



Engineering and Testing for EMC and Safety Compliance



Accredited under A2LA Testing Certificate # 2653.01

FCC Part 15.247 Certification Application Test Report

| | | | |
|--|---|---|----------------------------|
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| | | | |
| FCC ID: | X86-AF3001000 | Test Report Date: | March 22, 2010 |
| Platform: | Wireless Camera | RTL Work Order #: | 2010038 |
| Model Name/Number: | Archerfish Solo/AF3001000 | RTL Quote #: | QRTL10-154 |
| American National Standard Institute: | ANSI C63.4-2003: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz | | |
| FCC Classification: | DTS – Part 15 Digital Transmission System | | |
| FCC Rule Part(s)/Guidance: | FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System October 1, 2009, DA 00-705 | | |
| Digital Interface Information | Digital Interface was found to be compliant | | |
| | | | |
| Frequency Range (MHz) | Output Power (W)* | Frequency Tolerance | Emission Designator |
| 2412 – 2462 | 0.078 | N/A | 18M1G7D |

* power is peak conducted

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15 and ANSI C63.4.

Signature: 

Date: March 22, 2010

Typed/Printed Name: Desmond A. Fraser

Position: President

This report may not be reproduced, except in full, without the written approval of Rhein Tech Laboratories, Inc. and Cernium Corporation. The test results relate only to the item(s) tested.

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1 General Information

1.1 Scope

This is an original certification application report.

Applicable Standards:

- FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

1.2 Description of EUT

| | |
|-----------------------------|----------------------|
| Equipment Under Test | Transceiver |
| Model | AF3001000 |
| Power Supply | 12V DC |
| Modulation Type | DSSS (CCK and OFDM) |
| Frequency Range | 2412 – 2462 MHz |
| Antenna Type | Chip antenna 4.4 dBi |

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4-2003).

1.4 Related Submittal(s)/Grant(s)

This is an original certification application for Cernium Corporation, Model # AF3001000, FCC ID: X86-AF3001000.

1.5 Modifications

No modifications were made to the equipment during testing in order to achieve compliance with these standards.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

Table 2-1: Channels Tested

| Channel | Frequency |
|---------|-----------|
| Low | 2412 |
| Middle | 2437 |
| High | 2462 |

2.2 Exercising the EUT

The EUT was supplied with test firmware programmed with a high, mid, and low channel for testing. The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

2.3 Test Result Summary

Table 2-2: Test Result Summary – FCC Part 15, Subpart C (Section 15.247)

| Standard | Test | Pass/Fail or N/A |
|------------------|--------------------------------------|------------------|
| FCC 15.207 | AC Power Conducted Emissions | Pass |
| FCC 15.209 | Radiated Emissions | Pass |
| FCC 15.247(a)(2) | 6 dB Bandwidth | Pass |
| FCC 15.247(b) | Maximum Peak Power Output | Pass |
| FCC 15.247(d) | Antenna Conducted Spurious Emissions | Pass |
| FCC 15.247(e) | Power Spectral Density | Pass |
| FCC 15.247(d) | Band Edge Measurement | Pass |

2.4 Test System Details

The test samples were received on March 12, 2010. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

Table 2-3: Equipment under Test

| Part | Manufacturer | Model # | Serial Number | FCC ID | Cable Description | RTL Bar Code |
|--------------------|------------------------------|-----------|---------------|---------------|--|--------------|
| Transceiver Camera | Cernium Corporation | AF3001000 | N/A | X86-AF3001000 | 4m USB Ethernet unshielded; 1.8m unshielded serial | 19441 |
| 12V AC Adapter | Cincon Electronics Co., Ltd. | TR1512 | N/A | N/A | 2m unshielded | 19440 |

Table 2-4: Support Equipment

| Part | Manufacturer | Model | Serial Number | FCC ID | Cable Description | RTL Bar Code |
|-------------------|--------------|---------------|--------------------------|--------|-------------------|--------------|
| Laptop | Dell | Latitude D630 | 10402 | N/A | N/A | 19438 |
| Laptop AC Adapter | Dell | LA65NS0-00 | CN-ODF263-71615-6CG-DE58 | N/A | 2.8m unshielded | 19439 |

2.5 Configuration of Tested System

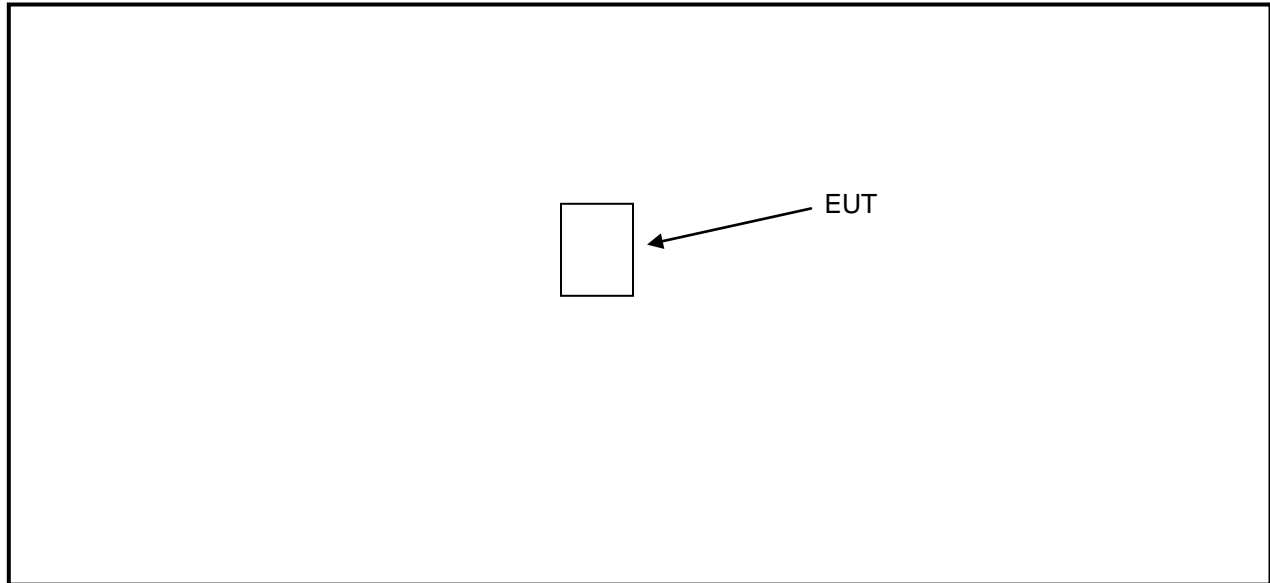


Figure 2-1: Configuration of System under Test

3 Peak Output Power - 15.247(b)(3)

3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken.

Table 3-1: Power Output Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|----------------------|--------|-----------------------------------|---------------|----------------------|
| 901356 | Agilent Technologies | E9323A | Power Sensor | 31764-264 | 11/18/10 |
| 901184 | Agilent Technologies | E4416A | EPM-P Power Meter, single channel | GB41050573 | 11/18/10 |

3.2 Power Output Test Data

Table 3-2: Power Output Test Data 802.11b (1 Mbps worst case data rate)

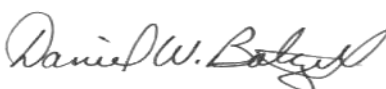
| Channel | Frequency (MHz) | Peak Power Conducted Output (dBm) |
|---------|-----------------|-----------------------------------|
| Low | 2412 | 15.4 |
| Middle | 2437 | 14.8 |
| High | 2462 | 14.7 |

Table 3-3: Power Output Test Data 802.11g (9 Mbps worst case data rate)

| Channel | Frequency (MHz) | Peak Power Conducted Output (dBm) |
|---------|-----------------|-----------------------------------|
| Low | 2412 | 18.9 |
| Middle | 2437 | 18.4 |
| High | 2462 | 18.4 |

Test Personnel:

Daniel W. Baltzell
Test Engineer



Signature

March 12, 2010
Date of Test

4 Compliance with the Band Edge – FCC 15.247(d)

4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. A conducted antenna port delta measurement was performed from the highest peak in the restricted band to the peak of the fundamental, and subtracted from the radiated field strength; the result was compared to the limit.

Table 4-1: Band Edge Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-------------------------|----------------------------|----------------------------------|-----------------|----------------------|
| 901413 | Agilent Technologies | E4448A | Spectrum Analyzer | US44020346 | 11/10/10 |
| 900878 | Rhein Tech Laboratories | AM3-1197-0005 | 3 meter Antenna Mast, polarizing | Outdoor Range 1 | Not Required |
| 901516 | Insulated Wire, Inc. | KPS-1503-2400-KPS-09302008 | RF cable, 20' | NA | 10/19/10 |
| 901517 | Insulated Wire Inc. | KPS-1503-360-KPS-09302008 | RF cable 36" | NA | 10/19/10 |
| 901242 | Rhein Tech Laboratories | WRT-000-0003 | Wood Rotating Table | N/A | Not Required |
| 900772 | EMCO | 3161-02 | Horn Antenna (2 - 4 GHz) | 9804-1044 | 6/14/10 |

4.2 Band Edge Test Results

4.2.1 Calculation of Lower Band Edge for 802.11b

99.6 dBuV/m is the field strength measurement, from which the delta measurement of 49.8 dB is subtracted, resulting in a level of 49.8 dB. This level has a margin of 4.2 dB below the limit of 54 dBuV/m.

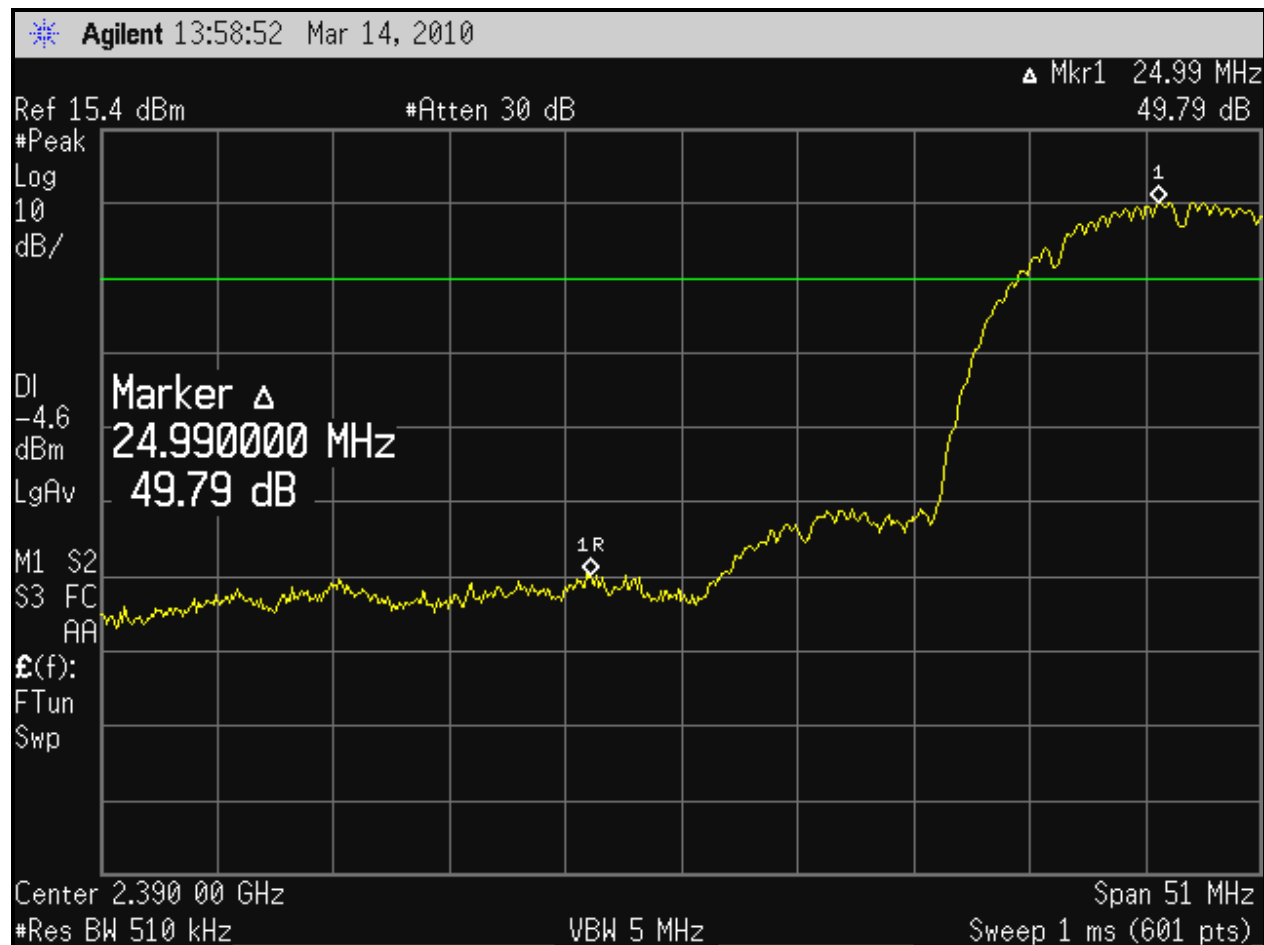
Calculation: $99.6 \text{ dBuV/m} - 49.8 \text{ dB} - 54 \text{ dBuV/m} = -4.2 \text{ dB}$

Peak Field Strength of Lower Band Edge (1 MHz RBW/8 MHz VBW) = 103.5 dBuV/m

Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 99.6 dBuV/m

Delta measurement = 49.8 dB

Plot 4-1: Lower Band Edge 802.11b



4.2.2 Calculation of Upper Band Edge for 802.11b

101.2 dBuV/m is the field strength measurement, from which the delta measurement of 51.3 dB is subtracted, resulting in a level of 49.9 dB. This level has a margin of 4.1 dB below the limit of 54 dBuV/m.

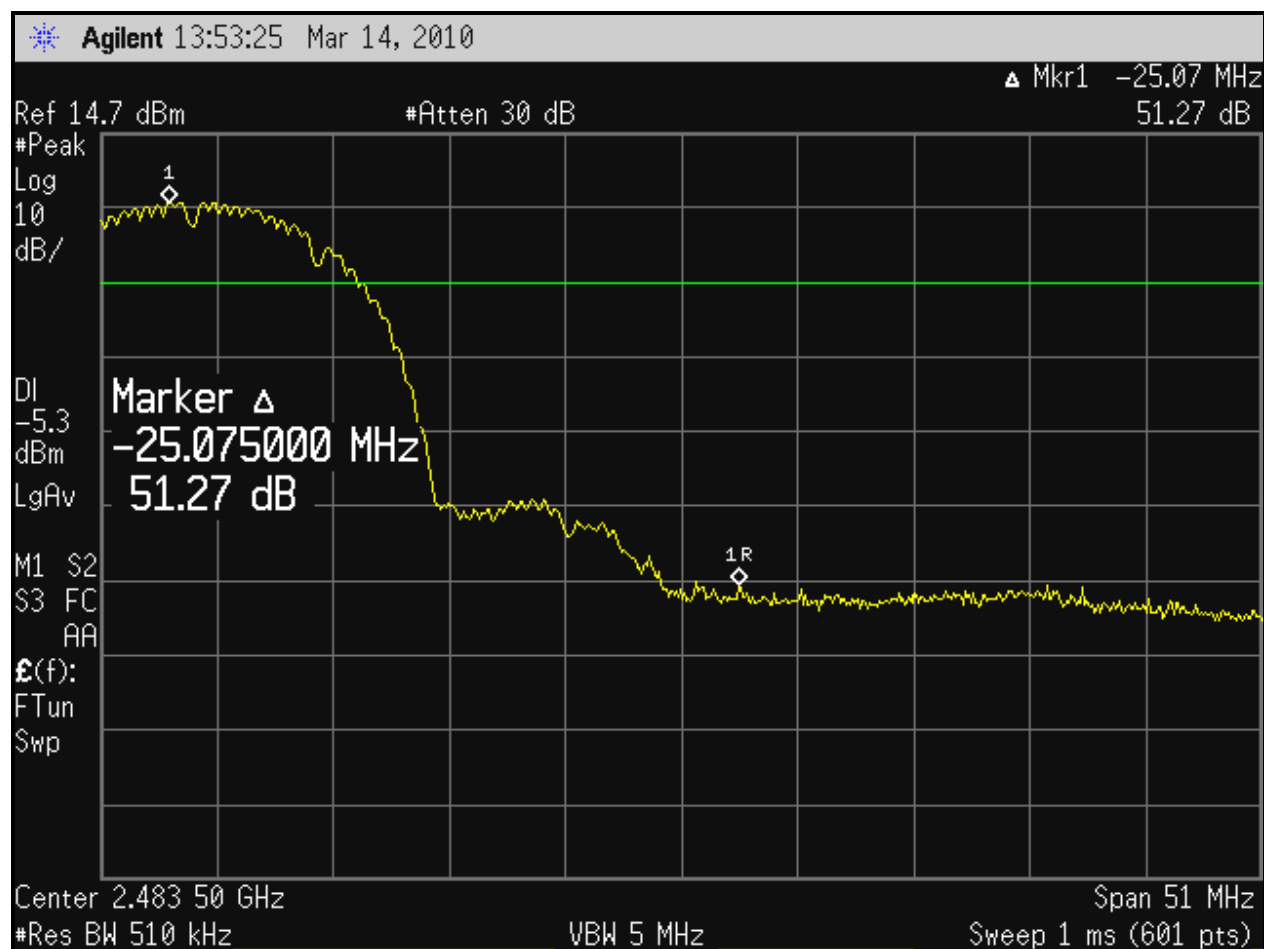
Calculation: $101.2 \text{ dBuV/m} - 51.3 \text{ dB} - 54 \text{ dBuV/m} = -4.1 \text{ dB}$

Peak Field Strength of Lower Band Edge (1 MHz RBW/8 MHz VBW) = 105.1 dBuV/m

Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 101.2 dBuV/m

Delta measurement = 51.3 dB

Plot 4-2: Upper Band Edge 802.11b



4.2.3 Calculation of Lower Band Edge for 802.11g

93.9 dBuV/m is the field strength measurement, from which the delta measurement of 42.8 dB is subtracted, resulting in a level of 51.1 dB. This level has a margin of 2.9 dB below the limit of 54 dBuV/m.

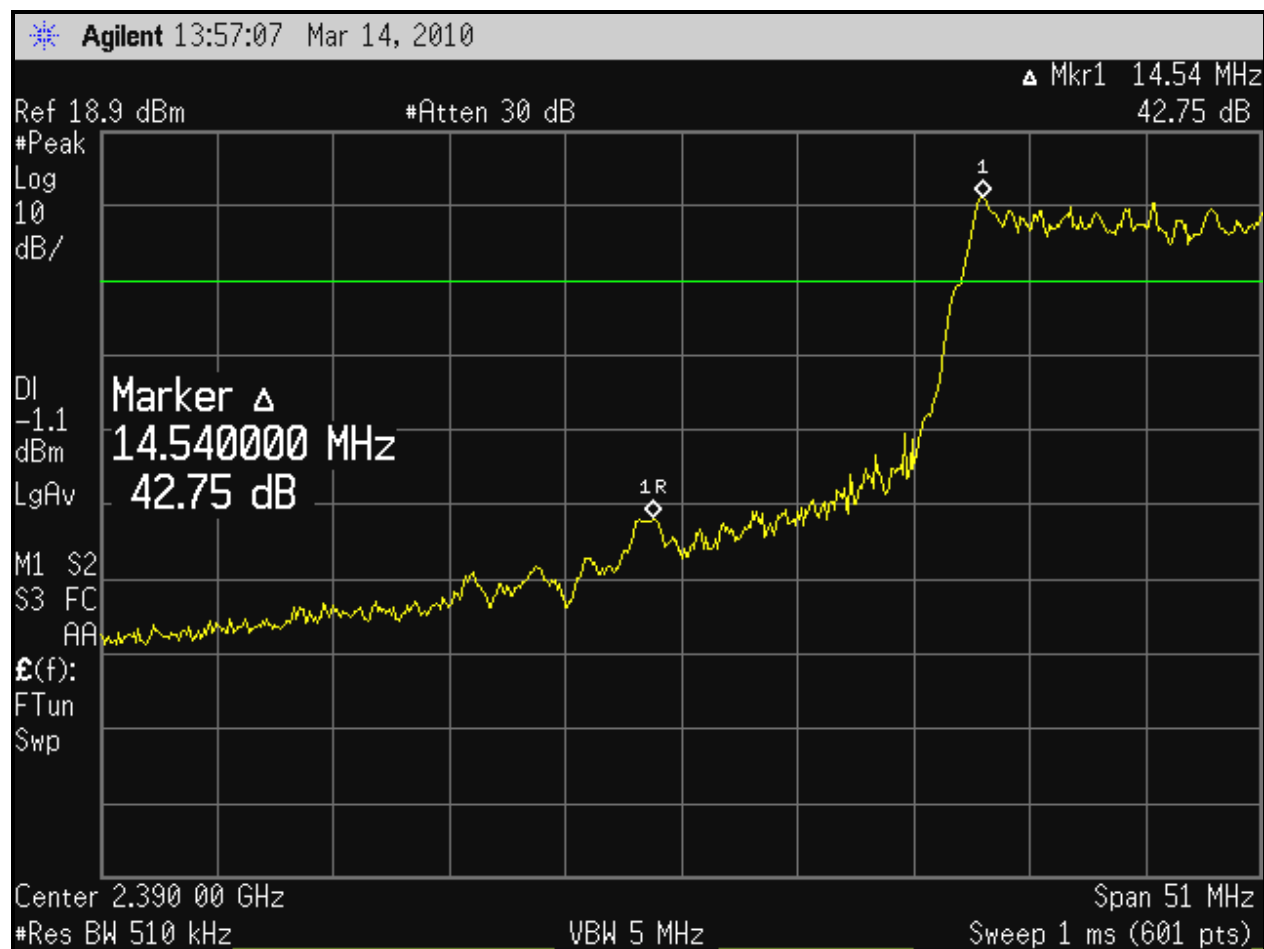
Calculation: $93.9 \text{ dBuV/m} - 42.8 \text{ dB} - 54 \text{ dBuV/m} = -2.9 \text{ dB}$

Peak Field Strength of Lower Band Edge (1 MHz RBW/8 MHz VBW) = 105.9 dBuV/m

Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 93.9 dBuV/m

Delta measurement = 42.8 dB

Plot 4-3: Lower Band Edge 802.11g



4.2.4 Calculation of Upper Band Edge for 802.11g

94.7 dBuV/m is the field strength measurement, from which the delta measurement of 41.1 dB is subtracted, resulting in a level of 53.6 dB. This level has a margin of 0.4 dB below the limit of 54 dBuV/m.

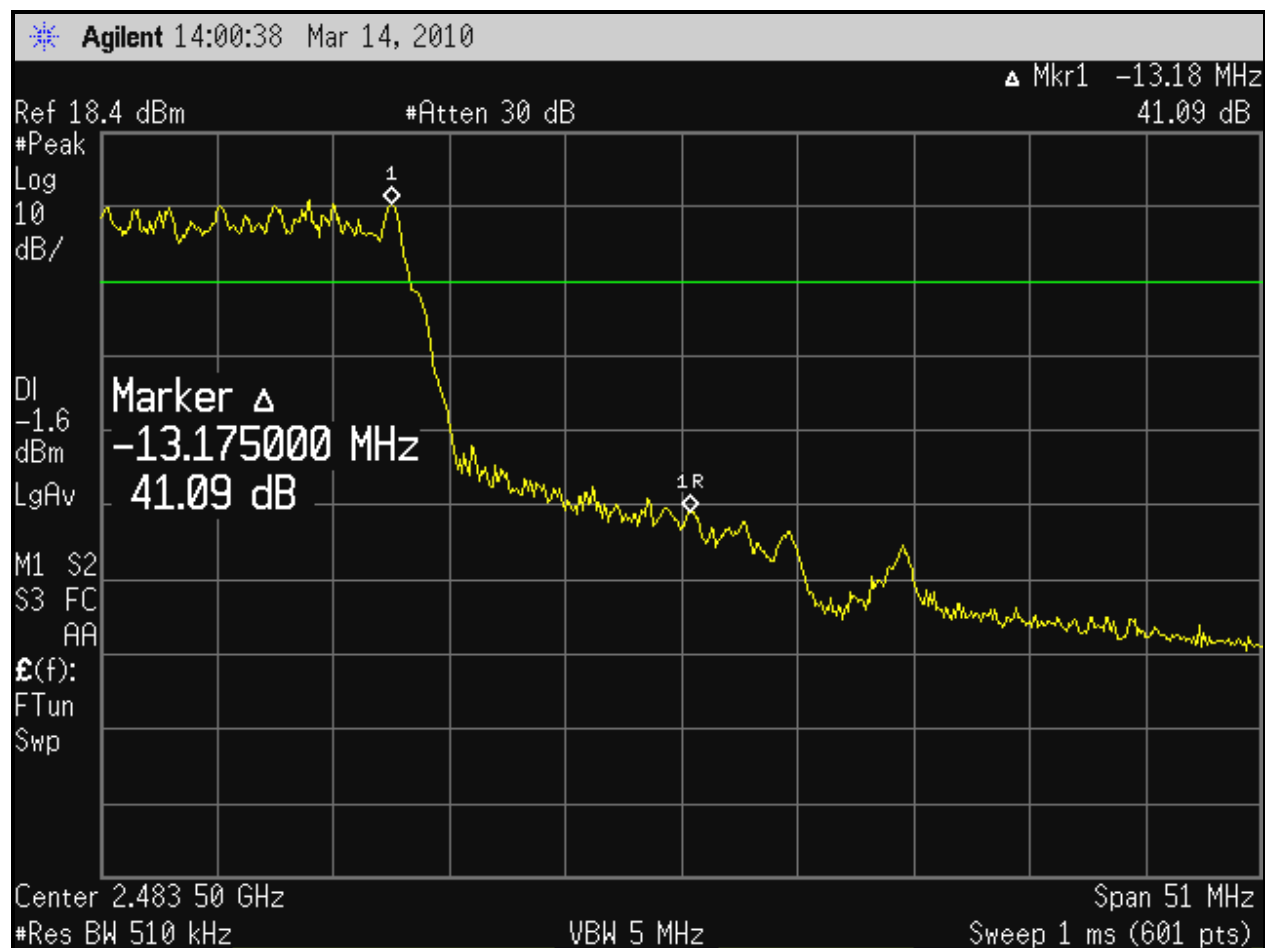
Calculation: $94.7 \text{ dBuV/m} - 41.1 \text{ dB} - 54 \text{ dBuV/m} = -0.4 \text{ dB}$

Peak Field Strength of Lower Band Edge (1 MHz RBW/8 MHz VBW) = 107.1 dBuV/m

Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 94.7 dBuV/m

Delta measurement = 41.1 dB

Plot 4-4: Upper Band Edge 802.11g



Test Personnel:

Daniel W. Baltzell
Test Engineer

Signature

March 14, 2010
Date of Tests

5 Antenna Conducted Spurious Emissions - 15.247(d)

5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(c) were measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 1 MHz. The modulated carrier was identified at the following frequencies: 2412 MHz, 2437 MHz and 2462 MHz.

No harmonics or spurs were found within 20 dB of the limit from the carrier to the 10th harmonic of the carrier frequency (note that we are reporting power as peak) . Per FCC 15.31(o), no data is being reported.

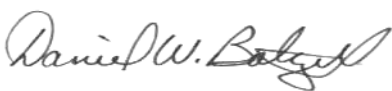
Table 5-1: Antenna Conducted Spurious Emissions Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|----------------------|--------|-------------------|---------------|----------------------|
| 901413 | Agilent Technologies | E4448A | Spectrum Analyzer | US44020346 | 11/10/10 |

5.2 Antenna Conducted Spurious Emissions Test Results

All emissions were more than 20 dB below the limit; per 15.31(o) no data is being reported.

Test Personnel:

| | | |
|--------------------|---|----------------|
| Daniel W. Baltzell |  | March 14, 2010 |
| Test Engineer | Signature | Date of Test |

6 6 dB Bandwidth - 15.247(a)(2)

6.1 6 dB Bandwidth Test Procedure – Minimum 6 dB Bandwidth

The minimum 6 dB bandwidths per FCC 15.247(a)(2) were measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 Hz. The device was modulated. The minimum 6 dB bandwidths are presented below.

Table 6-1: 6 dB Bandwidth Test Equipment

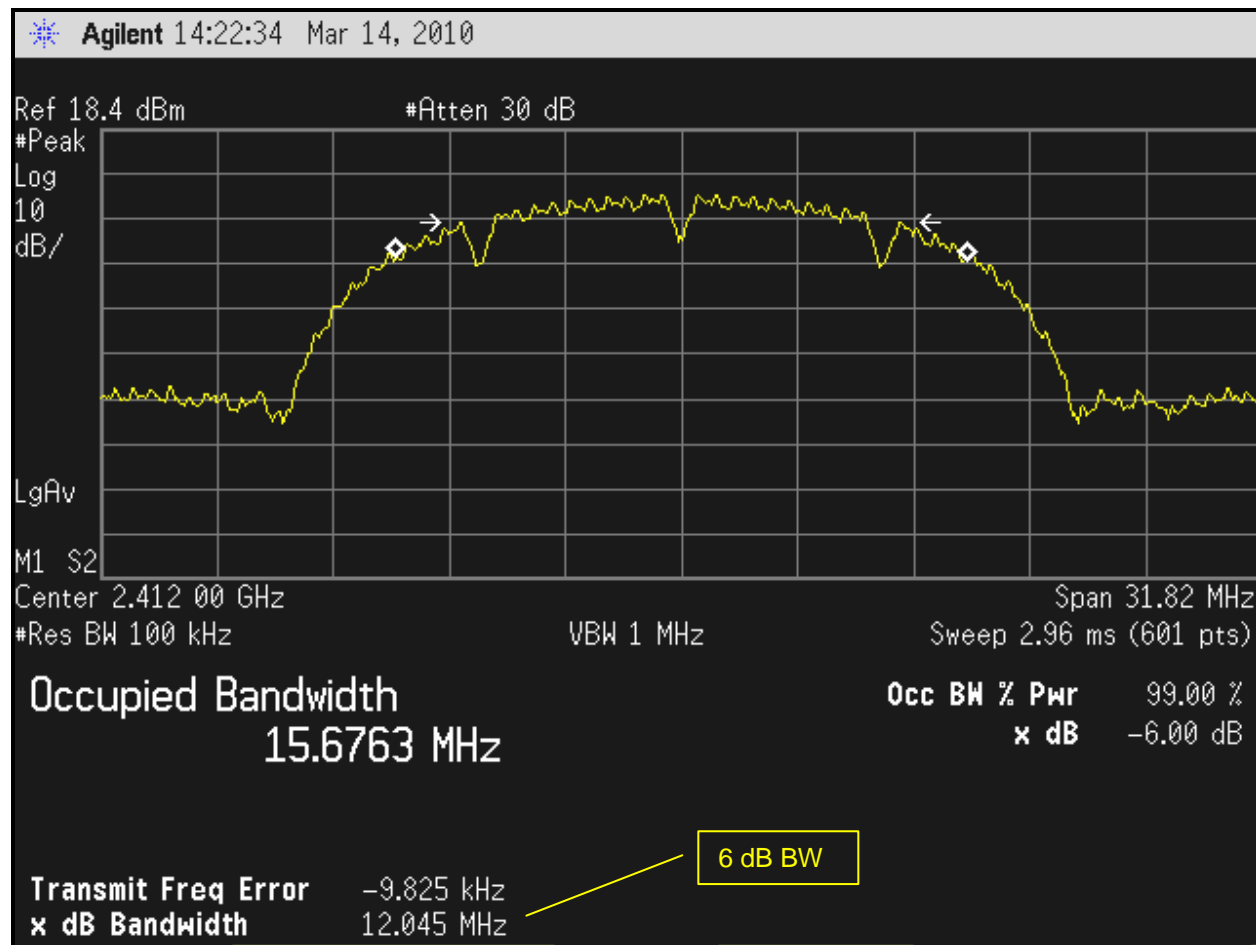
| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|----------------------|--------|-------------------|---------------|----------------------|
| 901413 | Agilent Technologies | E4448A | Spectrum Analyzer | US44020346 | 11/10/10 |

6.2 6 dB Bandwidth Test Results

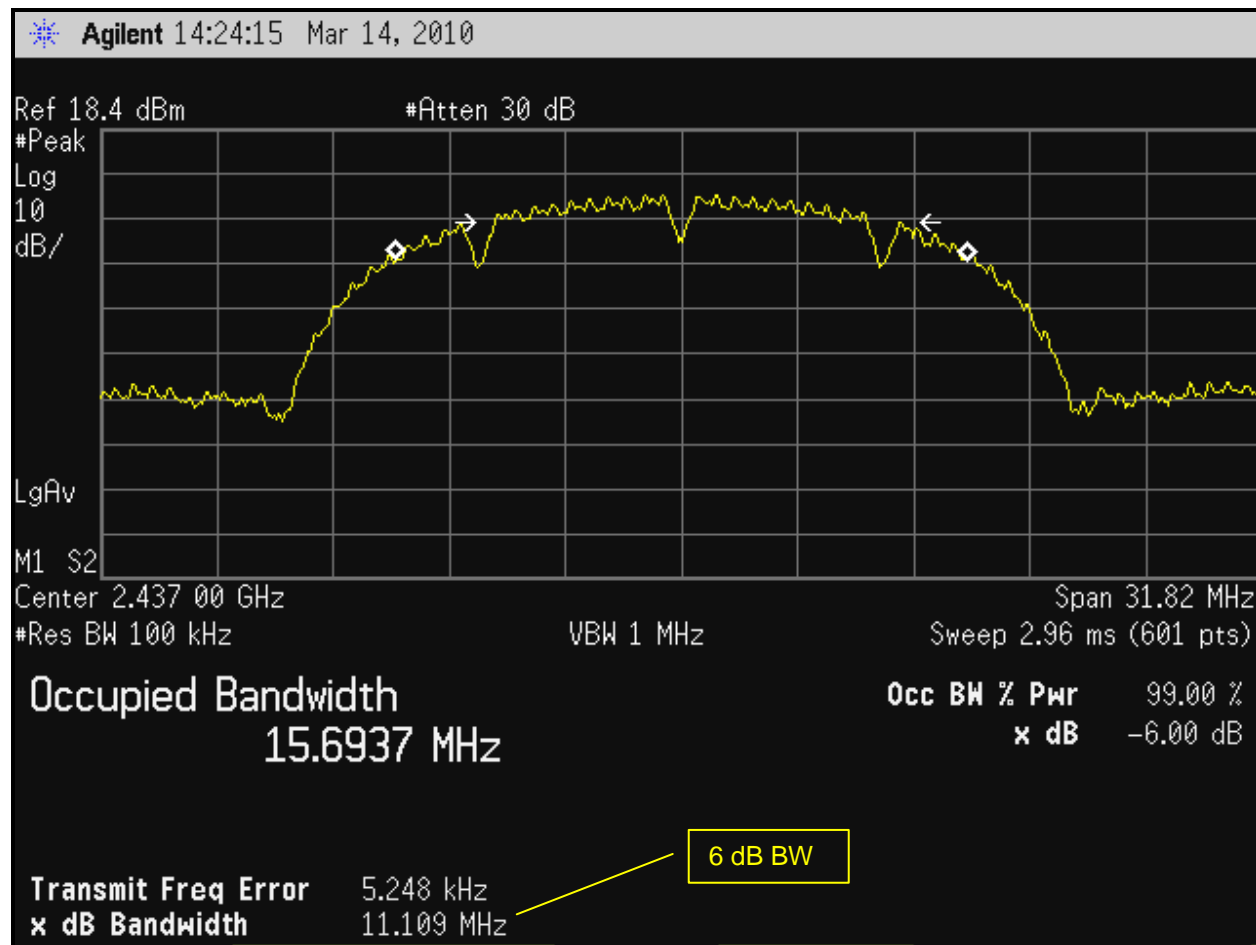
Table 6-2: 6 dB Bandwidth Test Data 802.11b

| Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/Fail |
|-----------------|----------------------|---------------------|-----------|
| 2412 | 12.05 | 0.5 | Pass |
| 2437 | 11.11 | 0.5 | Pass |
| 2462 | 12.05 | 0.5 | Pass |

Plot 6-1: 6 dB Bandwidth – 2412 MHz, 802.11b



Plot 6-2: 6 dB Bandwidth – 2437 MHz, 802.11b



Plot 6-3: 6 dB Bandwidth – 2462 MHz, 802.11b

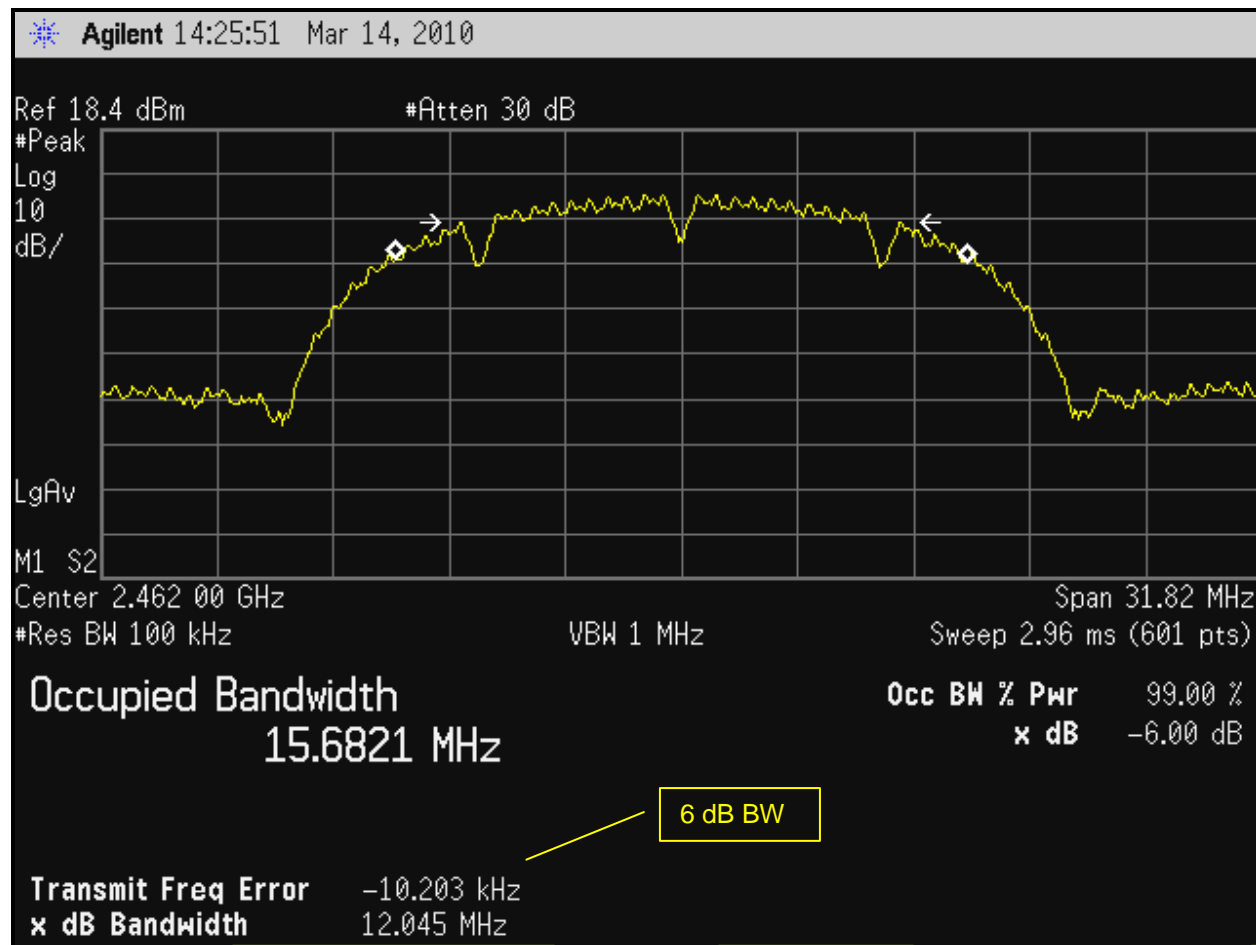
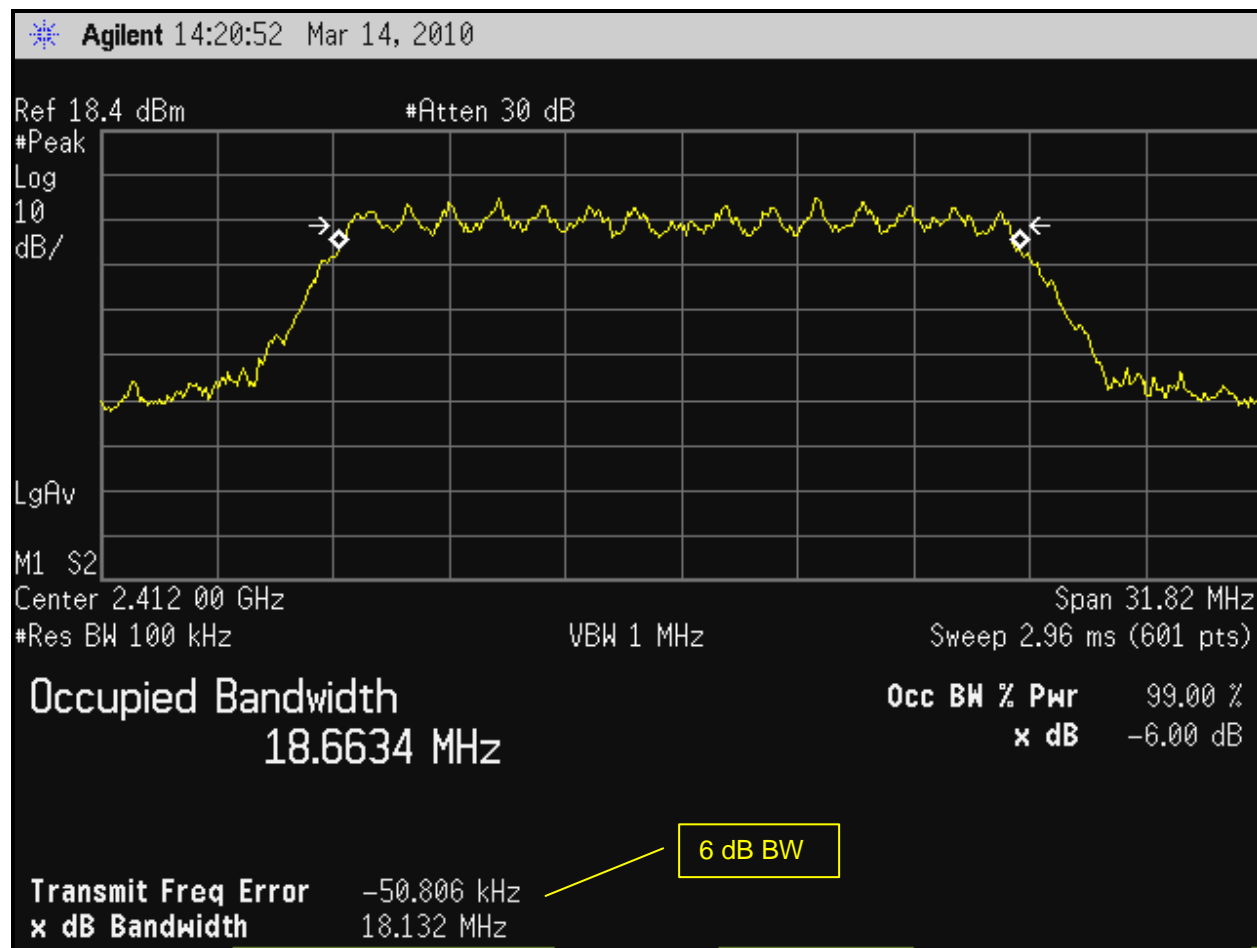


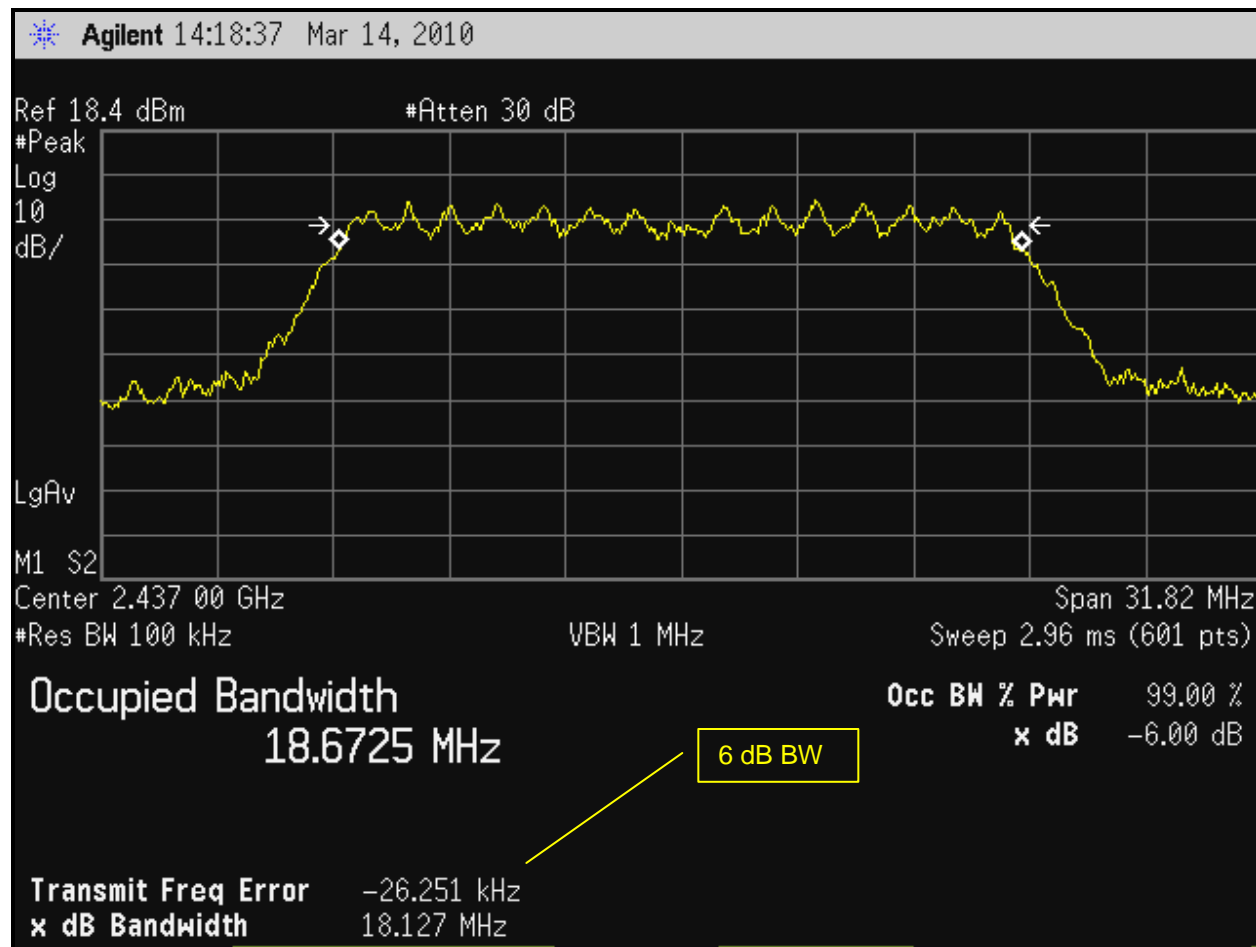
Table 6-3: 6 dB Bandwidth Test Data 802.11g

| Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (MHz) | Pass/Fail |
|-----------------|----------------------|---------------------|-----------|
| 2412 | 18.13 | 0.5 | Pass |
| 2437 | 18.13 | 0.5 | Pass |
| 2462 | 18.13 | 0.5 | Pass |

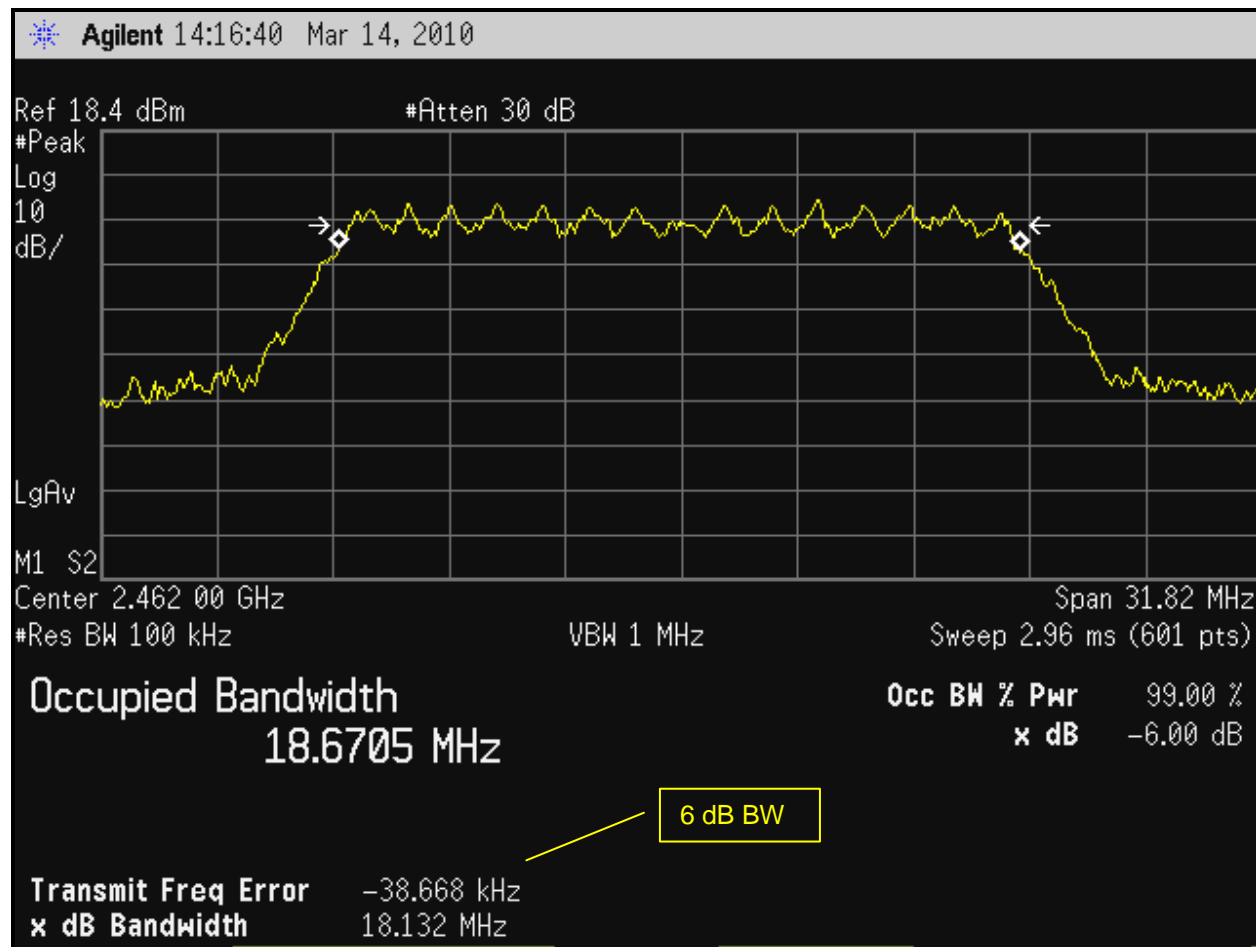
Plot 6-4: 6 dB Bandwidth – 2412 MHz, 802.11g



Plot 6-5: 6 dB Bandwidth – 2437 MHz, 802.11g



Plot 6-6: 6 dB Bandwidth – 2462 MHz, 802.11g



Test Personnel:

Daniel W. Baltzell
 Test Engineer

Daniel W. Baltzell

Signature

March 14, 2010
 Date of Tests

7 Power Spectral Density - 15.247(e)

7.1 Power Spectral Density Test Procedure

The power spectral density per FCC 15.247(e) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 3 kHz, the video bandwidth set at 30 kHz, and the sweep time set at 100 seconds. The spectral lines were resolved for the modulated carriers at 2412, 2437 and 2462 MHz. These levels are below the +8 dBm limit. See the power spectral density table and plots.

Table 7-1: Power Spectral Density Test Equipment

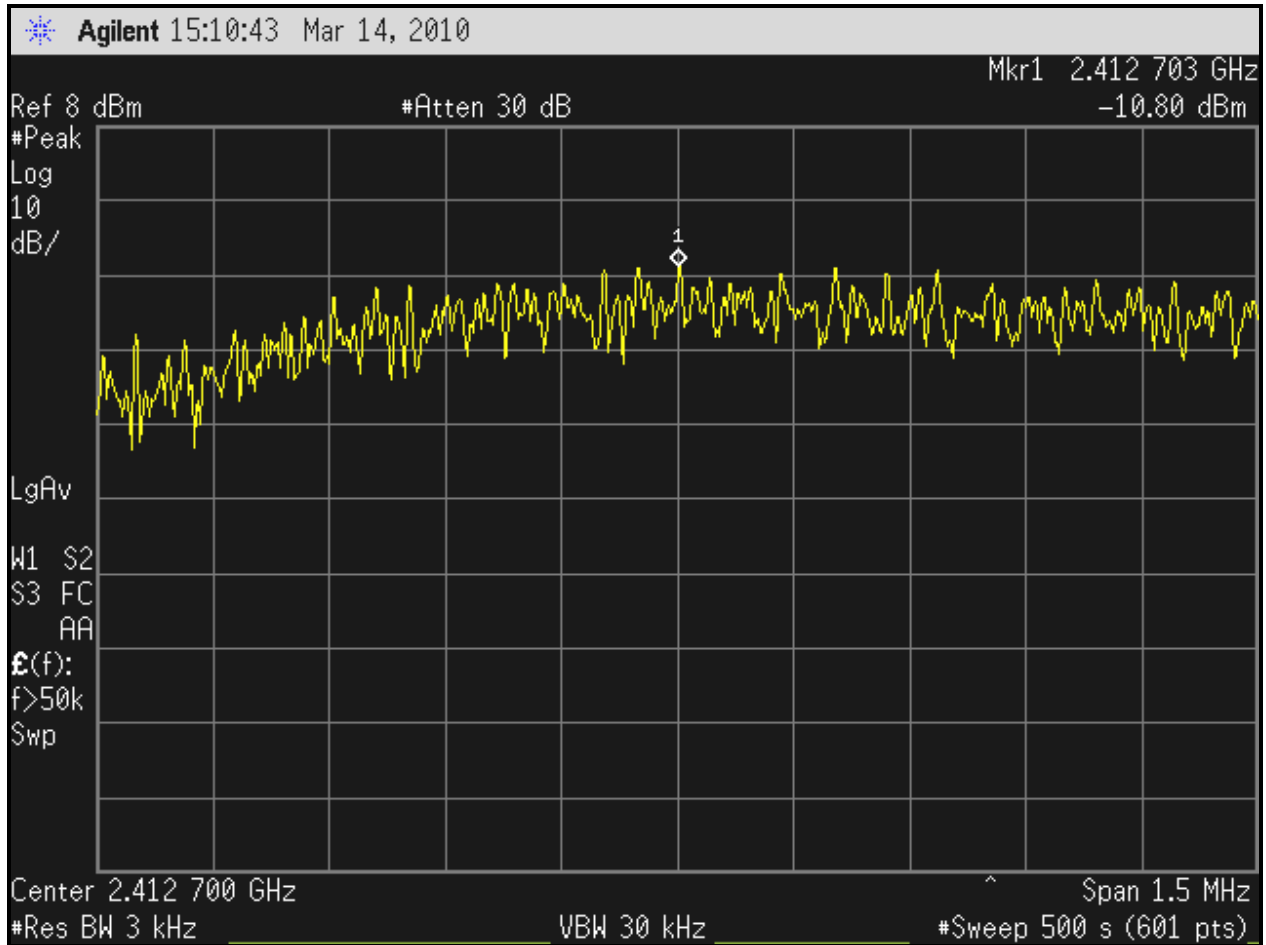
| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|----------------------|--------|-------------------|---------------|----------------------|
| 901413 | Agilent Technologies | E4448A | Spectrum Analyzer | US44020346 | 11/10/10 |

7.2 Power Spectral Density Test Data

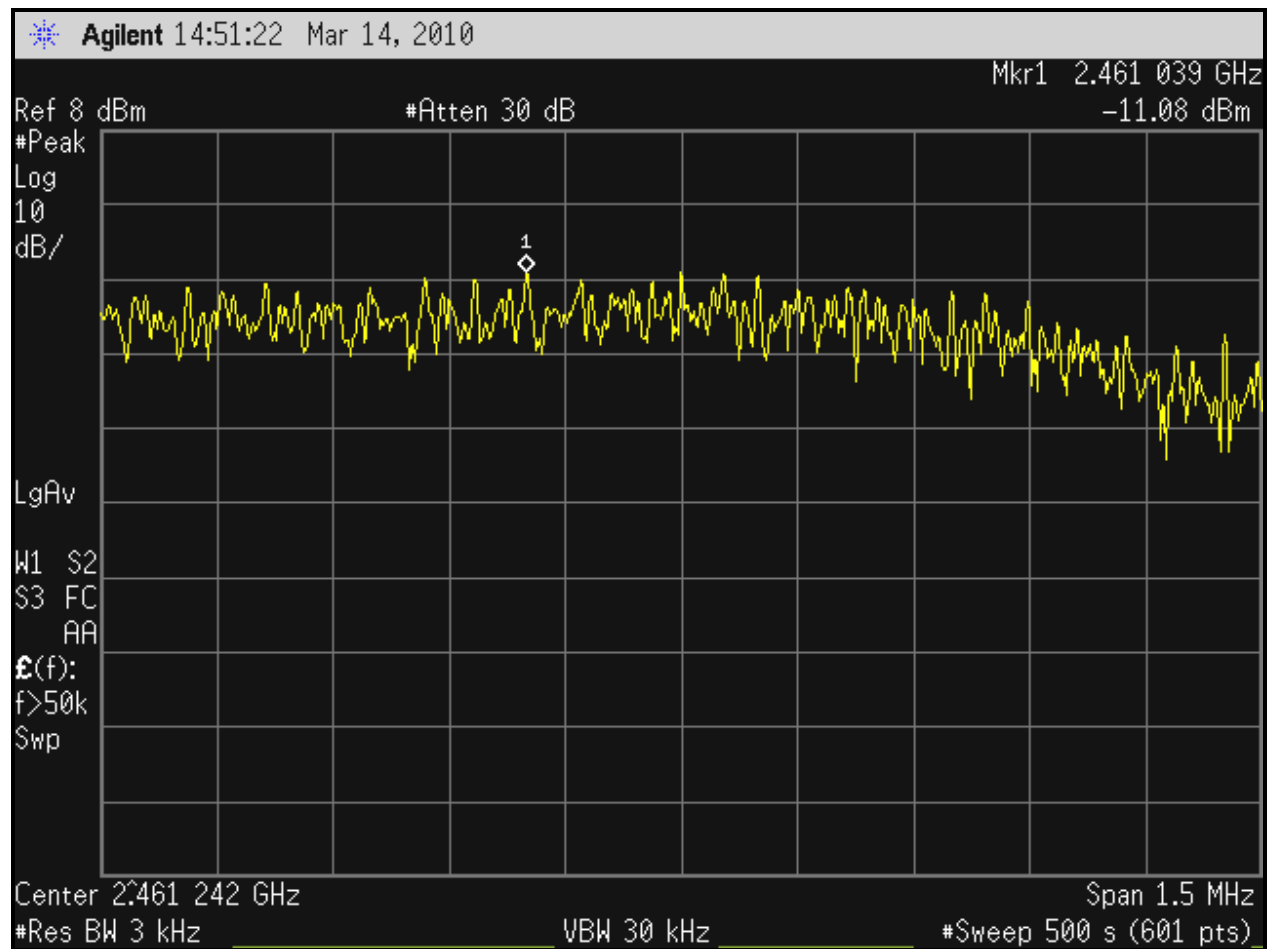
Table 7-2: Power Spectral Density Test Data 802.11b

| Frequency (MHz) | RF Power Level (dBm) | Maximum Limit +8dBm | Pass/Fail |
|-----------------|----------------------|---------------------|-----------|
| 2412 | -11.0 | 8 | Pass |
| 2437 | -11.1 | 8 | Pass |
| 2462 | -10.8 | 8 | Pass |

Plot 7-1: Power Spectral Density – 2412 MHz, 802.11b



Plot 7-2: Power Spectral Density – 2437 MHz, 802.11b



Plot 7-3: Power Spectral Density – 2462 MHz, 802.11b

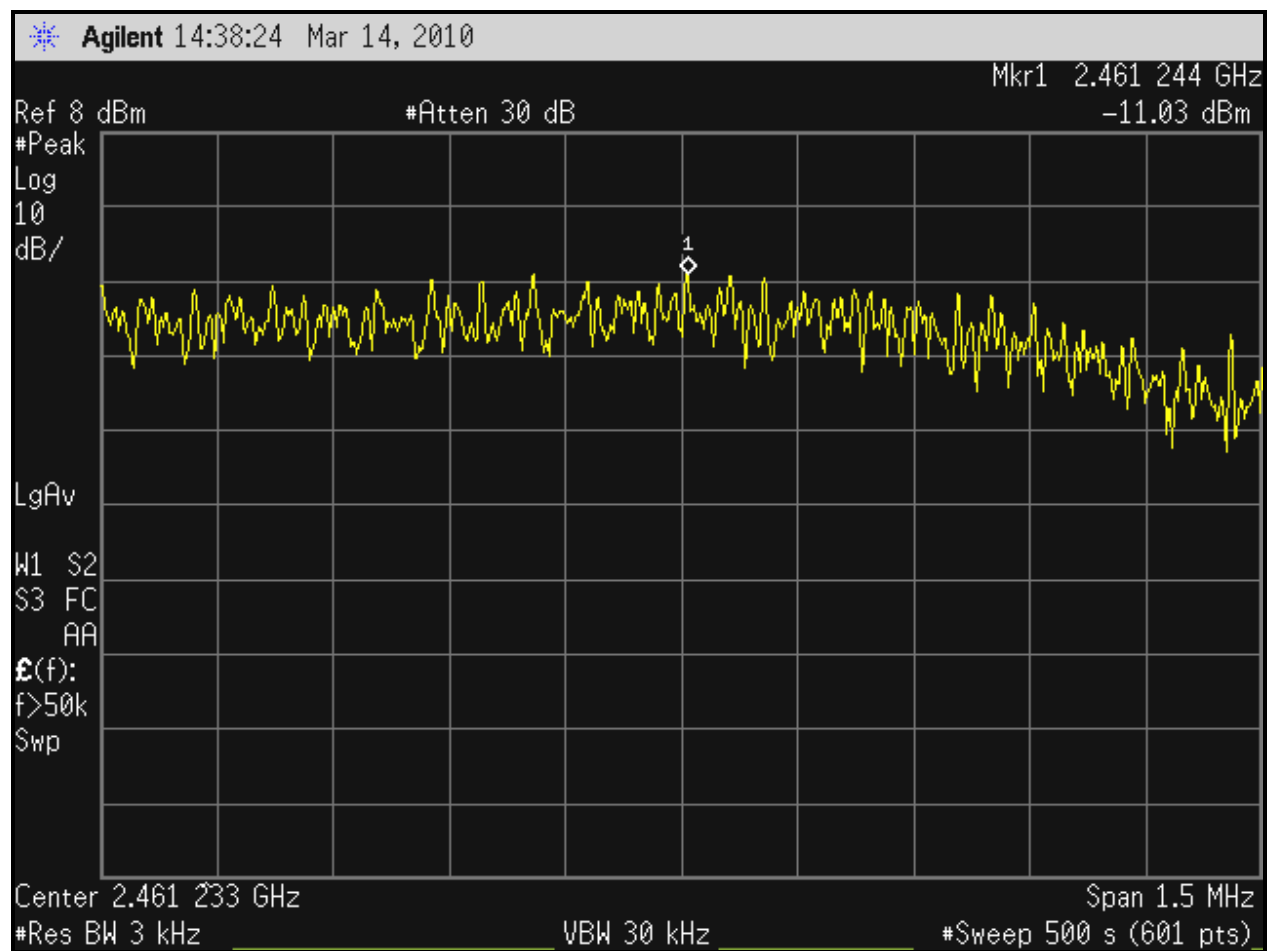
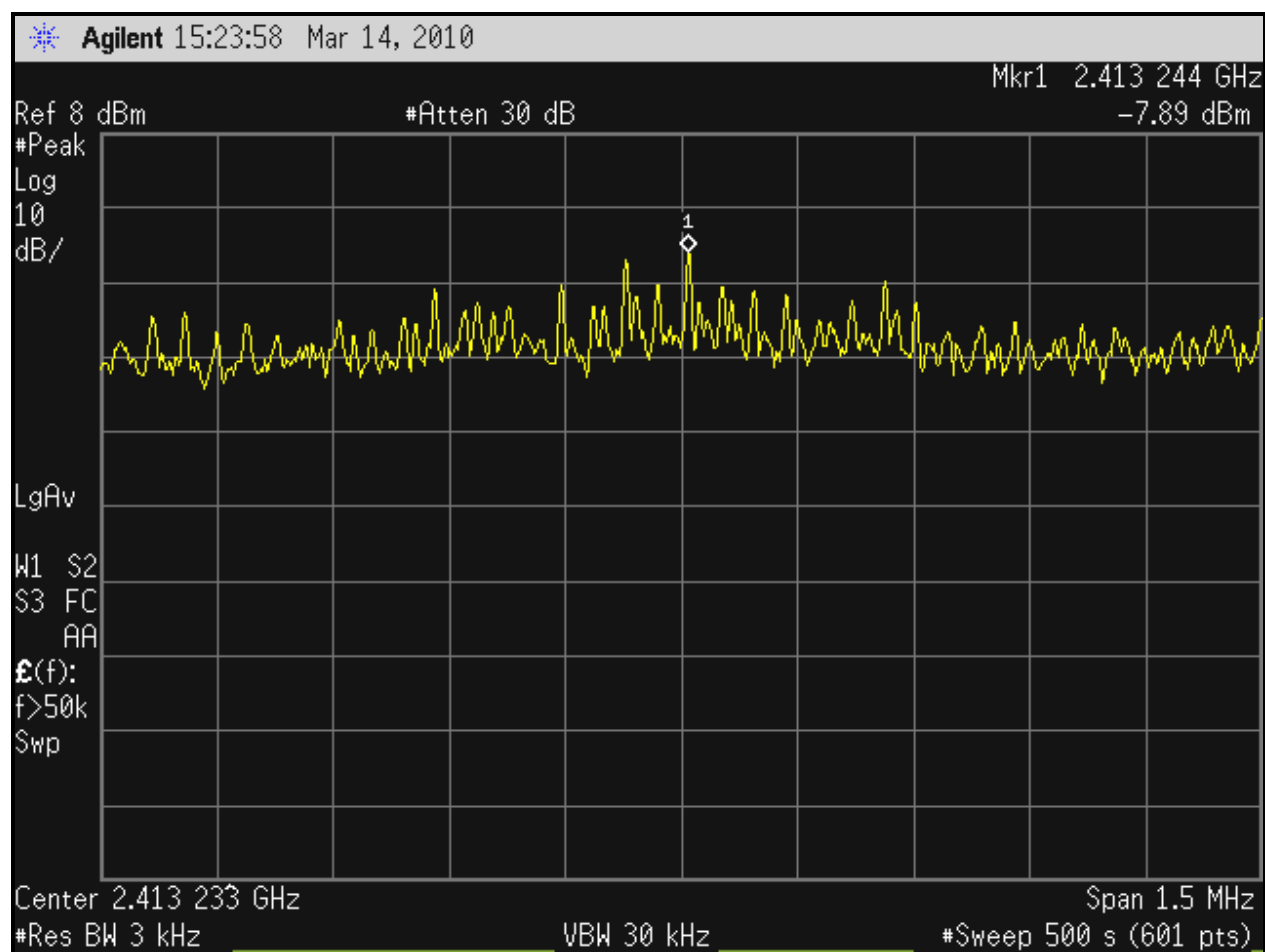


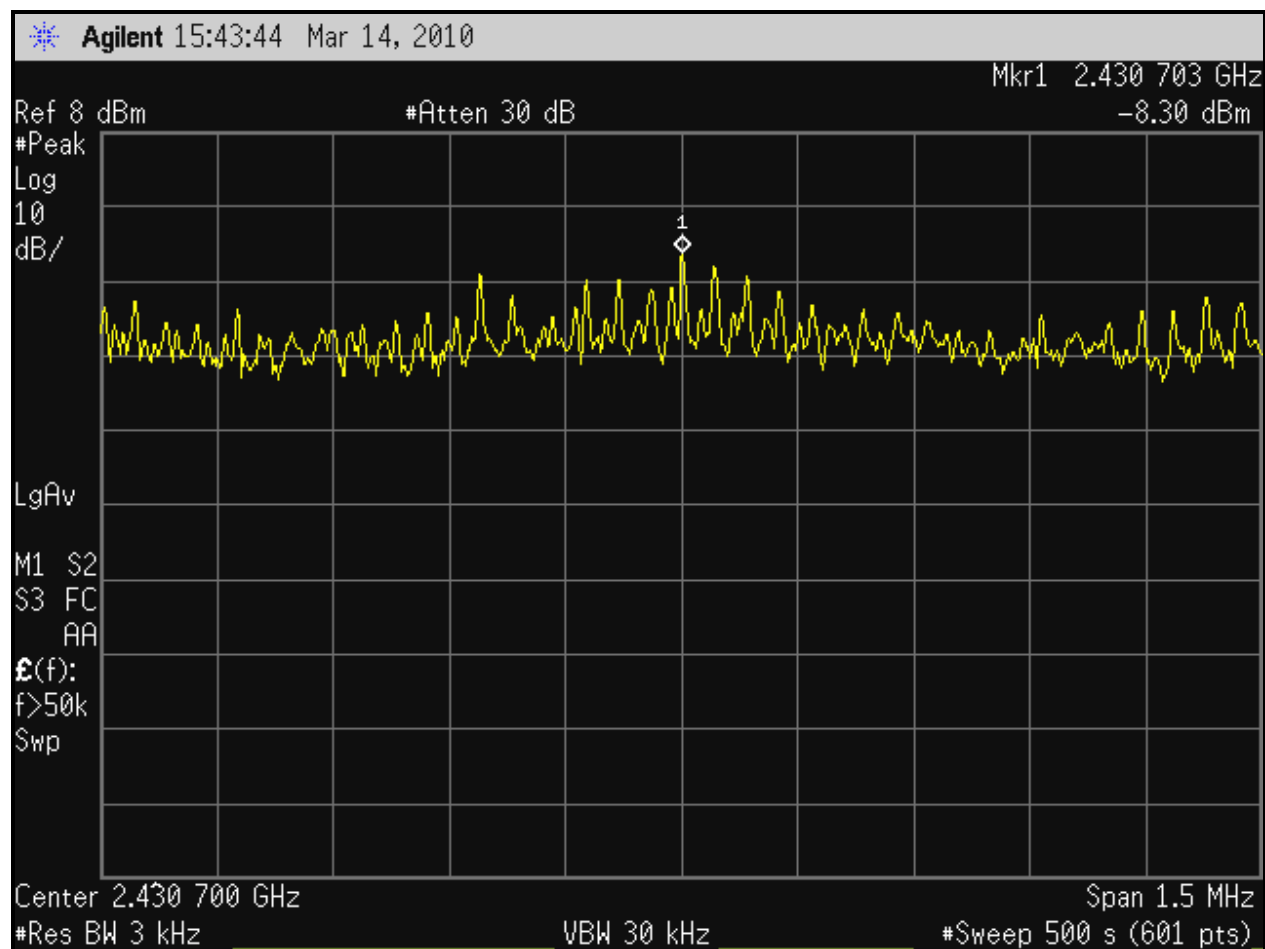
Table 7-3: Power Spectral Density Test Data 802.11g

| Frequency (MHz) | RF Power Level (dBm) | Maximum Limit +8dBm | Pass/Fail |
|-----------------|----------------------|---------------------|-----------|
| 2412 | -7.9 | 8 | Pass |
| 2437 | -8.3 | 8 | Pass |
| 2462 | -8.0 | 8 | Pass |

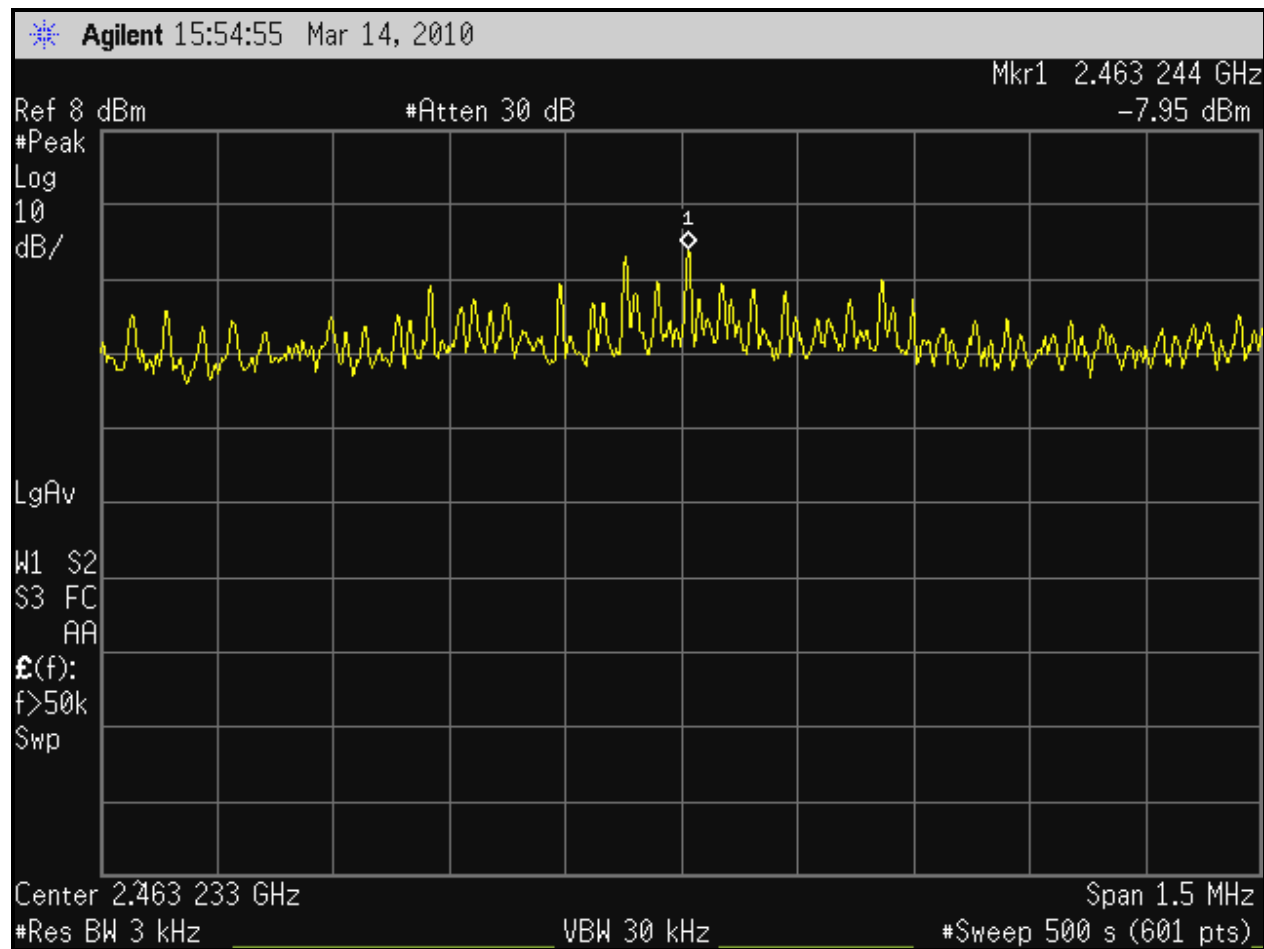
Plot 7-4: Power Spectral Density – 2412 MHz, 802.11g



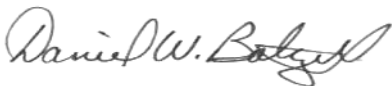
Plot 7-5: Power Spectral Density – 2437 MHz, 802.11g



Plot 7-6: Power Spectral Density – 2462 MHz, 802.11g



Test Personnel:

| | | |
|-------------------------------------|--|---------------------------------|
| Daniel W. Baltzell Test Engineer |  Signature | March 14, 2010 Date of Tests |
|-------------------------------------|--|---------------------------------|

8 Conducted Emissions Measurement Limits – FCC 15.207

8.1 Limits of Conducted Emissions Measurement

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|-----------------------------|------------------------|---------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66-56 | 56-46 |
| 0.5-5.0 | 56 | 46 |
| 5.0-30.0 | 60 | 50 |

8.2 Site and Test Description

The power line conducted emissions measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50 ohm/50 microhenry Line Impedance Stabilization Network (LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50 ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 100 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable).

The analyzer's 6 dB bandwidth was set to 9 kHz. Video filter less than 10 times the resolution bandwidth is not used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limits were measured and have been recorded.

Table 8-1: Conducted Emissions Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-------------------|--------|---|---------------|----------------------|
| 900970 | Hewlett Packard | 85662A | Display Section | 2542A11239 | 10/26/10 |
| 900968 | Hewlett Packard | 8567A | HP Spectrum Analyzer (10 KHz - 1.5GHz) | 2602A00160 | 10/26/10 |
| 900969 | Hewlett Packard | 85650A | Quasi-Peak Adapter (30 Hz - 1 GHz) | 2412A00414 | 8/26/10 |
| 901083 | AFJ International | LS16 | 16A LISN | 16010020080 | 11/4/10 |

8.3 Conducted Emissions Test Data

Table 8-2: Conducted Emissions Test Data – Neutral - TX Mode – 802.11b, Channel 6

| Temperature: 74°F Humidity: 38% | | | | | | | | | |
|---------------------------------|---------------|-------------------------|-----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|-----------|
| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC 15.207 QP Limit (dBuV) | FCC 15.207 QP Margin (dBuV) | FCC 15.207 AV Limit (dBuV) | FCC 15.207 AV Margin (dBuV) | Pass/Fail |
| 0.252 | Av | 44.3 | 0.4 | 44.7 | | | 51.7 | -7.0 | Pass |
| 0.252 | Qp | 53.9 | 0.4 | 54.3 | 61.7 | -7.4 | | | Pass |
| 0.325 | Av | 43.6 | 0.5 | 44.1 | | | 49.6 | -5.5 | Pass |
| 0.325 | Qp | 52.4 | 0.5 | 52.9 | 59.6 | -6.7 | | | Pass |
| 0.471 | Av | 42.0 | 0.6 | 42.6 | | | 46.5 | -3.9 | Pass |
| 0.471 | Qp | 48.5 | 0.6 | 49.1 | 56.5 | -7.4 | | | Pass |
| 0.505 | Av | 43.5 | 0.6 | 44.1 | | | 46.0 | -1.9 | Pass |
| 0.505 | Qp | 53.4 | 0.6 | 54.0 | 56.0 | -2.0 | | | Pass |
| 0.683 | Av | 41.5 | 0.5 | 42.0 | | | 46.0 | -4.0 | Pass |
| 0.683 | Qp | 52.0 | 0.5 | 52.5 | 56.0 | -3.5 | | | Pass |
| 0.899 | Av | 40.6 | 0.6 | 41.2 | | | 46.0 | -4.8 | Pass |
| 0.899 | Qp | 52.9 | 0.6 | 53.5 | 56.0 | -2.5 | | | Pass |
| 2.265 | Av | 33.4 | 1.3 | 34.7 | | | 46.0 | -11.3 | Pass |
| 2.265 | Qp | 50.3 | 1.3 | 51.6 | 56.0 | -4.4 | | | Pass |
| 9.100 | Pk | 33.8 | 2.4 | 36.2 | | | 50.0 | -13.8 | Pass |
| 27.080 | Pk | 31.3 | 4.3 | 35.6 | | | 50.0 | -14.4 | Pass |

Table 8-3: Conducted Emissions Test Data – Hot – TX Mode – 802.11b, Channel 6

| Temperature: 74°F Humidity: 38% | | | | | | | | | |
|---------------------------------|---------------|-------------------------|-----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|-----------|
| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC 15.207 QP Limit (dBuV) | FCC 15.207 QP Margin (dBuV) | FCC 15.207 AV Limit (dBuV) | FCC 15.207 AV Margin (dBuV) | Pass/Fail |
| 0.253 | Av | 41.2 | 0.3 | 41.5 | | | 51.7 | -10.2 | Pass |
| 0.253 | Qp | 48.4 | 0.3 | 48.7 | 61.7 | -13.0 | | | Pass |
| 0.325 | Av | 39.6 | 0.4 | 40.0 | | | 49.6 | -9.6 | Pass |
| 0.325 | Qp | 47.3 | 0.4 | 47.7 | 59.6 | -11.9 | | | Pass |
| 0.472 | Av | 38.0 | 0.4 | 38.4 | | | 46.5 | -8.1 | Pass |
| 0.472 | Qp | 38.4 | 0.4 | 38.8 | 56.5 | -17.7 | | | Pass |
| 0.505 | Av | 39.7 | 0.4 | 40.1 | | | 46.0 | -5.9 | Pass |
| 0.505 | Qp | 47.2 | 0.4 | 47.6 | 56.0 | -8.4 | | | Pass |
| 0.683 | Av | 38.9 | 0.4 | 39.3 | | | 46.0 | -6.7 | Pass |
| 0.683 | Qp | 45.9 | 0.4 | 46.3 | 56.0 | -9.7 | | | Pass |
| 0.897 | Av | 36.2 | 0.6 | 36.8 | | | 46.0 | -9.2 | Pass |
| 0.897 | Qp | 45.9 | 0.6 | 46.5 | 56.0 | -9.5 | | | Pass |
| 2.085 | Av | 30.3 | 1.2 | 31.5 | | | 46.0 | -14.5 | Pass |
| 2.085 | Qp | 42.5 | 1.2 | 43.7 | 56.0 | -12.3 | | | Pass |
| 9.210 | Pk | 33.1 | 2.4 | 35.5 | | | 50.0 | -14.5 | Pass |
| 26.680 | Pk | 31.4 | 5.2 | 36.6 | | | 50.0 | -13.4 | Pass |

Table 8-4: Conducted Emissions Test Data – Neutral - TX Mode – 802.11g, Channel 6

| Temperature: 74°F Humidity: 38% | | | | | | | | | |
|---------------------------------|---------------|-------------------------|-----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|-----------|
| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC 15.207 QP Limit (dBuV) | FCC 15.207 QP Margin (dBuV) | FCC 15.207 AV Limit (dBuV) | FCC 15.207 AV Margin (dBuV) | Pass/Fail |
| 0.176 | Av | 41.0 | 0.3 | 41.3 | | | 54.7 | -13.4 | Pass |
| 0.176 | Qp | 50.4 | 0.3 | 50.7 | 64.7 | -14.0 | | | Pass |
| 0.248 | Av | 41.5 | 0.4 | 41.9 | | | 51.8 | -9.9 | Pass |
| 0.248 | Qp | 52.7 | 0.4 | 53.1 | 61.8 | -8.7 | | | Pass |
| 0.284 | Av | 39.9 | 0.5 | 40.4 | | | 50.7 | -10.3 | Pass |
| 0.284 | Qp | 50.9 | 0.5 | 51.4 | 60.7 | -9.3 | | | Pass |
| 0.322 | Av | 40.9 | 0.5 | 41.4 | | | 49.7 | -8.3 | Pass |
| 0.322 | Qp | 52.5 | 0.5 | 53.0 | 59.7 | -6.7 | | | Pass |
| 0.431 | Av | 38.4 | 0.6 | 39.0 | | | 47.2 | -8.2 | Pass |
| 0.431 | Qp | 50.4 | 0.6 | 51.0 | 57.2 | -6.2 | | | Pass |
| 0.467 | Av | 39.6 | 0.6 | 40.2 | | | 46.6 | -6.4 | Pass |
| 0.467 | Qp | 52.1 | 0.6 | 52.7 | 56.6 | -3.9 | | | Pass |
| 0.502 | Av | 41.1 | 0.6 | 41.7 | | | 46.0 | -4.3 | Pass |
| 0.502 | Qp | 53.3 | 0.6 | 53.9 | 56.0 | -2.1 | | | Pass |
| 0.685 | Av | 40.9 | 0.5 | 41.4 | | | 46.0 | -4.6 | Pass |
| 0.685 | Qp | 42.0 | 0.5 | 42.5 | 56.0 | -13.5 | | | Pass |
| 0.899 | Av | 39.3 | 0.6 | 39.9 | | | 46.0 | -6.1 | Pass |
| 0.899 | Qp | 49.4 | 0.6 | 50.0 | 56.0 | -6.0 | | | Pass |
| 1.075 | Av | 38.4 | 0.7 | 39.1 | | | 46.0 | -6.9 | Pass |
| 1.075 | Qp | 52.8 | 0.7 | 53.5 | 56.0 | -2.5 | | | Pass |
| 2.076 | Av | 34.6 | 1.2 | 35.8 | | | 46.0 | -10.2 | Pass |
| 2.076 | Qp | 49.1 | 1.2 | 50.3 | 56.0 | -5.7 | | | Pass |
| 3.430 | Av | 31.0 | 1.5 | 32.5 | | | 46.0 | -13.5 | Pass |
| 3.430 | Qp | 32.7 | 1.5 | 34.2 | 56.0 | -21.8 | | | Pass |
| 9.000 | Pk | 34.9 | 2.4 | 37.3 | | | 50.0 | -12.7 | Pass |
| 27.380 | Pk | 31.9 | 4.4 | 36.3 | | | 50.0 | -13.7 | Pass |

Table 8-5: Conducted Emissions Test Data – Hot – TX Mode – 802.11g, Channel 6

| Temperature: 74°F Humidity: 38% | | | | | | | | | |
|---------------------------------|---------------|-------------------------|-----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|-----------|
| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC 15.207 QP Limit (dBuV) | FCC 15.207 QP Margin (dBuV) | FCC 15.207 AV Limit (dBuV) | FCC 15.207 AV Margin (dBuV) | Pass/Fail |
| 0.178 | Av | 38.6 | 0.2 | 38.8 | | | 54.6 | -15.8 | Pass |
| 0.178 | Qp | 48.7 | 0.2 | 48.9 | 64.6 | -15.7 | | | Pass |
| 0.214 | Av | 36.9 | 0.3 | 37.2 | | | 53.0 | -15.8 | Pass |
| 0.214 | Qp | 48.5 | 0.3 | 48.8 | 63.0 | -14.2 | | | Pass |
| 0.250 | Av | 39.3 | 0.3 | 39.6 | | | 51.8 | -12.2 | Pass |
| 0.250 | Qp | 48.6 | 0.3 | 48.9 | 61.8 | -12.9 | | | Pass |
| 0.325 | Av | 37.4 | 0.4 | 37.8 | | | 49.6 | -11.8 | Pass |
| 0.325 | Qp | 46.9 | 0.4 | 47.3 | 59.6 | -12.3 | | | Pass |
| 0.360 | Av | 32.5 | 0.4 | 32.9 | | | 48.7 | -15.8 | Pass |
| 0.360 | Qp | 41.3 | 0.4 | 41.7 | 58.7 | -17.0 | | | Pass |
| 0.682 | Av | 38.8 | 0.4 | 39.2 | | | 46.0 | -6.8 | Pass |
| 0.682 | Qp | 45.8 | 0.4 | 46.2 | 56.0 | -9.8 | | | Pass |
| 0.716 | Av | 36.6 | 0.4 | 37.0 | | | 46.0 | -9.0 | Pass |
| 0.716 | Qp | 44.2 | 0.4 | 44.6 | 56.0 | -11.4 | | | Pass |
| 2.910 | Av | 25.9 | 1.4 | 27.3 | | | 46.0 | -18.7 | Pass |
| 2.910 | Qp | 43.7 | 1.4 | 45.1 | 56.0 | -10.9 | | | Pass |
| 9.420 | Pk | 32.7 | 2.4 | 35.1 | | | 50.0 | -14.9 | Pass |
| 28.070 | Pk | 32.9 | 5.4 | 38.3 | | | 50.0 | -11.7 | Pass |

Table 8-6: Conducted Emissions Test Data – Neutral - RX Mode- Channel 6

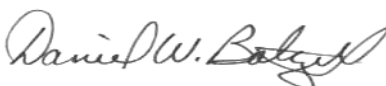
| Temperature: 74°F Humidity: 38% | | | | | | | | | |
|---------------------------------|---------------|-------------------------|-----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|-----------|
| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC 15.207 QP Limit (dBuV) | FCC 15.207 QP Margin (dBuV) | FCC 15.207 AV Limit (dBuV) | FCC 15.207 AV Margin (dBuV) | Pass/Fail |
| 0.251 | Av | 43.0 | 0.4 | 43.4 | | | 51.7 | -8.3 | Pass |
| 0.251 | Qp | 54.3 | 0.4 | 54.7 | 61.7 | -7.0 | | | Pass |
| 0.468 | Av | 40.7 | 0.6 | 41.3 | | | 46.5 | -5.2 | Pass |
| 0.468 | Qp | 53.1 | 0.6 | 53.7 | 56.5 | -2.8 | | | Pass |
| 0.503 | Av | 42.1 | 0.6 | 42.7 | | | 46.0 | -3.3 | Pass |
| 0.503 | Qp | 53.7 | 0.6 | 54.3 | 56.0 | -1.7 | | | Pass |
| 0.683 | Av | 40.2 | 0.5 | 40.7 | | | 46.0 | -5.3 | Pass |
| 0.683 | Qp | 52.0 | 0.5 | 52.5 | 56.0 | -3.5 | | | Pass |
| 0.863 | Av | 39.4 | 0.6 | 40.0 | | | 46.0 | -6.0 | Pass |
| 0.863 | Qp | 53.0 | 0.6 | 53.6 | 56.0 | -2.4 | | | Pass |
| 2.448 | Av | 32.8 | 1.3 | 34.1 | | | 46.0 | -11.9 | Pass |
| 2.448 | Qp | 50.1 | 1.3 | 51.4 | 56.0 | -4.6 | | | Pass |
| 11.730 | Pk | 39.9 | 2.8 | 42.7 | | | 50.0 | -7.3 | Pass |
| 24.580 | Pk | 43.2 | 4.1 | 47.3 | | | 50.0 | -2.7 | Pass |

Table 8-7: Conducted Emissions Test Data – Hot – RX Mode – Channel 6

| Temperature: 74°F Humidity: 38% | | | | | | | | | |
|---------------------------------|---------------|-------------------------|-----------------------------|-----------------------|----------------------------|-----------------------------|----------------------------|-----------------------------|-----------|
| Emission Frequency (MHz) | Test Detector | Analyzer Reading (dBuV) | Site Correction Factor (dB) | Emission Level (dBuV) | FCC 15.207 QP Limit (dBuV) | FCC 15.207 QP Margin (dBuV) | FCC 15.207 AV Limit (dBuV) | FCC 15.207 AV Margin (dBuV) | Pass/Fail |
| 0.252 | Av | 39.8 | 0.3 | 40.1 | | | 51.7 | -11.6 | Pass |
| 0.252 | Qp | 49.8 | 0.3 | 50.1 | 61.7 | -11.6 | | | Pass |
| 0.468 | Av | 37.1 | 0.4 | 37.5 | | | 46.5 | -9.0 | Pass |
| 0.468 | Qp | 46.8 | 0.4 | 47.2 | 56.5 | -9.3 | | | Pass |
| 0.683 | Av | 37.7 | 0.4 | 38.1 | | | 46.0 | -7.9 | Pass |
| 0.683 | Qp | 46.0 | 0.4 | 46.4 | 56.0 | -9.6 | | | Pass |
| 2.304 | Av | 29.4 | 1.3 | 30.7 | | | 46.0 | -15.3 | Pass |
| 2.304 | Qp | 44.3 | 1.3 | 45.6 | 56.0 | -10.4 | | | Pass |
| 9.610 | Pk | 38.4 | 2.5 | 40.9 | | | 50.0 | -9.1 | Pass |
| 11.710 | Pk | 35.8 | 2.8 | 38.6 | | | 50.0 | -11.4 | Pass |
| 24.580 | Pk | 42.4 | 4.8 | 47.2 | | | 50.0 | -2.8 | Pass |

Test Personnel:

Daniel W. Baltzell
Test Engineer



Signature

March 14, 2010
Date of Test

9 Radiated Emissions - 15.209

9.1 Limits of Radiated Emissions Measurement

| Frequency (MHz) | Field Strength (uV/m) | Measurement Distance (m) |
|-----------------|-----------------------|--------------------------|
| 0.009-0.490 | 2400/f (kHz) | 300 |
| 0.490-1.705 | 2400/f (kHz) | 30 |
| 1.705-30.0 | 30 | 30 |
| 30-88 | 100 | 3 |
| 88-216 | 150 | 3 |
| 216-960 | 200 | 3 |
| Above 960 | 500 | 3 |

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any circumstances of modulation.

9.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10th harmonic of the highest fundamental transmitter frequency (24.8 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 9-1: Radiated Emissions Test Equipment

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|-------------|-------------------------|----------------------------|--|-----------------|----------------------|
| 900151 | Rohde and Schwarz | HFH2-Z2 | Loop Antenna (9 kHz - 30 MHz) | 827525/019 | 10/1/12 |
| 900932 | Hewlett Packard | 8449B OPT H02 | Preamplifier (1 - 26.5 GHz) | 3008A00505 | 2/22/11 |
| 900905 | Rhein Tech Labs | PR-1040 | OATS 1 Preamplifier 40dB (30 MHz – 2 GHz) | 1006 | 4/10/10 |
| 900878 | Rhein Tech Laboratories | AM3-1197-0005 | 3 meter antenna mast, polarizing | Outdoor Range 1 | Not Required |
| 901516 | Insulated Wire, Inc. | KPS-1503-2400-KPS-09302008 | RF cable, 20' | NA | 10/19/10 |
| 901517 | Insulated Wire Inc. | KPS-1503-360-KPS-09302008 | RF cable 36" | NA | 10/19/10 |
| 901242 | Rhein Tech Laboratories | WRT-000-0003 | Wood rotating table | N/A | Not Required |
| 900913 | Hewlett Packard | 85462A | EMI Receiver RF Section (9 kHz – 6.5 GHz) | 3325A00159 | 6/8/10 |
| 901413 | Agilent Technologies | E4448A | Spectrum Analyzer | US44020346 | 11/10/10 |
| 900772 | EMCO | 3161-02 | Horn Antenna (2 - 4 GHz) | 9804-1044 | 6/14/10 |
| 900321 | EMCO | 3161-03 | Horn Antenna (4.0 - 8.2 GHz) | 9508-1020 | 6/14/10 |
| 900323 | EMCO | 3160-07 | Horn Antenna (8.2 - 12.4 GHz) | 9605-1054 | 6/14/10 |
| 900356 | EMCO | 3160-08 | Horn Antenna (12.4 - 18 GHz) | 9607-1044 | 6/14/10 |
| 900325 | EMCO | 3160-9 | Horn Antennas (18 - 26.5 GHz) | 9605-1051 | 6/14/10 |

9.3 Radiated Emissions Test Results

9.3.1 Radiated Emissions Harmonics/Spurious Test Data

Table 9-2: Radiated Emissions Harmonics/Spurious - 2412 MHz, 802.11b

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Average Analyzer Reading (dBuV) (1 MHz RBW 10 Hz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|--|---|-------------------------------|---------------------------------|------------------------|---------------------|
| 4824.000 | 46.0 | 34.7 | 11.9 | 46.6 | 54.0 | -7.4 |
| 12060.000 | 41.9 | 28.8 | 12.6 | 41.4 | 54.0 | -12.6 |
| 14472.000 | 38.4 | 27.8 | 17.5 | 45.3 | 54.0 | -8.7 |
| 19296.000 | 32.3 | 22.2 | 23.5 | 45.7 | 54.0 | -8.3 |

Table 9-3: Radiated Emissions Harmonics/Spurious - 2437 MHz, 802.11b

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Average Analyzer Reading (dBuV) (1 MHz RBW 10 Hz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|--|---|-------------------------------|---------------------------------|------------------------|---------------------|
| 4874.000 | 46.9 | 37.5 | 12.2 | 49.7 | 54.0 | -4.3 |
| 7311.000 | 41.5 | 28.9 | 10.5 | 39.4 | 54.0 | -14.6 |
| 12185.000 | 41.7 | 28.4 | 12.3 | 40.7 | 54.0 | -13.3 |
| 19496.000 | 33.5 | 20.3 | 21.6 | 41.9 | 54.0 | -12.1 |

Table 9-4: Radiated Emissions Harmonics/Spurious - 2462 MHz, 802.11b

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Average Analyzer Reading (dBuV) (1 MHz RBW 10 Hz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|--|---|-------------------------------|---------------------------------|------------------------|---------------------|
| 4924.000 | 42.7 | 33.7 | 12.2 | 45.9 | 54.0 | -8.1 |
| 7386.000 | 43.4 | 31.0 | 10.8 | 41.8 | 54.0 | -12.2 |
| 12310.000 | 37.1 | 28.9 | 12.4 | 41.3 | 54.0 | -12.7 |
| 19696.000 | 32.9 | 20.7 | 22.0 | 42.7 | 54.0 | -11.3 |
| 22158.000 | 34.2 | 21.8 | 20.1 | 41.9 | 54.0 | -12.1 |
| 24620.000 | 35.1 | 22.6 | 21.2 | 43.8 | 54.0 | -10.2 |

Table 9-5: Radiated Emissions Harmonics/Spurious - 2412 MHz, 802.11g

| Emission Frequency (MHz) | Peak Reading (dBuV) (1 MHz RBW/VBW) | Average Reading (dBuV) (1 MHz RBW 10 Hz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|-------------------------------------|--|-------------------------------|---------------------------------|------------------------|---------------------|
| 4824.000 | 40.3 | 30.5 | 11.9 | 42.4 | 54.0 | -11.6 |
| 12060.000 | 40.5 | 29.1 | 12.6 | 41.7 | 54.0 | -12.3 |
| 14472.000 | 39.1 | 28.3 | 17.5 | 45.8 | 54.0 | -8.2 |
| 19296.000 | 31.3 | 20.1 | 23.5 | 43.6 | 54.0 | -10.4 |

Table 9-6: Radiated Emissions Harmonics/Spurious - 2437 MHz, 802.11g

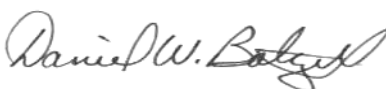
| Emission Frequency (MHz) | Peak Reading (dBuV) (1 MHz RBW/VBW) | Average Reading (dBuV) (1 MHz RBW 10 Hz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|-------------------------------------|--|-------------------------------|---------------------------------|------------------------|---------------------|
| 4874.000 | 41.4 | 30.5 | 12.2 | 42.7 | 54.0 | -11.3 |
| 7311.000 | 39.3 | 28.0 | 10.5 | 38.5 | 54.0 | -15.5 |
| 12185.000 | 39.9 | 28.3 | 12.3 | 40.6 | 54.0 | -13.4 |
| 19496.000 | 32.2 | 20.5 | 21.6 | 42.1 | 54.0 | -11.9 |

Table 9-7: Radiated Emissions Harmonics/Spurious - 2462 MHz, 802.11g

| Emission Frequency (MHz) | Peak Reading (dBuV) (1 MHz RBW/VBW) | Average Reading (dBuV) (1 MHz RBW 10 Hz VBW) | Site Correction Factor (dB/m) | Average Emission Level (dBuV/m) | Average Limit (dBuV/m) | Average Margin (dB) |
|--------------------------|-------------------------------------|--|-------------------------------|---------------------------------|------------------------|---------------------|
| 4924.000 | 41.7 | 30.3 | 12.2 | 42.5 | 54.0 | -11.5 |
| 7386.000 | 41.2 | 29.4 | 10.8 | 40.2 | 54.0 | -13.8 |
| 12310.000 | 39.9 | 28.2 | 12.4 | 40.6 | 54.0 | -13.4 |
| 19696.000 | 32.4 | 21.2 | 22.0 | 43.2 | 54.0 | -10.8 |
| 22158.000 | 31.0 | 21.5 | 20.1 | 41.6 | 54.0 | -12.4 |
| 24620.000 | 30.2 | 21.9 | 21.2 | 43.1 | 54.0 | -10.9 |

Test Personnel:

Daniel W. Baltzell
Test Engineer



Signature

March 14, 2010
Date of Test

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Client: Cernium Corporation
Model #: AF3001000
Standard: FCC 15.247
FCC ID: X86-AF3001000
Report #: 2010038

10 Conclusion

The data in this measurement report shows that the EUT as tested, Cernium Corporation Model # AF3001000, FCC ID: X86-AF3001000, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations.