

Schweitzer Engineering Laboratories, Inc.

SEL-3021

August 23, 2004

Report No. SCHW0043

Report Prepared By:



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

Test Report



22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Issue Date: August 23, 2004

Schweitzer Engineering Laboratories, Inc.

Model: SEL-3021

Emissions			
Specification	Test Method	Pass	Fail
FCC 15.207 AC Powerline Conducted Emissions:2003	ANSI C63.4:2001	☒	☐
FCC 15.247(a) Occupied Bandwidth:2003	ANSI C63.4:2001	☒	☐
FCC 15.247(b) Output Power:2003	ANSI C63.4:2001	☒	☐
FCC 15.247(c) Band Edge Compliance:2003	ANSI C63.4:2001	☒	☐
FCC 15.247(c) Spurious Emissions:2003	ANSI C63.4:2001	☒	☐
FCC 15.247(c) Spurious Radiated Emissions:2003	ANSI C63.4:2001	☒	☐
FCC 15.247(d) Power Spectral Density:2003	ANSI C63.4:2001	☒	☐

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:

Don 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 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, 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. Accreditation has been granted to Northwest EMC, Inc. under Certificate Numbers: 200629-0, 200630-0, and 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 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. 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 Nos. - 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?

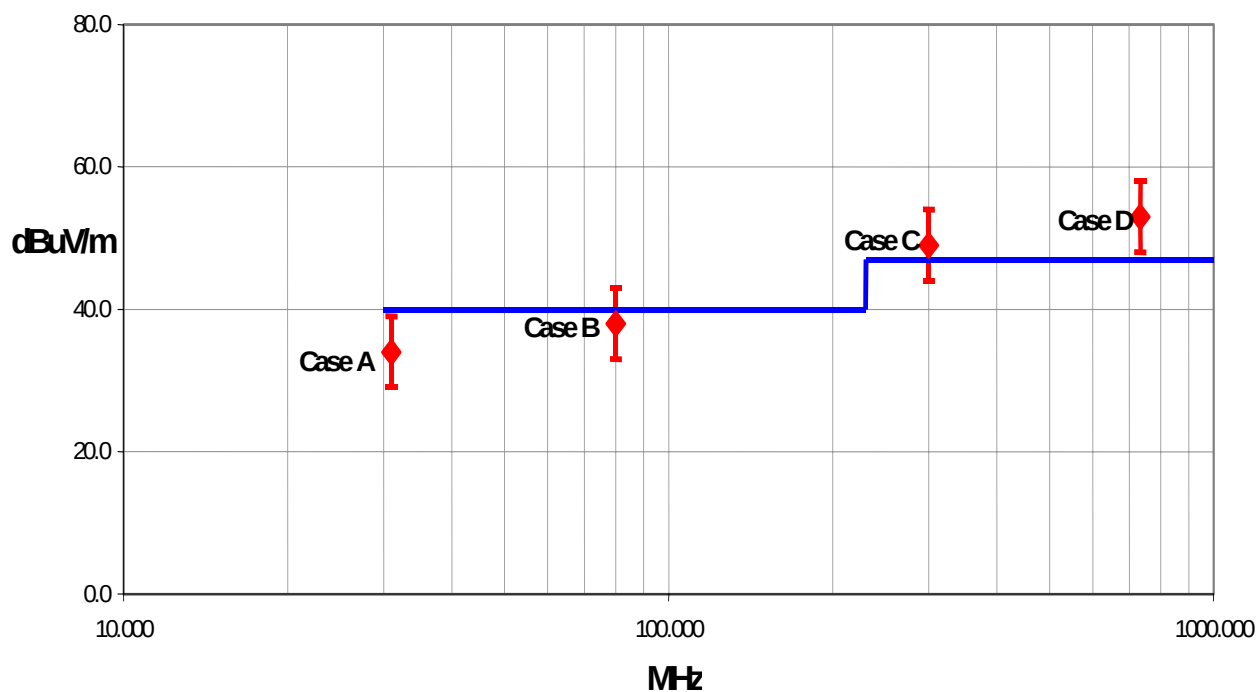
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following 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.

Radiated Emissions ≤ 1 GHz

Value (dB)

Test Distance	Probability Distribution	Biconical Antenna		Log Periodic Antenna		Dipole Antenna	
		3m	10m	3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86 - 1.88	+ 1.82 - 1.87	+ 2.23 - 1.41	+ 1.29 - 1.26	+ 1.31 - 1.27	+ 1.25 - 1.25
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k=2)	+ 3.72 - 3.77	+ 3.64 - 3.73	+ 4.46 - 2.81	+ 2.59 - 2.52	+ 2.61 - 2.55	+ 2.49 - 2.49

Radiated Emissions > 1 GHz

Value (dB)

Test Distance	Probability Distribution	Without High Pass Filter		With High Pass Filter	
		3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.29 - 1.25	+ 1.29 - 1.25	+ 1.38 - 1.35	+ 1.38 - 1.35
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k=2)	+ 2.57 - 2.51	+ 2.57 - 2.51	+ 2.76 - 2.70	+ 2.76 - 2.70

Conducted Emissions

Test Distance	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.48
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k = 2)	2.97

Radiated Immunity

Test Distance	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.05
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k = 2)	2.11

Conducted Immunity

Test Distance	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.05
Expanded uncertainty U (level of confidence $\approx 95\%$)	normal (k = 2)	2.10

Legend

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

U = combined standard uncertainty multiplied by the coverage factor: 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 $k=3$ (CL of 99.7%) can be used. Please note that with a coverage factor of one, $u_c(y)$ yields a confidence level of only 68%.

**California****Orange County Facility**

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

**Oregon****Evergreen Facility**

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

**Oregon****Trails End Facility**

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

**Washington****Sultan Facility**

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

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-3021
First Date of Test:	08-10-2004
Last Date of Test:	08-18-2004
Receipt Date of Samples:	08-10-2004
Equipment Design Stage:	Production
Equipment Condition:	No visual damage.

Information Provided by the Party Requesting the Test

Clocks/Oscillators:	Not provided.
I/O Ports:	Serial, Alarm

Functional Description of the EUT (Equipment Under Test):

Mobile 802.11(b) radio.

Client Justification for EUT Selection:

Not Provided

Client Justification for Test Selection:

These tests satisfy the requirements for FCC.

EUT Photo

Equipment modifications					
Item	Test	Date	Modification	Note	Disposition of EUT
1	Band Edge Compliance	08/10/2004	No EMI suppression devices were added or modified during this test.	Same configuration as delivered.	EUT remained at Northwest EMC.
2	Occupied Bandwidth	08/10/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
3	Output Power	08/10/2004	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	08/10/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
5	Spurious Radiated Emissions	08/11/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
6	AC Powerline Conducted Emissions	08/12/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
7	Spurious Emissions	08/18/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.

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	0.104.0.0
Firmware	SEL-3021	Version	X111
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
Serial Encrypting Transceiver	Schweitzer Engineering Laboratories	SEL-3021	000B6B197CAD
AC Adapter	APX Technologies Inc.	SPU10-102	01385809

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Notebook PC	Dell	Inspiron 8000	IS115
802.11b PCMCIA Card	U.S. Robotics	Wireless Access 802.11b	none
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	Serial Encrypting Transceiver	AC Adapter

Measurement Equipment

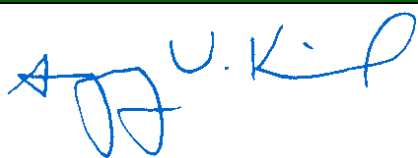
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo
Near Field Probe	EMCO	7405	IPD	NCR	NA

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 spectrum analyzer connected to a near field probe. The probe was placed on top of the EUT's integral transmit antenna. The EUT was transmitting at its maximum data rate using direct sequence modulation.

Completed by:



NORTHWEST
EMC**EMISSIONS DATA SHEET**Rev BETA
01/30/01

EUT: SEL-3021			Work Order: SCHW0043		
Serial Number: 000B6B197CAD			Date: 08/10/04		
Customer: Schweitzer Engineering Laboratories, Inc			Temperature: 73		
Attendees: Jeff Butler		Tested by: Greg Kiemel	Humidity: 46% RH		
Customer Ref. No.: N/A		Power: 120 V, 60 Hz	Job Site: EV06		

TEST SPECIFICATIONS

Specification: 47 CFR 15.247(a)(2)	Year: 2003	Method: FCC 97-114, ANSI C63.4	Year: 2003
------------------------------------	------------	--------------------------------	------------

SAMPLE CALCULATIONS**COMMENTS****EUT OPERATING MODES**

Modulated at maximum data rate, 802.11(b) modulation scheme

DEVIATIONS FROM TEST STANDARD

None

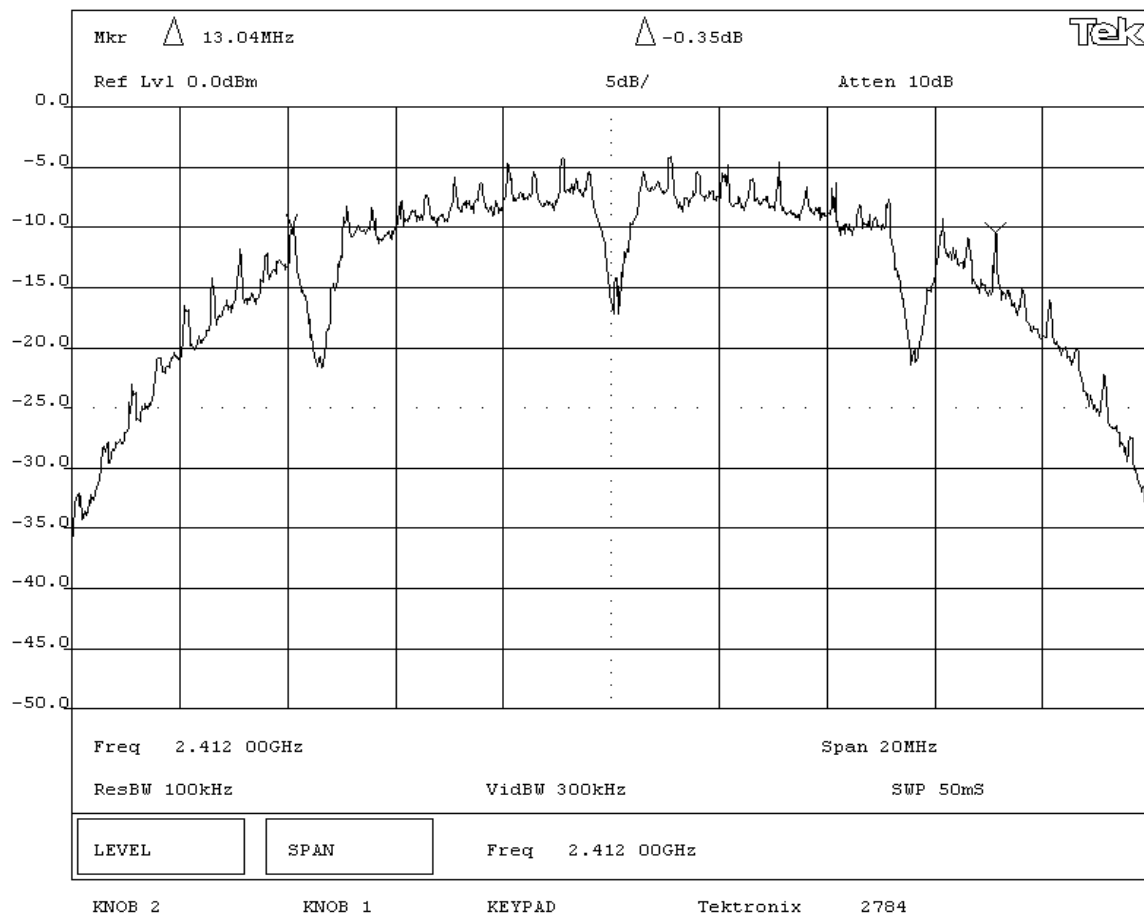
REQUIREMENTS

The minimum 6dB bandwidth is 500KHz

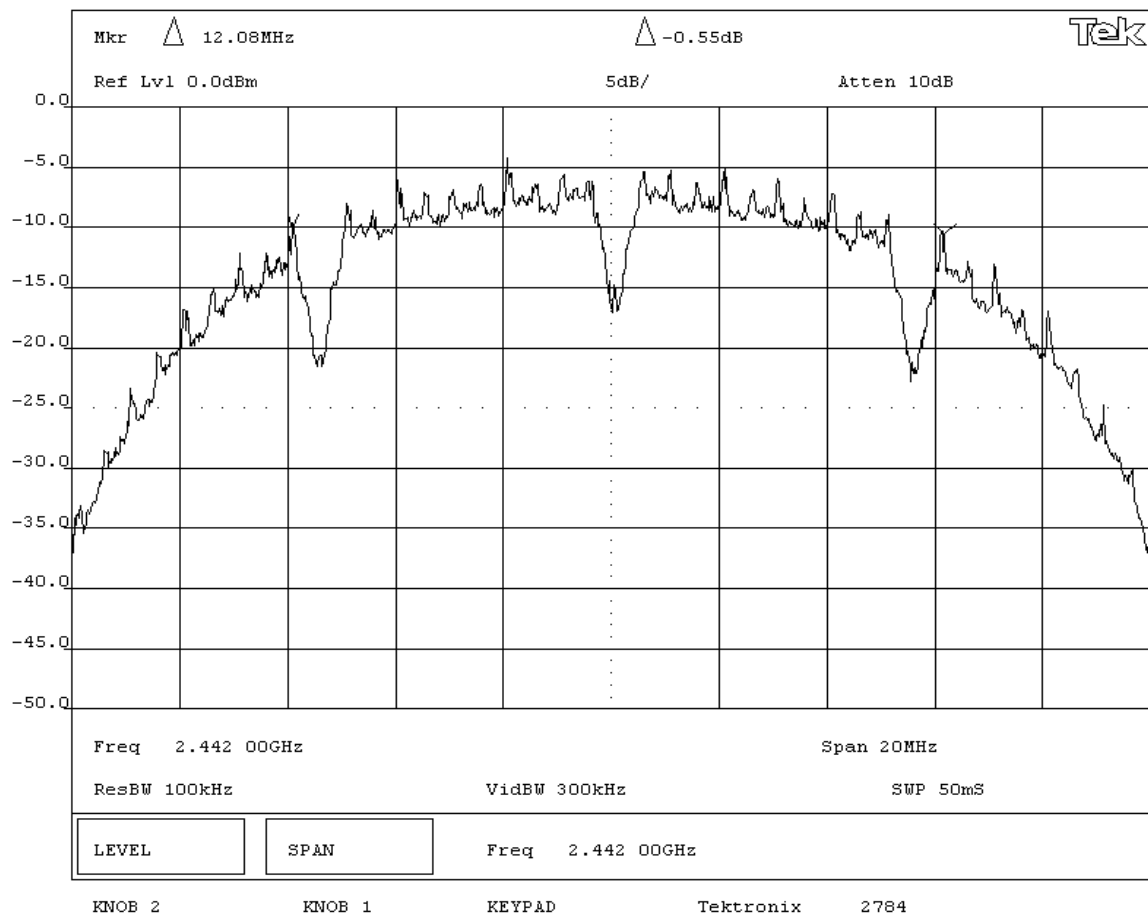
RESULTS**BANDWIDTH**

Pass

13.04 MHz

SIGNATURETested By: **DESCRIPTION OF TEST****Occupied Bandwidth - Low Channel**

NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: SEL-3021			Work Order: SCHW0043		
Serial Number: 000B6B197CAD			Date: 08/10/04		
Customer: Schweitzer Engineering Laboratories, Inc			Temperature: 73		
Attendees: Jeff Butler		Tested by: Greg Kiemel		Humidity: 46% RH	
Customer Ref. No.: N/A		Power: 120 V, 60 Hz		Job Site: EV06	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(a)(2)		Year: 2003		Method: FCC 97-114, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
EUT OPERATING MODES					
Modulated at maximum data rate, 802.11(b) modulation scheme					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
The minimum 6dB bandwidth is 500KHz					
RESULTS			BANDWIDTH		
Pass			12.08 MHz		
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Occupied Bandwidth - Mid Channel					



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: SEL-3021		Work Order: SCHW0043	
Serial Number: 000B6B197CAD		Date: 08/10/04	
Customer: Schweitzer Engineering Laboratories, Inc		Temperature: 73	
Attendees: Jeff Butler		Humidity: 46% RH	
Customer Ref. No.: N/A		Tested by: Greg Kiemel	Job Site: EV06
		Power: 120 V, 60 Hz	

TEST SPECIFICATIONS

Specification: 47 CFR 15.247(a)(2)	Year: 2003	Method: FCC 97-114, ANSI C63.4	Year: 2003
------------------------------------	------------	--------------------------------	------------

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated at maximum data rate, 802.11(b) modulation scheme

DEVIATIONS FROM TEST STANDARD

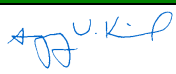
None

REQUIREMENTS

The minimum 6dB bandwidth is 500KHz

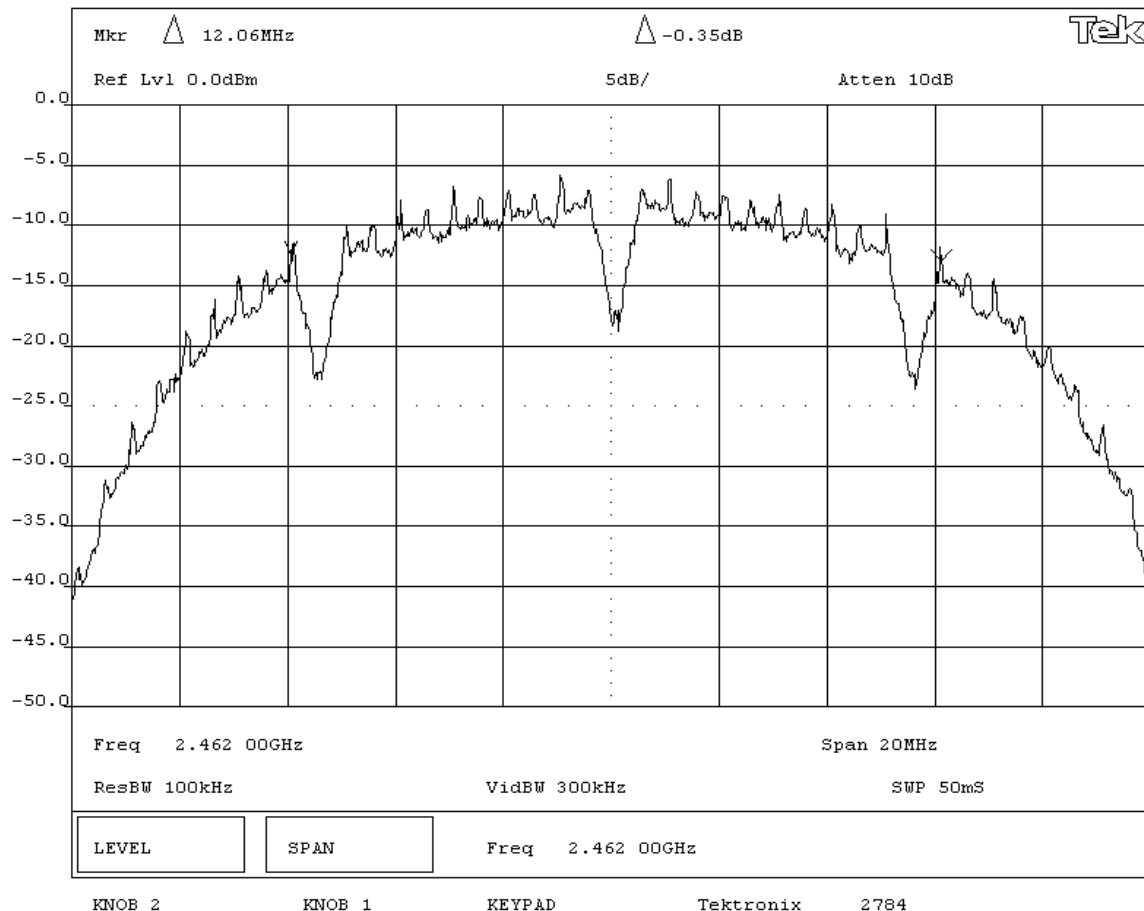
RESULTS	BANDWIDTH
Pass	12.06 MHz

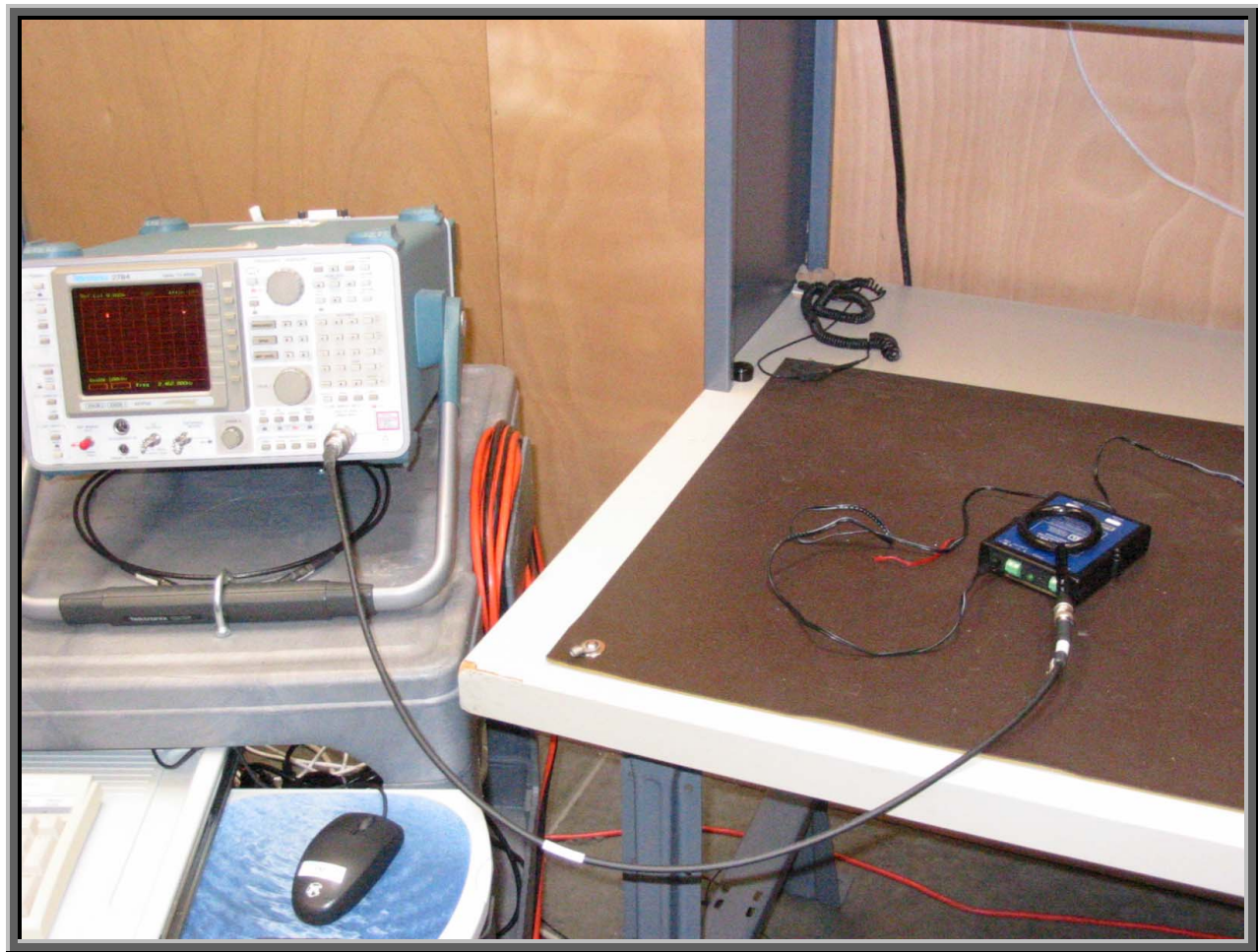
SIGNATURE

Tested By: 

DESCRIPTION OF TEST

Occupied Bandwidth - High Channel





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	0.104.0.0
Firmware	SEL-3021	Version	X111
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
Serial Encrypting Transceiver	Schweitzer Engineering Laboratories	SEL-3021	000B6B197CAD
AC Adapter	APX Technologies Inc.	SPU10-102	01385809

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Notebook PC	Dell	Inspiron 8000	IS115
802.11b PCMCIA Card	U.S. Robotics	Wireless Access 802.11b	none
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	Serial Encrypting Transceiver	AC Adapter
Serial Cables (2 each)	Yes	1.4	No	Serial Encrypting Transceiver	Unterminated
Alarm Leads	No	2.0	No	Serial Encrypting Transceiver	Unterminated

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/23/2003	13 mo
Antenna, Horn	EMCO	3115	AHC	09/18/2003	12 mo
RF Detector	RLC Electronics	CR-133-R	ZZA	NCR	NA
Oscilloscope	Tektronix	TDS 3052	TOF	07/21/2004	12 mo
Signal Generator	Hewlett Packard	8341B	TGN	01/23/2004	13 mo

Test Description

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

Configuration: 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 and data rate.

The measurement was made using the alternative test procedure described in FCC 97-114. The maximum field strength of the fundamental was measured at a 3 meter distance. The field strength was 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 C63.4:2001). Then a RF detector diode was connected via coaxial cable to the measurement antenna. The DC output of the diode was measured with the oscilloscope. The signal generator, tuned to the transmit frequency, was then connected to the RF detector diode.

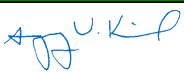
The CW output of the signal generator was adjusted until the DC output of the RF detector diode match the peak level produced when connected to the measurement antenna. The antenna factor and cable loss was added to the signal generator output level to provide the maximum field strength. The peak EIRP was calculated using the equation:

$$\text{EIRP} = (Ed)^2 / 30$$

Where: E is the measured maximum field strength in V/m as measured by the RF Detector Diode
d is the distance in meters from which the field strength was measured

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

Completed by:

NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT:	SEL-3021			Work Order:	SCHW0043
Serial Number:	000B6B197CAD			Date:	08/10/04
Customer:	Schweitzer Engineering Laboratories, Inc			Temperature:	73
Attendees:	Jeff Butler	Tested by:	Greg Kiemel	Humidity:	46% RH
Customer Ref. No.:	N/A	Power:	120 V, 60 Hz	Job Site:	EV06
TEST SPECIFICATIONS					
Specification:	47 CFR 15.247(b)(3)	Year:	2001	Method:	FCC 97-114, ANSI C63.4
SAMPLE CALCULATIONS					
COMMENTS					
EUT OPERATING MODES					
Modulated at maximum data rate, at maximum output power. 802.11(b) modulation scheme.					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum peak conducted output power does not exceed 1 Watt					
RESULTS		AMPLITUDE			
Pass		444 mW			
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Output Power - Low, Mid, & High Channels					
Frequency (MHz)			Power (mW)		
2412			444		
2442			395		
2462			329		





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	0.104.0.0
Firmware	SEL-3021	Version	X111
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
Serial Encrypting Transceiver	Schweitzer Engineering Laboratories	SEL-3021	000B6B197CAD
AC Adapter	APX Technologies Inc.	SPU10-102	01385809

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Notebook PC	Dell	Inspiron 8000	IS115
802.11b PCMCIA Card	U.S. Robotics	Wireless Access 802.11b	none
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	Serial Encrypting Transceiver	AC Adapter

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo
Near Field Probe	EMCO	7405	IPD	NCR	NA

Test Description

Requirement: Per 47 CFR 15.247(c), 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 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 spectrum analyzer connected to a near field probe. The probe was placed on top of the EUT's integral transmit antenna. 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.

Completed by:

NORTHWEST
EMC**EMISSIONS DATA SHEET**Rev BETA
01/30/01

EUT: SEL-3021			Work Order: SCHW0043		
Serial Number: 000B6B197CAD			Date: 08/10/04		
Customer: Schweitzer Engineering Laboratories, Inc			Temperature: 73		
Attendees: Jeff Butler		Tested by: Greg Kiemel	Humidity: 46% RH		
Customer Ref. No.: N/A		Power: 120 V, 60 Hz	Job Site: EV06		

TEST SPECIFICATIONS

Specification: 47 CFR 15.247(c)	Year: 2003	Method: FCC 97-114, ANSI C63.4	Year: 2003
---------------------------------	------------	--------------------------------	------------

SAMPLE CALCULATIONS**COMMENTS****EUT OPERATING MODES**

Modulated at maximum data rate, 802.11(b) modulation scheme

DEVIATIONS FROM TEST STANDARD

None

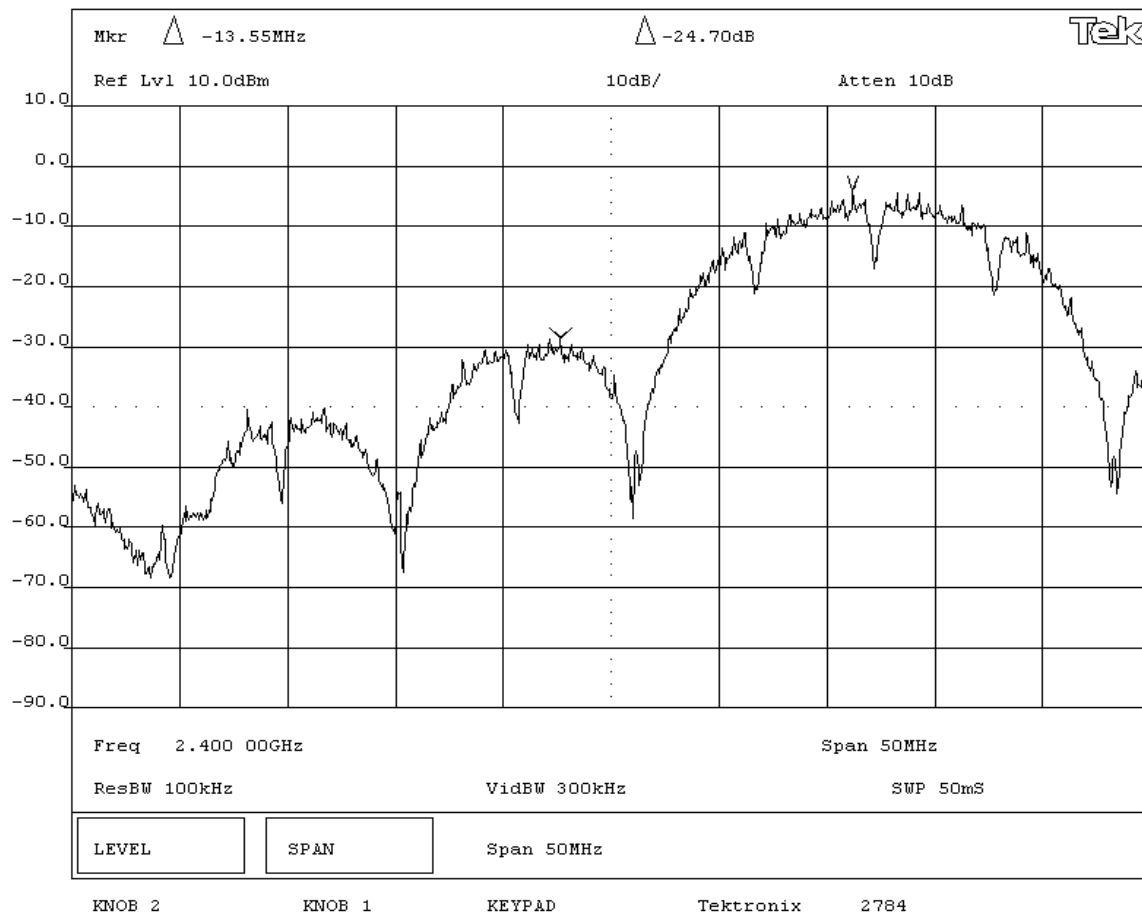
REQUIREMENTS

Maximum level of any spurious emission at the edge of the authorized band is 20 dB down from the fundamental

RESULTS**AMPLITUDE**

Pass

--24.7 dB

SIGNATURETested By: **DESCRIPTION OF TEST****Band Edge Compliance - Low Channel**

NORTHWEST
EMC**EMISSIONS DATA SHEET**Rev BETA
01/30/01

EUT: SEL-3021			Work Order: SCHW0043		
Serial Number: 000B6B197CAD			Date: 08/10/04		
Customer: Schweitzer Engineering Laboratories, Inc			Temperature: 73		
Attendees: Jeff Butler		Tested by: Greg Kiemel	Humidity: 46% RH		
Customer Ref. No.: N/A		Power: 120 V, 60 Hz	Job Site: EV06		

TEST SPECIFICATIONS

Specification: 47 CFR 15.247(c)	Year: 2003	Method: FCC 97-114, ANSI C63.4	Year: 2003
---------------------------------	------------	--------------------------------	------------

SAMPLE CALCULATIONS**COMMENTS****EUT OPERATING MODES**

Modulated at maximum data rate, 802.11(b) modulation scheme

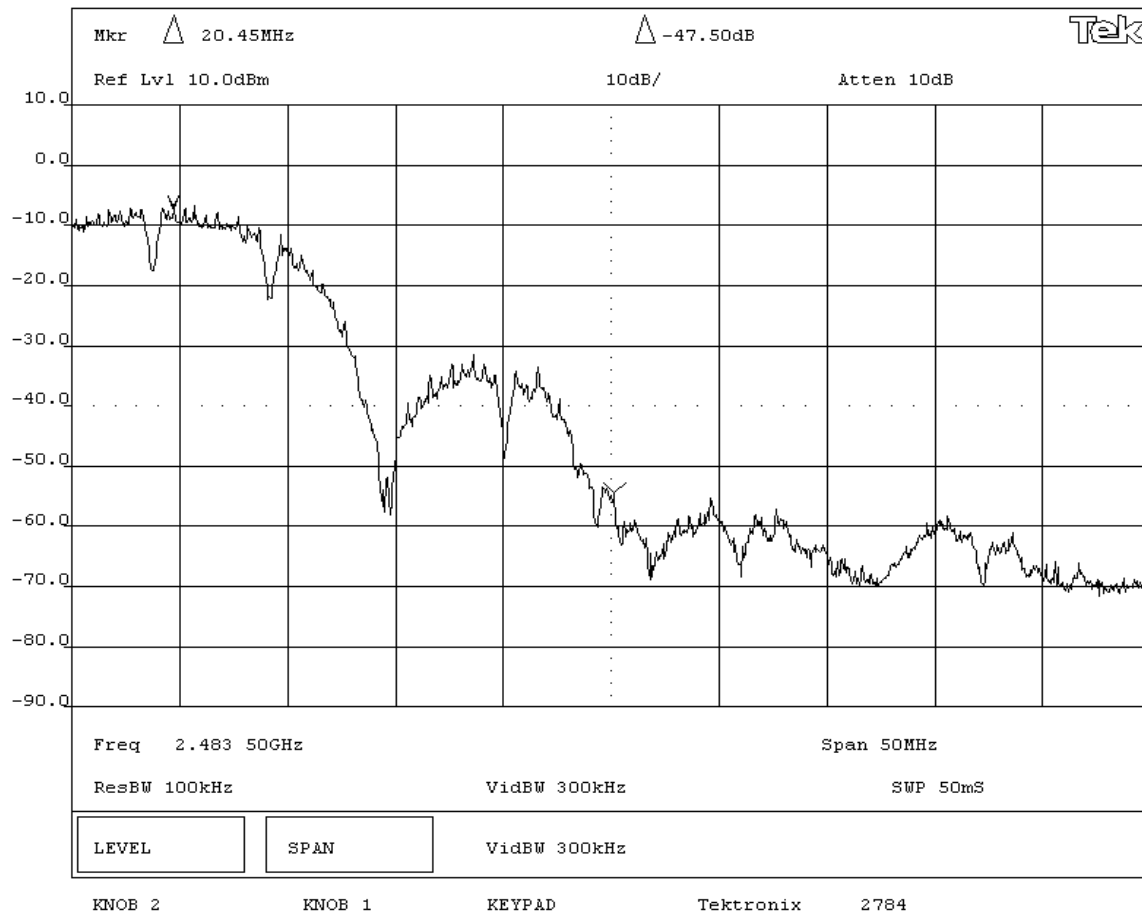
DEVIATIONS FROM TEST STANDARD

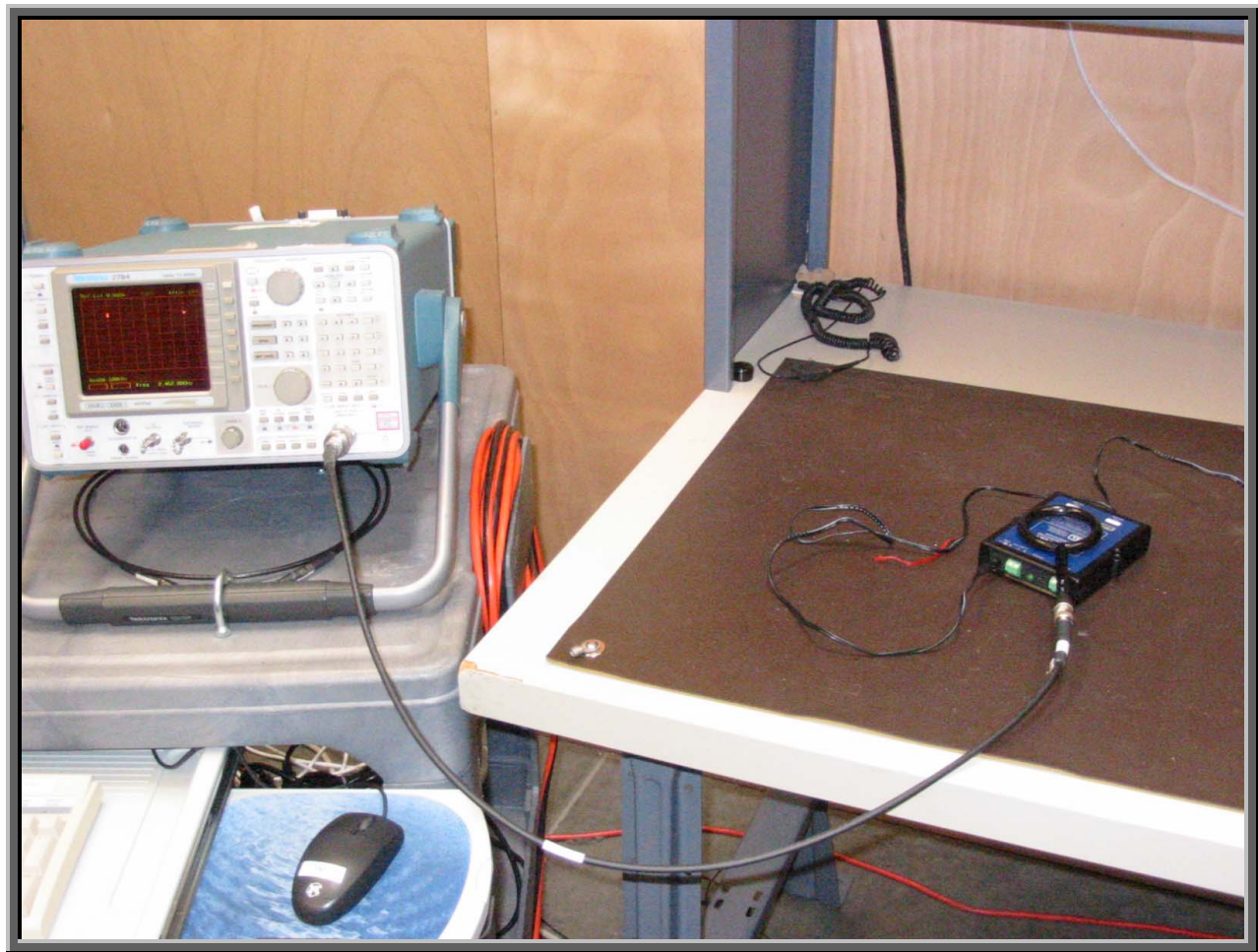
None

REQUIREMENTS

Maximum level of any spurious emission at the edge of the authorized band is 20 dB down from the fundamental

RESULTS	AMPLITUDE
Pass	-47.5 dB

SIGNATURETested By: **DESCRIPTION OF TEST****Band Edge Compliance - High Channel**



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	26 GHz
------------------------	--------	-----------------------	--------

Software\Firmware Applied During Test

Exercise software	SEL-5809 Settings Software	Version	0.104.0.0
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
Serial Encrypting Transceiver	Schweitzer Engineering Laboratories	SEL-3021	000B6B197CAD
AC Adapter	APX Technologies Inc.	SPU10-102	01385809

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Notebook PC	Dell	Inspiron 8000	IS115
802.11b PCMCIA Card	U.S. Robotics	Wireless Access 802.11b	none
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	Serial Encrypting Transceiver	AC Adapter
Serial Cables (2 each)	Yes	1.4	No	Serial Encrypting Transceiver	Unterminated
Alarm Leads	No	2.0	No	Serial Encrypting Transceiver	Unterminated

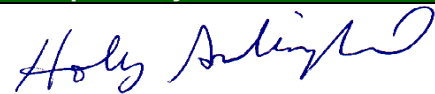
Measurement Equipment

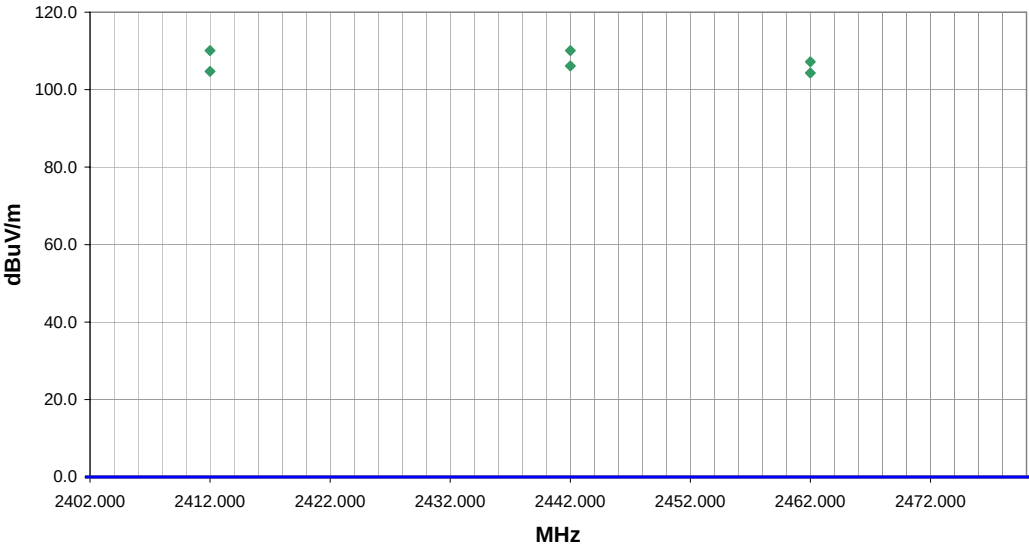
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Attenuator		2082-6148-20	ATE	02/03/2004	13 mo
High Pass Filter	Micro-Tronics	HPM50111	HFO	04/13/2004	13 mo
Antenna, Biconilog	EMCO	3141	AXE	12/03/2003	24 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	02/05/2004	13 mo
Antenna, Horn	EMCO	3115	AHC	09/18/2003	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/05/2004	13 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/23/2003	13 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	12/23/2003	13 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/23/2003	13 mo
Antenna, Horn	EMCO	3160-08	AHK	NCR	NA
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	10/08/2003	12 mo
Antenna, Horn	EMCO	3160-09	AHG	NCR	NA
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	10/08/2003	12 mo

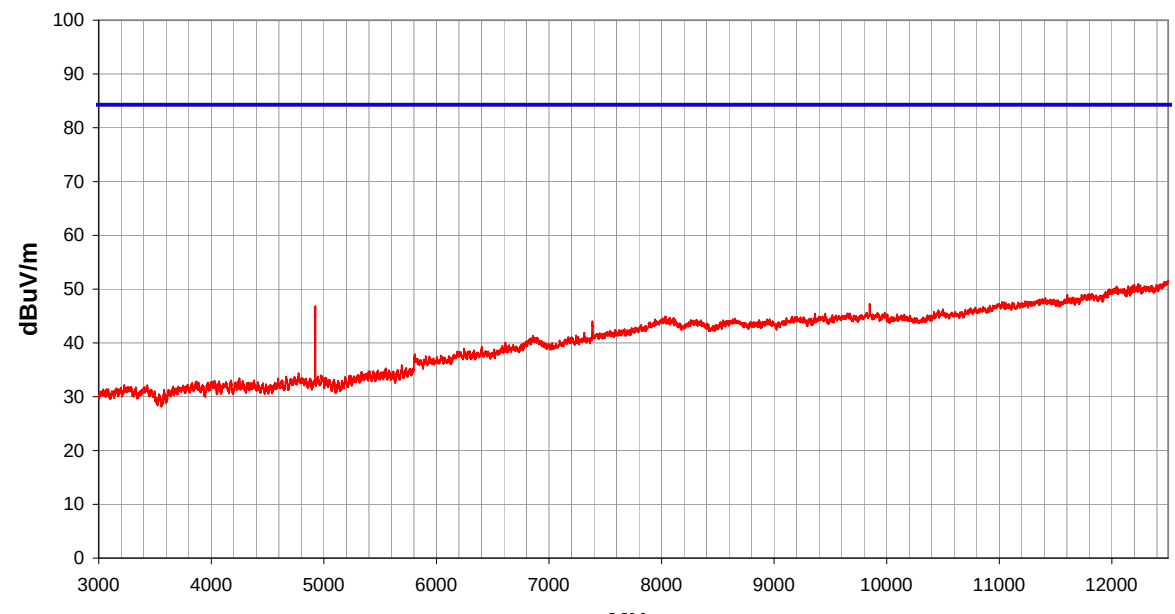
Test Description

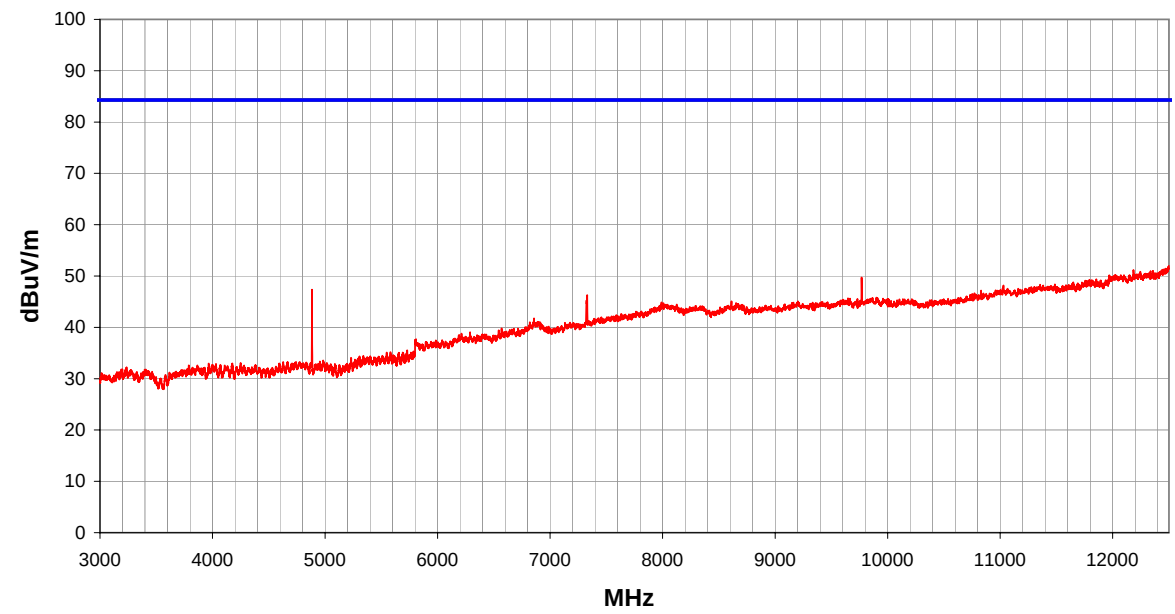
Requirement: Per 47 CFR 15.247(c), in any 100 kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100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

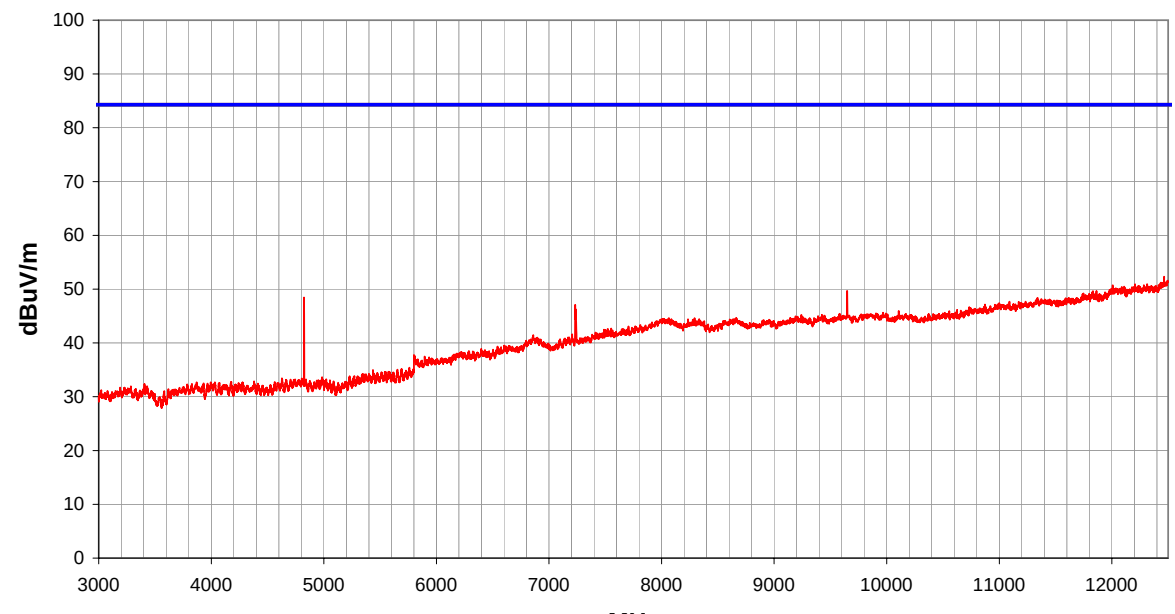
Configuration: The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. While scanning, emissions from the EUT were maximized by 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 C63.4:2001). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

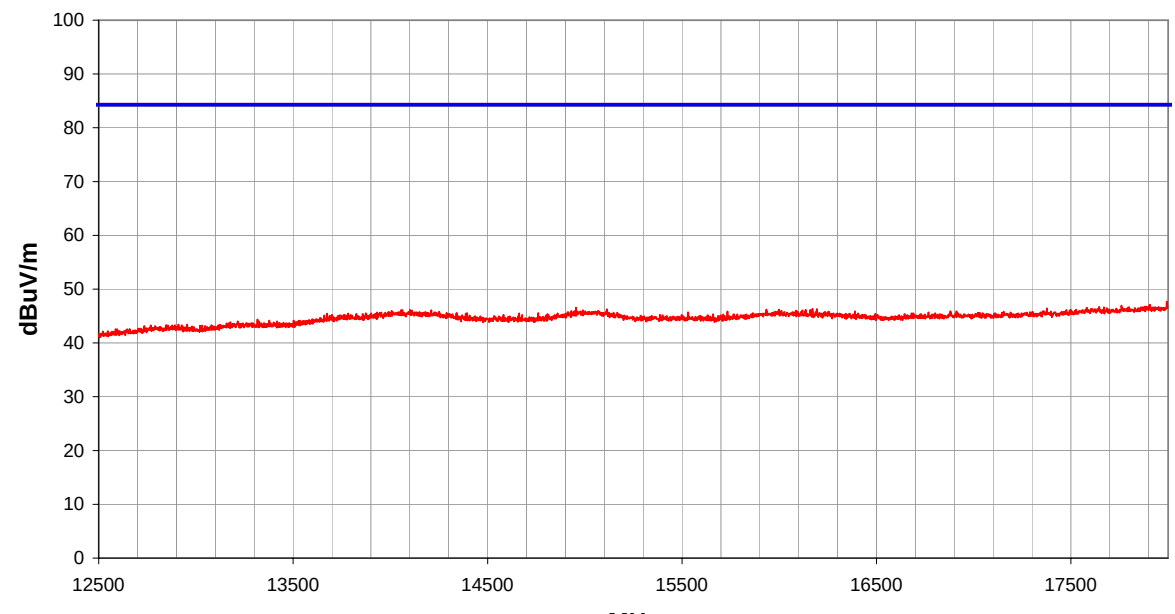
Completed by:

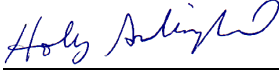
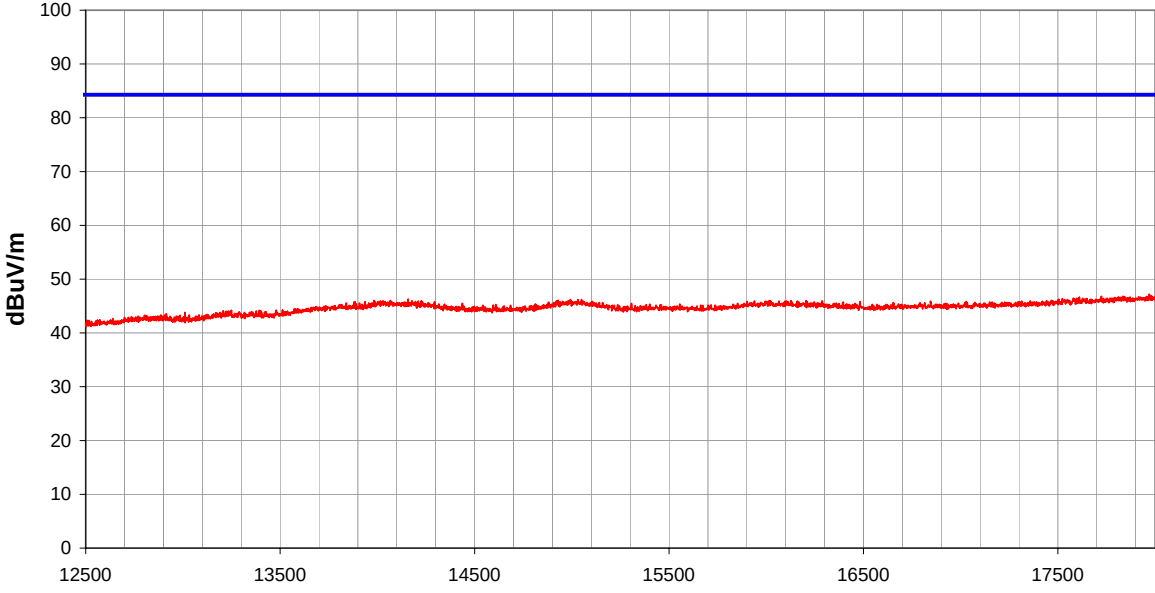
NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET										REV d14.2 08/10/2004	
EUT: SEL-3021										Work Order: SCHW0043											
Serial Number: 000B6B197CAD										Date: 08/18/04											
Customer: Schweitzer Engineering Laboratories, Inc.										Temperature: 79											
Attendees: None										Humidity: 43%											
Cust. Ref. No.:										Barometric Pressure 30.08											
Tested by: Holly Ashkannejhad										Power: 120V, 60Hz										Job Site: EV01	
TEST SPECIFICATIONS																					
Specification: N/A										Year: N/A											
Method: ANSI C63.4										Year: 2001											
SAMPLE CALCULATIONS																					
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																					
Max power, max modulation, See comments for channel																					
DEVIATIONS FROM TEST STANDARD																					
No deviations.																					
RESULTS																					
Pass																Run #					
																8					
Other																					
Conducted Spurious Emissions specification limit = Fundamental emissions - 20dB																					
Conducted Spurious Emissions specification limit = 104.3dBuV/m - 20dB = 84.3dB																					
Tested By:																					
																					
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								
2412.000	92.8	-2.7	83.0	2.6	3.0	20.0	H-Horn	PK	0.0	110.1	0.0	110.1	Low channel								
2442.000	92.7	-2.6	81.0	1.4	3.0	20.0	H-Horn	PK	0.0	110.1	0.0	110.1	Middle Channel								
2462.000	89.7	-2.5	62.0	1.6	3.0	20.0	H-Horn	PK	0.0	107.2	0.0	107.2	High Channel								
2442.000	88.7	-2.6	171.0	1.3	3.0	20.0	V-Horn	PK	0.0	106.1	0.0	106.1	Middle Channel								
2412.000	87.4	-2.7	31.0	1.2	3.0	20.0	V-Horn	PK	0.0	104.7	0.0	104.7	Low channel								
2462.000	86.8	-2.5	174.0	2.4	3.0	20.0	V-Horn	PK	0.0	104.3	0.0	104.3	High Channel								

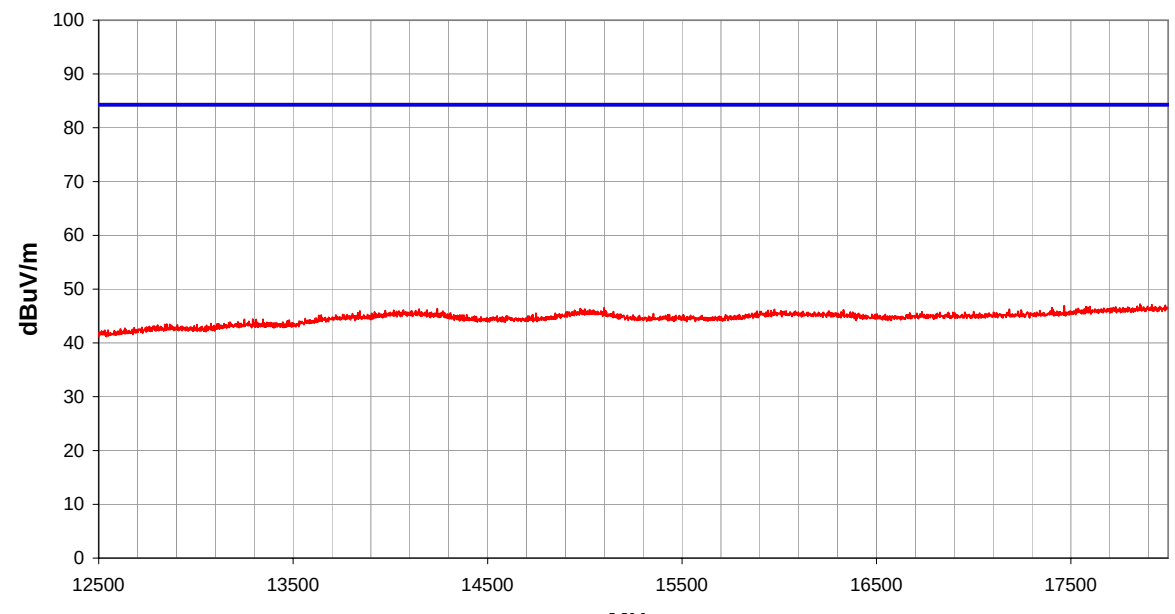
NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		REV df4.2 08/10/2004								
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/10/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation, High Channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS												
Test Distance (m)				Run #								
Pass				3 2								
Other												
				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
12498.000	29.8	31.5	0.0	39.4	13.9	0.0	V		0.0	51.6	74.0	-22.4
12498.000	29.7	31.5	0.0	39.4	13.9	0.0	H		0.0	51.5	74.0	-22.5
4923.959	43.1	35.2	0.0	33.3	5.7	0.0	H		0.0	46.9	74.0	-27.1
4923.959	35.6	35.2	0.0	33.3	5.7	0.0	V		0.0	39.4	74.0	-34.6

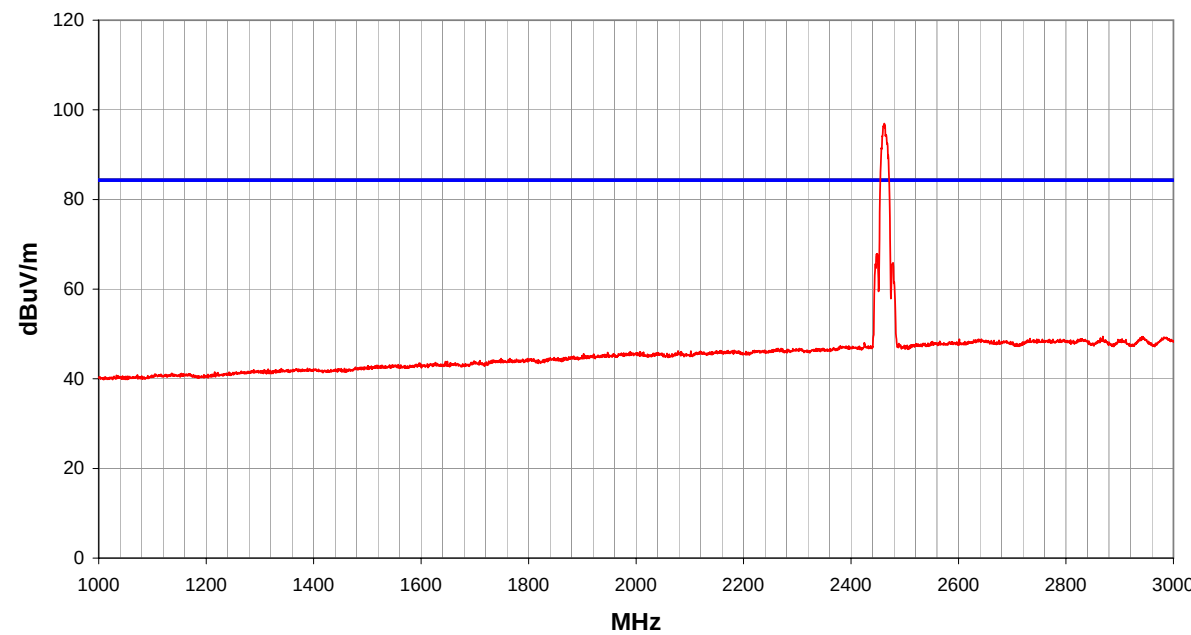
NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		REV df4.2 08/10/2004								
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/10/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation, Mid Channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS												
Test Distance (m)				Run #								
Pass				3								
Other												
				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
12498.000	30.2	31.5	0.0	39.4	13.9	0.0	V		0.0	52.0	74.0	-22.0
12496.000	29.8	31.5	0.0	39.4	13.9	0.0	H		0.0	51.6	74.0	-22.4
9768.203	33.7	32.1	0.0	38.2	9.9	0.0	V		0.0	49.7	74.0	-24.3
4883.568	43.7	35.2	0.0	33.2	5.7	0.0	H		0.0	47.3	74.0	-26.7
7329.129	35.6	34.8	0.0	36.1	9.3	0.0	V		0.0	46.3	74.0	-27.7
7324.600	34.6	34.8	0.0	36.1	9.3	0.0	H		0.0	45.3	74.0	-28.7
4883.568	34.2	35.2	0.0	33.2	5.7	0.0	V		0.0	37.8	74.0	-36.2

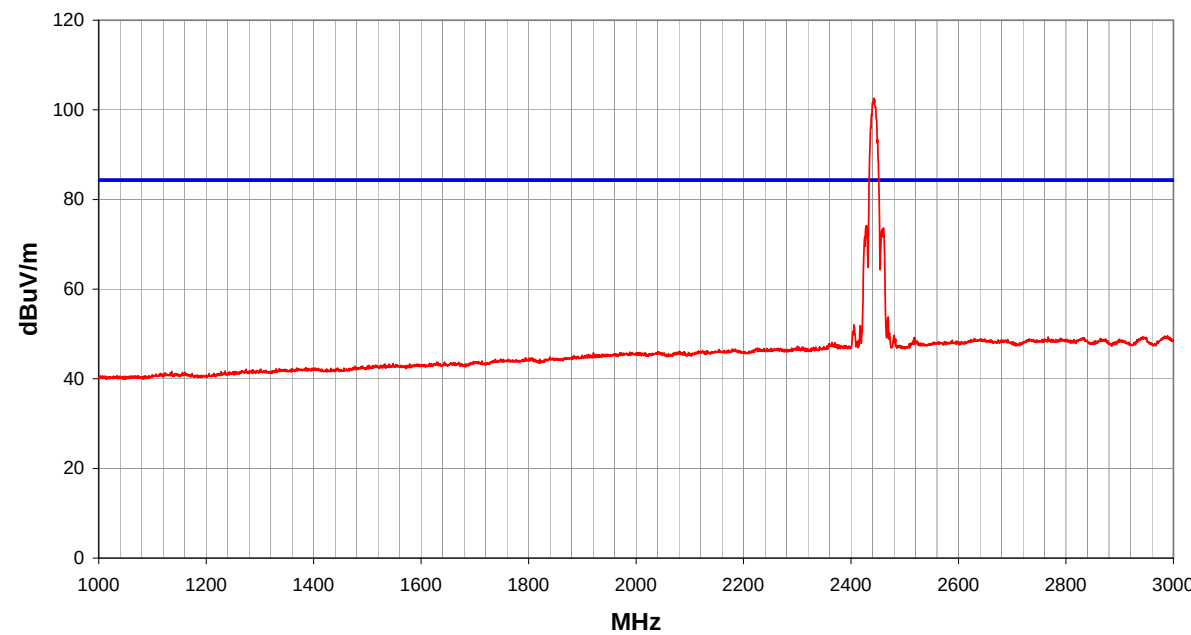
NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		REV df4.2 08/10/2004								
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/10/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation, Low Channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS												
Test Distance (m)				Run #								
Pass				3 4								
Other												
				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
12464.000	30.6	31.5	0.0	39.4	13.8	0.0	H		0.0	52.3	74.0	-21.7
12494.000	29.8	31.5	0.0	39.4	13.9	0.0	V		0.0	51.6	74.0	-22.4
9648.932	33.9	32.3	0.0	38.2	9.9	0.0	V		0.0	49.7	74.0	-24.3
4823.992	45.0	35.2	0.0	33.0	5.6	0.0	H		0.0	48.5	74.0	-25.5
7232.504	36.7	35.0	0.0	36.1	9.3	0.0	H		0.0	47.1	74.0	-26.9
7237.033	35.3	34.9	0.0	36.1	9.3	0.0	V		0.0	45.7	74.0	-28.3
4823.992	35.4	35.2	0.0	33.0	5.6	0.0	V		0.0	38.9	74.0	-35.1

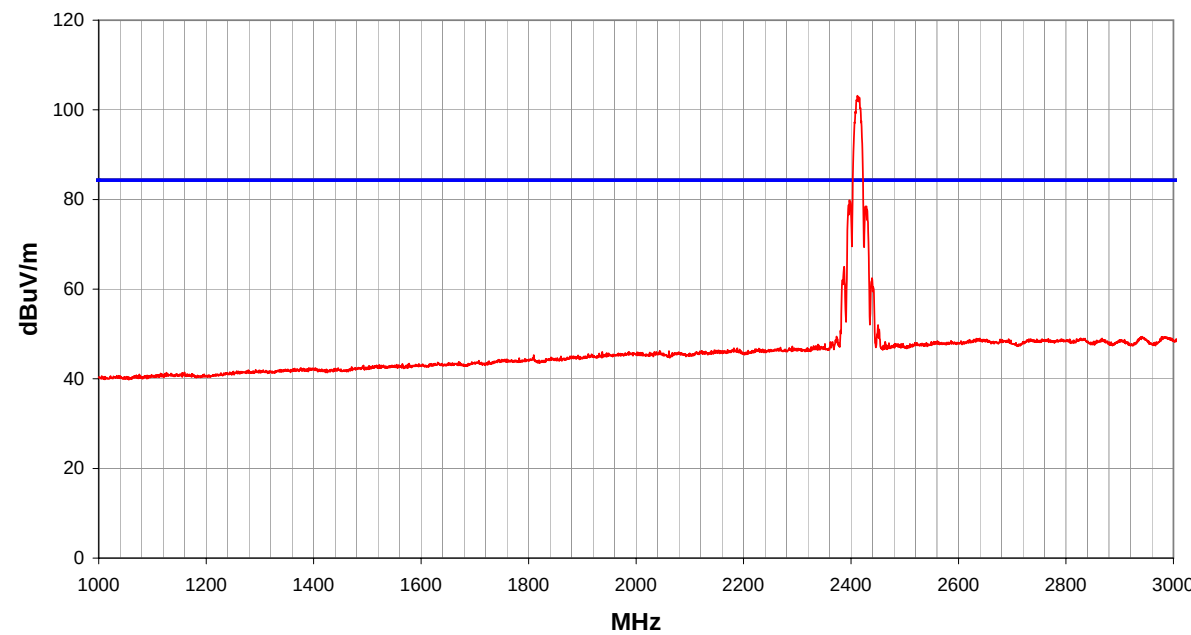
NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		REV df4.2 08/10/2004								
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/10/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation, Low Channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS												
Test Distance (m)				Run #								
Pass				3 5								
Other												
				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
17994.000	31.9	34.7	0.0	37.3	13.2	0.0	H		0.0	47.7	74.0	-26.3
17886.000	31.1	34.7	0.0	37.3	13.1	0.0	V		0.0	46.8	74.0	-27.2

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		REV df4.2 08/10/2004								
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/10/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation, Mid Channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS				Test Distance (m)								
Pass				3								
				Run #								
				6								
Other				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
17970.000	31.4	34.7	0.0	37.3	13.2	0.0	H		0.0	47.2	74.0	-26.8
17982.000	31.1	34.7	0.0	37.3	13.2	0.0	V		0.0	46.9	74.0	-27.1

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		REV df4.2 08/10/2004								
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/10/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation, High Channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS				Test Distance (m)	Run #							
Pass				3	7							
Other												
				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
17856.000	31.6	34.7	0.0	37.3	13.0	0.0	V		0.0	47.2	74.0	-26.8
17859.000	31.3	34.7	0.0	37.3	13.0	0.0	H		0.0	46.9	74.0	-27.1

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		REV df4.2 08/10/2004								
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/10/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS												
Test Distance (m)				Run #								
Pass				3 1								
Other												
				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pic] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
2462.069	80.9	34.0	0.0	28.0	3.5	20.0	H		0.0	98.3	74.0	24.3
2462.069	79.5	34.0	0.0	28.0	3.5	20.0	V		0.0	96.9	74.0	22.9
2478.389	54.3	34.0	0.0	28.0	3.5	20.0	H		0.0	71.8	74.0	-2.2
2447.789	51.5	34.0	0.0	27.9	3.4	20.0	H		0.0	68.9	74.0	-5.1
2448.809	50.5	34.0	0.0	27.9	3.4	20.0	V		0.0	67.9	74.0	-6.1
2478.389	48.3	34.0	0.0	28.0	3.5	20.0	V		0.0	65.8	74.0	-8.2

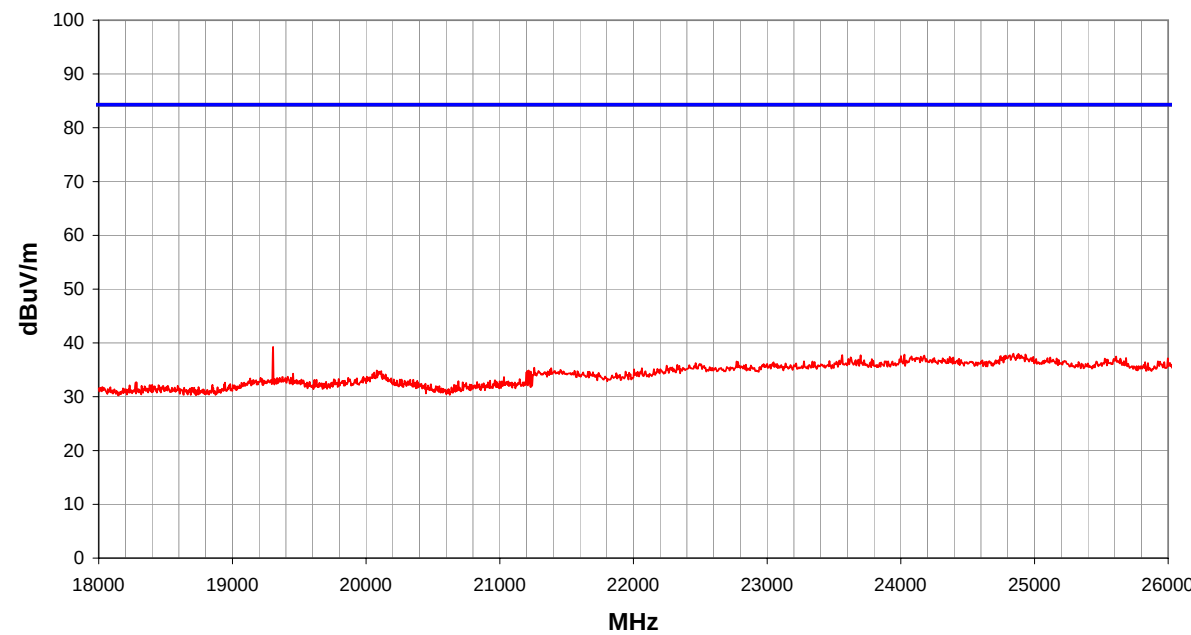
NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET				REV df4.2 08/10/2004	
EUT: SEL-3021								Work Order: SCHW0043							
Serial Number: 000B6B197CAD								Date: 08/11/04							
Customer: Schweitzer Engineering Laboratories, Inc.								Temperature: 75							
Attendees: Jeff Butler								Humidity: 44%							
Cust. Ref. No.:								Barometric Pressure: 30.08							
Tested by: Greg Kiemel						Power: 120V, 60Hz		Job Site: EV01							
TEST SPECIFICATIONS															
Specification: FCC 15.247(c) Spurious Conducted Emissions								Year: 2003							
Method: ANSI C63.4								Year: 2001							
SAMPLE CALCULATIONS															
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															
Max power, max modulation, mid channel															
DEVIATIONS FROM TEST STANDARD															
No deviations.															
RESULTS															
Pass								Test Distance (m)		Run #					
								3		8					
Other															
								 Tested By:							
															
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pic] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)			
2442.178	85.2	34.0	0.0	27.9	3.4	20.0	H		0.0	102.6	74.0	28.6			
2443.708	80.7	34.0	0.0	27.9	3.4	20.0	V		0.0	98.1	74.0	24.1			
2428.918	56.8	34.0	0.0	27.9	3.4	20.0	V		0.0	74.2	74.0	0.2			
2428.408	56.3	34.0	0.0	27.9	3.4	20.0	H		0.0	73.7	74.0	-0.3			
2460.539	56.2	34.0	0.0	28.0	3.5	20.0	V		0.0	73.6	74.0	-0.4			
2457.989	55.7	34.0	0.0	27.9	3.5	20.0	H		0.0	73.1	74.0	-0.9			
2405.458	34.7	34.0	0.0	27.9	3.4	20.0	H		0.0	52.0	74.0	-22.0			

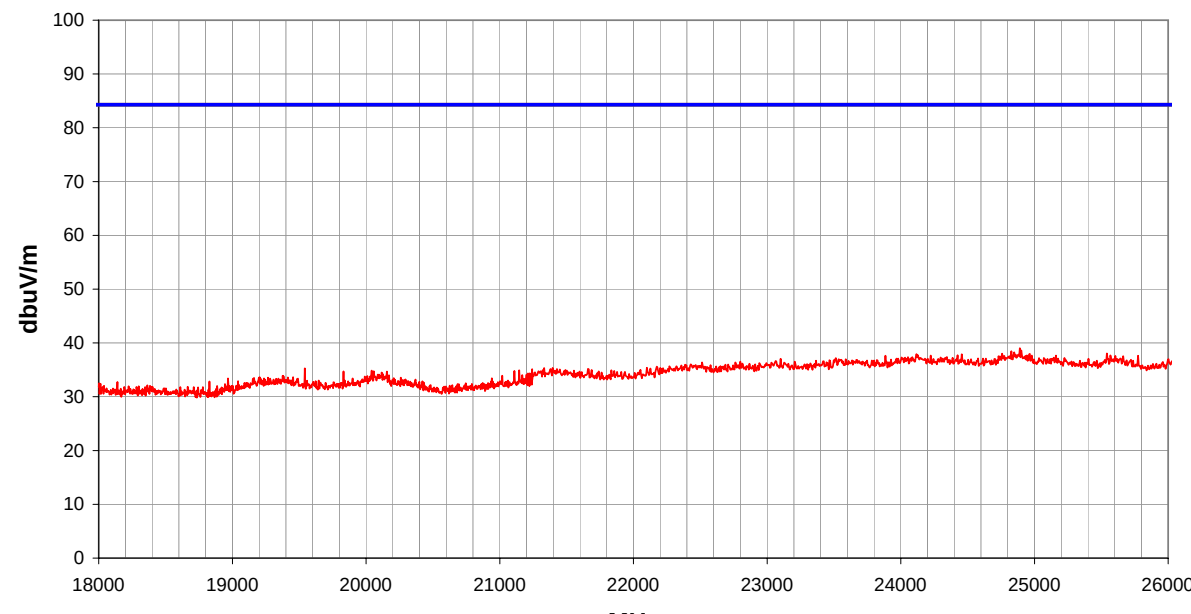
NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET				REV df4.2 08/10/2004						
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/11/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 75										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation, low channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS												
Pass				Test Distance (m)		Run #						
				3		9						
Other												
				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pic] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
2412.088	85.8	34.0	0.0	27.9	3.4	20.0	H		0.0	103.1	74.0	29.1
2413.618	84.7	34.0	0.0	27.9	3.4	20.0	V		0.0	102.0	74.0	28.0
2397.298	62.5	34.0	0.0	27.9	3.4	20.0	H		0.0	79.8	74.0	5.8
2428.918	61.1	34.0	0.0	27.9	3.4	20.0	H		0.0	78.5	74.0	4.5
2428.918	60.7	34.0	0.0	27.9	3.4	20.0	V		0.0	78.1	74.0	4.1
2398.828	57.5	34.0	0.0	27.9	3.4	20.0	V		0.0	74.8	74.0	0.8
2387.097	47.7	34.0	0.0	27.9	3.4	20.0	H		0.0	65.0	74.0	-9.0
2439.118	45.1	34.0	0.0	27.9	3.4	20.0	H		0.0	62.5	74.0	-11.5
2439.118	44.7	34.0	0.0	27.9	3.4	20.0	V		0.0	62.1	74.0	-11.9
2387.607	40.4	34.0	0.0	27.9	3.4	20.0	V		0.0	57.7	74.0	-16.3
2450.339	34.6	34.0	0.0	27.9	3.5	20.0	V		0.0	52.0	74.0	-22.0

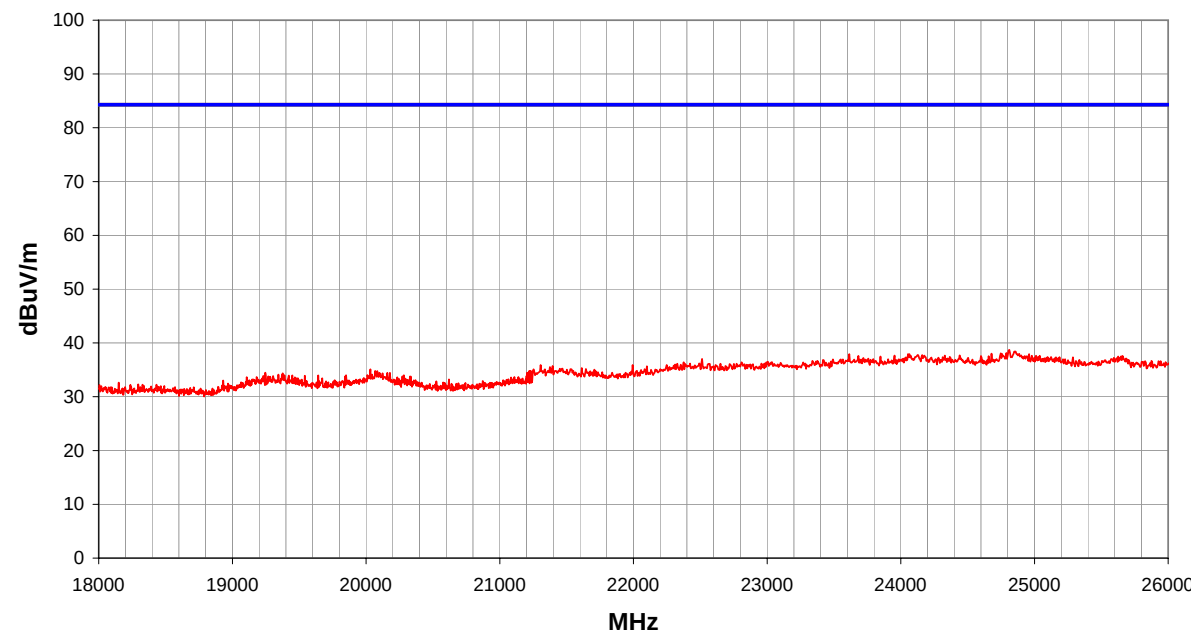
NORTHWEST		RADIATED EMISSIONS DATA SHEET										REV df4.2 08/10/2004	
EMC													
EUT: SEL-3021		Work Order: SCHW0043											
Serial Number: 000B6B197CAD		Date: 08/11/04											
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 75											
Attendees: Jeff Butler		Humidity: 44%											
Cust. Ref. No.:		Barometric Pressure: 30.08											
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz										Job Site: EV01	
TEST SPECIFICATIONS													
Specification: FCC 15.247(c) Spurious Conducted Emissions										Year: 2003			
Method: ANSI C63.4										Year: 2001			
SAMPLE CALCULATIONS													
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													
Max power, max modulation, low channel													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS													
Test Distance (m)										Run #			
Pass										3		10	
Other													
										Holly Ashkannejhad Tested By:			
100 90 80 70 60 50 40 30 20 10 0 10 100 1000 dBuV/m MHz													
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pic] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	
180.471	55.2	29.2	0.0	15.6	1.0	0.0	V		0.0	42.7	43.0	-0.3	
269.989	54.1	29.2	0.0	19.0	1.4	0.0	H		0.0	45.3	46.0	-0.7	
170.631	54.2	29.2	0.0	15.0	1.0	0.0	H		0.0	41.0	43.0	-2.0	
170.631	53.6	29.2	0.0	15.0	1.0	0.0	V		0.0	40.4	43.0	-2.6	
230.430	53.0	29.2	0.0	17.9	1.3	0.0	H		0.0	43.0	46.0	-3.0	
230.215	53.0	29.2	0.0	17.9	1.3	0.0	H		0.0	43.0	46.0	-3.0	
230.000	52.9	29.2	0.0	17.9	1.3	0.0	H		0.0	42.9	46.0	-3.1	
265.259	51.4	29.2	0.0	19.0	1.4	0.0	H		0.0	42.5	46.0	-3.5	
220.652	52.8	29.2	0.0	17.7	1.2	0.0	H		0.0	42.5	46.0	-3.5	
180.471	51.4	29.2	0.0	15.6	1.0	0.0	H		0.0	38.9	43.0	-4.1	
150.541	52.4	29.3	0.0	14.8	0.9	0.0	V		0.0	38.8	43.0	-4.2	
135.371	53.7	29.4	0.0	13.6	0.8	0.0	V		0.0	38.8	43.0	-4.2	
175.551	51.5	29.2	0.0	15.3	1.0	0.0	V		0.0	38.6	43.0	-4.4	
85.350	50.7	29.5	0.0	13.2	0.7	0.0	H		0.0	35.2	40.0	-4.8	
165.506	51.3	29.2	0.0	15.1	1.0	0.0	V		0.0	38.2	43.0	-4.8	
185.391	50.2	29.2	0.0	16.0	1.1	0.0	V		0.0	38.1	43.0	-4.9	
130.451	53.2	29.4	0.0	13.3	0.8	0.0	V		0.0	38.0	43.0	-5.0	
38.610	43.8	29.7	0.0	20.3	0.5	0.0	V		0.0	34.8	40.0	-5.2	
275.149	49.2	29.2	0.0	19.1	1.4	0.0	H		0.0	40.5	46.0	-5.5	

NORTHWEST		REV										
EMC		df4.2										
08/10/2004												
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/11/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 75										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz										
		Job Site: EV01										
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions		Year: 2003										
Method: ANSI C63.4		Year: 2001										
SAMPLE CALCULATIONS												
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												
Max power, max modulation, mid channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS		Test Distance (m)	Run #									
Pass		3	11									
Other												
		Holly Ashkannejhad Tested By:										
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pic] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
180.471	54.7	29.2	0.0	15.6	1.0	0.0	V		0.0	42.2	43.0	-0.8
270.419	53.3	29.2	0.0	19.0	1.4	0.0	H		0.0	44.5	46.0	-1.5
170.631	54.2	29.2	0.0	15.0	1.0	0.0	H		0.0	41.0	43.0	-2.0
265.259	52.2	29.2	0.0	19.0	1.4	0.0	H		0.0	43.3	46.0	-2.7
230.215	53.0	29.2	0.0	17.9	1.3	0.0	H		0.0	43.0	46.0	-3.0
170.426	52.9	29.2	0.0	15.0	1.0	0.0	V		0.0	39.7	43.0	-3.3
220.652	52.9	29.2	0.0	17.7	1.2	0.0	H		0.0	42.6	46.0	-3.4
230.430	52.6	29.2	0.0	17.9	1.3	0.0	H		0.0	42.6	46.0	-3.4
230.000	52.6	29.2	0.0	17.9	1.3	0.0	H		0.0	42.6	46.0	-3.4
180.471	51.8	29.2	0.0	15.6	1.0	0.0	H		0.0	39.3	43.0	-3.7
150.541	52.4	29.3	0.0	14.8	0.9	0.0	V		0.0	38.8	43.0	-4.2
175.551	51.6	29.2	0.0	15.3	1.0	0.0	V		0.0	38.7	43.0	-4.3
37.995	43.8	29.7	0.0	20.6	0.5	0.0	V		0.0	35.2	40.0	-4.8
165.506	51.3	29.2	0.0	15.1	1.0	0.0	V		0.0	38.2	43.0	-4.8
135.371	53.0	29.4	0.0	13.6	0.8	0.0	V		0.0	38.1	43.0	-4.9
130.451	52.9	29.4	0.0	13.3	0.8	0.0	V		0.0	37.7	43.0	-5.3
165.506	50.8	29.2	0.0	15.1	1.0	0.0	H		0.0	37.7	43.0	-5.3
85.350	49.6	29.5	0.0	13.2	0.7	0.0	H		0.0	34.1	40.0	-5.9
185.391	49.0	29.2	0.0	16.0	1.1	0.0	V		0.0	36.9	43.0	-6.1

NORTHWEST		RADIATED EMISSIONS DATA SHEET										REV df4.2 08/10/2004	
EMC													
EUT: SEL-3021		Work Order: SCHW0043											
Serial Number: 000B6B197CAD		Date: 08/11/04											
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 75											
Attendees: None		Humidity: 44%											
Cust. Ref. No.:		Barometric Pressure: 30.08											
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz										Job Site: EV01	
TEST SPECIFICATIONS													
Specification: FCC 15.247(c) Spurious Conducted Emissions										Year: 2003			
Method: ANSI C63.4										Year: 2001			
SAMPLE CALCULATIONS													
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													
Max power, max modulation, high channel													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS										Test Distance (m)		Run #	
Pass										3		12	
Other													
										Holly Ashkannejhad Tested By:			
100 90 80 70 60 50 40 30 20 10 0 10 100 1000 dBuV/m MHz													
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pic] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	
180.471	54.7	29.2	0.0	15.6	1.0	0.0	V		0.0	42.2	43.0	-0.8	
269.989	53.7	29.2	0.0	19.0	1.4	0.0	H		0.0	44.9	46.0	-1.1	
170.631	54.3	29.2	0.0	15.0	1.0	0.0	H		0.0	41.1	43.0	-1.9	
265.259	52.0	29.2	0.0	19.0	1.4	0.0	H		0.0	43.1	46.0	-2.9	
150.541	53.4	29.3	0.0	14.8	0.9	0.0	V		0.0	39.8	43.0	-3.2	
230.430	52.6	29.2	0.0	17.9	1.3	0.0	H		0.0	42.6	46.0	-3.4	
230.000	52.6	29.2	0.0	17.9	1.3	0.0	H		0.0	42.6	46.0	-3.4	
230.215	52.5	29.2	0.0	17.9	1.3	0.0	H		0.0	42.5	46.0	-3.5	
220.652	52.5	29.2	0.0	17.7	1.2	0.0	H		0.0	42.2	46.0	-3.8	
170.426	52.4	29.2	0.0	15.0	1.0	0.0	V		0.0	39.2	43.0	-3.8	
180.471	51.4	29.2	0.0	15.6	1.0	0.0	H		0.0	38.9	43.0	-4.1	
135.371	53.5	29.4	0.0	13.6	0.8	0.0	V		0.0	38.6	43.0	-4.4	
175.551	51.3	29.2	0.0	15.3	1.0	0.0	V		0.0	38.4	43.0	-4.6	
275.149	49.9	29.2	0.0	19.1	1.4	0.0	H		0.0	41.2	46.0	-4.8	
38.610	44.0	29.7	0.0	20.3	0.5	0.0	V		0.0	35.0	40.0	-5.0	
130.451	53.1	29.4	0.0	13.3	0.8	0.0	V		0.0	37.9	43.0	-5.1	
85.350	50.4	29.5	0.0	13.2	0.7	0.0	H		0.0	34.9	40.0	-5.1	
165.301	50.5	29.2	0.0	15.1	1.0	0.0	V		0.0	37.4	43.0	-5.6	
280.094	48.6	29.2	0.0	19.2	1.4	0.0	H		0.0	40.0	46.0	-6.0	

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET				REV df4.2 08/10/2004						
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/12/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 75										
Attendees: None		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Conducted Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation, low channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS												
Pass				Test Distance (m)		Run #						
				1		13						
Other												
				 Tested By:								
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
19304.930	40.8	37.6	0.0	40.2	5.4	0.0	V		-9.5	39.3	74.0	-34.7
19304.930	39.8	37.6	0.0	40.2	5.4	0.0	H		-9.5	38.3	74.0	-35.7
24842.910	37.9	36.8	0.0	40.4	6.0	0.0	H		-9.5	38.0	74.0	-36.0
24879.970	37.9	36.8	0.0	40.4	6.0	0.0	V		-9.5	38.0	74.0	-36.0

NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET				REV df4.2 08/10/2004	
EUT: SEL-3021						Work Order: SCHW0043									
Serial Number: 000B6B197CAD						Date: 08/12/04									
Customer: Schweitzer Engineering Laboratories, Inc.						Temperature: 75									
Attendees: None						Humidity: 44%									
Cust. Ref. No.:						Barometric Pressure: 30.08									
Tested by: Holly Ashkannejhad				Power: 120V, 60Hz		Job Site: EV01									
TEST SPECIFICATIONS															
Specification: FCC 15.247(c) Spurious Conducted Emissions						Year: 2003									
Method: ANSI C63.4						Year: 2001									
SAMPLE CALCULATIONS															
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															
Max power, max modulation, mid channel															
DEVIATIONS FROM TEST STANDARD															
No deviations.															
RESULTS															
Pass						Test Distance (m)		Run #							
						1		14							
Other															
						 Tested By:									
															
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)			
24890.560	38.9	36.8	0.0	40.4	6.0	0.0	V		-9.5	39.0	74.0	-35.0			
24885.270	38.4	36.8	0.0	40.4	6.0	0.0	H		-9.5	38.5	74.0	-35.5			

NORTHWEST EMC										REV df4.2 08/10/2004			
RADIATED EMISSIONS DATA SHEET													
EUT: SEL-3021						Work Order: SCHW0043							
Serial Number: 000B6B197CAD						Date: 08/12/04							
Customer: Schweitzer Engineering Laboratories, Inc.						Temperature: 75							
Attendees: None						Humidity: 44%							
Cust. Ref. No.:						Barometric Pressure: 30.08				Job Site: EV01			
Tested by: Holly Ashkannejhad				Power: 120V, 60Hz									
TEST SPECIFICATIONS													
Specification: FCC 15.247(c) Spurious Conducted Emissions						Year: 2003							
Method: ANSI C63.4						Year: 2001							
SAMPLE CALCULATIONS													
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													
Max power, max modulation, high channel													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS													
Pass						Test Distance (m)				Run #			
Pass						1				15			
Other													
						 Tested By:							
													
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	
24811.140	38.6	36.7	0.0	40.4	6.0	0.0	H		-9.5	38.7	74.0	-35.3	
24816.430	38.1	36.8	0.0	40.4	6.0	0.0	V		-9.5	38.2	74.0	-35.8	





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	0.104.0.0
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
Serial Encrypting Transceiver	Schweitzer Engineering Laboratories	SEL-3021	000B6B197CAD
AC Adapter	APX Technologies Inc.	SPU10-102	01385809

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Notebook PC	Dell	Inspiron 8000	IS115
802.11b PCMCIA Card	U.S. Robotics	Wireless Access 802.11b	none
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	Serial Encrypting Transceiver	AC Adapter
Serial Cables (2 each)	Yes	1.4	No	Serial Encrypting Transceiver	Unterminated
Alarm Leads	No	2.0	No	Serial Encrypting Transceiver	Unterminated

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo
Antenna, Horn	EMCO	3115	AHC	09/18/2003	12 mo

Test Description

Requirement: Per 47 CFR 15.247(d), 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 EUT was transmitting at its maximum data rate using direct sequence modulation.

The measurement was made using the alternative test procedure described in FCC 97-114. The maximum field strength of the fundamental was measured at a 3 meter distance. The field strength was 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 C63.4:2001). Then the analyzer was tuned to the highest point of the maximized fundamental emission and reset per the procedure outlined in FCC 97-114:

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."

The antenna factor and cable loss were added to the marker noise power density level to provide the maximum field strength (dBm/m/3kHz). The power spectral density (dBm/3kHz) (EIRP) was calculated using the equation:

$$\text{EIRP} = (\text{Ed})^2 / 30$$

Where: E is the measured maximum field strength in V/m/3kHz
d is the distance in meters from which the field strength was measured
EIRP is in W/3kHz

Completed by:

NORTHWEST
EMC**EMISSIONS DATA SHEET**Rev BETA
01/30/01

EUT: SEL-3021	Work Order: SCHW0043
Serial Number: 000B6B197CAD	Date: 08/10/04
Customer: Schweitzer Engineering Laboratories, Inc	Temperature: 73
Attendees: Jeff Butler	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 120 V, 60 Hz
	Humidity: 46% RH
	Job Site: EV06

TEST SPECIFICATIONS

Specification: 47 CFR 15.247(d)	Year: 2003	Method: FCC 97-114, ANSI C63.4	Year: 2003
---------------------------------	------------	--------------------------------	------------

SAMPLE CALCULATIONS

Marker level on spectrum analyzer is not compensated for antenna factor or cable loss

Field Strength per 1 Hz bandwidth = Marker level + correction factor (antenna + cable)

EIRP per 1 Hz bandwidth =

Power Spectral Density per 3kHz bandwidth (EIRP) = EIRP per 1 Hz bandwidth + Bandwidth Correction Factor.

Bandwidth Correction Factor = $10 \cdot \log(3 \text{ kHz} / 1 \text{ Hz}) = 34.8 \text{ dB}$ **COMMENTS**

Correction factor (antenna factor + cable loss) = 31.3 dB

EUT OPERATING MODES

Modulated at maximum data rate, 802.11(b) modulation scheme

DEVIATIONS FROM TEST STANDARD

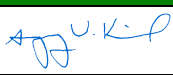
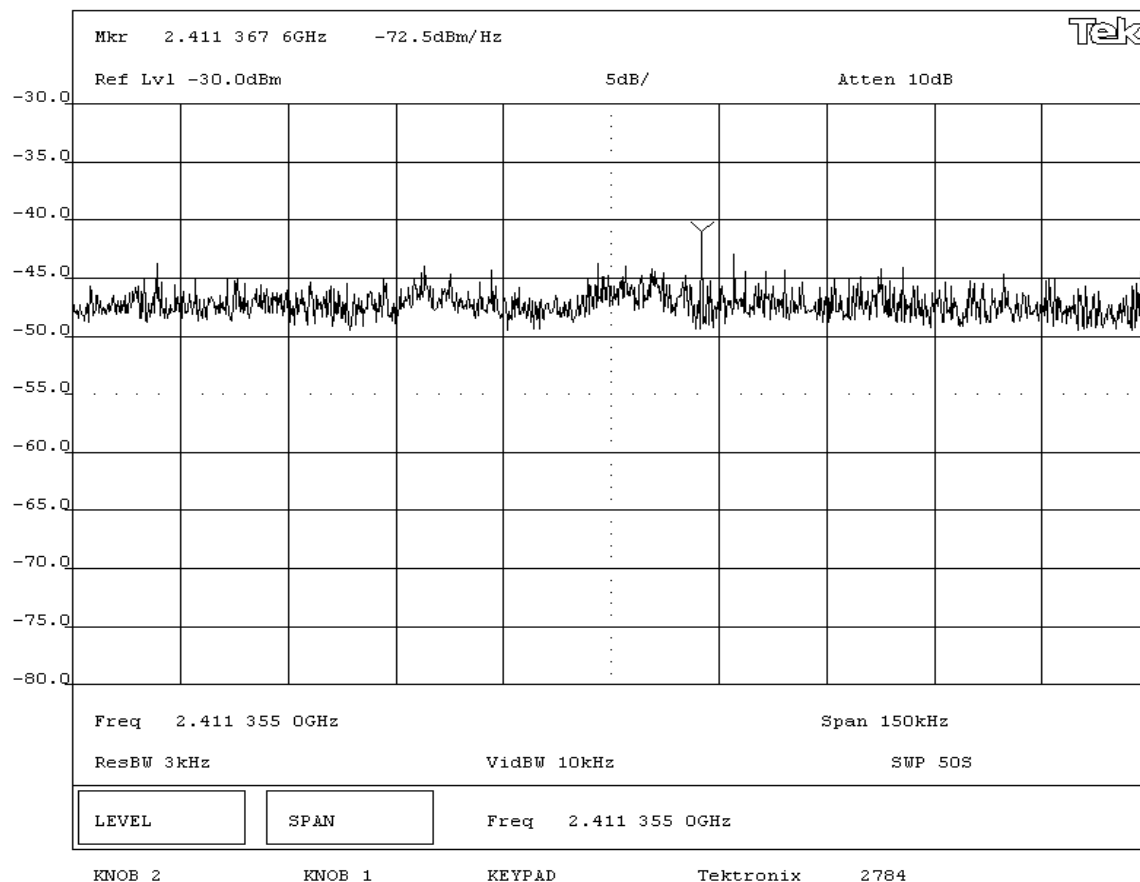
None

REQUIREMENTS

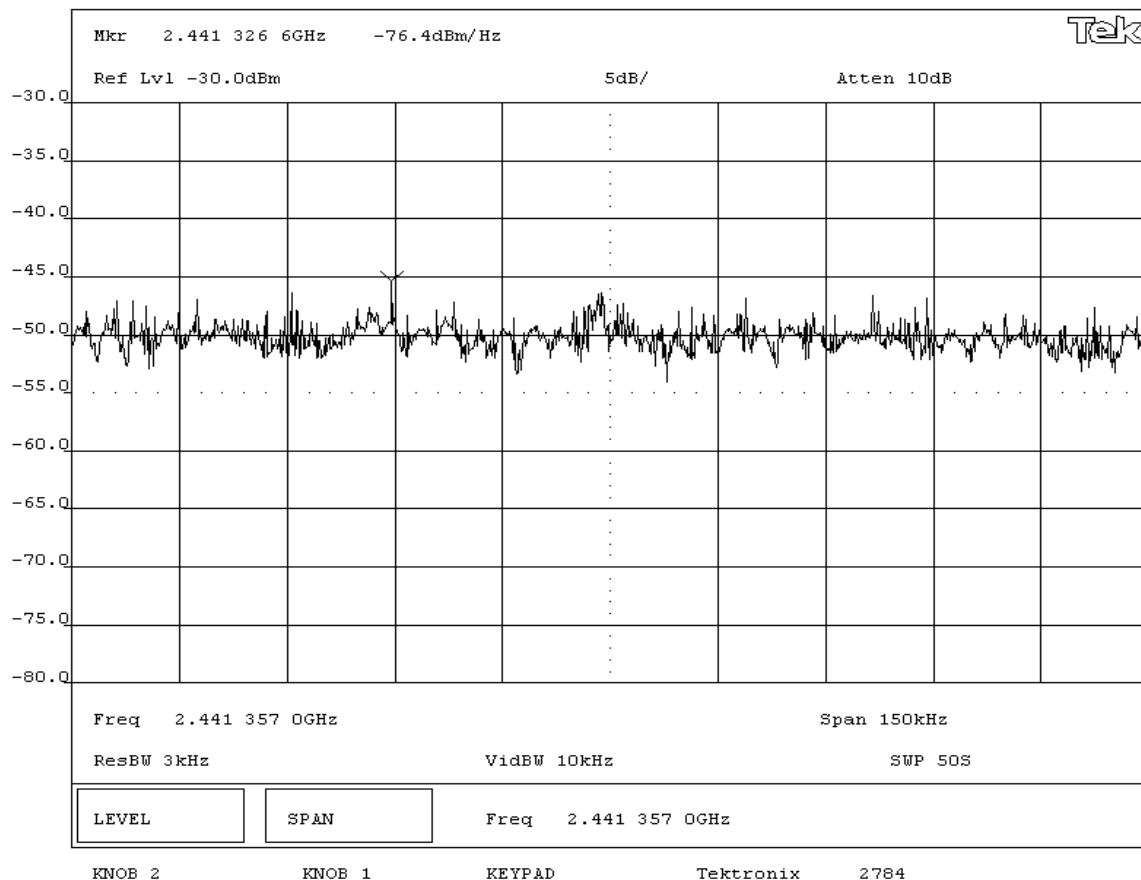
Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band

RESULTS**AMPLITUDE**

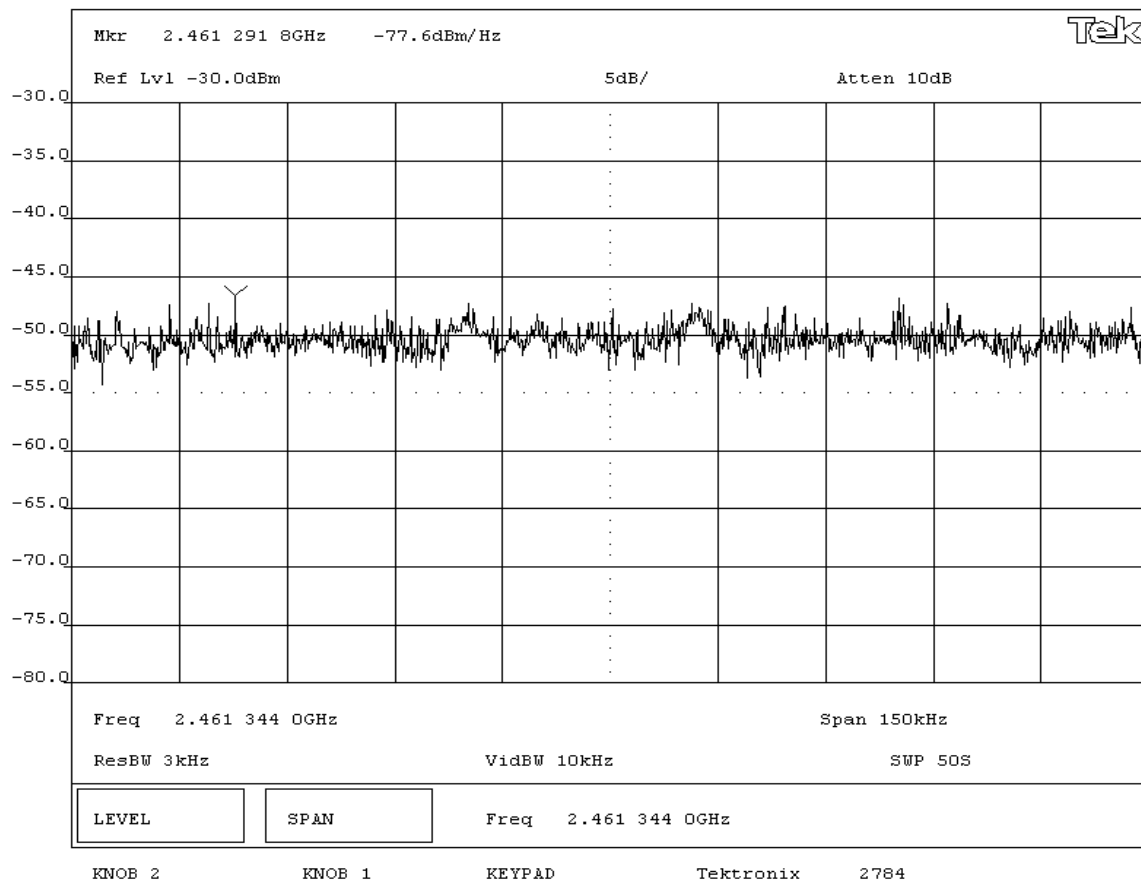
Pass Power Spectral Density = +5.4 dBm / 3kHz

SIGNATURETested By: **DESCRIPTION OF TEST****Power Spectral Density - Low Channel**

NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: SEL-3021			Work Order: SCHW0043		
Serial Number: 000B6B197CAD			Date: 08/10/04		
Customer: Schweitzer Engineering Laboratories, Inc			Temperature: 73		
Attendees: Jeff Butler		Tested by: Greg Kiemel		Humidity: 46% RH	
Customer Ref. No.: N/A		Power: 120 V, 60 Hz		Job Site: EV06	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: Most Current		Method: FCC 97-114, ANSI C63.4	
				Year: 1992	
SAMPLE CALCULATIONS					
Marker level on spectrum analyzer is not compensated for antenna factor or cable loss					
Field Strength per 1 Hz bandwidth = Marker level + correction factor (antenna + cable)					
EIRP per 1 Hz bandwidth =					
Power Spectral Density per 3kHz bandwidth (EIRP) = EIRP per 1 Hz bandwidth + Bandwidth Correction Factor.					
Bandwidth Correction Factor = $10 \cdot \log(3 \text{ kHz} / 1 \text{ Hz}) = 34.8 \text{ dB}$					
COMMENTS					
Correction factor (antenna factor + cable loss) = 31.4 dB					
EUT OPERATING MODES					
Modulated 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 exceed 8 dBm in any 3 kHz band					
RESULTS			AMPLITUDE		
Pass			Power Spectral Density = +1.6 dBm / 3kHz		
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Power Spectral Density - Mid Channel					



NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: SEL-3021		Work Order: SCHW0043			
Serial Number: 000B6B197CAD		Date: 08/10/04			
Customer: Schweitzer Engineering Laboratories, Inc		Temperature: 73			
Attendees: Jeff Butler		Tested by: Greg Kiemel		Humidity: 46% RH	
Customer Ref. No.: N/A		Power: 120 V, 60 Hz		Job Site: EV06	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: Most Current		Method: FCC 97-114, ANSI C63.4	
				Year: 1992	
SAMPLE CALCULATIONS					
Marker level on spectrum analyzer is not compensated for antenna factor or cable loss					
Field Strength per 1 Hz bandwidth = Marker level + correction factor (antenna + cable)					
EIRP per 1 Hz bandwidth =					
Power Spectral Density per 3kHz bandwidth (EIRP) = EIRP per 1 Hz bandwidth + Bandwidth Correction Factor.					
Bandwidth Correction Factor = $10 \cdot \log(3 \text{ kHz} / 1 \text{ Hz}) = 34.8 \text{ dB}$					
COMMENTS					
Correction factor (antenna factor + cable loss) = 31.5 dB					
EUT OPERATING MODES					
Modulated 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 exceed 8 dBm in any 3 kHz band					
RESULTS		AMPLITUDE			
Pass		Power Spectral Density = +0.47 dBm / 3kHz			
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Power Spectral Density - High Channel					







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	26 GHz
------------------------	--------	-----------------------	--------

Software\Firmware Applied During Test

Exercise software	SEL-5809 Settings Software	Version	0.104.0.0
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
Serial Encrypting Transceiver	Schweitzer Engineering Laboratories	SEL-3021	000B6B197CAD
AC Adapter	APX Technologies Inc.	SPU10-102	01385809

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Notebook PC	Dell	Inspiron 8000	IS115
802.11b PCMCIA Card	U.S. Robotics	Wireless Access 802.11b	none
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	Serial Encrypting Transceiver	AC Adapter
Serial Cables (2 each)	Yes	1.4	No	Serial Encrypting Transceiver	Unterminated
Alarm Leads	No	2.0	No	Serial Encrypting Transceiver	Unterminated

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/23/2003	13 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/23/2003	13 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	12/23/2003	13 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	02/05/2004	13 mo
Antenna, Biconilog	EMCO	3141	AXE	12/03/2003	24 mo
Antenna, Horn	EMCO	3115	AHC	09/18/2003	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/05/2004	13 mo
Antenna, Horn	EMCO	3160-08	AHK	NCR	NA
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	10/08/2003	12 mo
Antenna, Horn	EMCO	3160-09	AHG	NCR	NA
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	10/08/2003	12 mo
Attenuator		2082-6148-20	ATE	02/03/2004	13 mo
High Pass Filter	Micro-Tronics	HPM50111	HFO	04/13/2004	13 mo

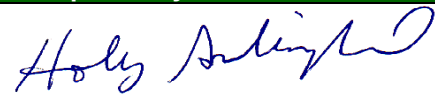
Test Description

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.

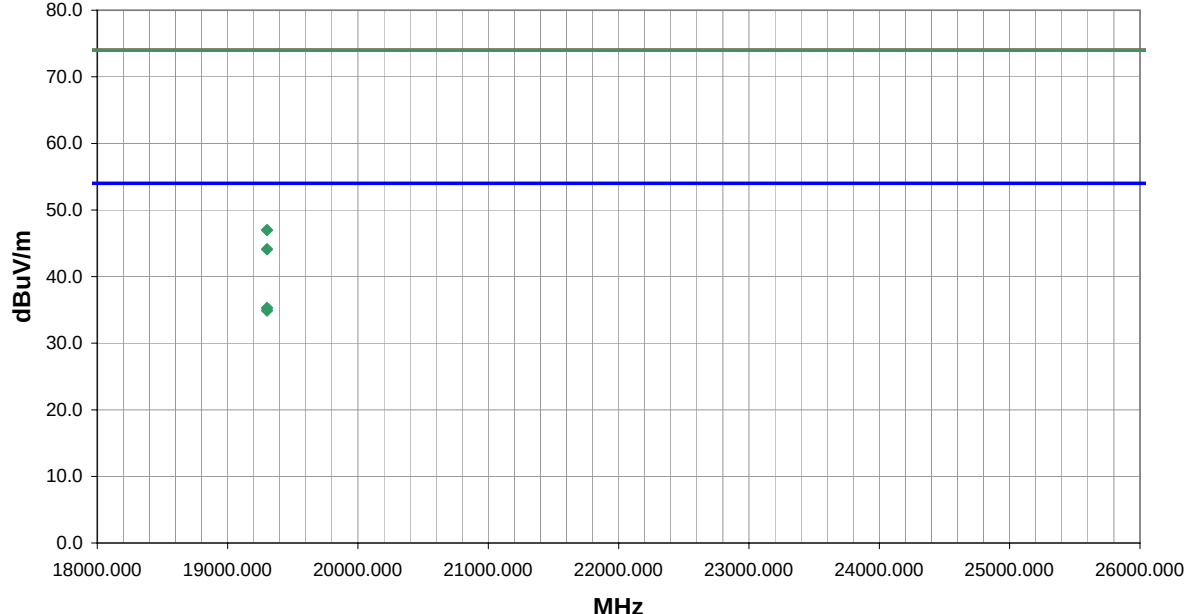
Configuration: The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands 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 C63.4:2001). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

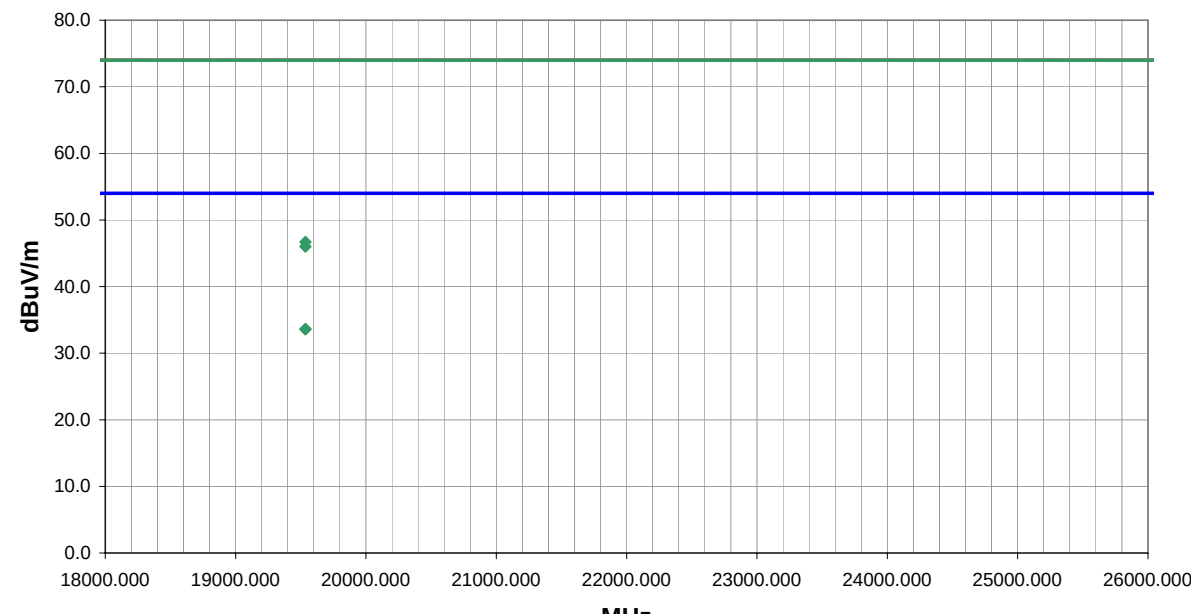
Bandwidths Used for Measurements			
Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 – 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0
<i>Measurements were made using the bandwidths and detectors specified. No video filter was used.</i>			

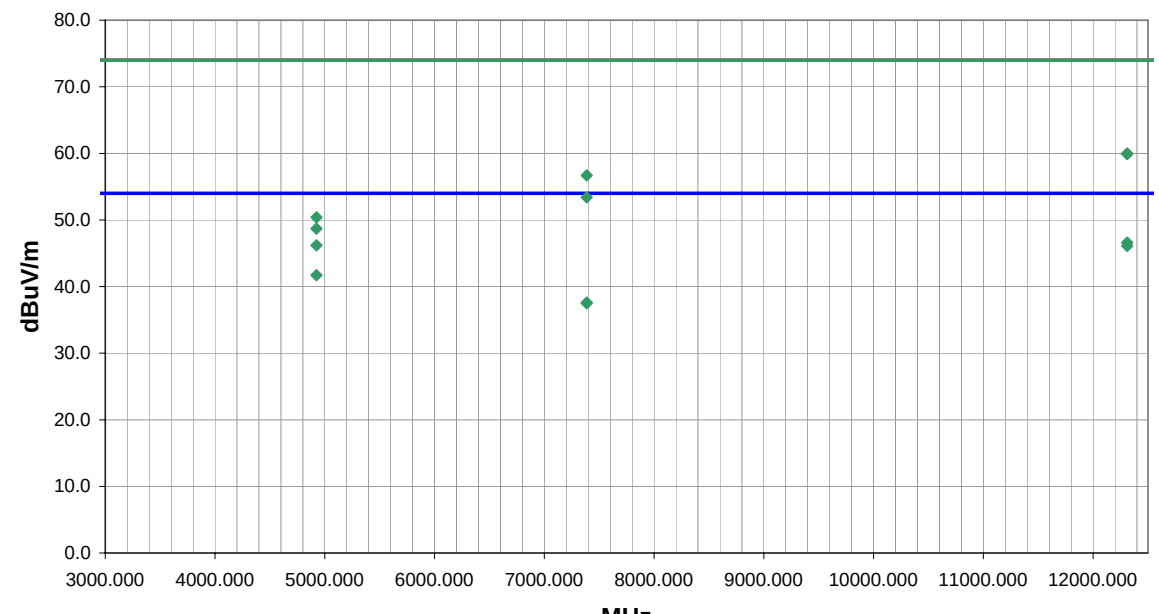
Completed by:

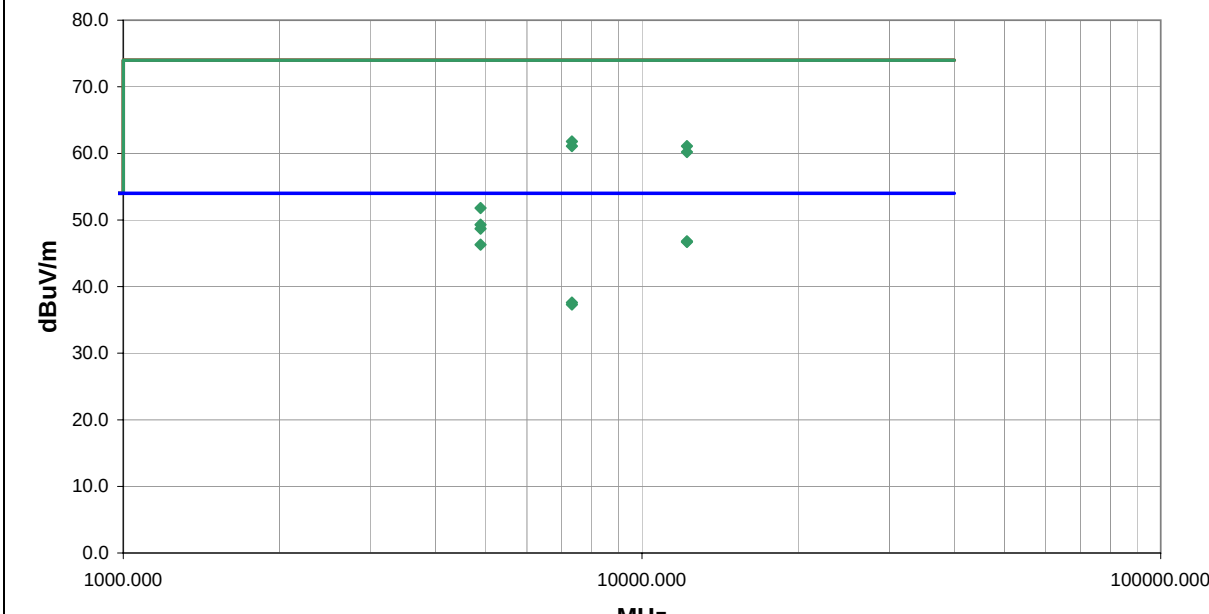


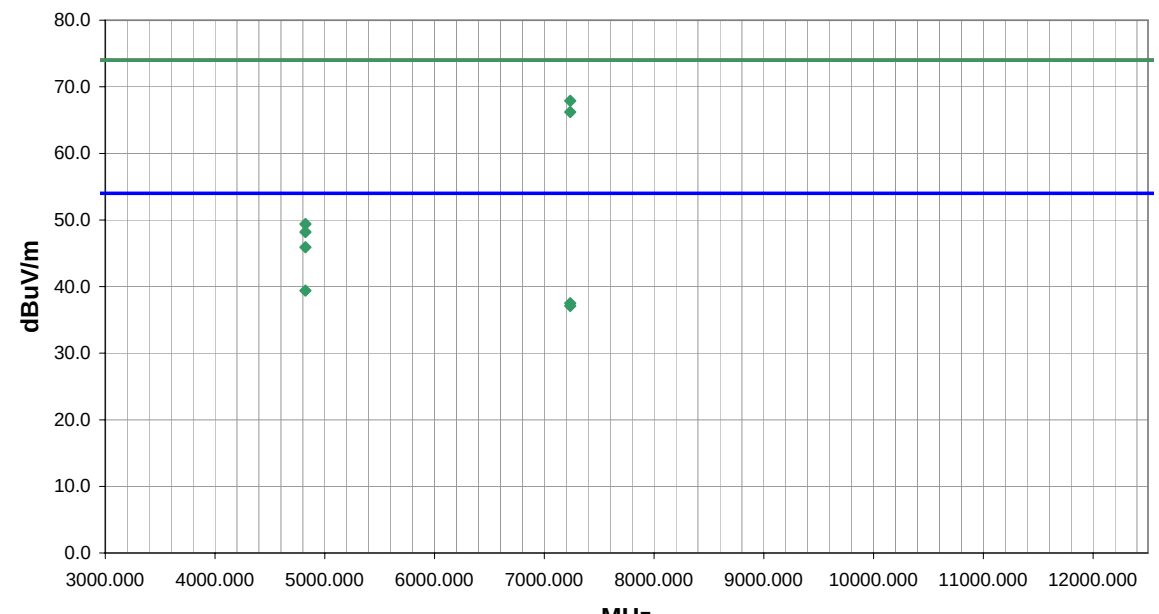
NORTHWEST		REV											
EMC		d14.2											
RADIATED EMISSIONS DATA SHEET		08/10/2004											
EUT: SEL-3021		Work Order: SCHW0043											
Serial Number: 000B6B197CAD		Date: 08/10/04											
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77											
Attendees: Jeff Butler		Humidity: 44%											
Cust. Ref. No.:		Barometric Pressure: 30.08											
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz											
		Job Site: EV01											
TEST SPECIFICATIONS													
Specification: FCC 15.247(c) Spurious Radiated Emissions		Year: 2003											
Method: ANSI C63.4		Year: 2001											
SAMPLE CALCULATIONS													
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													
Max power, max modulation, High Channel													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS		Run #											
Pass		2											
Other													
		Holly Ashkannejhad Tested By:											
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
2483.500	49.6	-2.5	95.0	1.1	3.0	20.0	H-Horn	PK	0.0	67.1	74.0	-6.9	EUT on side.
2483.500	29.4	-2.5	95.0	1.1	3.0	20.0	H-Horn	AV	0.0	46.9	54.0	-7.1	EUT on side.
2483.500	29.0	-2.5	57.0	1.0	3.0	20.0	V-Horn	AV	0.0	46.5	54.0	-7.5	EUT flat on table.
2483.500	45.6	-2.5	57.0	1.0	3.0	20.0	V-Horn	PK	0.0	63.1	74.0	-10.9	EUT flat on table.

NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET				REV df4.2 08/10/2004	
EUT: SEL-3021						Work Order: SCHW0043									
Serial Number: 000B6B197CAD						Date: 08/12/04									
Customer: Schweitzer Engineering Laboratories, Inc.						Temperature: 75									
Attendees: None						Humidity: 44%									
Cust. Ref. No.:						Barometric Pressure: 30.08									
Tested by: Holly Ashkannejhad				Power: 120V, 60Hz		Job Site: EV01									
TEST SPECIFICATIONS															
Specification: FCC 15.247(c) Spurious Radiated Emissions						Year: 2003									
Method: ANSI C63.4						Year: 2001									
SAMPLE CALCULATIONS															
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															
Max power, max modulation, low channel															
DEVIATIONS FROM TEST STANDARD															
No deviations.															
RESULTS										Run #					
Pass										3					
Other															
										 Tested By:					
															
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)			
19302.910	27.3	8.0	310.0	1.0	3.0	0.0	I-High Horr	AV	0.0	35.3	54.0	-18.7			
19302.910	26.9	8.0	125.0	1.1	3.0	0.0	V-High Horr	AV	0.0	34.9	54.0	-19.1			
19302.910	39.0	8.0	125.0	1.1	3.0	0.0	V-High Horr	PK	0.0	47.0	74.0	-27.0			
19302.910	36.1	8.0	310.0	1.0	3.0	0.0	I-High Horr	PK	0.0	44.1	74.0	-29.9			

NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET				REV df4.2 08/10/2004	
EUT: SEL-3021						Work Order: SCHW0043									
Serial Number: 000B6B197CAD						Date: 08/12/04									
Customer: Schweitzer Engineering Laboratories, Inc.						Temperature: 75									
Attendees: None						Humidity: 44%									
Cust. Ref. No.:						Barometric Pressure: 30.08									
Tested by: Holly Ashkannejhad				Power: 120V, 60Hz		Job Site: EV01									
TEST SPECIFICATIONS															
Specification: FCC 15.247(c) Spurious Radiated Emissions						Year: 2003									
Method: ANSI C63.4						Year: 2001									
SAMPLE CALCULATIONS															
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															
Max power, max modulation, mid channel															
DEVIATIONS FROM TEST STANDARD															
No deviations.															
RESULTS										Run #					
Pass										4					
Other															
										 Tested By:					
															
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)			
19536.000	25.2	8.4	69.0	1.1	3.0	0.0	V-High Horr	AV	0.0	33.6	54.0	-20.4			
19536.000	25.2	8.4	259.0	1.0	3.0	0.0	I-High Horr	AV	0.0	33.6	54.0	-20.4			
19536.000	38.3	8.4	69.0	1.1	3.0	0.0	V-High Horr	PK	0.0	46.7	74.0	-27.3			
19536.000	37.6	8.4	259.0	1.0	3.0	0.0	I-High Horr	PK	0.0	46.0	74.0	-28.0			

NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET				REV df4.2 08/10/2004	
EUT: SEL-3021						Work Order: SCHW0043									
Serial Number: 000B6B197CAD						Date: 08/12/04									
Customer: Schweitzer Engineering Laboratories, Inc.						Temperature: 77									
Attendees: None						Humidity: 44%									
Cust. Ref. No.:						Barometric Pressure: 30.08									
Tested by: Holly Ashkannejhad				Power: 120V, 60Hz		Job Site: EV01									
TEST SPECIFICATIONS															
Specification: FCC 15.247(c) Spurious Radiated Emissions						Year: 2003									
Method: ANSI C63.4						Year: 2001									
SAMPLE CALCULATIONS															
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															
Max power, max modulation, High Channel															
DEVIATIONS FROM TEST STANDARD															
No deviations.															
RESULTS										Run #					
Pass										5					
Other															
 Tested By:															
															
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)			
4924.000	45.0	3.7	225.0	1.1	3.0	0.0	H-Horn	AV	0.0	48.7	54.0	-5.3			
12310.000	25.3	21.3	10.0	2.1	3.0	0.0	V-Horn	AV	0.0	46.6	54.0	-7.4			
12310.000	24.8	21.3	188.0	1.3	3.0	0.0	H-Horn	AV	0.0	46.1	54.0	-7.9			
4924.000	38.0	3.7	32.0	1.2	3.0	0.0	V-Horn	AV	0.0	41.7	54.0	-12.3			
12310.000	38.7	21.3	10.0	2.1	3.0	0.0	V-Horn	PK	0.0	60.0	74.0	-14.0			
12310.000	38.6	21.3	188.0	1.3	3.0	0.0	H-Horn	PK	0.0	59.9	74.0	-14.1			
7386.100	26.8	10.8	268.0	1.2	3.0	0.0	H-Horn	AV	0.0	37.6	54.0	-16.4			
7386.100	26.7	10.8	339.0	1.1	3.0	0.0	V-Horn	AV	0.0	37.5	54.0	-16.5			
7386.100	45.9	10.8	268.0	1.2	3.0	0.0	H-Horn	PK	0.0	56.7	74.0	-17.3			
7386.100	42.6	10.8	339.0	1.1	3.0	0.0	V-Horn	PK	0.0	53.4	74.0	-20.6			
4924.000	46.7	3.7	225.0	1.1	3.0	0.0	H-Horn	PK	0.0	50.4	74.0	-23.6			
4924.000	42.5	3.7	32.0	1.2	3.0	0.0	V-Horn	PK	0.0	46.2	74.0	-27.8			

NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET				REV df4.2 08/10/2004	
EUT: SEL-3021										Work Order: SCHW0043					
Serial Number: 000B6B197CAD										Date: 08/12/04					
Customer: Schweitzer Engineering Laboratories, Inc.										Temperature: 77					
Attendees: Jeff Butler										Humidity: 44%					
Cust. Ref. No.:										Barometric Pressure: 30.08					
Tested by: Holly Ashkannejhad						Power: 120V, 60Hz		Job Site: EV01							
TEST SPECIFICATIONS															
Specification: FCC 15.247(c) Spurious Radiated Emissions										Year: 2003					
Method: ANSI C63.4										Year: 2001					
SAMPLE CALCULATIONS															
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															
Max power, max modulation, Mid Channel															
DEVIATIONS FROM TEST STANDARD															
No deviations.															
RESULTS												Run #			
Pass												6			
Other															
										 Tested By:					
															
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)			
4883.955	45.6	3.7	227.0	1.2	3.0	0.0	H-Horn	AV	0.0	49.3	54.0	-4.7			
12210.000	25.8	21.0	166.0	1.2	3.0	0.0	V-Horn	AV	0.0	46.8	54.0	-7.2			
12210.000	25.7	21.0	115.0	1.3	3.0	0.0	H-Horn	AV	0.0	46.7	54.0	-7.3			
4883.955	42.6	3.7	232.0	1.2	3.0	0.0	V-Horn	AV	0.0	46.3	54.0	-7.7			
7326.000	51.2	10.6	35.0	1.2	3.0	0.0	V-Horn	PK	0.0	61.8	74.0	-12.2			
7326.000	50.5	10.6	270.0	1.3	3.0	0.0	H-Horn	PK	0.0	61.1	74.0	-12.9			
12210.000	40.1	21.0	115.0	1.3	3.0	0.0	H-Horn	PK	0.0	61.1	74.0	-12.9			
12210.000	39.2	21.0	166.0	1.2	3.0	0.0	V-Horn	PK	0.0	60.2	74.0	-13.8			
7326.000	27.0	10.6	270.0	1.3	3.0	0.0	H-Horn	AV	0.0	37.6	54.0	-16.4			
7326.000	26.7	10.6	35.0	1.2	3.0	0.0	V-Horn	AV	0.0	37.3	54.0	-16.7			
4883.955	48.1	3.7	227.0	1.2	3.0	0.0	H-Horn	PK	0.0	51.8	74.0	-22.2			
4883.955	45.0	3.7	232.0	1.2	3.0	0.0	V-Horn	PK	0.0	48.7	74.0	-25.3			

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		REV df4.2 08/10/2004								
EUT: SEL-3021		Work Order: SCHW0043										
Serial Number: 000B6B197CAD		Date: 08/12/04										
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77										
Attendees: Jeff Butler		Humidity: 44%										
Cust. Ref. No.:		Barometric Pressure: 30.08										
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC 15.247(c) Spurious Radiated Emissions				Year: 2003								
Method: ANSI C63.4				Year: 2001								
SAMPLE CALCULATIONS												
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												
Max power, max modulation, Low Channel												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS					Run #							
Pass					7							
Other												
					Tested By:							
												
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)
7236.012	57.5	10.4	259.0	1.3	3.0	0.0	H-Horn	PK	0.0	67.9	74.0	-6.1
7236.012	55.8	10.4	31.0	1.2	3.0	0.0	V-Horn	PK	0.0	66.2	74.0	-7.8
4824.009	42.5	3.4	301.0	2.0	3.0	0.0	H-Horn	AV	0.0	45.9	54.0	-8.1
4824.009	36.0	3.4	322.0	1.2	3.0	0.0	V-Horn	AV	0.0	39.4	54.0	-14.6
7236.012	27.1	10.4	259.0	1.3	3.0	0.0	H-Horn	AV	0.0	37.5	54.0	-16.5
7236.012	26.7	10.4	31.0	1.2	3.0	0.0	V-Horn	AV	0.0	37.1	54.0	-16.9
4824.009	46.0	3.4	301.0	2.0	3.0	0.0	H-Horn	PK	0.0	49.4	74.0	-24.6
4824.009	44.8	3.4	322.0	1.2	3.0	0.0	V-Horn	PK	0.0	48.2	74.0	-25.8





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	0.104.0.0
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
Serial Encrypting Transceiver	Schweitzer Engineering Laboratories	SEL-3021	000B6B197CAD
AC Adapter	APX Technologies Inc.	SPU10-102	01385809

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Notebook PC	Dell	Inspiron 8000	IS115
802.11b PCMCIA Card	U.S. Robotics	Wireless Access 802.11b	none
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	Serial Encrypting Transceiver	AC Adapter
Serial Cables (2 each)	Yes	1.4	No	Serial Encrypting Transceiver	Unterminated
Alarm Leads	No	2.0	No	Serial Encrypting Transceiver	Unterminated

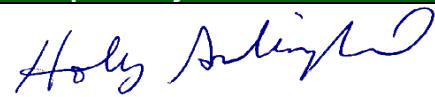
Measurement Equipment

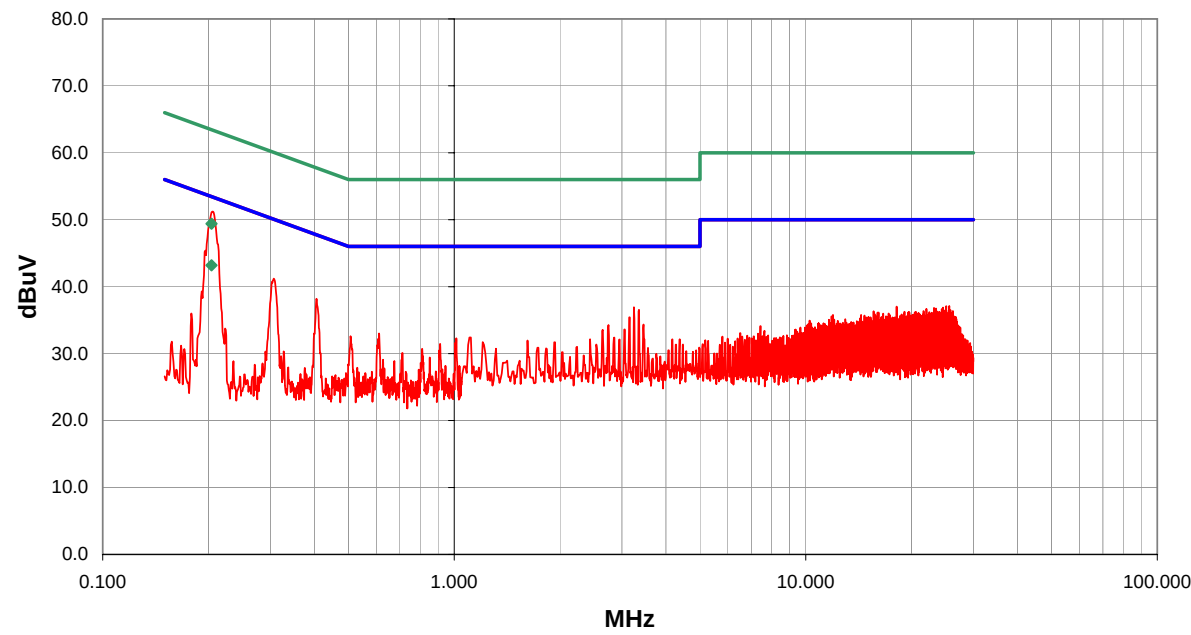
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Attenuator	Tektronix	011-0059-02	ATH	03/16/2004	13 mo
High Pass Filter	TTE	H97-100k-50-720B	HFC	02/01/2004	13 mo
LISN	Solar	9252-50-R-24-BNC	LIN	12/16/2003	13 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/23/2003	13 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/23/2003	13 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	12/23/2003	13 mo

Test Description

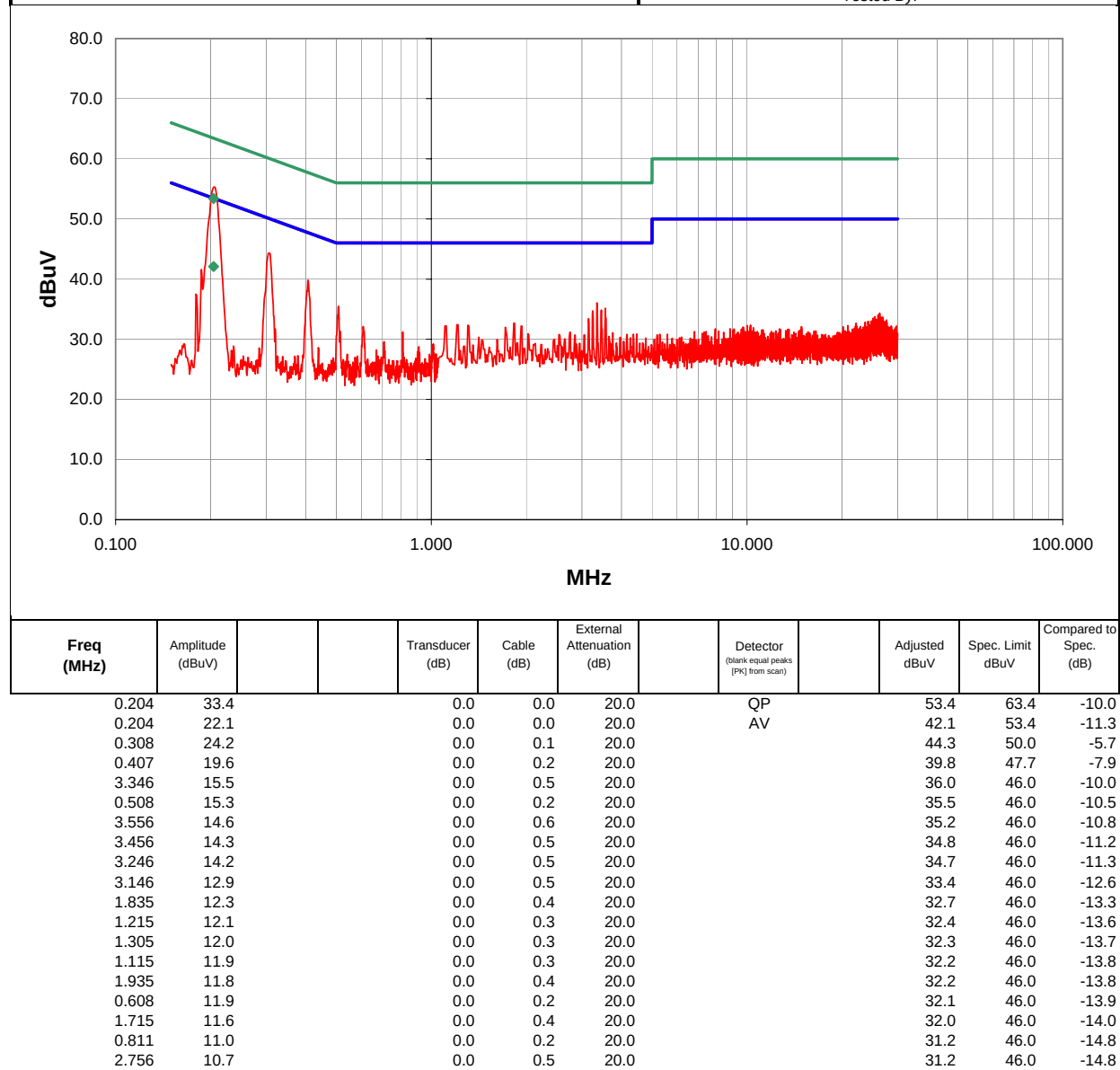
Requirement: Per 47 15.207(d), if the EUT is connected to the AC power line indirectly, obtaining its power from another device that is connected to the AC power line, then it should be tested to demonstrate compliance with the conducted limits of 15.207.

Configuration: The EUT will be powered from a device that could be connected to the AC power line. Therefore, the measurements were made on the device used to power the EUT. The AC power line conducted emissions were measured with the EUT operating at the lowest, the highest, and a middle channel in the operational band. The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.4-1992.

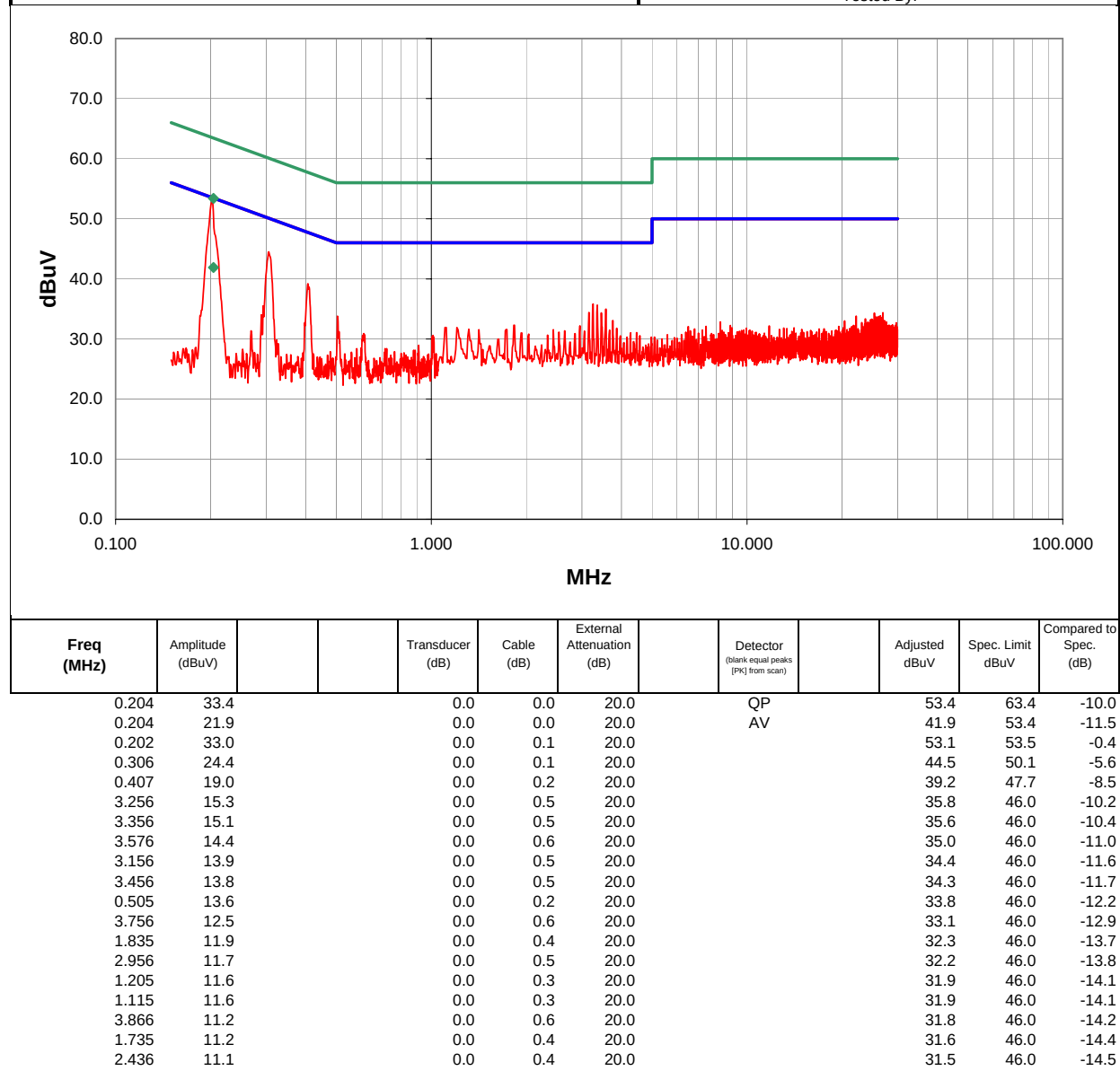
Completed by:


NORTHWEST EMC		CONDUCTED EMISSIONS DATA SHEET				REV df4.2 08/10/2004				
EUT: SEL-3021		Work Order: SCHW0043								
Serial Number: 000B6B197CAD		Date: 08/12/04								
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77								
Attendees: Jeff Butler		Humidity: 44%								
Cust. Ref. No.:		Barometric Pressure: 30.08								
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01						
TEST SPECIFICATIONS										
Specification: FCC 15.207 AC Powerline Conducted Emissions				Year: 2003						
Method: ANSI C63.4				Year: 2001						
SAMPLE CALCULATIONS										
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										
Max power, max modulation, Low Channel										
DEVIATIONS FROM TEST STANDARD										
No deviations.										
RESULTS										
Pass				Line L1		Run # 1				
Other										
				 Tested By:						
										
Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)	Detector (blank equal peaks [PK] from scan)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.204	23.2			0.0	0.0	20.0	AV	43.2	53.4	-10.2
0.204	29.4			0.0	0.0	20.0	QP	49.4	63.4	-14.0
0.206	31.1			0.0	0.1	20.0		51.2	53.4	-2.2
0.307	21.1			0.0	0.1	20.0		41.2	50.1	-8.9
3.246	16.4			0.0	0.5	20.0		36.9	46.0	-9.1
3.356	16.0			0.0	0.5	20.0		36.5	46.0	-9.5
0.406	18.0			0.0	0.2	20.0		38.2	47.7	-9.5
3.156	14.9			0.0	0.5	20.0		35.4	46.0	-10.6
3.456	13.8			0.0	0.5	20.0		34.3	46.0	-11.7
2.746	13.8			0.0	0.5	20.0		34.3	46.0	-11.7
3.056	13.1			0.0	0.5	20.0		33.6	46.0	-12.4
2.646	13.1			0.0	0.5	20.0		33.6	46.0	-12.4
25.600	15.6			0.0	1.5	20.0		37.1	50.0	-12.9
25.094	15.6			0.0	1.5	20.0		37.1	50.0	-12.9
18.144	15.8			0.0	1.2	20.0		37.0	50.0	-13.0
0.611	12.8			0.0	0.2	20.0		33.0	46.0	-13.0
24.588	15.4			0.0	1.5	20.0		36.9	50.0	-13.1
23.169	15.4			0.0	1.4	20.0		36.8	50.0	-13.2
23.466	15.3			0.0	1.4	20.0		36.7	50.0	-13.3

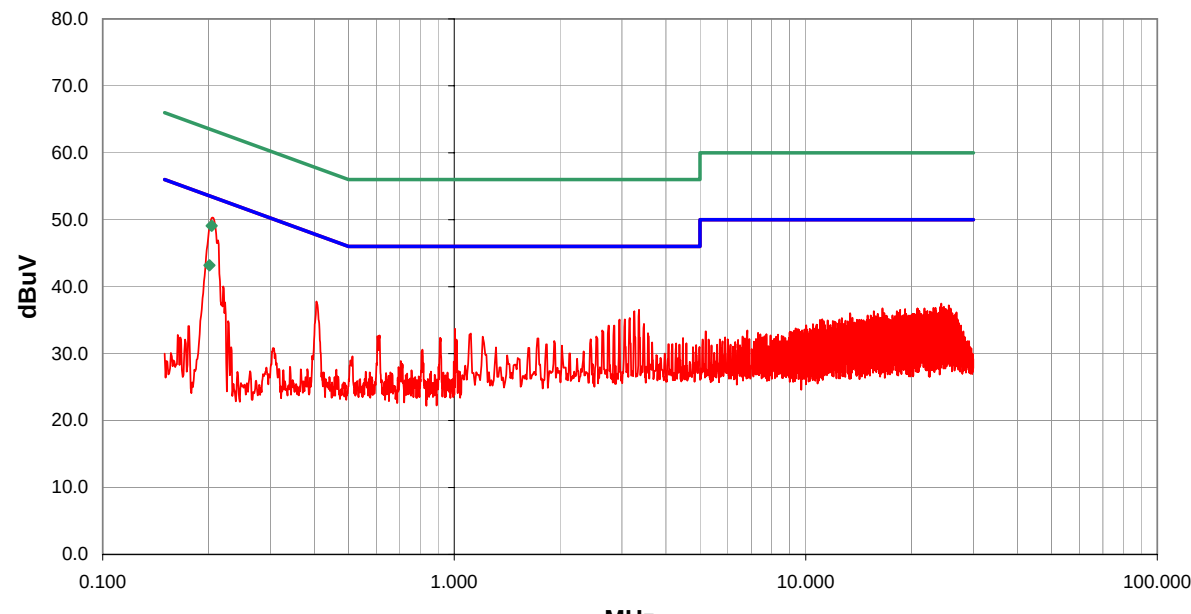
NORTHWEST EMC		CONDUCTED EMISSIONS DATA SHEET		REV df4.2 08/10/2004
EUT: SEL-3021		Work Order: SCHW0043		
Serial Number: 000B6B197CAD		Date: 08/12/04		
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77		
Attendees: Jeff Butler		Humidity: 44%		
Cust. Ref. No.:		Barometric Pressure: 30.08		
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01
TEST SPECIFICATIONS				
Specification: FCC 15.207 AC Powerline Conducted Emissions		Year: 2003		
Method: ANSI C63.4		Year: 2001		
SAMPLE CALCULATIONS				
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				
Max power, max modulation, Low Channel				
DEVIATIONS FROM TEST STANDARD				
No deviations.				
RESULTS		Line		Run #
Pass		N		2
Other		 Tested By:		



NORTHWEST EMC		CONDUCTED EMISSIONS DATA SHEET		REV df4.2 08/10/2004
EUT: SEL-3021		Work Order: SCHW0043		
Serial Number: 000B6B197CAD		Date: 08/12/04		
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77		
Attendees: Jeff Butler		Humidity: 44%		
Cust. Ref. No.:		Barometric Pressure: 30.08		
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01
TEST SPECIFICATIONS				
Specification: FCC 15.207 AC Powerline Conducted Emissions		Year: 2003		
Method: ANSI C63.4		Year: 2001		
SAMPLE CALCULATIONS				
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				
Max power, max modulation, Mid Channel				
DEVIATIONS FROM TEST STANDARD				
No deviations.				
RESULTS				
Pass		Line	Run #	
Pass		N	3	
Other		 Tested By:		



NORTHWEST		CONDUCTED EMISSIONS DATA SHEET				REV df4.2 08/10/2004				
EMC										
EUT: SEL-3021		Work Order: SCHW0043								
Serial Number: 000B6B197CAD		Date: 08/12/04								
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77								
Attendees: Jeff Butler		Humidity: 44%								
Cust. Ref. No.:		Barometric Pressure: 30.08								
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01						
TEST SPECIFICATIONS										
Specification: FCC 15.207 AC Powerline Conducted Emissions				Year: 2003						
Method: ANSI C63.4				Year: 2001						
SAMPLE CALCULATIONS										
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										
Max power, max modulation, Mid Channel										
DEVIATIONS FROM TEST STANDARD										
No deviations.										
RESULTS				Line		Run #				
Pass				L1		4				
Other										
				Holly Ashkannejhad Tested By:						
80.0 70.0 60.0 50.0 40.0 30.0 20.0 10.0 0.0 0.100 1.000 10.000 100.000 MHz dBuV										
Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)	Detector (blank equal peaks [PK] from scan)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.204	23.2			0.0	0.0	20.0	AV	43.2	53.4	-10.2
0.204	29.1			0.0	0.0	20.0	QP	49.1	63.4	-14.3
0.205	30.4			0.0	0.1	20.0		50.5	53.4	-2.9
0.307	21.6			0.0	0.1	20.0		41.7	50.1	-8.4
3.346	16.4			0.0	0.5	20.0		36.9	46.0	-9.1
3.246	16.4			0.0	0.5	20.0		36.9	46.0	-9.1
3.156	14.1			0.0	0.5	20.0		34.6	46.0	-11.4
3.456	14.0			0.0	0.5	20.0		34.5	46.0	-11.5
3.056	13.5			0.0	0.5	20.0		34.0	46.0	-12.0
2.856	13.3			0.0	0.5	20.0		33.8	46.0	-12.2
21.442	16.4			0.0	1.4	20.0		37.8	50.0	-12.2
2.536	13.3			0.0	0.5	20.0		33.8	46.0	-12.2
2.646	13.1			0.0	0.5	20.0		33.6	46.0	-12.4
2.026	12.9			0.0	0.4	20.0		33.3	46.0	-12.7
0.508	13.1			0.0	0.2	20.0		33.3	46.0	-12.7
25.622	15.7			0.0	1.5	20.0		37.2	50.0	-12.8
1.115	12.7			0.0	0.3	20.0		33.0	46.0	-13.0
2.956	12.5			0.0	0.5	20.0		33.0	46.0	-13.0
25.930	15.4			0.0	1.5	20.0		36.9	50.0	-13.1

NORTHWEST EMC		CONDUCTED EMISSIONS DATA SHEET				REV df4.2 08/10/2004				
EUT: SEL-3021		Work Order: SCHW0043								
Serial Number: 000B6B197CAD		Date: 08/12/04								
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 77								
Attendees: Jeff Butler		Humidity: 44%								
Cust. Ref. No.:		Barometric Pressure: 30.08								
Tested by: Holly Ashkannejhad		Power: 120V, 60Hz		Job Site: EV01						
TEST SPECIFICATIONS										
Specification: FCC 15.207 AC Powerline Conducted Emissions				Year: 2003						
Method: ANSI C63.4				Year: 2001						
SAMPLE CALCULATIONS										
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										
Max power, max modulation, High Channel										
DEVIATIONS FROM TEST STANDARD										
No deviations.										
RESULTS										
Pass		Line L1		Run # 5						
Other		 Tested By:								
										
Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)	Detector (blank equal peaks [PK] from scan)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.201	23.2			0.0	0.0	20.0	AV	43.2	53.6	-10.4
0.204	29.1			0.0	0.0	20.0	QP	49.1	63.4	-14.3
0.206	30.2			0.0	0.1	20.0		50.3	53.4	-3.1
3.356	16.0			0.0	0.5	20.0		36.5	46.0	-9.5
3.256	15.8			0.0	0.5	20.0		36.3	46.0	-9.7
0.406	17.6			0.0	0.2	20.0		37.8	47.7	-9.9
3.156	14.8			0.0	0.5	20.0		35.3	46.0	-10.7
3.056	14.6			0.0	0.5	20.0		35.1	46.0	-10.9
2.956	14.6			0.0	0.5	20.0		35.1	46.0	-10.9
3.466	13.9			0.0	0.5	20.0		34.4	46.0	-11.6
2.856	13.7			0.0	0.5	20.0		34.2	46.0	-11.8
2.756	13.7			0.0	0.5	20.0		34.2	46.0	-11.8
1.005	13.4			0.0	0.3	20.0		33.7	46.0	-12.3
24.302	16.0			0.0	1.5	20.0		37.5	50.0	-12.5
2.636	13.0			0.0	0.5	20.0		33.5	46.0	-12.5
25.534	15.7			0.0	1.5	20.0		37.2	50.0	-12.8
3.556	12.5			0.0	0.6	20.0		33.1	46.0	-12.9
1.115	12.7			0.0	0.3	20.0		33.0	46.0	-13.0
24.720	15.5			0.0	1.5	20.0		37.0	50.0	-13.0

NORTHWEST EMC		CONDUCTED EMISSIONS DATA SHEET		REV df4.2 08/10/2004
EUT:	SEL-3021	Work Order:	SCHW0043	
Serial Number:	000B6B197CAD	Date:	08/12/04	
Customer:	Schweitzer Engineering Laboratories, Inc.	Temperature:	77	
Attendees:	Jeff Butler	Humidity:	44%	
Cust. Ref. No.:		Barometric Pressure	30.08	
Tested by:	Holly Ashkannejhad	Power:	120V, 60Hz	Job Site:
EV01				
TEST SPECIFICATIONS				
Specification:	FCC 15.207 AC Powerline Conducted Emissions	Year:	2003	
Method:	ANSI C63.4	Year:	2001	
SAMPLE CALCULATIONS				
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				
Max power, max modulation, High Channel				
DEVIATIONS FROM TEST STANDARD				
No deviations.				
RESULTS		Line	Run #	
Pass		N	6	
Other		 Tested By:		

