



TEST REPORT

Report Number: 102429676DEN-001

Project Number: G102429676

Report Issue Date: 27-Jan-2016

Product Designation: RC-03 Raven Reader Controller

Standards: FCC Part 15 Subpart C (15.209):2016

FCC Part 15 Subpart C (15.225):2016

IC RSS-210, Issue 8: 2010

IC RSS-GEN, Issue 4: 2014

Tested by:
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Louisville, CO 80027

Client:
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Boulder, CO 80301

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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded **the product tested complies with the requirements of the standard(s) indicated**. The results obtained in this test report pertain only to the item(s) tested.

1.1 Test Report Scope

This test report covers FCC and IC requirements.

1.2 Test Methodology

All measurements were performed according to the procedures in the following documents:

- ANSI C63.10: 2013 – ANSI Standard for Testing Unlicensed Wireless Devices

Radiated emissions tests were formed at an antenna-to-product distance of 3-meters.

1.3 Test Facility

Intertek Denver's testing facilities are located at 1795 Dogwood St. Suite 200 Louisville, CO 80027. The testing facility is ISO17025:2005 accredited by A2LA, our lab code is 2506.02, our VCCI registration numbers are. R-1643, C-1752 and T-1558, our FCC designation no. US1121 and our IC lab no. 2042N.

Testing contained in this test report may not be covered under the laboratories scope of accreditation. A note will be placed in the specific test section for testing not covered under the laboratories scope.

2 Test Summary

TEST SECTION	TESTS	FCC/IC REFERENCE	TEST DATE	RESULT
4	Radiated Unintentional Spurious Emissions	FCC 15.209/15.109 RSS-GEN: Sec. 7/8.9 RSS-210: Sec. 2	1/11/2016- 1/12/2016	PASS
5	Tx Voltage Variation	FCC 15.31	1/11/2016- 1/12/2016	PASS
6	Tx Fundament and Harmonic Emissions	FCC 15.209/15.225 RSS-210: Sec. 2.5 RSS-210: A2.6	1/11/2016- 1/12/2016	PASS
7	AC Conducted Emissions	FCC 15.207 RSS-GEN: 2010	1/12/2016	PASS
8	Tx Frequency Tolerance (Stability)	FCC 15.31(e)/15.225(e) RSS-Gen 6.11 RSS-210 A2.6	1/12/2016	PASS
9	Occupied Bandwidth Measurement	RSS-GEN: 2010	11/27/2016	PASS

General Notes:

- 1) The following product options were covered in this testing:
 - Power Over Ethernet (POE)
 - 12/24VDC
- 2) Product is RSS-210 Category 1 equipment.

Radio Notes:

- 1) FCC CFR47 Part 15.31: Measurement Standards: In any case where the device is powered off a battery, a fresh battery was used during test. In cases where the device is powered off an AC supply, voltage was varied per Part 15.31 to find worst case emissions.
- 2) FCC CFR47 Part 15.35: Measurement Detector Functions and Bandwidths: FCC Part 15.35 was utilized when performing the measurements within this report.
- 3) Near field correction was made to Radiated emissions from unlicensed wireless devices below 30MHz. refer to ANSIC63.10-2013, section 6.4.4 for detail.

Description of Product Under Test

Model:	RC-03-ALLE-K
Serial Number:	Test 1
FCC ID:	OCZRC-03ALLE
Industry Canada ID:	8431A-RC03ALLE
Related Submittal(s) Grants:	NA
Company:	Isonas Inc
Customer:	Isonas Inc
Address:	4750 Walnut Street, Boulder, Colorado, USA, 80301
Phone:	970-324-0156
Fax:	N/A
e-mail:	MattM@isonas.com
Test Standards:	☒ 47 CFR, Part 15C:§15.225 ☒ RSS-210, Issue 8, 2010 ☒ RSS-Gen, Issue 3, 2010 ☒ Other 47 CFR, Part 15C:§15.209
Type of radio:	☒ Stand -alone ☐ Module ☐ Hybrid
Date Sample Submitted:	1/11/2016
Test Work Started:	1/11/2016
Test Work Completed:	1/13/2016
Test Sample Conditions:	☐ Damaged ☐ Poor (Usable) ☒ Good

Product Description:	RC-03 Raven Reader Controller
Transmitter Type:	RFID
Operating Frequency Range(s):	125.25kHz, 13.56MHz
Number of Channels:	1 in each band
Modulation:	NA
Antenna(s) Info:	Loop antenna
Rated Power:	EIRP 125kHz 6nW EIRP 13.56MHz 1.2uW
Antenna Installation:	☐ User ☐ Professional ☒ Factory
Transmitter power configuration:	☐ Internal battery ☒ External power source
Special Test Arrangement:	NA
Test Facility Accreditation:	A2LA (Certificate No. 2506.01)
Test Methodology:	Measurements performed according to the procedures in ANSI C63.10-2013

3 Product Description - Detailed**Description of Equipment Under Test (provided by client)**

The RC-03 is a Radio Frequency Identification Device (RFID) Reader / Controller that can be hardware configured with or without a 12 position numeric keypad for manual PIN entry. It is a dual technology reader comprising both LF and HF reader units.

The RC-03 intended uses are instances where items of value requiring the ability to control access to said items is desired, also known as "Access Control". The RC-03 provides a way to input access credentials either in the form of a RFID transponder (credential) operating in the low frequency band of the radio spectrum or in the High Frequency band of the radio spectrum by powering the credential and receiving said information via magnetic induction or by manual input of a PIN via keypad for the controller portion of the device to either act on or pass on via Ethernet connectivity to a control program resident elsewhere. The RC-03 has provision to be powered via IEEE802.3af Power Over Ethernet (POE) or by external DC voltage. It also has provision to source power out to and control or receive input from other external devices such as electromagnetic door locks and motion sensors. The RC-03 can operate either in "Standalone" mode where all access rules and allowable credentials are stored on board the unit locally with access decisions being made exclusively by the unit locally or in "Host" mode where the RC-03 is connected to a controlling computer via Ethernet. In this case all the access rules and credentials are handled by the remote computer, which could be handling many RC-03 controllers in different locations

Equipment Under Test Power Configuration

Rated Voltage	Rated Current	Rated Frequency	Number of Phases
POE	0.26A	DC	DC
12Vdc	0.130A	DC	DC
24Vdc	0.07A	DC	DC

Descriptions of EUT Exercising

☐ Standby/Idle Mode
☒ Continuous transmission, un-modulated carrier (CW)
☐ Continuous transmission, modulated carrier (CW) utilizing worst-case data rate
☐ Continuous Receive Mode

Note: The chosen mode of operation described above is dependent upon the specific test to be performed.

Variant Models:

The following variant models were not tested as part of this evaluation, but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

RC-03-ALLE (Non Keypad version) Model not tested

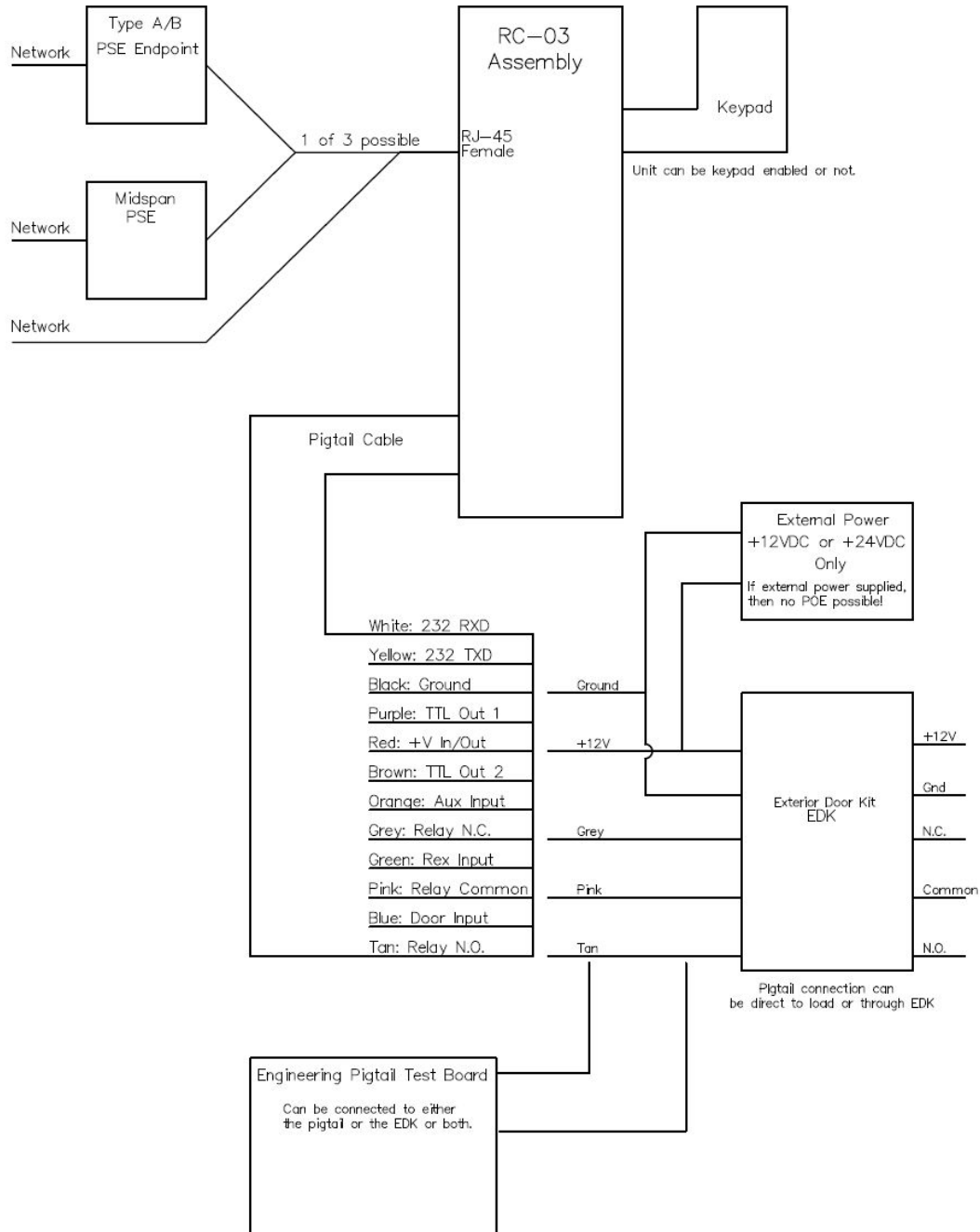
RC-03-ALLE-K (Keypad version) Model tested

System setup including cable interconnection details, support equipment and simplified block diagram

3.1 Method:

Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

3.2 EUT Block Diagram:



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3.3 Antenna Specifications: NA integral loop antenna

3.4 Determination of RF Power supplied to antenna input for testing

3.5 Support Data:

ID	Description/ Function	Shield Type	Length	Connector	Connection	Ferrites
1	Network cable	None	6 feet	RJ-45	POE	None
2	Pigtail	None	6 feet	DC	DC	Yes

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Load Board	Isonas	Custom	EMC-1
Generic Laptop	Dell	EMC-1	EMC-1

Notes:

3.6 Photograph: Product Tested -

4 Radiated Unintentional & Spurious Emissions

4.1 Method:

Unless otherwise stated no deviations were made from FCC 15.209/ IC RSS-210.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Testing with-in this section utilized the standard test methods of ANSI C63.4 sections 6.4 and 6.5. All measurements were made with an antenna to product test distance of 3m. Near field correction were made for frequencies below 30MHz, refer to ANSIC63.10-2013, section 6.4.4 for detail.

4.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	HP	5	5/19/2015	5/19/2016
19937	Bilog Antenna 30MHz - 6GHz	Sunol Sciences	JB6	A050707-2	4/10/2015	4/10/2016
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	12/19/2015	12/19/2016
CC1-E2	Radiated Cable	Teledyne	90-206-300; PN:F-130-S1S1-100; 90-206-072;	E2-A; 5026702002; E2-C; E2-D	11/17/2015	11/17/2016
18897	Magnetic loop	EMCO	6502	9205-2738	11/12/2015	11/12/2016
LAB-012	Wireless BP, Tem and Humidity sensor	Omega	zED-BTH	0070368	9/01/2015	9/1/2016

4.3 Results:

The sample tested was found to comply.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where
 FS = Field Strength in dB μ V/m
 RA = Receiver Amplitude (including preamplifier) in dB μ V
 CF = Cable Attenuation Factor in dB
 AF = Antenna Factor in dB
 AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 52.0 dB μ V
 AF = 7.4 dB/m
 CF = 1.6 dB
 AG = 29.0 dB
 FS = 32 dB μ V/m

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To convert from dB μ V to μ V or mV the following was used:

UF = $10^{(NF / 20)}$ where UF = Net Reading in μ V
NF = Net Reading in dB μ V

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
UF = $10^{(32 \text{ dB}\mu\text{V} / 20)}$ = 39.8 μ V/m

4.4 Test Data:

Test Report #:	G102429676	Test Area:	CC1 Radiated		Temperature:	21.1	°C
Test Method:	FCC 15.209/ IC RSS-210	Test Date:	1/11/2016		Relative Humidity:	11.0	%
EUT Model #:	RC-03-ALLE-K	EUT Power:	POE, 12Vdc		Air Pressure:	835.7	kPa
EUT Serial #:	Test 1						
Manufacturer:	Isonas			Level Key			
EUT Description:	RC-03 Raven Reader Controller			Pk – Peak			
Notes:				Qp – Quasi Peak			
				Av - Average			

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTE N	FINAL	POL	HG T	AZ	DELTA1	RBW
MHz	dBuV	Qp Av Pk Rms	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 < 1GHz Qp	(MHz)
V_48V_POE_Ferrite on control cable_					Enguage_IP_							
40.6811	50.18	Qp	0.57	13.19	28.02	0.00	35.92	V	1.00	261.0	- 4.08	0.120
44.2420	49.17	Qp	0.59	10.95	28.01	0.00	32.71	V	1.00	264.6	- 7.29	0.120
73.0769	53.86	Qp	0.76	8.40	27.91	0.00	35.12	V	1.00	65.8	- 4.88	0.120
157.6923	42.53	Qp	1.13	12.83	27.52	0.00	28.97	V	1.00	232.2	- 14.55	0.120
189.8429	53.17	Qp	1.22	11.30	27.33	0.00	38.36	V	1.00	0.0	- 5.16	0.120
239.8573	40.58	Qp	1.38	11.60	27.03	0.00	26.53	V	1.00	307.7	- 19.49	0.120
H_48V_POE_Ferrite on control cable_					Enguage_IP_							
40.6811	37.51	Qp	0.57	13.19	28.02	0.00	23.25	H	3.28	183.5	- 16.75	0.120
75.0032	52.90	Qp	0.77	8.30	27.90	0.00	34.07	H	3.99	193.8	- 5.93	0.120
159.1843	41.34	Qp	1.13	12.80	27.51	0.00	27.76	H	2.17	109.9	- 15.76	0.120
189.8429	55.79	Qp	1.22	11.30	27.33	0.00	40.98	H	1.50	259.5	- 2.54	0.120
245.5128	43.23	Qp	1.40	11.59	27.01	0.00	29.21	H	1.21	87.4	- 16.81	0.120
640.0240	35.56	Qp	2.26	19.60	28.27	0.00	29.15	H	1.50	359.9	- 16.87	0.120
V_48V_POE_Ferrite on control cable_X2_					Enguage_IP_							
40.6811	50.45	Qp	0.57	13.19	28.02	0.00	36.19	V	1.00	277.0	- 3.81	0.120
44.2404	49.39	Qp	0.59	10.96	28.01	0.00	32.93	V	1.00	262.9	- 7.07	0.120
70.2724	54.44	Qp	0.74	8.40	27.92	0.00	35.66	V	1.00	33.8	- 4.34	0.120
189.8429	50.97	Qp	1.22	11.30	27.33	0.00	36.16	V	1.00	359.9	- 7.36	0.120
221.1538	45.73	Qp	1.33	10.85	27.13	0.00	30.77	V	1.00	312.3	- 15.25	0.120
712.2596	36.35	Qp	2.40	20.70	28.16	0.00	31.29	V	1.16	201.5	- 14.73	0.120

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FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA1	RBW
MHz	dBuV	Qp Av Pk Rms	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 < 1GHz Qp	(MHz)
H_48V_POE_Ferrite on control cable_X2_					Engauge_IP_							
40.6811	37.09	Qp	0.57	13.19	28.02	0.00	22.83	H	3.62	181.2	- 17.17	0.120
76.8478	48.48	Qp	0.78	8.22	27.89	0.00	29.58	H	2.56	182.4	- 10.42	0.120
157.6923	42.72	Qp	1.13	12.83	27.52	0.00	29.16	H	2.27	76.4	- 14.36	0.120
186.6635	47.90	Qp	1.22	11.30	27.35	0.00	33.07	H	1.50	63.3	- 10.45	0.120
189.8429	53.91	Qp	1.22	11.30	27.33	0.00	39.10	H	1.04	247.8	- 4.42	0.120
295.3686	40.61	Qp	1.55	13.51	26.93	0.00	28.73	H	1.00	289.2	- 17.29	0.120
V_12Vdc_Ferrite on control cable_X2_					Engauge_IP_							
40.6811	41.51	Qp	0.57	13.19	28.02	0.00	27.25	V	1.00	88.7	- 12.75	0.120
44.2420	42.00	Qp	0.59	10.95	28.01	0.00	25.54	V	1.00	359.9	- 14.46	0.120
50.0016	41.12	Qp	0.62	8.40	27.99	0.00	22.15	V	1.00	359.9	- 17.85	0.120
81.3622	46.10	Qp	0.80	8.26	27.87	0.00	27.29	V	1.00	54.0	- 12.71	0.120
95.6907	45.16	Qp	0.88	9.54	27.82	0.00	27.75	V	1.00	167.8	- 15.77	0.120
189.8429	43.12	Qp	1.22	11.30	27.33	0.00	28.31	V	1.00	359.9	- 15.21	0.120
H_12Vdc_Ferrite on control cable_X2_					Engauge_IP_							
40.6811	31.52	Qp	0.57	13.19	28.02	0.00	17.26	H	3.41	171.5	- 22.74	0.120
62.5224	32.83	Qp	0.70	7.90	27.95	0.00	13.48	H	3.33	216.5	- 26.52	0.120
94.7035	35.53	Qp	0.87	9.31	27.83	0.00	17.89	H	1.83	204.9	- 25.63	0.120
162.7228	40.51	Qp	1.14	12.63	27.49	0.00	26.79	H	2.10	257.9	- 16.73	0.120
189.8429	42.74	Qp	1.22	11.30	27.33	0.00	27.93	H	1.50	106.6	- 15.59	0.120
285.7997	40.40	Qp	1.51	13.70	26.92	0.00	28.69	H	1.00	249.7	- 17.33	0.120
V_12Vdc_Ferrite on control cable_X1_					Engauge_IP_							
40.6811	41.32	Qp	0.57	13.19	28.02	0.00	27.06	V	1.23	80.6	- 12.94	0.120
44.2420	41.80	Qp	0.59	10.95	28.01	0.00	25.34	V	1.00	359.9	- 14.66	0.120
81.3782	46.42	Qp	0.80	8.26	27.87	0.00	27.61	V	1.00	147.4	- 12.39	0.120
95.6442	45.53	Qp	0.88	9.53	27.82	0.00	28.11	V	1.00	175.4	- 15.41	0.120
162.7228	38.93	Qp	1.14	12.63	27.49	0.00	25.21	V	1.00	359.9	- 18.31	0.120
189.8429	44.23	Qp	1.22	11.30	27.33	0.00	29.42	V	1.00	0.0	- 14.10	0.120
H_12Vdc_Ferrite on control cable_X1_					Engauge_IP_							
40.6811	31.56	Qp	0.57	13.19	28.02	0.00	17.30	H	3.07	175.3	- 22.70	0.120
125.0048	30.77	Qp	1.01	13.60	27.70	0.00	17.68	H	2.56	60.9	- 25.84	0.120
162.7228	41.13	Qp	1.14	12.63	27.49	0.00	27.41	H	2.40	264.1	- 16.11	0.120
176.2836	42.03	Qp	1.20	11.57	27.41	0.00	27.39	H	1.39	93.0	- 16.13	0.120
189.8429	45.74	Qp	1.22	11.30	27.33	0.00	30.93	H	1.50	99.2	- 12.59	0.120
283.8445	41.26	Qp	1.51	13.65	26.92	0.00	29.50	H	1.00	269.9	- 16.52	0.120

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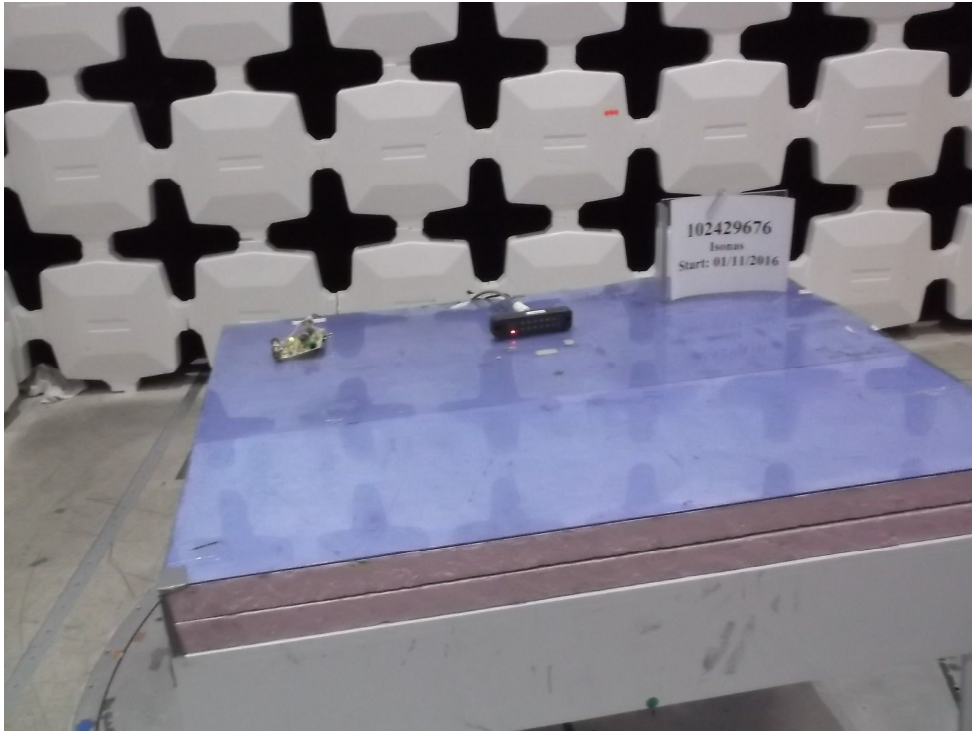
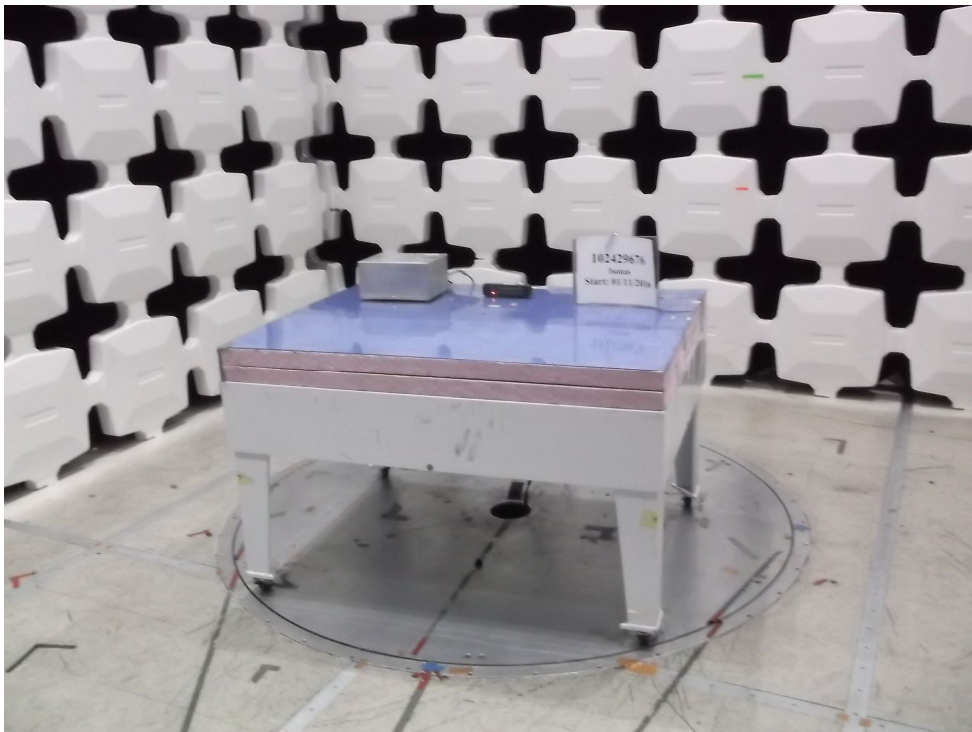
FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA1		RBW
MHz	dBuV	Qp Av Pk Rms	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 < 1GHz Qp	limit	(MHz)
Perpendicular_loop_12Vdc_Ferrite on control cable_X1_						Enguage_IP_							
0.6061	- 24.47	Qp	0.07	10.20	0.00	0.00	- 14.20	H	1.00	0.0	- 46.20	(32.00)	0.009
0.9925	- 15.85	Qp	0.08	10.39	0.00	0.00	- 5.38	H	1.00	0.0	- 33.08	(27.70)	0.009
22.4680	- 13.27	Qp	0.42	9.91	0.00	0.00	- 2.94	H	1.00	0.0	- 32.44	(29.50)	0.009
Parallel_loop_12Vdc_Ferrite on control cable_X1_						Enguage_IP_							
0.1458	- 74.63	Qp	0.04	10.25	0.00	0.00	- 64.34	H	1.00	0.0	- 88.66	(24.32)	0.0002
0.3849	- 47.52	Qp	0.06	10.10	0.00	0.00	- 37.36	H	1.00	0.0	- 53.26	(15.90)	0.009
0.9924	- 15.12	Qp	0.08	10.39	0.00	0.00	- 4.65	H	1.00	0.0	- 32.32	(27.67)	0.009
3.8578	- 20.30	Qp	0.17	10.49	0.00	0.00	- 9.65	H	1.00	0.0	- 39.15	(29.50)	0.009
27.0567	- 11.31	Qp	0.46	8.82	0.00	0.00	- 2.03	H	1.00	0.0	- 31.53	(29.50)	0.009
Parallel_loop_12Vdc_Ferrite on control cable_X2_						Enguage_IP_							
0.5200	- 25.38	Qp	0.06	10.28	0.00	0.00	- 15.04	H	1.00	0.0	- 48.32	(33.28)	0.009
0.9925	- 15.59	Qp	0.08	10.39	0.00	0.00	- 5.12	H	1.00	0.0	- 32.79	(27.67)	0.009
2.8590	- 20.73	Qp	0.14	10.40	0.00	0.00	- 10.19	H	1.00	0.0	- 39.73	(29.54)	0.009
23.3619	- 12.81	Qp	0.44	9.73	0.00	0.00	- 2.65	H	1.00	0.0	- 32.19	(29.54)	0.009
0.1405	- 50.70	Qp	0.04	10.26	0.00	0.00	- 40.40	H	1.00	0.0	- 65.02	(24.62)	0.0002
Perpendicular_loop_12Vdc_Ferrite on control cable_X2_													
0.1489	- 74.21	Qp	0.04	10.25	0.00	0.00	- 63.92	H	1.00	0.0	- 88.06	(24.14)	0.0002
0.4167	- 47.07	Qp	0.06	10.13	0.00	0.00	- 36.88	H	1.00	0.0	- 52.08	(15.20)	0.009
0.7030	- 23.51	Qp	0.07	10.20	0.00	0.00	- 13.24	H	1.00	0.0	- 43.91	(30.67)	0.009
25.0010	- 3.64	Qp	0.45	9.40	0.00	0.00	6.21	H	1.00	0.0	- 23.33	(29.54)	0.009
29.5192	- 10.00	Qp	0.48	8.13	0.00	0.00	- 1.39	H	1.00	0.0	- 30.93	(29.54)	0.009
Perpendicular_loop_POE_Ferrite on control cable_X2_						Enguage_IP_							
0.3857	- 47.73	Qp	0.06	10.10	0.00	0.00	- 37.57	H	1.00	0.0	- 53.44	(15.87)	0.009
0.9942	- 17.58	Qp	0.08	10.39	0.00	0.00	- 7.11	H	1.00	0.0	- 34.77	(27.66)	0.009
7.8878	- 15.54	Qp	0.25	10.60	0.00	0.00	- 4.69	H	1.00	0.0	- 34.23	(29.54)	0.009
0.1481	- 54.21	Qp	0.04	10.25	0.00	0.00	- 43.92	H	1.00	0.0	- 68.12	(24.20)	0.0002
Parallel_loop_POE_Ferrite on control cable_X2_						Enguage_IP_							
0.9947	- 15.58	Qp	0.08	10.39	0.00	0.00	- 5.11	H	1.00	0.0	- 32.76	(27.65)	0.009
2.2905	- 20.45	Qp	0.12	10.40	0.00	0.00	- 9.93	H	1.00	0.0	- 39.47	(29.54)	0.009
Parallel_loop_POE_Ferrite on control cable_X1_						Enguage_IP_							
0.5091	- 22.85	Qp	0.06	10.29	0.00	0.00	- 12.50	H	1.00	0.0	- 45.97	(33.47)	0.009
0.7636	- 21.78	Qp	0.08	10.20	0.00	0.00	- 11.50	H	1.00	0.0	- 41.45	(29.95)	0.009
0.9947	- 13.71	Qp	0.08	10.39	0.00	0.00	- 3.24	H	1.00	0.0	- 30.89	(27.65)	0.009
0.1379	- 50.66	Qp	0.04	10.26	0.00	0.00	- 40.36	H	1.00	0.0	- 65.17	(24.81)	0.0002

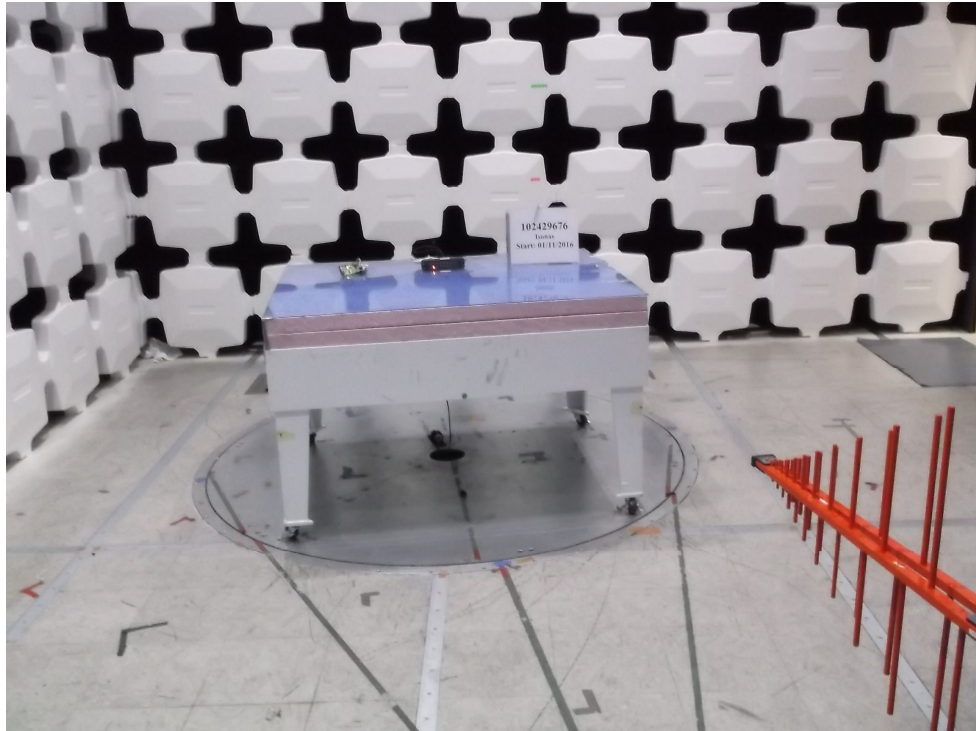
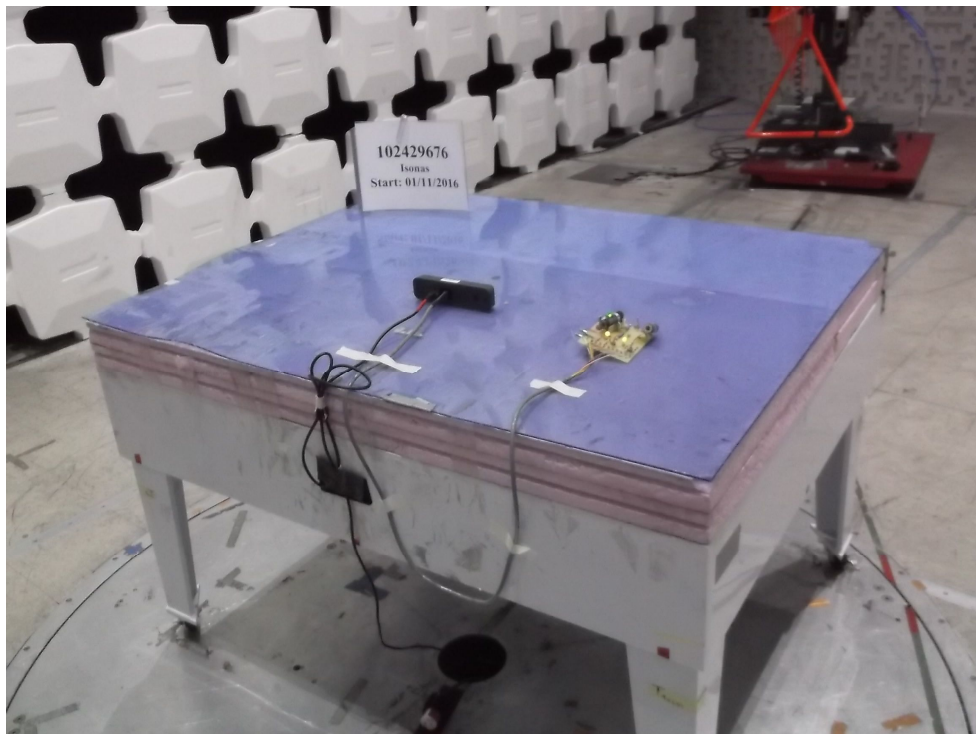
Intertek

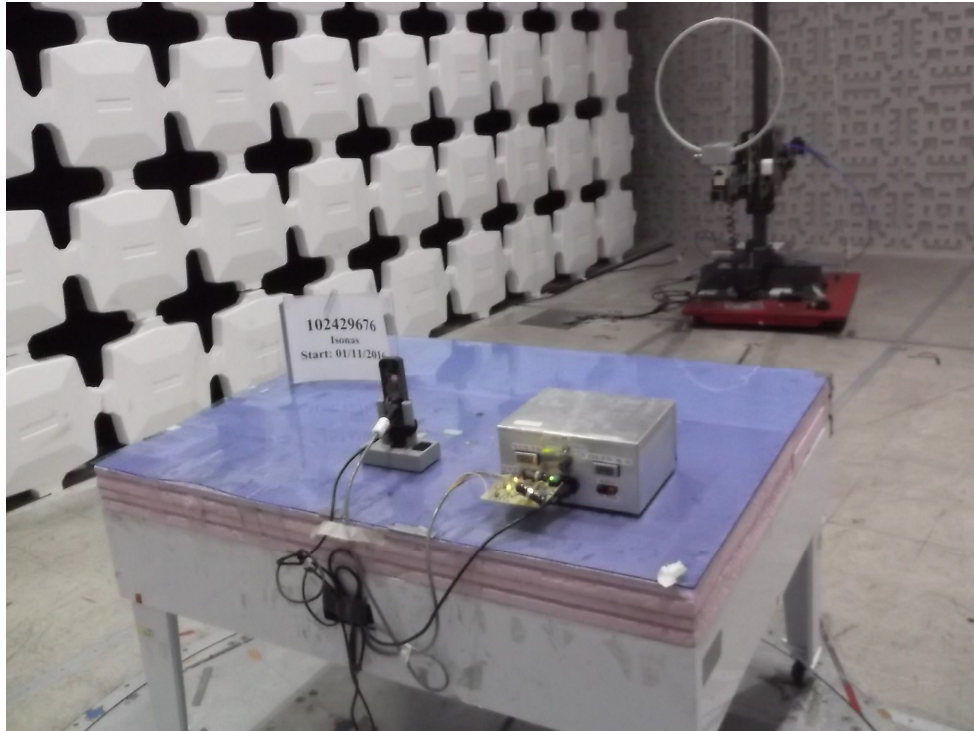
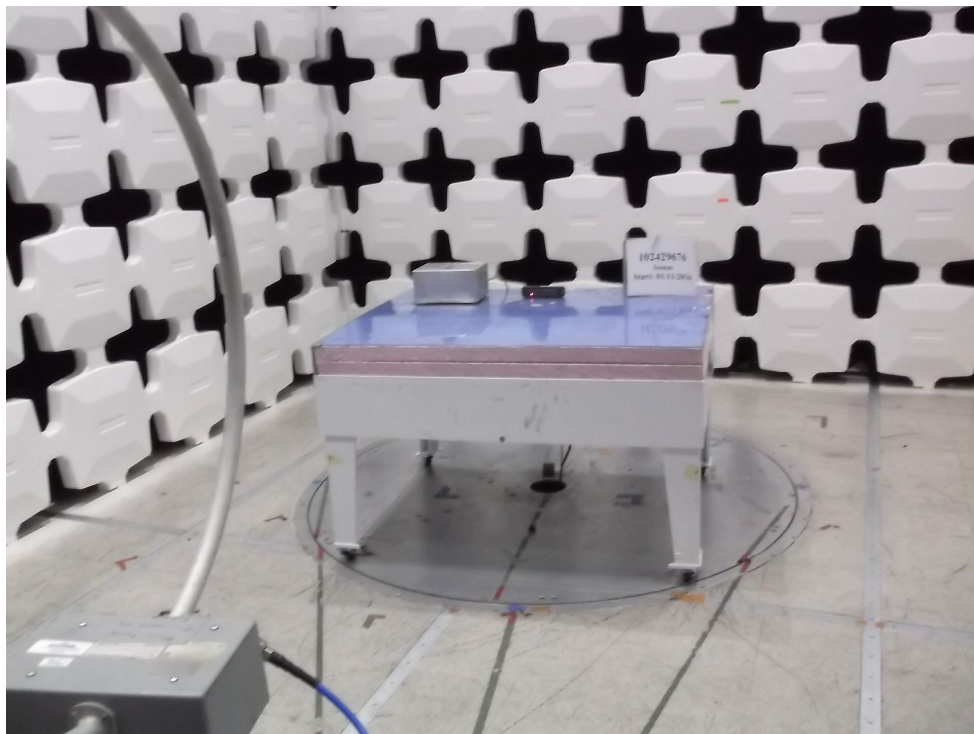
Report Number: 102429676DEN-001

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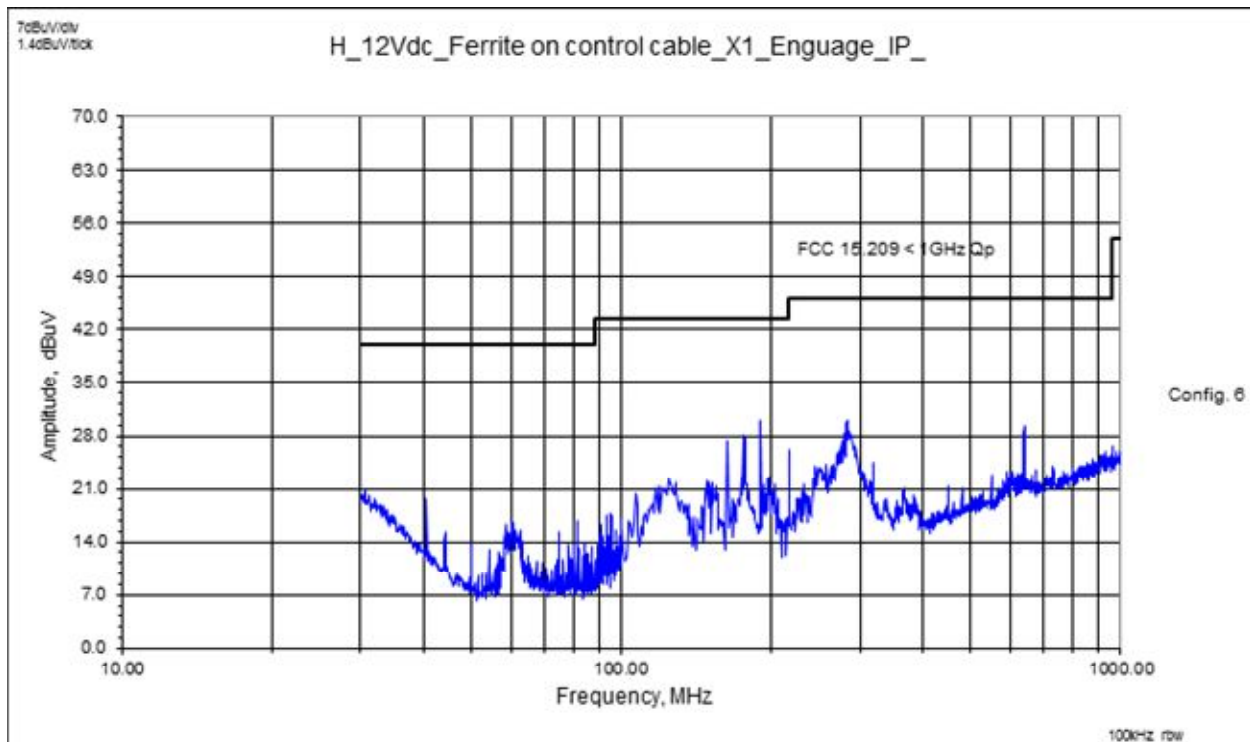
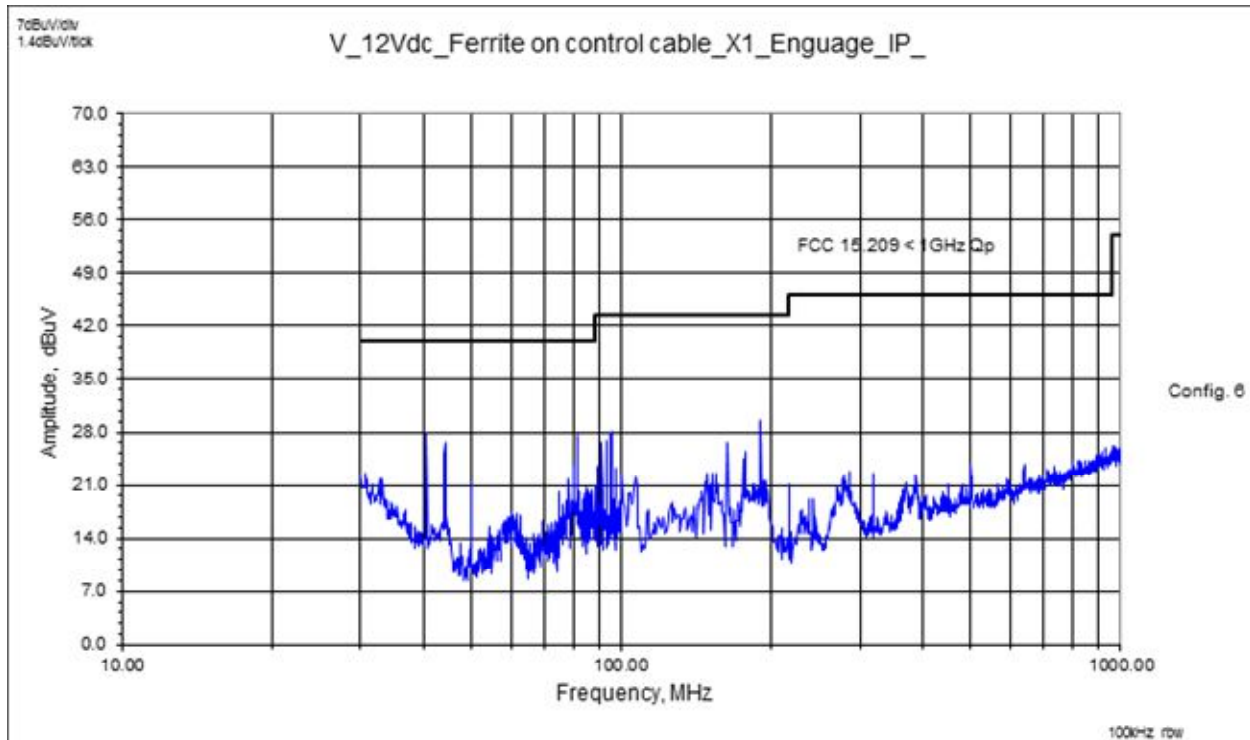
FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA1		RBW
MHz	dBuV	Qp Av Pk Rms	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 < 1GHz Qp	limit	(MHz)
Perpendicular_loop_POE_Ferrite on control cable_X1_						Enguage_IP_							
0.1490	- 74.07	Qp	0.04	10.25	0.00	0.00	- 63.78	H	1.00	0.0	- 87.92	(24.14)	0.0002
1.0184	- 21.67	Qp	0.08	10.40	0.00	0.00	- 11.19	H	1.00	0.0	- 40.73	(29.54)	0.009
1.2730	- 21.05	Qp	0.09	10.40	0.00	0.00	- 10.56	H	1.00	0.0	- 40.10	(29.54)	0.009
19.8077	- 14.26	Qp	0.39	10.41	0.00	0.00	- 3.46	H	1.00	0.0	- 33.00	(29.54)	0.009

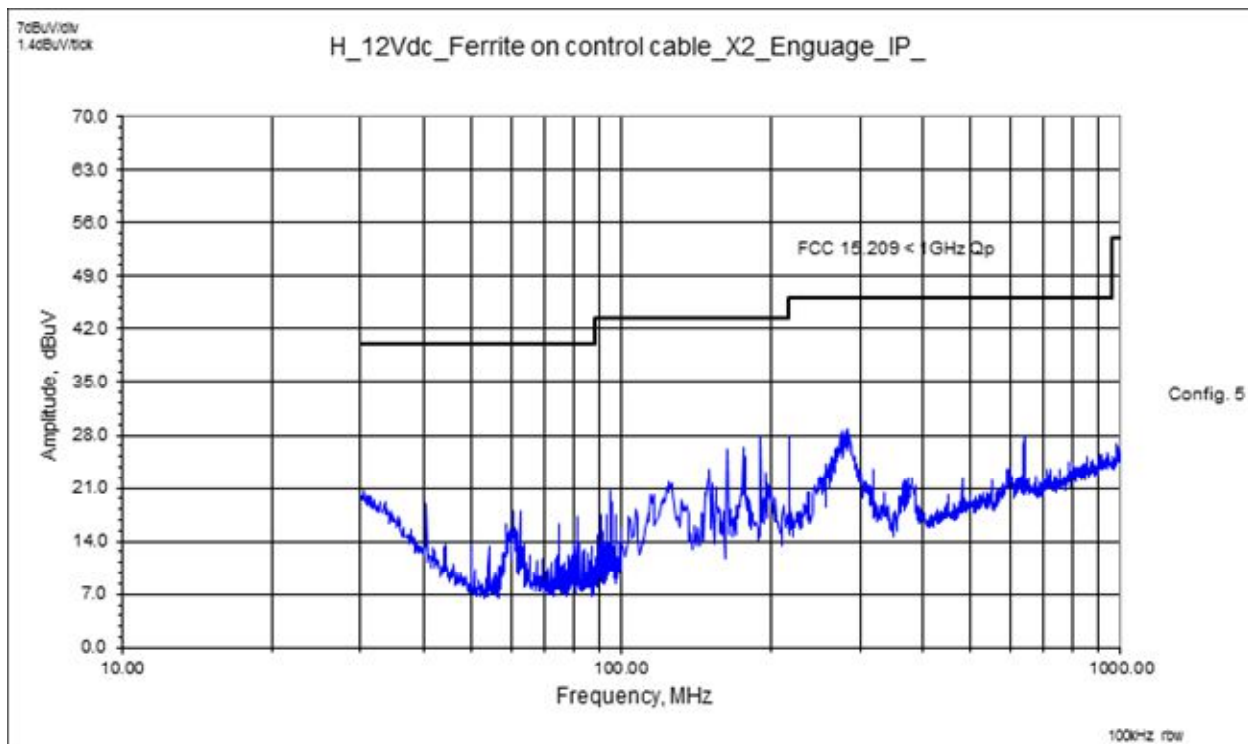
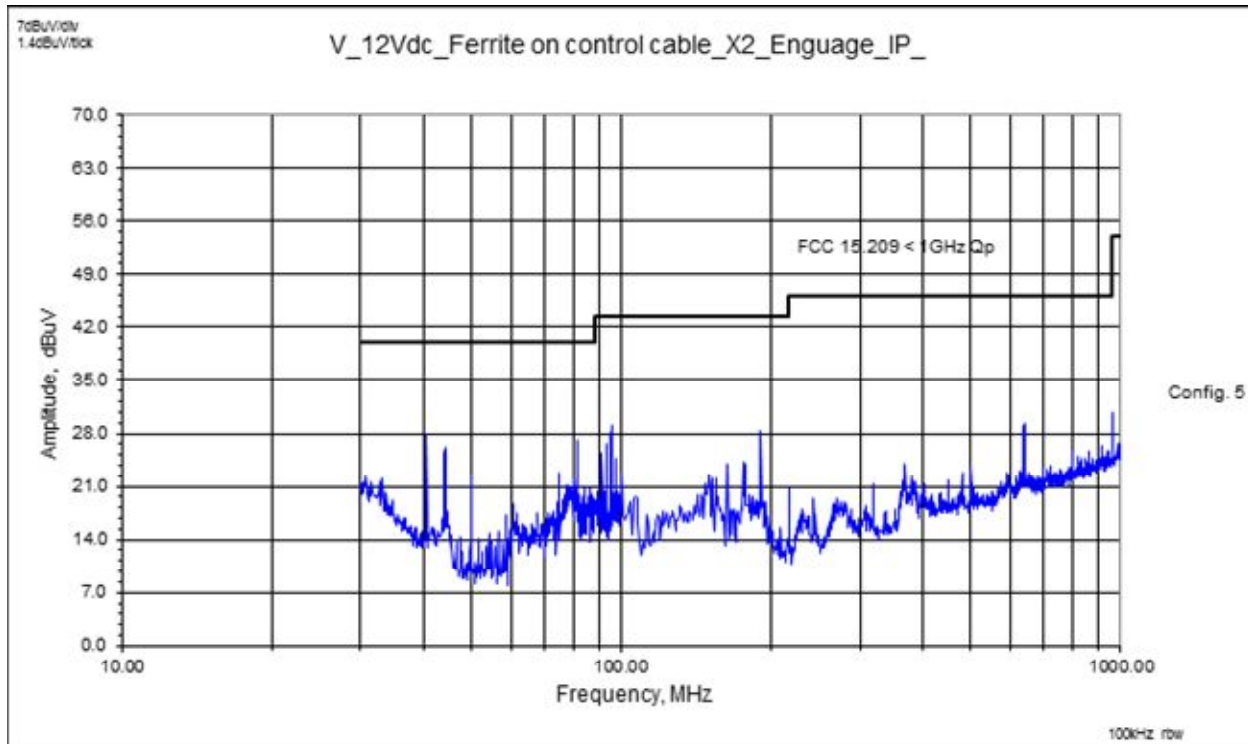
4.5 Setup Photographs:**Test Setup – POE****Test Setup – DC Power**

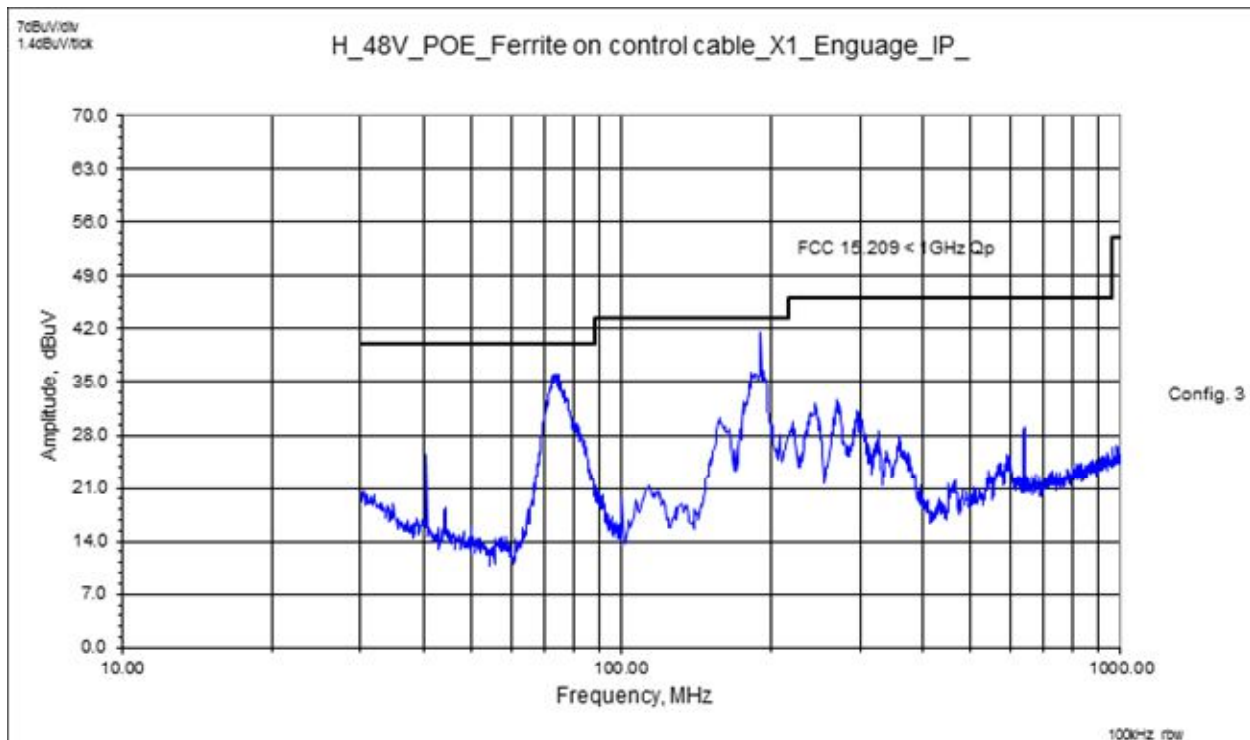
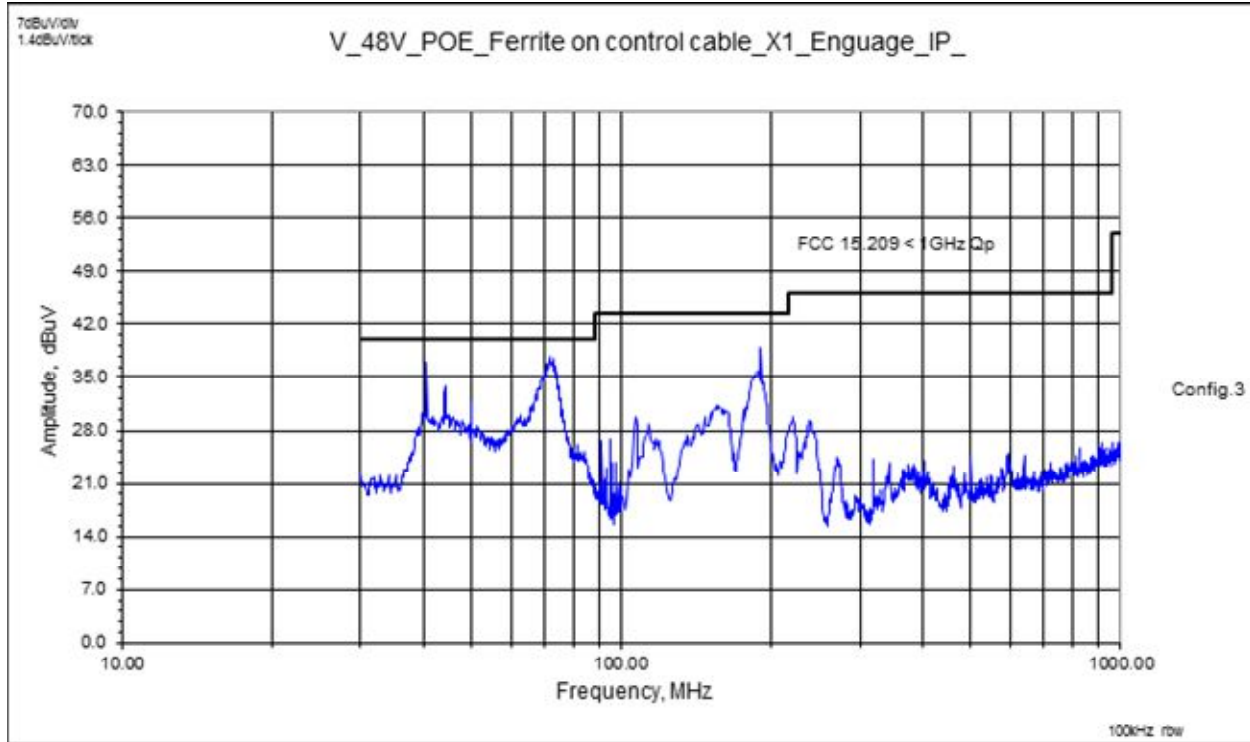
**Test Setup – Front (30MHz – 1GHz)****Test Setup – Rear (30MHz – 1GHz)**

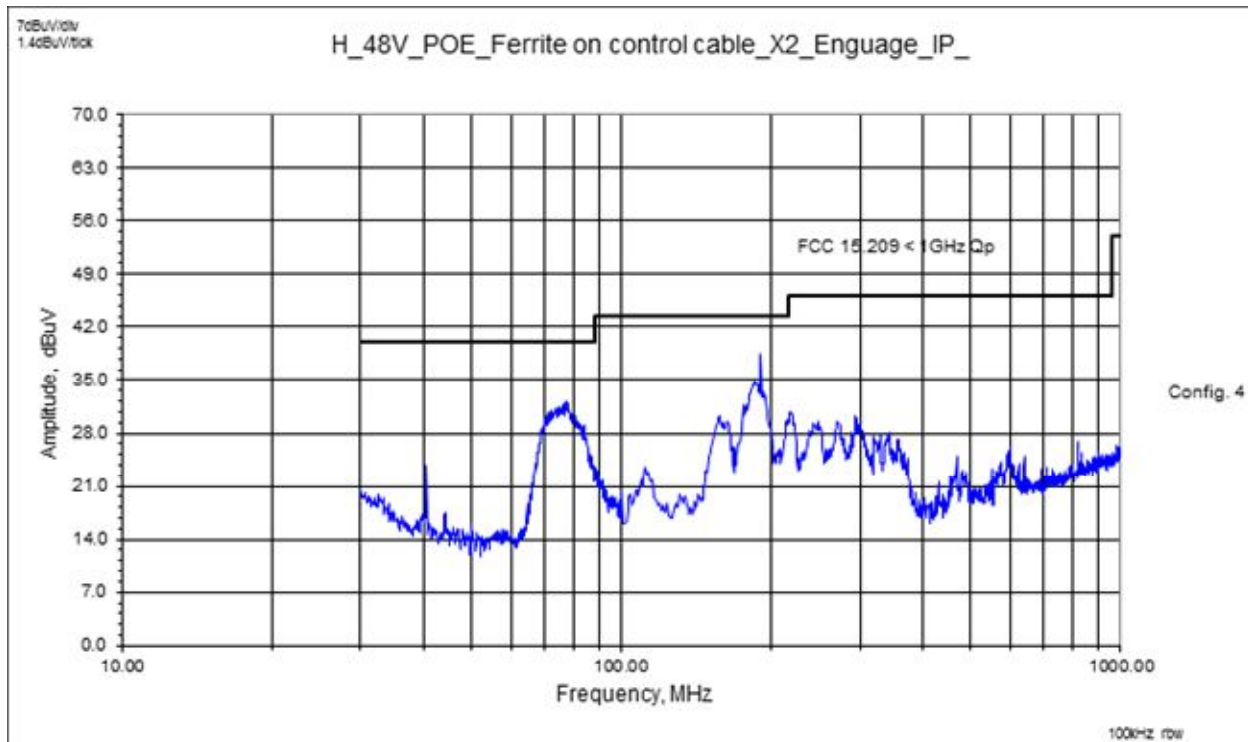
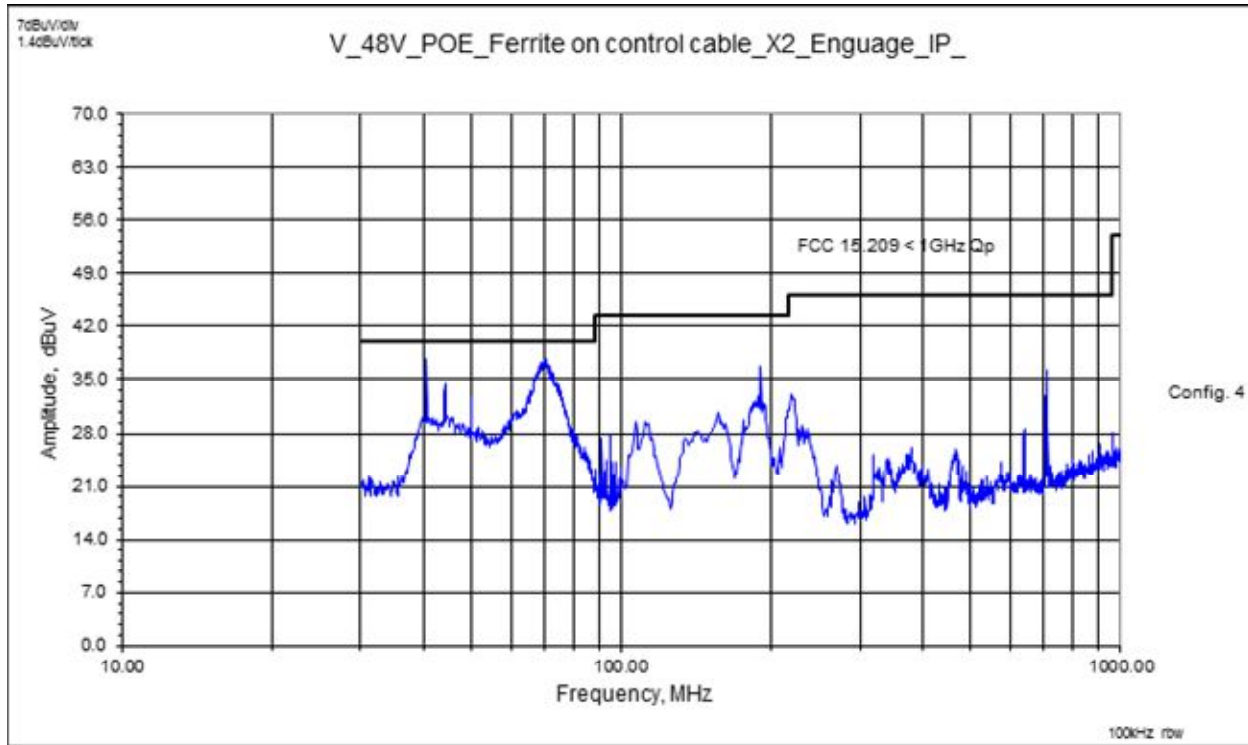
**Test Setup – Rear (9kHz – 30MHz)****Test Setup – Front (9kHz – 30MHz)**

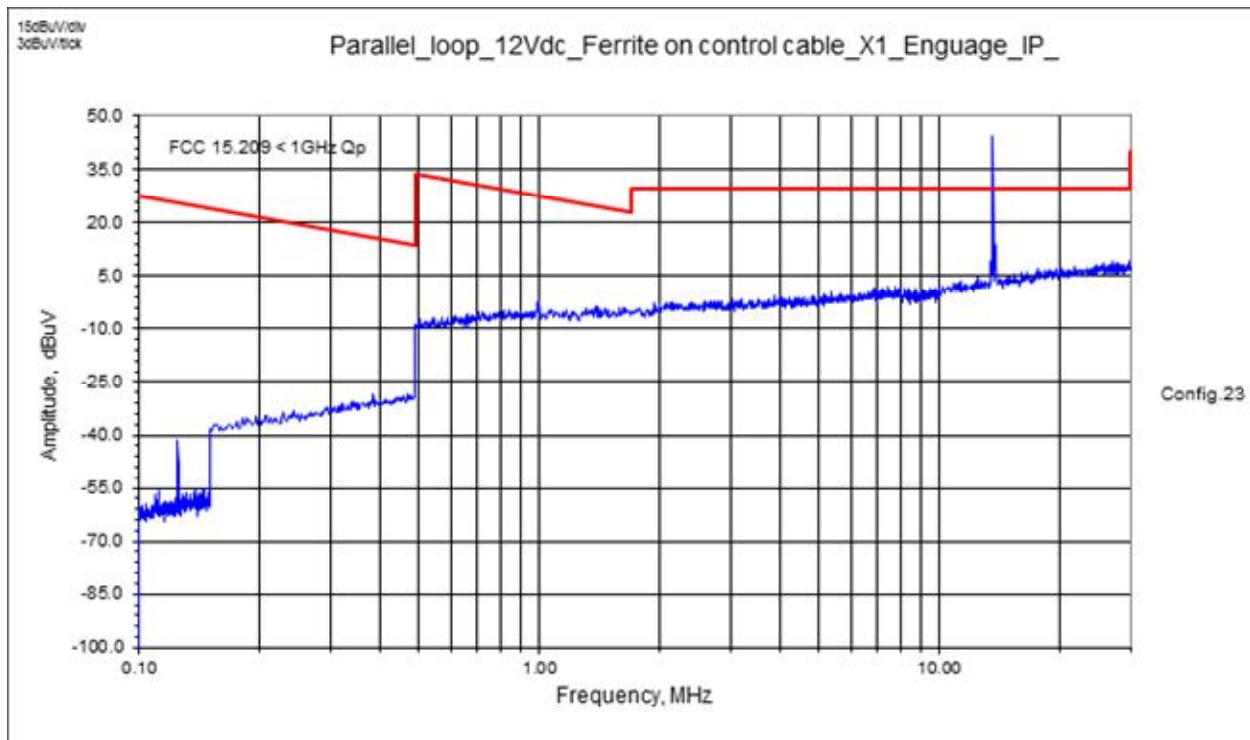
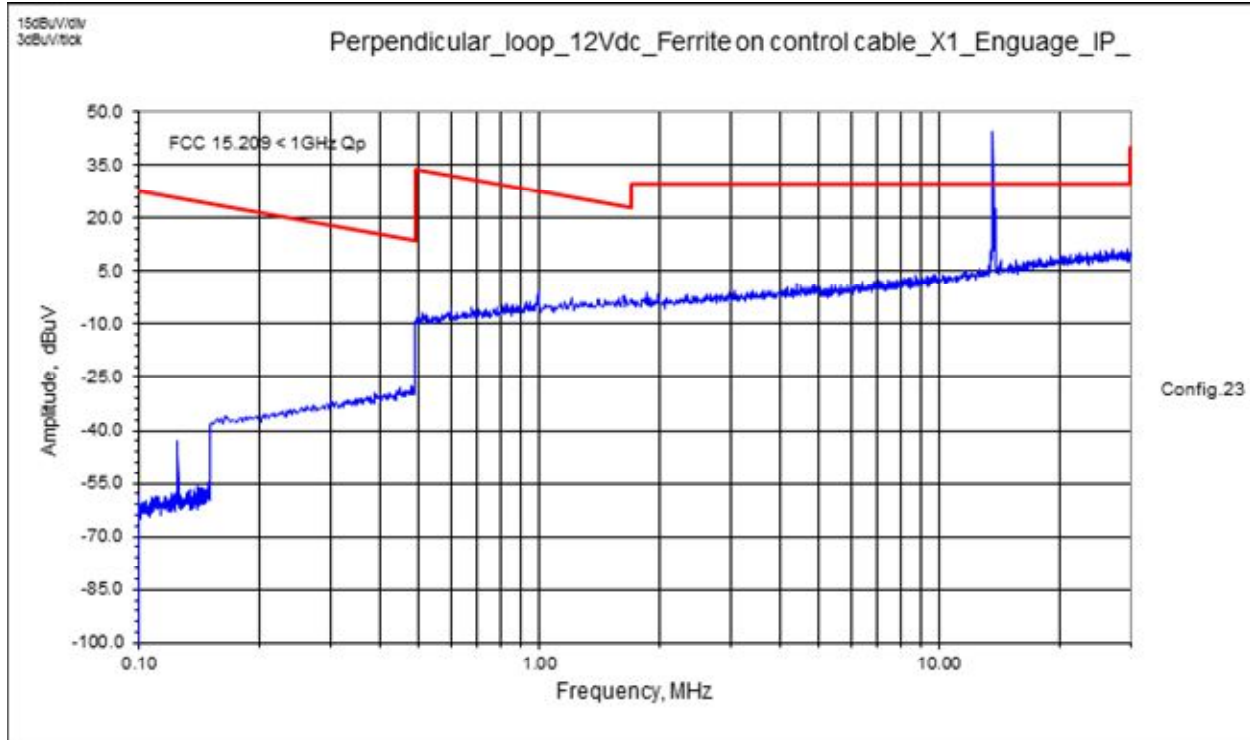
4.6 Plots:

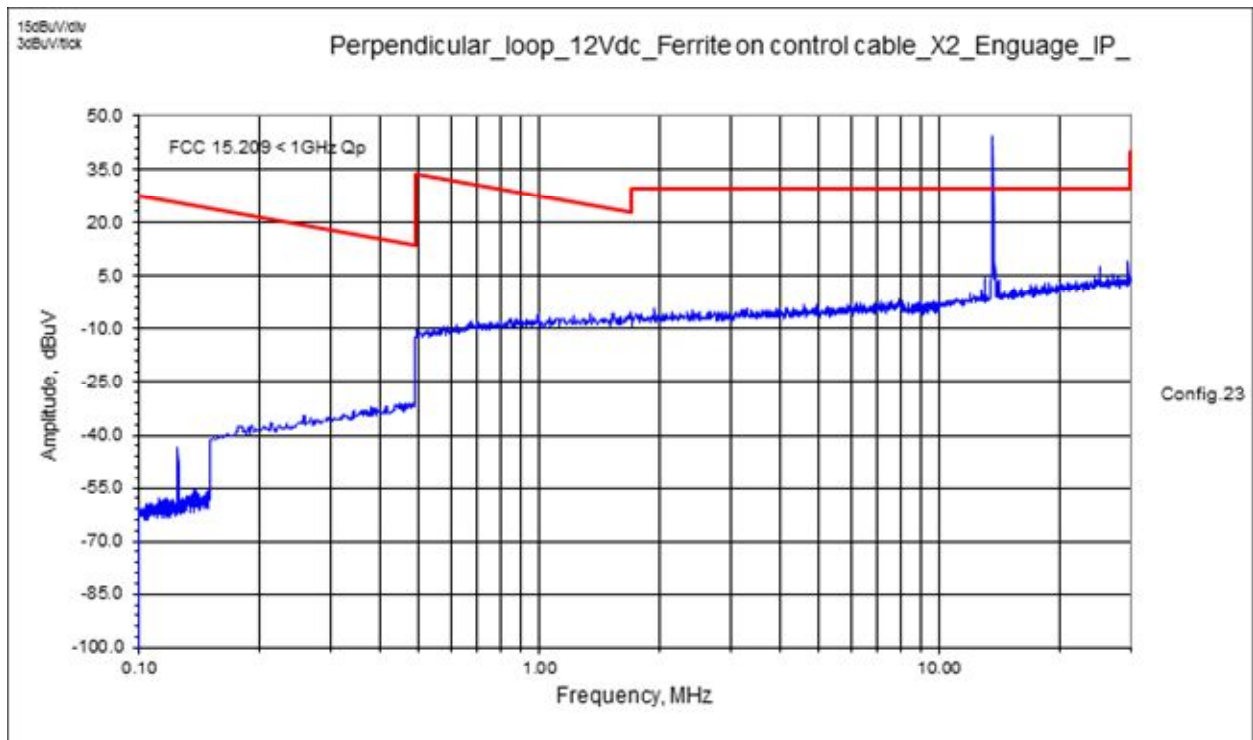
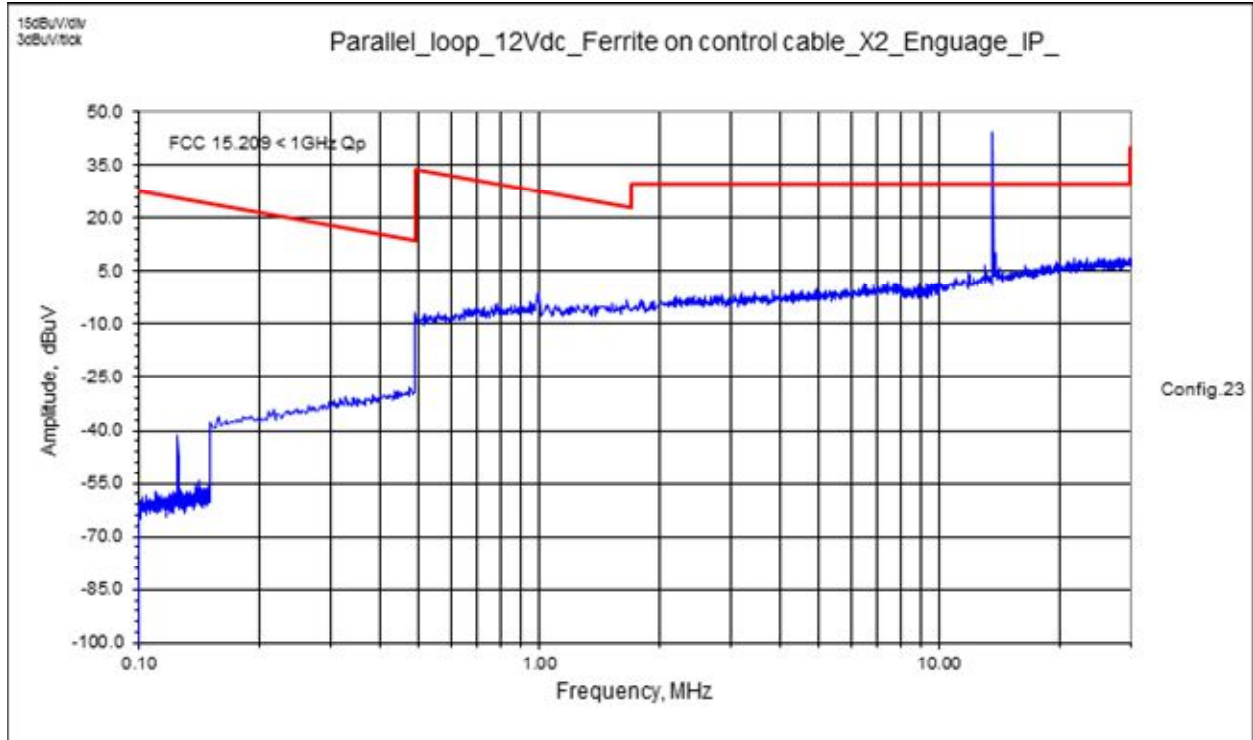


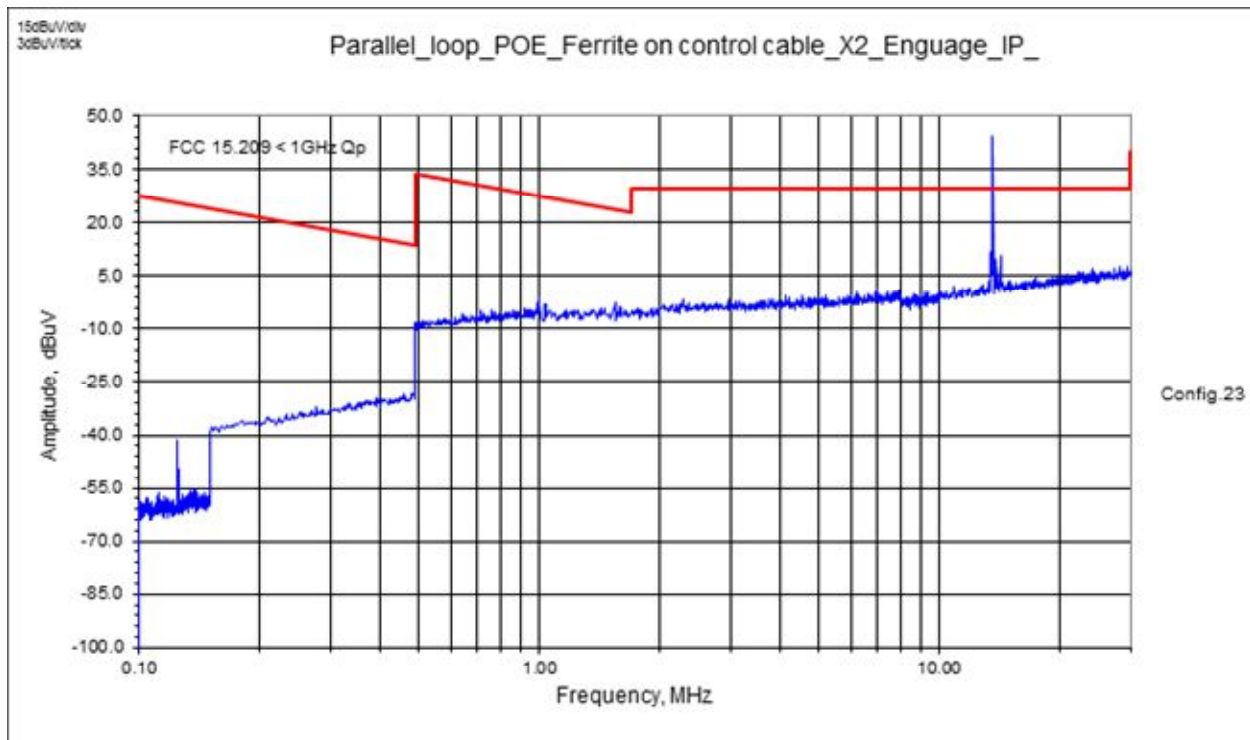
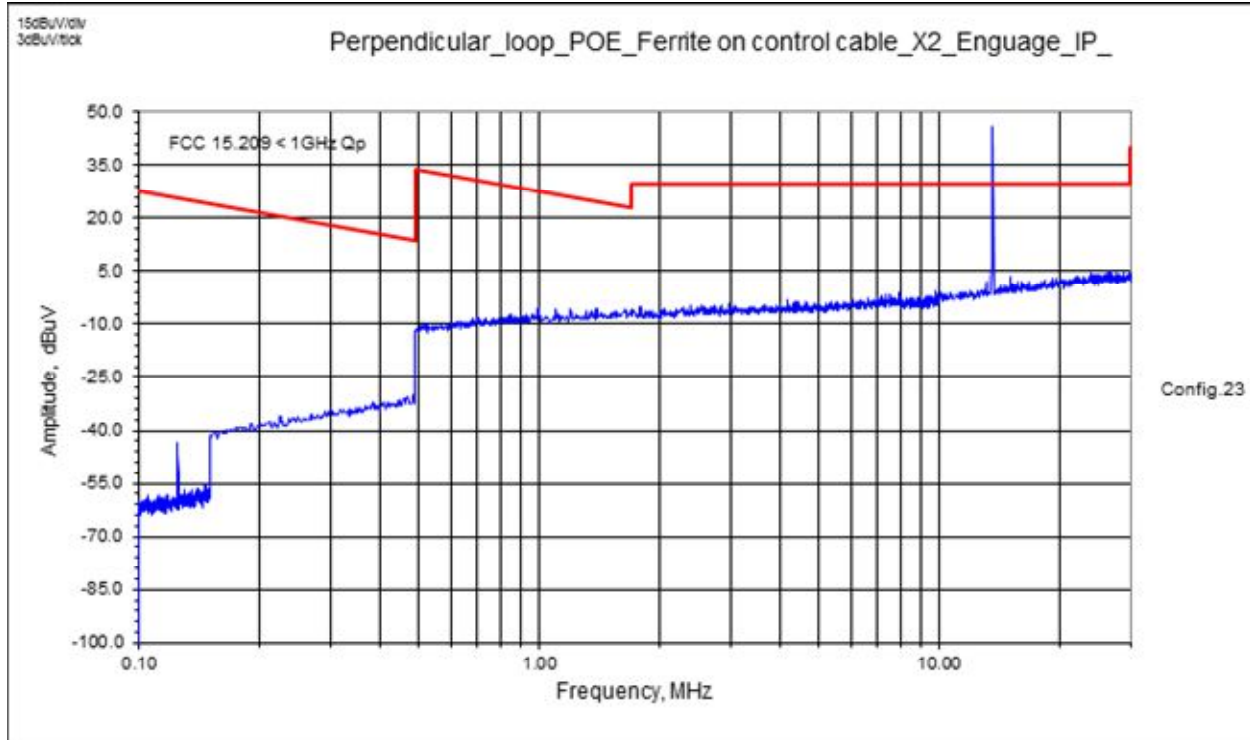


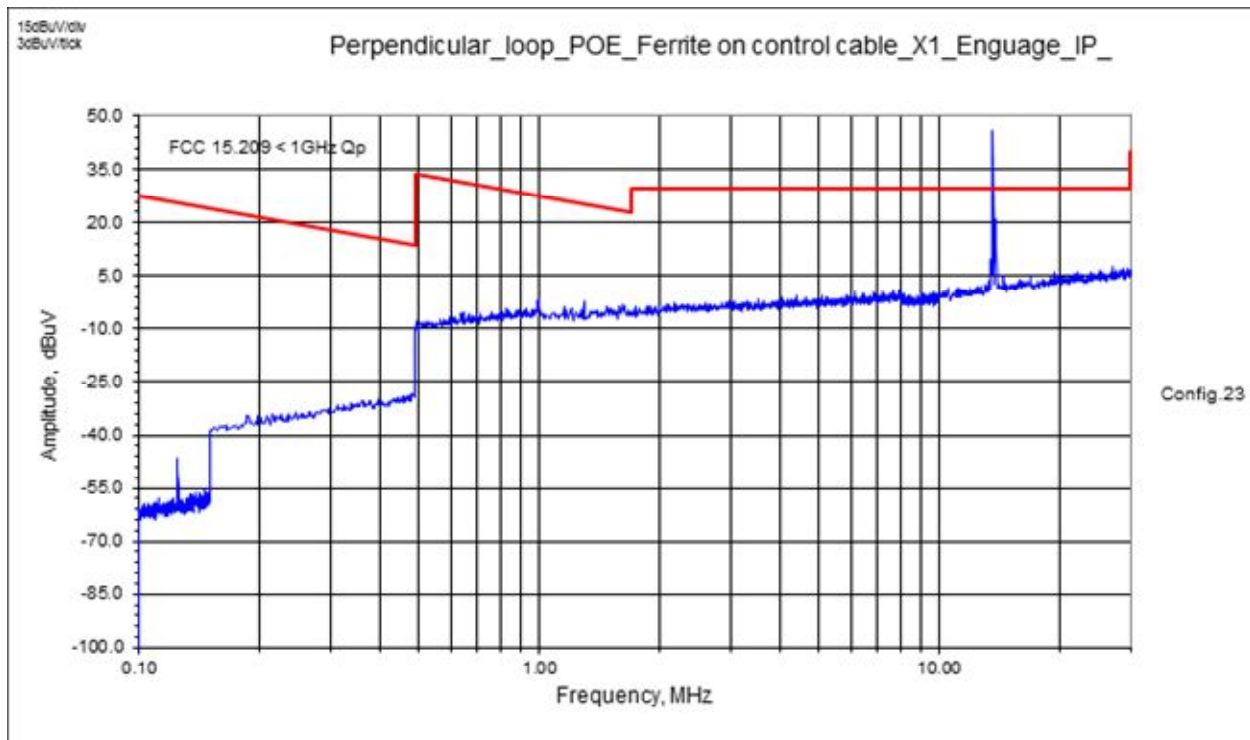
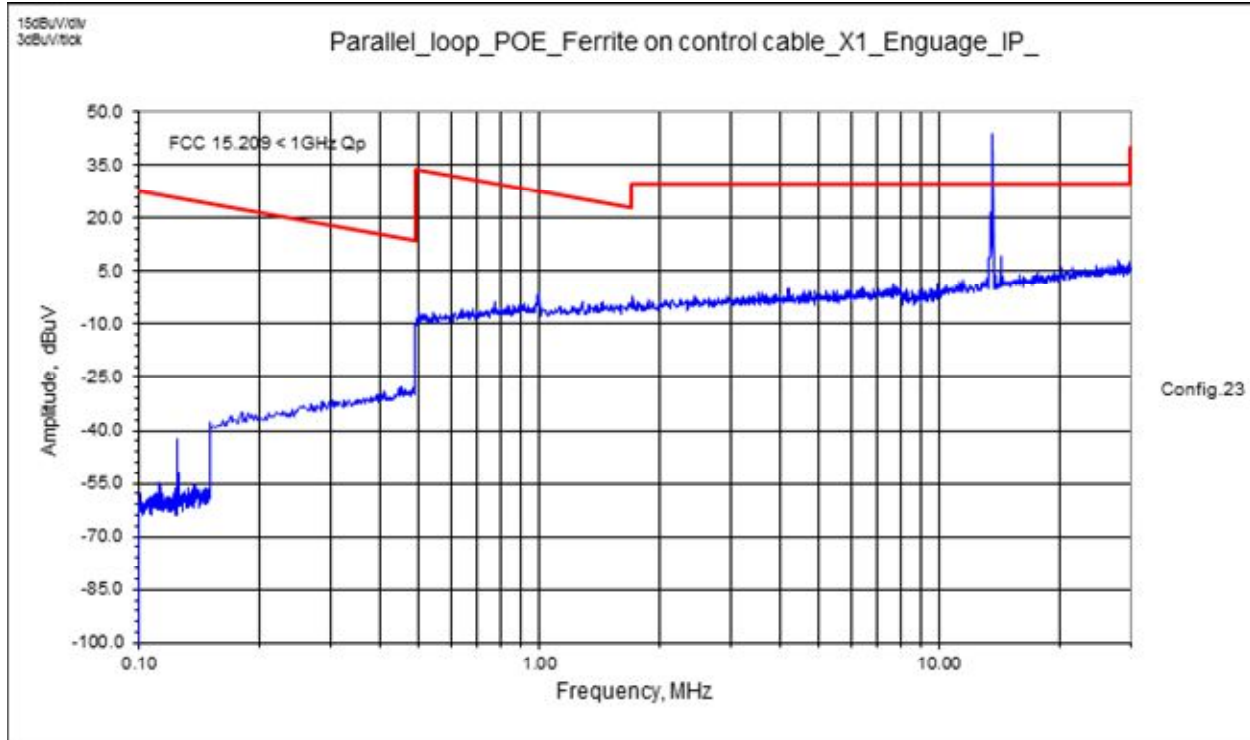












5 Tx Voltage Variation – FCC 15.31**5.1 Method**

Unless otherwise stated no deviations were made from FCC 15.31.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Testing with-in this section utilized the general measurement and setup considerations of ANSI C63.4 section 5.13. All measurements were made with an antenna to product test distance of 3m.

5.2 Test Equipment Used:

<u>Asset</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	HP	5	5/19/2015	5/19/2016
19937	Bilog Antenna 30MHz - 6GHz	Sunol Sciences	JB6	A050707-2	4/10/2015	4/10/2016
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	12/19/2015	12/19/2016
CC1-E2	Radiated Cable	Teledyne	90-206-300; PN:F-130-S1S1-100; 90-206-072;	E2-A; 5026702002; E2-C; E2-D	11/17/2015	11/17/2016
18897	Magnetic loop	EMCO	6502	9205-2738	11/12/2015	11/12/2016
LAB-012	Wireless BP, Tem and Humidity sensor	Omega	zED-BTH	0070368	9/01/2015	9/1/2016

5.3 Test Results:

The sample tested was found to Comply.

5.4 Test Data:

Tx Voltage Variation

Test Report #:	G102429676	Test Area:	CC1 Radiated		Temperature:	21.1	°C
Test Method:	FCC 15.209/ IC RSS-210	Test Date:	1/11/2016		Relative Humidity:	11.0	%
EUT Model #:	RC-03-ALLE-K	EUT Power:	POE, 12Vdc		Air Pressure:	835.7	kPa
EUT Serial #:	Test 1						
Manufacturer:	Isonas				Level Key		
EUT Description:	RC-03 Raven Reader Controller				Pk – Peak		
Notes:					Qp – Quasi Peak		
					Av - Average		

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	Delta2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)			(MHz)
Product 12VDC Option													
Voltage Nominal – 12VDC													
0.1249	30.93	Pk	0.04	10.28	0.00	0.00	41.25	H	1	0.0	N/A	N/A	.009
Minus 15% of Nominal - 10.2VDC													
0.1249	31.61	Pk	0.04	10.28	0.00	0.00	41.93	H	1	0.0	N/A	N/A	.009
Plus 15% of Nominal 13.8VDC													
0.1249	30.98	Pk	0.04	10.28	0.00	0.00	41.3	H	1	199.0	N/A	N/A	.009
Voltage Nominal – 12VDC													
13.560	52.9	Pk	0.33	10.67	0.00	0.00	63.9	H	1	0.0	N/A	N/A	.009
Minus 15% of Nominal - 10.2VDC													
13.560	52.83	Pk	0.33	10.67	0.00	0.00	63.83	H	1	0.0	N/A	N/A	.009
Plus 15% of Nominal 13.8VDC													
13.560	52.93	Pk	0.33	10.67	0.00	0.00	63.93	H	1	0.0	N/A	N/A	.009

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Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	Delta2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)			(MHz)
Product POE Option													
Voltage Nominal – 48 VDC													
0.1251	32.43	Pk	0.04	10.27	0.00	0.00	42.74	H	1.00	0.0	N/A	N/A	.009
Minus 15% of Nominal – 40.8 VDC													
0.1251	32.34	Pk	0.04	10.27	0.00	0.00	42.65	H	1.00	360.0	N/A	N/A	.009
Plus 15% of Nominal 55.2 VDC													
0.1251	32.39	Pk	0.04	10.27	0.00	0.00	42.70	H	1.00	0.0	N/A	N/A	.009
Voltage Nominal – 48 VDC													
13.5599	53.62	Pk	0.33	10.67	0.00	0.00	64.62	H	1.00	360.0	N/A	N/A	.009
Minus 15% of Nominal – 40.8 VDC													
13.5603	54.47	Pk	0.33	10.67	0.00	0.00	65.47	H	1.00	149.0	N/A	N/A	.009
Plus 15% of Nominal 55.2 VDC													
13.5603	53.52	Pk	0.33	10.67	0.00	0.00	64.52	H	1.00	0.0	N/A	N/A	.009

6 Radiated Tx Intentional Emissions – Fundamental & Harmonics of the Fundamental

6.1 Method:

Unless otherwise stated no deviations were made from FCC 15.209/ IC RSS-210.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Testing with-in this section utilized the standard test methods of ANSI C63.4 sections 6.4 and 6.5. All measurements were made with an antenna to product test distance of 3m. Near field correction were made for frequencies below 30MHz, refer to ANSIC63.10-2013, section 6.4.4 for detail.

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	HP	5	5/19/2015	5/19/2016
19937	Bilog Antenna 30MHz - 6GHz	Sunol Sciences	JB6	A050707-2	4/10/2015	4/10/2016
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	12/19/2015	12/19/2016
CC1-E2	Radiated Cable	Teledyne	90-206-300; PN:F-130-S1S1-100; 90-206-072;	E2-A; 5026702 002; E2-C; E2-D	11/17/2015	11/17/2016
18897	Magnetic loop	EMCO	6502	9205-2738	11/12/2015	11/12/2016
LAB-012	Wireless BP, Tem and Humidity sensor	Omega	zED-BTH	0070368	9/01/2015	9/1/2016

6.3 Test Results:

The sample tested was found to Comply

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where

FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

$$NF = \text{Net Reading in dB}\mu\text{V}$$

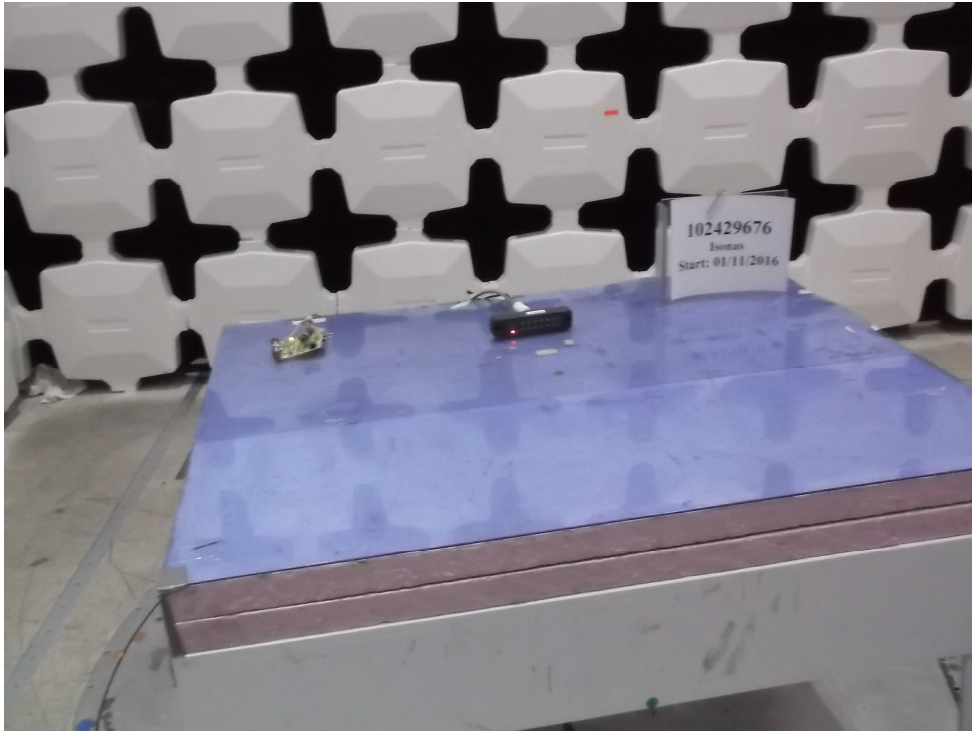
Intertek	
Report Number: 102429676DEN-001	Issued: 1/27/2016

Example:

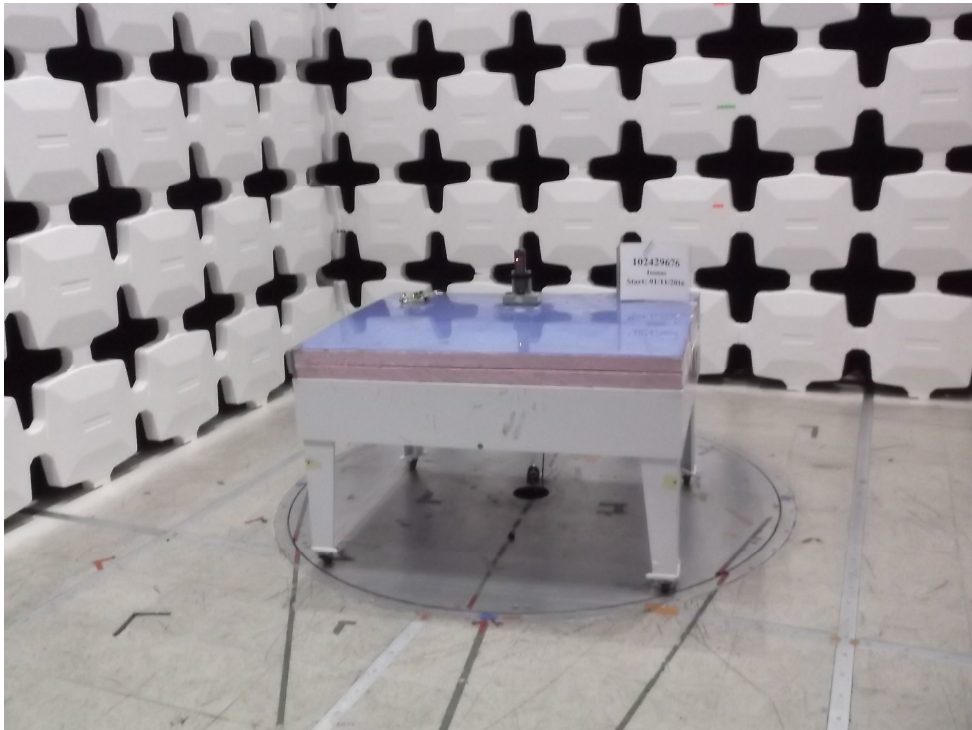
$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}_{\mu V} / 20)} = 39.8 \text{ } \mu V/m$$

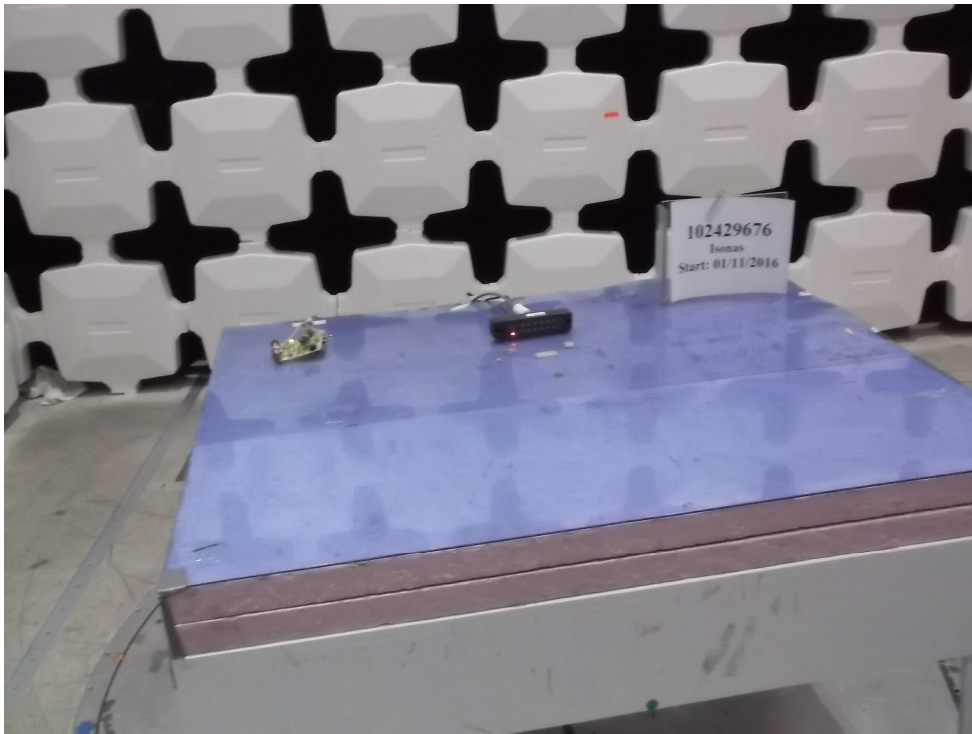
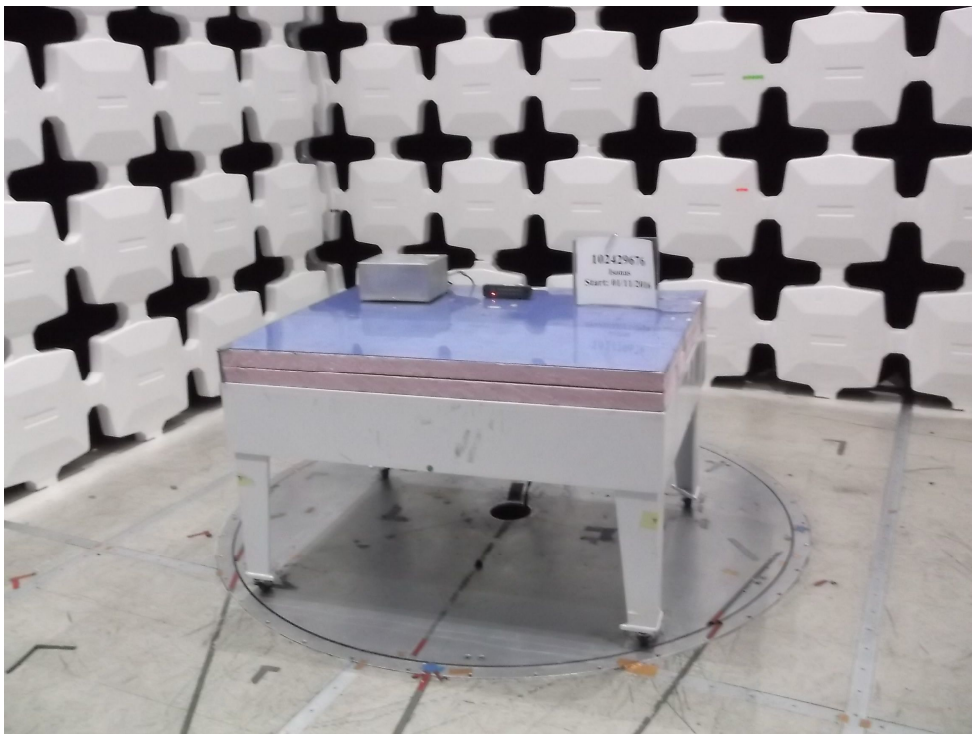
6.4 Setup Photographs:

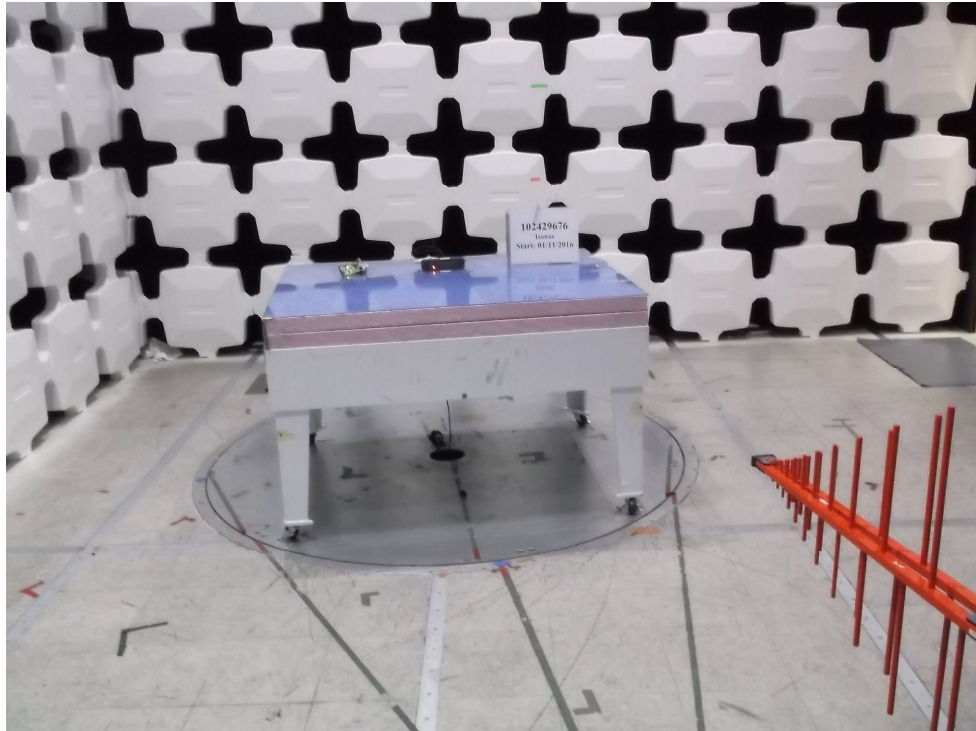
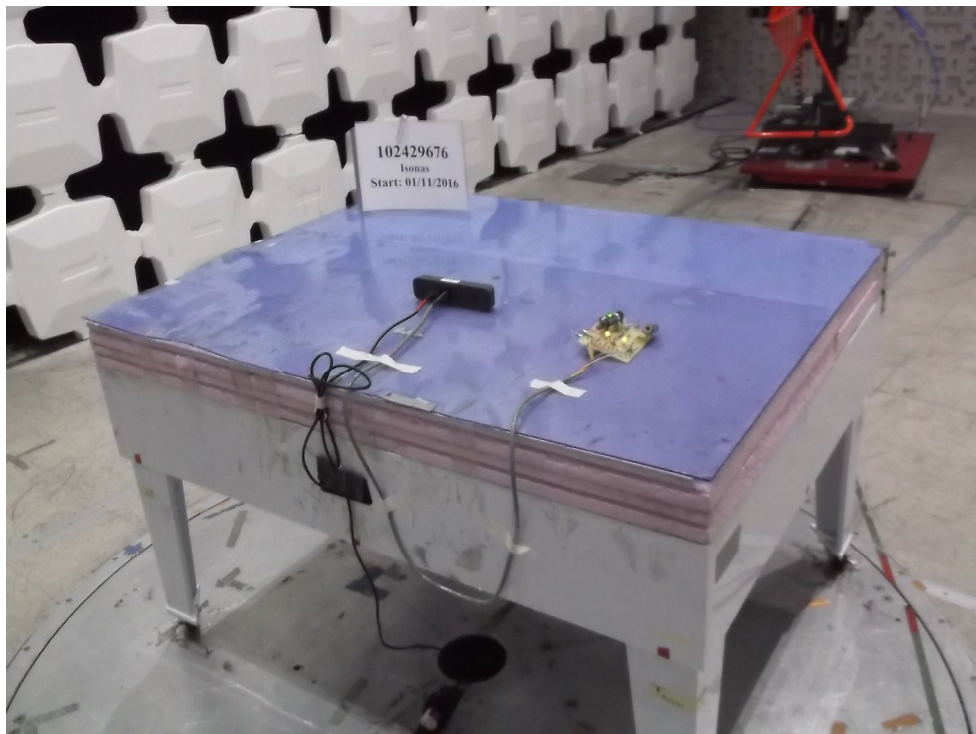


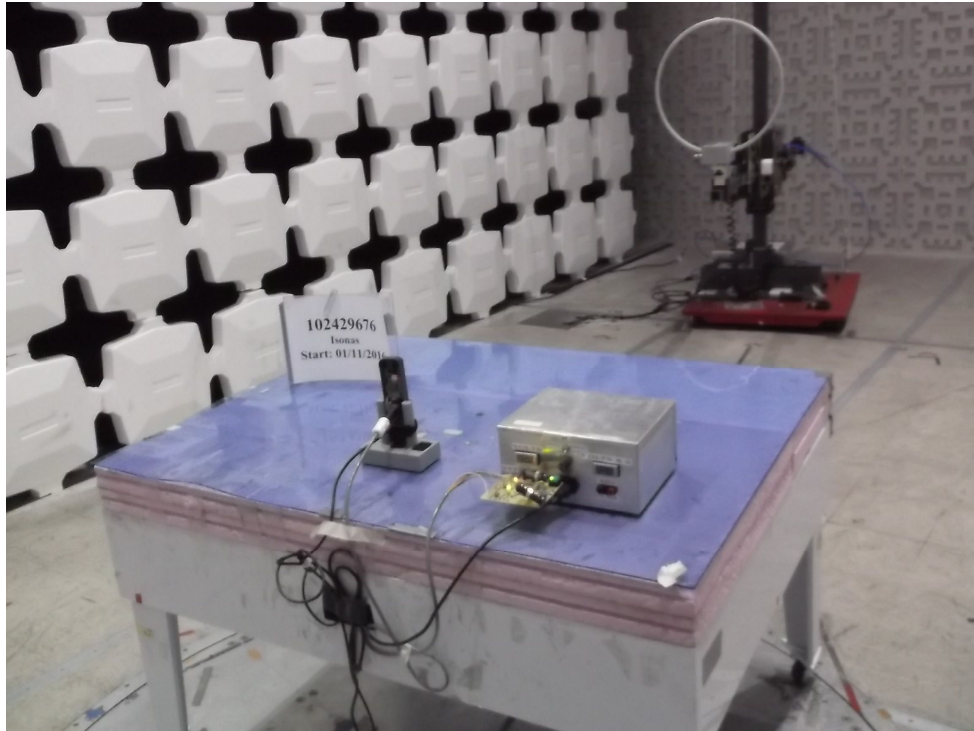
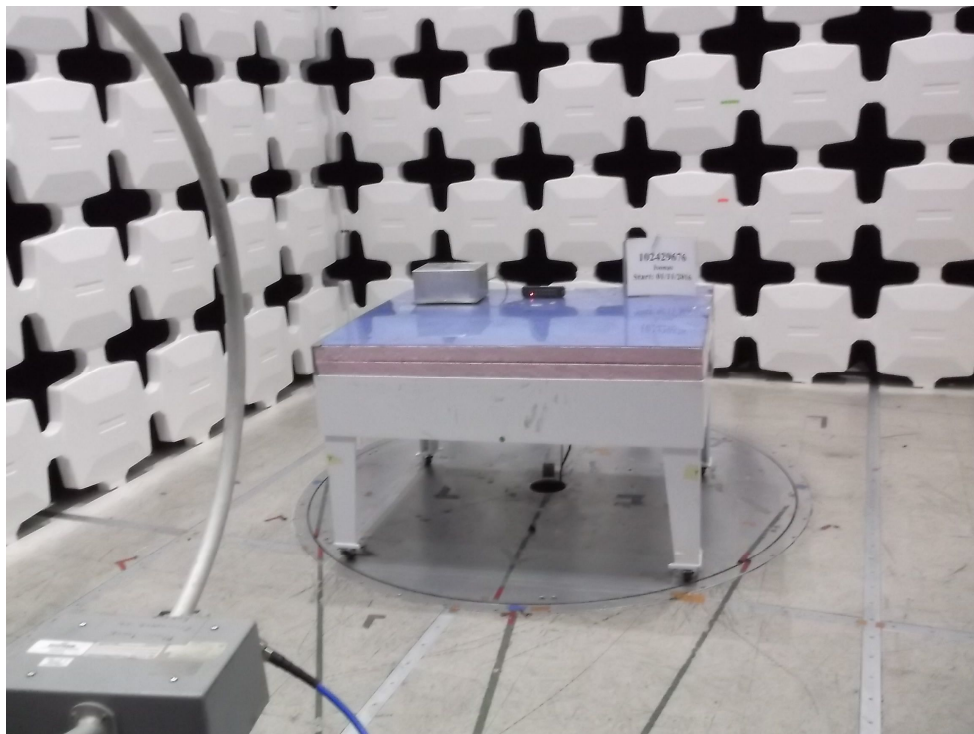
Test Setup – Axis 1

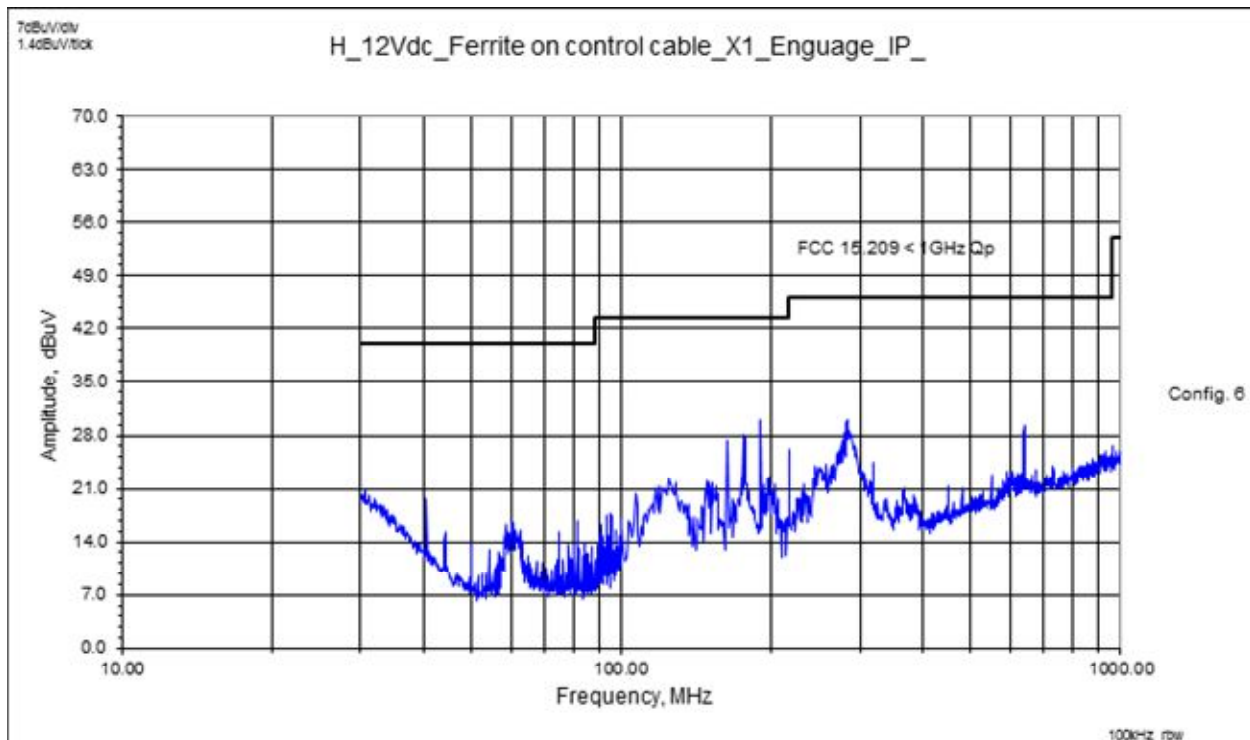
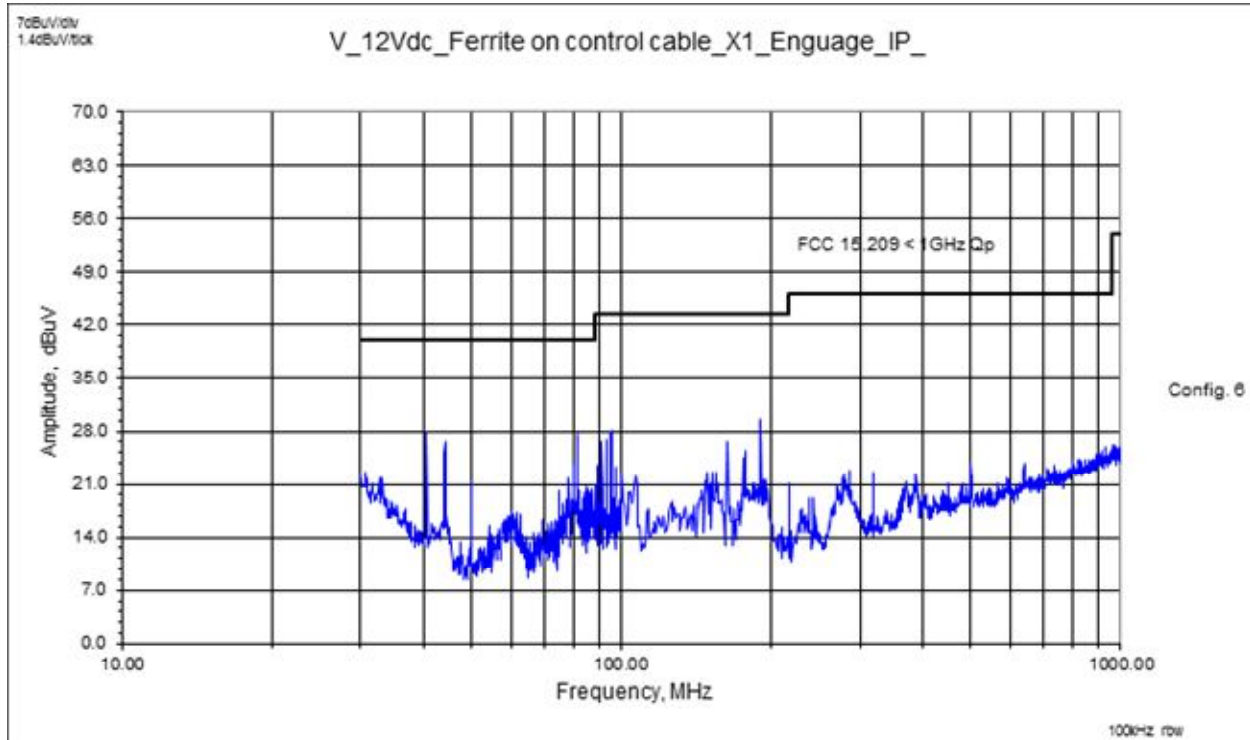


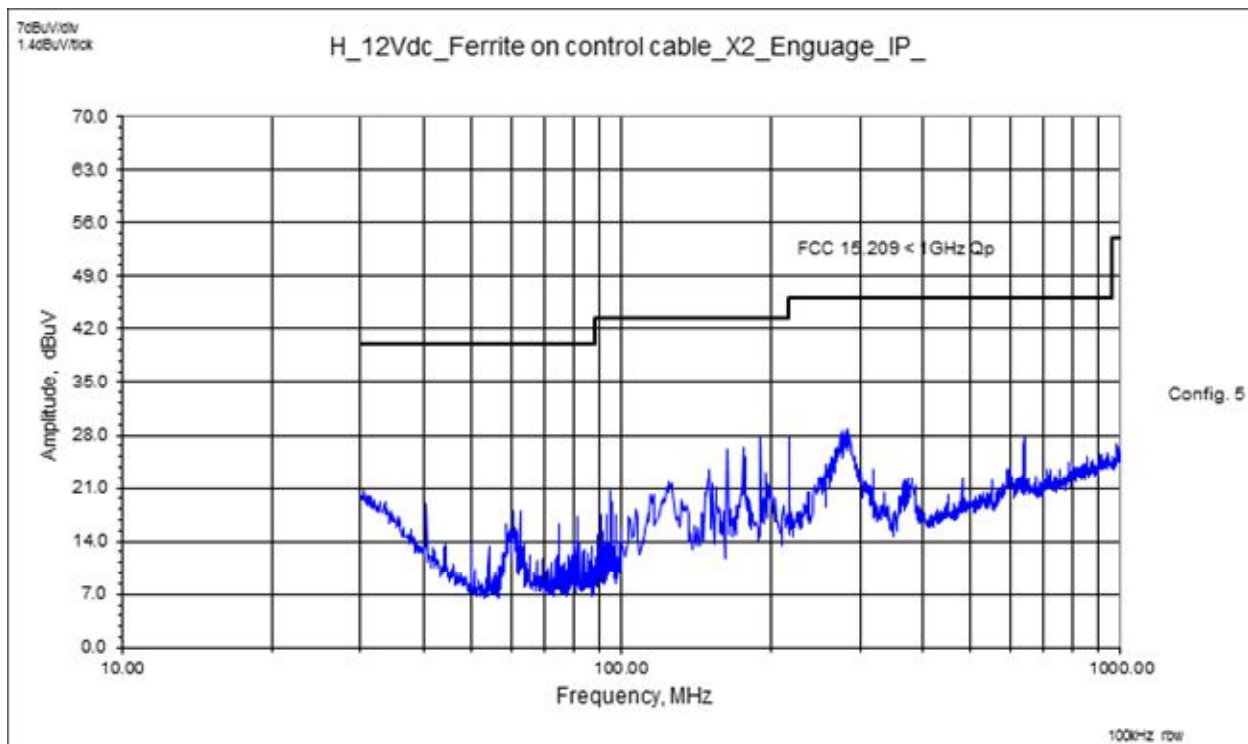
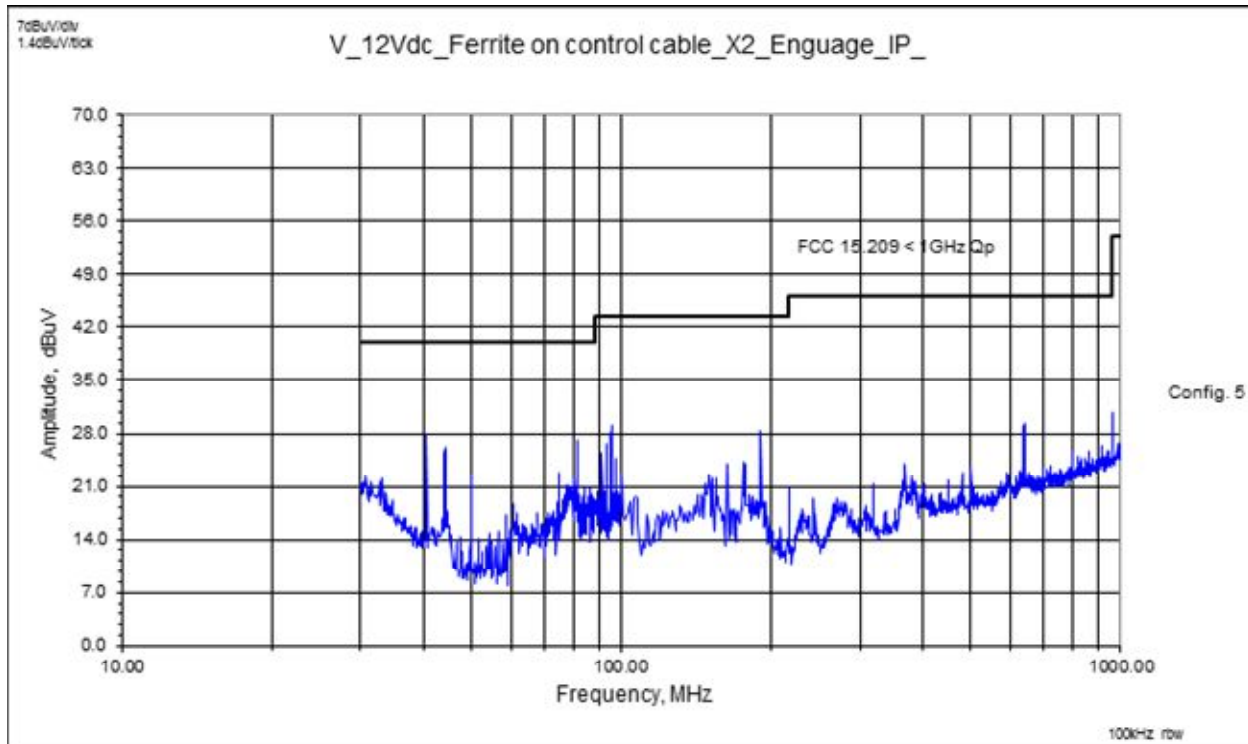
Test Setup – Axis 2

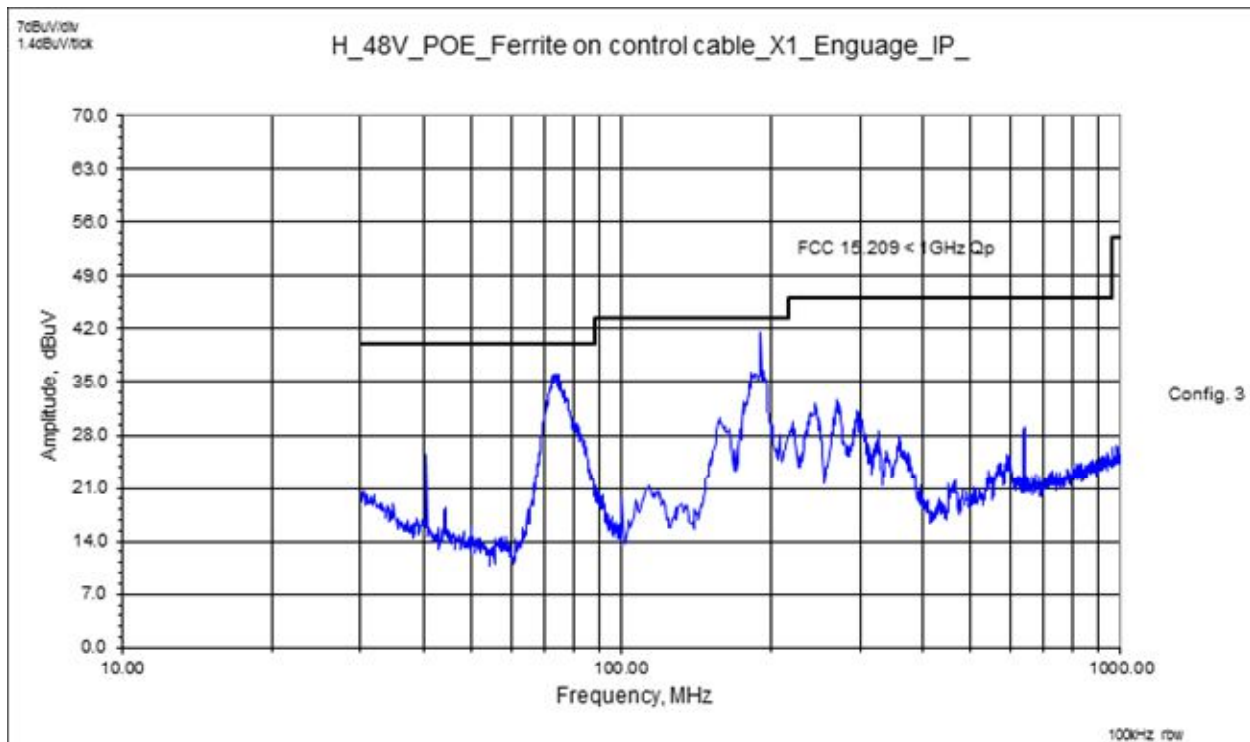
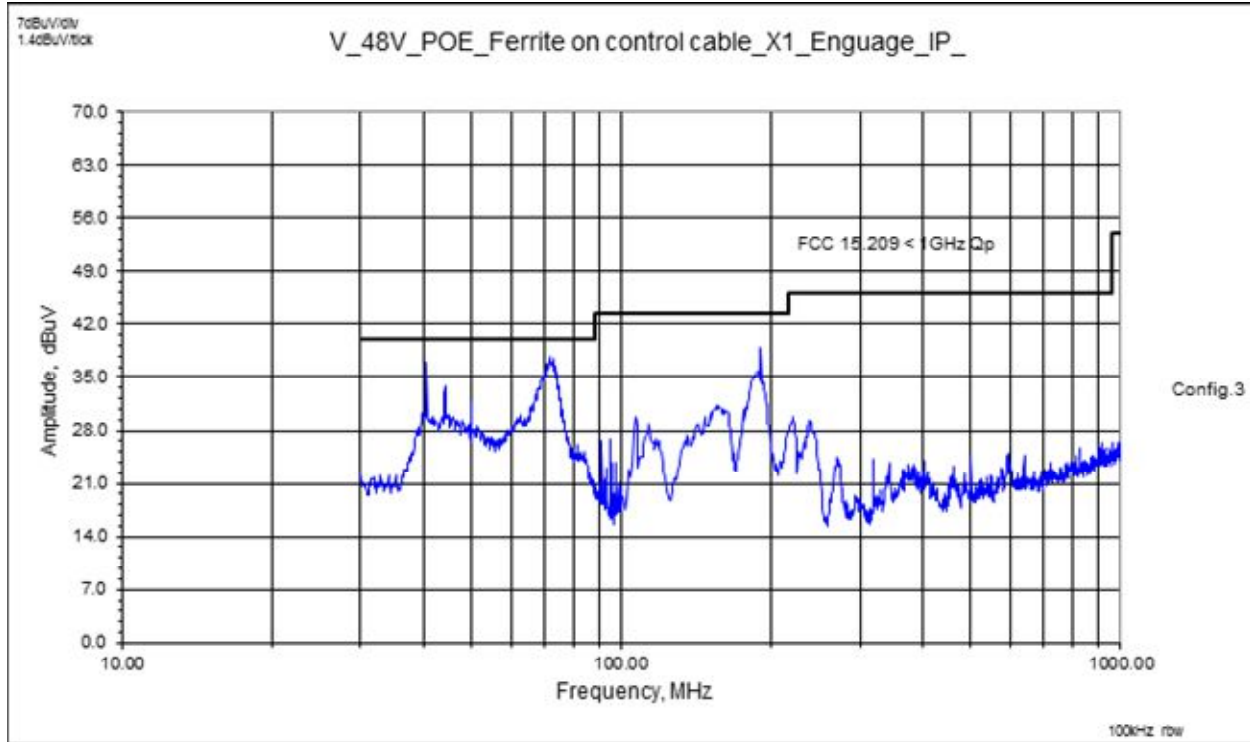
**Test Setup – POE****Test Setup – DC Power**

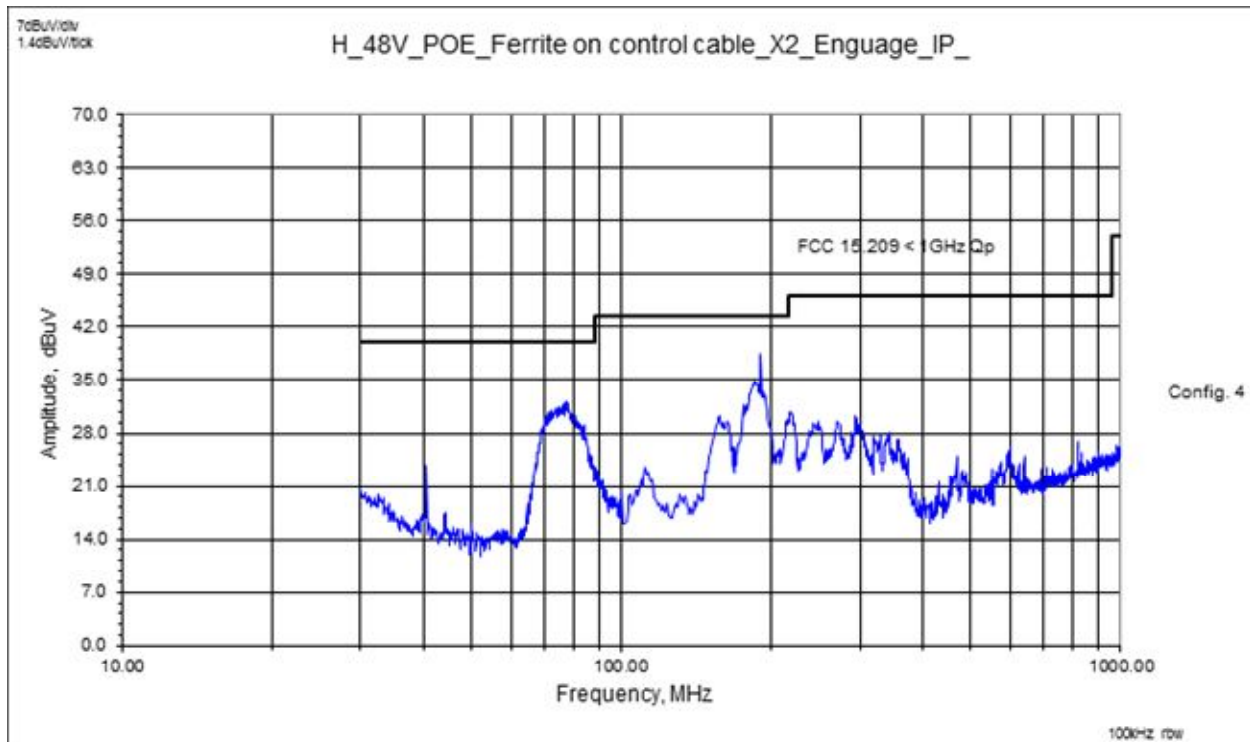
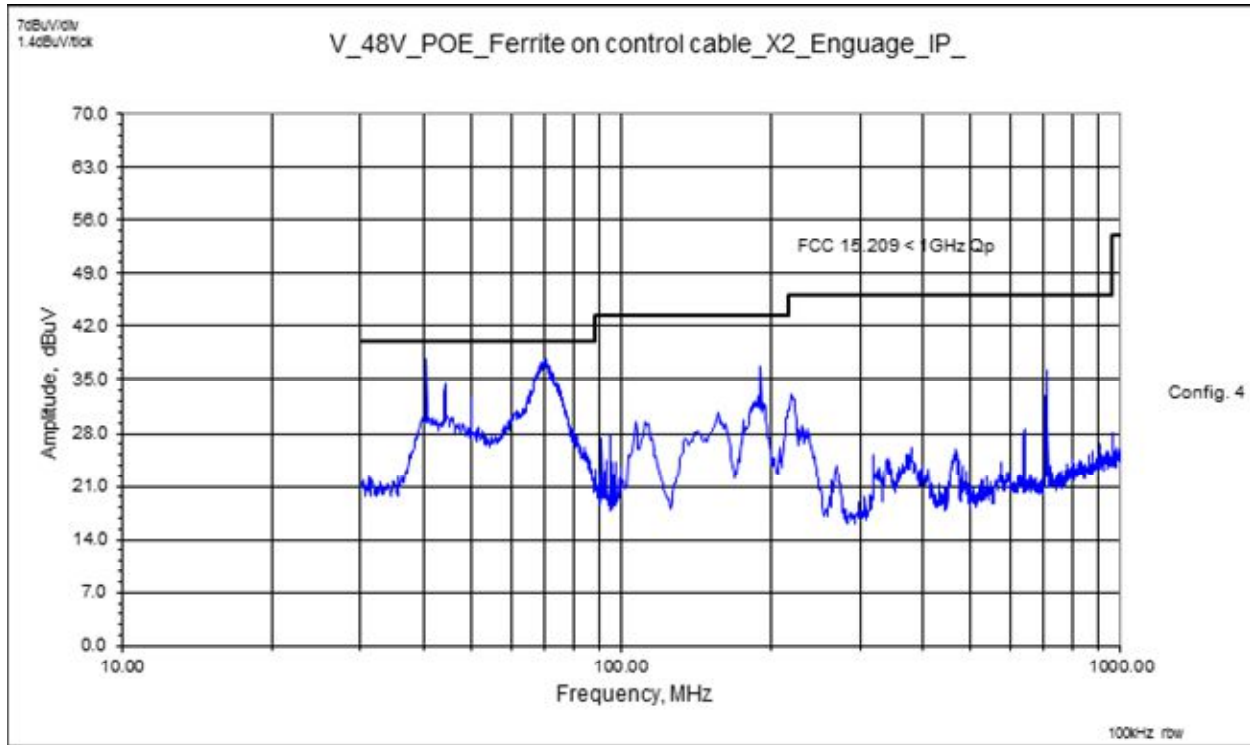
**Test Setup – Front (30MHz – 1GHz)****Test Setup – Rear (30MHz – 1GHz)**

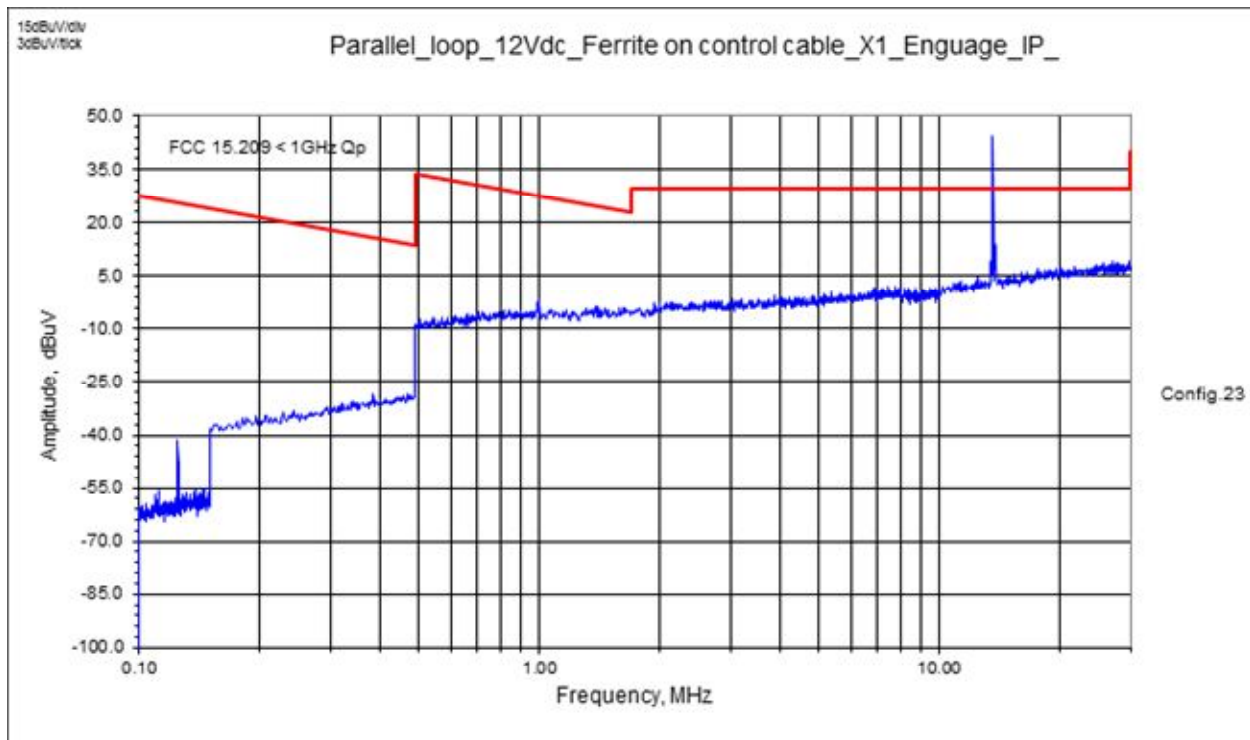
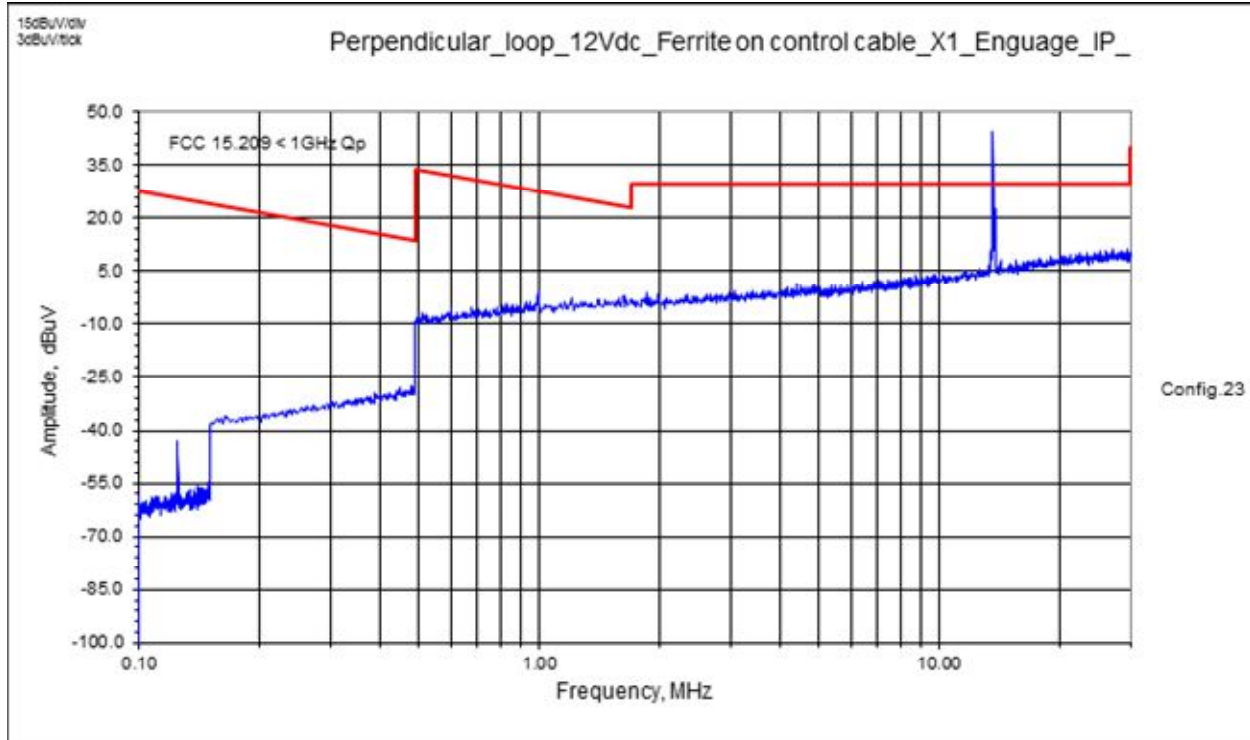
**Test Setup – Rear (9kHz – 30MHz)****Test Setup – Front (9kHz – 30MHz)**

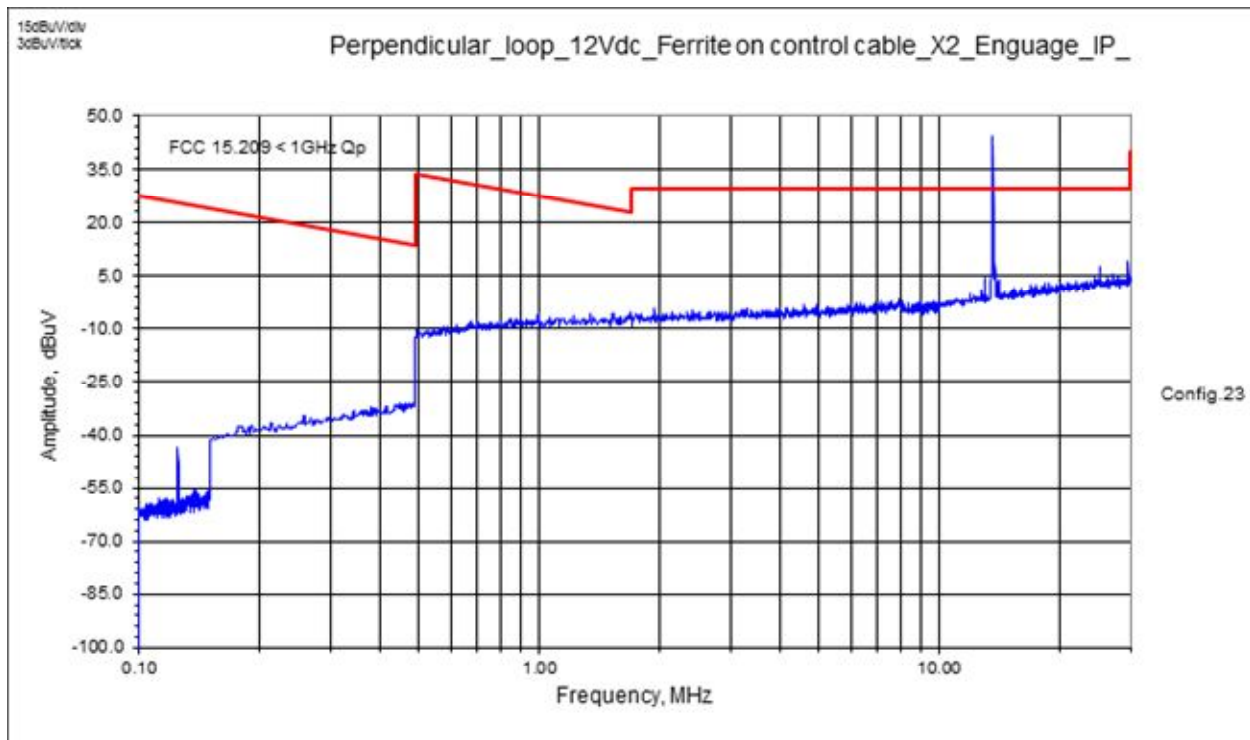
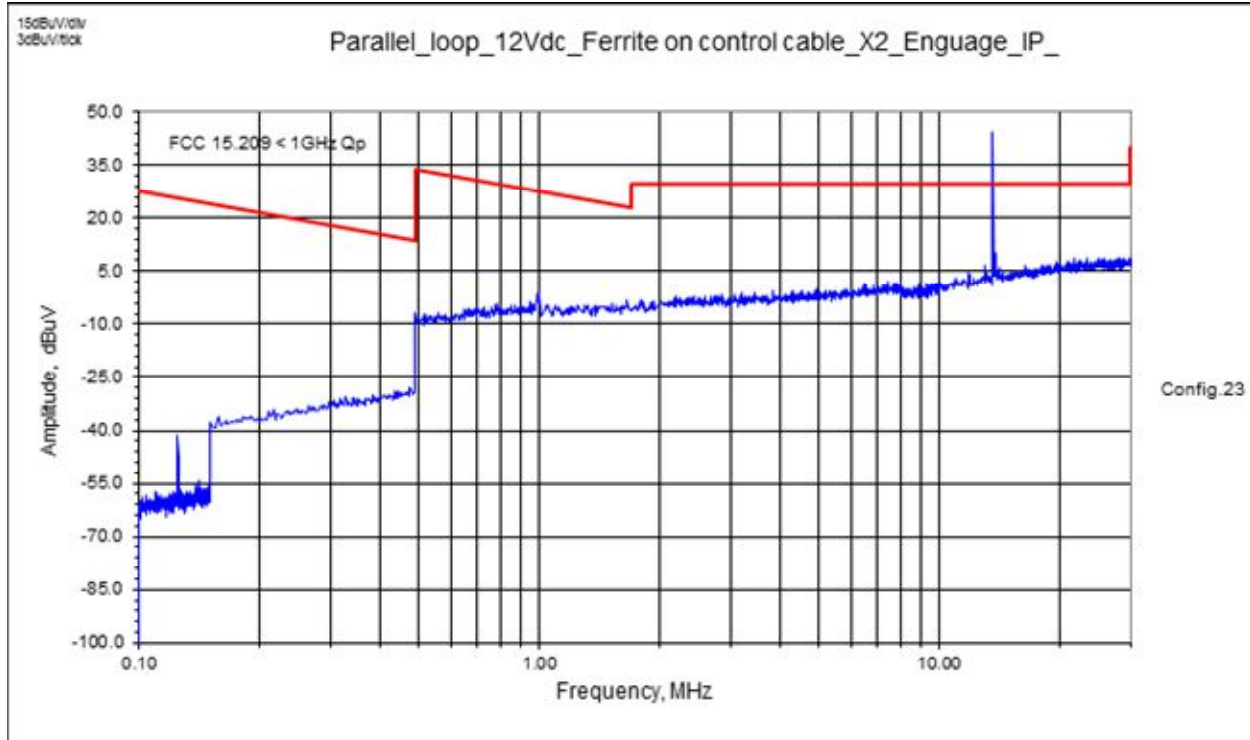
6.5 Plots:

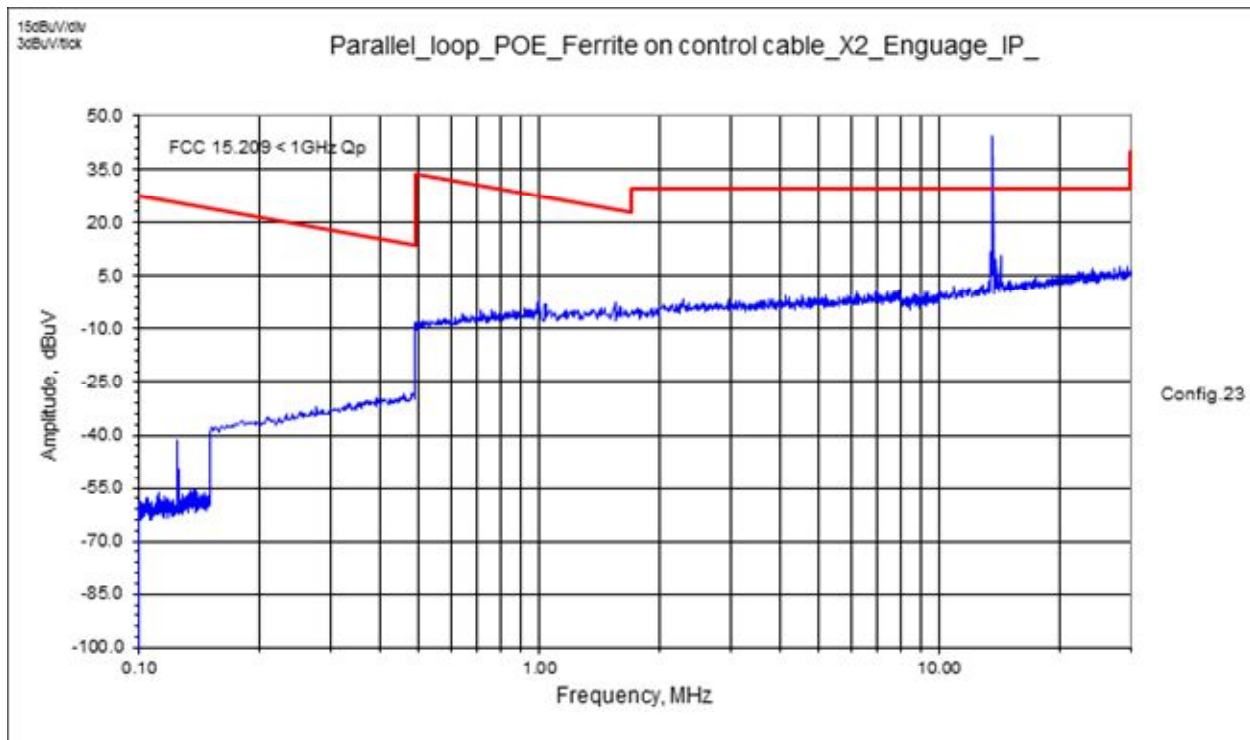
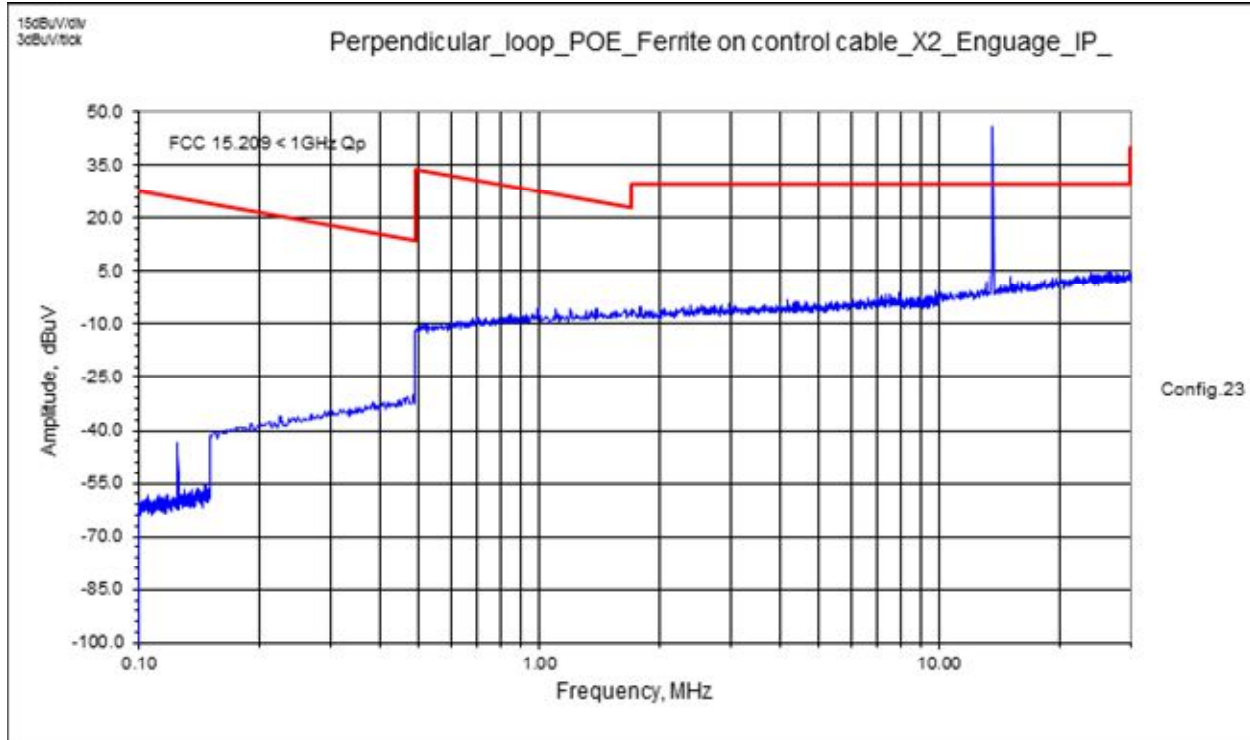


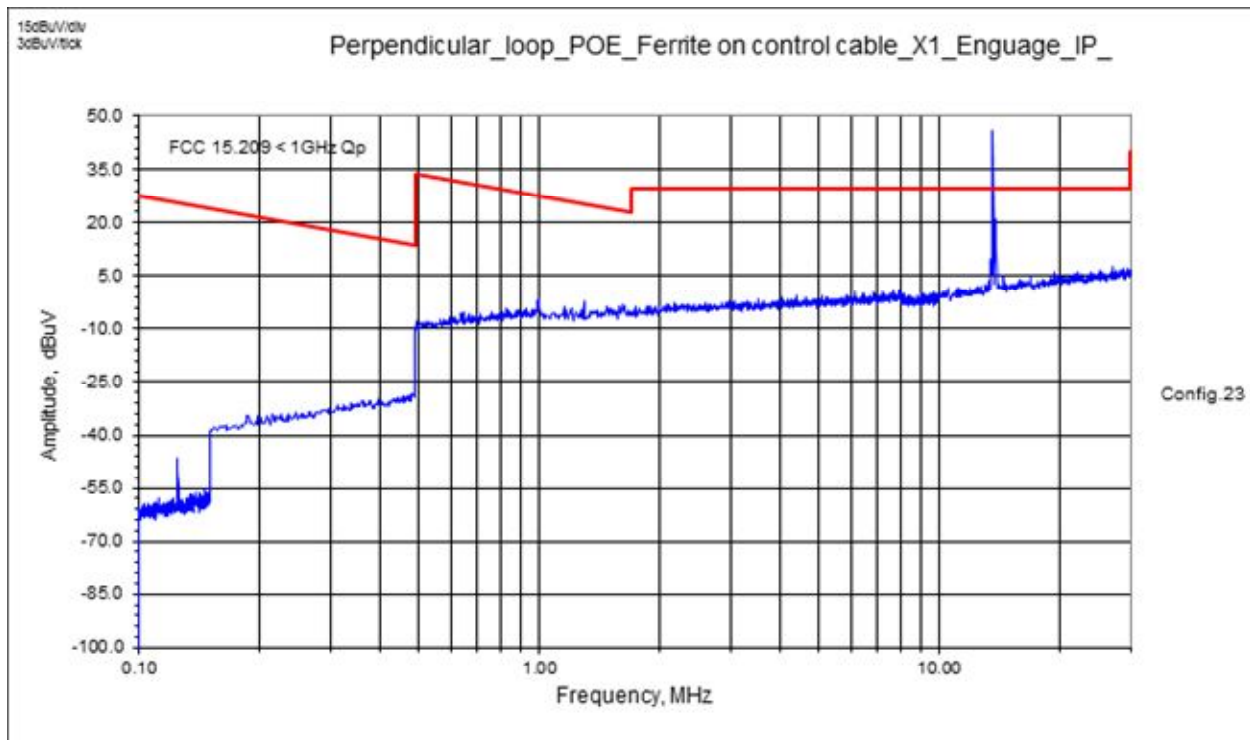
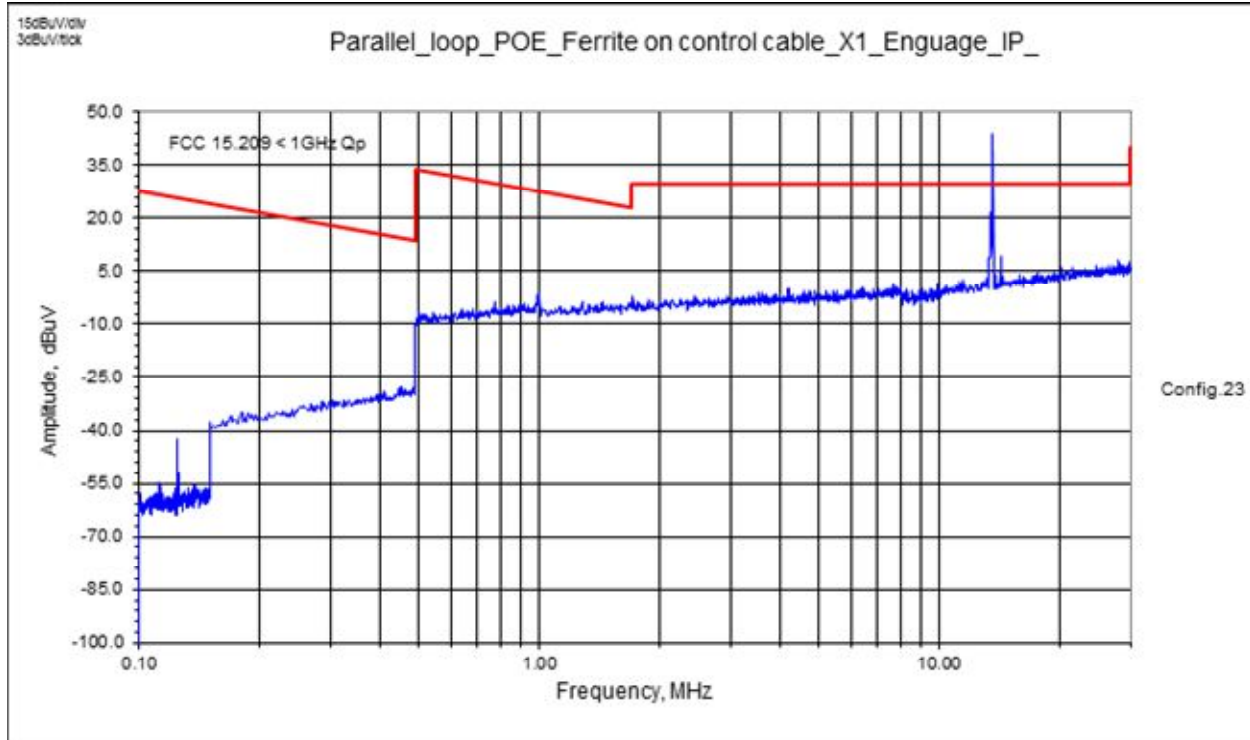


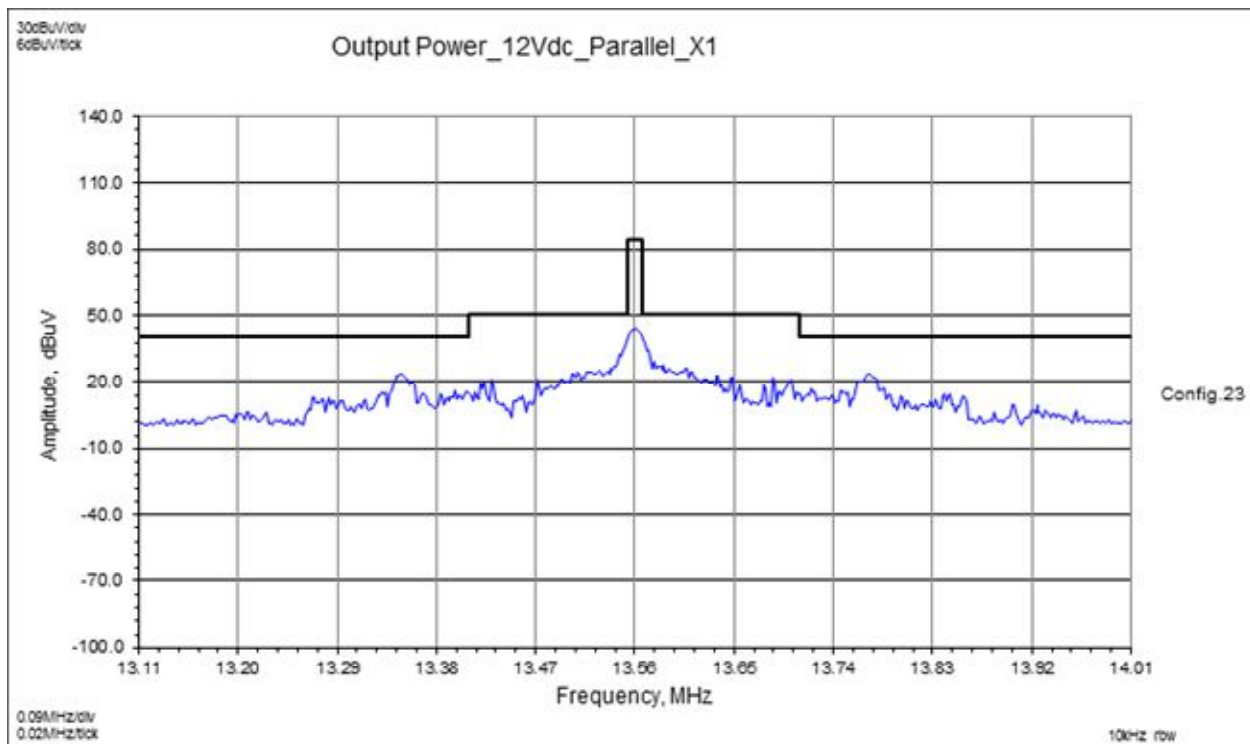
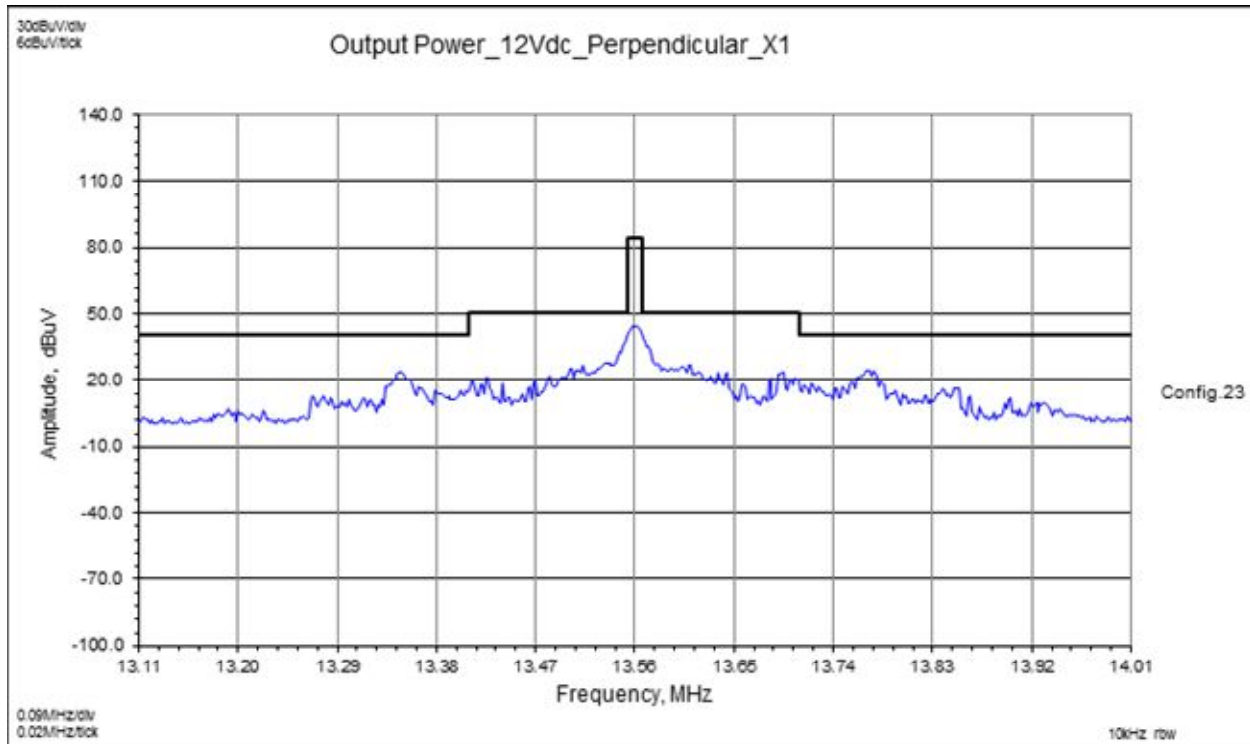


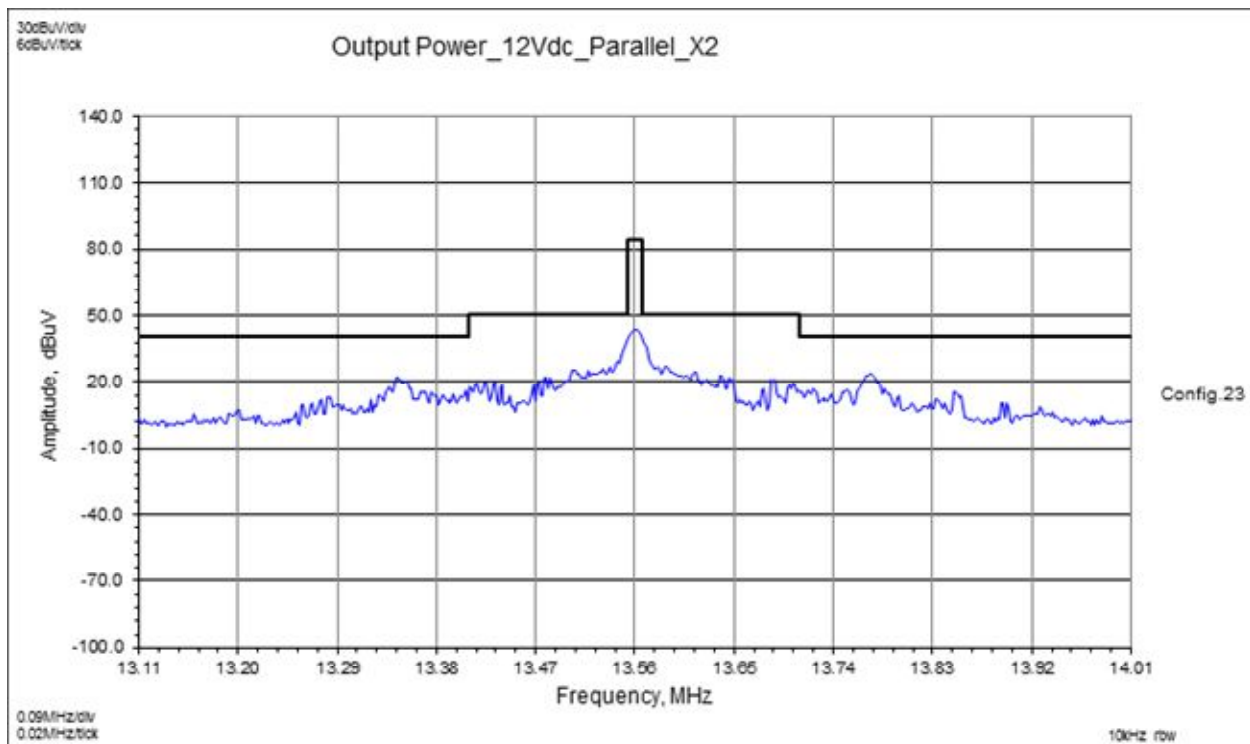
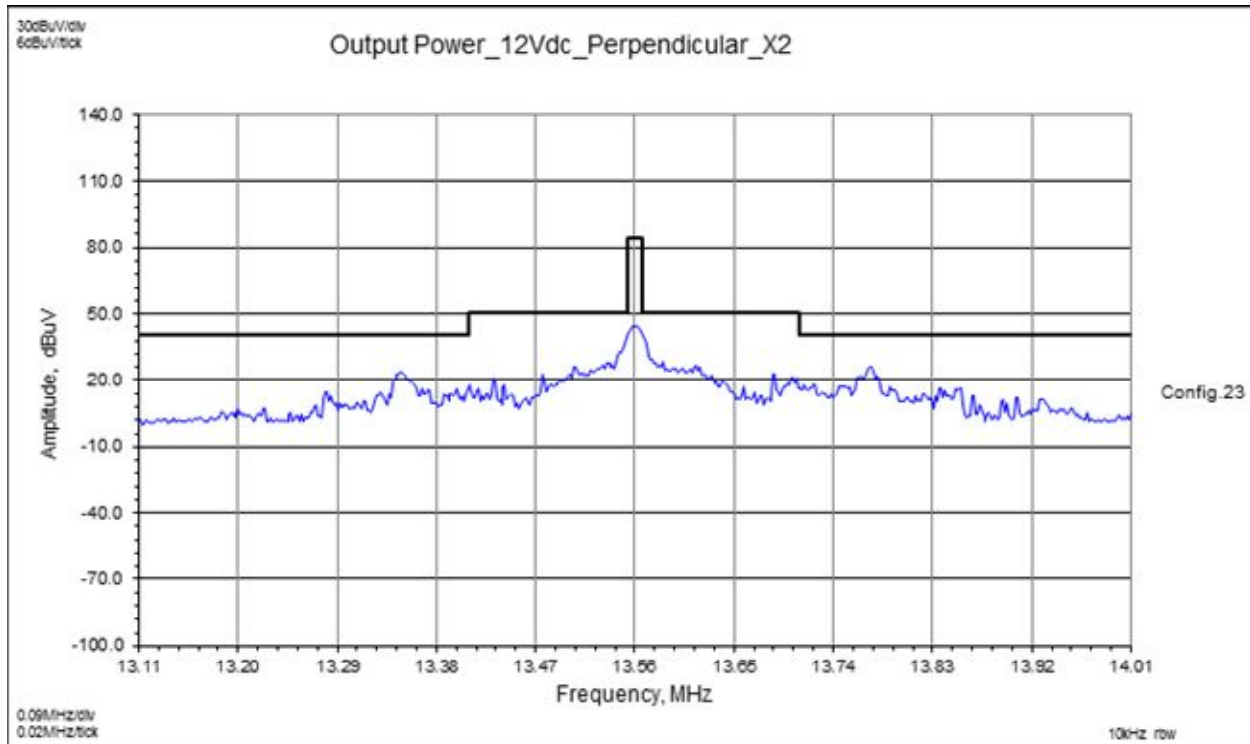


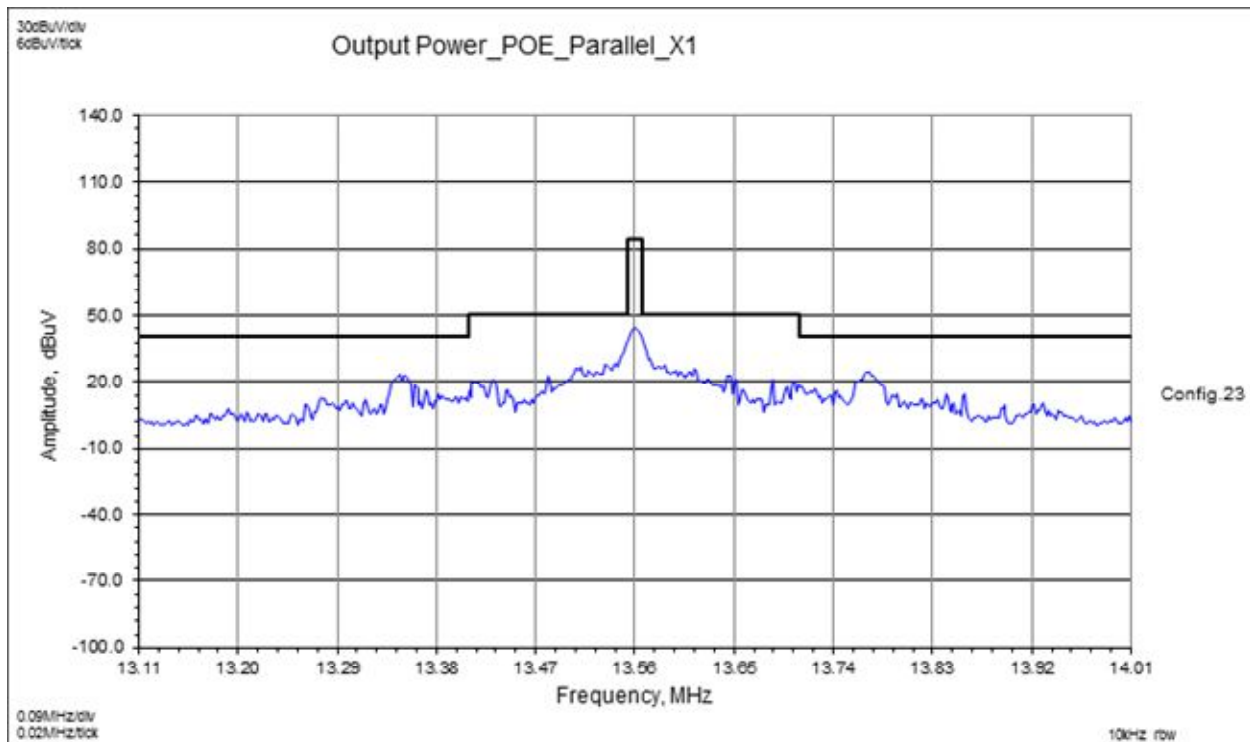
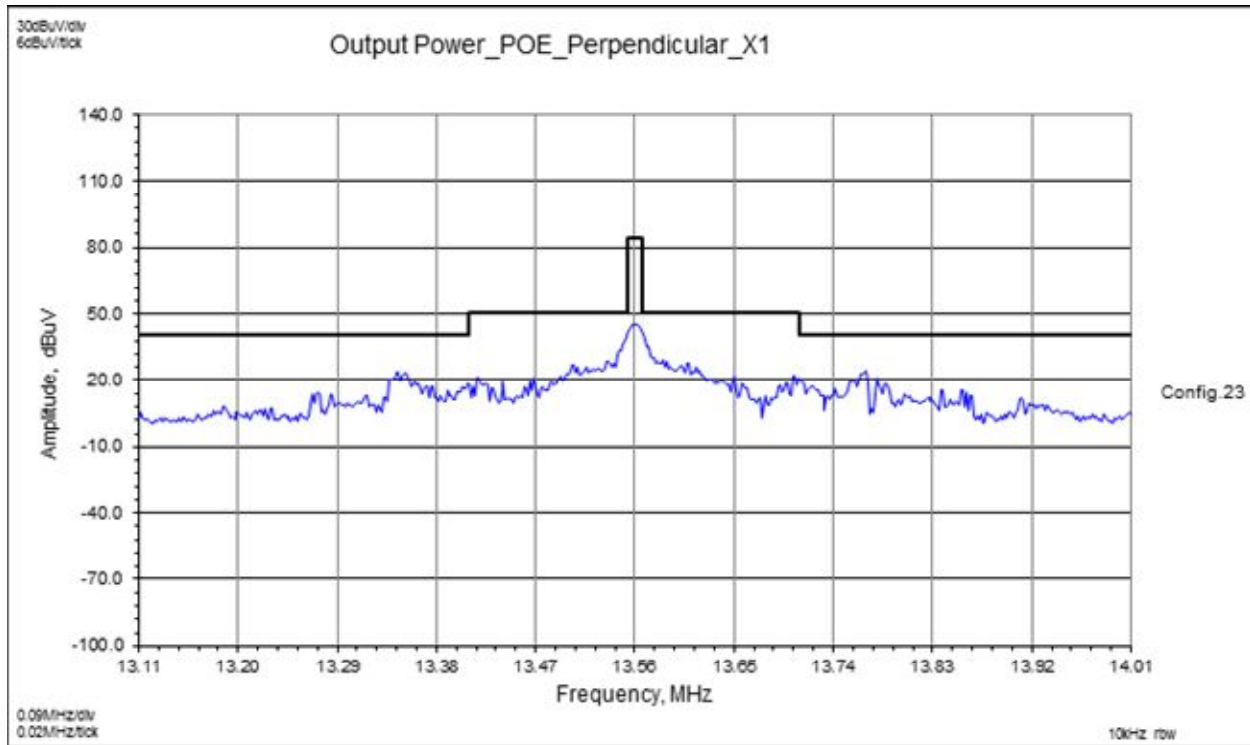


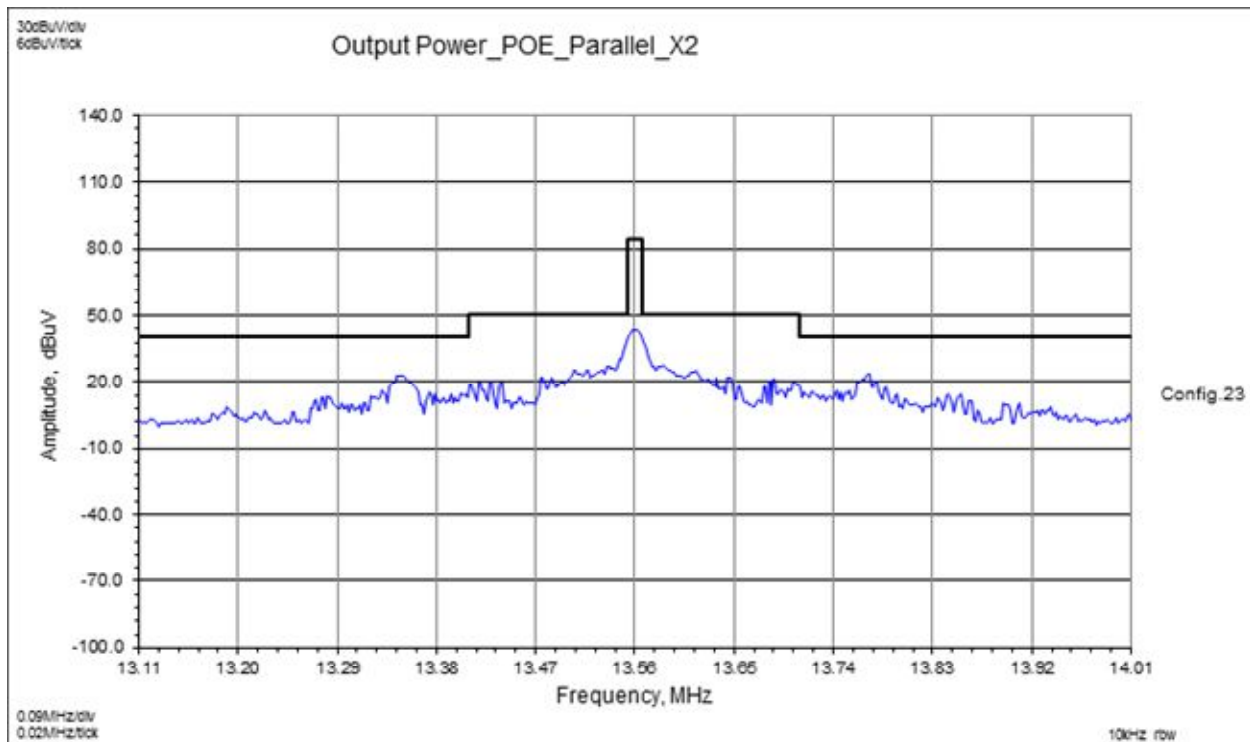
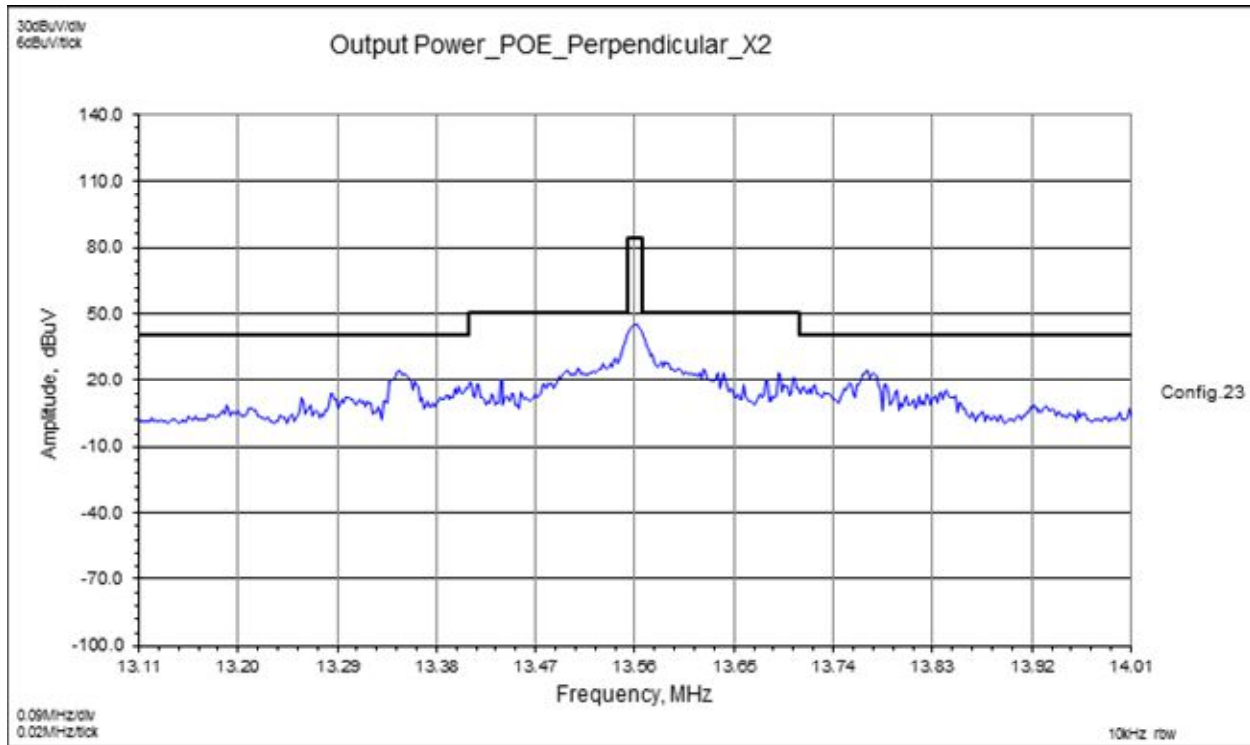












Intertek	
Report Number: 102429676DEN-001	Issued: 1/27/2016

6.6 Test Data: Radiated Emissions Axis 1 – Horizontal (Product Flat on Table)

Radiated Electromagnetic Emissions

Test Report #:	G102429676	Test Area:	CC1 Radiated	Temperature:	21.1	°C
Test Method:	FCC 15.209/ IC RSS-210	Test Date:	1/11/2016	Relative Humidity:	11.0	%
EUT Model #:	RC-03-ALLE-K	EUT Power:	POE, 12Vdc	Air Pressure:	835.7	kPa
EUT Serial #:	Test 1					
Manufacturer:	Isonas			Level Key		
EUT Description:	RC-03 Raven Reader Controller			Pk – Peak		
Notes:				Qp – Quasi Peak		
				Av - Average		

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA1		RBW
MHz	dBuV	Qp Av Pk Rms	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209	Limit	(MHz)
Fundamental Measurements													
POE_Parallel_X1													
13.558	27.02	Qp	0.33	10.67	0	0	38.03	H	1	0	-45.97	84	0.009
0.1251	-34.11	Qp	0.04	10.27	0	0	-23.79	H	1	0	-49.39	25.6	0.0002
POE_Perpendicular_X1													
13.5609	29.22	Qp	0.33	10.67	0	0	40.22	H	1	0	-43.78	84	0.009
0.1251	-57.39	Qp	0.04	10.27	0	0	-47.07	H	1	0	-72.67	25.6	0.0002
POE_Perpendicular_X2													
13.5609	28.78	Qp	0.33	10.67	0	0	39.78	H	1	0	-44.22	84	0.009
0.1251	-36.37	Qp	0.04	10.27	0	0	-26.05	H	1	0	-51.65	25.6	0.0002
POE_Parallel_X2													
13.5609	27.77	Qp	0.33	10.67	0	0	38.77	H	1	0	-45.23	84	0.009
0.1251	-52.75	Qp	0.04	10.27	0	0	-42.43	H	1	0	-68.03	25.6	0.0002
12Vdc_Parallel_X2													
13.5609	27.34	Qp	0.33	10.67	0	0	38.34	H	1	0	-45.66	84	0.009
0.1252	-32.74	Qp	0.04	10.27	0	0	-22.42	H	1	0	-48.02	25.6	0.0002
12Vdc_Perpendicular_X2													
13.5609	28.4	Qp	0.33	10.67	0	0	39.4	H	1	0	-44.6	84	0.009
0.1252	-56.11	Qp	0.04	10.27	0	0	-45.79	H	1	0	-71.39	25.6	0.0002
12Vdc_Perpendicular_X1													
13.5609	28.24	Qp	0.33	10.67	0	0	39.24	H	1	0	-44.76	84	0.009
0.1252	-36.34	Qp	0.04	10.27	0	0	-26.02	H	1	0	-51.62	25.6	0.0002
12Vdc_Parallel_X1													
13.5609	27.75	Qp	0.33	10.67	0	0	38.75	H	1	0	-45.25	84	0.009
0.1252	-52.97	Qp	0.04	10.27	0	0	-42.65	H	1	0	-68.25	25.6	0.0002

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FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA1	RBW
MHz	dBuV	Qp Av Pk Rms	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 < 1GHz Qp	(MHz)
Harmonics Measurements												
V_48V_POE_Ferrite on control cable_					Enguage_IP_							
40.6811	50.18	Qp	0.57	13.19	28.02	0.00	35.92	V	1.00	261.0	- 4.08	0.120
44.2420	49.17	Qp	0.59	10.95	28.01	0.00	32.71	V	1.00	264.6	- 7.29	0.120
73.0769	53.86	Qp	0.76	8.40	27.91	0.00	35.12	V	1.00	65.8	- 4.88	0.120
157.6923	42.53	Qp	1.13	12.83	27.52	0.00	28.97	V	1.00	232.2	- 14.55	0.120
189.8429	53.17	Qp	1.22	11.30	27.33	0.00	38.36	V	1.00	0.0	- 5.16	0.120
239.8573	40.58	Qp	1.38	11.60	27.03	0.00	26.53	V	1.00	307.7	- 19.49	0.120
H_48V_POE_Ferrite on control cable_					Enguage_IP_							
40.6811	37.51	Qp	0.57	13.19	28.02	0.00	23.25	H	3.28	183.5	- 16.75	0.120
75.0032	52.90	Qp	0.77	8.30	27.90	0.00	34.07	H	3.99	193.8	- 5.93	0.120
159.1843	41.34	Qp	1.13	12.80	27.51	0.00	27.76	H	2.17	109.9	- 15.76	0.120
189.8429	55.79	Qp	1.22	11.30	27.33	0.00	40.98	H	1.50	259.5	- 2.54	0.120
245.5128	43.23	Qp	1.40	11.59	27.01	0.00	29.21	H	1.21	87.4	- 16.81	0.120
640.0240	35.56	Qp	2.26	19.60	28.27	0.00	29.15	H	1.50	359.9	- 16.87	0.120
V_48V_POE_Ferrite on control cable_X2_					Enguage_IP_							
40.6811	50.45	Qp	0.57	13.19	28.02	0.00	36.19	V	1.00	277.0	- 3.81	0.120
44.2404	49.39	Qp	0.59	10.96	28.01	0.00	32.93	V	1.00	262.9	- 7.07	0.120
70.2724	54.44	Qp	0.74	8.40	27.92	0.00	35.66	V	1.00	33.8	- 4.34	0.120
189.8429	50.97	Qp	1.22	11.30	27.33	0.00	36.16	V	1.00	359.9	- 7.36	0.120
221.1538	45.73	Qp	1.33	10.85	27.13	0.00	30.77	V	1.00	312.3	- 15.25	0.120
712.2596	36.35	Qp	2.40	20.70	28.16	0.00	31.29	V	1.16	201.5	- 14.73	0.120
H_48V_POE_Ferrite on control cable_X2_					Enguage_IP_							
40.6811	37.09	Qp	0.57	13.19	28.02	0.00	22.83	H	3.62	181.2	- 17.17	0.120
76.8478	48.48	Qp	0.78	8.22	27.89	0.00	29.58	H	2.56	182.4	- 10.42	0.120
157.6923	42.72	Qp	1.13	12.83	27.52	0.00	29.16	H	2.27	76.4	- 14.36	0.120
186.6635	47.90	Qp	1.22	11.30	27.35	0.00	33.07	H	1.50	63.3	- 10.45	0.120
189.8429	53.91	Qp	1.22	11.30	27.33	0.00	39.10	H	1.04	247.8	- 4.42	0.120
295.3686	40.61	Qp	1.55	13.51	26.93	0.00	28.73	H	1.00	289.2	- 17.29	0.120
V_12Vdc_Ferrite on control cable_X2_					Enguage_IP_							
40.6811	41.51	Qp	0.57	13.19	28.02	0.00	27.25	V	1.00	88.7	- 12.75	0.120
44.2420	42.00	Qp	0.59	10.95	28.01	0.00	25.54	V	1.00	359.9	- 14.46	0.120
50.0016	41.12	Qp	0.62	8.40	27.99	0.00	22.15	V	1.00	359.9	- 17.85	0.120
81.3622	46.10	Qp	0.80	8.26	27.87	0.00	27.29	V	1.00	54.0	- 12.71	0.120
95.6907	45.16	Qp	0.88	9.54	27.82	0.00	27.75	V	1.00	167.8	- 15.77	0.120
189.8429	43.12	Qp	1.22	11.30	27.33	0.00	28.31	V	1.00	359.9	- 15.21	0.120
H_12Vdc_Ferrite on control cable_X2_					Enguage_IP_							
40.6811	31.52	Qp	0.57	13.19	28.02	0.00	17.26	H	3.41	171.5	- 22.74	0.120
62.5224	32.83	Qp	0.70	7.90	27.95	0.00	13.48	H	3.33	216.5	- 26.52	0.120
94.7035	35.53	Qp	0.87	9.31	27.83	0.00	17.89	H	1.83	204.9	- 25.63	0.120
162.7228	40.51	Qp	1.14	12.63	27.49	0.00	26.79	H	2.10	257.9	- 16.73	0.120
189.8429	42.74	Qp	1.22	11.30	27.33	0.00	27.93	H	1.50	106.6	- 15.59	0.120
285.7997	40.40	Qp	1.51	13.70	26.92	0.00	28.69	H	1.00	249.7	- 17.33	0.120
V_12Vdc_Ferrite on control cable_X1_					Enguage_IP_							
40.6811	41.32	Qp	0.57	13.19	28.02	0.00	27.06	V	1.23	80.6	- 12.94	0.120
44.2420	41.80	Qp	0.59	10.95	28.01	0.00	25.34	V	1.00	359.9	- 14.66	0.120

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FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA1	RBW
MHz	dBuV	Qp Av Pk Rms	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 < 1GHz Qp	(MHz)
81.3782	46.42	Qp	0.80	8.26	27.87	0.00	27.61	V	1.00	147.4	- 12.39	0.120
95.6442	45.53	Qp	0.88	9.53	27.82	0.00	28.11	V	1.00	175.4	- 15.41	0.120
162.7228	38.93	Qp	1.14	12.63	27.49	0.00	25.21	V	1.00	359.9	- 18.31	0.120
189.8429	44.23	Qp	1.22	11.30	27.33	0.00	29.42	V	1.00	0.0	- 14.10	0.120
H_12Vdc_Ferrite on control cable_X1_					Enguage_IP_							
40.6811	31.56	Qp	0.57	13.19	28.02	0.00	17.30	H	3.07	175.3	- 22.70	0.120
125.0048	30.77	Qp	1.01	13.60	27.70	0.00	17.68	H	2.56	60.9	- 25.84	0.120
162.7228	41.13	Qp	1.14	12.63	27.49	0.00	27.41	H	2.40	264.1	- 16.11	0.120
176.2836	42.03	Qp	1.20	11.57	27.41	0.00	27.39	H	1.39	93.0	- 16.13	0.120
189.8429	45.74	Qp	1.22	11.30	27.33	0.00	30.93	H	1.50	99.2	- 12.59	0.120
283.8445	41.26	Qp	1.51	13.65	26.92	0.00	29.50	H	1.00	269.9	- 16.52	0.120

FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA1		RBW
MHz	dBuV	Qp Av Pk Rms	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 < 1GHz Qp	limit	(MHz)
Perpendicular_loop_12Vdc_Ferrite on control cable_X1_						Enguage_IP_							
0.6061	- 24.47	Qp	0.07	10.20	0.00	0.00	- 14.20	H	1.00	0.0	- 46.20	(32.00)	0.009
0.9925	- 15.85	Qp	0.08	10.39	0.00	0.00	- 5.38	H	1.00	0.0	- 33.08	(27.70)	0.009
22.4680	- 13.27	Qp	0.42	9.91	0.00	0.00	- 2.94	H	1.00	0.0	- 32.44	(29.50)	0.009
Parallel_loop_12Vdc_Ferrite on control cable_X1_						Enguage_IP_							
0.1458	- 74.63	Qp	0.04	10.25	0.00	0.00	- 64.34	H	1.00	0.0	- 88.66	(24.32)	0.0002
0.3849	- 47.52	Qp	0.06	10.10	0.00	0.00	- 37.36	H	1.00	0.0	- 53.26	(15.90)	0.009
0.9924	- 15.12	Qp	0.08	10.39	0.00	0.00	- 4.65	H	1.00	0.0	- 32.32	(27.67)	0.009
3.8578	- 20.30	Qp	0.17	10.49	0.00	0.00	- 9.65	H	1.00	0.0	- 39.15	(29.50)	0.009
27.0567	- 11.31	Qp	0.46	8.82	0.00	0.00	- 2.03	H	1.00	0.0	- 31.53	(29.50)	0.009
Parallel_loop_12Vdc_Ferrite on control cable_X2_						Enguage_IP_							
0.5200	- 25.38	Qp	0.06	10.28	0.00	0.00	- 15.04	H	1.00	0.0	- 48.32	(33.28)	0.009
0.9925	- 15.59	Qp	0.08	10.39	0.00	0.00	- 5.12	H	1.00	0.0	- 32.79	(27.67)	0.009
2.8590	- 20.73	Qp	0.14	10.40	0.00	0.00	- 10.19	H	1.00	0.0	- 39.73	(29.54)	0.009
23.3619	- 12.81	Qp	0.44	9.73	0.00	0.00	- 2.65	H	1.00	0.0	- 32.19	(29.54)	0.009
0.1405	- 50.70	Qp	0.04	10.26	0.00	0.00	- 40.40	H	1.00	0.0	- 65.02	(24.62)	0.0002
Perpendicular_loop_12Vdc_Ferrite on control cable_X2_													
0.1489	- 74.21	Qp	0.04	10.25	0.00	0.00	- 63.92	H	1.00	0.0	- 88.06	(24.14)	0.0002
0.4167	- 47.07	Qp	0.06	10.13	0.00	0.00	- 36.88	H	1.00	0.0	- 52.08	(15.20)	0.009
0.7030	- 23.51	Qp	0.07	10.20	0.00	0.00	- 13.24	H	1.00	0.0	- 43.91	(30.67)	0.009
25.0010	- 3.64	Qp	0.45	9.40	0.00	0.00	6.21	H	1.00	0.0	- 23.33	(29.54)	0.009
29.5192	- 10.00	Qp	0.48	8.13	0.00	0.00	- 1.39	H	1.00	0.0	- 30.93	(29.54)	0.009
Perpendicular_loop_POE_Ferrite on control cable_X2_						Enguage_IP_							

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FREQ	LEVEL	DET	CABLE	ANT	PREAMP	ATTEN	FINAL	POL	HGT	AZ	DELTA1		RBW
MHz	dBuV	Qp Av Pk Rms	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.209 < 1GHz Qp	limit	(MHz)
0.3857	- 47.73	Qp	0.06	10.10	0.00	0.00	- 37.57	H	1.00	0.0	- 53.44	(15.87)	0.009
0.9942	- 17.58	Qp	0.08	10.39	0.00	0.00	- 7.11	H	1.00	0.0	- 34.77	(27.66)	0.009
7.8878	- 15.54	Qp	0.25	10.60	0.00	0.00	- 4.69	H	1.00	0.0	- 34.23	(29.54)	0.009
0.1481	- 54.21	Qp	0.04	10.25	0.00	0.00	- 43.92	H	1.00	0.0	- 68.12	(24.20)	0.0002
Parallel_loop_POE_Ferrite on control cable_X2_						Enguage_IP_							
0.9947	- 15.58	Qp	0.08	10.39	0.00	0.00	- 5.11	H	1.00	0.0	- 32.76	(27.65)	0.009
2.2905	- 20.45	Qp	0.12	10.40	0.00	0.00	- 9.93	H	1.00	0.0	- 39.47	(29.54)	0.009
Parallel_loop_POE_Ferrite on control cable_X1_						Enguage_IP_							
0.5091	- 22.85	Qp	0.06	10.29	0.00	0.00	- 12.50	H	1.00	0.0	- 45.97	(33.47)	0.009
0.7636	- 21.78	Qp	0.08	10.20	0.00	0.00	- 11.50	H	1.00	0.0	- 41.45	(29.95)	0.009
0.9947	- 13.71	Qp	0.08	10.39	0.00	0.00	- 3.24	H	1.00	0.0	- 30.89	(27.65)	0.009
0.1379	- 50.66	Qp	0.04	10.26	0.00	0.00	- 40.36	H	1.00	0.0	- 65.17	(24.81)	0.0002
Perpendicular_loop_POE_Ferrite on control cable_X1_						Enguage_IP_							
0.1490	- 74.07	Qp	0.04	10.25	0.00	0.00	- 63.78	H	1.00	0.0	- 87.92	(24.14)	0.0002
1.0184	- 21.67	Qp	0.08	10.40	0.00	0.00	- 11.19	H	1.00	0.0	- 40.73	(29.54)	0.009
1.2730	- 21.05	Qp	0.09	10.40	0.00	0.00	- 10.56	H	1.00	0.0	- 40.10	(29.54)	0.009
19.8077	- 14.26	Qp	0.39	10.41	0.00	0.00	- 3.46	H	1.00	0.0	- 33.00	(29.54)	0.009

7 AC Mains Conducted Emissions - Transmitter

7.1 Method

Unless otherwise stated no deviations were made from FCC Part 15.207.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Testing with-in this section utilized the standard test methods of ANSI C63.4 sections 6.2

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
18914	Single Phase LISN	EMCO	3816/NM	9408-1003	04/13/2015	04/13/2016
18730	Transient Limiter	Hewlett-Packard	11947A	2820A00277	06/24/2015	06/24/2016
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	12/19/2015	12/19/2016
CC1-001A	50 Ohm Cable	Pasternak Enterprise	RG-223/U	N/A	05/27/15	05/27/16
CC1-001B	50 Ohm Cable	Pasternak Enterprise	RG-223/U	N/A	05/27/15	05/27/16
LAB-012	Wireless BP, Tem and Humidity sensor	Omega	zED-BTH	0070368	9/01/2015	9/1/2016

7.3 Test Requirement/ Specification:

The product must pass the AC Conducted average and quasi-peak Class B Limits defined in FCC Part 15.207. The product is operated with all radios enabled and active.

7.4 Test Procedure:

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at all frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

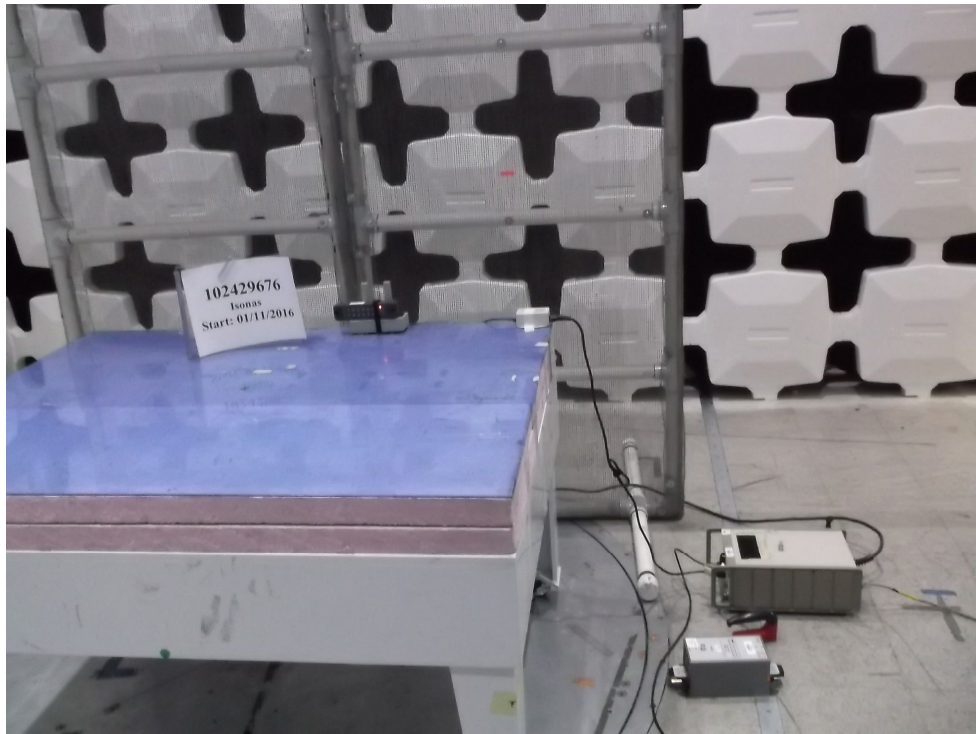
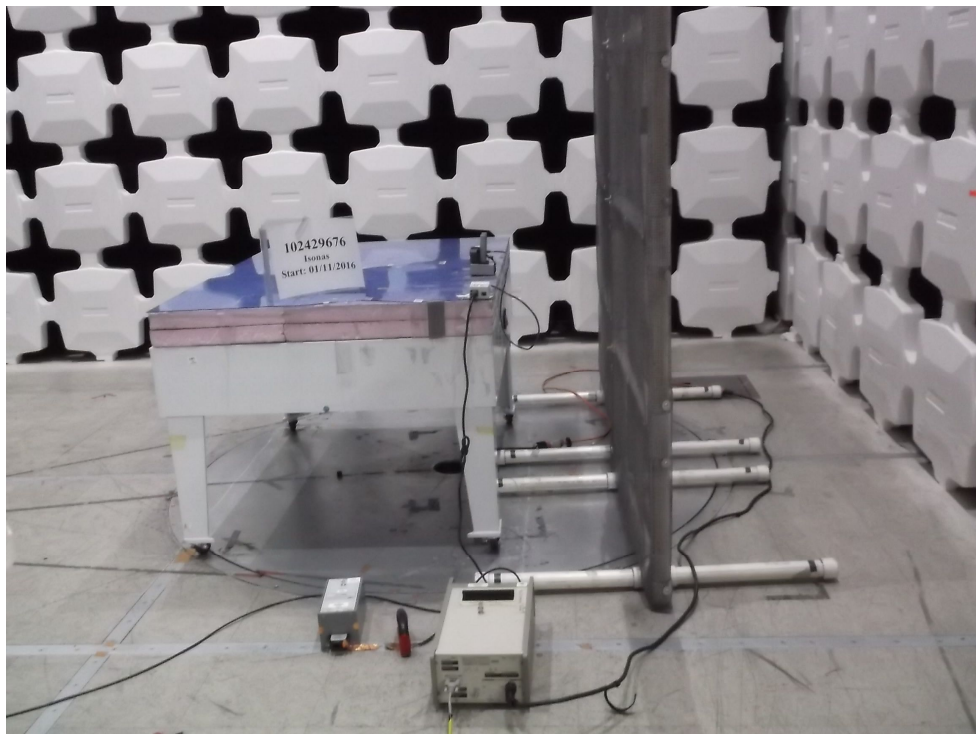
Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

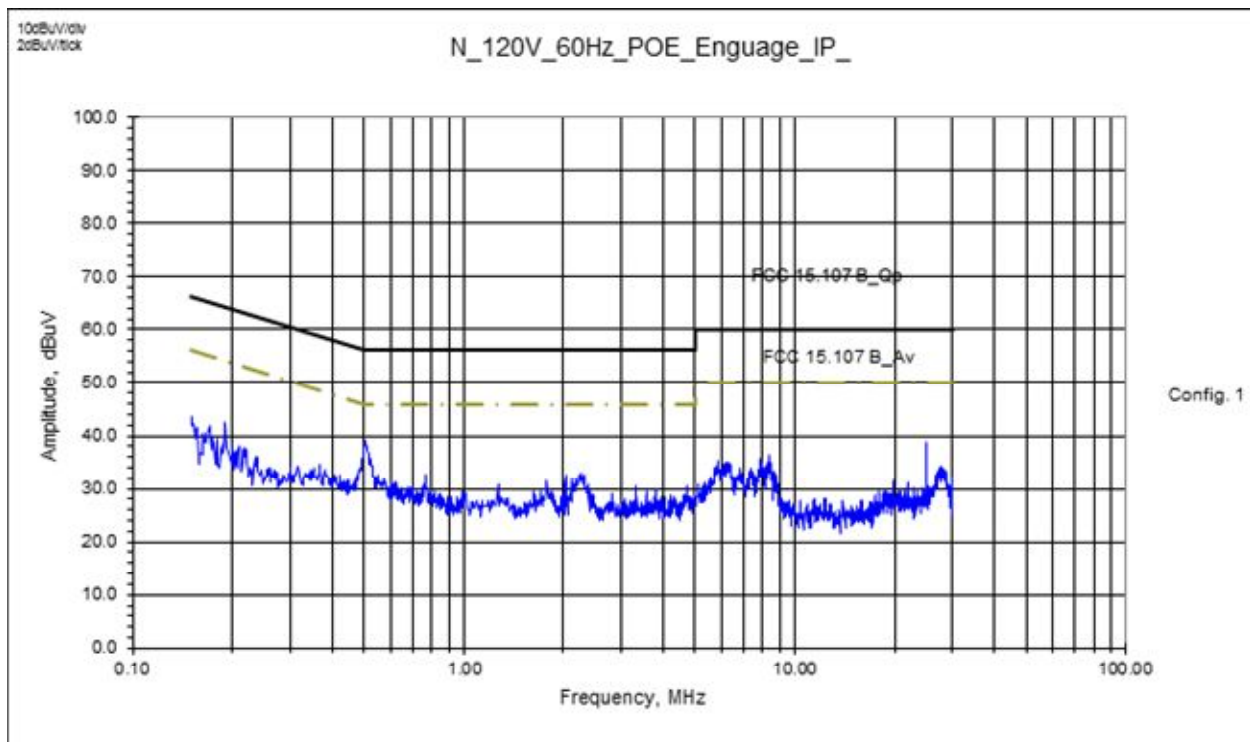
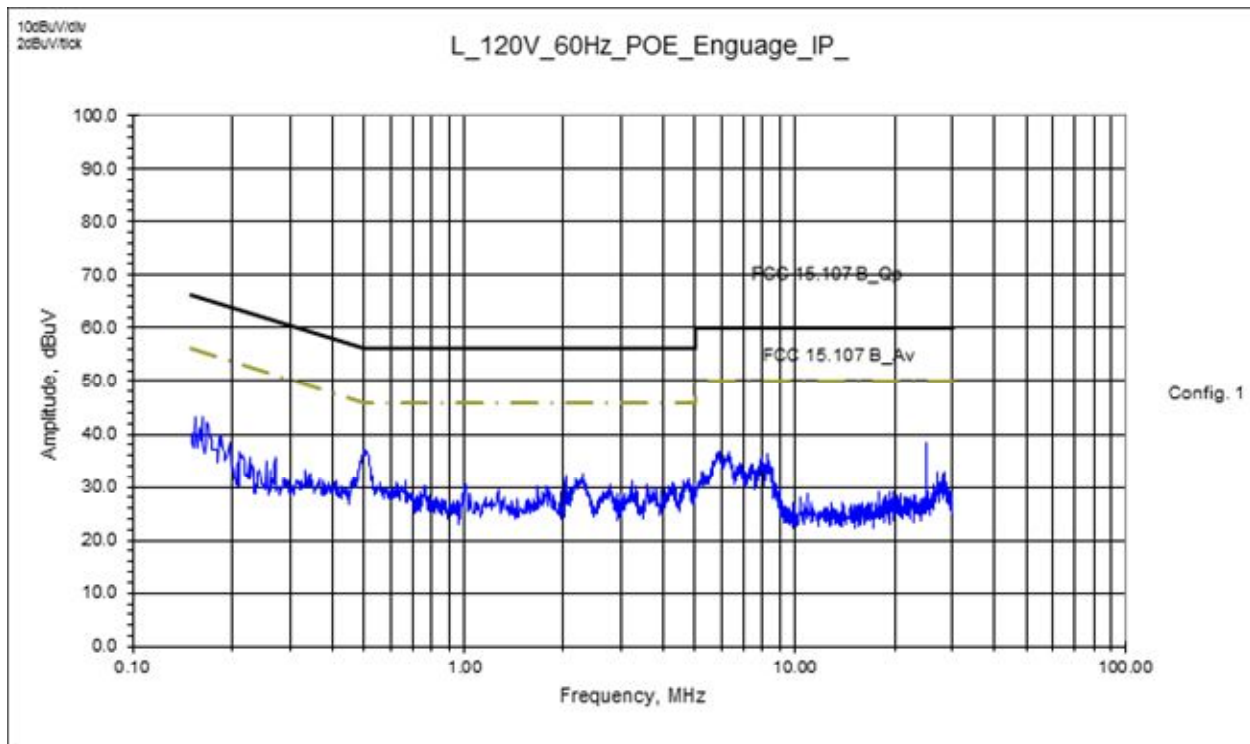
The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Equipment setup for conducted disturbance tests followed the guidelines of:

7.5 Test Results:

The sample tested was found to Comply.

7.6 Setup Photographs:**Test Setup – Front****Test Setup - Side**

7.7 Plots:

Tx AC Conducted Electromagnetic Emissions

Test Report #:	G102429676	Test Area:	CC1 Conducted		Temperature:	20.1	C
Test Method:	FCC 15.207	Test Date:	1/12/2016		Relative Humidity:	7.4	%
EUT Model #:	RC-03-ALLE-K	EUT Power:	120V/60Hz (POE power supply)		Air Pressure:	838.5	kPa
EUT Serial #:	Test 1						
Manufacturer:	Isonas				Level Key		
EUT Description:	RC-03 Raven Reader Controller				Pk - Peak	Nb - Narrow Band	
Notes:					Qp - QuasiPeak	Bb - Broad Band	
					Av - Average		

FREQ	LEVEL	DET	CABLE	LISN	PREAMP	ATTEN	FINAL	TEST POINT			DELTA1	DELTA2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	Other - N - L1 - L2 - L3			FCC 15.107 B_Qp	FCC 15.107 B_Av	(MHz)
L_120V_60Hz_POE_			Enguage_IP_										
0.170	25.42	Qp	0.11	0.08	0.00	9.95	35.56		Line 1		- 29.41	NA	0.009
0.267	14.46	Qp	0.12	0.08	0.00	9.95	24.61		Line 1		- 36.61	NA	0.009
0.508	24.87	Qp	0.13	0.06	0.00	9.95	35.01		Line 1		- 20.99	NA	0.009
2.288	17.65	Qp	0.22	0.10	0.00	9.96	27.93		Line 1		- 28.07	NA	0.009
5.846	23.75	Qp	0.38	0.23	0.00	9.97	34.33		Line 1		- 25.67	NA	0.009
25.001	26.28	Qp	0.82	2.01	0.00	10.05	39.16		Line 1		- 20.84	NA	0.009
0.170	21.93	Av	0.11	0.08	0.00	9.95	32.07		Line 1		NA	- 22.90	0.009
0.267	8.94	Av	0.12	0.08	0.00	9.95	19.09		Line 1		NA	- 32.13	0.009
0.508	20.71	Av	0.13	0.06	0.00	9.95	30.85		Line 1		NA	- 15.15	0.009
2.288	10.86	Av	0.22	0.10	0.00	9.96	21.14		Line 1		NA	- 24.86	0.009
5.846	18.80	Av	0.38	0.23	0.00	9.97	29.38		Line 1		NA	- 20.62	0.009
25.001	25.86	Av	0.82	2.01	0.00	10.05	38.74		Line 1		NA	- 11.26	0.009
N_120V_60Hz_POE_			Enguage_IP_										
0.193	23.28	Qp	0.11	0.07	0.00	9.95	33.42		Line 2		- 30.48	NA	0.009
0.508	25.91	Qp	0.13	0.05	0.00	9.95	36.04		Line 2		- 19.96	NA	0.009
0.763	17.02	Qp	0.14	0.07	0.00	9.95	27.18		Line 2		- 28.82	NA	0.009
2.314	16.49	Qp	0.22	0.11	0.00	9.96	26.78		Line 2		- 29.22	NA	0.009
5.846	21.53	Qp	0.38	0.25	0.00	9.97	32.14		Line 2		- 27.86	NA	0.009
25.001	26.79	Qp	0.82	2.26	0.00	10.05	39.92		Line 2		- 20.08	NA	0.009
0.193	21.57	Av	0.11	0.07	0.00	9.95	31.71		Line 2		NA	- 22.19	0.009
0.508	21.99	Av	0.13	0.05	0.00	9.95	32.12		Line 2		NA	- 13.88	0.009
0.763	12.89	Av	0.14	0.07	0.00	9.95	23.05		Line 2		NA	- 22.95	0.009
2.314	7.02	Av	0.22	0.11	0.00	9.96	17.31		Line 2		NA	- 28.69	0.009
5.846	16.17	Av	0.38	0.25	0.00	9.97	26.78		Line 2		NA	- 23.22	0.009
25.001	26.21	Av	0.82	2.26	0.00	10.05	39.34		Line 2		NA	- 10.66	0.009

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8 Tx Frequency Tolerance (Stability)

8.1 Method

Unless otherwise stated no deviations were made from FCC 15.31(e)/15.225(e) and IC RSS-Gen 7.2.6/RSS-210 A2.6.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

Testing with-in this section utilized the standard test methods of ANSI C63.4 sections 6.8

8.2 Test Equipment Used:

<u>Asset ID</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
18648	Environmental Chamber	Envirotronics	System Plus	---	VBU	VBU
18913	Spectrum Analyzer	Agilent Technologies Inc.	E7405A	MY44211889	9/14/2015	9/14/2016
18784	Loop sensor	SOLAR	7334-1	927606	02/17/2015	02/17/2016
Lab-013	Wireless Temp and humidity sensor	Omega	zED-THP	0180793	4/26/2015	3/26/2016

8.3 Results:

The sample tested was found to Comply.

9 Occupied Bandwidth (OBW) – RSS-GEN, Section 6.6**9.1 Method**

Unless otherwise stated no deviations were made from RSS-GEN:2014, Section 6.6.

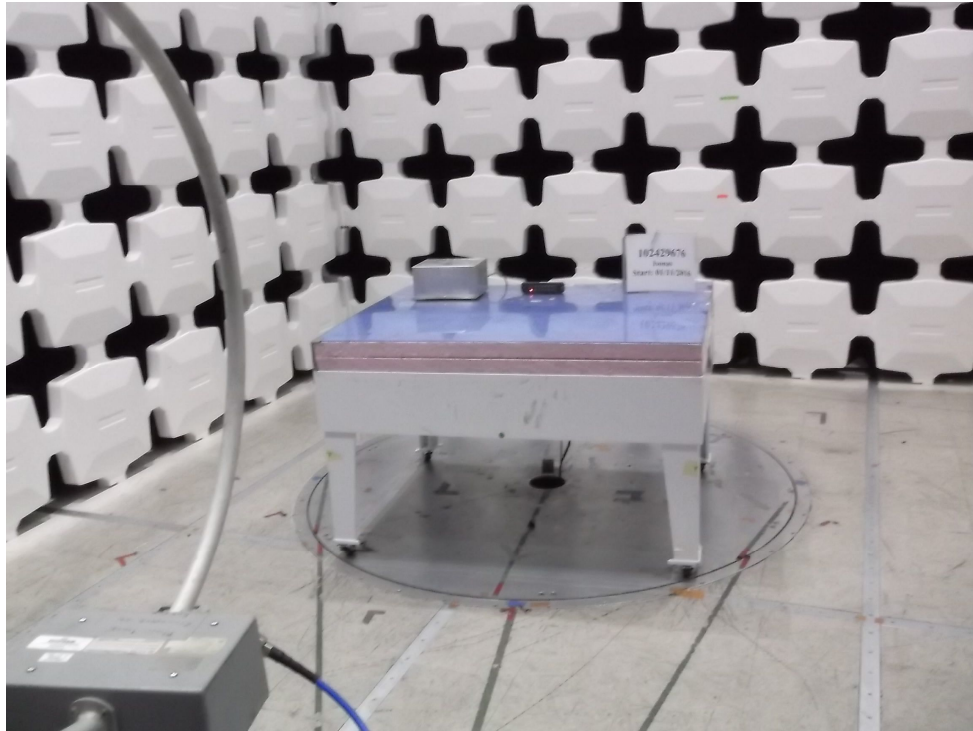
This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

9.2 Test Equipment Used:

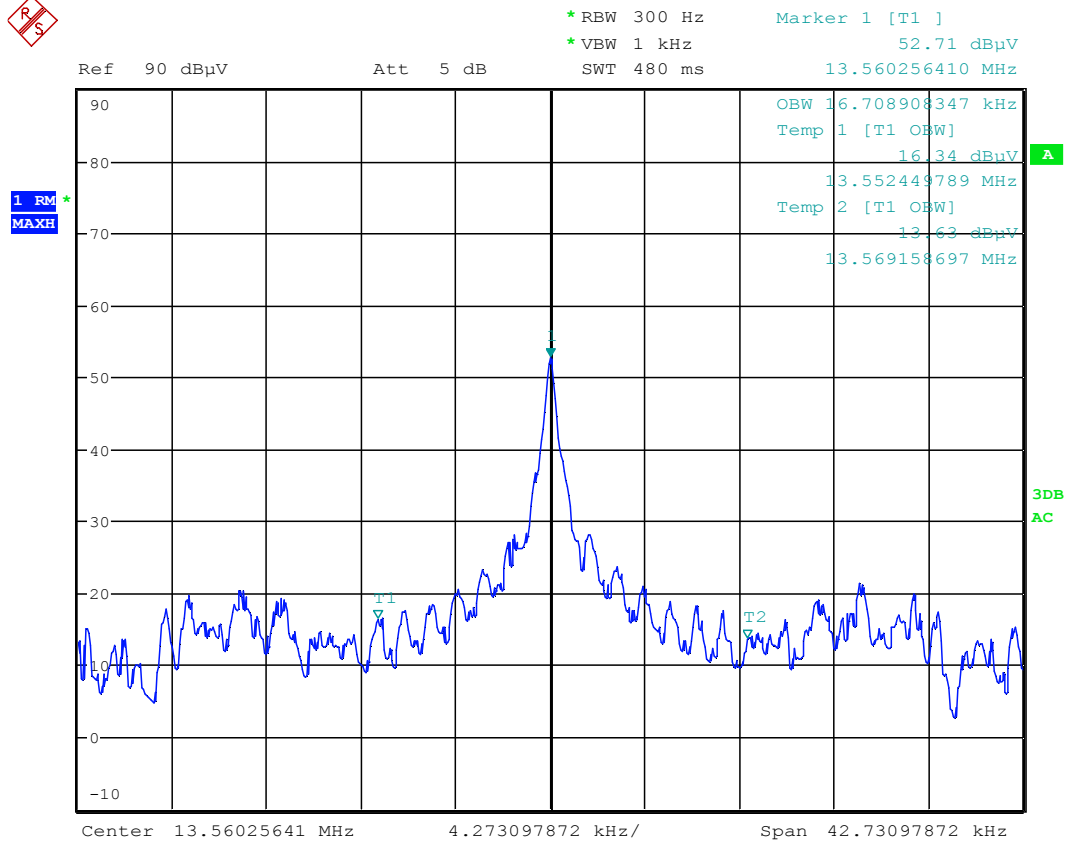
<u>Asset</u>	<u>Description</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial</u>	<u>Cal Date</u>	<u>Cal Due</u>
DEN-073	EMI Receiver (10Hz – 26.5GHz)	RHODE & SCHWARZ	ESU 26	100265	12/19/2015	12/19/2016
CC1-E2	Radiated Cable	Teledyne	90-206-300; PN:F-130-S1S1-100; 90-206-072;	E2-A; 5026702002; E2-C; E2-D	11/17/2015	11/17/2016
18897	Magnetic loop	EMCO	6502	9205-2738	11/12/2015	11/12/2016
LAB-012	Wireless BP, Tem and Humidity sensor	Omega	zED-BTH	0070368	9/01/2015	9/1/2016

9.3 Results:

The product tested was found to comply.

9.4 Setup Photographs:

Occupied Bandwidth - (RSS-GEN, Section 6.6) – 13.56MHz Tx



Date: 27.JAN.2016 14:34:13

Notes: Measured OBW for the Tx 123 kHz: 3.67kHz
 Measured OBW for the Tx 13.56MHz: 16.71kHz

10 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of $k = 2$, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty $\pm$	Notes
Radiated emissions, 10kHz to 30 MHz	3.4 dB	
Radiated emissions, 30 to 200 MHz HP	2.2 dB	
Radiated emissions, 30 to 200 MHz VP	3.8 dB	
Radiated emissions, 200 to 1000 MHz HP	2.8 dB	
Radiated emissions, 200 to 1000 MHz VP	2.7 dB	
Radiated emissions, 1 to 18 GHz	5.2 dB	
Conducted port emissions 10kHz to 1000 MHz	1.0 dB	
Conducted port emissions 1 – 26.5 GHz	1.6 dB	
AC mains Conducted emissions, 9kHz to 30 MHz	3.14 dB	

11 Revision History

Revision Level	Date	Report Number	Notes
0	1/27/2016	102429676DEN-001	Original Issue
1	4/25/2016	102429676DEN-001	Added Date to CFR 47 on page 1. Updated test section numbers. Added test methods to all test sections. Added sample calculations to sections 4, 6, and 7. By: Michael Spataro  Reviewed by: Duan We Lin 
2	4/29/2016	102429676DEN-001	Recalculated the 15.209 <30MHz limits(removed distance extrapolation) Updated data tables on pages 14, 48, 50 and 51 for new deltas. Updated plots on pages 23-26 and 40-43 with new limit lines. By: Michael Spataro  Reviewed by: Duan We Lin 