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July 8, 2014

Pruf Energy Controls 900 Washington Ave Suite 506 Waco, TX 76701

Gentlemen:

Thank you for allowing Professional Testing (EMI), Inc. an opportunity to perform testing for Pruf Energy Controls. Enclosed is the Wireless Certification Report for the PEC915V10. This report can be used to demonstrate compliance with requirements for wireless devices in the United States and Canada.

If you have any questions, please contact me.

Sincerely,

Jeffrey A. Lenk

President

Attachment

Project 15590-15

Pruf Energy Controls PEC915V10

Wireless Certification Report

Prepared for:

Pruf Energy Controls 900 Washington Ave Suite 506 Waco, TX 76701

By

Professional Testing (EMI), Inc. 1601 North A.W. Grimes Blvd., Suite B Round Rock, Texas 78665

July 8, 2014

Reviewed by

Written by

Larry Finn
Product Development Engineer

Eric Lifsey Test Engineer

15590 Page 2 of 70

Revision History

Revision Number	Description	Date
00	Draft for review.	June 17, 2014
01	Revised per client JD comments.	June 19, 2014
02	Revised per TUV/BABT comments & BW change.	July 8, 2014

15590 Page 3 of 70

Table of Contents

Revision History	
Certificate of Compliance	6
1.0 Introduction	7
1.1 Scope	7
1.2 EUT Description	7
1.3 EUT Operation	7
1.4 Modifications to Equipment	
1.5 Test Site	
2.0 Fundamental Power	
2.1 Test Procedure	
2.2 Test Criteria	
2.3 Test Results	
2.3.1 Low Channel	
2.3.2 Middle Channel	
2.3.3 High Channel	
3.0 Power Spectral Density	
± •	
3.2 Test Criteria	
3.3 Test Results	
3.3.1 Low Channel PSD	
3.3.2 Middle Channel PSD	
3.3.3 High Channel PSD	
4.0 Transmitter Duty Cycle	
4.1 Test Procedure	
4.2 Test Criteria	
4.3 Test Results	
5.0 Occupied Bandwidth	
5.1 Test Procedure	
5.2 Test Criteria	
5.3 Test Results	
5.3.1 Bandwidth Plots, 6 dB	
5.3.2 Bandwidth Plots, 20 dB	22
6.0 Band Edge	25
6.1 Test Procedure	25
6.2 Test Criteria	25
6.3 Test Results	25
6.3.1 High Channel Band Edge	
6.3.2 Low Channel Band Edge	
7.0 Radiated Spurious Emissions, Receive Mode	28
7.1 Test Procedure	28
7.2 Test Criteria	28
7.3 Test Results	28
8.0 Radiated Spurious Emissions, Transmit Mode, Antenna 1: Pulse	33
8.1 Test Procedure	
8.2 Test Criteria	
8.3 Test Results	
9.0 Radiated Spurious Emissions, Transmit Mode, Antenna 2: Helical	
9.1 Test Procedure	
9.2 Test Criteria	
9.3 Test Results	
10.0 Conducted Spurious Emissions, Transmit Mode	
10.1 Test Procedure	
10.2 Test Criteria	
10.3 Test Results	
11.0 Conducted Emissions, Mains	
11.1 Test Procedure	
11.3 Test Results	
15590	Pag

Pruf Energy Controls PEC915V10

12.0	Antenna Construction Requirements	64
12.1	Procedure	64
12.2	Criteria	64
12.3	Results	64
13.0	Equipment and Bandwidths	65
13.1	Equipment for Spurious Radiated Emissions 30 MHz to 12 GHz	65
13.2	Equipment for Mains Conducted Emissions	66
13.3	Equipment for Timings, Bandwidth, and Conducted Spurious Measurements	66
13.4	Measurement Bandwidths, Radiated Emissions	67
13.5	Measurement Bandwidths, Mains Conducted Emissions	67
Appendi	x: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty	68
End of R	Report	70

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15590 Page 5 of 70



Certificate of Compliance

Applicant	Device & Test Identification	
Pruf Energy Controls	FCC ID:	2ACB8-PEC915V10
900 Washington Ave	Industry Canada ID:	11970A-PEC915V10
Suite 506	Model(s):	PEC915V10
Waco, TX 76701	Part Number(s):	N/A
Certificate Date: July 8, 2014	Laboratory Project ID:	15590-15

The device named above was tested utilizing the following documents and found to be in compliance with the required criteria:

Standard	Reference	Detail
FCC 47 CFR Part 15 C	15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
FCC 47 CFR Part 15 C	15.209	Radiated emission limits; general requirements.
FCC 47 CFR Part 15 C	15.207	Conducted limits.
FCC 47 CFR Part 15 C	15.205	Restricted Bands of Operation
KDB 558074 D01	DR01	DTS Measurement Guidance v03r02
KDB 412172	D01	Guidelines for Determining the ERP and EIRP of an RF Transmitting System
OET Bulletin 65*	Edition 97-01, and Supplement C, Ed. 01-01	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
RSS-210	Issue 8	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS-Gen	Issue 3	General Requirements and Information for the Certification of Radio Apparatus
RSS-102	Issue 4	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

^{*}MPE is reported separately from this document.

I, Jeffrey A. Lenk, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures, have reviewed the test setup, measured data, and this report. I believe them to be true and accurate.

Jeffrey A. Lenk President

This report has been reviewed and accepted by Pruf Energy Controls. The undersigned is responsible for ensuring that the PEC915V10 by Pruf Energy Controls will continue to comply with the applicable rules.

Representative of Pruf Energy Controls

15590 Page 6 of 70

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States and Canada.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing. The procedures of ANSI C63.4: 2009 were used for making all radiated enclosure and mains emission measurements.

1.2 EUT Description

The EUT is the **PEC915V10** by **Pruf Energy Controls**. This device is a wireless transmitter/receiver module. The EUT as tested consisted of the following:

Table 1.2.1: Equipment Under Test

Manufacturer	Model	Serial #	Description
Pruf Energy Controls	PEC915V10	V4 003 (Ant 1)	Wireless transmitter/receiver
		V4 002 (Ant 2)	module for 902 – 928 MHz.

This device is constructed as a modular component for wireless applications. It is supplied either with an external printed-circuit antenna (Antenna 1) or a directly soldered-on helical antenna (Antenna 2).

The EUT is powered by a 3.3 Volts DC.

The EUT measures approximately 30 x 24 x 3 mm. A photograph of the EUT is provided below.



Photograph 1.2.1: EUT

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations. This device could be powered by systems connected to the AC mains network, so mains conducted emission measurements are included.

The EUT internal software operated the transmitter in a continuous modulated mode or unmodulated mode as required.

15590 Page 7 of 70

1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

15590 Page 8 of 70

2.0 Fundamental Power

2.1 Test Procedure

Bandwidth is first determined to select correct entire bandwidth for power measurement and the fundamental power is measured.

2.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(a)(3) // Fundamental Power		2014-07-07
RSS-210 Issue 8, A2.9	Conducted Limit: 1 Watt	2014-07-07

2.3 Test Results

Bandwidth is found to be 579 kHz in 20 dB, so 1 MHz resolution bandwidth was employed for peak power measurement.

Fundamental Power Measured as Field Streng	th
Conducted Limit 1 Watt (30 dBm)	

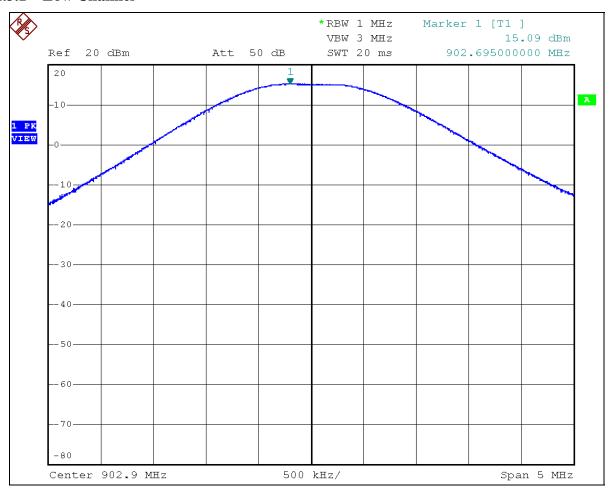
Conducted Port Power		
Frequency	Measured Peak Power	
(MHz)	(dBm)	
902.9	15.09	
915.0	14.56	
927.5	14.98	

Measured in 1 MHz RBW, 3 MHz VBW.

The EUT was found to be in compliance with the applicable criteria. Plotted measurement appears below.

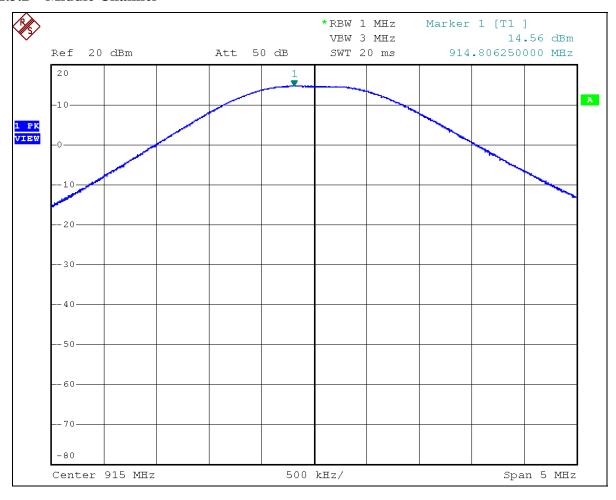
15590 Page 9 of 70

2.3.1 Low Channel



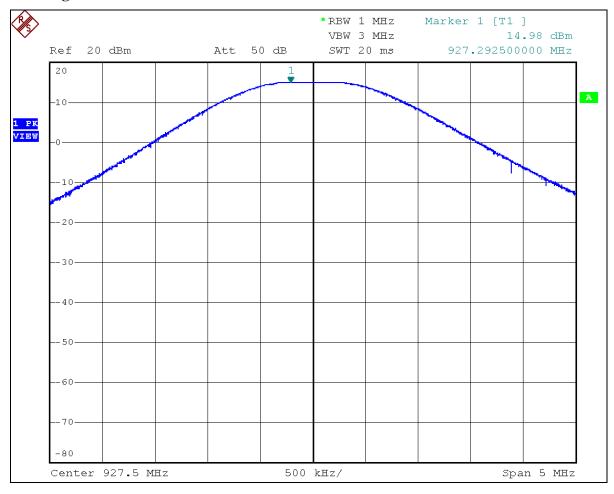
15590 Page 10 of 70

2.3.2 Middle Channel



15590 Page 11 of 70

2.3.3 High Channel



15590 Page 12 of 70

3.0 Power Spectral Density

3.1 Test Procedure

The EUT is connected to a spectrum analyzer. The spectrum analyzer is then adjusted to measure the power spectral density in the prescribed resolution bandwidth with an extended sweep time.

3.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247e //	Power Spectral Density, Conducted	2014-07-07
RSS-210 Issue 8, A2.9	Limit: 8 dBm / 3 kHz	2014-07-07

3.3 Test Results

Power Spectral Density		
Conducted Limit 8 dBm, Measured Conducted		

	Corrected*
Frequency	Measured Peak
MHz	PSD
	(dBm)
902.9	7.36
915.0	6.45
927.5	6.69

^{*}Connection to the spectrum analyzer was direct.

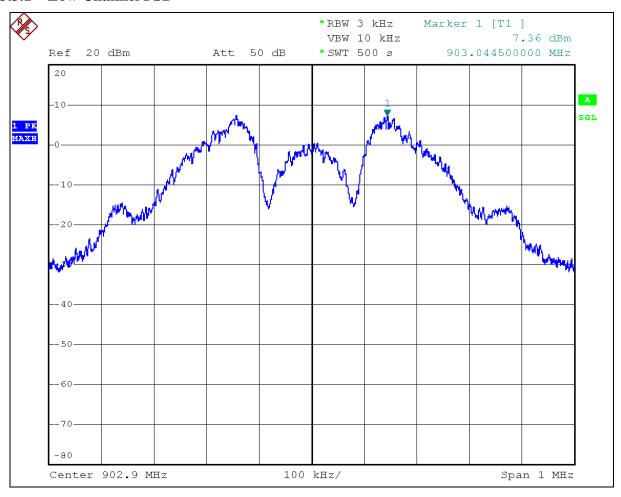
Sweep time 500 seconds.

The EUT was found to be in compliance with the applicable criteria.

Plotted measurements appear below.

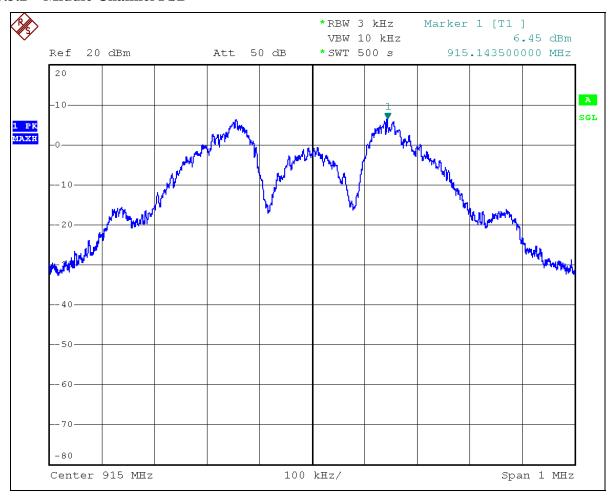
15590 Page 13 of 70

3.3.1 Low Channel PSD



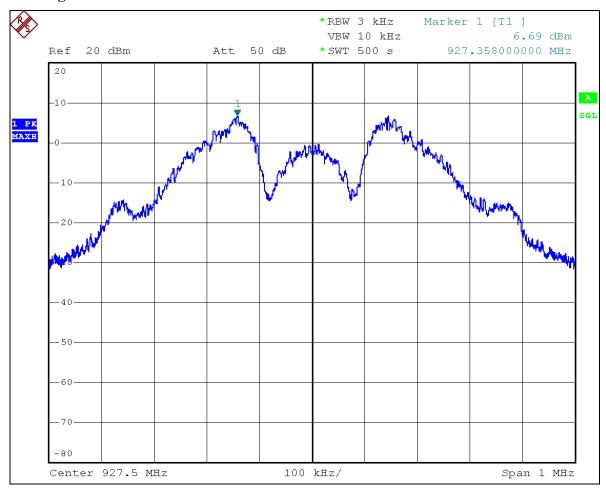
15590 Page 14 of 70

3.3.2 Middle Channel PSD



15590 Page 15 of 70

3.3.3 High Channel PSD



15590 Page 16 of 70

4.0 Transmitter Duty Cycle

4.1 Test Procedure

EUT is placed into normal transmit operation to observe and record transmitter time domain performance.

4.2 Test Criteria

Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. This is not a pass/fail measurement.

4.3 Test Results

Due to the low peak power of the fundamental and spurious emissions, the duty cycle was not measured.

15590 Page 17 of 70

5.0 Occupied Bandwidth

5.1 Test Procedure

Bandwidth is measured by conducted means. A recording of the results is included.

5.2 Test Criteria

47 CFR (USA) // IC (Canada)								
Section Reference	Parameter	Date(s)						
14.247(a)(2), 2.1049, KDB 558074 D01 // RSS-Gen Issue 3, 4.6	Bandwidth, 6 dB, 20 dB	2014-07-07						

5.3 Test Results

EUT was found to be in compliance with applicable requirements.

Bandwidth 6 dB	
Minimum 500 kHz	
(RBW 100 kHz Per FCC KDB 558074 D01)	

	Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Minimum BW (kHz)
l	504.0	507.0	510.0	504.0

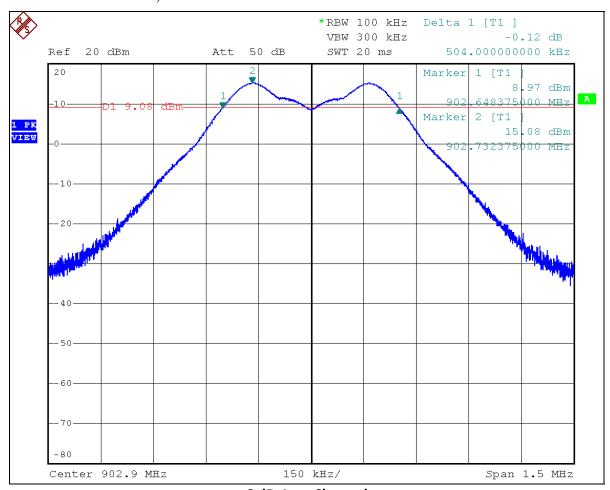
Bandwidth 20 dB	
Measure and Report	

Low Channel	Mid Channel	High Channel	Reported
Measured BW	Measured BW	Measured BW	Maximum BW
(kHz)	(kHz)	(kHz)	(kHz)
579.0	576.0	573.0	579.0

Plotted measurements appear on the following pages.

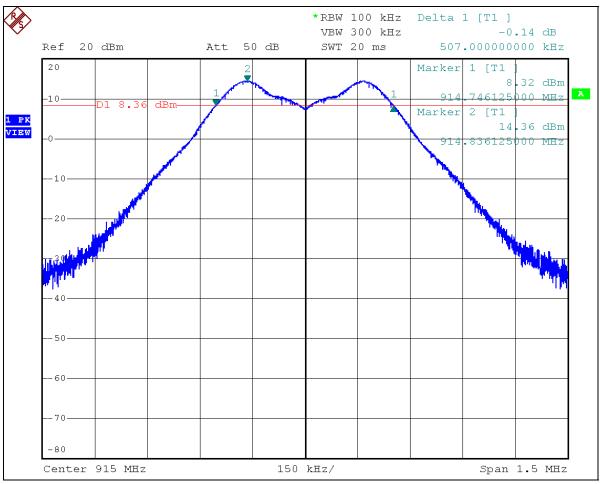
15590 Page 18 of 70

5.3.1 Bandwidth Plots, 6 dB



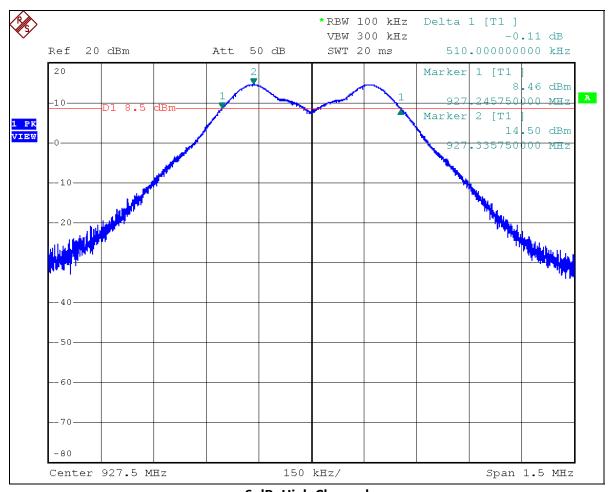
6 dB, Low Channel

15590 Page 19 of 70



6 dB, Middle Channel

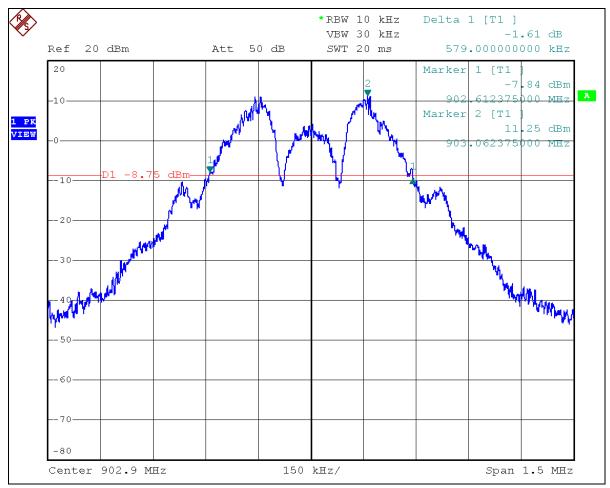
15590 Page 20 of 70



6 dB, High Channel

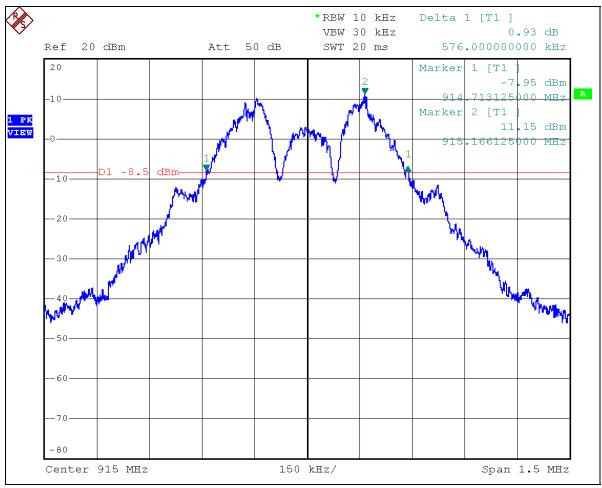
15590 Page 21 of 70

5.3.2 Bandwidth Plots, 20 dB



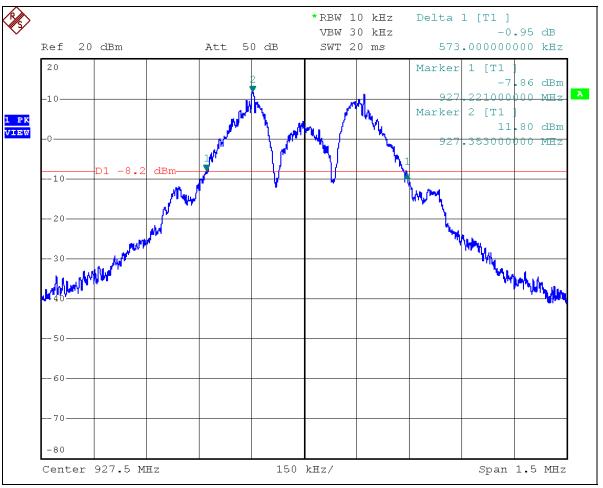
20 dB, Low Channel

15590 Page 22 of 70



20 dB, Middle Channel

15590 Page 23 of 70



20 dB, High Channel

15590 Page 24 of 70

6.0 Band Edge

6.1 Test Procedure

EUT is placed into normal transmit operation on the nearest band edge channel. The spectrum analyzer is centered on the band edge frequency with span sufficient to include the peak of the adjacent fundamental signal. Measurement includes two standard bandwidths from the respective band edge. If required, the band-edge marker-delta method of C63.4 is utilized.

6.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.205 //	Unwanted Emissions Adjacent to Authorized	2014-05-22
RSS-Gen Issue 3, 4.9	Band, Conducted	2014-03-22

6.3 Test Results

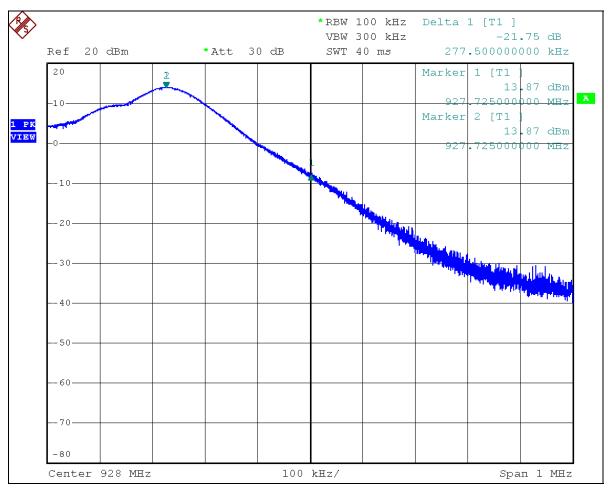
Measurements included more than 2 standard bandwidths (standard bandwidth 100 kHz) from the band edges to provide a clear view of the declining emission levels.

Peak detection of emissions at band edges were below the -20dBc limits with worse case margin of -21.75 dB. No restricted bands are adjacent to this band.

The EUT satisfied the criteria. Plotted results appears on the following pages.

15590 Page 25 of 70

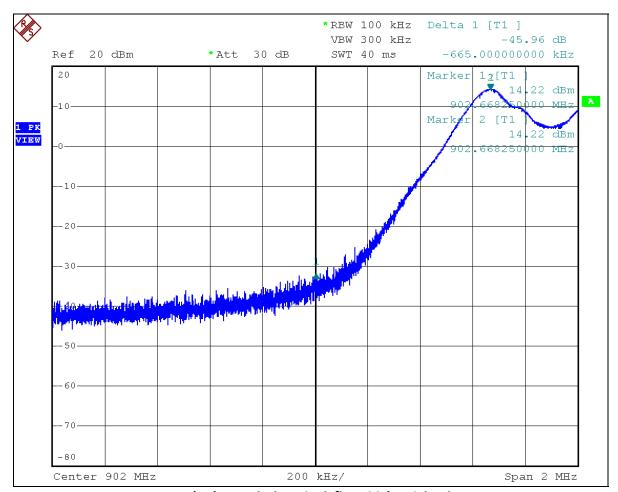
6.3.1 High Channel Band Edge



Band Edge Emission, Satisfies -20dBc Criteria

15590 Page 26 of 70

6.3.2 Low Channel Band Edge



Band Edge Emission, Satisfies -20dBc Criteria

15590 Page 27 of 70

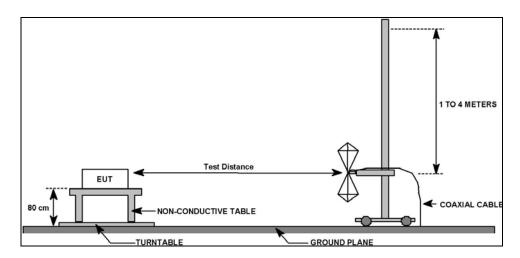
7.0 Radiated Spurious Emissions, Receive Mode

Out of band spurious/harmonic emissions measurements were performed on the EUT to determine compliance to 47 CFR, Part 15.

7.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate. A diagram showing the test setup appears below.



7.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 //	Field Strength of Radiated	2014-05-19
RSS-Gen Issue 3, 4.9, 4.10	Spurious/Harmonic Emissions	2014-05-20

7.3 Test Results

Emission measurements of receiver spurious were taken using the antenna with the highest gain plus largest radiating structure. The EUT was tuned to the middle channel.

The EUT satisfied the criteria. Recorded data is presented below.

15590 Page 28 of 70

Table 7.3.1: Radiated Spurious Emissions, Receive Mode, Below 1 GHz, Vertical Polarity
Antenna 1: Pulse Printed Circuit Antenna

			Profes	sional Te	sting, EN	VII, Inc.			
Test Metho	d:			ds of Measurer e Range of 9 kH				_	
In accordar	ice with:	FCC Part 15.2 Limits	09 - Code of	Federal Regulat	ions Part 47, S	Subpart C - Int	entional Radi	ators, Radiate	ed Emissions
Section:		15.209					_		
Test Date(s):	5/19/2014			EUT Serial		V4 003		
Customer:		_	IS LLC DBA	Pruf Energy	EUT Part #:		None		
Project Nur		15590-15			Test Techni		Dave Kohu		
Purchase O		PTI_014_00			Supervisor:		Rob McCol		
Equip. Und		PEC915V10			Witness' N	ame:	J.D. Hollan	d	
			issions Test	t Results Data	1		Pa	ge: 1	of 1
EUT Li	ne Voltage	: 3	.3 VDC		EUT Pow	er Frequen	cy: N	/A N/A	
Antenna	Orientation	n:	Vertic	al	Frequ	ency Range:		30MHz to	1GHz
	EUT N	/lode of Ope	eration:			Receiv	er Mode, 91	L5MHz	
Frequency Measured	Test Distance	EUT Direction	Antenna Height	Detector	Recorded Amplitude	Corrected Level	Limit Level	Margin	Test Result:
(MHz)	(Meters)	(Degrees)	(Meters)	Function	(dBμV)	(dBµV/m)	(dBμV/m)	(dB)	rest result
30.0133	10	148	0	Quasi-peak	30.8	19.788	29.5	-9.7	Pass
30.3304	10	62	2.5	Quasi-peak	24.1	12.919	29.5	-16.6	Pass
60.0208	10	242	3.83	Quasi-peak	33.2	11.862	29.5	-17.6	Pass
93.7134	10	273	3.74	Quasi-peak	28.4	7.737	33.1	-25.4	Pass
94.6828	10	78	2.18	Quasi-peak	30.3	9.767	33.1	-23.3	Pass
622.849	10	190	1.44	Quasi-peak	22.1	16.496	35.6	-19.1	Pass
876.64	10	233	3.04	Quasi-peak	21.4	20.552	35.6	-15.0	Pass
955.641	10	95	3.73	Quasi-peak	21.1	21.481	35.6	-14.1	Pass
Radiated	sional Testing, Emissions, 10m D 1GHz Vertical F	,	Emissions			 ∇ Co Pe 	uasi-peak Limit Le orrected Quasi-pea rak Limit Level orrected Peak Valu	k Readir	SSIONAL
Strength (dBµV/m) 30 60 60 60 60 60 60 60 60 60 60 60 60 60									
Field Str	Marchell Student bereich	Manhall W. Calence and		Adlantina I and despression		abite de la constant	and the same of th		V V
15590-15_	: Dave Kohutek RE_V4 003_915M PM, Monday, Ma	_	EUT Po	Free ode: 915MHz, Receiver: 3.3VDC humber: V4 003	nuency ver	I	EUT: PEC915V10 Project Number: 1: Client: BCP Contro		1G f Energy

15590 Page 29 of 70

Table 7.3.2: Radiated Spurious Emissions, Receive Mode, Below 1 GHz, Horizontal Polarity
Antenna 1: Pulse Printed Circuit Antenna

Antenna 1	: Pulse Pr	inted Circu	it Antenn	a					
			Profes	sional Te	sting, EN	VII, Inc.			
Test Method: ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).									
In accordan	ice with:	FCC Part 15.2 Limits	09 - Code of	Federal Regulat	ions Part 47, S	Subpart C - Int	entional Radi	ators, Radiat	ed Emissions
Section:		15.209							
Test Date(s):	5/19/2014			EUT Serial #	# :	V4 003		
Customer:		BCP Contro	Is LLC DBA	Pruf Energy	EUT Part #:		None		
Project Nur	nber:	15590-15			Test Techni	ician:	Dave Kohu	tek	
Purchase O		PTI_014_00			Supervisor:		Rob McCol		
Equip. Und	er Test:	PEC915V10			Witness' Na	ame:	J.D. Hollan	d	
	F	Radiated Em	issions Test	Results Data	Sheet		Pa	ge: 1	of 1
	ne Voltage		.3 VDC			er Frequen		/A N/A	
Antenna	Orientation	n:	Horizor	ntal	Freque	ency Range:		30MHz to	1GHz
	EUT N	lode of Ope	eration:			Receiv	er Mode, 91	L5MHz	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
30.731	10	185	1.26	Quasi-peak	24.2	12.763	29.5	-16.7	Pass
32.281	10	28	3.95	Quasi-peak	23.9	11.659	29.5	-17.8	Pass
42.748	10	351	1.33	Quasi-peak	23	5.505	29.5	-24.0	Pass
45.6423	10	275	3.26	Quasi-peak	23.5	4.865	29.5	-24.6	Pass
94.3566	10	34	1.74	Quasi-peak	23.4	2.806	33.1	-30.3	Pass
179.924	10	98	2.08	Quasi-peak	22.8	5.276	33.1	-27.8	Pass
721.081	10	181	3.75	Quasi-peak	21.8	17.899	35.6	-17.7	Pass
909.709	10	237	3.59	Quasi-peak	21.3	21.118	35.6	-14.5	Pass
984.666	10	145	3.56	Quasi-peak	21.1	22.02	43.5	-21.5	Pass
Radiated	sional Testing, Emissions, 10m D 1GHz Horizonta	,	ed Emissions			▽ Co — Pe	uasi-peak Limit Le orrected Quasi-pea eak Limit Level orrected Peak Valu	k Readin	SSIONAL
Field Strength (dBµV/m) 90 20 20 20 20 20 20 20 20 20 20 20 20 20									
10 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	more was produced as the same of the same	and the contract of the second	100M	terrapiding and the state of th	Y Y	And the second second second second		V Alexandra de la companya de la com	TG
Operator 15590-15_	: Dave Kohutek _RE_V4 003_915M PM, Monday, Ma	_	EUT Mo EUT Po	Fred ode: 915MHz, Recei- wer: 3.3VDC fumber: V4 003	puency ver	1	EUT: PEC915V10 Project Number: 1 Client: BCP Contro		

15590 Page 30 of 70

Table 7.3.3: Radiated Spurious Emissions, Receive Mode, Above 1 GHz, Vertical Polarity
Antenna 1: Pulse Printed Circuit Antenna

	Pulse Pri								
			Profess	sional Te	sting, EN	VII, Inc.			
Test Method	l:			ds of Measurer Range of 9 kH					
In accordanc	e with:	FCC Part 15.2 Limits	209 - Code of F	ederal Regulat	ions Part 47, S	Subpart C - Int	entional Rac	liators, Radiat	ed Emissions
Section:		15.209					_		
Test Date(s):		5/19/2014			EUT Serial #	# :	V4 003		
Customer:		BCP Contro	ols LLC DBA	Pruf Energy	EUT Part #:		None		
Project Num	ber:	15590-15			Test Techni	ician:	Dave Koh	utek	
Purchase Or	der #:	PTI_014_0)1		Supervisor:		Rob McCo	llough	
Equip. Unde	r Test:	PEC915V10			Witness' Na	ame:	J.D. Hollaı	nd	
	F	Radiated Em	issions Test	Results Data	a Sheet		P	age: 1	of 1
EUT Lin	e Voltage:	: 3	.3 VDC		EUT Pow	er Frequen	cy: N	N/A	
Antenna	Orientatio	n:	Vertic	al	Freque	ency Range:	:	Above 1	.GHz
	EUT N	lode of Ope	eration:			Receiv	er Mode, 9	15MHz	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level	_	Test Results
1947.43	3	64	1	Average	34.7	24.467	54.0	-29.5	Pass
1974.36	3	189	1	Average	42.5	32.302	54.0	-21.7	Pass
2704.66	3	33	1	Average	34.9	27.045	54.0	-26.9	Pass
5488.04	3	136	1	Average	33.5	30.425	54.0	-23.5	Pass
10424.2	3	145	1	Average	26.8	37.063	54.0	-16.9	Pass
11607.8	3	297	1	Average	27.6	38.449	54.0	-15.5	Pass
Radiated Er 1-12GHz V	onal Testing, missions, 3m Dis Vertical Polarity		ons	·		 ∇ Co Pe 	erage Limit Lev orrected Average ak Limit Level orrected Peak Re	Reading	SSIONAL
Field Strength (dBµV/m) 90 90 90 90 90 90 90 90 90 9									T 1 N 6

15590 Page 31 of 70

Table 7.3.4: Radiated Spurious Emissions, Receive Mode, Above 1 GHz, Vertical Polarity Antenna 1: Pulse Printed Circuit Antenna

Antenna 1	: Pulse Pri	inted Circ	uit Antenn	a					
			Profess	sional Te	sting, El	MI, Inc.			
Test Metho	d:			ds of Measurer e Range of 9 kH				•	
In accordar	nce with:	FCC Part 15. Limits	209 - Code of I	Federal Regulat	ions Part 47,	Subpart C - Int	tentional Ra	diators, Radiat	ed Emissions
Section:		15.209							
Test Date(s	;):	5/19/2014	ļ.		EUT Serial	#:	V4 003		
Customer:		BCP Contr	ols LLC DBA	Pruf Energy	EUT Part #:		None		
Project Nui	nber:	15590-15			Test Techn	ician:	Dave Koh	utek	
Purchase O	rder #:	PTI_014_0	01		Supervisor		Rob McCo	ollough	
Equip. Und	er Test:	PEC915V1	0		Witness' N	ame:	J.D. Holla	nd	
	F	Radiated En	nissions Test	Results Data	a Sheet		Р	age: 1	of 1
EUT Li	ne Voltage	: 3	3.3 VDC		EUT Pov	ver Frequen	cy: I	N/A N/A	
Antenna	Orientatio	n:	Horizor	ntal	Frequ	ency Range	:	Above 1	.GHz
	EUT N	/lode of Op	eration:			Receiv	er Mode,	915MHz	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Leve	0	Test Resul
2242.46	3	331	1	Average	34.6	25.659	54.0	-28.3	Pass
3356.87	3	214	1	Average	34.2	26.593	54.0	-27.4	Pass
5278.56	3	126	1	Average	32.5	29.028	54.0	-24.9	Pass
8814.2	3	284	1	Average	27.2	35.497	54.0	-18.5	Pass
11483.9	3	173	1	Average	27.4	38.681	54.0	-15.3	Pass
Radiated	sional Testing, Emissions, 3m Dis Horizontal Polar	stance	issions			▽ Co — Po	verage Limit Le orrected Average eak Limit Level orrected Peak R	e Reading	SSIONAL
95 40 30	And the second second second	the state of the following of	January, Hiller Hiller Hiller	territoria de la compansión de la compan				V Linguistic	
20			7	7					
1G Operator	: Dave Kohutek RE_V4 003_915M	Thz RCV.til	EUT Mo	Fred ode: 915MHz, Recei	quency ver		EUT: PEC915V1 Project Number		G 12G

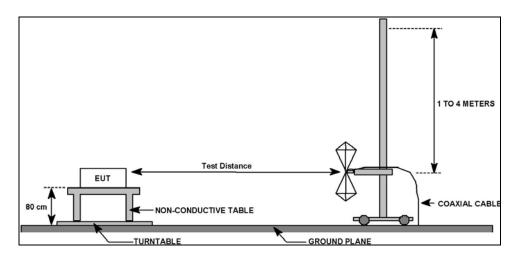
15590 Page 32 of 70

8.0 Radiated Spurious Emissions, Transmit Mode, Antenna 1: Pulse

8.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate. A diagram showing the test setup appears below.



8.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 //	Field Strength of Radiated	2014-05-19,
RSS-Gen Issue 3, 4.9, 4.10	Spurious/Harmonic Emissions	2014-05-20

8.3 Test Results

This section reports results with the Pulse printed circuit board antenna option.

Below 1 GHz measurements were taken in transmit mode on the middle channel. Above 1 GHz measurements were taken on the three standard channels of the band.

The applicable duty cycle factor for averaging above 1 GHz is 0 dB. All peak emissions can be seen as being well below the average limit, meaning the average level would also be under the average limit.

15590 Page 33 of 70

Table 8.3.1: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Vertical Polarity, Mid. Channel Antenna 1: Pulse Printed Circuit Antenna

Antenna 1	: Pulse Pr	inted Circu	it Antenn	a					
			Profes	sional Te	sting, EN	VII, Inc.			
Test Metho	d:			ds of Measurer e Range of 9 kH				_	
In accordan	ice with:	FCC Part 15.2 Limits	109 - Code of	Federal Regulat	ions Part 47, S	Subpart C - Int	tentional Radi	ators, Radiate	ed Emissions
Section:		15.209							
Test Date(s	s):	5/19/2014			EUT Serial	# :	V4 003		
Customer:		BCP Contro	Is LLC DBA	Pruf Energy	EUT Part #:		None		
Project Nur	mber:	15590-15			Test Techni	ician:	Dave Kohu	tek	
Purchase O	rder #:	PTI_014_00)1		Supervisor:		Rob McCol	lough	
Equip. Und	er Test:	PEC915V10			Witness' N	ame:	J.D. Hollan	d	
	F	Radiated Em	issions Test	Results Data	Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage	: 3	.3 VDC		EUT Pow	er Frequen	cy: N	/A N/A	
Antenna	Orientatio	n:	Vertic	al	Frequ	ency Range		30MHz to	1GHz
	EUT N	Aode of Ope	eration:			Transn	nit Mode, 9	15MHz	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
30.0098	10	291	1.37	Quasi-peak	30.3	19.245	29.5	-10.3	Pass
32.0581	10	122	1.57	Quasi-peak	24.1	11.997	29.5	-17.5	Pass
55.9652	10	326	2.67	Quasi-peak	26.1	5.219	29.5	-24.3	Pass
59.9803	10	161	3.36	Quasi-peak	33.4	12.067	29.5	-17.4	Pass
93.709	10	125	2.24	Quasi-peak	28.9	8.287	33.1	-24.8	Pass
94.6549	10	191	3.75	Quasi-peak	30.2	9.615	33.1	-23.5	Pass
257.236	10	323	3.07	Quasi-peak	22.1	8.427	35.6	-27.2	Pass
720.918	10	8	1.89	Quasi-peak	21.8	17.849	35.6	-17.8	Pass
772.448	10	327	1.72	Quasi-peak	21.6	18.298	35.6	-17.3	Pass
Radiated	sional Testing, Emissions, 10m D 1GHz Vertical P	,	Emissions			▽ Co — Pe	uasi-peak Limit Le orrected Quasi-pea eak Limit Level orrected Peak Valu	k Readin	SSIONAL T N 6
Field Strength (dBµV/m) 100 200 200 200 200 200 200 20	The same of the sa								
30M Operator 15590-15_	: Dave Kohutek RE_V4 003_915M PM, Monday, Ma	y 19, 2014	EUT Por Serial N	Fred de: 915MHz, GFSK wer: 3.3VDC umber: V4 003			EUT: PEC915V10 Project Number: 1 Client: BCP Contro		1G f Energy

15590 Page 34 of 70

Table 8.3.2: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Horizontal Polarity, Mid. Channel Antenna 1: Pulse Printed Circuit Antenna

(MHz) (Meters) (Degrees) (Meters) Function (dBμν) (dBμν/m) (d	Antenna 1	L: Pulse Pr	inted Circu	uit Antenn	a					
Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).				Profes	sional Te	sting, El	MI, Inc.			
Section: 15.209	Test Metho	od:								
Test Date(s): 5/19/2014 EUT Serial #: V4 003 Customer: BCP Controls LLC DBA Pruf Energy EUT Part #: None Project Number: 15590-15	In accorda	nce with:		209 - Code of	Federal Regulat	ions Part 47, S	Subpart C - In	tentional Radi	ators, Radiato	ed Emissions
Customer: BCP Controls LLC DBA Pruf Energy EUT Part #: None Dave Kohutek			, 			1				
Project Number: 15590-15 Test Technician: Dave Kohutek		s):								
Purchase Order #: PTI 014 001 Supervisor: Rob McCollough			_	ols LLC DBA	Pruf Energy					
Radiated Emissions Test Results Data Sheet Page: 1 of			_	01				_		
Radiated Emissions Test Results Data Sheet Page: 1 of						-				
EUT Line Voltage: 3.3 VDC EUT Power Frequency: N/A N/A	Equip. Ond				t Posults Date	•	anie.			of 1
Frequency Test EUT Antenna Detector (Meters) Distance (Meters) (Meter	CUT I				results Date	1			9 -	01 1
Frequency Test Recorded (MHz) Detector (MHz) Detector (MHz) (Imit Level (Imit Imit Level (Imit Level (Imit Imit Imit Imit Imit Imit (Imit Imit Imit Imit Imit Imit Imit Imit					ntal		•			1647
Test Distance Distance (Meters) Detector Height (Meters) Detector Function (Meters) (Meters) Detector Function (Meters) (Meters) Detector Function (Meters) (Meters) Detector Function (Meters) Detector General Meters Detector Function (Meters) Detector General Meters Detector Detector General Meters Detector Detec	Antenna				ıtaı	riequ				10112
Measured (MHz)						Descrided				
36.9482 10 11 1.84 Quasi-peak 23.1 8.274 29.5 -21.2 Past 40.0834 10 27 1.42 Quasi-peak 24 7.461 29.5 -22.0 Past 165.223 10 352 3.58 Quasi-peak 22.8 4.082 33.1 -29.0 Past 206.702 10 168 1.03 Quasi-peak 22.4 5.893 33.1 -27.2 Past 737.889 10 229 2.95 Quasi-peak 21.8 18.31 35.6 -17.3 Past 801.816 10 318 1.16 Quasi-peak 21.4 19.066 35.6 -16.5 Past Professional Testing, EMI, Inc Rudated Emissions 10m Distance 30MHz - 1GHz Horizontal Polarity Measured Emissions 110 100 100 100 100 100 100 100 100 10	Measured	Distance	Direction	Height		Amplitude	Level		_	Test Results
40.0834 10 27 1.42 Quasi-peak 24 7.461 29.5 -22.0 Past 165.223 10 352 3.58 Quasi-peak 22.8 4.082 33.1 -29.0 Past 206.702 10 168 1.03 Quasi-peak 22.4 5.893 33.1 -27.2 Past 737.889 10 229 2.95 Quasi-peak 21.8 18.31 35.6 -17.3 Past 801.816 10 318 1.16 Quasi-peak 21.4 19.066 35.6 -16.5 Past Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz - 1GHz Horizontal Polarity Measured Emissions Quasi-peak 21.4 19.066 35.6 -16.5 Past 10.0	31.1133	10	126	3.14	Quasi-peak	24.2	12.574	29.5	-16.9	Pass
165.223 10 352 3.58 Quasi-peak 22.8 4.082 33.1 -29.0 Pas 206.702 10 168 1.03 Quasi-peak 22.4 5.893 33.1 -27.2 Pas 737.889 10 229 2.95 Quasi-peak 21.8 18.31 35.6 -17.3 Pas 801.816 10 318 1.16 Quasi-peak 21.4 19.066 35.6 -16.5 Pas Professional Testing, EMI, Inc Radiated Emissions 10m Distance 30MHz - 1GHz Horizontal Polarity Measured Emissions 110 100 100 100 100 100 100 100 100 10	36.9482	10	11	1.84	Quasi-peak	23.1	8.274	29.5	-21.2	Pass
206.702 10 168 1.03 Quasi-peak 22.4 5.893 33.1 -27.2 Past 737.889 10 229 2.95 Quasi-peak 21.8 18.31 35.6 -17.3 Past 801.816 10 318 1.16 Quasi-peak 21.4 19.066 35.6 -16.5 Past 90.000 Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emissions 10m Distance 30MHz - IGHz Horizontal Polarity Measured Emi	,		27	1.42	Quasi-peak		7.461	29.5	-22.0	Pass
737.889 10 229 2.95 Quasi-peak 21.8 18.31 35.6 -17.3 Pas 801.816 10 318 1.16 Quasi-peak 21.4 19.066 35.6 -16.5 Pas Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz - 1GHz Horizontal Polarity Measured Emissions (a) 90	•		 		· ·	_				Pass
801.816 10 318 1.16 Quasi-peak 21.4 19.066 35.6 -16.5 Pas Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz - 1GHz Horizontal Polarity Measured Emissions Quasi-peak Limit Level			_		1					Pass
Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz - 1GHz Horizontal Polarity Measured Emissions 110 100 90 100 100 100 100 100 100 100	7				†			7		Pass
Radiated Emissions, 10m Distance 30MHz - 1GHz Horizontal Polarity Measured Emissions Peak Limit Level Corrected Peak Value Professional Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Professional Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Peak Value Orrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Peak Value Orrected Peak Value Orrected Peak Value Orrected Quasi-peak Readin Peak Limit Level Corrected Peak Value Orrected Peak Value Orrec	801.816	10	318	1.16	Quasi-peak	21.4	19.066	35.6	-16.5	Pass
90	Radiated 30MHz - 110	Emissions, 10m D	istance	ed Emissions			▽ C — Pe	orrected Quasi-pea eak Limit Level	k Readin	SSIONAL 7 N 6
20 10 10 30M 100M	I									
0 7 7 9 30M 100M 1G	Field Streng 30 20 20 20 20 20 20 20 20 20 20 20 20 20									
15590-15_RE_V4 003_915Miz.til EUT Mode: 915MHz, GFSK14.3ŏdBm Output Project Number: 15590-15	0 30M Operator		Thz. til	EUT Mo	Fred	quency 14.36dBm Output			5590-15	1G
01:14:58 PM, Monday, May 19, 2014 EUT Power: 3.3VDC Serial Number: V4 003 Client: BCP Controls LLC DBA Pruf Energy ≤ 1GHz Horizontal Antenna Polarity Measured Emissions	01:14:58	PM, Monday, Ma	<u> </u>	Serial N	wer: 3.3VDC lumber: V4 003			Client: BCP Contro		f Energy

15590 Page 35 of 70

Table 8.3.3: Radiated Spurious Emissions, TX Mode, Above 1 GHz, Vertical Polarity, Low Channel Antenna 1: Pulse Printed Circuit Antenna

		P	rofessional Te	sting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated			•	ical and	i
In accordance with:	FCC Pa		Code of Federal Regulat	tions Part 47, Subpart C - Int	tentional	l Radiators,	Radiate	d Emis	ions
Section:	15.20	9							
Test Date(s):	5/19/	/2014		EUT Serial #:	V4 003	3			
Customer:	ВСР (Controls L	LC DBA Pruf Energy	EUT Part #:	None				
Project Number:	1559	0-15		Test Technician:	Dave K	Cohutek			
Purchase Order #:	PTI_0	14_001		Supervisor: Rob		b McCollough			
Equip. Under Test:	PEC9	15V10		Witness' Name:	J.D. Ho	olland			
	Radiat	ed Emissi	ons Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltage:		3.3	VDC	EUT Power Frequen	су:	N/A	N/A		
Antenna Orientation:			Vertical	Frequency Range:	Above 1GHz				
EU	T Mode	of Operat	ion·	Transm	i+ N/od	- 002 01/	111-		
Professional Test	0,	•		— Av	verage Lim				
Radiated Emissions, 3n 1-12GHz Vertical Pol: 90 80 (III/ A 70 40 60 40 50 40 50 40 50 40 50 40 50 40 50 40 50 60 40 50 60 60 60 60 60 60 60 60 60 60 60 60 60	n Distance	inc		— Av ▽ Co — Pe	verage Lim orrected Av eak Limit L	it Level verage Reading		SIONAL	
Radiated Emissions, 3n 1-12GHz Vertical Pole 90 80 80 80 50 40 50 40 80 80 80 80 80 80 80 80 80 80 80 80 80	n Distance	inc		— Av ▽ Co — Pe	verage Lim orrected Av eak Limit L	it Level verage Reading evel	PROFES		
Radiated Emissions, 3n 1-12GHz Vertical Pole 90 80 80 60 60 60 60 60 60 60 60 60 60 60 60 60	n Distance arity Measure tek 902.9Mhz.til	ed Emissions		quency SK14.36dBm Output	verage Lim orrected Aveak Limit L orrected Pe	it Level rerage Reading evel eak Reading	PROFES 10G	12	G

15590 Page 36 of 70

Table 8.3.4: Radiated Spurious Emissions, TX Mode, Above 1 GHz, Horizontal Polarity, Low Channel Antenna 1: Pulse Printed Circuit Antenna

		P	rofessional Te	esting, EMI, Inc	•				
Test Method:				ment of Radio-Noise Emis Hz to 40 GHz" (incorporat			~	ical and	t
n accordance with:	FCC Pa	ert 15.209 -	· Code of Federal Regula	tions Part 47, Subpart C -	Intention	al Radiators	, Radiate	d Emis	sion
Section:	15.209	9							
Test Date(s):	5/19/	2014		EUT Serial #:	V4 00	03			
Customer:	ВСР С	Controls L	LC DBA Pruf Energy	EUT Part #:	None	:			
Project Number:	15590)-15		Test Technician:	Dave	Kohutek			
Purchase Order #:	PTI_0	14_001		Supervisor:	Rob I	McColloug	h		
Equip. Under Test:	PEC9:	15V10		Witness' Name:	J.D. H	lolland			
	Radiate	ed Emissi	ons Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequ	ency:	N/A	N/A		
Antenna Orientat	tion:		Horizontal	Frequency Rang	ge:	А	bove 10	6Hz	
EUT	Mode o	of Operat	ion:	Trans	smit Mo	de, 902.9N	ЛHz		
Radiated Emissions, 3m 1-12GHz Horizontal Po 90 80 80 60 60 40 40		red Emissions			Peak Limit	Average Reading Level Peak Reading	PROFES	SIONAL	
20	The second secon								G

15590 Page 37 of 70

Table 8.3.5: Radiated Spurious Emissions, TX Mode, Above 1 GHz, Vertical Polarity, Mid. Channel Antenna 1: Pulse Printed Circuit Antenna

		P	rofessional Te	esting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated			_	ical and	I
In accordance with:	FCC Par Limits	rt 15.209	- Code of Federal Regula	itions Part 47, Subpart C - Int	entiona	l Radiators	, Radiate	d Emiss	ions
Section:	15.209								
Test Date(s):	5/19/	2014		EUT Serial #:	V4 003	3			
Customer:	ВСР С	ontrols	LLC DBA Pruf Energy	EUT Part #:	None				
Project Number:	15590	-15		Test Technician:	Dave I	Kohutek			
Purchase Order #:	PTI_0:	14_001		Supervisor:	Rob IV	1cColloug	h		
Equip. Under Test:	PEC91	.5V10		Witness' Name:	J.D. H	olland			
	Radiate	d Emiss	ions Test Results Dat	ta Sheet		Page:	1	of	1
EUT Line Voltag	e:	3.3	VDC	EUT Power Frequen	cy:	N/A	N/A		
Antenna Orientat	ion:		Vertical	Frequency Range:		A	bove 10	SHz	
EUT	Mode o	f Opera	tion:	Transn	nit Mo	de, 915M	Hz		
Professional Testin Radiated Emissions, 3m I 1-12GHz Vertical Polar 90 80 70 60 60 50 50 60 60 60 60 60 60 60 60 60 60 60 60 60	Distance			▽ Co — Pe	ak Limit I	verage Reading	PROFES	SIONAL N 6	
ield Strei		ورا برور والمراور	A STATE OF THE PARTY OF THE PAR		ali lali a patati		la la sulle de la constante de		
30 30 30 30 30 30 30 30 30 30 30 30 30 3		a desired large to the	Fr	equency	EUT: PECS		10G	120	G.
30 July 20 1G	5Mhz.til	and least like	Fr EUT Mode: 915MHz, GFS EUT Power: 3.3VDC Serial Number: V4 003	equency K14.36dBm Output F	Project Nu	015V10 mber: 15590-15	5		G-

15590 Page 38 of 70

Table 8.3.6: Radiated Spurious Emissions, TX Mode, Above 1 GHz, Horizontal Polarity, Mid. Channel Antenna 1: Pulse Printed Circuit Antenna

Fest Method:				sting, EMI, In	. • •				
est Method:			"Methods of Measure ent in the Range of 9 kl				_	ical and	1
n accordance with:	FCC Part Limits	15.209 -	Code of Federal Regula	tions Part 47, Subpart C	C - Intention	al Radiators	, Radiate	d Emiss	ions
Section:	15.209								
Test Date(s):	5/19/2	014		EUT Serial #:	V4 00)3			
Customer:	BCP Co	ntrols LI	LC DBA Pruf Energy	EUT Part #:	None				
Project Number:	15590-1	L5		Test Technician:	Dave	Kohutek			
Purchase Order #:	PTI_014	1_001		Supervisor:	Rob I	McColloug	h		
quip. Under Test:	PEC915	V10		Witness' Name:	J.D. I	Iolland			
	Radiated	Emissio	ons Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltag	e:	3.3	VDC	EUT Power Freq	uency:	N/A	N/A		
Antenna Orientat	ion:		Horizontal	Frequency Ra	nge:	Α	bove 10	SHz	
EUT	Mode of	Operati	on:	Tra	ansmit Mo	ode, 915M	Hz		
Professional Testing Radiated Emissions, 3m I 1-12GHz Horizontal Pol 90 80 70 70 60 50 50 50 50 50 50 50 50 50 50 50 50 50	Distance	d Emissions			Peak Limit	Average Reading	PROFES	SIONAL	
30 20 1G Operator: Dave Kohutek					EUT: PE	C015V10	10G	120	G
15590-15_RE_V4 003_915 11:53:34 AM, Monday, M	Mhz.til		Fre EUT Mode: 915MHz, GFSI EUT Power: 3.3VDC Serial Number: V4 003	quency K14.36dBm Output	Project N	Jumber: 15590-1: CP Controls LLO		Energy	

15590 Page 39 of 70

Table 8.3.7: Radiated Spurious Emissions, TX Mode, Above 1 GHz, Vertical Polarity, High Channel Antenna 1: Pulse Printed Circuit Antenna

		Professional T	esting, EMI, Inc.				
Гest Method:			ement of Radio-Noise Emissi kHz to 40 GHz" (incorporated		_	rical and	d
n accordance with:	FCC Part 15.2 Limits	09 - Code of Federal Regul	ations Part 47, Subpart C - In	tentional Radiato	ors, Radiate	d Emiss	sions
Section:	15.209						
Гest Date(s):	5/19/2014		EUT Serial #:	V4 003			
Customer:	BCP Contro	Is LLC DBA Pruf Energy	EUT Part #:	None			
Project Number:	15590-15		Test Technician:	Dave Kohute	k		
Purchase Order #:	PTI_014_00	1	Supervisor:	Rob McCollo	ugh		
Equip. Under Test:	PEC915V10		Witness' Name:	J.D. Holland			
	Radiated Em	issions Test Results Da	ta Sheet	Page	: 1	of	1
EUT Line Voltag	e: 3.	3 VDC	EUT Power Frequer	ncy: N/A	N/A		
Antenna Orientat	ion:	Vertical	Frequency Range	:	Above 10	3Hz	
EUT	Mode of Ope	ration:	Transm	nit Mode, 927.	5MHz		
Radiated Emissions, 3m I 1-12GHz Vertical Polari 90			— Pe	orrected Average Reaceak Limit Level orrected Peak Reading		SIONAL	
20 1G Operator: Dave Kohutek 15590-15_RE_V4 003_927		Fr EUT Mode: 927.5MHz, G EUT Power: 3.3VDC		EUT: PEC915V10 Project Number: 1559	10G 0-15	120 Energy	G

15590 Page 40 of 70

Table 8.3.8: Radiated Spurious Emissions, TX Mode, Above 1 GHz, Horizontal Polarity, High Channel Antenna 1: Pulse Printed Circuit Antenna

		P	rofessional Te	sting, EMI, Inc	•				
Test Method:				ment of Radio-Noise Emis Hz to 40 GHz" (incorporat			_	ical and	t
In accordance with:	FCC Pa	rt 15.209	- Code of Federal Regula	tions Part 47, Subpart C -	Intention	al Radiators	, Radiate	d Emis	sions
Section:	15.209)							
Test Date(s):	5/19/	2014		EUT Serial #:	V4 00	3			
Customer:	BCP C	Controls I	LC DBA Pruf Energy	EUT Part #:	None				
Project Number:	15590)-15		Test Technician:	Dave	Kohutek			
Purchase Order #:	PTI_0	14_001		Supervisor:	Rob I	AcColloug	h		
Equip. Under Test:	PEC91	15V10		Witness' Name:	J.D. H	olland			
	Radiate	ed Emissi	ons Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltag	e:	3.3	VDC	EUT Power Freque	ency:	N/A	N/A		
Antenna Orientat	ion:		Horizontal	Frequency Rang	ge:	Α	bove 10	SHz	
EUT	Mode o	of Operat	ion:	Trans	mit Mo	de, 927.5N	ИHz		
Professional Testin Radiated Emissions, 3m I 1-12GHz Horizontal Pol 90 80 60 60 40 30	Distance				Peak Limit	Average Reading	PROFES	SIBNAL	
20 IG Operator: Dave Kohutek 15590-15_RE_V4 003_92 01:36:23 PM, Monday, M	7.5Mhz.til		EUT Mode: 927.5MHz, GF EUT Power: 3.3VDC Serial Number: V4 003	quency SK14.36dBm Output Polarity Measured Em	Client: BC	915V10 umber: 15590-1: P Controls LLC		12 Energy	G

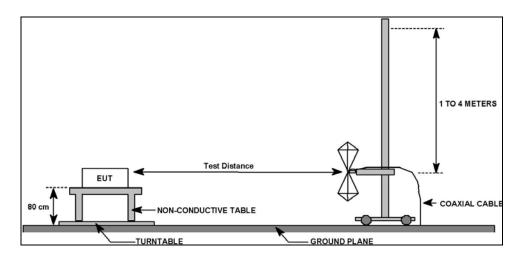
15590 Page 41 of 70

9.0 Radiated Spurious Emissions, Transmit Mode, Antenna 2: Helical

9.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate. A diagram showing the test setup appears below.



9.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 //	Field Strength of Radiated	2014-05-19,
RSS-Gen Issue 3, 4.9, 4.10	Spurious/Harmonic Emissions	2014-05-20

9.3 Test Results

This section reports results with the helical antenna option.

Below 1 GHz measurements were taken in transmit mode on the middle channel. Above 1 GHz measurements were taken on the three standard channels of the band.

The applicable duty cycle factor for averaging above 1 GHz is 0 dB. All peak emissions can be seen as being well below the average limit, meaning the average level would also be under the average limit.

15590 Page 42 of 70

Table 9.3.1: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Vertical Polarity, Mid. Channel Antenna 2: Helical

Antenna 2	: Helical								
			Profes	sional Te	sting, EN	MI, Inc.			
Test Metho	d:			ds of Measurer e Range of 9 kH				•	
In accordar	nce with:	FCC Part 15.2 Limits	209 - Code of	Federal Regulat	ions Part 47, S	Subpart C - Int	entional Radi	ators, Radiate	ed Emissions
Section:		15.209		_			K		
Test Date(s	s):	5/19/2014			EUT Serial		V4 002		
Customer:			ols LLC DBA	Pruf Energy	EUT Part #:		None		
Project Nur		15590-15			Test Techn		Dave Kohu		
Purchase O		PTI_014_00			Supervisor:		Rob McCol		
Equip. Und		PEC915V10			Witness' N	ame:	J.D. Hollan	a	
		Radiated Em	issions Test	Results Data	a Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage	: 3	.3 VDC		EUT Pow	ver Frequen	cy: N	/A N/A	
Antenna	orientation of the contraction o	on:	Vertic	al	Frequ	ency Range:	1	30MHz to	1GHz
	EUT N	Mode of Ope	eration:			Transn	nit Mode, 9	15MHz	
Frequency	Test	EUT	Antenna	_	Recorded	Corrected			
Measured	Distance	Direction	Height	Detector	Amplitude	Level	Limit Level	Margin	Test Results
(MHz)	(Meters)	(Degrees)	(Meters)	Function	dBμV)	(dBµV/m)	(dBµV/m)	(dB)	
30.8376	10	170	2.15	Quasi-peak	24.2	12.731	29.5	-16.8	Pass
37.9117	10	113	2.76	Quasi-peak	23.7	8.321	29.5	-21.2	Pass
59.9874	10	292	3.23	Quasi-peak	32.7	11.392	29.5	-18.1	Pass
93.6608	10	342	1.21	Quasi-peak	28.5	7.873	33.1	-25.2	Pass
94.6398	10	55	2.07	Quasi-peak	30.2	9.609	33.1	-23.5	Pass
723.986	10	159	1.18	Quasi-peak	21.9	18.065	35.6	-17.5	Pass
743.178	10	290	3.04	Quasi-peak	21.8	18.478	35.6	-17.1	Pass
873.425	10	173	1.96	Quasi-peak	21.4	20.472	35.6	-15.1	Pass
Radiated 30MHz - 1100 mm.mm.mm.mm.mm.mm.mm.mm.mm.mm.mm.mm.mm.	sional Testing, Emissions, 10m D 1GHz Vertical F	,	Emissions			 ∇ Co Pe 	uasi-peak Limit Le prrected Quasi-pea eak Limit Level prrected Peak Valu	k Readir	SIONAL
15590-15	: Dave Kohutek RE_V4 002_915N AM, Tuesday, Ma	ny 20, 2014	EUT Po Serial N	Frede: 915MHz, GFSK wer: 3.3VDC umber: V4 002		(EUT: PEC915V10 Project Number: 1: Client: BCP Contro		1G f Energy

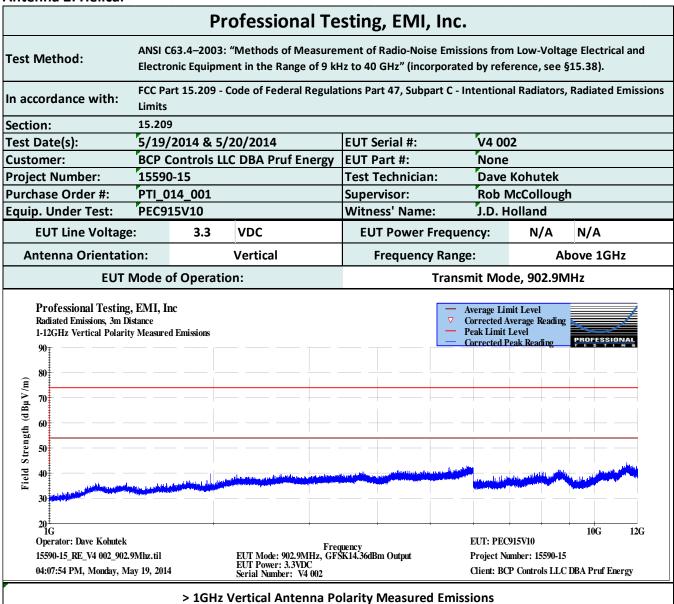
15590 Page 43 of 70

Table 9.3.2: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Horizontal Polarity, Mid. Channel Antenna 2: Helical

Antenna 2	2: Helical								
			Profes	sional Te	sting, El	MI, Inc.			
Test Metho	od:			ds of Measurer e Range of 9 kH				_	
In accorda	nce with:	FCC Part 15.	209 - Code of	Federal Regulat	ions Part 47,	Subpart C - Int	tentional Rad	liators, Radiato	ed Emissions
Section:		15.209							
Test Date(s):	 	8 5/20/201		EUT Serial		V4 002		
Customer:		-	ols LLC DBA	Prut Energy	EUT Part #:		None		
Project Nu		15590-15	.01		Test Techn		Dave Kohi		
Purchase C		PTI_014_0 PEC915V1			Supervisor: Witness' N		Rob McCo J.D. Hollar		
Equip. Und				t Results Data		ame:			of 1
				Results Data	1	5			Of 1
	ine Voltage a Orientatio		3.3 VDC Horizoi			ver Frequen	•	I/A N/A 30MHz to	164-
Antenn		Mode of Op		ıtaı	Frequ	ency Range	nit Mode, 9		10112
_							int wiode, s	13141112	
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
30.3061	10	60	3.45	Quasi-peak	24	12.758	29.5	-16.7	Pass
31.8996	10	205	2.82	Quasi-peak	24.2	12.09	29.5	-17.4	Pass
182.418	10	157	2.16	Quasi-peak	22.6	5.061	33.1	-28.0	Pass
189.536	10	228	2.85	Quasi-peak	22.6	4.858	33.1	-28.2	Pass
753.119	10	184	3.71	Quasi-peak	21.8	18.597	35.6	-17.0	Pass
801.24	10	97	1.78	Quasi-peak	21.4	19.06	35.6	-16.5	Pass
810.261	10	35	2.76	Quasi-peak	21.5	19.218	35.6	-16.4	Pass
Radiated	sional Testing, Emissions, 10m D - 1GHz Horizonta	istance	red Emissions			▽ Co — Po	uasi-peak Limit I orrected Quasi-pe eak Limit Level orrected Peak Va	eak Readin	SSIONAL 7 N 6
100									
(E) 90 - −									
Field Strength (dBµV/m) 80 09 00 00 00 00 00 00 00 00 00 00 00 00									
#B 70									
= 50 = 50 = −			_ _ + _ +				_	_ _	_
S 40			_						- #
를 30									
20 10	Mary and mark market and and			la are an are transmission					
0 30M		- virtual and and other first property of the state of th	100M		77				1G
Operato 15590-15	r: Dave Kohutek 5_RE_V4 002_915M AM, Tuesday, Ma		EUT M EUT Po Serial N	Fred ode: 915MHz, GFSK wer: 3.3VDC lumber: V4 002	wency 114.36dBm Output]]	EUT: PEC915V10 Project Number: Client: BCP Cont		
		> 10	ONZ MORIZONI	tal Antenna P	orarity iviea	isureu EMIS	210112		

15590 Page 44 of 70

Table 9.3.3: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Vertical Polarity, Low Channel Antenna 2: Helical



15590 Page 45 of 70

Table 9.3.4: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Horizontal Polarity, Low Channel Antenna 2: Helical

		Pr	ofessional Te	sting, EMI, Inc	·				
Test Method:				ment of Radio-Noise Emi Hz to 40 GHz" (incorporat			U	ical and	d
n accordance with:	FCC Par Limits	t 15.209 -	Code of Federal Regula	tions Part 47, Subpart C -	· Intention	al Radiators	, Radiate	d Emiss	sions
Section:	15.209								
Test Date(s):	5/19/2	2014 & 5,	/20/2014	EUT Serial #:	V4 00	2			
Customer:	BCP Co	ontrols LI	LC DBA Pruf Energy	EUT Part #:	None				
Project Number:	15590-	-15		Test Technician:	Dave	Kohutek			
Purchase Order #:	PTI_01	4_001		Supervisor:	Rob N	/lcColloug	h		
Equip. Under Test:	PEC91	5V10		Witness' Name:	J.D. H	olland			
	Radiate	d Emissic	ons Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltag	e:	3.3	VDC	EUT Power Frequ	iency:	N/A	N/A		
Antenna Orientat	ion:		Horizontal	Frequency Ran	ge:	A	bove 10	SHz	
EUT	Mode of	f Operati	on:	Tran	smit Mod	de, 902.9N	ИHz		
Radiated Emissions, 3m I 1-12GHz Horizontal Pol 90 80 60 60 60 60 60 60 60 60 60 60 60 60 60		ed Emissions			Peak Limit	verage Reading Level Peak Reading	PROFES	SIBNAL	
20 1G Operator: Dave Kohutek 15590-15_RE_V4 002_902 04:07:52 PM, Monday, M	.9Mhz.til		Free EUT Mode: 902.9MHz, GF EUT Power: 3.3VDC Serial Number: V4 002	quency SK14.36dBm Output	·	915V10 mber: 15590-15 P Controls LLC		12 Energy	G

15590 Page 46 of 70

Table 9.3.5: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Vertical Polarity, Mid. Channel Antenna 2: Helical

		Pı	rofessional Te	sting, EMI, Inc.						
Test Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated			~	ical and	I	
In accordance with:	FCC Pa		Code of Federal Regulat	tions Part 47, Subpart C - Int	tentiona	l Radiators,	, Radiate	d Emiss	ion	
Section:	15.20	9								
Test Date(s):	5/19/	/2014 & 5	/20/2014	EUT Serial #:	V4 002	2				
Customer:	BCP (Controls L	LC DBA Pruf Energy	EUT Part #:	None					
Project Number:	1559	0-15		Test Technician:	Dave I	Kohutek				
Purchase Order #:	PTI_0	014_001		Supervisor:	Rob M	1cColloug	h			
Equip. Under Test:	PEC9	15V10		Witness' Name:	J.D. Ho	olland				
	Radiat	ed Emissi	ons Test Results Dat	a Sheet		Page:	1	of	1	
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	су:	N/A	N/A			
Antenna Orienta	tion:		Vertical	Frequency Range		Al	bove 10	Hz		
EUT	Mode of	of Onorot:		Transmit Mode, 915MHz						
Professional Testin		•	on:		nit Moo	-	Hz			
Radiated Emissions, 3m 1-12GHz Vertical Polar 90	ng, EMI, I Distance	inc	on:	— A	verage Lim orrected Av	it Level verage Reading		SIONAL		
Radiated Emissions, 3m 1-12GHz Vertical Polar 90 80 80 70 60 60 60	ng, EMI, I Distance	inc		— A	verage Lim orrected Av	iit Level verage Reading .evel		SIONAL		

15590 Page 47 of 70

Table 9.3.6: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Horizontal Polarity, Mid. Channel Antenna 2: Helical

		Pr	rofessional Te	sting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated			_	ical and	I
In accordance with:	FCC Pa		Code of Federal Regulat	tions Part 47, Subpart C - Int	entiona	l Radiators,	. Radiate	d Emiss	ion
Section:	15.20	9							
Test Date(s):	5/19/	/2014 & 5	/20/2014	EUT Serial #:	V4 002	2			
Customer:	BCP (Controls LI	LC DBA Pruf Energy	EUT Part #:	None				
Project Number:	1559	0-15		Test Technician:	Dave I	Kohutek			
Purchase Order #:	PTI_0	14_001		Supervisor:	Rob M	1cColloug	h		
Equip. Under Test:	PEC9	15V10		Witness' Name:	J.D. Ho	olland			
	Radiat	ed Emissio	ons Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	су:	N/A	N/A		
Antenna Orienta	tion:	Horizontal	Frequency Range:		Al	bove 10	iΗz		
				Transmit Mode, 915MHz					
Professional Testin	ng, EMI, I	of Operati	on:	— Av	erage Lim	it Level			
Professional Testin Radiated Emissions, 3m 1-12GHz Horizontal Po	ng, EMI, I Distance	nc	on:	— Av ▽ Cv — Pe	verage Lim orrected Av eak Limit I	nit Level verage Reading		SIONAL	
Professional Testin Radiated Emissions, 3m 1-12GHz Horizontal Po 90 80 80 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ng, EMI, I Distance	nc	on:	— Av ▽ Cv — Pe	verage Lim orrected Av eak Limit I	nit Level verage Reading Level		STOWAL N a	

15590 Page 48 of 70

Table 9.3.7: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Vertical Polarity, High Channel Antenna 2: Helical

		Pı	ofessional Te	sting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emiss Iz to 40 GHz" (incorporate			•	ical and	t
In accordance with:	FCC Par Limits	rt 15.209 -	Code of Federal Regulat	tions Part 47, Subpart C - Ir	ntentiona	l Radiators,	. Radiate	d Emis	sions
Section:	15.209								
Test Date(s):	5/19/	2014 & 5,	/20/2014	EUT Serial #:	V4 002	2			
Customer:	BCP C	ontrols L	LC DBA Pruf Energy	EUT Part #:	None				
Project Number:	15590	-15		Test Technician:	Dave I	Kohutek			
Purchase Order #:	PTI_01	14_001		Supervisor:	Rob N	1cColloug	h		
Equip. Under Test:	PEC91	.5V10		Witness' Name:	J.D. H	olland			
	Radiate	d Emissio	ons Test Results Data	a Sheet		Page:	1	of	1
EUT Line Voltag	e:	3.3	VDC	EUT Power Freque	ncy:	N/A	N/A		
Antenna Orientat	ion:		Vertical	Frequency Range	e:	A	bove 10	3Hz	
EUT	Mode o	f Operati	on:	Transr	nit Mod	e, 927.5N	1Hz		
Radiated Emissions, 3m I 1-12GHz Vertical Polari 90 80 60 60 40 40 40		Emissions		— I	Corrected Aveak Limit I		PROFESS	SIONAL	
30 20 1G Operator: Dave Kohutek 15590-15_RE_V4 002_927 04:25:52 PM, Monday, N	.5Mhz.til		EUT Mode: 927.5MHz, GFS EUT Power: 3.3VDC Serial Number: V4 002	juency SK14.36dBm Output Diarity Measured Emiss	Client: BCF	15V10 mber: 15590-15 P Controls LLC		120 Energy	<u></u>

15590 Page 49 of 70

Table 9.3.8: Radiated Spurious Emissions, TX Mode, Below 1 GHz, Horizontal Polarity, High Channel Antenna 2: Helical

		Р	rofessional Te	sting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emiss Hz to 40 GHz" (incorporate			_	ical and	t
In accordance with:	FCC Pa	CC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions imits							
Section:	15.20	9							
Test Date(s):	5/19/	/2014 & !	5/20/2014	EUT Serial #:	V4 00	2			
Customer:	ВСР	Controls	LLC DBA Pruf Energy	EUT Part #:	None				
Project Number:	15590)- 1 5		Test Technician:	Dave	Kohutek			
Purchase Order #:	PTI_0	14_001		Supervisor:	Rob N	/lcColloug	h		
Equip. Under Test:	PEC9	15V10		Witness' Name:	J.D. H	olland			
	Radiat	ed Emiss	ions Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Freque	ncy:	N/A	N/A		
Antenna Orientat	ion:		Horizontal	Frequency Range: Above 1GH			SHz		
EUT	Mode o	of Operat	tion:	Transı	nit Mod	le, 927.5N	ИHz		
Professional Testin Radiated Emissions, 3m 1-12GHz Horizontal Po 90 80 80 60 40 30	Distance			<u>▽</u>	Peak Limit	verage Reading	PROFES	SIONAL	
20 1G Operator: Dave Kohutel 15590-15_RE_V4 002_92 04:25:51 PM, Monday, 1	7.5Mhz.til		EUT Mode: 927.5MHz, GF EUT Power: 3.3VDC Serial Number: V4 002	quency SK14.36dBm Output	Client: BC	915V10 umber: 15590-1: P Controls LLC		12 Energy	G

15590 Page 50 of 70

10.0 Conducted Spurious Emissions, Transmit Mode

10.1 Test Procedure

Spurious emissions were measured with peak detection using resolution bandwidth 100 kHz and video bandwidth 300 kHz.

10.2 Test Criteria

47 CFR (USA) // IC (Canada)									
Section Reference	Parameter	Date(s)							
15.247, 15.209 //	Field Strength of Radiated	2014 05 22							
RSS-Gen Issue 3, 4.9, 4.10	Spurious/Harmonic Emissions	2014-05-22							

10.3 Test Results

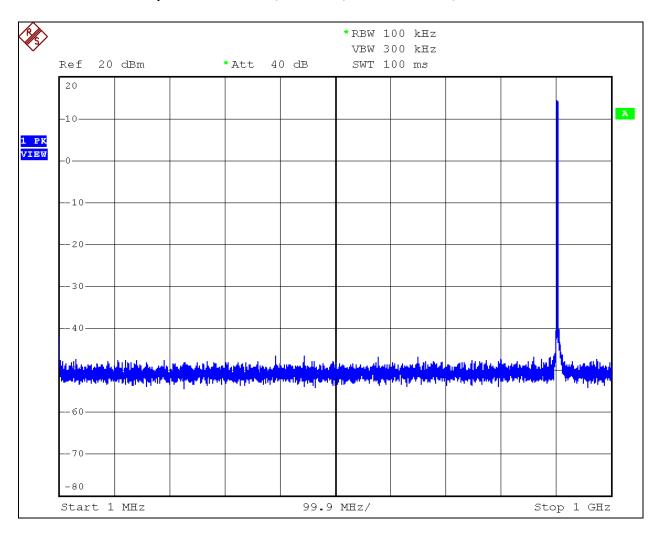
Measurements were taken for frequency range of 1 MHz to 10 GHz and repeated for each of the three standard transmit channels.

The transmitter operation was verified by including the fundamental frequency where possible.

The EUT satisfied the criteria. Plotted data appears on the following pages.

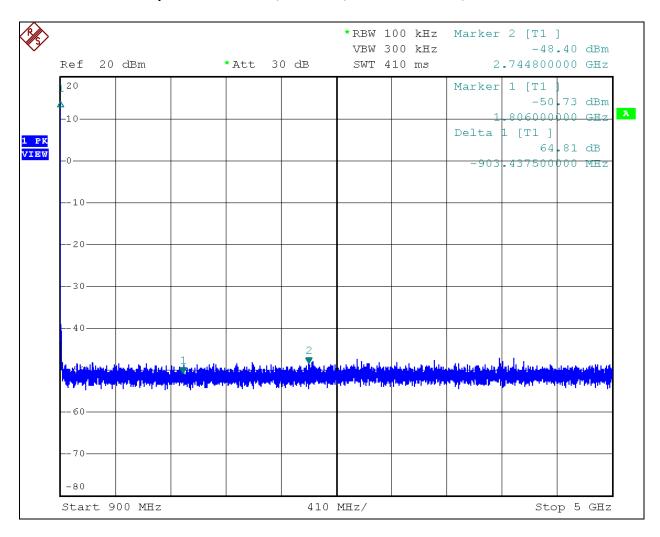
15590 Page 51 of 70

Plot 10.3.1: Conducted Spurious Emissions, TX Mode, 1 MHz to 1 GHz, Low Channel



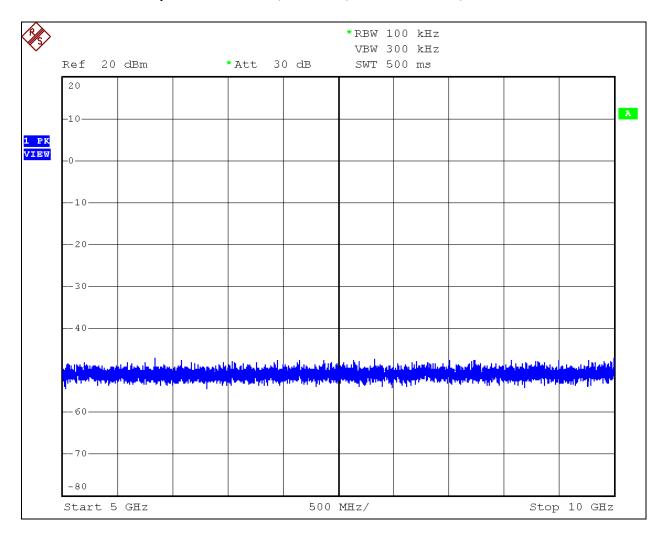
15590 Page 52 of 70

Plot 10.3.2: Conducted Spurious Emissions, TX Mode, 0.9 GHz to 5 GHz, Low Channel



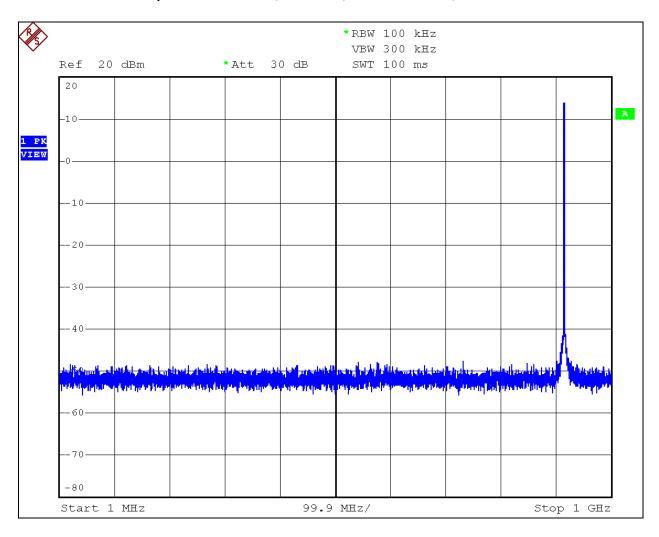
15590 Page 53 of 70

Plot 10.3.3: Conducted Spurious Emissions, TX Mode, 5 GHz to 10 GHz, Low Channel



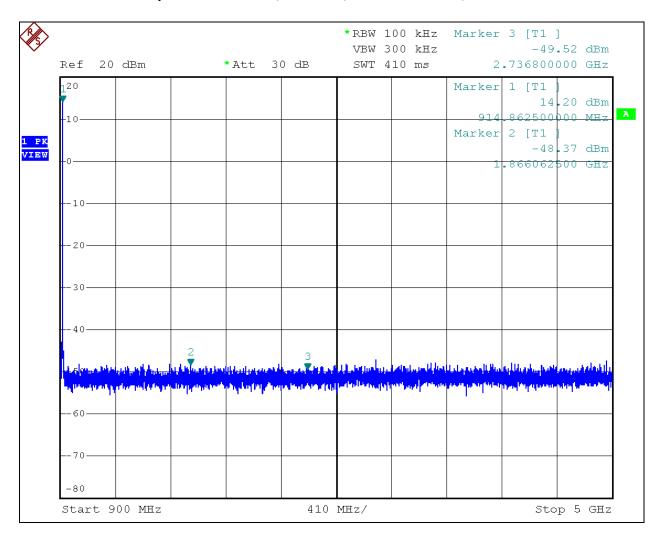
15590 Page 54 of 70

Plot 10.3.4: Conducted Spurious Emissions, TX Mode, 1 MHz to 1 GHz, Middle Channel



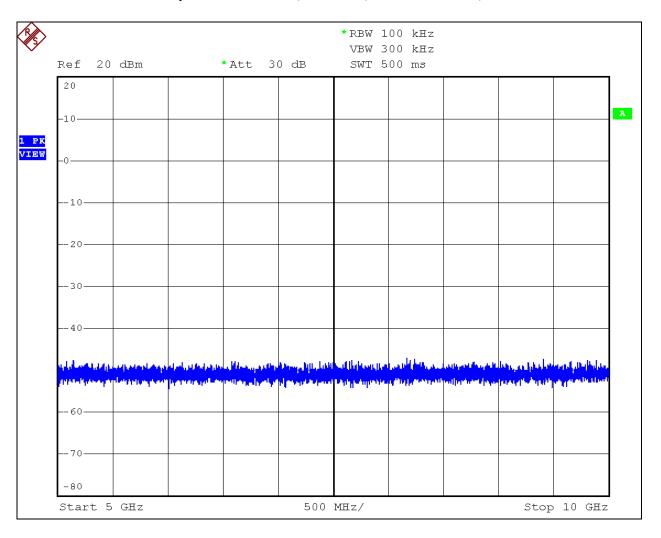
15590 Page 55 of 70

Plot 10.3.5: Conducted Spurious Emissions, TX Mode, 0.9 GHz to 5 GHz, Middle Channel



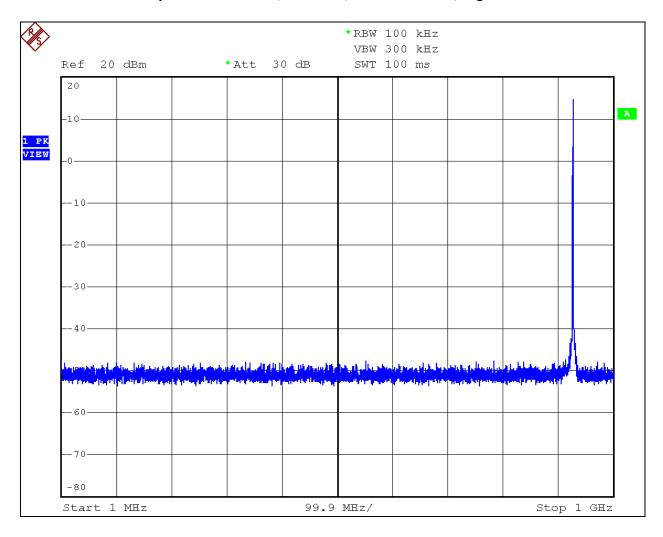
15590 Page 56 of 70

Plot 10.3.6: Conducted Spurious Emissions, TX Mode, 5 GHz to 10 GHz, Middle Channel



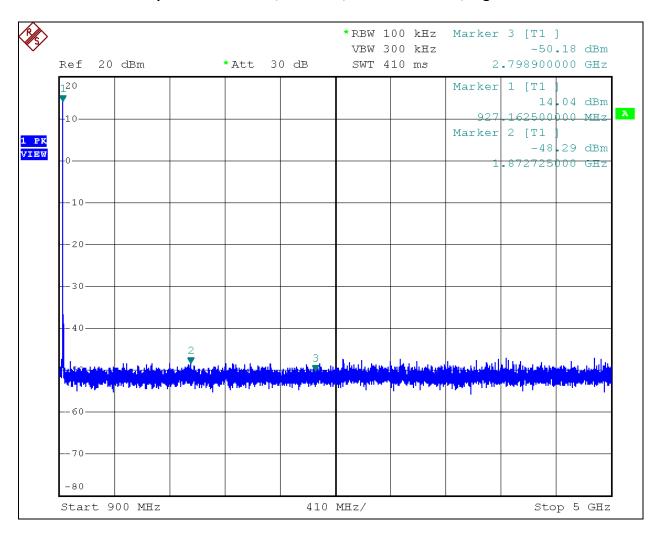
15590 Page 57 of 70

Plot 10.3.7: Conducted Spurious Emissions, TX Mode, 1 MHz to 1 GHz, High Channel



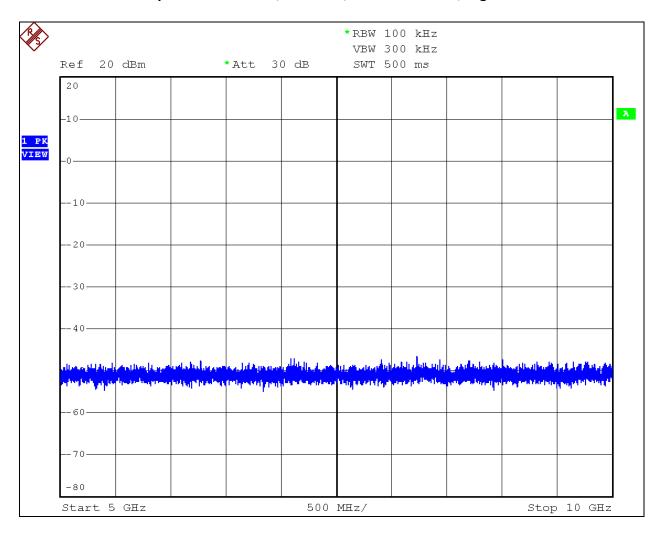
15590 Page 58 of 70

Plot 10.3.8: Conducted Spurious Emissions, TX Mode, 0.9 GHz to 5 GHz, High Channel



15590 Page 59 of 70

Plot 10.3.9: Conducted Spurious Emissions, TX Mode, 5 GHz to 10 GHz, High Channel



15590 Page 60 of 70

11.0 Conducted Emissions, Mains

11.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the floor and 0.4 meters from the conductive reference plane (wall). The EUT is powered through a line impedance stabilization network (LISN) that provides a measurement tap and a termination approximating 50 Ohms in the measurement range of 150 kHz to 30 MHz. A spectrum analyzer is connected, in turn, to each mains line measurement tap and software is employed to measure the radio frequency noise generated by the EUT.

11.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.207 // RSS-210 Issue 8	Mains conducted emissions	2014-05-20

11.3 Test Results

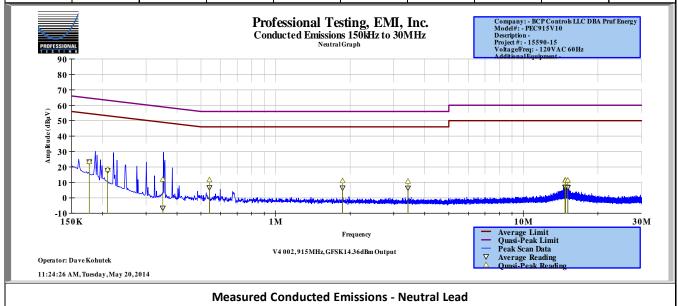
Note that the power supply employed had no additional or built-in EMI filtering.

The EUT satisfied the criteria. Tabular and plotted measurements appear on the following pages.

15590 Page 61 of 70

Professional Testing, EMI, Inc.									
Test Method:	d: ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference, see §15.38).								
In accordance with:	FCC Part 15.207 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Conducted Emissions Limits								
Section:	15.207								
Test Date(s):	5/20/2014	EUT Serial #:	V4 002						
Customer:	BCP Controls LLC DBA Pruf Energy	EUT Part #:	None						
Project Number:	15590-15	Test Technician:	Dave Kohutek						
Purchase Order #:	PTI_014_001	Supervisor:	Rob McCollough						
Equip. Under Test:	PEC915V10	Witness' Name:	None						
Condu	Page:	1 of	2						

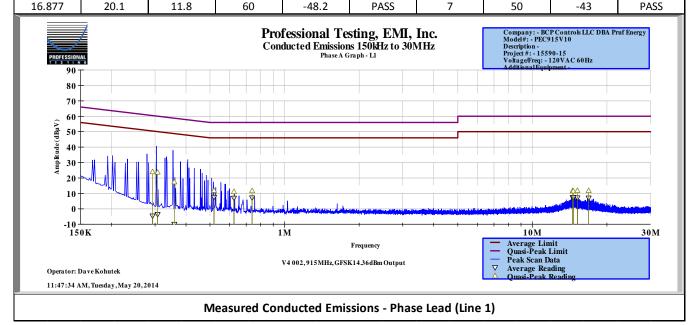
EUT Line Voltage:			120	VAC	EUT Line Frequency:			60	Hz
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi-peak Detector Reading (dBµV)	Quasi-peak Detector Limit (dBµV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results
0.17705	34.8	23.4	64.6	-41.2	PASS	23.4	54.6	-31.3	PASS
0.21	31.9	18.5	63.2	-44.7	PASS	17.7	53.2	-35.5	PASS
0.35034	28.3	11.9	59	-47	PASS	-6.6	49	-55.6	PASS
0.54077	20.4	11.6	56	-44.4	PASS	6.6	46	-39.4	PASS
1.8631	18.2	11	56	-45	PASS	6.5	46	-39.5	PASS
3.4228	19.1	10.7	56	-45.3	PASS	6.3	46	-39.7	PASS
14.7477	18.9	11.4	60	-48.6	PASS	6.9	50	-43.1	PASS
14.8014	19.4	11.3	60	-48.7	PASS	7	50	-43	PASS
15.1112	18.4	11.2	60	-48.8	PASS	6.9	50	-43.1	PASS
15.1144	19.1	11.4	60	-48.6	PASS	6.7	50	-43.3	PASS



15590 Page 62 of 70

Professional Testing, EMI, Inc.										
ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference, see §15.38).										
FCC Part 15.207 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Conducted Emissions Limits										
15.207										
5/20/2014	EUT Serial #:	V4 002								
BCP Controls LLC DBA Pruf Energy	EUT Part #:	None								
		Davis Kalentali								
15590-15	Test Technician:	Dave Kohutek								
15590-15 PTI_014_001	Supervisor:	Rob McCollough								
	ANSI C63.4–2009: Methods of Measurem Equipment in the Range of 9 kHz to 40 GH FCC Part 15.207 - Code of Federal Regular Limits 15.207 5/20/2014 BCP Controls LLC DBA Pruf Energy	ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissi Equipment in the Range of 9 kHz to 40 GHz (incorporated by refere FCC Part 15.207 - Code of Federal Regulations Part 47, Subpart C - Limits 15.207 5/20/2014 BCP Controls LLC DBA Pruf Energy EUT Part #:	ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electric Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference, see §15.38). FCC Part 15.207 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Conductimits 15.207 5/20/2014 EUT Serial #: V4 002 BCP Controls LLC DBA Pruf Energy EUT Part #: None	ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference, see §15.38). FCC Part 15.207 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Conducted Emission Limits 15.207 5/20/2014						

EUT Line Voltage:			120	VAC	EUT Line Frequency:			60 Hz			
Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi-peak Detector Reading (dBµV)	Quasi-peak Detector Limit (dBµV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results		
0.29315	38.5	24	60.4	-36.4	PASS	-4.6	50.4	-55	PASS		
0.30727	41.4	23.7	60	-36.4	PASS	-3.6	50	-53.7	PASS		
0.35891	34	17.4	58.8	-41.3	PASS	-10	48.8	-58.7	PASS		
0.519	19.4	11.9	56	-44.1	PASS	7.4	46	-38.6	PASS		
0.6246	19.4	11.1	56	-44.9	PASS	6.9	46	-39.1	PASS		
0.7394	19.1	11.6	56	-44.4	PASS	7.1	46	-38.9	PASS		
14.5514	18.9	11.8	60	-48.2	PASS	7.2	50	-42.8	PASS		
14.6407	19.2	11.5	60	-48.5	PASS	7.4	50	-42.6	PASS		
15.2062	20.6	11.8	60	-48.2	PASS	7.1	50	-42.9	PASS		
16 077	20.1	11.0	CO	40.2	DACC	7	ΓO	42	DACC		



15590 Page 63 of 70

12.0 Antenna Construction Requirements

The design was investigated for meeting the antenna construction requirements of the applicable rules.

12.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users in ways that would void their authorization to use the device. Note that this device is supplied as a modular unit.

12.2 Criteria

47 CFR (USA) // IC (Canada)									
Section Reference	Parameter	Date(s)							
15.203 // RSS-210 Issue 8, A2.9	Antenna Construction	2014-06-17							

12.3 Results

Antenna 1: Pulse (printed circuit antenna)										
Antenna Manufacturer and Model Specifications										
Pulse Antenna USA 12220 World Trade Drive Sand Diego, CA 92128, USA W3538B0200 / W3538E0200 / W3538M0200 / W3538T0200 Typical free space performance, measured in test unit mechanics (position1.)										
Frequency Range [MHz]	Max Gain [dBi]	Efficiency [%] / [dB]	Return loss min. [dB]	Impedance $[\Omega]$	Operating Temperature [° C]					
824 – 960	2,8 (peak) 0,5 (min)	70 / -1,6 (peak) 50 / -3,0 (min)	-6	50	-40 to +85					

Antenna 2: Helical (loaded wire antenna)	
Antenna Manufacturer and Model	Specifications
	Helical Style (inductive loaded quarter-wave)
Pruf Energy Controls	Gain: 0 dBi
PEC Drawing Number 34915-HELI	
	Appearance:

- Antennas 1 and 2 are not supplied together.
- Antenna 1 is kitted with 1 of 2 configurations of the product.
- Antenna 2 is kitted with 1 of 2 configurations of the product and is soldered to the module board.
- As a modular device, the final integrator is instructed not to substitute any other antenna.

The antenna designs above satisfy the requirements of the rules.

15590 Page 64 of 70

13.0 Equipment and Bandwidths

13.1 Equipment for Spurious Radiated Emissions 30 MHz to 12 GHz

13.1 E(purious Kaulai	— Ellissi									
	Professional Testing, EMI, Inc.											
Test Method	Test Method: ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference,											
	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators,											
In accordance with: Radiated Emissions Limits												
Section: 15.209												
Test Date(s)		2014, 5/20/2014		EUT Serial #:	V4 003							
Customer:		Controls LLC DBA P	ruf Energy	EUT Part #:	None Dave Kohutek							
Project Num Purchase Or		14_001		Test Technician: Supervisor:	Rob McCollough							
Equip. Unde	_ _	14_001 15V10		Witness' Name:	J.D. Holland							
Equip. Onuc			d Emissions	Test Equipment List	J.D. Honana							
Til	Tile! Software Version: 4.2.A, May 23, 2010, 08:38:52 AM											
	Test Profile:	Radia	ted Emissio	ns_Profile Version Octob	er 12, 2011							
Asset #	Manufacturer	Model	Equipr	nent Nomenclature	Serial Number	Calibration Due Date						
1509A	Braden	N/A	TDK 10M	Chamber, NSA < 1 GHz	DAC-012915-005	7/29/2014						
1890	HP	8447F	Preamp/	Amp, 9kHz-1300MHz, 28/25dB	3313A05298	1/22/2015						
1937	Agilent	E4440A	Spectrum A	analyzer, 3 Hz - 26.5 GHz	MY44303298	12/2/2015						
1926	ETS-Lindgren	3142D	Antenna, B	iconilog, 26 MHz - 6 GHz	00135454	7/29/2014						
C027	N/A	RG214	Cabl	e Coax, N-N, 25m	none	9/26/2014						
1327	EMCO	1050	Contro	oller, Antenna Mast	none	N/A						
0942	EMCO	11968D	Т	urntable, 4ft.	9510-1835	N/A						
1969	HP	11713A	Attenu	uator/Switch Driver	3748A04113	N/A						
1509B	Braden	N/A	TDK 10M C	hamber, VSWR > 1 GHz	DAC-012915-005	7/16/2014						
2004	Miteq	AFS44-00101800- 2S-10P-44	Amplif	fier, 40dB, .1-18GHz	0	11/19/2014						
C030	N/A	0	Cabl	e Coax, N-N, 30m	none	9/26/2014						
1780	ETS-Lindgren	3117	· ·	Double Ridged Guide orn, 1 - 18 GHz	00110313	1/21/2015						
1325	EMCO	1050	Contro	oller, Antenna Mast	9003-1461	N/A						

15590 Page 65 of 70

13.2 Equipment for Mains Conducted Emissions

	<u> </u>										
Professional Testing, EMI, Inc.											
Test Metho	a. ANSI	C63.4-2009: Metho	ods of Meas	urement of Radio-Noise	Emissions from Lov	w-Voltage					
Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference											
FCC Part 15.207 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators,											
	ccordance with: Conducted Emissions Limits										
Section:	· · · · · · · · · · · · · · · · · · ·										
Test Date(s)		/2014		EUT Serial #:	V4 002						
Customer:		Controls LLC DBA P	ruf Energy	EUT Part #: Test Technician:	None Dave Kohutek						
Project Num Purchase Or		0-15 014 001		Supervisor:	Rob McCollough						
Equip. Unde		15V10		Witness' Name:	None						
-quipi onac				1	Hone						
Conducted Emissions Test Equipment List											
Til	e! Software Versi	on: 4.1.A.	.0, April 14,	2009, 11:01:00PM							
	Test Profile:	Profil	e#: CE_2010	til, dated December 16,	2010						
Asset #	Manufacturer	Model	Equip	ment Nomenclature	Serial Number	Calibration Due Date					
1842	НР	8568B	Spo	ectrum Analyzer	2732A03633	6/17/2014					
0045	НР	85662A	Spec Ar	nal Dsply for AN1842	2816A16413	N/A					
0990	НР	85685A	ı	RF Preselector	3010A01119	8/29/2014					
1281	НР	85650A	Qua	asi Peak Adapter	2043A00063	6/5/2014					
1173	PTI	100k HPF	Filter	, High Pass, 100kHz	none	10/30/2014					
1086	PTI	PTI-ALF2	Atten	uator Limiter Filter	none	5/7/2015					
C107	Pomona	RG-223	Cable 9	ft BNC RG-223 (black)	none	7/10/2014					
C108	Pomona	RG-223	Cable 5.5 ft BNC RG-223 (black)		none	7/10/2014					
0939	EMCO	3825/2	LISI	N, 10kHz-100MHz	9603-2521	10/31/2014					
1668	B&K Precision	1610	Power :	Supply 30VDC 1 Amp	145-00069	N/A					

13.3 Equipment for Timings, Bandwidth, and Conducted Spurious Measurements

Asset #	Manufacturer	Model #	Description	Calibration Due
ALN-077	Rohde & Schwarz	FSP-30	Spectrum Analyzer	2015-01-29

15590 Page 66 of 70

13.4 Measurement Bandwidths, Radiated Emissions

Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan					
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range	
0.009	0.15	0.3	2	Multiple Sweeps	
0.15	30	9	6	Multiple Sweeps	
30	1000	120	2	Multiple 800 mS Sweeps	
1000	6000	1000	2	Multiple Sweeps	
6000	18000	300	2	Multiple Sweeps	

*Notes

- 1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range.
- 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz.
- 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.
- 4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz.
- 5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.

13.5 Measurement Bandwidths, Mains Conducted Emissions

Conducted Emissions Spectrum Analyzer Bandwidth and Measurement Time					
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range	
0.01	0.15	0.3	7	Five 1 second sweeps	
0.15	30	9	20	Five 1 second sweeps	

*Notes:

- 1. The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1,000 data points per range.
- 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 10-150 kHz.
- 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz.

15590 Page 67 of 70

Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

15590 Page 68 of 70

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
naulatea Elilissiolis	1 to 18 GHz	3 m	5.7

15590 Page 69 of 70

End of Report

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15590 Page 70 of 70