LS RESEARCH, LLC
WIRELESS PRODUCT DEVELOPMENT
ACCREDITED
Testing Cert. 1255.01
W66 N220 Commerce Court ● Cedarburg, WI 53012 ● USA
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# TEST REPORT # 311231
# LSR Job #: C-1315

Compliance Testing of:
ZRX

Test Date(s):
November 1-3, 8, 23, December 15-17, 2011

Prepared For:
Vigil Health Solutions
2102-4464 Markham St.
Victoria, BC, Canada V8Z 7X

**In accordance with:**
**Federal Communications Commission (FCC)**
**Part 15, Subpart C, Section 15.247**
**Industry Canada (IC) RSS 210 Annex 8**
**Digital Modulation Transmitters (DTS) Operating in the**
**Frequency Band 2400 MHz – 2483.5 MHz**

**This Test Report is issued under the Authority of:**

Signature: Thomas T. Smith Date: 12/27/2011

| **Test Report Reviewed by:** | **Tested by:** |
|---|---|
| Signature: Thomas T. Smith Date: 12/27/2011 | Signature: Peter Fisken Date: 12/12/11 |

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# EXHIBIT 1. INTRODUCTION

## 1.1 SCOPE

| | |
|---|---|
| **References:** | FCC Part 15, Subpart C, Section 15.247 and 15.209<br>FCC Part 2, Section 2.1043 paragraph (b)1.<br>RSS GEN and RSS 210 |
| **Title:** | FCC : Telecommunication – Code of Federal Regulations, CFR 47, Part 15.<br>IC : Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment |
| **Purpose of Test:** | To gain FCC and IC Certification Authorization for Low-Power License-Exempt Transmitters. |
| **Test Procedures:** | Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |
| **Environmental Classification:** | • Commercial, Industrial or Business<br>• Residential |

## 1.2 NORMATIVE REFERENCES

| Publication | Title |
|---|---|
| 47 CFR, Parts 0-15 (FCC) | Code of Federal Regulations - Telecommunications |
| RSS 210 Annex 8 | Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment |
| ANSI C63.4 | American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |
| CISPR 16-1-1 | Specification for radio disturbance and immunity measuring apparatus and methods.<br>Part 1-1: Measuring Apparatus. |
| CISPR 16-2-1 | Specification for radio disturbance and immunity measuring apparatus and methods.<br>Part 201: Conducted disturbance measurement. |
| FCC Public Notice DA 00-1407 | Part 15 Unlicensed Modular Transmitter Approval |
| FCC ET Docket No. 99-231 | Amendment to FCC Part 15 of the Commission's Rules Regarding Spread Spectrum Devices. |
| FCC Procedures | Measurement of Digital Transmission Systems operating under Section 15.247. |

## 1.3 LS Research, LLC TEST FACILITY

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 "General Requirements for the Competence of Calibration and Testing Laboratories".

LS Research, LLC's scope of accreditation includes all test methods listed herein, unless otherwise noted. A copy of the accreditation may be accessed on our web site: www.lsr.com. Accreditation status can be verified at A2LA's web site: www.a2la2.net.

## 1.4 LOCATION OF TESTING

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Chamber
- Semi-Anechoic Chamber
- Open Area Test Site (OATS)

## 1.5 TEST EQUIPMENT UTILIZED

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated in accordance with A2LA standards.

# EXHIBIT 2. PERFORMANCE ASSESSMENT

## 2.1 CLIENT INFORMATION

| | |
|---|---|
| **Manufacturer Name:** | **Vigil Health Solutions** |
| **Address:** | **2102-4464 Markham St., Victoria, BC, Canada V8Z 7X** |
| **Contact Name:** | **Jason Cai** |

## 2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

*The following information has been supplied by the applicant.*

| | |
|---|---|
| **Product Name:** | Vitality Wireless Receiver |
| **Model Number:** | ZRX |
| **Serial Number:** | Engineering Sample |

## 2.3 ASSOCIATED ANTENNA DESCRIPTION

An inverted-F PCB antenna is used in the ZRX.

## 2.4 EUT'S TECHNICAL SPECIFICATIONS

### Additional Information:

| | |
|---|---|
| EUT Frequency Range (in MHz) | 2405-2480 MHz |
| Maximum EIRP in Watts | 0.0708 W |
| Maximum Conducted Output Power (in dBm) | 18.5 dBm |
| Type of Modulation | OQPSK |
| Occupied Bandwidth (99% BW) | 2.40 MHz |
| Emission Designator | 2M40G7D |
| Transmitter Spurious (worst case) at 3 meters | 62.2 dBuV/m @ 7334.7 MHz<br>With duty-cycle correction added, 28.3 dBuV/m (62.2-33.9 dBuV/m) |
| Receiver Spurious (worst case) at 3 meters | 41.4 dBuV/m @ 4889.6 MHz @ 3m<br>*Note: No duty-cycle relaxation applied |
| Frequency Tolerance %, Hz, ppm | Better than 100 ppm |
| Transceiver Model # (if applicable) | CC2530, CC2591 |
| Receiver Bandwidth (MHz) | 2 MHz |
| Receiver Sensitivity (dBm) | -108 dBm |
| Antenna Information | |
| Detachable/non-detachable | Non-detachable |
| Type | Trace |
| Gain (in dBi) | 0 dBi |
| EUT will be operated under FCC Rule Part(s) | 15.247 |
| EUT will be operated under RSS Rule Part(s) | RSS-210 |
| Modular Filing | ☐ Yes ☒ No |
| Portable or Mobile? | Mobile |

### RF Technical Information:

| | | |
|---|---|---|
| Type of Evaluation (check one) | | SAR Evaluation: Device Used in the Vicinity of the Human Head |
| | | SAR Evaluation: Body-worn Device |
| | X | RF Evaluation |

If RF Evaluation checked above, test engineer to complete the following:

- Evaluated against exposure limits: ☒ General Public Use ☐ Controlled Use
- Duty Cycle used in evaluation: 100 %
- Standard used for evaluation: OET 65
- Measurement Distance: 20 cm
- RF Value: 0.14052 W/m² ☐ V/m ☐ A/m ☒ W/m²
  ☒ Measured ☐ Computed ☐ Calculated

## 2.5 PRODUCT DESCRIPTION

The ZRX is part of the Vigil® Vitality Care System, the newest innovation in nurse call and emergency call systems bringing the benefits of wireless and hardwired architecture together on one platform. The Vitality Care System supports active living for residents by providing them with a small, lightweight, fully supervised pendant that offers them the freedom and independence to move through the community and still be able to call for help if needed. The attractive design of the pendant allows residents to carry them without feeling encumbered or stigmatized. The advanced technology also enables longer battery life while still allowing you to change batteries instead of replacing the entire device.

The Vitality Care System was designed to allow for scalability for small to large communities without additional costly infrastructure. The open architecture allows for continued future innovation and additions to your system such as pull stations, call stations, motion sensors, bed monitoring, smoke detector monitoring, perimeter monitoring and wander management.

The ZRX can be wall or ceiling mounted and operates from a 24VAC supply.

# EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

## 3.1 CLIMATE TEST CONDITIONS

| | |
|---|---|
| **Temperature:** | 20-26 ˚C |
| **Humidity:** | 32-41% R.H. |

## 3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

| FCC and IC Paragraph | Test Requirements | Compliance (yes/no) |
|---|---|---|
| FCC : 15.247(a)(2)<br>IC : RSS 210 A8.2(a) | 6 dB Bandwidth of a Digital Modulation System | Yes |
| IC : RSS GEN section 4.6.1 | 20 dB Bandwidth | Yes |
| FCC : 15.247(b) & 1.1310<br>IC : RSS 210 A8.4 | Maximum Output Power | Yes |
| FCC : 15.247(i), 1.1307, 1.1310, 2.1091 & 2.1093<br>IC : RSS 102 | RF Exposure Limit | Yes |
| FCC :15.247(c)<br>IC : RSS 210 A8.5 | RF Conducted Spurious Emissions at the Transmitter Antenna Terminal | Yes |
| FCC : 15.247(d)<br>IC : RSS 210 A8.2(b) | Transmitted Power Spectral Density of a Digital Modulation System | Yes |
| FCC : 15.247(c), 15.209 & 15.205<br>IC : RSS 210 A8.2(b), section 2.2, 2.6 and 2.7 | Transmitter Radiated Emissions | Yes |
| *The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices (RSS GEN and RSS 210 of IC) and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers (RSS GEN and RSS 210 of IC). The Receiver Test Report is available upon request.* | | |

## 3.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

☐ **None** ☒ **Yes (explain below)**

**Duty-cycle relaxation has been utilized and the justification for the duty-cycle relaxation amount can be found in Appendix D.**

## 3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

☒ **None** ☐ **Yes (explain below)**

# EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, and Industry Canada RSS-210, Issue 8 (2010), Section Annex 8 (section 8.2) for a Digital Spread Spectrum (DTS) Transmitter.

If some emissions are seen to be within 3 dB of their respective limits:
As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

# EXHIBIT 5. RADIATED EMISSIONS TEST

## 5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15, RSS GEN and ANSI C63.4. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was operated in and final testing was performed using continuous transmit mode. The unit has the capability to operate on 16 channels. Three units were provided, each operable on a unique channel.

The applicable limits apply at a 3 meter distance. Measurements above 4 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment. The test sample was operated on one of three (3) standard channels: low (2405 MHz), middle (2445 MHz) and high (2480 MHz) to comply with FCC Part 15.31(m). Unique samples were provided, programmed to a single channel each for test purposes.

## 5.2 Test Procedure

Radiated RF measurements were performed on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber. The frequency range from 30 MHz to 25000 MHz was scanned and investigated. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the EUT. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. A Double-Ridged Waveguide Horn Antenna was used from 1 GHz to 18 GHz. The maximum radiated RF emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities. From 18 GHz to 25 GHz, the EUT was measured using a standard gain Horn Antenna and pre-amplifier.

The EUT was rotated along three orthogonal axes during the investigations to find the highest emission levels.

## 5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and an Agilent E4445A/N9039A EMI System. The resulting correction factors and the cable loss factors from these calibrations were entered into the EMI Receiver database. As a result, the data taken from the EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz for peak measurements, 10Hz for average measurements). From 4 GHz to 18 GHz, an Agilent E4446A Spectrum Analyzer and an EMCO Horn Antenna were used. From 18 GHz to 25 GHz, the Agilent E4446A Spectrum Analyzer as well as a standard gain horn, and preamp were used.

**Test Equipment List**

Please see Appendix A

## 5.4 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 and Canada RSS-210, Issue 8 (2010), Annex 8 for a DTS transmitter. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

## 5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

The maximum peak output power of an intentional radiator in the 2400-2483.5 MHz band, as specified in Title 47 CFR 15.247 (b)(3) and RSS 210 A8.4 is 1 Watt. The harmonic and spurious RF emissions, as measured in any 100 kHz bandwidth, as specified in 15.247 (d) and RSS 210 A8.2(b), shall be at least 20 dB below the measured power of the desired signal, and must also meet the requirements described in 15.205(c) for FCC and section 2.2,2.6 and 2.7 of RSS 210 for IC.

The following table depicts the general radiated emission limits above 30 MHz. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements. These limits were applied to any signals found in the 15.205 restricted bands. The mentioned limits correspond to those limits listed in RSS 210 section 2.7.

| Frequency (MHz) | 3 m Limit μV/m | 3 m Limit (dBμV/m) | 1 m Limit (dBμV/m) |
|---|---|---|---|
| 30-88 | 100 | 40.0 | - |
| 88-216 | 150 | 43.5 | - |
| 216-960 | 200 | 46.0 | - |
| > 960 | 500 | 54.0 | 63.5 |

Sample conversion from field strength μV/m to dBμV/m:
$dB\mu V/m = 20 \log_{10} (100)$
= 40 dBμV/m (from 30-88 MHz)

For measurements made at 1.0 meter, a 9.5 dB correction has been invoked.

> 960 MHz
500μV/m or 54.0 dB/μV/m at 3 meters
54.0 + 9.5 = 63.5 dB/μV/m at 1 meter

Sample Calculation using correction factors from the device
Raw Receiver Data + Antenna Factor + Cable Factor + = Reported Value
Generic example of reported data at 57.0 MHz:
Reported Measurement data = 16.6 (raw receiver measurement ) + 9.8 (antenna factor) + 0.64 (cable factor) = 27.0 dBμV

## 5.6 RADIATED EMISSIONS TEST DATA CHART

3 Meter Measurements of Electromagnetic Radiated Emissions
Test Standard: 47CFR, Part 15.205 and 15.247(DTS)
RSS 210 A8, sections 2.2,2.6 and 2.7
Frequency Range Inspected: 30 MHz to 25000 MHz

| | | | | | | |
|---|---|---|---|---|---|---|
| Manufacturer: | Vigil Healthcare Solutions | | | | | |
| Date(s) of Test: | November 1, 2, 8, 2011 | | | | | |
| Test Engineer(s): | Peter Feilen, Mike Hintzke | | | | | |
| Voltage: | 24 VAC | | | | | |
| Operation Mode: | continuous transmit mode | | | | | |
| Environmental Conditions in the Lab: | Temperature: 20 – 25° C<br>Relative Humidity: 30 – 60 % | | | | | |
| EUT Power: | X | Single Phase 24VAC | | 3 Phase ___VAC | | |
| | | Battery | | Other: | | |
| EUT Placement: | X | 80cm non-conductive table | | 10cm Spacers | | |
| EUT Test Location: | X | 3 Meter Semi-Anechoic FCC Listed Chamber | | 3/10m OATS | | |
| Measurements: | | Pre-Compliance | | Preliminary | X | Final |
| Detectors Used: | X | Peak | X | Quasi-Peak | X | Average |

The following table depicts the level of significant spurious radiated RF emissions found:

| Frequency (MHz) | Height (m) | Azimuth (degree) | Electric Field Reading (dBµV/m) | Electric Field Limit (dBµV/m) | Margin (dB) | Antenna Polarity | EUT orientation |
|---|---|---|---|---|---|---|---|
| 1696.6 | 1.27 | 163 | 53.57 | 54.0 | 0.4 | H | F |
| 3860.4 | 1.00 | 0 | 50.5 | 54.0 | 3.5 | H | F |
| 310.5 | 1.00 | 0 | 26.8 | 46.0 | 19.2 | H | F |
| 300.1 | 1.00 | 162 | 24.49 | 46.0 | 21.5 | V | F |
| 35.3 | 1.00 | 239 | 35.78 | 40.0 | 4.2 | V | F |
| 57.0 | 1.15 | 0 | 26.99 | 40.0 | 13.0 | V | F |
| 80.0 | 1.00 | 324 | 30.56 | 40.0 | 9.4 | V | F |
| 105.2 | 1.00 | 112 | 28.97 | 43.5 | 14.5 | V | F |
| 151.0 | 1.00 | 0 | 16.86 | 43.5 | 26.6 | V | F |
| 57.4 | 1.11 | 61 | 27.23 | 40.0 | 12.8 | H | F |
| 35.4 | 2.49 | 0 | 25.74 | 40.0 | 14.3 | H | F |
| 299.0 | 1.00 | 0 | 25.18 | 46.0 | 20.8 | H | F |

Notes:

1) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
2) Measurements above 4 GHz were made at 1 meters of separation from the EUT
3) Measurement at receiver system noise floor.
4) A relaxation of the limit is invoked based on the average duty factor of the transmitter on-air-time. Justification appears in Appendix D.

# RADIATED EMISSIONS DATA CHART (continued)

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 11:

| Frequency (MHz) | Height (m) | Azimuth (degree) | Peak Reading (dBµV/m) | Avg Reading (dBµV/m) | Avg Limit (dBµV/m) | Margin (dB) | Antenna Polarity | EUT orientation |
|---|---|---|---|---|---|---|---|---|
| 4810 | 1.03 | 42 | 66.6 | 59.4 | 63.5 | 4.1 | H | Side |
| 12025 | 1.06 | 46 | 67.4 | 57.0 | 63.5 | 6.5 | H | Side |
| 19240 | Note 3 | 0 | 0.0 | 0.0 | 63.5 | 63.5 | H | Vertical |

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 19:

| Frequency (MHz) | Height (m) | Azimuth (degree) | Peak Reading (dBµV/m) | Avg Reading (dBµV/m) | Avg Limit (dBµV/m) | Duty Cycle Correction Amount (dB) Note 4 | Adjusted Reading (Peak-DC) (dBuV/m) | Adjusted Margin (dB) | Antenna Polarity | EUT orientation |
|---|---|---|---|---|---|---|---|---|---|---|
| 4889.8 | 1.06 | 47 | 67.2 | 60.1 | 63.5 | -33.9 | 33.3 | 30.2 | H | Side |
| 7334.7 | 1 | 316 | 79.3 | 71.7 | 63.5 | -33.9 | 45.4 | 18.1 | H | Side |
| 12224.5 | 1.05 | 46 | 67.6 | 56.8 | 63.5 | -33.9 | 33.7 | 29.8 | H | Side |
| 19559.2 | Note 3 | | | | 63.5 | N/A | N/A | N/A | | |

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 26:

| Frequency (MHz) | Height (m) | Azimuth (degree) | Peak Reading (dBµV/m) | Avg Reading (dBµV/m) | Avg Limit (dBµV/m) | Duty Cycle Correction Amount (dB) Note 4 | Adjusted Reading (Peak-DC) (dBuV/m) | Adjusted Margin (dB) | Antenna Polarity | EUT orientation |
|---|---|---|---|---|---|---|---|---|---|---|
| 4960 | 1.07 | 352 | 62.4 | 54.4 | 63.5 | -33.9 | 28.5 | 35.0 | V | Vertical |
| 7440 | 1 | 315 | 72.9 | 65.1 | 63.5 | -33.9 | 39.0 | 24.5 | H | Side |
| 12400 | 1.08 | 47 | 58.4 | 46.9 | 63.5 | -33.9 | 24.5 | 39.0 | H | Side |
| 19840 | Note 3 | | | | | N/A | N/A | N/A | | |
| 22320 | Note 3 | | | | | N/A | N/A | N/A | | |

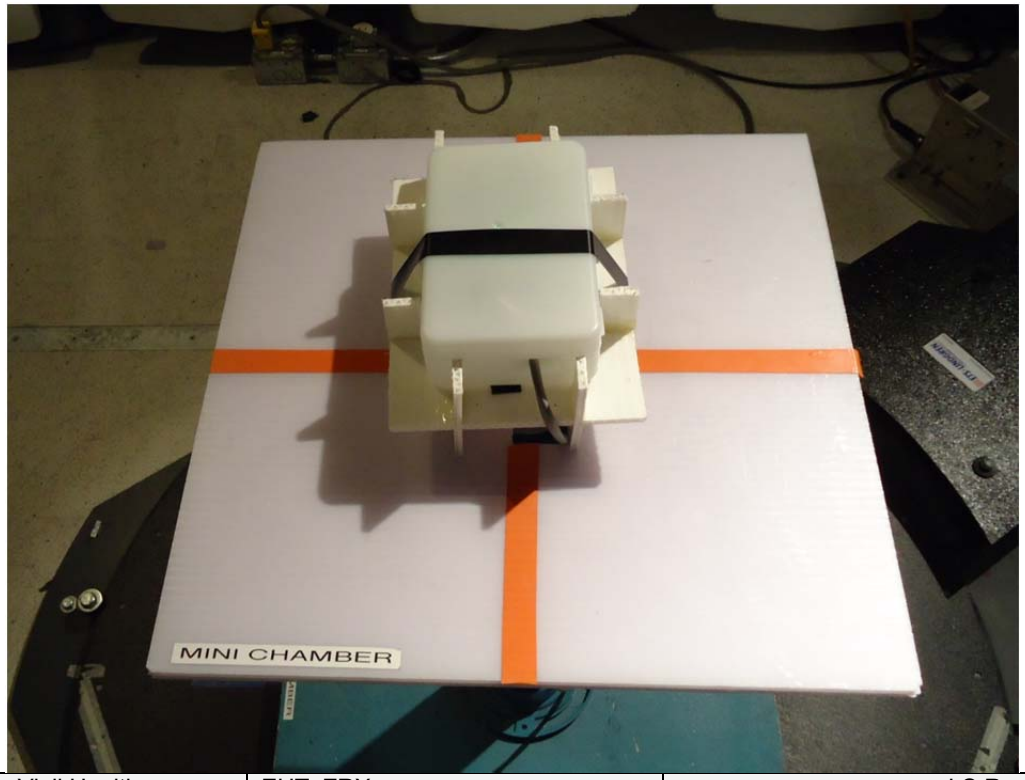
Notes:

5) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
6) Measurements above 4 GHz were made at 1 meters of separation from the EUT
7) Measurement at receiver system noise floor.
8) A relaxation of the limit is invoked based on the average duty factor of the transmitter on-air-time. Justification appears in Appendix D.

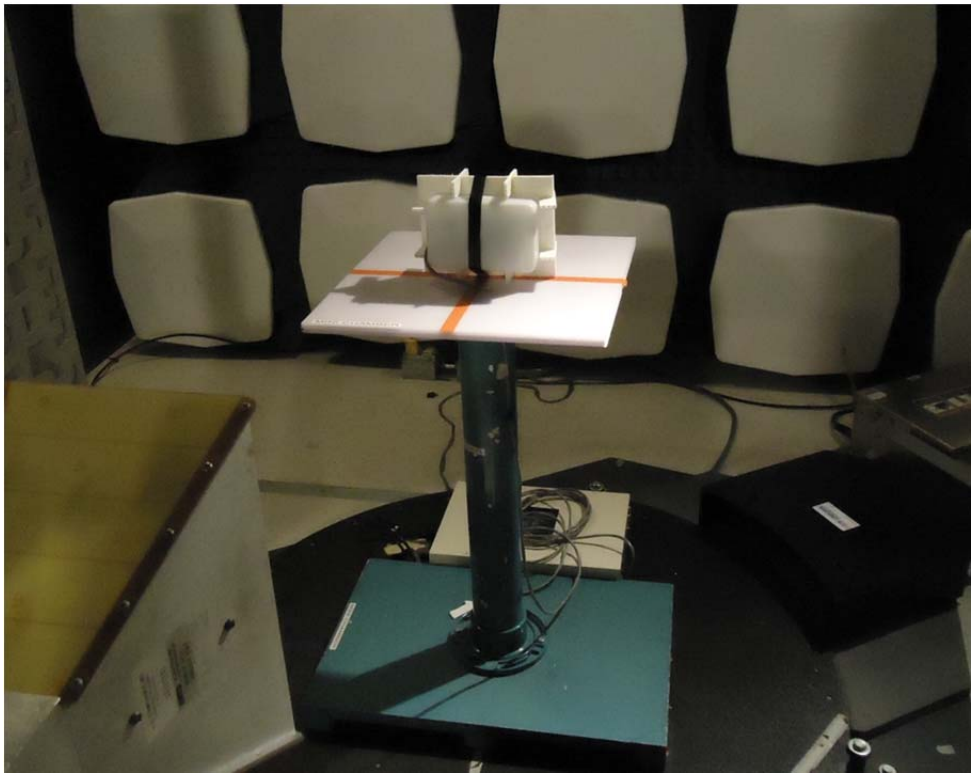
## 5.7 Test Setup Photo(s) – Radiated Emissions Test

**Vertical Orientation**

**Horizontal Orientation**



**Side Orientation**

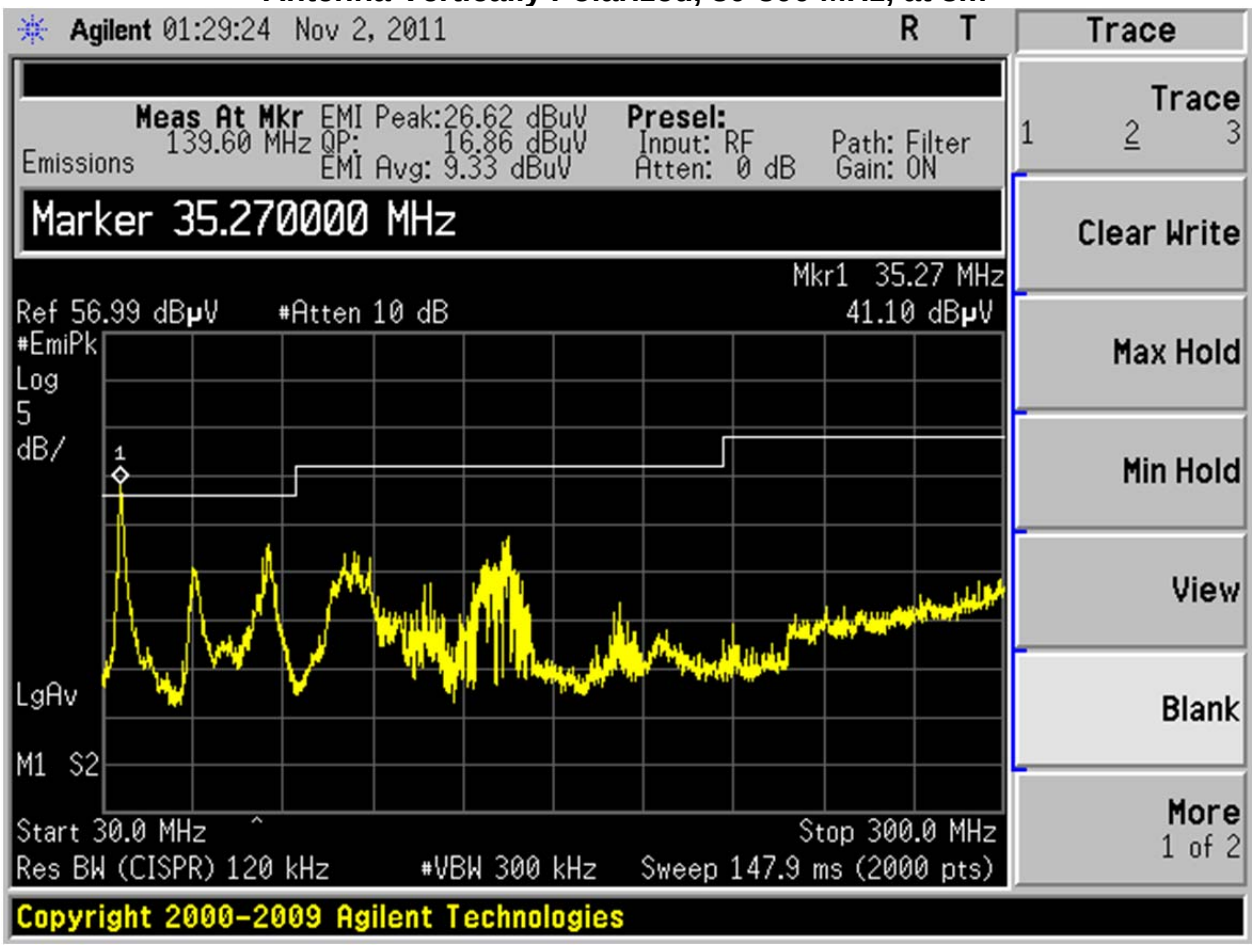


## 5.8 Screen Captures - Radiated Emissions Test

These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

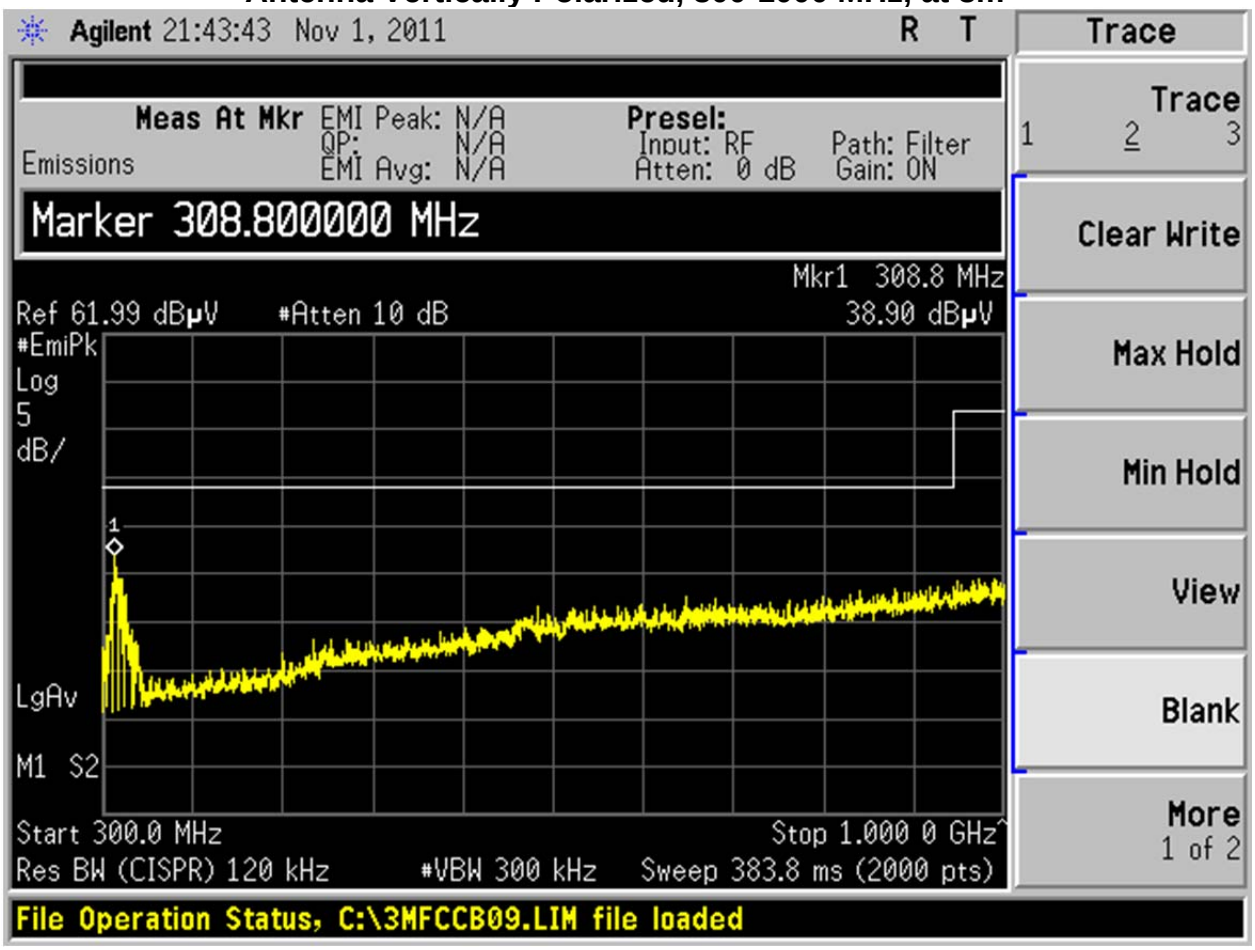
The signature scans shown here are from worst-case emissions, as measured on channels 1, 5, or 10, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

**Antenna Vertically Polarized, 30-300 MHz, at 3m**



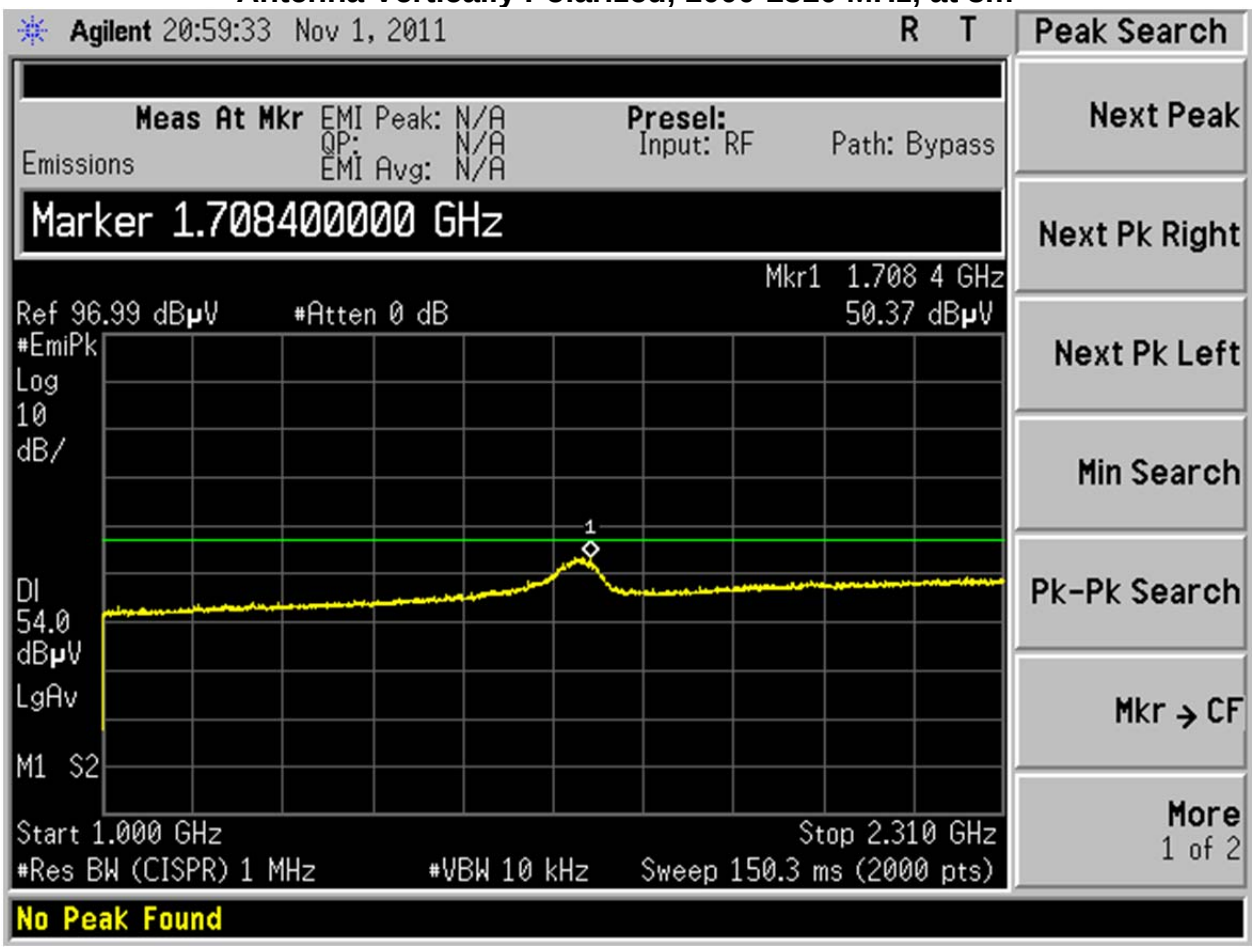
**Screen Captures - Radiated Emissions Testing** ***(continued)***

**Antenna Vertically Polarized, 300-1000 MHz, at 3m**



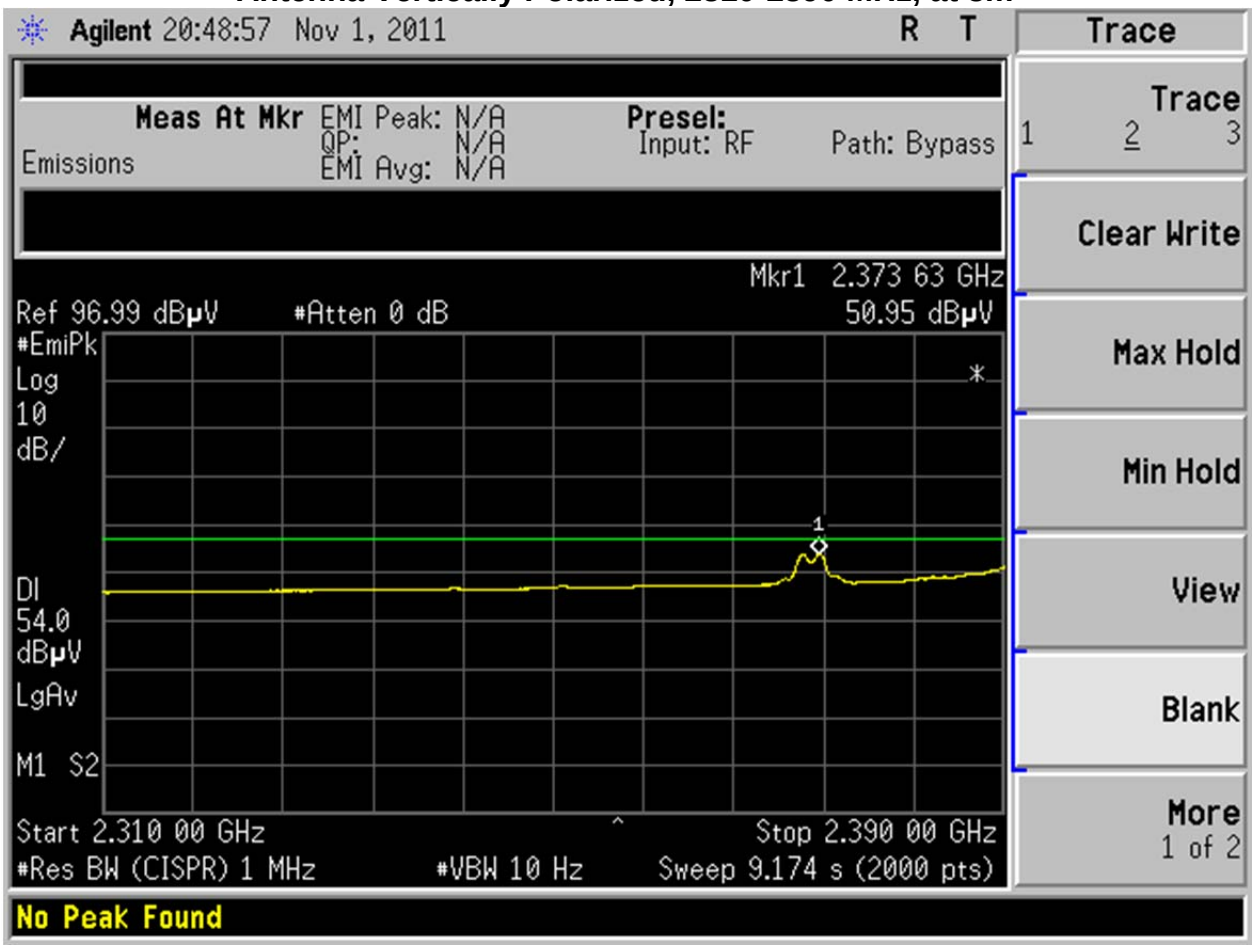
**Screen Captures - Radiated Emissions Testing** ***(continued)***

**Antenna Vertically Polarized, 1000-2310 MHz, at 3m**



**Screen Captures - Radiated Emissions Testing *(continued)***

**Antenna Vertically Polarized, 2310-2390 MHz, at 3m**

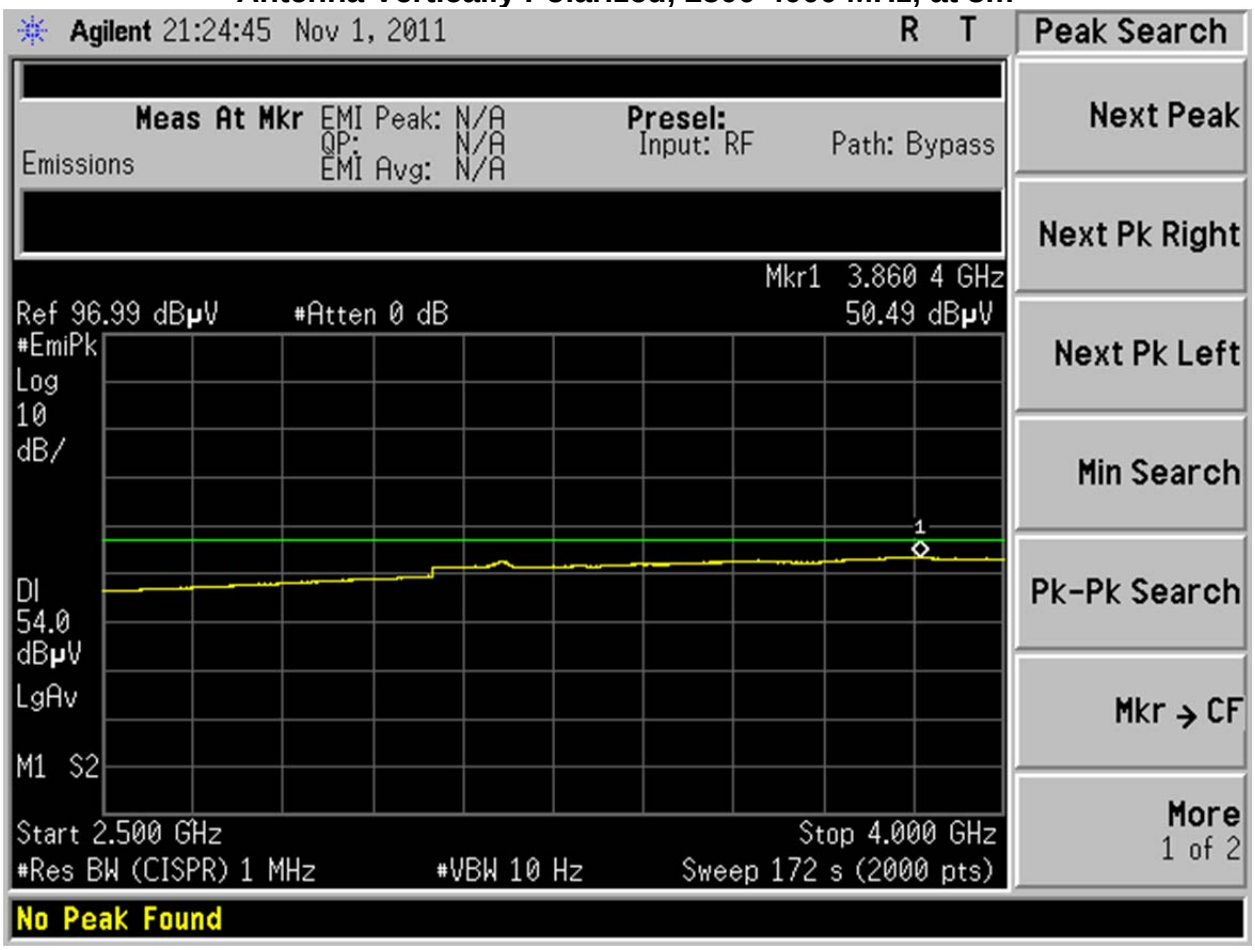



2390-2400 MHz is represented in Section 8, Bandedge Measurements

2400-2483.5 MHz is represented in Section 8, Bandedge Measurements

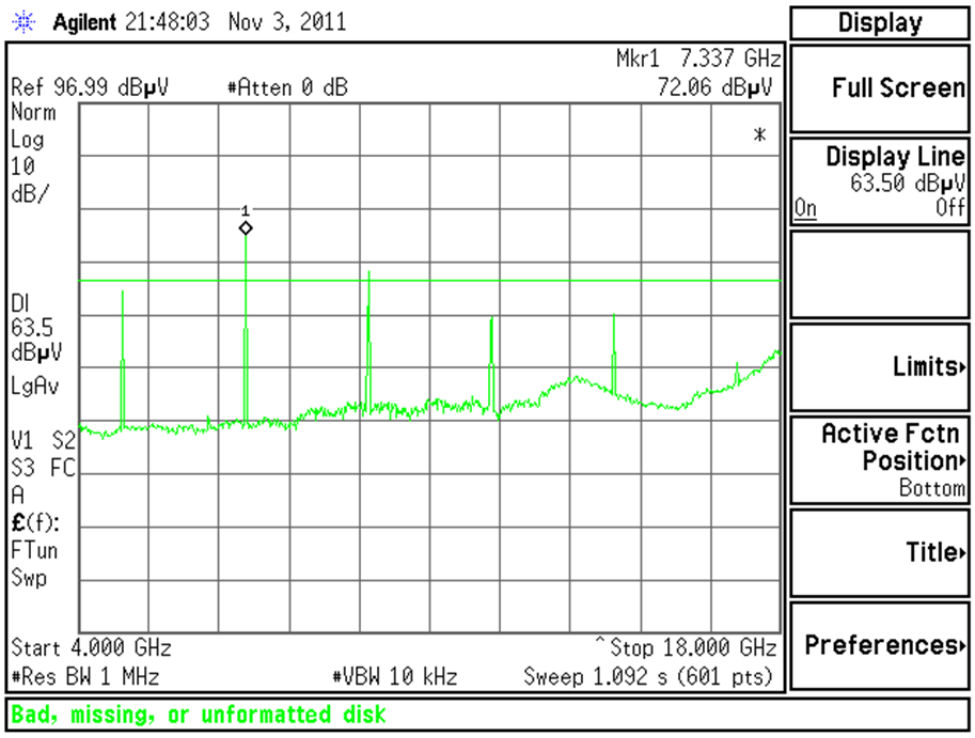
**Screen Captures - Radiated Emissions Testing** ***(continued)***

**Antenna Vertically Polarized, 2500-4000 MHz, at 3m**



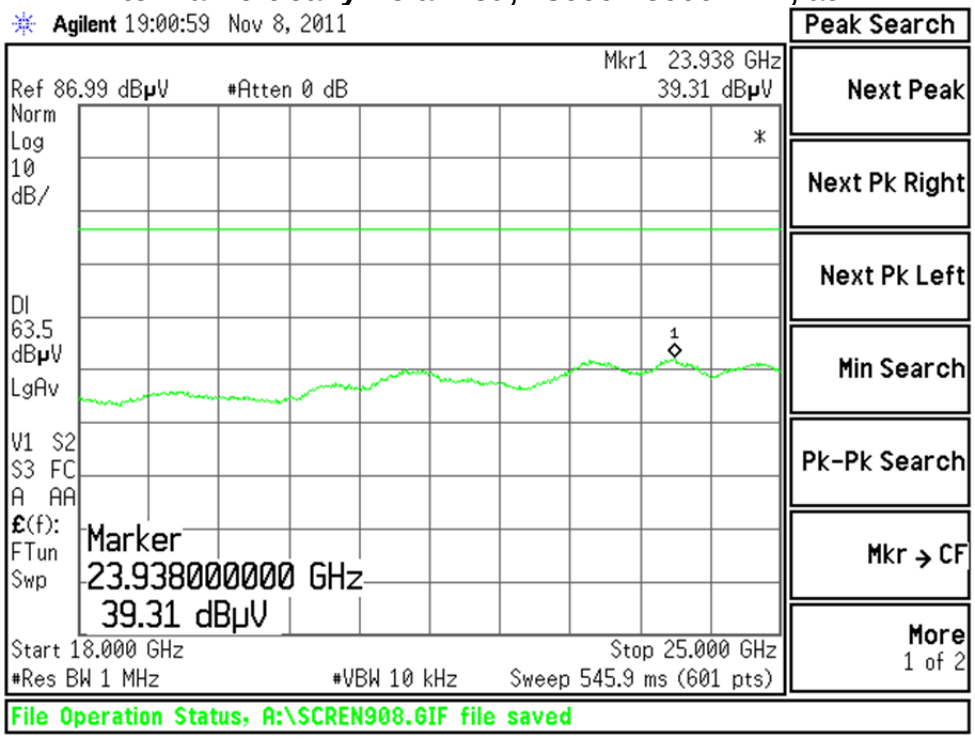
## Screen Captures - Radiated Emissions Testing *(continued)*

### Antenna Vertically Polarized, 4000-18000 MHz, at 1m



## Screen Captures - Radiated Emissions Testing *(continued)*

**Antenna Vertically Polarized, 18000-25000 MHz, at 1m**



## 5.9 Receive Mode Testing

Per the requirements of RSS-210, the EUT was placed in continuous receive mode and the radiated spurious emissions were measured and compared to the limits stated in RSS-Gen Section 4.10.

The test setup, procedure, and equipment utilized were identical to that described in sections 5.1, 5.2, and 5.3 of this document.

Measurement data and screen captures from the receive tests are presented below:

| Frequency (MHz) | Height (m) | Azimuth (degree) | Peak Reading (dBµV/m) | Average Reading (dBµV/m) | Average Limit (dBµV/m) | Margin (dB) | Antenna Polarity | EUT orientation |
|---|---|---|---|---|---|---|---|---|
| 4809.6 | 1.00 | 312 | 50.8 | 45.9 | 63.5 | 17.6 | H | S |
| 4889.6 | 1.08 | 8 | 53.6 | 50.9 | 63.5 | 12.6 | H | S |
| 4959.6 | 1.11 | 42 | 53.3 | 50.1 | 63.5 | 13.4 | H | S |
| 1210.0 | 1.00 | 0 | 24.7 | 19.9 | 54.0 | 34.1 | V | V |

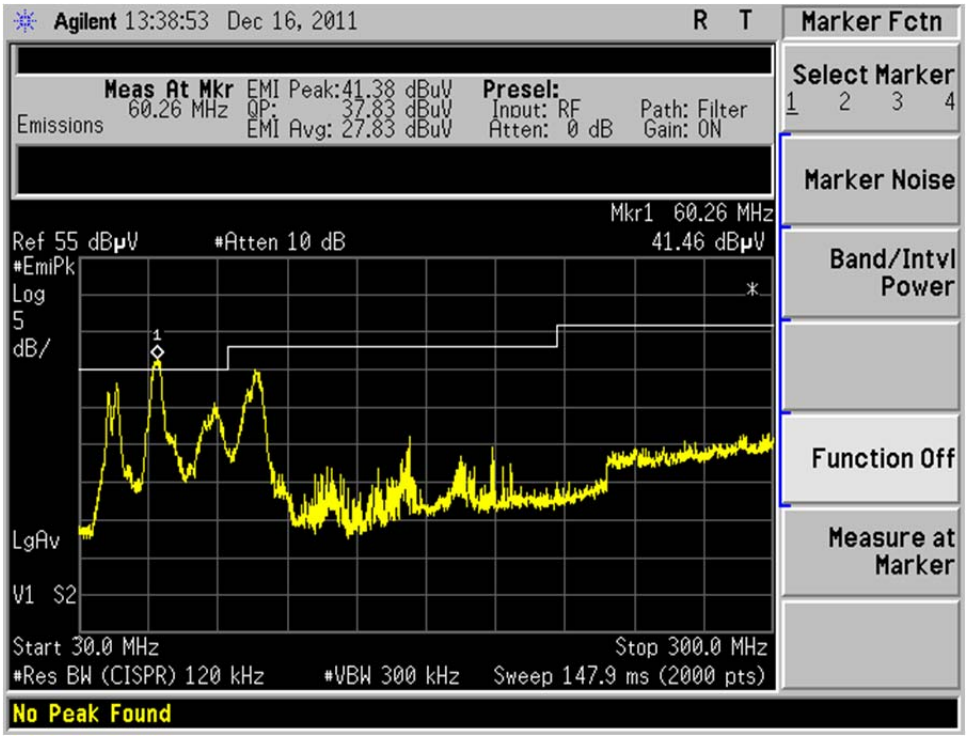
| Frequency (MHz) | Height (m) | Azimuth (degree) | Quasi Peak Reading (dBµV/m) | Quasi Peak Limit (dBµV/m) | Margin (dB) | Antenna Polarity | EUT orientation |
|---|---|---|---|---|---|---|---|
| 60.5 | 362.00 | 97 | 31.7 | 40.0 | 8.3 | H | V |
| 59.0 | 1.00 | 306 | 38.4 | 40.0 | 1.6 | V | V |
| 44.7 | 1.00 | 358 | 35.5 | 40.0 | 4.5 | V | V |
| 98.2 | 1.34 | 0 | 38.2 | 43.5 | 5.4 | V | V |
| 331.0 | 1.00 | 131 | 30.3 | 46.0 | 15.7 | H | V |
| 329.0 | 1.17 | 360 | 32.8 | 46.0 | 13.2 | V | F |
| 314.3 | 1.00 | 312 | 30.3 | 46.0 | 15.7 | H | F |
| 321.7 | 1.34 | 0 | 28.6 | 46.0 | 17.4 | V | V |
| 318.8 | 1.49 | 329 | 34.0 | 46.0 | 12.0 | V | S |
| 314.3 | 1.00 | 234 | 31.2 | 46.0 | 14.8 | H | S |
| 98.9 | 1.00 | 67 | 35.8 | 43.5 | 7.7 | V | S |
| 81.8 | 1.00 | 0 | 34.3 | 40.0 | 5.8 | V | S |
| 57.6 | 1.00 | 249 | 33.5 | 40.0 | 6.5 | V | S |
| 42.0 | 1.00 | 0 | 35.3 | 40.0 | 4.7 | V | S |
| 94.6 | 1.00 | 0 | 38.4 | 43.5 | 5.1 | V | F |
| 80.1 | 1.00 | 0 | 32.8 | 40.0 | 7.2 | V | F |
| 55.6 | 1.00 | 247 | 32.6 | 40.0 | 7.4 | V | F |

## Screen Captures - Radiated Emissions Testing – Receive Mode

These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

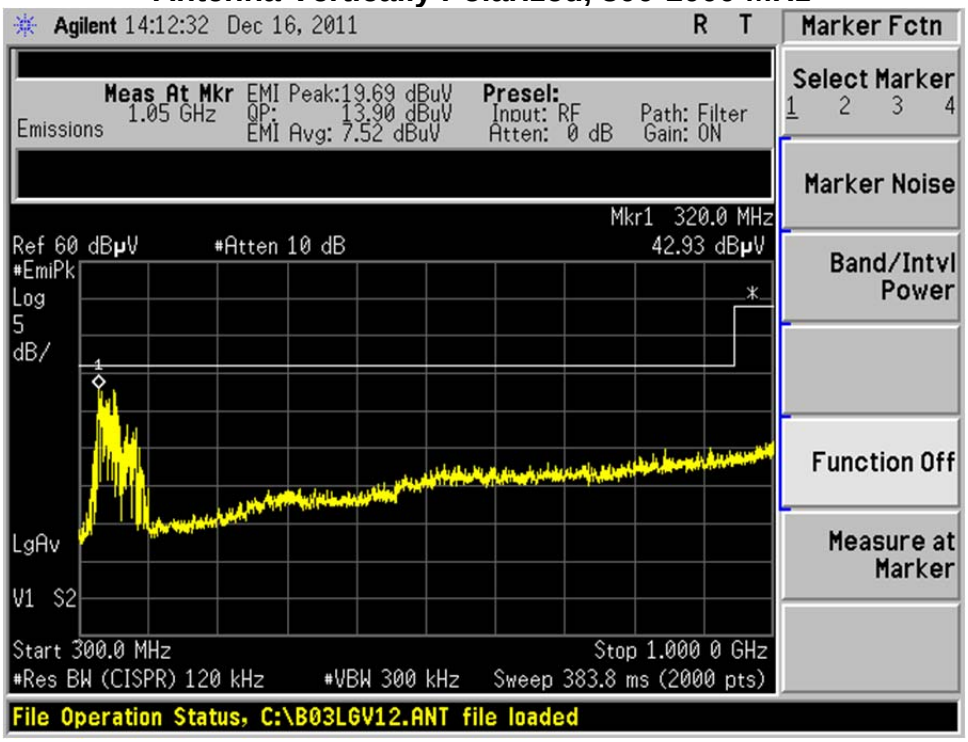
The signature scans shown here are from worst-case emissions, as measured on channels 11, 19 and 26, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

### Antenna Vertically Polarized, 30-300 MHz

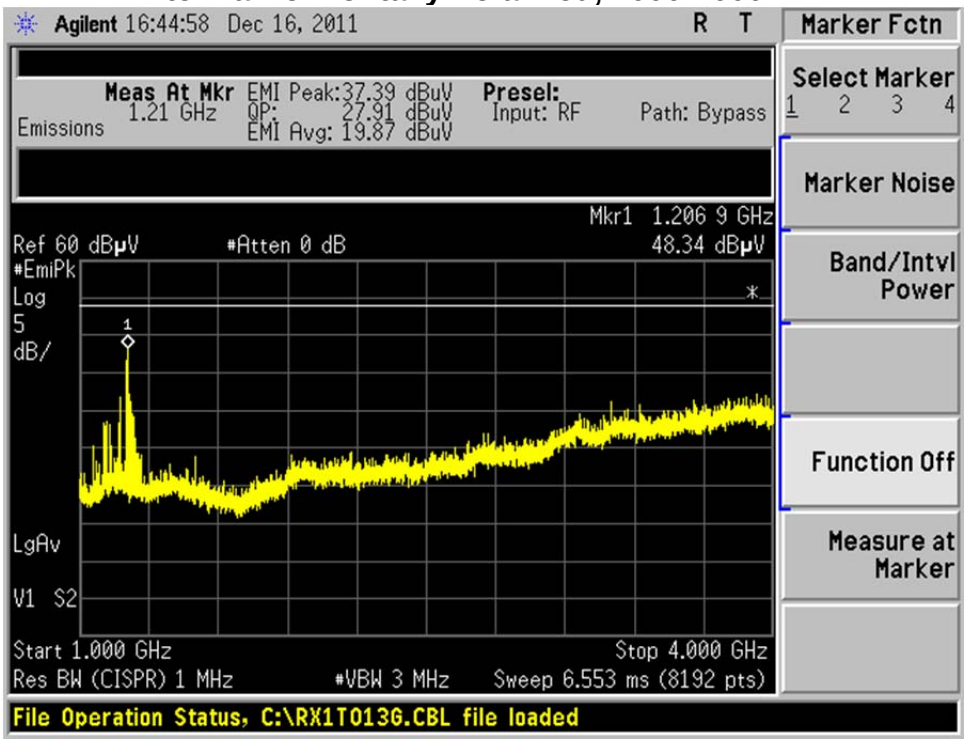


**Screen Captures - Radiated Emissions Testing – Receive Mode *(continued)***

## Antenna Vertically Polarized, 300-1000 MHz

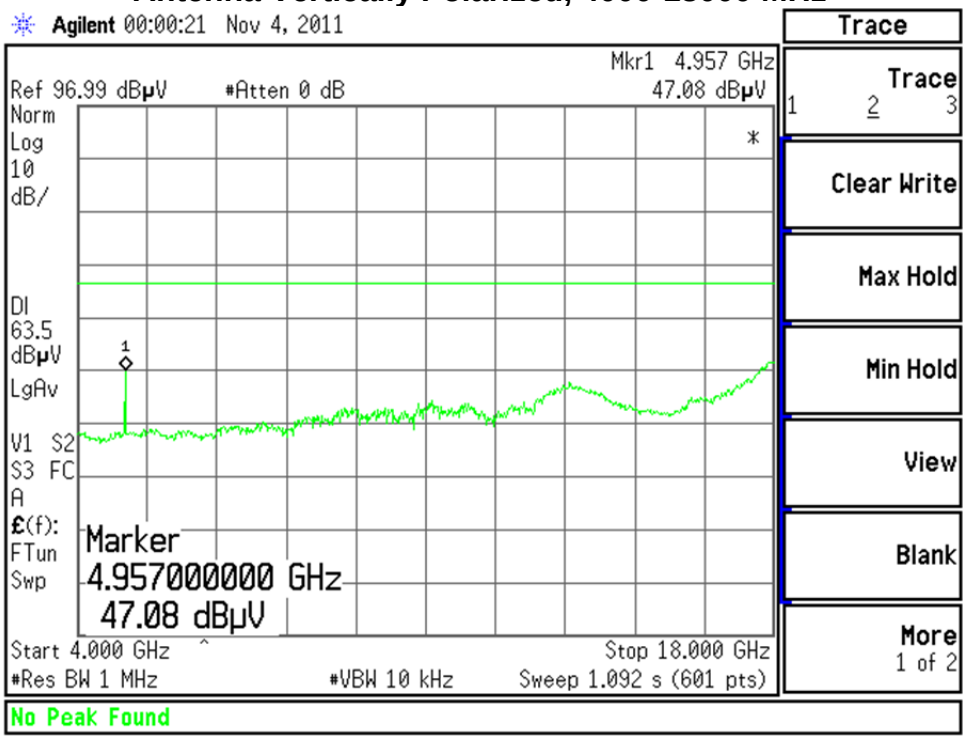



## Antenna Horizontally Polarized, 1000-4000 MHz

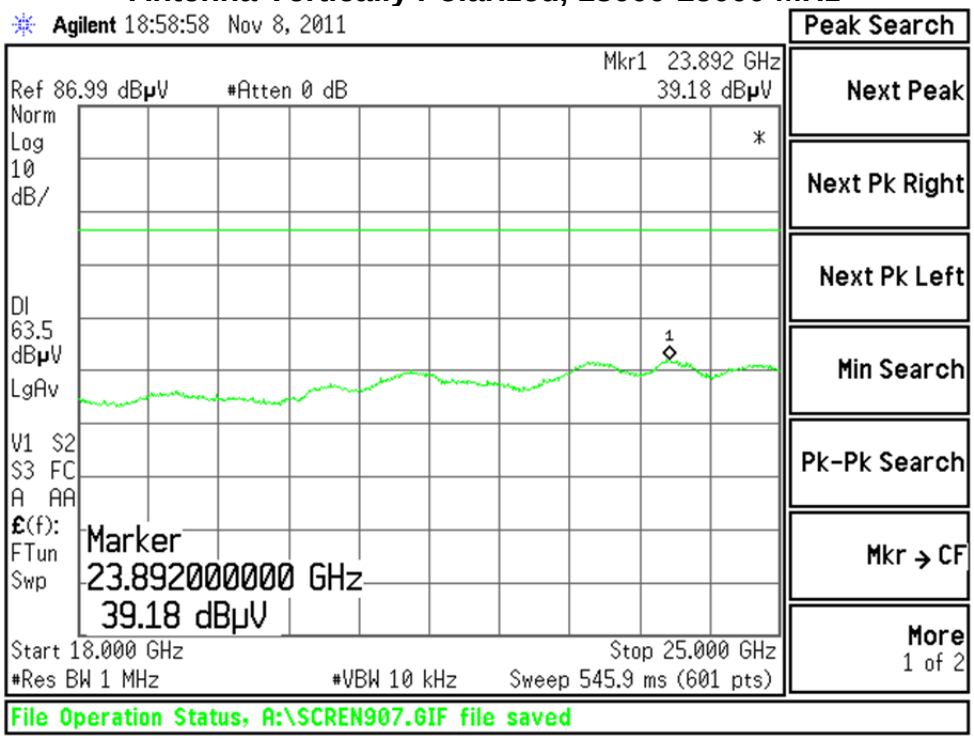


## ***Screen Captures - Radiated Emissions Testing*** – Receive Mode (continued)

### Antenna Vertically Polarized, 4000-18000 MHz




### Antenna Vertically Polarized, 18000-25000 MHz



# EXHIBIT 6.CONDUCTED EMISSIONS TEST, AC POWER LINE:

## 6.1 Test Setup

The test area and setup are in accordance with ANSI C63.4 and with Title 47 CFR, FCC Part 15, Industry Canada RSS-210 and RSS GEN. The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50Ω (ohm), 50/250 μH Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided at the conducted emissions test area via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the HP 8591 receiver. The EMCO LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

## 6.2 Test Procedure

The EUT was investigated in continuous modulated transmit and receive mode for this portion of the testing. The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1, Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30 MHz. Final readings were then taken and recorded.

## 6.3 Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the Agilent E4445A/N9039A EMI System, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

### Test Equipment List

Please see Appendix A

## 6.4 Test Results

The EUT was found to **MEET** the Conducted Emission requirements of FCC Part 15.207 Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

## 6.5 FCC Limits of Conducted Emissions at the AC Mains Ports

| Frequency Range (MHz) | Class B Limits (dBµV) | | Measuring Bandwidth |
|---|---|---|---|
| | Quasi-Peak | Average | |
| 0.150 -0.50 * | 66-56 | 56-46 | RBW = 9 kHz<br>VBW ≥ 9 kHz for QP<br>VBW = 1 Hz for Average |
| 0.5 – 5.0 | 56 | 46 | |
| 5.0 – 30 | 60 | 50 | |
| * The limit decreases linearly with the logarithm of the frequency in this range. | | | |

## 6.6 CONDUCTED EMISSIONS TEST DATA CHART

Frequency Range inspected: 150 KHz to 30 MHz
Test Standard: FCC 15.207 Class B
IC RSS GEN 7.2.2

| | | | | | | |
|---|---|---|---|---|---|---|
| Manufacturer: | Vigil Healthcare Solutions | | | | | |
| Date(s) of Test: | December 15, 2011 | | | | | |
| Test Engineer: | Mike Hintzke | | | | | |
| Voltage: | 24VAC | | | | | |
| Operation Mode: | continuous transmit and receive | | | | | |
| Environmental Conditions in the Lab: | Temperature: 20 – 25° C<br>Relative Humidity: 30 – 60 % | | | | | |
| Test Location: | X | Conducted Emissions Test Area | | | | Chamber |
| EUT Placed On: | X | 40cm from Vertical Ground Plane | | | | 10cm Spacers |
| | X | 80cm above Ground Plane | | | | Other: |
| Measurements: | | Pre-Compliance | | Preliminary | X | Final |
| Detectors Used: | | Peak | X | Quasi-Peak | X | Average |

### Transmit Mode

| | | Quasi-Peak | | | Average | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Line | Q-Peak Reading (dBµV) | Q-Peak Limit (dBµV) | Quasi-Peak Margin (dB) | Average Reading (dBµV) | Average Limit (dBµV) | Average Margin (dB) |
| 0.233 | L2 | 51.200 | 62.347 | 11.147 | 47.800 | 52.347 | 4.547 |
| 12.400 | L2 | 49.200 | 60.000 | 10.800 | 40.300 | 50.000 | 9.700 |
| 0.234 | L1 | 51.300 | 62.297 | 10.997 | 47.400 | 52.297 | 4.897 |
| 0.292 | L1 | 44.400 | 60.477 | 16.077 | 36.200 | 50.477 | 14.277 |
| 12.540 | L1 | 49.200 | 60.000 | 10.800 | 41.800 | 50.000 | 8.200 |
| 20.540 | L2 | 44.900 | 60.000 | 15.100 | 38.300 | 50.000 | 11.700 |

### Receive Mode

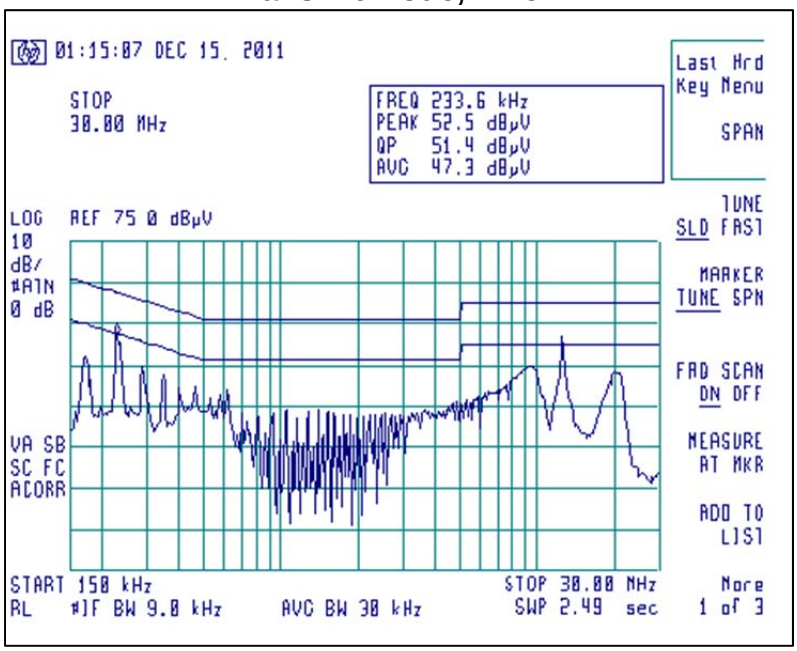
| | | Quasi-Peak | | | Average | | |
|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Line | Q-Peak Reading (dBµV) | Q-Peak Limit (dBµV) | Quasi-Peak Margin (dB) | Average Reading (dBµV) | Average Limit (dBµV) | Average Margin (dB) |
| 0.234 | L1 | 51.900 | 62.315 | 10.415 | 47.900 | 52.315 | 4.415 |
| 13.250 | L1 | 49.600 | 60.000 | 10.400 | 35.800 | 50.000 | 14.200 |
| 0.234 | L2 | 52.100 | 62.315 | 10.215 | 48.700 | 52.315 | 3.615 |
| 13.020 | L2 | 47.500 | 60.000 | 12.500 | 32.400 | 50.000 | 17.600 |
| 14.310 | L2 | 30.100 | 60.000 | 29.900 | 18.600 | 50.000 | 31.400 |

## 6.7 Screen Captures – Conducted Emissions Test

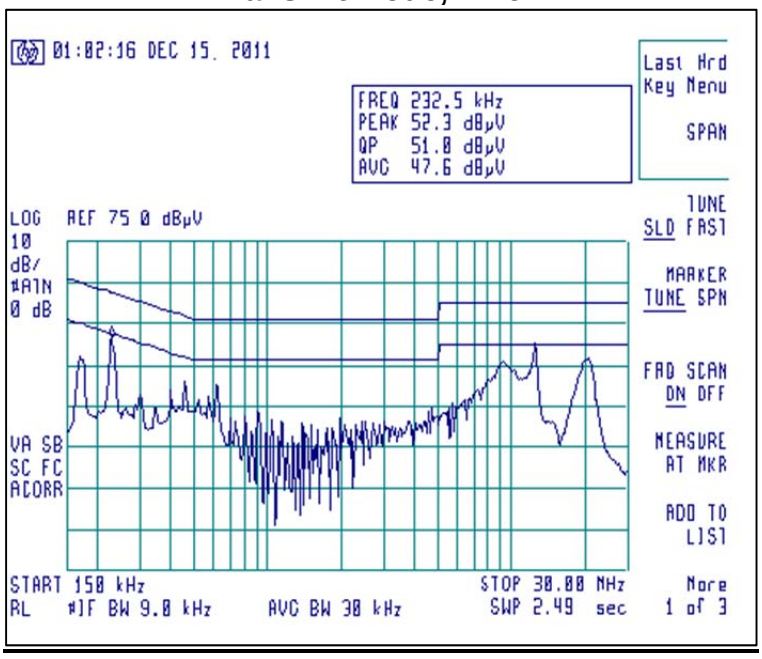
These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.207 and RSS GEN 7.2.2 (Table 2).

The signature scans shown here are from channel 19, chosen as being a good representative of channels.

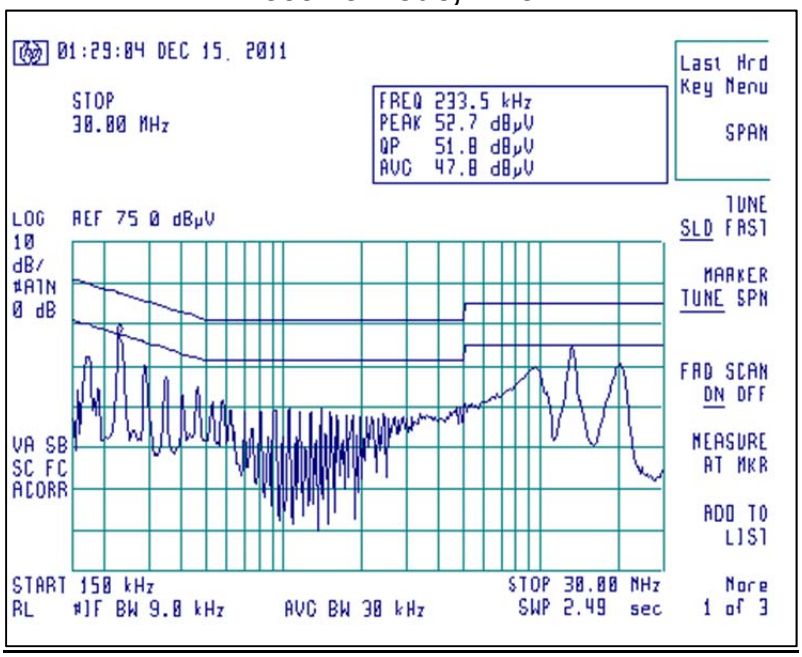
**Transmit Mode, Line 1**



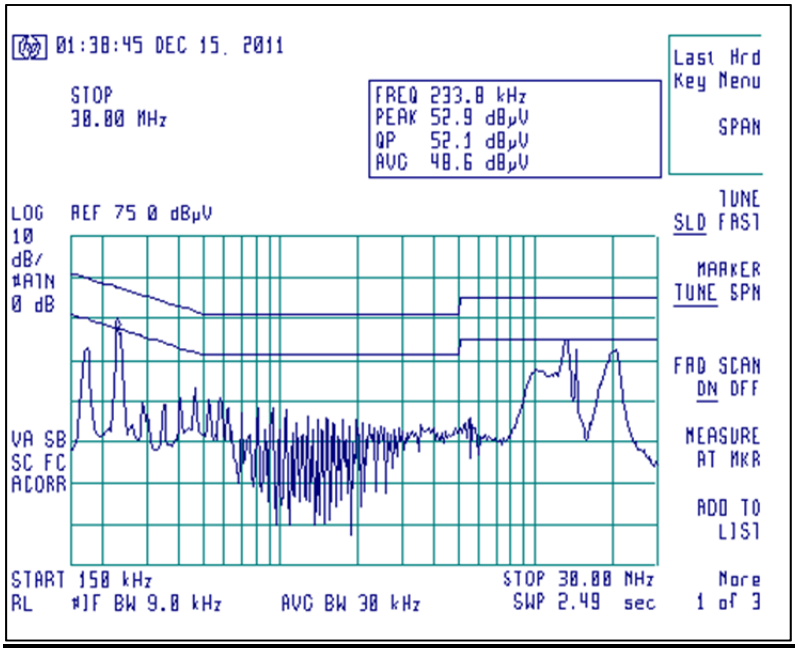

**Transmit Mode, Line 2**



## Receive Mode, Line 1




## Receive Mode, Line 2



# EXHIBIT 7. OCCUPIED BANDWIDTH:

## 7.1 Limits

For a Digital Modulation System, the 6 dB bandwidth shall be at least 500 kHz.

## 7.2 Method of Measurements

Refer to ANSI C63.4 and FCC Procedures (2007) for Digital Transmission Systems operating under 15.247.

The transmitter output was connected to the Spectrum Analyzer. The bandwidth of the fundamental frequency was measured with the Spectrum Analyzer using 30 kHz RBW and VBW=300 kHz.

The bandwidth requirement found in FCC Part 15.247(a)(2) and RSS 210 A8.2(a) requires a minimum -6dBc occupied bandwidth of 500 kHz. In addition, Industry Canada (IC RSS GEN 4.6.1) requires the measurement of the 99% dBc occupied bandwidth. For this portion of the tests, a direct measurement of the transmitted signal was performed at the antenna port of the EUT, via a cable connection to the Agilent E4446A spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, thereby allowing direct measurements, without the need for any further corrections. An Agilent model E4446A spectrum analyzer was used with the resolution bandwidth set to 30 kHz for this portion of the tests. The EUT was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used in peak-hold mode while measurements were made, as presented in the chart below.

From this data, the closest measurement (6 dB bandwidth) when compared to the specified limit, is 1370 kHz, which is above the minimum of 500 kHz.

## 7.3 Test Equipment List

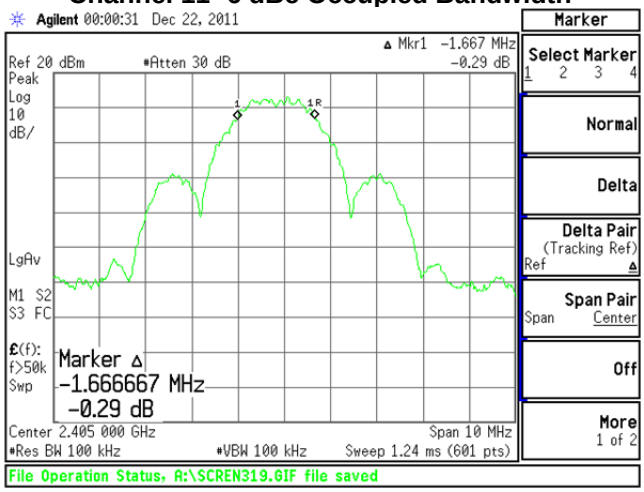
Please see Appendix A

## 7.4 Test Data

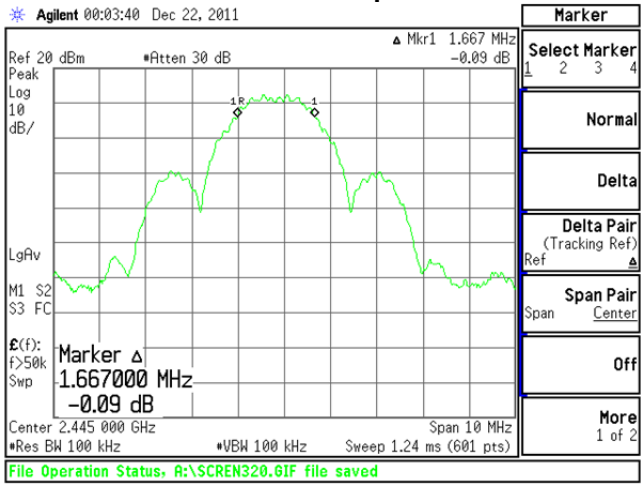
| Channel | Center Frequency (MHz) | Measured -6 dBc Occ. BW (kHz) | Minimum -6 dBc Limit (kHz) | Measured -20 dBc Occ.Bw (kHz) |
|---|---|---|---|---|
| 11 | 2405 | 1667 | 500 | 2680 |
| 19 | 2445 | 1667 | 500 | 2660 |
| 26 | 2480 | 1667 | 500 | 2590 |

## 7.5 Screen Captures - OCCUPIED BANDWIDTH

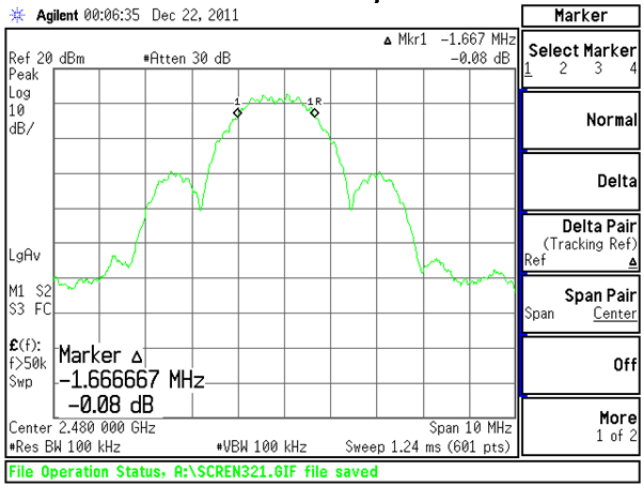
**Channel 11 -6 dBc Occupied Bandwidth**



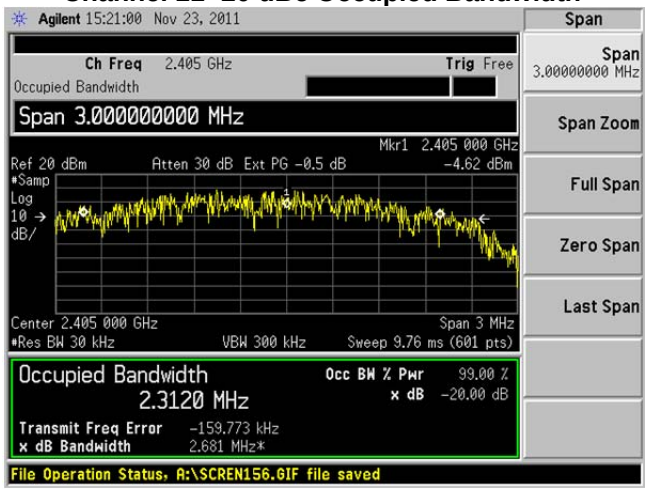

**Channel 19 -6 dBc Occupied Bandwidth**



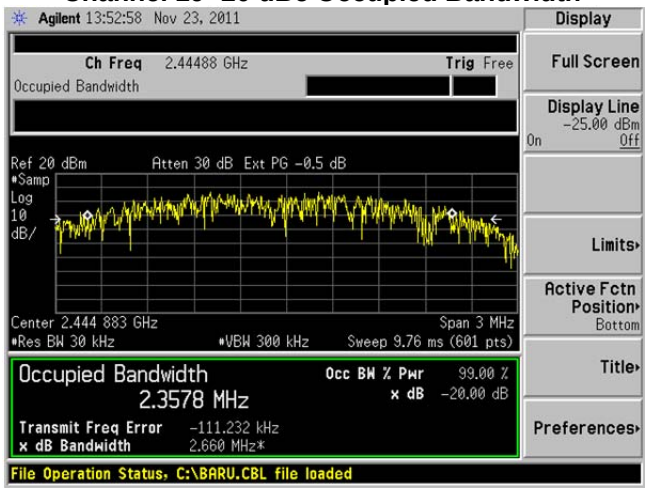

**Channel 26 -6 dBc Occupied Bandwidth**



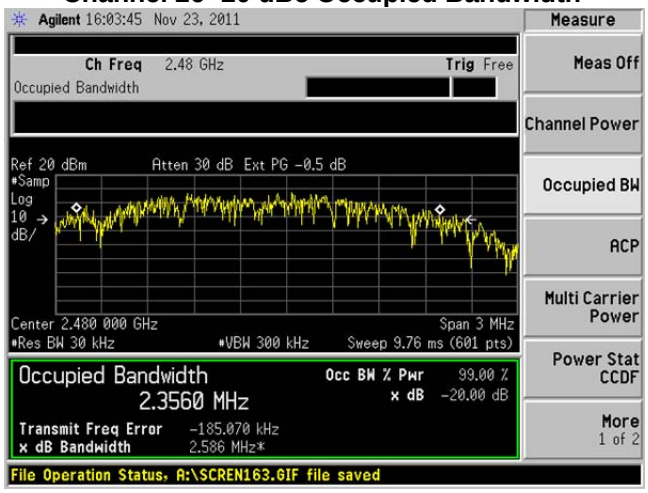
**Channel 11 -20 dBc Occupied Bandwidth**




**Channel 19 -20 dBc Occupied Bandwidth**




**Channel 26 -20 dBc Occupied Bandwidth**



# EXHIBIT 8. BAND-EDGE MEASUREMENTS

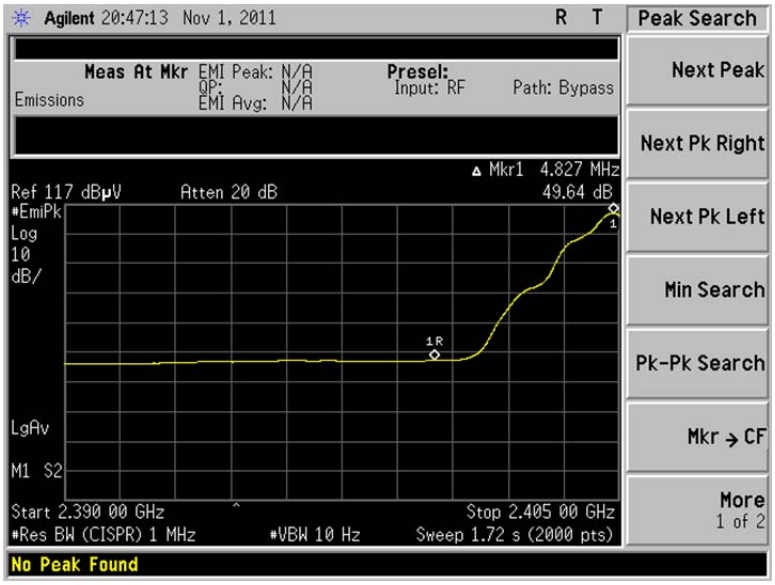
## 8.1 Method of Measurements

FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. Also, RSS 210 Section 2.2 requires that unwanted emissions meet limits listed in tables 2 and 3 of the same standard and also to the limits in the applicable annex. The following screen captures demonstrate compliance of the intentional radiator at the 2400-2483.5 MHz Band-Edges. The EUT was operated in continuous transmit mode with continuous modulation, with internally generated data as the modulating source. The EUT was operated at the lowest channel for the investigation of the lower Band-Edge, and at the highest channel for the investigation of the higher Band-Edge.

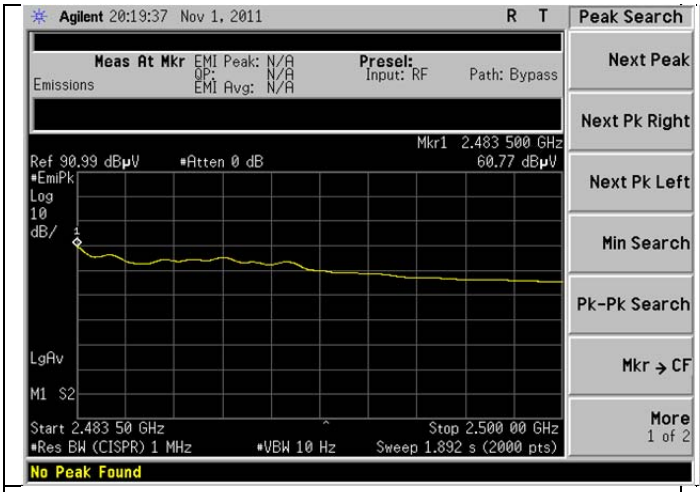
***The Lower Band-Edge limit, in this case, would be -20 dBc with respect to the fundamental level.***

***The Upper Band-Edge limit, in this case, would be + 54 dBµV/m at 3m.***

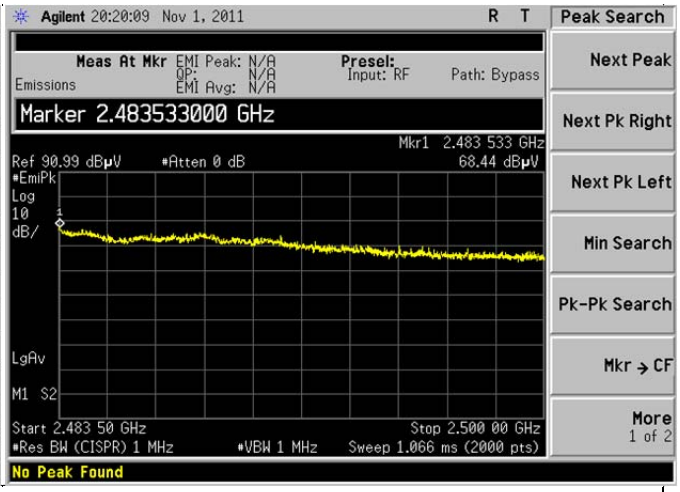
Screen Capture Demonstrating Compliance at the Lower Band-Edge



Screen Capture Demonstrating Compliance at the Higher Band-Edge




**Upper bandedge average**
**Limit is 54 dBuV/m @ 3m**




**Upper bandedge peak**
**Limit is 74 dBuV/m**

**Based on the duty-cycle relaxation (justification in appendix d), the peak measurement can be adjusted and compared to the average limit. As such:**

**68.44dBuV/m - 33.9dB = 34.5dBuV/m**
**34.5 < 54.0 dBuV/m**

**Passing Result**

# EXHIBIT 9. POWER OUTPUT (CONDUCTED): 15.247(b)

## 9.1 Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a a u.fl to SMA wire-connector and a short RF cable. The loss from the connector was added on the analyzer as gain offset settings, and the cable loss was accounted for with a file loaded through the hard drive of the spectrum analyzer. Accounting for cable losses as such allows for direct measurements without the need for any further corrections. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with resolution and video bandwidths set to 3 MHz, and a span of 10 MHz, with measurements from a peak detector presented in the chart below.

## 9.2 Test Equipment List

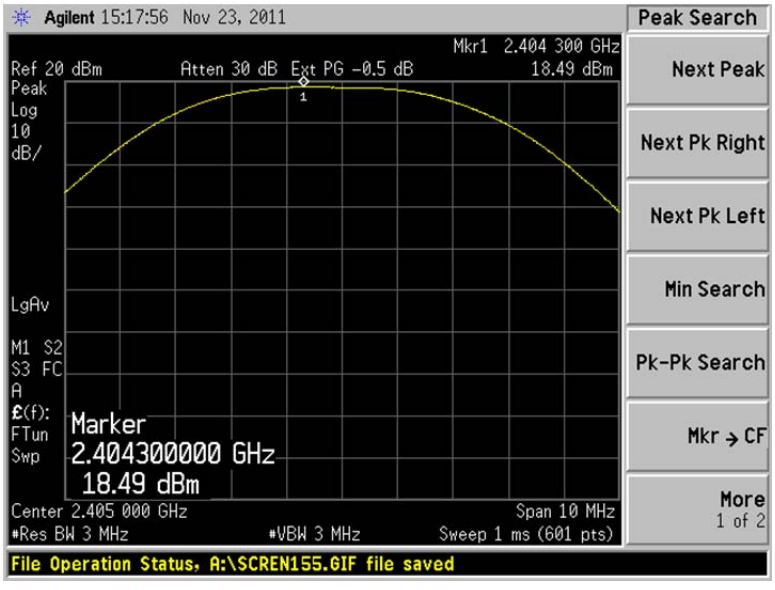
Please see Appendix A for a list of test equipment

## 9.3 Test Data

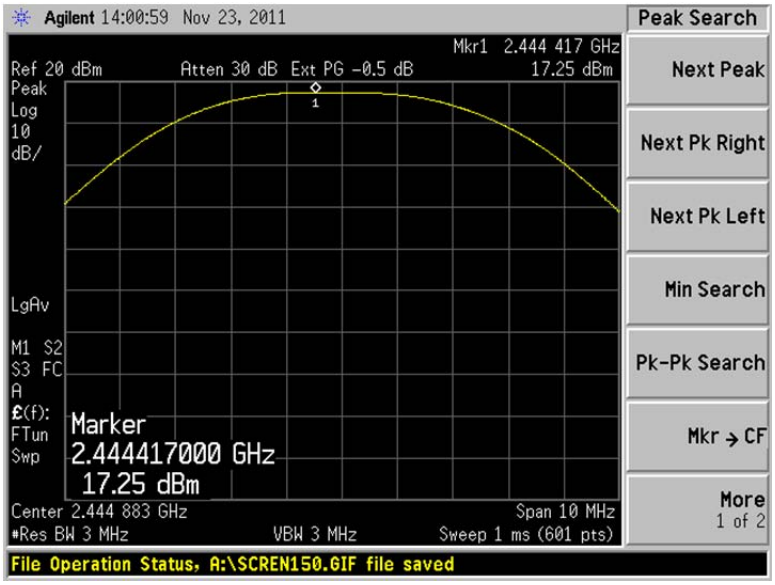
| CHANNEL | CENTER FREQ (MHz) | LIMIT (dBm) | MEASURED POWER (dBm) | MARGIN (dB) |
|---|---|---|---|---|
| 11 | 2405 | +30.0 dBm | 18.5 | 11.5 |
| 19 | 2445 | +30.0 dBm | 17.3 | 12.8 |
| 26 | 2480 | +30.0 dBm | 17.6 | 12.4 |

## 9.4 Screen Captures – Power Output (Conducted)

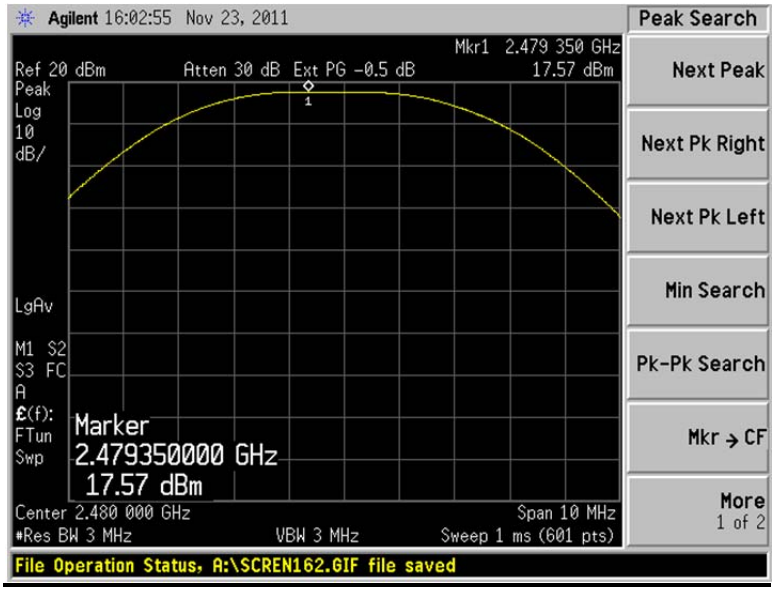
**Channel 11**



## Channel 19




## Channel 26



# EXHIBIT 10: POWER SPECTRAL DENSITY: 15.247(e)

## 10.1 Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

In accordance with FCC Part 15.247(e) and RSS 210 A8.2(b), the peak power spectral density should not exceed +8 dBm in any 3 kHz band. This measurement was performed along with the conducted power output readings performed as described in previous sections. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth, and reduced sweep, and a power density measurement was performed using the utility built into the HP Analyzer. The resultant density was then corrected to a 3 kHz bandwidth. The highest density was found to be no greater than -7.1 dBm, which is under the allowable limit by 15.1 dB.

## 10.2 Test Equipment List

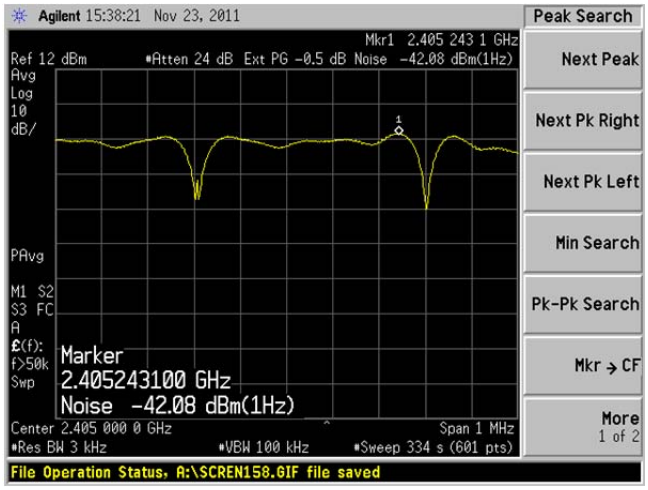
Please see Appendix A

## 10.3 Test Data

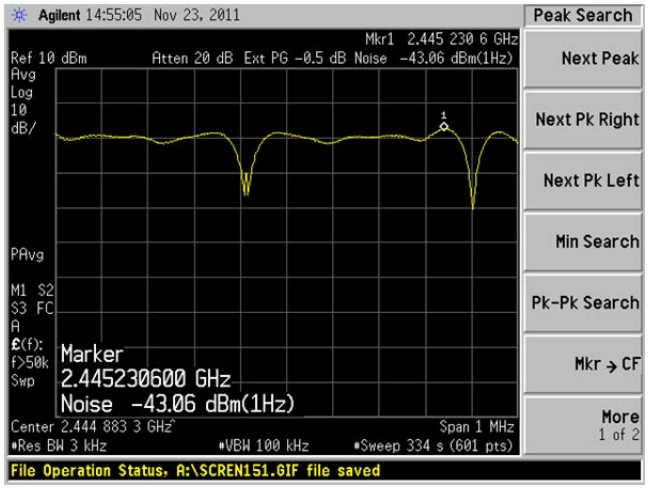
| Channel | Center Frequency (MHz) | Noise Marker Method Power (dBm/1Hz) | 3 kHz Correction (dB) | Corrected Power Measurement (dBm/3kHz) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 11 | 2405 | -42.1 | 35.0 | -7.1 | +8.0 | 15.1 |
| 19 | 2445 | -43.1 | 35.0 | -8.1 | +8.0 | 16.1 |
| 26 | 2480 | -42.6 | 35.0 | -7.6 | +8.0 | 15.6 |

## 10.4 Screen Captures – Power Spectral Density

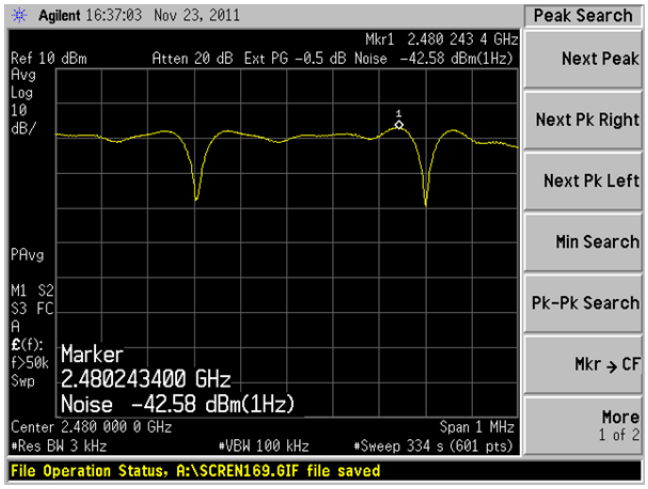
**Channel 11**




**Channel 19**




**Channel 26**



# EXHIBIT 11. SPURIOUS CONDUCTED EMISSIONS: 15.247(d)

## 11.1 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

FCC Part 15.247(d) and IC RSS 210 A8.5 requires a measurement of conducted harmonic and spurious RF emission levels, as reference to the carrier level when measured in a 100 kHz bandwidth. For this test, the spurious and harmonic RF emissions from the EUT were measured at the EUT antenna port using a short RF cable. The loss from the cable was added on the analyzer as gain offset settings, there by allowing direct readings of the measurements made without the need for any further corrections. An Agilent model E4446A spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with measurements from a peak detector presented in the chart below. Screen captures were acquired and any noticeable spurious and harmonic signals were identified and measured.

No significant emissions could be noted within 40 dBc of the fundamental level for this product.

## 11.2 Test Equipment List

Please see Appendix A

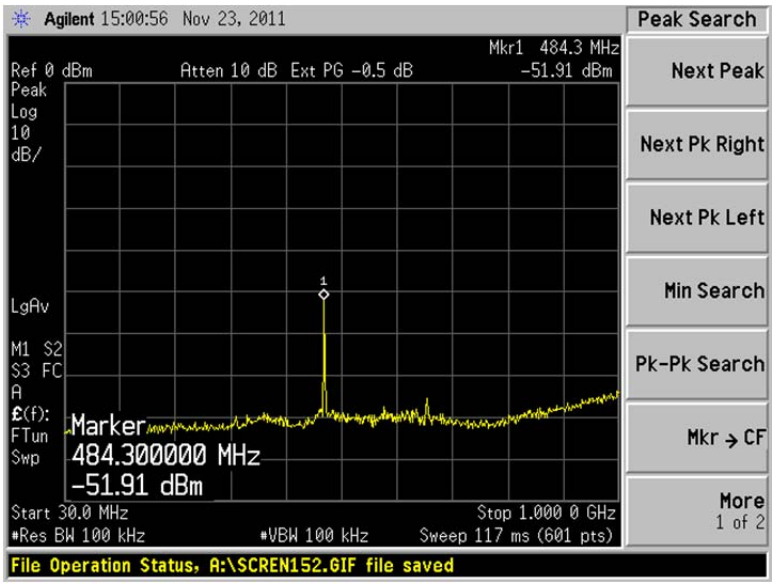
## 11.3 Test Data

| Chan\fREQ | 11\2405 | 19\2445 | 24\2480 |
|---|---|---|---|
| fo | 13.8 | 13.1 | 13.7 |
| 2fo | -47.8 | -45.6 | -47.1 |
| 3fo | -43.6 | -46.3 | -43.9 |
| 4fo | -27.0 | -30.1 | -28.1 |
| 5fo | -42.1 | -48.4 | -47.2 |
| 6fo | -51.8 | -45.8 | -46.6 |
| 7fo | -69.7 | -72.6 | -74.1 |
| 8fo | Note 1 | Note 1 | -74.2 |
| 9fo | Note 1 | Note 1 | Note 1 |
| 10fo | Note 1 | Note 1 | Note 1 |

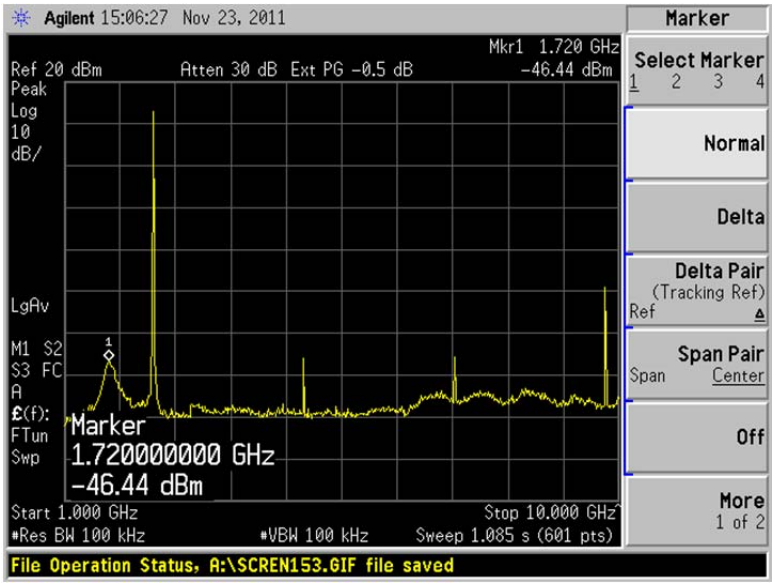
Notes:
(1) Measurement at system noise floor.

## 11.4 Screen Captures – Spurious Radiated Emissions

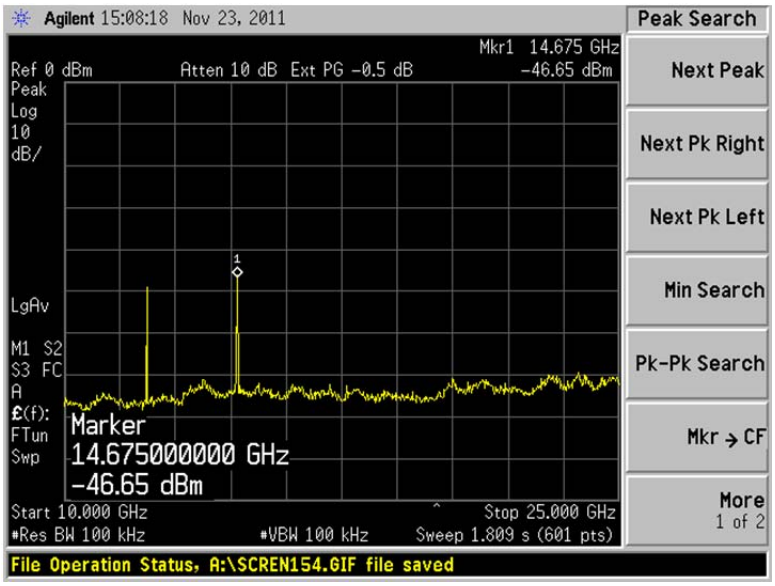
### Channel 19, shown from 30 MHz up to 1000 MHz




### Channel 19, shown from 1000 MHz up to 10000 MHz



## Channel 19, shown from 10000 MHz up to 25000 MHz



## EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

The stability of the device was examined as a function of the input voltage available to the EUT. A Spectrum Analyzer was used to measure the frequency at the appropriate frequency markers. For this test, the transmitter portion of the EUT placed in CW modulated continuous transmit mode. Power was supplied by an external bench-type variable power supply, and the frequency of operation was monitored using the spectrum analyzer.

In this case, the EUT has a power supply unit, which is powered off of 24 VAC nominally.

A spectrum analyzer was used to measure the frequency at the appropriate frequency markers. For this test, the EUT was placed in continuous transmit CW mode. Power to the EUT was supplied by an external bench-type variable power supply. The frequency of operation was monitored using the spectrum analyzer with RBW=VBW=1 kHz settings while the voltage was varied. The output power was monitored with RBW=VBW=3 MHz.

| 20.4 VAC | | 24.0 VAC | | 27.6 VAC | | |
|---|---|---|---|---|---|---|
| Power | Frequency | Power | Frequency | Power | Frequency | Channel |
| 18.50 | 2404.727000 | 18.50 | 2404.727000 | 18.50 | 2404.727000 | 11 |
| 17.30 | 2445.200000 | 17.30 | 2445.200000 | 17.30 | 2445.200000 | 19 |
| 17.57 | 2479.743000 | 17.57 | 2479.743000 | 17.57 | 2479.743000 | 26 |

The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characterizes were well behaved, and the system returned to the same state of operation as before the power cycle.

No anomalies were noted in the measured transmit power, varying less than 1 dB, during the voltage variation tests.

# APPENDIX A

LS RESEARCH LLC
Wireless Product Development
**Equipment Calibration**

Date : 1-Nov-2011 Type Test : Radiated Emissions Job # : C-1315

Prepared By: PETER Customer : Vigil Health Solutions Quote #: 311231

| No. | Asset # | Description | Manufacturer | Model # | Serial # | Cal Date | Cal Due Date | Equipment Status |
|---|---|---|---|---|---|---|---|---|
| 1 | AA 960081 | Double Ridge Horn Antenna | EMCO | 3115 | 6907 | 1/4/2011 | 1/4/2012 | Active Calibration |
| 2 | EE 960147 | Pre-Amp | Adv. Micro | WLA612 | 123101 | 1/4/2011 | 1/4/2012 | Active Calibration |
| 3 | AA 960153 | 2.4GHz High Pass Filter | KWM | HPF-L-14186 | 7272-04 | 2/28/2011 | 2/28/2012 | Active Calibration |
| 4 | AA 960144 | Phaseflex | Gore | EKD01D010720 | 5800373 | 6/1/2011 | 6/1/2012 | Active Calibration |
| 5 | EE 960156 | 100kHz-1GHz Analog Signal Generator | Agilent | N5181A | MY49060062 | 6/6/2011 | 6/6/2012 | Active Calibration |
| 6 | EE 960157 | 3Hz-13.2GHz Spectrum Analyzer | Agilent | E4445A | MY48250225 | 6/6/2011 | 6/6/2012 | Active Calibration |
| 7 | EE 960158 | RF Preselecter | Agilent | N9039A | MY46520110 | 6/11/2011 | 6/11/2012 | Active Calibration |
| 8 | AA 960004 | Log Periodic Antenna | EMCO | 93146 | 9512-4276 | 9/19/2011 | 9/19/2012 | Active Calibration |
| 9 | AA 960005 | Biconical Antenna | EMCO | 93110B | 9601-2280 | 6/10/2011 | 6/10/2012 | Active Calibration |

Project Engineer: Peter Feiler Quality Assurance: Thomas T. Smith

LS RESEARCH LLC
Wireless Product Development
**Equipment Calibration**

Date : 19-Nov-2011 Type Test : Conducted Radio Measurements Job # : C-1315

Prepared By: PETER Customer : Vigil Health Solutions Quote #: 311231

| No. | Asset # | Description | Manufacturer | Model # | Serial # | Cal Date | Cal Due Date | Equipment Status |
|---|---|---|---|---|---|---|---|---|
| 1 | AA 960144 | Phaseflex | Gore | EKD01D010720 | 5800373 | 6/1/2011 | 6/1/2012 | Active Calibration |
| 2 | EE 960073 | Spectrum Analyzer | Agilent | E4446A | US45300564 | 4/25/2011 | 4/25/2012 | Active Calibration |

Project Engineer: Peter Feiler Quality Assurance: Thomas T. Smith

# APPENDIX B – TEST STANDARDS: CURRENT PUBLICATION DATES

| STANDARD # | DATE | Am. 1 | Am. 2 |
|---|---|---|---|
| ANSI C63.4 | 2003 | | |
| ANSI C63.10 | 2009 | | |
| CISPR 11 | 2009-05 | 2009-12 P | |
| CISPR 12 | 2007-05 | | |
| CISPR 14-1 | 2005-11 | 2008-11 | |
| CISPR 14-2 | 2001-11 | 2001-11 | 2008-05 |
| CISPR 16-1-1 Note 1 | 2010-01 | | |
| CISPR 16-1-2 Note 1 | 2003 | 2004-04 | 2006-07 |
| CISPR 22 | 2008-09 | | |
| CISPR 24 | 1997-09 | 2001-07 | 2002-10 |
| EN 55011 | 2009 | | |
| EN 55014-1 | 2006 | | |
| EN 55014-2 | 1997 | | |
| EN 55022 | 2006 | 2007 | |
| EN 60601-1-2 | 2007-03 | | |
| EN 61000-3-2 | 2006-05 | | |
| EN 61000-3-3 | 2008-12 | | |
| EN 61000-4-2 | 2009-05 | | |
| EN 61000-4-3 | 2006-07 | 2008-05 | |
| EN 61000-4-4 | 2004 | | |
| EN 61000-4-5 | 2006-12 | | |
| EN 61000-4-6 | 2009-05 | | |
| EN 61000-4-8 | 1994 | 2001 | |
| EN 61000-4-11 | 2004-10 | | |
| EN 61000-6-1 | 2007-02 | | |
| EN 61000-6-2 | 2005-12 | | |
| EN 61000-6-3 | 2007-02 | | |
| EN 61000-6-4 | 2007-02 | | |
| FCC 47 CFR, Parts 0-15, 18, 90, 95 | 2011 | | |
| FCC Public Notice DA 00-1407 | 2000 | | |
| FCC ET Docket # 99-231 | 2002 | | |
| FCC Procedures | 2007 | | |
| ICES 001 | 2006-06 | | |
| ICES 002 | 2009-08 | | |
| ICES 003 | 2004-02 | | |
| IEC 60601-1-2 Note 1 | 2007-03 | | |
| IEC 61000-3-2 | 2005-11 | 2008-03 | 2009-02 |
| IEC 61000-3-3 | 2008-06 | | |
| IEC 61000-4-2 | 2008-12 | | |
| IEC 61000-4-3 | 2008-04 | 2008-04 | 2009-12 FD |

| STANDARD # | DATE | Am. 1 |
|---|---|---|
| IEC 61000-4-4 | 2004-07 | 2010-10 |
| IEC 61000-4-5 | 2005-11 | |
| IEC 61000-4-6 | 2008-10 | |
| IEC 61000-4-8 | 2009-09 | |
| IEC 61000-4-11 | 2004-03 | |
| IEC 61000-6-1 | 2005-03 | |
| IEC 61326-1 | 2006-06 | |
| ISO 14982 | 1998-07 | |
| MIL Std. 461E | 1999-08 | |
| RSS GEN | 2010-12 | |
| RSS 119 | 2007-06 | |
| RSS 123 | 1999-11 | |
| RSS 125 | 2000-03 | |
| RSS 131 | 2003-07 | |
| RSS 136 | 2002-10 | |
| RSS 137 | 2009-02 | |
| RSS 210 | 2010-12 | |
| RSS 213 | 2005-12 | |
| RSS 243 | 2010-02 | |
| RSS 310 | 2007-06 | |
| | | |
| | | |
| | | |
| Updated on 08-23-11 | | |

*Note 1: Test not on LSR Scope of Accreditation.*

# APPENDIX C
## Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

*Table of Expanded Uncertainty Values, (K=2) for Specified Measurements*

| Measurement Type | Particular Configuration | Uncertainty Values |
|---|---|---|
| Radiated Emissions | 3 – Meter chamber, Biconical Antenna | 4.24 dB |
| Radiated Emissions | 3-Meter Chamber, Log Periodic Antenna | 4.8 dB |
| Radiated Emissions | 10-Meter OATS, Biconical Antenna | 4.18 dB |
| Radiated Emissions | 10-Meter OATS, Log Periodic Antenna | 3.92 dB |
| Conducted Emissions | Shielded Room/EMCO LISN | 1.60 dB |
| Radiated Immunity | 3 Volts/Meter in 3-Meter Chamber | 1.128 Volts/Meter |
| Conducted Immunity | 3 Volts level | 1.0 V |

# APPENDIX D
## Justifications of Average Duty Factor Calculations

*Note: This information provided by the manufacturer*

### Average (Relaxation) Factor

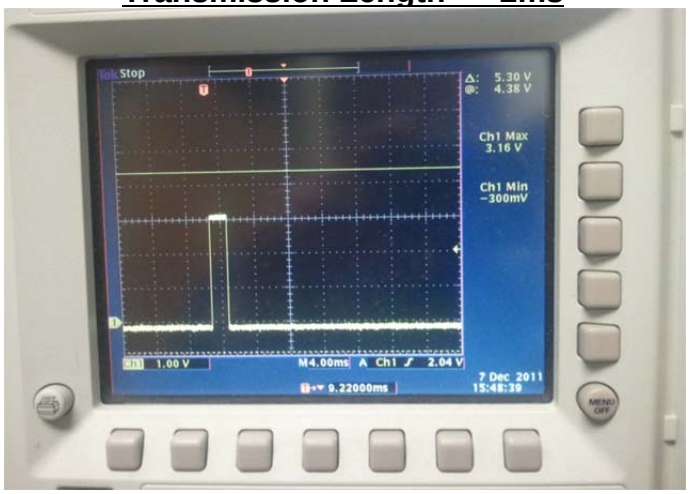
Average Factor = 20* $Log_{10}$ (Worst Case EUT On-time over 100 ms time window)

The transmit packet occupies 2 ms of time, within any 100 ms window. Therefore, the relaxation factor allowance is calculated as:

Average Factor = 20* $Log_{10}$ (2 ms / 100 ms) = -33.9

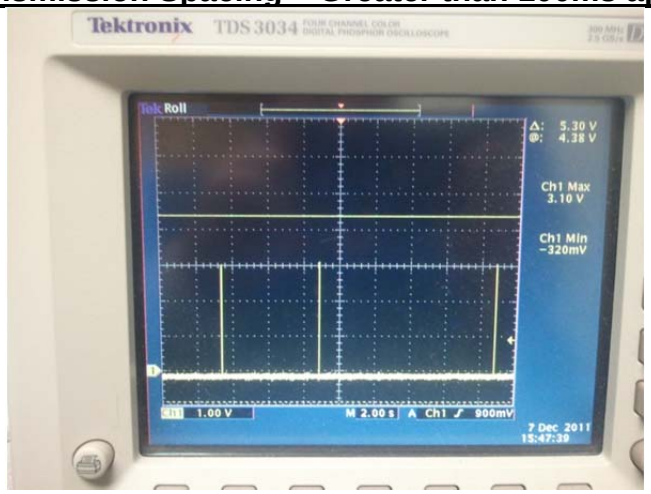
A relaxation factor of 33.9 dB would be allowable for this product.

### Transmission Length – <2ms




**x-axis scale is 4-ms per division**

### Transmission Spacing – Greater than 100ms apart




**x-axis scale is 2-sec per division**