Schweitzer Engineering Laboratories, Inc.

SEL-3031

FCC 15.247:2018

902 – 928 MHz FHSS Transceiver

Report # SCHW0240

NVLAP LAB CODE: 200630-0

CERTIFICATE OF TEST

Last Date of Test: July 26, 2018
Schweitzer Engineering Laboratories, Inc.
Model: SEL-3031

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2018	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for C2PC to FCC ID: R34SEL-3031 for component changes.
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
7.5	Duty Cycle	Yes	Pass	
7.8.2	Carrier Frequency Separation	No	N/A	Not required for C2PC to FCC ID: R34SEL-3031 for component changes.
7.8.3	Number of Hopping Frequencies	No	N/A	Not required for C2PC to FCC ID: R34SEL-3031 for component changes.
7.8.4	Dwell Time	No	N/A	Not required for C2PC to FCC ID: R34SEL-3031 for component changes.
7.8.5	Output Power	Yes	Pass	
7.8.6	Band Edge Compliance	Yes	Pass	
7.8.6	Band Edge Compliance - Hopping Mode	Yes	Pass	
7.8.7	Occupied Bandwidth	Yes	Pass	
7.8.8	Spurious Conducted Emissions	Yes	Pass	
11.10.2	Power Spectral Density	No	N/A	Not required for FHSS devices.

Deviations From Test Standards

None

Approved By:

Kyle Holgate, Operations Manager

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. 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. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIT / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

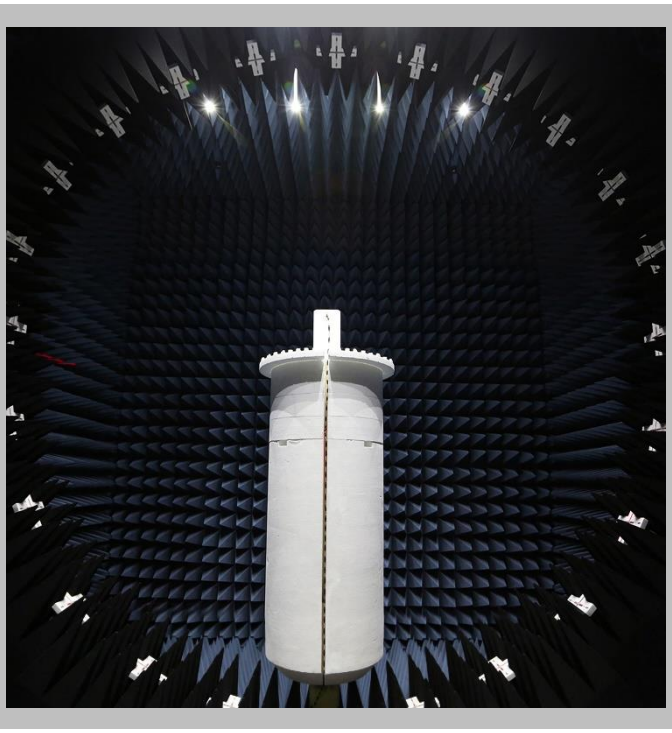
MIC – Recognized by MIC as a CAB for the acceptance of test data.

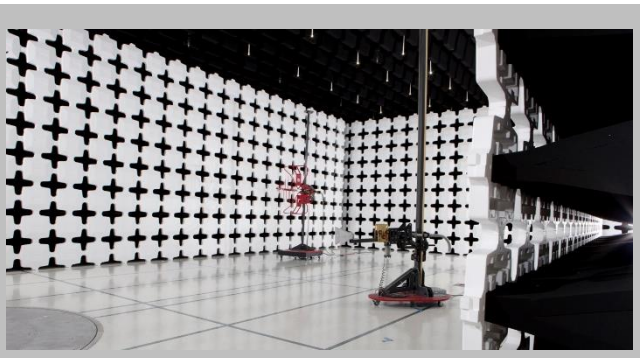
SCOPE

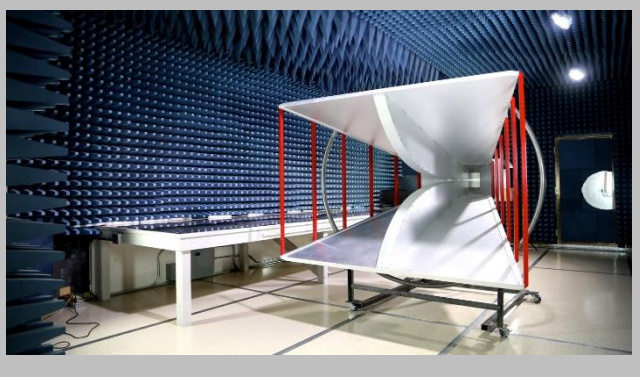
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

FACILITIES

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

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. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

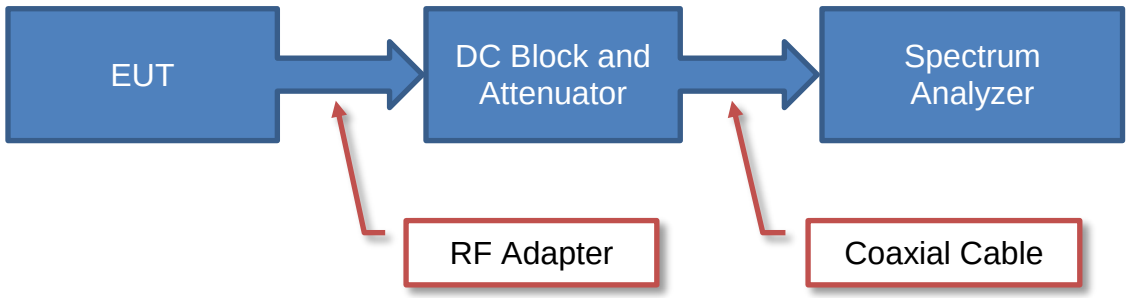
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

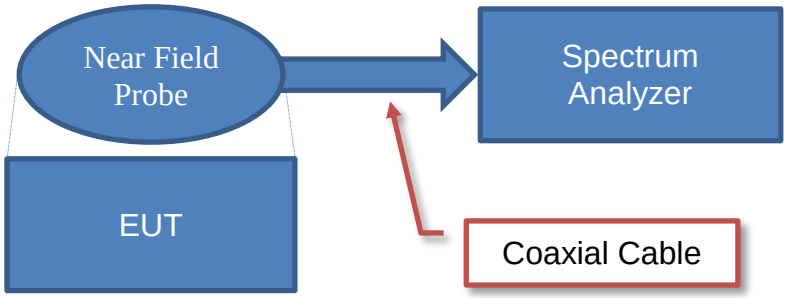
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

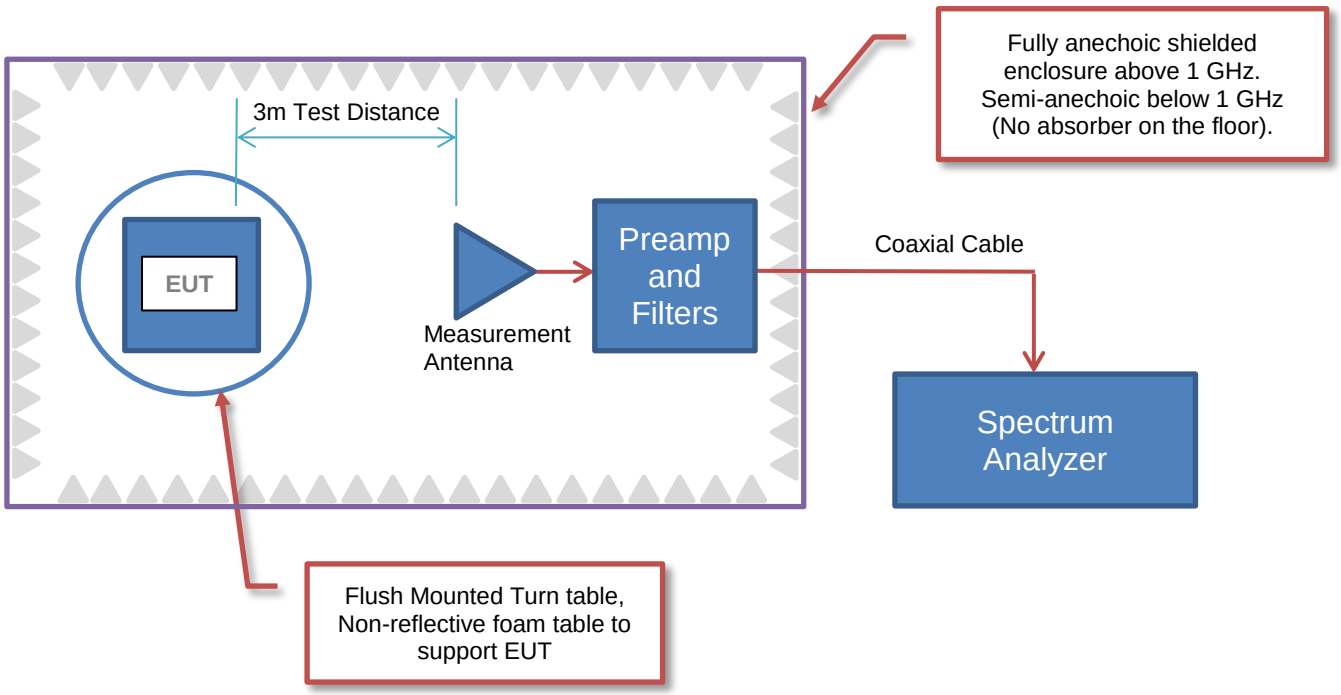
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Schweitzer Engineering Laboratories, Inc.
Address:	2350 NE Hopkins Court
City, State, Zip:	Pullman, WA 99163
Test Requested By:	Miralem Cosic
Model:	SEL-3031
First Date of Test:	July 19, 2018
Last Date of Test:	July 26, 2018
Receipt Date of Samples:	July 19, 2018
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Frequency Hopping radio used in two different enclosures (rack mount and wall mount) with various external antenna options.

Testing Objective:
Seeking to demonstrate continuing compliance under FCC 15.247:2018 for operation in the 902 - 928 MHz Band with a Class II Permissive Change to FCC ID: R34SEL-3031 due to new components in the RF circuitry.

CONFIGURATIONS

Configuration SCHW0240- 1

Software/Firmware Running during test	
Description	**Version**
Firmware	SEL-3031-R104-V0-Z003001-D20111228
FPGA	SEL-3031-R101-D20101018
TeraTerm	4.84

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wall Mount Radio	Schweitzer Engineering Laboratories, Inc.	SEL-3031/3031W01XXX	1181590420

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Dell	Latitude E6540	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB	Yes	1.5 m	Yes	Laptop	Wall Mount Radio
DC Power	No	2.0 m	No	AC/DC Supply	Wall Mount Radio

CONFIGURATIONS

Configuration SCHW0240- 2

Software/Firmware Running during test	
Description	**Version**
Firmware	SEL-3031-R104-V0-Z003001-D20111228
FPGA	SEL-3031-R101-D20101018
TeraTerm	4.84

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Rack Mount Radio	Schweitzer Engineering Laboratories, Inc.	SEL-3031/3031r21xxx	1181590363

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Dell	Latitude E6540	None
Yagi Antenna	Unknown	None	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Linear Power Supply	Schweitzer Engineering Laboratories, Inc.	SEL-LPS/LPS000-110	1111020502

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	No	2.0 m	No	Radio	DC Power
DC Power	No	2.0 m	No	DC Power	Linear Power Supply
Leads	No	4.0 m	No	Radio	Unterminated
RS232 Cables x3	Yes	1.8 m	No	Radio	Unterminated
Coax	Yes	0.6 m	No	Rack Mount Radio	Yagi Antenna

CONFIGURATIONS

Configuration SCHW0240- 3

Software/Firmware Running during test	
Description	**Version**
Firmware	SEL-3031-R104-V0-Z003001-D20111228
FPGA	SEL-3031-R101-D20101018
TeraTerm	4.84

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wall Mount Radio	Schweitzer Engineering Laboratories, Inc.	SEL-3031/3031W01XXX	1181590420

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Dell	Latitude E6540	None
Monopole	PCTel	MFB9150	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Linear Power Supply	Schweitzer Engineering Laboratories, Inc.	SEL-LPS/LPS000-110	1111020502

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	No	2.0 m	No	Radio	DC Power
DC Power	No	2.0 m	No	DC Power	Linear Power Supply
Leads	No	4.0 m	No	Radio	Unterminated
RS232 Cables x3	Yes	1.8 m	No	Radio	Unterminated
Coax	Yes	1.0 m	No	Wallmount Radio	Monopole

CONFIGURATIONS

Configuration SCHW0240- 5

Software/Firmware Running during test	
Description	**Version**
Firmware	SEL-3031-R104-V0-Z003001-D20111228
FPGA	SEL-3031-R101-D20101018
TeraTerm	4.84

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Wall Mount Radio	Schweitzer Engineering Laboratories, Inc.	SEL-3031/3031W01XXX	1181590420

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Dell	Latitude E6540	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB	Yes	1.5 m	Yes	Laptop	Wall Mount Radio
DC Power	No	2.0 m	No	AC/DC Supply	Wall Mount Radio

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	7/19/2018	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	7/19/2018	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	7/19/2018	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	7/24/2018	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	7/26/2018	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	7/26/2018	Band Edge Compliance – Hopping Mode	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	7/26/2018	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

SPURIOUS RADIATED EMISSIONS - RACKMOUNT

PSA-ESCI 2018.05.04

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

MODES OF OPERATION

TX Low Channel = 902.6 MHz, Mid Channel = 915.2 MHz, High Channel = 927.5 MHz, 2FSK Modulation, Software power setting = 21 dBm

POWER SETTINGS INVESTIGATED

24.0 VDC

CONFIGURATIONS INVESTIGATED

SCHW0240 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12.4 GHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Cable	None	Standard Gain Horns Cable	EVF	30-Nov-2017	12 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	30-Nov-2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Cable	N/A	Double Ridge Horn Cables	EVB	29-Nov-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	29-Nov-2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	7-Feb-2018	24 mo
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HFT	5-Dec-2017	12 mo
Filter - High Pass	Micro-Tronics	HPM50108	HFV	1-Feb-2018	12 mo
Filter - Low Pass	Micro-Tronics	LPM50003	LFB	28-Feb-2018	12 mo
Attenuator	Coaxicom	3910-20	AXZ	28-Feb-2018	12 mo
Attenuator	Coaxicom	3910-10	AWX	28-Feb-2018	12 mo
Cable	N/A	Bilog Cables	EVA	30-Nov-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	30-Nov-2017	12 mo
Antenna - Biconilog	EMCO	3141	AXH	NCR	0 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	18-Mar-2018	12 mo

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual 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 if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

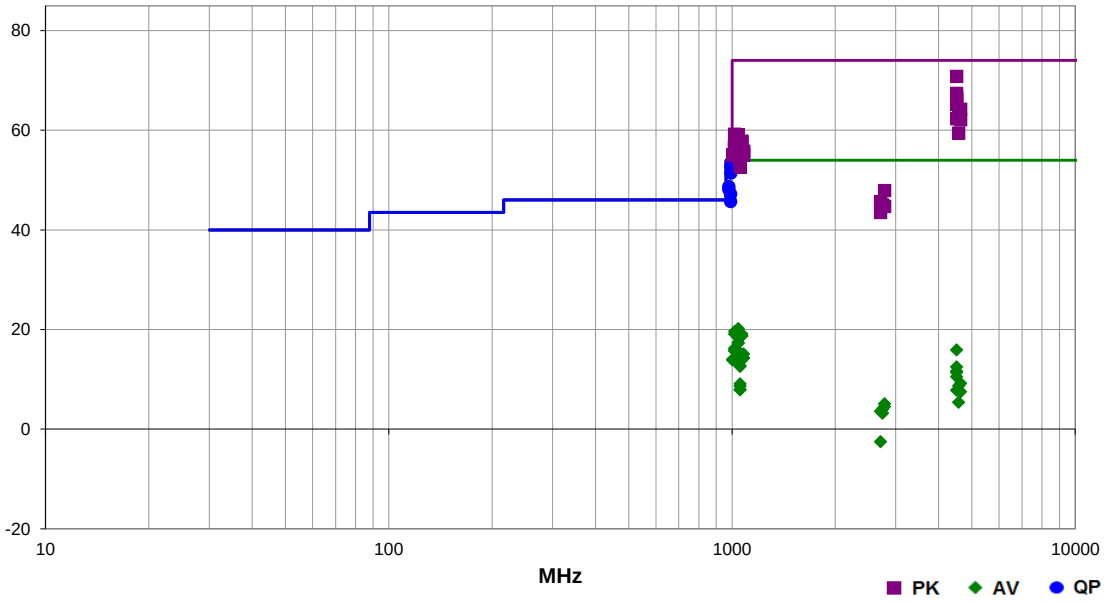
SPURIOUS RADIATED EMISSIONS - RACKMOUNT

EmiR5 2018.05.07 PSA-ESCI 2018.05.04

Work Order:	SCHW0240	**Date:**	19-Jul-2018		
Project:	None	**Temperature:**	22.7 °C		
Job Site:	EV01	**Humidity:**	43% RH		
Serial Number:	1181590420	**Barometric Pres.:**	1026 mbar	**Tested by:**	Jeff Alcoke
EUT:	SEL-3031				
Configuration:	2				
Customer:	Schweitzer Engineering Laboratories, Inc.				
Attendees:	Miralem Cosic				
EUT Power:	24.0 VDC				
Operating Mode:	TX Low Channel = 902.6 MHz, Mid Channel = 915.2 MHz, High Channel = 927.5 MHz, 2FSK Modulation, Software power setting = 21 dBm, Yagi antenna				
Deviations:	None				
Comments:	See comments below for Channel, EUT orientation, and antenna orientation. The test software provided by the manufacturer configured the radio to a 46.1% duty cycle. The average data was corrected up to 100% Duty Cycle using the 10*log(t) where t is the duty cycle, giving a factor of 3.36 dB. The Average Data was then downwardly corrected as per FCC 15.35(c) for FHSS devices. From FCC Grant R34SEL-3031, the dwell time in 100 ms window is 1.4 ms. Using the equation found in ANSI C63.10:2013 section 7.5 the additional correction factor is 20*log(0.014) = -37.1 dB, giving a total correction factor of -33.7 dB added to the average data.				

Test Specifications	**Test Method**
FCC 15.247: 2018	ANSI C63.10:2013

Run #	9	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
992.207	30.8	11.9	1.0	349.0	0.0	10.0	Vert	QP	0.0	52.7	54.0	-1.3	Low Ch, EUT Horz, Ant on Side
992.197	29.5	11.9	1.0	351.0	0.0	10.0	Horz	QP	0.0	51.4	54.0	-2.6	Low Ch, EUT Horz, Ant Horz
4512.815	66.7	4.1	1.1	265.0	0.0	0.0	Horz	PK	0.0	70.8	74.0	-3.2	Low Ch, EUT Vert, Ant Vert
979.195	27.1	11.6	1.0	360.0	0.0	10.0	Vert	QP	0.0	48.7	54.0	-5.3	Mid Ch, EUT Horz, Ant on Side
979.185	26.5	11.6	1.0	360.0	0.0	10.0	Horz	QP	0.0	48.1	54.0	-5.9	Mid Ch, EUT Horz, Ant Horz
4512.335	63.3	4.1	2.6	297.0	0.0	0.0	Horz	PK	0.0	67.4	74.0	-6.6	Low Ch, EUT on Side, Ant on Side
991.499	25.3	11.9	1.0	351.0	0.0	10.0	Vert	QP	0.0	47.2	54.0	-6.8	High Ch, EUT Horz, Ant on Side
4512.790	62.3	4.1	1.0	255.0	0.0	0.0	Vert	PK	0.0	66.4	74.0	-7.6	Low Ch, EUT Horz, Ant Horz
4512.625	62.0	4.1	3.1	311.0	0.0	0.0	Horz	PK	0.0	66.1	74.0	-7.9	Low Ch, EUT Horz, Ant Horz
991.506	23.8	11.9	1.0	360.0	0.0	10.0	Horz	QP	0.0	45.7	54.0	-8.3	High Ch, EUT Horz, Ant Horz
4512.715	61.1	4.1	1.1	260.0	0.0	0.0	Vert	PK	0.0	65.2	74.0	-8.8	Low Ch, EUT on Side, Ant on Side
4637.283	59.9	4.3	1.0	129.0	0.0	0.0	Horz	PK	0.0	64.2	74.0	-9.8	High Ch, EUT Vert, Ant Vert
4575.792	59.5	4.3	1.1	123.0	0.0	0.0	Horz	PK	0.0	63.8	74.0	-10.2	Mid Ch, EUT Vert, Ant Vert
4512.895	58.2	4.1	1.0	254.0	0.0	0.0	Vert	PK	0.0	62.3	74.0	-11.7	Low Ch, EUT Vert, Ant Vert
4637.150	57.8	4.3	1.0	74.0	0.0	0.0	Vert	PK	0.0	62.1	74.0	-11.9	High Ch, EUT Horz, Ant Horz
4575.950	55.1	4.3	1.0	71.0	0.0	0.0	Vert	PK	0.0	59.4	74.0	-14.6	Mid Ch, EUT Horz, Ant Horz
1017.805	49.5	-10.3	1.5	135.0	0.0	20.0	Vert	PK	0.0	59.2	74.0	-14.8	Low Ch, EUT Horz, Ant Vert
1043.460	48.9	-9.8	1.7	132.0	0.0	20.0	Vert	PK	0.0	59.1	74.0	-14.9	Low Ch, EUT Horz, Ant Vert

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
1017.875	49.0	-10.3	1.2	129.0	0.0	20.0	Horz	PK	0.0	58.7	74.0	-15.3	Low Ch, EUT Horz, Ant Horz
1043.435	48.4	-9.8	1.1	131.0	0.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	Low Ch, EUT Horz, Ant Horz
1069.155	47.4	-9.6	1.7	125.0	0.0	20.0	Vert	PK	0.0	57.8	74.0	-16.2	Low Ch, EUT Horz, Ant Vert
1069.200	47.3	-9.6	1.0	128.0	0.0	20.0	Horz	PK	0.0	57.7	74.0	-16.3	Low Ch, EUT Horz, Ant Horz
1042.820	47.4	-9.8	1.2	134.0	0.0	20.0	Vert	PK	0.0	57.6	74.0	-16.4	High Ch, EUT Horz, Ant on Side
1030.108	47.1	-10.0	1.1	134.0	0.0	20.0	Vert	PK	0.0	57.1	74.0	-16.9	Mid Ch, EUT Horz, Ant on Side
1042.550	46.9	-9.8	1.1	131.0	0.0	20.0	Horz	PK	0.0	57.1	74.0	-16.9	High Ch, EUT Horz, Ant Horz
1017.200	47.2	-10.3	1.1	135.0	0.0	20.0	Horz	PK	0.0	56.9	74.0	-17.1	High Ch, EUT Horz, Ant Horz
1017.070	46.9	-10.3	1.3	129.0	0.0	20.0	Vert	PK	0.0	56.6	74.0	-17.4	High Ch, EUT Horz, Ant on Side
1030.067	46.2	-10.0	1.3	136.0	0.0	20.0	Horz	PK	0.0	56.2	74.0	-17.8	Mid Ch, EUT Horz, Ant Horz
1068.240	45.5	-9.6	1.3	148.0	0.0	20.0	Vert	PK	0.0	55.9	74.0	-18.1	High Ch, EUT Horz, Ant on Side
1081.800	45.1	-9.3	1.4	128.0	0.0	20.0	Vert	PK	0.0	55.8	74.0	-18.2	Mid Ch, EUT Horz, Ant on Side
1004.958	45.5	-10.4	1.0	140.0	0.0	20.0	Horz	PK	0.0	55.1	74.0	-18.9	Mid Ch, EUT Horz, Ant Horz
1056.175	44.8	-9.7	1.2	129.0	0.0	20.0	Horz	PK	0.0	55.1	74.0	-18.9	Mid Ch, EUT Horz, Ant Horz
1068.375	44.7	-9.6	1.2	127.0	0.0	20.0	Horz	PK	0.0	55.1	74.0	-18.9	High Ch, EUT Horz, Ant Horz
1081.608	44.3	-9.3	1.1	143.0	0.0	20.0	Horz	PK	0.0	55.0	74.0	-19.0	Mid Ch, EUT Horz, Ant Horz
1055.775	44.6	-9.7	1.7	127.0	0.0	20.0	Vert	PK	0.0	54.9	74.0	-19.1	Mid Ch, EUT Horz, Ant on Side
1004.617	45.3	-10.4	1.0	143.0	0.0	20.0	Vert	PK	0.0	54.9	74.0	-19.1	Mid Ch, EUT Horz, Ant on Side
1055.942	44.5	-9.7	1.0	133.0	0.0	20.0	Vert	PK	0.0	54.8	74.0	-19.2	Mid Ch, EUT Horz, Ant on Side
1056.508	42.7	-9.7	1.0	126.0	0.0	20.0	Vert	PK	0.0	53.0	74.0	-21.0	Mid Ch, EUT Horz, Ant Horz
1057.750	42.7	-9.7	1.0	256.0	0.0	20.0	Horz	PK	0.0	53.0	74.0	-21.0	Mid Ch, EUT Horz, Ant Vert
1057.575	42.5	-9.7	2.1	0.0	0.0	20.0	Horz	PK	0.0	52.8	74.0	-21.2	Mid Ch, EUT Horz, Ant on Side
1057.700	42.3	-9.7	2.9	16.0	0.0	20.0	Vert	PK	0.0	52.6	74.0	-21.4	Mid Ch, EUT Horz, Ant Vert
2782.317	50.7	-2.8	1.0	355.0	0.0	0.0	Vert	PK	0.0	47.9	74.0	-26.1	High Ch, EUT Horz, Ant Horz
2707.650	48.8	-3.2	1.0	288.0	0.0	0.0	Vert	PK	0.0	45.6	74.0	-28.4	Low Ch, EUT Horz, Ant Horz
2745.167	48.0	-3.0	1.3	352.0	0.0	0.0	Vert	PK	0.0	45.0	74.0	-29.0	Mid Ch, EUT Horz, Ant Horz
2745.208	47.9	-3.0	1.0	303.0	0.0	0.0	Horz	PK	0.0	44.9	74.0	-29.1	Mid Ch, EUT Vert, Ant Vert
2782.217	47.5	-2.8	1.0	306.0	0.0	0.0	Horz	PK	0.0	44.7	74.0	-29.3	High Ch, EUT Vert, Ant Vert
2707.620	46.7	-3.2	1.0	298.0	0.0	0.0	Horz	PK	0.0	43.5	74.0	-30.5	Low Ch, EUT Vert, Ant Vert
1043.365	43.7	-9.8	1.7	132.0	-33.7	20.0	Vert	AV	0.0	20.2	54.0	-33.8	Low Ch, EUT Horz, Ant Vert
1043.360	43.3	-9.8	1.1	131.0	-33.7	20.0	Horz	AV	0.0	19.8	54.0	-34.2	Low Ch, EUT Horz, Ant Horz
1017.820	43.6	-10.3	1.5	135.0	-33.7	20.0	Vert	AV	0.0	19.6	54.0	-34.4	Low Ch, EUT Horz, Ant Vert
1017.800	43.1	-10.3	1.2	129.0	-33.7	20.0	Horz	AV	0.0	19.1	54.0	-34.9	Low Ch, EUT Horz, Ant Horz
1068.940	42.4	-9.6	1.7	125.0	-33.7	20.0	Vert	AV	0.0	19.1	54.0	-34.9	Low Ch, EUT Horz, Ant Vert
1069.035	42.0	-9.6	1.0	128.0	-33.7	20.0	Horz	AV	0.0	18.7	54.0	-35.3	Low Ch, EUT Horz, Ant Horz
1042.720	40.9	-9.8	1.2	134.0	-33.7	20.0	Vert	AV	0.0	17.4	54.0	-36.6	High Ch, EUT Horz, Ant on Side
1042.708	40.7	-9.8	1.1	131.0	-33.7	20.0	Horz	AV	0.0	17.2	54.0	-36.8	High Ch, EUT Horz, Ant Horz
1017.100	40.2	-10.3	1.3	129.0	-33.7	20.0	Vert	AV	0.0	16.2	54.0	-37.8	High Ch, EUT Horz, Ant on Side
1030.458	39.7	-10.0	1.1	134.0	-33.7	20.0	Vert	AV	0.0	16.0	54.0	-38.0	Mid Ch, EUT Horz, Ant on Side
4512.805	45.5	4.1	1.1	265.0	-33.7	0.0	Horz	AV	0.0	15.9	54.0	-38.1	Low Ch, EUT Vert, Ant Vert
1030.375	39.4	-10.0	1.3	136.0	-33.7	20.0	Horz	AV	0.0	15.7	54.0	-38.3	Mid Ch, EUT Horz, Ant Horz
1017.100	39.7	-10.3	1.1	135.0	-33.7	20.0	Horz	AV	0.0	15.7	54.0	-38.3	High Ch, EUT Horz, Ant Horz
1081.567	38.1	-9.3	1.4	128.0	-33.7	20.0	Vert	AV	0.0	15.1	54.0	-38.9	Mid Ch, EUT Horz, Ant on Side
1068.292	37.7	-9.6	1.2	127.0	-33.7	20.0	Horz	AV	0.0	14.4	54.0	-39.6	High Ch, EUT Horz, Ant Horz
1081.583	37.3	-9.3	1.1	143.0	-33.7	20.0	Horz	AV	0.0	14.3	54.0	-39.7	Mid Ch, EUT Horz, Ant Horz
1056.008	37.5	-9.7	1.2	129.0	-33.7	20.0	Horz	AV	0.0	14.1	54.0	-39.9	Mid Ch, EUT Horz, Ant Horz
1004.733	38.1	-10.4	1.0	140.0	-33.7	20.0	Horz	AV	0.0	14.0	54.0	-40.0	Mid Ch, EUT Horz, Ant Horz
1004.758	38.0	-10.4	1.0	143.0	-33.7	20.0	Vert	AV	0.0	13.9	54.0	-40.1	Mid Ch, EUT Horz, Ant on Side
1068.285	37.2	-9.6	1.3	148.0	-33.7	20.0	Vert	AV	0.0	13.9	54.0	-40.1	High Ch, EUT Horz, Ant on Side
1056.042	36.1	-9.7	1.0	133.0	-33.7	20.0	Vert	AV	0.0	12.7	54.0	-41.3	Mid Ch, EUT Horz, Ant on Side
1055.900	36.0	-9.7	1.7	127.0	-33.7	20.0	Vert	AV	0.0	12.6	54.0	-41.4	Mid Ch, EUT Horz, Ant on Side
4512.765	42.1	4.1	2.6	297.0	-33.7	0.0	Horz	AV	0.0	12.5	54.0	-41.5	Low Ch, EUT on Side, Ant on Side
4512.760	41.2	4.1	1.0	255.0	-33.7	0.0	Vert	AV	0.0	11.6	54.0	-42.4	Low Ch, EUT Horz, Ant Horz
4512.830	41.0	4.1	3.1	311.0	-33.7	0.0	Horz	AV	0.0	11.4	54.0	-42.6	Low Ch, EUT Horz, Ant Horz
4512.790	40.1	4.1	1.1	260.0	-33.7	0.0	Vert	AV	0.0	10.5	54.0	-43.5	Low Ch, EUT on Side, Ant on Side
4637.225	38.6	4.3	1.0	129.0	-33.7	0.0	Horz	AV	0.0	9.2	54.0	-44.8	High Ch, EUT Vert, Ant Vert
1056.042	32.5	-9.7	1.0	126.0	-33.7	20.0	Vert	AV	0.0	9.1	54.0	-44.9	Mid Ch, EUT Horz, Ant Horz
4575.767	38.1	4.3	1.1	123.0	-33.7	0.0	Horz	AV	0.0	8.7	54.0	-45.3	Mid Ch, EUT Vert, Ant Vert
1055.975	32.0	-9.7	1.0	256.0	-33.7	20.0	Horz	AV	0.0	8.6	54.0	-45.4	Mid Ch, EUT Horz, Ant Vert
1055.950	31.3	-9.7	2.1	0.0	-33.7	20.0	Horz	AV	0.0	7.9	54.0	-46.1	Mid Ch, EUT Horz, Ant on Side
1055.817	31.3	-9.7	2.9	16.0	-33.7	20.0	Vert	AV	0.0	7.9	54.0	-46.1	Mid Ch, EUT Horz, Ant Vert
4512.805	37.4	4.1	1.0	254.0	-33.7	0.0	Vert	AV	0.0	7.8	54.0	-46.2	Low Ch, EUT Vert, Ant Vert
4637.242	36.9	4.3	1.0	74.0	-33.7	0.0	Vert	AV	0.0	7.5	54.0	-46.5	High Ch, EUT Horz, Ant Horz
4575.733	34.8	4.3	1.0	71.0	-33.7	0.0	Vert	AV	0.0	5.4	54.0	-48.6	Mid Ch, EUT Horz, Ant Horz
2782.467	41.6	-2.8	1.0	355.0	-33.7	0.0	Vert	AV	0.0	5.1	54.0	-48.9	High Ch, EUT Horz, Ant Horz
2782.467	41.0	-2.8	1.0	306.0	-33.7	0.0	Horz	AV	0.0	4.5	54.0	-49.5	High Ch, EUT Vert, Ant Vert
2745.600	40.7	-3.0	1.0	303.0	-33.7	0.0	Horz	AV	0.0	4.0	54.0	-50.0	Mid Ch, EUT Vert, Ant Vert
2707.835	40.5	-3.2	1.0	298.0	-33.7	0.0	Horz	AV	0.0	3.6	54.0	-50.4	Low Ch, EUT Vert, Ant Vert
2745.633	39.9	-3.0	1.3	352.0	-33.7	0.0	Vert	AV	0.0	3.2	54.0	-50.8	Mid Ch, EUT Horz, Ant Horz
2707.725	34.4	-3.2	1.0	288.0	-33.7	0.0	Vert	AV	0.0	-2.5	54.0	-56.5	Low Ch, EUT Horz, Ant Horz

SPURIOUS RADIATED EMISSIONS - WALLMOUNT

PSA-ESCI 2018.05.04

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

MODES OF OPERATION

TX Low Channel = 902.6 MHz, Mid Channel = 915.2 MHz, High Channel = 927.5 MHz, 2FSK Modulation, Software power setting = 28 dBm.

POWER SETTINGS INVESTIGATED

24.0 VDC

CONFIGURATIONS INVESTIGATED

SCHW0240 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12400 MHz

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	18-Mar-2018	12 mo
Antenna - Biconilog	EMCO	3141	AXH	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	30-Nov-2017	12 mo
Cable	N/A	Bilog Cables	EVA	30-Nov-2017	12 mo
Attenuator	Coaxicom	3910-10	AWX	28-Feb-2018	12 mo
Attenuator	Coaxicom	3910-20	AXZ	28-Feb-2018	12 mo
Filter - Low Pass	Micro-Tronics	LPM50003	LFB	28-Feb-2018	12 mo
Filter - High Pass	Micro-Tronics	HPM50108	HFV	1-Feb-2018	12 mo
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HFT	5-Dec-2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	7-Feb-2018	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	29-Nov-2017	12 mo
Cable	N/A	Double Ridge Horn Cables	EVB	29-Nov-2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	30-Nov-2017	12 mo
Cable	None	Standard Gain Horns Cable	EVF	30-Nov-2017	12 mo

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual 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 if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

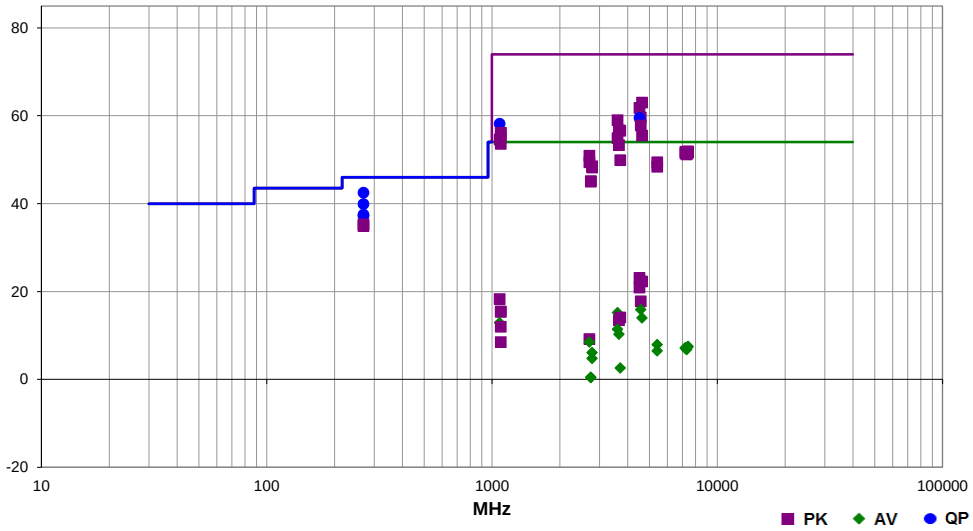
SPURIOUS RADIATED EMISSIONS - WALLMOUNT

EmiR5 2018.05.07 PSA-ESCI 2018.05.04

Work Order:	SCHW0240	**Date:**	20-Jul-2018		
Project:	None	**Temperature:**	23.1 °C		
Job Site:	EV01	**Humidity:**	42% RH		
Serial Number:	1181590420	**Barometric Pres.:**	1023 mbar	**Tested by:**	Jody House & Rod Peloquin
EUT:	SEL-3031				
Configuration:	3				
Customer:	Schweitzer Engineering Laboratories, Inc.				
Attendees:	Miralem Cosic				
EUT Power:	24.0 VDC				
Operating Mode:	TX Low Channel = 902.6 MHz, Mid Channel = 915.2 MHz, High Channel = 927.5 MHz, 2FSK Modulation.				
Deviations:	None				
Comments:	See comments below for Channel, EUT orientation, antenna orientation, and power setting. The test software provided by the manufacturer configured the radio to a 46.1% duty cycle. The average data was corrected up to 100% Duty Cycle using the 10*log(t) where t is the duty cycle, giving a factor of 3.36 dB. The Average Data was then downwardly corrected as per FCC 15.35(c) for FHSS devices. From FCC Grant R34SEL-3031, the dwell time in a 100 ms window is 1.4 ms. Using the equation found in ANSI C63.10:2013 section 7.5, the additional correction factor is 20*log(0.014) = -37.1 dB, giving a total correction factor of -33.7 dB added to the average data. Software Power setting 28, 2.1 dBi dipole antenna. Worst case orientation determined during preliminary testing.				

Test Specifications	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

Run #	35	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
268.806	45.6	-3.1	1.1	179.0	3.0	0.0	Horz	QP	0.0	42.5	46.0	-3.5	Low Channel, EUT Vertical, Ant. Horizontal, Power 28
268.806	43.0	-3.1	1.5	26.0	3.0	0.0	Horz	QP	0.0	39.9	46.0	-6.1	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
268.802	40.6	-3.1	1.0	94.0	3.0	0.0	Horz	QP	0.0	37.5	46.0	-8.5	High Channel, EUT Vertical, Antenna Horizontal, Power 28
268.804	40.3	-3.1	1.3	49.0	3.0	0.0	Vert	QP	0.0	37.2	46.0	-8.8	Low Channel, EUT Horizontal, Ant. Horizontal, Power 28
268.802	38.4	-3.1	1.5	72.0	3.0	0.0	Vert	QP	0.0	35.3	46.0	-10.7	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
4637.160	58.7	4.3	1.0	11.0	0.0	0.0	Vert	PK	0.0	63.0	74.0	-11.0	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
268.804	38.0	-3.1	1.9	40.0	3.0	0.0	Vert	QP	0.0	34.9	46.0	-11.1	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
4512.633	57.7	4.1	1.0	334.0	0.0	0.0	Horz	PK	0.0	61.8	74.0	-12.2	Low Channel, EUT Vertical, Antenna Horizontal, Power 28
4575.765	55.3	4.3	1.2	351.0	0.0	0.0	Horz	PK	0.0	59.6	74.0	-14.4	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
4512.600	55.4	4.1	3.9	357.0	0.0	0.0	Vert	PK	0.0	59.5	74.0	-14.5	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
3609.700	57.1	1.9	1.2	326.0	0.0	0.0	Horz	PK	0.0	59.0	74.0	-15.0	Low Channel, EUT Vertical, Antenna Horizontal, Power 28
1081.565	47.5	-9.3	1.5	299.0	0.0	20.0	Horz	PK	0.0	58.2	74.0	-15.8	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
4575.758	53.5	4.3	1.1	9.0	0.0	0.0	Vert	PK	0.0	57.8	74.0	-16.2	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
3660.920	54.6	2.1	1.0	353.0	0.0	0.0	Horz	PK	0.0	56.7	74.0	-17.3	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
3709.665	54.2	2.4	1.1	346.0	0.0	0.0	Horz	PK	0.0	56.6	74.0	-17.4	High Channel, EUT Vertical, Antenna Horizontal, Power 28
1093.792	45.4	-9.3	1.0	300.0	0.0	20.0	Horz	PK	0.0	56.1	74.0	-17.9	High Channel, EUT Vertical, Antenna Horizontal, Power 28
1094.517	45.4	-9.3	1.0	281.0	0.0	20.0	Horz	PK	0.0	56.1	74.0	-17.9	Low Channel, EUT Vertical, Antenna Horizontal, Power 28
4637.260	51.2	4.3	1.0	351.0	0.0	0.0	Horz	PK	0.0	55.5	74.0	-18.5	High Channel, EUT Vertical, Antenna Horizontal, Power 28
1094.508	44.3	-9.3	3.5	355.0	0.0	20.0	Vert	PK	0.0	55.0	74.0	-19.0	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
3610.033	53.0	1.9	3.6	343.0	0.0	0.0	Vert	PK	0.0	54.9	74.0	-19.1	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
1081.557	43.9	-9.3	3.5	12.0	0.0	20.0	Vert	PK	0.0	54.6	74.0	-19.4	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
1094.175	42.9	-9.3	1.0	321.0	0.0	20.0	Vert	PK	0.0	53.6	74.0	-20.4	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
3660.467	51.2	2.1	3.9	360.0	0.0	0.0	Vert	PK	0.0	53.3	74.0	-20.7	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
7420.430	38.9	13.0	3.5	353.0	0.0	0.0	Vert	PK	0.0	51.9	74.0	-22.1	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
7219.875	39.8	12.0	1.0	121.0	0.0	0.0	Horz	PK	0.0	51.8	74.0	-22.2	Low Channel, EUT Vertical, Antenna Horizontal, Power 28
7419.575	38.6	13.0	1.0	243.0	0.0	0.0	Horz	PK	0.0	51.6	74.0	-22.4	High Channel, EUT Vertical, Antenna Horizontal, Power 28
7220.700	39.4	12.0	1.0	298.0	0.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
7320.120	39.1	12.2	3.4	360.0	0.0	0.0	Horz	PK	0.0	51.3	74.0	-22.7	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
7318.067	39.0	12.2	1.0	141.0	0.0	0.0	Vert	PK	0.0	51.2	74.0	-22.8	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
2707.425	54.1	-3.2	1.1	186.0	0.0	0.0	Vert	PK	0.0	50.9	74.0	-23.1	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
3709.595	47.5	2.4	1.3	210.0	0.0	0.0	Vert	PK	0.0	49.9	74.0	-24.1	High Channel, EUT Horizontal, Antenna Horizontal, Power 28

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2707.508	52.6	-3.2	1.0	227.0	0.0	0.0	Horz	PK	0.0	49.4	74.0	-24.6	Low Channel, EUT Vertical, Antenna Horizontal, Power 28
5415.500	43.1	6.3	1.2	18.0	0.0	0.0	Horz	PK	0.0	49.4	74.0	-24.6	Low Channel, EUT Vertical, Antenna Horizontal, Power 28
2782.295	51.3	-2.8	1.0	105.0	0.0	0.0	Horz	PK	0.0	48.5	74.0	-25.5	High Channel, EUT Vertical, Antenna Horizontal, Power 28
5415.025	42.1	6.3	1.9	156.0	0.0	0.0	Vert	PK	0.0	48.4	74.0	-25.6	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
2782.305	51.0	-2.8	1.0	85.0	0.0	0.0	Vert	PK	0.0	48.2	74.0	-25.8	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
2745.430	48.1	-3.0	2.7	145.0	0.0	0.0	Horz	PK	0.0	45.1	74.0	-28.9	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
2745.467	48.0	-3.0	1.0	243.0	0.0	0.0	Vert	PK	0.0	45.0	74.0	-29.0	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
4512.950	52.7	4.1	1.0	334.0	-33.7	0.0	Horz	AV	0.0	23.1	54.0	-30.9	Low Channel, EUT Vertical, Antenna Horizontal, Power 28
4637.525	51.7	4.3	1.0	11.0	-33.7	0.0	Vert	AV	0.0	22.3	54.0	-31.7	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
4512.967	50.5	4.1	3.9	357.0	-33.7	0.0	Vert	AV	0.0	20.9	54.0	-33.1	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
1081.648	41.3	-9.3	1.5	299.0	-33.7	20.0	Horz	AV	0.0	18.3	54.0	-35.7	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
4575.950	47.2	4.3	1.2	351.0	-33.7	0.0	Horz	AV	0.0	17.8	54.0	-36.2	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
4575.875	45.3	4.3	1.1	9.0	-33.7	0.0	Vert	AV	0.0	15.9	54.0	-38.1	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
1093.917	38.5	-9.3	1.0	300.0	-33.7	20.0	Horz	AV	0.0	15.5	54.0	-38.5	High Channel, EUT Vertical, Antenna Horizontal, Power 28
1094.567	38.4	-9.3	1.0	281.0	-33.7	20.0	Horz	AV	0.0	15.4	54.0	-38.6	Low Channel, EUT Vertical, Antenna Horizontal, Power 28
3610.392	47.0	1.9	1.2	326.0	-33.7	0.0	Horz	AV	0.0	15.2	54.0	-38.8	Low Channel, EUT Vertical, Antenna Horizontal, Power 28
3710.000	45.4	2.4	1.1	346.0	-33.7	0.0	Horz	AV	0.0	14.1	54.0	-39.9	High Channel, EUT Vertical, Antenna Horizontal, Power 28
4637.510	43.4	4.3	1.0	351.0	-33.7	0.0	Horz	AV	0.0	14.0	54.0	-40.0	High Channel, EUT Vertical, Antenna Horizontal, Power 28
3660.765	45.1	2.1	1.0	353.0	-33.7	0.0	Horz	AV	0.0	13.5	54.0	-40.5	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
1081.565	35.9	-9.3	3.5	12.0	-33.7	20.0	Vert	AV	0.0	12.9	54.0	-41.1	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
1094.633	35.0	-9.3	3.5	355.0	-33.7	20.0	Vert	AV	0.0	12.0	54.0	-42.0	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
3610.408	43.2	1.9	3.6	343.0	-33.7	0.0	Vert	AV	0.0	11.4	54.0	-42.6	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
3660.775	41.9	2.1	3.9	360.0	-33.7	0.0	Vert	AV	0.0	10.3	54.0	-43.7	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
2707.750	46.1	-3.2	1.1	186.0	-33.7	0.0	Vert	AV	0.0	9.2	54.0	-44.8	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
1093.833	31.5	-9.3	1.0	321.0	-33.7	20.0	Vert	AV	0.0	8.5	54.0	-45.5	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
2707.733	45.4	-3.2	1.0	227.0	-33.7	0.0	Horz	AV	0.0	8.5	54.0	-45.5	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
5415.600	35.3	6.3	1.2	18.0	-33.7	0.0	Horz	AV	0.0	7.9	54.0	-46.1	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
7418.825	28.2	13.0	3.5	353.0	-33.7	0.0	Vert	AV	0.0	7.5	54.0	-46.5	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
7418.505	28.1	13.0	1.0	243.0	-33.7	0.0	Horz	AV	0.0	7.4	54.0	-46.6	High Channel, EUT Vertical, Antenna Horizontal, Power 28
7220.617	28.9	12.0	1.0	121.0	-33.7	0.0	Horz	AV	0.0	7.2	54.0	-46.8	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
7218.825	28.8	12.0	1.0	298.0	-33.7	0.0	Vert	AV	0.0	7.1	54.0	-46.9	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
7322.442	28.6	12.2	1.0	141.0	-33.7	0.0	Vert	AV	0.0	7.1	54.0	-46.9	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
7320.945	28.3	12.2	3.4	360.0	-33.7	0.0	Horz	AV	0.0	6.8	54.0	-47.2	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28
5415.600	33.9	6.3	1.9	156.0	-33.7	0.0	Vert	AV	0.0	6.5	54.0	-47.5	Low Channel, EUT Horizontal, Antenna Horizontal, Power 28
2782.555	42.6	-2.8	1.0	105.0	-33.7	0.0	Horz	AV	0.0	6.1	54.0	-47.9	High Channel, EUT Vertical, Antenna Horizontal, Power 28
2782.415	41.3	-2.8	1.0	85.0	-33.7	0.0	Vert	AV	0.0	4.8	54.0	-49.2	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
3709.940	33.9	2.4	1.3	210.0	-33.7	0.0	Vert	AV	0.0	2.6	54.0	-51.4	High Channel, EUT Horizontal, Antenna Horizontal, Power 28
2745.583	37.2	-3.0	1.0	243.0	-33.7	0.0	Vert	AV	0.0	0.5	54.0	-53.5	Mid Channel, EUT Horizontal, Antenna Horizontal, Power 28
2745.600	37.1	-3.0	2.7	145.0	-33.7	0.0	Horz	AV	0.0	0.4	54.0	-53.6	Mid Channel, EUT Vertical, Antenna Horizontal, Power 28

DUTY CYCLE

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFU	27-Oct-15	27-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	Fairview Microwave	18B5W-26	RFZ	6-Sep-17	6-Sep-18
Attenuator	Fairview Microwave	SA26B-10	TWH	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	12-Jan-18	12-Jan-19

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.

DUTY CYCLE

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**SEL-3031**			**Work Order:**	**SCHW0240**
Serial Number:	**1181590420**			**Date:**	**19-Jul-18**
Customer:	**Schweitzer Engineering Laboratories, Inc.**			**Temperature:**	**22.7 °C**
Attendees:	**Miralem Cosic**			**Humidity:**	**43.7% RH**
Project:	**None**			**Barometric Pres.:**	**1026 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**15.0 VDC**	**Job Site:**	**EV06**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Continuous Tx with 2FSK Modulation. Software power setting = 28 dBm

DEVIATIONS FROM TEST STANDARD

None

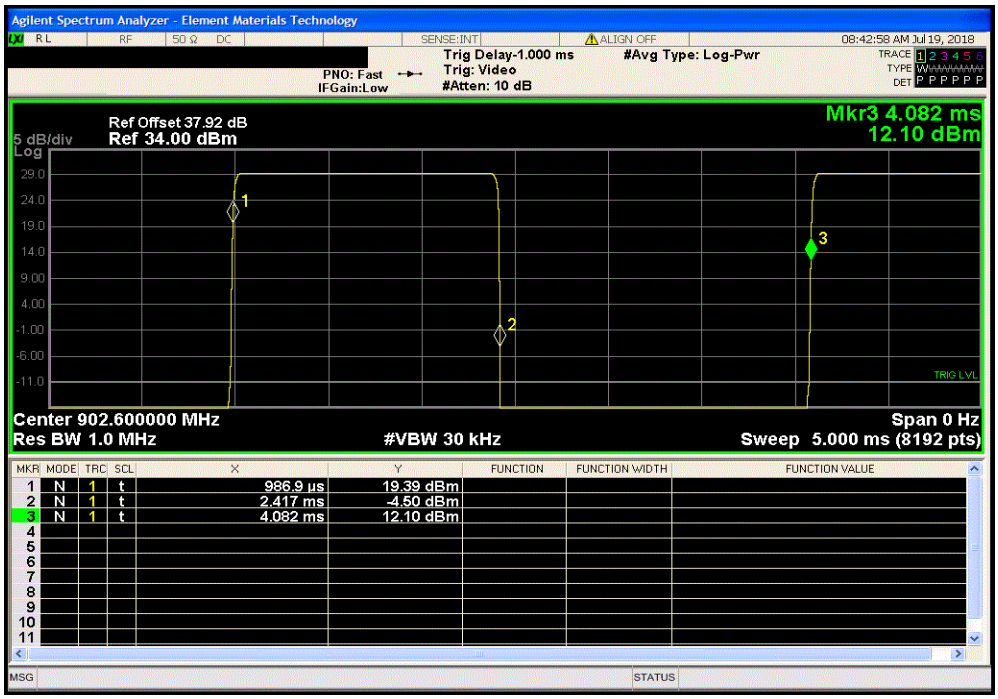
Configuration #	**1**	*Signature*

	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
High Power Mode						
Low Channel, 902.6 MHz	1.43 ms	3.095 ms	1	46.2	N/A	N/A
Low Channel, 902.6 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 915.2 MHz	1.43 ms	3.101 ms	1	46.1	N/A	N/A
Mid Channel, 915.2 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel, 927.5 MHz	1.43 ms	3.099 ms	1	46.2	N/A	N/A
High Channel, 927.5 MHz	N/A	N/A	5	N/A	N/A	N/A

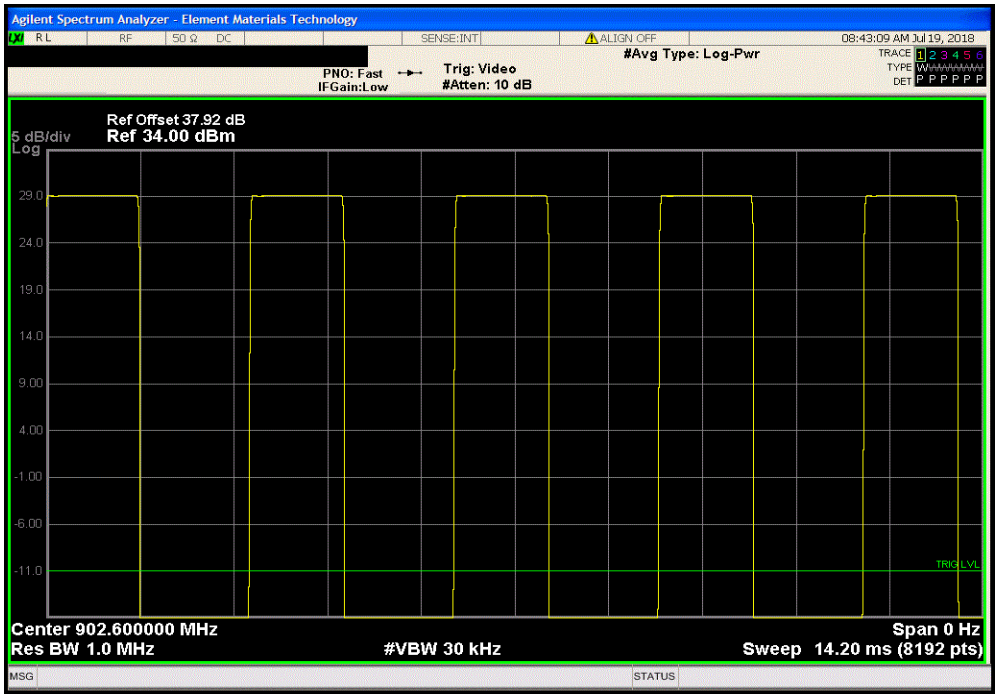
DUTY CYCLE

TbtTx 2017.12.14 XMit 2017.12.13

High Power Mode, Low Channel, 902.6 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	1.43 ms	3.095 ms	1	46.2	N/A	N/A



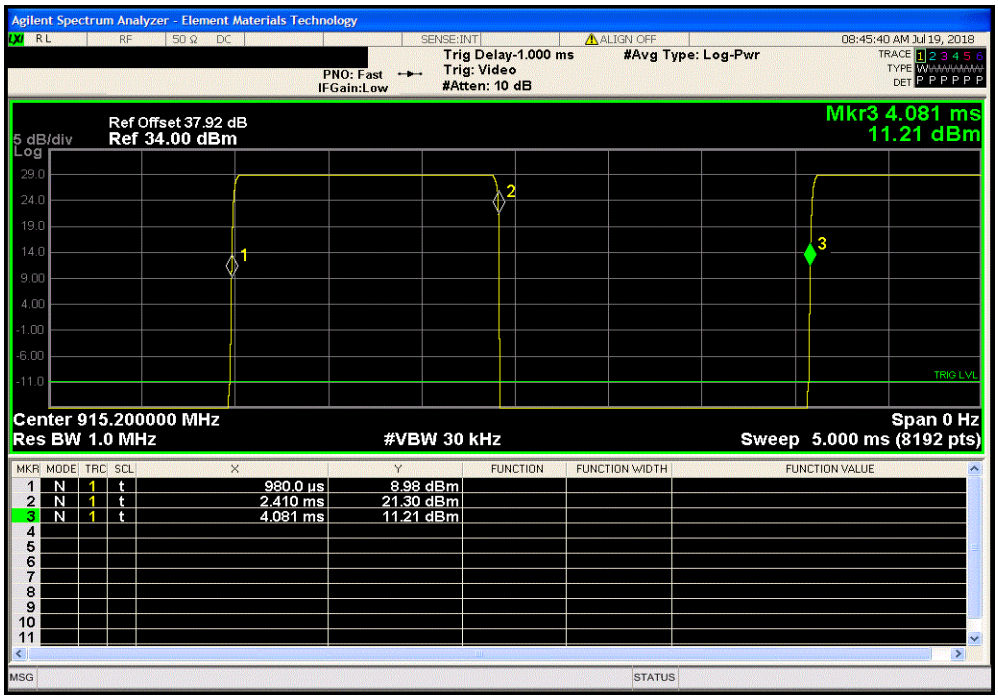
High Power Mode, Low Channel, 902.6 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



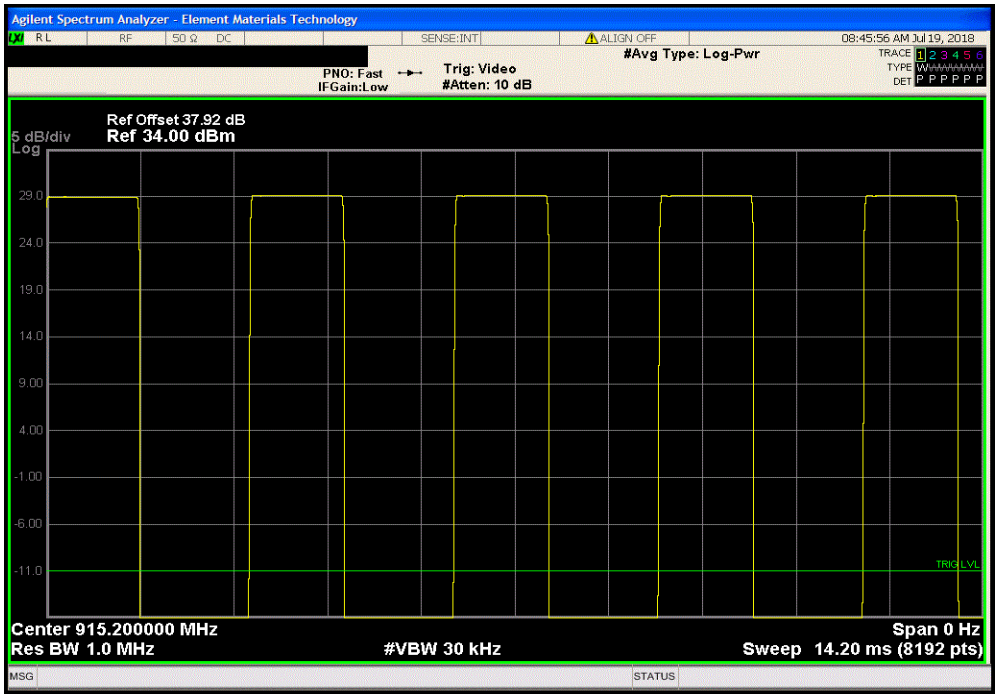
DUTY CYCLE

TbtTx 2017.12.14 XMit 2017.12.13

High Power Mode, Mid Channel, 915.2 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	1.43 ms	3.101 ms	1	46.1	N/A	N/A



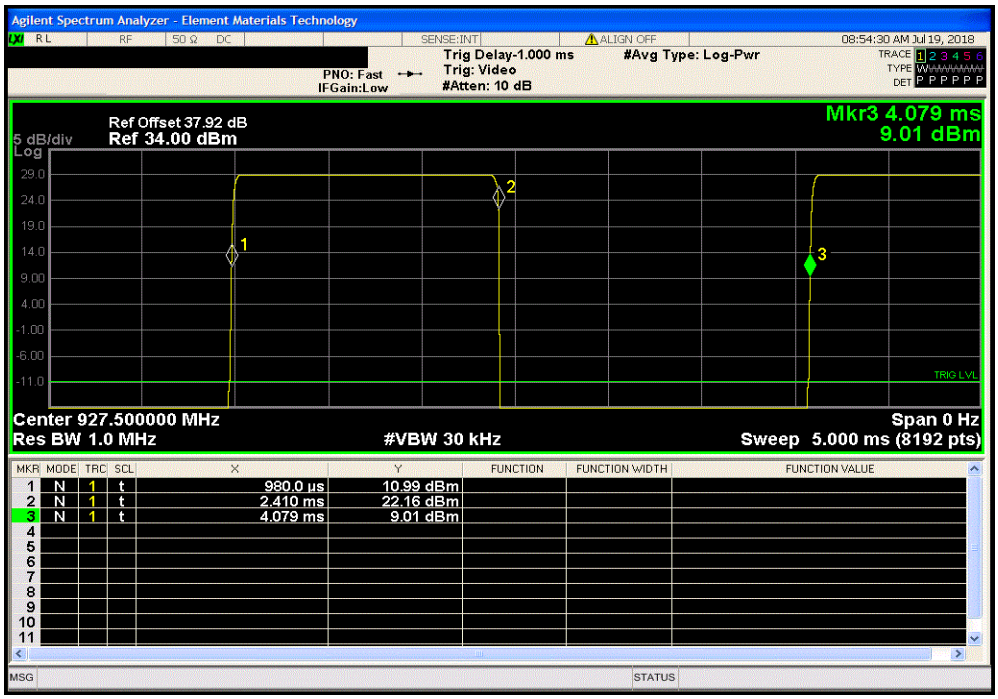
High Power Mode, Mid Channel, 915.2 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



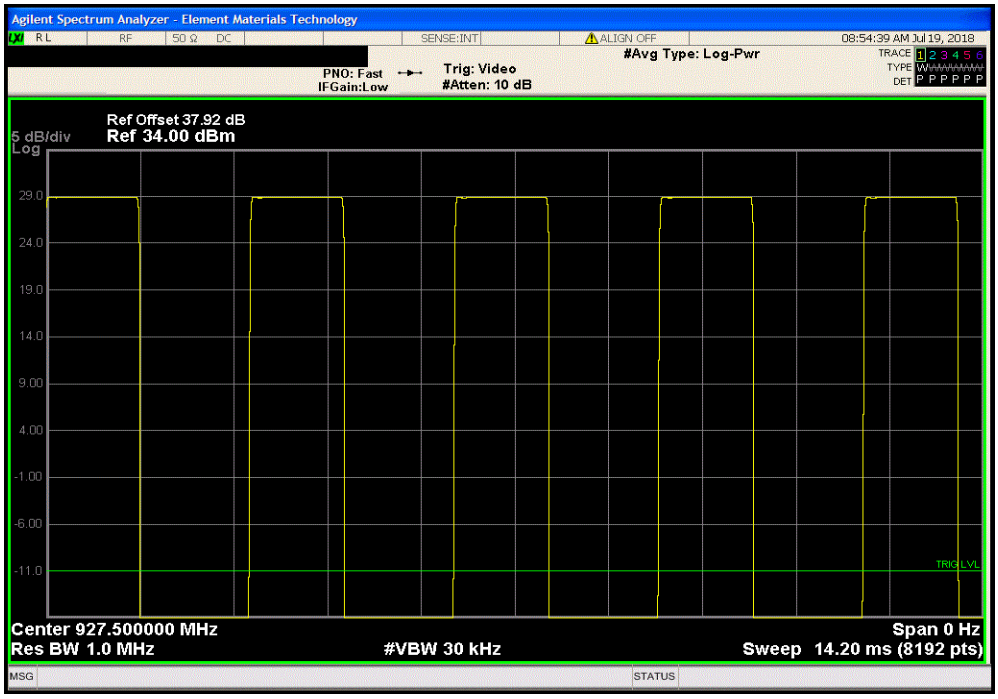
DUTY CYCLE

TbtTx 2017.12.14 XMit 2017.12.13

High Power Mode, High Channel, 927.5 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	1.43 ms	3.099 ms	1	46.2	N/A	N/A



High Power Mode, High Channel, 927.5 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



OUTPUT POWER

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	12-Jan-18	12-Jan-19
Generator - Signal	Keysight	N5182B	TFU	27-Oct-15	27-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Attenuator	Fairview Microwave	SA26B-10	TWH	16-Apr-18	16-Apr-19
Attenuator	Fairview Microwave	18B5W-26	RFZ	6-Sep-17	6-Sep-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The peak output power was measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**SEL-3031**			**Work Order:**	**SCHW0240**
Serial Number:	**1181590420**			**Date:**	**24-Jul-18**
Customer:	**Schweitzer Engineering Laboratories, Inc.**			**Temperature:**	**23.1 °C**
Attendees:	**None**			**Humidity:**	**43% RH**
Project:	**None**			**Barometric Pres.:**	**1022 mbar**
Tested by:	**Jody House & Rod Peloquin**	**Power:**	**24.0 VDC**	**Job Site:**	**EV06**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Low power mode = 21 setting. High power mode = 28 setting.

DEVIATIONS FROM TEST STANDARD

None

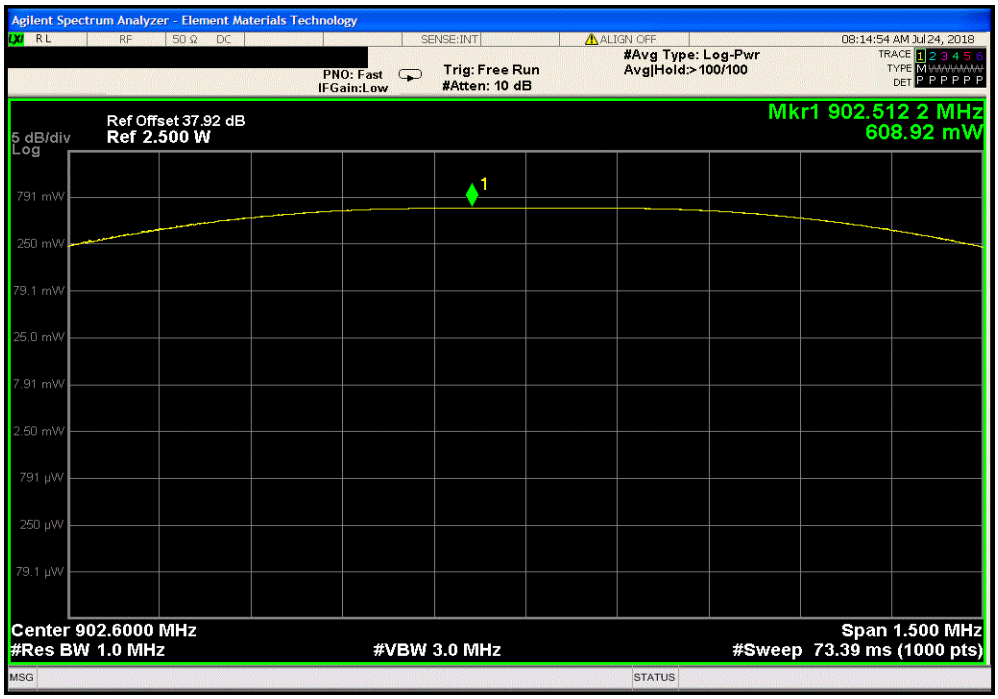
Configuration #	**5**	*Signature*

		Value	**Limit (<)**	**Result**
High Power Mode				
	Low Channel, 902.6 MHz	608.92 mW	1 W	Pass
	Mid Channel, 915.2 MHz	563.34 mW	1 W	Pass
	High Channel, 927.5 MHz	565.98 mW	1 W	Pass
Low Power Mode				
	Low Channel, 902.6 MHz	124.92 mW	1 W	Pass
	Mid Channel, 915.2 MHz	120.16 mW	1 W	Pass
	High Channel, 927.5 MHz	118.91 mW	1 W	Pass

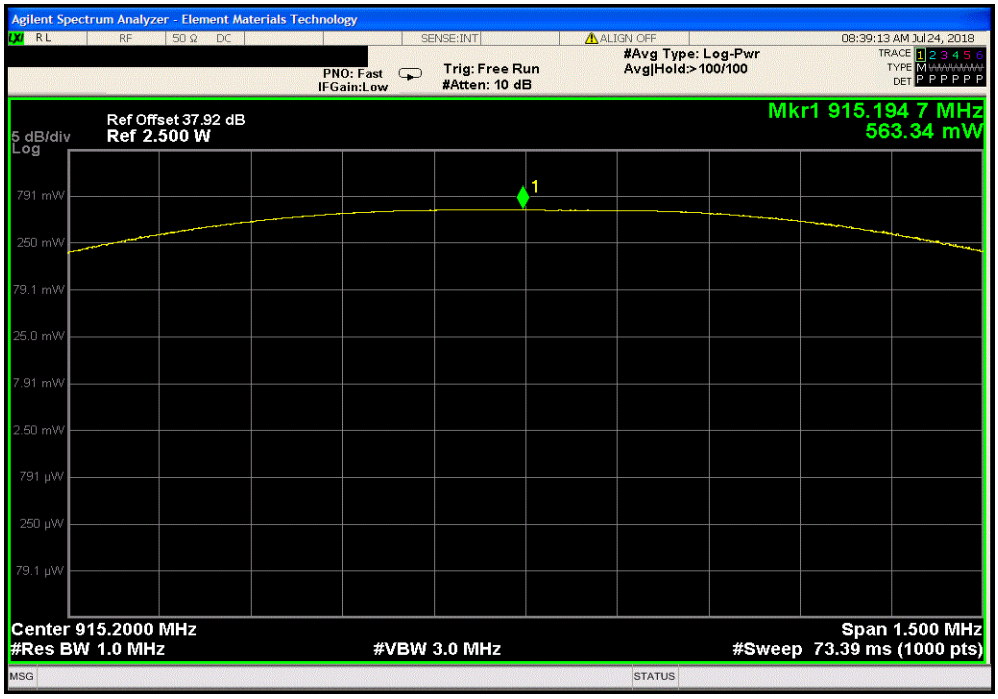
OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

High Power Mode, Low Channel, 902.6 MHz						
				Value	Limit (<)	Result
				608.92 mW	1 W	Pass



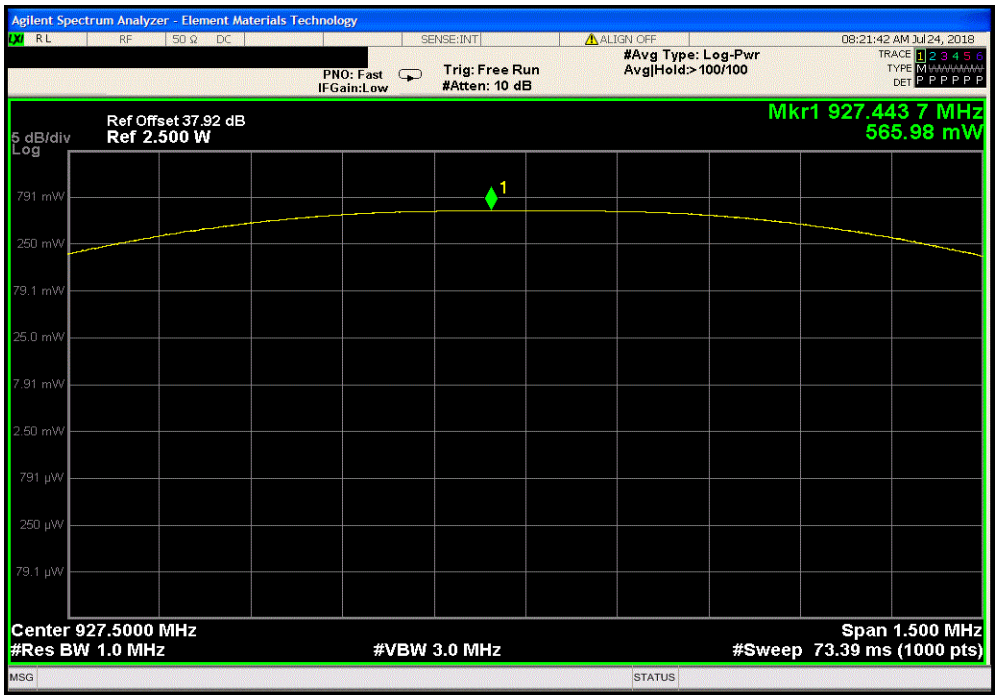
High Power Mode, Mid Channel, 915.2 MHz						
				Value	Limit (<)	Result
				563.34 mW	1 W	Pass



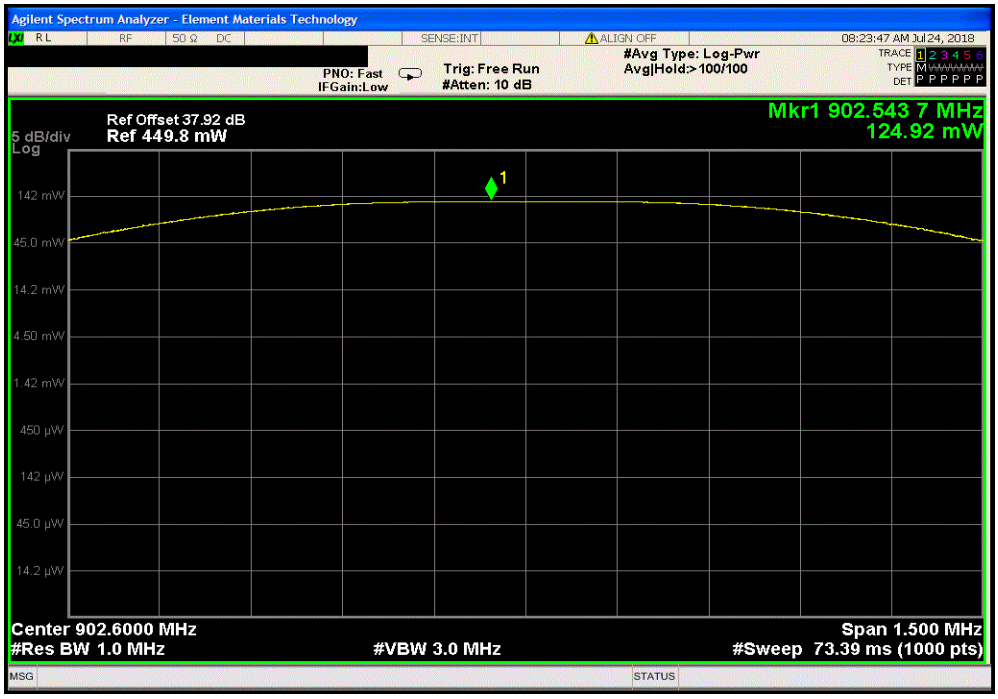
OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

High Power Mode, High Channel, 927.5 MHz						
				Value	Limit (<)	Result
				565.98 mW	1 W	Pass



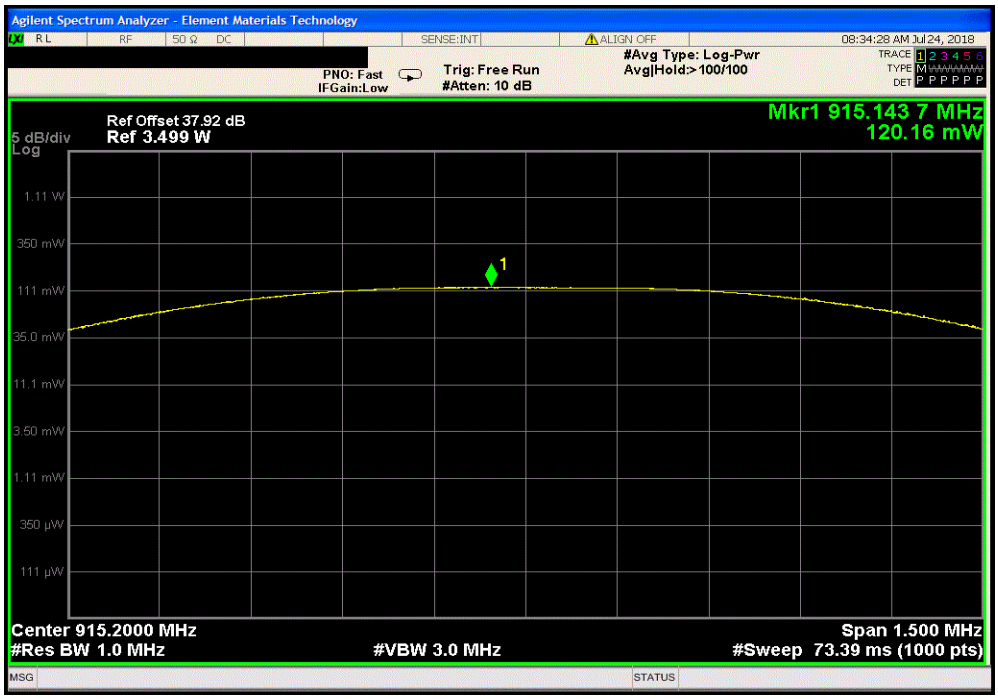
Low Power Mode, Low Channel, 902.6 MHz						
				Value	Limit (<)	Result
				124.92 mW	1 W	Pass



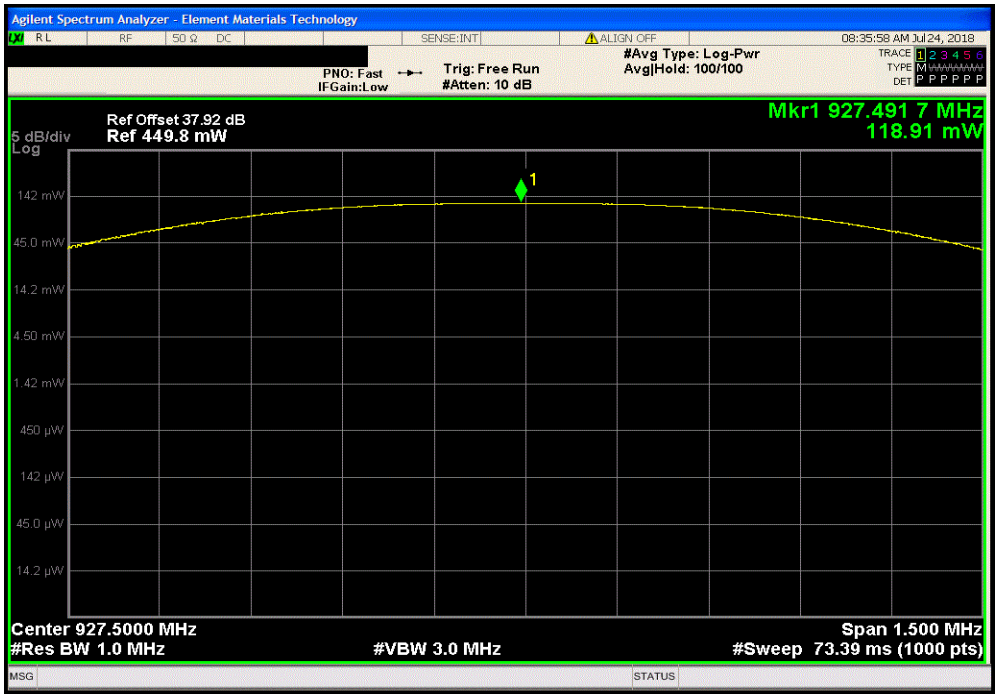
OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

Low Power Mode, Mid Channel, 915.2 MHz						
				Value	Limit (<)	Result
				120.16 mW	1 W	Pass



Low Power Mode, High Channel, 927.5 MHz						
				Value	Limit (<)	Result
				118.91 mW	1 W	Pass



BAND EDGE COMPLIANCE

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	12-Jan-18	12-Jan-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Attenuator	Fairview Microwave	SA26B-10	TWH	16-Apr-18	16-Apr-19
Attenuator	Fairview Microwave	18B5W-26	RFZ	6-Sep-17	6-Sep-18
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Generator - Signal	Keysight	N5182B	TFU	27-Oct-15	27-Oct-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**SEL-3031**			**Work Order:**	**SCHW0240**
Serial Number:	**1181590420**			**Date:**	**26-Jul-18**
Customer:	**Schweitzer Engineering Laboratories, Inc.**			**Temperature:**	**23 °C**
Attendees:	**None**			**Humidity:**	**43.8% RH**
Project:	**None**			**Barometric Pres.:**	**1021 mbar**
Tested by:	**Jody House & Rod Peloquin**	**Power:**	**24.0 VDC**	**Job Site:**	**EV06**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Transmitting with 2FSK Modulation at a software power setting of 28.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	**1**	*Signature*

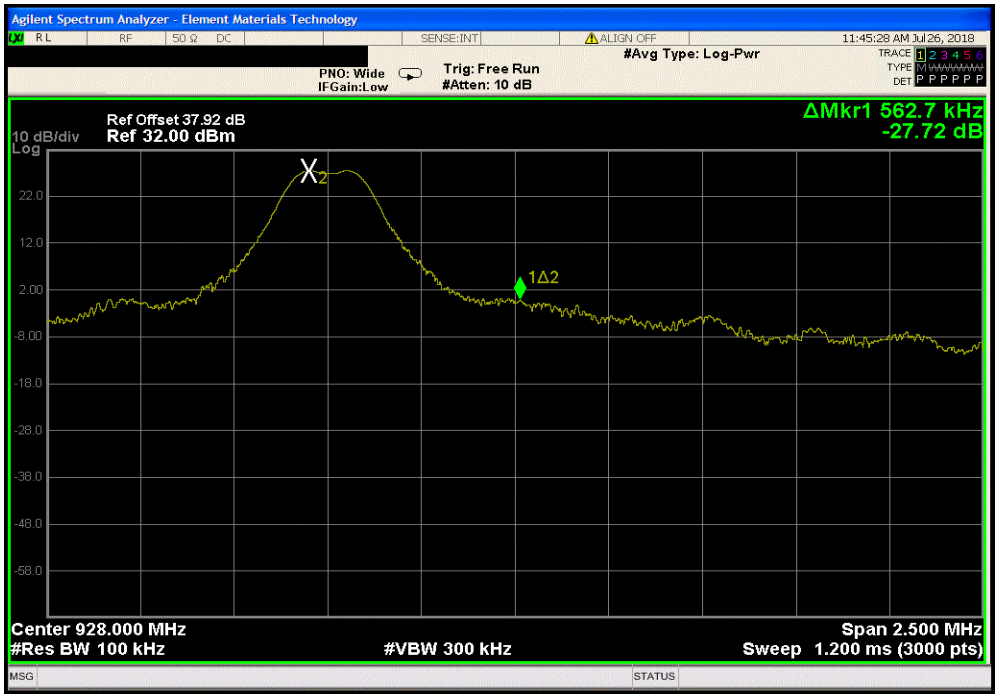
	Value (dBc)	**Limit ≤ (dBc)**	**Result**
High Power Mode			
Low Channel, 902.6 MHz	-24.32	-20	Pass
High Channel, 927.5 MHz	-27.72	-20	Pass

BAND EDGE COMPLIANCE

TbtTx 2017.12.14 XMit 2017.12.13

High Power Mode, Low Channel, 902.6 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-24.32	-20	Pass

High Power Mode, High Channel, 927.5 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-27.72	-20	Pass



BAND EDGE COMPLIANCE - HOPPING MODE

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFU	27-Oct-15	27-Oct-18
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Attenuator	Fairview Microwave	SA26B-10	TWH	16-Apr-18	16-Apr-19
Attenuator	Fairview Microwave	18B5W-26	RFZ	6-Sep-17	6-Sep-18
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	12-Jan-18	12-Jan-19

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to its normal pseudo-random hopping sequence. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE - HOPPING MODE

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**SEL-3031**			**Work Order:**	**SCHW0240**
Serial Number:	**1181590420**			**Date:**	**26-Jul-18**
Customer:	**Schweitzer Engineering Laboratories, Inc.**			**Temperature:**	**23 °C**
Attendees:	**None**			**Humidity:**	**43.7% RH**
Project:	**None**			**Barometric Pres.:**	**1021 mbar**
Tested by:	**Jody House & Rod Peloquin**	**Power:**	**24.0 VDC**	**Job Site:**	**EV06**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Transmitting with 2FSK modulation at a software power setting of 28.

DEVIATIONS FROM TEST STANDARD

None

Configuration #	**1**	*Signature*

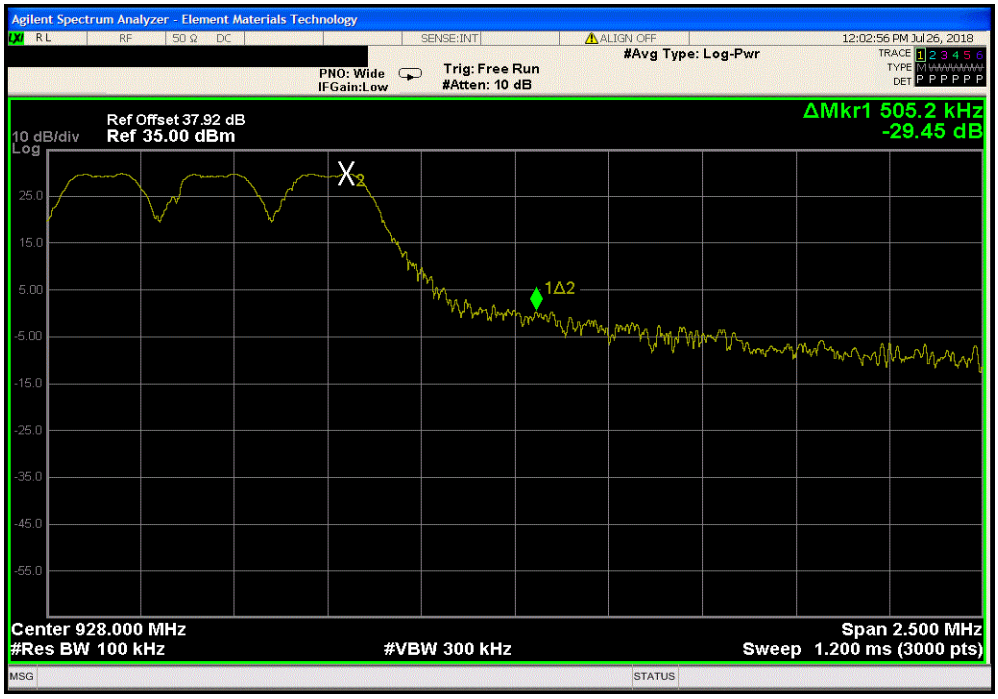
	Value (dBc)	**Limit ≤ (dBc)**	**Result**
High Power Mode			
Hopping mode, 902 MHz band edge	-25.06	-20	Pass
Hopping mode, 928 MHz band edge	-29.45	-20	Pass

BAND EDGE COMPLIANCE - HOPPING MODE

TbtTx 2017.12.14 XMit 2017.12.13

Hopping mode, 902 MHz band edge						
				Value (dBc)	Limit ≤ (dBc)	Result
				-25.06	-20	Pass

Hopping mode, 928 MHz band edge						
				Value (dBc)	Limit ≤ (dBc)	Result
				-29.45	-20	Pass



OCCUPIED BANDWIDTH

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5182B	TFU	27-Oct-15	27-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Attenuator	Fairview Microwave	18B5W-26	RFZ	6-Sep-17	6-Sep-18
Attenuator	Fairview Microwave	SA26B-10	TWH	16-Apr-18	16-Apr-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	12-Jan-18	12-Jan-19

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The 20 dB occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode.

OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	**SEL-3031**			**Work Order:**	**SCHW0240**
Serial Number:	**1181590420**			**Date:**	**19-Jul-18**
Customer:	**Schweitzer Engineering Laboratories, Inc.**			**Temperature:**	**22.8 °C**
Attendees:	**Miralem Cosic**			**Humidity:**	**42.7% RH**
Project:	**None**			**Barometric Pres.:**	**1025 mbar**
Tested by:	**Jeff Alcoke**	**Power:**	**15.0 VDC**	**Job Site:**	**EV06**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Continuous Tx with 2FSK Modulation. Software power setting = 28 dBm

DEVIATIONS FROM TEST STANDARD

None

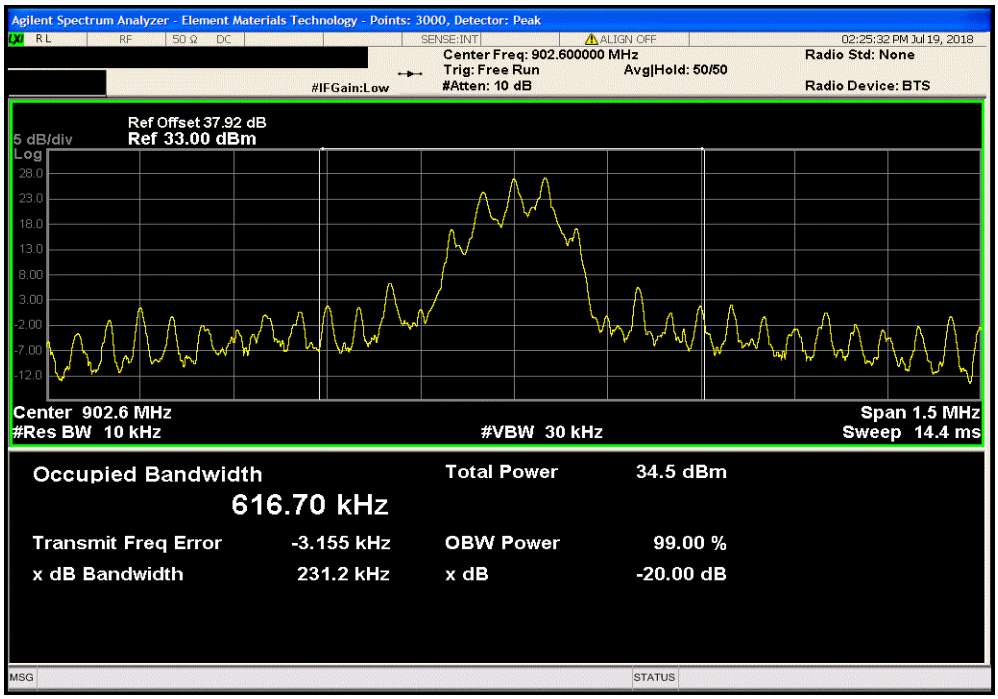
Configuration #	**1**	*Signature*

	Value	**Limit (≤)**	**Result**
High Power Mode			
Low Channel, 902.6 MHz	231.192 kHz	500 kHz	Pass
Mid Channel, 915.2 MHz	231.702 kHz	500 kHz	Pass
High Channel, 927.5 MHz	231.674 kHz	500 kHz	Pass

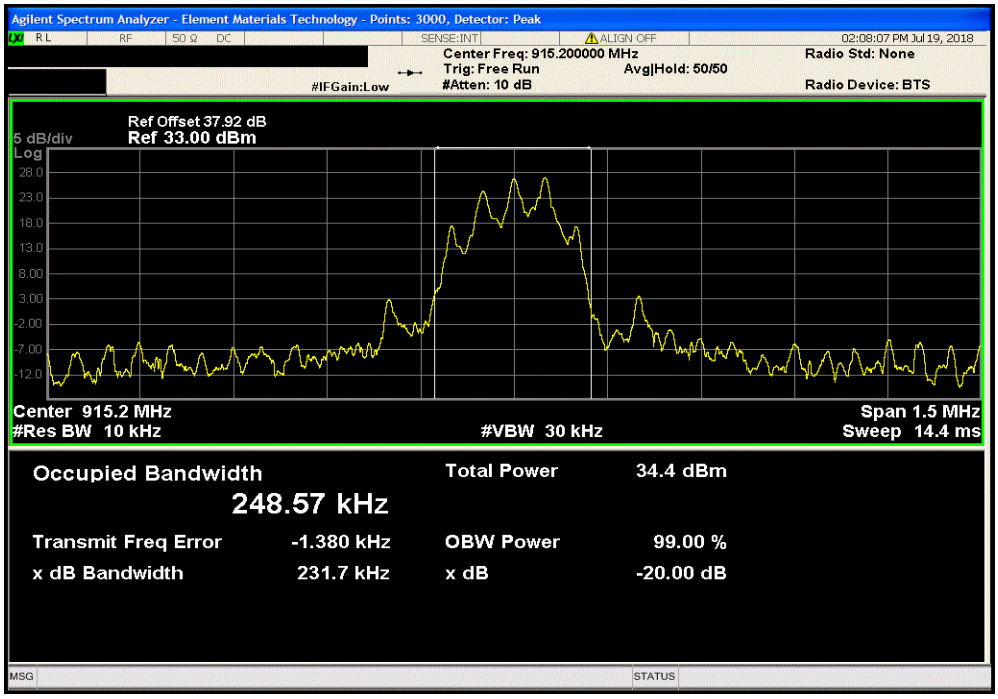
OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

High Power Mode, Low Channel, 902.6 MHz						
				Value	Limit (≤)	Result
				231.192 kHz	500 kHz	Pass



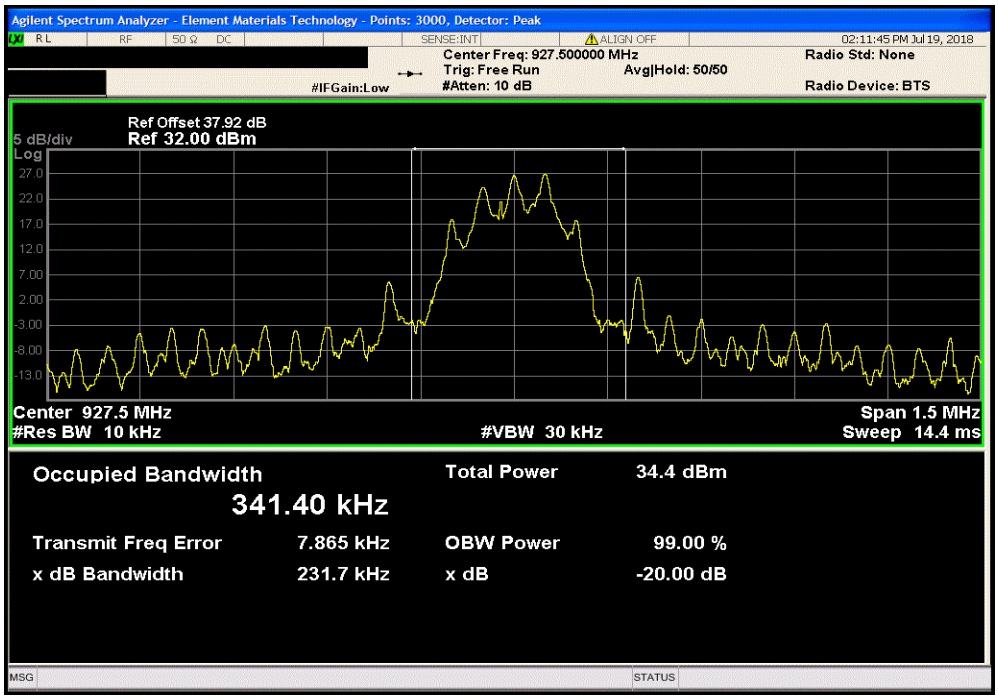
High Power Mode, Mid Channel, 915.2 MHz						
				Value	Limit (≤)	Result
				231.702 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

High Power Mode, High Channel, 927.5 MHz						
				Value	Limit (≤)	Result
				231.674 kHz	500 kHz	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	12-Jan-18	12-Jan-19
Block - DC	Fairview Microwave	SD3379	AMW	23-Apr-18	23-Apr-19
Attenuator	Fairview Microwave	SA26B-10	TWH	16-Apr-18	16-Apr-19
Attenuator	Fairview Microwave	18B5W-26	RFZ	6-Sep-17	6-Sep-18
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	23-Apr-18	23-Apr-19
Generator - Signal	Keysight	N5182B	TFU	27-Oct-15	27-Oct-18

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.12.14 XMit 2017.12.13

EUT:	SEL-3031			**Work Order:**	SCHW0240
Serial Number:	1181590420			**Date:**	26-Jul-18
Customer:	Schweitzer Engineering Laboratories, Inc.			**Temperature:**	23 °C
Attendees:	None			**Humidity:**	43.9% RH
Project:	None			**Barometric Pres.:**	1021 mbar
Tested by:	Jody House & Rod Peloquin	**Power:**	24.0 VDC	**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Transmitting with 2FSK Modulation at a software power setting of 28.

DEVIATIONS FROM TEST STANDARD

None

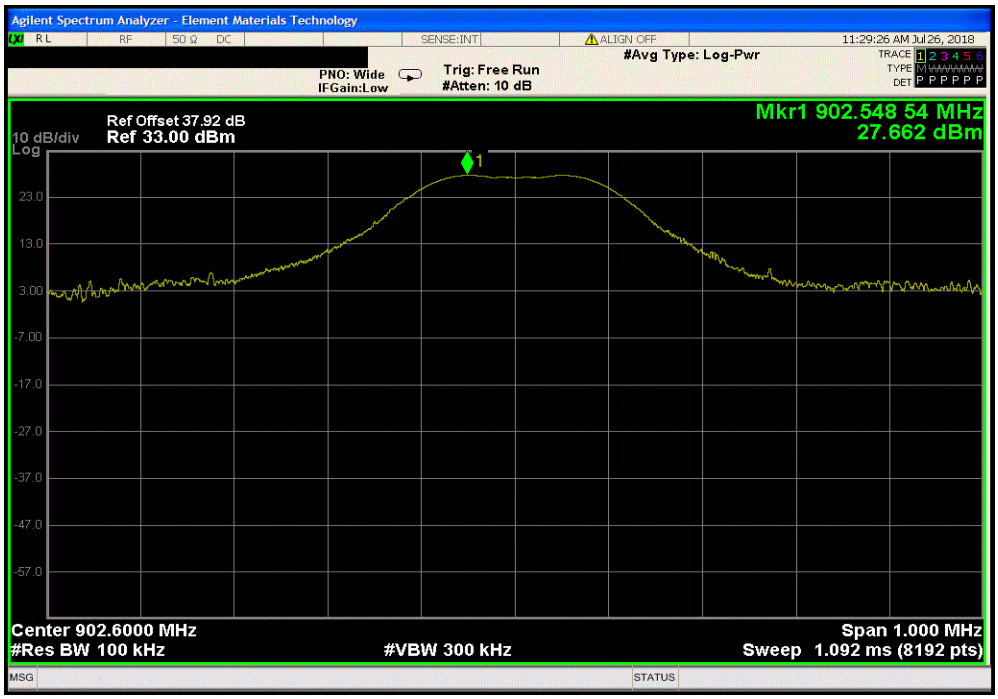
Configuration #	1	Signature

	Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result
High Power Mode				
Low Channel, 902.6 MHz	Fundamental	N/A	N/A	N/A
Low Channel, 902.6 MHz	30 MHz - 12 GHz	-50.83	-20	Pass
Mid Channel, 915.2 MHz	Fundamental	N/A	N/A	N/A
Mid Channel, 915.2 MHz	30 MHz - 12 GHz	-50.74	-20	Pass
High Channel, 927.5 MHz	Fundamental	N/A	N/A	N/A
High Channel, 927.5 MHz	30 MHz - 12 GHz	-53.62	-20	Pass

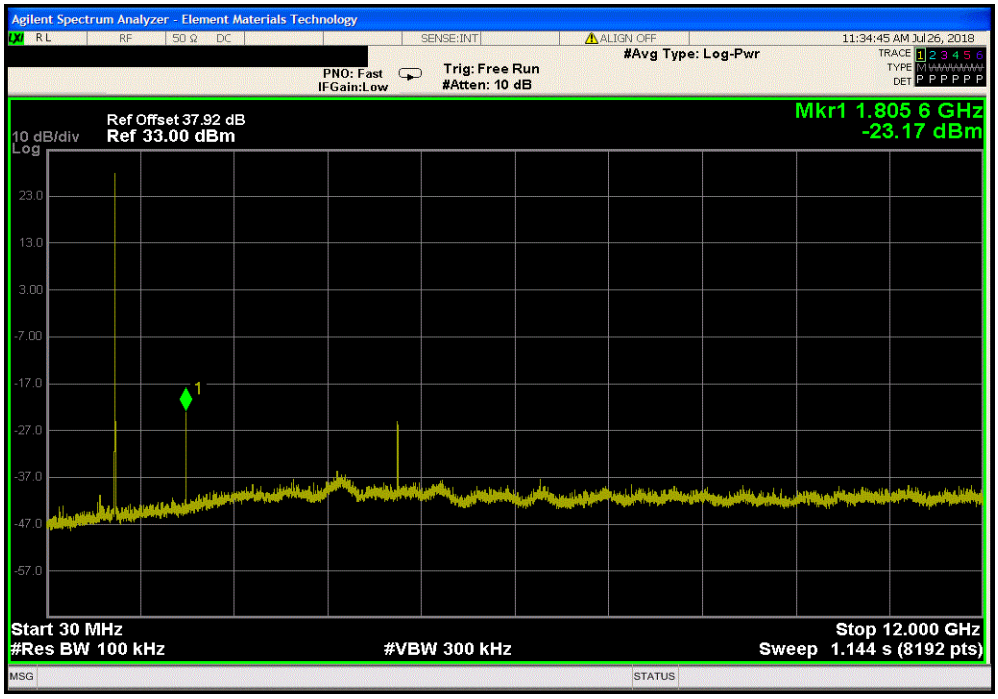
SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.12.14 XMit 2017.12.13

High Power Mode, Low Channel, 902.6 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



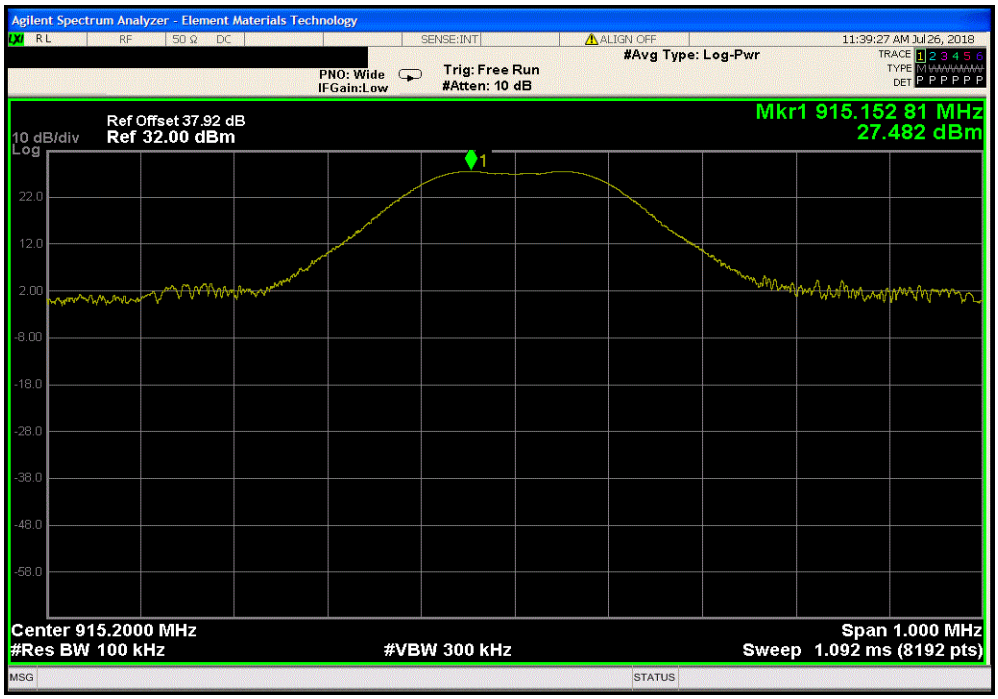
High Power Mode, Low Channel, 902.6 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12 GHz			-50.83	-20	Pass



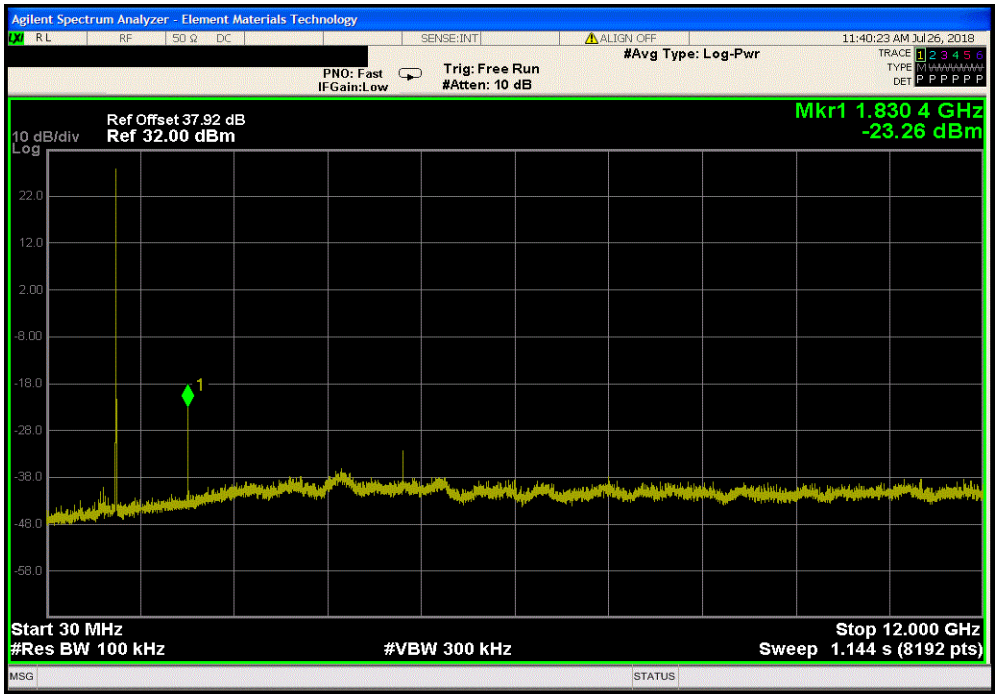
SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.12.14 XMit 2017.12.13

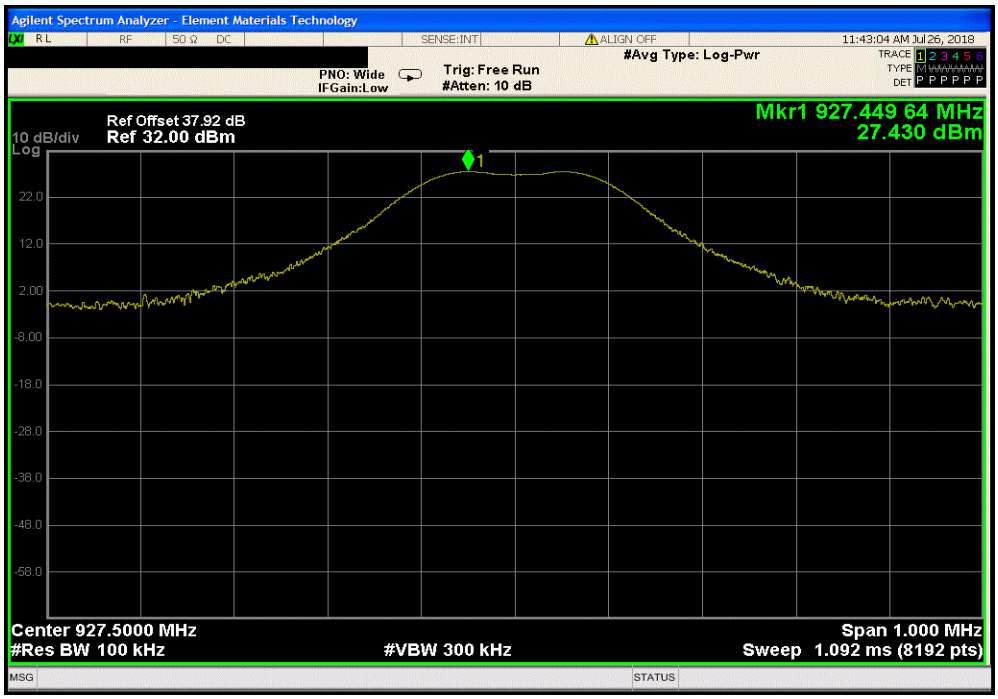
High Power Mode, Mid Channel, 915.2 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



High Power Mode, Mid Channel, 915.2 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12 GHz			-50.74	-20	Pass



High Power Mode, High Channel, 927.5 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



High Power Mode, High Channel, 927.5 MHz					
Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12 GHz			-53.62	-20	Pass