Excellence in Compliance Testing

Certification Test Report

FCC ID: UGL622ANH
IC: 7888B-622ANH

FCC Rule Part: 15.407
IC Radio Standards Specification: RSS-210

ACS Report Number: 11-2009.W04.22.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

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 19 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart E 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)
802.11a	5180 - 5240	4	6000
802.11a	5260 - 5320	5	6000
802.11a	5500 - 5700	5	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. Data corresponding to the radiated emissions for the 802.11b/g configurations are provided in a separate certification report. The EUT was evaluated at the channels described in Table 1.3-1 below . The data rates listed led to the worst case emissions.

Table 1.3-1: Configurations evaluated

Mode of Operation	Channel	Frequency (MHz)	Data Rates Mbps
802.11a	36	5180	6
	40	5200	6
	48	5240	6
	52	5260	6
	56	5280	6
	64	5320	6
	100	5500	6
	120	5600	6
	140	5700	6
	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. The tests methods described within this report are not 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:

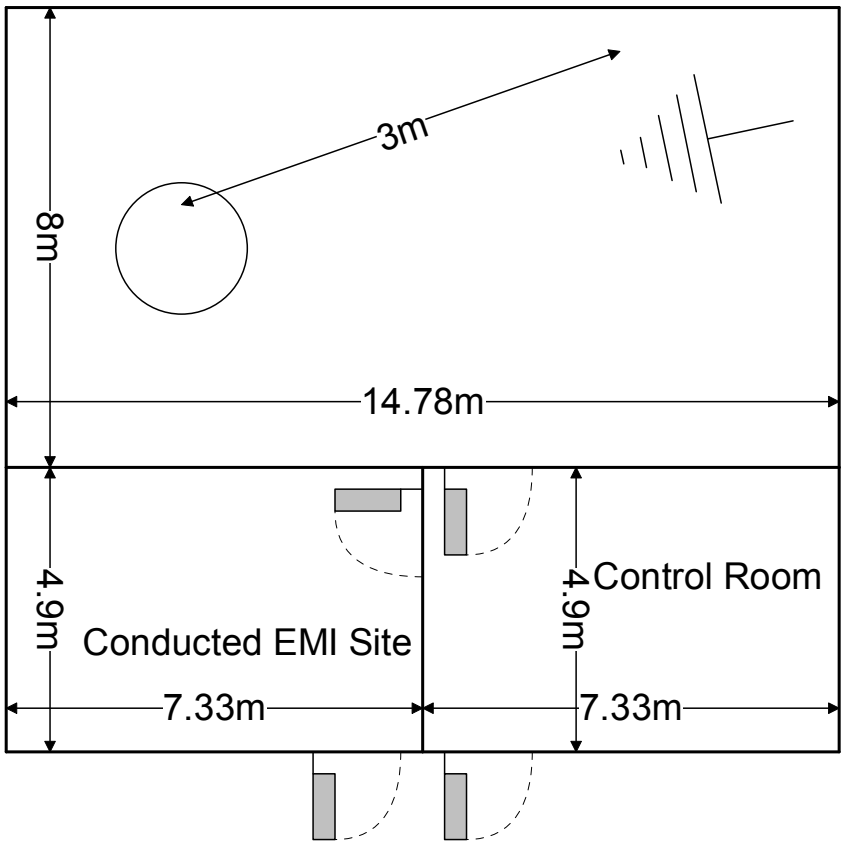


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

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:

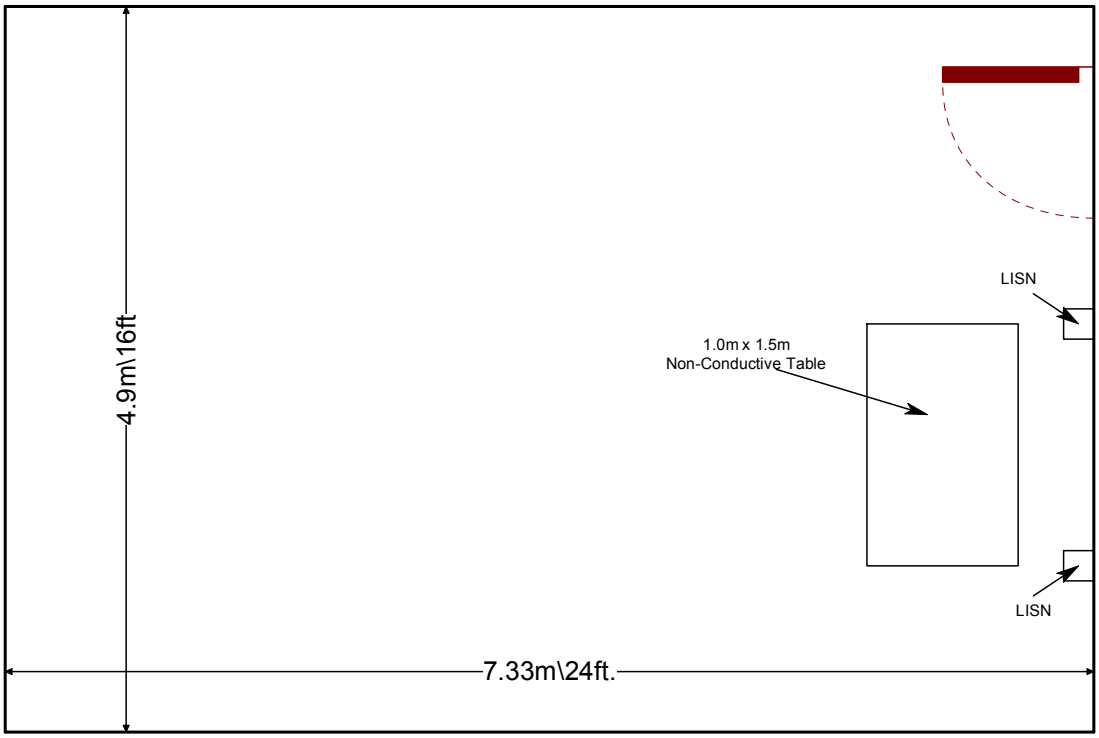


Figure 2.3.2-1: AC Mains Conducted EMI Site

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 E: Unlicensed National Information Infrastructure Devices, 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
335	Suhner	SF-102A	Cables	882/2A	10/29/2010	10/29/2011
2076	Hewlett Packard	HP5061-5458	Cables	2076	2/2/2011	2/2/2012
332	Rohde&Schwarz	TS-PR40	Amplifiers	100021	10/29/2010	10/29/2011
2012	Hewlett-Packard	HP83017A	Amplifiers	3123A00324	2/25/2011	2/25/2012
333	Rohde&Schwarz	3160-09	Antennas	49404	11/4/2010	NCR

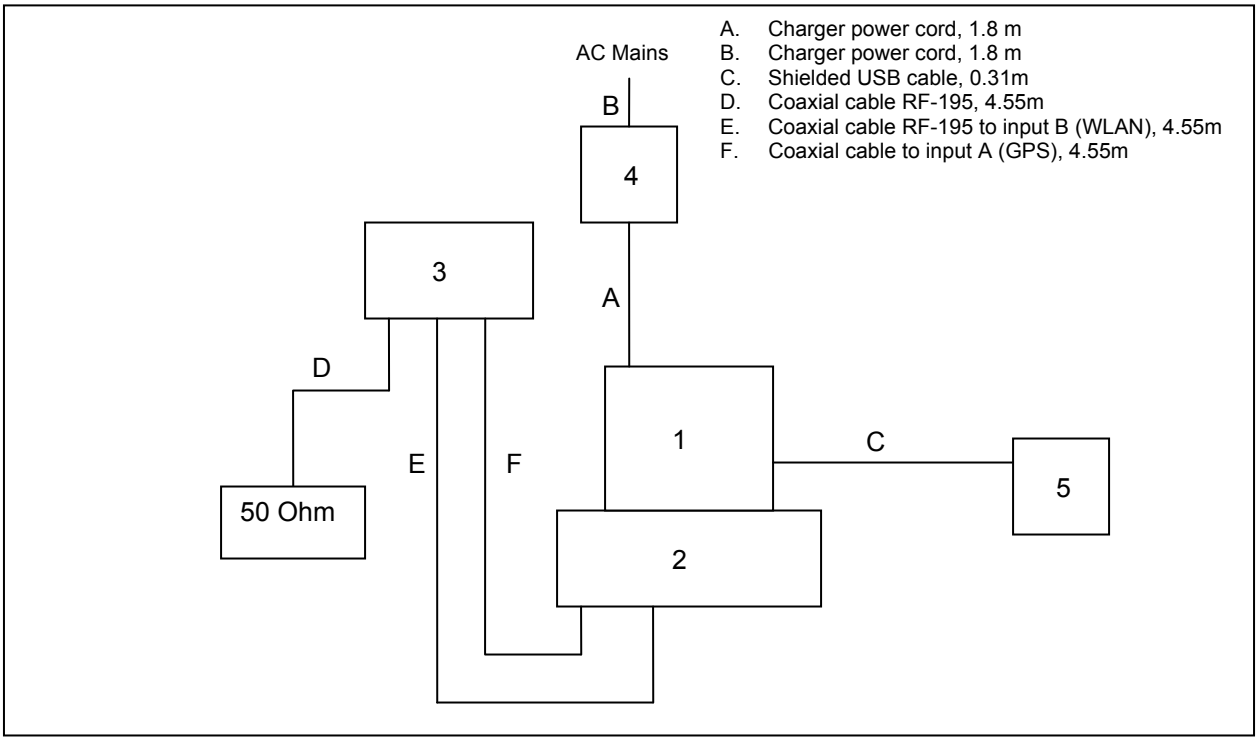
NCR = No Cal Required

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 15.407(b) IC RSS-210 A8.5 and 2.5

7.2.1 Measurement Procedure

The EUT was investigated at the edges of the bands of operation nearing the restricted bands to determine band-edge compliance 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 – 7.2.2-6 and Tables 7.2.2-1 – 7.2.2-3.

802.11a – 5180 MHz to 5240 MHz

Figure 7.2.2-1: Lower Band-edge - Horizontal

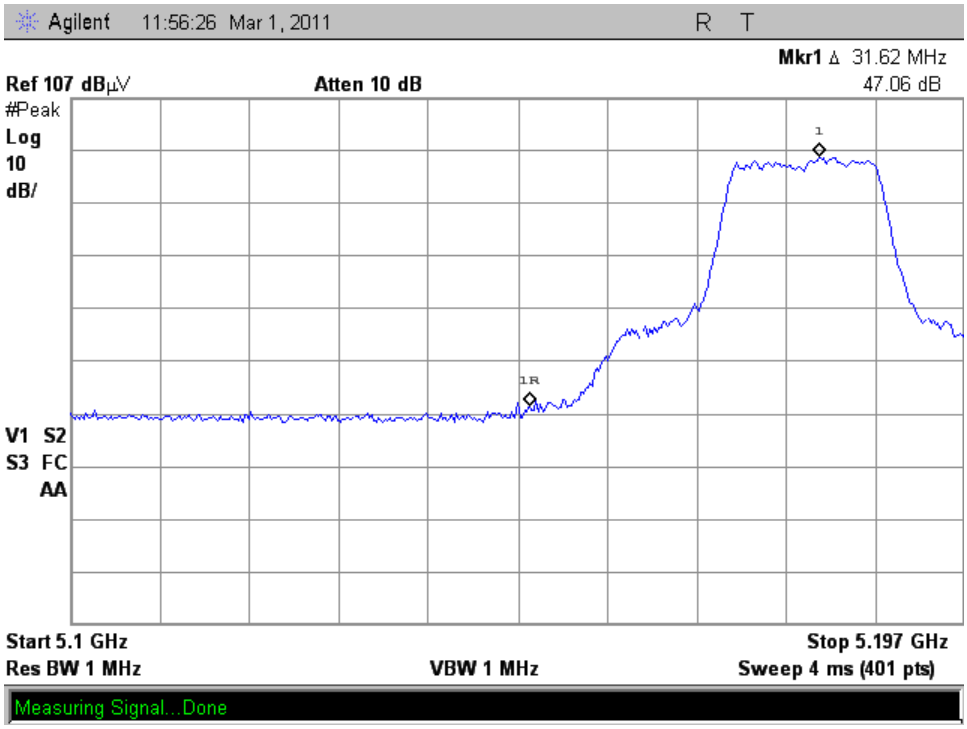


Figure 7.2.2-2: Lower Band-edge - Vertical

Table 7.2.2-1: Lower 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
5180	90.53	78.89	H	4.97	95.50	83.86	42.63	52.87	41.23	21.13	12.77
5180	95.93	84.98	V	4.97	100.90	89.95	47.06	53.84	42.89	20.16	11.11

802.11a – 5260 MHz to 5320 MHz

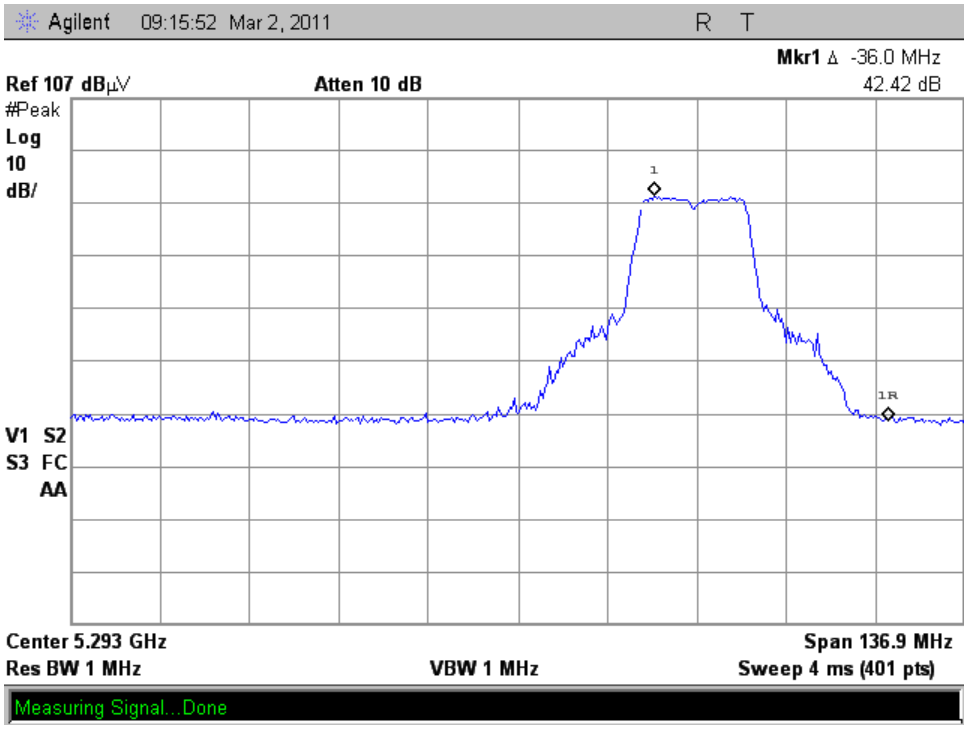


Figure 7.2.2-3: Upper Band-edge - Horizontal

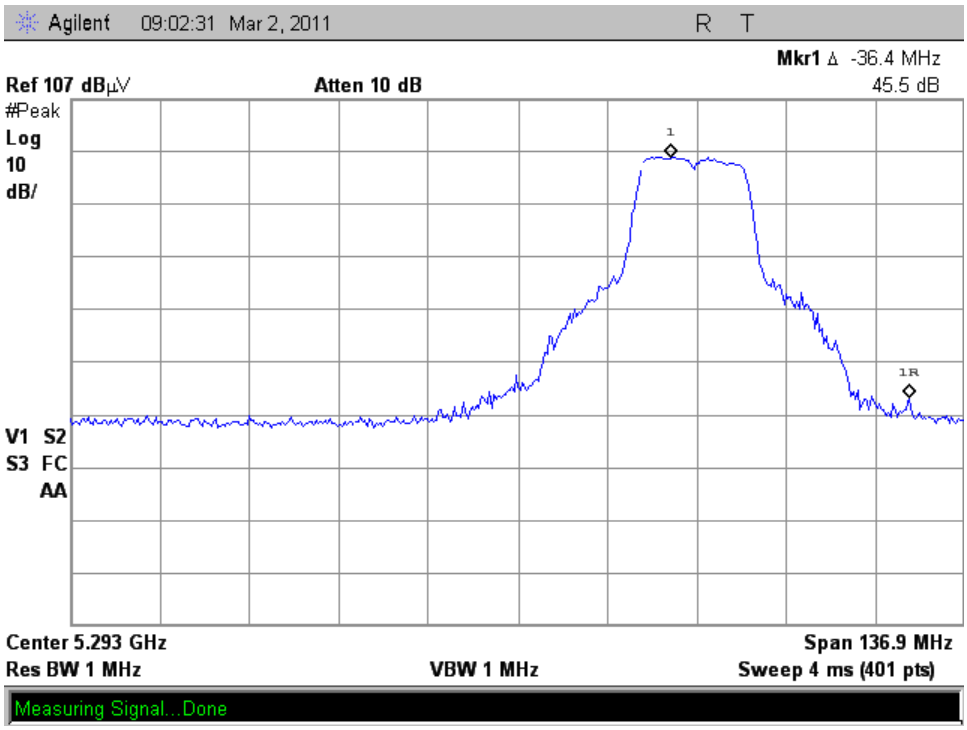


Figure 7.2.2-4: Upper Band-edge – Vertical

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
5320	89.17	79.65	H	5.78	94.95	85.43	42.42	52.53	43.01	21.47	10.99
5320	96.03	87.84	V	5.78	101.81	93.62	45.50	56.31	48.12	17.69	5.88

802.11a – 5500 MHz to 5700 MHz

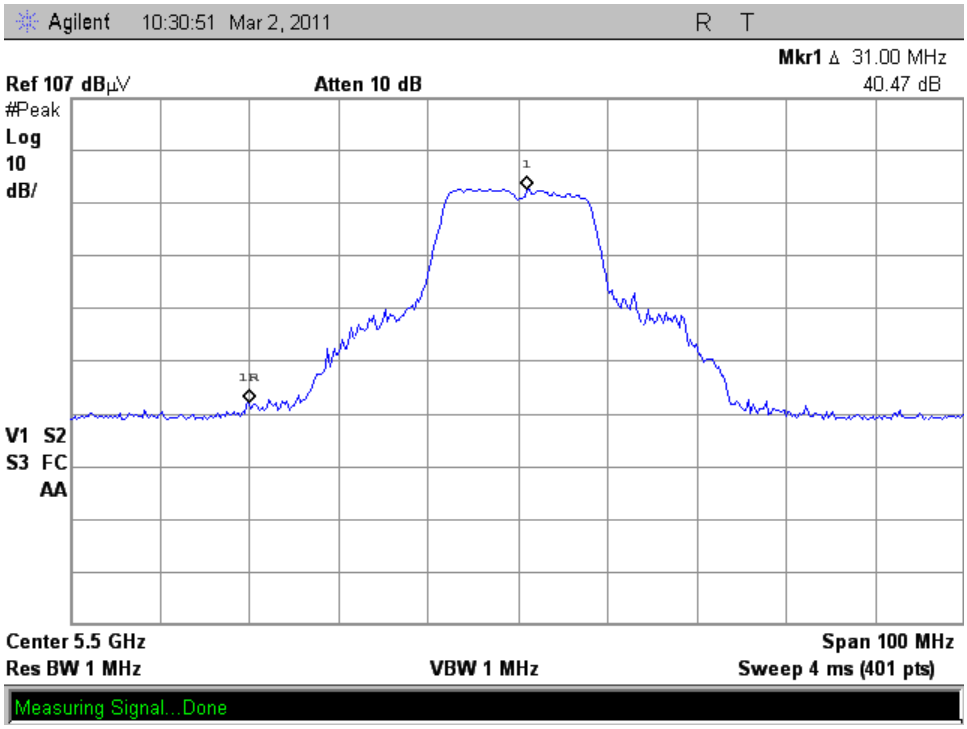


Figure 7.2.2-5: Lower Band-edge – Horizontal

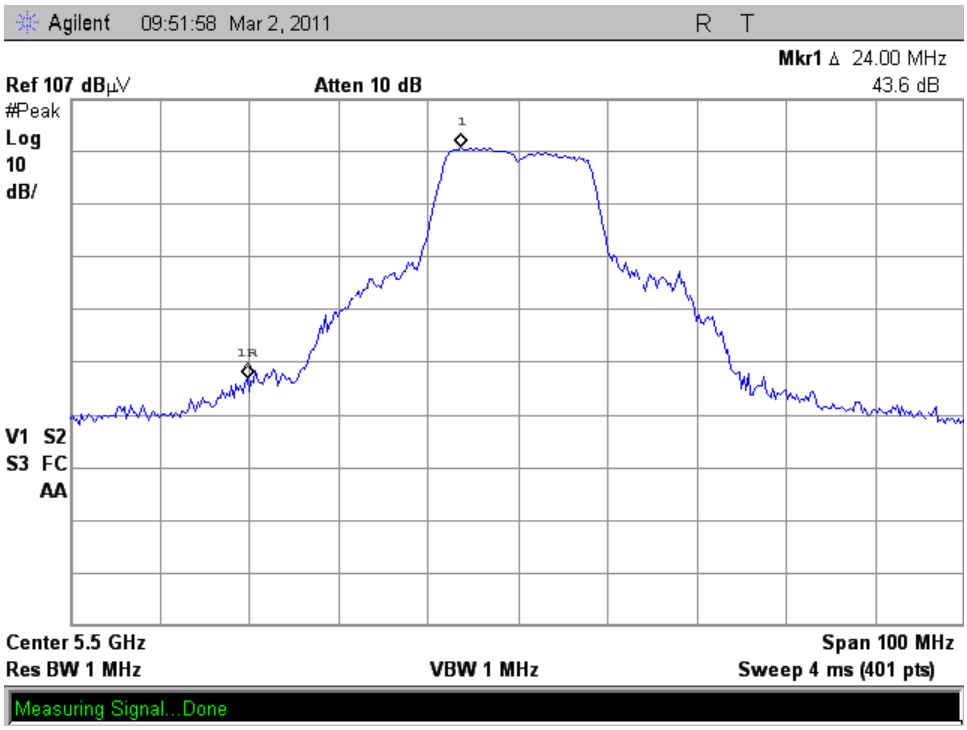


Figure 7.2.2-6: Lower Band-edge - Vertical

Table 7.2.2-3: Lower 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
5500	89.66	81.42	H	6.81	96.47	88.23	40.47	56.00	47.76	18.00	6.24
5500	98.54	89.53	V	6.81	105.35	96.34	43.60	61.75	52.74	12.25	1.26

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 range of 40 GHz, 10 times the highest fundamental frequency, for the 802.11a transmitter.

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 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak and average measurements made with RBW and VBW of 1 MHz and 3MHz respectively.

7.3.2 Measurement Results

Radiated spurious emissions found in the band of 30 MHz to 40 GHz for the 802.11a transmitter are reported in the Tables 7.3.2-1 to 7.3.2-4 below.

Table 7.3.2-1: 802.11a (5180 MHz to 5240 MHz)

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 5180 MHz										
Noise Floor										
Middle Channel 5200 MHz										
Noise Floor										
High Channel 5240 MHz										
15720	45.67	32.10	V	17.75	63.42	49.85	83.5	63.5	20.1	13.6

* Note: All emissions above 15720 MHz were attenuated below the permissible limit. The measurements above 10 GHz were performed at 1m. The limits are corrected using the distance factor of 20*log (3/1) dB.

Table 7.3.2-2: 802.11a (5260 MHz to 5320 MHz)

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 5260 MHz										
15780	45.83	31.48	V	17.22	63.05	48.70	83.5	63.5	20.4	14.8
15780	43.72	31.03	H	17.22	60.94	48.25	83.5	63.5	22.6	15.2
Middle Channel 5280 MHz										
15840	44.67	31.86	H	16.69	61.36	48.55	83.5	63.5	22.1	14.9
15840	43.54	31.42	V	16.69	60.23	48.11	83.5	63.5	23.3	15.4
High Channel 5320 MHz										
15960	42.55	30.89	H	15.63	58.18	46.52	83.5	63.5	25.3	17.0

* Note: All emissions above 15960 MHz were attenuated below the permissible limit. The measurements above 10 GHz were performed at 1m. The limits are corrected using the distance factor of 20*log (3/1) dB.

Table 7.3.2-3: 802.11a (5500 MHz to 5700 MHz

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 5500 MHz										
Noise Floor										
Middle Channel 5600 MHz										
Noise Floor										
High Channel 5700 MHz										
Noise Floor										

* Note: All emissions were attenuated below the permissible limit and the noise floor. The measurements above 10 GHz were performed at 1m. The limits are corrected using the distance factor of 20*log (3/1) dB.

Table 7.3.2-4: 802.11a (5745 MHz to 5825 MHz

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 5745 MHz										
Noise Floor										
Middle Channel 5785 MHz										
Noise Floor										
High Channel 5825 MHz										
11650	41.83	29.60	H	13.43	55.26	43.03	83.5	63.5	28.2	20.5
11650	43.99	31.04	V	13.43	57.42	44.47	83.5	63.5	26.1	19.0

* Note: All emissions above 11650 MHz were attenuated below the permissible limit. The measurements above 10 GHz were performed at 1m. The limits are corrected using the distance factor of 20*log (3/1) dB.

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: 45.67 + 17.75 = 63.42dBuV/m
Margin: 83.5dBuV/m – 63.42dBuV/m = 20.1dB

Example Calculation: Average
Corrected Level: 32.1 + 17.75 - 0= 49.85dBuV/m
Margin: 63.5dBuV/m – 49.85 dBuV/m = 13.6dB

8 CONCLUSION

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

END REPORT