# Schweitzer Engineering Laboratories, Inc.

**SEL-3022** 

June 08, 2005

Report No. SCHW0048

Report Prepared By



www.nwemc.com 1-888-EMI-CERT

© 2005 Northwest EMC, Inc



22975 NW Evergreen Parkway Suite 400 Hillsboro, Oregon 97124

#### **Certificate of Test**

Issue Date: June 08, 2005 Schweitzer Engineering Laboratories, Inc. Model: SEL-3022

Er	nissions		
Specification	Test Method	Pass	Fail
FCC 15.247(a) Occupied Bandwidth:2005-04	ANSI C63.4:2003		
FCC 15.247(b) Output Power:2005-04	ANSI C63.4:2003		
FCC 15.247(d) Band Edge Compliance:2005-04	ANSI C63.4:2003		
FCC 15.247(d) Spurious Conducted Emissions:2005-04	ANSI C63.4:2003		
FCC 15.247(d) Spurious Radiated Emissions:2005-04	ANSI C63.4:2003	$\boxtimes$	
FCC 15.247(e) Power Spectral Density:2005-04	ANSI C63.4:2003		

## 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:

Donald Facteau, IS Manager

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 History**

Revision 05/05/03

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 recognized 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, MILSTD 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.



200629-0 200630-0 200676-0

**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 TUV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TUV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TUV's current Listing of CARAT Laboratories, available from TUV. A certificate was issued to represent that this laboratory continues to meet TUV's CARAT Program requirements. Certificate No. USA0401C.



**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).



**Technology International:** Assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LACO196. Based upon that assessment, Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.



**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 and R-1025, Irvine: C-2094 and R-1943, Newberg: C-1877 and R-1760, Sultan: R-871, C-1784 and R-1761).* 



**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

#### What is measurement uncertainty?

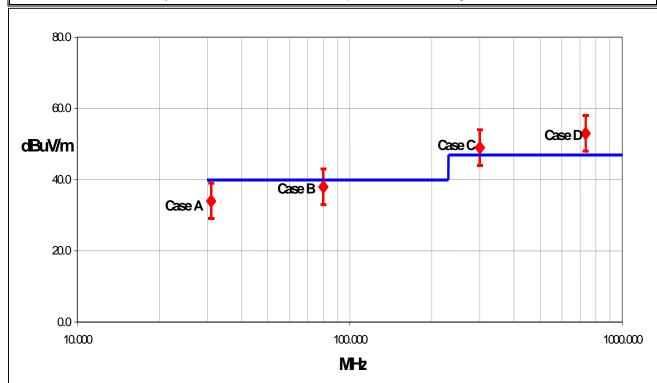
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" value. In the case of transient tests (ESD, EFT, Surge, Voltage Dips and Interruptions), the test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements.

The following documents were the basis for determining the uncertainty levels of our measurements:

- "ISO Guide to the Expression of Uncertainty in Measurements", October 1993
- "NIS81: The Treatment of Uncertainty in EMC Measurements", May 1994
- "IEC CISPR 16-3 A1 f1 Ed.1: Radio-interference measurements and statistical techniques", December 2000

#### How might measurement uncertainty be applied to test results?

If the diamond marks the measured value for the test and the vertical bars bracket the range of + and – measurement uncertainty, then test results can be interpreted from the diagram below.



#### **Test Result Scenarios:**

Case A: Product complies.

Case B: Product conditionally complies. It is not possible to say with 95% confidence that the product complies.

Case C: Product conditionally does not comply. It is not possible to say with 95% confidence that the product does not comply.

Case D: Product does not comply.

## **Measurement Uncertainty**

Radiated Emissions ≤ 1 GHz		Value (	dB)				
Probability		Bico	nical	Log Pe	eriodic	D	ipole
	Distribution	Antenna		Ante	enna	An	tenna
Test Distance		3m	10m	3m	10m	3m	10m
Combined standard	normal	+ 1.86	+ 1.82	+ 2.23	+ 1.29	+ 1.31	+ 1.25
uncertainty <b>u</b> <sub>c</sub> (y)		- 1.88	- 1.87	- 1.41	- 1.26	- 1.27	- 1.25
Expanded uncertainty <i>U</i>	normal (k=2)	+ 3.72	+ 3.64	+ 4.46	+ 2.59	+ 2.61	+ 2.49
(level of confidence ≈ 95%)		- 3.77	- 3.73	-2.81	- 2.52	- 2.55	- 2.49

Radiated Emissions > 1 GHz	Value (dB)		
	Probability Distribution	Without High Pass Filter	With High Pass Filter
Combined standard uncertainty $u_c(y)$	normal	+ 1.29 - 1.25	+ 1.38 - 1.35
Expanded uncertainty <i>U</i> (level of confidence ≈ 95%)	normal (k=2)	+ 2.57 - 2.51	+ 2.76 2.70

Conducted Emissions		
	Probability	Value
	Distribution	(+/- dB)
Combined standard uncertainty <i>uc(y)</i>	normal	1.48
Expanded uncertainty <b>U</b> (level of confidence ≈ 95 %)	normal (k = 2)	2.97

Radiated Immunity		
	Probability	Value
	Distribution	(+/- dB)
Combined standard uncertainty uc(y)	normal	1.05
Expanded uncertainty <i>U</i> (level of confidence ≈ 95 %)	normal (k = 2)	2.11

Conducted Immunity					
	Probability	Value			
	Distribution	(+/- dB)			
Combined standard uncertainty <i>uc(y</i> )	normal	1.05			
Expanded uncertainty <b>U</b>	normal (k = 2)	2.10			
(level of confidence ≈ 95 %)	1101111ai (K = 2) 2.1				

#### Legend

 $u_c(y)$  = square root of the sum of squares of the individual standard uncertainties

 $\it U$  = combined standard uncertainty multiplied by the coverage factor:  $\it k$ . This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then  $\it k$ =3 (CL of 99.7%) can be used. Please note that with a coverage factor of one, uc(y) yields a confidence level of only 68%.

## **Facilities**



#### 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 – EV10

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



#### Oregon

### Trails End Facility

#### Labs TE01 - TE03

30475 NE Trails End Lane Newberg, OR 97132 (503) 844-4066 FAX (503) 537-0735



### Washington

### **Sultan Facility**

## Labs SU01 - SU07

14128 339<sup>th</sup> Ave. SE Sultan, WA 98294 (888) 364-2378 FAX (360) 793-2536

## **Product Description**

Revision 10/3/03

Party Requesting the Test		
Company Name:	Schweitzer Engineering Laboratories, Inc.	
Address:	2350 NE Hopkins Court	
City, State, Zip:	Pullman, WA 99163	
Test Requested By:	Pat Schacher	
Model:	SEL-3022	
First Date of Test:	05/23/2005	
Last Date of Test:	05/27/2005	
Receipt Date of Samples:	05/23/2005	
<b>Equipment Design Stage:</b>	Production	
Equipment Condition:	No visual damage.	

#### **Information Provided by the Party Requesting the Test**

Clocks/Oscillators:	Not provided.
I/O Ports:	Serial, Antenna, Alarm terminals, DC power jack, DC power terminals

Functional Description of the EUT (Equipment Under Test):	
Wireless Encrypting Transceiver	

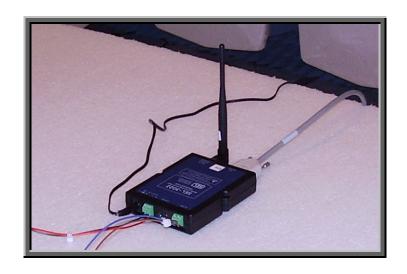
#### Client Justification for EUT Selection:

The product is a representative production sample.

#### **Client Justification for Test Selection:**

These tests satisfy the requirements for FCC certification under 15.247.

#### **EUT Photo**



## **Modifications**

Revision 4/28/03

	Equipment modifications				
Item	Test	Date	Modification	Note	Disposition of EUT
1	Band Edge Compliance	05/25/2005	No EMI suppression devices were added or modified during this test.	Same configuration as delivered.	EUT remained at Northwest EMC.
2	Occupied Bandwidth	05/25/2005	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
3	Spurious Conducted Emissions	05/25/2005	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
4	Power Spectral Density	05/25/2005	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
5	Output Power	05/25/2005	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
6	Spurious Radiated Emissions	05/27/2005	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.

## **Occupied Bandwidth**

Revision 10/1/03

02425173

#### **Justification**

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

#### **Operating Modes Investigated:**

Typical

#### Data Rates Investigated:

Maximum

#### **Output Power Setting(s) Investigated:**

APX Technologies Inc.

Maximum

#### **Power Input Settings Investigated:**

120 VAC, 60 Hz.

AC Adapter

Software\Firmware Applied During Test					
Exercise software SEL-5809 Settings Software Version 0.132.0.0					
Description					
The system was tested using standard operating production software to exercise the functions of the device during the testing. The software ran on the remote notebook PC and permitted channel selection.					

EUT and Peripherals				
Description	Manufacturer	Model/Part Number	Serial Number	
EUT- SEL-3022	Schweitzer Engineering Laboratories	SEL-3022	None	

SP10005

Remote Equipment Outside of Test Setup Boundary				
Description Manufacturer Model/Part Number Serial Number				
Notebook PC	Dell	Inspiron 2500	IS116	
Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary				



## **Occupied Bandwidth**

Revision 10/1/03

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	2.0	No	EUT- SEL-3022	AC Adapter
Serial Cable	Yes	1.4	No	EUT- SEL-3022	Notebook PC

Measurement Equipment					
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo

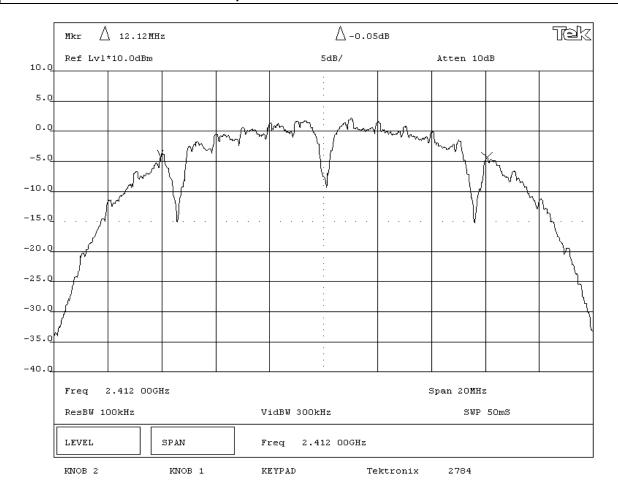
#### **Test Description**

**Requirement:** Per 47 CFR 15.247(a)(2), the 6 dB bandwidth of a direct sequence channel must be at least 500kHz. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

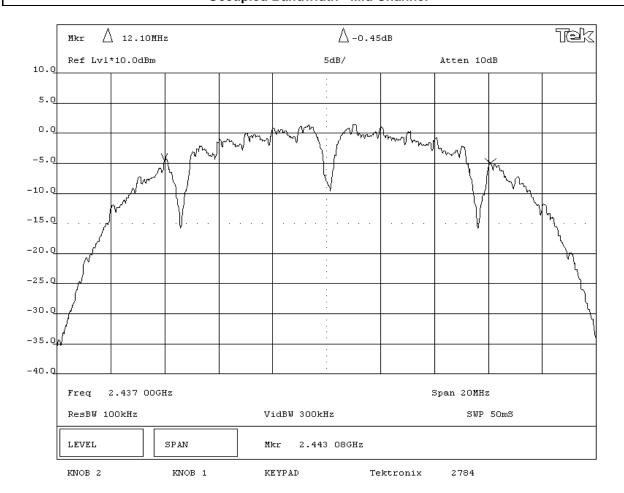
**Configuration**: The occupied bandwidth was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation.

Completed by:

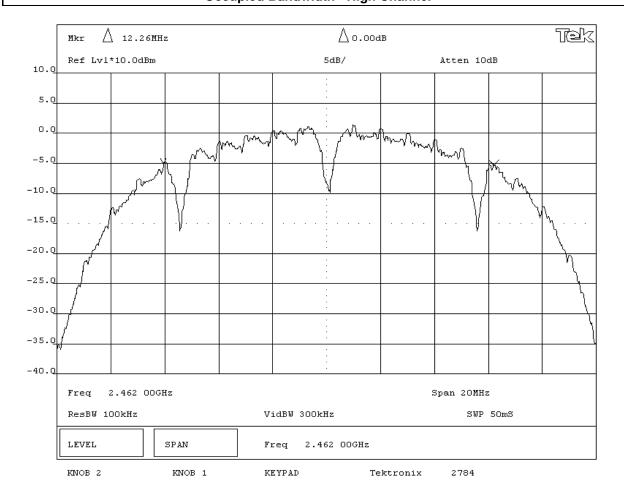
EMC		OCCUPIED	BANDWIE	OTH		Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Laborato	ories			Temperature:	21°C
Attendees:	None		Tested by:	Rod Peloquin	Humidity:	36% RH
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION	IS					
Specification:	FCC Part 15.247(a)(2)	Year: 2005-04	Method:	FCC 97-114, ANSI C63	.4 Year:	2003
SAMPLE CALCULATION	ONS					
COMMENTS						
EUT OPERATING MOD						
	t maximum data rate, 802.11(b) me	odulation scheme				
DEVIATIONS FROM T	EST STANDARD					
None						
REQUIREMENTS						
The minimum 6dB bar	ndwidth is 500KHz					
RESULTS			BANDWIDTH			
Pass	Pass 12.12 MHz					
SIGNATURE						
Rochy la Releng						
DESCRIPTION OF TES	ST					
Occupied Bandwidth - Low Channel						

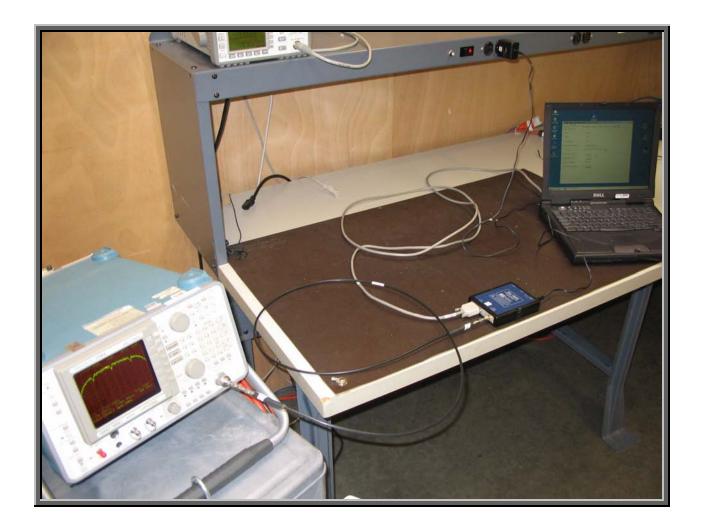


NORTHWEST		COCUDIED	DANDWIE	NTII		
<b>EMC</b>		OCCUPIED	BANDWIL	ЛH		Rev BETA 01/30/01
	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labo	ratories			Temperature:	21°C
Attendees:	None		Tested by:	Rod Peloquin	Humidity:	
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION	NS					
Specification:	FCC Part 15.247(a)(2)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.4	Year:	2003
SAMPLE CALCULATION	ONS					
COMMENTS						
EUT OPERATING MO	DES at maximum data rate, 802.11(b)	) madulation ashema				
DEVIATIONS FROM T		) modulation scheme				
None	EST STANDARD					
REQUIREMENTS						
The minimum 6dB bar	ndwidth is 500KHz					
RESULTS			BANDWIDTH			
Pass			12.1 MHz			
SIGNATURE						
Tested By:	Rolly be Feling	<u> </u>				
DESCRIPTION OF TES	ST					
		Occupied Band	width - Mid Cha	annel		



NORTHWEST		COCUDIED	DANDWIE	NTII		
<b>EMC</b>		OCCUPIED	BANDWIL	ЛH		Rev BETA 01/30/01
	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labor	ratories			Temperature:	21°C
Attendees:	None		Tested by:	Rod Peloquin	Humidity:	
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION	IS					
Specification:	FCC Part 15.247(a)(2)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.4	Year:	2003
SAMPLE CALCULATION	ONS					
COMMENTS						
<b>EUT OPERATING MOI</b>						
	t maximum data rate, 802.11(b)	modulation scheme				
<b>DEVIATIONS FROM T</b>	EST STANDARD					
None						
REQUIREMENTS						
The minimum 6dB bar	ndwidth is 500KHz					
RESULTS			BANDWIDTH			
Pass			12.26 MHz			
SIGNATURE						
Tested By:	Rochy la Feling	<u> </u>				
DESCRIPTION OF TES	ST					
		Occupied Bandy	width - High Ch	annel	•	





## **Output Power**

Revision 10/1/03

#### **Justification**

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

#### **Operating Modes Investigated:**

Typical

#### **Data Rates Investigated:**

Maximum

#### **Output Power Setting(s) Investigated:**

Maximum

#### **Power Input Settings Investigated:**

120 VAC, 60 Hz.

Software\Firmware Applied During Test				
Exercise software	SEL-5809 Settings Software	Version	0.132.0.0	
Description				
The system was tested using standard operating production software to exercise the functions of the				

The system was tested using standard operating production software to exercise the functions of the device during the testing. The software ran on the remote notebook PC and permitted channel selection.

EUT and Peripherals					
Description	Manufacturer	Model/Part Number	Serial Number		
EUT- SEL-3022	Schweitzer Engineering Laboratories	SEL-3022	None		
AC Adapter	APX Technologies Inc.	SP10005	02425173		

Remote Equipment Outside of Test Setup Boundary				
Description Manufacturer Model/Part Number Serial Number				
Notebook PC	Dell	Inspiron 2500	IS116	
Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary				

## **Output Power**

Revision 10/1/03

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	2.0	No	EUT- SEL-3022	AC Adapter
Serial Cable	Yes	1.4	No	EUT- SEL-3022	Notebook PC

Measurement Equipment							
Description	Manufacturer	Model	Identifier	Last Cal	Interval		
Oscilloscope	Tektronix	TDS 3052	TOF	12/02/2004	13 mo		
RF Detector	RLC Electronics	CR-133-R	ZZA	NCR	NA		
Power Meter	Hewlett Packard	E4418A	SPA	07/23/2004	24 mo		
Power Sensor	Hewlett-Packard	8481H	SPB	07/23/2004	24 mo		
Signal Generator	Hewlett Packard	8341B	TGN	02/07/2005	13 mo		

#### **Test Description**

Requirement: Per 47 CFR 15.247(b)(3), the maximum peak output power must not exceed 1 Watt.

<u>Configuration</u>: The peak output power was measured with the EUT set to low, medium, and high transmit frequencies. The EUT was transmitting at its maximum output power. The data rate of the radio was varied to determine the level that produced the highest output power.

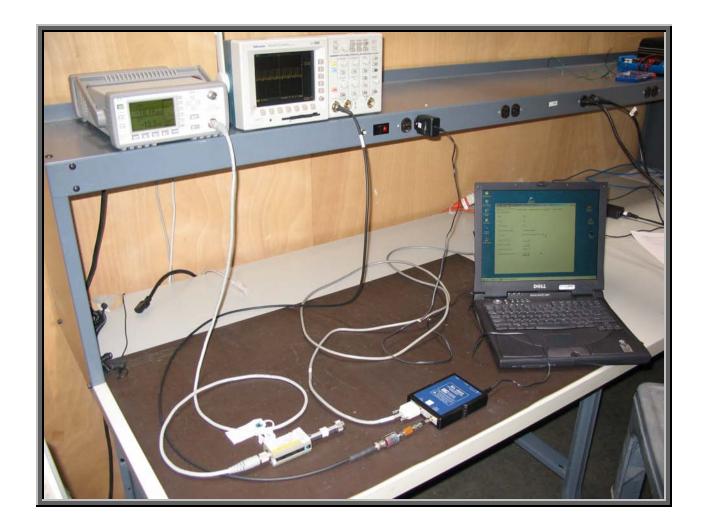
The measurement was made using a direct connection between the RF output of the EUT and a RF detector diode. The DC output of the diode was measured with the oscilloscope. The signal generator, tuned to the transmit frequency, was then substituted for the EUT. The CW output of the signal generator was adjusted until the DC output of the RF detector diode match the peak level produced when connected to the EUT. To further reduce measurement error, the power meter and sensor were then used to measure the output power level of the signal generator.

De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36dBm.



NORTHWEST		OLITBUT	DOWED				
<b>EMC</b>		OUTPUT	POWER			Rev BETA 01/30/01	
EUT	: SEL-3022				Work Orde	r: SCHW0048	
Serial Number	75				Dat	e: 05/25/05	
Customer	: Schweitzer Engineering Labora	weitzer Engineering Laboratories				e: 21°C	
Attendees	: None		Tested by:	Rod Peloquin	Humidit	y: 36% RH	
Customer Ref. No.			Power:	120VAC/60Hz	Job Sit	e: EV06	
TEST SPECIFICATION							
	: 47 CFR 15.247(b)(3)	Year: 2005-04	Method:	FCC 97-114, ANSI C63	.4 Yea	r: 2003	
SAMPLE CALCULAT	TIONS						
ł							
ł							
COMMENTS							
EUT OPERATING MO							
•	•	ım output power. 802.11(b) modula	tion scheme.				
DEVIATIONS FROM	TEST STANDARD						
None							
REQUIREMENTS							
	lucted output power does not ex	ceed 1 Watt					
RESULTS			AMPLITUDE				
Pass	·	33.8 mW					
SIGNATURE							
Tested By	Rolly le Reling	<u> </u>					
DESCRIPTION OF TE	EST						

Frequency (MHz)	Power (mW)
2412	33.8
2437	31.1
2462	28.4



## **Band Edge Compliance**

Revision 10/1/03

#### **Justification**

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
High

#### **Operating Modes Investigated:**

Typical

#### **Data Rates Investigated:**

Maximum

#### **Output Power Setting(s) Investigated:**

Maximum

#### **Power Input Settings Investigated:**

120 VAC, 60 Hz.

Software\Firmware Applied During Test					
Exercise software	SEL-5809 Settings Software	Version	0.132.0.0		
Description					
The system was tested using standard operating production software to exercise the functions of the					
device during the testing. The software ran on the remote notebook PC and permitted channel selection.					

EUT and Peripherals					
Description	Manufacturer	Model/Part Number	Serial Number		
EUT- SEL-3022	Schweitzer Engineering Laboratories	SEL-3022	None		
AC Adapter	APX Technologies Inc.	SP10005	02425173		

Remote Equipment Outside of Test Setup Boundary						
Description	Manufacturer	Model/Part Number	Serial Number			
Notebook PC	Dell	Inspiron 2500	IS116			
Equipment isolated from the	Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary					



## **Band Edge Compliance**

Revision 10/1/03

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	2.0	No	EUT- SEL-3022	AC Adapter
Serial Cable	Yes	1.4	No	EUT- SEL-3022	Notebook PC

Measurement Equipment						
Description	Manufacturer	Model	Identifier	Last Cal	Interval	
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo	

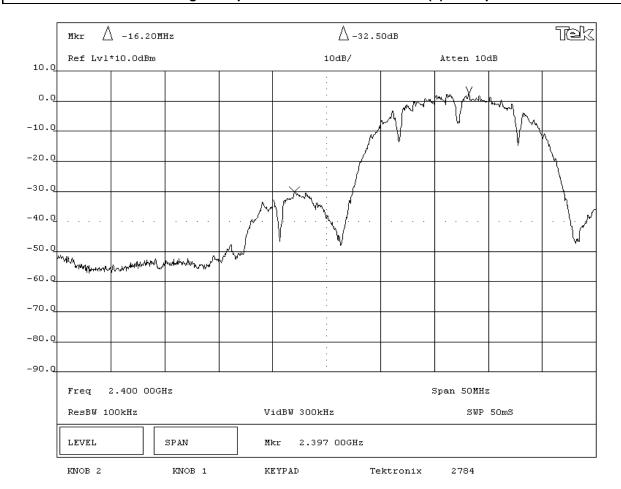
#### **Test Description**

**Requirement**: Per 47 CFR 15.247(d), in any 100 kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100 kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

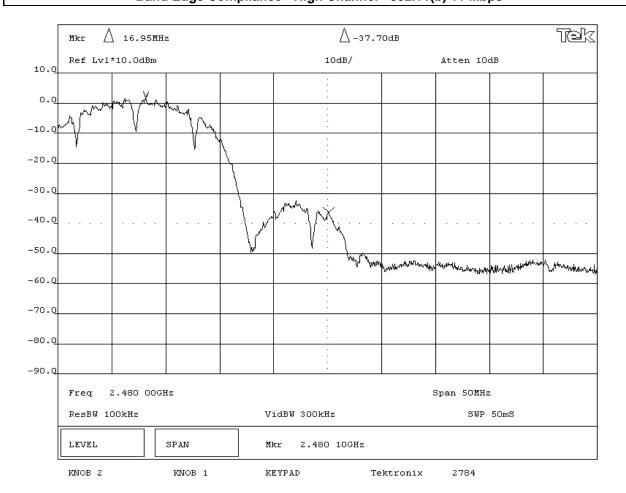
**Configuration**: The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation. The channels closest to the band edges were selected. The spectrum was scanned across each band edge from 25 MHz below the band edge to 25 MHz above the band edge.

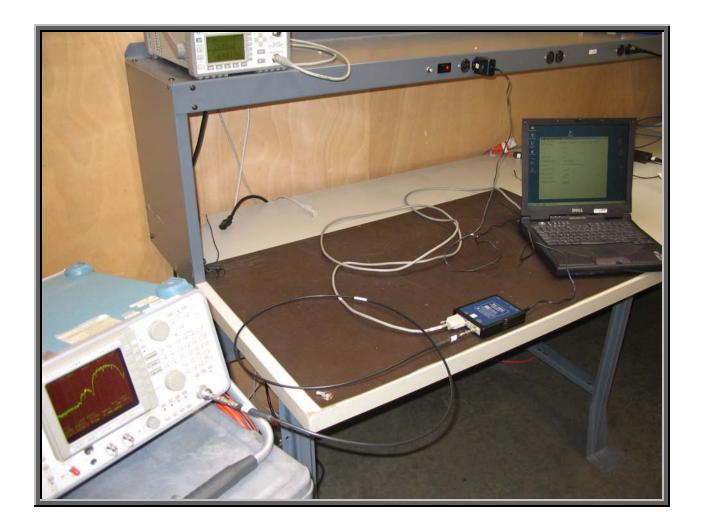
Rocky be Relenge

NORTHWEST EMC		BAND EDGE	COMPLIA	NCE		Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labora	tories			Temperature:	21°C
Attendees:	None	,			Humidity:	
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION						
	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.4	4 Year:	2003
SAMPLE CALCULATION	DNS					
COMMENTS  EUT OPERATING MOD  Modulated by PRBS at  DEVIATIONS FROM TE	maximum data rate, 802.11(b) r	modulation scheme				
None	ESI SIANDARD					
REQUIREMENTS						
	spurious emission at the edge	of the authorized band is 20 dB down	n from the fundamenta	l.		
RESULTS			AMPLITUDE			
Pass	- 32.7 dB					
SIGNATURE						
Tested By:	Rody to Felings					
DESCRIPTION OF TES	T					
	Band Edg	ge Compliance - Low	Channel - 80	02.11(b) 11 MI	bps	_



EMC		BAND EDGE	COMPLIA	NCE		Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labora	atories			Temperature:	21°C
Attendees:	None		Tested by:	Rod Peloquin	Humidity:	36% RH
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION	NS					
Specification:	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.	4 Year:	2003
COMMENTS						
EUT OPERATING MO	DES at maximum data rate, 802.11(b) ı	modulation scheme				
DEVIATIONS FROM T		modulation scheme				
None	EST STANDARD					
REQUIREMENTS						
Maximum level of any	spurious emission at the edge	of the authorized band is 20 dB dov	vn from the fundamenta	l.		
RESULTS			AMPLITUDE			
Pass			- 37.7 dB			
SIGNATURE  Tested By:	Poeling la Fielings					
DESCRIPTION OF TE	ST					
	Band Edd	ge Compliance - Hig	h Channel - 8	02.11(b) 11 M	bps	





## **Spurious Conducted Emissions**

Revision 10/1/03

#### **Justification**

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

### **Operating Modes Investigated:**

Typical

#### **Data Rates Investigated:**

Maximum

#### **Output Power Setting(s) Investigated:**

Maximum

#### **Power Input Settings Investigated:**

120 VAC, 60 Hz.

Frequency Range Investigated					
Start Frequency	30 MHz	Stop Frequency	25 GHz		

Software\Firmware Applied During Test							
Exercise software SEL-5809 Settings Software Version 0.132.0.0							
Description							
The system was tested using standard operating production software to exercise the functions of the							
device during the testing. The software ran on the remote notebook PC and permitted channel selection.							

EUT and Peripherals						
Description	Manufacturer	Model/Part Number	Serial Number			
EUT- SEL-3022	Schweitzer Engineering Laboratories	SEL-3022	None			
AC Adapter	APX Technologies Inc.	SP10005	02425173			



## **Spurious Conducted Emissions**

Revision 10/1/03

Remote Equipment Outside of Test Setup Boundary							
Description Manufacturer Model/Part Number Serial Number							
Notebook PC	Dell	Inspiron 2500	IS116				
Equipment isolated from the	Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary						

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	2.0	No	EUT- SEL-3022	AC Adapter
Serial Cable	Yes	1.4	No	EUT- SEL-3022	Notebook PC

Measurement Equipment							
Description	Manufacturer	Model	Identifier	Last Cal	Interval		
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo		

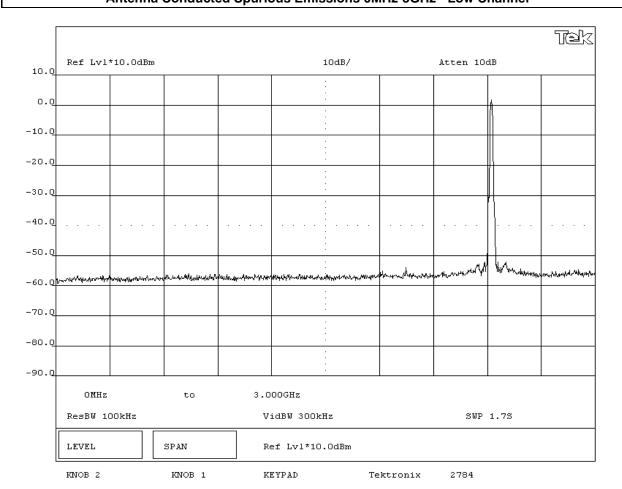
#### **Test Description**

**Requirement**: Per 47 CFR 15.247(d), in any 100 kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100 kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

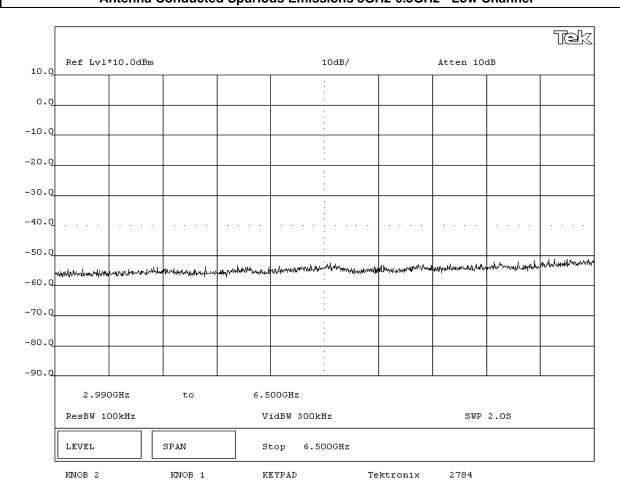
**Configuration**: The spurious RF conducted emissions were measured with the EUT set to low, medium, and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

Completed by:

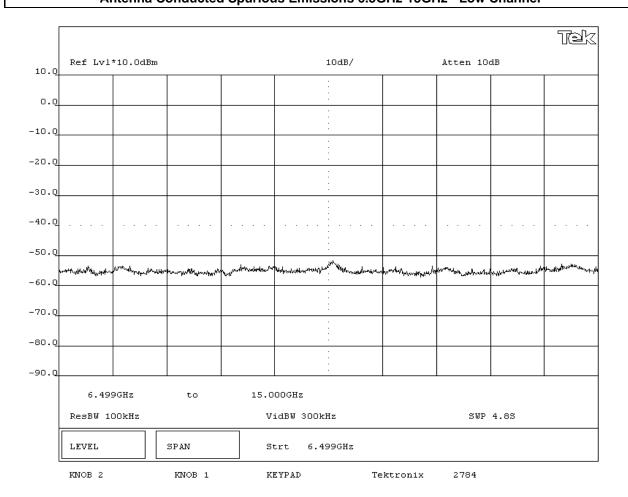
NORTHWEST EMC	SPL	JRIOUS CONE	OUCTED E	MISSIONS		Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labo	chweitzer Engineering Laboratories				21°C
Attendees:	None			Rod Peloquin	Humidity:	
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION						
Specification: SAMPLE CALCULATION	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.4	Year:	2003
EUT OPERATING MOD Modulated by PRBS at DEVIATIONS FROM TE	t maximum data rate, 802.11(b	) modulation scheme				
DEVIATIONS FROM TE	EST STANDARD					
REQUIREMENTS						
Maximum level of any	spurious emission outside of	the authorized band is 20 dB down	from the fundamental.			
RESULTS						
Pass						
SIGNATURE		<u> </u>				
Tested By:	Rochy la Reling	>				
DESCRIPTION OF TES	ST					
	Antenna Cor	ducted Spurious E	missions 0MHz	-3GHz - Low (	Channel	_



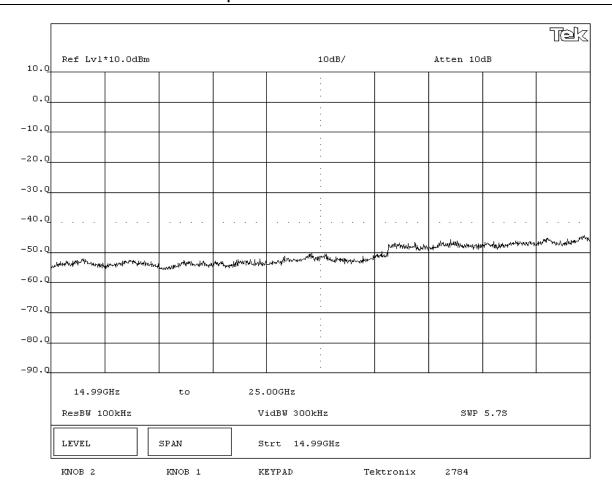
EMC	SPU	RIOUS CONE	DUCTED E	MISSIONS		Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labora	atories			Temperature:	21°C
Attendees:	None		Tested by:	Rod Peloquin	Humidity:	36% RH
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION	IS					
Specification:	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.4	Year:	2003
SAMPLE CALCULATION	ONS					
COMMENTS						
EUT OPERATING MO	DES					
Modulated by PRBS a	t maximum data rate, 802.11(b)	modulation scheme				
<b>DEVIATIONS FROM T</b>	EST STANDARD					
None						
REQUIREMENTS						
	spurious emission outside of the	he authorized band is 20 dB dow	n from the fundamental.			
RESULTS						
Pass						
SIGNATURE						
Tested By:	Poely le Reling	<u> </u>				
DESCRIPTION OF TE						
ĺ	Antenna Cond	ucted Spurious En	niesions 3GHz.	6 5GHz - I ow	Channel	



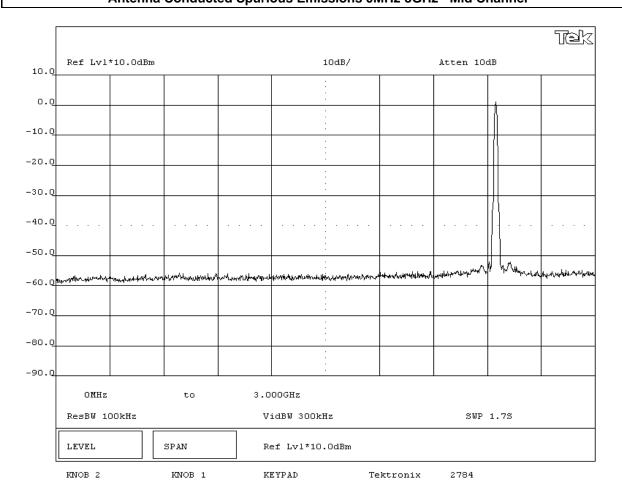
NORTHWEST EMC	SPU	JRIOUS CONE	OUCTED E	MISSIONS		Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labor	chweitzer Engineering Laboratories				21°C
Attendees:	None			Rod Peloquin	Humidity:	
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION						
Specification: SAMPLE CALCULATION	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.4	Year:	2003
EUT OPERATING MOD  Modulated by PRBS at  DEVIATIONS FROM TE	maximum data rate, 802.11(l	b) modulation scheme				
None						
REQUIREMENTS						
Maximum level of any	spurious emission outside o	f the authorized band is 20 dB dow	n from the fundamental.			
RESULTS						
Pass						
SIGNATURE						
Tested By:	Rochy la Reling	<u></u>				
DESCRIPTION OF TES	T.					
	Antenna Cond	ducted Spurious Em	issions 6.5GH:	z-15GHz - Low	Channel	_



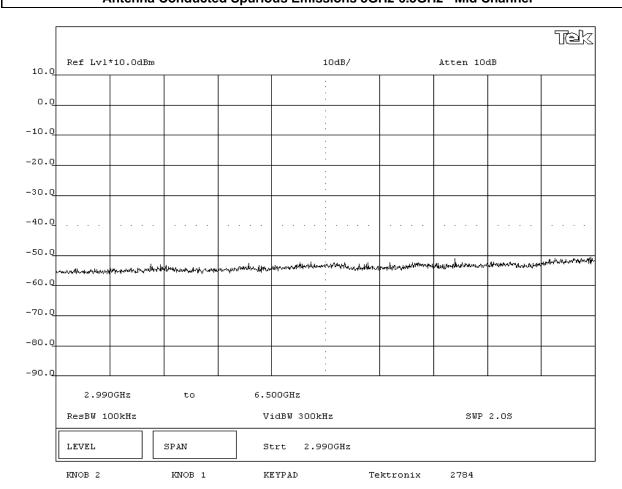
EMC	SPUF	RIOUS COND	UCTED E	MISSIONS	5	Rev BETA 01/30/01	
EUT:	SEL-3022				Work Order:	SCHW0048	
Serial Number:					Date:	05/25/05	
Customer:	Schweitzer Engineering Laborato	ories			Temperature:	21°C	
Attendees:	None		Tested by:	Rod Peloquin	Humidity:	36% RH	
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06	
TEST SPECIFICATION	s						
Specification:	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.	.4 Year:	2003	
SAMPLE CALCULATION	ONS						
COMMENTS							
EUT OPERATING MOD							
	maximum data rate, 802.11(b) mo	odulation scheme					
DEVIATIONS FROM TE	EST STANDARD						
None							
REQUIREMENTS		4 : 11 1: 00 15 1					
	spurious emission outside of the	authorized band is 20 dB down	from the fundamental.				
RESULTS							
Pass SIGNATURE							
	Rochy le Felings						
DESCRIPTION OF TES	T						
	Antenna Conducted Spurious Emissions 15GHz - 25GHz - Low Channel						



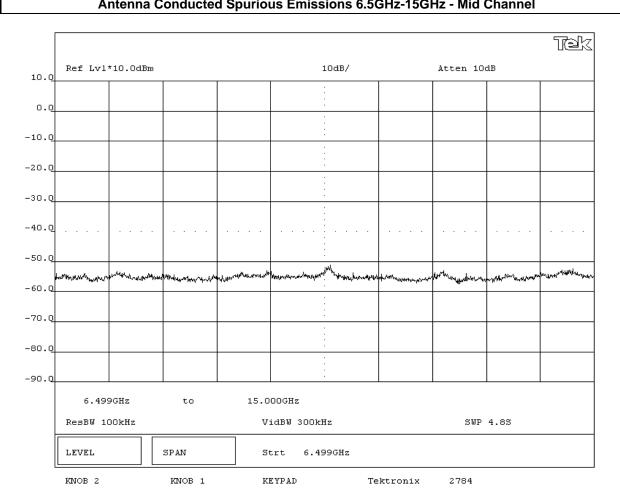
NORTHWEST EMC	SPU	JRIOUS CONE	OUCTED E	MISSIONS		Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labor	chweitzer Engineering Laboratories				21°C
Attendees:	None			Rod Peloquin	Humidity:	
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION						
Specification: SAMPLE CALCULATION	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.4	Year:	2003
EUT OPERATING MOD Modulated by PRBS at DEVIATIONS FROM TE	maximum data rate, 802.11(l	o) modulation scheme				
None						
REQUIREMENTS						
Maximum level of any	spurious emission outside o	f the authorized band is 20 dB dow	n from the fundamental.			
RESULTS						
Pass						
SIGNATURE  Tested By:	Rochy la Feling	<u> </u>				
DESCRIPTION OF TES	T					
	Antenna Co	nducted Spurious E	missions 0MH	z-3GHz - Mid (	Channel	



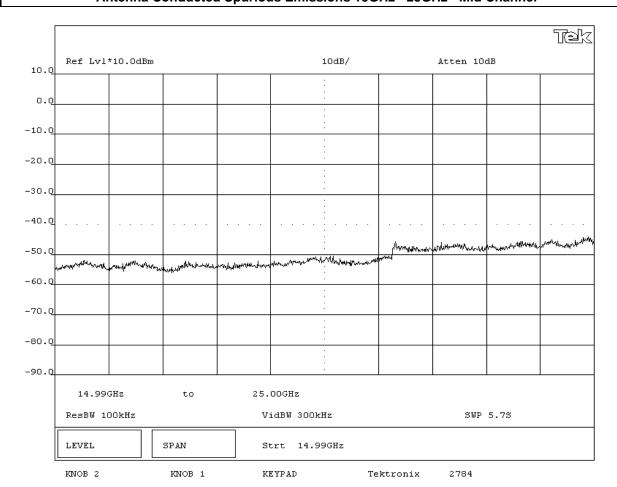
EMC	SPU	RIOUS COND	UCTED EI	MISSIONS	5	Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labora	tories			Temperature:	21°C
Attendees:	None		Tested by:	Rod Peloquin	Humidity:	36% RH
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION	NS					
Specification:	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63	.4 Year:	2003
SAMPLE CALCULATION	ons					
COMMENTS  EUT OPERATING MO						
	t maximum data rate, 802.11(b) n	nodulation scheme				
DEVIATIONS FROM T	EST STANDARD					
None						
REQUIREMENTS						
	spurious emission outside of th	e authorized band is 20 dB down	from the fundamental.			
RESULTS						
Pass						
SIGNATURE  Tested By:	Roeling le Felings					
DESCRIPTION OF TES						
ĺ	Antenna Cond	ucted Shurious Fm	iccione 3GHz	-6 5GHz - Mid	l Channel	



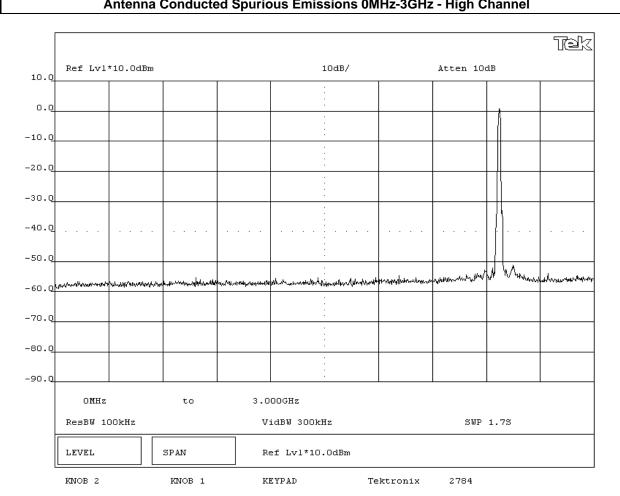
NORTHWEST	OBLIE	NOUS SONDI	IATED E	MODIONIC		
<b>EMC</b>	SPUR	RIOUS CONDL	ICTED EI	MISSIONS	<b>S</b>	Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Laborato	pries			Temperature:	21°C
Attendees:	None		Tested by:	Rod Peloquin	Humidity:	36% RH
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION						
Specification:	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.	.4 Year:	2003
SAMPLE CALCULATION	ONS					
COMMENTS						
EUT OPERATING MOI						
	t maximum data rate, 802.11(b) mo	odulation scheme				
DEVIATIONS FROM T	EST STANDARD					
None						
REQUIREMENTS		4 . 11 1: 00 10 1	4 6 1 61			
	spurious emission outside of the	authorized band is 20 dB down fro	om the fundamental.			
RESULTS						
Pass						
SIGNATURE	1 - 2					
	Rody la Relenge					
	The state of the s					
Tested By:						
DESCRIPTION OF TES						
	Antenna Conduc	cted Spurious Emis	sions 6.5GH	z-15GHz - Mid	d Channel	ļ.



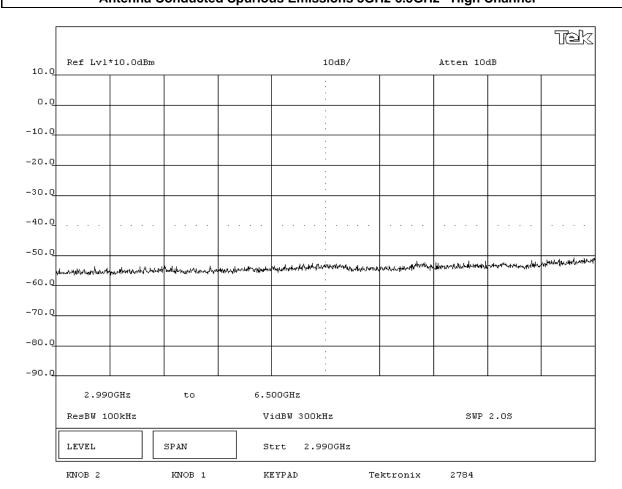
NORTHWEST EMC	SPUF	RIOUS CONDL	JCTED EI	MISSIONS	5	Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Laborato	ries			Temperature:	21°C
Attendees:	None Tested by: Rod Peloquin			Humidity:		
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION						
Specification: SAMPLE CALCULATION	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63.	.4 Year:	2003
EUT OPERATING MOD Modulated by PRBS at DEVIATIONS FROM TE None	maximum data rate, 802.11(b) mo	odulation scheme				
REQUIREMENTS						
	spurious emission outside of the	authorized band is 20 dB down fro	om the fundamental.			
RESULTS	<u> </u>					
Pass						
SIGNATURE  Tested By:	Rochy le Reling					
DESCRIPTION OF TES	T					
	Antenna Conduc	ted Spurious Emis	sions 15GHz	- 25GHz - Mi	d Channel	



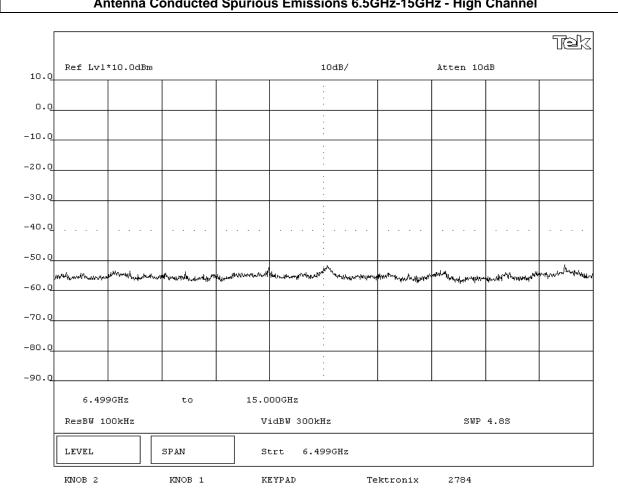
	UNIOUS COND	UCTED EMISSIONS		Rev BET. 01/30/01
EUT: SEL-3022	Work Order:			
Serial Number:				05/25/05
Customer: Schweitzer Engineering L	Temperature:			
Attendees: None				36% RH
Customer Ref. No.:				EV06
EST SPECIFICATIONS				1
Specification: FCC Part 15.247(d)	Year: 2005-04	Method: FCC 97-114, ANSI C63.	4 Year:	2003
UT OPERATING MODES odulated by PRBS at maximum data rate, 802.1	1(b) modulation scheme			
DEVIATIONS FROM TEST STANDARD	T(b) modulation solicine			
Vone				
REQUIREMENTS				
Maximum level of any spurious emission outside	e of the authorized band is 20 dB down	from the fundamental.		
RESULTS				
Pass				
SIGNATURE				
Poeling les Poling Tested By:	<u> </u>			
DESCRIPTION OF TEST				
Antonno C	andusted Churious Em	nissions OMHz-3GHz - High	Channal	•



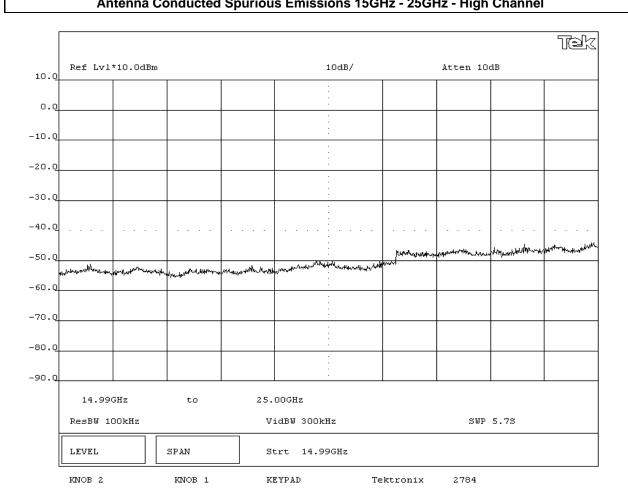
EMC	SPU	RIOUS COND	UCTED EI	MISSIONS	5	Rev BETA 01/30/01
EUT:	SEL-3022				Work Order:	SCHW0048
Serial Number:					Date:	05/25/05
Customer:	Schweitzer Engineering Labora	tories			Temperature:	21°C
Attendees:	None		Tested by:	Rod Peloquin	Humidity:	36% RH
Customer Ref. No.:			Power:	120VAC/60Hz	Job Site:	EV06
TEST SPECIFICATION	NS					
Specification:	FCC Part 15.247(d)	Year: 2005-04	Method:	FCC 97-114, ANSI C63	.4 Year:	2003
SAMPLE CALCULATI	ONS					
COMMENTS  EUT OPERATING MO						
	t maximum data rate, 802.11(b) r	nodulation scheme				
DEVIATIONS FROM T	EST STANDARD					
REQUIREMENTS						
	spurious emission outside of th	e authorized band is 20 dB down	from the fundamental			
RESULTS	spurious emission outside of th	le authorized band is 20 db down	Tom the fundamental.			
Pass						
SIGNATURE						
Tested By:	Poely le Relings					
DESCRIPTION OF TE	ST					
	Antenna Condi	icted Spurious Emi	esions 3GHz-	6 5GHz - High	Channel	



EMC SPURIOUS CONDUCTED EMISSIONS  REV BETA 01/30/01							
EUT:	SEL-3022			Work Order:	SCHW0048		
Serial Number:				Date:	05/25/05		
Customer:	Schweitzer Engineering Laborate	ories		Temperature:			
Attendees:	None		Tested by: Rod Peloquin	Humidity:			
Customer Ref. No.:			Power: 120VAC/60Hz	Job Site:	EV06		
TEST SPECIFICATION					1		
Specification: SAMPLE CALCULATION	FCC Part 15.247(d)	Year: 2005-04	Method: FCC 97-114, ANSI C63.	4 Year:	2003		
COMMENTS							
COMMENTS							
EUT OPERATING MOD	DES						
Modulated by PRBS at	t maximum data rate, 802.11(b) m	odulation scheme					
<b>DEVIATIONS FROM TI</b>	EST STANDARD						
None							
REQUIREMENTS							
	spurious emission outside of the	e authorized band is 20 dB dow	n from the fundamental.				
RESULTS							
Pass SIGNATURE							
Rocky le Frelings Tested By:							
DESCRIPTION OF TES	ST .						
Antenna Conducted Spurious Emissions 6.5GHz-15GHz - High Channel							



EMC SPURIOUS CONDUCTED EMISSIONS Rev BETA O1/20/01								
EUT:	SEL-3022			Work Order:	SCHW0048			
Serial Number:				Date:	05/25/05			
Customer:	Schweitzer Engineering Laborat	ories		Temperature:				
Attendees:	None		Tested by: Rod Peloquin	Humidity:				
Customer Ref. No.:			Power: 120VAC/60Hz	Job Site:	EV06			
TEST SPECIFICATION					1			
Specification: SAMPLE CALCULATION	FCC Part 15.247(d)	Year: 2005-04	Method: FCC 97-114, ANSI C63.	4 Year:	2003			
COMMENTS								
COMMENTS								
EUT OPERATING MOD	DES							
Modulated by PRBS at	t maximum data rate, 802.11(b) m	odulation scheme						
<b>DEVIATIONS FROM TI</b>	EST STANDARD							
None								
REQUIREMENTS								
	spurious emission outside of the	e authorized band is 20 dB dow	n from the fundamental.					
RESULTS								
Pass SIGNATURE								
Rocky le Fielings Tested By:								
DESCRIPTION OF TES	ST .							
Antenna Conducted Spurious Emissions 15GHz - 25GHz - High Channel								





# **Power Spectral Density**

Revision 10/1/03

02425173

#### **Justification**

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:
Low
Mid
High

### **Operating Modes Investigated:**

Typical

#### **Data Rates Investigated:**

Maximum

#### **Output Power Setting(s) Investigated:**

Maximum

AC Adapter

#### **Power Input Settings Investigated:**

APX Technologies Inc.

120 VAC, 60 Hz.

Software\Firmware Applied During Test						
Exercise software	SEL-5809 Settings Software	Version	0.132.0.0			
Description						
The system was tested using standard operating production software to exercise the functions of the device during the testing. The software ran on the remote notebook PC and permitted channel selection.						

EUT and Peripherals							
Description	Manufacturer	Model/Part Number	Serial Number				
EUT- SEL-3022	Schweitzer Engineering Laboratories	SEL-3022	none				

SP10005

Remote Equipment Outside of Test Setup Boundary					
Description Manufacturer Model/Part Number Serial Number					
Notebook PC	Dell	Inspiron 2500	IS116		
Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary					

## **Power Spectral Density**

Revision 10/1/03

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	2.0	No	EUT- SEL-3022	AC Adapter
Serial Cable	Yes	1.4	No	EUT- SEL-3022	Notebook PC

Measurement Equipment						
Description Manufacturer Model Identifier Last Cal Interval						
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo	

#### **Test Description**

**Requirement**: Per 47 CFR 15.247(e), the peak power spectral density conducted from the antenna port of a direct sequence transmitter must not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission.

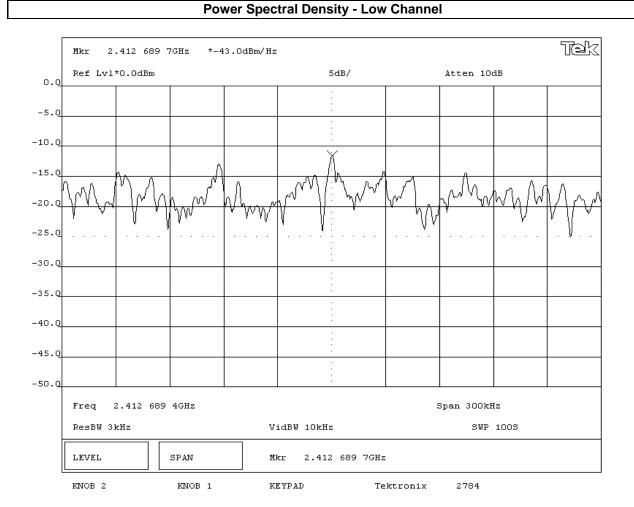
**Configuration**: The peak power spectral density measurements were measured with the EUT set to low, mid, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate using direct sequence modulation. Per the procedure outlined in FCC 97-114, the spectrum analyzer was used as follows:

The emission peak(s) were located and zoom in on within the passband. The resolution bandwidth was set to 3 kHz, the video bandwidth was set to greater than or equal to the resolution bandwidth. The sweep speed was set equal to the span divided by 3 kHz (sweep = (SPAN/3 kHz)). For example, given a span of 1.5 MHz, the sweep should be  $1.5 \times 10^6 \div 3 \times 10^3 = 500$  seconds. External attenuation was used and added to the reading. The following FCC procedure was used for modifying the power spectral density measurements:

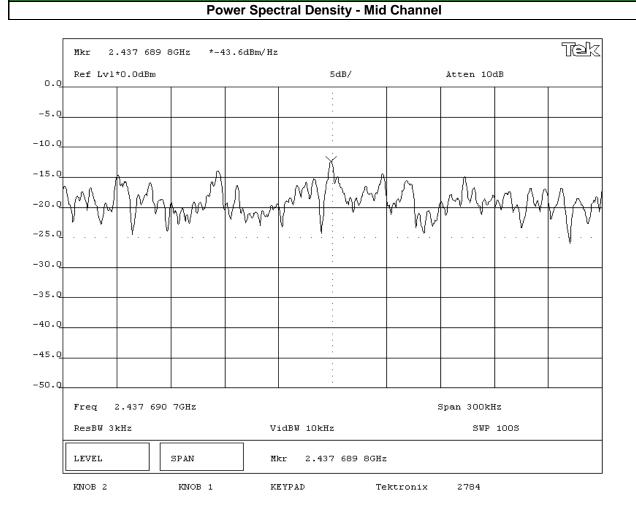
"If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 34.8 dB for correction to 3 kHz."

Rochy be Releys

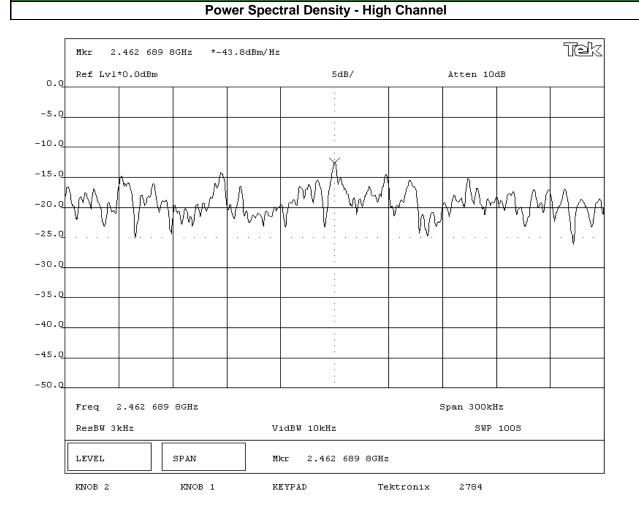
EMC POWER SPE	CTRAL DE	VSITY		Rev BETA 01/30/01	
EUT: SEL-3022			Work Order:	SCHW0048	
Serial Number:			Date:	05/25/05	
Customer: Schweitzer Engineering Laboratories	Customer: Schweitzer Engineering Laboratories				
Attendees: None Tested by: Rod Peloquin			Humidity:	36% RH	
Customer Ref. No.:	Power:	120VAC/60Hz	Job Site:	EV06	
TEST SPECIFICATIONS					
Specification: FCC Part 15.247(e) Year: 2005-04	Method:	FCC 97-114, ANSI C63.4	4 Year:	2003	
SAMPLE CALCULATIONS					
Meter reading on spectrum analyzer is internally compensated for cable loss and ex					
Power Spectral Density per 3kHz bandwidth = Power Spectral Density per 1 Hz band	width + Bandwidth Correction	n Factor.			
Bandwidth Correction Factor = 10*log(3 kHz / 1 Hz) = 34.8 dB					
COMMENTS					
EUT OPERATING MODES					
Modulated by PRBS at maximum data rate, 802.11(b) modulation scheme					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum peak power spectral density conducted from a DSSS transmitter does not		pand			
RESULTS	Amplitude				
Pass Power Spectral Density = -8.2 dBm / 3kHz					
SIGNATURE					
Rocky be Freleys					
DESCRIPTION OF TEST					



EMC	POWE	ER SPECT	TRAL DE	NSITY		Rev BETA 01/30/01		
	SEL-3022				Work Order:	SCHW0048		
Serial Number:					Date:	05/25/05		
Customer:	Schweitzer Engineering Laboratories				Temperature:	21°C		
Attendees:	None		Tested by:	Rod Peloquin	Humidity	36% RH		
Customer Ref. No.:					Job Site:	EV06		
TEST SPECIFICATION	IS							
Specification:	FCC Part 15.247(e) Year:	2005-04	Method:	FCC 97-114, ANSI C63	3.4 Year:	2003		
SAMPLE CALCULATION	ONS							
Meter reading on spec	trum analyzer is internally compensated for o	cable loss and external	attenuation.					
Power Spectral Densi	ty per 3kHz bandwidth = Power Spectral Dens	sity per 1 Hz bandwidth	+ Bandwidth Correction	on Factor.				
<b>Bandwidth Correction</b>	Factor = 10*log(3 kHz / 1 Hz) = 34.8 dB							
COMMENTS								
<b>EUT OPERATING MO</b>	DES							
Modulated by PRBS a	t maximum data rate, 802.11(b) modulation so	cheme						
<b>DEVIATIONS FROM T</b>	EST STANDARD							
None								
REQUIREMENTS								
Maximum peak power	spectral density conducted from a DSSS tran	nsmitter does not exce	ed 8 dBm in any 3 kHz	band				
RESULTS			Amplitude					
Pass	Pass Power Spectral Density = -8.8 dBm / 3kHz							
SIGNATURE								
Tested By:	Roly le Reling							
DESCRIPTION OF TES	ST							



	<b>POWER SPEC</b>	TRAL DE	NSITY		Rev BETA 01/30/01	
: SEL-3022				Work Order:	SCHW0048	
*				Date:	05/25/05	
: Schweitzer Engineering Labo	oratories			Temperature:	21°C	
: None		Tested by:	Rod Peloquin	Humidity:	36% RH	
:	Power: 120VAC/60Hz			Job Site:	EV06	
NS						
: FCC Part 15.247(e)	Year: 2005-04	Method:	FCC 97-114, ANSI C63	.4 Year:	2003	
IONS						
ectrum analyzer is internally co	mpensated for cable loss and externa	al attenuation.				
ity per 3kHz bandwidth = Powe	er Spectral Density per 1 Hz bandwidt	h + Bandwidth Correction	on Factor.			
n Factor = 10*log(3 kHz / 1 Hz)	= 34.8 dB					
at maximum data rate, 802.11(b	o) modulation scheme					
TEST STANDARD						
er spectral density conducted f	rom a DSSS transmitter does not exce	eed 8 dBm in any 3 kHz	band			
		Amplitude				
Pass Power Spectral Density = -9.0 dBm / 3kHz						
-						
	: None : PS : FCC Part 15.247(e) : FCC Part 15.247(e) : FCC Part 15.247(e) : IONS : Sectrum analyzer is internally co- sity per 3kHz bandwidth = Powe in Factor = 10°log(3 kHz / 1 Hz)  DDES at maximum data rate, 802.11(b	SEL-3022  Schweitzer Engineering Laboratories  None  FCC Part 15.247(e)  Year: 2005-04  IONS  Setrum analyzer is internally compensated for cable loss and externally per skylet bandwidth = Power Spectral Density per 1 Hz bandwidth in Factor = 10*log(3 kHz / 1 Hz) = 34.8 dB  DDES  at maximum data rate, 802.11(b) modulation scheme  TEST STANDARD  Ser spectral density conducted from a DSSS transmitter does not exceed the standard of the standard	SEL-3022  Schweitzer Engineering Laboratories  None  Tested by: Power:  Power:  SEC Part 15.247(e)  Year: 2005-04  Method:  IONS  Sectrum analyzer is internally compensated for cable loss and external attenuation.  Sity per 3kHz bandwidth = Power Spectral Density per 1 Hz bandwidth + Bandwidth Correction  Factor = 10*log(3 kHz / 1 Hz) = 34.8 dB  DDES  at maximum data rate, 802.11(b) modulation scheme  TEST STANDARD  Per spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz  Amplitude  Power Spectral Density  Power Spectr	Schweitzer Engineering Laboratories  Schweitzer Engineering Laboratories  None  Power: 120VAC/60Hz  NS  FCC Part 15.247(e)  Year: 2005-04  Method: FCC 97-114, ANSI C63  IONS  Setrum analyzer is internally compensated for cable loss and external attenuation.  Sity per 3kHz bandwidth = Power Spectral Density per 1 Hz bandwidth + Bandwidth Correction Factor.  In Factor = 10*log(3 kHz / 1 Hz) = 34.8 dB  DDES  at maximum data rate, 802.11(b) modulation scheme  IEST STANDARD  Prespectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band  Amplitude  Power Spectral Density = -9.0 dBm / 3kHz   Abdy W. Refuy.  Part Standard  Power Spectral Density = -9.0 dBm / 3kHz	SEL-3022 Work Order:  Schweitzer Engineering Laboratories Temperature:  None Tested by: Rod Peloquin Humidity:  Power: 120VAC/60Hz Job Site:  NS  FCC Part 15.247(e) Year: 2005-04 Method: FCC 97-114, ANSI C63.4 Year:  IONS  Schrum analyzer is internally compensated for cable loss and external attenuation. Sity per 3kHz bandwidth = Power Spectral Density per 1 Hz bandwidth + Bandwidth Correction Factor. In Factor = 10*log(3 kHz / 1 Hz) = 34.8 dB  DDES  at maximum data rate, 802.11(b) modulation scheme  TEST STANDARD  Power Spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band  Amplitude  Power Spectral Density = -9.0 dBm / 3kHz  Add Amplitude  Power Spectral Density = -9.0 dBm / 3kHz	





## **Spurious Radiated Emissions**

Revision 10/1/03

#### **Justification**

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:	
Low	
Mid	
High	

#### **Operating Modes Investigated:**

Typical

#### Antennas Investigated:

Omni Antenna: Antenex TRAB24003
Whip Antenna: Mobile Mark PSKN-2400

### **Data Rates Investigated:**

Maximum

#### **Output Power Setting(s) Investigated:**

Maximum

### **Power Input Settings Investigated:**

120 VAC, 60 Hz.

Frequency Range Invest	gated		
Start Frequency	30 MHz	Stop Frequency	26 GHz

Software\Firmware Appl	lied During Test		
Exercise software	SEL-5809 Settings Software	Version	0.132.0.0
Description			

The system was tested using standard operating production software to exercise the functions of the device during the testing. The software ran on the remote notebook PC and permitted channel selection.



<b>EUT and Periphe</b>	rals		
Description	Manufacturer	Model/Part Number	Serial Number
EUT- SEL-3022	Schweitzer Engineering Laboratories	SEL-3022	N/A
AC Adapter	APX Technologies Inc.	SPU10-102	N/A
Whip Antenna	Mobile Mark	PSKN-2400	N/A
Omni Antenna	Antenex	TRAB24003	N/A

Remote Equipment C	Outside of Test Setup B	oundary	
Description	Manufacturer	Model/Part Number	Serial Number
Notebook PC	Dell	Inspiron 8000	IS115
Equipment isolated from the	EUT so as not to contribute to the	e measurement result is considered to be outs	side the test setup boundary

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Input	No	1.0	No	EUT- SEL-3022	Unterminated
Alarm Leads	No	1.0	No	EUT- SEL-3022	Unterminated
Serial Cables	Yes	5.0	No	EUT- SEL-3022	Notebook PC
DC Leads	No	1.4	No	EUT- SEL-3022	AC Adapter
Antenna	Yes	1.0	No	EUT- SEL-3022	Omni Antenna

Measurement Equipr	nent				
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Attenuator	Coaxicom	66702 5910-20	RBJ	02/25/2005	13 mo
High Pass Filter	Micro-Tronics	HPM50111	HFO	03/09/2005	13 mo
Antenna, Horn	EMCO	3160-09	AHG	NCR	NA
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	02/15/2005	13 mo
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/02/2004	13 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	12/02/2004	13 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/02/2004	13 mo
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	05/05/2005	3 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	03/01/2005	13 mo
Antenna, Biconilog	EMCO	3141	AXE	12/03/2003	24 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	02/17/2005	13 mo
Antenna, Horn	EMCO	3160-08	AHK	NCR	NA

## **Spurious Radiated Emissions**

Revision 10/1/03

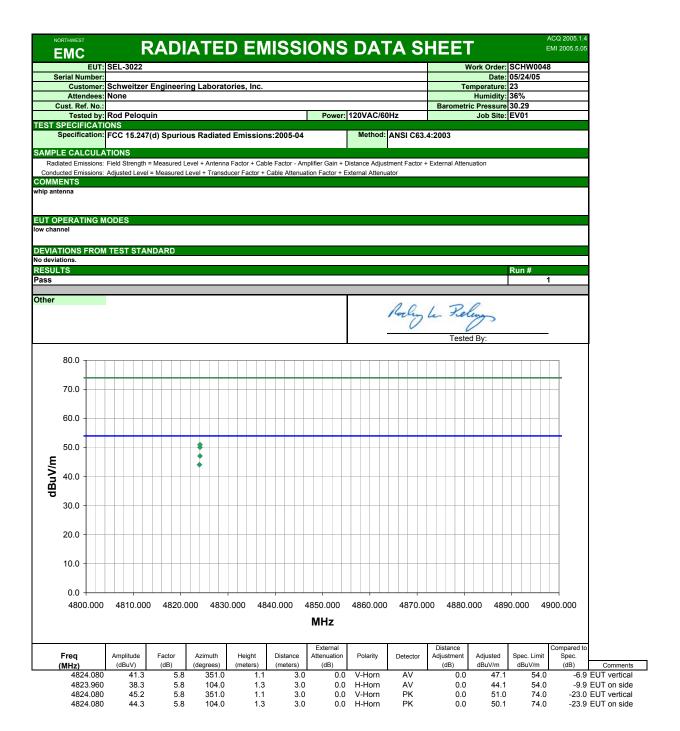
#### **Test Description**

**Requirement:** The field strength of any spurious emissions or modulation products that fall in a restricted band, as defined in 47 CFR 15.205, is measured. The peak level must comply with the limits specified in 47 CFR 15.35(b). The average level (taken with a 10Hz VBW) must comply with the limits specified in 15.209.

**Configuration**: The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis, and adjusting the measurement antenna height and polarization (per ANSI C63.4:2003). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Bandwidths Used for Mea	surements		
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 ma	ade using the bandwidths	and detectors specified. No	video filter was used.

Holy Aling



NORTHWEST EMC	F	RADI	ATE	D EN	<b>IISS</b>	IONS	DA	TA S	HEET				ACQ 2005.1.4 MI 2005.5.0
	: SEL-3022									ork Order:	SCHV	V0048	
Serial Number									***		05/24		
	: Schweitzer	Fngineeri	ng Lahorat	ories Inc					Tel	mperature:		,00	
Attendees		Liigiiicciii	ng Laborat	.01100, 1110.					10.	Humidity:			
Cust. Ref. No.									Barometri				
	: Rod Peloqu	ıin				Power:	120VAC/6	0Hz		Job Site:	EV01		
ST SPECIFICAT						1 011011		VIII.		COD CITO			
	FCC 15.247	(d) Spurio	us Radiate	d Emissio	ns:2005-04		Method	ANSI C63	.4:2003				
MPLE CALCUL	ATIONS												
Radiated Emission:	s: Field Strength :	= Measured L	evel + Antenna	a Factor + Cat	ole Factor - An	nplifier Gain + D	istance Adjus	stment Factor +	External Attenu	ation			
Conducted Emissions	s: Adjusted Level	= Measured L	_evel + Transo	lucer Factor +	Cable Attenua	ation Factor + E	xternal Attenu	ıator					
DMMENTS p antenna													
OPERATING Channel	MODES												
		NDAPD											
VIATIONS FRO deviations. SULTS	MILOISIA	VDAND											
SULTS											Run #	<b>#</b>	
ss												2	
ner								Rocky	Le Red	d By:			
80.0													
70.0													
0.0													
60.0													
50.0													
	•												
40.0													
30.0													
30.0													
20.0													_
10.0													
0.0													<b>⊣</b>
0.000	5000.000	10000.0	00 1500	00.000	20000.000	25000.0	000 300	000.000	35000.000	40000	.000	450	00.000
	1	ı			1	External		1	Distance		I	1	Compared to
Freq	Amplitude	Factor	Azimuth	Height	Distance	Attenuation	Polarity	Detector	Adjustment	Adjusted	Spec.		Spec.
(MHz)	(dBuV)	(dB)	(degrees)	(meters)	(meters)	(dB)	, ·		(dB)	dBuV/m	dBu'		(dB)
4924.000	0 41.6	6.3	8.0	1.3	3.0	0.0	H-Horn	AV	0.0	47.9		54.0	-6.1
4924.00	0 37.8	6.3	3.0	1.1	3.0	0.0	V-Horn	AV	0.0	44.1		54.0	-9.9
4924.00		6.3	8.0	1.3			H-Horn	PK	0.0	51.5		74.0	-22.5
4924.000	0 44.3	6.3	3.0	1.1	3.0	0.0	V-Horn	PK	0.0	50.6		74.0	-23.4

	HWEST MC	F	RADI	ATE	D EN	IISSI	IONS	DA'	TA S	HEET	-		ACQ 2005.1.4 EMI 2005.5.05
		SEL-3022		<i>-</i> —							ork Order	lecuw.	0049
Seri	ial Number									V		05/24/0	
		: Schweitzer	Engineeri	ng Labora	tories, Inc.					Te	mperature		
	Attendees										Humidity		
Cus	st. Ref. No.	: Rod Peloqu	ulm				Dawari	120VAC/6	enu-	Barometri	c Pressure		
TEST SP	ECIFICAT		J111				Power:	120VAC/	OUNZ		Job Site:	EVUI	
		FCC 15.247	(d) Spurio	us Radiate	d Emission	ns:2005-04		Method	: ANSI C63	4:2003			
OAMBLE	OAL OUL	ATIONO											
	CALCUL ed Emissions	s: Field Strength	= Measured L	evel + Antenn	a Factor + Cah	le Factor - Am	nlifier Gain + D	istance Adius	stment Factor +	- External Attenu	ation		
		s: Adjusted Level											
COMMEN													
whip anten	na												
	RATING	MODES											
high chann	eı												
DEVIATION	ONS FRO	M TEST STA	NDARD										
No deviatio	ns.												
RESULTS	S											Run#	2
Pass												_	3
Other													
l									Roclin	he Res	ena		
									0	/	1		
										Teste	d By:		
80.0 -													
70.0 -													
70.0 -													
60.0 -													
F0.0		•											
50.0 -		•											
	Г	•											
40.0 -													
30.0 -													
20.0 -													
_0.0													
10.0 -													+
0.0 -													
0.0	000	5000.000	10000.0	00 150	00.000	20000.000	25000.0	) ) ) )	000.000	35000.000	40000	000	45000.000
0.0	,,,,	5000.000	10000.0	00 100	00.000	_0000.000	23000.0	JUU 30		55000.000	+0000	.000	-5000.000
		1 1	1		l	l	External	1	1	Distance		1	Compared to
	req	Amplitude	Factor	Azimuth	Height	Distance	Attenuation	Polarity	Detector	Adjustment	Adjusted	Spec. Li	mit Spec.
(M	1Hz)	(dBuV)	(dB)	(degrees)	(meters)	(meters)	(dB)	LI Haw	A\/	(dB)	dBuV/m	dBuV/i	
	4874.023 4874.023		6.0 6.0	-3.0 350.0	1.1 1.2	3.0 3.0		H-Horn V-Horn	AV AV	0.0 0.0	48.1 45.5		4.0 -5.9 4.0 -8.5
			6.0	350.0	1.2	3.0			PK	0.0	51.6		4.0 -22.4
	4874.023		6.0	-3.0	1.1	3.0			PK	0.0	51.2		4.0 -22.8

### Case   Section   Adjusted   Factor   Case   Fa	NORTH					R/	۱D	IA	П	= [	) E	ΞN	115	SS		10	NS	C	)A	ТΑ	S	HE	E	_			ACQ 2005.1.4 EMI A2.13	
Serial Number:   Customer   Schweltzer Engineering Laboratories, Inc.   Temperature   23	LIV		EUT.	le E I										_											ISCH	WOO	10	
Costsome   Schweltzer Engineering Laboratories, Inc.   Temperature   23	Seria			SEL.	JU22	•																						1
Attendees   None				Schv	veitz	er En	ainee	rina	Labo	rato	ries.	Inc.											Te					1
Tested By:   Baronetic Press   30.29							<u>g</u>	<u></u>			,																	1
Translation by   Noting Ashinane had   Power   120VAC600Hz   Job Site   EV01   SIST SECRIFICATIONS   Specifications   FCC 15.247(d) Spurious Radiated Emissions:2004   Method:   ANSI C63.4:2003   M																						Bai	ometr			9		
Method: ANSI C63.4:2003   Method: ANSI C63					/ Ash	nkann	ejhac	đ								Po	ower:	120	VAC/	0Hz				Job Site:	EV0	1		
MPLE CALCULATIONS   Radiased Emissions: Fall Strength = Measured Level + Antenna Factor + Cable Factor + Amplifier Gain + Distance Adjustment Factor + External Attenuation Conducted Emissions, Ends Strength   Measured Level + Transducer Factor + Cable Administral Factor + External Attenuation   Modes																												
Radiated Christones: Field Strength - Measured Level + Anteriors Facior + Carlor Attenuation Facior + External Attenuator						47(d)	Spur	ious	Radi	ated	l Emi	oies	าร:20	004				N	Method	: ANS	II C63	3.4:200	3					
Conducted Consistence   Algebrate Level + Transactioner Factor + Cabbre Attenuation Factor + External Attenuator	AMPLE (	CALC	CULA	TION	S	th = Mo	0011504	d Louis	I Ant		Footor	. Cob	lo Foo	tor A	mali	fior C	oin I F	lieton	oo Adiu	tmont [	ootor	LEutomo	I Attoni	uation				
Tested By:																					-actor -	+ Externa	ii Attent	lation				
Charmon   Char	OMMEN hip antenn	TS na																										
Sult   S	JT OPEF	RATII	NG I	ИODE	S																							
Run #			RON	/ TES	т ѕт	AND	ARD																					
A	deviation	ıs.																										
## Programment   Height   Height   Medical   M	ESULTS	;																							Run			
## Tested By:    80.0	ass						_																				4	1
## Tested By:    80.0	thor																											4
70.0	vanoi																			4	oli	, 1	Ju Teste	d By:	7		=	
60.0	80.0 T							_																				
60.0							Ш																					
50.0  40.0  30.0  10.0  5000.000  10000.000  15000.000  20000.000  20000.000  25000.000  25000.000  30000.000  30000.000  35000.000  40000.000  40000.000  45000.000  45000.000  45000.000  45000.000  5000.000  45000.0000  45000.0000  45000.0000  45000.0000  45000.0000  45000.0000  45000.0000  45000.0000  450	70.0	+						-																				
50.0  40.0  30.0  10.0  5000.000  10000.000  15000.000  20000.000  20000.000  25000.000  25000.000  30000.000  30000.000  35000.000  40000.000  40000.000  45000.000  45000.000  45000.000  45000.000  5000.000  45000.0000  45000.0000  45000.0000  45000.0000  45000.0000  45000.0000  45000.0000  45000.0000  450																												
40.0  30.0  10.0  0.000  5000.000  10000.000  15000.000  25000.0000  25000.0000  25000.0000  25000.0000  25000.0000  25000.0000  250	60.0	+						+																				
40.0  30.0  10.0  0.000  5000.000  10000.000  15000.000  25000.0000  25000.0000  25000.0000  25000.0000  25000.0000  25000.0000  250	50.0	$\vdash$					+	+																				
30.0 20.0 20.0 10.00 15000.000 15000.000 20000.000 25000.000 30000.000 35000.000 40000.000 45000.000 20000.000 25000.000 30000.000 35000.000 40000.000 45000.000 45000.000 25000.000 30000.000 35000.000 40000.000 45000.0000 45000.000 45000.000 45000.000 45000.000 45000.000 45000.000 45000.000 45000.000 4500	50.0		*																									
30.0 20.0 20.0 10.00 15000.000 15000.000 20000.000 25000.000 30000.000 35000.000 40000.000 45000.000 25000.000 30000.000 35000.000 40000.000 45000.000 45000.000 25000.000 30000.000 35000.000 40000.000 45000.000 45000.000 25000.000 30000.000 35000.000 40000.000 45000.0000 45000.000 45000.000 45000.000 45000.000 45000.000 45000.000 45000.000 45000.000 4500	40.0																											
20.0   10.0   0.000    5000.000    10000.000    15000.000    20000.000    25000.000    30000.000    35000.000    40000.000    45000.000        Freq			•																									
20.0   10.0   0.000    5000.000    10000.000    15000.000    20000.000    25000.000    30000.000    35000.000    40000.000    45000.000        Freq	30.0																											
10.0	00.0																											
10.0	20.0							1																				
0.0   0.000   5000.000   10000.000   15000.000   20000.000   25000.000   30000.000   35000.000   40000.000   45000.000																												
Distance   Compared to   Com	10.0						4	+												-								
Distance   Compared to   Com																												
Distance   Compared to   Com	0.0			1			Щ.	$\perp$		Щ							4			$\perp$							Ц	
Freq (MHz)         Amplitude (dBuV)         Factor (dB)         Azimuth (degrees)         Height (meters)         Distance (meters)         Attenuation (dB)         Polarity (dB)         Detector (dB)         Adjusted dBuV/m         Spec. Limit dBuV/m         Spec. Li		00		5000.	000	1	0000	.000	1	5000	0.000	2	2000	0.00	0	25	000.	000	30	0.000	00	3500	0.000	40000	.000	45	000.000	
(MHz)         (dBuV)         (dB)         (degrees)         (meters)         (dB)         (dB)         (dB)         dBuV/m         dBuV/m         dBuV/m         (dB)         Comments           2483.500         19.2         30.4         269.0         1.0         1.0         0.0         V-Horn         AV         -9.5         40.1         54.0         -13.9         Antenna vertica           2483.500         16.9         30.4         211.0         1.0         1.0         0.0         V-Horn         AV         -9.5         37.8         54.0         -16.2         Antenna vertica           2483.500         29.1         30.4         269.0         1.0         1.0         0.0         V-Horn         PK         -9.5         50.0         74.0         -24.0         Antenna vertica						1		$\neg$		<u> </u>					1			l		1								+
2483.500 19.2 30.4 269.0 1.0 1.0 0.0 V-Horn AV -9.5 40.1 54.0 -13.9 Antenna vertical 2483.500 16.9 30.4 211.0 1.0 1.0 0.0 H-Horn AV -9.5 37.8 54.0 -16.2 Antenna horizon 2483.500 29.1 30.4 269.0 1.0 1.0 0.0 V-Horn PK -9.5 50.0 74.0 -24.0 Antenna vertical															-			Р	olarity	De	tector							
2483.500 16.9 30.4 211.0 1.0 1.0 0.0 H-Horn AV -9.5 37.8 54.0 -16.2 Antenna horizon 2483.500 29.1 30.4 269.0 1.0 1.0 0.0 V-Horn PK -9.5 50.0 74.0 -24.0 Antenna vertical			E00								(mete		(m			(dl		Ι,,	I la ····		A \ /	(d						
2483.500 29.1 30.4 269.0 1.0 1.0 0.0 V-Horn PK -9.5 50.0 74.0 -24.0 Antenna vertical																												
												1.0											-9.5 -9.5					

	THWEST		F	RADI	ATE	DEN	IISS	IONS	DA'	TA S	HEET			ACQ 2005.1.4 EMI A2.13
	VIO		SEL-3022										SCHW004	.8
Seri	ial Nu										,		05/24/05	
			Schweitzer	Engineeri	ng Labora	atories, Inc.					Te	mperature:		
			None									Humidity:		
Cus	st. Ref							D	4200/40/6	2011-	Barometri	c Pressure		
TEST SP			Holly Ashk	annejnad				Power:	120VAC/6	OHZ		Job Site:	EV01	
			FCC 15.247	(d) Spurio	us Radiat	ed Emission	15:2004		Method	: ANSI C63.	4.2003			
			1 00 10.24	(u) opulio	uo rtuulut	Cu <b>L</b> 111100101	10.2004			AITOI GOO.	4.2000			
SAMPLE	CAL	CUL	ATIONS											
			: Field Strength								External Attenu	ation		
		issions	: Adjusted Leve	= Measured I	Level + Trans	ducer Factor +	Cable Attenua	ation Factor + E	xternal Attenu	uator				
COMMEN Whip anten														
vinp unten														
EUT OPE		ING I	MODES											
High chann	nel													
DEV/	<u> </u>		. ======	VD 4 D 2										
DEVIATION DE VIATION D	UNS	FRO	M TEST STA	NDARD										
RESULT													Run#	
Pass	_													5
Other													2	
l										1/ 0	Ale	1.		
l										Holy	Jane	$\gamma \sim$		
										11-0	Teste			_
											16866	д Бу.		
90 O														
80.0 -														
	-	++												
70.0 -	$\sqcup \!\!\! \perp$													
70.0	Ш													
60.0 -	$\vdash$	+												_
	Ш													
	IН	•												
50.0 -	Н	•												
	Ш	•												
	1	1 1												
40.0 -	-	•												
30.0 -	+	+												
00.5														
20.0 -														
10.0														
10.0 -														
0.0														
0.0 -			E000 000	10000.0	00 450	000 000	20000 000	25000	200	000 000	35000 000	40000	000 45	
0.0	000		5000.000	10000.0	00 150	000.000	20000.000	25000.0	JUU 300	000.000	35000.000	40000.	UUU 45	000.000
-	*05		Amplificate	Foot	A =======#1	Uetek	Diet	External	Dolasit	D-1 1	Distance	A diverse of	Coos Limit	Compared to
	req		Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	Attenuation (dB)	Polarity	Detector	Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Spec. (dB)
(IVI	1 <b>Hz)</b> 248:	3.500		30.4					V-Horn	AV	-9.5	45.1	54.0	
		3.500 3.500		30.4					V-Horn	AV	-9.5 -9.5	41.6	54.0	
		3.500		30.4			1.0		V-Horn	PK	-9.5	53.7		
		3.500		30.4	128.0				V-Horn	PK	-9.5	51.5		

	EMC			F	RA	DI.	ΑT	ΈΙ	) E	EM	IS	SI	O	NS	E	AC	T	Α	SI	ΗE	E	Т					MI A2.13	
			SEL-	3022																	ı	Nork	Order:			48		
S	erial Nu		Schw	eitzer	Engi	neeri	ng La	borat	ories.	Inc.											Т	empe	Date: rature:		24/05			
	Atten	dees:	None																			Hu	midity:	36%				
C	ust. Ref		Holly	Ashk	annei	ihad							F	ower	120	VAC	/60H	Ηz		Bar	ometi		essure b Site:					
TEST S		ICATI	ONS				ue Pa	diato	l Emi	eeion	e-200	и			Ι.	/letho	d: A	ANSI (	~63.	1-200	2							
					(u) 3	purio	us Na	luiate	J E1111	55101	5.200	/ <del>-</del>			. "	netiio	u.	AINOI V	.00.	+.200	,							
SAMPL	LE CAL iated Emi				= Meas	sured L	evel + A	Antenna	Factor	+ Cabl	e Facto	r - Am	plifier (	Gain +	Distar	nce Adi	iustm	ent Fa	ctor +	Extern	al Atter	nuation	1					
Condu	ucted Emi:																											
Whip and																												
EUT O	PERAT	ING N	IODE:	8																								
DEVIA No devia	TIONS	FRON	I TES	Γ STA	NDAF	<b>R</b> D																						
RESUL																								Rur	า #			
Pass																										6		
Other															П						177		99	_				
																	9	40	ly	A	Teste	ed By	~	/		_		
	80.0																											
dBuV/m				++						++		++	++	++	-	+	+		-	++	++	++		-	++	+		
	70.0 -																									+		
	60.0 -																		Н									
	•																									+		
	50.0 -																		Н									
						*																				•		
Bu	40.0 -																		П									
⊽	20.0					•												ľ								•		
	30.0 -																		П									
	20.0 -																											
	20.0																											
	10.0 -																											
	0.0 -			-		Щ		Щ			$\perp$		4			$\perp$			Ш		Щ			$\perp$		Щ		
	1920	0.000	192	50.00	0 19	300.	000	19350	.000	194	00.00	0 1	9450	.000	195	0.00	00	1955	50.00	00 1	9600	.000	1965	50.00	00 19	9700.	.000	
													MH	z														
	Freq			mplitude Factor (dBuV) (dB)		Azimuth		Height		Distance		Atter	External Attenuation (dB)		Polarity		Detec	tor	Distance Adjustment			Adjusted		Spec. Limit dBuV/m		npared to Spec.	Occupants	
(MHz) 19536.080		6.080	(dB	28.0	(dE	8.4	(degr	22.0	(mete	1.0	(mete	3.0	(6	,	l H-Hi	igh H	orr	A۷	,	(0	B) 0.0		36.4		54.		(dB) -17.6	Comments Mid channel, EUT on side
	1953	6.080		27.8		8.4		32.0		1.0		3.0		0.0	V-Hi	igh H	orr	A۷	,		0.0		36.2	2	54.	0	-17.8	Mid channel, EUT vertical
	1969 1929	6.090		25.1 25.3		8.6 8.0		45.0 45.0		1.0 1.0		3.0 3.0		0.0	√-Hi	igh Ho igh Ho	orr	A۷	,		0.0		33.7 33.3	3	54. 54.	0	-20.7	High channel, EUT on side Low channel, EUT vertical
	1969 1929			24.7 25.1		8.6 8.0		85.0 14.0		1.0 1.0		3.0 3.0				igh Ho igh Ho		A۷			0.0		33.3 33.1		54. 54.			High channel, EUT vertical Low channel, EUT on side
	1953	6.080		39.1		8.4	1	22.0		1.0		3.0		0.0	H-H	igh H	orr	Pk			0.0		47.5	5	74.	0	-26.5	Mid channel, EUT on side
	1953 1929			38.4 38.6		8.4 8.0		32.0 45.0		1.0 1.0		3.0 3.0				igh Ho igh Ho		Pk Pk			0.0		46.8 46.6		74. 74.			Mid channel, EUT vertical Low channel, EUT vertical
	1969	6.090		37.5		8.6	1	38.0		1.0		3.0		0.0	H-Hi	igh H	orr	Pk			0.0		46.1		74.	0	-27.9	High channel, EUT on side
	1969 1929			36.9 37.0		8.6 8.0		85.0 14.0		1.0 1.0		3.0 3.0				igh Ho igh Ho		Pk Pk			0.0		45.5 45.0		74. 74.			High channel, EUT vertical Low channel, EUT on side
	.020	000		25		0.0				5		0.0		0.0							0.0					-	_0.0	

	RTHWEST MC			RADI	ATE	D EM	IISSI	ONS	DA	TA SI				ACQ 2005.1.4 EMI 2005.5.08
	-1-1-1		SEL-3022						-		W		SCHW004	8
Se	rial Nu	mber: omer:	Schweitze	r Fngineeri	ng Laborat	ories. Inc					To	Date: mperature:	05/27/05 25	
			None	. Lugineen	g Laborat	o.163, IIIC.					Tel	Humidity:		
С	ust. Ret	f. No.:									Barometri	c Pressure	29.7	
			Holly Ashl	kannejhad				Power:	120VAC/6	0Hz		Job Site:	EV01	
TEST S				7(d) Cpu=!-	uo Bodista	d Emissier	0:2005.04		Mothod	ANGL CC2	1.2002			
	pecilic	auon:	15.24	r (u) spurio	us Radiate	u Emissión	s.∠uu5-u4		wethod	ANSI C63.4	+.2003			
SAMPL	E CAL	CULA	TIONS											
										stment Factor +	External Attenu	ation		
COMME		ssions:	Adjusted Leve	el = Measured I	Level + Transd	ucer Factor + 0	Cable Attenuat	tion Factor + Ex	ternal Attenu	ıator				
Omni ant														
EUT OF	EDAT	ING M	IODES											
Low char		MG IV	IODES											
		FRON	I TEST STA	NDARD										
No deviat													Dun #	
RESUL Pass	15												Run #	7
. 400														
Other													2	
										11 0.	Ale	-M	/	
										Holy	Jan	1		
											Tested			-
								•				•		
	80.0 -													
	_													Ш
	70.0 -													
	10.0 -													
	60.0 -													H
	_													•
	50.0													$\perp$
_	30.0													
5														•
dBuV/m	40.0 -													Ħ
쁑														
	30.0 -	$\vdash$												$\perp$
	-													
	00.0													
	20.0 -													Ħ
	10.0 -													$\perp$
	0.0													
	0.0 -		F0.0	0.000	0000 00	0 -	200.000	0000	200	0000 000	4000	0.000	44000.0	
	4800	0.000	580	0.000	6800.00	υ 78	300.000	8800.	UUU	9800.000	1080	0.000	11800.0	UU
								MHz						
					I	1		External			Distance			Compared to
	Freq		Amplitude	Factor	Azimuth	Height	Distance	Attenuation	Polarity	Detector	Adjustment	Adjusted	Spec. Limit	Spec.
(	MHz)	4.000	(dBuV)	(dB)	(degrees)	(meters)	(meters)	(dB)	LI Linux	A\/	(dB)	dBuV/m	dBuV/m	(dB)
		4.020 4.020	43.7 39.4	5.8 5.8	359.0 119.0	1.6 1.2	3.0 3.0		H-Horn V-Horn	AV AV	0.0 0.0	49.5 45.2		-4.5 -8.8
	1206		25.8	17.3	200.0	3.3	3.0		H-Horn	AV	0.0	43.1	54.0	-10.9
	1206	0.000	25.7	17.3	162.0	1.2	3.0	0.0	V-Horn	AV	0.0	43.0	54.0	-11.0
	1206		39.2	17.3	200.0	3.3	3.0		H-Horn	PK	0.0	56.5		-17.5
	1206		39.2		162.0	1.2	3.0		V-Horn	PK	0.0	56.5		-17.5
		4.020 4.020	46.8 43.6	5.8 5.8	359.0 119.0	1.6 1.2	3.0 3.0		H-Horn V-Horn	PK PK	0.0 0.0	52.6 49.4	74.0 74.0	-21.4 -24.6
	+02	7.020	45.0	5.0	115.0	1.2	5.0	0.0	v -1 10111	1.17	0.0	45.4	74.0	-24.0

#### **RADIATED EMISSIONS DATA SHEET** EMI 2005.5.08 **EMC** Work Order: SCHW0048 EUT: SEL-3022 Serial Number: Date: 05/27/05 Customer: Schweitzer Engineering Laboratories, Inc. Temperature: 25 Humidity: 36% Attendees: None Cust. Ref. No. Barometric Pressure 29.7 Tested by: Holly Ashkannejhad Power: 120VAC/60Hz Job Site: EV01 **TEST SPECIFICATIONS** Specification: FCC 15.247(d) Spurious Radiated Emissions:2005-04 Method: ANSI C63.4:2003 Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator COMMENTS EUT OPERATING MODES DEVIATIONS FROM TEST STANDARD No deviations. RESULTS Pass Holy Arling 80.0 70.0 60.0 50.0 dBuV/m 40.0 30.0 20.0 10.0 0.0 4800.000 5300.000 5800.000 6300.000 6800.000 7300.000 MHz External Distance Compared to Distance Polarity Frea Amplitude Factor Azimuth Height Detector Adjusted Spec. Limit Attenuation Adjustment Comments (dB) (degrees) (meters) (meters) (dB) (dB) (MHz) 89.0 H-Horn 54.0 -6.4 EUT on side V-Horn 4884.027 37.3 6.2 149.0 3.0 ΑV 43.5 -10.5 EUT Vertical 7326.000 25.4 11.8 166.0 2.7 3.0 0.0 V-Horn ΑV 0.0 37.2 54.0 -16.8 EUT Vertical 7326.000 25.3 11.8 287.0 3.9 3.0 0.0 H-Horn ΑV 0.0 37.1 54.0 -16.9 EUT on side 74.0 45.1 89.0 -22.7 EUT on side 4884.027 H-Horn PK 6.2 1.2 3.0 0.0 0.0 51.3 7326.000 39.0 11.8 287.0 3.9 0.0 H-Horn PK 0.0 50.8 74.0 -23.2 EUT on side

3.0

3.0

3.0

V-Horn

V-Horn

0.0

0.0

PK

0.0

0.0

49.8

74.0

-23.5 EUT Vertical

-24.2 EUT Vertical

2.7

1.3

7326.000

4884.027

38.7

43.6

11.8

6.2

166.0

149.0

#### RADIATED EMISSIONS DATA SHEET EMI 2005.5.08 **EMC** Work Order: SCHW0048 EUT: SEL-3022 Serial Number: Date: 05/27/05 Customer: Schweitzer Engineering Laboratories, Inc. Temperature: 25 Humidity: 36% Attendees: None Cust. Ref. No. Barometric Pressure 29.7 Power: 120VAC/60Hz Tested by: Holly Ashkannejhad Job Site: EV01 TEST SPECIFICATIONS Specification: FCC 15.247(d) Spurious Radiated Emissions:2005-04 Method: ANSI C63.4:2003 Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator COMMENTS EUT OPERATING MODES DEVIATIONS FROM TEST STANDARD No deviations. Pass Holy Solingho 80.0 70.0 60.0 • 50.0 dBuV/m 40.0 30.0 20.0 10.0 0.0 4500.000 5500.000 6500.000 7500.000 8500.000 9500.000 10500.000 11500.000 12500.000 MHz External Distance Compared to Frea Amplitude Factor Azimuth Height Distance Polarity Detector Adjusted Spec. Limit Attenuation Adjustment (dB) (degrees) (meters) (meters) (dB) (dB) Comments (MHz) V-Horn 54.0 -5.1 EUT Vertical 4924.031 42.5 155.0 3.0 H-Horn 48.8 -5.2 EUT on side 12310.000 25.1 17.2 232 0 1.2 3.0 0.0 V-Horn ΑV 0.0 42.3 54.0 -11 7 FUT Vertical 12310.000 25.0 17.2 183 0 1.3 3.0 0.0 H-Horn ΑV 0.0 42.2 54.0 -11 8 FUT on side

V-Horn

H-Horn

H-Horn

V-Horn

V-Horn

V-Horn

H-Horn

H-Horn

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

ΑV

ΑV

PK

PΚ

PΚ

PK PK

PK

37.7

37.6

56.0

55.6

52.4

51.5

51.2

51.1

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

54.0

54.0

74.0

74.0

74.0

74.0

74.0

74.0

-16.3 EUT Vertical

-16.4 EUT on side

-18.0 EUT on side

-18.4 EUT Vertical

-21.6 EUT Vertical

-22.5 EUT Vertical

-22.8 EUT on side

-22.9 EUT on side

7386.000

7386.000

12310.000

12310.000

4924.031

7386.000

4924.031

7386.000

25.7

25.6

38.8

38.4

46.1

39.5

44.9

39.1

12.0

12.0

17.2

17.2

6.3

12.0

6.3

12.0

279.0

234.0

183.0

232.0

150.0

279.0

155.0

234.0

1.8

1.3

1.3

1.2

1.5

1.8

1.6

1.3

3.0

3.0

3.0

3.0

3.0

3.0

3.0

3.0





