RHEIN TECH LABORATORIES, INC.

Engineering Solutions & Electromagnetic Compatibility Services

**Certification Application Report**
**FCC Part 15.247 & Industry Canada RSS-210**

| Test Lab: | Applicant: |
|---|---|
| Rhein Tech Laboratories, Inc. Phone: 703-689-0368<br>360 Herndon Parkway Fax: 703-689-2056<br>Suite 1400 www.rheintech.com<br>Herndon, VA 20170<br>E-Mail: atcbinfo@rheintech.com | Vocollect, Inc. Phone: 412-349-2580<br>Contact: Joe Lesik Fax: 412-829-1063<br>703 Rodi Road<br>Pittsburgh, PA 15235 |

| | | | |
|---|---|---|---|
| **FCC ID/ IC:** | MQO-TAP801-01/ 2570A-TAP80101 | **Test Report Date:** | December 3, 2011 |
| **Platform:** | N/A | **RTL Work Order Number:** | 2011184-2 |
| **Model Name/ Model Number:** | A500 / TAP801-01 | **RTL Quote Number:** | QRTL11-256 |
| | | | |
| **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 (WLAN portion) | | |
| **FCC Rule Part(s):** | FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System (10-01-10) | | |
| **Industry Canada:** | RSS-210 Issue 8: Low Power License-Exempt Communications Devices | | |
| **Digital Interface Information** | Digital Interface was found to be compliant | | |

| Frequency Range (MHz) | Output Power (W) | Frequency Tolerance | Emission Designator |
|---|---|---|---|
| 2412-2462 | 0.047 | N/A | 10M2G7D |
| 2412-2462 | 0.132 | N/A | 16M6G7D |

** 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, FCC 97-114, ANSI C63.4, and Industry Canada RSS-210.

Signature: _____ Date: December 3, 2011

Typed/Printed Name: Desmond A. Fraser Position: President

*These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.*

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# 1 General Information

## 1.1 Scope

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.
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

## 1.2 Description of EUT

| | |
|---|---|
| **Equipment Under Test** | Body Worn Terminal |
| **Model Name / Model #** | A500 / TAP801-01 |
| **Power Supply** | Battery operated |
| **Modulation Type** | DSSS |
| **Transfer Rate** | 1, 2, 5.5, 11, 6, 9, 12, 18, 24, 36, 48, 54 |
| **Frequency Range** | 2412 – 2462 MHz |
| **Antenna Connector Type** | Internal |
| **Antenna Types** | Internal |

## 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 Vocollect, Inc. Model Name: A500, Model # TAP801-01, FCC ID: MQO-TAP801-01, IC: 2570A-TAP80101.

## 1.5 Modifications

No modifications were required for compliance.

# 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 (MHz) |
|---|---|
| 1 | 2412 |
| 6 | 2437 |
| 11 | 2462 |

## 2.2 Exercising the EUT

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, and all modes were investigated and the worst-case mode was used for final testing. 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 sample was received on November 1, 2011. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

**Table 2-3: Equipment Under Test (EUT)**

| Part | Manufacturer | Model # | Serial Number | FCC ID | Cable Description | RTL Bar Code |
|---|---|---|---|---|---|---|
| A500 Talkman WLAN/Bluetooth Terminal | Vocollect, Inc. | TAP801-01 | SAMPLE #2 | MQO-TAP801-01 | N/A | 20216 |
| Battery | Vocollect, Inc. | BT-700 (730037) | 3500519002 | N/A | N/A | 20215 |
| Battery | Vocollect, Inc. | BT-700 (730037) | 3504920164 | N/A | N/A | 20472 |
| Battery | Vocollect, Inc. | BT-700 (730037) | 3505008954 | N/A | N/A | 20473 |

**Table 2-4: Support Equipment**

| Part | Manufacturer | Model | Serial Number | FCC ID | Cable Description | RTL Bar Code |
|---|---|---|---|---|---|---|
| Battery Charger | Vocollect, Inc. | CM-700-2 | 160171016B | N/A | N/A | 20471 |
| Headset | Vocollect, Inc. | N/A | N/A | N/A | N/A | 20217 |

### 2.5 Configuration of Tested System

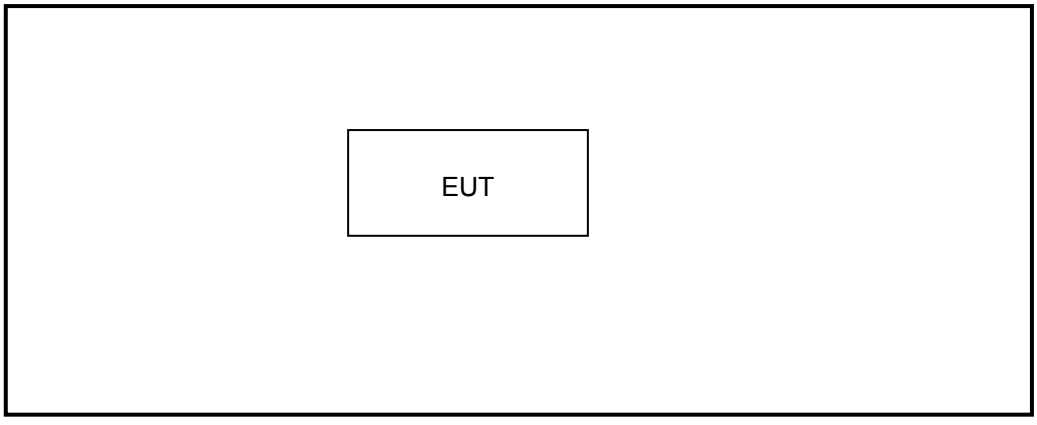



**Figure 2-1: Configuration of System Under Test**

## 3 Peak Output Power – FCC 15.247(b)(1); RSS-210 A8.4(4)

### 3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor.

**Table 3-1: Power Output Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 901184 | Agilent Technologies | E4416A | EPM-P Power Meter, single channel | GB41050573 | 1/20/12 |
| 901356 | Agilent Technologies | E9323A | Power Sensor | 31764-264 | 1/20/12 |

### 3.2 Power Output Test Data

**Table 3-2: Power Output Test Data – 802.11b (worst-case 11 Mbps)**

| Channel | Frequency (MHz) | Peak Power Conducted Output (dBm) |
|---|---|---|
| 1 | 2412 | 16.7 |
| 6 | 2437 | 16.1 |
| 11 | 2462 | 15.6 |

**Table 3-3: Power Output Test Data – 802.11g (worst-case 24 Mbps)**

| Channel | Frequency (MHz) | Peak Power Conducted Output (dBm) |
|---|---|---|
| 1 | 2412 | 21.2 |
| 6 | 2437 | 20.1 |
| 11 | 2462 | 19.5 |

**Test Personnel:**

| Daniel W. Baltzell | Daniel W. Baltzell | November 1, 2011 |
|---|---|---|
| Test Engineer | Signature | Date Of Test |

# 4 Compliance with the Band Edge – FCC 15.247(d); RSS-210 2.2

## 4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. Peak (1 MHz RBW/VBW) and average (1 MHz RBW/10 Hz VBW) radiated measurements were taken with a suitable span to encompass the peak of the fundamental. A delta measurement was performed from the highest peak in the restricted band to the peak of the fundamental, and subtracted from the field strength; the result was compared to the limit in the restricted band (54 dBuV/m).

**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 | 4/8/12 |
| 900878 | Rhein Tech Laboratories | AM3-1197-0005 | 3 meter antenna mast, polarizing | Outdoor Range 1 | Not Required |
| 901517 | Insulated Wire Inc. | KPS-1503-360-KPS-09302008 | RF cable 36" | NA | 10/14/12 |
| 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 | 6/14/12 |

## 4.2 Restricted Band Edge Test Results

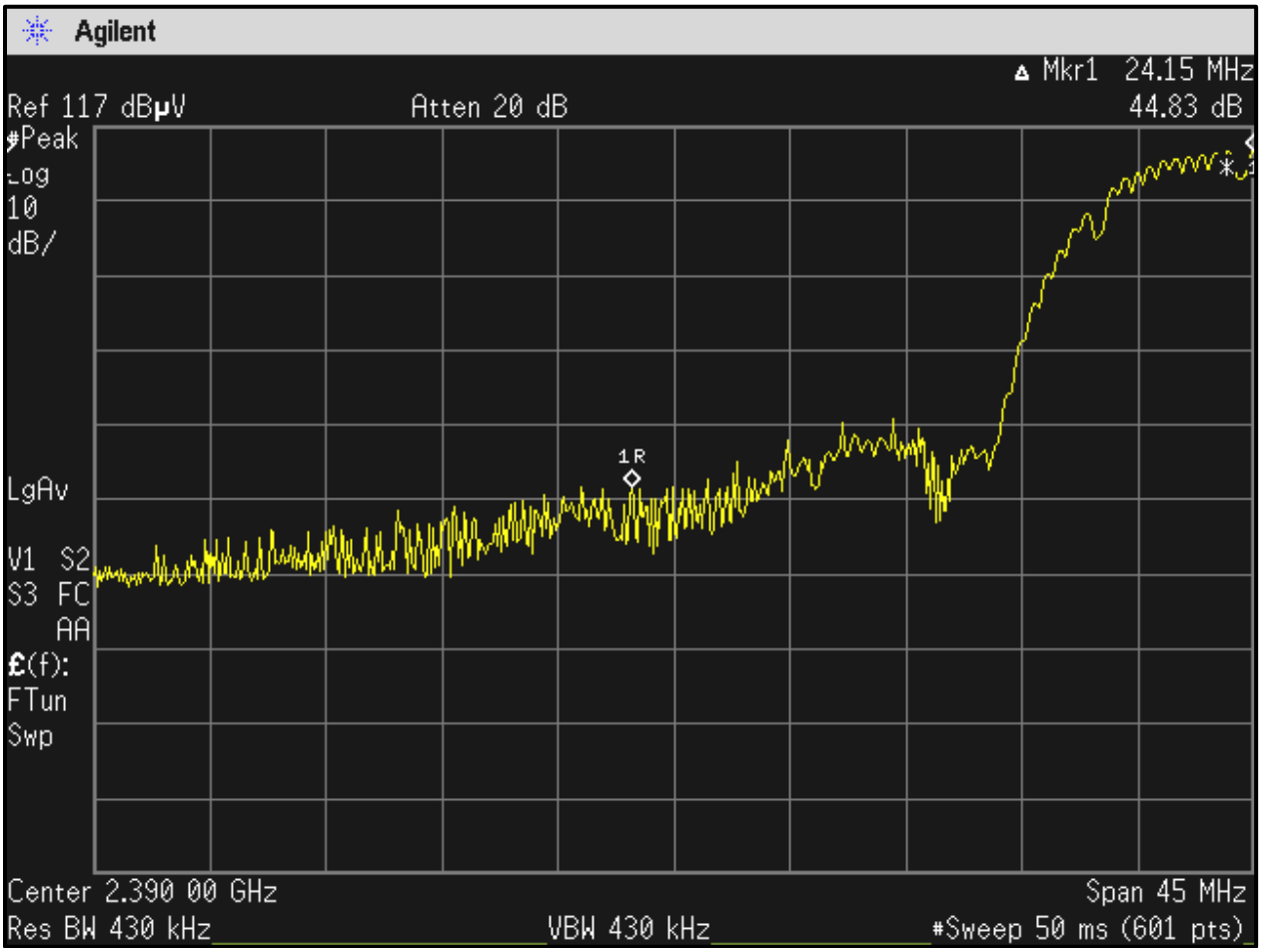
### 4.2.1 Calculation of Lower Band Edge – 802.11b

97.8 dBuV/m is the field strength measurement, from which the delta measurement of 44.8 dB is subtracted (reference plots), resulting in a level of 53.0 dBuV/m. This level has a margin of 1.0 dB below the limit of 54 dBuV/m.

Calculation: 97.8 dBuV/m – 44.8 dB – 54 dBuV/m = -1.0 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 109.5 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 97.8 dBuV/m
Delta measurement = 44.8 dB

**Plot 4-1: Lower Band Edge: Channel 1 (TX Frequency 2412 MHz) – 802.11b**



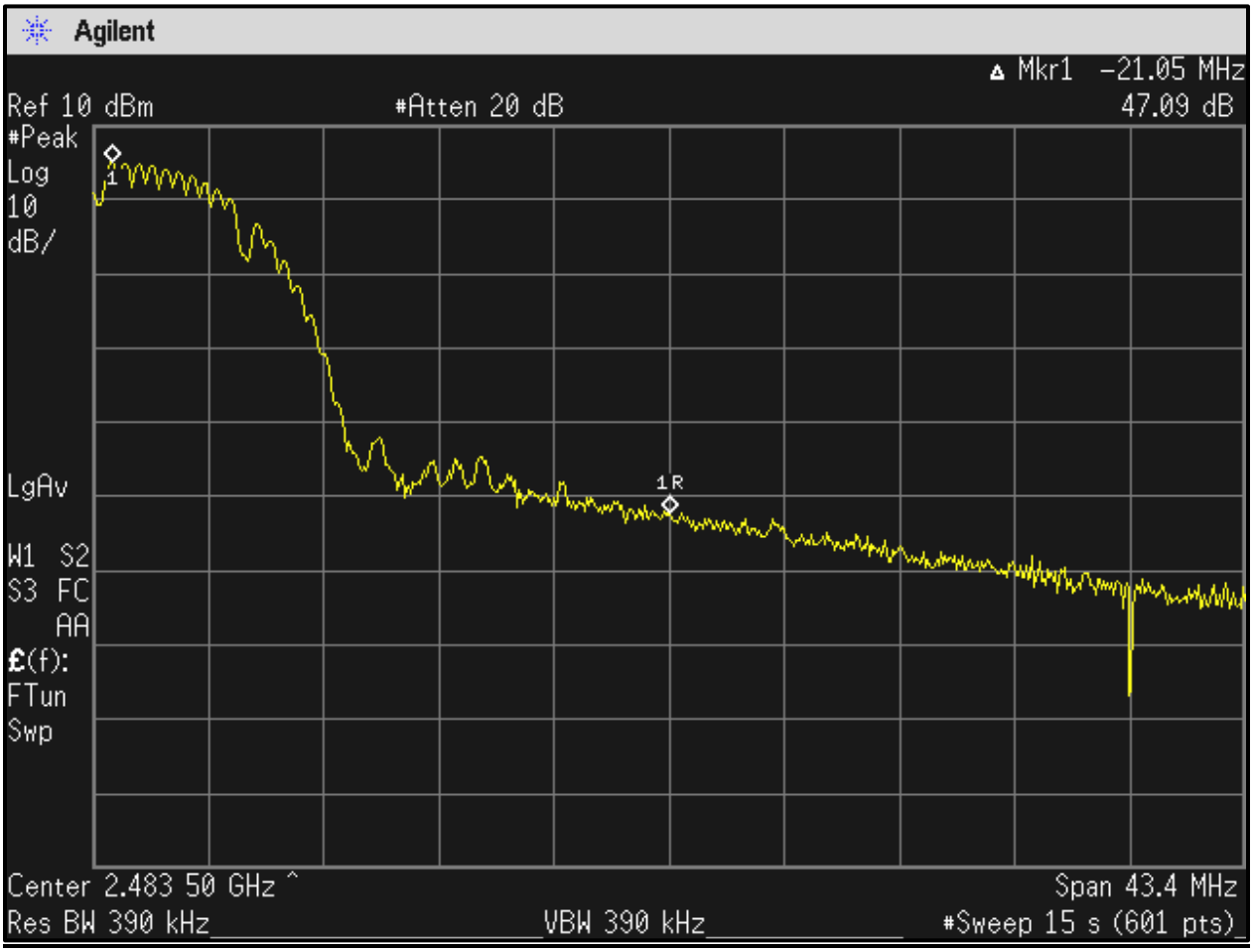
### 4.2.2 Calculation of Upper Band Edge – 802.11b

98.8 dBuV/m is the field strength measurement, from which the delta measurement of 47.1 dB is subtracted (reference plots), resulting in a level of 51.7 dBuV/m. This level has a margin of 2.3 dB below the limit of 54 dBuV/m.

Calculation: 98.8 dBuV/m – 47.1 dB – 54 dBuV/m = -2.3 dB

Peak Field Strength of Upper Band Edge (1 MHz RBW/1 MHz VBW) = 108.2 dBuV/m
Average Field Strength of Upper Band Edge (1 MHz RBW/10 Hz VBW) = 98.8 dBuV/m
Delta measurement = 47.1 dB

**Plot 4-2: Upper Band Edge: Channel 11 (TX Frequency 2462 MHz) – 802.11b**



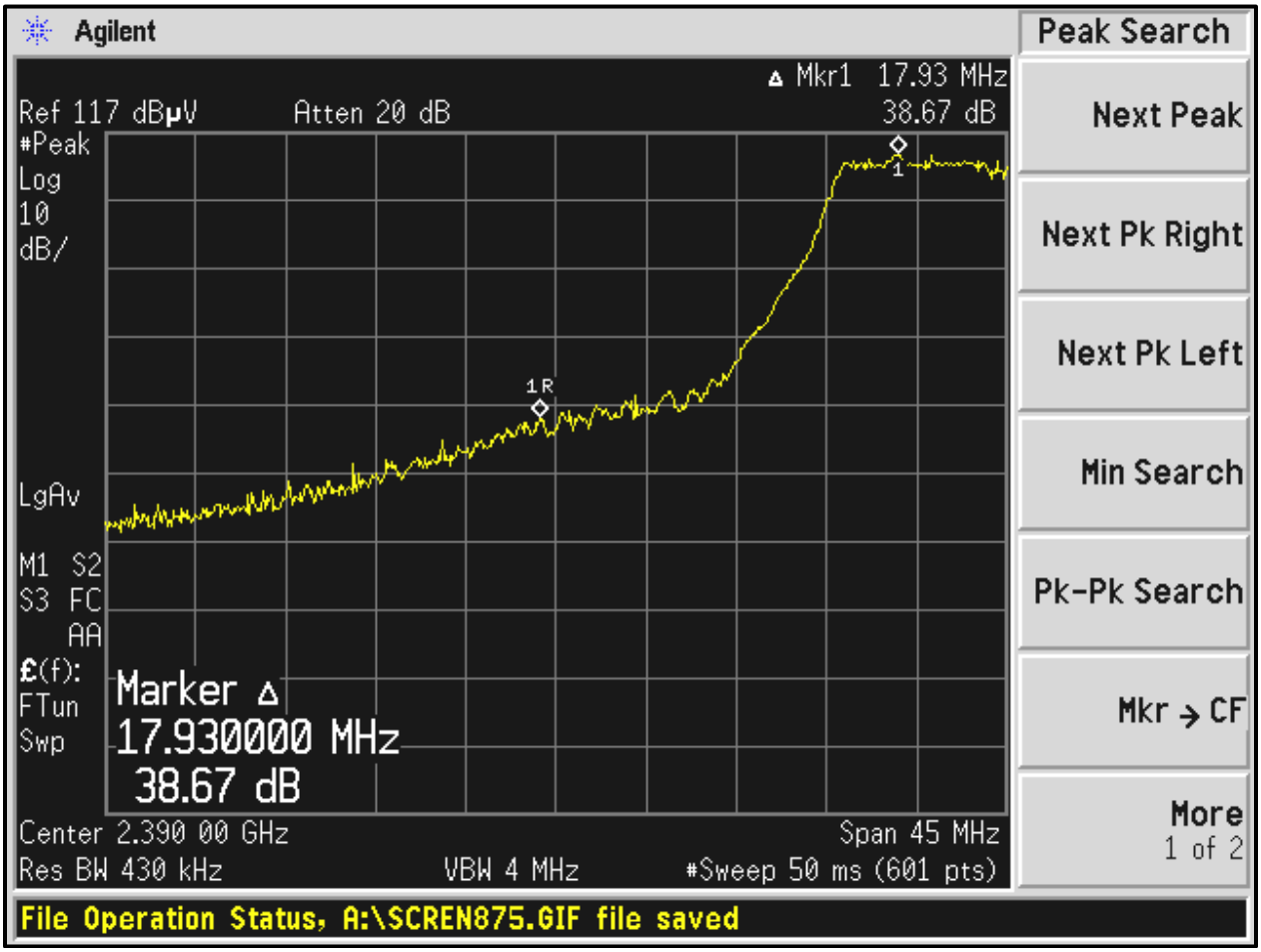
### 4.2.3 Calculation of Lower Band Edge – 802.11g

74.5 dBuV/m is the field strength measurement, from which the delta measurement of 38.7 dB is subtracted (reference plots), resulting in a level of 35.8 dBuV/m. This level has a margin of 18.2 dB below the limit of 54 dBuV/m.

Calculation: 74.5 dBuV/m – 38.7 dB – 54 dBuV/m = -18.2 dB

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 112.5 dBuV/m
Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 74.5 dBuV/m
Delta measurement = 38.7 dB

**Plot 4-3: Lower Band Edge: Channel 1 (TX Frequency 2412 MHz) – 802.11g**



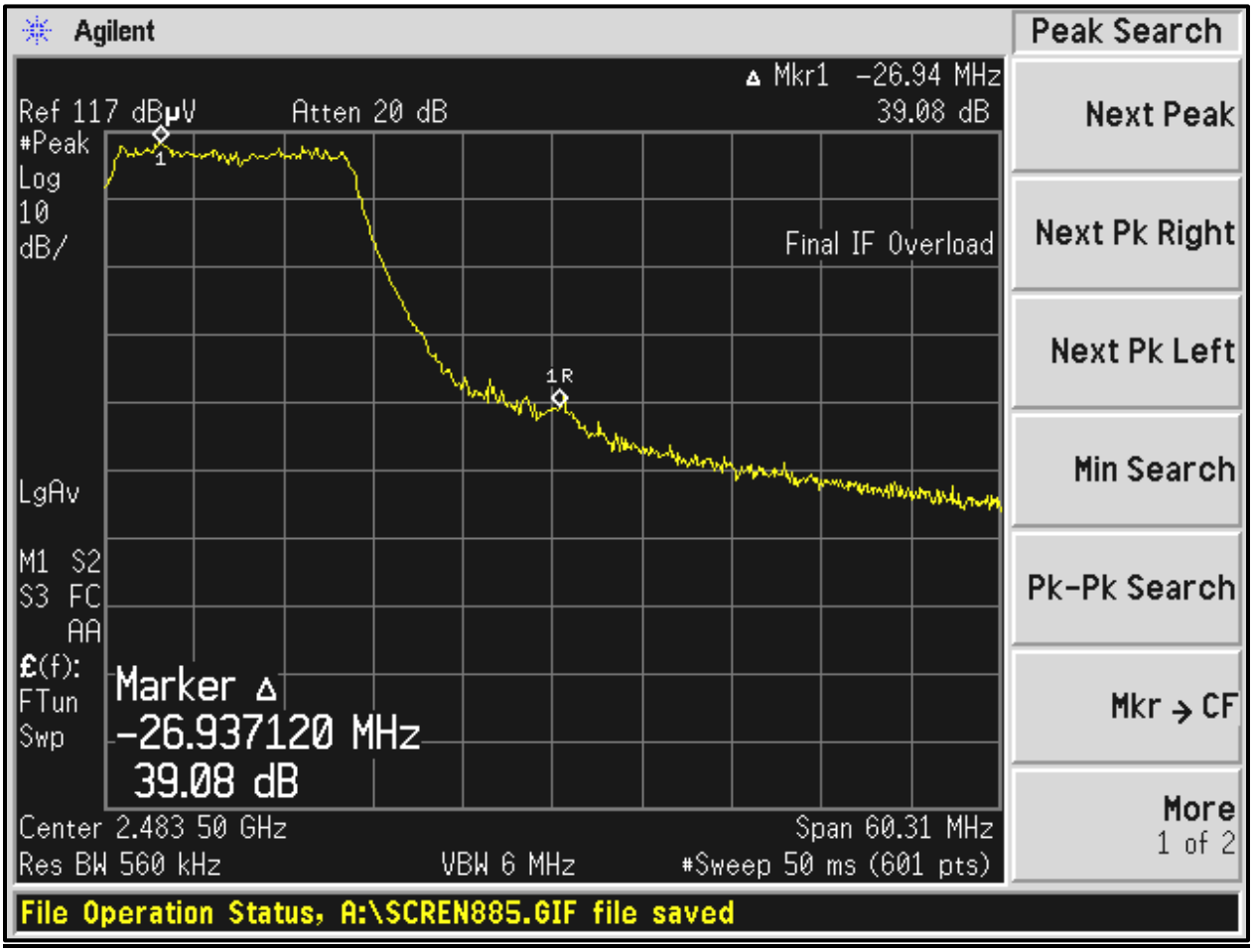
### 4.2.4 Calculation of Upper Band Edge – 802.11g

74.3 dBuV/m is the field strength measurement, from which the delta measurement of 39.1 dB is subtracted (reference plots), resulting in a level of 35.2 dBuV/m. This level has a margin of 18.8 dB below the limit of 54 dBuV/m.

Calculation: 74.3 dBuV/m – 39.1 dB – 54 dBuV/m = -18. 8 dB

Peak Field Strength of Upper Band Edge (1 MHz RBW/1 MHz VBW) = 112.5 dBuV/m
Average Field Strength of Upper Band Edge (1 MHz RBW/10 Hz VBW) = 74.3 dBuV/m
Delta measurement = 39.1 dB

**Plot 4-4: Upper Band Edge: Channel 11 (TX Frequency 2462 MHz) – 802.11g**




**Test Personnel:**

| Daniel W. Baltzell | Daniel W. Baltzell | November 3, 2011 |
|---|---|---|
| Test Engineer | Signature | Date of Test |

# 5 Antenna Conducted Spurious Emissions – FCC 15.247(d); RSS-Gen

## 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 300 kHz. The modulated carrier was identified at the following frequencies: 2412 MHz, 2437 MHz and 2462 MHz.

## 5.2 Antenna Conducted Spurious Emissions Test Results

No harmonics or spurs were found within 20 dB (note that we are reporting power as peak) of the carrier level from the carrier to the 10$^{th}$ harmonic of the carrier frequency. 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 |
|---|---|---|---|---|---|
| WL00528 | Agilent Technologies | E4446A | Spectrum Analyzer | US44300513 | 8/30/12 |

**Test Personnel:**

| Richard B. McMurray, P.E. | Richard B. McMurray | December 3, 2011 |
|---|---|---|
| Test Engineer | Signature | Date of Test |

# 6 6 dB Bandwidth – FCC 15.247(a)(2); RSS-210 A8.2

## 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 |
|---|---|---|---|---|---|
| WL00528 | Agilent Technologies | E4446A | Spectrum Analyzer | US44300513 | 8/30/12 |

## 6.2 6 dB Bandwidth Test Results

**Table 6-2: 6 db Bandwidth Test Data – 802.11b**

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (kHz) | Pass/Fail |
|---|---|---|---|---|
| 1 | 2412 | 10.2 | 500 | Pass |
| 6 | 2437 | 10.2 | 500 | Pass |
| 11 | 2462 | 10.2 | 500 | Pass |

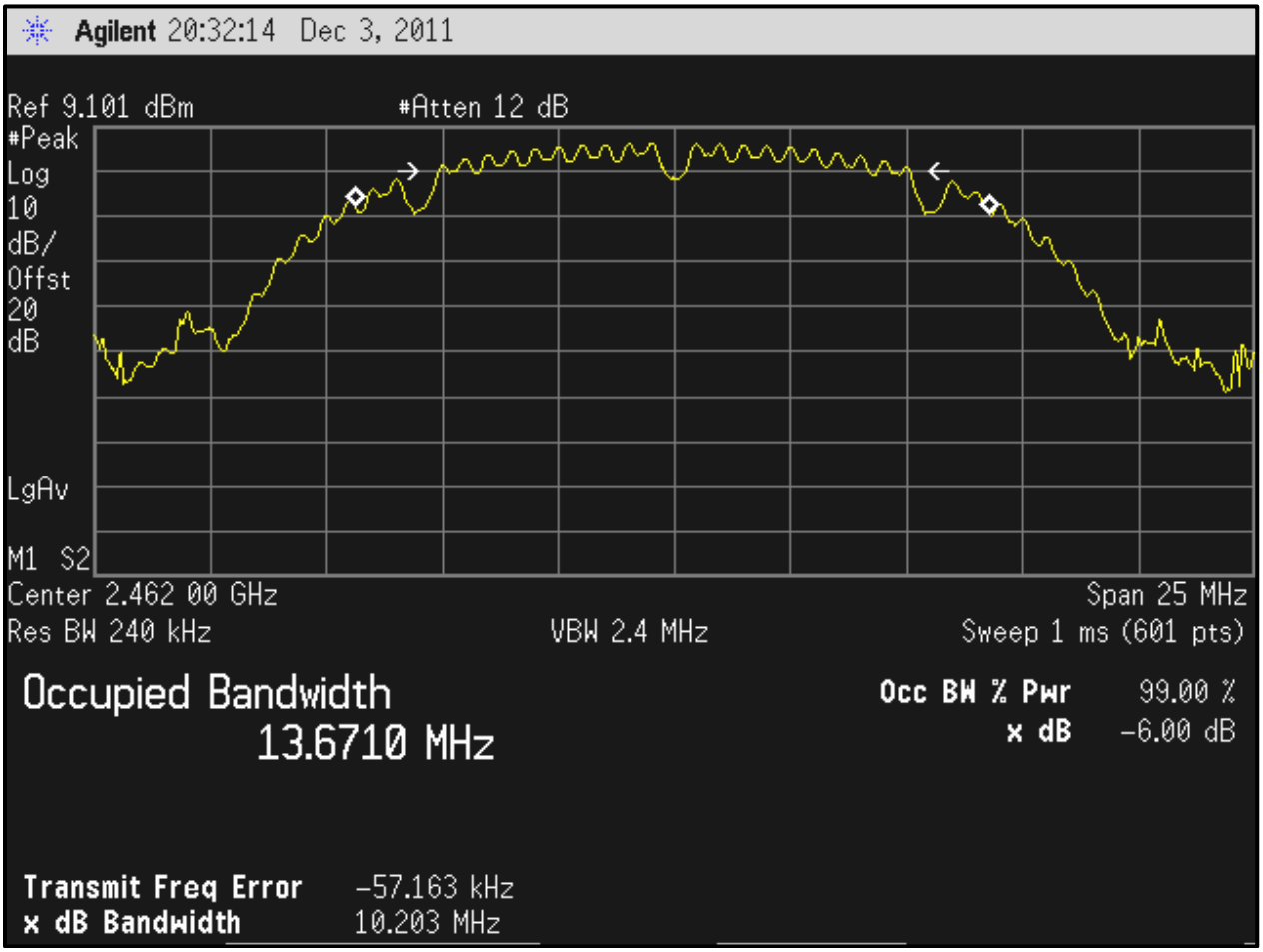
**Table 6-3: 6 db Bandwidth Test Data – 802.11g**

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Minimum Limit (kHz) | Pass/Fail |
|---|---|---|---|---|
| 1 | 2412 | 16.6 | 500 | Pass |
| 6 | 2437 | 16.5 | 500 | Pass |
| 11 | 2462 | 16.6 | 500 | Pass |

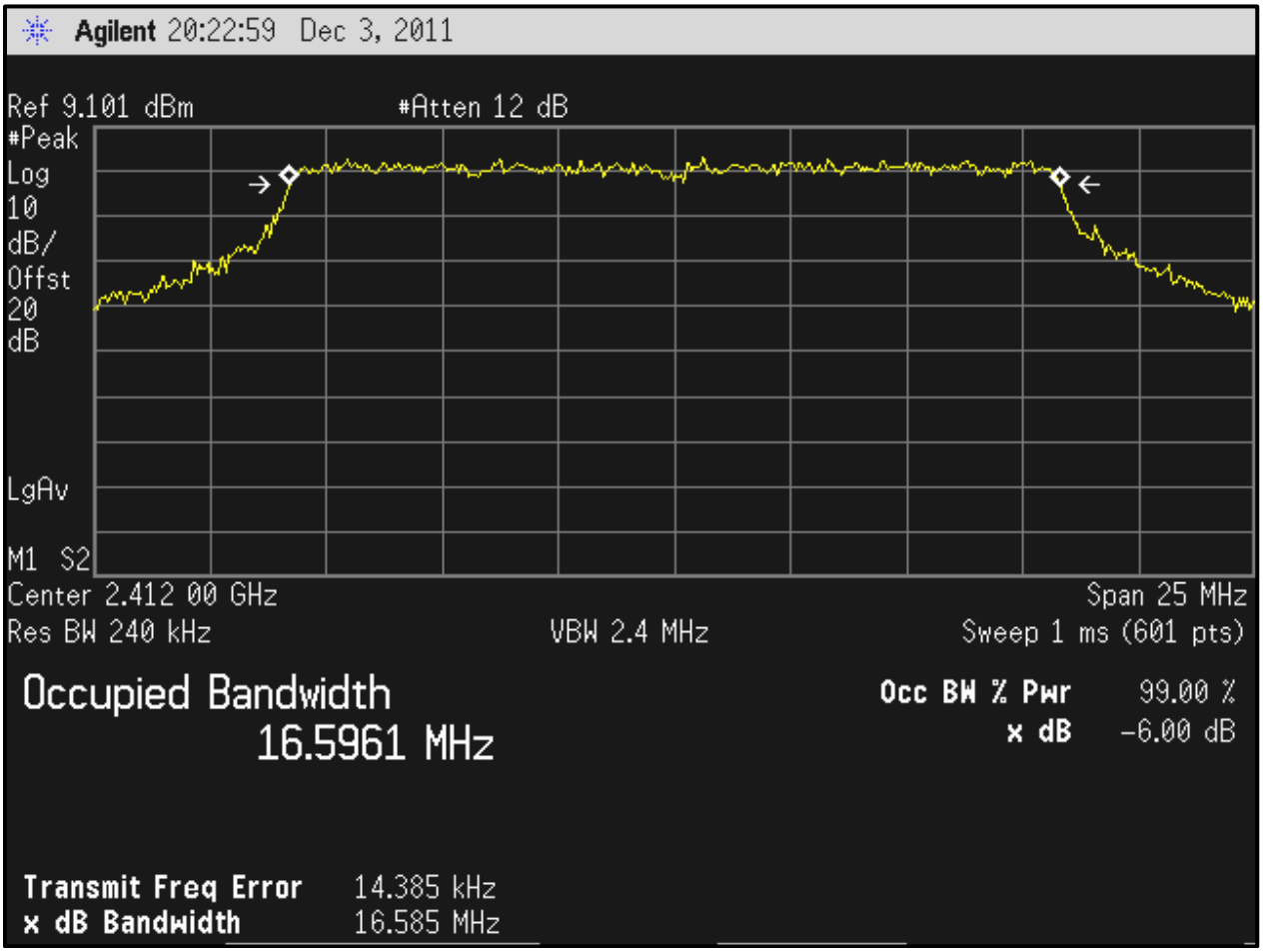
**Plot 6-1: 6 dB Bandwidth 2412 MHz - 802.11b**

**Plot 6-2: 6 dB Bandwidth 2437 MHz - 802.11b**

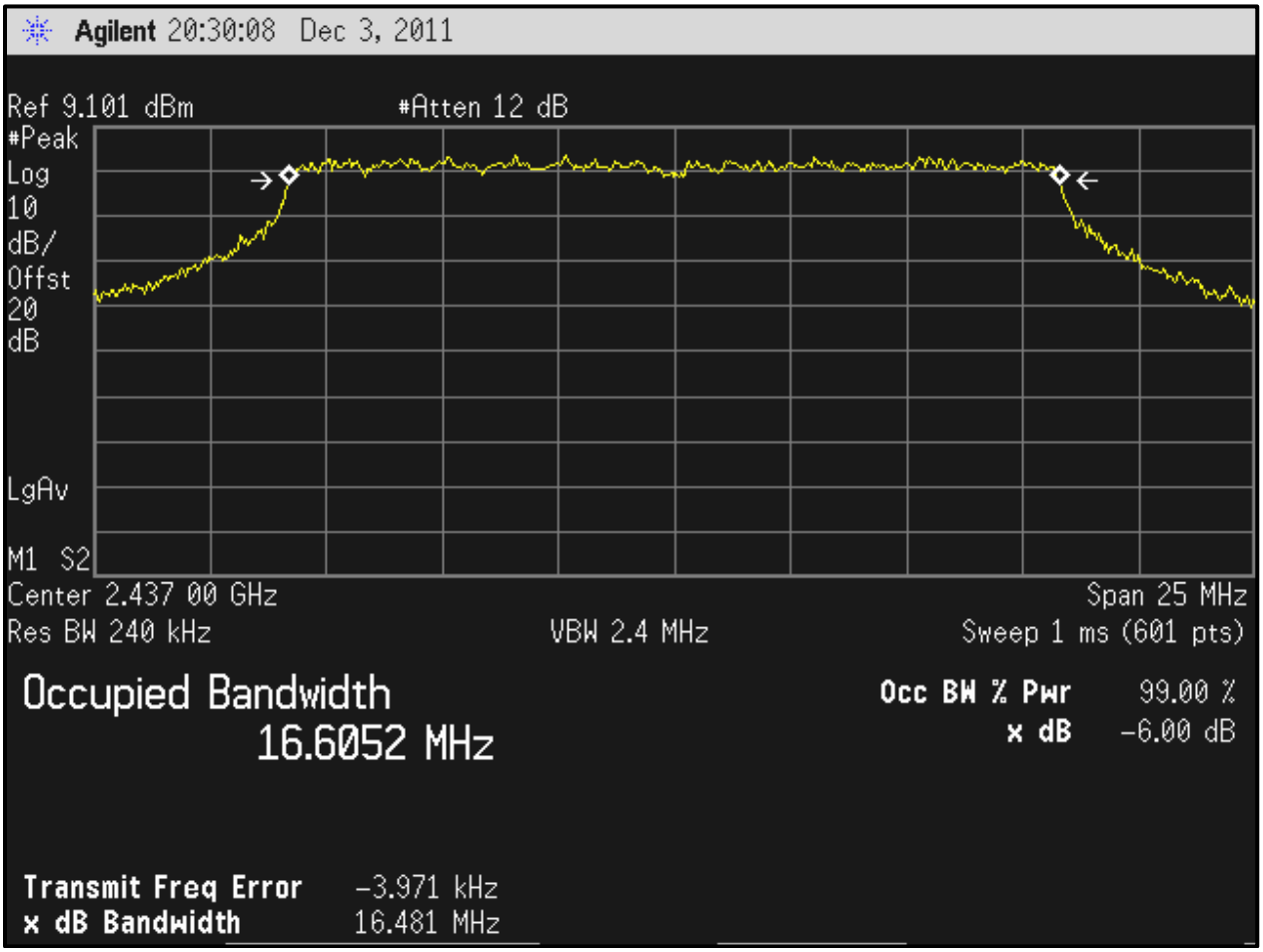
**Plot 6-3: 6 dB Bandwidth 2462 MHz - 802.11b**



**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:**

| Richard B. McMurray, P.E. | Richard B. McMurray | December 3, 2011 |
|---|---|---|
| Test Engineer | Signature | Date of Test |

# 7 Power Spectral Density – FCC 15.247(e); RSS-210 A8.2

## 7.1 Power Spectral Density Test Procedure

The power spectral density per FCC 15.247(d) 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 500 seconds. The spectral lines were resolved for the modulated carriers at 2412 MHz, 2437 MHz, and 2462 MHz respectively. 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 |
|---|---|---|---|---|---|
| WL00528 | Agilent Technologies | E4446A | Spectrum Analyzer | US44300513 | 8/30/12 |

## 7.2 Power Spectral Density Test Data – DSSS WLAN

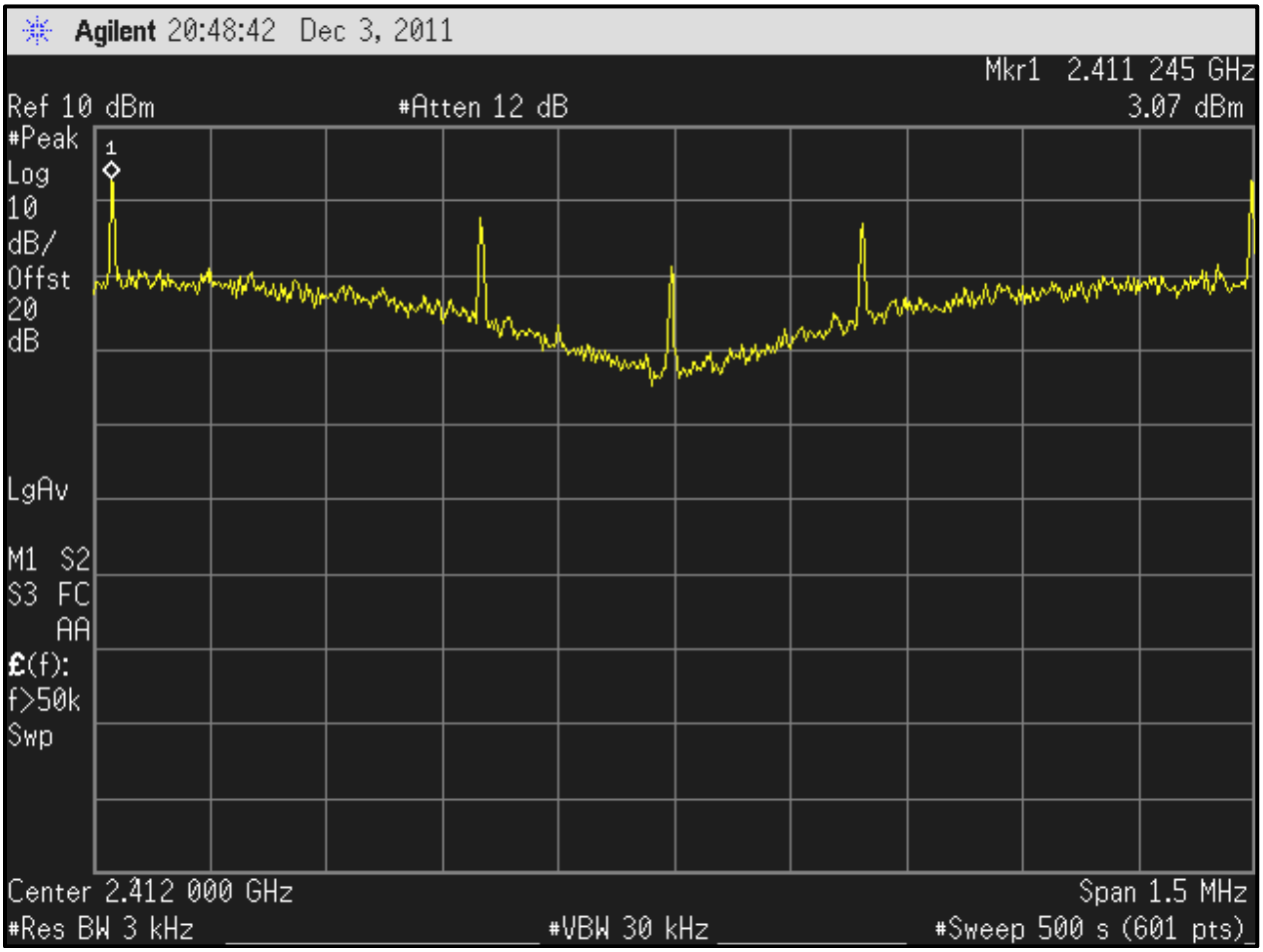
**Table 7-2: Power Spectral Density Test Data – 802.11b**

| Channel | Frequency (MHz) | RF Power Level (dBm) | Maximum Limit +8dBm | Pass/Fail |
|---|---|---|---|---|
| 1 | 2412 | 3.1 | 8 | Pass |
| 6 | 2437 | 2.8 | 8 | Pass |
| 11 | 2462 | 3.1 | 8 | Pass |

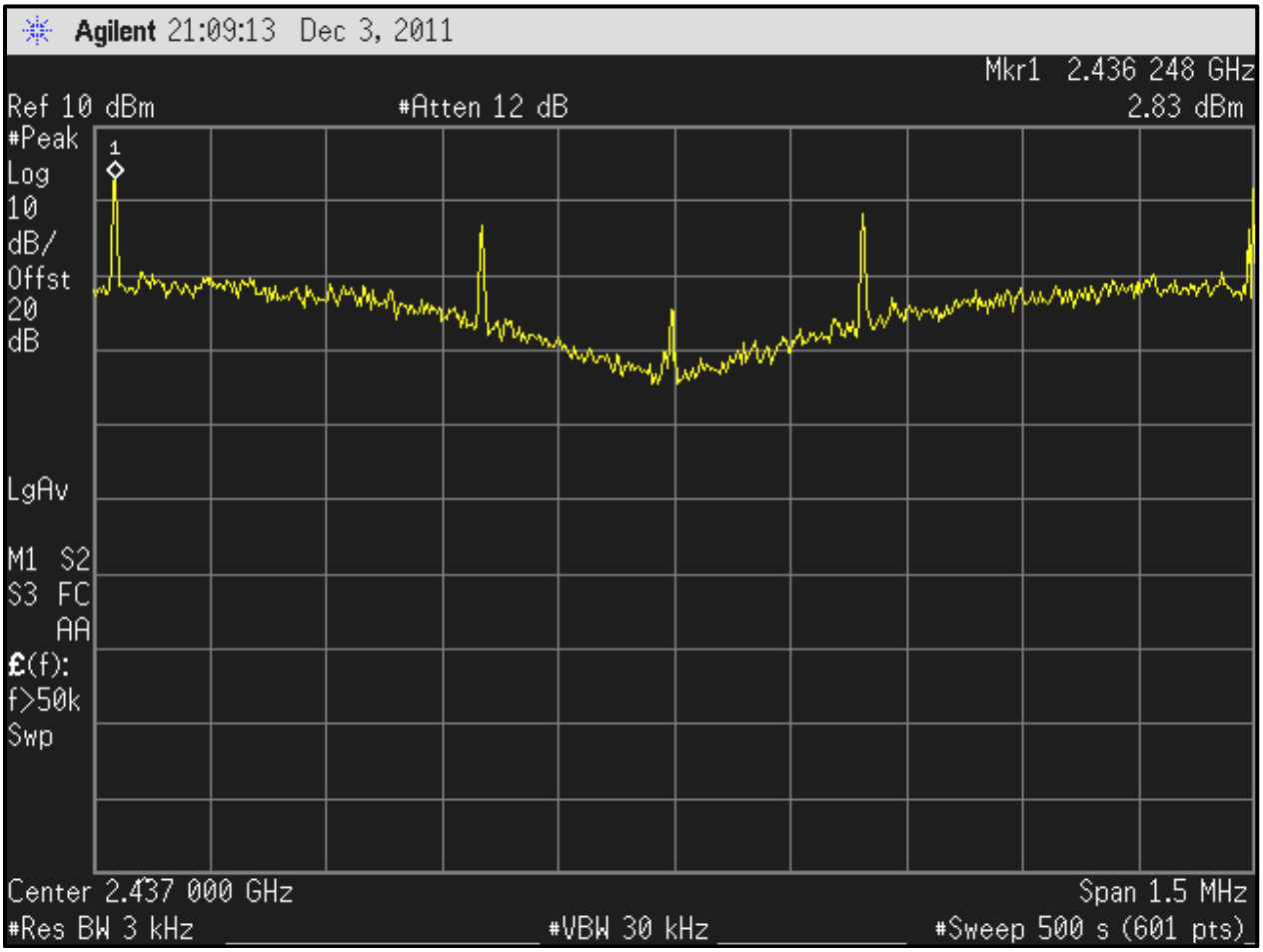
**Table 7-3: Power Spectral Density Test Data – 802.11g**

| Channel | Frequency (MHz) | RF Power Level (dBm) | Maximum Limit +8dBm | Pass/Fail |
|---|---|---|---|---|
| 1 | 2412 | -14.8 | 8 | Pass |
| 6 | 2437 | -14.8 | 8 | Pass |
| 11 | 2462 | -15.3 | 8 | Pass |

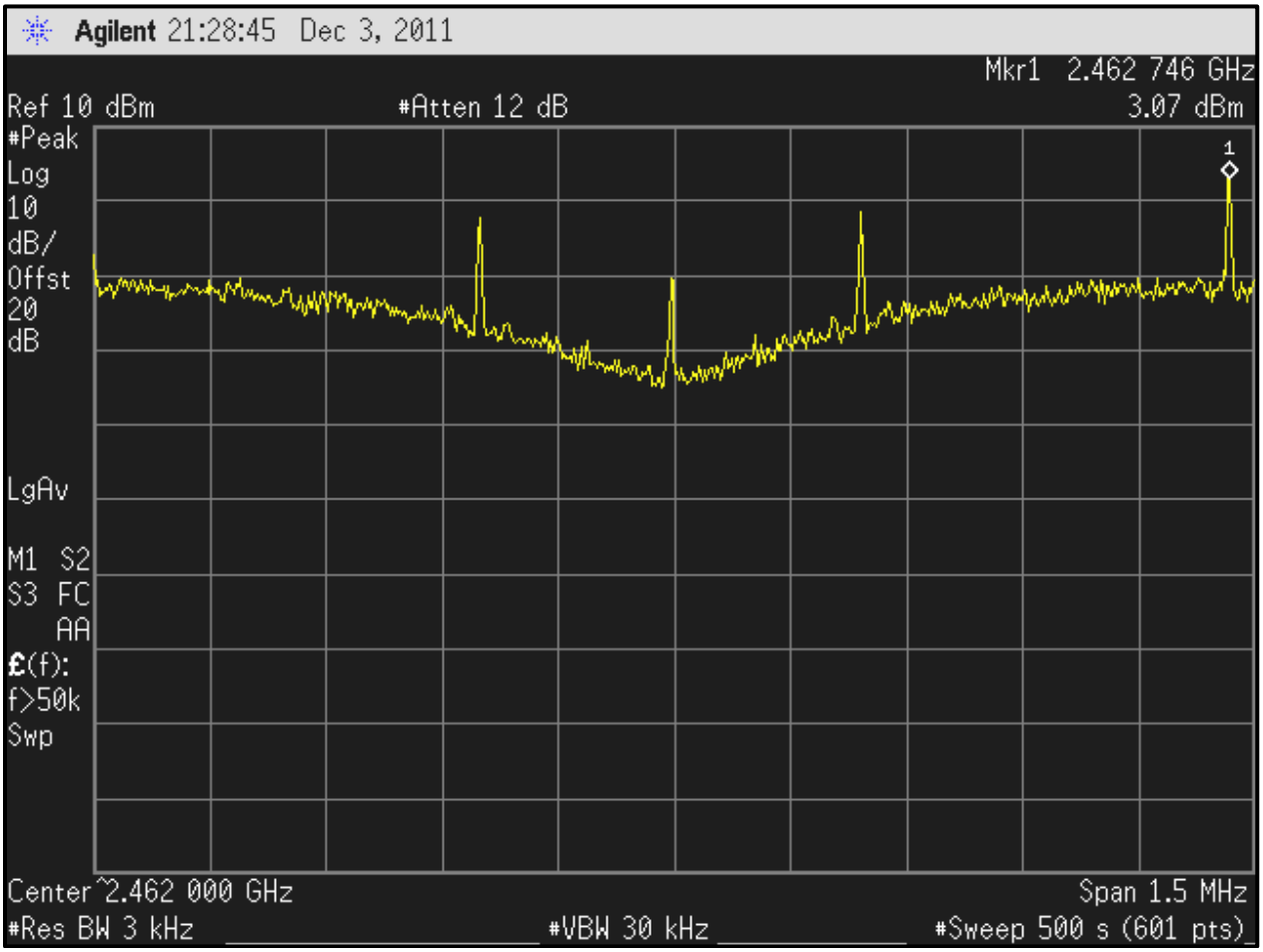
**Plot 7-1: Power Spectral Density 2412 MHz - 802.11b**



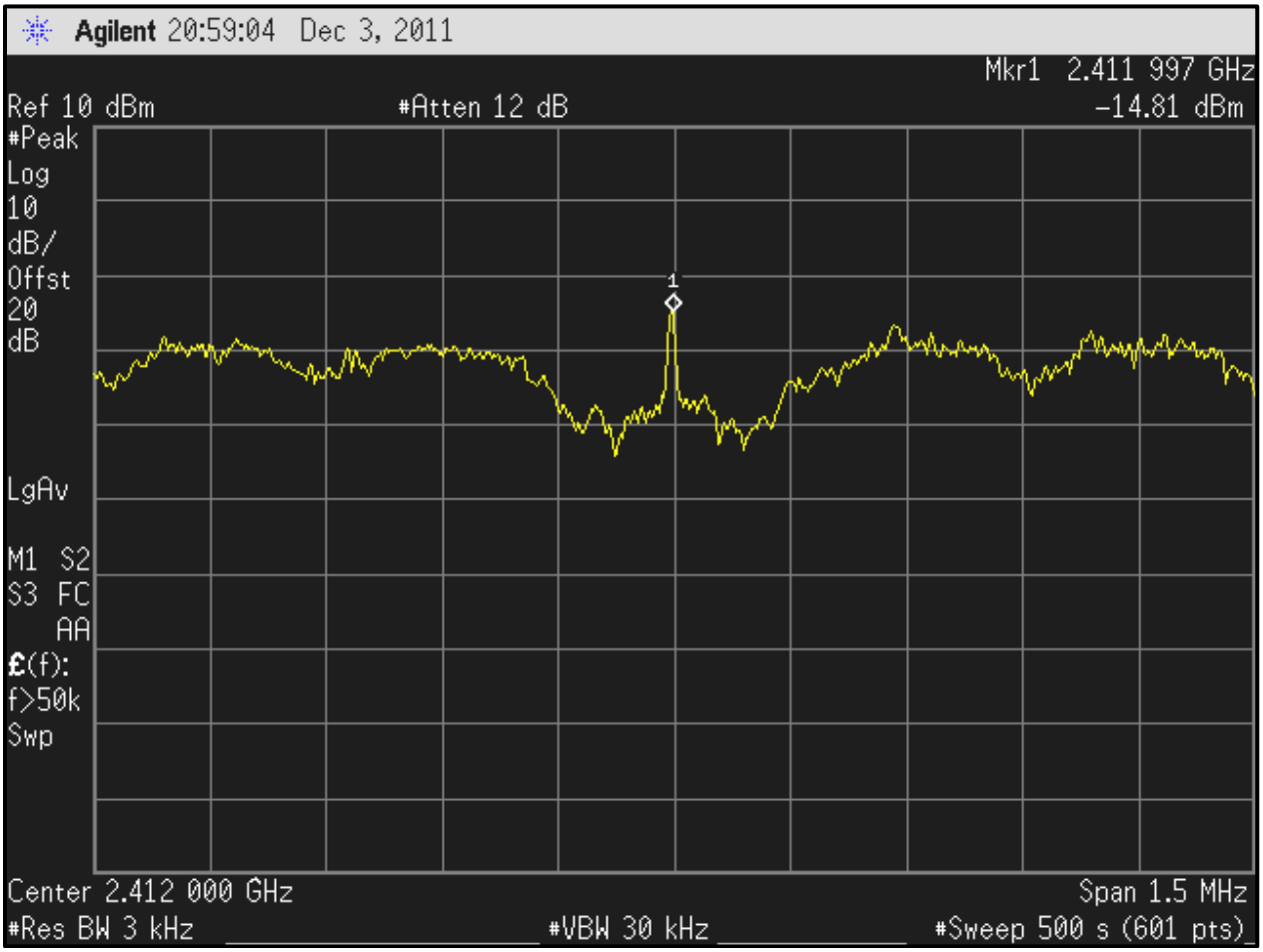
**Plot 7-2: Power Spectral Density 2437 MHz - 802.11b**



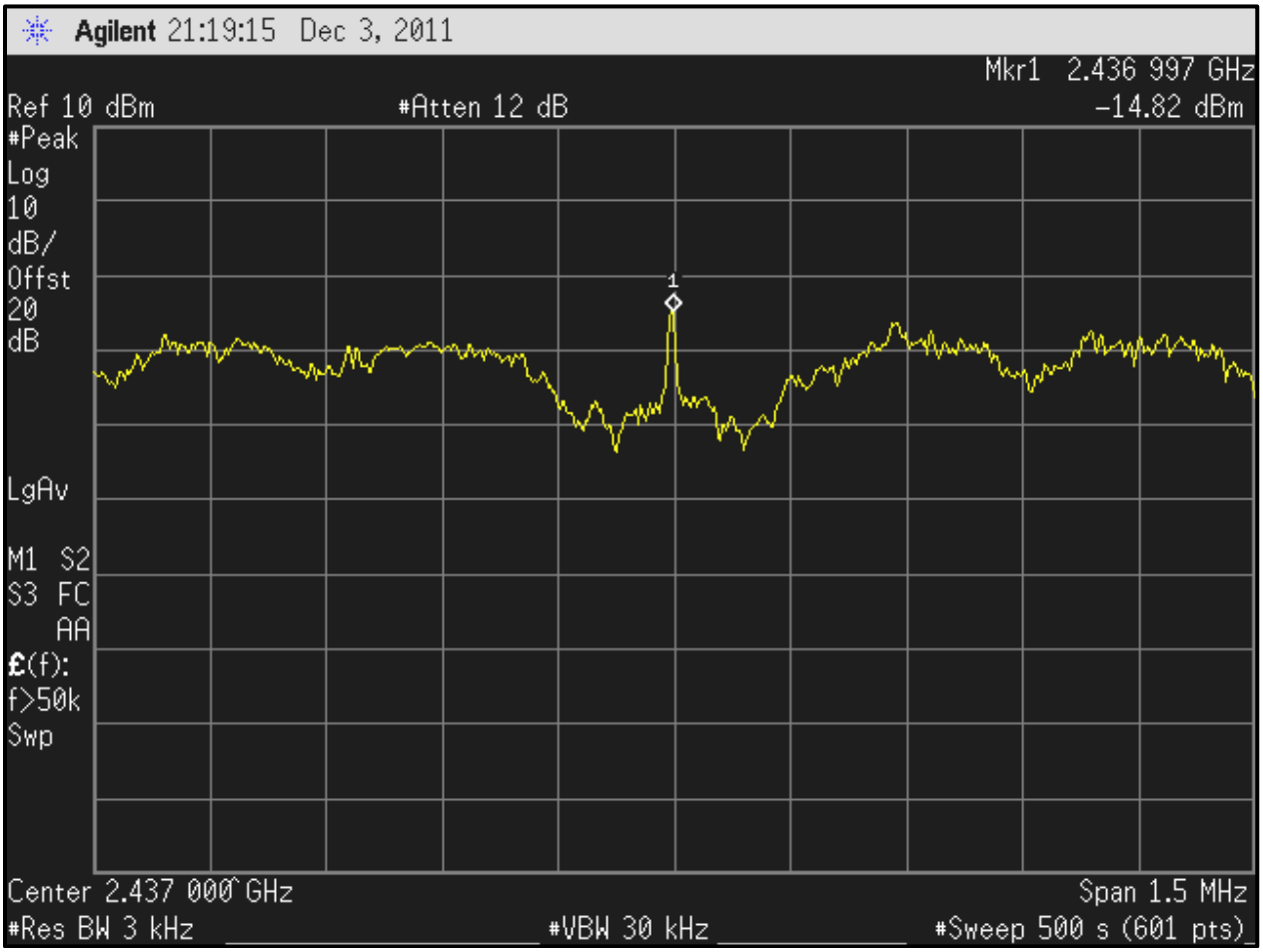
**Plot 7-3: Power Spectral Density 2462 MHz - 802.11b**



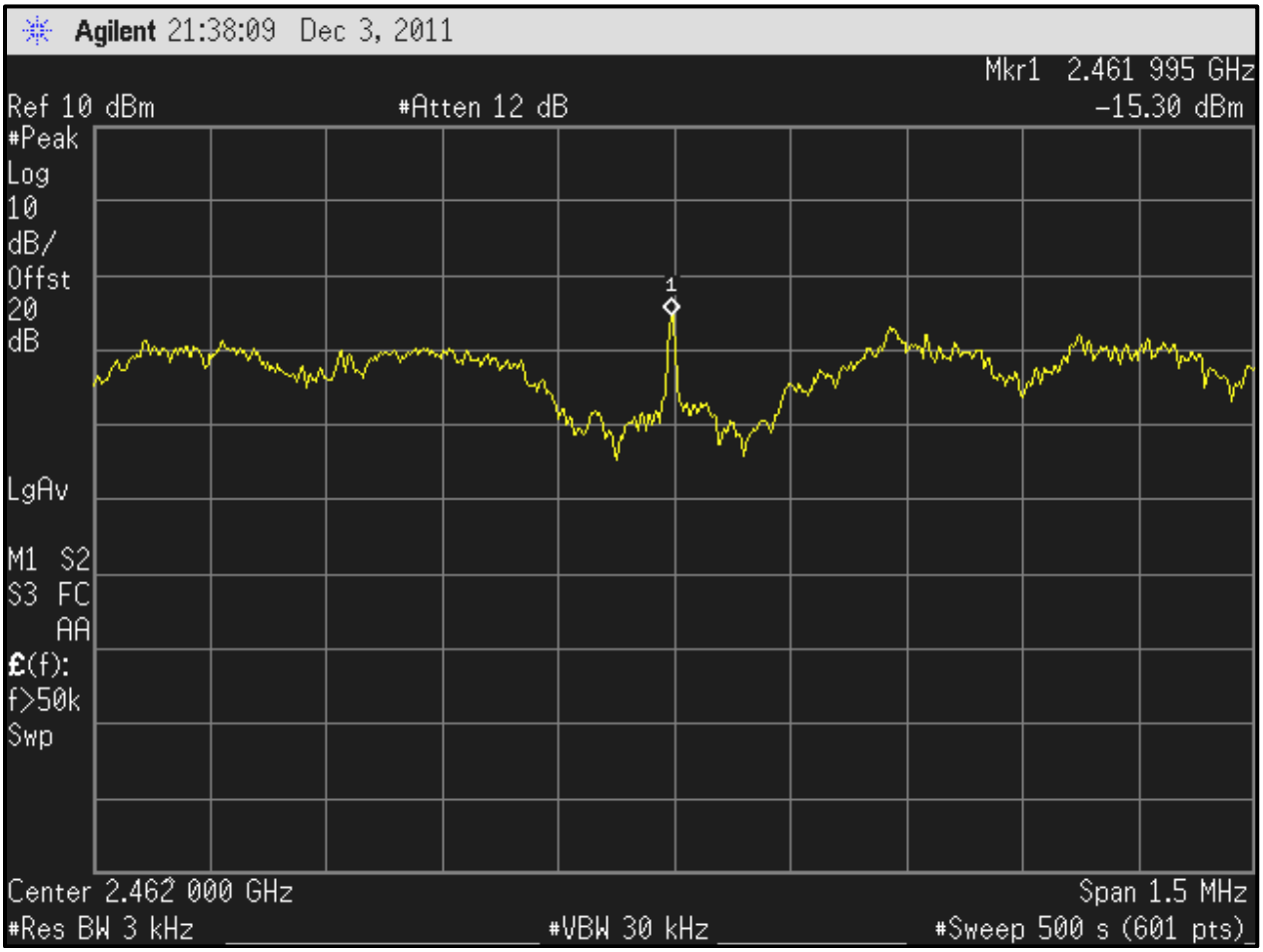
**Plot 7-4: Power Spectral Density 2412 MHz - 802.11g**



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



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




**Test Personnel:**

| Richard B. McMurray, P.E. | Richard B. McMurray | December 3, 2011 |
|---|---|---|
| Test Engineer | Signature | Date of Test |

# 8 Conducted Emissions Measurement Limits – FCC 15.207; RSS-Gen

## 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 Conducted Emissions Measurement Test Procedure

The conducted emissions measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 0.8 meters high. Power was fed to the EUT through a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EUT LISN was fed power through an AC 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 AC 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 AC line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 7 kHz high-pass filter. The filter was used to prevent overload of the spectrum analyzer from noise below 7 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or average mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements were performed in a linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by decreasing the sweep time in order to obtain a calibrated measurement. The highest emissions amplitudes relative to the appropriate limits were measured and have been recorded in this report.

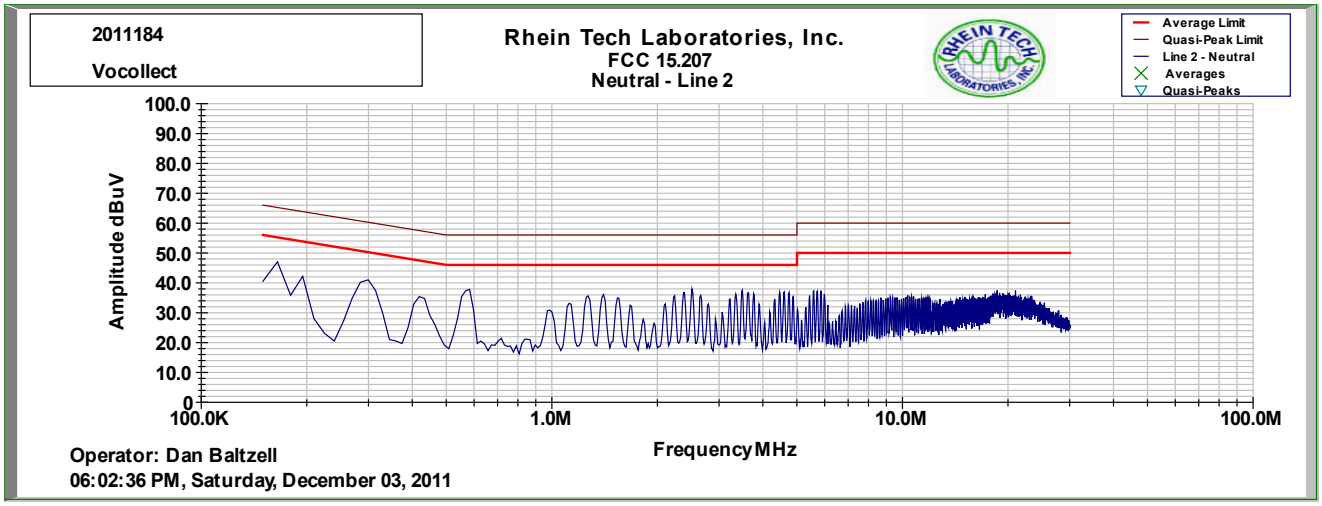
**Table 8-1: Conducted Emissions Test Equipment**

| RTL Asset # | Manufacturer | Model | Part Type | Serial Number | Calibration Due Date |
|---|---|---|---|---|---|
| 900968 | Hewlett Packard | 8567A | Spectrum Analyzer (10 kHz - 1.5 GHz) | 2602A00160 | 11/17/12 |
| 900969 | Hewlett Packard | 85650A | Quasi-Peak Adapter | 2412A00414 | 11/17/12 |
| 900970 | Hewlett Packard | 85662A | Spectrum Analyzer Display | 2542A11239 | 11/17/12 |
| 901082 | AFJ International | LS16 | 16A LISN | 16010020081 | 4/13/12 |
| N/A | Rhein Tech Laboratories, Inc. | Automated Emission Tester | Emissions testing software Rev. 14.0.2 | N/A | N/A |

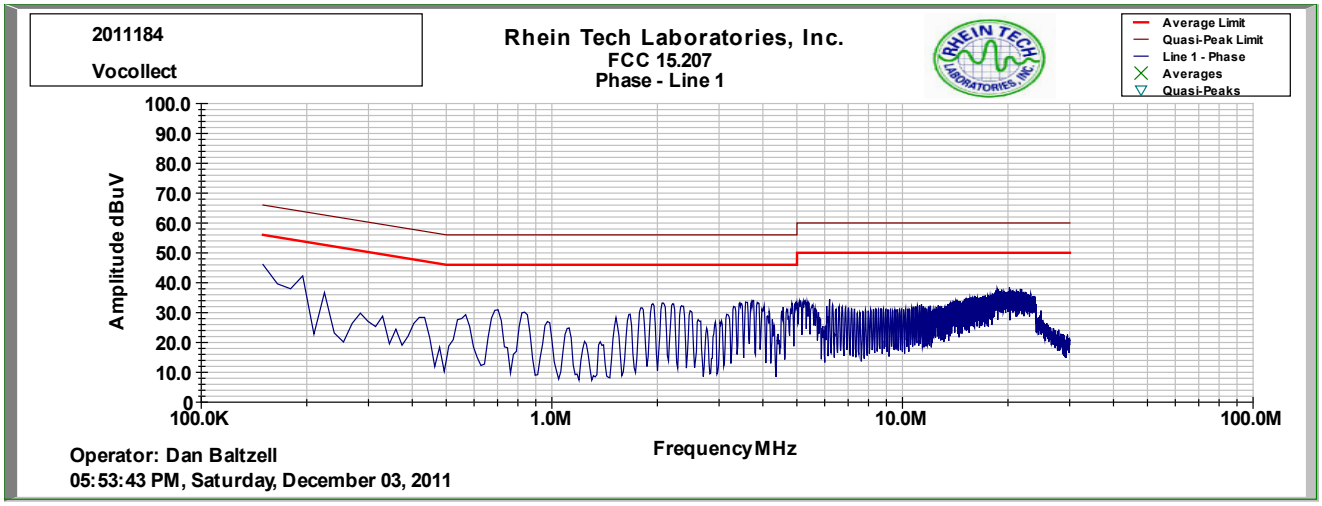
## 8.3 Conducted Emissions Test Results

### 8.3.1 Conducted Emissions Transmit Center Channel FHSS/DSSS

**Plot 8-1: Conducted Emissions Transmit Center Channel FHSS/DSSS Neutral Side**

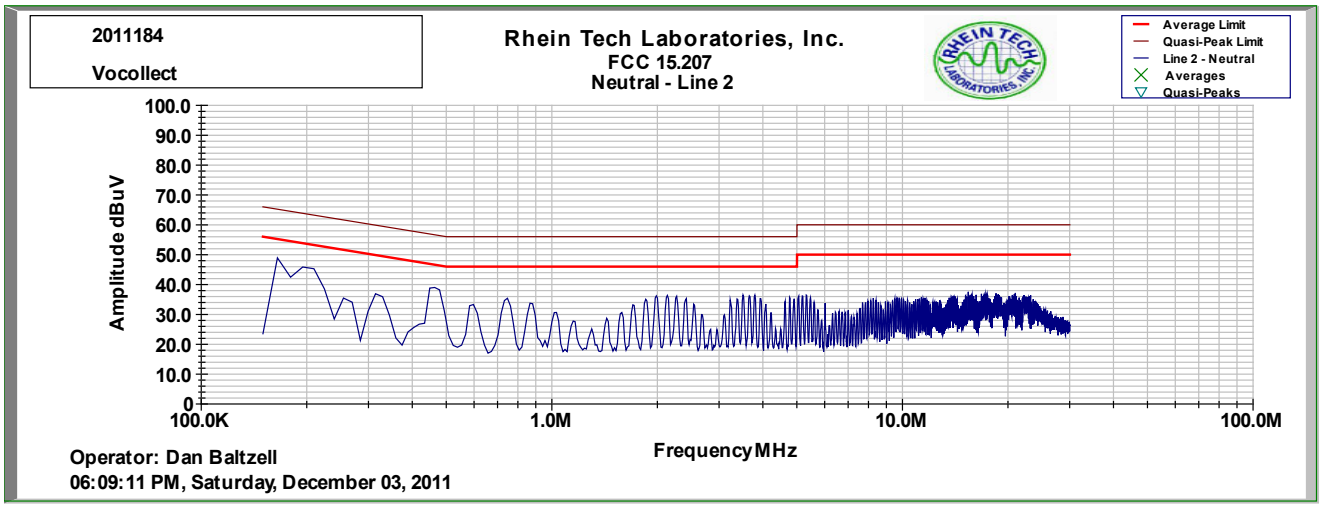



**Plot 8-2: Conducted Emissions Transmit Center Channel FHSS/DSSS Hot Side**

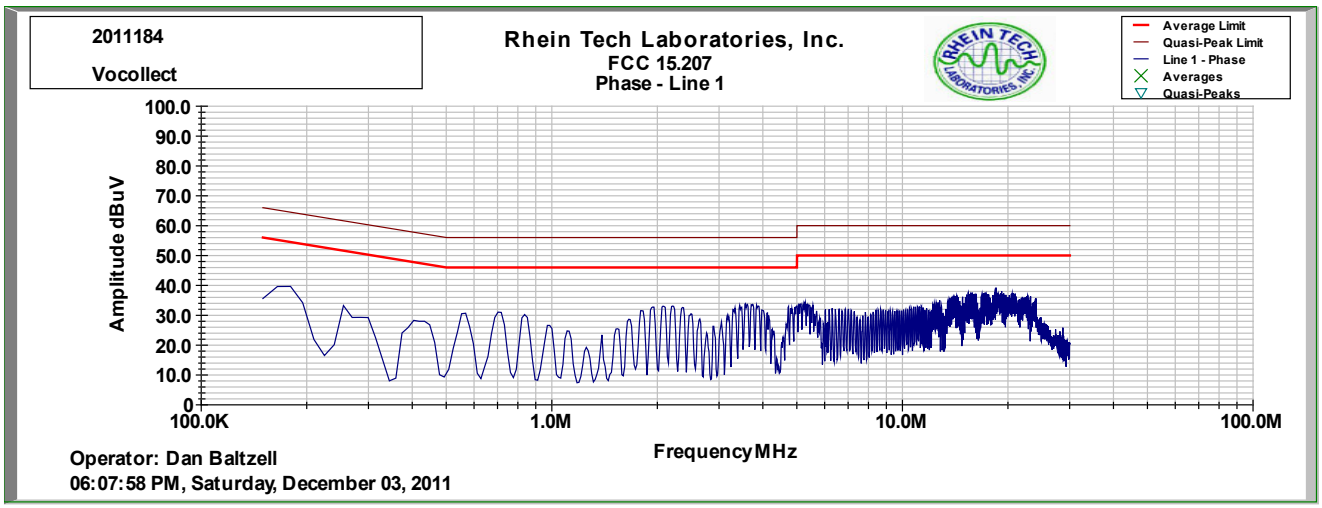


### 8.3.2 Conducted Emissions Receive Channel 6 DSSS

**Plot 8-3: Conducted Emissions Receive Channel 6 DSSS Neutral Side**




**Plot 8-4: Conducted Emissions Receive Channel 6 FHSS/DSSS Hot Side**




**Test Personnel:**

| Daniel W. Baltzell | Daniel W. Baltzell | December 3, 2011 |
|---|---|---|
| Test Engineer | Signature | Date of Test |

# 9 Radiated Emissions – FCC 15.209; RSS-210 A8.5 and RSS-Gen

## 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 $10^{th}$ 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 | Antenna (Loop, 9 kHz - 30 MHz) | 827525/019 | 10/1/12 |
| 901364 | MITEQ | JS4-01002600-36-5P | Amplifier 0.1-26 GHz, 28 dB gain, power 5 dB | 849863 | 7/14/12 |
| 900905 | Rhein Tech Laboratories | PR-1040 | OATS 1 Preamplifier 40 dB (30 MHz – 2 GHz) | 1006 | 7/14/12 |
| 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 | 10/14/12 |
| 901517 | Insulated Wire Inc. | KPS-1503-360-KPS-09302008 | RF cable 36" | NA | 10/14/12 |
| 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 | 6/14/12 |
| 900321 | EMCO | 3161-03 | Horn Antennas (4 - 8,2 GHz) | 9508-1020 | 6/14/12 |
| 900323 | EMCO | 3160-7 | Horn Antennas (8,2 - 12,4 GHz) | 9605-1054 | 6/14/12 |
| 900356 | EMCO | 3160-08 | Horn Antenna (12.4 - 18 GHz) | 9607-1044 | 6/14/12 |
| 900325 | EMCO | 3160-9 | Horn Antennas (18 - 26.5 GHz) | 9605-1051 | 6/14/12 |
| 900392 | Hewlett Packard | 1197OK | Harmonic Mixer (18 – 26.5 GHz) | 3525A00159 | 6/14/12 |
| 900791 | Chase | CBL6111B | Bilog Antenna (30 MHz – 2000 MHz) | N/A | 1/31/13 |
| 900913 | Hewlett Packard | 85462A | EMI Receiver RF Section (9 KHz – 6.5 GHz) | 3325A00159 | 8/17/12 |
| 900914 | Hewlett Packard | 8546OA | RF Filter Section (100 kHz - 6.5 GHz) | 3330A00107 | 8/17/12 |
| 901413 | Agilent Technologies | E4448A | Spectrum Analyzer | US44020346 | 4/8/12 |

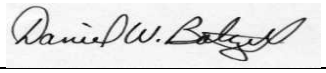
### 9.3 Radiated Emissions Test Results

#### 9.3.1 Radiated Emissions Digital/Receiver Test Data

**Table 9-2: Digital/Receiver Radiated Emissions**

| Temperature: 43°F Humidity: 80% | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Emission Frequency (MHz)** | **Test Detector** | **Antenna Polarity (H/V)** | **Turntable Azimuth (deg)** | **Antenna Height (m)** | **Analyzer Reading (dBuV)** | **Site Correction Factor (dB/m)** | **Emission Level (dBuV/m)** | **Limit (dBuV/m)** | **Margin (dB)** | **Pass/ Fail** |
| 40.800 | Qp | V | 0 | 1.0 | 38.0 | -16.4 | 21.6 | 40.0 | -18.4 | Pass |
| 44.400 | Qp | H | 0 | 1.4 | 47.3 | -18.2 | 29.1 | 40.0 | -10.9 | Pass |
| 46.000 | Qp | V | 0 | 1.0 | 37.0 | -18.9 | 18.1 | 40.0 | -21.9 | Pass |
| 260.000 | Qp | H | 270 | 1.0 | 40.9 | -13.8 | 27.1 | 46.0 | -18.9 | Pass |
| 280.000 | Qp | V | 270 | 2.0 | 34.2 | -14.3 | 19.9 | 46.0 | -26.1 | Pass |
| 282.500 | Qp | H | 90 | 1.0 | 45.0 | -14.1 | 30.9 | 46.0 | -15.1 | Pass |

**Test Personnel:**

| Daniel W. Baltzell |  | December 3, 2011 |
|---|---|---|
| Test Engineer | Signature | Date of Test |

### 9.3.2 Radiated Emissions Harmonics/Spurious Test Data - WLAN DSSS (802.11b)

**Table 9-3: Radiated Emissions Harmonics/Spurious 2412 MHz - Peak**

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Site Correction Factor (dB/m) | Peak Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Peak Margin (dB) |
|---|---|---|---|---|---|
| 4824.0 | 47.4 | -11.6 | 35.8 | 74.0 | -38.2 |
| 12060.0 | 42.5 | 0.9 | 43.4 | 74.0 | -30.6 |
| 14472.0 | 44.4 | 5.5 | 49.9 | 74.0 | -24.1 |
| 19296.0 | 25.3 | 26.8 | 52.1 | 74.0 | -21.9 |

**Table 9-4: Radiated Emissions Harmonics/Spurious 2412 MHz - Average**

| Emission Frequency (MHz) | 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) |
|---|---|---|---|---|---|
| 4824.0 | 34.5 | -11.6 | 22.9 | 54.0 | -31.1 |
| 12060.0 | 30.3 | 0.9 | 31.2 | 54.0 | -22.8 |
| 14472.0 | 31.9 | 5.5 | 37.4 | 54.0 | -16.6 |
| 19296.0 | 14.0 | 26.8 | 40.8 | 54.0 | -13.2 |

**Table 9-5: Radiated Emissions Harmonics/Spurious 2437 MHz - Peak**

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Site Correction Factor (dB/m) | Peak Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Peak Margin (dB) |
|---|---|---|---|---|---|
| 4874.0 | 49.5 | -11.4 | 38.1 | 74.0 | -35.9 |
| 7311.0 | 42.6 | -7.6 | 35.0 | 74.0 | -39.0 |
| 12185.0 | 42.1 | -0.1 | 42.0 | 74.0 | -32.0 |
| 19496.0 | 23.3 | 16.9 | 40.2 | 74.0 | -33.8 |

**Table 9-6: Radiated Emissions Harmonics/Spurious 2437 MHz - Average**

| Emission Frequency (MHz) | 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) |
|---|---|---|---|---|---|
| 4874.0 | 37.6 | -11.4 | 26.2 | 54.0 | -27.8 |
| 7311.0 | 30.6 | -7.6 | 23.0 | 54.0 | -31.0 |
| 12185.0 | 30.8 | -0.1 | 30.7 | 54.0 | -23.3 |
| 19496.0 | 12.2 | 16.9 | 29.1 | 54.0 | -24.9 |

**Table 9-7: Radiated Emissions Harmonics/Spurious 2462 MHz - Peak**

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Site Correction Factor (dB/m) | Peak Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Peak Margin (dB) |
|---|---|---|---|---|---|
| 4924.0 | 50.2 | -11.3 | 38.9 | 74.0 | -35.1 |
| 7386.0 | 43.3 | -7.6 | 35.7 | 74.0 | -38.3 |
| 12310.0 | 43.6 | -0.6 | 43.0 | 74.0 | -31.0 |
| 19696.0 | 24.6 | 26.7 | 51.3 | 74.0 | -22.7 |
| 22158.0 | 24.6 | 15.8 | 40.4 | 74.0 | -33.6 |
| 24620.0 | 25.1 | 16.9 | 42.0 | 74.0 | -32.0 |

**Table 9-8: Radiated Emissions Harmonics/Spurious 2462 MHz - Average**

| Emission Frequency (MHz) | 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) |
|---|---|---|---|---|---|
| 4924.0 | 38.7 | -11.3 | 27.4 | 54.0 | -26.6 |
| 7386.0 | 32.6 | -7.6 | 25.0 | 54.0 | -29.0 |
| 12310.0 | 31.8 | -0.6 | 31.2 | 54.0 | -22.8 |
| 19696.0 | 12.5 | 26.7 | 39.2 | 54.0 | -14.8 |
| 22158.0 | 13.3 | 15.8 | 29.1 | 54.0 | -24.9 |
| 24620.0 | 14.3 | 16.9 | 31.2 | 54.0 | -22.8 |

### 9.3.3 Radiated Emissions Harmonics/Spurious Test Data - WLAN DSSS (802.11g)

**Table 9-9: Radiated Emissions Harmonics/Spurious 2412 MHz - Peak**

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Site Correction Factor (dB/m) | Peak Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Peak Margin (dB) |
|---|---|---|---|---|---|
| 4824.0 | 46.2 | -11.6 | 34.6 | 74.0 | -39.4 |
| 12060.0 | 43.1 | 0.9 | 44.0 | 74.0 | -30.0 |
| 14472.0 | 44.6 | 5.5 | 50.1 | 74.0 | -23.9 |
| 19296.0 | 24.6 | 26.8 | 51.4 | 74.0 | -22.6 |

**Table 9-10: Radiated Emissions Harmonics/Spurious 2412 MHz - Average**

| Emission Frequency (MHz) | 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) |
|---|---|---|---|---|---|
| 4824.0 | 33.4 | -11.6 | 21.8 | 54.0 | -32.2 |
| 12060.0 | 32.1 | 0.9 | 33.0 | 54.0 | -21.0 |
| 14472.0 | 33.5 | 5.5 | 39.0 | 54.0 | -15.0 |
| 19296.0 | 13.7 | 26.8 | 40.5 | 54.0 | -13.5 |

**Table 9-11: Radiated Emissions Harmonics/Spurious 2437 MHz - Peak**

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Site Correction Factor (dB/m) | Peak Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Peak Margin (dB) |
|---|---|---|---|---|---|
| 4874.0 | 46.0 | -11.4 | 34.6 | 74.0 | -39.4 |
| 7311.0 | 43.3 | -7.6 | 35.7 | 74.0 | -38.3 |
| 12185.0 | 43.0 | -0.1 | 42.9 | 74.0 | -31.1 |
| 19496.0 | 23.3 | 16.9 | 40.2 | 74.0 | -33.8 |

**Table 9-12: Radiated Emissions Harmonics/Spurious 2437 MHz - Average**

| Emission Frequency (MHz) | 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) |
|---|---|---|---|---|---|
| 4874.0 | 34.0 | -11.4 | 22.6 | 54.0 | -31.4 |
| 7311.0 | 31.2 | -7.6 | 23.6 | 54.0 | -30.4 |
| 12185.0 | 31.7 | -0.1 | 31.6 | 54.0 | -22.4 |
| 19496.0 | 12.2 | 16.9 | 29.1 | 54.0 | -24.9 |

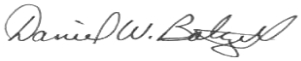
**Table 9-13: Radiated Emissions Harmonics/Spurious 2462 MHz - Peak**

| Emission Frequency (MHz) | Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW) | Site Correction Factor (dB/m) | Peak Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Peak Margin (dB) |
|---|---|---|---|---|---|
| 4924.0 | 46.4 | -11.3 | 35.1 | 74.0 | -38.9 |
| 7386.0 | 45.0 | -7.6 | 37.4 | 74.0 | -36.6 |
| 12310.0 | 43.0 | -0.6 | 42.4 | 74.0 | -31.6 |
| 19696.0 | 24.0 | 26.7 | 50.7 | 74.0 | -23.3 |
| 22158.0 | 24.2 | 15.8 | 40.0 | 74.0 | -34.0 |
| 24620.0 | 25.4 | 16.9 | 42.3 | 74.0 | -31.7 |

**Table 9-14: Radiated Emissions Harmonics/Spurious 2462 MHz - Average**

| Emission Frequency (MHz) | 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) |
|---|---|---|---|---|---|
| 4924.0 | 34.3 | -11.3 | 23.0 | 54.0 | -31.0 |
| 7386.0 | 33.0 | -7.6 | 25.4 | 54.0 | -28.6 |
| 12310.0 | 32.2 | -0.6 | 31.6 | 54.0 | -22.4 |
| 19696.0 | 13.1 | 26.7 | 39.8 | 54.0 | -14.2 |
| 22158.0 | 13.4 | 15.8 | 29.2 | 54.0 | -24.8 |
| 24620.0 | 14.4 | 16.9 | 31.3 | 54.0 | -22.7 |

**Test Personnel:**

| Daniel W. Baltzell |  | November 2, 2011 |
|---|---|---|
| Test Engineer | Signature | Date Of Test |

## 10 Conclusion

The data in this measurement report shows that the EUT as tested, Vocollect, Inc. Model Name A500, Model # TAP801-01, FCC ID: MQO-TAP801-01, IC: 2570A-TAP80101, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and Industry Canada RSS-210.