EMISSIONS TEST REPORT

(FULL COMPLIANCE)

Report Number: 102149440BOX-001b
Project Number: G102149440

Report Issue Date: 11/10/2015

Model(s) Tested: Z-Wave Radio
Model(s) Partially Tested: None
Model(s) Not Tested but declared equivalent by the client: None

Standards: FCC 47CRF Part 15 (8/2015) Subpart C Section 15.249,
FCC 47CRF Part 15 (8/2015) Subpart B,
ICES-003 Issue 5 August 2012,
RSS-Gen Issue 4 November 2014,
RSS-210 Issue 8 December 2010

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
Powerhouse Dynamics, Inc.
1 Bridge Street
3rd Floor, Suite 301
Newton, MA 02458
USA

Report prepared by

Kouma Sinn / Staff Engineer, EMC

Report reviewed by

Michael F. Murphy / Sr. Staff Engineer

Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. 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. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	System Setup and Method	--
6	Transmitter Fundamental Power FCC 47CFR Part 15 (8/2015) Section 15.249(a), RSS-210 Issue 8 December 2010	Pass
7	Transmitter Spurious Emissions FCC 47CFR Part 15 (8/2015) Section 15.249(d), RSS-210 Issue 8 December 2010	Pass
8	Receiver Spurious Emissions FCC 47CFR Part 15 (8/2015) Section 15.109, RSS-Gen Issue 4 November 2014, ICES-003 Issue 5 August 2012	Pass
9	Transmitter Bandwidth FCC 47CFR Part 2.1049 (8/2015), RSS-Gen Issue 4 November 2014	No limit
10	Transmitter Duty Cycle FCC 47CFR Part 15.35(c) (8/2015), RSS-Gen Issue 4 November 2014	No limit
11	AC Mains Conducted Emissions FCC 47CFR PT 15.107, RSS-Gen Issue 4 November 2014, ICES-003 Issue 5 August 2012)	Pass
12	Revision History	--

3 Client Information

This EUT was tested at the request of:

Client: Powerhouse Dynamics, Inc.
1 Bridge Street
3rd Floor, Suite 301
Newton, MA 02458
USA

Contact: Peter Dodd
Telephone: 617-340-6582
Email: peter@powerhousedynamics.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Powerhouse Dynamics, Inc.
1 Bridge Street
3rd Floor, Suite 301
Newton, MA 02458
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Z-Wave Radio (Used for Tx testing)	Powerhouse Dynamics	950-000020	AG0859315260100
Z-Wave Radio (Used for Rx testing)	Powerhouse Dynamics	950-000020	AG0859315260103
Z-Wave Radio (Used Bandwidth Testing)	Powerhouse Dynamics	950-000020	AG0859315260101

Receive Date:	8/11/2015
Received Condition:	Good
Type:	Production
Test Date(s):	8/12/2015 & 8/15/2015

Description of Equipment Under Test (provided by client)
The device is a Z-Wave Radio.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
120 VAC	1 A	50 / 60 Hz	1

Notes: The power configuration relates to the Gateway, which is the host for the Z-Wave module. The Z-Wave itself is 3V3 @ 140mA peak.

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	AG0859315260100 – Pre-program to transmit continuously
2	AG0859315260103 – Pre-program to receive
3	AG0859315260101 – Normal operation (Production unit, used for bandwidth and duty cycle testing)

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	None

Radio/Receiver Characteristics	
Frequency Band(s)	908 MHz
Modulation Type(s)	GFSK Manchester channel encoding
Maximum Output Power	5uW-1.2mW
Test Channels	1
Occupied Bandwidth	91.912 kHz
Frequency Hopper: Number of Hopping Channels	N/A
Frequency Hopper: Channel Dwell Time	N/A
Frequency Hopper: Max interval between two instances of use of the same channel	N/A
MIMO Information (# of Transmit and Receive antenna ports)	N/A
Equipment Type	Standalone
ETSI LBT/Adaptivity	N/A
ETSI Adaptivity Type	N/A
ETSI Temperature Category (I, II, III)	N/A
ETSI Receiver Category (1, 2, 3)	N/A
Antenna Type and Gain	PCB

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.

None

5 System Setup and Method

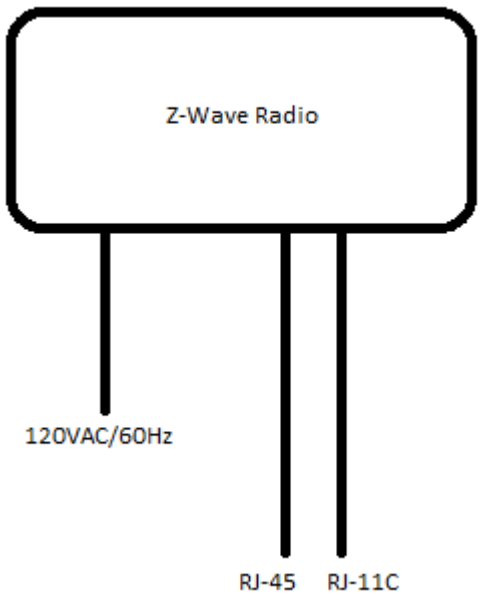
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	AC cable	1	None	None	AC mains
2	RJ-45	5	None	None	Hub
3	RJ-11C	5	None	None	Unterminated

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Thermostat	PowerHouse Dynamics	N/A	N/A

5.1 Method:

Configuration as required by FCC 47CRF Part 15 Subpart C Section 15.249 (8/2015), FCC 47CRF Part 15 Subpart B (8/2015), ICES-003 Issue 5 August 2012, RSS-Gen Issue 4 November 2014, and RSS-210 Issue 8 December 2010, ANSI C63.4:2014, and ANSI C63.10:2013.

5.2 EUT Block Diagram:



6 Transmitter Fundamental Power

6.1 Method

Tests are performed in accordance with FCC 47CFR Part 15 (8/2015) Section 15.249(a), RSS-210 Issue 8 December 2010, ANSI C63.4:2014, and ANSI C63.10:2013.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6	6.3
Radiated Emissions, 3m	30-1000 MHz	5.3	6.3
Radiated Emissions, 3m	1-6 GHz	4.5	5.2
Radiated Emissions, 3m	6-15 GHz	5.2	5.5
Radiated Emissions, 3m	15-18 GHz	5.0	5.5
Radiated Emissions, 3m	18-40 GHz	5.0	5.5

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 dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
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 dBμV 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 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

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

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

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

Alternately, when C5 Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. “AF” is the Antenna Factor; “PA+CL” are Preamp and Cable Loss. These are already accounted for in the “Level” column.

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
145013'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2944A07027	10/11/2014	10/11/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015

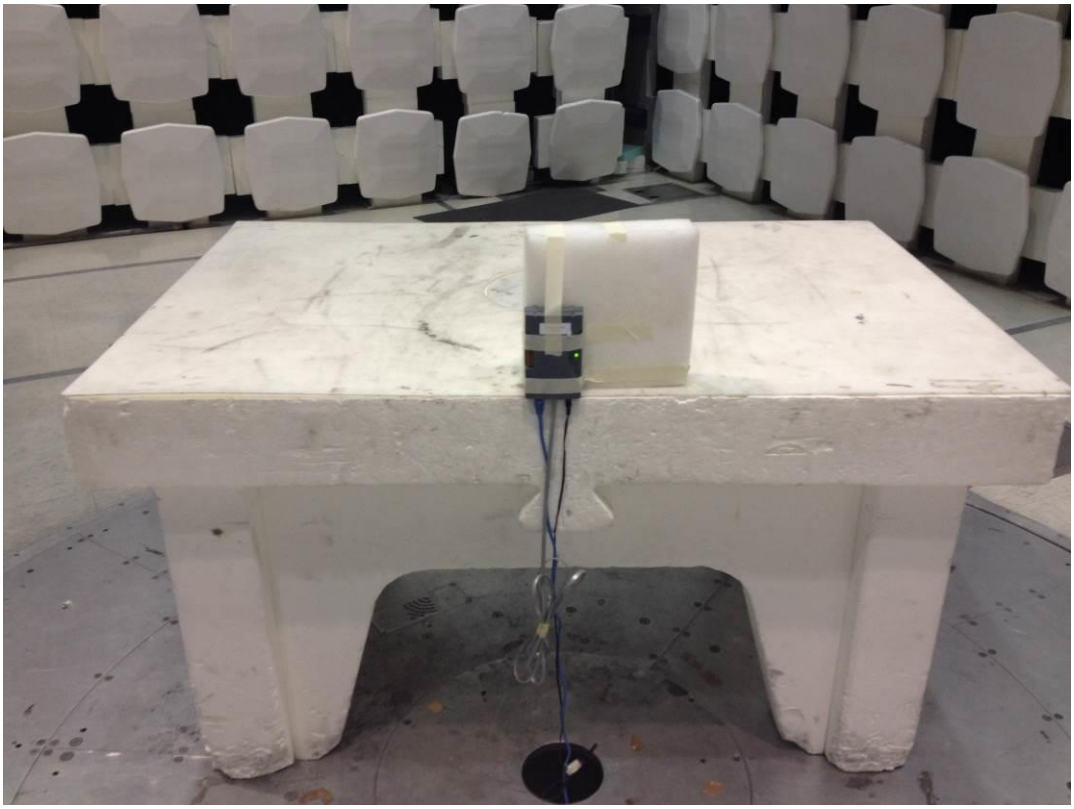
Software Utilized:

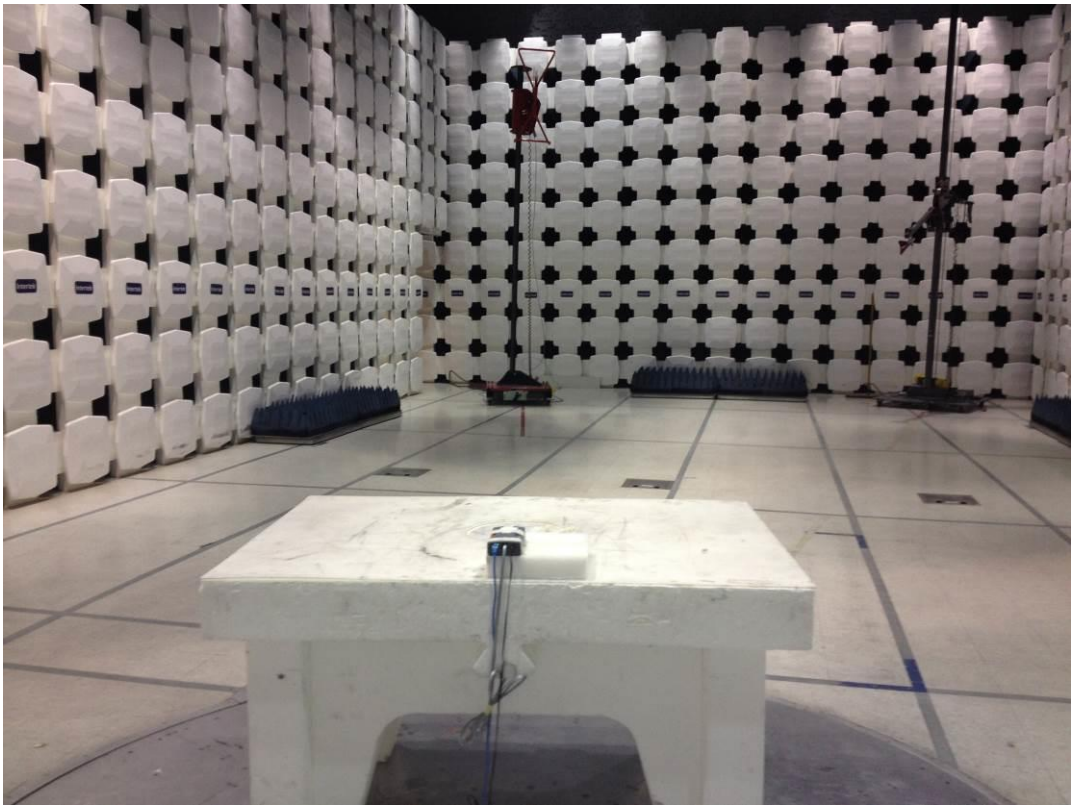
Name	Manufacturer	Version
C5	Teseq	5.02.00 Build 5.26.46.46.

6.3 Results:

The sample tested was found to Comply.

6.4 Setup Photographs:





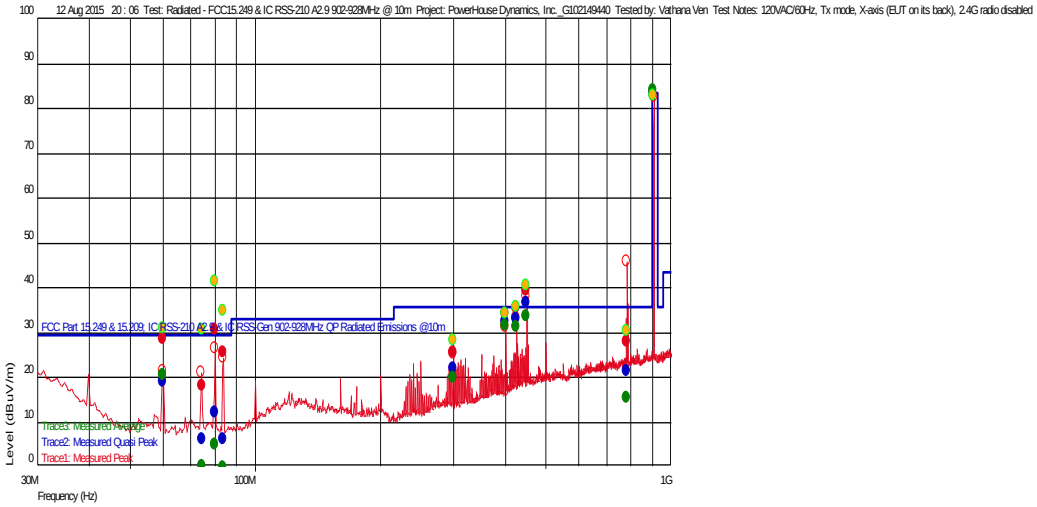
6.5 Plots/Data:

Fundamental Radiated Emission (X-axis, EUT on its back)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 10m	
Project:	PowerHouse Dynamics, Inc._G102149440	
Test Notes:	120VAC/60Hz, Tx mode, X-axis (EUT on its back), 2.4G radio disabled	
Temperature:	25 deg C	
Humidity:	42%, 997 mB	
Tested by:	Vathana Ven	
Test Started:	12 Aug 2015 20 : 06	

Prescan Emission Graph



Measured Peak Value	Swept Peak Data
Measured Quasi Peak Value	Swept Quasi Peak Data
Measured Average Value	Swept Average Data
Maximum Value of Mast and Turntable	

Emissions Test Data

Trace1: Measured Peak

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
908.397595641 M	83.27	22.068	-21.300	103.52	-20.25	|	320	2.09	120 k	Fundamental

Trace1: Measured Peak with average factor applied

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
908.397595641 M	66.07	22.068	-21.3	83.52	-17.45	|	320	2.09	120 k	Fundamental

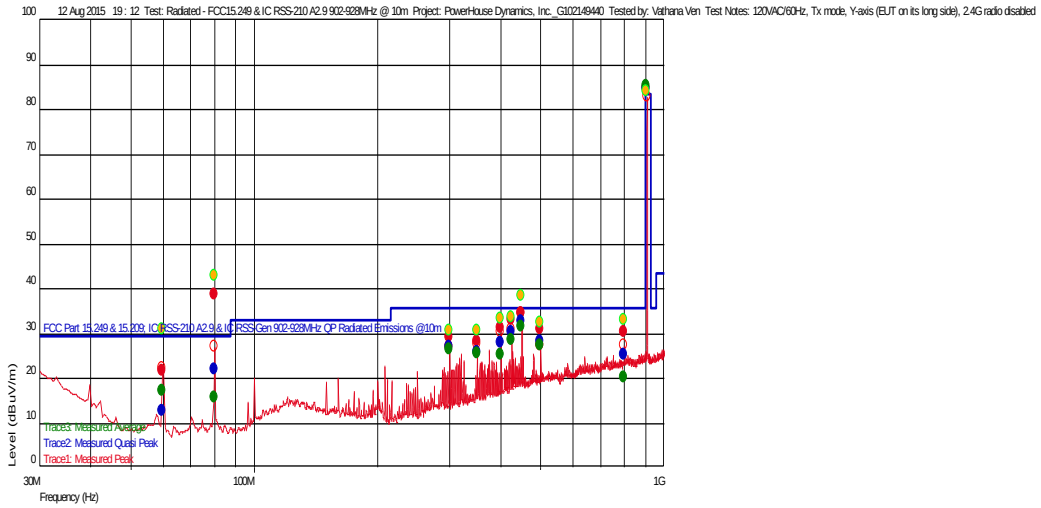
Notes: The EUT was programmed to transmit continuously. An Average factor of 17.2 dB was applied to the peak reading.

Fundamental Radiated Emission (Y-axis, EUT on its long side)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 10m	
Project:	PowerHouse Dynamics, Inc._G102149440	
Test Notes:	120VAC/60Hz, Tx mode, Y-axis (EUT on its long side), 2.4G radio disabled	
Temperature:	25 deg C	
Humidity:	42%, 997 mB	
Tested by:	Vathana Ven	
Test Started:	12 Aug 2015 19 : 12	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace1: Measured Peak

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
908.391984419 M	84.62	22.068	-21.300	103.52	-18.9	--	30	1.05	120 k	Fundamental

Trace1: Measured Peak with average factor applied

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
908.391984419 M	67.42	22.068	-21.3	83.52	-16.1	--	30	1.05	120 k	Fundamental

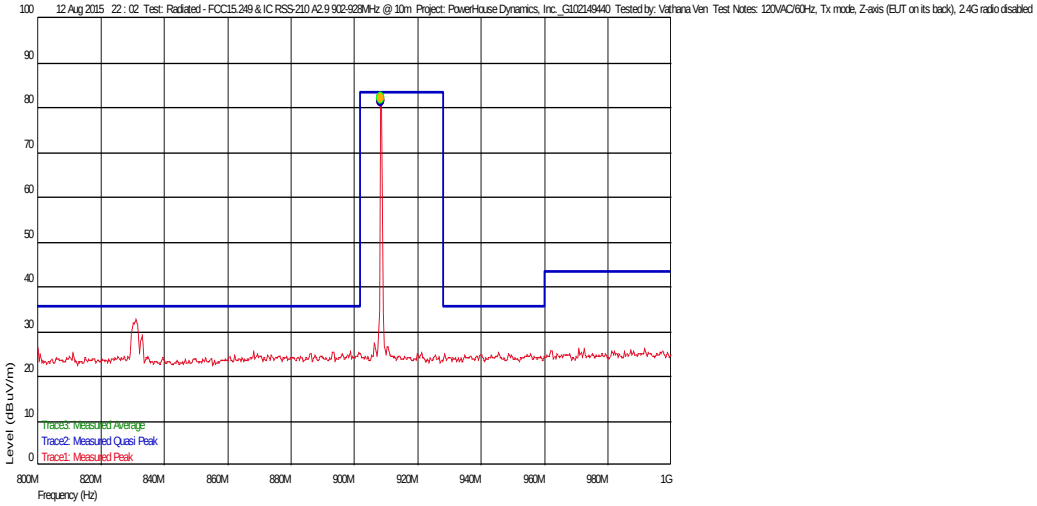
Notes: The EUT was programmed to transmit continuously. An Average factor of 17.2 dB was applied to the peak reading.

Fundamental Radiated Emission (Z-axis, EUT on its short side)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 10m	
Project:	PowerHouse Dynamics, Inc._G102149440	
Test Notes:	120VAC/60Hz, Tx mode, Z-axis (EUT on its short side), 2.4G radio disabled	
Temperature:	25 deg C	
Humidity:	42%, 997 mB	
Tested by:	Vathana Ven	
Test Started:	12 Aug 2015 22 : 02	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace1: Measured Peak

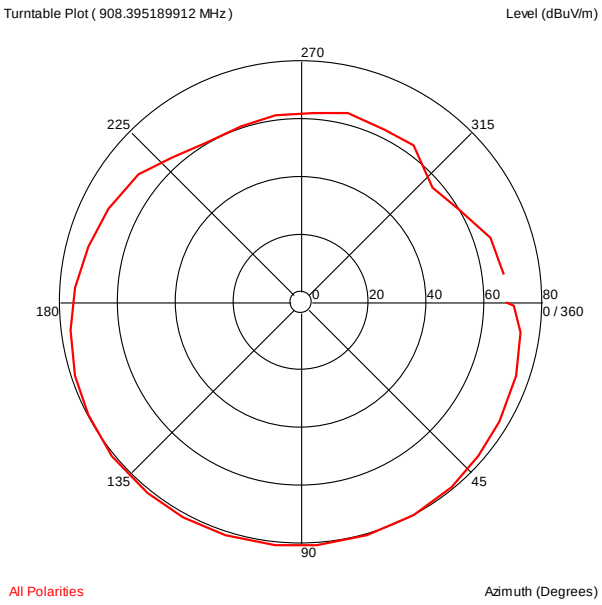
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
908.395189912 M	81.41	22.068	-21.300	103.52	-22.1	|	129	3.84	120 k	

Trace1: Measured Peak with average factor applied

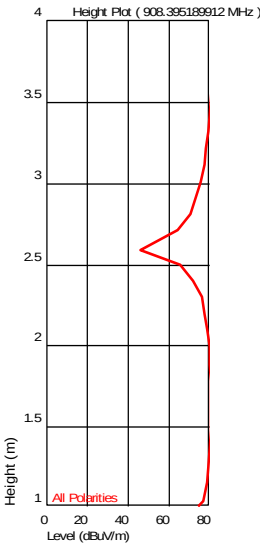
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
908.395189912 M	64.21	22.068	-21.3	83.52	-19.31	|	129	3.84	120 k	

Notes: The EUT was programmed to transmit continuously. An Average factor of 17.2 dB was applied to the peak reading.

Azimuth Plots



Turntable Plots



Test Personnel:	Vathana F. Ven VFV	Test Date:	08/12/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC 47CRF Part 15.249, RSS-210	Limit Applied:	FCC Part15.249(a), Annex 2.9(a)
Input Voltage:	120VAC/60Hz	Ambient Temperature:	25 ºC
Pretest Verification w/ Ambient Signals or BB Source:	BB Source	Relative Humidity:	42 %
		Atmospheric Pressure:	997 mbars

Deviations, Additions, or Exclusions: None

7 Transmitter Spurious Emissions

7.1 Method

Tests are performed in accordance with FCC 47CFR Part 15 (8/2015) Section 15.249(d), RSS-210 Issue 8 December 2010, ANSI C63.4:2014, and ANSI C63.10:2013.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6	6.3
Radiated Emissions, 3m	30-1000 MHz	5.3	6.3
Radiated Emissions, 3m	1-6 GHz	4.5	5.2
Radiated Emissions, 3m	6-15 GHz	5.2	5.5
Radiated Emissions, 3m	15-18 GHz	5.0	5.5
Radiated Emissions, 3m	18-40 GHz	5.0	5.5

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 dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
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 dBμV 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 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

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

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

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

Alternately, when C5 Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. “AF” is the Antenna Factor; “PA+CL” are Preamp and Cable Loss. These are already accounted for in the “Level” column.

7.2 Test Equipment Used:

3m Track B

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/13/2015	05/13/2016
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015
REA003'	1GHz High Pass Filter	Reactel, Inc	7HS-1G/10G-S11	06-1	12/30/2013	12/30/2015

10m Track A

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
145013'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2944A07027	10/11/2014	10/11/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015

Software Utilized:

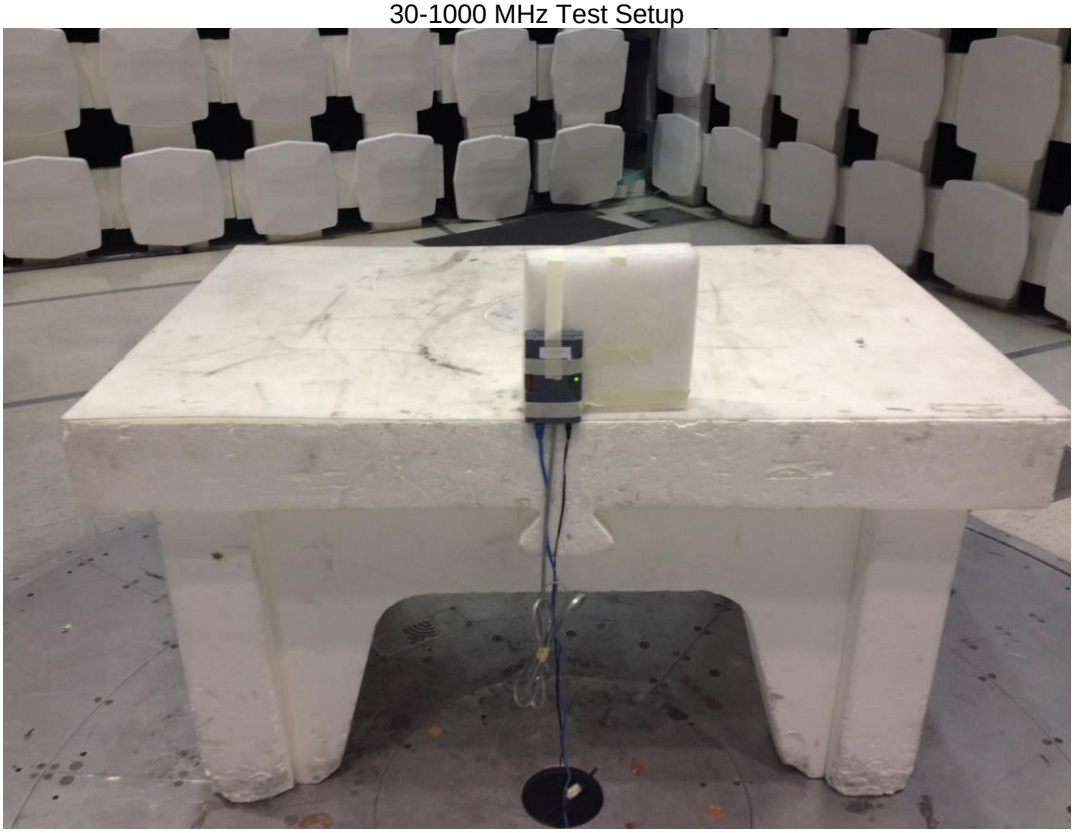
Name	Manufacturer	Version
C5	Teseq	5.26.46.46

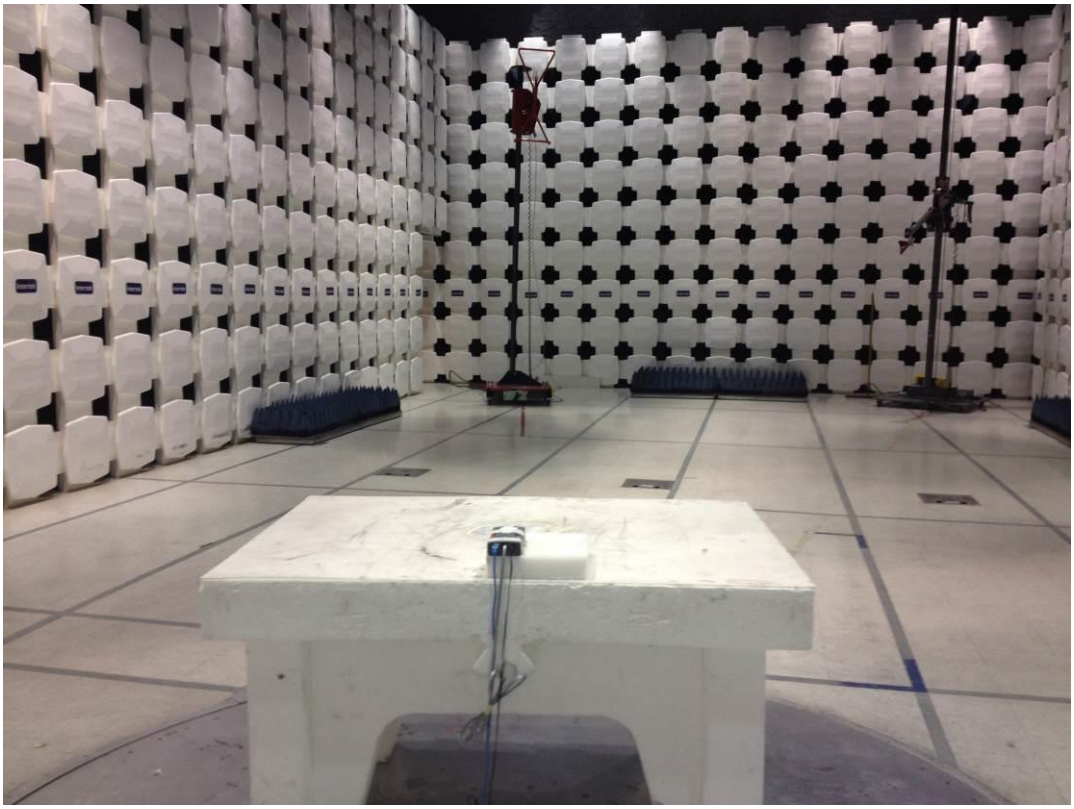
7.3 Results:

The sample tested was found to Comply.

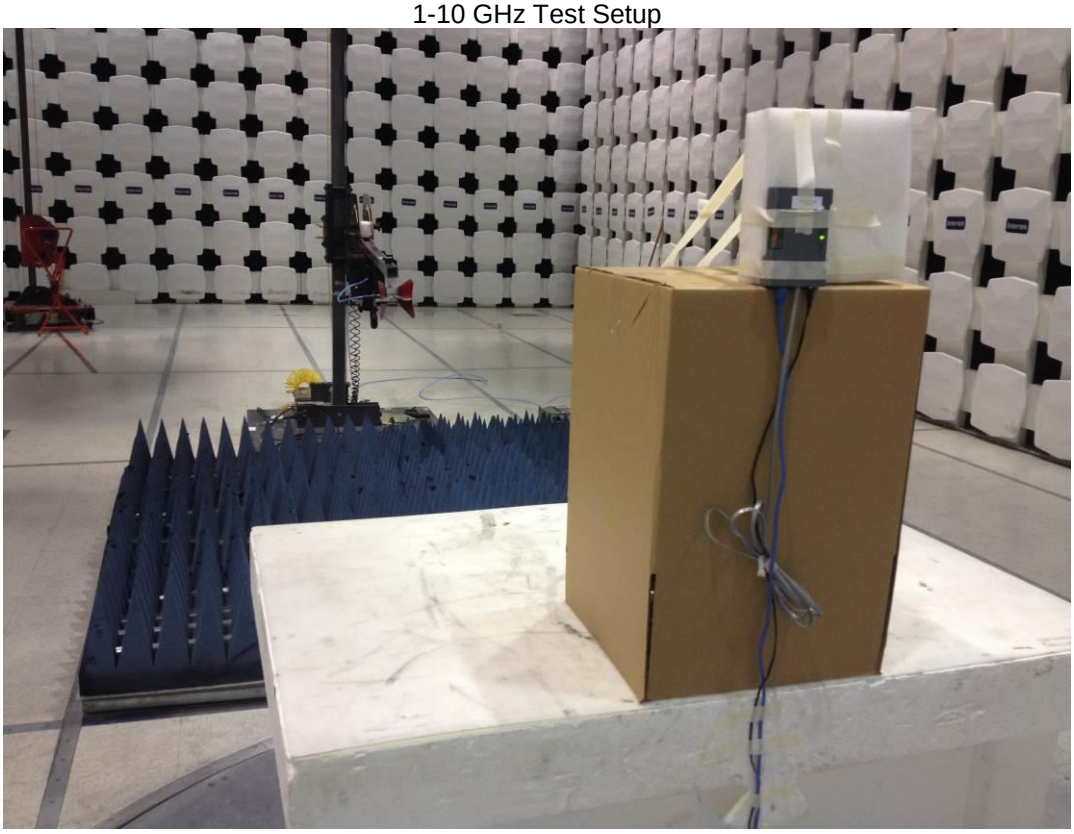
7.4 Setup Photographs:

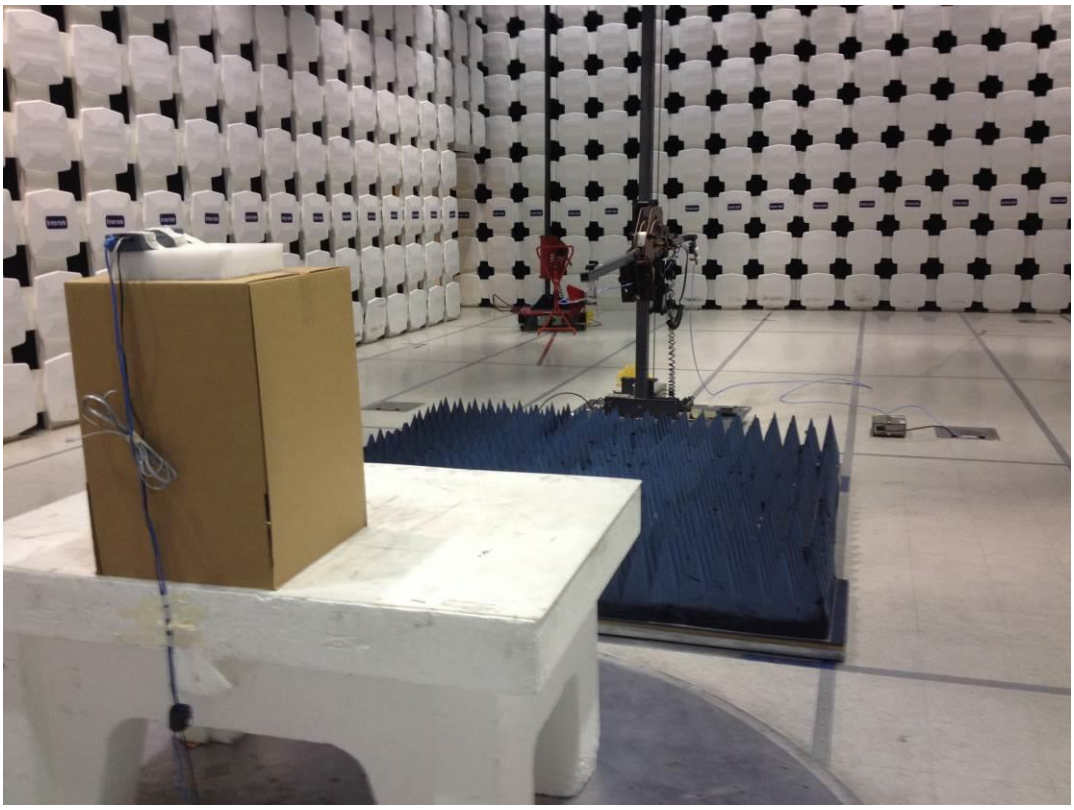
30-1000 MHz Test Setup





1-10 GHz Test Setup





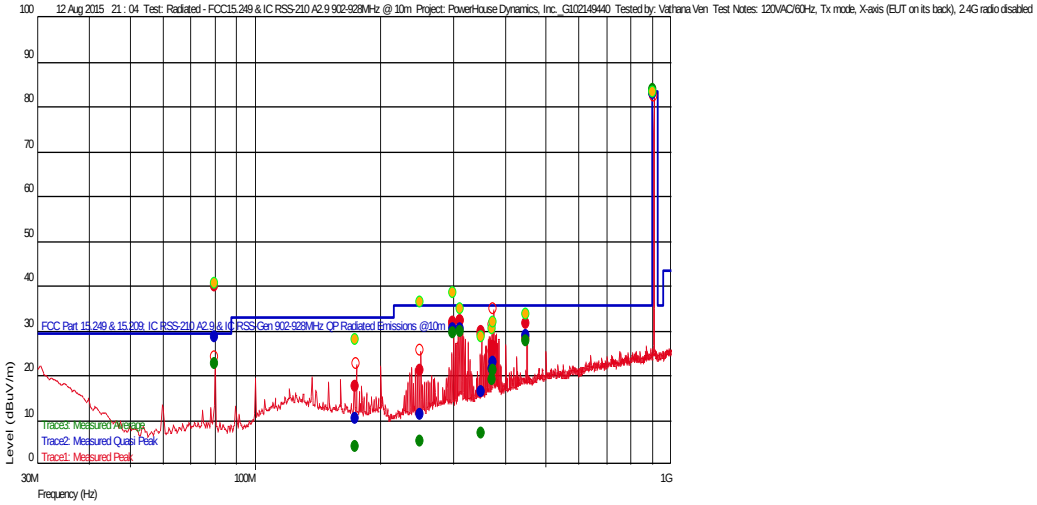
7.5 Plots/Data:

Transmitter Spurious Radiated Emission (X-axis, EUT on its back), 30-1000 MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 10m	
Project:	PowerHouse Dynamics, Inc._G102149440	
Test Notes:	120VAC/60Hz, Tx mode, X-axis (EUT on its back), 2.4G radio disabled	
Temperature:	25 deg C	
Humidity:	42%, 997 mB	
Tested by:	Vathana Ven	
Test Started:	12 Aug 2015 21 : 04	

Prescan Emission Graph



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable

Swept Peak Data
Swept Quasi Peak Data
Swept Average Data

Emissions Test Data

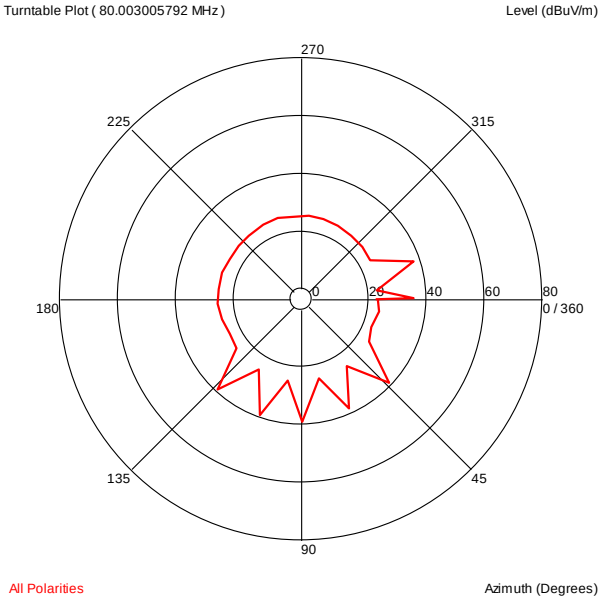
Trace1: Measured Peak

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
174.740480739 M	17.40	11.300	-24.267	53.04	-35.64	|	286	2.61	120 k	
249.887174768 M	21.04	11.402	-23.551	55.54	-34.5	|	96	1.05	120 k	
372.493185932 M	25.13	15.050	-22.886	55.54	-30.41	|	109	1.67	120 k	
374.97995976 M	26.49	15.100	-22.875	55.54	-29.05	|	32	1.05	120 k	
349.977955834 M	29.56	14.299	-22.980	55.54	-25.98	|	251	2.28	120 k	
450.005611703 M	31.47	16.800	-22.610	55.54	-24.07	--	80	2.29	120 k	
300.018236615 M	31.80	13.101	-23.160	55.54	-23.74	|	264	1.06	120 k	
312.485971545 M	31.94	13.499	-23.115	55.54	-23.6	|	254	1.04	120 k	
80.003005792 M	39.70	7.500	-25.188	49.54	-9.84	|	100	2.42	120 k	

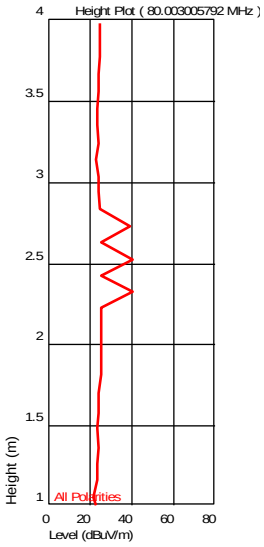
Trace2: Measured Quasi Peak

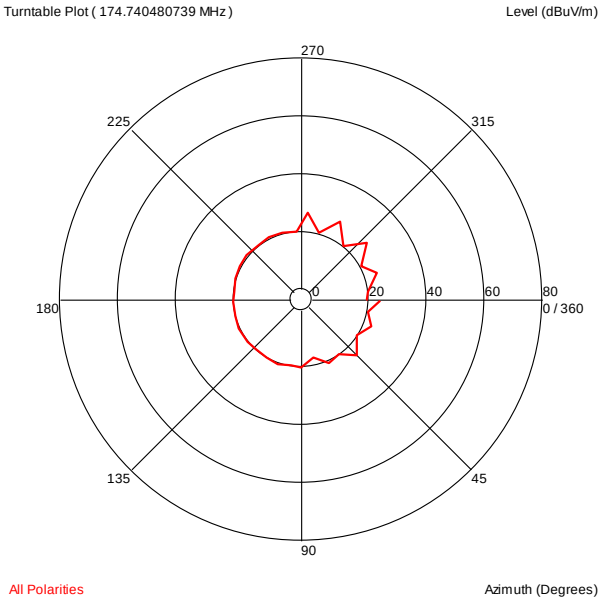
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
249.887174768 M	11.08	11.402	-23.551	35.540	-24.46	|	96	1.05	120 k	
174.740480739 M	10.16	11.300	-24.267	33.040	-22.88	|	286	2.61	120 k	
349.977955834 M	16.26	14.299	-22.980	35.540	-19.28	|	251	2.28	120 k	
372.493185932 M	21.31	15.050	-22.886	35.540	-14.23	|	109	1.67	120 k	
374.97995976 M	22.94	15.100	-22.875	35.540	-12.60	|	32	1.05	120 k	
450.005611703 M	28.94	16.800	-22.610	35.540	-6.60	--	80	2.29	120 k	
312.485971545 M	30.21	13.499	-23.115	35.540	-5.33	|	254	1.04	120 k	
300.018236615 M	30.21	13.101	-23.160	35.540	-5.33	|	264	1.06	120 k	
80.003005792 M	28.62	7.500	-25.188	29.540	-0.92	|	100	2.42	120 k	

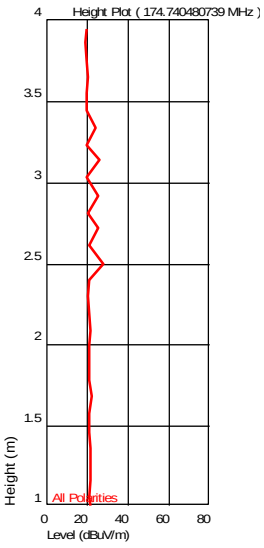
Azimuth Plots

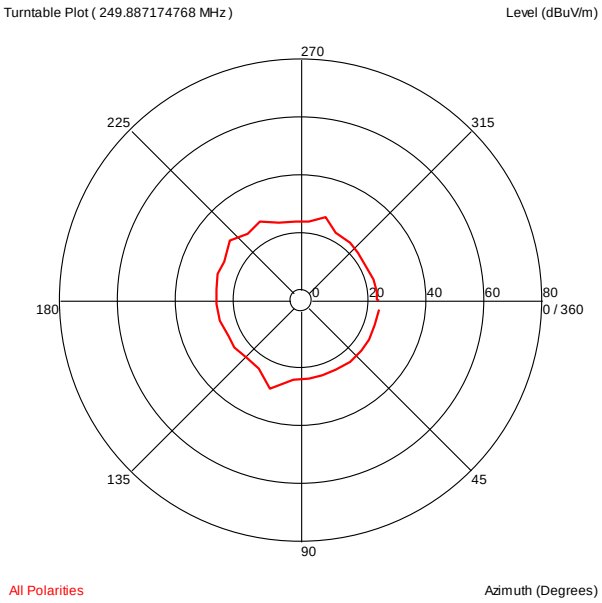


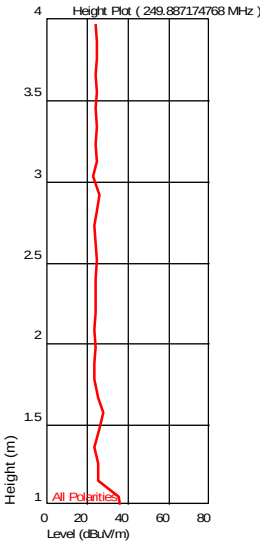
Turntable Plots

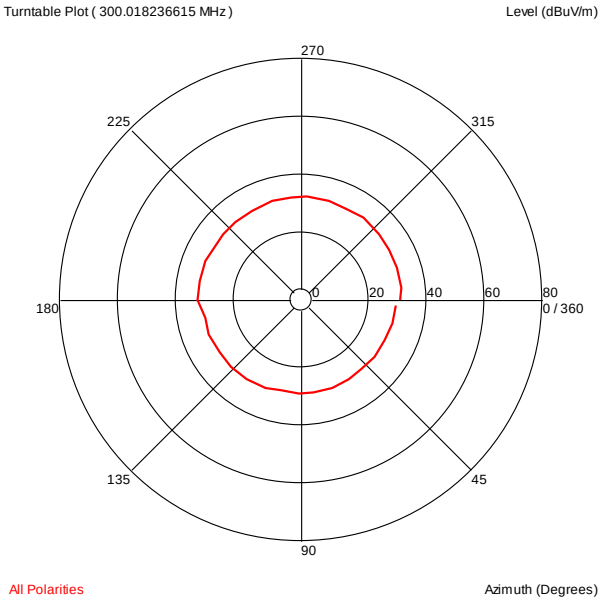


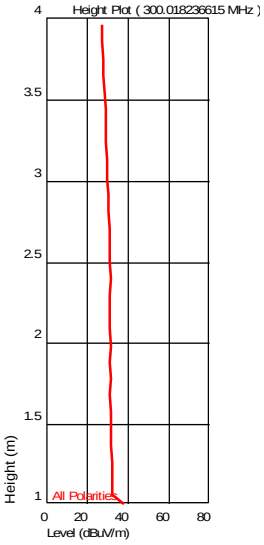


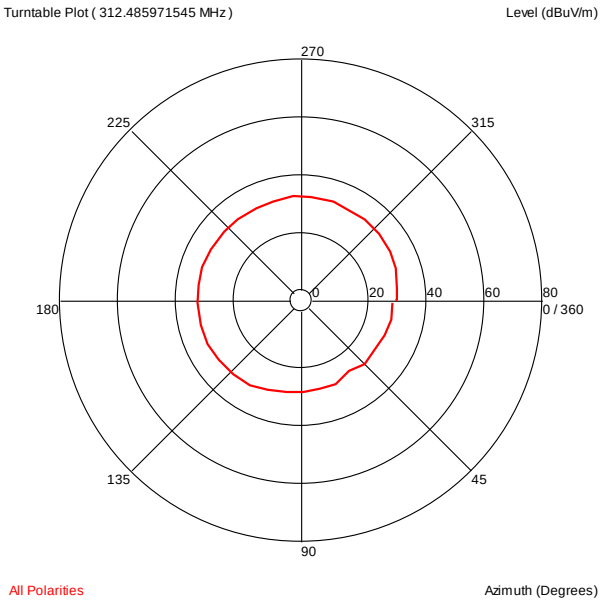


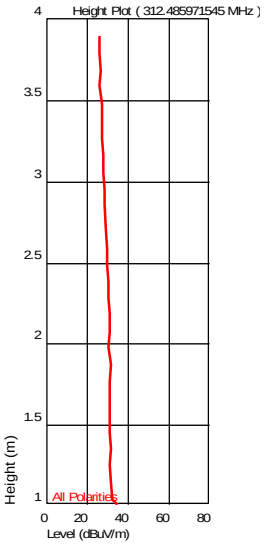

Turntable Plot (249.887174768 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

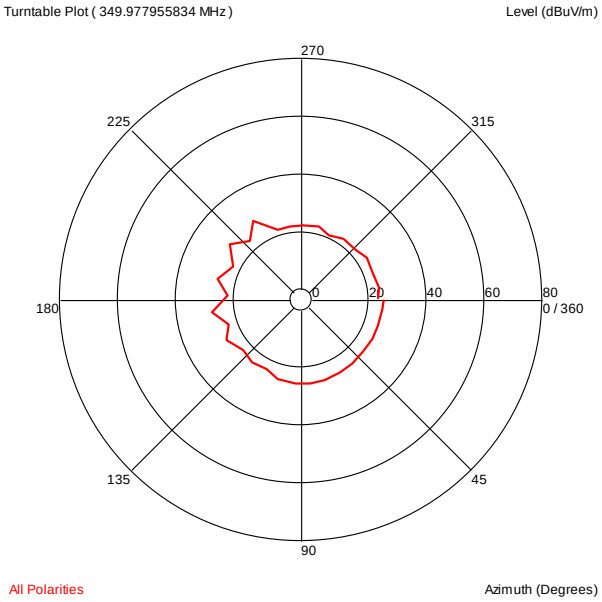

Height Plot (249.887174768 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

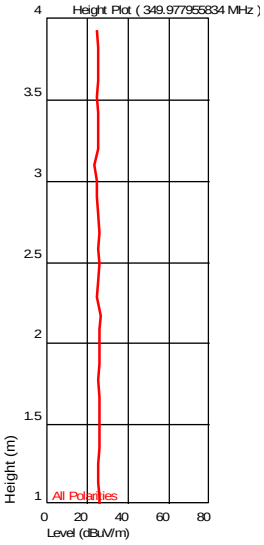

Turntable Plot (300.018236615 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

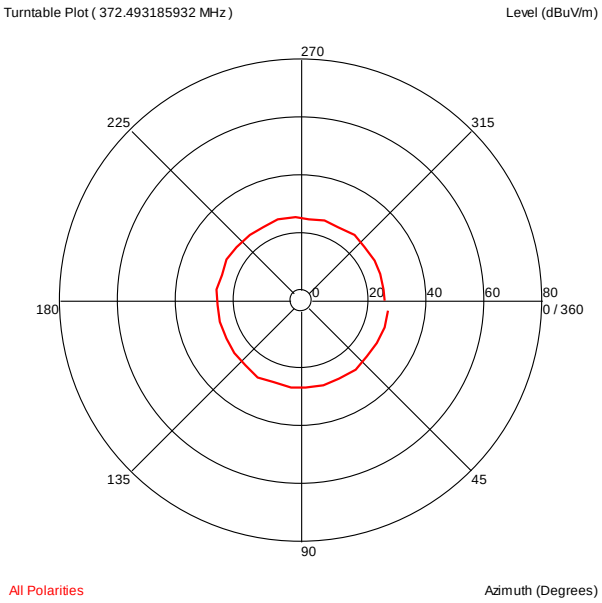

Height Plot (300.018236615 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

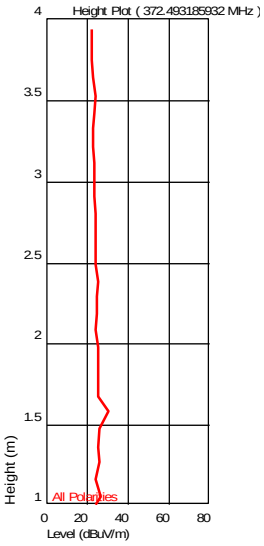

Turntable Plot (312.485971545 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

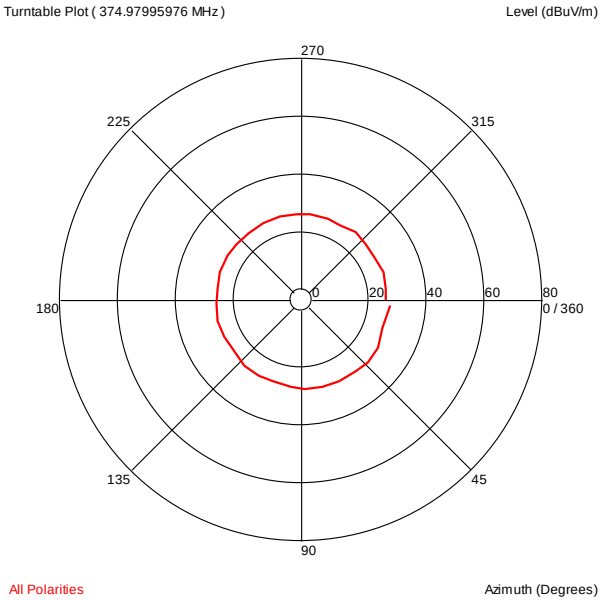

Height Plot (312.485971545 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

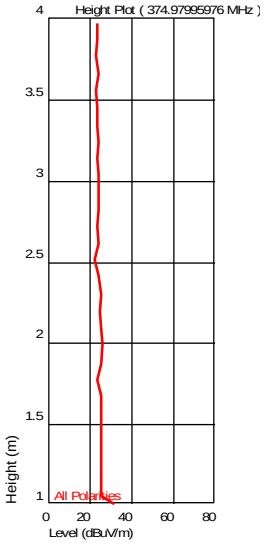

Turntable Plot (349.977955834 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

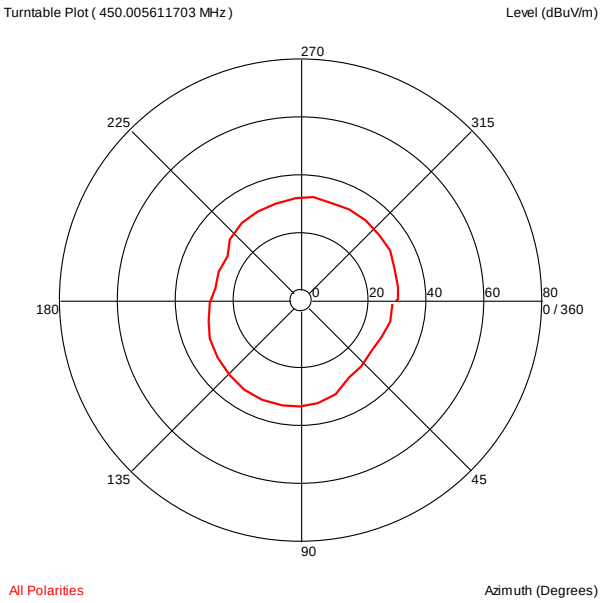

Height Plot (349.977955834 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

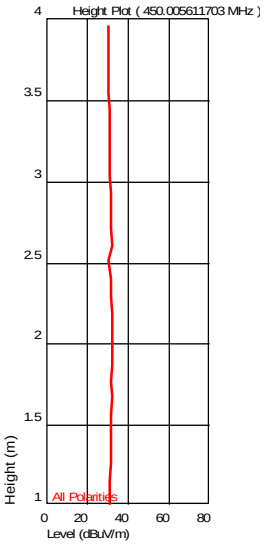

Turntable Plot (372.493185932 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

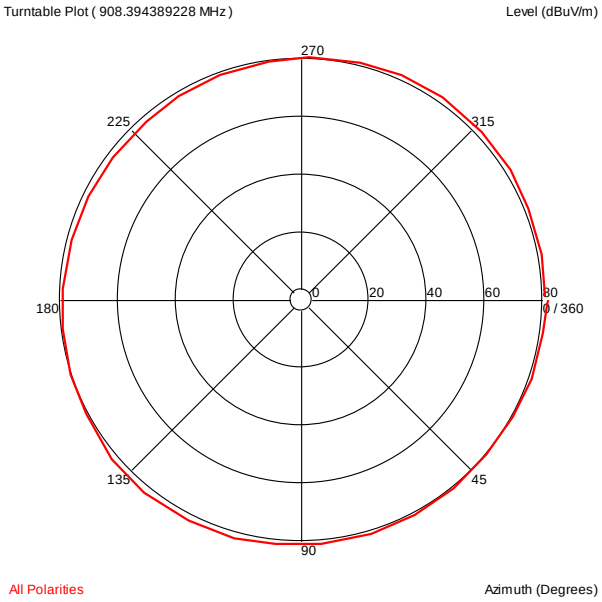

Height Plot (372.493185932 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

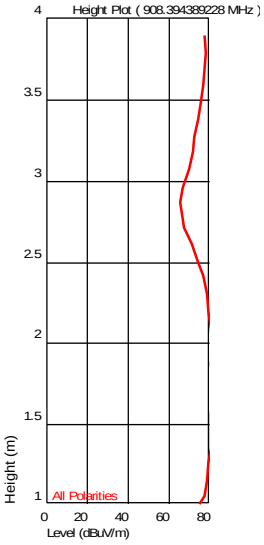

Turntable Plot (374.97995976 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (374.97995976 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (450.005611703 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (450.005611703 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (908.394389228 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

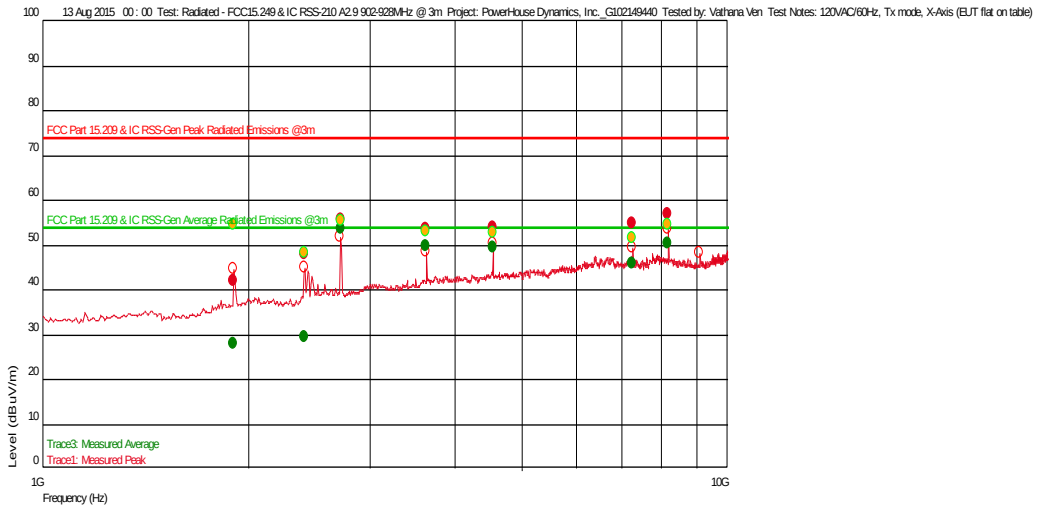

Height Plot (908.394389228 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Transmitter Spurious Radiated Emission (X-axis, EUT on its back), 1-10 GHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 3m	
Project:	PowerHouse Dynamics, Inc._G102149440	
Test Notes:	120VAC/60Hz, Tx mode, X-Axis (EUT flat on table)	
Temperature:	25 deg C	
Humidity:	42%, 997 mB	
Tested by:	Vathana Ven	
Test Started:	13 Aug 2015 00 : 00	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace1: Measured Peak

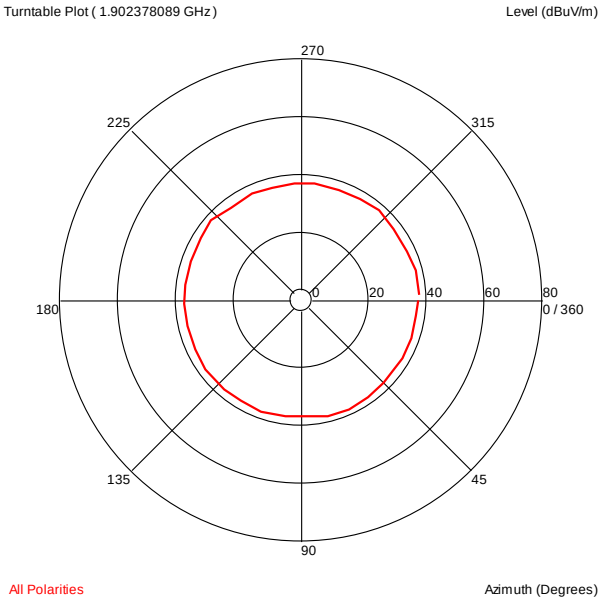
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
1.902378089 G	42.03	30.793	-32.619	74.000	-31.97	|	233	1.07	1 M	
2.41256513 G	48.01	32.063	-31.982	74.000	-25.99	|	360	3.12	1 M	
3.633667335 G	53.47	33.180	-29.027	74.000	-20.53	--	229	3.87	1 M	
4.542004008 G	53.87	33.943	-27.744	74.000	-20.13	|	342	1.25	1 M	
7.267214429 G	54.64	35.599	-25.919	74.000	-19.36	|	278	1.45	1 M	
2.725190381 G	55.79	32.494	-31.259	74.000	-18.21	--	29	3.72	1 M	
8.175691382 G	56.92	35.806	-25.766	74.000	-17.08	--	218	1.69	1 M	

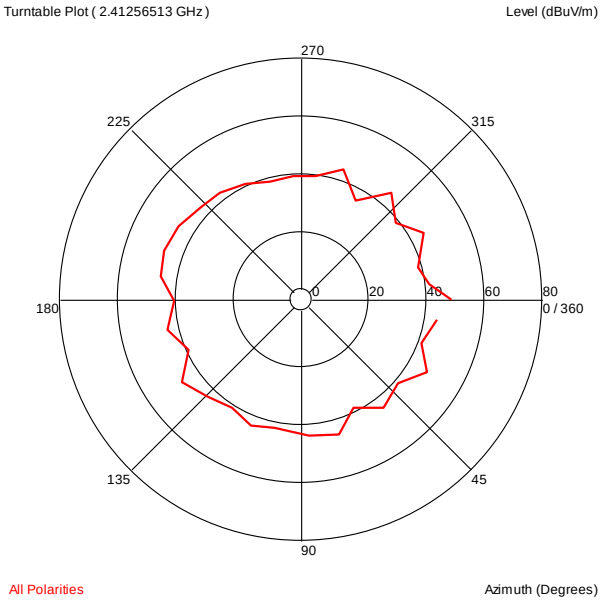
Trace3: Measured Average

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
1.902378089 G	24.83	30.793	-32.619	54.000	-29.17	|	233	1.07	1 M	
2.41256513 G	30.81	32.063	-31.982	54.000	-23.19	|	360	3.12	1 M	
3.633667335 G	36.27	33.18	-29.027	54.000	-17.73	--	229	3.87	1 M	
4.542004008 G	36.67	33.943	-27.744	54.000	-17.33	|	342	1.25	1 M	
7.267214429 G	37.44	35.599	-25.919	54.000	-16.56	|	278	1.45	1 M	
2.725190381 G	38.59	32.494	-31.259	54.000	-15.41	--	29	3.72	1 M	
8.175691382 G	39.72	35.806	-25.766	54.000	-14.28	--	218	1.69	1 M	

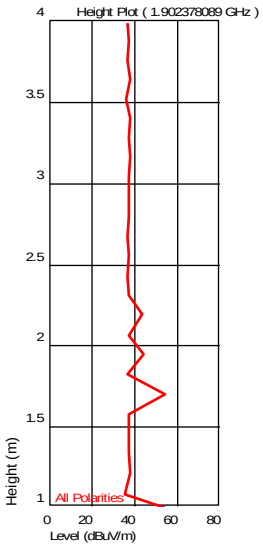
Notes: Measured average = Measured peak – Average factor, where average factor = 17.2 dB (disregard the CISPR average readings on the plot).

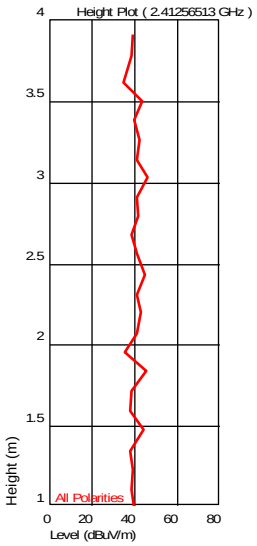
Azimuth Plots

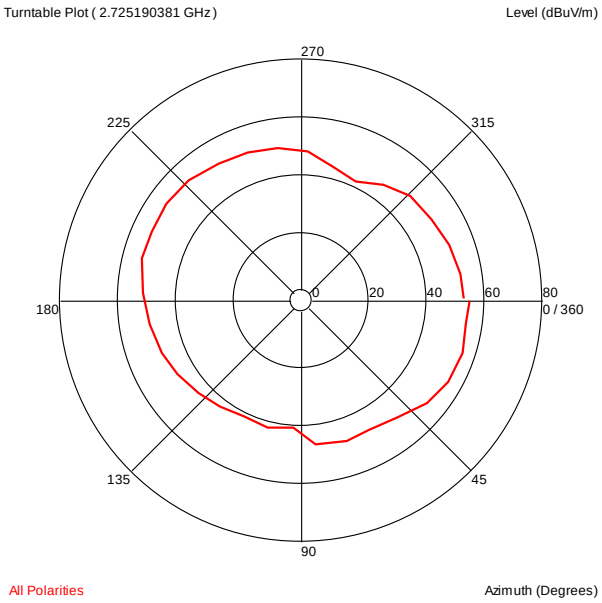


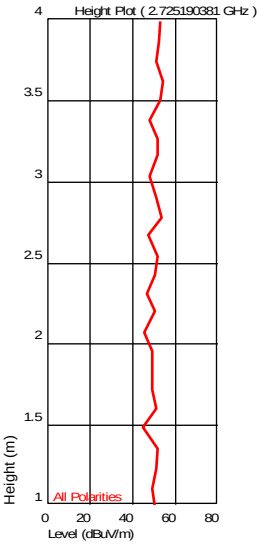


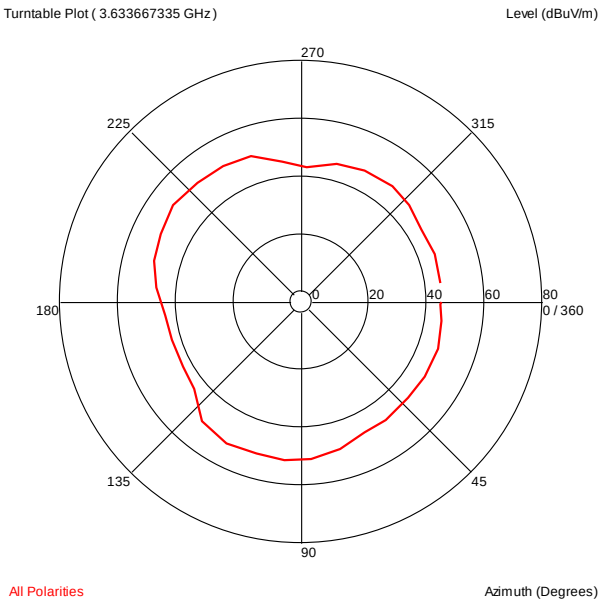
Turntable Plots

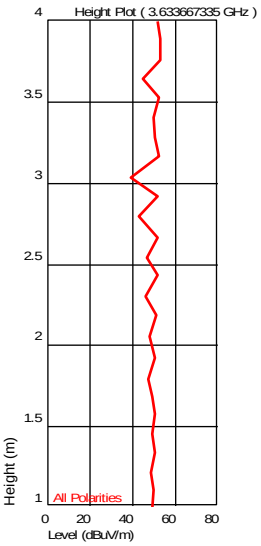


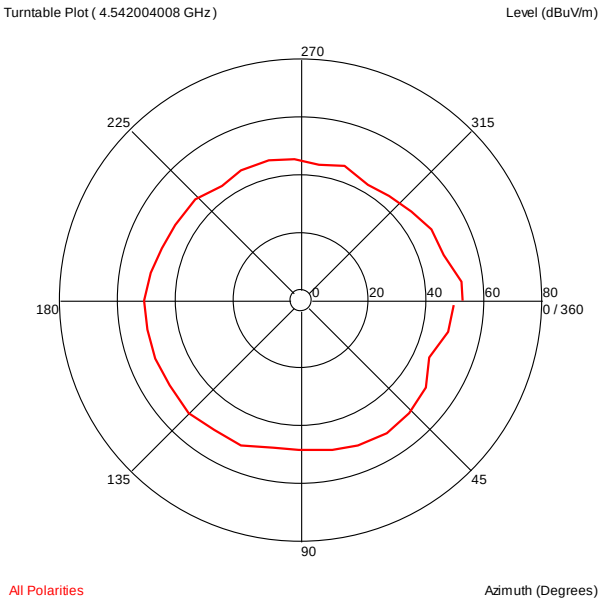


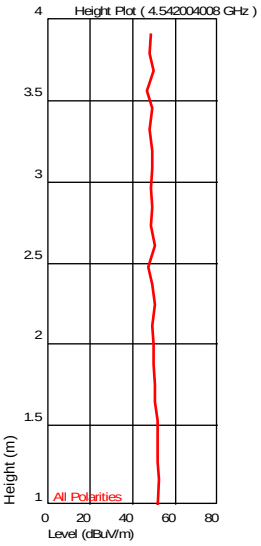

Turntable Plot (2.725190381 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

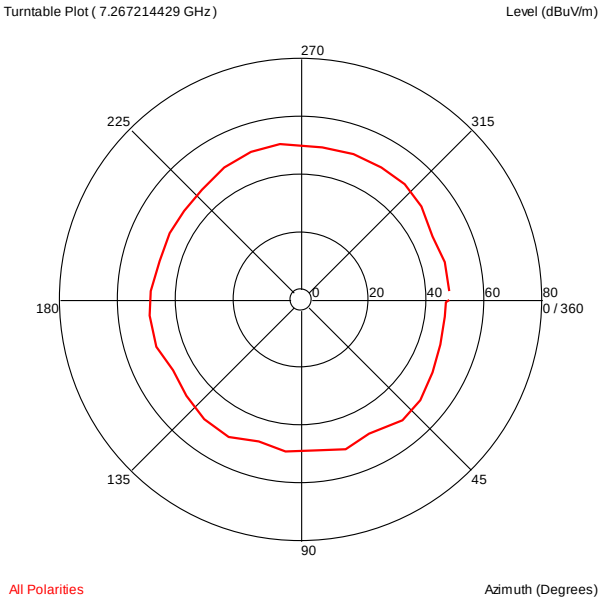

Height Plot (2.725190381 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

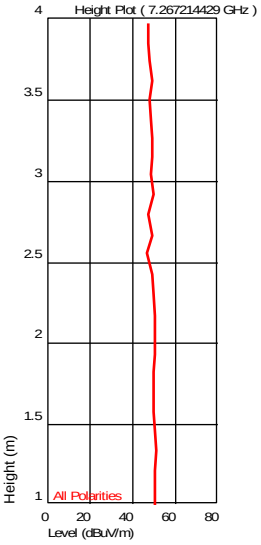

Turntable Plot (3.633667335 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

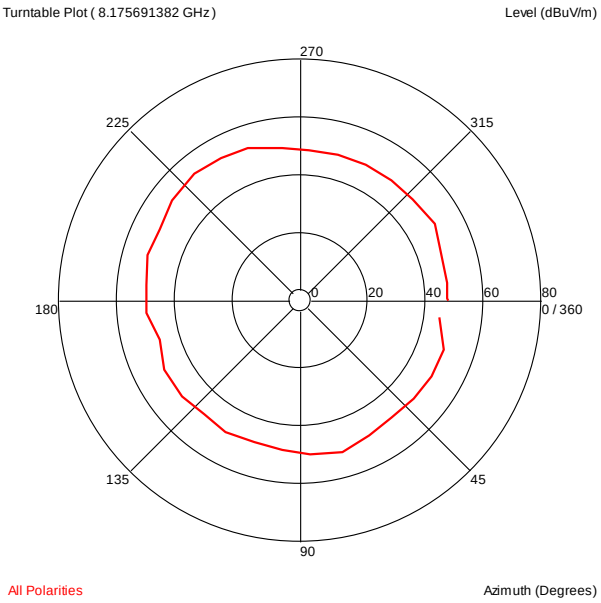

Height Plot (3.633667335 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

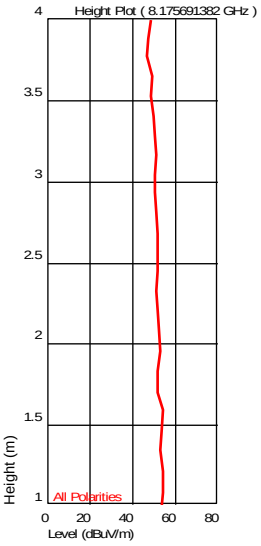

Turntable Plot (4.542004008 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (4.542004008 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (7.267214429 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (7.267214429 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (8.175691382 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

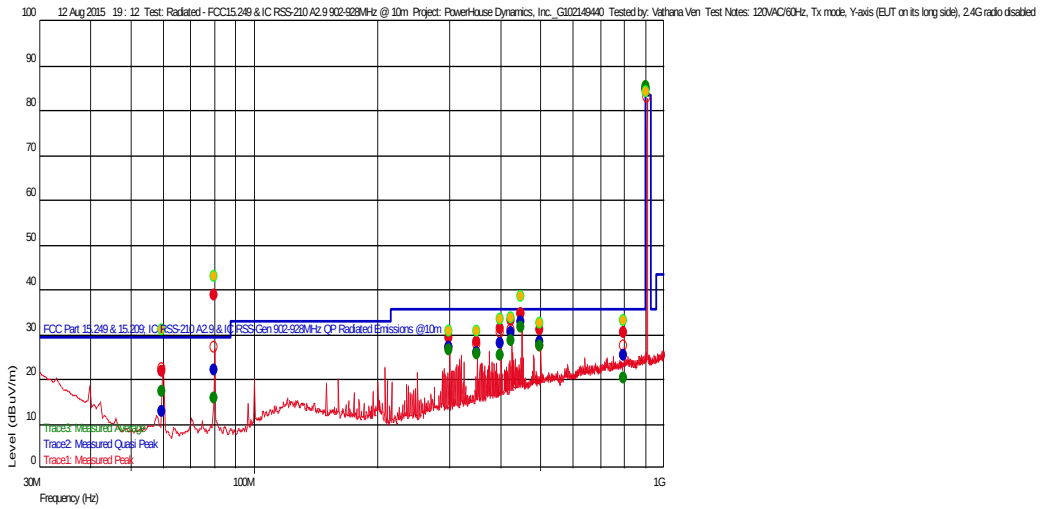

Height Plot (8.175691382 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Transmitter Spurious Radiated Emission (Y-axis, EUT on its long side), 30-1000 MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 10m	
Project:	PowerHouse Dynamics, Inc._G102149440	
Test Notes:	120VAC/60Hz, Tx mode, Y-axis (EUT on its long side), 2.4G radio disabled	
Temperature:	25 deg C	
Humidity:	42%, 997 mB	
Tested by:	Vathana Ven	
Test Started:	12 Aug 2015 19 : 12	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

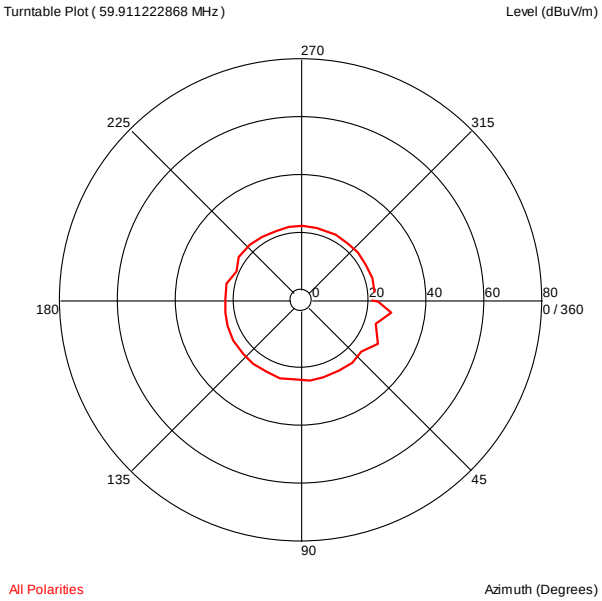
Trace1: Measured Peak

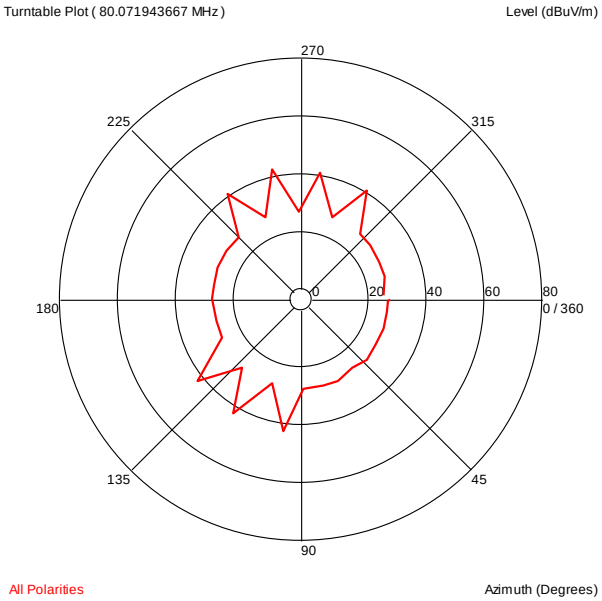
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
59.911222868 M	21.60	7.182	-25.753	49.54	-27.94	|	18	1.05	120 k	
349.982765453 M	28.16	14.299	-22.980	55.54	-27.38	|	98	1.26	120 k	
299.975751645 M	29.21	13.100	-23.160	55.54	-26.33	|	102	1.05	120 k	
799.960721325 M	30.43	20.998	-21.530	55.54	-25.11	--	360	1.36	120 k	
500.00080192 M	30.82	17.500	-22.500	55.54	-24.72	--	188	2.07	120 k	
400.059518739 M	31.27	15.404	-22.770	55.54	-24.27	|	150	1.55	120 k	
424.963727074 M	32.89	15.999	-22.690	55.54	-22.65	|	150	1.26	120 k	
450.020040561 M	34.63	16.800	-22.610	55.54	-20.91	--	199	2.29	120 k	
80.071943667 M	38.68	7.500	-25.187	49.54	-10.86	|	268	2.48	120 k	

Trace2: Measured Quasi Peak

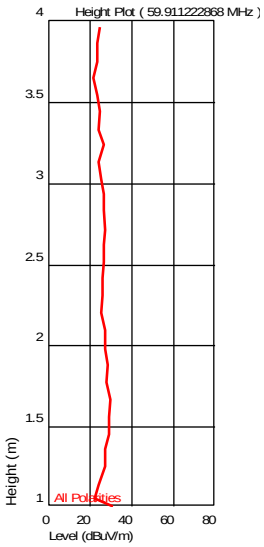
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
59.911222868 M	12.79	7.182	-25.753	29.540	-16.75	|	18	1.05	120 k	
799.960721325 M	25.12	20.998	-21.530	35.540	-10.42	--	360	1.36	120 k	
349.982765453 M	25.72	14.299	-22.980	35.540	-9.82	|	98	1.26	120 k	
299.975751645 M	27.12	13.100	-23.160	35.540	-8.42	|	102	1.05	120 k	
400.059518739 M	27.82	15.404	-22.770	35.540	-7.72	|	150	1.55	120 k	
80.071943667 M	22.02	7.500	-25.187	29.540	-7.52	|	268	2.48	120 k	
500.00080192 M	28.13	17.500	-22.500	35.540	-7.41	--	188	2.07	120 k	
424.963727074 M	30.37	15.999	-22.690	35.540	-5.17	|	150	1.26	120 k	
450.020040561 M	32.67	16.800	-22.610	35.540	-2.87	--	199	2.29	120 k	

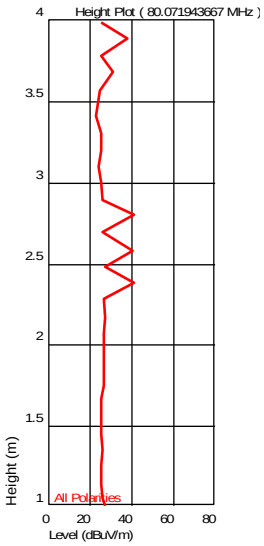
Azimuth Plots

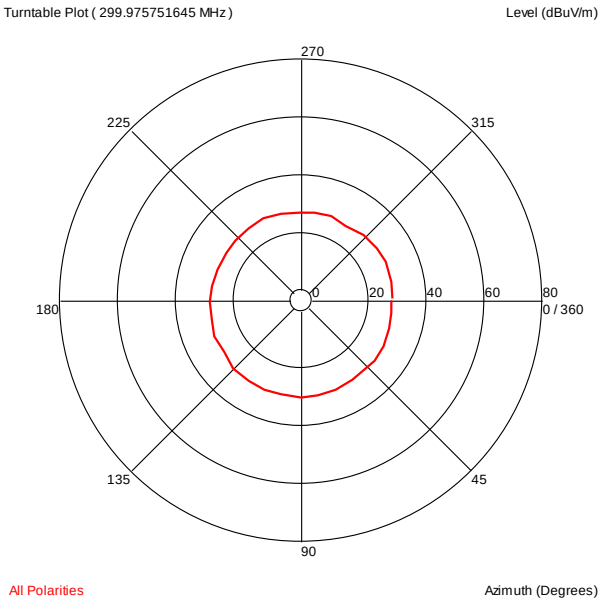


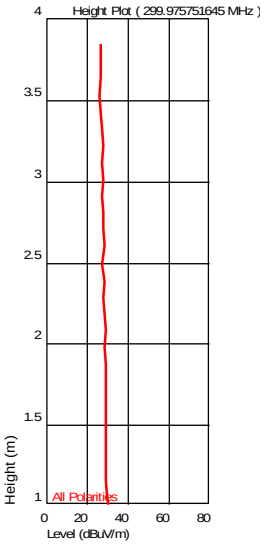


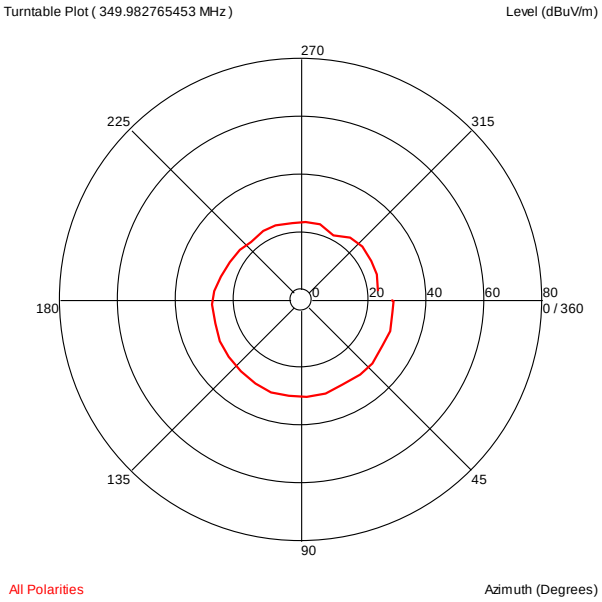
Turntable Plots

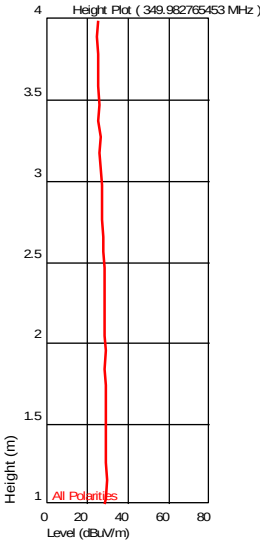


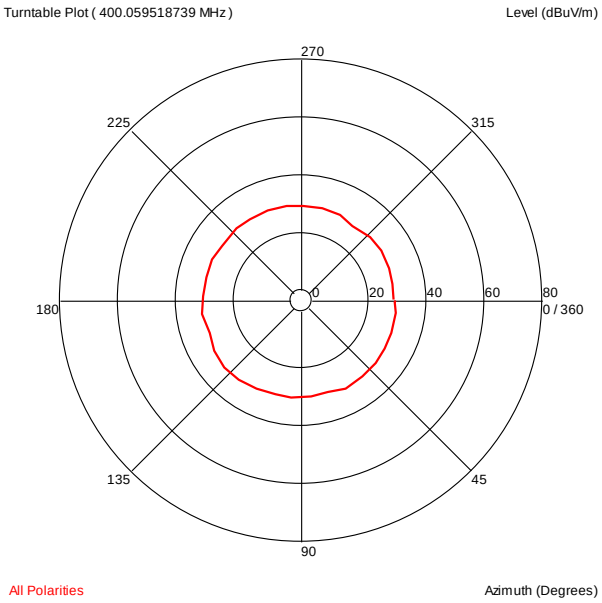


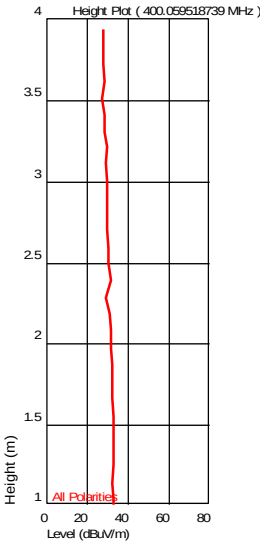

Turntable Plot (299.975751645 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

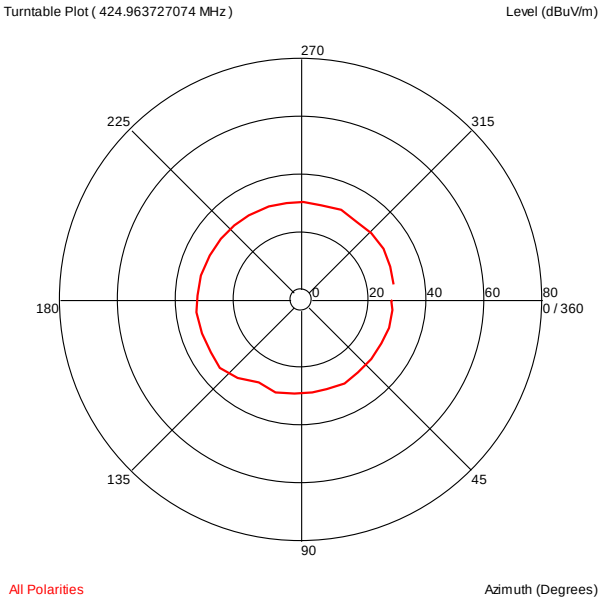

Height Plot (299.975751645 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

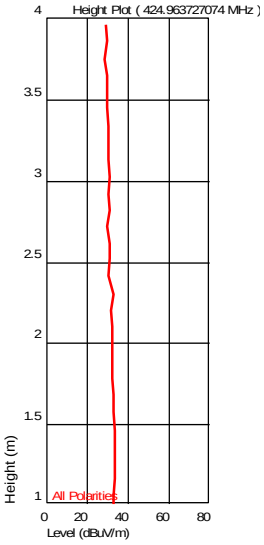

Turntable Plot (349.982765453 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

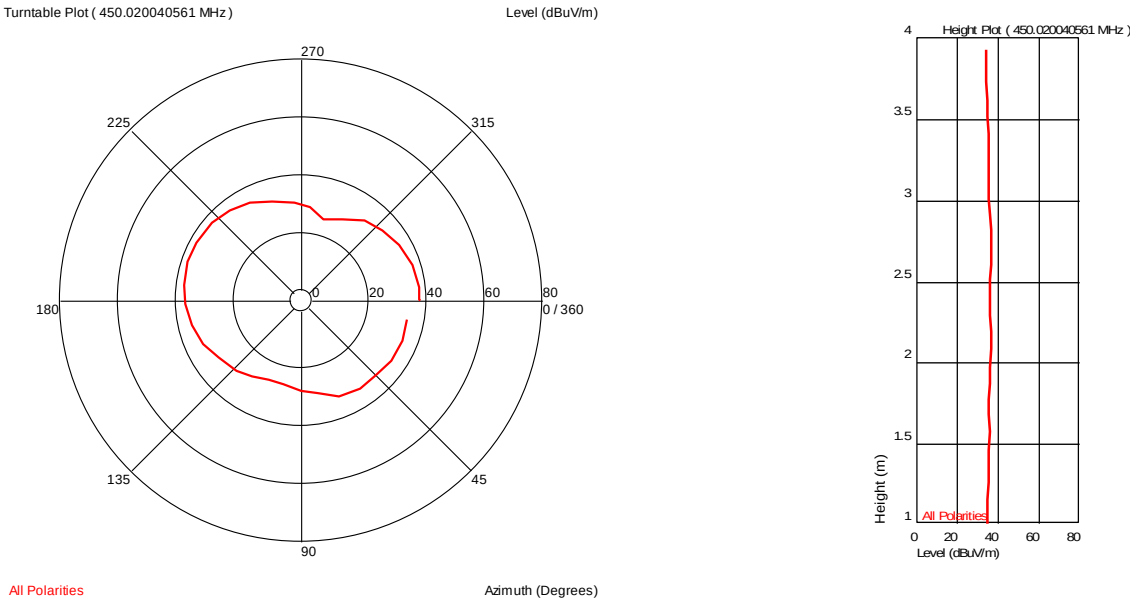

Height Plot (349.982765453 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

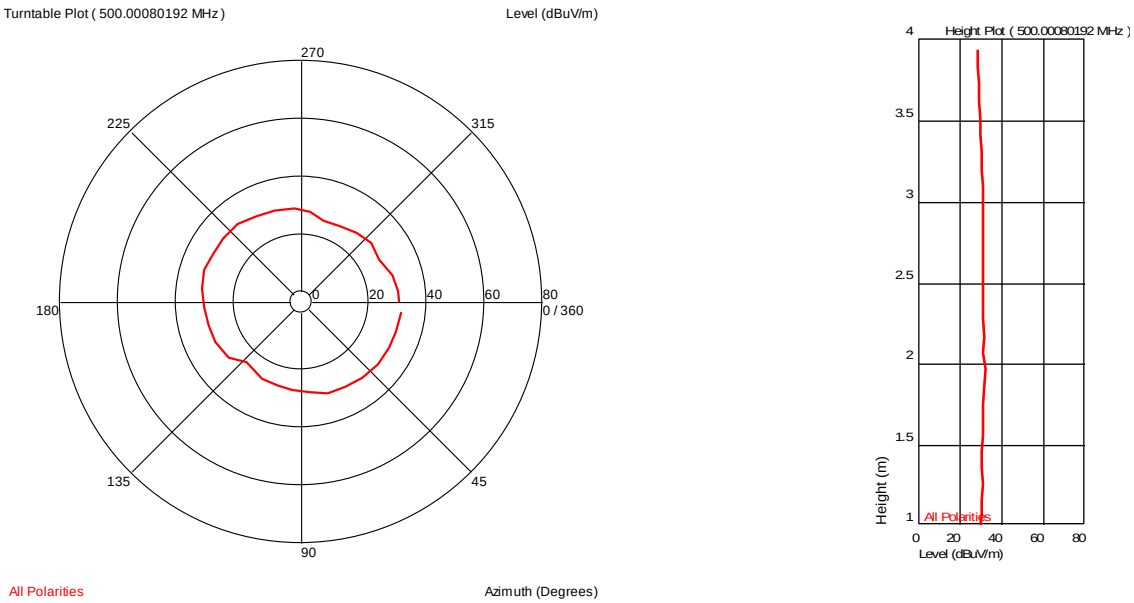

Turntable Plot (400.059518739 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

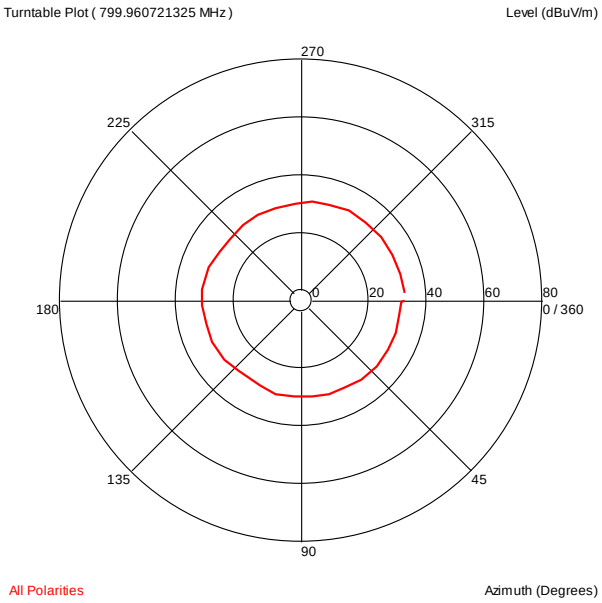

Height Plot (400.059518739 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

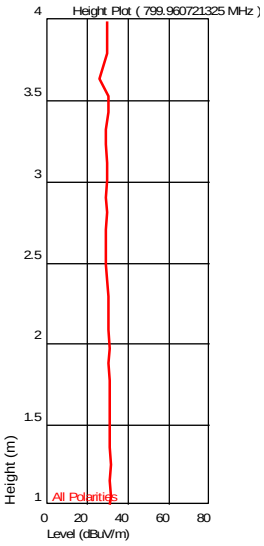

Turntable Plot (424.963727074 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

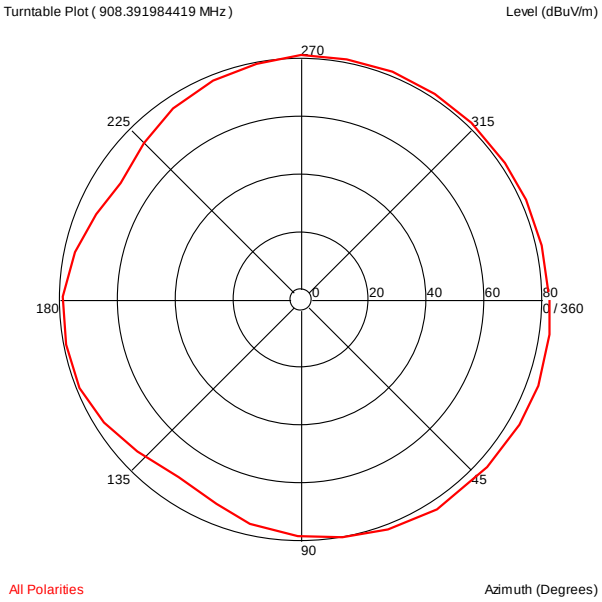

Height Plot (424.963727074 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

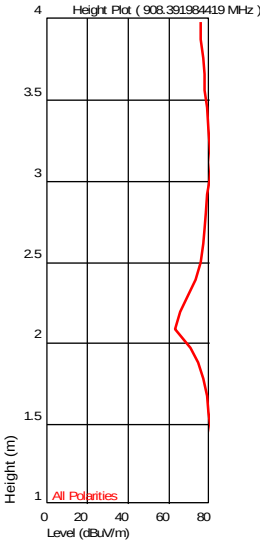

Turntable Plot (450.020040561 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)
Height Plot (450.020040561 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (500.00080192 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)
Height Plot (500.00080192 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (799.960721325 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (799.960721325 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (908.391984419 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

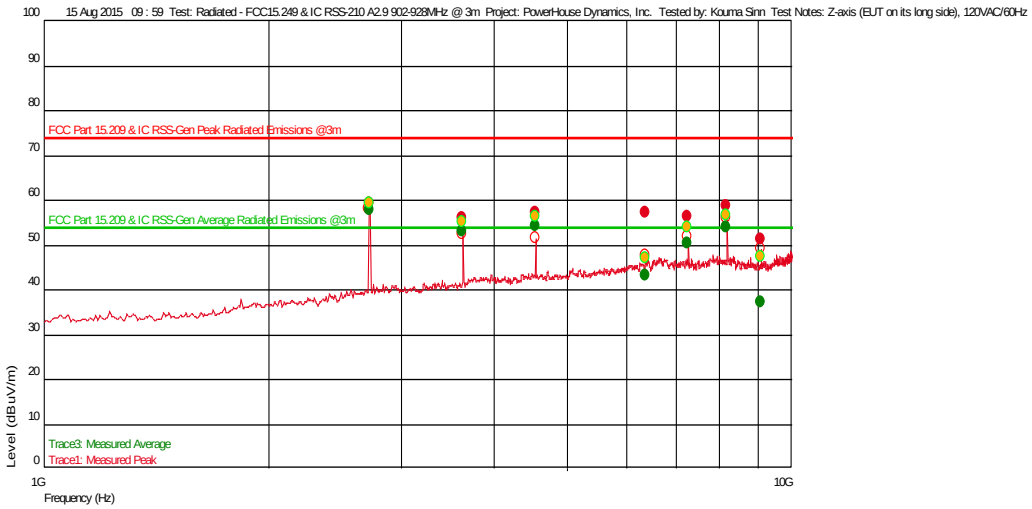

Height Plot (908.391984419 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Transmitter Spurious Radiated Emission (Y-axis, EUT on its long side), 1-10 GHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 3m	
Project:	PowerHouse Dynamics, Inc.	
Test Notes:	Y-axis (EUT on its long side), 120VAC/60Hz	
Temperature:	22C	
Humidity:	44%, 1009mbar	
Tested by:	Kouma Sinn	
Test Started:	15 Aug 2015 09 : 59	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace1: Measured Peak

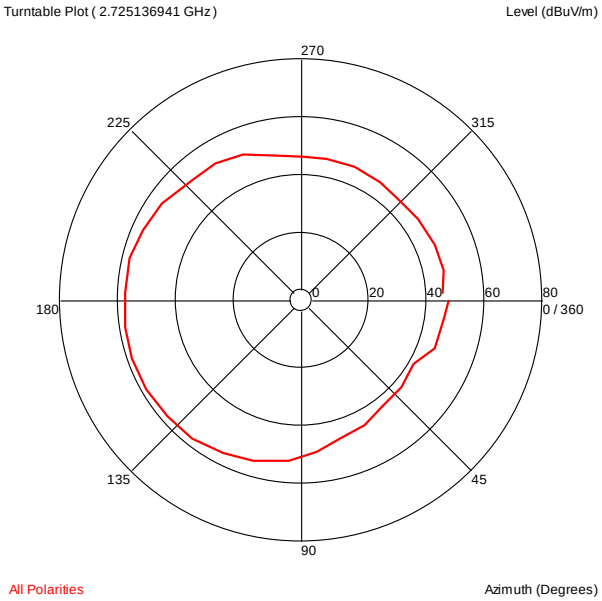
Frequency(Hz)	Level (dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.094816299 G	51.06	36.213	-26.476	74.000	-22.94	|	8	3.43	1 M	
3.633607214 G	55.88	33.180	-29.027	74.000	-18.12	--	160	1.06	1 M	
7.267134268 G	56.39	35.600	-25.919	74.000	-17.61	|	132	4.01	1 M	
4.541990648 G	57.12	33.943	-27.744	74.000	-16.88	|	166	1.33	1 M	
6.381082164 G	57.22	35.704	-25.847	74.000	-16.78	--	156	1.90	1 M	
8.175584502 G	58.61	35.806	-25.766	74.000	-15.39	|	153	3.87	1 M	
2.725136941 G	59.16	32.494	-31.259	74.000	-14.84	|	171	2.29	1 M	

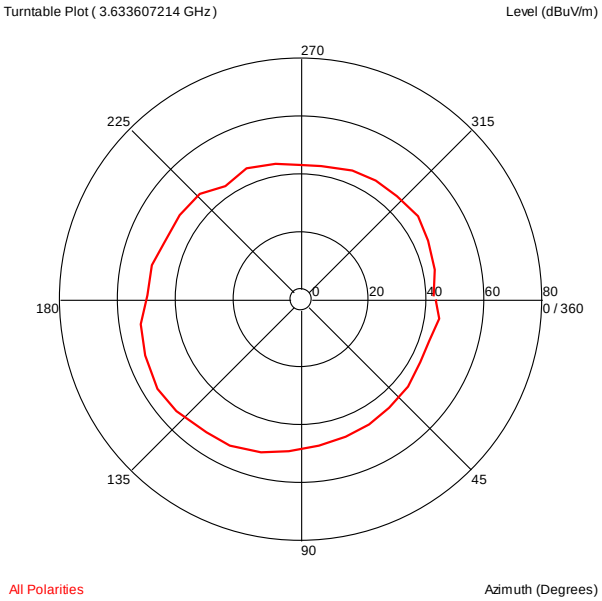
Trace3: Measured Average

Frequency(Hz)	Level (dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.094816299 G	33.86	36.213	-26.476	54.000	-22.94	|	8	3.43	1 M	
3.633607214 G	38.68	33.18	-29.027	54.000	-18.12	--	160	1.06	1 M	
7.267134268 G	39.19	35.6	-25.919	54.000	-17.61	|	132	4.01	1 M	
4.541990648 G	39.92	33.943	-27.744	54.000	-16.88	|	166	1.33	1 M	
6.381082164 G	40.02	35.704	-25.847	54.000	-16.78	--	156	1.90	1 M	
8.175584502 G	41.41	35.806	-25.766	54.000	-15.39	|	153	3.87	1 M	
2.725136941 G	41.96	32.494	-31.259	54.000	-14.84	|	171	2.29	1 M	

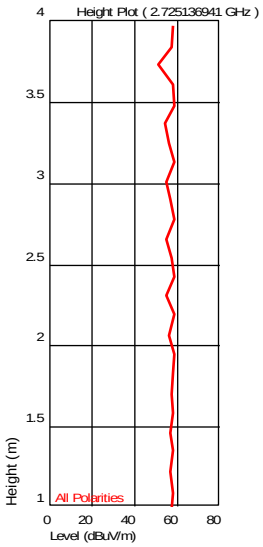
Notes: Measured average = Measured peak – Average factor, where average factor = 17.2 dB (disregard the CISPR average readings on the plot).

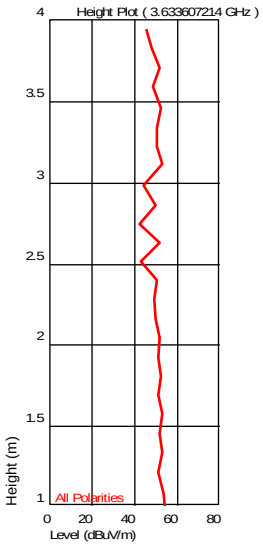
Azimuth Plots

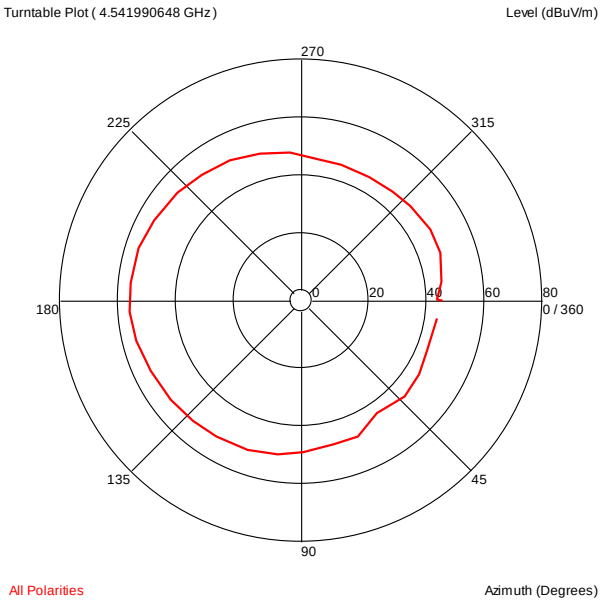


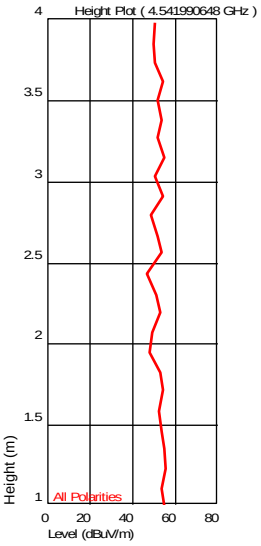


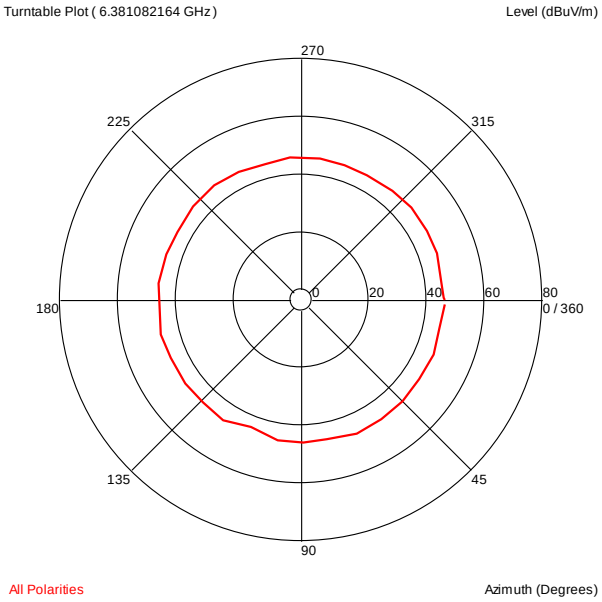
Turntable Plots

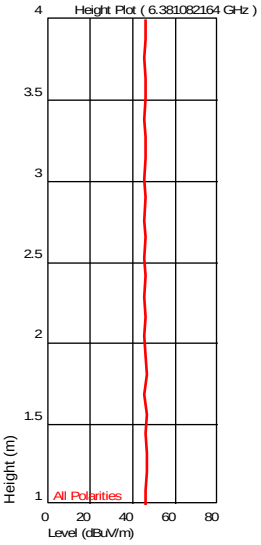


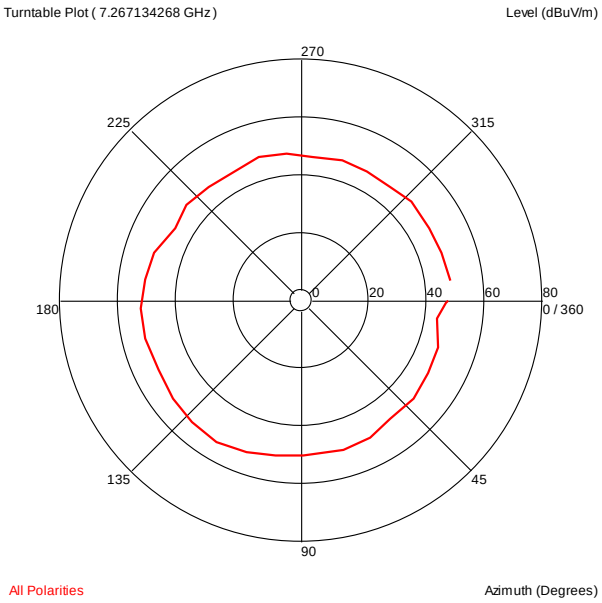


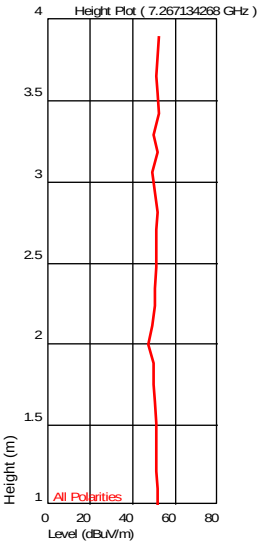

Turntable Plot (4.541990648 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

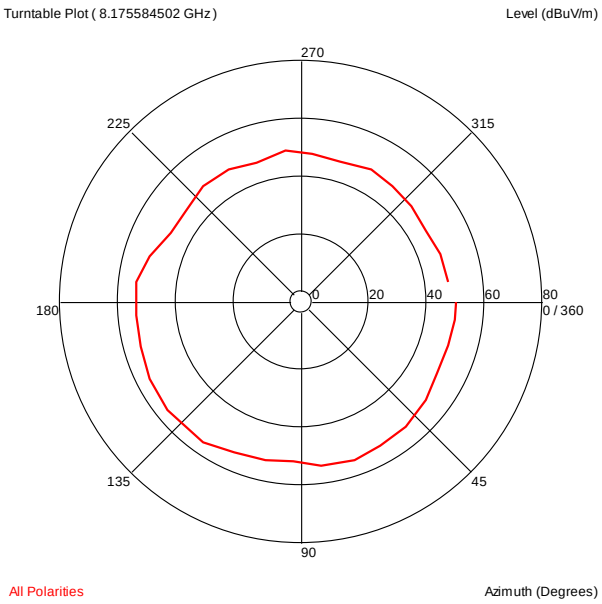

Height Plot (4.541990648 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

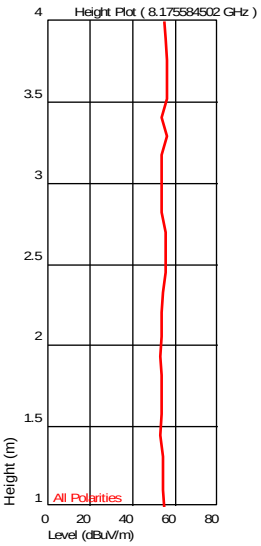

Turntable Plot (6.381082164 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

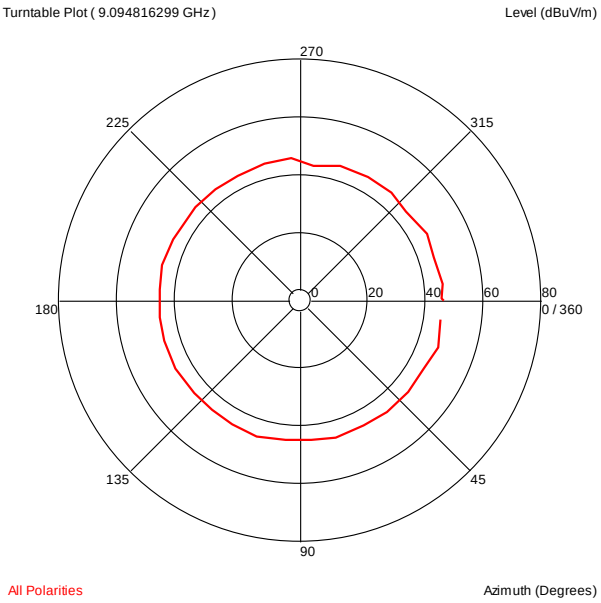

Height Plot (6.381082164 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

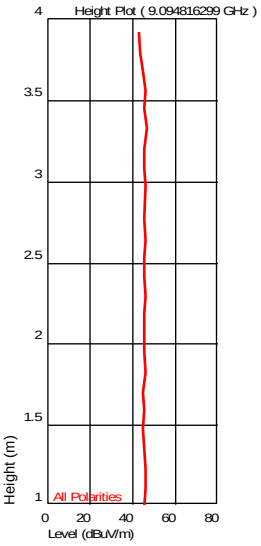

Turntable Plot (7.267134268 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (7.267134268 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (8.175584502 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (8.175584502 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (9.094816299 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

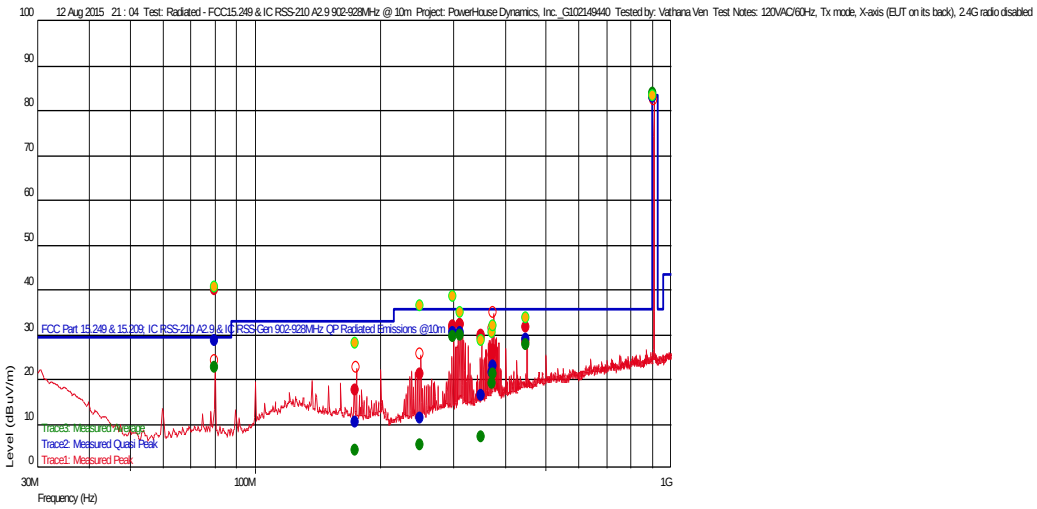

Height Plot (9.094816299 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Transmitter Spurious Radiated Emission (Z-axis, EUT on its short side), 30-1000 MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 10m	
Project:	PowerHouse Dynamics, Inc._G102149440	
Test Notes:	120VAC/60Hz, Tx mode, Z-axis (EUT on its short side), 2.4G radio disabled	
Temperature:	25 deg C	
Humidity:	42%, 997 mB	
Tested by:	Vathana Ven	
Test Started:	12 Aug 2015 21 : 04	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

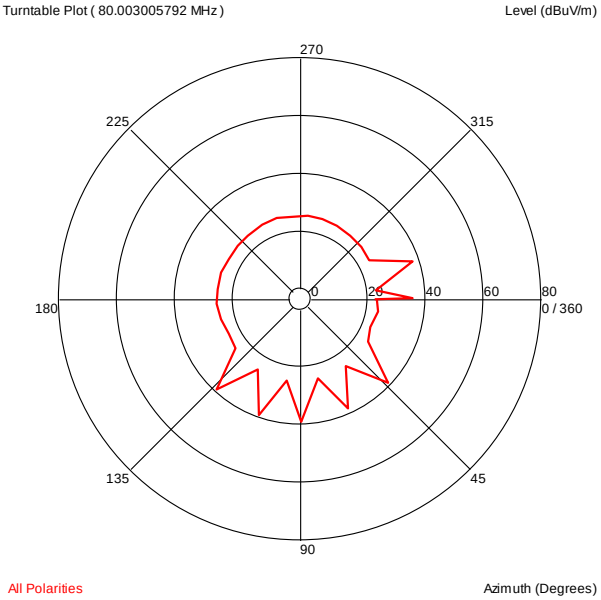
Trace1: Measured Peak

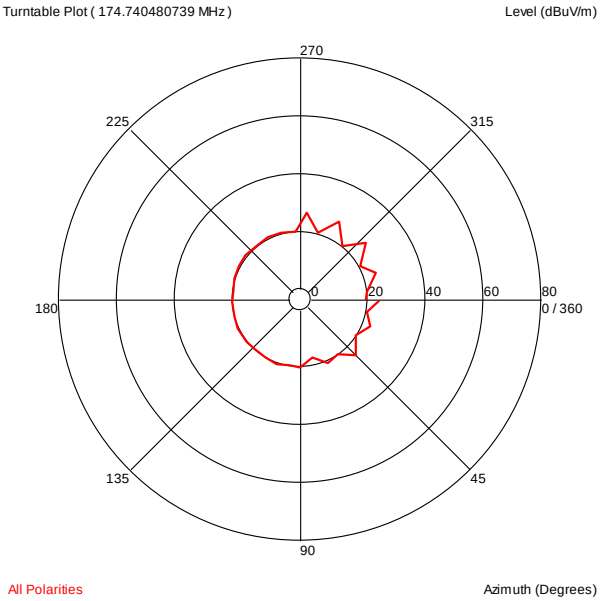
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
174.740480739 M	17.40	11.300	-24.267	53.04	-35.64	|	286	2.61	120 k	
249.887174768 M	21.04	11.402	-23.551	55.54	-34.5	|	96	1.05	120 k	
372.493185932 M	25.13	15.050	-22.886	55.54	-30.41	|	109	1.67	120 k	
374.97995976 M	26.49	15.100	-22.875	55.54	-29.05	|	32	1.05	120 k	
349.977955834 M	29.56	14.299	-22.980	55.54	-25.98	|	251	2.28	120 k	
450.005611703 M	31.47	16.800	-22.610	55.54	-24.07	--	80	2.29	120 k	
300.018236615 M	31.80	13.101	-23.160	55.54	-23.74	|	264	1.06	120 k	
312.485971545 M	31.94	13.499	-23.115	55.54	-23.6	|	254	1.04	120 k	
80.003005792 M	39.70	7.500	-25.188	49.54	-9.84	|	100	2.42	120 k	

Trace2: Measured Quasi Peak

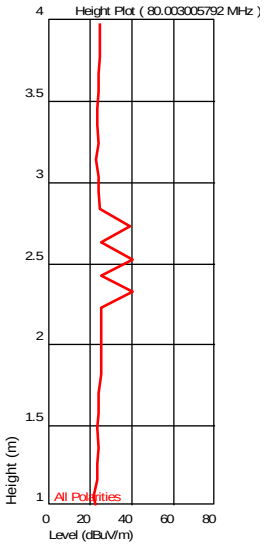
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
249.887174768 M	11.08	11.402	-23.551	35.540	-24.46	|	96	1.05	120 k	
174.740480739 M	10.16	11.300	-24.267	33.040	-22.88	|	286	2.61	120 k	
349.977955834 M	16.26	14.299	-22.980	35.540	-19.28	|	251	2.28	120 k	
372.493185932 M	21.31	15.050	-22.886	35.540	-14.23	|	109	1.67	120 k	
374.97995976 M	22.94	15.100	-22.875	35.540	-12.60	|	32	1.05	120 k	
450.005611703 M	28.94	16.800	-22.610	35.540	-6.60	--	80	2.29	120 k	
312.485971545 M	30.21	13.499	-23.115	35.540	-5.33	|	254	1.04	120 k	
300.018236615 M	30.21	13.101	-23.160	35.540	-5.33	|	264	1.06	120 k	
80.003005792 M	28.62	7.500	-25.188	29.540	-0.92	|	100	2.42	120 k	

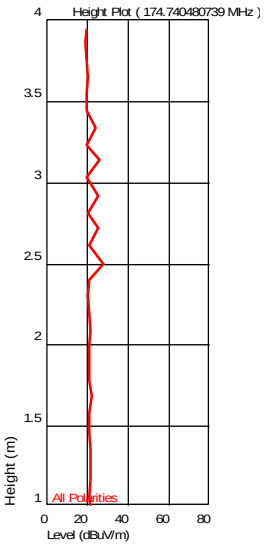
Azimuth Plots

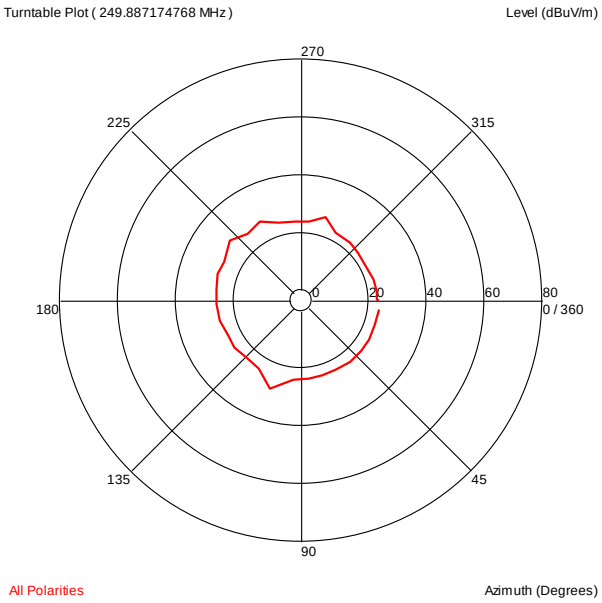


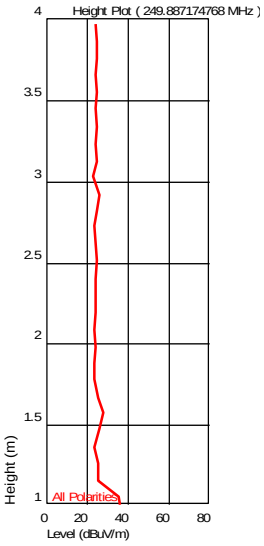


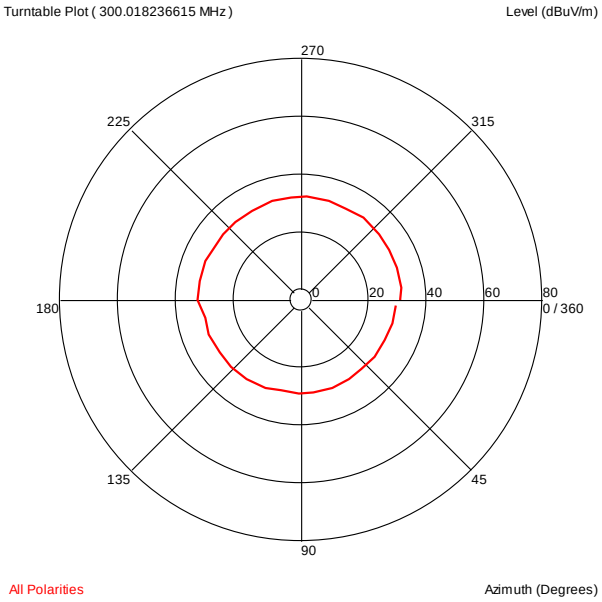
Turntable Plots

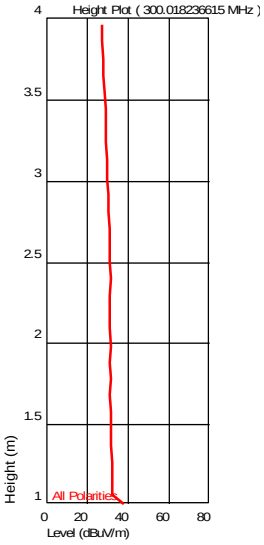


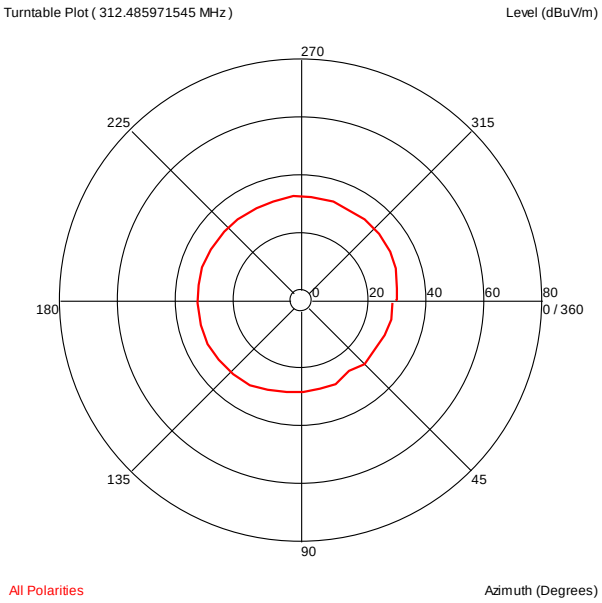


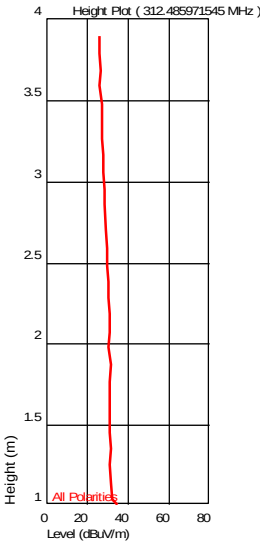

Turntable Plot (249.887174768 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

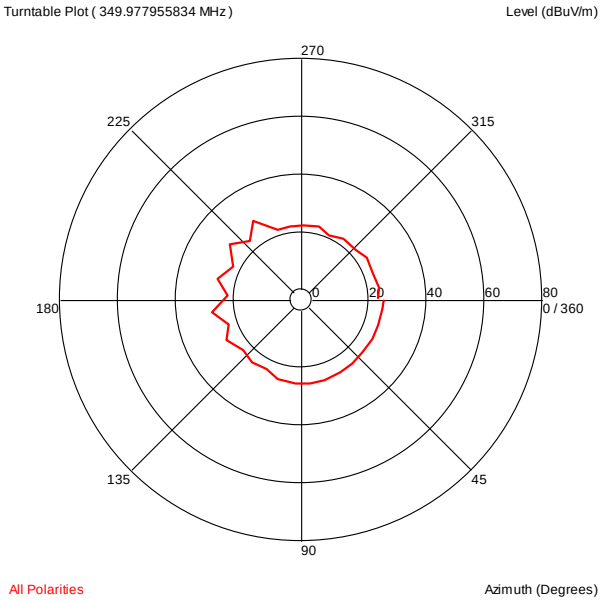

Height Plot (249.887174768 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

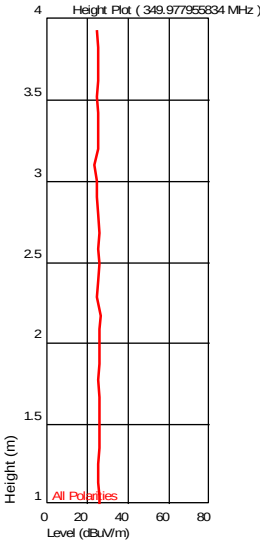

Turntable Plot (300.018236615 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

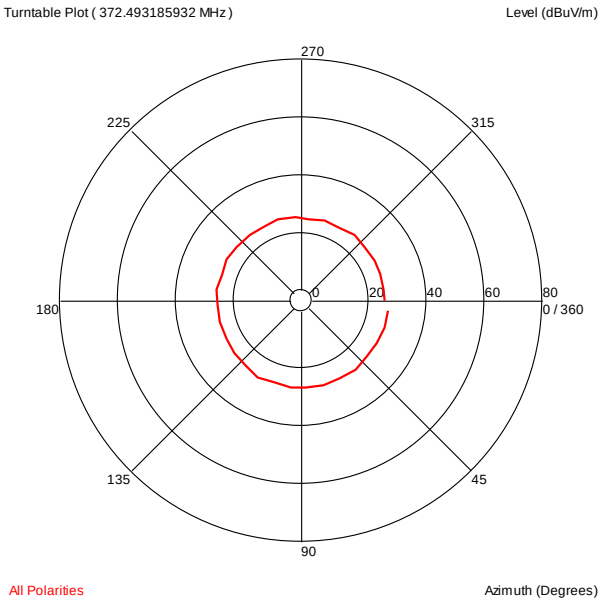

Height Plot (300.018236615 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

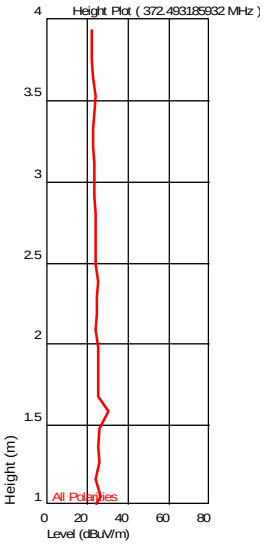

Turntable Plot (312.485971545 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

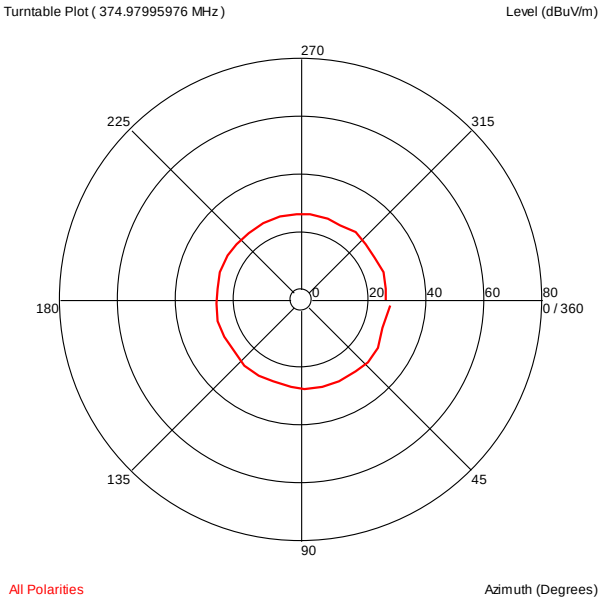

Height Plot (312.485971545 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

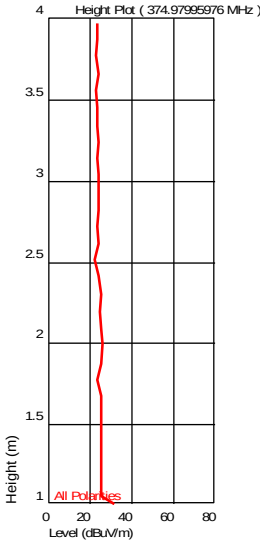

Turntable Plot (349.977955834 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

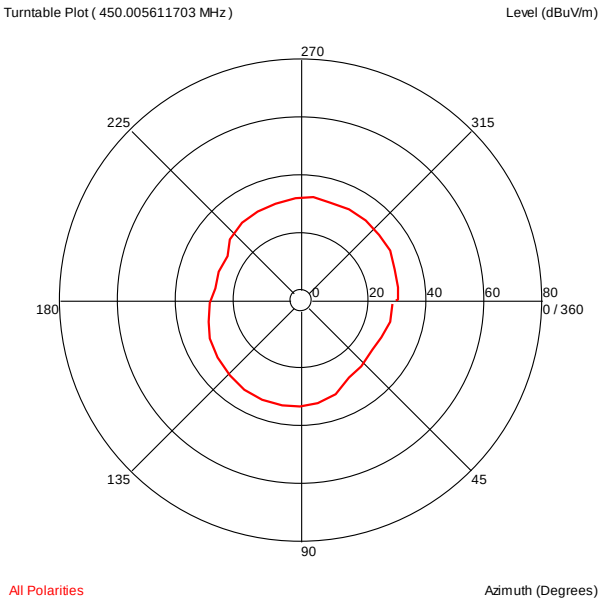

Height Plot (349.977955834 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

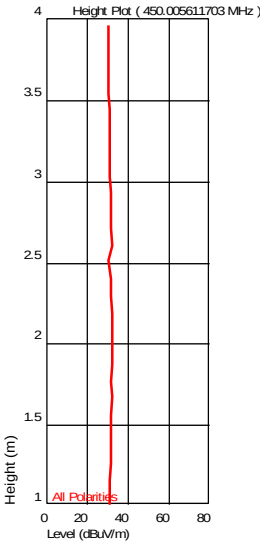

Turntable Plot (372.493185932 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

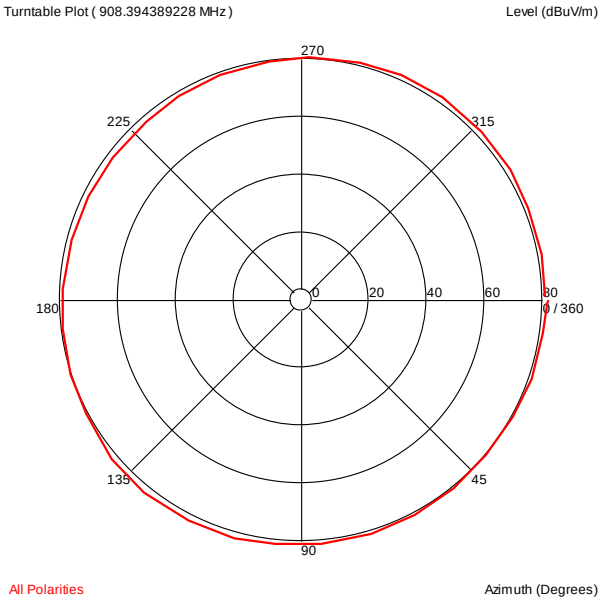

Height Plot (372.493185932 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

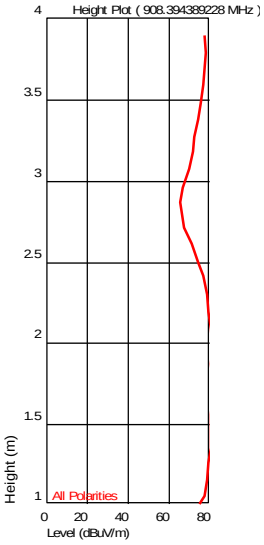

Turntable Plot (374.97995976 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (374.97995976 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (450.005611703 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (450.005611703 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (908.394389228 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

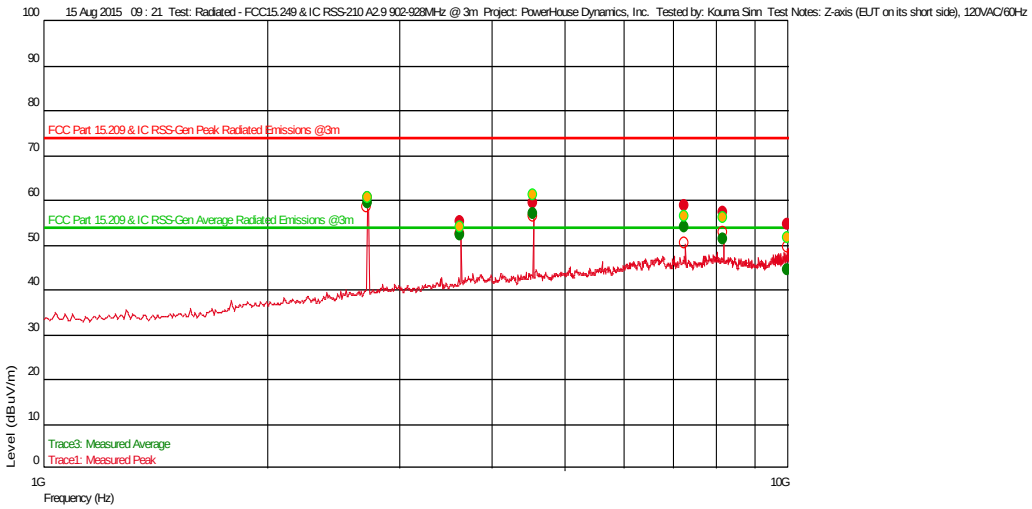

Height Plot (908.394389228 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Transmitter Spurious Radiated Emission (Z-axis, EUT on its short side), 1-10 GHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 3m	
Project:	PowerHouse Dynamics, Inc.	
Test Notes:	Z-axis (EUT on its short side), 120VAC/60Hz	
Temperature:	22C	
Humidity:	44%, 1009mbar	
Tested by:	Kouma Sinn	
Test Started:	15 Aug 2015 09 : 21	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace1: Measured Peak

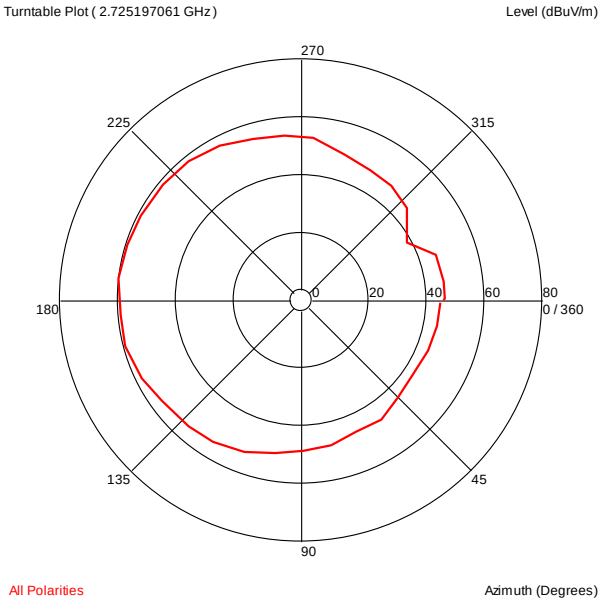
Frequency(Hz)	Level (dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.99245825 G	54.61	36.899	-26.006	74.000	-19.39	--	223	3.54	1 M	
3.633560454 G	55.07	33.180	-29.027	74.000	-18.93	|	198	1.08	1 M	
8.175671342 G	57.14	35.806	-25.766	74.000	-16.86	--	198	3.90	1 M	
7.267267869 G	58.53	35.599	-25.919	74.000	-15.47	--	149	2.41	1 M	
4.541997328 G	59.15	33.943	-27.744	74.000	-14.85	--	221	3.00	1 M	
2.725197061 G	60.46	32.494	-31.259	74.000	-13.54	--	175	3.71	1 M	

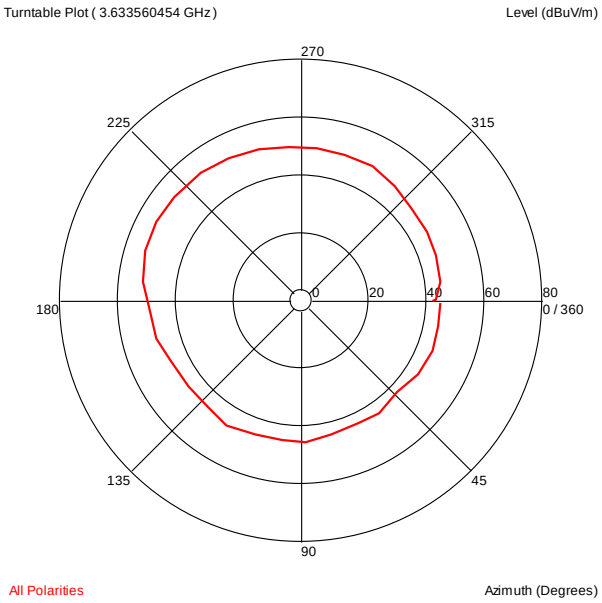
Trace3: Measured Average

Frequency(Hz)	Level (dBuV/m)	AF	PA+CL	Limit(dBuV/m)	Margin(dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
9.99245825 G	37.41	36.899	-26.006	54.000	-19.39	--	223	3.54	1 M	
3.633560454 G	37.87	33.18	-29.027	54.000	-18.93	|	198	1.08	1 M	
8.175671342 G	39.94	35.806	-25.766	54.000	-16.86	--	198	3.90	1 M	
7.267267869 G	41.33	35.599	-25.919	54.000	-15.47	--	149	2.41	1 M	
4.541997328 G	41.95	33.943	-27.744	54.000	-14.85	--	221	3.00	1 M	
2.725197061 G	43.26	32.494	-31.259	54.000	-13.54	--	175	3.71	1 M	

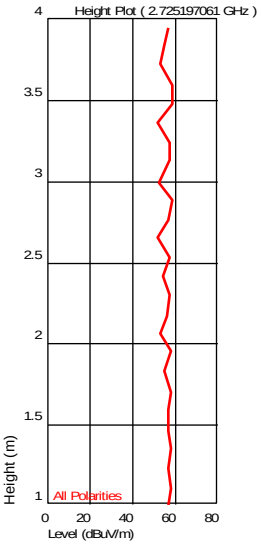
Notes: Measured average = Measured peak – Average factor, where average factor = 17.2 dB (disregard the CISPR average readings on the plot).

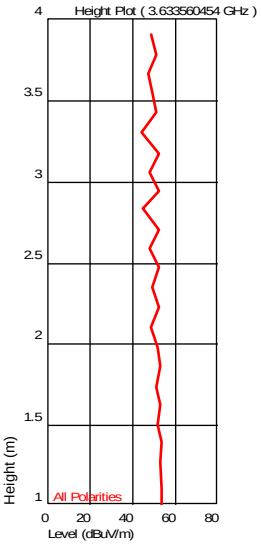
Azimuth Plots

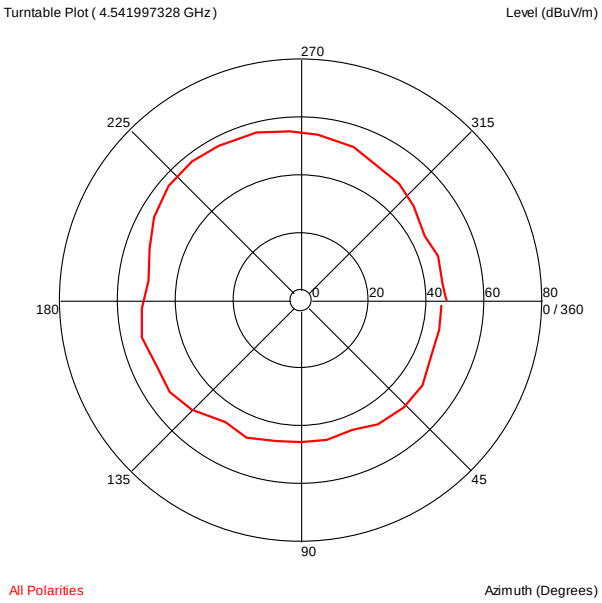


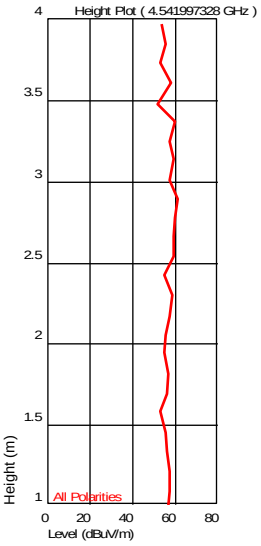


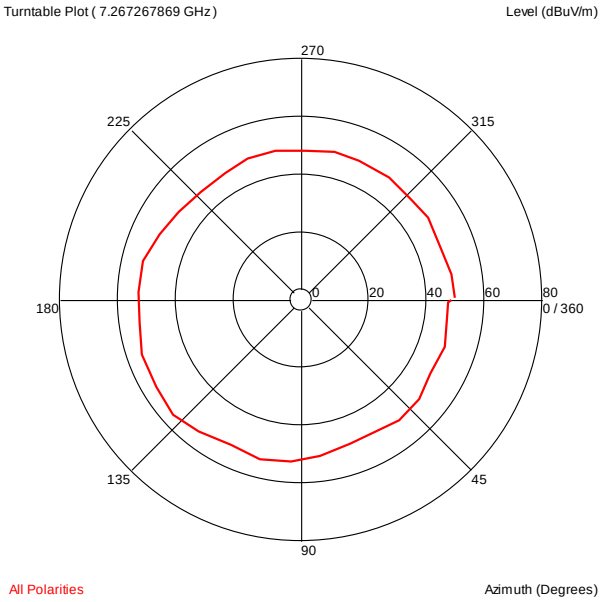
Turntable Plots

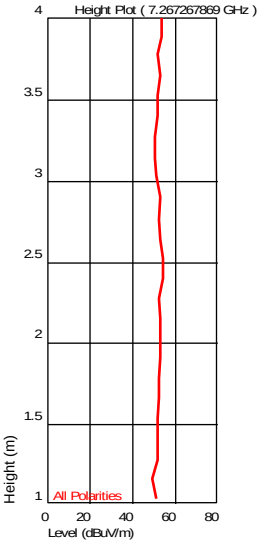


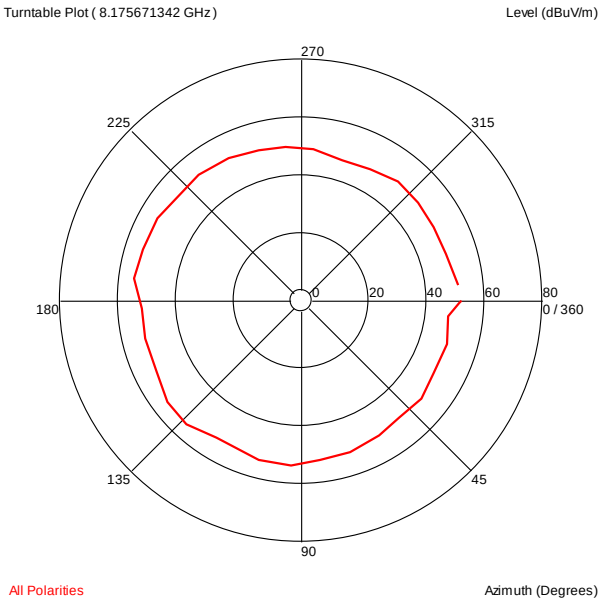


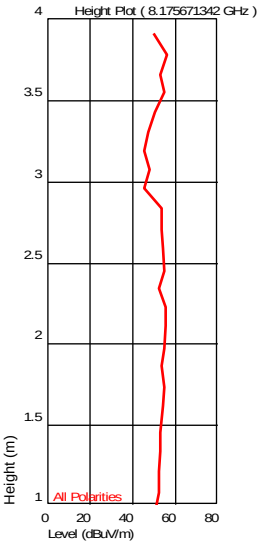

Turntable Plot (4.541997328 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

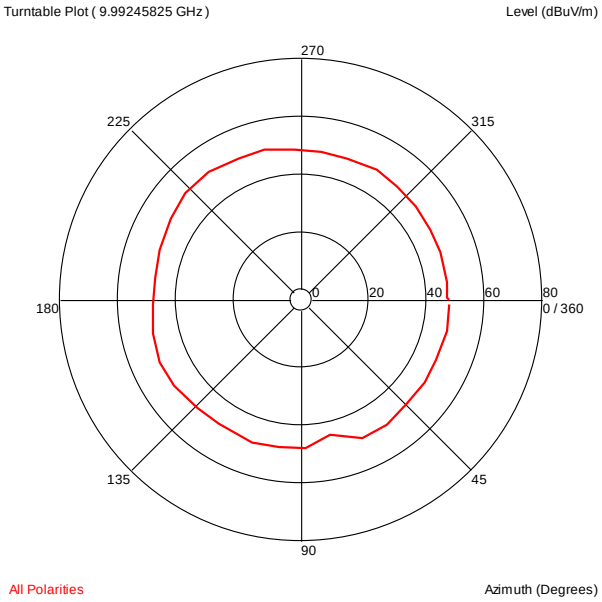

Height Plot (4.541997328 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

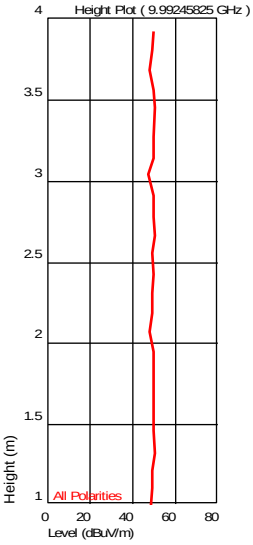

Turntable Plot (7.267267869 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (7.267267869 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (8.175671342 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (8.175671342 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (9.99245825 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (9.99245825 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Test Personnel:	Vathana F. Ven VFV	Test Date:	08/12/2015
	Kouma Sinn KPS		08/15/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC 47CRF Part 15.249, RSS-210	Limit Applied:	FCC Part15.209, Annex 2.9(a), RSS-GEN 8.9
Input Voltage:	120VAC/60Hz	Ambient Temperature:	25, 22 ºC
Pretest Verification w/ Ambient Signals or BB Source:	BB Source	Relative Humidity:	42, 44 %
		Atmospheric Pressure:	997, 1009 mbars

Deviations, Additions, or Exclusions: None

8 Receiver Spurious Emissions

8.1 Method

Tests are performed in accordance with FCC 47CFR Part 15 (8/2015) Section 15.109, RSS-Gen Issue 4 November 2014, ICES-003 Issue 5 August 2012, and ANSI C63.4:2014.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.6	6.3
Radiated Emissions, 3m	30-1000 MHz	5.3	6.3
Radiated Emissions, 3m	1-6 GHz	4.5	5.2
Radiated Emissions, 3m	6-15 GHz	5.2	5.5
Radiated Emissions, 3m	15-18 GHz	5.0	5.5
Radiated Emissions, 3m	18-40 GHz	5.0	5.5

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 dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
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 dBμV 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 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

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

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

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

Alternately, when C5 Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. “AF” is the Antenna Factor; “PA+CL” are Preamp and Cable Loss. These are already accounted for in the “Level” column.

8.2 Test Equipment Used:

3m Track B

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
ETS001	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/05/2014	05/05/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015

10m Track A

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
145013'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2944A07027	10/11/2014	10/11/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015

Software Utilized:

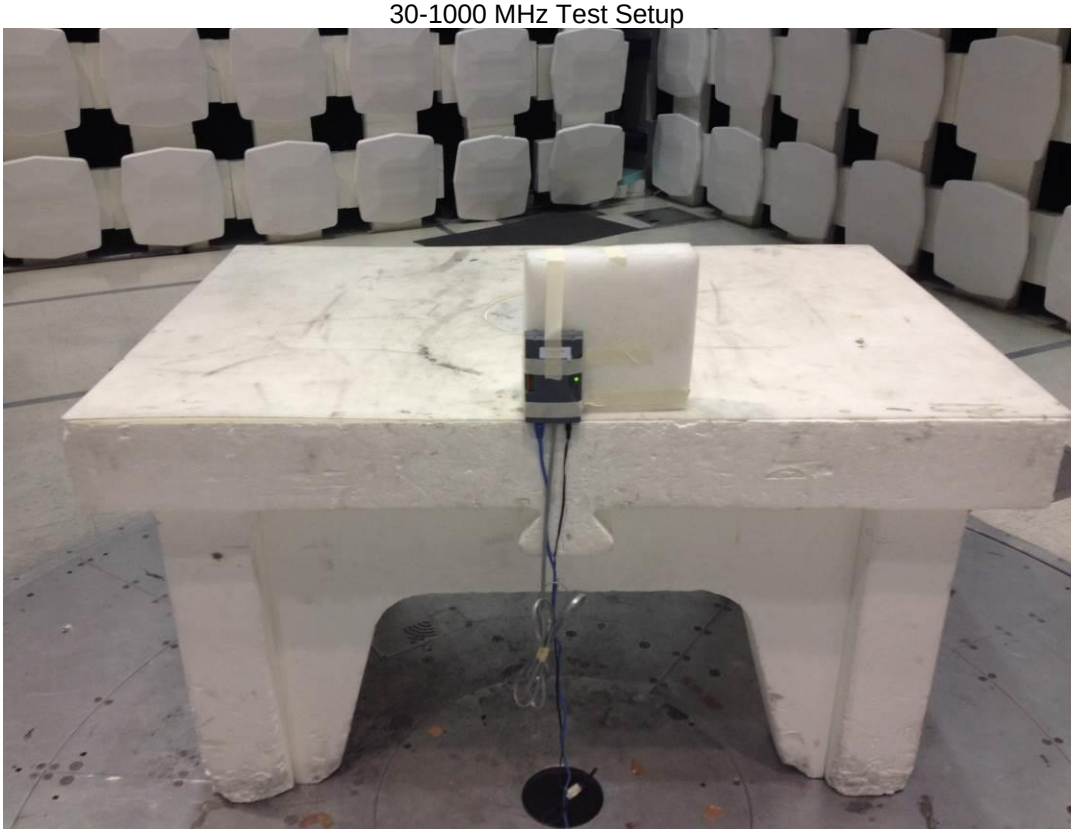
Name	Manufacturer	Version
C5	Teseq	5.26.46.46

8.3 Results:

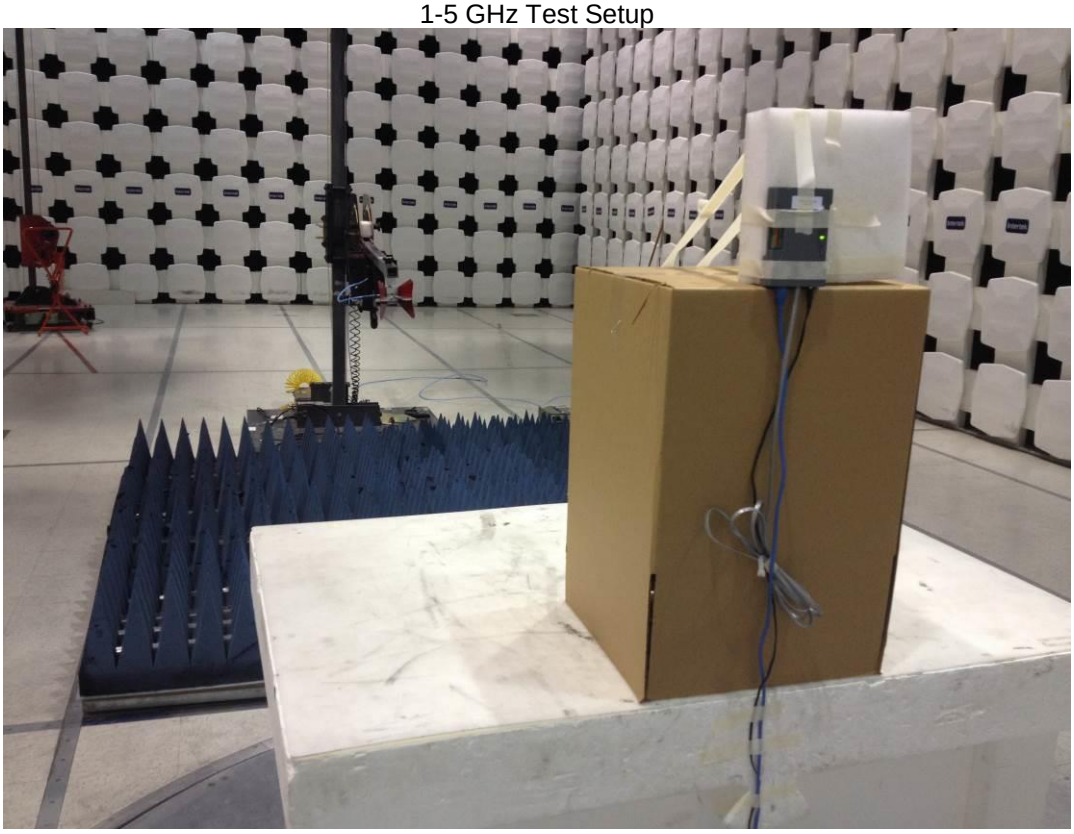
The sample tested was found to Comply.

8.4 Setup Photographs:

30-1000 MHz Test Setup



1-5 GHz Test Setup



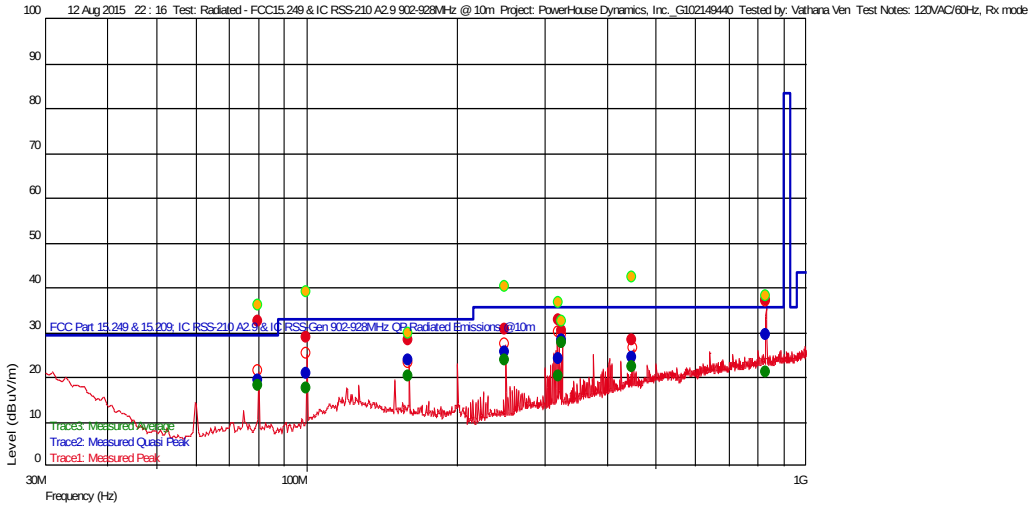
8.5 Plots/Data:

Receive Mode, 30-1000 MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15.249 & IC RSS-210 A2.9 902-928MHz @ 10m	
Project:	PowerHouse Dynamics, Inc._G102149440	
Test Notes:	120VAC/60Hz, Rx mode	
Temperature:	25 deg C	
Humidity:	42%, 997 mB	
Tested by:	Vathana Ven	
Test Started:	12 Aug 2015 22 : 16	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

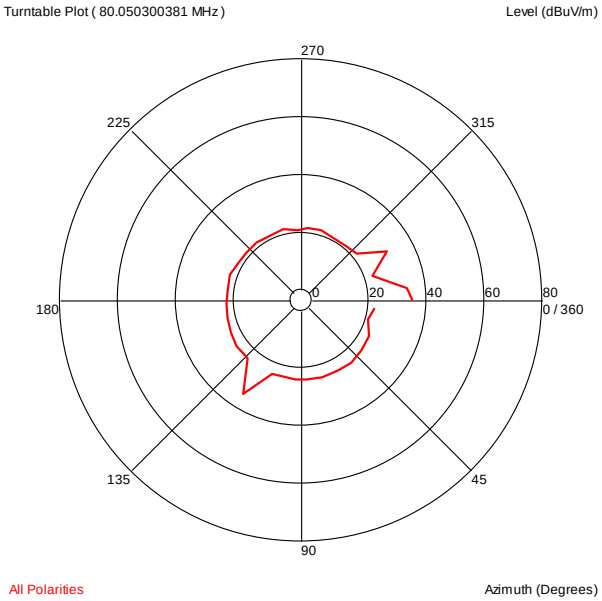
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

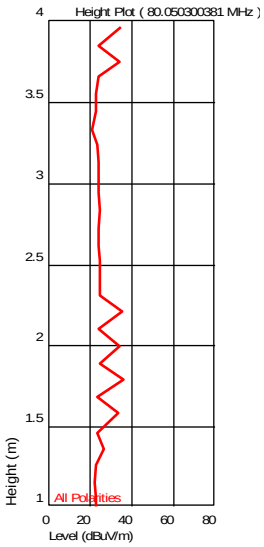
Trace2: Measured Quasi Peak

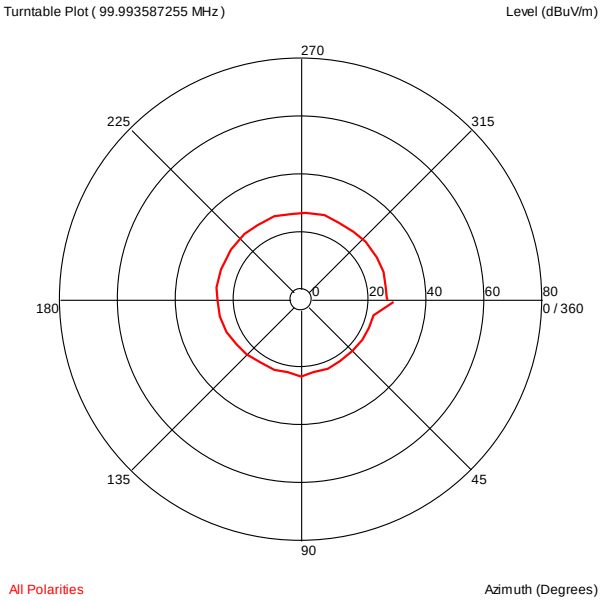
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
99.993587255 M	20.87	9.898	-24.830	33.040	-12.17	|	0	1.15	120 k	
319.913427297 M	23.89	13.698	-23.088	35.540	-11.65	|	164	1.99	120 k	
450.033867273 M	24.43	16.800	-22.610	35.540	-11.11	--	56	1.15	120 k	
80.050300381 M	19.21	7.500	-25.187	29.540	-10.33	|	112	1.89	120 k	
250.050701822 M	25.56	11.400	-23.550	35.540	-9.98	|	0	1.04	120 k	
159.987174387 M	23.74	12.000	-24.400	33.040	-9.30	|	286	1.95	120 k	
325.013827715 M	28.35	13.900	-23.070	35.540	-7.19	|	165	1.10	120 k	
831.042084641 M	29.40	21.279	-21.463	35.540	-6.14	|	355	4.00	120 k	

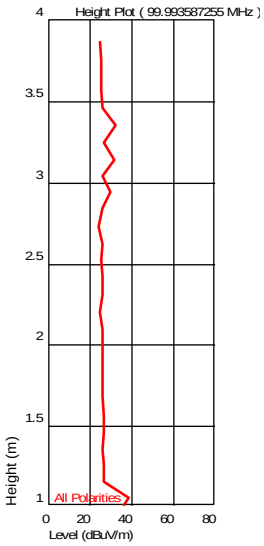
Azimuth Plots

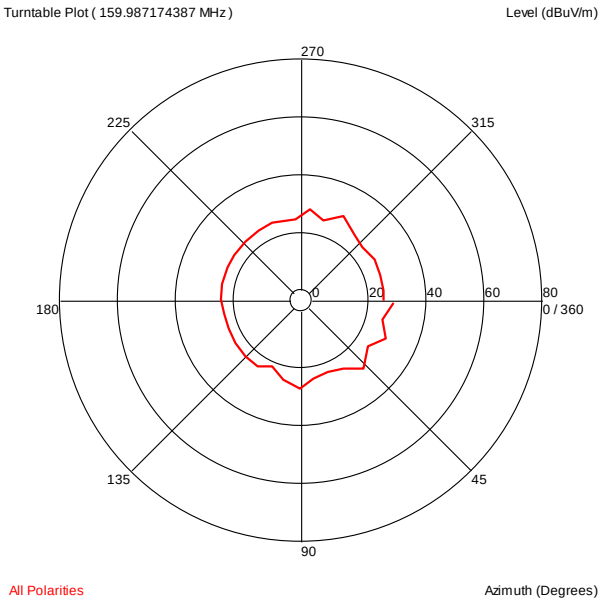


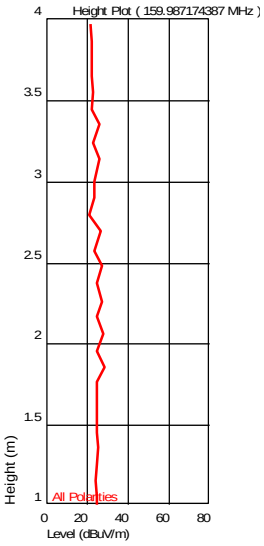
Turntable Plots

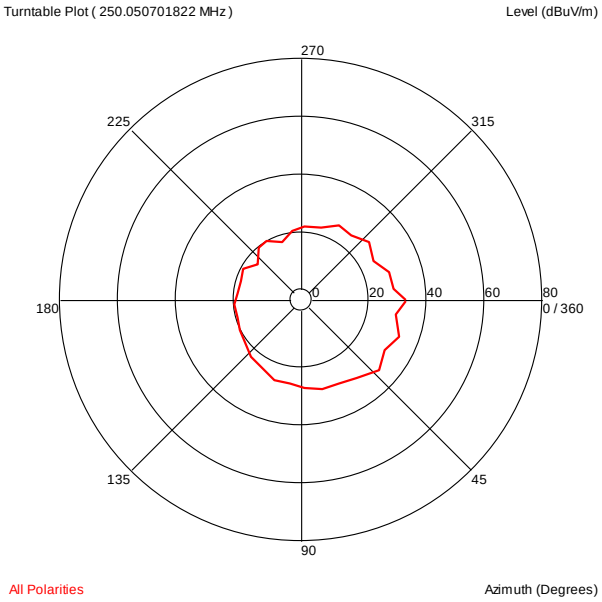


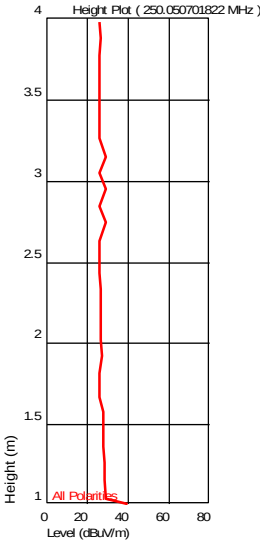


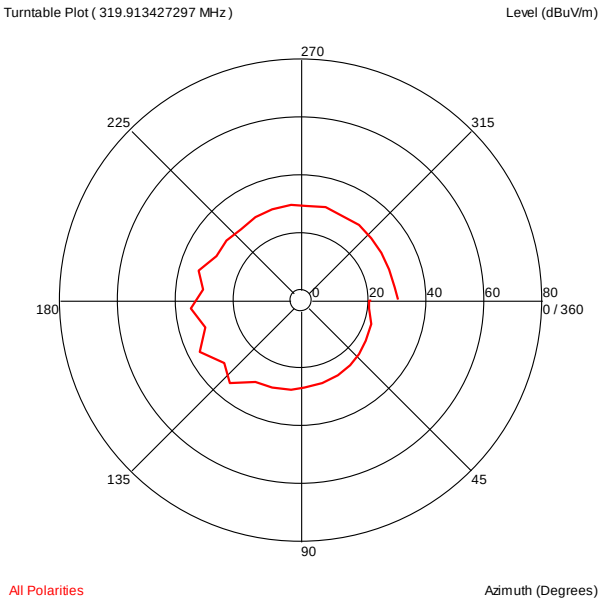


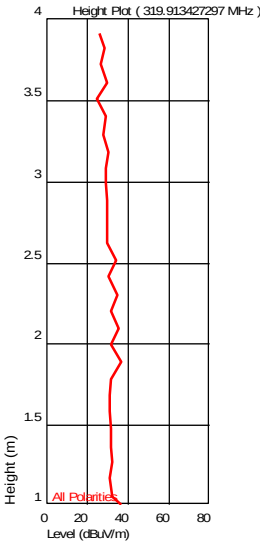

Turntable Plot (159.987174387 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

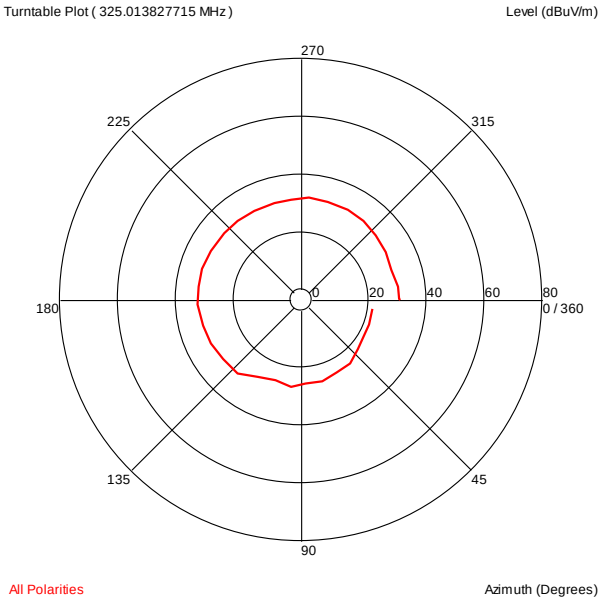

Height Plot (159.987174387 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

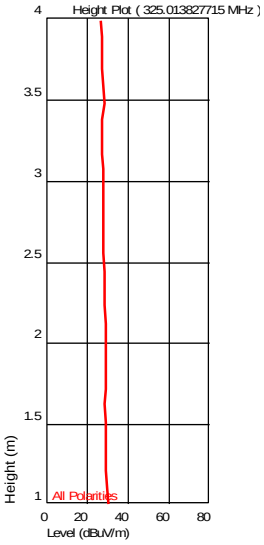

Turntable Plot (250.050701822 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

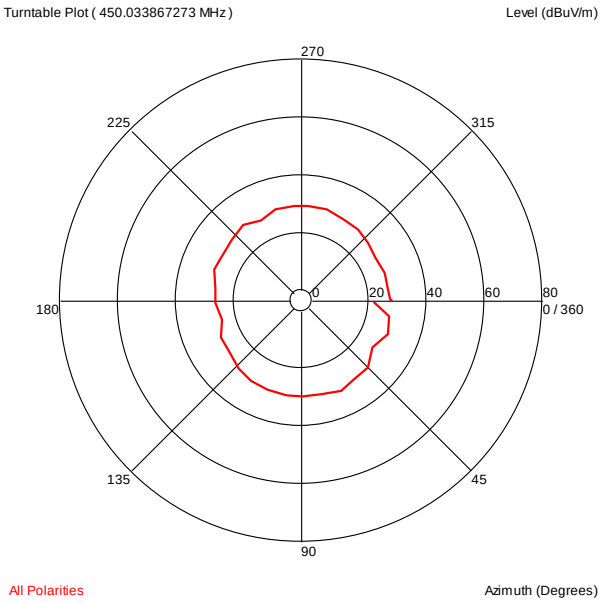

Height Plot (250.050701822 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

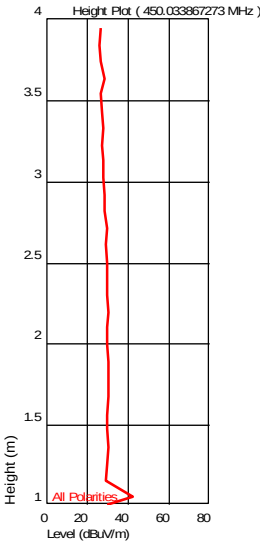

Turntable Plot (319.913427297 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

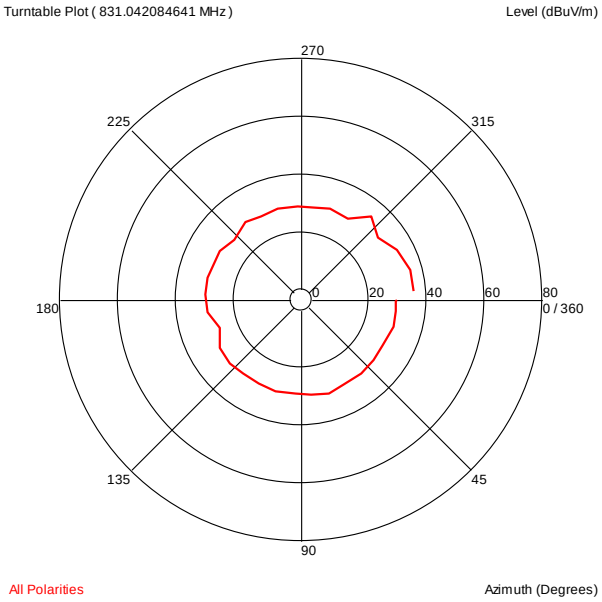

Height Plot (319.913427297 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

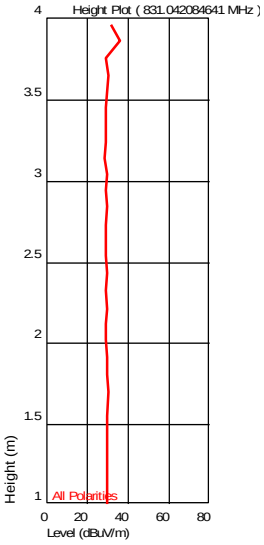

Turntable Plot (325.013827715 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (325.013827715 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (450.033867273 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (450.033867273 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (831.042084641 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

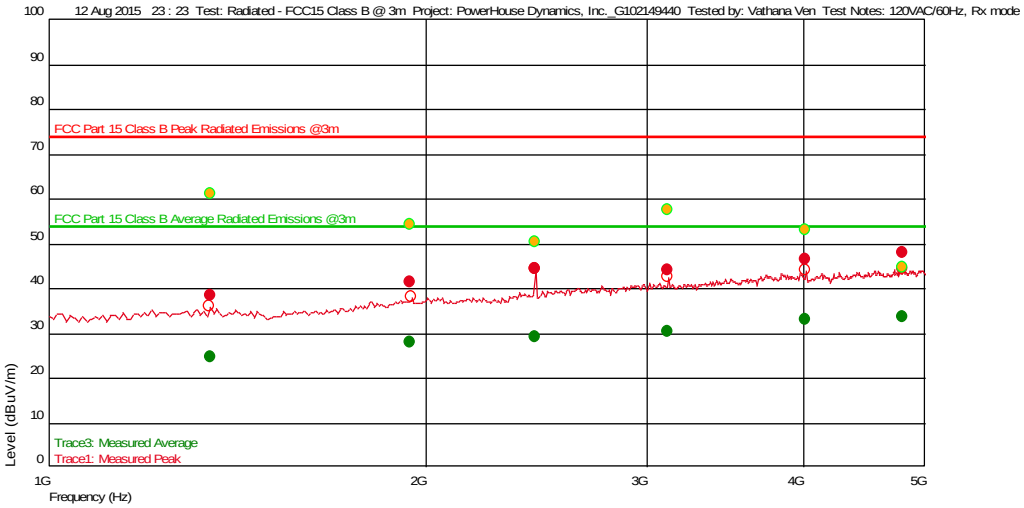

Height Plot (831.042084641 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Receive Mode, 1-5 GHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 3m	
Project:	PowerHouse Dynamics, Inc._G102149440	
Test Notes:	120VAC/60Hz, Rx mode	
Temperature:	25 deg C	
Humidity:	42%, 997 mB	
Tested by:	Vathana Ven	
Test Started:	12 Aug 2015 23 : 23	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

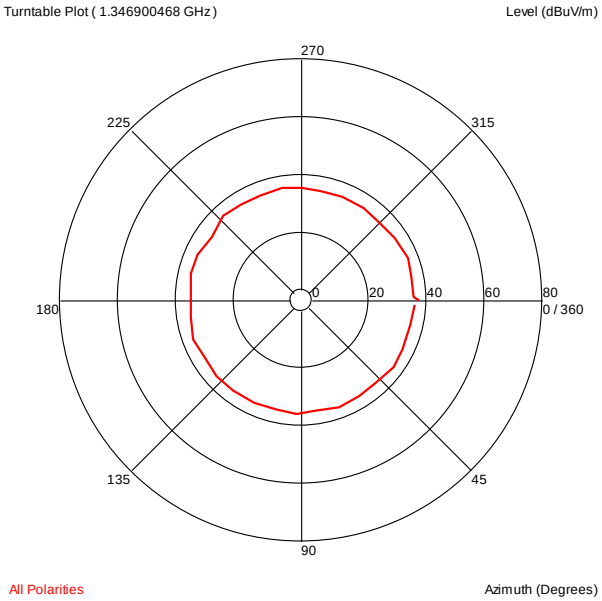
Trace1: Measured Peak

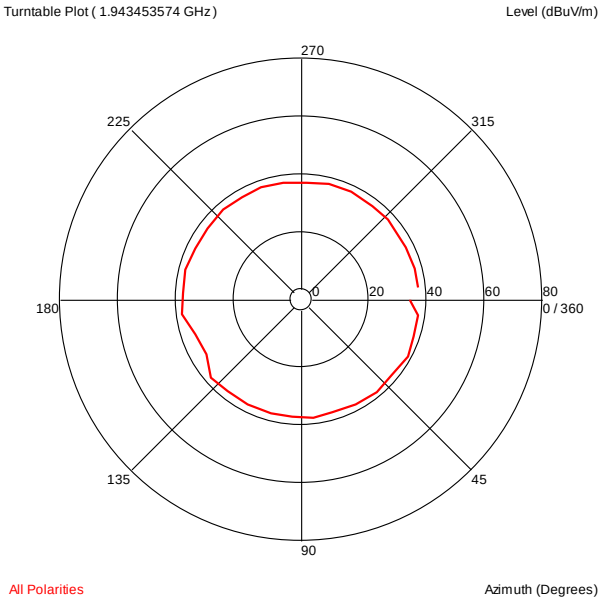
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
1.346900468 G	38.24	28.800	-33.529	74.000	-35.76	--	358	1.21	1 M	
1.943453574 G	41.40	30.971	-32.535	74.000	-32.60	--	40	1.57	1 M	
3.120494322 G	43.99	32.966	-30.495	74.000	-30.01	--	298	2.16	1 M	
2.443807616 G	44.28	32.195	-31.922	74.000	-29.72	|	8	1.67	1 M	
4.019505678 G	46.40	33.446	-28.286	74.000	-27.60	--	177	1.09	1 M	
4.796452906 G	47.85	34.007	-27.399	74.000	-26.15	--	214	4.01	1 M	

Trace3: Measured Average

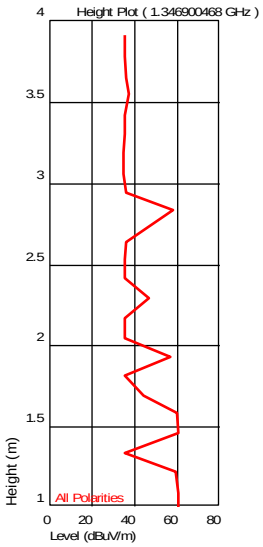
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg)(Deg)	Mast Height(m)	RBW(Hz)	Comment
1.346900468 G	24.51	28.800	-33.529	54.000	-29.49	--	358	1.21	1 M	
1.943453574 G	27.83	30.971	-32.535	54.000	-26.17	--	40	1.57	1 M	
2.443807616 G	29.03	32.195	-31.922	54.000	-24.97	|	8	1.67	1 M	
3.120494322 G	30.35	32.966	-30.495	54.000	-23.65	--	298	2.16	1 M	
4.019505678 G	32.85	33.446	-28.286	54.000	-21.15	--	177	1.09	1 M	
4.796452906 G	33.71	34.007	-27.399	54.000	-20.29	--	214	4.01	1 M	

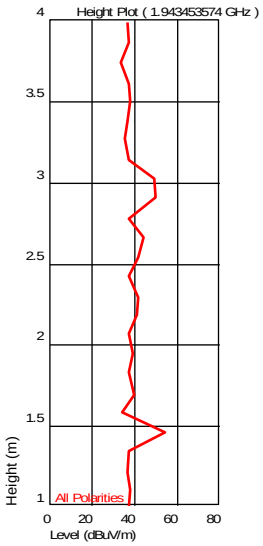
Azimuth Plots

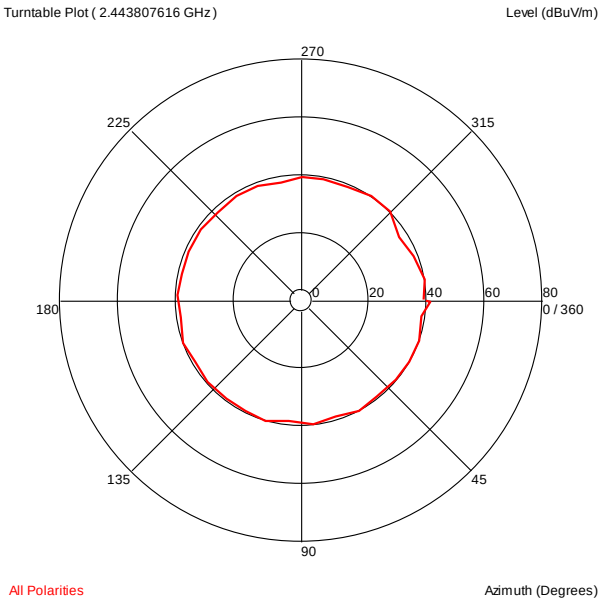


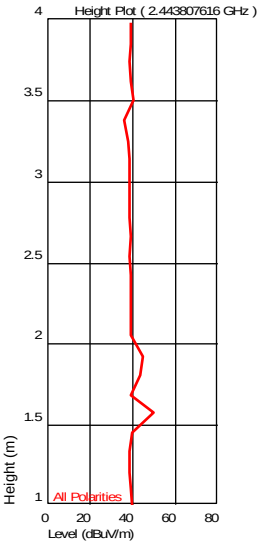


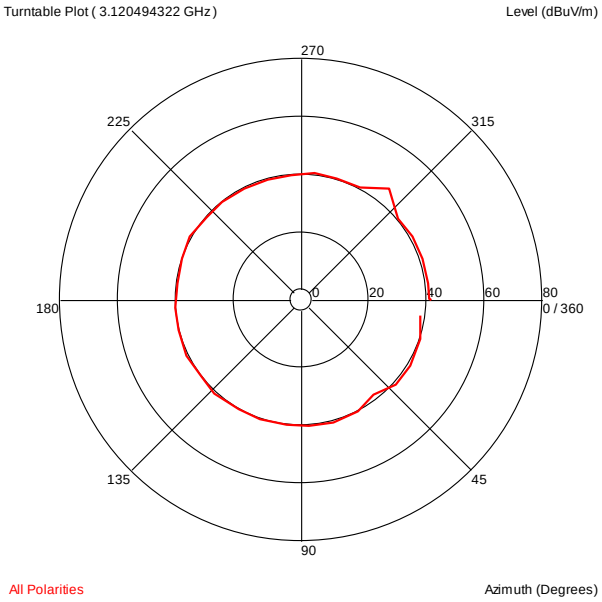
Turntable Plots

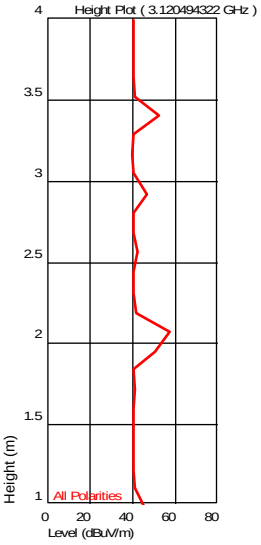


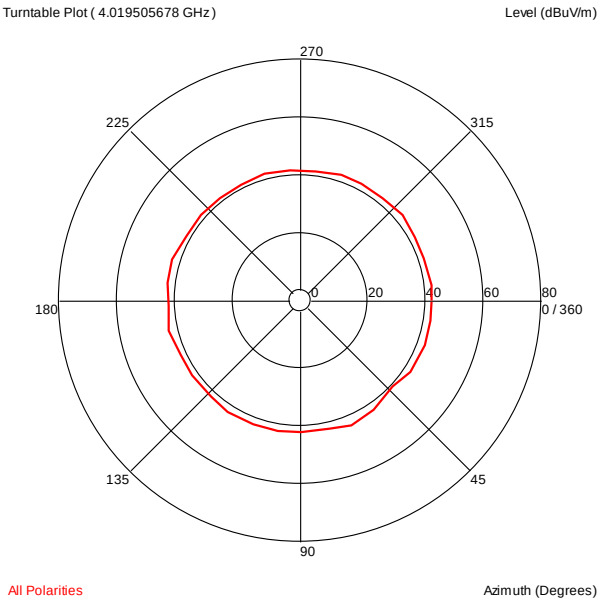


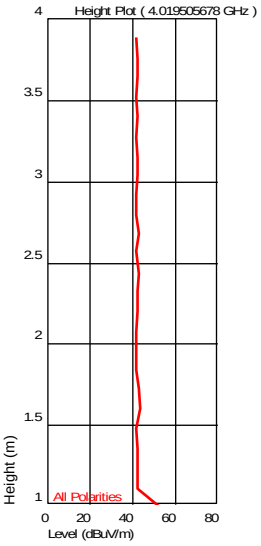

Turntable Plot (2.443807616 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

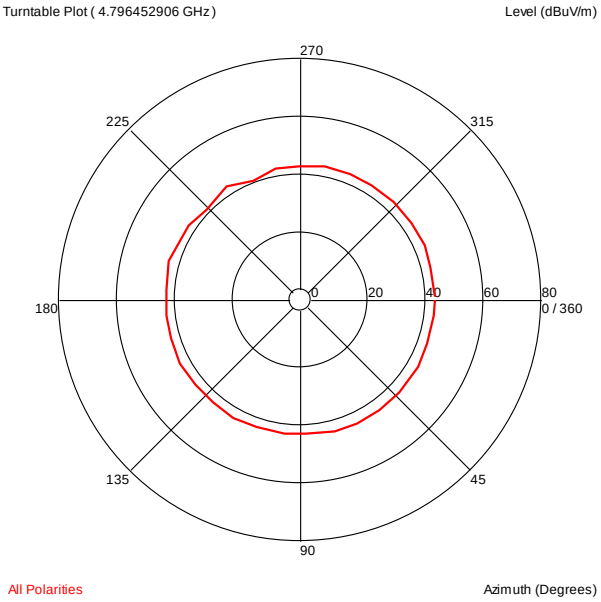

Height Plot (2.443807616 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

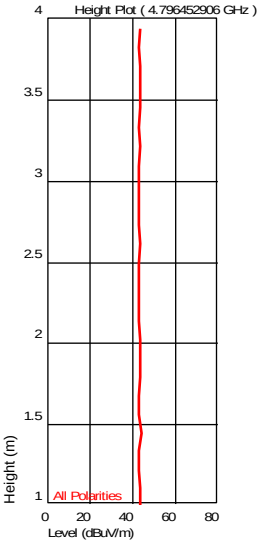

Turntable Plot (3.120494322 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (3.120494322 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)









Test Personnel:	Vathana F. Ven VFV	Test Date:	08/12/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC 47CRF Part 15.249, RSS-210	Limit Applied:	FCC Part 15.109, RSS-Gen 7.1.2
Input Voltage:	120VAC/60Hz	Ambient Temperature:	25 ºC
Pretest Verification w/ Ambient Signals or BB Source:	BB Source	Relative Humidity:	42 %
		Atmospheric Pressure:	997 mbars

Deviations, Additions, or Exclusions: None

9 Transmitter Bandwidth

9.1 Method

Tests are performed in accordance with FCC 47CFR Part 2.1049 (8/2015) and RSS-Gen Issue 4 November 2014.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
ANT1C'	BROADBAND ANTENNA	Compliance Design	B300	00668	11/04/2014	11/04/2015
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145013'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2944A07027	10/11/2014	10/11/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015

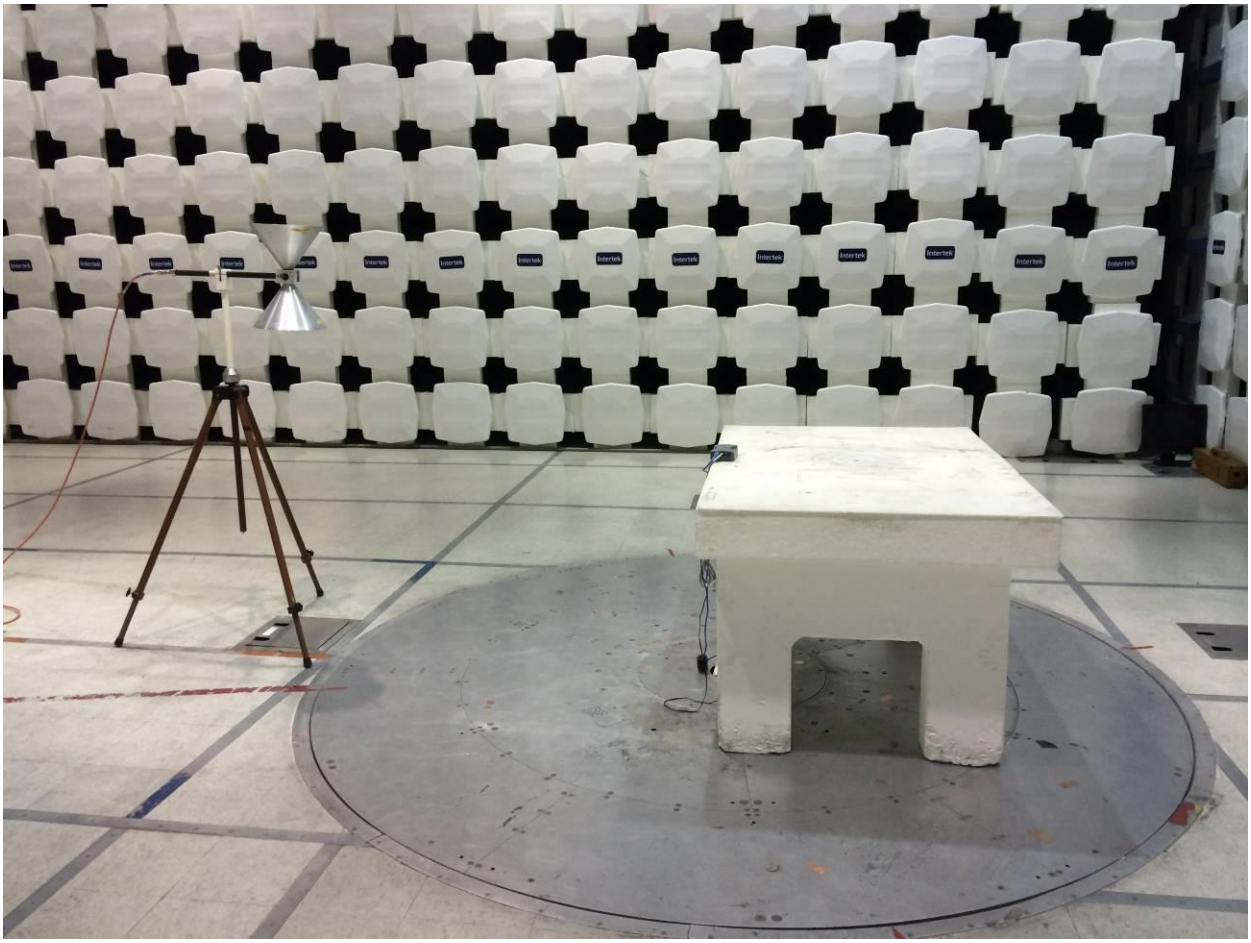
Software Utilized:

Name	Manufacturer	Version
None		

9.3 Results:

The sample tested was found to Comply.

9.4 Setup Photograph:



9.5 Plots/Data:

20 dB Bandwidth – 91.287 kHz

Occupied Bandwidth – 91.912 kHz

Test Personnel:	Kouma Sinn KPS	Test Date:	08/15/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC 47CRF Part 15.249, RSS-210	Limit Applied:	N/A
Input Voltage:	120VAC/60Hz	Ambient Temperature:	22 ºC
Pretest Verification w/ Ambient Signals or BB Source:	BB Source	Relative Humidity:	44 %
		Atmospheric Pressure:	1009 mbars

Deviations, Additions, or Exclusions: None

10 Transmitter Duty Cycle

10.1 Method

Tests are performed in accordance with FCC 47CFR Part 15.35(c) (8/2015), and RSS-Gen Issue 4 November 2014.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

10.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
ANT1C'	BROADBAND ANTENNA	Compliance Design	B300	00668	11/04/2014	11/04/2015
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145013'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2944A07027	10/11/2014	10/11/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015

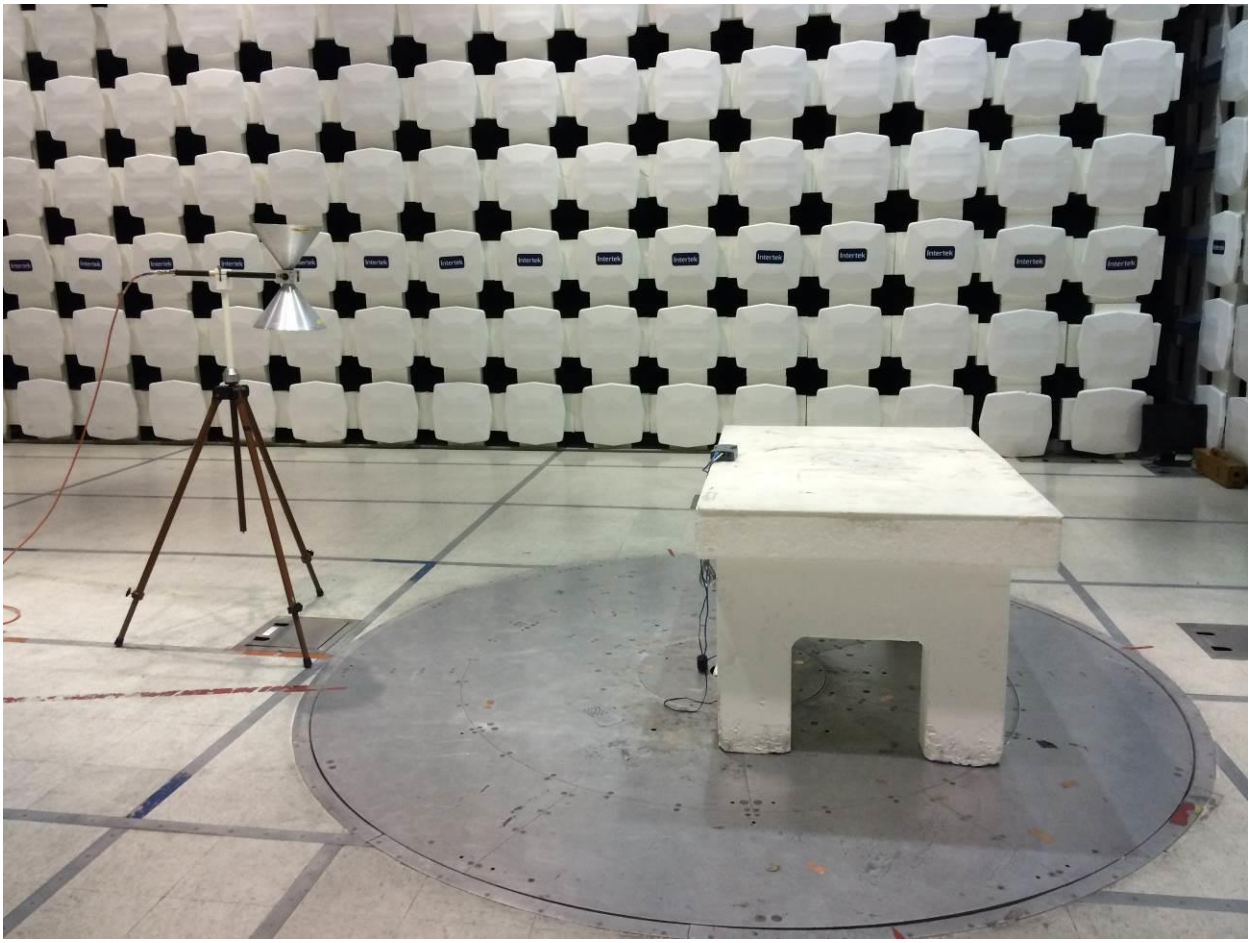
Software Utilized:

Name	Manufacturer	Version
None		

10.3 Results:

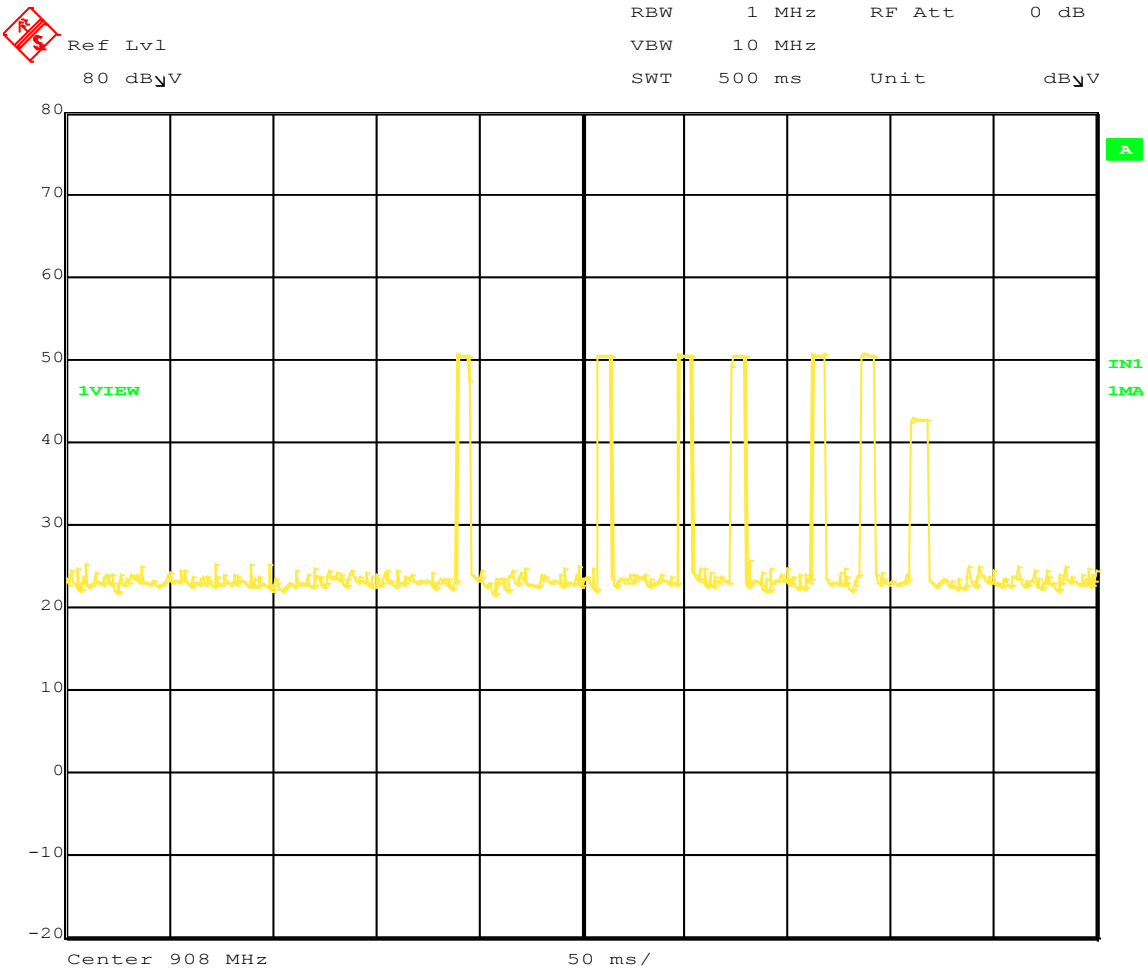
The sample tested was found to Comply.

10.4 Setup Photograph:

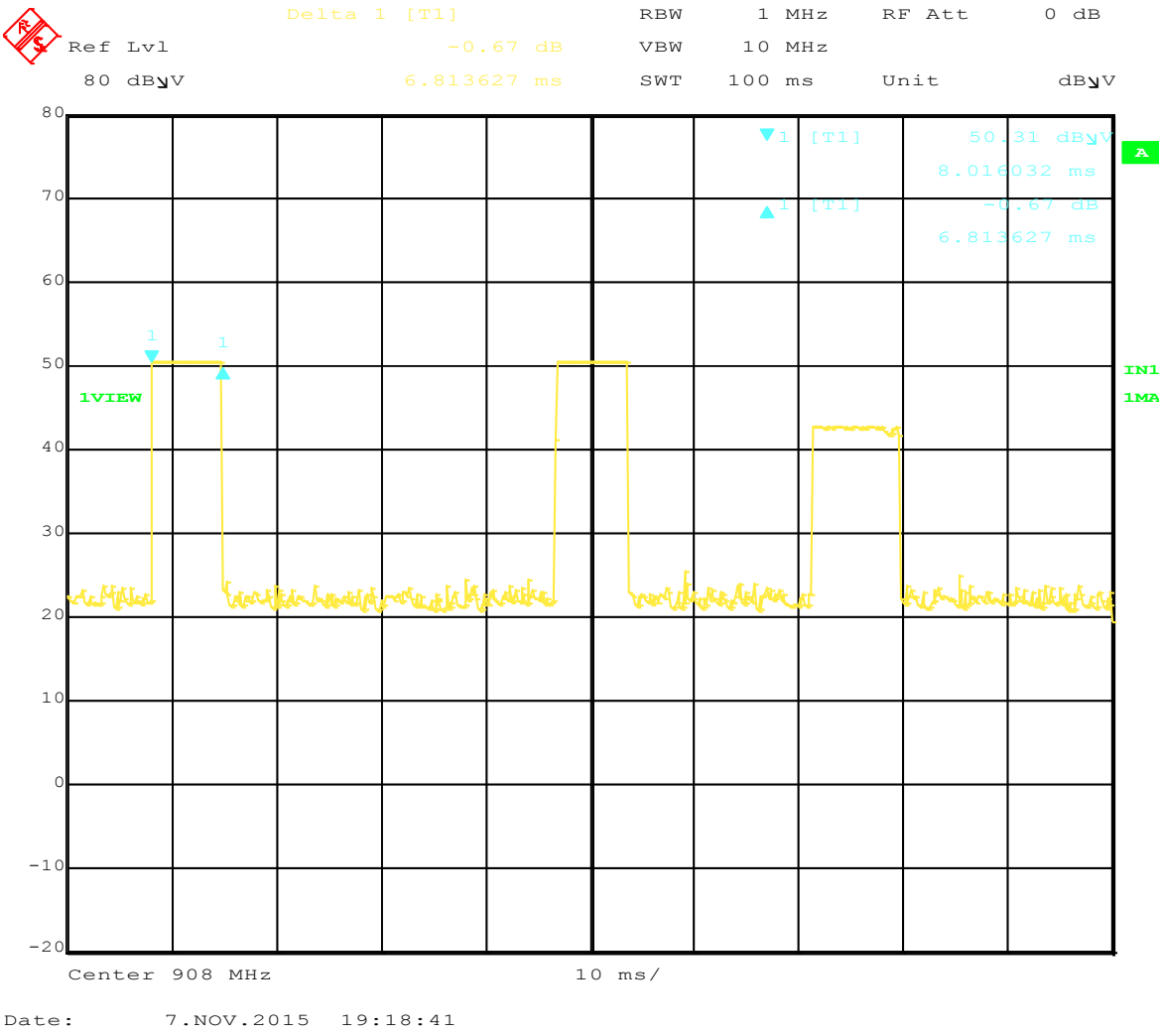


10.5 Plots/Data:

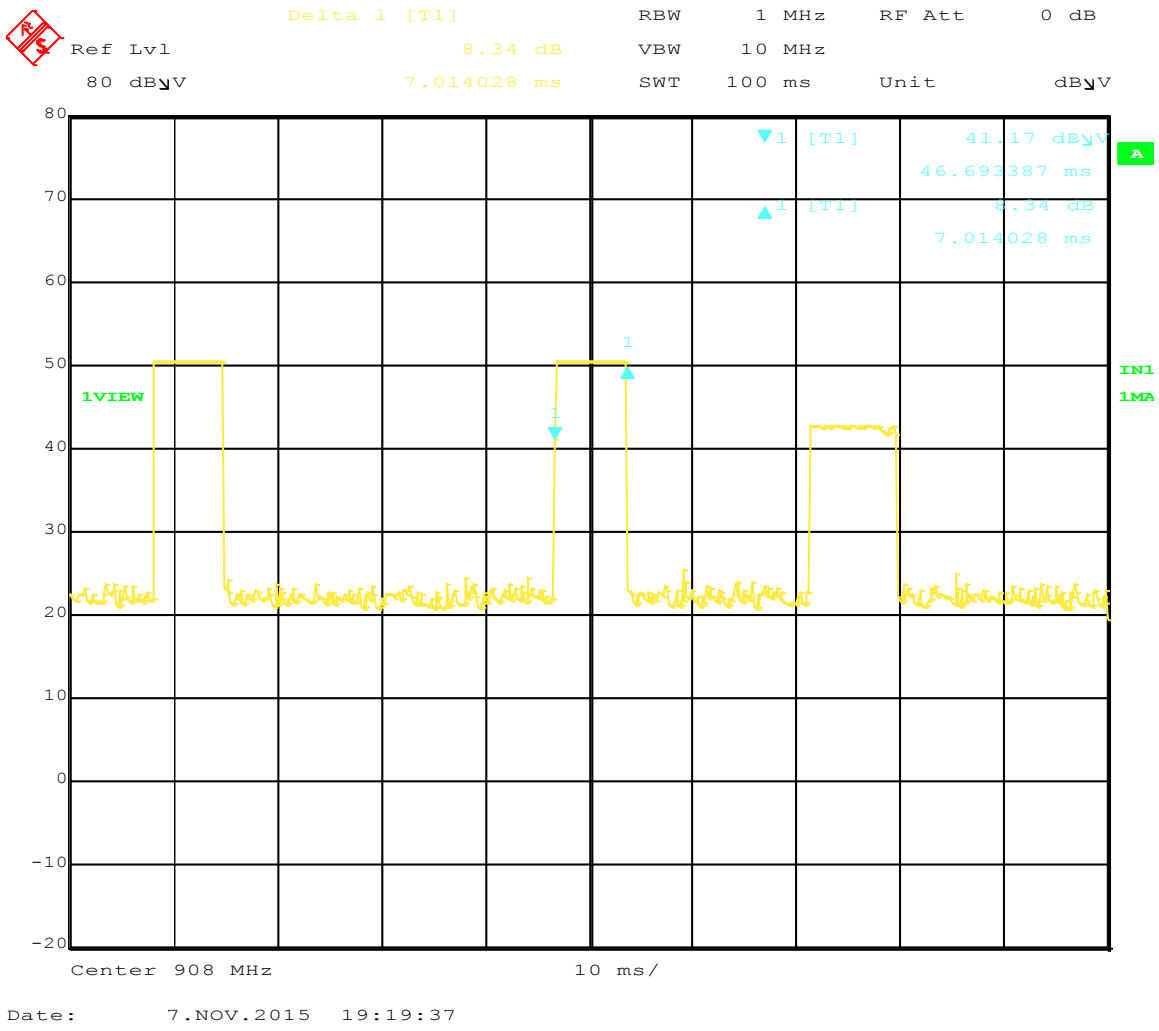
Pulses within 500ms



$t_{on}1$: 6.813627 ms (within 100 ms)



$t_{on}2$: 7.014028 ms (within 100 ms)



Duty Cycle Factor: 20*log[($t_{on}1$ + $t_{on}2$)/100] or 20*log[(6.813627+7.014028)/100] or -17.185 dB

Notes: The short pulse on the right is from the support equipment.

Test Personnel:	Kouma Sinn KPS	Test Date:	08/15/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC 47CRF Part 15.249, RSS-210	Limit Applied:	N/A
Input Voltage:	120VAC/60Hz	Ambient Temperature:	22 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**BB Source**	Relative Humidity:	44 %
		Atmospheric Pressure:	1009 mbars

Deviations, Additions, or Exclusions: None

11 AC Mains Conducted Emissions

11.1 Method

Tests are performed in accordance with FCC 47CFR Part 15 (8/2015) Section 15.207, ICES-003 Issue 5 August 2012, RSS-Gen Issue 4 November 2014, and ANSI C63.4:2014.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
AC Line Conducted Emissions	150 kHz - 30 MHz	2.8	3.4
Telco Port Emissions	150 kHz - 30 MHz	3.2	5

Sample Calculations

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBμV
RF = Reading from receiver in dBμV
LF = LISN or ISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBμV
$UF = 10^{(49.1\ dB\mu V / 20)}$ = 285.1 μV/m

Alternately, when C5 Software is used, the “Level” includes all losses and gains and is compared directly in the “Margin” column to the “Limit”. “TF” is the Transducer Factor; in this case LISN or ISN loss.

11.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
CBLBNC10'	25 ft, 50 Ohm BNC Cable	Pomona	RG 58 C/U	CBLBNC10	10/04/2014	10/04/2015
DS27'	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS27	10/01/2014	10/01/2015
LISN33'	LISN - CISPR16 Compliant 9kHz-30MHz	Com-Power	LI-215A	191953	03/02/2015	03/02/2016
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015
LISN32	LISN - CISPR16 Compliant 9kHz-30MHz	Com-Power	LI-215A	191955	03/18/2015	03/18/2016

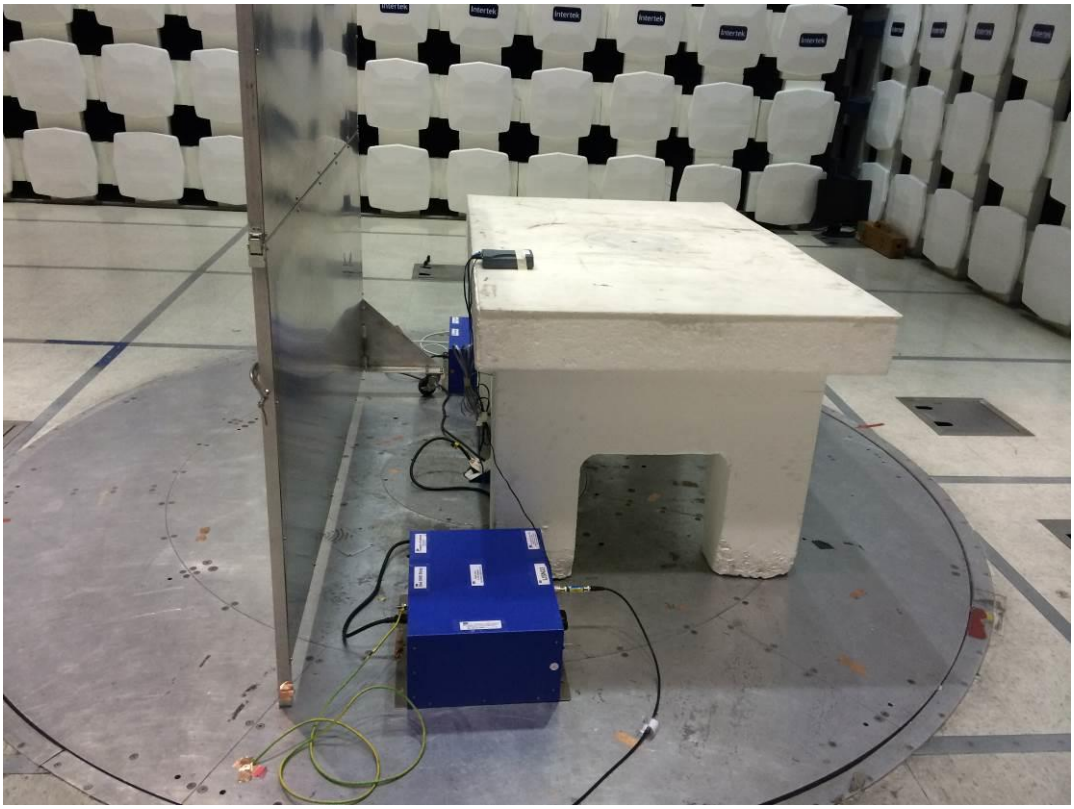
Software Utilized:

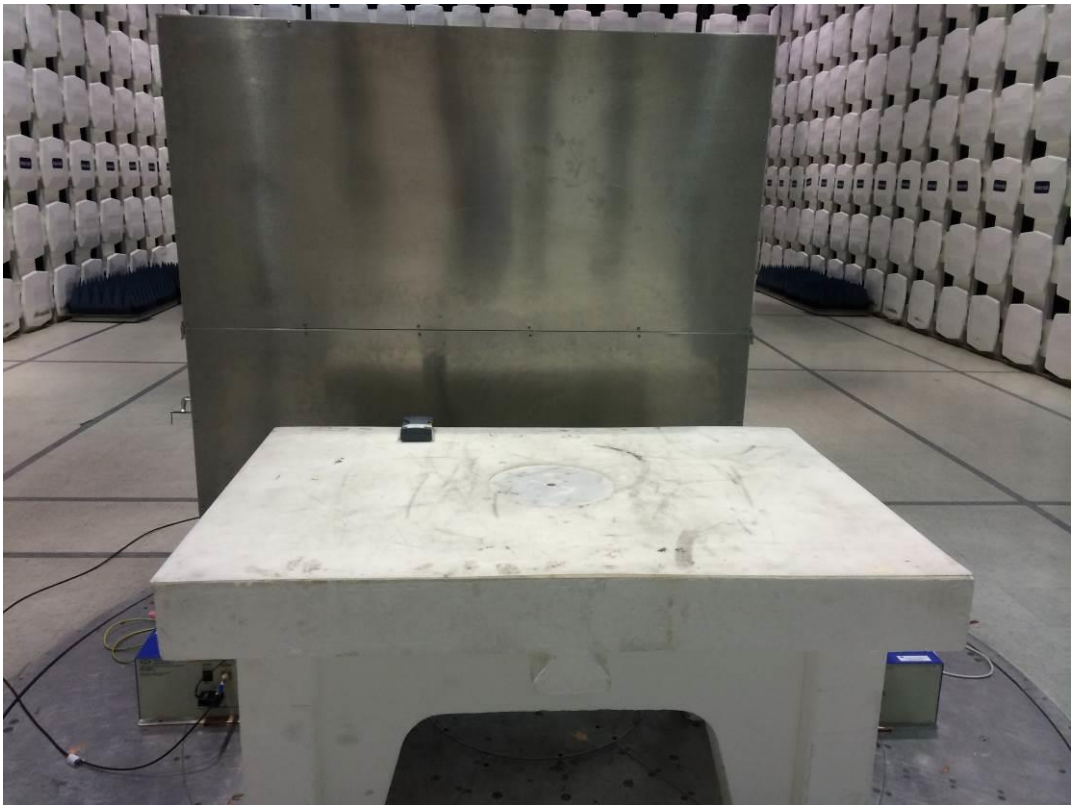
Name	Manufacturer	Version
C5	Teseq	5.26.46.46

11.3 Results:

The sample tested was found to Comply.

11.4 Setup Photographs:





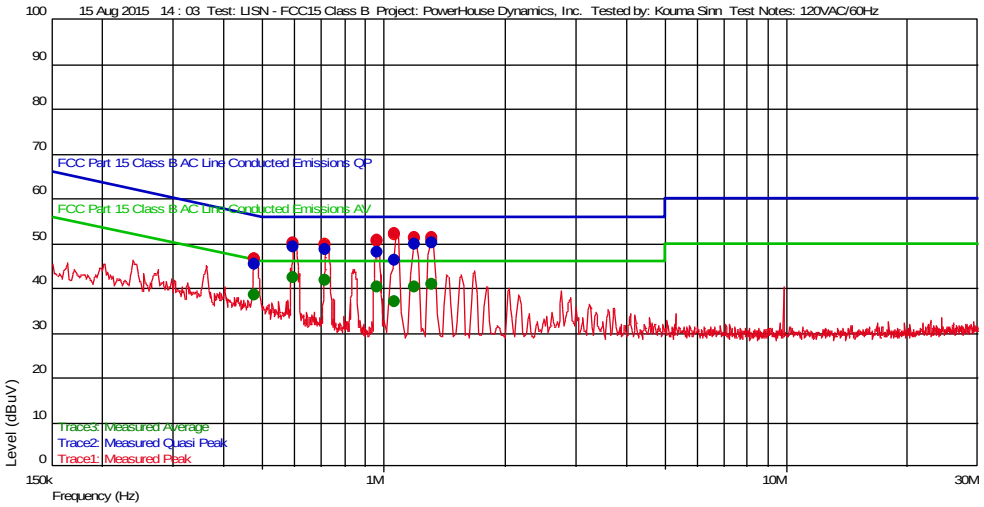
11.5 Plots/Data:

Transmit Mode

Test Information

Test Details	User Entry	Additional Information
Test:	LISN - FCC15 Class B	
Project:	PowerHouse Dynamics, Inc.	
Test Notes:	120VAC/60Hz	
Temperature:	26C	
Humidity:	42%, 1007mbar	
Tested by:	Kouma Sinn	
Test Started:	15 Aug 2015 14 : 03	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable

- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace2: Measured Quasi Peak

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	Comment	LINE
480.460921844 k	45.26	0.030	20.582	56.331	-11.07	9 k		N
1.072144289 M	46.19	0.030	20.619	56.000	-9.81	9 k		N
967.635270541 k	47.91	0.030	20.619	56.000	-8.09	9 k		N
720.641282565 k	48.53	0.030	20.606	56.000	-7.47	9 k		N
601.402805611 k	49.20	0.030	20.599	56.000	-6.80	9 k		N
1.198396794 M	49.74	0.030	20.610	56.000	-6.26	9 k		N
1.324649299 M	49.96	0.030	20.628	56.000	-6.04	9 k		N

Trace3: Measured Average

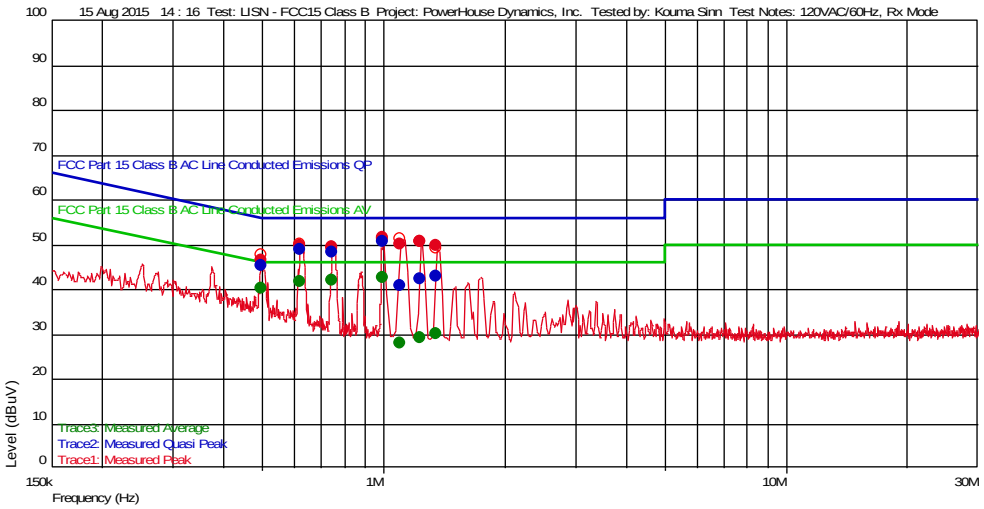
Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	Comment	LINE
1.072144289 M	36.88	0.030	20.619	46.000	-9.12	9 k		N
480.460921844 k	38.45	0.030	20.582	46.331	-7.88	9 k		N
967.635270541 k	40.14	0.030	20.619	46.000	-5.86	9 k		N
1.198396794 M	40.18	0.030	20.610	46.000	-5.82	9 k		N
1.324649299 M	40.89	0.030	20.628	46.000	-5.11	9 k		N
720.641282565 k	41.64	0.030	20.606	46.000	-4.36	9 k		N
601.402805611 k	42.11	0.030	20.599	46.000	-3.89	9 k		N

Receive Mode

Test Information

Test Details	User Entry	Additional Information
Test:	LISN - FCC15 Class B	
Project:	PowerHouse Dynamics, Inc.	
Test Notes:	120VAC/60Hz, Rx Mode	
Temperature:	26C	
Humidity:	42%, 1007mbar	
Tested by:	Kouma Sinn	
Test Started:	15 Aug 2015 14 : 16	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

Trace2: Measured Quasi Peak

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	Comment	LINE
1.108216433 M	40.70	0.030	20.610	56.000	-15.30	9 k		N
1.234468938 M	42.17	0.030	20.618	56.000	-13.83	9 k		N
1.360721443 M	42.70	0.030	20.628	56.000	-13.30	9 k		N
499.198396794 k	45.13	0.030	20.589	56.013	-10.88	9 k		N
749.599198397 k	48.33	0.030	20.609	56.000	-7.67	9 k		N
623.547094188 k	48.95	0.030	20.608	56.000	-7.05	9 k		N
996.593186373 k	50.70	0.030	20.619	56.000	-5.30	9 k		N

Trace3: Measured Average

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	Comment	LINE
1.108216433 M	27.94	0.030	20.610	46.000	-18.06	9 k		N
1.234468938 M	29.23	0.030	20.618	46.000	-16.77	9 k		N
1.360721443 M	30.06	0.030	20.628	46.000	-15.94	9 k		N
499.198396794 k	40.11	0.030	20.589	46.013	-5.90	9 k		N
623.547094188 k	41.52	0.030	20.608	46.000	-4.48	9 k		N
749.599198397 k	42.08	0.030	20.609	46.000	-3.92	9 k		N
996.593186373 k	42.43	0.030	20.619	46.000	-3.57	9 k		N

Test Personnel:	Kouma Sinn KPS	Test Date:	08/15/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC 47CRF Part 15.249, RSS-210	Limit Applied:	FCC Part 15.207 RSS-GEN 8.8
Input Voltage:	120VAC/60Hz	Ambient Temperature:	26 ºC
Pretest Verification w/ Ambient Signals or BB Source:	Ambient Signals	Relative Humidity:	42 %
		Atmospheric Pressure:	1007 mbars

Deviations, Additions, or Exclusions: None

12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	08/19/2015	102149440BOX-001a	KPS	MFM	Original Issue
1	11/10/2015	102149440BOX-001b	KPS	MFM	Re-measured duty cycle factor