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# Certification Test Report

## FCC ID: UGL622ANH
## IC: 7888B-622ANH

## FCC Rule Part: 15.247
## IC Radio Standards Specification: RSS-210

## ACS Report Number: 11-2009.W04.12.C

Manufacturer: DRS Tactical Systems, Inc.
Model: 622ANHMW

Test Begin Date: February 25, 2011
Test End Date: March 4, 2011

Report Issue Date: March 29, 2011

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200897-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.


**Project Manager:**

**Thierry Jean-Charles**
**EMC Engineer**
**Advanced Compliance Solutions, Inc.**

**Reviewed by:**

**Kirby Munroe**
**Director, Wireless Certifications**
**Advanced Compliance Solutions, Inc.**




**This report contains 20 pages**

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# 1 GENERAL

## 1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210 for a class II permissive change.

## 1.2 Product description

The 622ANHMW is a 802.11a/b/g/n module. The module is hosted by the Armor X7 Tablet PC which is handheld computer that also incorporates WWAN (EVDO and GSM) and Bluetooth modules.

| Mode of Operation | Frequency Range (MHz) | Number of Channels | Data Rates Supported (kbps) |
|---|---|---|---|
| 802.11b | 2412 - 2462 | 11 | 5500 |
| 802.11g | 2412 - 2462 | 11 | 6000 |
| 802.11a | 5745- 5825 | 5 | 6000 |

Manufacturer Information:

DRS Tactical Systems, Inc.
1110 W. Hibiscus Blvd.
Melbourne, FL 32901
(321) 727-3672

Test Sample Serial Number(s): No serial number was provided on the sample provided.

Test Sample Condition: Good

## 1.3 Test Methodology and Considerations

The EUT was evaluated for radiated emission measurements for the 802.11a/b/g configuration when used in conjunction with the 5 dBi SMW-301-3C3C2C Mobile Mark communications antenna. The EUT was evaluated at the channels listed in Table 1.3-1 below. The data rates described led to the worst case emissions.

**Table 1.3-1: Configurations evaluated**

| Mode of Operation | Channel | Frequency (MHz) | Data Rates Mbps |
|---|---|---|---|
| 802.11b | 1 | 2412 | 5.5 |
| | 6 | 2437 | 5.5 |
| | 11 | 2462 | 5.5 |
| 802.11g | 1 | 2412 | 6 |
| | 6 | 2437 | 6 |
| | 11 | 2462 | 6 |
| 802.11a | 149 | 5745 | 6 |
| | 157 | 5785 | 6 |
| | 165 | 5825 | 6 |

# 2 TEST FACILITIES

## 2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions, Inc.
3998 FAU Blvd, Suite 310
Boca Raton, Florida 33431
Phone: (561) 961-5585
Fax: (561) 961-5587
www.acstestlab.com

FCC Test Firm Registration #: 581606
Industry Canada Lab Code: 4175C

## 2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200897-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

## 2.3 Radiated & Conducted Emissions Test Site Description

### 2.3.1 Semi-Anechoic Chamber Test Site

The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

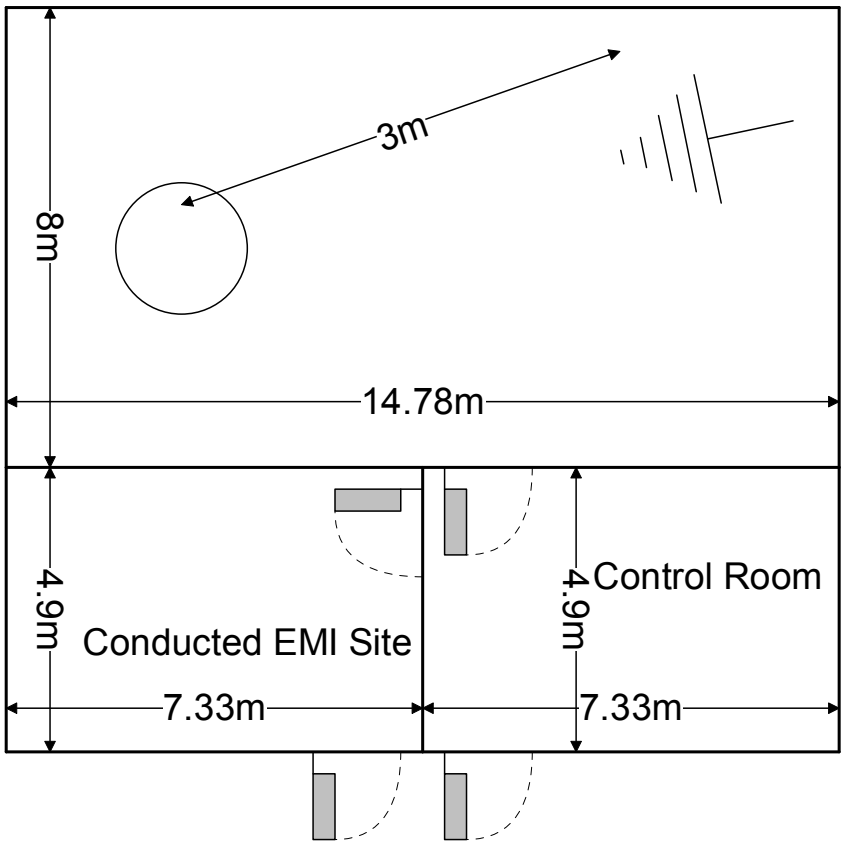



**Figure 2.3.1-1: Semi-Anechoic Chamber Test Site**

### 2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 $m^3$. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 µH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

A diagram of the room is shown below in figure 2.3.2-1:

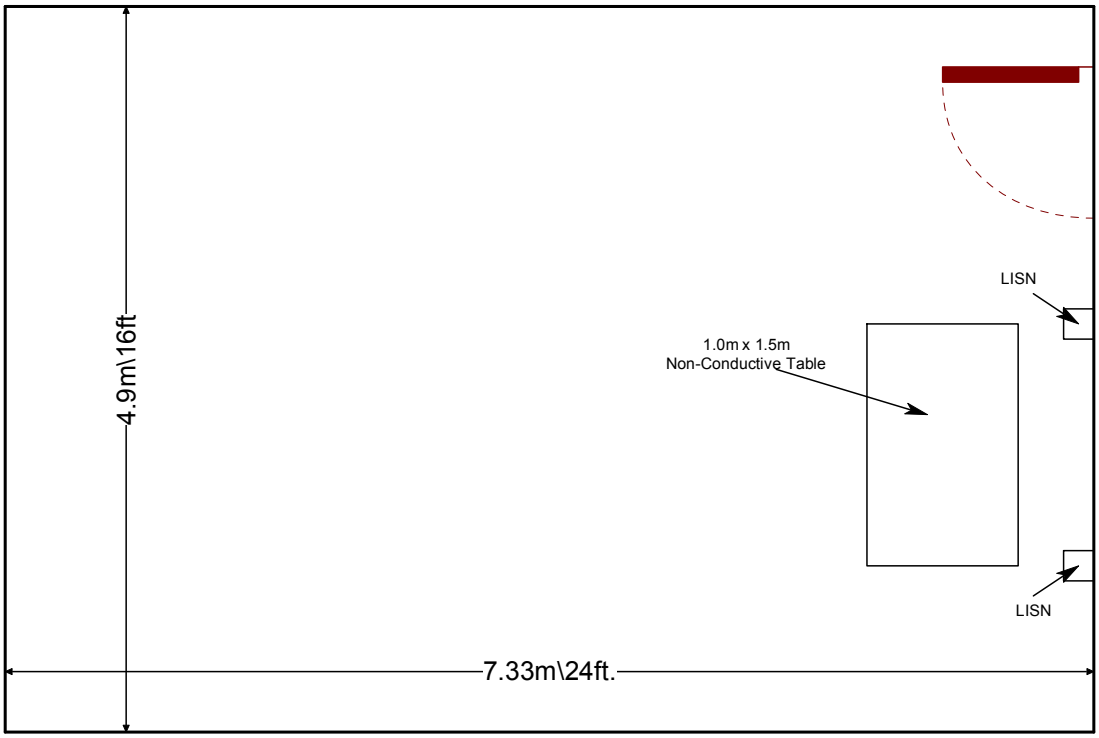



**Figure 2.3.2-1: AC Mains Conducted EMI Site**

## 3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2010
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2010
- KDB Publication No. 558074 - Measurement of Digital Transmission Systems Operating under Section 15.247, March 23, 2005
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8, December 2010.
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue3, December 2010.

## 4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

**Table 4-1: Test Equipment**

| AssetID | Manufacturer | Model # | Equipment Type | Serial # | Last Calibration Date | Calibration Due Date |
|---|---|---|---|---|---|---|
| 524 | Chase | CBL6111 | Antennas | 1138 | 7/1/2011 | 7/1/2013 |
| 2081 | Hewlett Packard | 11975A | Amplifier | 2517A00669 | NCR | NCR |
| 2001 | Hewlett-Packard | 11971A | Mixer | 2332A01214 | 2/25/2011 | 2/25/2013 |
| 2007 | EMCO | 3115 | Antennas | 2419 | 1/12/2010 | 1/12/2012 |
| 2008 | COM-Power | AH-826 | Antennas | 81009 | NCR | NCR |
| 2011 | Hewlett-Packard | HP 8447D | Amplifiers | 2443A03952 | 1/3/2011 | 1/3/2012 |
| 2013 | Hewlett Packard | HP8566B | Spectrum Analyzers | 2407A03233 | 8/5/2010 | 8/5/2012 |
| 2014 | Hewlett Packard | HP 85650A | Quasi Peak Adapter | 2430A00559 | 8/5/2010 | 8/5/2012 |
| 2037 | ACS Boca | Chamber EMI Cable Set | Cable Set | 2037 | 1/7/2011 | 1/7/2012 |
| 2044 | QMI | N/A | Cables | 2044 | 1/7/2011 | 1/7/2012 |
| 523 | Agilent | E7405 | Spectrum Analyzers | MY45103293 | 1/5/2011 | 1/5/2013 |
| 2077 | Hewlett Packard | HP 5061-5458 | Cables | 2077 | 2/2/2011 | 2/2/2012 |
| RE581 | Hewlett Packard | 8449B | Amplifier | 3008A00198 | 1/20/2011 | 1/20/2012 |
| 2070 | Mini Circuits | VHF-8400+ | Filter | 2070 | 2/3/2011 | 2/3/2012 |
| 2072 | Mini Circuits | VHF-3100+ | Filter | 30737 | 2/3/2011 | 2/3/2012 |
| 2076 | Hewlett Packard | HP5061-5458 | Cables | 2076 | 2/2/2011 | 2/2/2012 |
| 2012 | Hewlett-Packard | HP83017A | Amplifiers | 3123A00324 | 2/25/2011 | 2/25/2012 |
| 332 | Rohde&Schwarz | TS-PR40 | Amplifiers | 100021 | 10/29/2010 | 10/29/2011 |
| 333 | Rohde&Schwarz | 3160-09 | Antennas | 49404 | 11/4/2010 | NCR |
| 335 | Suhner | SF-102A | Cables | 882/2A | 10/29/2010 | 10/29/2011 |

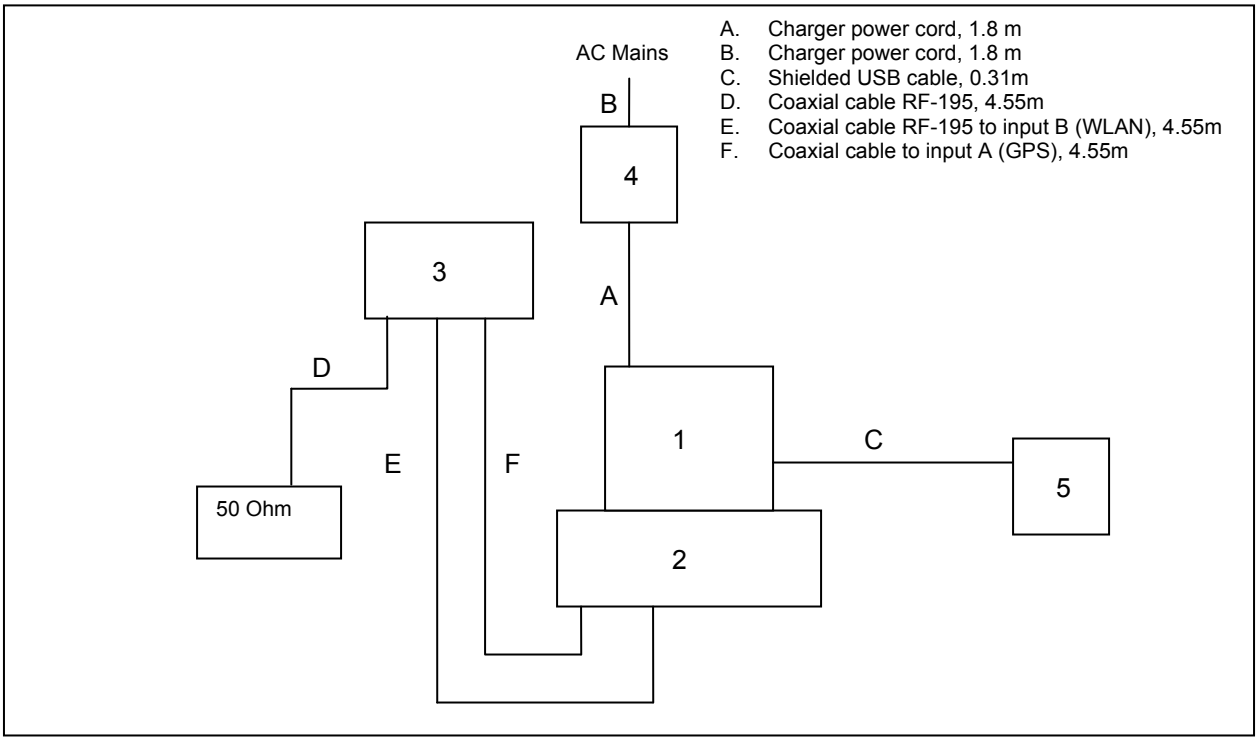
**NCR = No Cal Required**

## 5 SUPPORT EQUIPMENT

**Table 5-1: Support Equipment**

| Item | Equipment Type | Manufacturer | Model Number | Serial Number |
|---|---|---|---|---|
| 1 | Host Device | DRS Tactical Systems | Armor X7 Tablet | N/A |
| 2 | Dock | DRS Tactical Systems | 9800F26300-1000 | X7D00547 |
| 3 | Antenna | Mobile Mark | SMW-301-3C3C2C | N/A |
| 4 | AC/DC Adaptor | DRS Tactical Systems | ADP-40PH BB | 251027600104000133VD00 |
| 5 | USB Drive | Delta Electronics | JDSP256-00-540C | N/A |

## 6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



# 7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

## 7.1 Antenna Requirement – FCC: Section 15.203

The 622ANHMW uses a 5 dBi SMW-301-3C3C2C Mobile Mark communications antenna with the vehicle dock. The vehicle dock will provide an RP-SMA connector for the WLAN transceiver in order to meet the requirements of 15.203.

## 7.2 Band-Edge Compliance of Radiated Spurious Emissions - FCC Sections 15.205 and 15.247(d) IC RSS-210 A8.5 and 2.5

### 7.2.1 Measurement Procedure

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. Because the upper band-edge of the 802.11b/g frequency band coincides with a restricted band, band-edge compliance for the upper band-edge was determined using the radiated marker-delta method. The radiated field strength of the fundamental emission was first determined and then the marker-delta method was used to determine the field strength of the band-edge emission

### 7.2.2 Measurement Results

Band-edge compliance is displayed in Figures 7.2.2-1 – 7.2.2.-12 and Tables 7.2.2-1 to 7.2.2-2.

802.11b Band Edge Results:

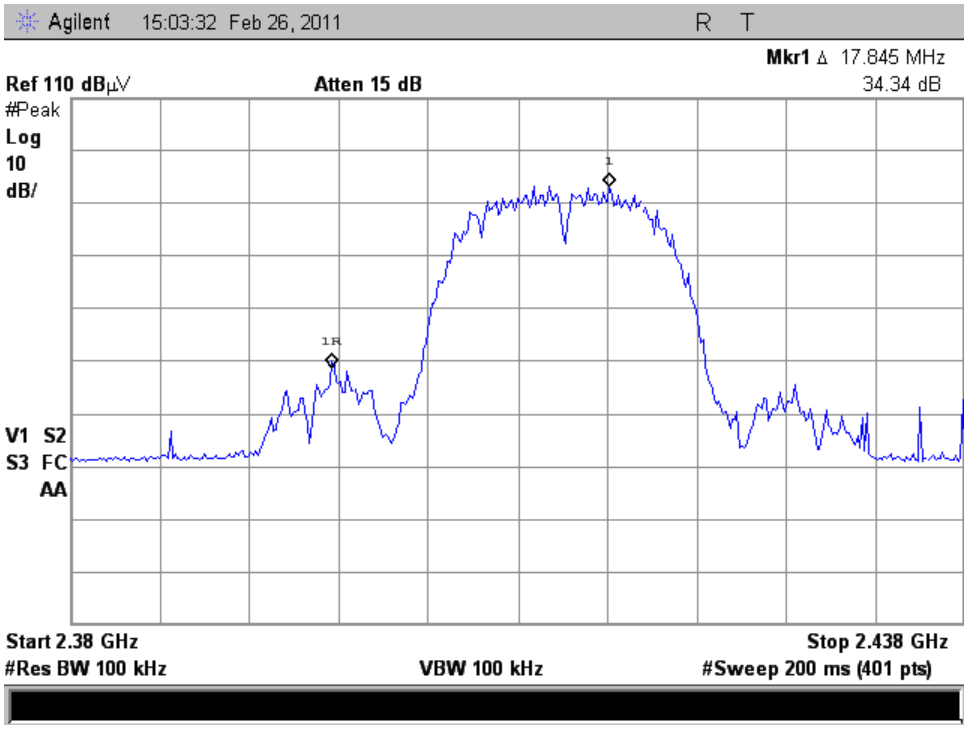


Figure 7.2.2-1: Lower Band-edge - Horizontal

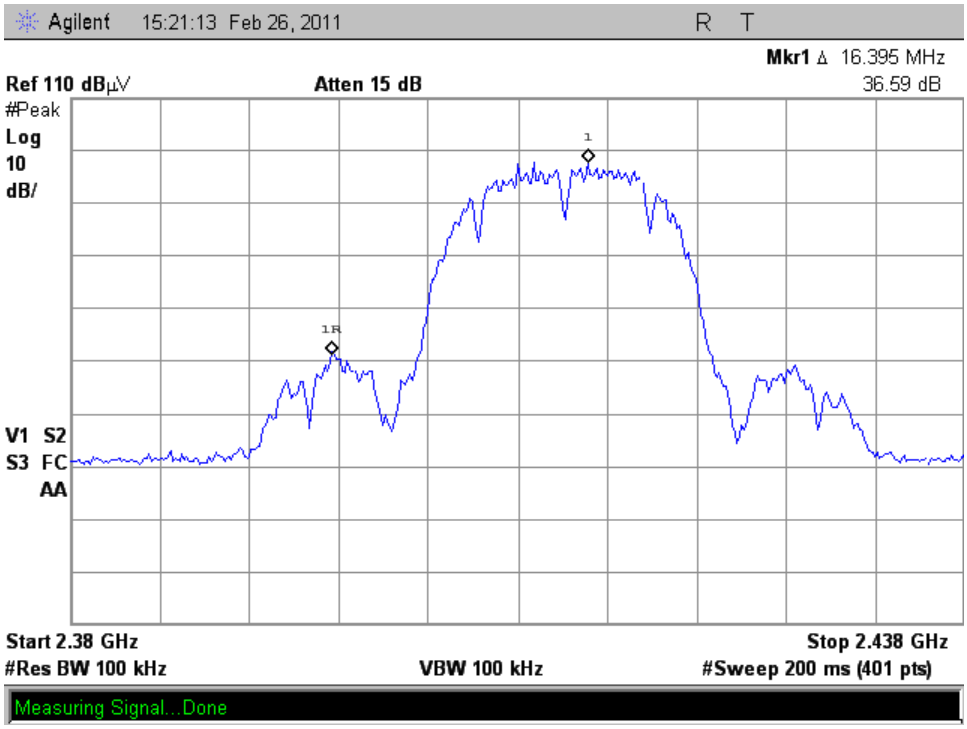



Figure 7.2.2-2: Lower Band-edge - Vertical

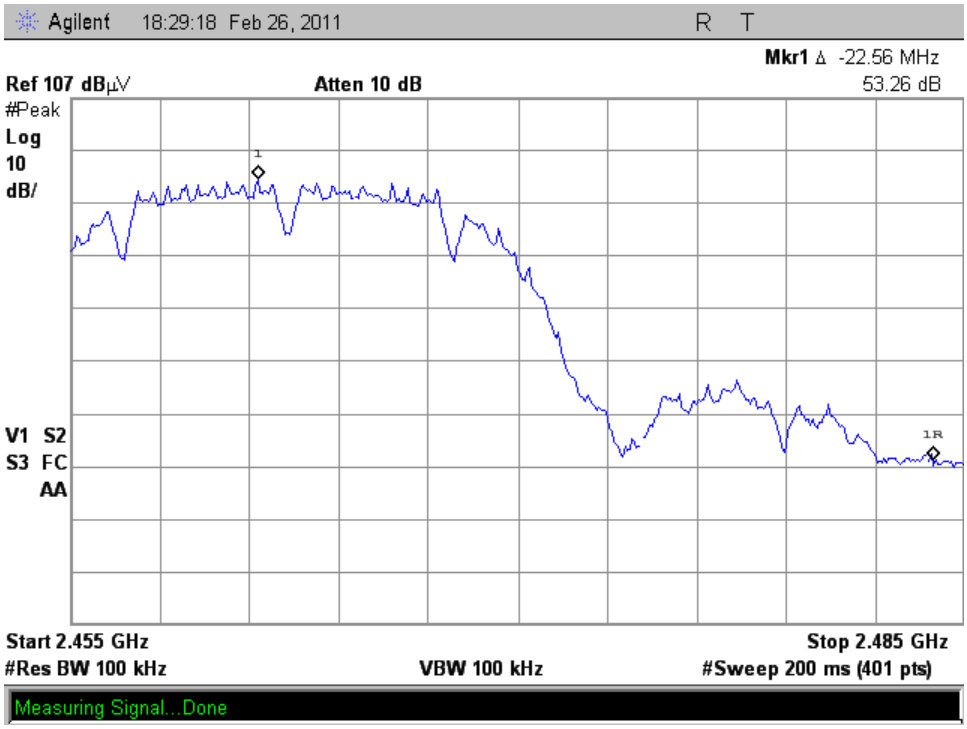



Figure 7.2.2-3: Upper Band-edge - Horizontal

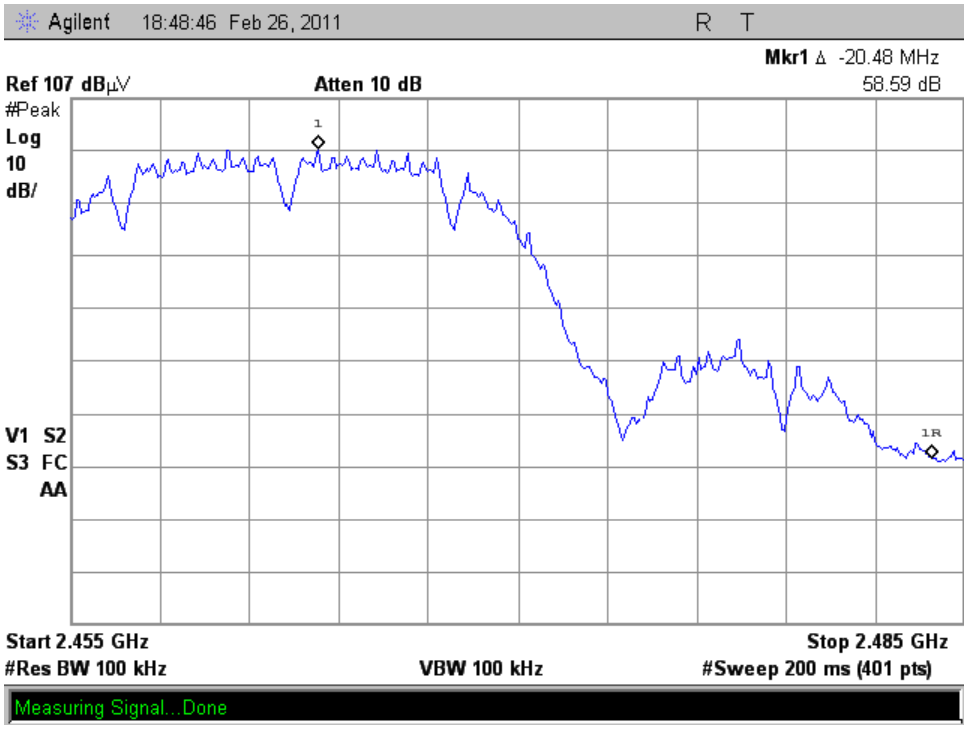



**Figure 7.2.2-4: Upper Band-edge – Vertical**

**Table 7.2.2-1: Upper Band-edge – Marker Delta Table**

| Frequency (MHz) | Uncorrected Level (dBuV) | | Antenna Polarity | Correction Factors | Fundamental Level (dBuV/m) | | Marker-Delta (dB) | Band-Edge Level (dBuV/m) | | Margin to Limit (dBµV/m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | | pk | Qpk/Avg | 74 pk | 54 Qpk/Avg |
| | | | | | | | | | | | |
| 2462 | 95.71 | 92.14 | H | -2.51 | 93.20 | 89.63 | 53.26 | 39.94 | 36.37 | 34.06 | 17.63 |
| 2462 | 100.70 | 97.31 | V | -2.51 | 98.19 | 94.80 | 58.59 | 39.60 | 36.21 | 34.40 | 17.79 |

802.11g Band Edge Results:

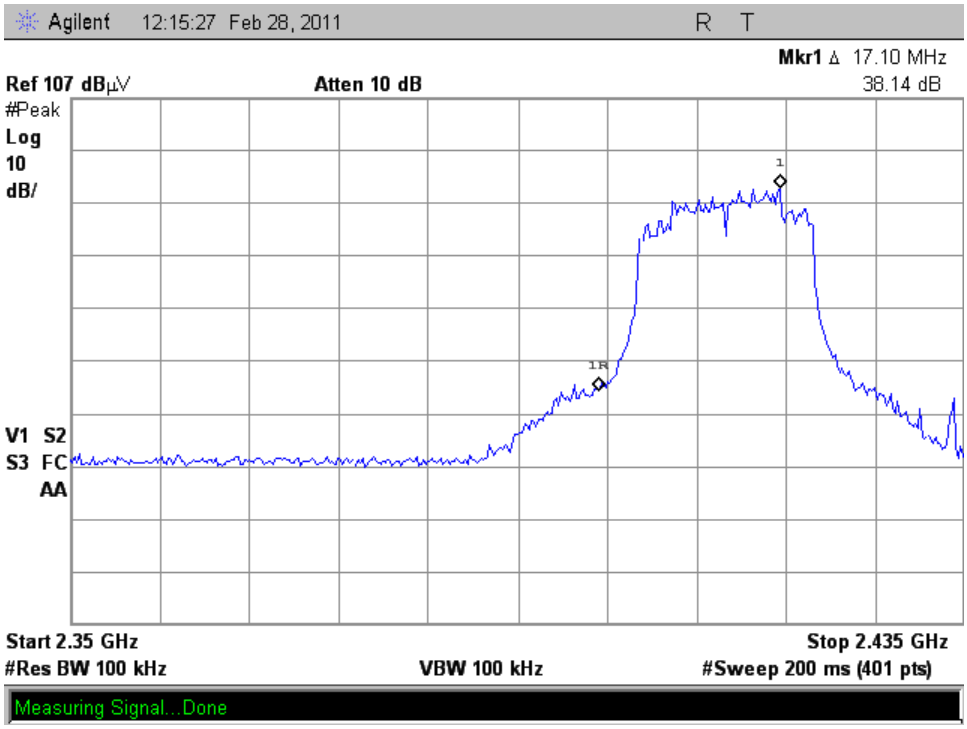



**Figure 7.2.2-5: Lower Band-edge - Horizontal**

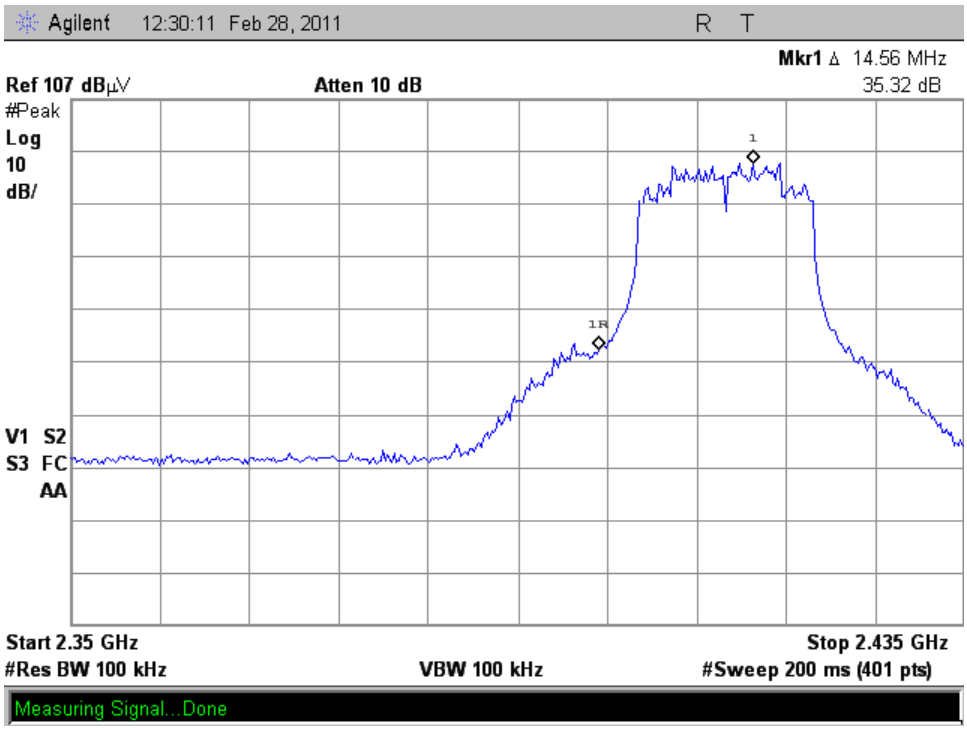



**Figure 7.2.2-6: Lower Band-edge - Vertical**

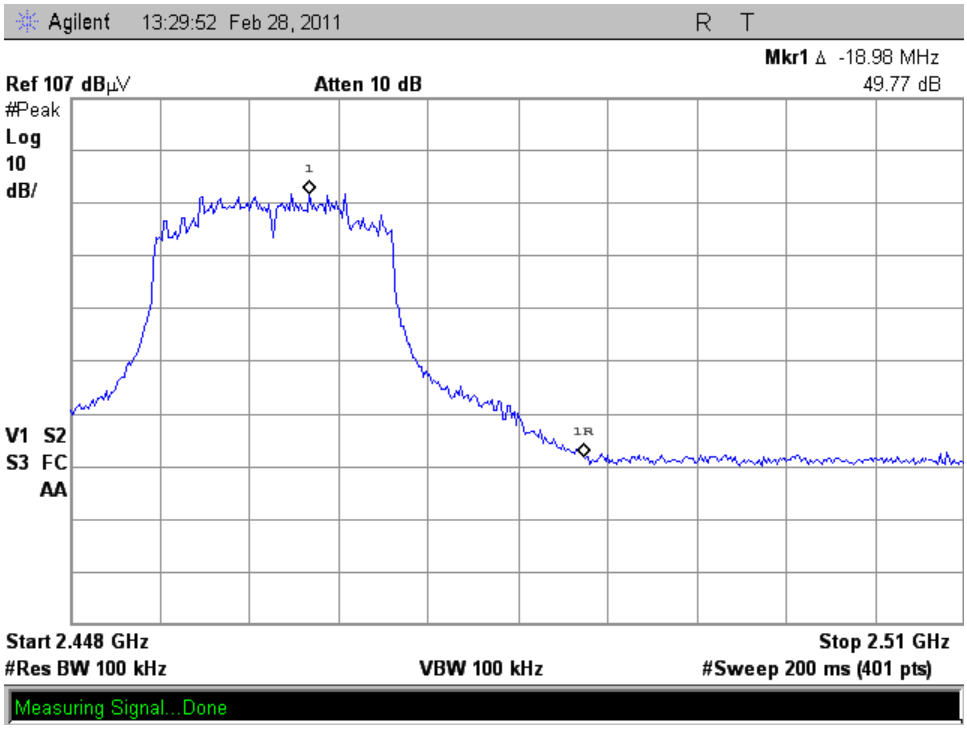



**Figure 7.2.2-7: Upper Band-edge - Horizontal**

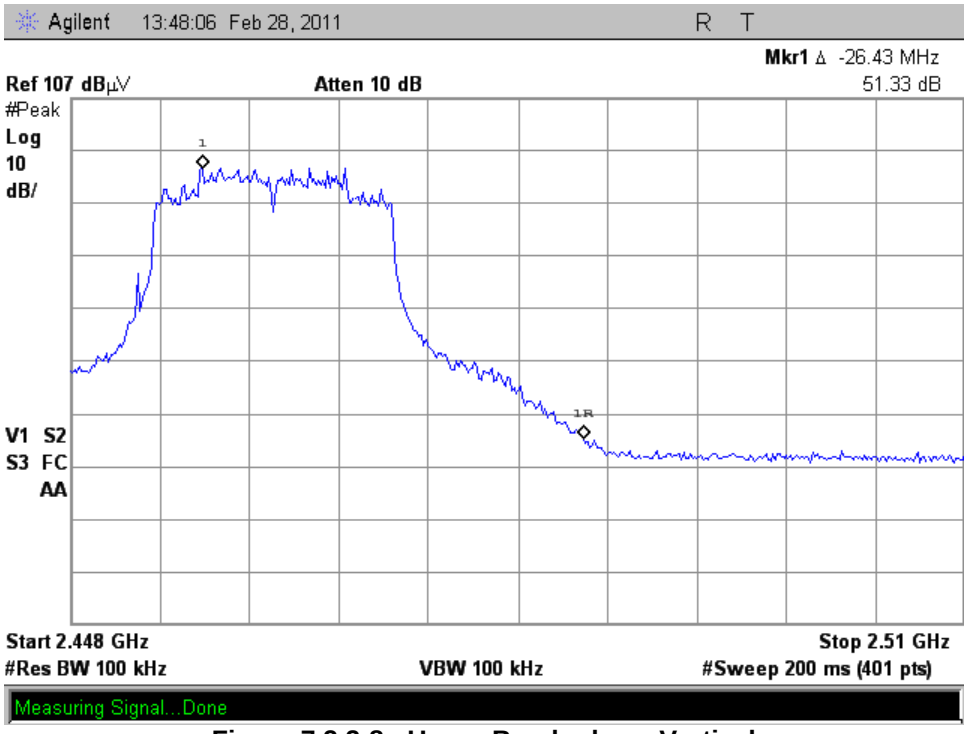



**Figure 7.2.2-8: Upper Band-edge – Vertical**

**Table 7.2.2-2: Upper Band-edge – Marker Delta Table**

| Frequency (MHz) | Uncorrected Level (dBuV) | | Antenna Polarity | Correction Factors | Fundamental Level (dBuV/m) | | Marker-Delta (dB) | Band-Edge Level (dBuV/m) | | Margin to Limit (dBµV/m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | | pk | Qpk/Avg | 74 pk | 54 Qpk/Avg |
| | | | | | | | | | | | |
| **2462** | 97.43 | 87.45 | H | -3.73 | 93.70 | 83.72 | 49.77 | 43.93 | 33.95 | 30.07 | 20.05 |
| **2462** | 103.10 | 92.10 | V | -3.73 | 99.37 | 88.37 | 51.33 | 48.04 | 37.04 | 25.96 | 16.96 |

802.11a Band Edge Results:

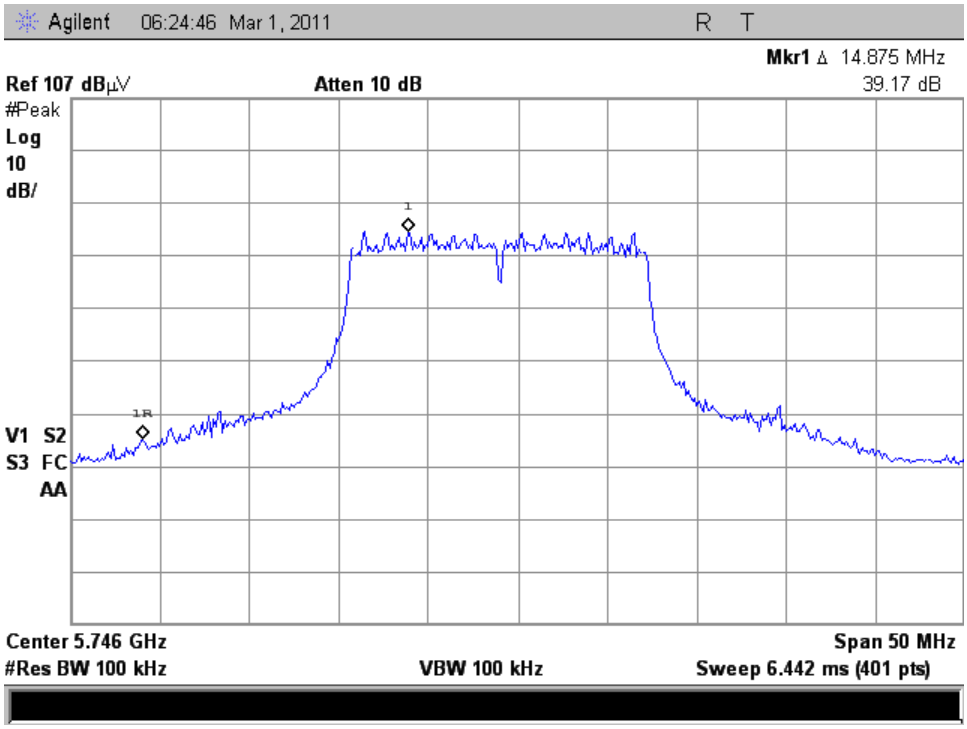



**Figure 7.2.2-9: Lower Band-edge - Horizontal**

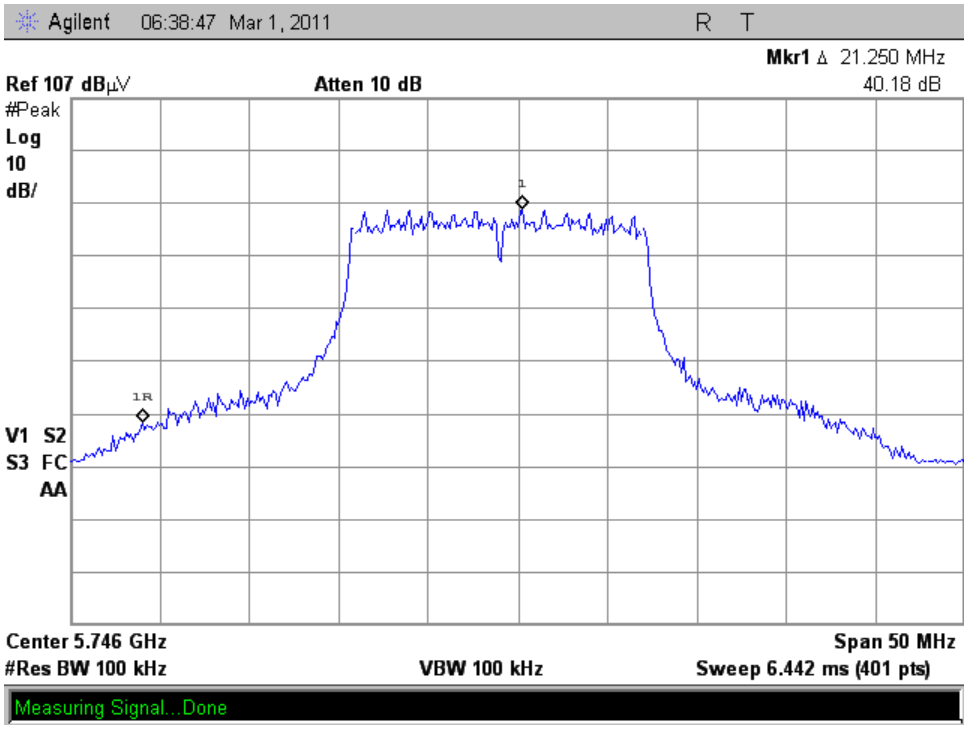



**Figure 7.2.2-10: Lower Band-edge - Vertical**

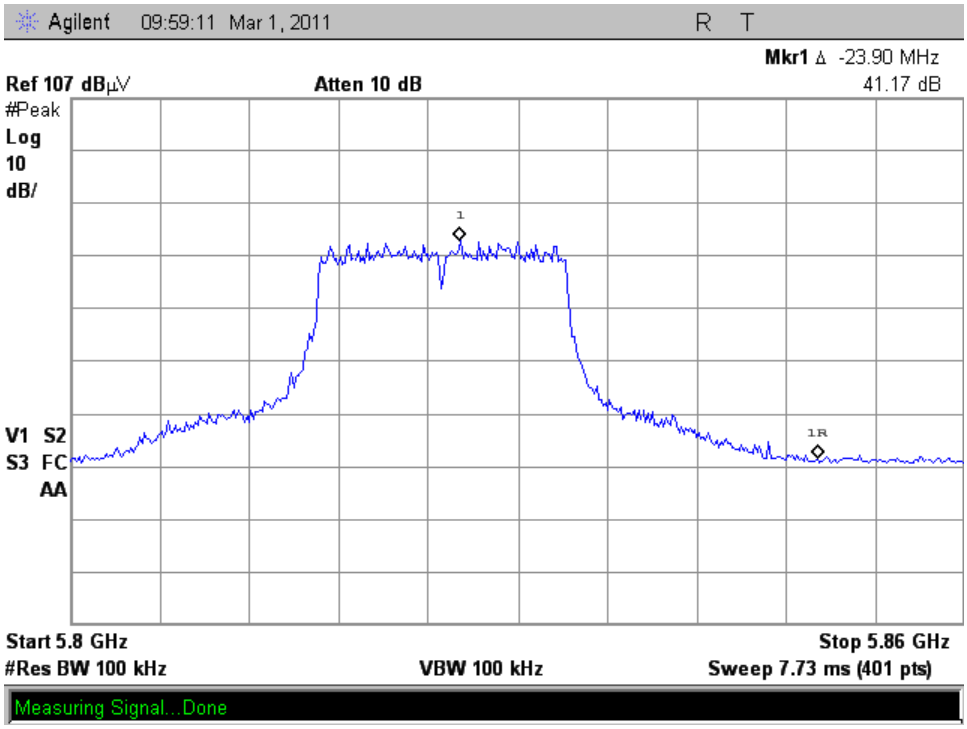



**Figure 7.2.2-11: Upper Band-edge - Horizontal**

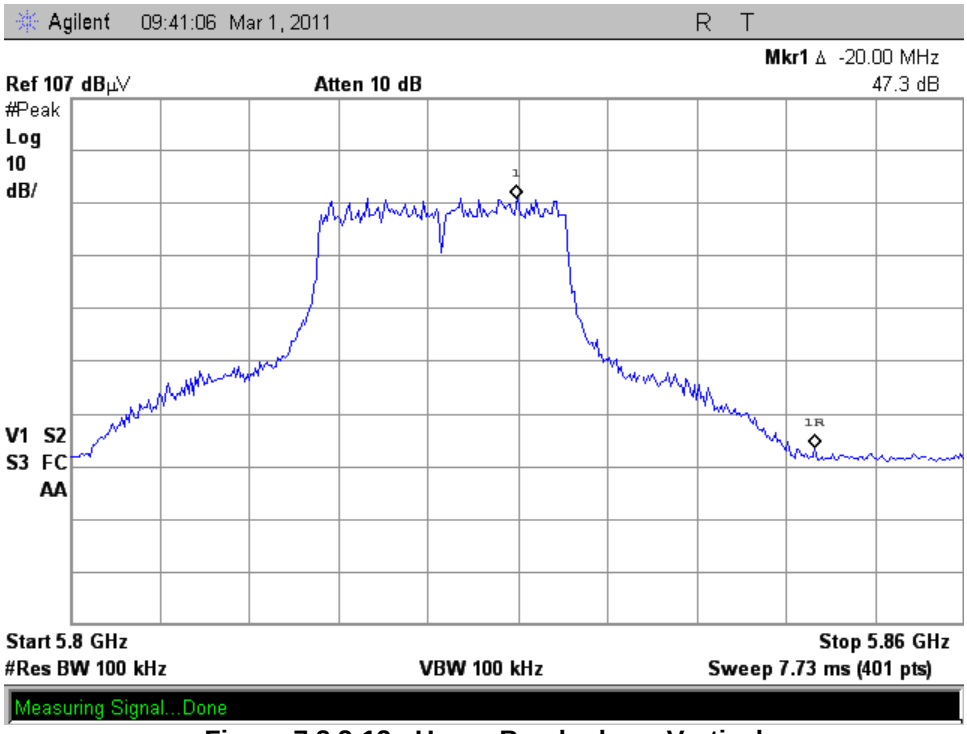



**Figure 7.2.2-12: Upper Band-edge – Vertical**

## 7.3 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.5

### 7.3.1 Measurement Procedure

Radiated emissions tests were made over the frequency ranges of 30MHz to 25 GHz and 30MHz to 40 GHz, 10 times the highest fundamental frequency, for the 802.11b/g and the 802.11a transmitters, respectively.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak and average measurements made with RBW and VBW of 1 MHz and 3 MHz respectively.

### 7.3.2 Measurement Results

Radiated spurious emissions found in the band of 30 MHz to 25 GHz for the 802.11b/g and 30 MHz to 40 GHz for the 802.11a transmitters are reported in the Tables 7.3.2-1 to 7.3.2-3 below.

**Table 7.3.2-1: Radiated Spurious Emissions Tabulated Data (802.11b)**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **Low Channel** | | | | | | | | | | |
| **4824** | 42.61 | 32.23 | H | 2.53 | 45.14 | 34.76 | 74.0 | 54.0 | 28.90 | 19.20 |
| **4824** | 43.99 | 35.37 | V | 2.53 | 46.52 | 37.90 | 74.0 | 54.0 | 27.50 | 16.10 |
| **Middle Channel** | | | | | | | | | | |
| **4874** | 43.98 | 34.31 | H | 2.62 | 46.60 | 36.93 | 74.0 | 54.0 | 27.40 | 17.10 |
| **4874** | 44.61 | 36.44 | V | 2.62 | 47.23 | 39.06 | 74.0 | 54.0 | 26.80 | 14.90 |
| **High Channel** | | | | | | | | | | |
| **4924** | 42.60 | 31.50 | H | 2.71 | 45.31 | 34.21 | 74.0 | 54.0 | 28.70 | 19.80 |
| **4924** | 44.61 | 37.34 | V | 2.71 | 47.32 | 40.05 | 74.0 | 54.0 | 26.70 | 13.90 |

* Note: All emissions above 4924 MHz were attenuated below the permissible limit.

**Table 7.3.2-2: Radiated Spurious Emissions Tabulated Data (802.11g)**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **Low Channel** | | | | | | | | | | |
| **Noise floor** | | | | | | | | | | |
| **Middle Channel** | | | | | | | | | | |
| **Noise floor** | | | | | | | | | | |
| **High Channel** | | | | | | | | | | |
| **4924** | 40.91 | 29.15 | V | 3.79 | 44.70 | 32.94 | 74.0 | 54.0 | 29.30 | 21.10 |

* Note: All emissions above 4924 MHz were attenuated below the permissible limit.

**Table 7.3.2-3: Radiated Spurious Emissions Tabulated Data (802.11a)**

| Frequency (MHz) | Level (dBuV) | | Antenna Polarity | Correction Factors | Corrected Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | pk | Qpk/Avg | (H/V) | (dB) | pk | Qpk/Avg | pk | Qpk/Avg | pk | Qpk/Avg |
| **Low Channel** | | | | | | | | | | |
| **Noise floor** | | | | | | | | | | |
| **Middle Channel** | | | | | | | | | | |
| **Noise floor** | | | | | | | | | | |
| **High Channel** | | | | | | | | | | |
| **11650** | 41.83 | 29.60 | H | 13.43 | 55.26 | 43.03 | 83.5 | 63.5 | 28.20 | 20.50 |
| **11650** | 43.99 | 31.04 | V | 13.43 | 57.42 | 44.47 | 83.5 | 63.5 | 26.10 | 19.00 |

* Note: All emissions above 11650 MHz were attenuated below the permissible limit.

#### *7.3.2.1* Sample Calculation:

$R_C = R_U + CF_T$

Where:

| | | |
|---|---|---|
| $CF_T$ | = | Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only) |
| $R_U$ | = | Uncorrected Reading |
| $R_C$ | = | Corrected Level |
| AF | = | Antenna Factor |
| CA | = | Cable Attenuation |
| AG | = | Amplifier Gain |
| DC | = | Duty Cycle Correction Factor |

**Example Calculation: Peak**
Corrected Level: 42.61 + 2.53 = 45.14dBuV/m
Margin: 74dBuV/m – 45.14dBuV/m = 28.9dB

**Example Calculation: Average**
Corrected Level: 32.23 + 2.53 - 0= 34.76dBuV/m
Margin: 54dBuV/m – 34.76dBuV/m = 19.2dB

## 8 CONCLUSION

In the opinion of ACS, Inc. the 622ANHMW, manufactured by DRS Tactical Systems, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

# END REPORT