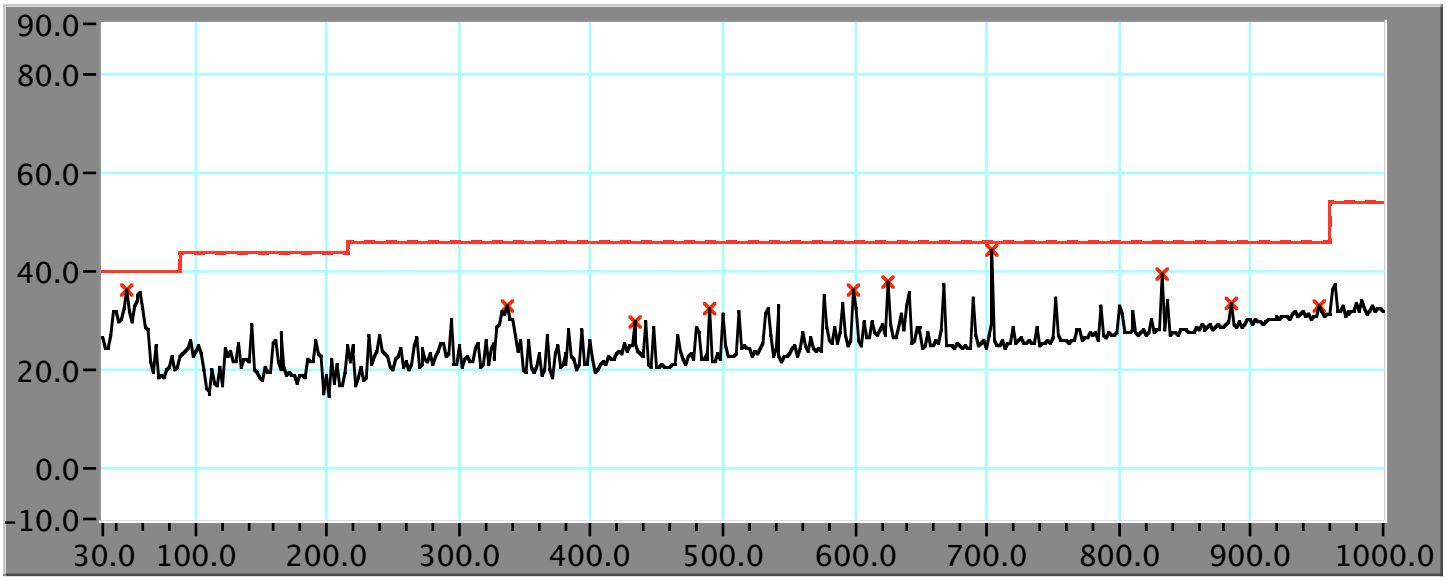
All levels are with a peak detector unless otherwise indicated.
Date of Test: March 4, 2005

Radiated Emissions less than 1 GHz Instrument Settings:

| Instrument Settings | | | | |
|---|---|---|---|---|
| Frequency Range | Reference Level | Attenuation | Resolution BW | Video BW |
| 30 MHz - 1 GHz | 70 dBuV | 10 | 120 kHz | 300 kHz |

Radiated emissions measurements from 30 MHz - 1 GHz were performed with the 802.11 b/g transmitter set to low, mid and high channels. Two host systems were tested. In each of these cases, the results did not vary with the channel or modulation. Only the data from the scans with channel 1 transmitting in 802.11g mode.

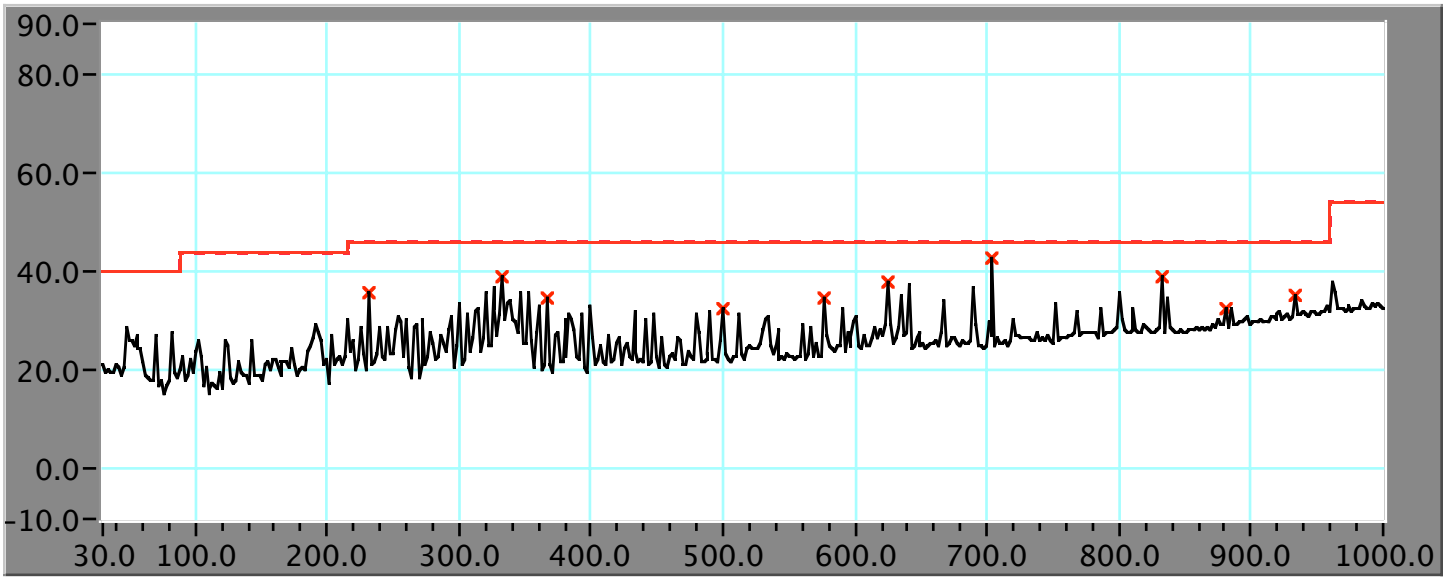
Channel 1 (2412 MHz) Vertical - 802.11g Host System #1




| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 47.49 | 36.1 | 40.0 | -3.9 | 57.84 | 8.40 | 1.72 | 31.85 |
| 337.13 | 32.7 | 46.0 | -13.3 | 45.26 | 14.33 | 4.23 | 31.08 |
| 432.38 | 29.9 | 46.0 | -16.1 | 39.89 | 16.30 | 4.97 | 31.26 |
| 490.70 | 32.3 | 46.0 | -13.7 | 40.99 | 17.80 | 5.36 | 31.80 |
| 599.56 | 36.2 | 46.0 | -9.8 | 43.79 | 18.67 | 6.06 | 32.28 |
| 624.83 | 37.9 | 46.0 | -8.1 | 44.64 | 19.30 | 6.23 | 32.26 |
| 704.53 | 44.1 | 46.0 | -1.9 | 50.06 | 19.90 | 6.71 | 32.56 |
| 832.83 | 39.3 | 46.0 | -6.7 | 43.08 | 21.30 | 7.63 | 32.74 |
| 885.31 | 33.4 | 46.0 | -12.6 | 36.04 | 21.92 | 8.01 | 32.60 |
| 951.40 | 32.8 | 46.0 | -13.2 | 33.72 | 22.40 | 8.55 | 31.90 |
| | | | | | | | |
| | | | | | | | |

Date of Test: March 3, 2005

Channel 1 (2412 MHz) Horizontal - 802.11g Host System #1




| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 232.16 | 35.9 | 46.0 | -10.1 | 51.72 | 11.87 | 3.48 | 31.20 |
| 333.25 | 38.9 | 46.0 | -7.1 | 51.36 | 14.40 | 4.21 | 31.03 |
| 366.29 | 34.5 | 46.0 | -11.5 | 45.89 | 15.40 | 4.47 | 31.24 |
| 500.42 | 32.5 | 46.0 | -13.5 | 41.01 | 18.10 | 5.41 | 32.05 |
| 576.23 | 34.7 | 46.0 | -11.3 | 41.71 | 19.12 | 5.89 | 32.04 |
| 624.83 | 37.7 | 46.0 | -8.3 | 44.50 | 19.20 | 6.23 | 32.26 |
| 704.53 | 42.6 | 46.0 | -3.4 | 47.92 | 20.50 | 6.71 | 32.56 |
| 832.83 | 38.7 | 46.0 | -7.3 | 41.91 | 21.90 | 7.63 | 32.74 |
| 881.42 | 32.5 | 46.0 | -13.5 | 34.89 | 22.10 | 8.05 | 32.53 |
| 933.91 | 35.1 | 46.0 | -10.9 | 36.55 | 22.82 | 8.44 | 32.73 |
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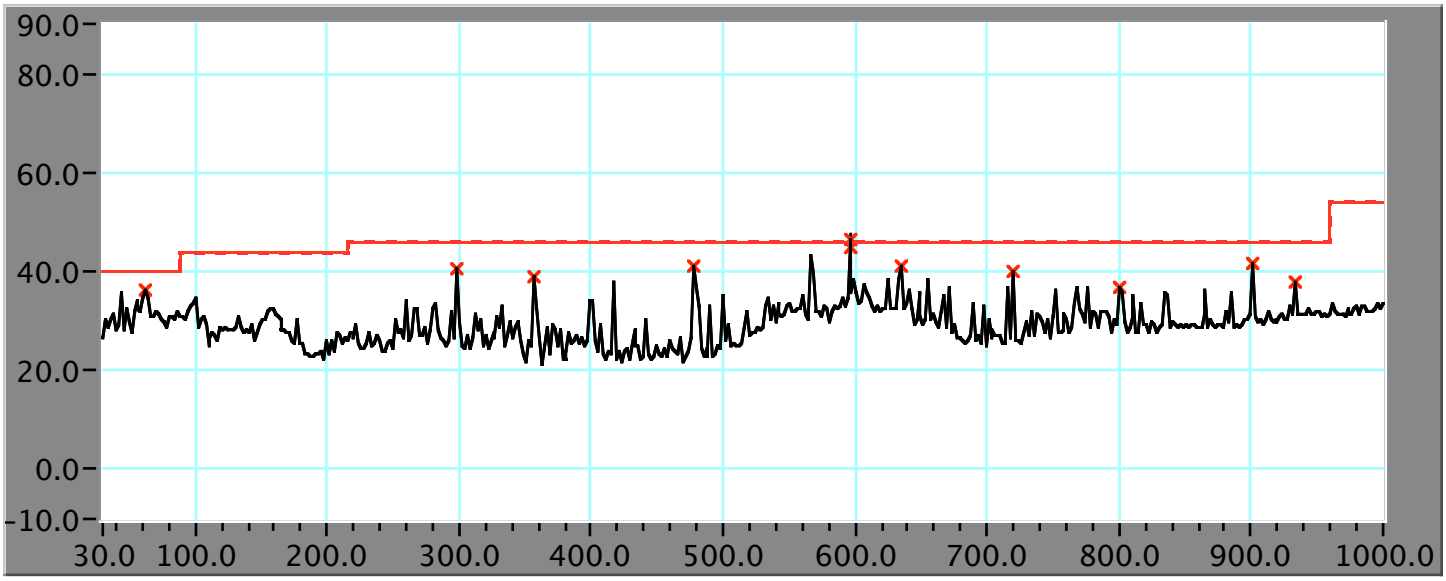
Date of Test: March 3, 2005

Channel 1 (2412 MHz) Vertical - 802.11g Host System #2




| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 63.05 | 36.3 | 40.0 | -3.7 | 57.60 | 8.20 | 1.93 | 31.47 |
| 298.26 | 40.6 | 46.0 | -5.4 | 54.16 | 13.51 | 3.95 | 31.04 |
| 356.57 | 39.0 | 46.0 | -7.0 | 50.89 | 14.89 | 4.41 | 31.22 |
| 477.09 | 41.1 | 46.0 | -4.9 | 50.14 | 17.39 | 5.29 | 31.69 |
| 595.67 | 46.7 | 46.0 | 0.7 | 54.28 | 18.52 | 6.03 | 32.18 |
| 596.26 | 44.8 QP | 46.0 | -1.2 | 52.46 | 18.52 | 6.03 | 32.18 |
| 634.55 | 41.3 | 46.0 | -4.7 | 47.95 | 19.60 | 6.30 | 32.52 |
| 720.08 | 40.0 | 46.0 | -6.0 | 45.42 | 20.37 | 6.82 | 32.59 |
| 799.78 | 36.8 | 46.0 | -9.2 | 40.81 | 21.20 | 7.38 | 32.57 |
| 900.86 | 41.4 | 46.0 | -4.6 | 43.52 | 22.20 | 8.14 | 32.48 |
| 933.91 | 37.8 | 46.0 | -8.2 | 39.82 | 22.30 | 8.44 | 32.73 |
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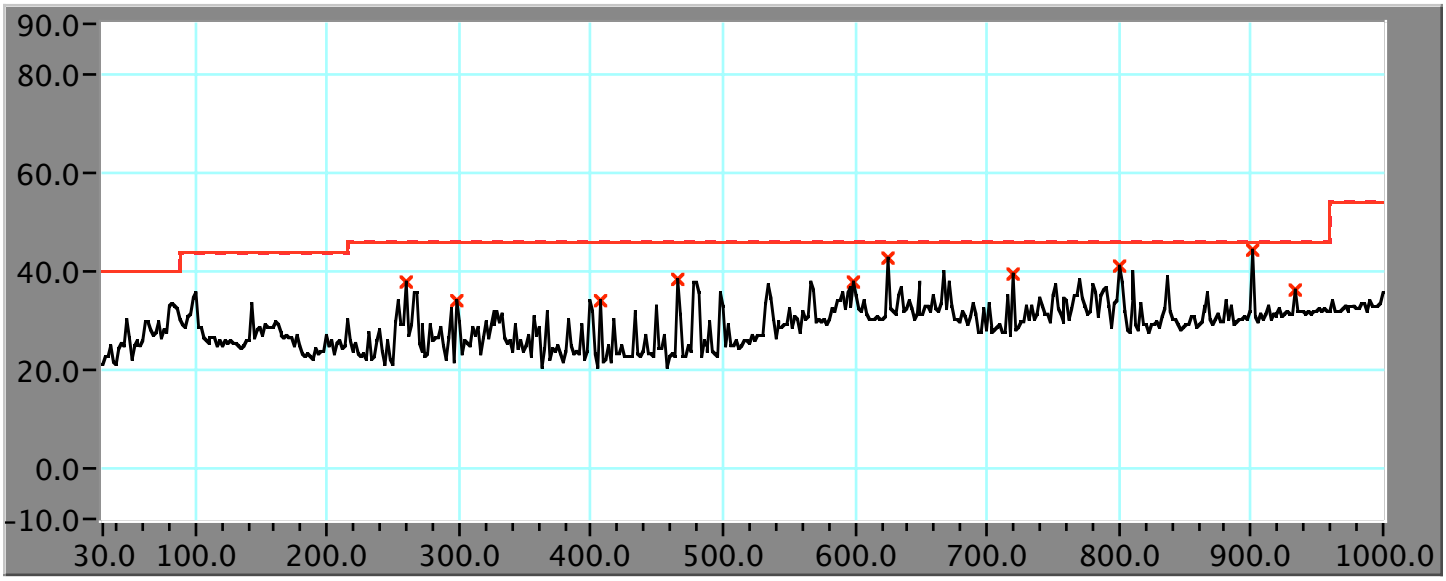
Date of Test: March 3, 2005

Channel 1 (2412 MHz) Horizontal - 802.11g Host System #2




| Frequency | Level | Limit | Delta | Raw Data | Antenna | Cable | Amp |
|---|---|---|---|---|---|---|---|
| MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB | dB |
| 259.38 | 37.7 | 46.0 | -8.3 | 52.99 | 12.40 | 3.68 | 31.32 |
| 298.26 | 33.9 | 46.0 | -12.1 | 47.16 | 13.80 | 3.95 | 31.04 |
| 407.11 | 34.1 | 46.0 | -11.9 | 44.44 | 16.16 | 4.79 | 31.28 |
| 465.43 | 38.1 | 46.0 | -7.9 | 47.21 | 17.40 | 5.16 | 31.65 |
| 599.56 | 37.9 | 46.0 | -8.1 | 44.88 | 19.23 | 6.06 | 32.28 |
| 624.83 | 42.7 | 46.0 | -3.3 | 49.57 | 19.20 | 6.23 | 32.26 |
| 720.08 | 39.7 | 46.0 | -6.3 | 44.99 | 20.47 | 6.82 | 32.59 |
| 799.78 | 41.1 | 46.0 | -4.9 | 44.95 | 21.38 | 7.38 | 32.57 |
| 900.86 | 44.4 | 46.0 | -1.6 | 46.26 | 22.53 | 8.14 | 32.48 |
| 933.91 | 36.2 | 46.0 | -9.8 | 37.63 | 22.82 | 8.44 | 32.73 |
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Date of Test: March 3, 2005

## 8.8 AC Power Line

Limit

The emissions from the ac power line must conform to the limits specified in CFR 15.205.

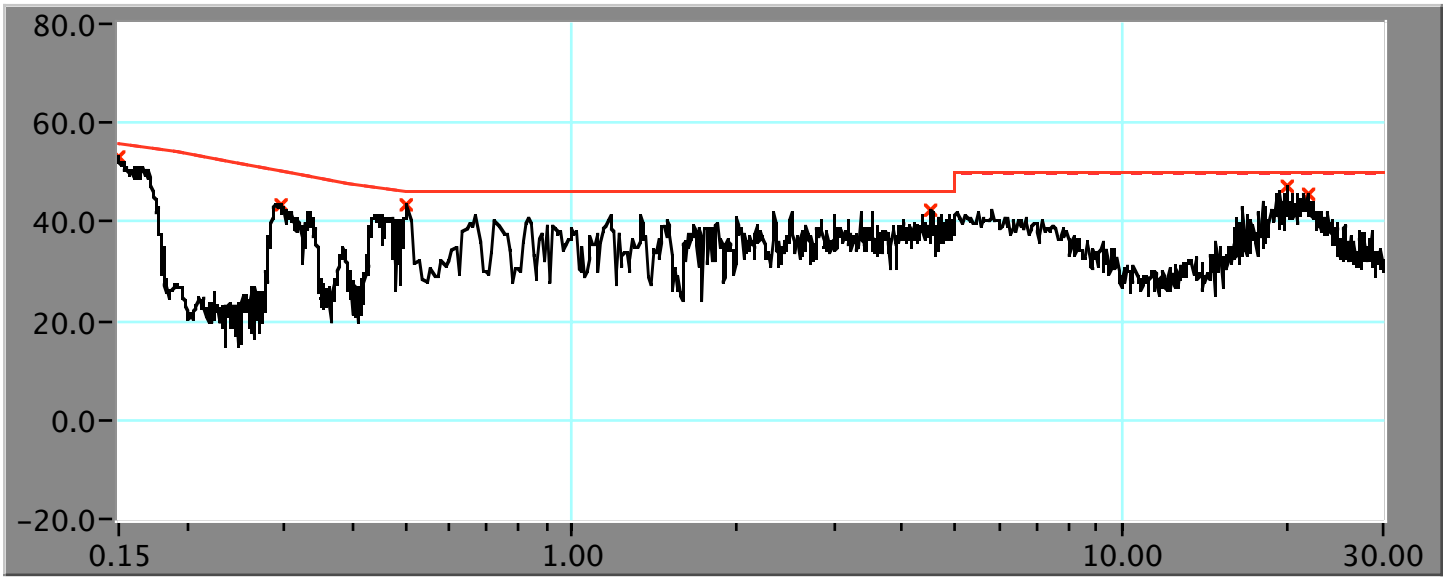
Test Procedure

The EUT is a 3.3 Volt DC device. However, it can be powered from a host system which does have an ac adapter. The power line measurements were performed at the ac power terminals of the host system. The transmitter was set to continuously transmit. Pre-scans were performed with the transmitter set to low, mid and high channels in both 802.11b and 802.11g modes. In each of these cases, no difference in the ac power line conducted emission levels was detected regardless of which mode or channel was transmitting. The data shown is with the transmitter set to continuously transmit on the low channel using the host system #1.

AC Power Line Results

Based on the results in this report, no non-compliance was found.

Line 1 – Peak Detection




| Frequency | Level | Limit | Delta | Raw Data | LISN | Cable | All Factors |
|---|---|---|---|---|---|---|---|
| MHz | dBuV | dBuV | dB | dBuV | dB | dB | dB |
| 0.150 | 53.0 | 56.0 | -3.0 | 51.38 | 1.56 | 0.06 | -1.62 |
| 0.295 | 43.5 | 50.4 | -6.9 | 42.73 | 0.69 | 0.07 | -0.75 |
| 0.500 | 43.3 | 46.0 | -2.7 | 42.94 | 0.31 | 0.05 | -0.36 |
| 4.523 | 42.2 | 46.0 | -3.8 | 41.86 | 0.14 | 0.16 | -0.30 |
| 20.100 | 47.1 | 50.0 | -2.9 | 45.91 | 0.79 | 0.38 | -1.17 |
| 21.850 | 45.7 | 50.0 | -4.3 | 44.41 | 0.87 | 0.39 | -1.26 |
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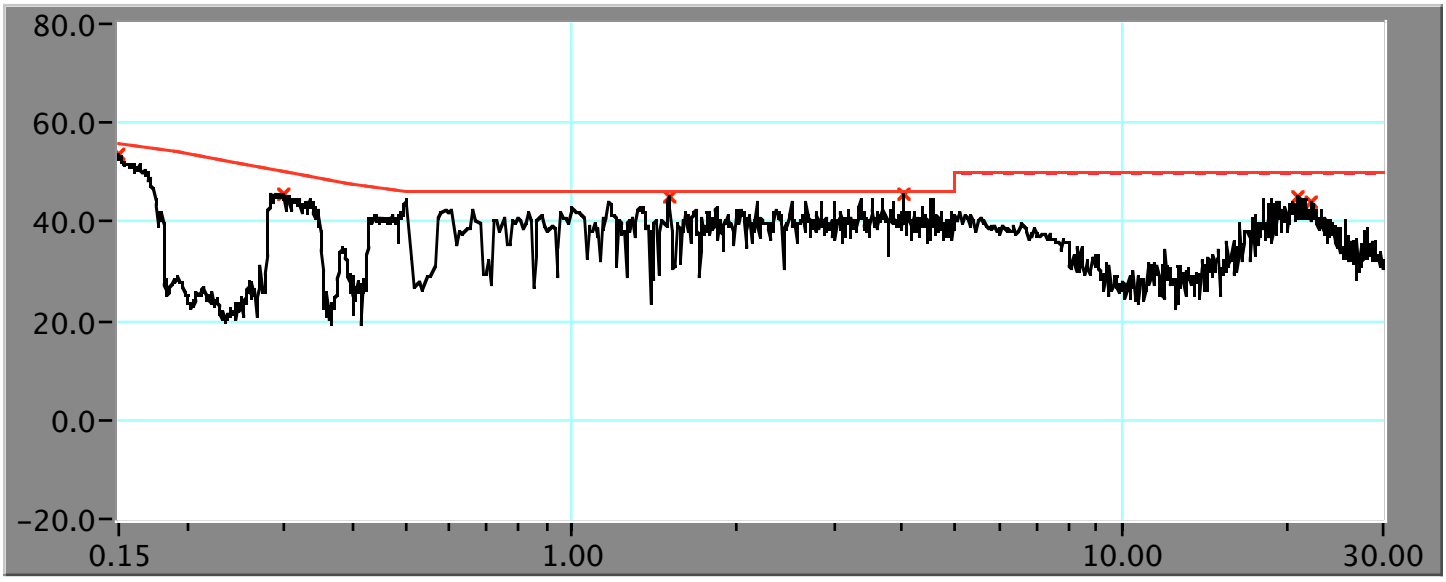
Date of Test: March 11, 2005

Line 2 – Peak Detection




| Frequency | Level | Limit | Delta | Raw Data | LISN | Cable | All Factors |
|---|---|---|---|---|---|---|---|
| MHz | dBuV | dBuV | dB | dBuV | dB | dB | dB |
| 0.150 | 53.6 | 56.0 | -2.4 | 51.89 | 1.64 | 0.06 | -1.70 |
| 0.299 | 45.7 | 50.3 | -4.6 | 44.92 | 0.70 | 0.06 | -0.76 |
| 1.508 | 44.9 | 46.0 | -1.1 | 44.67 | 0.14 | 0.07 | -0.21 |
| 4.028 | 45.4 | 46.0 | -0.6 | 45.14 | 0.13 | 0.17 | -0.30 |
| 21.100 | 45.0 | 50.0 | -5.0 | 43.81 | 0.78 | 0.38 | -1.16 |
| 22.250 | 43.8 | 50.0 | -6.2 | 42.59 | 0.82 | 0.35 | -1.17 |
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Date of Test: March 11, 2005