

# Schweitzer Engineering Laboratories, Inc.

## RadioRanger SEL-8310

February 20, 2007

Report No. SCHW0069.3

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 20, 2007  
Schweitzer Engineering Laboratories, Inc.  
Model: RadioRanger SEL-8310

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.*

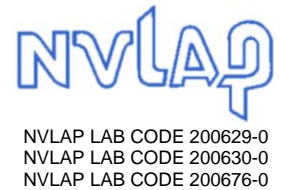
*Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested,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



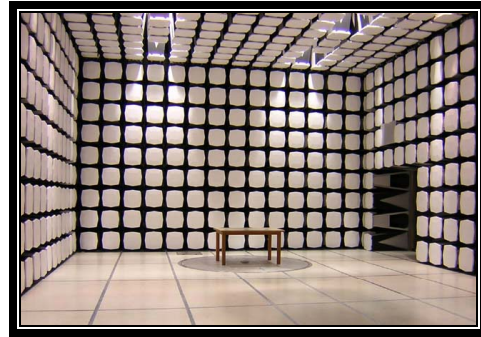
**GOST:** Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results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



## SCOPE

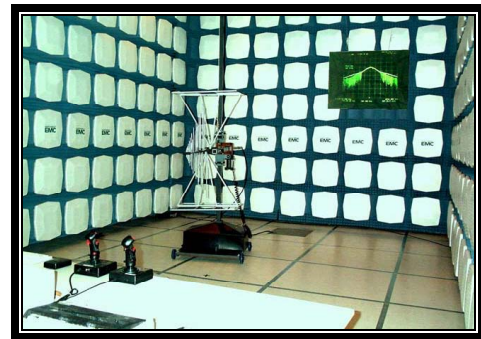
For details on the Scopes of our Accreditations, please visit:

<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-8310
<b>First Date of Test:</b>	February 8, 2007
<b>Last Date of Test:</b>	February 13, 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 8310 is a 915 MHz radio transceiver, which uses either a short coaxial monopole, or a detachable 1/4 wave stub antenna with magnet that can be mounted on a truck roof-top.

**Testing Objective:**

Seeking TCB authorization under 15.249.

**CONFIGURATION 3 SCHW0069**

<b>EUT</b>			
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>
EUT - 8310 integral antenna	Schweitzer Engineering Laboratories, Inc.	RadioRanger SEL-8310	NWEMC-7

**CONFIGURATION 4 SCHW0069**

<b>EUT</b>			
<b>Description</b>	<b>Manufacturer</b>	<b>Model/Part Number</b>	<b>Serial Number</b>
EUT - 8310 integral antenna	Schweitzer Engineering Laboratories, Inc.	RadioRanger SEL-8310	NWEMC-7
1/4 wave stub mobile antenna	Schweitzer Engineering Laboratories, Inc.	Unknown	Unknown



<b>Equipment modifications</b>					
Item	Date	Test	Modification	Note	Disposition of EUT
1	2/8/2007	Field Strength of Fundamental	Modified from delivered configuration. Initial or No Modification	Adjusted power down to a customer power setting of 6. Modification done by Customer.	EUT remained at Northwest EMC following the test.
2	2/13/2007	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

SEL-8310 with Integral antenna, Typical modulation, Low Channel
SEL-8310 with Integral antenna, Typical modulation, Mid Channel
SEL-8310 with Integral antenna, Typical modulation, High Channel
SEL-8310 with External antenna, Typical modulation, Low Channel
SEL-8310 with External antenna, Typical modulation, Mid Channel
SEL-8310 with External antenna, Typical modulation, High Channel

#### POWER SETTINGS INVESTIGATED

Battery

#### 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
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 BANDWIDTHS

	Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (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/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-8310	Work Order: SCHW0069
Serial Number: NWEMC-7	Date: 02/08/07
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

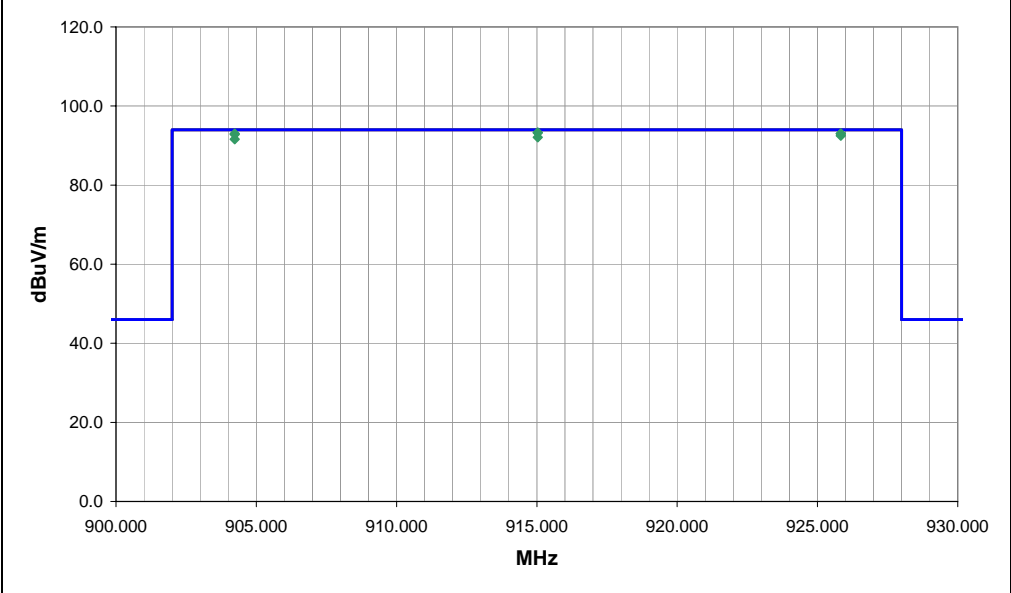
TEST PARAMETERS	
Antenna Height(s) (m)	1 - 4
Test Distance (m)	0

**COMMENTS**  
Integral Co-axial monopole

**EUT OPERATING MODES**  
Typical modulation

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	6	NVLAP Lab Code 200630-0	Signature <i>Rod Peloquin</i>
Configuration #	3		
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
915.030	59.1	34.2	91.0	1.0	0.0	0.0	H-Bilog	QP	0.0	93.3	94.0	-0.7	EUT on side, power level 6
915.031	59.0	34.2	97.0	1.0	0.0	0.0	H-Bilog	QP	0.0	93.2	94.0	-0.8	EUT horizontal, power level 6
904.230	58.9	34.1	219.0	1.0	0.0	0.0	H-Bilog	QP	0.0	93.0	94.0	-1.0	EUT on side, power level 6
925.830	58.7	34.3	93.0	1.0	0.0	0.0	H-Bilog	QP	0.0	93.0	94.0	-1.0	EUT on side, power level 6
925.831	58.7	34.3	103.0	1.0	0.0	0.0	H-Bilog	QP	0.0	93.0	94.0	-1.0	EUT Horizontal, power level 6
904.229	58.7	34.1	233.0	1.0	0.0	0.0	H-Bilog	QP	0.0	92.8	94.0	-1.2	EUT horizontal, power level 6
925.830	58.2	34.3	19.0	1.2	0.0	0.0	V-Bilog	QP	0.0	92.5	94.0	-1.5	EUT vertical, power level 6
915.030	57.9	34.2	234.0	1.1	0.0	0.0	V-Bilog	QP	0.0	92.1	94.0	-1.9	EUT vertical, power level 6
904.229	57.5	34.1	64.0	1.2	0.0	0.0	V-Bilog	QP	0.0	91.6	94.0	-2.4	EUT vertical, power level 6

EUT:	RadioRanger SEL-8310	Work Order:	SCHW0069
Serial Number:	NWEMC-7	Date:	02/08/07
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)   0

**COMMENTS**  
External 1/4 wave stub magnetic car mount antenna

**EUT OPERATING MODES**

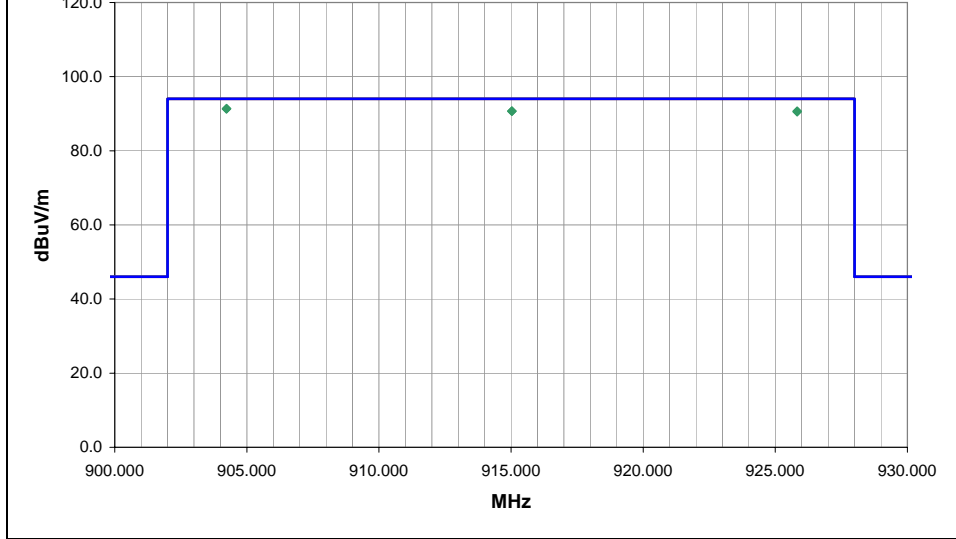
Typical modulation

**DEVIATIONS FROM TEST STANDARD**

No deviations.

Run #	8
Configuration #	4
Results	Pass

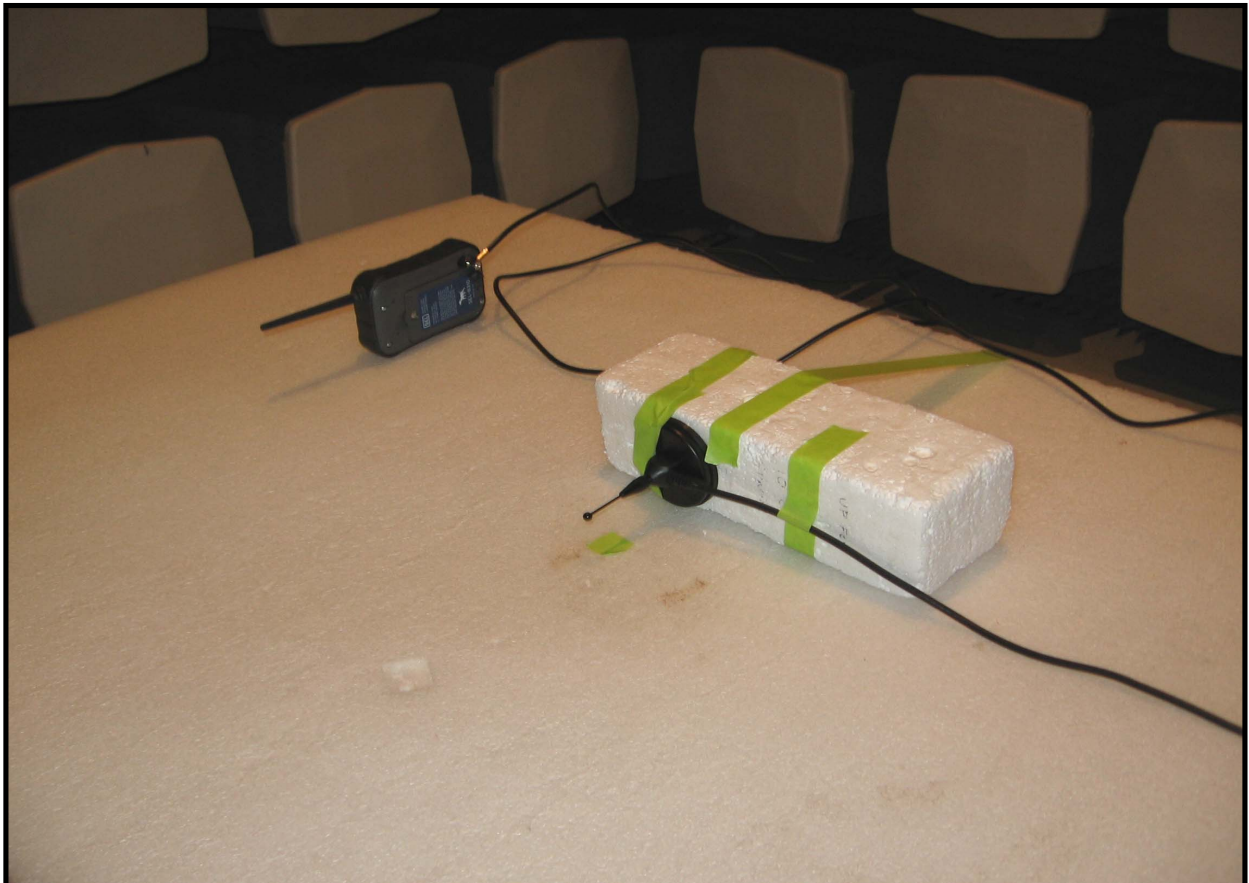
NVLAP Lab Code 200630-0 *Signature*

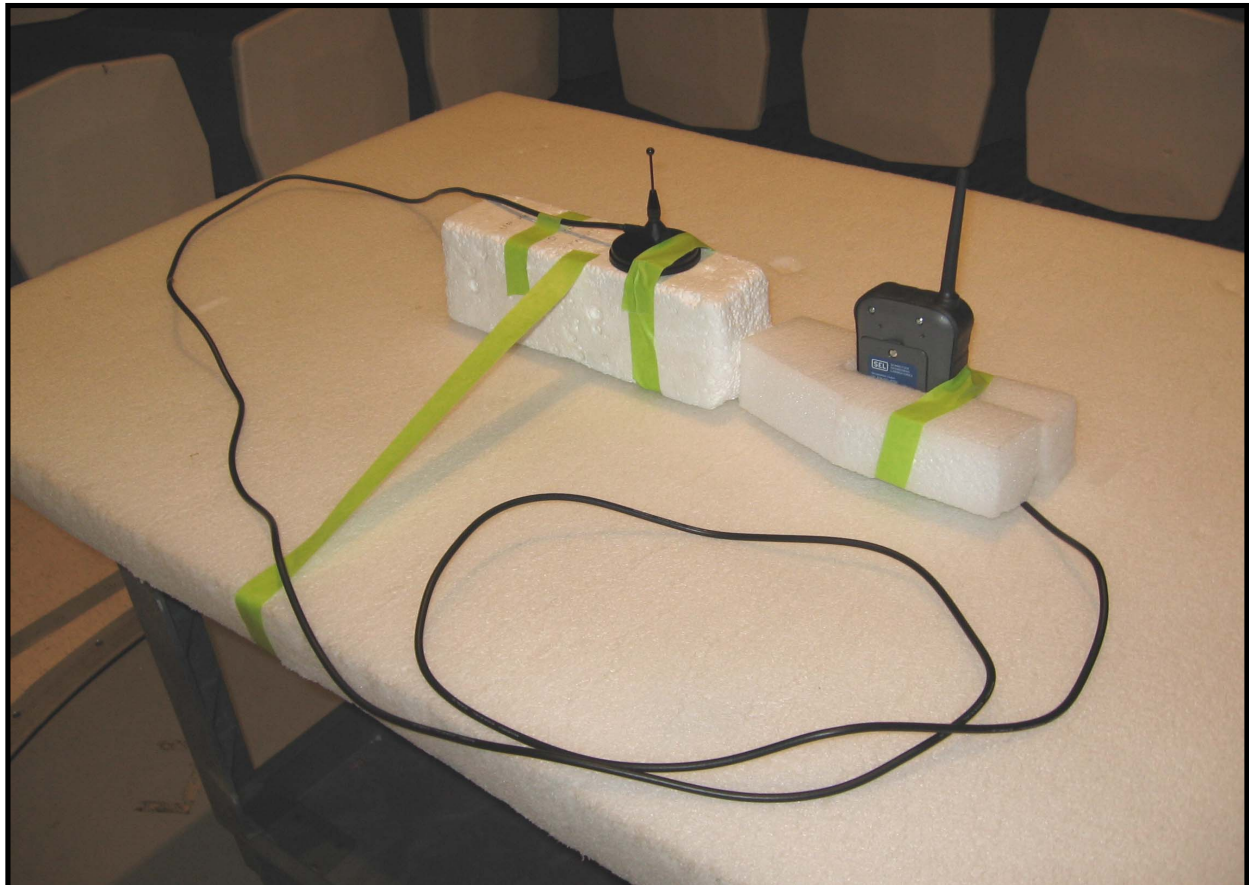
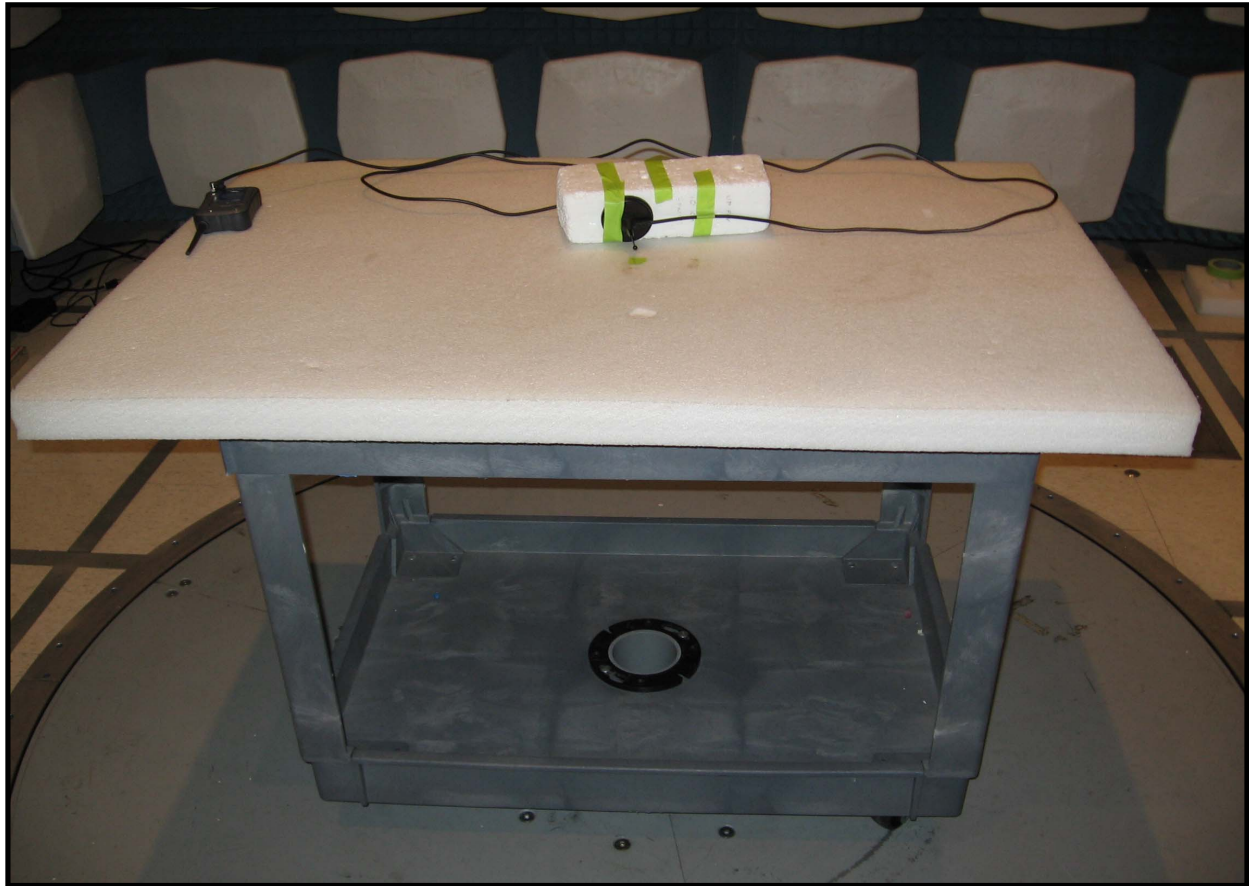


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
904.232	57.3	34.1	257.0	1.0	0.0	0.0	H-Bilog	QP	0.0	91.4	94.0	-2.6	Antenna and EUT Horizontal, power level 6
904.229	57.2	34.1	212.0	1.1	0.0	0.0	V-Bilog	QP	0.0	91.3	94.0	-2.7	Antenna and EUT Vertical, power level 6
915.029	56.5	34.2	251.0	1.0	0.0	0.0	H-Bilog	QP	0.0	90.7	94.0	-3.3	Antenna and EUT Horizontal, power level 6
915.029	56.5	34.2	11.0	1.1	0.0	0.0	V-Bilog	QP	0.0	90.7	94.0	-3.3	Antenna and EUT Vertical, power level 6
925.830	56.4	34.3	195.0	1.1	0.0	0.0	V-Bilog	QP	0.0	90.7	94.0	-3.3	Antenna and EUT Vertical, power level 6
925.829	56.2	34.3	312.0	1.0	0.0	0.0	H-Bilog	QP	0.0	90.5	94.0	-3.5	Antenna and EUT Horizontal, power level 6

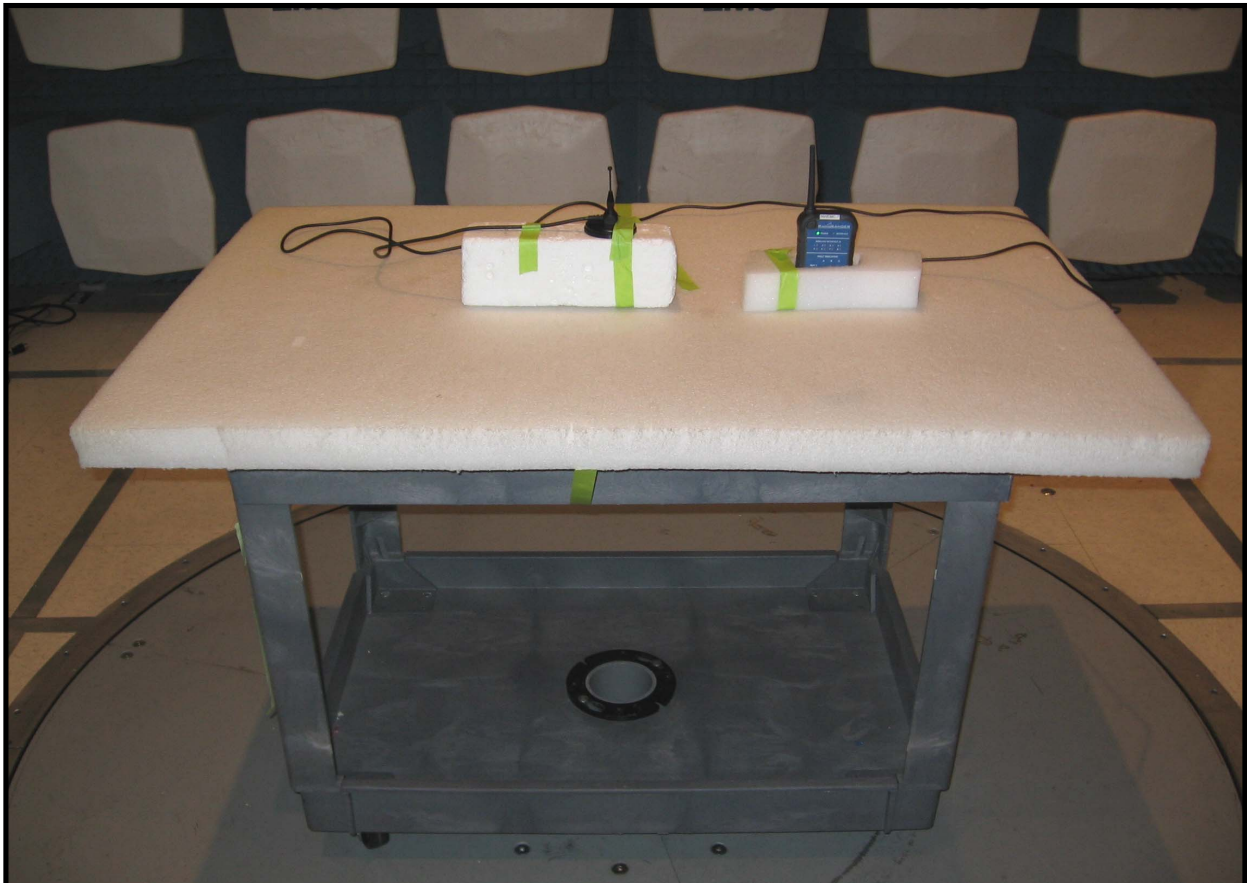
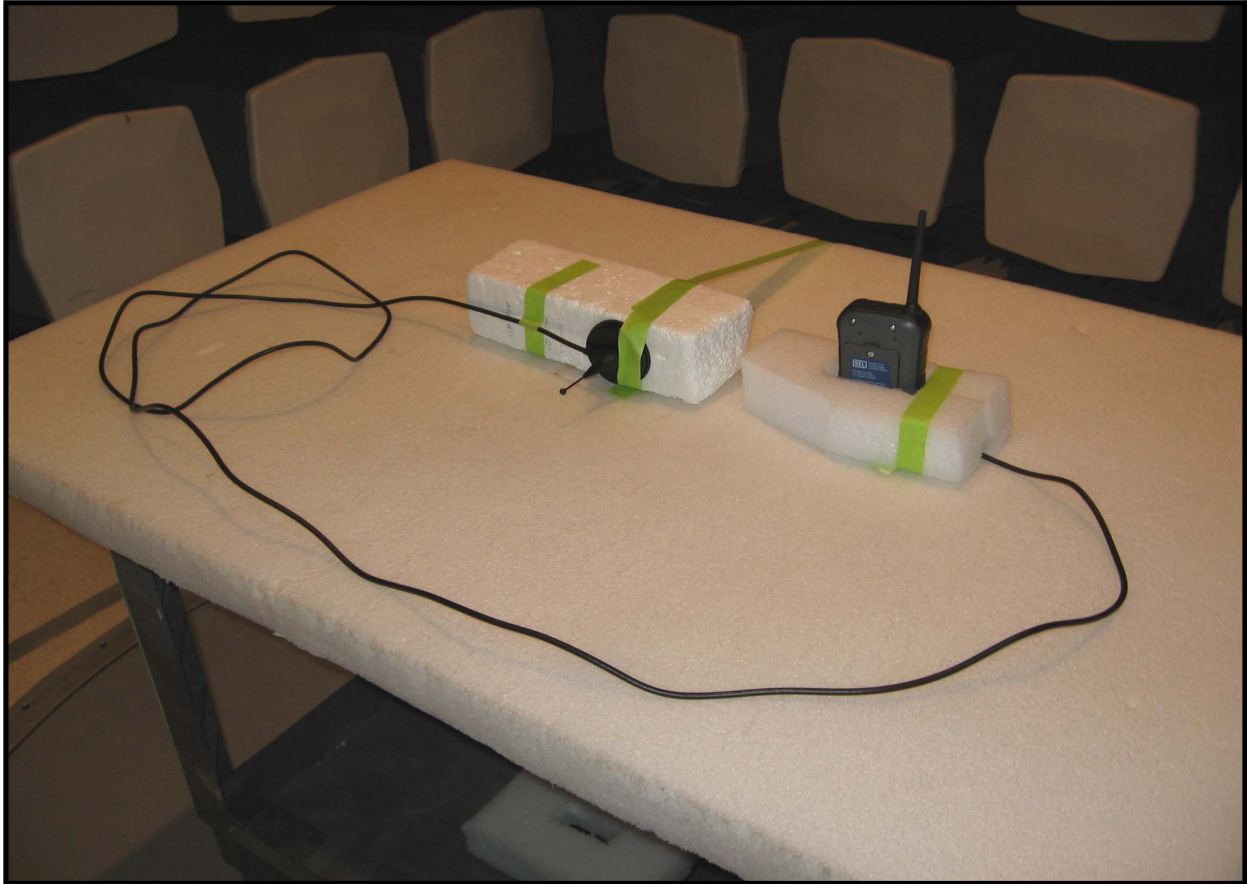




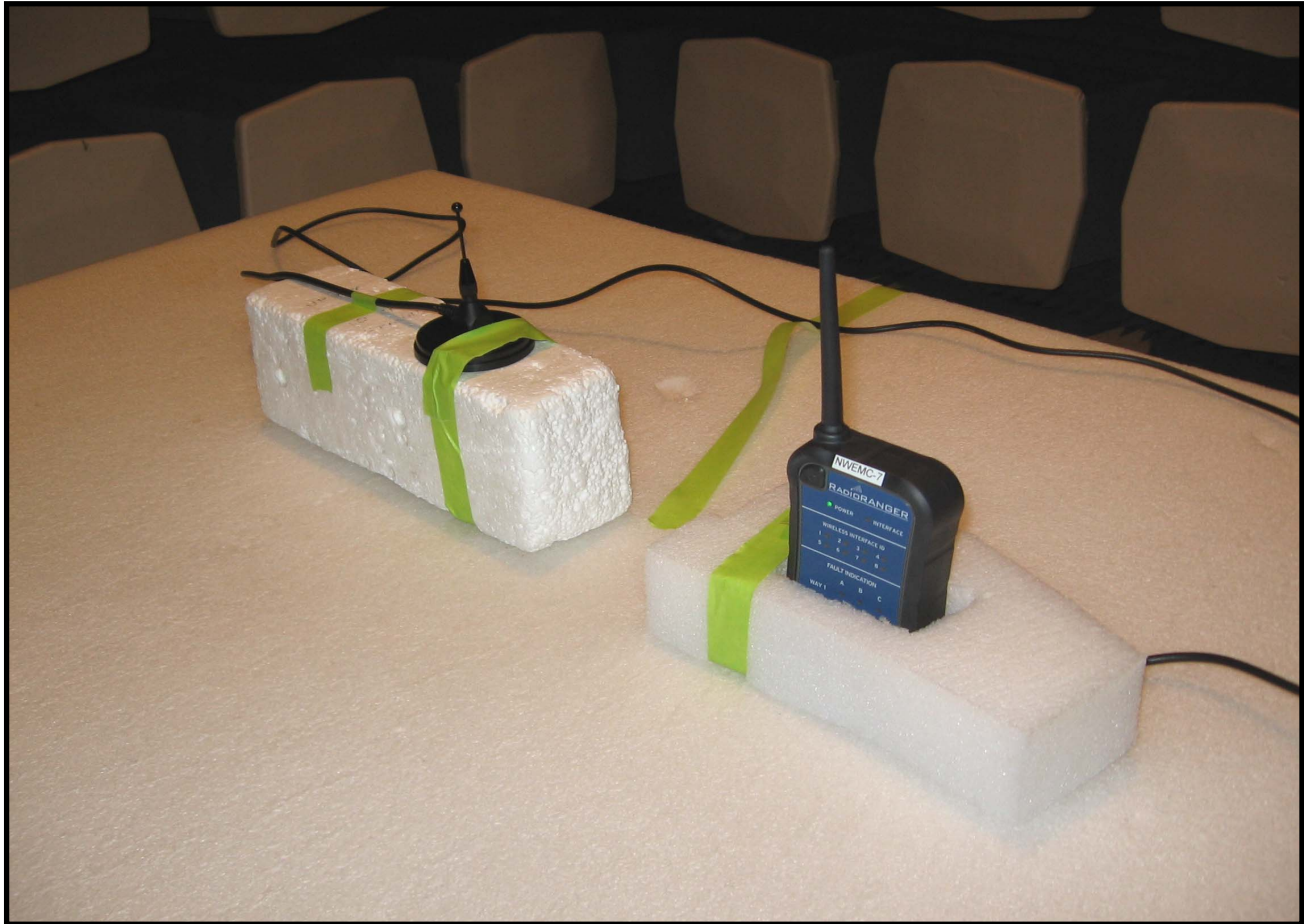












Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this 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-8310		Work Order: SCHW0069
Serial Number: NWEMC-7		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

**TEST SPECIFICATIONS**

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

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

Integral antenna

**EUT OPERATING MODES**

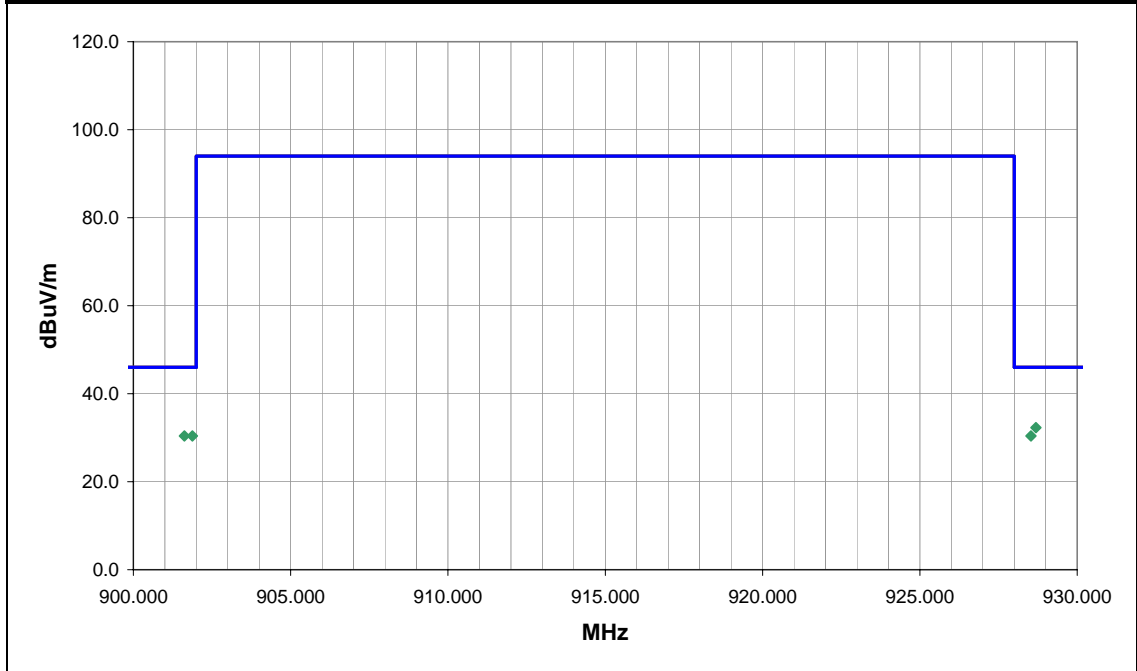
Typical modulation

**DEVIATIONS FROM TEST STANDARD**

No deviations.

Run #	17	 Signature
Configuration #	3	
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
928.688	19.2	13.1	254.0	1.6	3.0	0.0	H-Bilog	QP	0.0	32.3	46.0	-13.7	High channel
901.624	17.4	13.0	248.0	1.8	3.0	0.0	V-Bilog	QP	0.0	30.4	46.0	-15.6	Low channel
901.875	17.4	13.0	-1.0	2.2	3.0	0.0	H-Bilog	QP	0.0	30.4	46.0	-15.6	Low channel
928.530	17.3	13.1	196.0	1.5	3.0	0.0	V-Bilog	QP	0.0	30.4	46.0	-15.6	High channel

EUT: RadioRanger SEL-8310		Work Order: SCHW0069
Serial Number: NWEMC-7		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

**TEST SPECIFICATIONS**

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

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

External magnetic mount mobile antenna

**EUT OPERATING MODES**

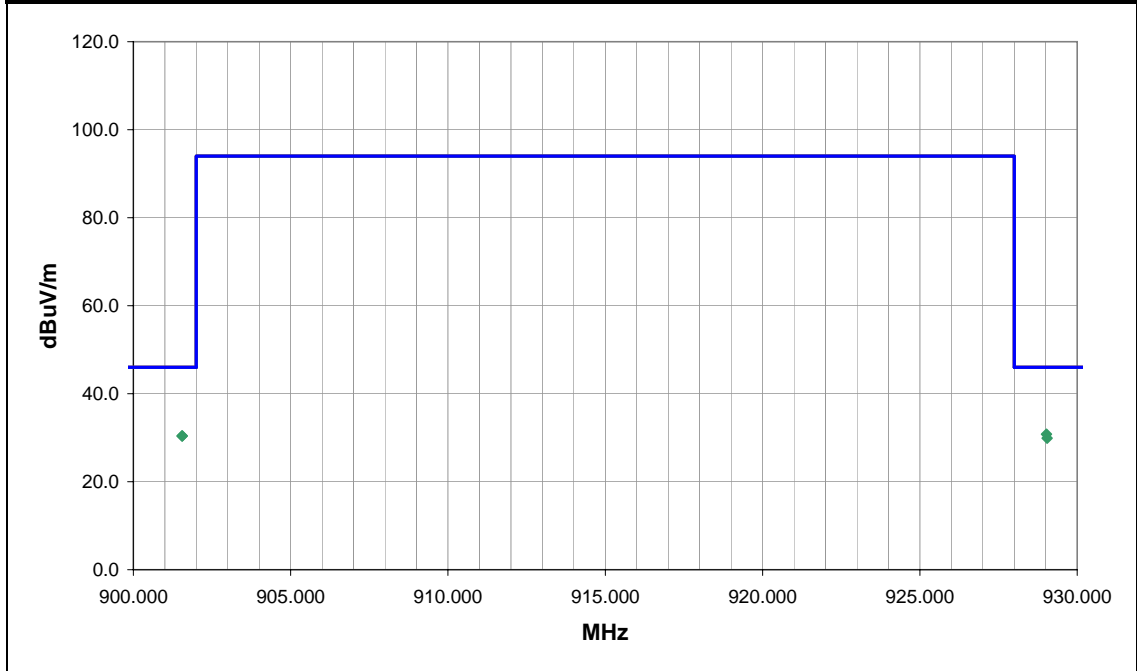
Typical modulation

**DEVIATIONS FROM TEST STANDARD**

No deviations.

Run #	18	 Signature
Configuration #	4	
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
929.022	17.7	13.1	69.0	1.2	3.0	0.0	V-Bilog	QP	0.0	30.8	46.0	-15.2	High channel
901.550	17.4	13.0	256.0	1.2	3.0	0.0	V-Bilog	QP	0.0	30.4	46.0	-15.6	Low channel
901.550	17.4	13.0	239.0	1.2	3.0	0.0	H-Bilog	QP	0.0	30.4	46.0	-15.6	Low channel
929.043	16.8	13.1	117.0	2.0	3.0	0.0	H-Bilog	QP	0.0	29.9	46.0	-16.1	High channel

EUT: RadioRanger SEL-8310	Work Order: SCHW0069
Serial Number: NWEMC-7	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

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**  
External 1/4 wave stub mobile antenna

**EUT OPERATING MODES**

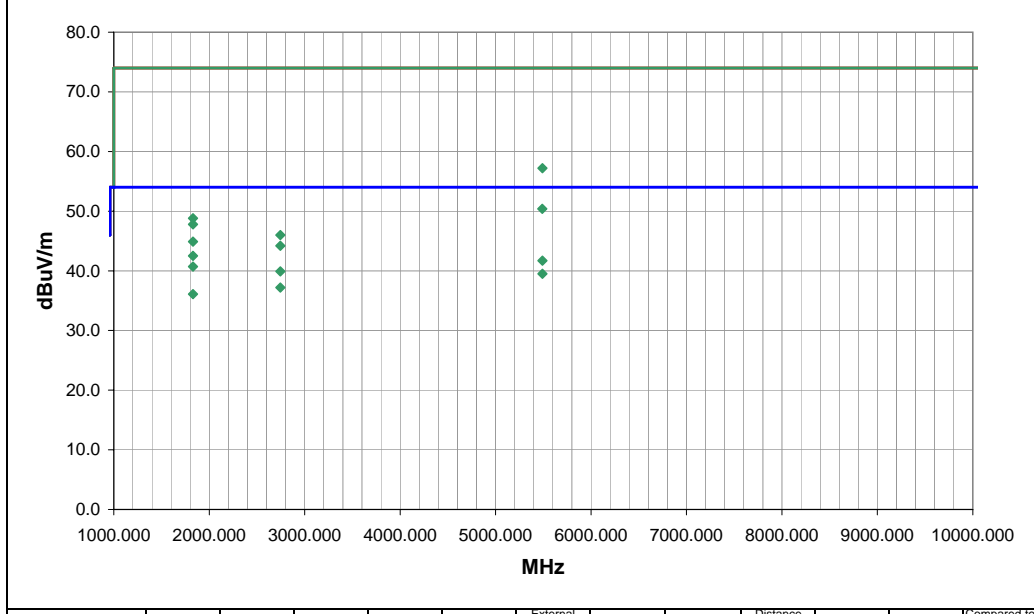
Typical modulation, mid channel

**DEVIATIONS FROM TEST STANDARD**

No deviations.

Run #	19	 Signature
Configuration #	4	
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
1830.040	43.5	-1.0	297.0	1.1	3.0	0.0	H-Horn	AV	0.0	42.5	54.0	-11.5	EUT and Antenna horizontal
5490.130	30.7	11.0	55.0	1.3	3.0	0.0	V-Horn	AV	0.0	41.7	54.0	-12.3	EUT and Antenna vertical
1830.047	41.7	-1.0	17.0	1.7	3.0	0.0	V-Horn	AV	0.0	40.7	54.0	-13.3	EUT and Antenna vertical
2745.057	37.0	2.9	26.0	1.0	3.0	0.0	H-Horn	AV	0.0	39.9	54.0	-14.1	EUT and Antenna horizontal
5490.057	28.5	11.0	317.0	1.3	3.0	0.0	H-Horn	AV	0.0	39.5	54.0	-14.5	EUT and Antenna horizontal
2745.063	34.3	2.9	209.0	1.2	3.0	0.0	V-Horn	AV	0.0	37.2	54.0	-16.8	EUT and Antenna vertical
5490.370	46.2	11.0	55.0	1.3	3.0	0.0	V-Horn	PK	0.0	57.2	74.0	-16.8	EUT and Antenna vertical
1830.040	37.1	-1.0	157.0	1.6	3.0	0.0	V-Horn	AV	0.0	36.1	54.0	-17.9	EUT and Antenna horizontal
5489.690	39.4	11.0	317.0	1.3	3.0	0.0	H-Horn	PK	0.0	50.4	74.0	-23.6	EUT and Antenna horizontal
1829.767	49.8	-1.0	297.0	1.1	3.0	0.0	H-Horn	PK	0.0	48.8	74.0	-25.2	EUT and Antenna horizontal
1830.087	48.8	-1.0	157.0	1.6	3.0	0.0	V-Horn	PK	0.0	47.8	74.0	-26.2	EUT and Antenna horizontal
2745.003	43.1	2.9	26.0	1.0	3.0	0.0	H-Horn	PK	0.0	46.0	74.0	-28.0	EUT and Antenna horizontal
1829.943	45.9	-1.0	17.0	1.7	3.0	0.0	V-Horn	PK	0.0	44.9	74.0	-29.1	EUT and Antenna vertical
2745.087	41.3	2.9	209.0	1.2	3.0	0.0	V-Horn	PK	0.0	44.2	74.0	-29.8	EUT and Antenna vertical

EUT: RadioRanger SEL-8310	Work Order: SCHW0069
Serial Number: NWEMC-7	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

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

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

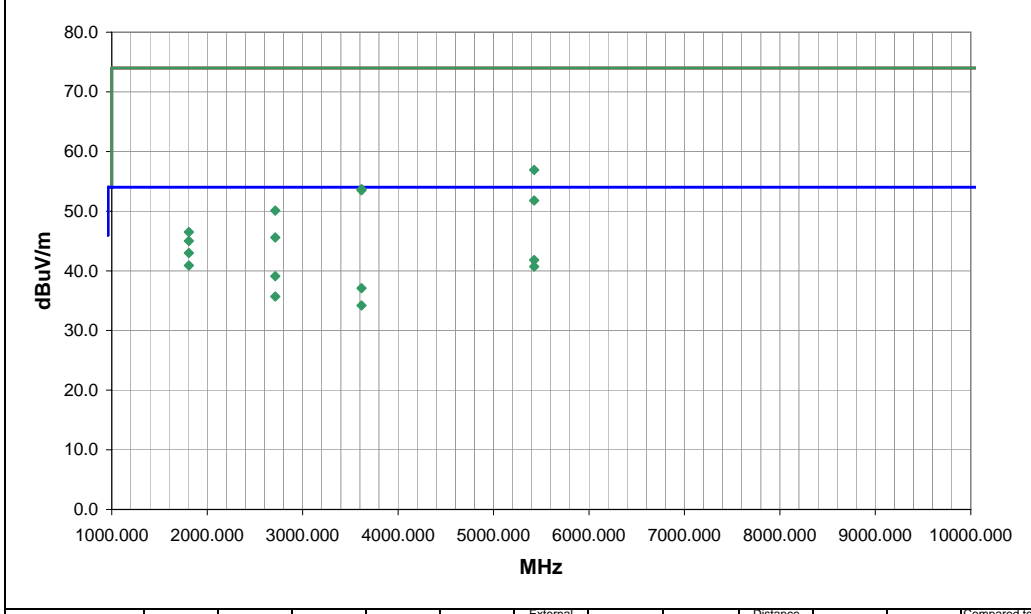
**COMMENTS**  
External 1/4 wave stub mobile antenna

**EUT OPERATING MODES**  
Typical modulation, low channel

**DEVIATIONS FROM TEST STANDARD**  
No deviations.

Run #	20	 Signature
Configuration #	4	
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
1808.414	44.0	-1.0	4.0	1.2	3.0	0.0	H-Horn	AV	0.0	43.0	54.0	-11.0	EUT and antenna horizontal
5425.328	30.9	10.9	65.0	1.2	3.0	0.0	V-Horn	AV	0.0	41.8	54.0	-12.2	EUT and antenna vertical
1808.434	41.9	-1.0	209.0	1.2	3.0	0.0	V-Horn	AV	0.0	40.9	54.0	-13.1	EUT and antenna vertical
5425.321	29.8	10.9	9.0	1.2	3.0	0.0	H-Horn	AV	0.0	40.7	54.0	-13.3	EUT and antenna horizontal
2712.660	36.3	2.8	155.0	1.0	3.0	0.0	H-Horn	AV	0.0	39.1	54.0	-14.9	EUT and antenna horizontal
3616.890	30.1	7.0	-1.0	1.2	3.0	0.0	H-Horn	AV	0.0	37.1	54.0	-16.9	EUT and antenna horizontal
5425.406	46.0	10.9	9.0	1.2	3.0	0.0	H-Horn	PK	0.0	56.9	74.0	-17.1	EUT and antenna horizontal
2712.652	32.9	2.8	194.0	1.1	3.0	0.0	V-Horn	AV	0.0	35.7	54.0	-18.3	EUT and antenna vertical
3616.842	27.2	7.0	317.0	1.1	3.0	0.0	V-Horn	AV	0.0	34.2	54.0	-19.8	EUT and antenna vertical
3617.072	46.7	7.0	317.0	1.1	3.0	0.0	V-Horn	PK	0.0	53.7	74.0	-20.3	EUT and antenna vertical
3616.835	46.5	7.0	-1.0	1.2	3.0	0.0	H-Horn	PK	0.0	53.5	74.0	-20.5	EUT and antenna horizontal
5425.553	40.9	10.9	65.0	1.2	3.0	0.0	V-Horn	PK	0.0	51.8	74.0	-22.2	EUT and antenna vertical
2712.710	47.3	2.8	194.0	1.1	3.0	0.0	V-Horn	PK	0.0	50.1	74.0	-23.9	EUT and antenna vertical
1808.540	47.5	-1.0	4.0	1.2	3.0	0.0	H-Horn	PK	0.0	46.5	74.0	-27.5	EUT and antenna horizontal
2712.730	42.8	2.8	155.0	1.0	3.0	0.0	H-Horn	PK	0.0	45.6	74.0	-28.4	EUT and antenna horizontal
1808.674	46.0	-1.0	209.0	1.2	3.0	0.0	V-Horn	PK	0.0	45.0	74.0	-29.0	EUT and antenna vertical

EUT: RadioRanger SEL-8310	Work Order: SCHW0069
Serial Number: NWEMC-7	Date: 02/13/07
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>	<b>Test Method</b>
FCC 15.249:2006	ANSI C63.4:2003

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

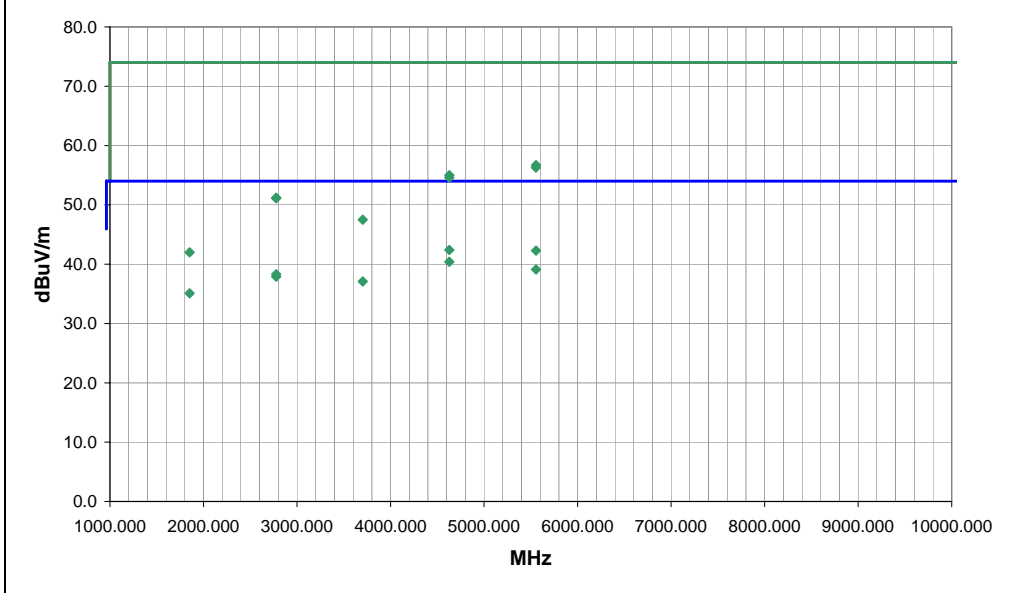
**COMMENTS**  
 External 1/4 wave stub mobile antenna

**EUT OPERATING MODES**  
 Typical modulation, high channel

**DEVIATIONS FROM TEST STANDARD**  
 No deviations.

Run #	21
Configuration #	4
Results	Pass

NVLAP Lab Code 200630-0  
 Signature: *Rod Peloquin*



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
4629.113	33.8	8.6	156.0	1.2	3.0	0.0	V-Horn	AV	0.0	42.4	54.0	-11.6	EUT and antenna vertical
5554.901	31.4	10.9	334.0	1.2	3.0	0.0	H-Horn	AV	0.0	42.3	54.0	-11.7	EUT on side, antenna horizontal
4629.088	31.8	8.6	9.0	1.2	3.0	0.0	H-Horn	AV	0.0	40.4	54.0	-13.6	EUT on side, antenna horizontal
5554.948	28.2	10.9	51.0	1.3	3.0	0.0	V-Horn	AV	0.0	39.1	54.0	-14.9	EUT and antenna vertical
2777.454	35.2	3.1	192.0	1.3	3.0	0.0	H-Horn	AV	0.0	38.3	54.0	-15.7	EUT on side, antenna horizontal
2777.499	34.8	3.1	226.0	1.1	3.0	0.0	V-Horn	AV	0.0	37.9	54.0	-16.1	EUT and antenna vertical
3703.297	29.9	7.2	158.0	1.4	3.0	0.0	H-Horn	AV	0.0	37.1	54.0	-16.9	EUT on side, antenna horizontal
5555.111	45.8	10.9	51.0	1.3	3.0	0.0	V-Horn	PK	0.0	56.7	74.0	-17.3	EUT and antenna vertical
5554.678	45.4	10.9	334.0	1.2	3.0	0.0	H-Horn	PK	0.0	56.3	74.0	-17.7	EUT on side, antenna horizontal
1851.630	35.8	-0.7	115.0	1.2	3.0	0.0	H-Horn	AV	0.0	35.1	54.0	-18.9	EUT on side, antenna horizontal
4629.183	46.4	8.6	156.0	1.2	3.0	0.0	V-Horn	PK	0.0	55.0	74.0	-19.0	EUT and antenna vertical
4628.810	46.0	8.6	9.0	1.2	3.0	0.0	H-Horn	PK	0.0	54.6	74.0	-19.4	EUT on side, antenna horizontal
2777.484	48.1	3.1	192.0	1.3	3.0	0.0	H-Horn	PK	0.0	51.2	74.0	-22.8	EUT on side, antenna horizontal
2777.179	48.0	3.1	226.0	1.1	3.0	0.0	V-Horn	PK	0.0	51.1	74.0	-22.9	EUT and antenna vertical
3703.282	40.3	7.2	158.0	1.4	3.0	0.0	H-Horn	PK	0.0	47.5	74.0	-26.5	EUT on side, antenna horizontal
1851.810	42.7	-0.7	115.0	1.2	3.0	0.0	H-Horn	PK	0.0	42.0	74.0	-32.0	EUT on side, antenna horizontal

EUT: RadioRanger SEL-8310		Work Order: SCHW0069
Serial Number: NWEMC-7	Date: 02/13/07	
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

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

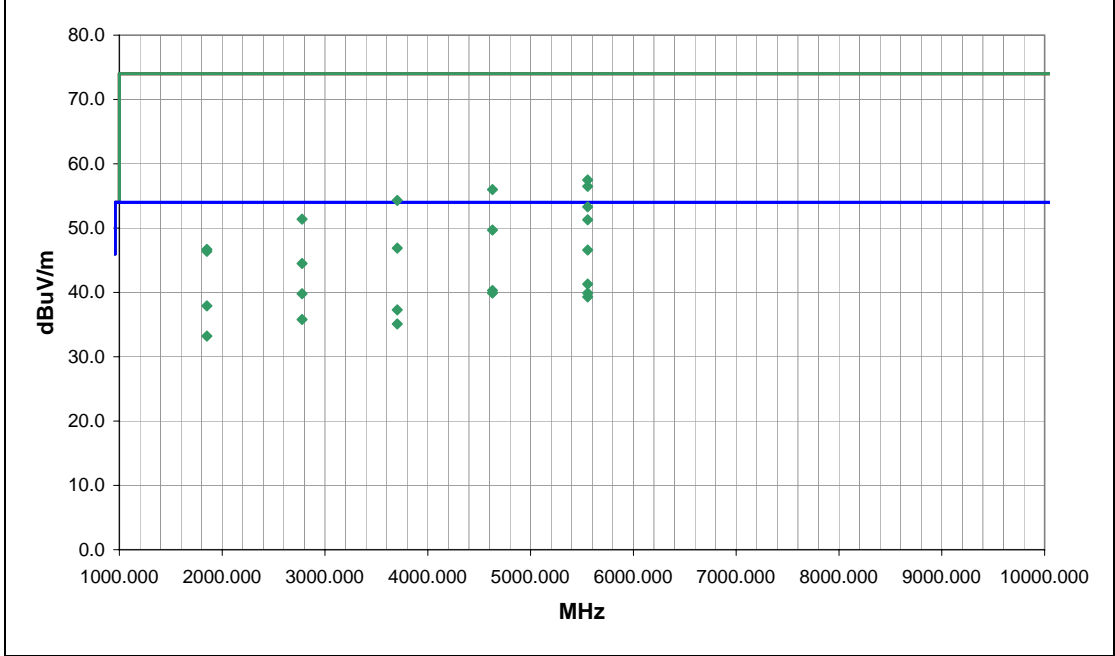
Typical modulation, high channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	22	 Signature
Configuration #	3	
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
5554.928	35.7	10.9	272.0	1.2	3.0	0.0	V-Horn	AV	0.0	46.6	54.0	-7.4	EUT on side
5554.964	30.4	10.9	65.0	1.4	3.0	0.0	V-Horn	AV	0.0	41.3	54.0	-12.7	EUT vertical
4629.108	31.7	8.6	267.0	1.3	3.0	0.0	H-Horn	AV	0.0	40.3	54.0	-13.7	EUT on side
5554.906	29.0	10.9	31.0	1.2	3.0	0.0	H-Horn	AV	0.0	39.9	54.0	-14.1	EUT on side
4629.118	31.3	8.6	204.0	1.5	3.0	0.0	V-Horn	AV	0.0	39.9	54.0	-14.1	EUT on side
2777.472	36.7	3.1	149.0	1.3	3.0	0.0	H-Horn	AV	0.0	39.8	54.0	-14.2	EUT on side
5554.936	28.4	10.9	211.0	1.0	3.0	0.0	H-Horn	AV	0.0	39.3	54.0	-14.7	EUT horizontal
1851.653	38.6	-0.7	31.0	1.4	3.0	0.0	H-Horn	AV	0.0	37.9	54.0	-16.1	EUT on side
5554.938	46.6	10.9	31.0	1.2	3.0	0.0	H-Horn	PK	0.0	57.5	74.0	-16.5	EUT on side
3703.307	30.1	7.2	19.0	1.2	3.0	0.0	V-Horn	AV	0.0	37.3	54.0	-16.7	EUT on side
5554.774	45.6	10.9	211.0	1.0	3.0	0.0	H-Horn	PK	0.0	56.5	74.0	-17.5	EUT horizontal
4629.376	47.4	8.6	204.0	1.5	3.0	0.0	V-Horn	PK	0.0	56.0	74.0	-18.0	EUT on side
2777.452	32.7	3.1	231.0	1.1	3.0	0.0	V-Horn	AV	0.0	35.8	54.0	-18.2	EUT on side
3703.227	27.9	7.2	356.0	1.2	3.0	0.0	H-Horn	AV	0.0	35.1	54.0	-18.9	EUT on side
3703.320	47.1	7.2	19.0	1.2	3.0	0.0	V-Horn	PK	0.0	54.3	74.0	-19.7	EUT on side
5554.888	42.4	10.9	272.0	1.2	3.0	0.0	V-Horn	PK	0.0	53.3	74.0	-20.7	EUT on side
1851.656	33.9	-0.7	171.0	1.1	3.0	0.0	V-Horn	AV	0.0	33.2	54.0	-20.8	EUT on side
2777.456	48.3	3.1	149.0	1.3	3.0	0.0	H-Horn	PK	0.0	51.4	74.0	-22.6	EUT on side
5554.964	40.4	10.9	65.0	1.4	3.0	0.0	V-Horn	PK	0.0	51.3	74.0	-22.7	EUT vertical
4629.086	41.1	8.6	267.0	1.3	3.0	0.0	H-Horn	PK	0.0	49.7	74.0	-24.3	EUT on side





EUT: RadioRanger SEL-8310	Work Order: SCHW0069
Serial Number: NWEMC-7	Date: 02/13/07
Customer: Schweitzer Engineering Laboratories, Inc.	Temperature: 22
Attendees: None	Humidity: 32%
Project: None	Barometric Pres.: 29.98
Tested by: Eric Greenwood	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 antenna

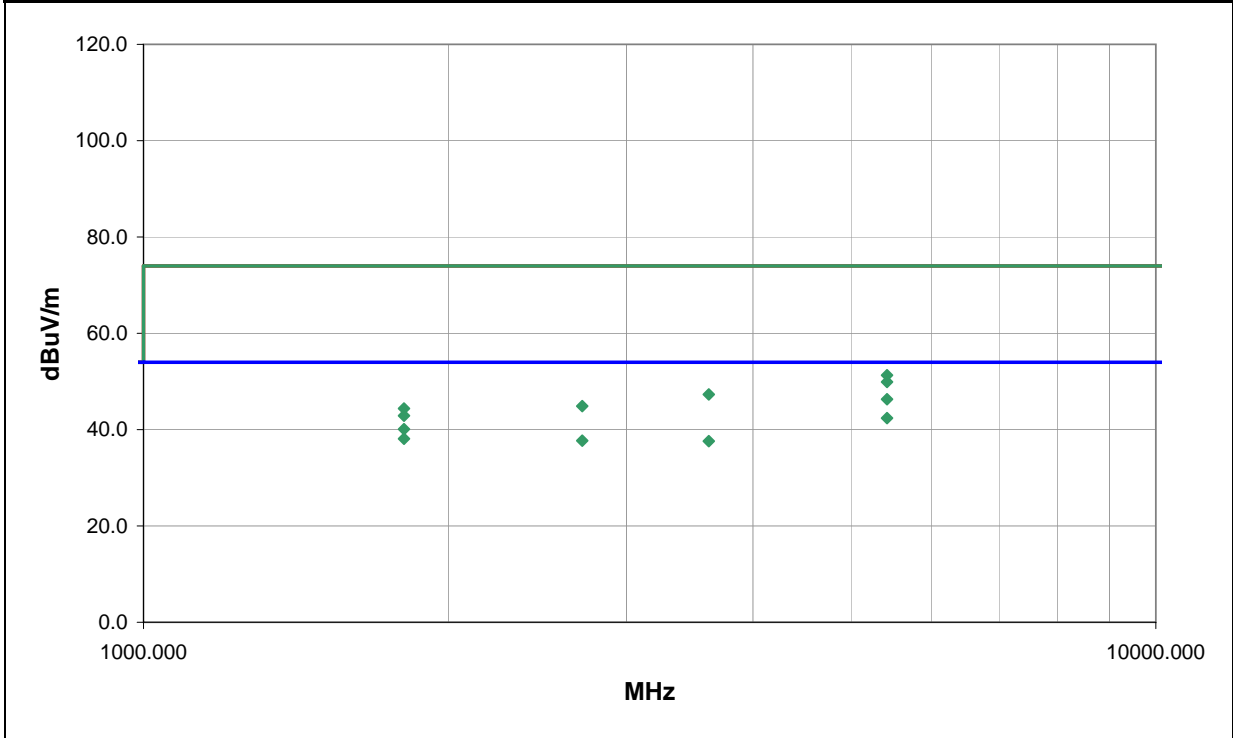
**EUT OPERATING MODES**

Typical modulation, low channel

**DEVIATIONS FROM TEST STANDARD**

No deviations.

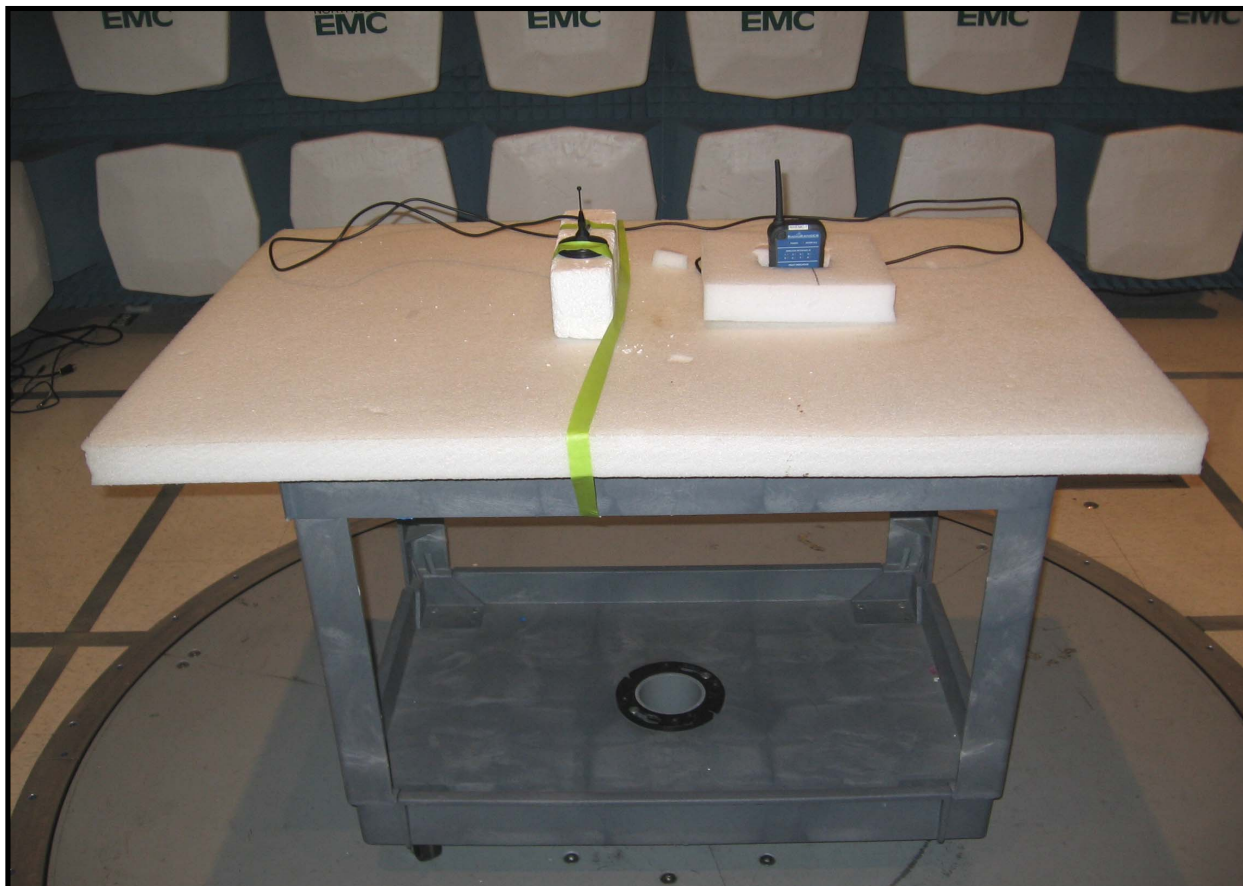
Run #	24	NVLAP Lab Code 200630-0 Signature 
Configuration #	3	
Results	Pass	

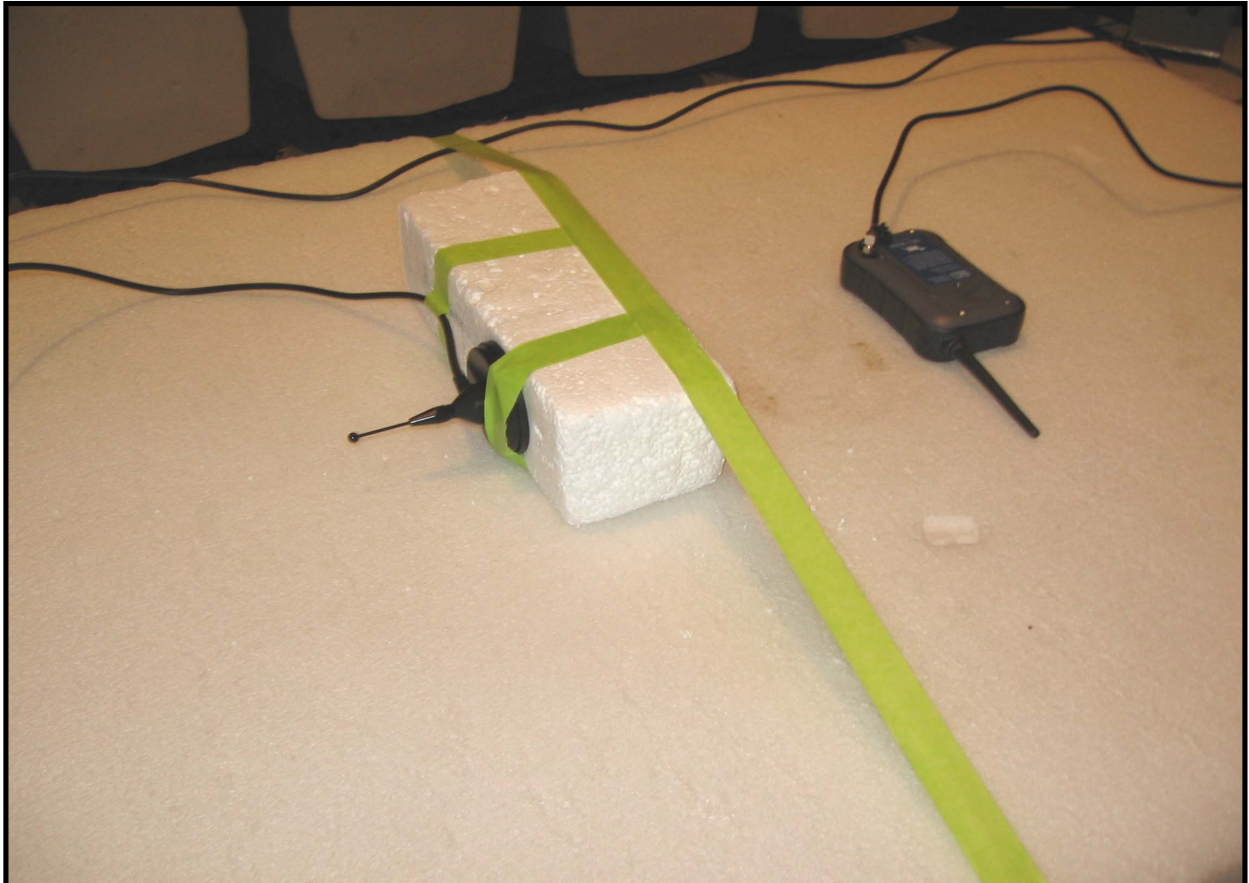
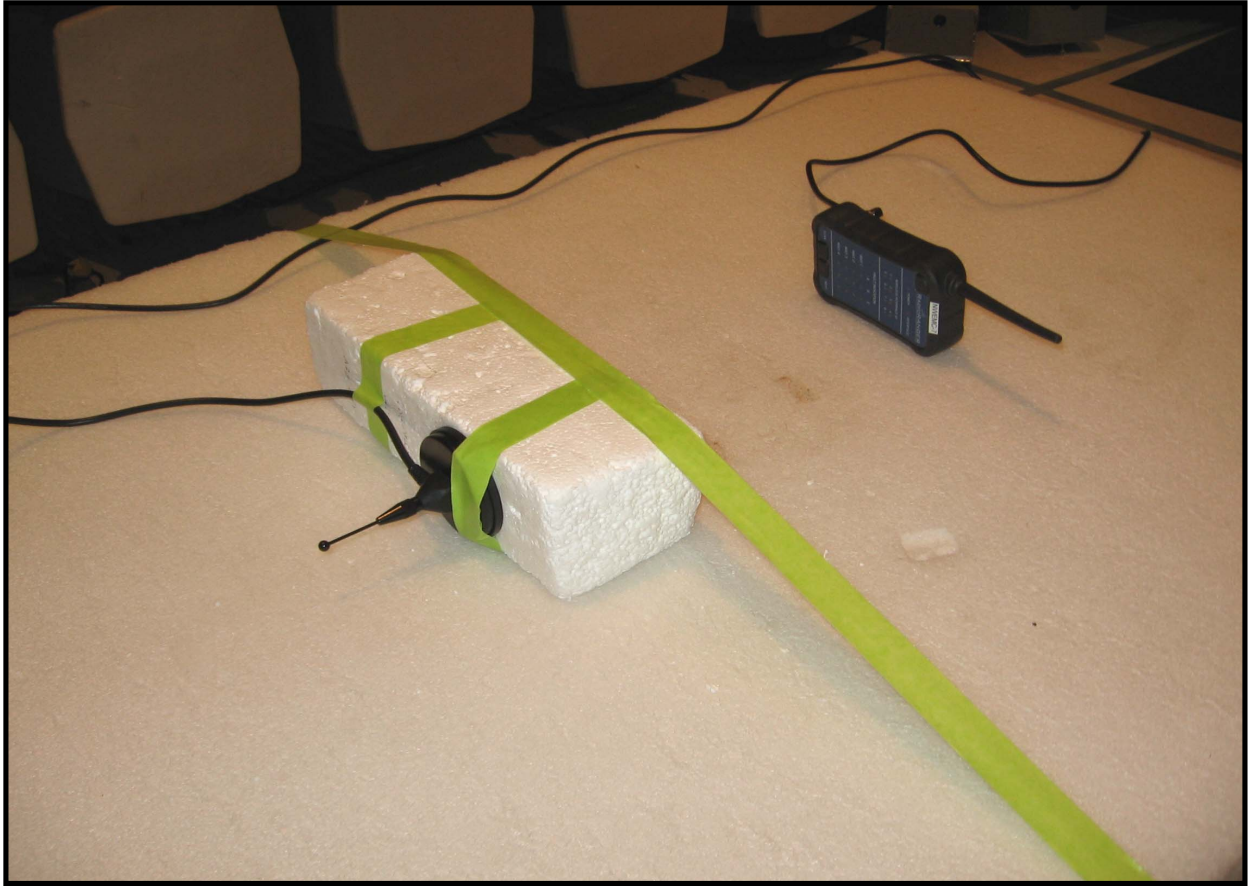


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
5425.346	35.4	10.9	19.0	1.4	3.0	0.0	V-Horn	AV	0.0	46.3	54.0	-7.7
5425.324	31.5	10.9	19.0	1.1	3.0	0.0	H-Horn	AV	0.0	42.4	54.0	-11.6
1808.470	41.1	-1.0	69.0	1.1	3.0	0.0	H-Horn	AV	0.0	40.1	54.0	-13.9
1808.457	39.1	-1.0	324.0	2.2	3.0	0.0	V-Horn	AV	0.0	38.1	54.0	-15.9
2712.664	34.9	2.8	211.0	1.1	3.0	0.0	V-Horn	AV	0.0	37.7	54.0	-16.3
3616.888	30.6	7.0	78.0	1.1	3.0	0.0	V-Horn	AV	0.0	37.6	54.0	-16.4
5425.411	40.4	10.9	19.0	1.1	3.0	0.0	H-Horn	PK	0.0	51.3	74.0	-22.7
5425.210	39.0	10.9	19.0	1.4	3.0	0.0	V-Horn	PK	0.0	49.9	74.0	-24.1
3616.902	40.3	7.0	78.0	1.1	3.0	0.0	V-Horn	PK	0.0	47.3	74.0	-26.7
2712.734	42.1	2.8	211.0	1.1	3.0	0.0	V-Horn	PK	0.0	44.9	74.0	-29.1
1808.584	45.4	-1.0	69.0	1.1	3.0	0.0	H-Horn	PK	0.0	44.4	74.0	-29.6
1808.492	43.9	-1.0	324.0	2.2	3.0	0.0	V-Horn	PK	0.0	42.9	74.0	-31.1









## 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).