

# Schweitzer Engineering Laboratories, Inc.

## RadioRanger SEL-8300

February 19, 2007

Report No. SCHW0069.2

Report Prepared By



[www.nwemc.com](http://www.nwemc.com)  
1-888-EMI-CERT

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**EMC Test Report**

## Certificate of Test

Issue Date: February 19, 2007  
Schweitzer Engineering Laboratories, Inc.  
Model: RadioRanger SEL-8300

Emissions				
Test Description	Specification	Test Method	Pass	Fail
Field Strength of Fundamental	FCC 15.249:2006	ANSI C63.4:2003	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Field Strength of Spurious Emissions	FCC 15.249:2006	ANSI C63.4:2003	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### Modifications made to the product

See the Modifications section of this report

### Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.  
22975 NW Evergreen Parkway, Suite 400  
Hillsboro, OR 97124

Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada.

### Approved By:



Greg Kiemel, Director of Engineering

*This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.*

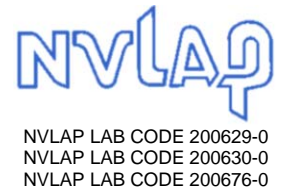
*Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested, the specific description is noted in each of the individual sections of the test report supporting this certificate of test.*

Revision Number	Description	Date	Page Number
00	None		

**FCC:** Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.



**NVLAP:** Northwest EMC, Inc. is accredited under the United States Department of Commerce, National Institute of Standards and Technology, and National Voluntary Laboratory Accreditation Program for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 89/336/EEC, ANSI C63.4, MIL-STD 461E, DO-160D and SAE J1113. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.



**Industry Canada:** Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS 212, Issue 1 (Provisional) and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements.



**CAB:** Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.



**TÜV Product Service:** Included in TÜV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TÜV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TÜV's current Listing of CARAT Laboratories, available from TÜV. A certificate was issued to represent that this laboratory continues to meet TÜV's CARAT Program requirements. Certificate No. USA0604C.



**TÜV Rheinland:** Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.



**NEMKO:** Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).



**Australia/New Zealand:** The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).



**VCCI:** Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. (*Registration Numbers. - Hillsboro: C-1071, R-1025, C-2687, T-289, and R-2318, Irvine: C-2094 and R-1943, Sultan: R-871, C-1784, and T-294.*)



**BSMI:** Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement. License No.SL2-IN-E-1017.



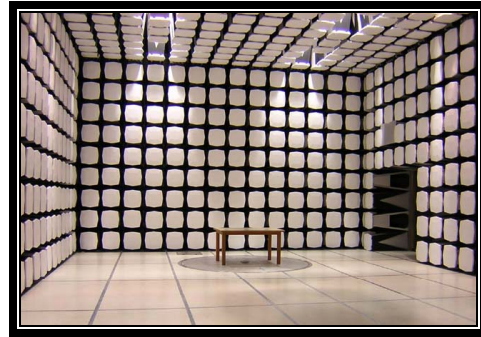
**GOST:** Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification



## SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/scope.asp>



**California – Orange County Facility  
Labs OC01 – OC13**

41 Tesla Ave. Irvine, CA 92618  
(888) 364-2378 Fax: (503) 844-3826



**Oregon – Evergreen Facility  
Labs EV01 – EV11**

22975 NW Evergreen Pkwy. Suite 400 Hillsboro, OR 97124  
(503) 844-4066 Fax: (503) 844-3826



**Washington – Sultan Facility  
Labs SU01 – SU07**

14128 339<sup>th</sup> Ave. SE Sultan, WA 98294  
(888) 364-2378

**Party Requesting the Test**

<b>Company Name:</b>	Schweitzer Engineering Laboratories, Inc.
<b>Address:</b>	2350 NE Hopkins Court
<b>City, State, Zip:</b>	Pullman, WA 99163
<b>Test Requested By:</b>	Witold Teller
<b>Model:</b>	RadioRanger SEL-8300
<b>First Date of Test:</b>	February 7, 2007
<b>Last Date of Test:</b>	February 12, 2007
<b>Receipt Date of Samples:</b>	February 7, 2007
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage

**Information Provided by the Party Requesting the Test****Functional Description of the EUT (Equipment Under Test):**

The RadioRanger 8300 is a 915 MHz radio transceiver, which uses either a short coaxial monopole, or a extended coax cable with coaxial monopole.

**Testing Objective:**

Seeking TCB authorization under 15.249.

**CONFIGURATION 1 SCHW0069**

<b>EUT</b>			
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>
EUT - 8300 integral antenna	Schweitzer Engineering Laboratories, Inc.	RadioRanger SEL-8300	NWEMC-6
Co-axial Monopole Antenna	Schweitzer Engineering Laboratories, Inc.	Unknown	None

**CONFIGURATION 2 SCHW0069**

<b>EUT</b>			
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>
EUT - 8300 external antenna	Schweitzer Engineering Laboratories, Inc.	RadioRanger SEL-8300	NWEMC-5
Co-axial Monopole Antenna	Schweitzer Engineering Laboratories, Inc.	Unknown	None

<b>Cables</b>					
<b>Cable Type</b>	<b>Shield</b>	<b>Length (m)</b>	<b>Ferrite</b>	<b>Connection 1</b>	<b>Connection 2</b>
Antenna cable	Yes	4.5m	No	EUT - 8300	Co-axial Monopole Antenna
<b>PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.</b>					



<b>Equipment modifications</b>					
Item	Date	Test	Modification	Note	Disposition of EUT
1	2/7/2007	Field Strength of Fundamental	Modified from delivered configuration. Initial or No Modification	Adjusted power down to a customer power setting of 7. Modification done by Customer.	EUT remained at Northwest EMC following the test.
2	2/12/2007	Field Strength of Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

#### MODES OF OPERATION

Integral antenna, typical modulation, high channel
Integral antenna, typical modulation, low channel
Integral antenna, typical modulation, mid channel
External antenna, typical modulation, high channel
External antenna, typical modulation, low channel
External antenna, typical modulation, mid channel

#### POWER SETTINGS INVESTIGATED

Battery

#### FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	10 GHz
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#### SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
.5-1 GHz Notch Filter	K&L Microwave	3TNF-500/1000-N/N	HFT	8/29/2006	13
Low Pass Filter 0-425 MHz	Micro-Tronics	LPM50003	LFB	12/29/2006	13
Spectrum Analyzer	Agilent	E4446A	AAT	12/7/2006	13
Antenna, Biconilog	EMCO	3141	AXE	12/28/2005	24
Pre-Amplifier	Miteq	AM-1616-1000	AOL	12/29/2006	13
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	12/29/2006	13
Antenna, Horn	EMCO	3115	AHC	8/24/2006	12
High Pass Filter 1.2 - 18 GHz	Micro-Tronics	HPM50108	HFV	12/29/2006	13
EV01 cables c,g, h			EVA	12/29/2006	13
EV01 cables g,h,j			EVB	12/29/2006	13

#### MEASUREMENT BANDWIDTHS

	Frequency Range	Peak Data	Quasi-Peak Data	Average Data
	(MHz)	(kHz)	(kHz)	(kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

#### MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

#### TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and receiving while set at the lowest channel, a middle channel, and the highest channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:2003). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

EUT: RadioRanger SEL-8300	Work Order: SCHW0069
Serial Number: NWEMC-6	Date: 02/08/07
Customer: Schweitzer Engineering Laboratories, Inc.	Temperature: 22
Attendees: None	Humidity: 32%
Project: None	Barometric Pres.: 29.98
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.249:2006	ANSI C63.4:2003

TEST PARAMETERS
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

COMMENTS
Integral antenna

EUT OPERATING MODES

Typical modulation, mid channel

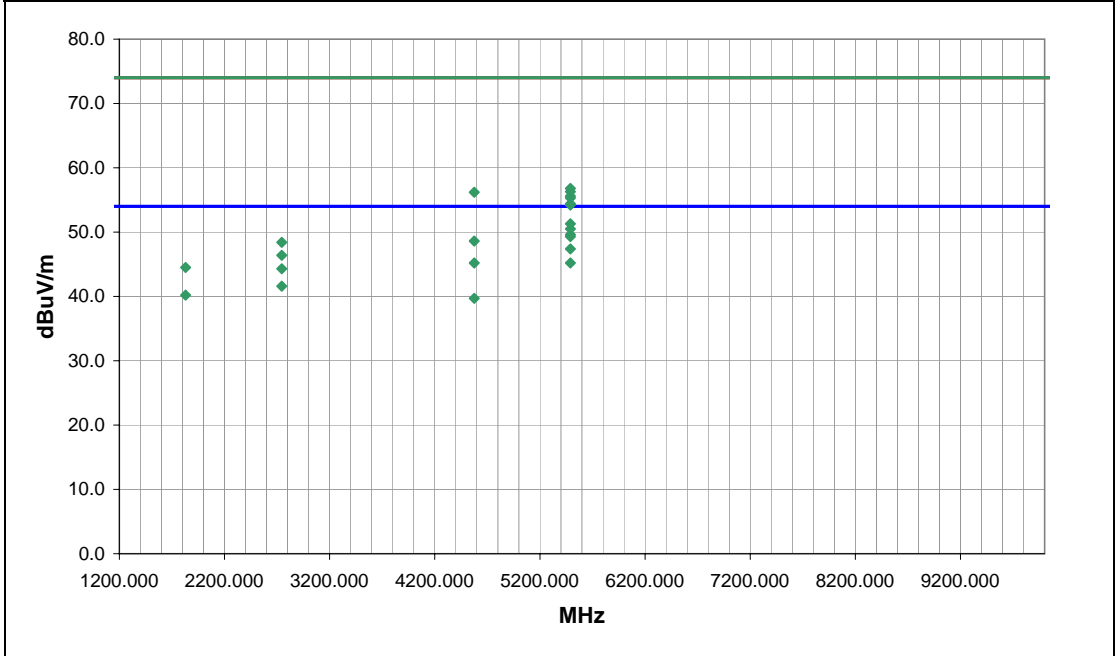
DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	9
Configuration #	1
Results	Pass

NVLAP Lab Code 200630-0

Signature

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
5490.012	40.3	11.0	150.0	1.3	3.0	0.0	H-Horn	AV	0.0	51.3	54.0	-2.7	EUT on side
5490.021	39.5	11.0	162.0	1.0	3.0	0.0	V-Horn	AV	0.0	50.5	54.0	-3.5	EUT horizontal
5490.012	38.6	11.0	74.0	1.3	3.0	0.0	H-Horn	AV	0.0	49.6	54.0	-4.4	EUT vertical
5490.031	38.3	11.0	290.0	1.0	3.0	0.0	V-Horn	AV	0.0	49.3	54.0	-4.7	EUT vertical
5490.001	36.4	11.0	269.0	1.0	3.0	0.0	V-Horn	AV	0.0	47.4	54.0	-6.6	EUT on side
4575.017	37.0	8.2	285.0	1.2	3.0	0.0	H-Horn	AV	0.0	45.2	54.0	-8.8	EUT on side
5490.032	34.2	11.0	174.0	1.3	3.0	0.0	H-Horn	AV	0.0	45.2	54.0	-8.8	EUT horizontal
2745.027	41.4	2.9	270.0	1.4	3.0	0.0	H-Horn	AV	0.0	44.3	54.0	-9.7	EUT on side
2745.033	38.7	2.9	350.0	1.4	3.0	0.0	V-Horn	AV	0.0	41.6	54.0	-12.4	EUT horizontal
1830.030	41.2	-1.0	256.0	1.4	3.0	0.0	H-Horn	AV	0.0	40.2	54.0	-13.8	EUT on side
4575.020	31.5	8.2	333.0	1.2	3.0	0.0	V-Horn	AV	0.0	39.7	54.0	-14.3	EUT horizontal
5489.877	45.8	11.0	174.0	1.3	3.0	0.0	H-Horn	PK	0.0	56.8	74.0	-17.2	EUT horizontal
5490.241	45.3	11.0	269.0	1.0	3.0	0.0	V-Horn	PK	0.0	56.3	74.0	-17.7	EUT on side
4575.060	48.0	8.2	285.0	1.2	3.0	0.0	H-Horn	PK	0.0	56.2	74.0	-17.8	EUT on side
5489.652	44.6	11.0	150.0	1.3	3.0	0.0	H-Horn	PK	0.0	55.6	74.0	-18.4	EUT on side
5489.851	44.3	11.0	162.0	1.0	3.0	0.0	V-Horn	PK	0.0	55.3	74.0	-18.7	EUT horizontal
5489.952	43.4	11.0	74.0	1.3	3.0	0.0	H-Horn	PK	0.0	54.4	74.0	-19.6	EUT vertical
5489.831	43.2	11.0	290.0	1.0	3.0	0.0	V-Horn	PK	0.0	54.2	74.0	-19.8	EUT vertical
4574.973	40.4	8.2	333.0	1.2	3.0	0.0	V-Horn	PK	0.0	48.6	74.0	-25.4	EUT horizontal
2744.723	45.5	2.9	270.0	1.4	3.0	0.0	H-Horn	PK	0.0	48.4	74.0	-25.6	EUT on side

EUT: RadioRanger SEL-8300		Work Order: SCHW0069
Serial Number: NWEMC-6		Date: 02/09/07
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 23
Attendees: None		Humidity: 32%
Project: None		Barometric Pres.: 30.05
Tested by: Rod Peloquin	Power: Battery	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.249:2006	ANSI C63.4:2003

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS
Integral antenna

**EUT OPERATING MODES**

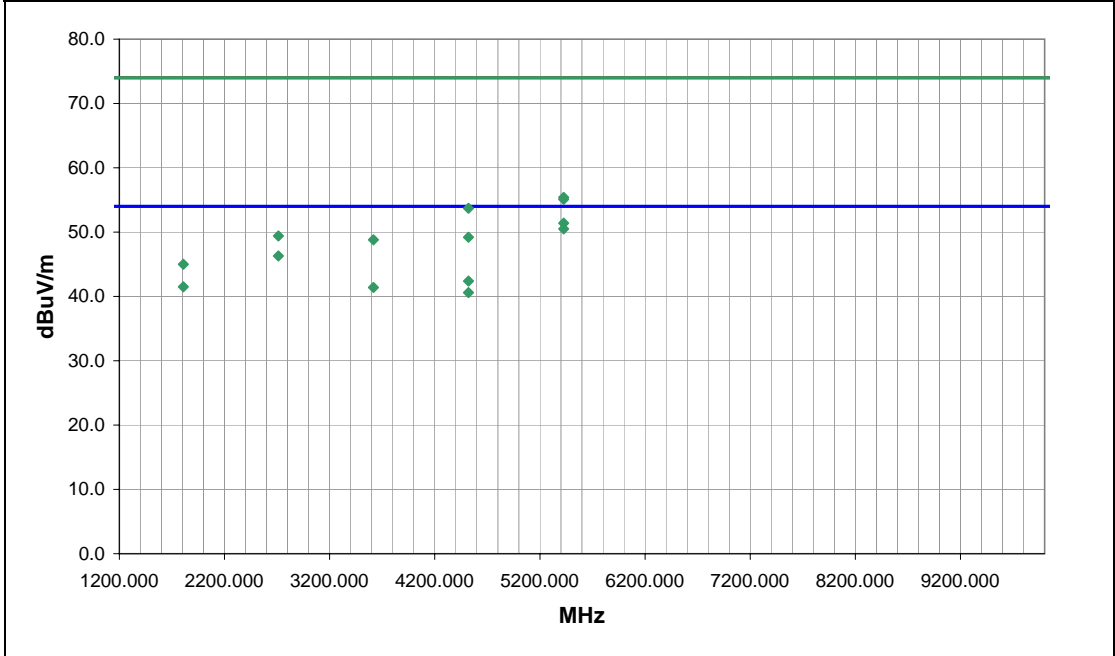
Typical modulation, low channel

**DEVIATIONS FROM TEST STANDARD**

No deviations.

Run #	10	 Signature
Configuration #	1	
Results	Pass	

NVLAP Lab Code 200630-0



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
5425.221	40.5	10.9	162.0	1.2	3.0	0.0	H-Horn	AV	0.0	51.4	54.0	-2.6	EUT on side
5425.273	39.6	10.9	163.0	1.3	3.0	0.0	V-Horn	AV	0.0	50.5	54.0	-3.5	EUT horizontal
2712.635	43.5	2.8	277.0	1.2	3.0	0.0	H-Horn	AV	0.0	46.3	54.0	-7.7	EUT on side
4520.998	34.4	8.0	327.0	1.2	3.0	0.0	H-Horn	AV	0.0	42.4	54.0	-11.6	EUT on side
1808.440	42.5	-1.0	261.0	1.4	3.0	0.0	H-Horn	AV	0.0	41.5	54.0	-12.5	EUT on side
3616.835	34.5	6.9	194.0	1.1	3.0	0.0	H-Horn	AV	0.0	41.4	54.0	-12.6	EUT on side
4521.043	32.6	8.0	336.0	1.1	3.0	0.0	V-Horn	AV	0.0	40.6	54.0	-13.4	EUT horizontal
5425.441	44.5	10.9	162.0	1.2	3.0	0.0	H-Horn	PK	0.0	55.4	74.0	-18.6	EUT on side
5425.303	44.2	10.9	163.0	1.3	3.0	0.0	V-Horn	PK	0.0	55.1	74.0	-18.9	EUT horizontal
4520.798	45.7	8.0	336.0	1.1	3.0	0.0	V-Horn	PK	0.0	53.7	74.0	-20.3	EUT horizontal
2712.615	46.6	2.8	277.0	1.2	3.0	0.0	H-Horn	PK	0.0	49.4	74.0	-24.6	EUT on side
4520.923	41.2	8.0	327.0	1.2	3.0	0.0	H-Horn	PK	0.0	49.2	74.0	-24.8	EUT on side
3616.550	41.8	7.0	194.0	1.1	3.0	0.0	H-Horn	PK	0.0	48.8	74.0	-25.2	EUT on side
1808.495	46.0	-1.0	261.0	1.4	3.0	0.0	H-Horn	PK	0.0	45.0	74.0	-29.0	EUT on side

EUT: RadioRanger SEL-8300	Work Order: SCHW0069
Serial Number: NWEMC-6	Date: 02/09/07
Customer: Schweitzer Engineering Laboratories, Inc.	Temperature: 22
Attendees: None	Humidity: 32%
Project: None	Barometric Pres.: 29.98
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.249:2006	ANSI C63.4:2003

TEST PARAMETERS
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

COMMENTS
Integral antenna

EUT OPERATING MODES

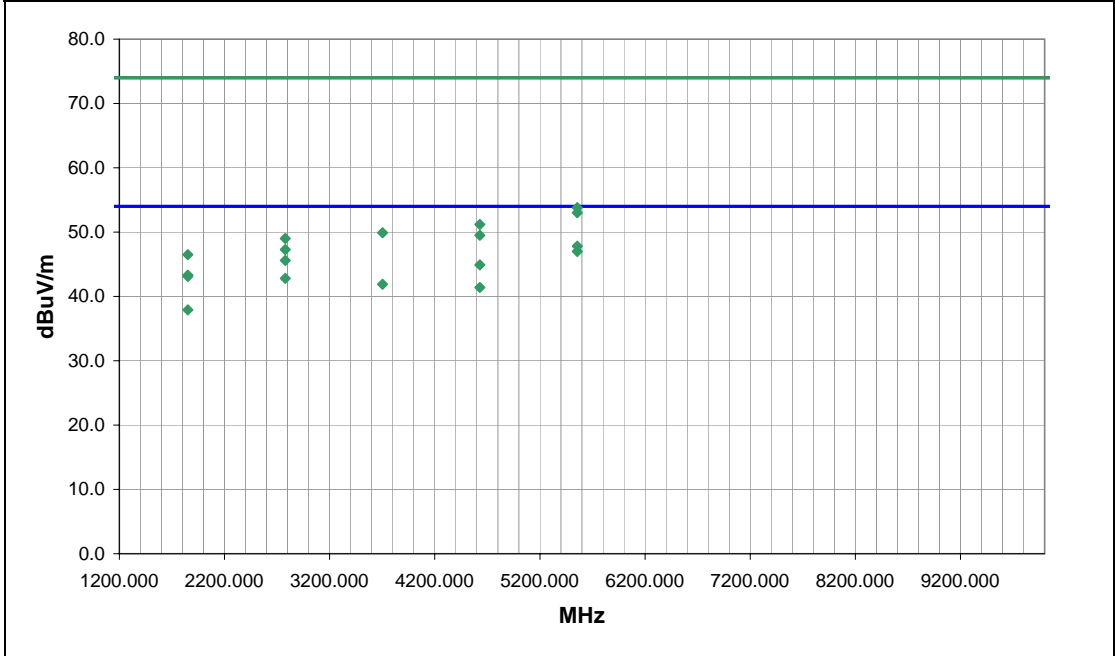
Typical modulation, high channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	11	 Signature
Configuration #	1	
Results	Pass	

NVLAP Lab Code 200630-0



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
5554.836	36.9	10.9	161.0	1.4	3.0	0.0	H-Horn	AV	0.0	47.8	54.0	-6.2	EUT on side
5554.837	36.1	10.9	101.0	1.2	3.0	0.0	V-Horn	AV	0.0	47.0	54.0	-7.0	EUT horizontal
2777.446	42.5	3.1	314.0	1.2	3.0	0.0	H-Horn	AV	0.0	45.6	54.0	-8.4	EUT on side
4629.016	36.3	8.6	306.0	1.3	3.0	0.0	H-Horn	AV	0.0	44.9	54.0	-9.1	EUT on side
1851.619	44.0	-0.7	273.0	1.4	3.0	0.0	H-Horn	AV	0.0	43.3	54.0	-10.7	EUT on side
2777.421	39.7	3.1	10.0	1.2	3.0	0.0	V-Horn	AV	0.0	42.8	54.0	-11.2	EUT horizontal
3703.219	34.7	7.2	244.0	1.2	3.0	0.0	H-Horn	AV	0.0	41.9	54.0	-12.1	EUT on side
4629.020	32.8	8.6	26.0	1.3	3.0	0.0	V-Horn	AV	0.0	41.4	54.0	-12.6	EUT horizontal
1851.644	38.6	-0.7	320.0	1.0	3.0	0.0	V-Horn	AV	0.0	37.9	54.0	-16.1	EUT horizontal
5554.550	42.9	10.9	161.0	1.4	3.0	0.0	H-Horn	PK	0.0	53.8	74.0	-20.2	EUT on side
5554.687	42.1	10.9	101.0	1.2	3.0	0.0	V-Horn	PK	0.0	53.0	74.0	-21.0	EUT horizontal
4629.087	42.6	8.6	306.0	1.3	3.0	0.0	H-Horn	PK	0.0	51.2	74.0	-22.8	EUT on side
3703.294	42.7	7.2	244.0	1.2	3.0	0.0	H-Horn	PK	0.0	49.9	74.0	-24.1	EUT on side
4628.854	40.9	8.6	26.0	1.3	3.0	0.0	V-Horn	PK	0.0	49.5	74.0	-24.5	EUT horizontal
2777.250	45.9	3.1	314.0	1.2	3.0	0.0	H-Horn	PK	0.0	49.0	74.0	-25.0	EUT on side
2777.421	44.2	3.1	10.0	1.2	3.0	0.0	V-Horn	PK	0.0	47.3	74.0	-26.7	EUT horizontal
1851.694	47.2	-0.7	273.0	1.4	3.0	0.0	H-Horn	PK	0.0	46.5	74.0	-27.5	EUT on side
1851.569	43.8	-0.7	320.0	1.0	3.0	0.0	V-Horn	PK	0.0	43.1	74.0	-30.9	EUT horizontal

EUT: RadioRanger SEL-8300	Work Order: SCHW0069
Serial Number: NWEMC-5	Date: 02/09/07
Customer: Schweitzer Engineering Laboratories, Inc.	Temperature: 22
Attendees: None	Humidity: 33%
Project: None	Barometric Pres.: 30.04
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.249:2006	ANSI C63.4:2003

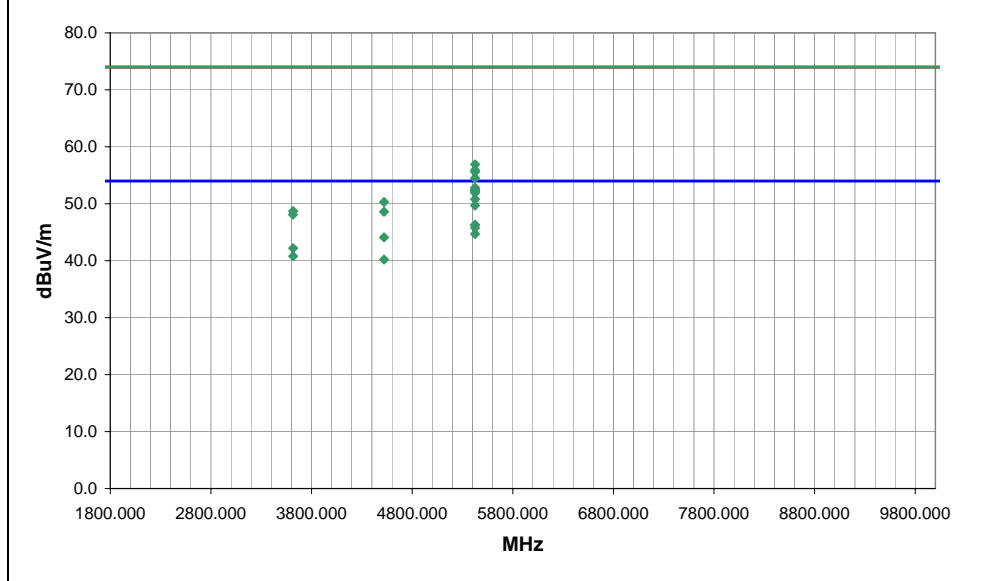
TEST PARAMETERS
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

COMMENTS  
External monopole antenna on cable

EUT OPERATING MODES  
Typical modulation, low channel

DEVIATIONS FROM TEST STANDARD  
No deviations.

Run #	12	NVLAP Lab Code 200630-0	Signature <i>Rod Peloquin</i>
Configuration #	2		
Results	Pass		



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
5425.227	41.3	10.9	154.0	1.4	3.0	0.0	H-Horn	AV	0.0	52.2	54.0	-1.8	EUT on side, Antenna vertical
5425.240	41.0	10.9	152.0	1.4	3.0	0.0	H-Horn	AV	0.0	51.9	54.0	-2.1	EUT on side, Antenna horizontal
5425.239	39.9	10.9	162.0	1.4	3.0	0.0	V-Horn	AV	0.0	50.8	54.0	-3.2	EUT horizontal, Antenna horizontal
5425.240	38.8	10.9	174.0	1.3	3.0	0.0	H-Horn	AV	0.0	49.7	54.0	-4.3	EUT and Antenna vertical
5425.222	35.4	10.9	207.0	1.3	3.0	0.0	V-Horn	AV	0.0	46.3	54.0	-7.7	EUT on side, Antenna vertical
5425.239	35.4	10.9	210.0	1.3	3.0	0.0	V-Horn	AV	0.0	46.3	54.0	-7.7	EUT on side, Antenna horizontal
5425.252	34.9	10.9	337.0	1.4	3.0	0.0	H-Horn	AV	0.0	45.8	54.0	-8.2	EUT horizontal, Antenna horizontal
5425.264	33.8	10.9	303.0	1.1	3.0	0.0	V-Horn	AV	0.0	44.7	54.0	-9.3	EUT and Antenna vertical
4521.012	36.1	8.0	293.0	1.0	3.0	0.0	H-Horn	AV	0.0	44.1	54.0	-9.9	EUT on side, Antenna vertical
3616.829	35.2	7.0	197.0	1.1	3.0	0.0	H-Horn	AV	0.0	42.2	54.0	-11.8	EUT on side, Antenna vertical
3616.862	33.9	6.9	231.0	1.1	3.0	0.0	V-Horn	AV	0.0	40.8	54.0	-13.2	EUT horizontal, Antenna horizontal
4521.029	32.2	8.0	300.0	1.1	3.0	0.0	V-Horn	AV	0.0	40.2	54.0	-13.8	EUT horizontal, Antenna horizontal
5425.452	46.0	10.9	152.0	1.4	3.0	0.0	H-Horn	PK	0.0	56.9	74.0	-17.1	EUT on side, Antenna horizontal
5425.310	45.0	10.9	154.0	1.4	3.0	0.0	H-Horn	PK	0.0	55.9	74.0	-18.1	EUT on side, Antenna vertical
5425.272	44.7	10.9	162.0	1.4	3.0	0.0	V-Horn	PK	0.0	55.6	74.0	-18.4	EUT horizontal, Antenna horizontal
5424.977	43.6	10.9	174.0	1.3	3.0	0.0	H-Horn	PK	0.0	54.5	74.0	-19.5	EUT and Antenna vertical
5425.030	41.9	10.9	207.0	1.3	3.0	0.0	V-Horn	PK	0.0	52.8	74.0	-21.2	EUT on side, Antenna vertical
5425.669	41.6	10.9	337.0	1.4	3.0	0.0	H-Horn	PK	0.0	52.5	74.0	-21.5	EUT horizontal, Antenna horizontal
5425.147	41.5	10.9	303.0	1.1	3.0	0.0	V-Horn	PK	0.0	52.4	74.0	-21.6	EUT and Antenna vertical
5425.614	41.5	10.9	210.0	1.3	3.0	0.0	V-Horn	PK	0.0	52.4	74.0	-21.6	EUT on side, Antenna horizontal

EUT: RadioRanger SEL-8300	Work Order: SCHW0069
Serial Number: NWEMC-5	Date: 02/09/07
Customer: Schweitzer Engineering Laboratories, Inc.	Temperature: 22
Attendees: None	Humidity: 33%
Project: None	Barometric Pres.: 30.04
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01

TEST SPECIFICATIONS	Test Method
FCC 15.249:2006	ANSI C63.4:2003

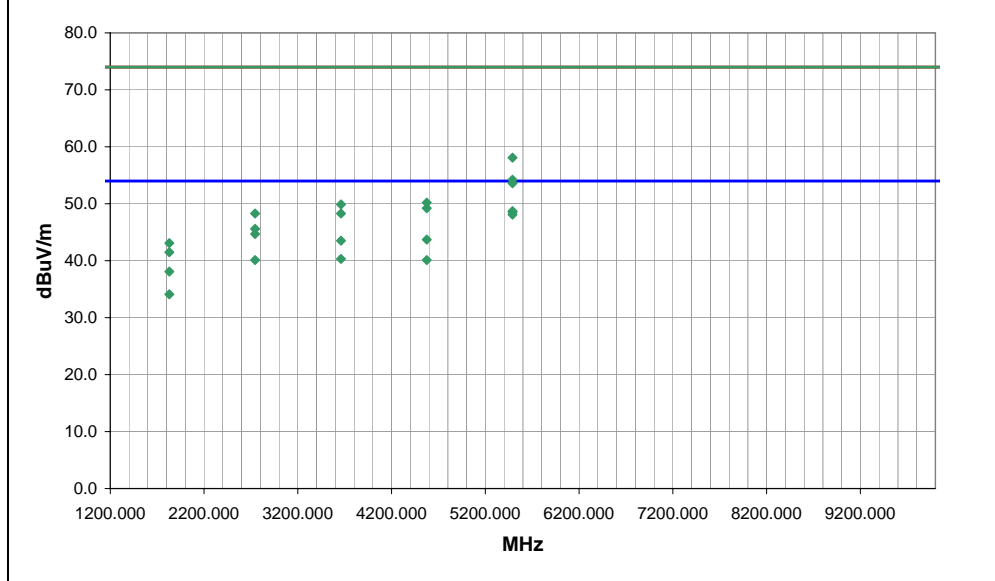
TEST PARAMETERS
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

COMMENTS  
External monopole antenna on cable

EUT OPERATING MODES  
Typical modulation, mid channel

DEVIATIONS FROM TEST STANDARD  
No deviations.

Run #	13	NVLAP Lab Code 200630-0 <i>Signature</i>
Configuration #	2	
Results	Pass	



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
5490.011	37.7	11.0	143.0	1.3	3.0	0.0	H-Horn	AV	0.0	48.7	54.0	-5.3	EUT on side, Antenna vertical
5490.032	37.5	11.0	224.0	1.2	3.0	0.0	V-Horn	AV	0.0	48.5	54.0	-5.5	EUT horizontal, Antenna horizontal
5490.048	37.1	11.0	223.0	1.2	3.0	0.0	V-Horn	AV	0.0	48.1	54.0	-5.9	EUT horizontal, Antenna vertical
2745.047	41.8	2.9	317.0	1.2	3.0	0.0	H-Horn	AV	0.0	44.7	54.0	-9.3	EUT on side, Antenna vertical
4575.057	35.5	8.2	289.0	1.3	3.0	0.0	H-Horn	AV	0.0	43.7	54.0	-10.3	EUT on side, Antenna vertical
3660.023	36.4	7.1	196.0	1.3	3.0	0.0	H-Horn	AV	0.0	43.5	54.0	-10.5	EUT on side, Antenna vertical
3660.030	33.2	7.1	205.0	1.1	3.0	0.0	V-Horn	AV	0.0	40.3	54.0	-13.7	EUT horizontal, Antenna horizontal
2745.027	37.2	2.9	358.0	1.4	3.0	0.0	V-Horn	AV	0.0	40.1	54.0	-13.9	EUT horizontal, Antenna horizontal
4575.053	31.9	8.2	333.0	1.3	3.0	0.0	V-Horn	AV	0.0	40.1	54.0	-13.9	EUT horizontal, Antenna horizontal
1830.047	39.1	-1.0	271.0	1.3	3.0	0.0	H-Horn	AV	0.0	38.1	54.0	-15.9	EUT on side, Antenna vertical
5490.215	47.1	11.0	224.0	1.2	3.0	0.0	V-Horn	PK	0.0	58.1	74.0	-15.9	EUT horizontal, Antenna horizontal
5489.908	43.2	11.0	143.0	1.3	3.0	0.0	H-Horn	PK	0.0	54.2	74.0	-19.8	EUT on side, Antenna vertical
1830.050	35.1	-1.0	207.0	1.2	3.0	0.0	V-Horn	AV	0.0	34.1	54.0	-19.9	EUT horizontal, Antenna horizontal
5490.005	42.6	11.0	223.0	1.2	3.0	0.0	V-Horn	PK	0.0	53.6	74.0	-20.4	EUT horizontal, Antenna vertical
4575.197	42.0	8.2	289.0	1.3	3.0	0.0	H-Horn	PK	0.0	50.2	74.0	-23.8	EUT on side, Antenna vertical
3660.173	42.8	7.1	196.0	1.3	3.0	0.0	H-Horn	PK	0.0	49.9	74.0	-24.1	EUT on side, Antenna vertical
4574.833	41.0	8.2	333.0	1.3	3.0	0.0	V-Horn	PK	0.0	49.2	74.0	-24.8	EUT horizontal, Antenna horizontal
3659.987	41.2	7.1	205.0	1.1	3.0	0.0	V-Horn	PK	0.0	48.3	74.0	-25.7	EUT horizontal, Antenna horizontal
2745.043	45.4	2.9	317.0	1.2	3.0	0.0	H-Horn	PK	0.0	48.3	74.0	-25.7	EUT on side, Antenna vertical
2744.977	42.7	2.9	358.0	1.4	3.0	0.0	V-Horn	PK	0.0	45.6	74.0	-28.4	EUT horizontal, Antenna horizontal

EUT: RadioRanger SEL-8300	Work Order: SCHW0069
Serial Number: NWEMC-5	Date: 02/09/07
Customer: Schweitzer Engineering Laboratories, Inc.	Temperature: 22
Attendees: None	Humidity: 33%
Project: None	Barometric Pres.: 30.04
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01

<b>TEST SPECIFICATIONS</b>	Test Method
FCC 15.249:2006	ANSI C63.4:2003

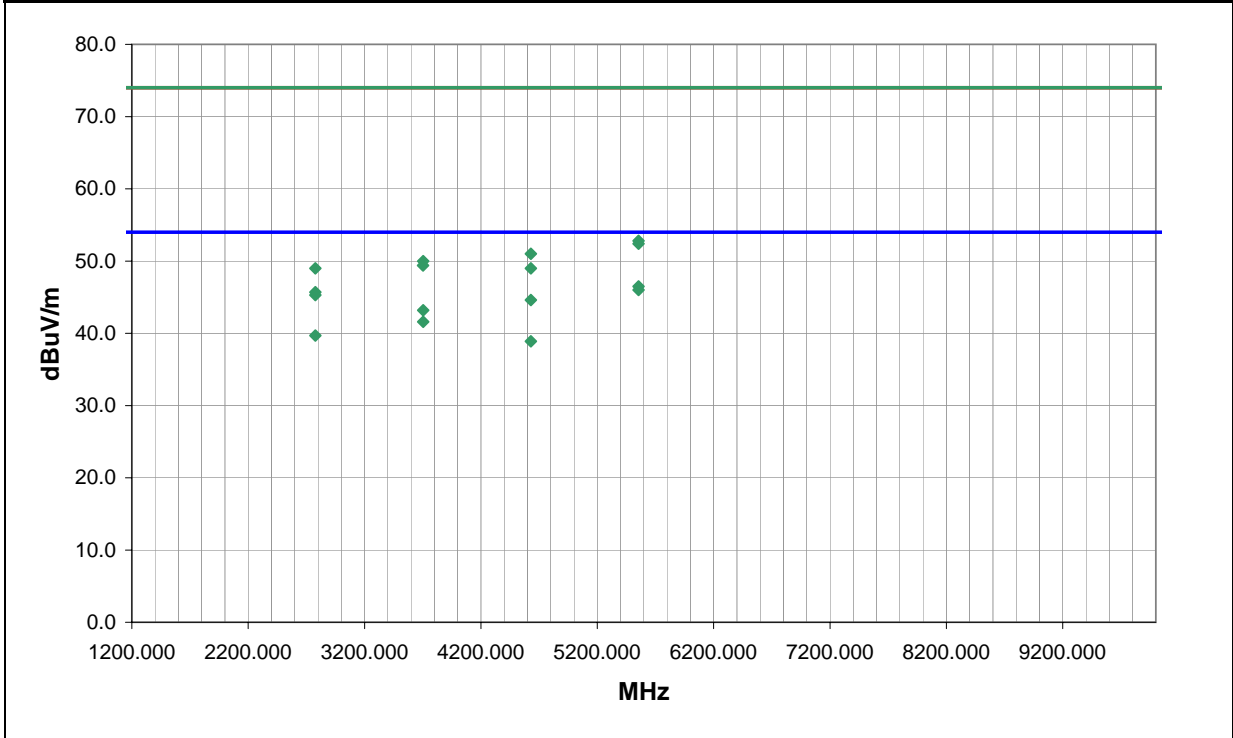
<b>TEST PARAMETERS</b>
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

**COMMENTS**  
External monopole antenna on cable

**EUT OPERATING MODES**  
Typical modulation, high channel  
**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	14	<i>Rod Peloquin</i> Signature
Configuration #	2	
Results	Pass	

NVLAP Lab Code 200630-0



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
5554.848	35.6	10.9	187.0	1.0	3.0	0.0	V-Horn	AV	0.0	46.5	54.0	-7.5
5554.824	35.1	10.9	129.0	1.3	3.0	0.0	H-Horn	AV	0.0	46.0	54.0	-8.0
2777.441	42.6	3.1	278.0	1.1	3.0	0.0	H-Horn	AV	0.0	45.7	54.0	-8.3
4629.035	36.0	8.6	318.0	1.1	3.0	0.0	H-Horn	AV	0.0	44.6	54.0	-9.4
3703.222	36.0	7.2	180.0	1.3	3.0	0.0	H-Horn	AV	0.0	43.2	54.0	-10.8
3703.252	34.4	7.2	255.0	1.2	3.0	0.0	V-Horn	AV	0.0	41.6	54.0	-12.4
2777.424	36.6	3.1	4.0	1.5	3.0	0.0	V-Horn	AV	0.0	39.7	54.0	-14.3
4629.028	30.3	8.6	122.0	1.3	3.0	0.0	V-Horn	AV	0.0	38.9	54.0	-15.1
5554.654	41.9	10.9	129.0	1.3	3.0	0.0	H-Horn	PK	0.0	52.8	74.0	-21.2
5555.144	41.5	10.9	187.0	1.0	3.0	0.0	V-Horn	PK	0.0	52.4	74.0	-21.6
4629.258	42.4	8.6	318.0	1.1	3.0	0.0	H-Horn	PK	0.0	51.0	74.0	-23.0
3703.332	42.8	7.2	180.0	1.3	3.0	0.0	H-Horn	PK	0.0	50.0	74.0	-24.0
3703.142	42.2	7.2	255.0	1.2	3.0	0.0	V-Horn	PK	0.0	49.4	74.0	-24.6
2777.404	45.9	3.1	278.0	1.1	3.0	0.0	H-Horn	PK	0.0	49.0	74.0	-25.0
4629.101	40.4	8.6	122.0	1.3	3.0	0.0	V-Horn	PK	0.0	49.0	74.0	-25.0
2777.667	42.2	3.1	4.0	1.5	3.0	0.0	V-Horn	PK	0.0	45.3	74.0	-28.7



EUT: RadioRanger SEL-8300		Work Order: SCHW0069
Serial Number: NWEMC-5		Date: 02/09/07
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 22
Attendees: None		Humidity: 33%
Project: None		Barometric Pres.: 30.04
Tested by: Rod Peloquin	Power: Battery	Job Site: EV01

**TEST SPECIFICATIONS**

FCC 15.249:2006	Test Method
	ANSI C63.4:2003

**TEST PARAMETERS**

Antenna Height(s) (m)	1 - 4	Test Distance (m)	3
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**COMMENTS**

External monopole antenna on cable

**EUT OPERATING MODES**

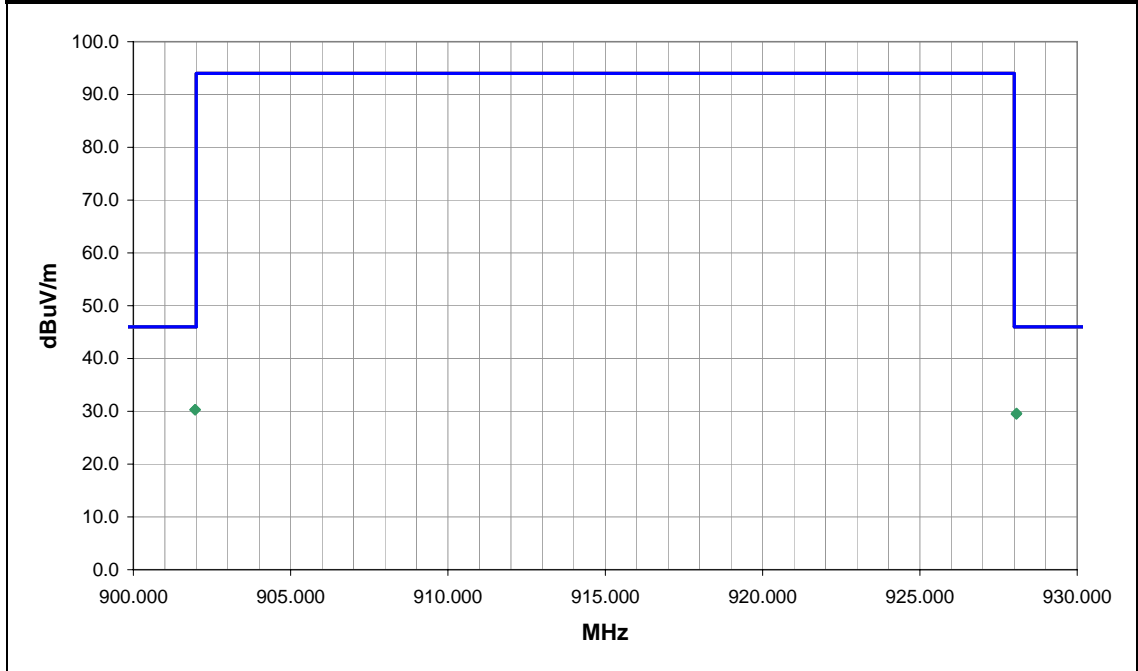
Typical modulation

**DEVIATIONS FROM TEST STANDARD**

No deviations.

Run #	15	 Signature
Configuration #	2	
Results	Pass	

NVLAP Lab Code 200630-0



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
901.962	17.3	13.0	236.0	1.7	3.0	0.0	H-Bilog	QP	0.0	30.3	46.0	-15.7	Low channel
901.965	17.3	13.0	254.0	2.5	3.0	0.0	V-Bilog	QP	0.0	30.3	46.0	-15.7	Low channel
928.071	16.4	13.2	319.0	3.0	3.0	0.0	V-Bilog	QP	0.0	29.6	46.0	-16.4	High channel
928.067	16.3	13.2	31.0	1.2	3.0	0.0	H-Bilog	QP	0.0	29.5	46.0	-16.5	High channel

EUT: RadioRanger SEL-8300	Work Order: SCHW0069
Serial Number: NWEMC-6	Date: 02/12/07
Customer: Schweitzer Engineering Laboratories, Inc.	Temperature: 22
Attendees: None	Humidity: 34%
Project: None	Barometric Pres.: 30.04
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01

<b>TEST SPECIFICATIONS</b>	Test Method
FCC 15.249:2006	ANSI C63.4:2003

<b>TEST PARAMETERS</b>
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

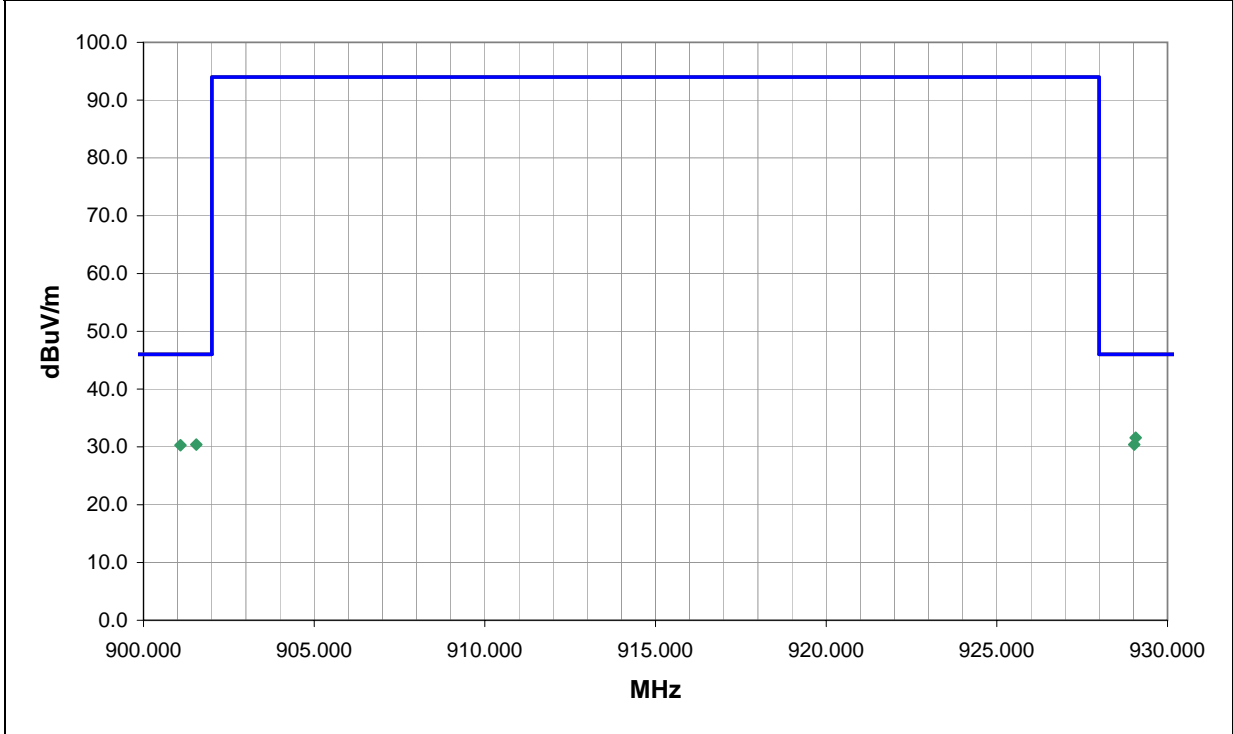
**COMMENTS**  
Integral monopole antenna

**EUT OPERATING MODES**  
Typical modulation

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

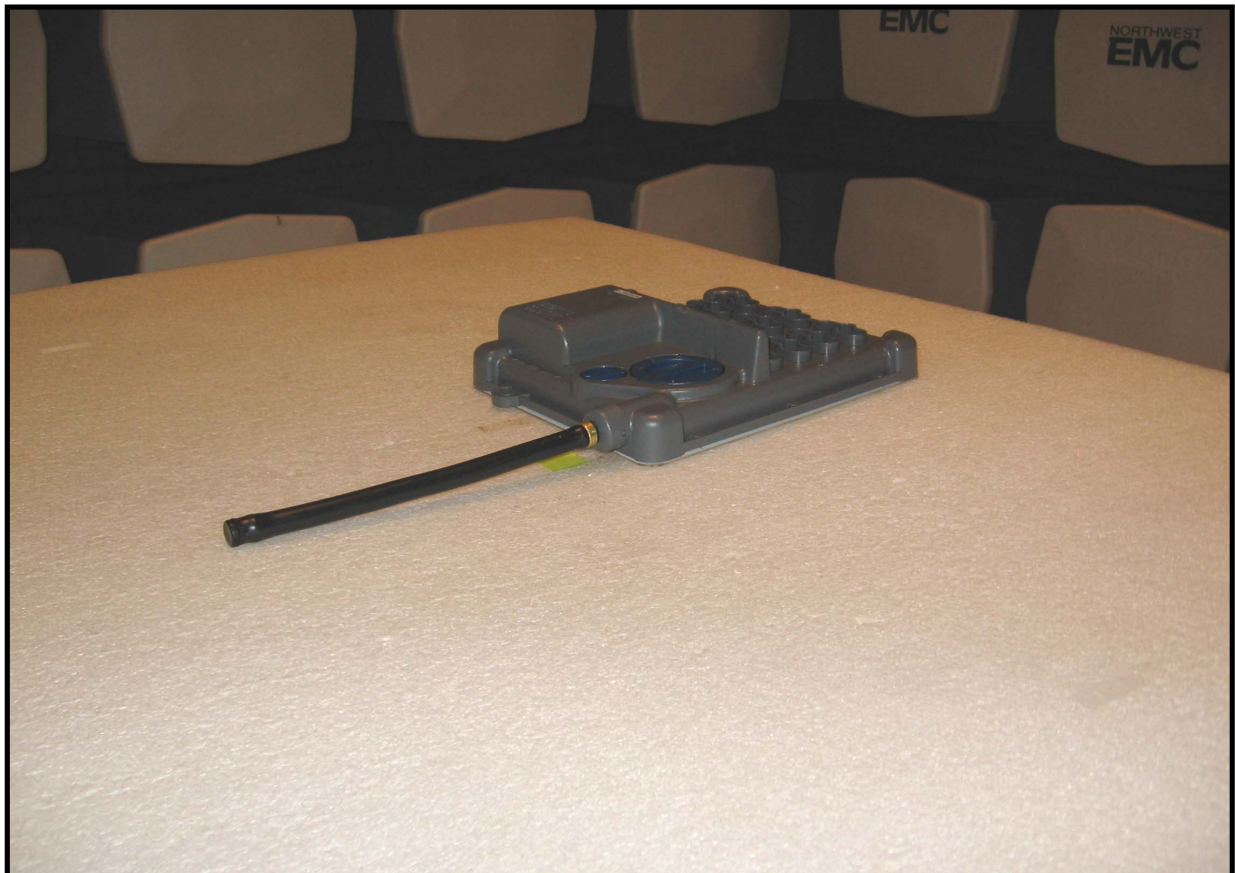
Run #	16	<i>Rod Peloquin</i> Signature
Configuration #	1	
Results	Pass	

NVLAP Lab Code 200630-0

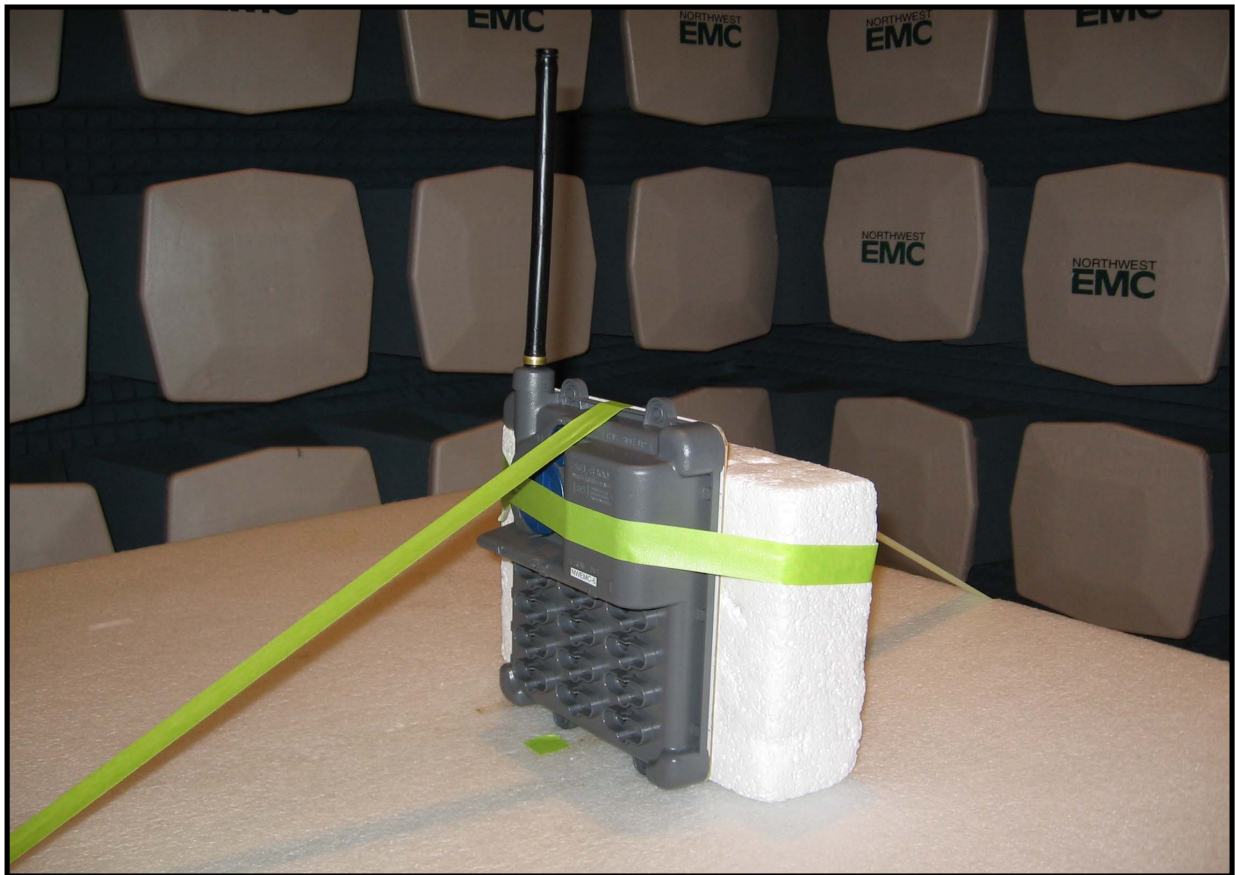
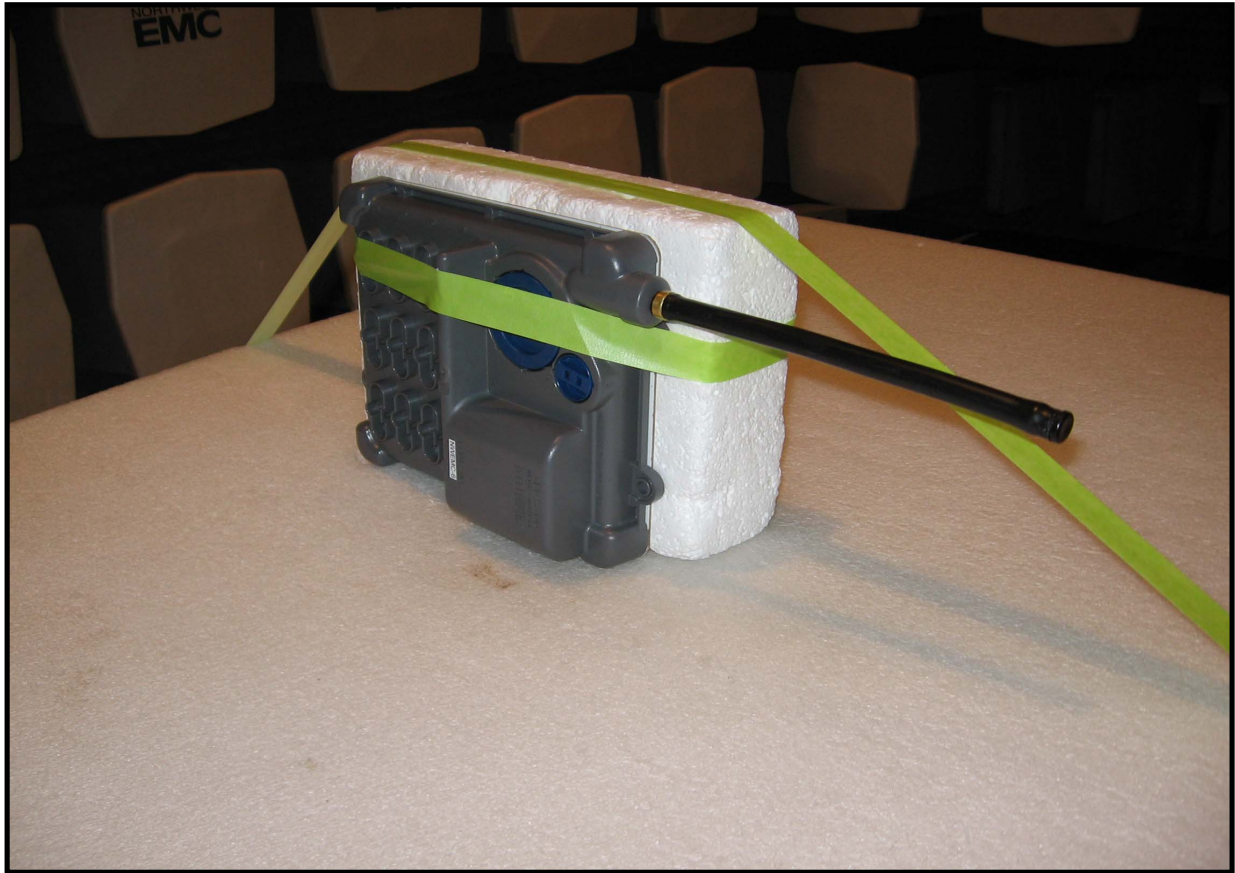


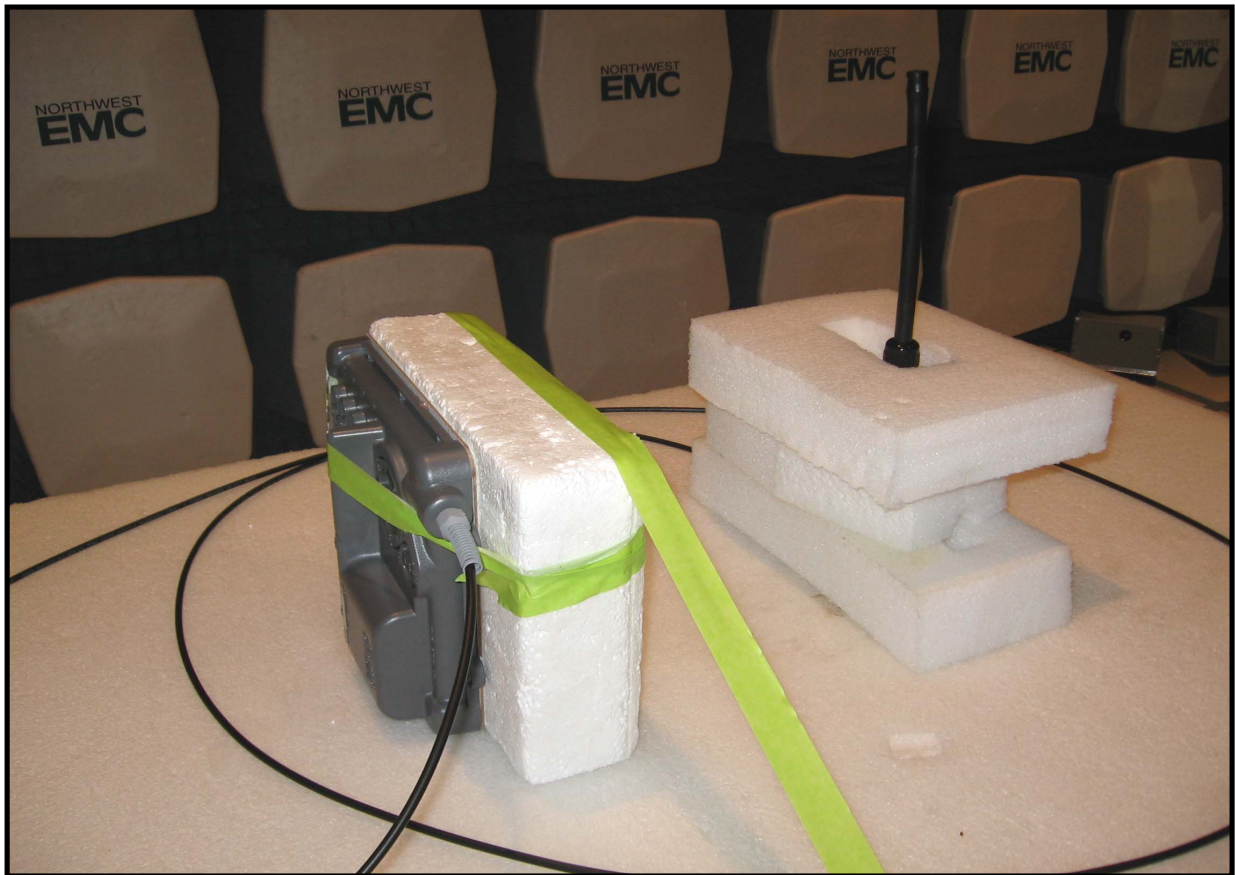
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
929.068	18.5	13.1	76.0	1.5	3.0	0.0	H-Bilog	QP	0.0	31.6	46.0	-14.4
901.548	17.4	13.0	207.0	1.0	3.0	0.0	H-Bilog	QP	0.0	30.4	46.0	-15.6
929.026	17.3	13.1	339.0	1.0	3.0	0.0	V-Bilog	QP	0.0	30.4	46.0	-15.6
901.084	17.3	13.0	226.0	1.0	3.0	0.0	V-Bilog	QP	0.0	30.3	46.0	-15.7

# FIELD STRENGTH OF SPURIOUS EMISSIONS

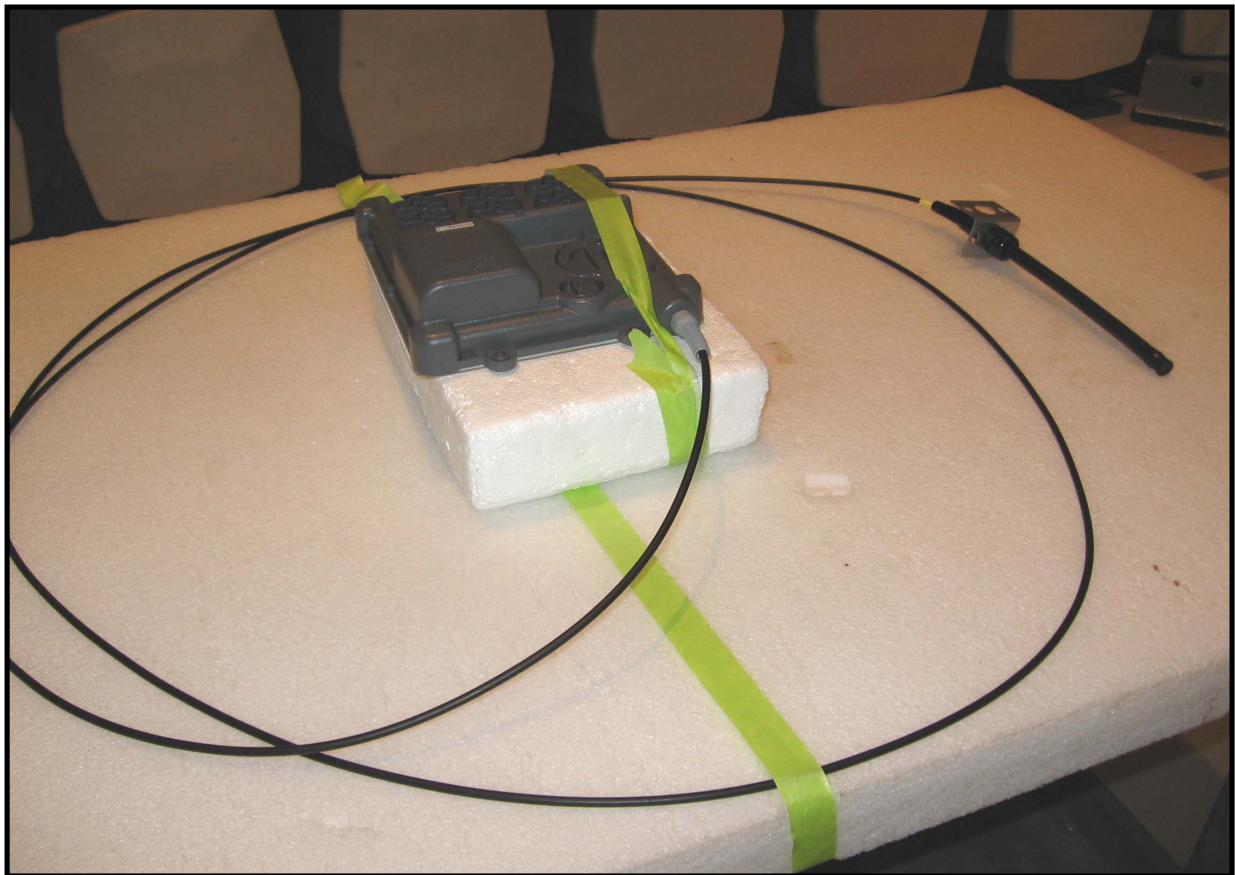
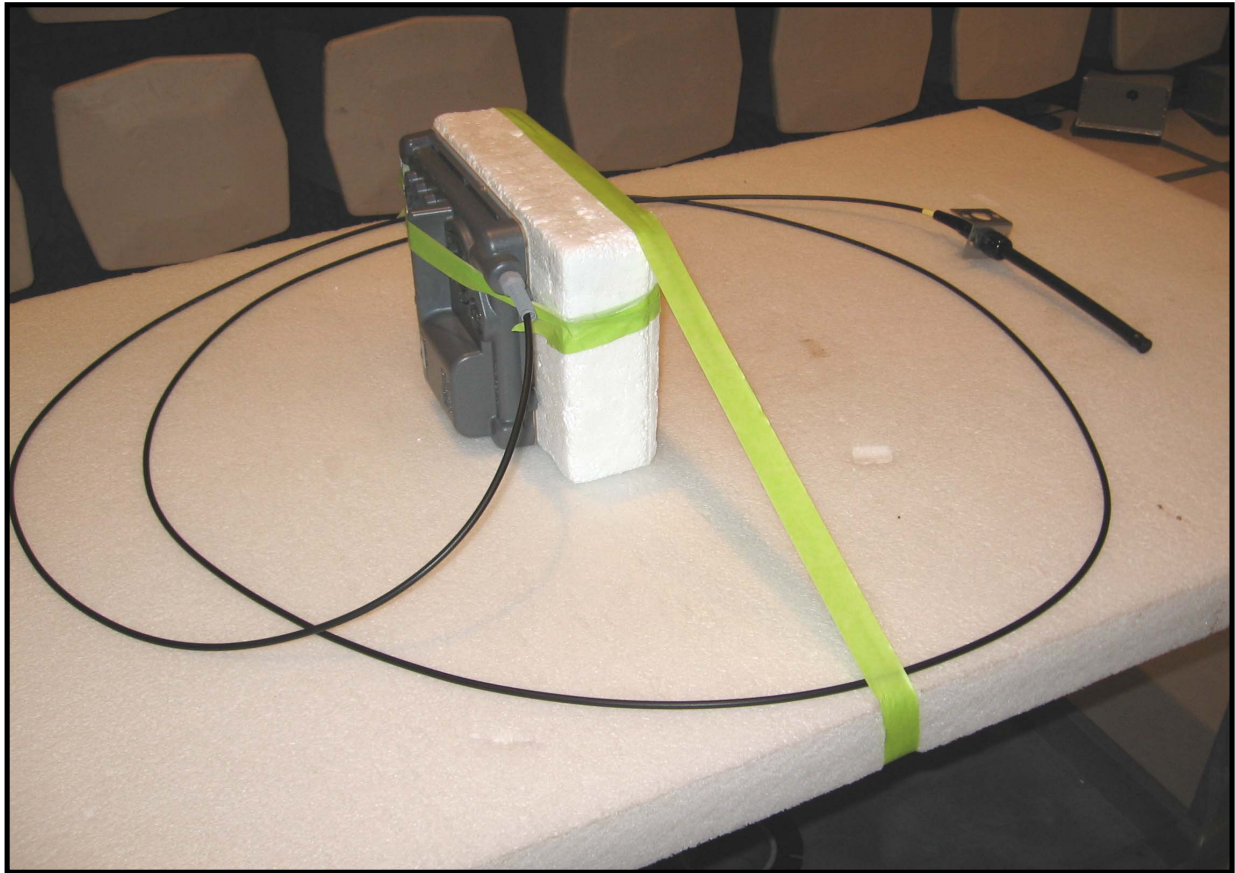




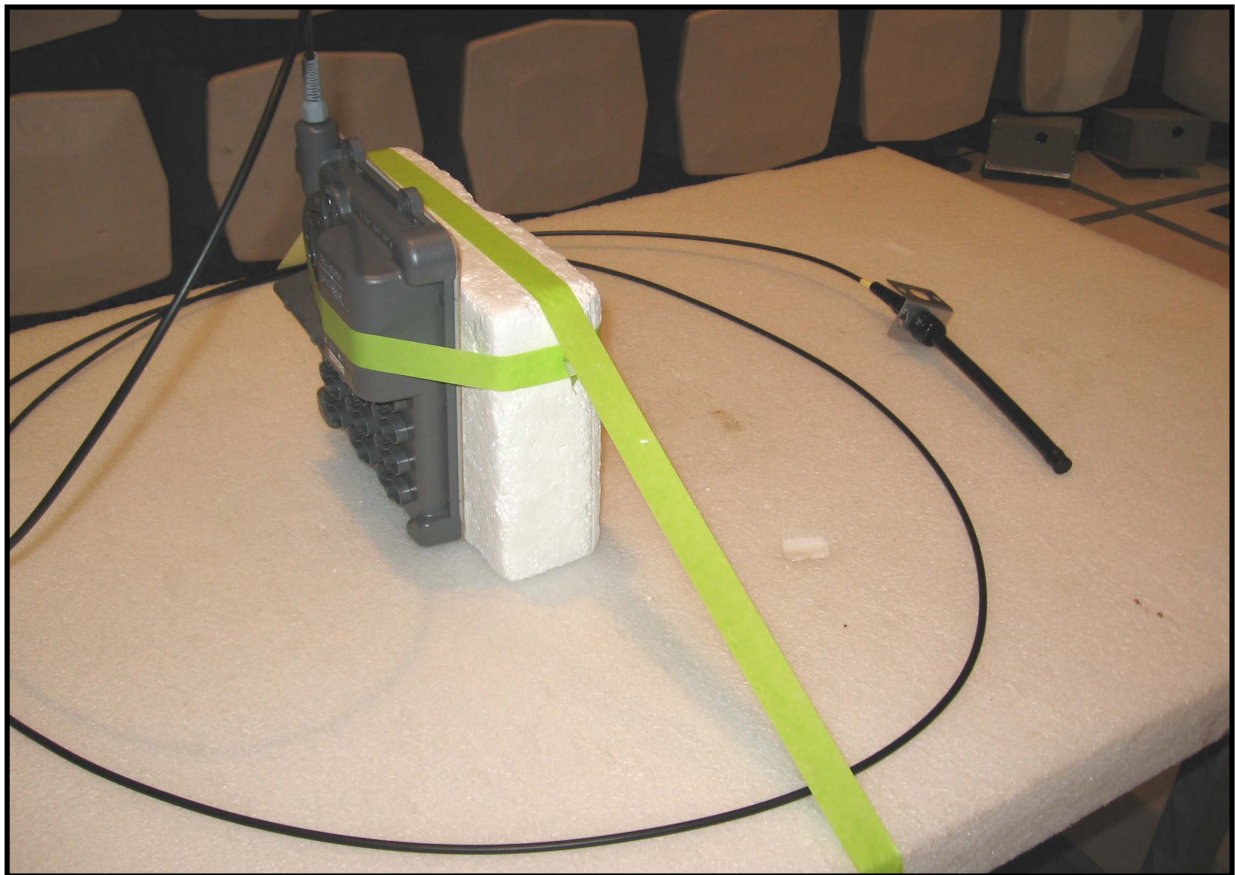
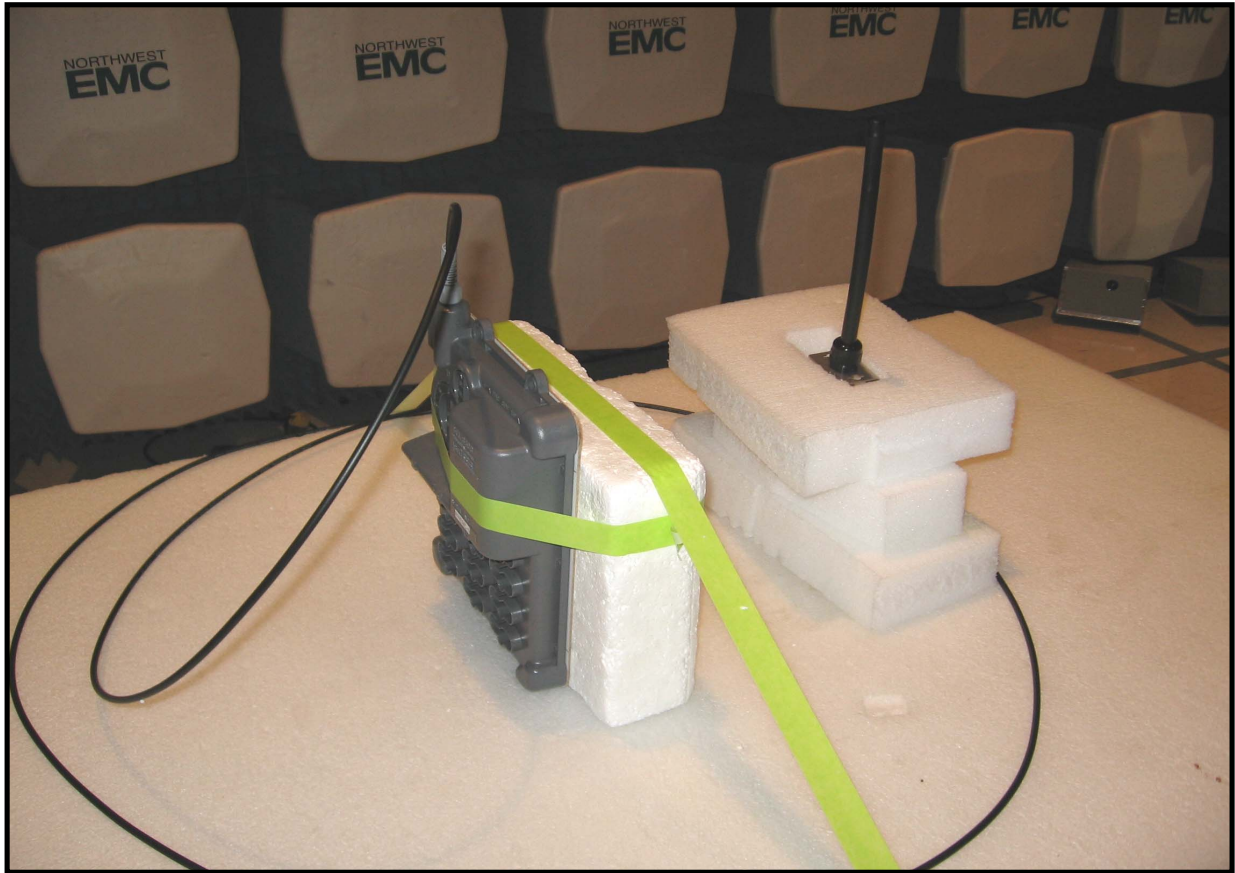




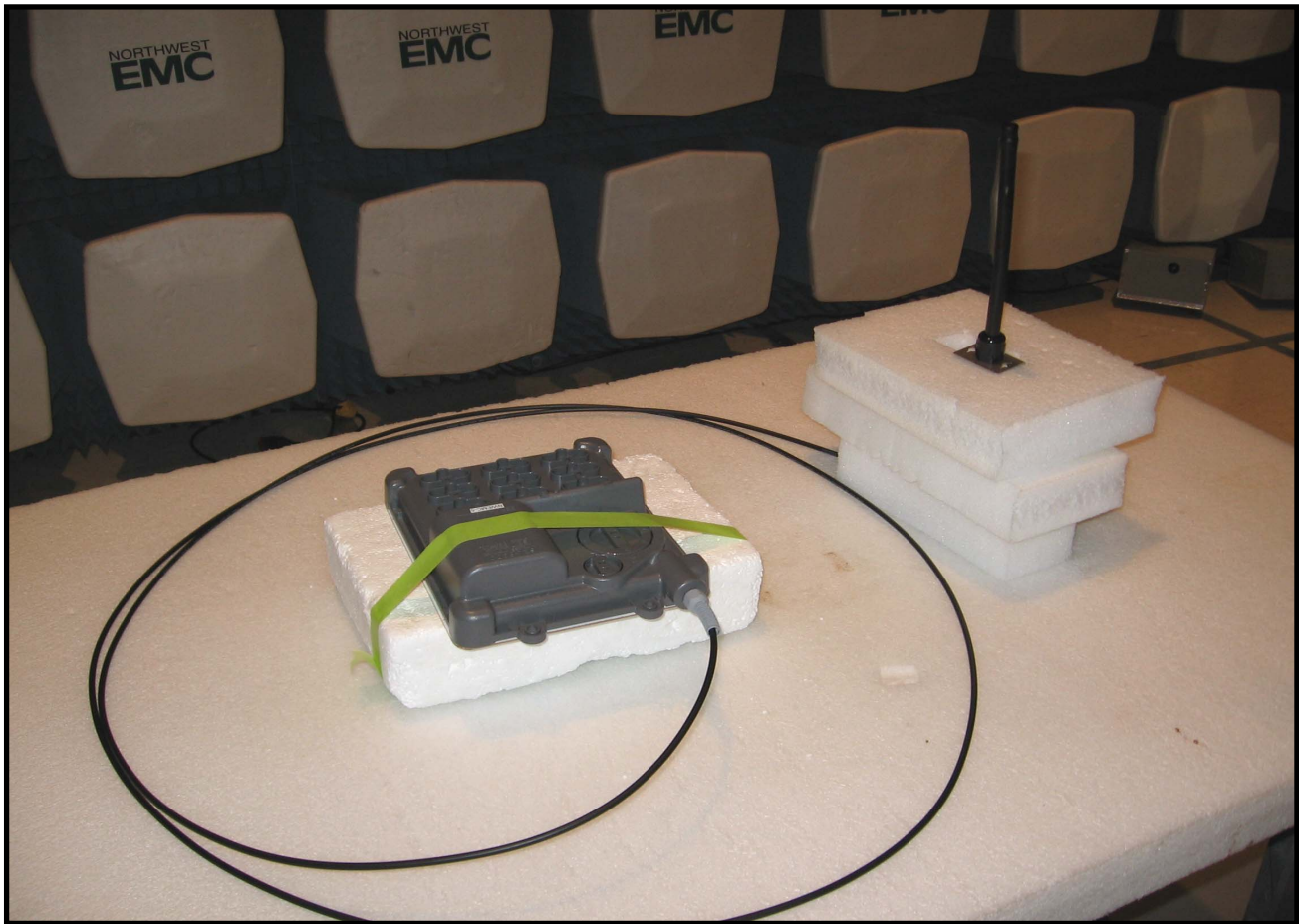








# FIELD STRENGTH OF SPURIOUS EMISSIONS





Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

#### MODES OF OPERATION

SEL-8300 with Integral antenna, Typical modulation, Low Channel
SEL-8300 with Integral antenna, Typical modulation, Mid Channel
SEL-8300 with Integral antenna, Typical modulation, High Channel
SEL-8300 with External antenna, Typical modulation, Low Channel
SEL-8300 with External antenna, Typical modulation, Mid Channel
SEL-8300 with External antenna, Typical modulation, High Channel

#### POWER SETTINGS INVESTIGATED

Battery

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4446A	AAT	12/7/2006	13
Antenna, Biconilog	EMCO	3141	AXE	12/28/2005	24
EV01 cables c,g, h			EVA	12/29/2006	13

#### MEASUREMENT UNCERTAINTY

Measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. In the case of transient tests our test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements. The measurement uncertainty for any test is available upon request.

#### TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and/or receiving while set at the lowest channel, a middle channel, and the highest channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:2003).

EUT: RadioRanger SEL-8300	Work Order: SCHW0069
Serial Number: NWEMC-6	Date: 02/07/07
Customer: Schweitzer Engineering Laboratories, Inc.	Temperature: 22
Attendees: Witold Teller	Humidity: 32%
Project: None	Barometric Pres.: 29.98
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01

TEST SPECIFICATIONS	
FCC 15.249:2006	Test Method ANSI C63.4:2003

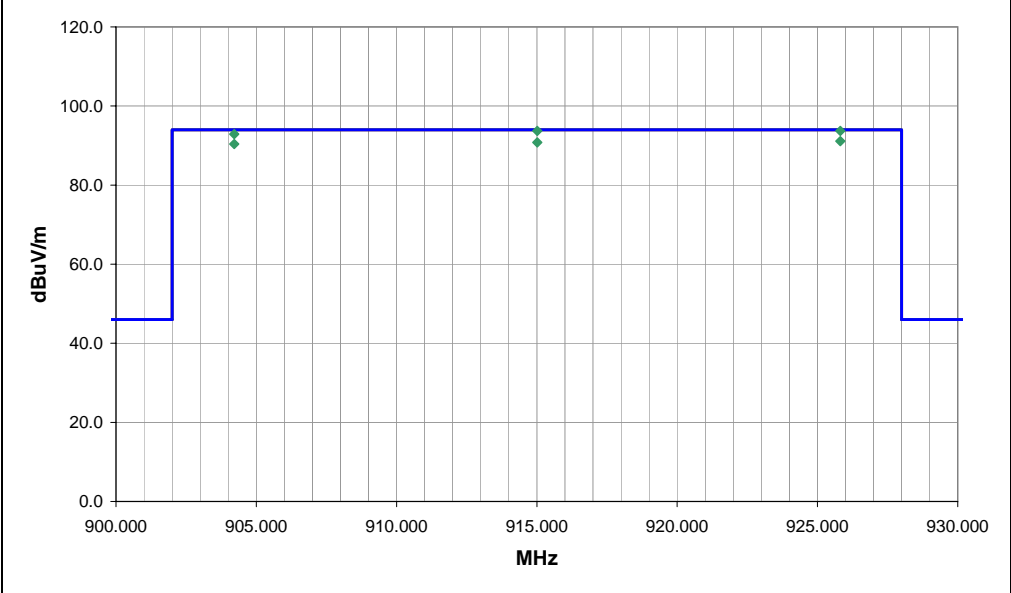
TEST PARAMETERS	
Antenna Height(s) (m)	1 - 4
Test Distance (m)	3

**COMMENTS**  
Integral co-axial monopole

**EUT OPERATING MODES**  
Typical modulation

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	2	NVLAP Lab Code 200630-0 <i>Signature: Rod Peloquin</i>
Configuration #	1	
Results	Pass	



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
915.017	59.5	34.2	84.0	1.0	3.0	0.0	H-Bilog	QP	0.0	93.7	94.0	-0.3	EUT Horizontal, power level 7
925.816	59.4	34.3	76.0	1.0	3.0	0.0	H-Bilog	QP	0.0	93.7	94.0	-0.3	EUT Horizontal, power level 7
904.216	58.8	34.1	81.0	1.0	3.0	0.0	H-Bilog	QP	0.0	92.9	94.0	-1.1	EUT Horizontal, power level 7
925.817	56.8	34.3	61.0	1.4	3.0	0.0	V-Bilog	QP	0.0	91.1	94.0	-2.9	EUT Vertical, power level 7
915.017	56.6	34.2	67.0	1.4	3.0	0.0	V-Bilog	QP	0.0	90.8	94.0	-3.2	EUT Vertical, power level 7
904.216	56.3	34.1	119.0	1.4	3.0	0.0	V-Bilog	QP	0.0	90.4	94.0	-3.6	EUT Vertical, power level 7

**EMC FIELD STRENGTH OF FUNDAMENTAL**

PSA 2007.01.31  
EMI 2006.12.20

EUT: RadioRanger SEL-8300	Work Order: SCHW0069
Serial Number: NWEMC-5	Date: 02/07/07
Customer: Schweitzer Engineering Laboratories, Inc.	Temperature: 22
Attendees: Witold Teller	Humidity: 32%
Project: None	Barometric Pres.: 29.98
Tested by: Rod Peloquin	Power: Battery
	Job Site: EV01


<b>TEST SPECIFICATIONS</b>	Test Method
FCC 15.249:2006	ANSI C63.4:2003

<b>TEST PARAMETERS</b>
Antenna Height(s) (m)   1 - 4   Test Distance (m)   3

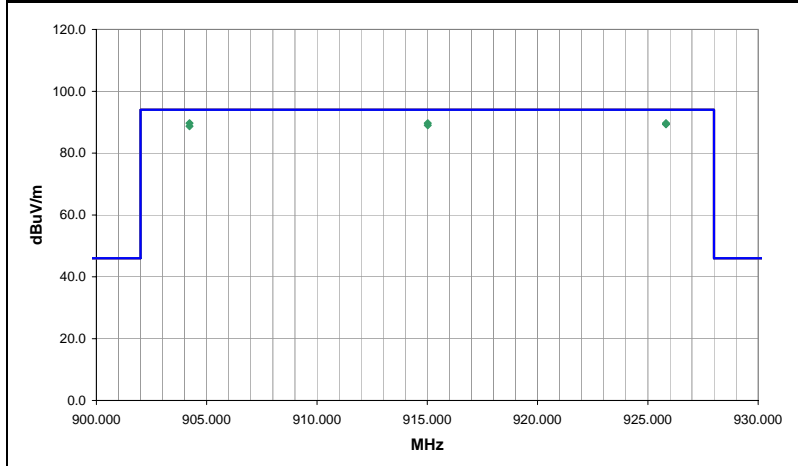
**COMMENTS**  
Co-axial monopole on extended antenna cable

**EUT OPERATING MODES**  
Typical modulation

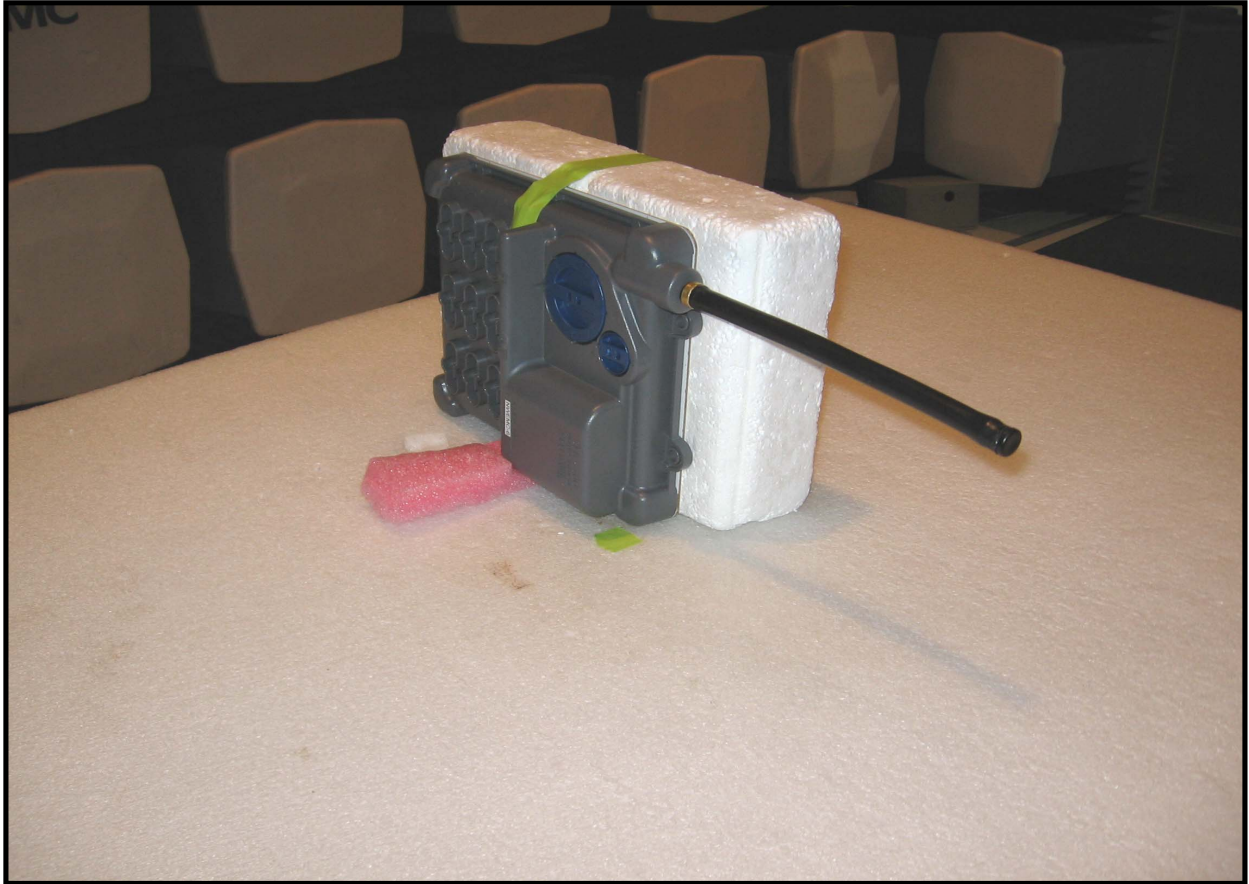
**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	3	
Configuration #	2	
Results	Pass	

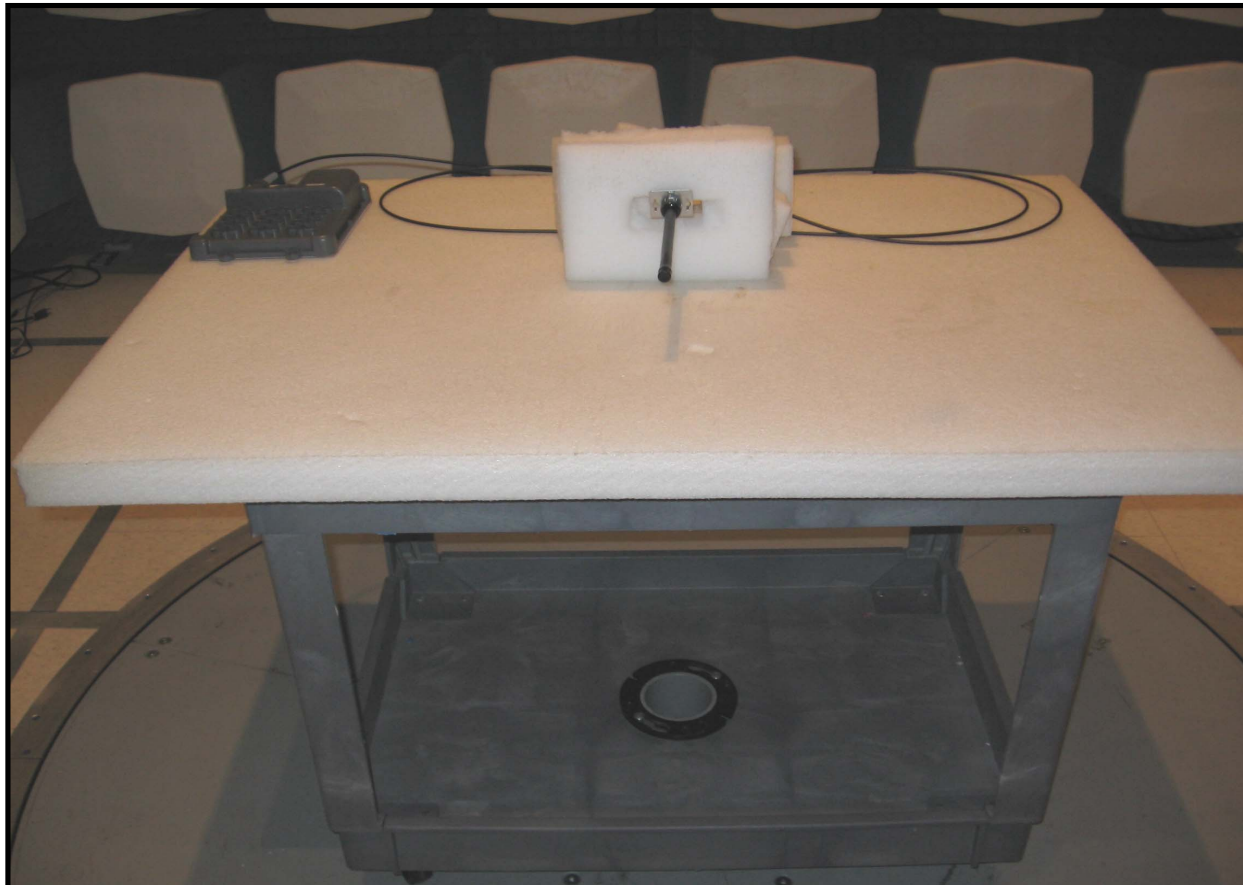
NVLAP Lab Code 200630-0

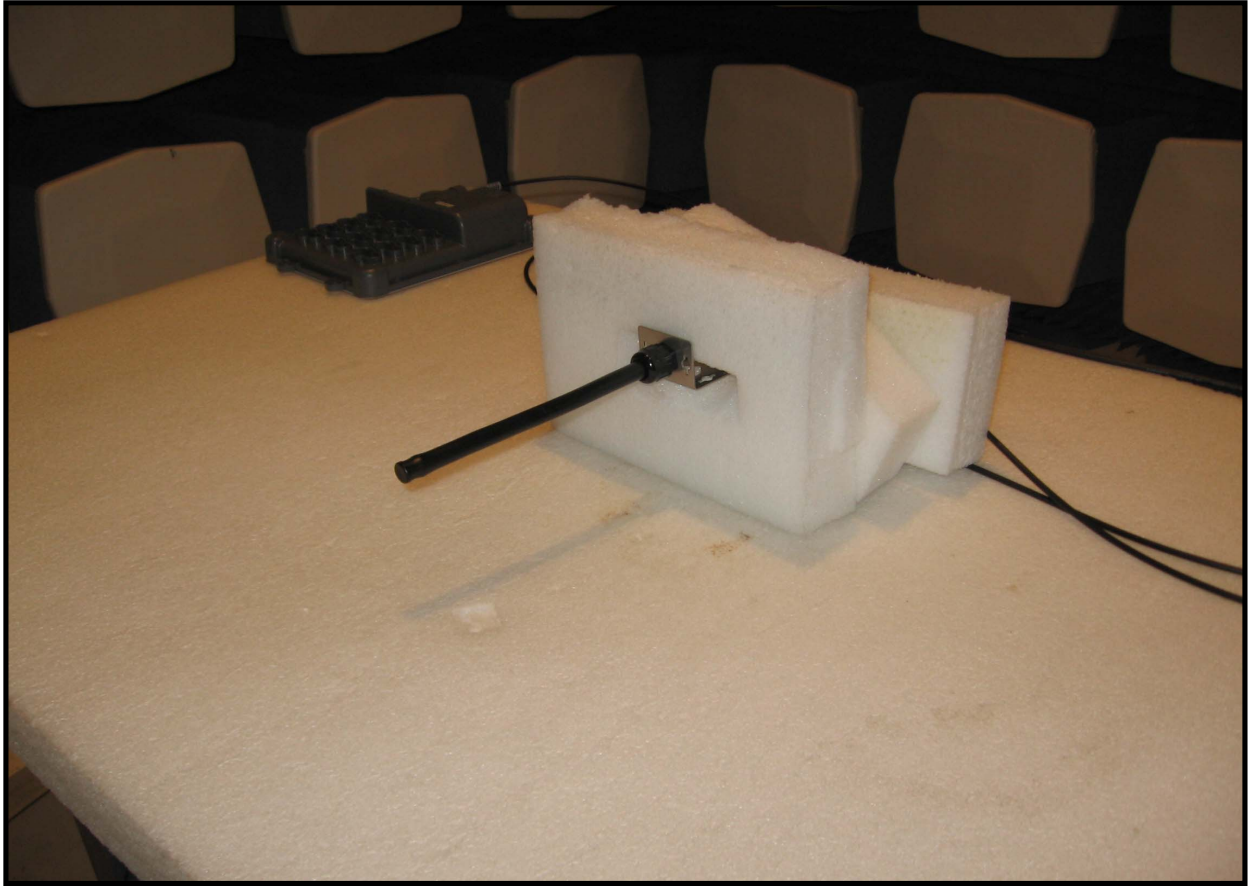


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit (dB)	Compared to Spec. (dB)	Comments
904.220	55.6	34.1	85.0	1.5	3.0	0.0	V-Bilog	QP	0.0	89.7	94.0	-4.3	Antenna Vertical, EUT Horizontal, power level 7
915.020	55.5	34.2	88.0	1.5	3.0	0.0	V-Bilog	QP	0.0	89.7	94.0	-4.3	Antenna Vertical, EUT Horizontal, power level 7
925.820	55.4	34.3	85.0	1.5	3.0	0.0	V-Bilog	QP	0.0	89.7	94.0	-4.3	Antenna Vertical, EUT Horizontal, power level 7
925.820	55.0	34.3	74.0	1.5	3.0	0.0	H-Bilog	QP	0.0	89.3	94.0	-4.7	Antenna and EUT Horizontal, power level 7
915.019	54.8	34.2	283.0	1.0	3.0	0.0	H-Bilog	QP	0.0	89.0	94.0	-5.0	Antenna and EUT Horizontal, power level 7
904.219	54.6	34.1	108.0	1.0	3.0	0.0	H-Bilog	QP	0.0	88.7	94.0	-5.3	Antenna and EUT Horizontal, power level 7

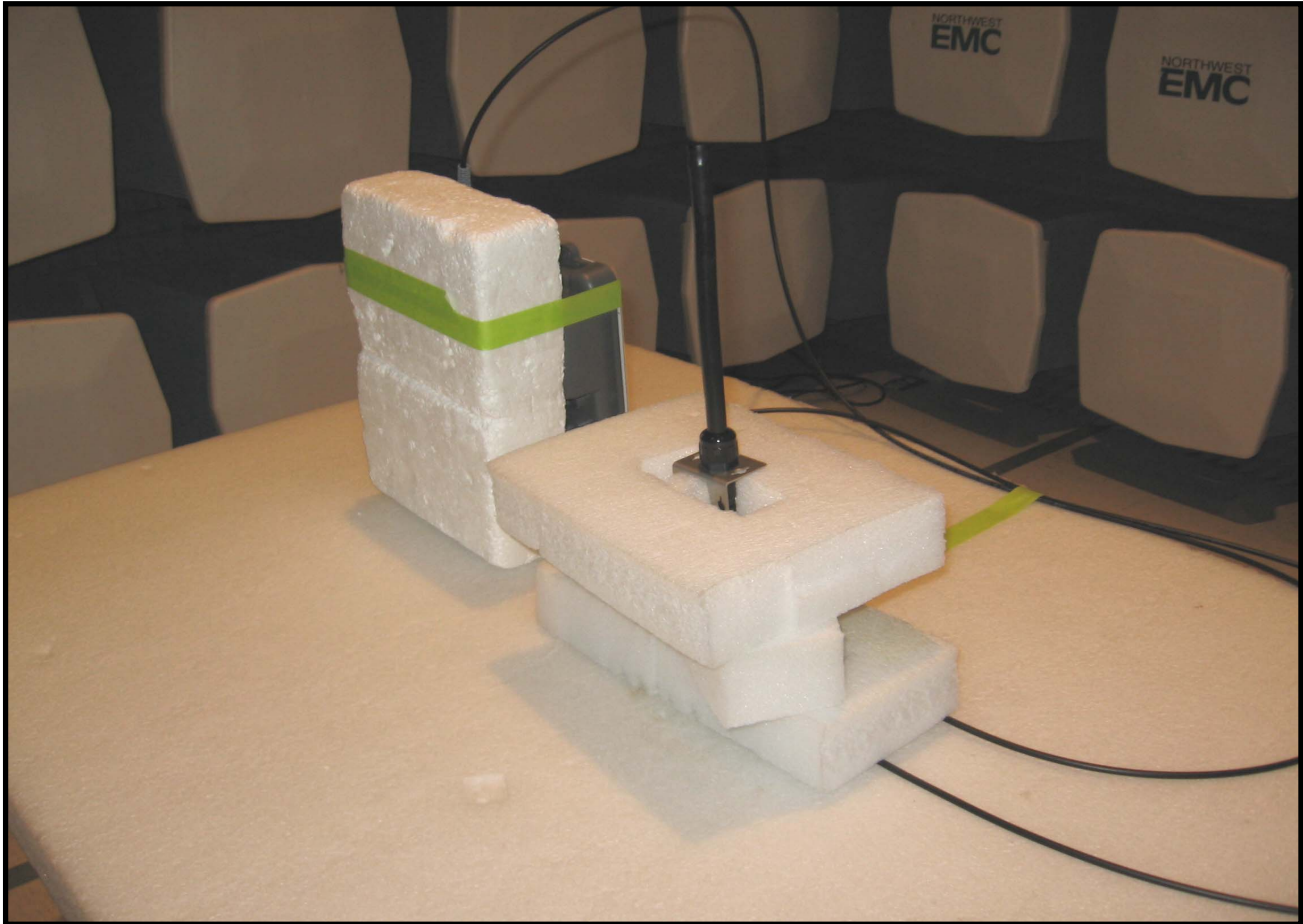












## Attestation by the Responsible Party

Regulatory authorities require the "Responsible Party" to retain the test report. The test report must include the name and signature of an official of the Responsible Party.

To satisfy this requirement, the Responsible Party should complete the following attestation and maintain a copy with the test report:

Test Report #: \_\_\_\_\_ Test Date(s): \_\_\_\_\_

Model(s): \_\_\_\_\_ Responsible Party: \_\_\_\_\_

As an official of the Responsible Party, I attest that the product tested is representative of all production units bearing the same Model number(s)

Name: \_\_\_\_\_ Position: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Additional information regarding product labeling and user manual information can be found at [www.nwemc.com](http://www.nwemc.com).