

AC – POWERLINE CONDUCTED EMISSIONS



TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESCI	ARH	3/27/2017	3/27/2018
Cable - Conducted Cable Assembly	Northwest EMC	EVG, HHD, RKA	EVGA	4/13/2017	4/13/2018
LISN	Solar Electronics	9252-50-R-24-BNC	LIP	10/4/2016	10/4/2018
LISN	Solar Electronics	9252-50-R-24-BNC	LIR	9/25/2017	9/25/2018

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

SCHW0228-4

MODES INVESTIGATED

Continuous Tx, Mid CH 915 MHz

AC – POWERLINE CONDUCTED EMISSIONS



EUT:	9630-9110	Work Order:	SCHW0228
Serial Number:	See Config	Date:	10/20/2017
Customer:	Schweitzer Engineering Laboratories, Inc.	Temperature:	23.3°C
Attendees:	Allan Davis	Relative Humidity:	41.3%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Jeff Alcock and Rod Peloquin	Job Site:	EV07
Power:	3.5 VDC	Configuration:	SCHW0228-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	1	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

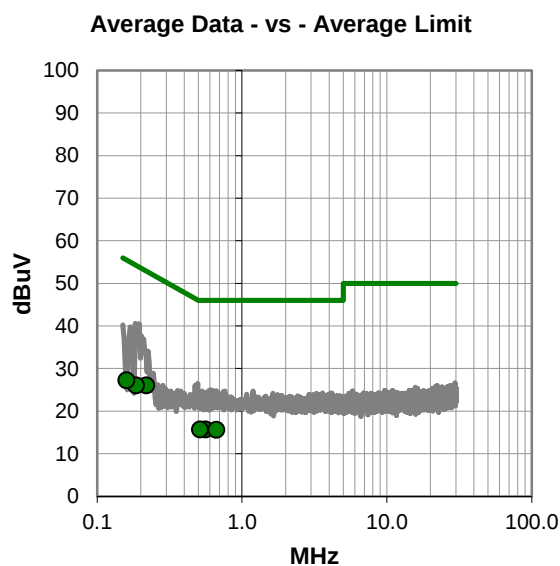
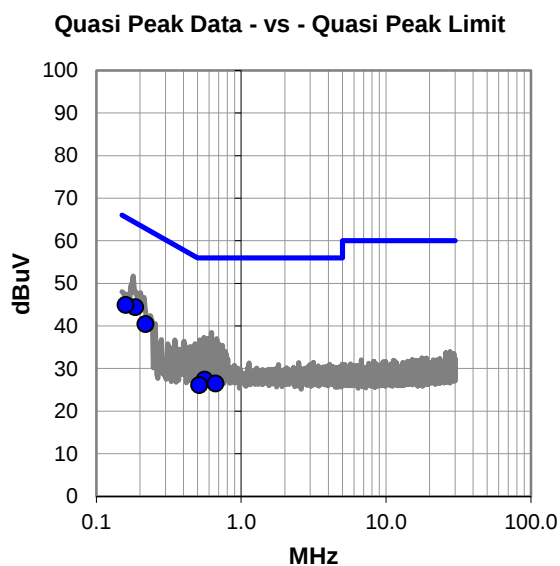
Measuring 3.5 VDC supply. AC/DC supply has no filtering.

EUT OPERATING MODES

Continuous Tx, Mid CH 915 MHz

DEVIATIONS FROM TEST STANDARD

None



AC – POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #1

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.185	24.9	19.5	44.4	64.3	-19.9
0.159	25.3	19.6	44.9	65.5	-20.6
0.218	20.8	19.6	40.4	62.9	-22.5
0.559	7.9	19.5	27.4	56.0	-28.6
0.666	7.0	19.5	26.5	56.0	-29.5
0.515	6.6	19.5	26.1	56.0	-29.9

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.218	6.4	19.6	26.0	52.9	-26.9
0.185	6.5	19.5	26.0	54.3	-28.3
0.159	7.6	19.6	27.2	55.5	-28.3
0.559	-3.8	19.5	15.7	46.0	-30.3
0.515	-3.8	19.5	15.7	46.0	-30.3
0.666	-3.9	19.5	15.6	46.0	-30.4

CONCLUSION

Pass

Tested By

AC – POWERLINE CONDUCTED EMISSIONS



EUT:	9630-9110	Work Order:	SCHW0228
Serial Number:	See Config	Date:	10/20/2017
Customer:	Schweitzer Engineering Laboratories, Inc.	Temperature:	23.3°C
Attendees:	Allan Davis	Relative Humidity:	41.3%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Jeff Alcock and Rod Peloquin	Job Site:	EV07
Power:	3.5 VDC	Configuration:	SCHW0228-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	2	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

Measuring 3.5 VDC supply. AC/DC supply has no filtering.

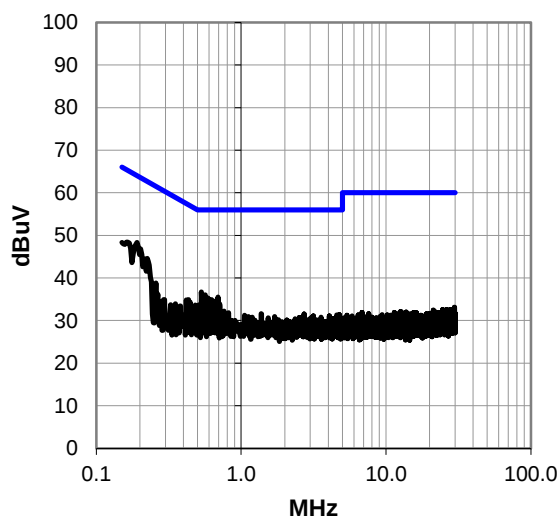
EUT OPERATING MODES

Continuous Tx, Mid CH 915 MHz

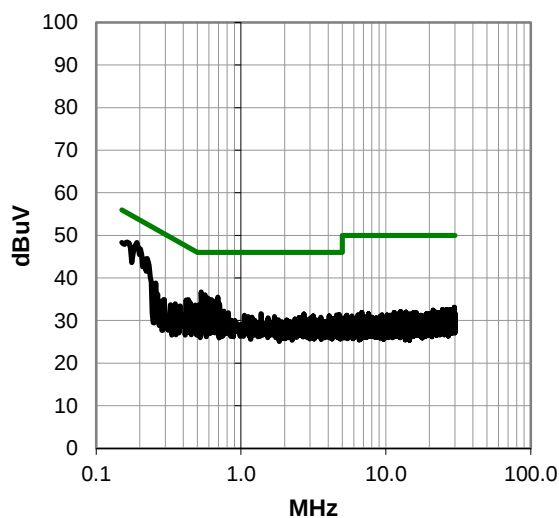
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



AC – POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #2

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.191	28.7	19.6	48.3	64.0	-15.7
0.161	28.8	19.6	48.4	65.4	-17.0
0.531	17.2	19.5	36.7	56.0	-19.3
0.564	16.5	19.5	36.0	56.0	-20.0
0.691	16.0	19.5	35.5	56.0	-20.5
0.549	15.9	19.5	35.4	56.0	-20.6
0.590	15.8	19.5	35.3	56.0	-20.7
0.624	15.4	19.5	34.9	56.0	-21.1
0.654	15.0	19.5	34.5	56.0	-21.5
0.672	14.5	19.5	34.0	56.0	-22.0
0.710	14.4	19.5	33.9	56.0	-22.1
0.434	15.4	19.5	34.9	57.2	-22.3
0.508	14.1	19.5	33.6	56.0	-22.4
0.482	14.1	19.5	33.6	56.3	-22.7
0.258	19.2	19.6	38.8	61.5	-22.7
0.419	15.3	19.5	34.8	57.5	-22.7
0.445	14.8	19.5	34.3	57.0	-22.7
0.471	13.5	19.5	33.0	56.5	-23.5
0.762	12.7	19.5	32.2	56.0	-23.8
0.728	12.3	19.5	31.8	56.0	-24.2
0.818	12.3	19.5	31.8	56.0	-24.2
1.377	12.1	19.5	31.6	56.0	-24.4
0.456	12.8	19.5	32.3	56.8	-24.5
2.717	11.8	19.7	31.5	56.0	-24.5
0.747	11.9	19.5	31.4	56.0	-24.6
4.750	11.6	19.8	31.4	56.0	-24.6

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.191	28.7	19.6	48.3	54.0	-5.7
0.161	28.8	19.6	48.4	55.4	-7.0
0.531	17.2	19.5	36.7	46.0	-9.3
0.564	16.5	19.5	36.0	46.0	-10.0
0.691	16.0	19.5	35.5	46.0	-10.5
0.549	15.9	19.5	35.4	46.0	-10.6
0.590	15.8	19.5	35.3	46.0	-10.7
0.624	15.4	19.5	34.9	46.0	-11.1
0.654	15.0	19.5	34.5	46.0	-11.5
0.672	14.5	19.5	34.0	46.0	-12.0
0.710	14.4	19.5	33.9	46.0	-12.1
0.434	15.4	19.5	34.9	47.2	-12.3
0.508	14.1	19.5	33.6	46.0	-12.4
0.482	14.1	19.5	33.6	46.3	-12.7
0.258	19.2	19.6	38.8	51.5	-12.7
0.419	15.3	19.5	34.8	47.5	-12.7
0.445	14.8	19.5	34.3	47.0	-12.7
0.471	13.5	19.5	33.0	46.5	-13.5
0.762	12.7	19.5	32.2	46.0	-13.8
0.728	12.3	19.5	31.8	46.0	-14.2
0.818	12.3	19.5	31.8	46.0	-14.2
1.377	12.1	19.5	31.6	46.0	-14.4
0.456	12.8	19.5	32.3	46.8	-14.5
2.717	11.8	19.7	31.5	46.0	-14.5
0.747	11.9	19.5	31.4	46.0	-14.6
4.750	11.6	19.8	31.4	46.0	-14.6

CONCLUSION

Pass

Tested By

AC – POWERLINE CONDUCTED EMISSIONS



EUT:	9630-9110	Work Order:	SCHW0228
Serial Number:	See Config	Date:	10/20/2017
Customer:	Schweitzer Engineering Laboratories, Inc.	Temperature:	23.3°C
Attendees:	Allan Davis	Relative Humidity:	41.3%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Jeff Alcock and Rod Peloquin	Job Site:	EV07
Power:	3.0 VDC	Configuration:	SCHW0228-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	3	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

Measuring 3.0 VDC supply. AC/DC supply has no filtering.

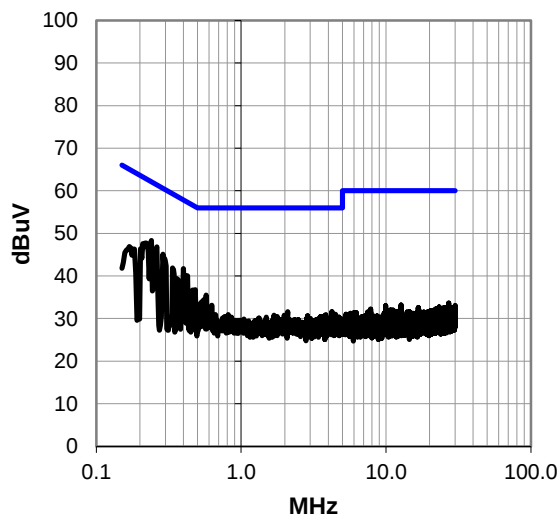
EUT OPERATING MODES

Continuous Tx, Mid CH 915 MHz

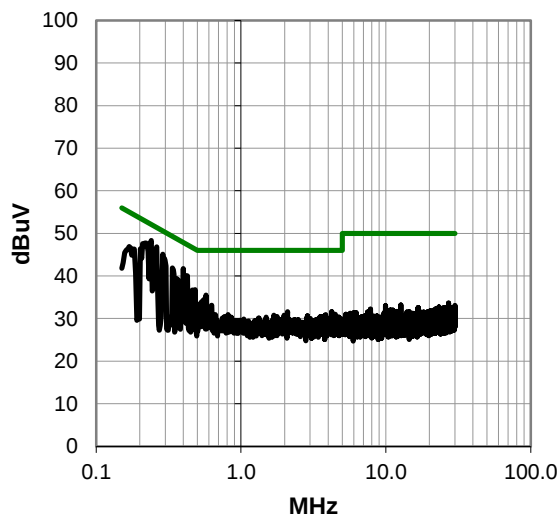
DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



Peak Data - vs - Average Limit



AC – POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #3

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.240	28.7	19.6	48.3	62.1	-13.8
0.262	27.2	19.6	46.8	61.4	-14.6
0.217	28.1	19.6	47.7	62.9	-15.2
0.288	25.5	19.6	45.1	60.6	-15.5
0.400	22.2	19.5	41.7	57.9	-16.2
0.422	20.6	19.5	40.1	57.4	-17.3
0.337	22.4	19.5	41.9	59.3	-17.4
0.169	27.4	19.5	46.9	65.0	-18.1
0.359	19.9	19.5	39.4	58.8	-19.4
0.482	17.3	19.5	36.8	56.3	-19.5
0.463	17.2	19.5	36.7	56.6	-19.9
0.572	16.0	19.5	35.5	56.0	-20.5
0.564	15.1	19.5	34.6	56.0	-21.4
0.549	14.9	19.5	34.4	56.0	-21.6
0.516	13.9	19.5	33.4	56.0	-22.6
0.624	13.6	19.5	33.1	56.0	-22.9
0.587	12.3	19.5	31.8	56.0	-24.2
2.094	12.0	19.6	31.6	56.0	-24.4
4.231	11.8	19.8	31.6	56.0	-24.4
4.467	11.2	19.8	31.0	56.0	-25.0
0.665	11.4	19.5	30.9	56.0	-25.1
0.814	11.4	19.5	30.9	56.0	-25.1
3.832	11.1	19.8	30.9	56.0	-25.1
1.687	11.2	19.6	30.8	56.0	-25.2
1.986	11.2	19.6	30.8	56.0	-25.2
4.455	11.0	19.8	30.8	56.0	-25.2

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.240	28.7	19.6	48.3	52.1	-3.8
0.262	27.2	19.6	46.8	51.4	-4.6
0.217	28.1	19.6	47.7	52.9	-5.2
0.288	25.5	19.6	45.1	50.6	-5.5
0.400	22.2	19.5	41.7	47.9	-6.2
0.422	20.6	19.5	40.1	47.4	-7.3
0.337	22.4	19.5	41.9	49.3	-7.4
0.169	27.4	19.5	46.9	55.0	-8.1
0.359	19.9	19.5	39.4	48.8	-9.4
0.482	17.3	19.5	36.8	46.3	-9.5
0.463	17.2	19.5	36.7	46.6	-9.9
0.572	16.0	19.5	35.5	46.0	-10.5
0.564	15.1	19.5	34.6	46.0	-11.4
0.549	14.9	19.5	34.4	46.0	-11.6
0.516	13.9	19.5	33.4	46.0	-12.6
0.624	13.6	19.5	33.1	46.0	-12.9
0.587	12.3	19.5	31.8	46.0	-14.2
2.094	12.0	19.6	31.6	46.0	-14.4
4.231	11.8	19.8	31.6	46.0	-14.4
4.467	11.2	19.8	31.0	46.0	-15.0
0.665	11.4	19.5	30.9	46.0	-15.1
0.814	11.4	19.5	30.9	46.0	-15.1
3.832	11.1	19.8	30.9	46.0	-15.1
1.687	11.2	19.6	30.8	46.0	-15.2
1.986	11.2	19.6	30.8	46.0	-15.2
4.455	11.0	19.8	30.8	46.0	-15.2

CONCLUSION

Pass

Rocky L. Pellego

Tested By

AC – POWERLINE CONDUCTED EMISSIONS



EUT:	9630-9110	Work Order:	SCHW0228
Serial Number:	See Config	Date:	10/20/2017
Customer:	Schweitzer Engineering Laboratories, Inc.	Temperature:	23.3°C
Attendees:	Allan Davis	Relative Humidity:	41.3%
Customer Project:	None	Bar. Pressure:	1016 mb
Tested By:	Jeff Alcock and Rod Peloquin	Job Site:	EV07
Power:	3.0 VDC	Configuration:	SCHW0228-4

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2017	ANSI C63.10:2013

TEST PARAMETERS

Run #:	4	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

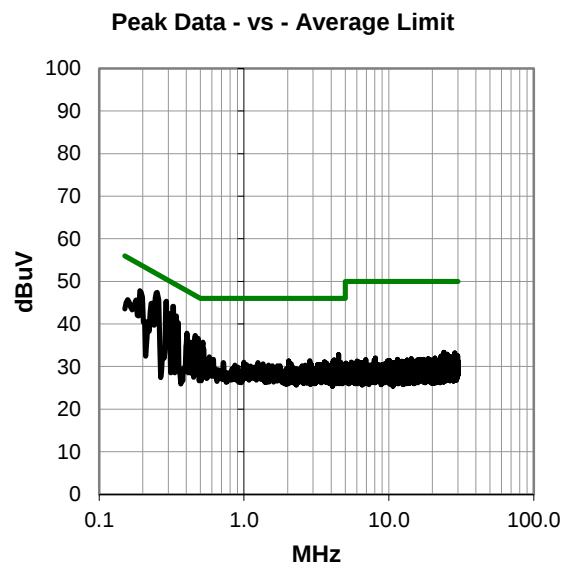
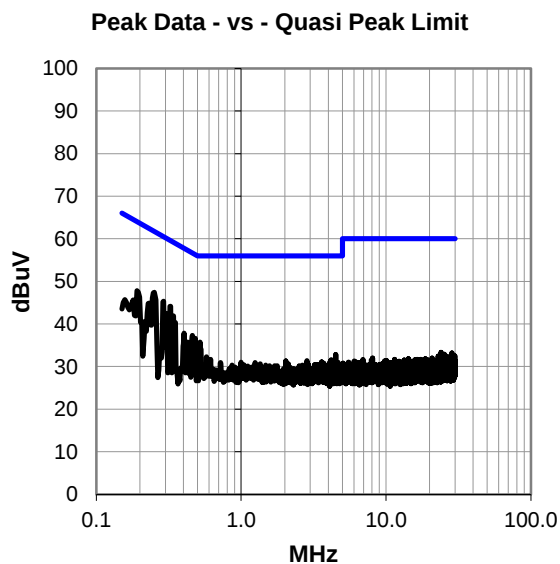
Measuring 3.0 VDC supply. AC/DC supply has no filtering.

EUT OPERATING MODES

Continuous Tx, Mid CH 915 MHz

DEVIATIONS FROM TEST STANDARD

None



AC – POWERLINE CONDUCTED EMISSIONS



RESULTS - Run #4

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.251	27.8	19.6	47.4	61.7	-14.3
0.292	25.7	19.6	45.3	60.5	-15.2
0.322	24.6	19.5	44.1	59.7	-15.6
0.191	28.2	19.6	47.8	64.0	-16.2
0.340	22.4	19.5	41.9	59.2	-17.3
0.232	25.3	19.6	44.9	62.4	-17.5
0.303	22.9	19.5	42.4	60.2	-17.8
0.351	20.8	19.5	40.3	58.9	-18.6
0.460	17.8	19.5	37.3	56.7	-19.4
0.482	17.1	19.5	36.6	56.3	-19.7
0.157	26.1	19.6	45.7	65.6	-19.9
0.404	18.3	19.5	37.8	57.8	-20.0
0.519	16.2	19.5	35.7	56.0	-20.3
0.419	16.2	19.5	35.7	57.5	-21.8
0.441	15.2	19.5	34.7	57.0	-22.3
4.500	13.0	19.8	32.8	56.0	-23.2
0.575	12.8	19.5	32.3	56.0	-23.7
0.616	12.2	19.5	31.7	56.0	-24.3
0.598	12.1	19.5	31.6	56.0	-24.4
4.198	11.8	19.8	31.6	56.0	-24.4
2.840	11.7	19.7	31.4	56.0	-24.6
2.034	11.7	19.6	31.3	56.0	-24.7
4.120	11.4	19.8	31.2	56.0	-24.8
3.597	11.3	19.8	31.1	56.0	-24.9
0.997	11.5	19.5	31.0	56.0	-25.0
0.721	11.4	19.5	30.9	56.0	-25.1

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.251	27.8	19.6	47.4	51.7	-4.3
0.292	25.7	19.6	45.3	50.5	-5.2
0.322	24.6	19.5	44.1	49.7	-5.6
0.191	28.2	19.6	47.8	54.0	-6.2
0.340	22.4	19.5	41.9	49.2	-7.3
0.232	25.3	19.6	44.9	52.4	-7.5
0.303	22.9	19.5	42.4	50.2	-7.8
0.351	20.8	19.5	40.3	48.9	-8.6
0.460	17.8	19.5	37.3	46.7	-9.4
0.482	17.1	19.5	36.6	46.3	-9.7
0.157	26.1	19.6	45.7	55.6	-9.9
0.404	18.3	19.5	37.8	47.8	-10.0
0.519	16.2	19.5	35.7	46.0	-10.3
0.419	16.2	19.5	35.7	47.5	-11.8
0.441	15.2	19.5	34.7	47.0	-12.3
4.500	13.0	19.8	32.8	46.0	-13.2
0.575	12.8	19.5	32.3	46.0	-13.7
0.616	12.2	19.5	31.7	46.0	-14.3
0.598	12.1	19.5	31.6	46.0	-14.4
4.198	11.8	19.8	31.6	46.0	-14.4
2.840	11.7	19.7	31.4	46.0	-14.6
2.034	11.7	19.6	31.3	46.0	-14.7
4.120	11.4	19.8	31.2	46.0	-14.8
3.597	11.3	19.8	31.1	46.0	-14.9
0.997	11.5	19.5	31.0	46.0	-15.0
0.721	11.4	19.5	30.9	46.0	-15.1

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.06.01

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

Transmitting continuously at Low Ch (903 MHz), Mid Ch (915 MHz), High Ch (927 MHz).

POWER SETTINGS INVESTIGATED

3.5 VDC

CONFIGURATIONS INVESTIGATED

SCHW0219 - 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
Filter - Low Pass	Micro-Tronics	LPM50003	LFB	4/19/2017	12 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	2/7/2017	12 mo
Cable	None	Standard Gain Horns Cable	EVF	2/6/2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	7/20/2017	12 mo
Cable	N/A	Double Ridge Horn Cables	EVB	7/20/2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	2/3/2016	24 mo
Attenuator	Coaxicom	66702 5910-10	RBI	11/30/2016	12 mo
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HFT	1/4/2017	12 mo
Cable	N/A	Bilog Cables	EVA	2/6/2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	6/30/2016	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	2/6/2017	12 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	4/13/2017	12 mo

MEASUREMENT BANDWIDTHS

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

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



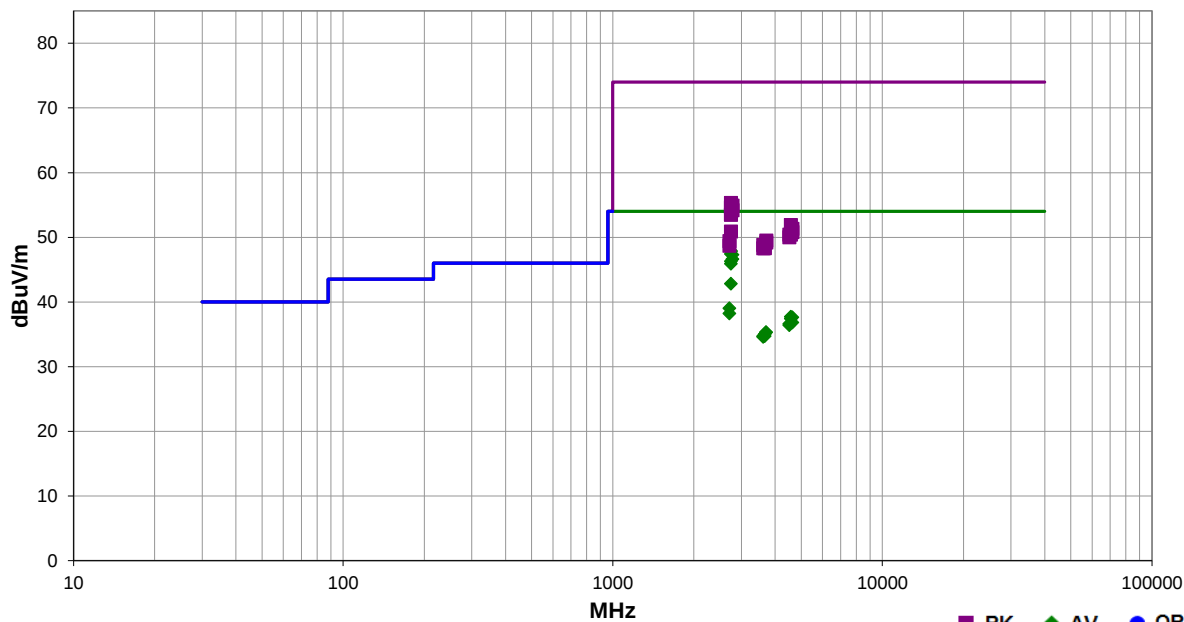
EmiRS 2017.07.11

PSA-ESCI 2017.06.01

Work Order:	SCHW0219	Date:	07/25/17		
Project:	None	Temperature:	23.2 °C		
Job Site:	EV01	Humidity:	43.6% RH		
Serial Number:	A02654144	Barometric Pres.:	1019 mbar	Tested by:	Mark Baytan
EUT:	9630-9110				
Configuration:	3				
Customer:	Schweitzer Engineering Laboratories, Inc.				
Attendees:	Allan Davis				
EUT Power:	3.5 VDC				
Operating Mode:	Transmitting continuously at Low Ch (903 MHz), Mid Ch (915 MHz), High Ch (927 MHz).				
Deviations:	None				
Comments:	Power level setting: 27 dBm. Yagi Antenna (14.15dBi) with 3dB attenuator.				

Test Specifications	Test Method
FCC 15.247:2017	ANSI C63.10:2013

Run #	19	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2745.340	43.3	4.6	1.0	198.0	3.0	0.0	Horz	AV	0.0	47.9	54.0	-6.1	Mid Ch, EUT on Side
2745.310	43.2	4.6	1.0	197.0	3.0	0.0	Horz	AV	0.0	47.8	54.0	-6.2	Mid Ch, EUT Horz
2745.335	42.8	4.6	1.0	339.0	3.0	0.0	Vert	AV	0.0	47.4	54.0	-6.6	Mid Ch, EUT on Side
2781.020	42.4	4.9	1.0	292.0	3.0	0.0	Vert	AV	0.0	47.3	54.0	-6.7	High Ch, EUT on Side
2781.010	41.7	4.9	1.0	230.0	3.0	0.0	Horz	AV	0.0	46.6	54.0	-7.4	High Ch, EUT on Side
2745.350	41.7	4.6	1.0	197.0	3.0	0.0	Vert	AV	0.0	46.3	54.0	-7.7	Mid Ch, EUT Vert
2745.360	41.3	4.6	1.0	172.0	3.0	0.0	Vert	AV	0.0	45.9	54.0	-8.1	Mid Ch, EUT Horz
2745.375	38.2	4.6	1.0	258.0	3.0	0.0	Horz	AV	0.0	42.8	54.0	-11.2	Mid Ch, EUT Vert
2709.010	34.6	4.4	1.0	215.0	3.0	0.0	Vert	AV	0.0	39.0	54.0	-15.0	Low Ch, EUT on Side
2708.970	33.8	4.4	1.0	196.0	3.0	0.0	Horz	AV	0.0	38.2	54.0	-15.8	Low Ch, EUT on Side
4575.895	26.0	11.7	1.3	241.0	3.0	0.0	Vert	AV	0.0	37.7	54.0	-16.3	Mid Ch, EUT on Side
4635.820	26.0	11.6	1.0	157.0	3.0	0.0	Vert	AV	0.0	37.6	54.0	-16.4	High Ch, EUT on Side
4575.835	25.7	11.7	2.8	152.0	3.0	0.0	Horz	AV	0.0	37.4	54.0	-16.6	Mid Ch, EUT on Side
4635.930	25.2	11.6	1.0	127.0	3.0	0.0	Horz	AV	0.0	36.8	54.0	-17.2	High Ch, EUT on Side
4515.850	25.1	11.5	1.0	45.0	3.0	0.0	Vert	AV	0.0	36.6	54.0	-17.4	Low Ch, EUT on Side
4515.815	24.9	11.5	1.0	256.0	3.0	0.0	Horz	AV	0.0	36.4	54.0	-17.6	Low Ch, EUT on Side
2745.670	50.7	4.6	1.0	197.0	3.0	0.0	Horz	PK	0.0	55.3	74.0	-18.7	Mid Ch, EUT Horz
3707.095	25.7	9.6	1.0	317.0	3.0	0.0	Horz	AV	0.0	35.3	54.0	-18.7	High Ch, EUT on Side

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
3706.790	25.7	9.6	3.7	126.0	3.0	0.0	Vert	AV	0.0	35.3	54.0	-18.7	High Ch, EUT on Side
3660.710	25.7	9.3	2.4	189.0	3.0	0.0	Horz	AV	0.0	35.0	54.0	-19.0	Mid Ch, EUT on Side
2780.370	50.0	4.9	1.0	292.0	3.0	0.0	Vert	PK	0.0	54.9	74.0	-19.1	High Ch, EUT on Side
2745.530	50.1	4.6	1.0	198.0	3.0	0.0	Horz	PK	0.0	54.7	74.0	-19.3	Mid Ch, EUT on Side
3659.070	25.4	9.3	1.0	115.0	3.0	0.0	Vert	AV	0.0	34.7	54.0	-19.3	Mid Ch, EUT on Side
3612.595	25.6	9.1	1.0	169.0	3.0	0.0	Vert	AV	0.0	34.7	54.0	-19.3	Low Ch, EUT on Side
2745.540	50.0	4.6	1.0	339.0	3.0	0.0	Vert	PK	0.0	54.6	74.0	-19.4	Mid Ch, EUT on Side
3613.240	25.5	9.1	1.0	289.0	3.0	0.0	Horz	AV	0.0	34.6	54.0	-19.4	Low Ch, EUT on Side
2780.525	49.3	4.9	1.0	230.0	3.0	0.0	Horz	PK	0.0	54.2	74.0	-19.8	High Ch, EUT on Side
2745.440	48.9	4.6	1.0	172.0	3.0	0.0	Vert	PK	0.0	53.5	74.0	-20.5	Mid Ch, EUT Horz
2745.480	48.9	4.6	1.0	197.0	3.0	0.0	Vert	PK	0.0	53.5	74.0	-20.5	Mid Ch, EUT Vert
4574.255	40.2	11.7	1.3	241.0	3.0	0.0	Vert	PK	0.0	51.9	74.0	-22.1	Mid Ch, EUT on Side
4634.290	39.6	11.7	1.0	157.0	3.0	0.0	Vert	PK	0.0	51.3	74.0	-22.7	High Ch, EUT on Side
2745.425	46.3	4.6	1.0	258.0	3.0	0.0	Horz	PK	0.0	50.9	74.0	-23.1	Mid Ch, EUT Vert
4636.410	39.2	11.6	1.0	127.0	3.0	0.0	Horz	PK	0.0	50.8	74.0	-23.2	High Ch, EUT on Side
4575.825	38.7	11.7	2.8	152.0	3.0	0.0	Horz	PK	0.0	50.4	74.0	-23.6	Mid Ch, EUT on Side
4515.265	38.9	11.5	1.0	256.0	3.0	0.0	Horz	PK	0.0	50.4	74.0	-23.6	Low Ch, EUT on Side
4513.875	38.5	11.5	1.0	45.0	3.0	0.0	Vert	PK	0.0	50.0	74.0	-24.0	Low Ch, EUT on Side
3708.735	39.8	9.7	3.7	126.0	3.0	0.0	Vert	PK	0.0	49.5	74.0	-24.5	High Ch, EUT on Side
2708.660	45.0	4.4	1.0	215.0	3.0	0.0	Vert	PK	0.0	49.4	74.0	-24.6	Low Ch, EUT on Side
3708.210	39.6	9.6	1.0	317.0	3.0	0.0	Horz	PK	0.0	49.2	74.0	-24.8	High Ch, EUT on Side
3612.190	39.7	9.1	1.0	169.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	Low Ch, EUT on Side
2709.590	44.3	4.4	1.0	196.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Low Ch, EUT on Side
3660.820	39.1	9.3	2.4	189.0	3.0	0.0	Horz	PK	0.0	48.4	74.0	-25.6	Mid Ch, EUT on Side
3660.420	39.0	9.3	1.0	115.0	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Mid Ch, EUT on Side
3612.245	39.2	9.1	1.0	289.0	3.0	0.0	Horz	PK	0.0	48.3	74.0	-25.7	Low Ch, EUT on Side

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.06.01

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

Transmitting continuously at Low Ch (903 MHz), Mid Ch (915 MHz), High Ch (927 MHz).

POWER SETTINGS INVESTIGATED

3.5 VDC

CONFIGURATIONS INVESTIGATED

SCHW0219 - 4

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
Filter - Low Pass	Micro-Tronics	LPM50003	LFB	4/19/2017	12 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	2/7/2017	12 mo
Cable	None	Standard Gain Horns Cable	EVF	2/6/2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	7/20/2017	12 mo
Cable	N/A	Double Ridge Horn Cables	EVB	7/20/2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	2/3/2016	24 mo
Attenuator	Coaxicom	66702 5910-10	RBI	11/30/2016	12 mo
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HFT	1/4/2017	12 mo
Cable	N/A	Bilog Cables	EVA	2/6/2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	6/30/2016	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	2/6/2017	12 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	4/13/2017	12 mo

MEASUREMENT BANDWIDTHS

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

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



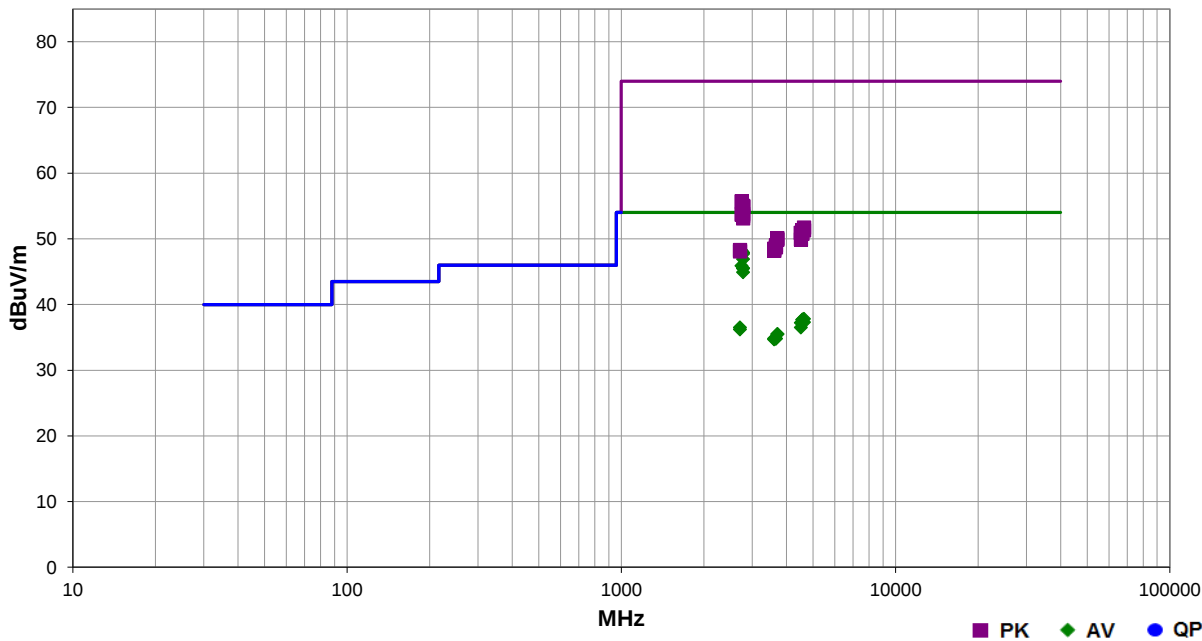
EmiRS 2017.07.11

PSA-ESCI 2017.06.01

Work Order:	SCHW0219	Date:	07/25/17		
Project:	None	Temperature:	23.2 °C		
Job Site:	EV01	Humidity:	43.6% RH		
Serial Number:	A02654144	Barometric Pres.:	1019 mbar	Tested by:	Mark Baytan
EUT:	9630-9110				
Configuration:	4				
Customer:	Schweitzer Engineering Laboratories, Inc.				
Attendees:	Allan Davis				
EUT Power:	3.5 VDC				
Operating Mode:	Transmitting continuously at Low Ch (903 MHz), Mid Ch (915 MHz), High Ch (927 MHz).				
Deviations:	None				
Comments:	Power level setting: 27 dBm. Yagi Antenna (8.55 dBi)				

Test Specifications	Test Method
FCC 15.247:2017	ANSI C63.10:2013

Run #	25	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2745.035	43.6	4.6	1.0	91.0	3.0	0.0	Vert	AV	0.0	48.2	54.0	-5.8	Mid Ch, EUT Vert
2781.030	43.0	4.9	1.2	177.0	3.0	0.0	Horz	AV	0.0	47.9	54.0	-6.1	High Ch, EUT Vert
2781.010	42.8	4.9	1.2	264.0	3.0	0.0	Vert	AV	0.0	47.7	54.0	-6.3	High Ch, EUT Vert
2781.000	42.0	4.9	1.2	219.0	3.0	0.0	Vert	AV	0.0	46.9	54.0	-7.1	High Ch, EUT Horz
2745.015	41.3	4.6	1.0	175.0	3.0	0.0	Horz	AV	0.0	45.9	54.0	-8.1	Mid Ch, EUT Vert
2781.035	40.6	4.9	1.2	227.0	3.0	0.0	Horz	AV	0.0	45.5	54.0	-8.5	High Ch, EUT Horz
2781.025	40.6	4.9	1.2	336.0	3.0	0.0	Vert	AV	0.0	45.5	54.0	-8.5	High Ch, EUT on Side
2781.040	40.0	4.9	1.2	227.0	3.0	0.0	Horz	AV	0.0	44.9	54.0	-9.1	High Ch, EUT on Side
4635.880	26.2	11.6	1.0	141.0	3.0	0.0	Vert	AV	0.0	37.8	54.0	-16.2	High Ch, EUT Vert
4575.880	26.0	11.7	3.9	124.0	3.0	0.0	Horz	AV	0.0	37.7	54.0	-16.3	Mid Ch, EUT Vert
4575.830	26.0	11.7	1.0	63.0	3.0	0.0	Vert	AV	0.0	37.7	54.0	-16.3	Mid Ch, EUT Vert
4635.910	25.7	11.6	1.0	88.0	3.0	0.0	Horz	AV	0.0	37.3	54.0	-16.7	High Ch, EUT Vert
4515.885	25.7	11.5	1.0	96.0	3.0	0.0	Horz	AV	0.0	37.2	54.0	-16.8	Low Ch, EUT Vert
2709.250	32.1	4.4	1.0	87.0	3.0	0.0	Vert	AV	0.0	36.5	54.0	-17.5	Low Ch, EUT Vert
4515.920	25.0	11.5	3.9	117.0	3.0	0.0	Vert	AV	0.0	36.5	54.0	-17.5	Low Ch, EUT Vert
2709.350	31.8	4.4	1.0	200.0	3.0	0.0	Horz	AV	0.0	36.2	54.0	-17.8	Low Ch, EUT Vert
2745.555	51.1	4.6	1.0	91.0	3.0	0.0	Vert	PK	0.0	55.7	74.0	-18.3	Mid Ch, EUT Vert

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
3708.955	25.8	9.7	1.0	91.0	3.0	0.0	Horz	AV	0.0	35.5	54.0	-18.5	High Ch, EUT Vert
3708.890	25.8	9.7	1.0	342.0	3.0	0.0	Vert	AV	0.0	35.5	54.0	-18.5	High Ch, EUT Vert
2780.485	50.1	4.9	1.2	177.0	3.0	0.0	Horz	PK	0.0	55.0	74.0	-19.0	High Ch, EUT Vert
2781.390	50.0	4.9	1.2	264.0	3.0	0.0	Vert	PK	0.0	54.9	74.0	-19.1	High Ch, EUT Vert
2781.500	50.0	4.9	1.2	219.0	3.0	0.0	Vert	PK	0.0	54.9	74.0	-19.1	High Ch, EUT Horz
3661.025	25.5	9.3	1.6	269.0	3.0	0.0	Horz	AV	0.0	34.8	54.0	-19.2	Mid Ch, EUT Vert
3660.510	25.5	9.3	1.3	232.0	3.0	0.0	Vert	AV	0.0	34.8	54.0	-19.2	Mid Ch, EUT Vert
3611.290	25.7	9.1	2.4	123.0	3.0	0.0	Vert	AV	0.0	34.8	54.0	-19.2	Low Ch, EUT Vert
3610.610	25.6	9.1	1.0	271.0	3.0	0.0	Horz	AV	0.0	34.7	54.0	-19.3	Low Ch, EUT Vert
2780.595	48.9	4.9	1.2	336.0	3.0	0.0	Vert	PK	0.0	53.8	74.0	-20.2	High Ch, EUT on Side
2745.505	49.1	4.6	1.0	175.0	3.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	Mid Ch, EUT Vert
2780.505	48.6	4.9	1.2	227.0	3.0	0.0	Horz	PK	0.0	53.5	74.0	-20.5	High Ch, EUT Horz
2780.440	48.2	4.9	1.2	227.0	3.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	High Ch, EUT on Side
4635.675	40.0	11.7	1.0	88.0	3.0	0.0	Horz	PK	0.0	51.7	74.0	-22.3	High Ch, EUT Vert
4635.775	39.7	11.6	1.0	141.0	3.0	0.0	Vert	PK	0.0	51.3	74.0	-22.7	High Ch, EUT Vert
4574.010	39.6	11.7	1.0	63.0	3.0	0.0	Vert	PK	0.0	51.3	74.0	-22.7	Mid Ch, EUT Vert
4513.900	39.4	11.5	1.0	96.0	3.0	0.0	Horz	PK	0.0	50.9	74.0	-23.1	Low Ch, EUT Vert
4575.550	39.1	11.7	3.9	124.0	3.0	0.0	Horz	PK	0.0	50.8	74.0	-23.2	Mid Ch, EUT Vert
3706.850	40.5	9.6	1.0	91.0	3.0	0.0	Horz	PK	0.0	50.1	74.0	-23.9	High Ch, EUT Vert
3708.180	40.3	9.6	1.0	342.0	3.0	0.0	Vert	PK	0.0	49.9	74.0	-24.1	High Ch, EUT Vert
4516.190	38.4	11.5	3.9	117.0	3.0	0.0	Vert	PK	0.0	49.9	74.0	-24.1	Low Ch, EUT Vert
3661.390	39.7	9.3	1.3	232.0	3.0	0.0	Vert	PK	0.0	49.0	74.0	-25.0	Mid Ch, EUT Vert
3661.360	39.4	9.3	1.6	269.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Mid Ch, EUT Vert
3612.400	39.4	9.1	2.4	123.0	3.0	0.0	Vert	PK	0.0	48.5	74.0	-25.5	Low Ch, EUT Vert
2709.650	43.9	4.4	1.0	87.0	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Low Ch, EUT Vert
3612.290	39.1	9.1	1.0	271.0	3.0	0.0	Horz	PK	0.0	48.2	74.0	-25.8	Low Ch, EUT Vert
2708.700	43.7	4.4	1.0	200.0	3.0	0.0	Horz	PK	0.0	48.1	74.0	-25.9	Low Ch, EUT Vert

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.06.01

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

Transmitting continuously at Low Ch (903 MHz), Mid Ch (915 MHz), High Ch (927 MHz).

POWER SETTINGS INVESTIGATED

3.5 VDC

CONFIGURATIONS INVESTIGATED

SCHW0219 - 5

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
Filter - Low Pass	Micro-Tronics	LPM50003	LFB	4/19/2017	12 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	2/7/2017	12 mo
Cable	None	Standard Gain Horns Cable	EVF	2/6/2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	7/20/2017	12 mo
Cable	N/A	Double Ridge Horn Cables	EVB	7/20/2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	2/3/2016	24 mo
Attenuator	Coaxicom	66702 5910-10	RBI	11/30/2016	12 mo
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HFT	1/4/2017	12 mo
Cable	N/A	Bilog Cables	EVA	2/6/2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	6/30/2016	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	2/6/2017	12 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	4/13/2017	12 mo

MEASUREMENT BANDWIDTHS

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

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



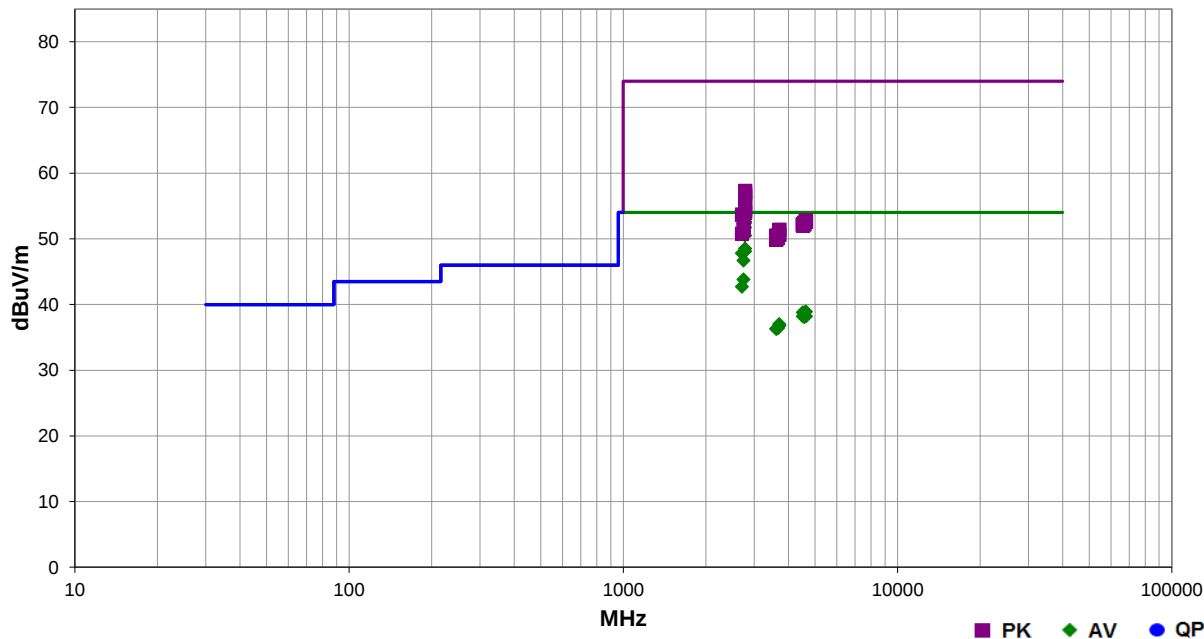
EmiRS 2017.07.11

PSA-ESCI 2017.06.01

Work Order:	SCHW0219	Date:	07/26/17	
Project:	None	Temperature:	23 °C	
Job Site:	EV01	Humidity:	43% RH	
Serial Number:	A02654144	Barometric Pres.:	1021 mbar	
EUT:	9630-9110			
Configuration:	5			
Customer:	Schweitzer Engineering Laboratories, Inc.			
Attendees:	Allan Davis			
EUT Power:	3.5 VDC			
Operating Mode:	Transmitting continuously at Low Ch (903 MHz), Mid Ch (915 MHz), High Ch (927 MHz).			
Deviations:	None			
Comments:	Power level setting: 27 dBm. Omni Antenna (9.15 dBi)			

Test Specifications	Test Method
FCC 15.247:2017	ANSI C63.10:2013

Run #	34	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2781.055	47.7	4.9	1.2	266.0	3.0	0.0	Vert	AV	0.0	52.6	54.0	-1.4	High Ch, EUT Horz
2781.055	47.5	4.9	1.2	268.0	3.0	0.0	Vert	AV	0.0	52.4	54.0	-1.6	High Ch, EUT on Side
2781.060	46.8	4.9	1.2	262.0	3.0	0.0	Horz	AV	0.0	51.7	54.0	-2.3	High Ch, EUT Horz
2781.060	45.6	4.9	1.2	193.0	3.0	0.0	Horz	AV	0.0	50.5	54.0	-3.5	High Ch, EUT on Side
2781.040	43.6	4.9	1.2	217.0	3.0	0.0	Vert	AV	0.0	48.5	54.0	-5.5	High Ch, EUT Vert
2781.015	43.2	4.9	1.2	308.0	3.0	0.0	Horz	AV	0.0	48.1	54.0	-5.9	High Ch, EUT Vert
2709.060	43.4	4.4	1.0	310.0	3.0	0.0	Horz	AV	0.0	47.8	54.0	-6.2	Low Ch, EUT Horz
2745.050	42.1	4.6	1.0	252.0	3.0	0.0	Horz	AV	0.0	46.7	54.0	-7.3	Mid Ch, EUT Horz
2745.045	39.2	4.6	1.0	172.0	3.0	0.0	Vert	AV	0.0	43.8	54.0	-10.2	Mid Ch, EUT Horz
2709.035	38.3	4.4	1.0	292.0	3.0	0.0	Vert	AV	0.0	42.7	54.0	-11.3	Low Ch, EUT Horz
4635.770	27.3	11.6	1.0	100.0	3.0	0.0	Vert	AV	0.0	38.9	54.0	-15.1	High Ch, EUT Horz
4575.750	27.1	11.7	1.0	202.0	3.0	0.0	Horz	AV	0.0	38.8	54.0	-15.2	Mid Ch, EUT Horz
4515.770	27.3	11.5	2.6	153.0	3.0	0.0	Horz	AV	0.0	38.8	54.0	-15.2	Low Ch, EUT Horz
4635.915	26.6	11.6	3.4	110.0	3.0	0.0	Horz	AV	0.0	38.2	54.0	-15.8	High Ch, EUT Horz
4515.960	26.7	11.5	2.4	85.0	3.0	0.0	Vert	AV	0.0	38.2	54.0	-15.8	Low Ch, EUT Horz
4575.950	26.4	11.7	1.0	123.0	3.0	0.0	Vert	AV	0.0	38.1	54.0	-15.9	Mid Ch, EUT Horz
2780.640	52.4	4.9	1.2	266.0	3.0	0.0	Vert	PK	0.0	57.3	74.0	-16.7	High Ch, EUT Horz

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
3707.870	27.4	9.6	1.0	188.0	3.0	0.0	Vert	AV	0.0	37.0	54.0	-17.0	High Ch, EUT Horz
2781.385	52.0	4.9	1.2	268.0	3.0	0.0	Vert	PK	0.0	56.9	74.0	-17.1	High Ch, EUT on Side
3708.330	27.2	9.6	1.0	229.0	3.0	0.0	Horz	AV	0.0	36.8	54.0	-17.2	High Ch, EUT Horz
2781.440	51.6	4.9	1.2	262.0	3.0	0.0	Horz	PK	0.0	56.5	74.0	-17.5	High Ch, EUT Horz
3660.590	27.1	9.3	1.0	49.0	3.0	0.0	Horz	AV	0.0	36.4	54.0	-17.6	Mid Ch, EUT Horz
3661.250	27.1	9.3	1.0	175.0	3.0	0.0	Vert	AV	0.0	36.4	54.0	-17.6	Mid Ch, EUT Horz
3613.315	27.2	9.1	1.0	34.0	3.0	0.0	Horz	AV	0.0	36.3	54.0	-17.7	Low Ch, EUT Horz
3613.405	27.2	9.1	1.0	106.0	3.0	0.0	Vert	AV	0.0	36.3	54.0	-17.7	Low Ch, EUT Horz
2781.390	50.6	4.9	1.2	193.0	3.0	0.0	Horz	PK	0.0	55.5	74.0	-18.5	High Ch, EUT on Side
2781.580	49.5	4.9	1.2	217.0	3.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	High Ch, EUT Vert
2781.645	49.1	4.9	1.2	308.0	3.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	High Ch, EUT Vert
2709.360	49.3	4.4	1.0	310.0	3.0	0.0	Horz	PK	0.0	53.7	74.0	-20.3	Low Ch, EUT Horz
2745.540	48.6	4.6	1.0	252.0	3.0	0.0	Horz	PK	0.0	53.2	74.0	-20.8	Mid Ch, EUT Horz
4633.880	41.1	11.7	1.0	100.0	3.0	0.0	Vert	PK	0.0	52.8	74.0	-21.2	High Ch, EUT Horz
4636.240	41.0	11.6	3.4	110.0	3.0	0.0	Horz	PK	0.0	52.6	74.0	-21.4	High Ch, EUT Horz
4574.715	40.8	11.7	1.0	202.0	3.0	0.0	Horz	PK	0.0	52.5	74.0	-21.5	Mid Ch, EUT Horz
4574.275	40.5	11.7	1.0	123.0	3.0	0.0	Vert	PK	0.0	52.2	74.0	-21.8	Mid Ch, EUT Horz
4514.250	40.7	11.5	2.6	153.0	3.0	0.0	Horz	PK	0.0	52.2	74.0	-21.8	Low Ch, EUT Horz
4514.585	40.5	11.5	2.4	85.0	3.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0	Low Ch, EUT Horz
3709.120	41.7	9.7	1.0	188.0	3.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	High Ch, EUT Horz
2744.625	46.8	4.6	1.0	172.0	3.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	Mid Ch, EUT Horz
2709.495	46.4	4.4	1.0	292.0	3.0	0.0	Vert	PK	0.0	50.8	74.0	-23.2	Low Ch, EUT Horz
3708.260	41.0	9.6	1.0	229.0	3.0	0.0	Horz	PK	0.0	50.6	74.0	-23.4	High Ch, EUT Horz
3660.675	41.2	9.3	1.0	175.0	3.0	0.0	Vert	PK	0.0	50.5	74.0	-23.5	Mid Ch, EUT Horz
3613.165	41.4	9.1	1.0	34.0	3.0	0.0	Horz	PK	0.0	50.5	74.0	-23.5	Low Ch, EUT Horz
3659.475	40.8	9.3	1.0	49.0	3.0	0.0	Horz	PK	0.0	50.1	74.0	-23.9	Mid Ch, EUT Horz
3612.255	40.8	9.1	1.0	106.0	3.0	0.0	Vert	PK	0.0	49.9	74.0	-24.1	Low Ch, EUT Horz

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.06.01

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

Continuous Tx, Low Ch 903 MHz

POWER SETTINGS INVESTIGATED

3.5 VDC

CONFIGURATIONS INVESTIGATED

SCHW0228 - 1

SCHW0228 - 2

SCHW0228 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	12.4 GHz
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SAMPLE CALCULATIONS

Radiated Emissions:

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Cable	None	Standard Gain Horns Cable	EVF	2/6/2017	12 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	2/7/2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Cable	N/A	Double Ridge Horn Cables	EVB	7/20/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	7/20/2017	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	2/3/2016	24 mo
Filter - Band Pass/Notch	K&L Microwave	3TNF-500/1000-N/N	HFT	1/4/2017	12 mo
Filter - High Pass	Micro-Tronics	HPM50108	HFV	2/6/2017	12 mo
Filter - Low Pass	Micro-Tronics	LPM50003	LFB	4/19/2017	12 mo
Attenuator	Coaxicom	3910-10	AWX	4/19/2017	12 mo
Attenuator	Coaxicom	3910-20	AXZ	4/19/2017	12 mo
Cable	N/A	Bilog Cables	EVA	2/6/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	2/6/2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	6/30/2016	24 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	4/13/2017	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



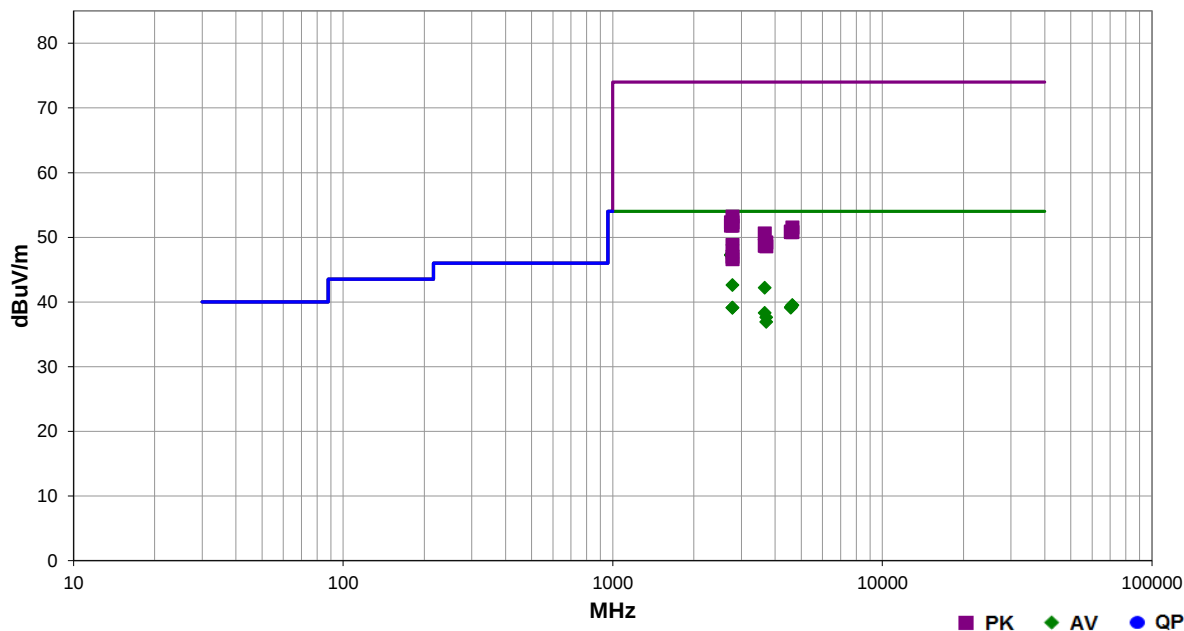
EmiRS 2017.07.11

PSA-ESCI 2017.06.01

Work Order:	SCHW0228	Date:	10/20/17	
Project:	None	Temperature:	23.3 °C	
Job Site:	EV01	Humidity:	41.2% RH	
Serial Number:	See Config	Barometric Pres.:	1011 mbar	
EUT:	9630-9110			
Configuration:	1			
Customer:	Schweitzer Engineering Laboratories, Inc.			
Attendees:	Allan Davis			
EUT Power:	3.5 VDC			
Operating Mode:	Continuous Tx, Low Ch 903 MHz			
Deviations:	None			
Comments:	See comments below for Channel, and EUT orientation.			

Test Specifications	Test Method
FCC 15.247:2017	ANSI C63.10:2013

Run #	5	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2780.742	47.2	1.6	3.4	176.0	3.0	0.0	Vert	AV	0.0	48.8	54.0	-5.2	High CH, EUT on Side
2781.433	46.0	1.6	1.0	326.0	3.0	0.0	Horz	AV	0.0	47.6	54.0	-6.4	High CH, EUT Horizontal
2745.350	46.0	1.3	1.7	167.0	3.0	0.0	Vert	AV	0.0	47.3	54.0	-6.7	Mid CH, EUT on Side
2744.758	45.9	1.3	1.0	16.0	3.0	0.0	Horz	AV	0.0	47.2	54.0	-6.8	Mid CH, EUT Horizontal
2780.775	45.2	1.6	1.0	96.0	3.0	0.0	Horz	AV	0.0	46.8	54.0	-7.2	High CH, EUT on Side
2780.675	41.0	1.6	1.0	146.0	3.0	0.0	Vert	AV	0.0	42.6	54.0	-11.4	High CH, EUT Horizontal
3660.633	35.3	6.9	3.9	6.0	3.0	0.0	Vert	AV	0.0	42.2	54.0	-11.8	Mid CH, EUT on Side
4636.025	29.1	10.4	1.0	125.0	3.0	0.0	Vert	AV	0.0	39.5	54.0	-14.5	High CH, EUT on Side
4637.450	29.1	10.4	1.0	270.0	3.0	0.0	Horz	AV	0.0	39.5	54.0	-14.5	High CH, EUT Horizontal
4577.017	28.7	10.5	1.0	97.0	3.0	0.0	Vert	AV	0.0	39.2	54.0	-14.8	Mid CH, EUT on Side
4577.442	28.6	10.5	1.0	284.0	3.0	0.0	Horz	AV	0.0	39.1	54.0	-14.9	Mid CH, EUT Horizontal
2780.792	37.5	1.6	1.0	144.0	3.0	0.0	Horz	AV	0.0	39.1	54.0	-14.9	High CH, EUT Vertical
2781.400	37.5	1.6	1.0	8.0	3.0	0.0	Vert	AV	0.0	39.1	54.0	-14.9	High CH, EUT Vertical
3659.508	31.4	6.9	1.0	309.0	3.0	0.0	Horz	AV	0.0	38.3	54.0	-15.7	Mid CH, EUT Horizontal
3707.258	30.5	7.1	1.0	48.0	3.0	0.0	Vert	AV	0.0	37.6	54.0	-16.4	High CH, EUT on Side
3707.508	29.8	7.1	1.0	134.0	3.0	0.0	Horz	AV	0.0	36.9	54.0	-17.1	High CH, EUT Horizontal
2781.533	51.6	1.6	3.4	176.0	3.0	0.0	Vert	PK	0.0	53.2	74.0	-20.8	High CH, EUT on Side
2744.825	51.0	1.3	1.7	167.0	3.0	0.0	Vert	PK	0.0	52.3	74.0	-21.7	Mid CH, EUT on Side

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2780.625	50.7	1.6	1.0	326.0	3.0	0.0	Horz	PK	0.0	52.3	74.0	-21.7	High CH, EUT Horizontal
2745.567	50.5	1.3	1.0	16.0	3.0	0.0	Horz	PK	0.0	51.8	74.0	-22.2	Mid CH, EUT Horizontal
2780.533	50.2	1.6	1.0	96.0	3.0	0.0	Horz	PK	0.0	51.8	74.0	-22.2	High CH, EUT on Side
4636.150	41.1	10.4	1.0	125.0	3.0	0.0	Vert	PK	0.0	51.5	74.0	-22.5	High CH, EUT on Side
4575.583	40.5	10.4	1.0	284.0	3.0	0.0	Horz	PK	0.0	50.9	74.0	-23.1	Mid CH, EUT Horizontal
4576.067	40.4	10.4	1.0	97.0	3.0	0.0	Vert	PK	0.0	50.8	74.0	-23.2	Mid CH, EUT on Side
4635.642	40.3	10.5	1.0	270.0	3.0	0.0	Horz	PK	0.0	50.8	74.0	-23.2	High CH, EUT Horizontal
3660.900	43.7	6.9	3.9	6.0	3.0	0.0	Vert	PK	0.0	50.6	74.0	-23.4	Mid CH, EUT on Side
3709.550	42.0	7.2	1.0	48.0	3.0	0.0	Vert	PK	0.0	49.2	74.0	-24.8	High CH, EUT on Side
2780.558	47.2	1.6	1.0	146.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	High CH, EUT Horizontal
3659.450	41.8	6.9	1.0	309.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Mid CH, EUT Horizontal
3707.725	41.5	7.1	1.0	134.0	3.0	0.0	Horz	PK	0.0	48.6	74.0	-25.4	High CH, EUT Horizontal
2780.625	45.4	1.6	1.0	144.0	3.0	0.0	Horz	PK	0.0	47.0	74.0	-27.0	High CH, EUT Vertical
2781.250	45.0	1.6	1.0	8.0	3.0	0.0	Vert	PK	0.0	46.6	74.0	-27.4	High CH, EUT Vertical

SPURIOUS RADIATED EMISSIONS



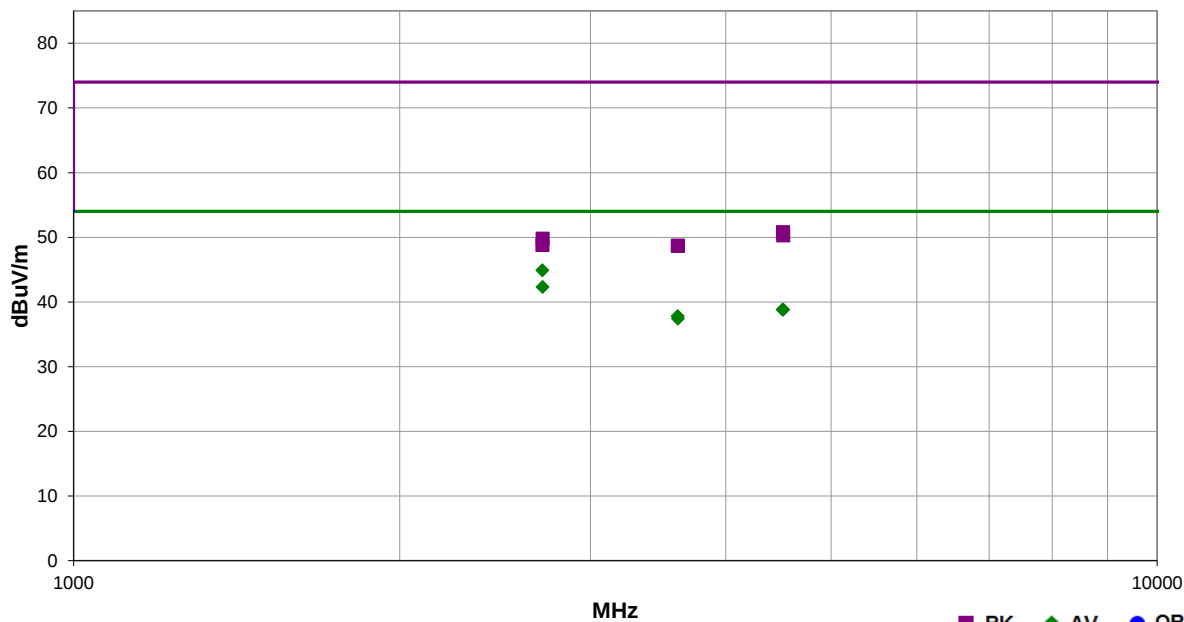
EmiRS 2017.07.11

PSA-ESCI 2017.06.01

Work Order:	SCHW0228	Date:	10/20/17	
Project:	None	Temperature:	23.3 °C	
Job Site:	EV01	Humidity:	41.2% RH	
Serial Number:	See Config	Barometric Pres.:	1011 mbar	
EUT:	9630-9110			
Configuration:	2			
Customer:	Schweitzer Engineering Laboratories, Inc.			
Attendees:	Allan Davis			
EUT Power:	3.5 VDC			
Operating Mode:	Continuous Tx, Low Ch 903 MHz			
Deviations:	None			
Comments:	See comments below for Channel, and EUT orientation.			

Test Specifications	Test Method
FCC 15.247:2017	ANSI C63.10:2013

Run #	6	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2708.742	43.8	1.1	3.9	51.0	3.0	0.0	Vert	AV	0.0	44.9	54.0	-9.1	Low CH, EUT on Side
2709.317	41.2	1.1	1.0	342.0	3.0	0.0	Horz	AV	0.0	42.3	54.0	-11.7	Low CH, EUT Horizontal
4513.042	28.7	10.1	1.0	206.0	3.0	0.0	Horz	AV	0.0	38.8	54.0	-15.2	Low CH, EUT Horizontal
4516.883	28.7	10.1	2.2	107.0	3.0	0.0	Vert	AV	0.0	38.8	54.0	-15.2	Low CH, EUT on Side
3611.317	30.9	6.9	2.9	97.0	3.0	0.0	Horz	AV	0.0	37.8	54.0	-16.2	Low CH, EUT Horizontal
3612.658	30.5	6.9	1.0	73.0	3.0	0.0	Vert	AV	0.0	37.4	54.0	-16.6	Low CH, EUT on Side
4515.792	40.7	10.1	2.2	107.0	3.0	0.0	Vert	PK	0.0	50.8	74.0	-23.2	Low CH, EUT on Side
4517.217	40.2	10.1	1.0	206.0	3.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	Low CH, EUT Horizontal
2709.133	48.7	1.1	3.9	51.0	3.0	0.0	Vert	PK	0.0	49.8	74.0	-24.2	Low CH, EUT on Side
2708.475	47.7	1.1	1.0	342.0	3.0	0.0	Horz	PK	0.0	48.8	74.0	-25.2	Low CH, EUT Horizontal
3612.567	41.8	6.9	2.9	97.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Low CH, EUT Horizontal
3611.500	41.8	6.9	1.0	73.0	3.0	0.0	Vert	PK	0.0	48.7	74.0	-25.3	Low CH, EUT on Side

DUTY CYCLE



TEST DESCRIPTION

The Duty Cycle (x) were measured for each of the EUT operating modes. 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.

The EUT operates at 100% Duty Cycle.

OUTPUT POWER - 18 dBm



XMR 2017.02.08

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
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Meter - Multimeter	Fluke	8846A	MMZ	10/22/2015	10/22/2018
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	5/30/2017	5/30/2018
Attenuator	Fairview Microwave	SA26B-10	TWG	4/15/2017	4/15/2018
Block - DC	Fairview Microwave	SD3379	AMW	6/5/2017	6/5/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission output power (maximum average conducted output power) was measured using the called out on the following data sheets. The transmit power was set to 18 dBm.

Prior to measuring output power; the emission bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The method AVGSA-2 in section 11.9.2.2.4 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding $[10 \log (1 / D)]$, where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.

The EUT operates at 100% Duty Cycle.

OUTPUT POWER - 18 dBm



THxTx 2017.04.18 XMt 2017.02.08

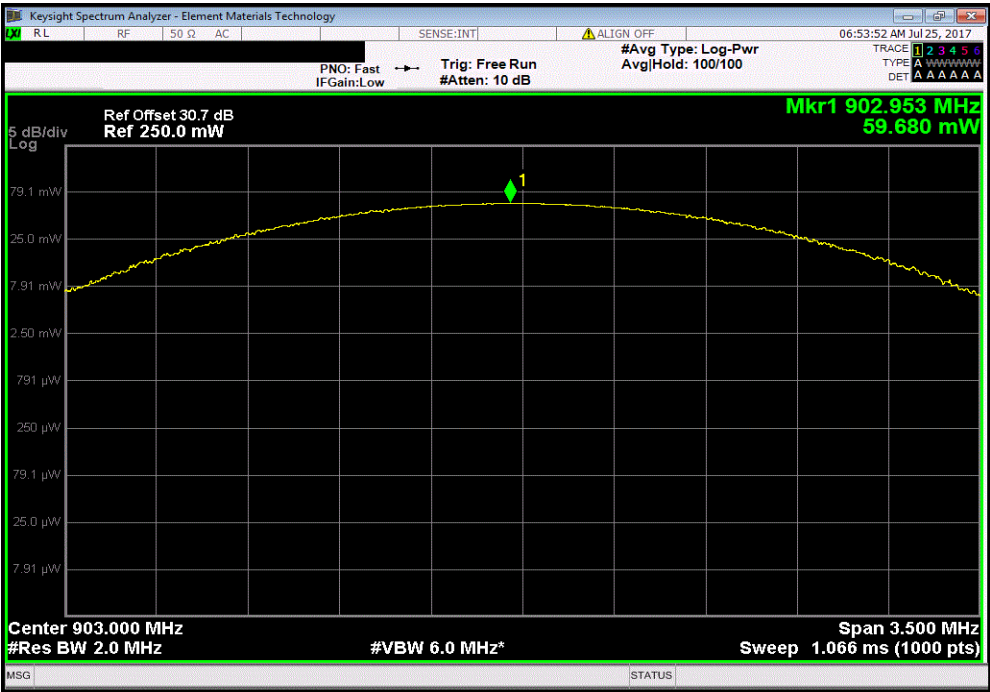
EUT: 9630-9110		Work Order: SCHW0219	
Serial Number: A02654144		Date: 07/24/17	
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 23.8 °C	
Attendees: Allan Davis		Humidity: 44.2% RH	
Project: None		Barometric Pres.: 1016 mbar	
Tested by: Mark Baytan		Power: 3.5 VDC	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
Total reference level offset (DC Block + 20dB Attenuator + 10dB Attenuator + RF Cable) = 30.7 dB. Power level setting: 18 dBm			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (<) Result
Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module			
	Low Channel, 903 MHz	59.68 mW	1 W Pass
	Mid Channel, 915 MHz	64.654 mW	1 W Pass
	High Channel, 927 MHz	59.671 mW	1 W Pass
Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module			
	Low Channel, 903 MHz	82.21 mW	1 W Pass
	Mid Channel, 915 MHz	78.186 mW	1 W Pass
	High Channel, 927 MHz	73.36 mW	1 W Pass
Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module			
	Low Channel, 903 MHz	59.755 mW	1 W Pass
	Mid Channel, 915 MHz	64.311 mW	1 W Pass
	High Channel, 927 MHz	59.681 mW	1 W Pass

OUTPUT POWER - 18 dBm

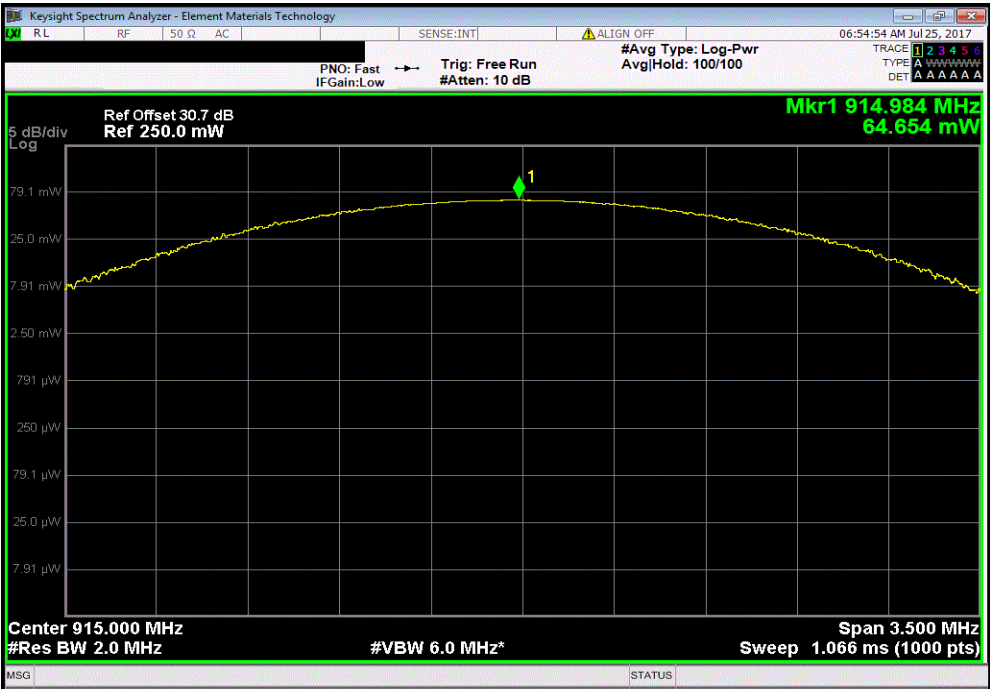


TMTx 2017.04.18 XMI 2017.02.08

Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module, Low Channel, 903 MHz						
	Value	Limit	Result			
	59.68 mW	1 W	Pass			



Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module, Mid Channel, 915 MHz						
	Value	Limit	Result			
	64.654 mW	1 W	Pass			

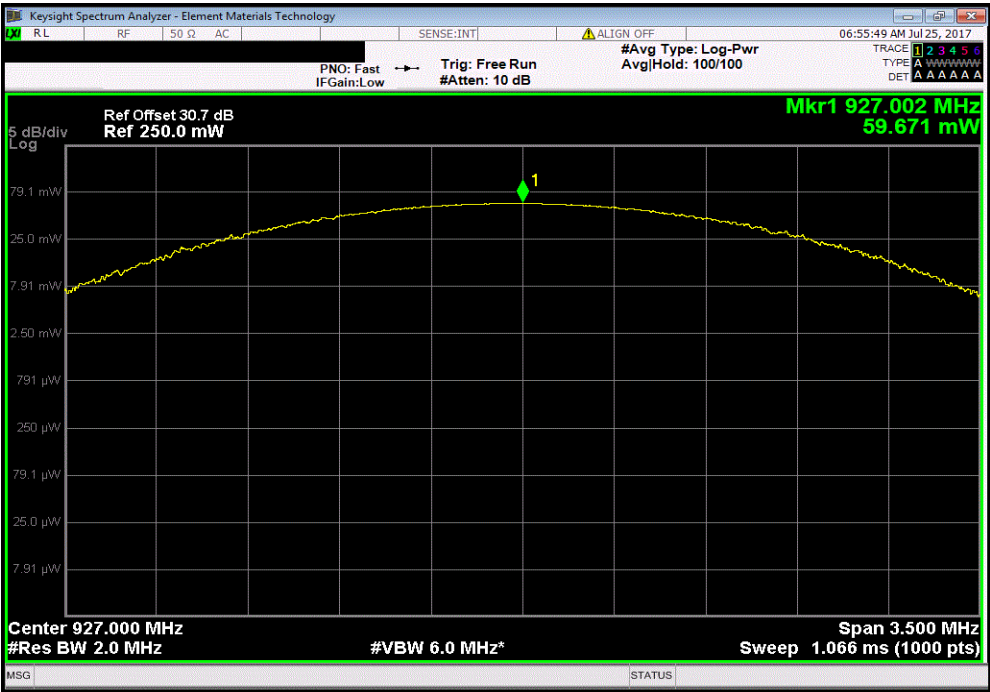


OUTPUT POWER - 18 dBm

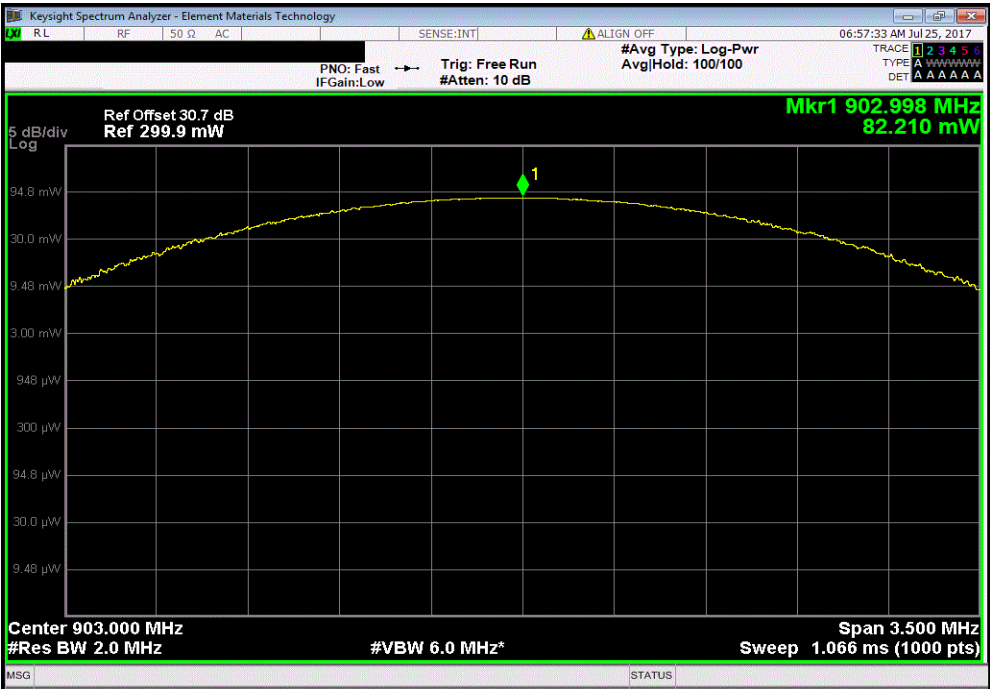


TMTx 2017.04.18 XMI 2017.02.08

Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module, High Channel, 927 MHz						
Value				Limit	Result	
				(<)		
				59.671 mW	1 W	Pass



Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module, Low Channel, 903 MHz						
Value				Limit	Result	
				(<)		
				82.21 mW	1 W	Pass

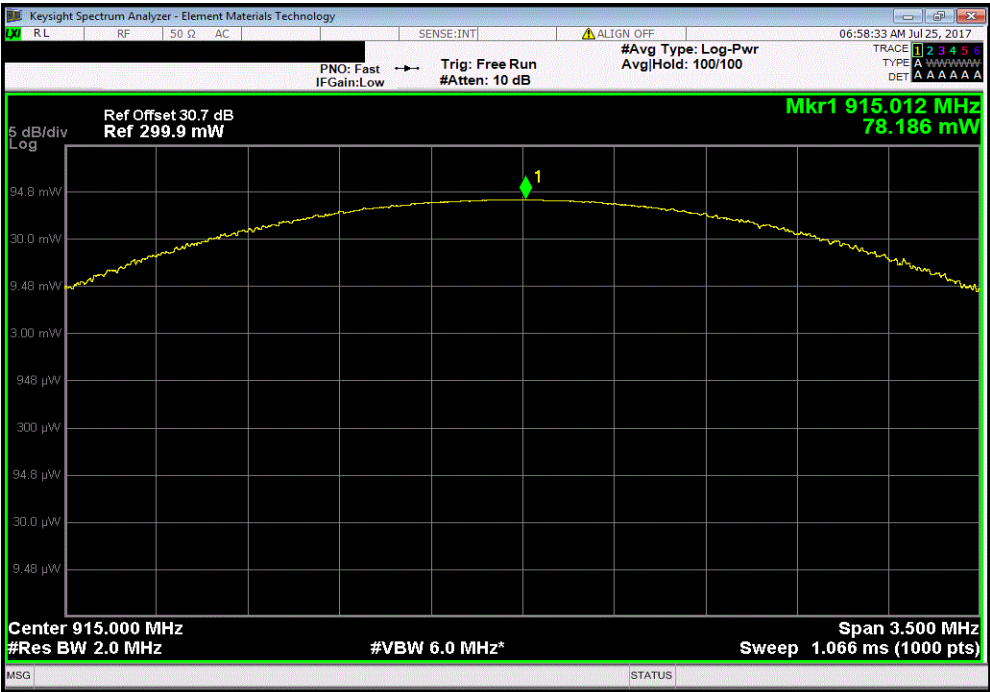


OUTPUT POWER - 18 dBm

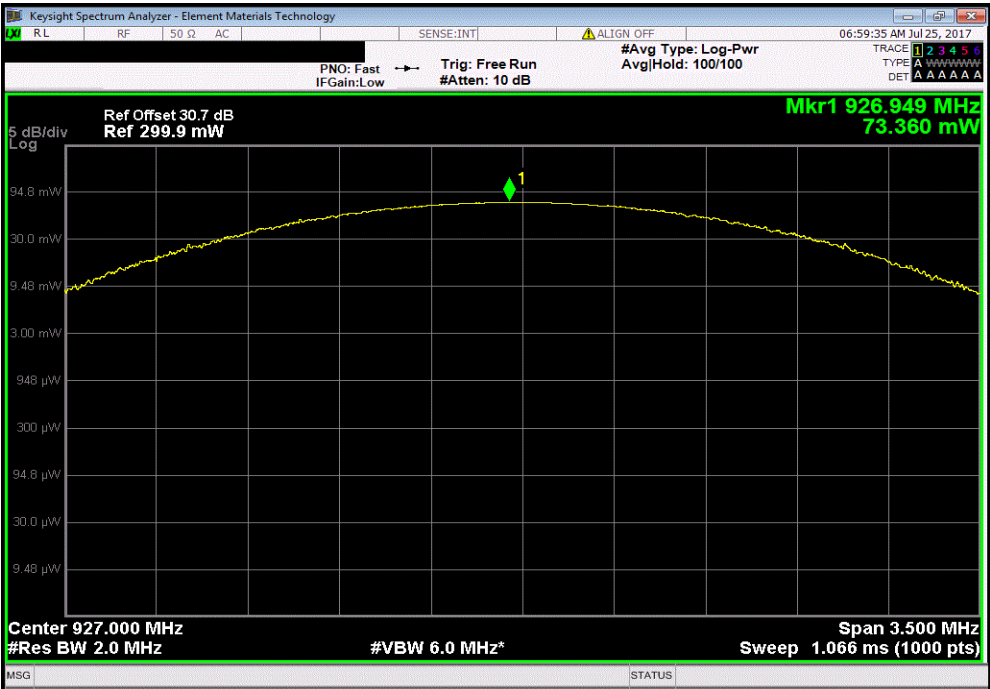


TMTx 2017.04.18 XMI 2017.02.08

Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module, Mid Channel, 915 MHz						
Value				Limit	Result	
				(<)		
			78.186 mW	1 W	Pass	



Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module, High Channel, 927 MHz						
Value				Limit	Result	
				(<)		
			73.36 mW	1 W	Pass	



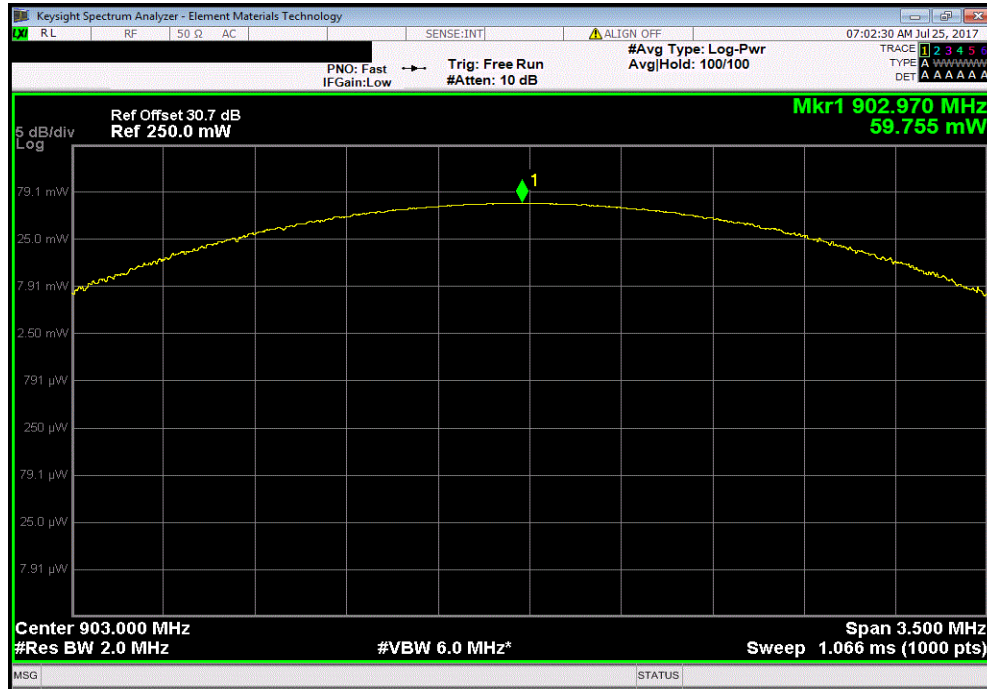
OUTPUT POWER - 18 dBm



TMTx 2017.04.18 XMI 2017.02.08

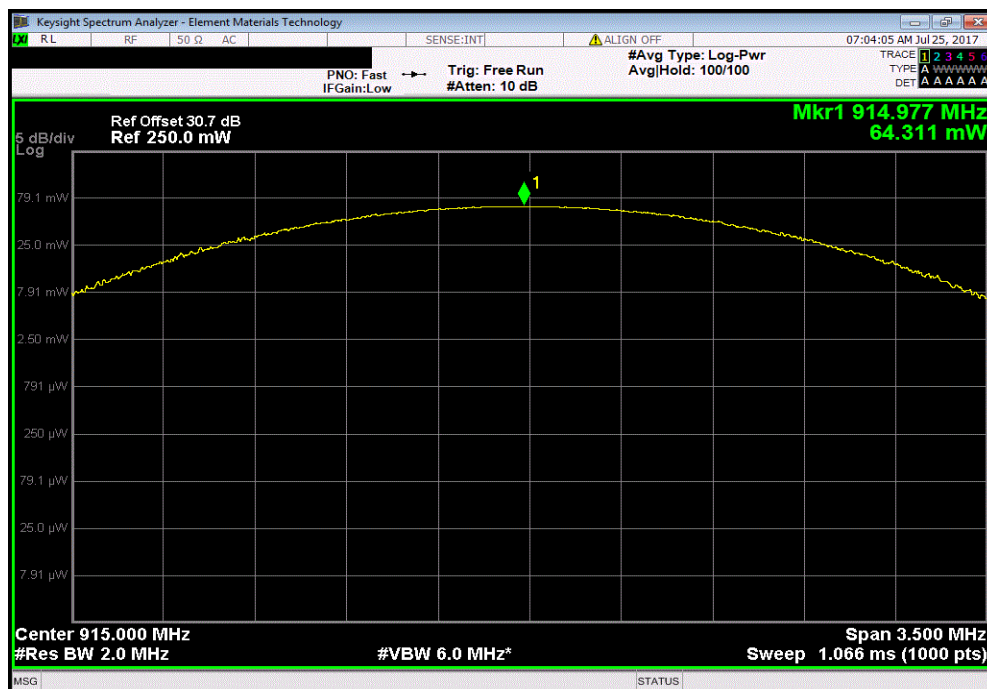
Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module, Low Channel, 903 MHz

	Value	Limit	Result
	59.755 mW	1 W	Pass



Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module, Mid Channel, 915 MHz

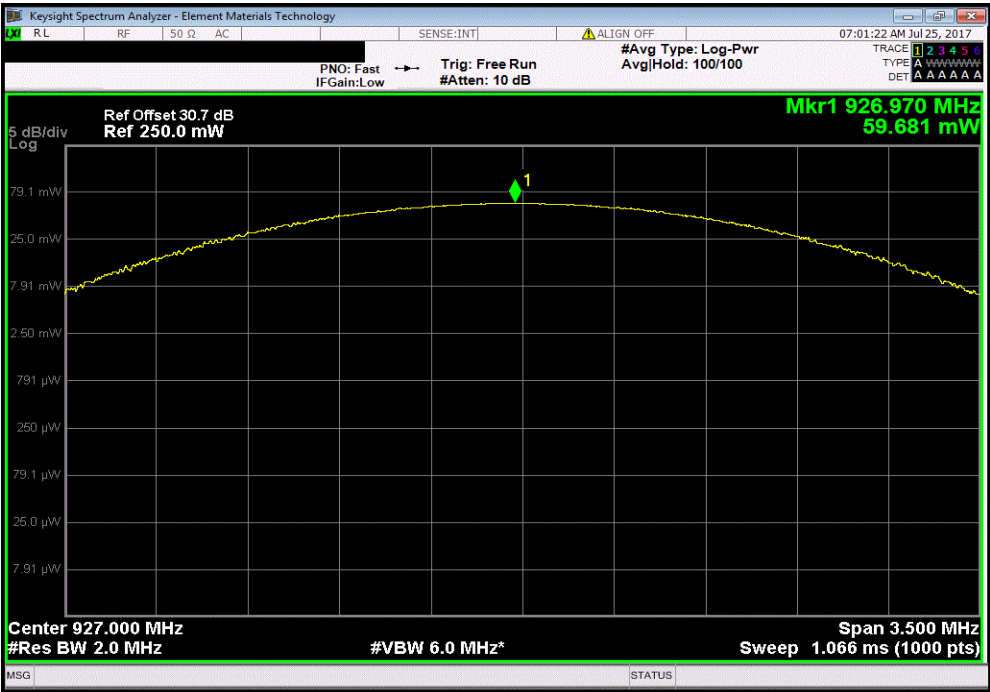
	Value	Limit	Result
	64.311 mW	1 W	Pass



OUTPUT POWER - 18 dBm



Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module, High Channel, 927 MHz						
				Value	Limit	Result
				59.681 mW	1 W	Pass



OUTPUT POWER - 27 dBm



XMIT 2017.02.08

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
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Meter - Multimeter	Fluke	8846A	MMZ	10/22/2015	10/22/2018
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	5/30/2017	5/30/2018
Attenuator	Fairview Microwave	SA26B-10	TWG	4/15/2017	4/15/2018
Attenuator	S.M. Electronics	SA26B-20	AUY	5/30/2017	5/30/2018
Block - DC	Fairview Microwave	SD3379	AMW	6/5/2017	6/5/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The fundamental emission output power (maximum average conducted output power) was measured using the channels as called out on the following data sheets. The transmit power was set to 27dBm.

Prior to measuring output power; the emission bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The method AVGSA-2 in section 11.9.2.2.4 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging across ON and OFF times of the EUT transmissions in the spectrum analyzer channel power function using an RMS detector. Following the measurement a duty cycle correction was applied by adding $[10 \log (1 / D)]$, where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.

The EUT operates at 100% Duty Cycle.

OUTPUT POWER - 27 dBm



TIMTx 2017.04.18 XMtM 2017.02.08

EUT: 9630-9110		Work Order: SCHW0219	
Serial Number: A02654144		Date: 07/24/17	
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 23.8 °C	
Attendees: Allan Davis		Humidity: 44.2% RH	
Project: None		Barometric Pres.: 1016 mbar	
Tested by: Mark Baytan		Power: 3.5 VDC	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
Total reference level offset (DC Block + 20dB Attenuator + 10dB Attenuator + RF Cable) = 30.7 dB. Power level setting: 27 dBm			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (<) Result
Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module			
	Low Channel, 903 MHz	451.55 mW	1 W Pass
	Mid Channel, 915 MHz	470.39 mW	1 W Pass
	High Channel, 927 MHz	464.46 mW	1 W Pass
Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module			
	Low Channel, 903 MHz	392.65 mW	1 W Pass
	Mid Channel, 915 MHz	394.14 mW	1 W Pass
	High Channel, 927 MHz	385.96 mW	1 W Pass
Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module			
	Low Channel, 903 MHz	460.2 mW	1 W Pass
	Mid Channel, 915 MHz	466.02 mW	1 W Pass
	High Channel, 927 MHz	447.26 mW	1 W Pass

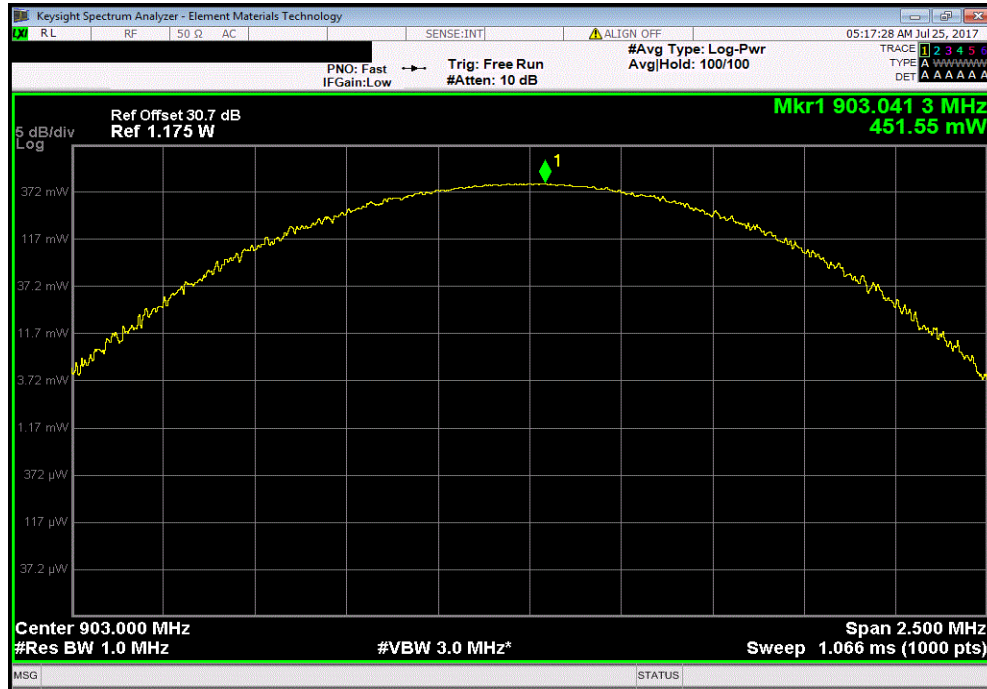
OUTPUT POWER - 27 dBm



TMTx 2017.04.18 XMt 2017.02.08

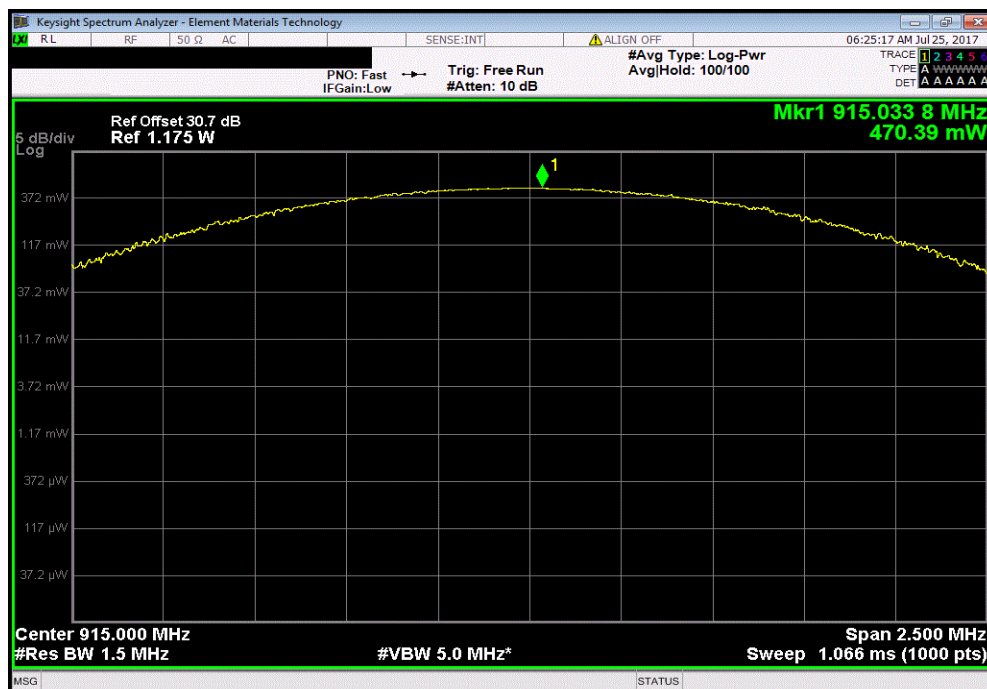
Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module, Low Channel, 903 MHz

	Value	Limit	Result
	451.55 mW	1 W	Pass



Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module, Mid Channel, 915 MHz

	Value	Limit	Result
	470.39 mW	1 W	Pass

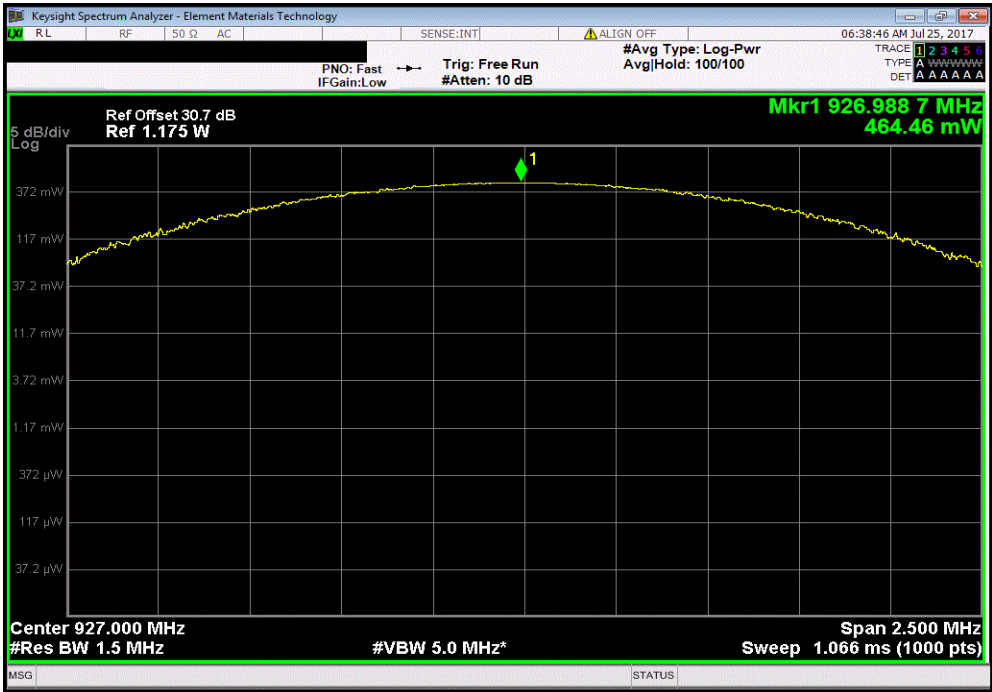


OUTPUT POWER - 27 dBm

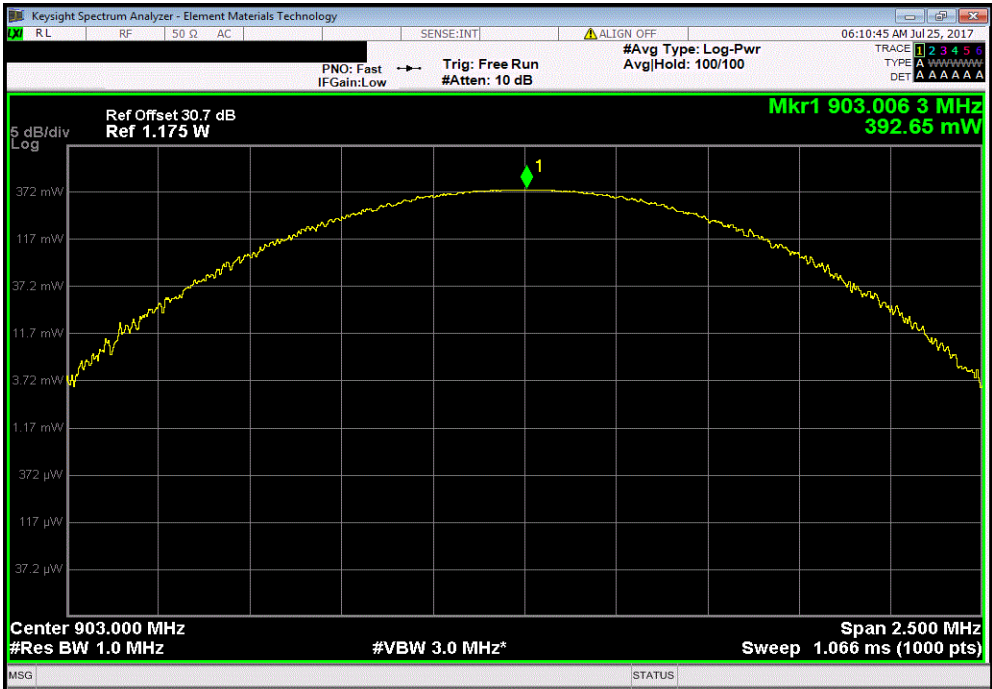


TMTx 2017.04.18 XMI 2017.02.08

Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module, High Channel, 927 MHz						
				Value	Limit	Result
				(<)		
				464.46 mW	1 W	Pass



Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module, Low Channel, 903 MHz						
				Value	Limit	Result
				(<)		
				392.65 mW	1 W	Pass



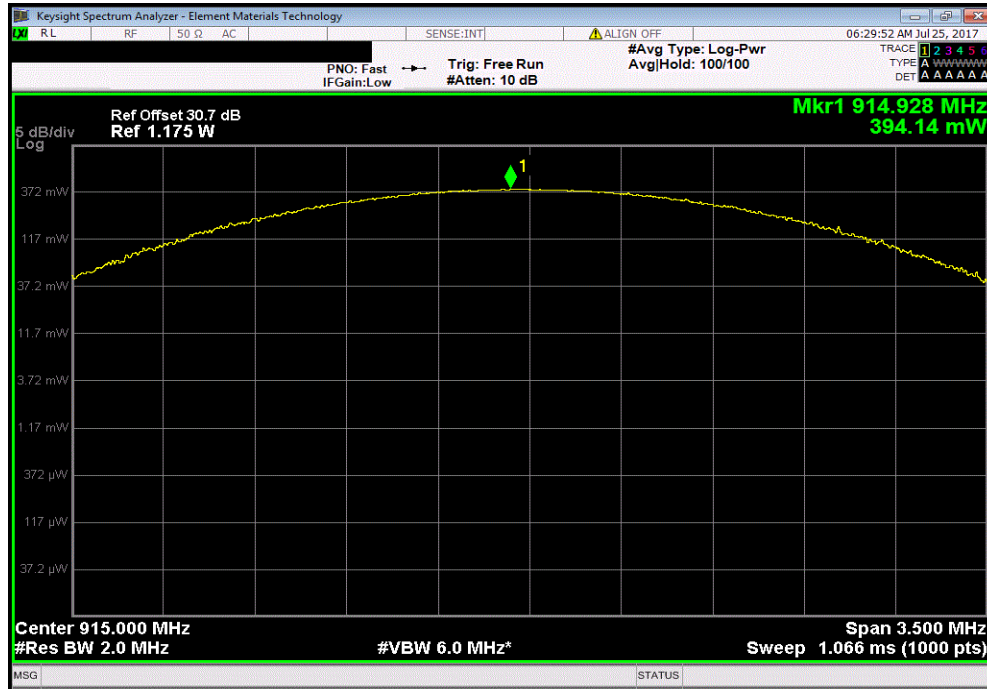
OUTPUT POWER - 27 dBm



TMTx 2017.04.18 XMI 2017.02.08

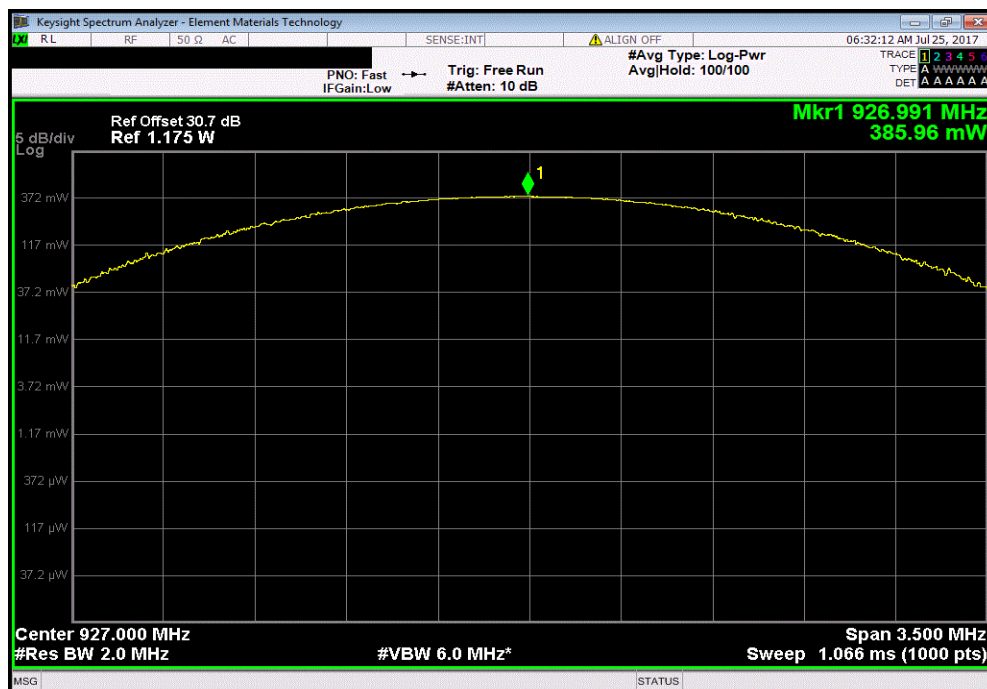
Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module, Mid Channel, 915 MHz

	Value	Limit	Result
	394.14 mW	1 W	Pass



Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module, High Channel, 927 MHz

	Value	Limit	Result
	385.96 mW	1 W	Pass

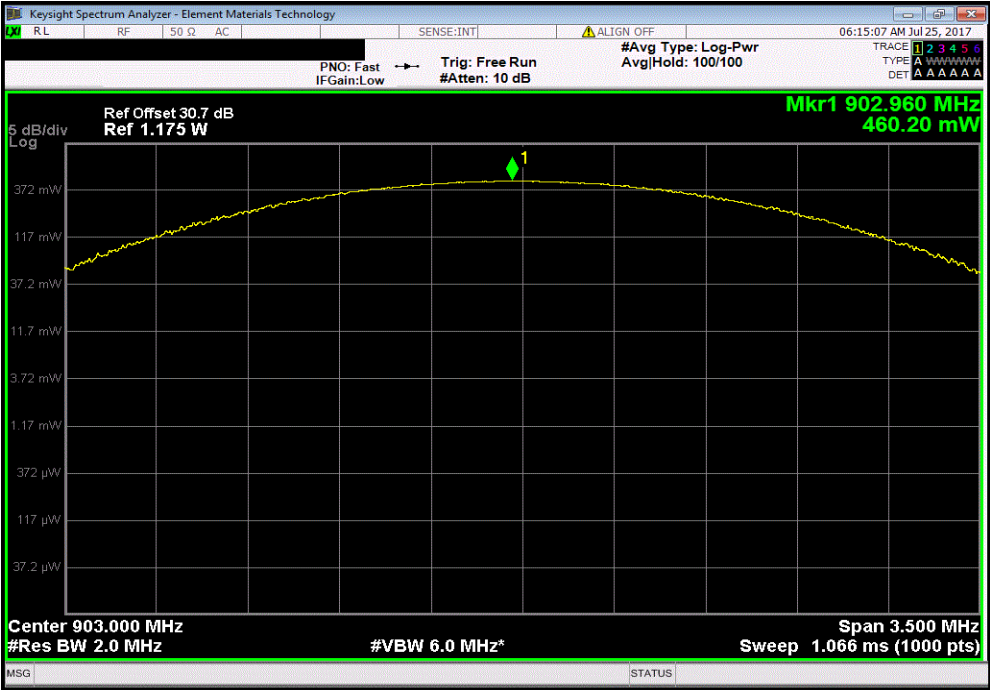


OUTPUT POWER - 27 dBm

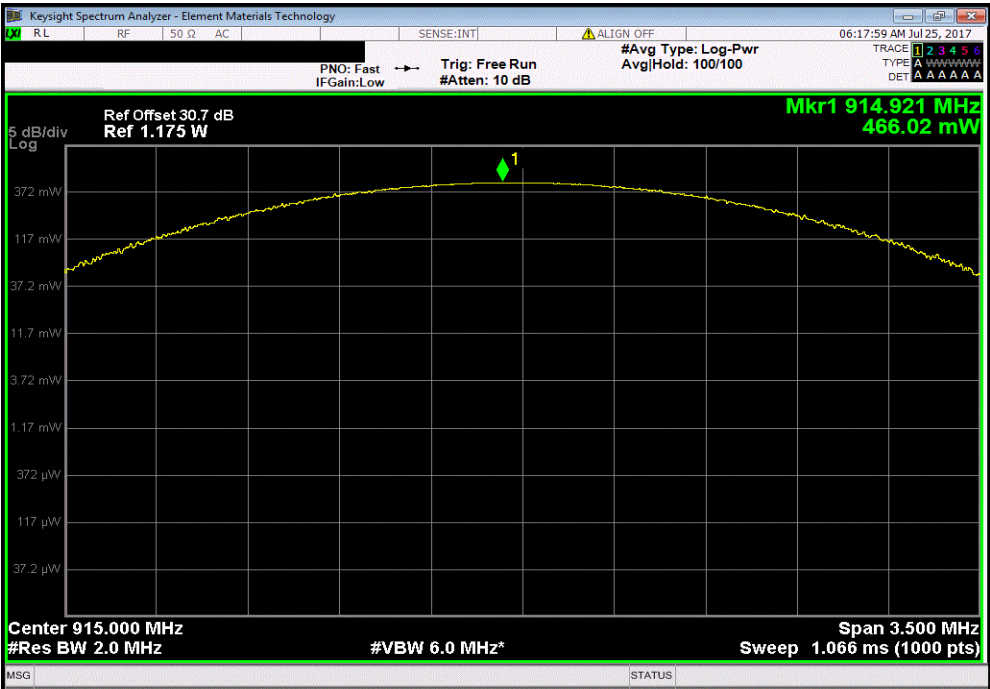


TMTx 2017.04.18 XMM 2017.02.08

Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module, Low Channel, 903 MHz						
				Value	Limit	Result
				(<)		
				460.2 mW	1 W	Pass



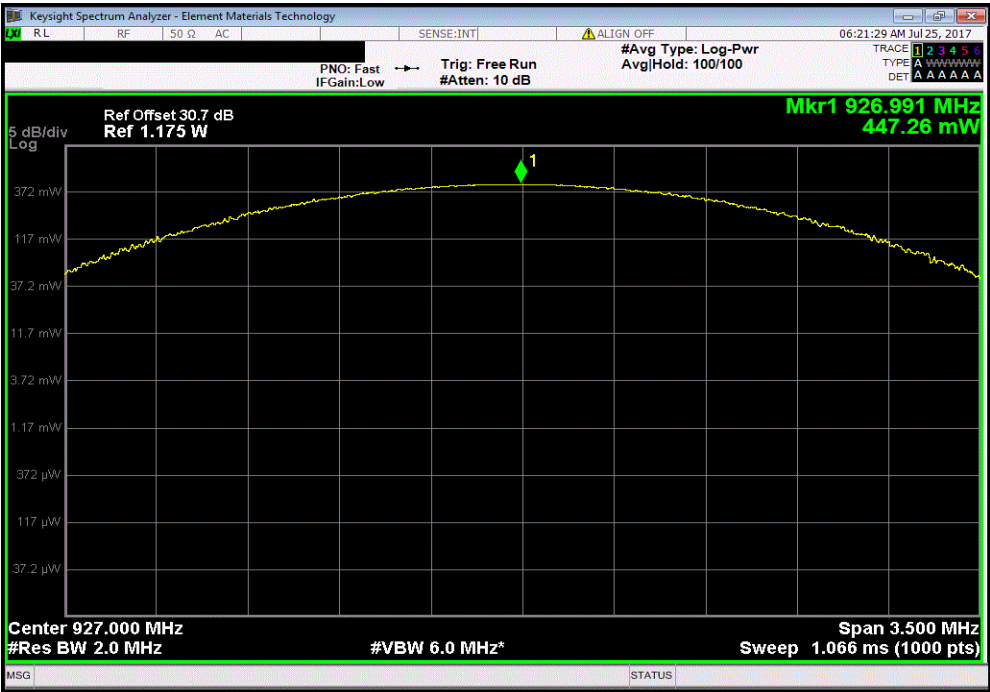
Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module, Mid Channel, 915 MHz						
				Value	Limit	Result
				(<)		
				466.02 mW	1 W	Pass



OUTPUT POWER - 27 dBm



Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module, High Channel, 927 MHz						
				Value	Limit	Result
				447.26 mW	1 W	Pass



BAND EDGE COMPLIANCE



XMIT 2017.02.08

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
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Meter - Multimeter	Fluke	8846A	MMZ	10/22/2015	10/22/2018
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	5/30/2017	5/30/2018
Attenuator	Fairview Microwave	SA26B-10	TWG	4/15/2017	4/15/2018
Attenuator	S.M. Electronics	SA26B-20	AUY	5/30/2017	5/30/2018
Block - DC	Fairview Microwave	SD3379	AMW	6/5/2017	6/5/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017

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 bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The EUT was transmitting at the channels listed in the datasheet.

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

An RMS detector was used to match the method called out for Output Power. Because the reference level was taken with an RMS detector, the attenuation requirement is -30 dBc.

BAND EDGE COMPLIANCE



THxTx 2017.04.18 XMt 2017.02.08

EUT: 9630-9110		Work Order: SCHW0219	
Serial Number: A02654144		Date: 07/24/17	
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 23.8 °C	
Attendees: Allan Davis		Humidity: 44.2% RH	
Project: None		Barometric Pres.: 1016 mbar	
Tested by: Mark Baytan		Power: 3.5 VDC	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
Total reference level offset (DC Block + 20dB Attenuator + 10dB Attenuator + RF Cable) = 30.7 dB. Power level setting: 27 dBm			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value (dBc)	Limit ≤ (dBc) Result
Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module			
Low Channel, 903 MHz		-52.8	-30 Pass
High Channel, 927 MHz		-52.34	-30 Pass
Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module			
Low Channel, 903 MHz		-51.79	-30 Pass
High Channel, 927 MHz		-50.15	-30 Pass
Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module			
Low Channel, 903 MHz		-52.33	-30 Pass
High Channel, 927 MHz		-49.65	-30 Pass

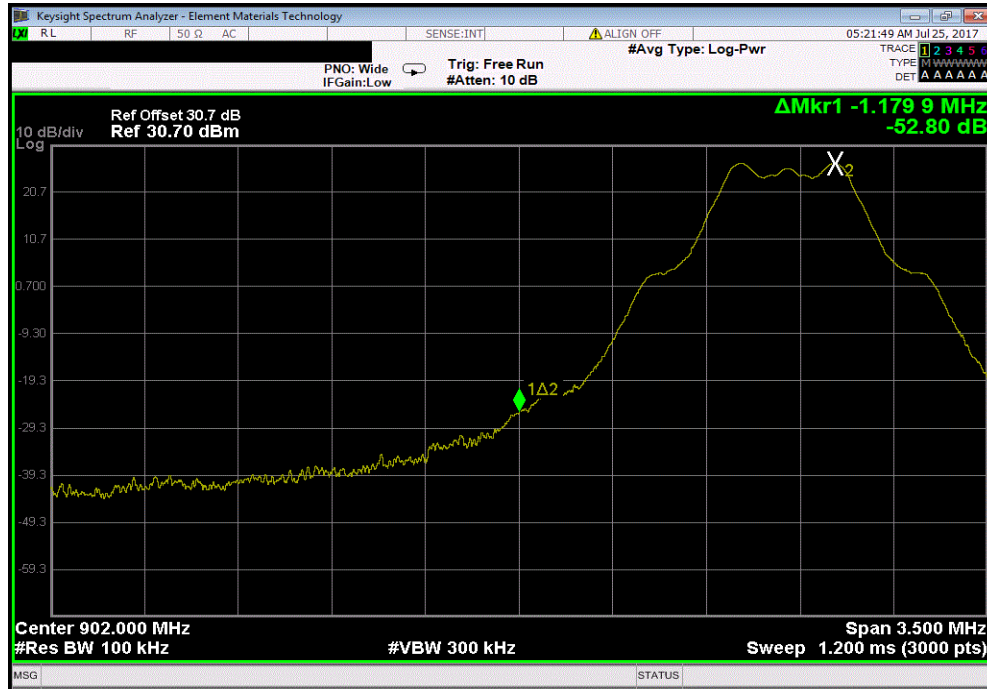
BAND EDGE COMPLIANCE



TMTx 2017.04.18 XMI 2017.02.08

Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module, Low Channel, 903 MHz

	Value (dBc)	Limit ≤ (dBc)	Result
	-52.8	-30	Pass



Nominal Voltage: 3.5 VDC at Voltage Regulator, 3.0 VDC at RF Module, High Channel, 927 MHz

	Value (dBc)	Limit ≤ (dBc)	Result
	-52.34	-30	Pass



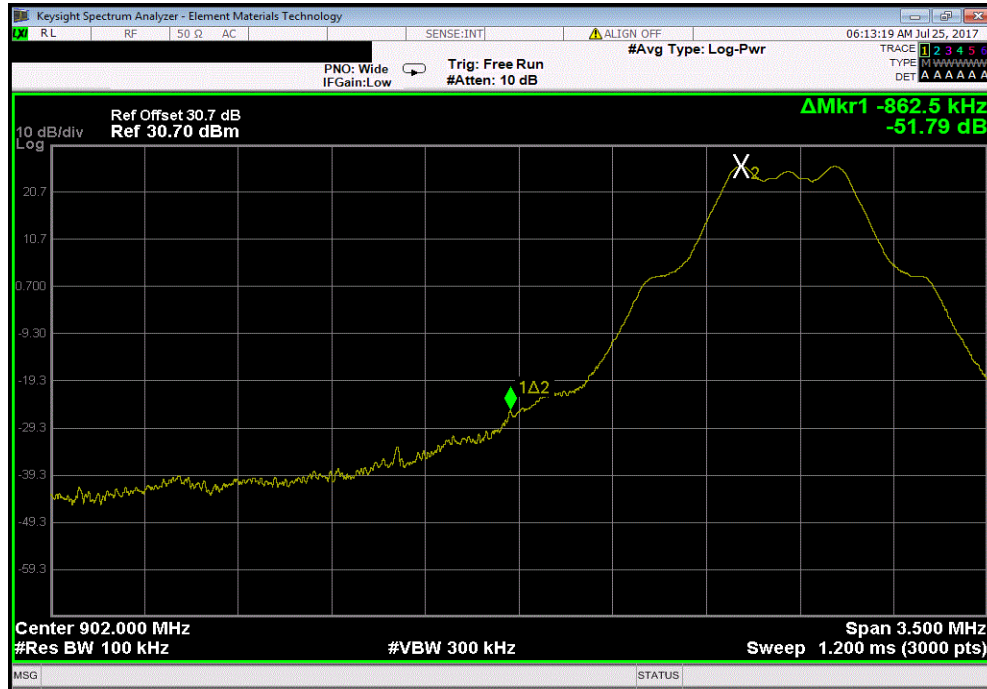
BAND EDGE COMPLIANCE



TMTx 2017.04.18 XMI 2017.02.08

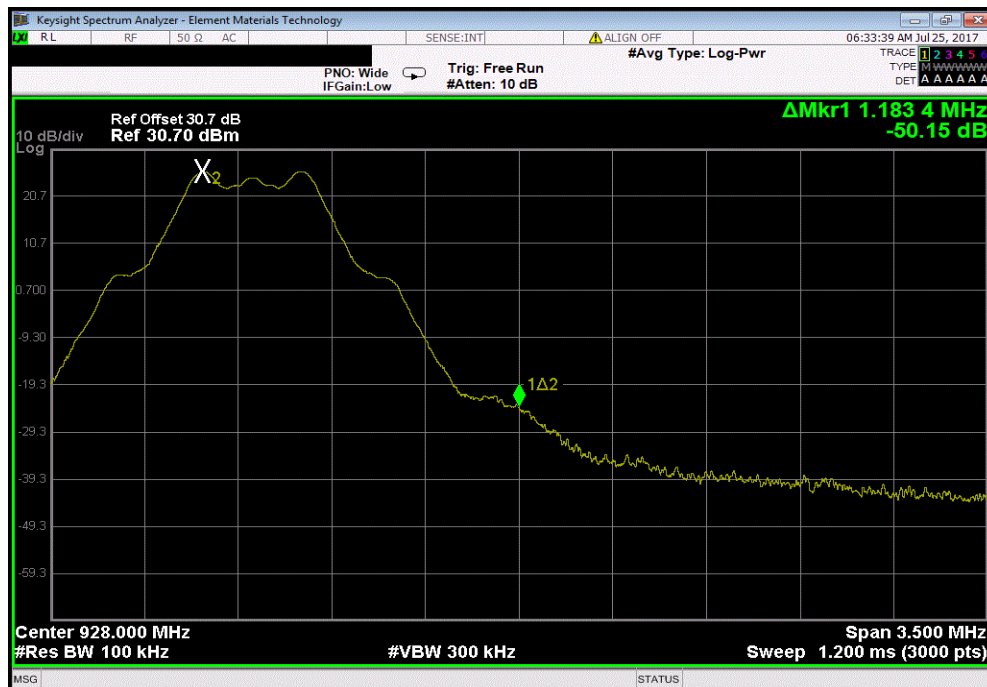
Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module, Low Channel, 903 MHz

Value (dBc)	Limit ≤ (dBc)	Result
-51.79	-30	Pass



Extreme Voltage Condition, Low: 2.7 VDC at Voltage Regulator, 2.7 VDC at RF Module, High Channel, 927 MHz

Value (dBc)	Limit ≤ (dBc)	Result
-50.15	-30	Pass

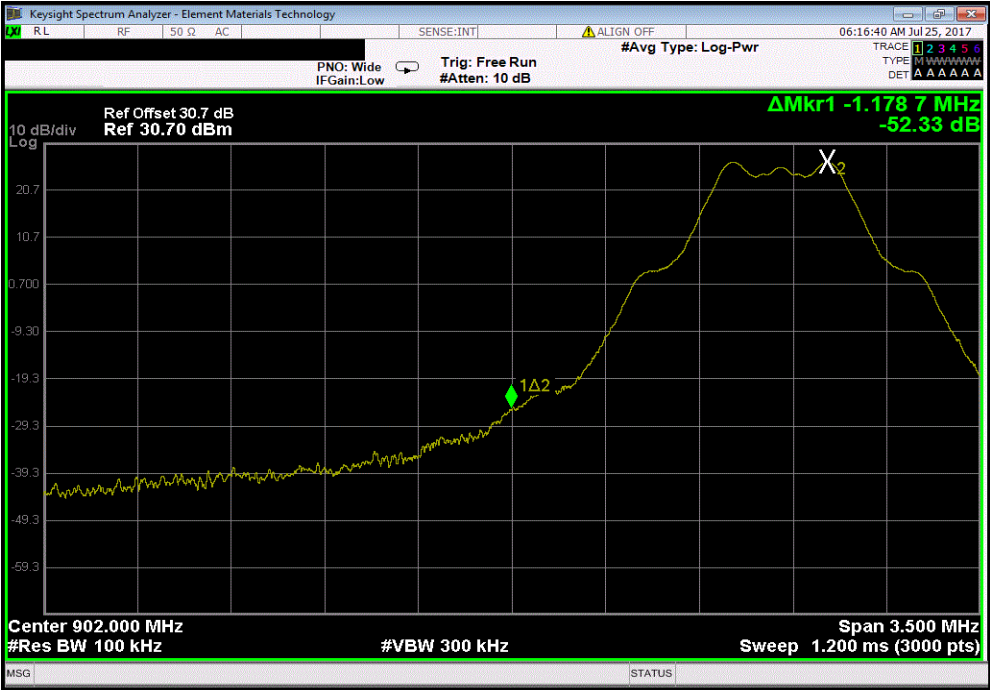


BAND EDGE COMPLIANCE



TMTx 2017.04.18 XMTx 2017.02.08

Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module, Low Channel, 903 MHz						
	Value (dBc)	Limit ≤ (dBc)	Result			
	-52.33	-30	Pass			



Extreme Voltage Condition, High: 5.025 VDC at Voltage Regulator, 3.465 VDC at RF Module, High Channel, 927 MHz						
	Value (dBc)	Limit ≤ (dBc)	Result			
	-49.65	-30	Pass			



OCCUPIED BANDWIDTH



XMIT 2017.02.08

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
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Meter - Multimeter	Fluke	8846A	MMZ	10/22/2015	10/22/2018
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	5/30/2017	5/30/2018
Attenuator	Fairview Microwave	SA26B-10	TWG	4/15/2017	4/15/2018
Attenuator	S.M. Electronics	SA26B-20	AUY	5/30/2017	5/30/2018
Block - DC	Fairview Microwave	SD3379	AMW	6/5/2017	6/5/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was set to the channels and modes listed in the datasheet.

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.

OCCUPIED BANDWIDTH



THtTx 2017.04.18 XMtM 2017.02.08

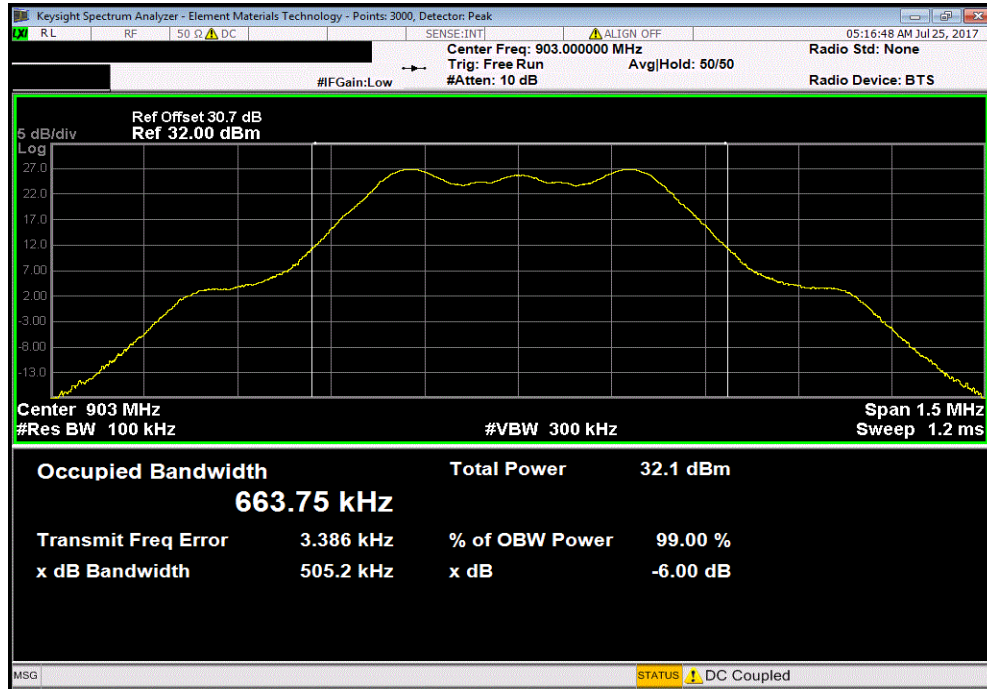
EUT: 9630-9110		Work Order: SCHW0219	
Serial Number: A02654144		Date: 07/24/17	
Customer: Schweitzer Engineering Laboratories, Inc.		Temperature: 23.8 °C	
Attendees: Allan Davis		Humidity: 44.2% RH	
Project: None		Barometric Pres.: 1016 mbar	
Tested by: Mark Baytan		Power: 3.5 VDC	
		Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2017		ANSI C63.10:2013	
COMMENTS			
Total reference level offset (DC Block + 20dB Attenuator + 10dB Attenuator + RF Cable) = 30.7 dB. Power level setting: 27 dBm			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (±) Result
Nominal Voltage: 3.5 VDC			
Low Channel, 903 MHz		505.242 kHz	500 kHz Pass
Mid Channel, 915 MHz		531.531 kHz	500 kHz Pass
High Channel, 927 MHz		520.878 kHz	500 kHz Pass

OCCUPIED BANDWIDTH

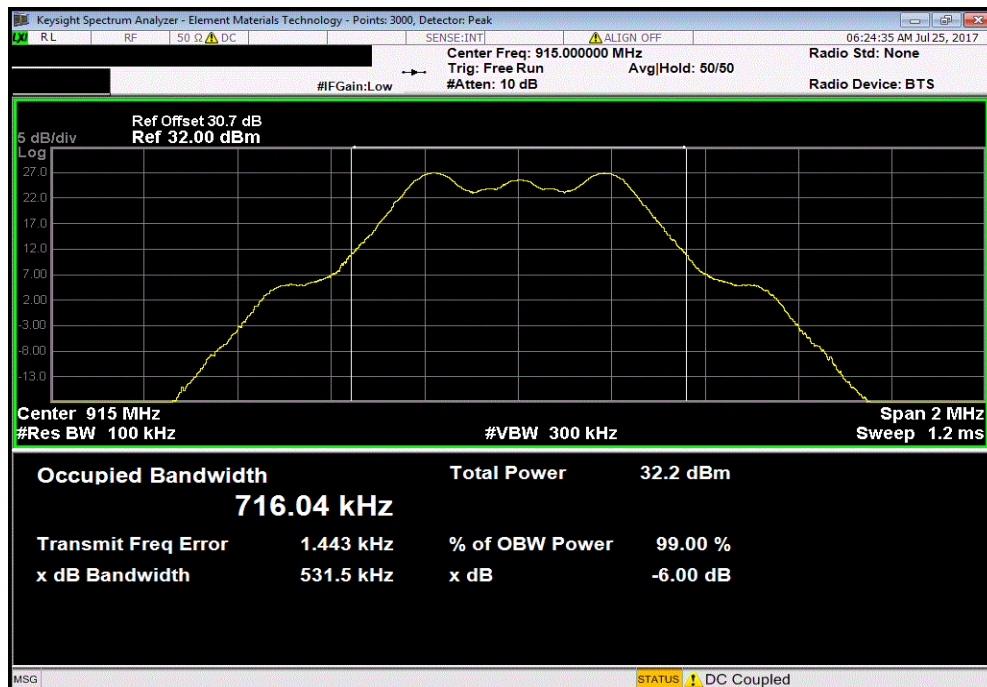


TMTx 2017.04.18 XMI 2017.02.08

Nominal Voltage: 3.5 VDC, Low Channel, 903 MHz						
				Value	Limit (≥)	Result
				505.242 kHz	500 kHz	Pass



Nominal Voltage: 3.5 VDC, Mid Channel, 915 MHz						
				Value	Limit (≥)	Result
				531.531 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH



TMTx 2017.04.18XMI 2017.02.08

Nominal Voltage: 3.5 VDC, High Channel, 927 MHz						
	Value	Limit	Result			
	520.878 kHz	500 kHz	Pass			

