

EMC TEST REPORT

Report Number: 101468944BOX-002

Project Number: G101468944

Report Issue Date: 01/20/2014

Product Designation: REMOTE-GPS, WRLS, PINPOINT

Standards: FCC Part 15:2013 Subpart C Section 15.249,
FCC Part 15:2013 Subpart B Class B,
RSS-210 Issue 8 December 2010,
ICES-003 Issue 5 August 2012
RSS-Gen Issue 3 December 2010
IC RSS-102 Issue 4 March 2010

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

Client:
Attwood Corporation
1016 N Monroe St
LOWELL, MI 49331
USA

Report prepared by Reviewer



Vathana Ven / Senior Project Engineer

Report reviewed by



Nicholas Abbondante / Chief Engineer, EMC

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

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.

2 Test Summary

Section	Test full name	Result
3	Client Information	
4	Description of Equipment Under Test	
5	System Setup and Method	
6	Fundamental Field Strength, Human RF Exposure and Duty Cycle (FCC Part 15:2013 Subpart C Section 15.249, 15.249(a), FCC Part 2.1091(c), RSS-210 Issue 8 December 2010, A2.9(a), IC RSS-102 Issue 4 March 2010)	Pass
7	Harmonics Field Strength (FCC Part 15:2013 Subpart C Section 15.249, 15.249(a), RSS-210 Issue 8 December 2010, A2.9(a))	Pass
8	Spurious Field Strength (FCC Part 15:2013 Subpart C Section 15.249, 15.249(d), FCC Part 15:2013 Subpart B, RSS-210 Issue 8 December 2010, A2.9(b), ICES-003 Issue 5 August 2012, RSS-Gen Issue 3 December 2010)	Pass
9	20 dB Bandwidth and Occupied bandwidth (FCC Part 15.215(c), RSS-Gen Issue 3 December 2010 4.6.3)	Pass
10	Revision History	

Note: The device is a transmitter only and it is powered by two 1.5V battery.

3 Client Information

This EUT was tested at the request of:

Client: Attwood Corporation
 1016 N Monroe St
 LOWELL, MI 49331
 USA

Contact: Rich Mullennix
Telephone: (616) 897-2332
Fax: (616) 897-2256
Email: Richard.Mullennix@attwoodmarine.com

4 Description of Equipment Under Test

Manufacturer: Attwood Corporation
 1016 N Monroe St
 LOWELL, MI 49331
 USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
MotorGuide Pinpoint	Attwood Corporation	001010148	BOX1312161413-002 (INTERTEK ASSIGNED)
MotorGuide Pinpoint	Attwood Corporation	001010148	BOX1312161413-003 (INTERTEK ASSIGNED)

Receive Date:	12/16/2013
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)

The device is a MotorGuide Pinpoint operates at 2424.5, 2449.5, and 2480 MHz with integral antenna.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
(2) 1.5VDC	N/A	N/A	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmit mode
2	

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	Firmware

5 System Setup and Method

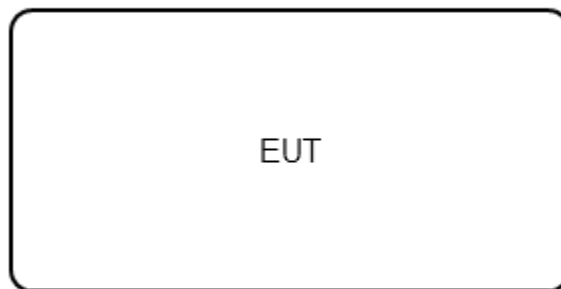
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
	N/A				

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
N/A			

5.1 Method:

Configuration as required by FCC Part 15:2013 Subpart C Section 15.249, FCC Part 15:2013 Subpart B Class B, RSS-210 Issue 8 December 2010, ICES-003 Issue 5 August 2012, RSS-Gen Issue 3 December 2010, ICES-003 Issue 5 August 2012, ANSI C63.10:2013, IC RSS-102 Issue 4 March 2010.

5.2 EUT Block Diagram:



6 Fundamental Field Strength, Human RF Exposure and Duty Cycle

6.1 Method

Tests are performed in accordance with FCC Part 15:2013 Subpart C Section 15.249, 15.249(a), RSS-210 Issue 8 December 2010, A2.9(a), IC RSS-102 Issue 4 March 2010, ANSI C63.4.

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

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

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

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

Where

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

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

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

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

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

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

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

Example:

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

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

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004	Weather Station	Davis Instruments	7400	PE80529A61 A	09/25/2012	09/25/2014
145128	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	10/01/2013	10/01/2014
EMC02	ANTENNA, RIDGED GUIDE, 1-18 GHZ	EMCO	3115	2784	02/12/2013	02/12/2014
145-416	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2013	10/04/2014

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

Note: Your Laptop may use a different version of Excel. Record the version you actually used!

6.3 Results:

The sample tested was found to Comply.

(a) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

FCC Part 15.249 (a) and RSS-210 A.9(a)

6.4 Plots/Data:

Human RF Exposure (EIRP)

Radiated Emissions

Company: Attwood Corporation	Antenna & Cables: HF Bands: N, LF, HF, SHF
Model #: PINPOINT GPS fob	Antenna: EMC02 V3m AF 02-12-14.txt EMC02 H3m AF 02-12-14.txt
Serial #: BOX1312161413-003 (INTERTEK ASSIGNED)	Cable(s): 145-416 3mTrkB 10-03-2014.txt NONE.
Engineers: Vathana Ven	Location: 10M Barometer: DAV004 Filter: NONE
Project #: G101468944	Date(s): 12/19/13
Standard: FCC Part 15.249/RSS-210	Temp/Humidity/Pressure: 20 deg C 16% 1005mB
Receiver: R&S ESI (145-128) 10-01-2014	Limit Distance (m): 3
PreAmp: PRE145014 12-13-2013.txt	Test Distance (m): 3
PreAmp Used? (Y or N): N	Voltage/Frequency: 3V Battery Frequency Range: See frequencies
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)	

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	EIRP Net dBm	EIRP Limit dBm	Margin dB	Bandwidth
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
Output power , F = 2424.5 MHz, X-Axis											
PK	V	2424.500	62.32	28.44	5.96	0.00	0.00	1.49	--	--	5/10 MHz
PK	H	2424.500	64.33	28.46	5.96	0.00	0.00	3.52	--	--	5/10 MHz
Output power , F = 2424.5 MHz, Y-Axis											
PK	V	2424.500	59.86	28.44	5.96	0.00	0.00	-0.97	--	--	5/10 MHz
PK	H	2424.500	58.65	28.46	5.96	0.00	0.00	-2.16	--	--	5/10 MHz
Output power , F = 2424.5 MHz, Z-Axis											
PK	V	2424.500	62.58	28.44	5.96	0.00	0.00	1.75	--	--	5/10 MHz
PK	H	2424.500	61.41	28.46	5.96	0.00	0.00	0.60	--	--	5/10 MHz
Output power , F = 2449.5 MHz, X-Axis											
PK	V	2449.500	60.63	28.50	6.00	0.00	0.00	-0.09	--	--	5/10 MHz
PK	H	2449.500	52.87	28.51	6.00	0.00	0.00	-7.83	--	--	5/10 MHz
Output power , F = 2449.5 MHz, Y-Axis											
PK	V	2449.500	60.63	28.50	6.00	0.00	0.00	-0.09	--	--	5/10 MHz
PK	H	2449.500	60.13	28.51	6.00	0.00	0.00	-0.57	--	--	5/10 MHz
Output power , F = 2449.5 MHz, Z-Axis											
PK	V	2449.500	61.41	28.50	6.00	0.00	0.00	0.69	--	--	5/10 MHz
PK	H	2449.500	60.51	28.51	6.00	0.00	0.00	-0.19	--	--	5/10 MHz
Output power , F = 2480 MHz, X-Axis											
PK	V	2480.000	57.80	28.57	6.06	0.00	0.00	-2.79	--	--	5/10 MHz
PK	H	2480.000	57.80	28.58	6.06	0.00	0.00	-2.77	--	--	5/10 MHz
Output power , F = 2480 MHz, Y-Axis											
PK	V	2480.000	58.05	28.57	6.06	0.00	0.00	-2.54	--	--	5/10 MHz
PK	H	2480.000	57.56	28.58	6.06	0.00	0.00	-3.01	--	--	5/10 MHz
Output power , F = 2480 MHz, Z-Axis											
PK	V	2480.000	54.97	28.57	6.06	0.00	0.00	-5.62	--	--	5/10 MHz
PK	H	2480.000	56.94	28.58	6.06	0.00	0.00	-3.63	--	--	5/10 MHz

The EUT was measured in a radiated fashion. The RF output power was measured using a resolution bandwidth which encompassed the entire emission bandwidth. The data obtained was adjusted for equipment losses and converted from a field strength reading to a power reading using the provisions of FCC KDB 558074 and RSS-Gen 4.6. The human RF exposure limit is 1 mW/cm². The power density S generated by some value of EIRP at a given distance d is related by the equation:

$$S = \text{EIRP} / (4\pi d^2)$$

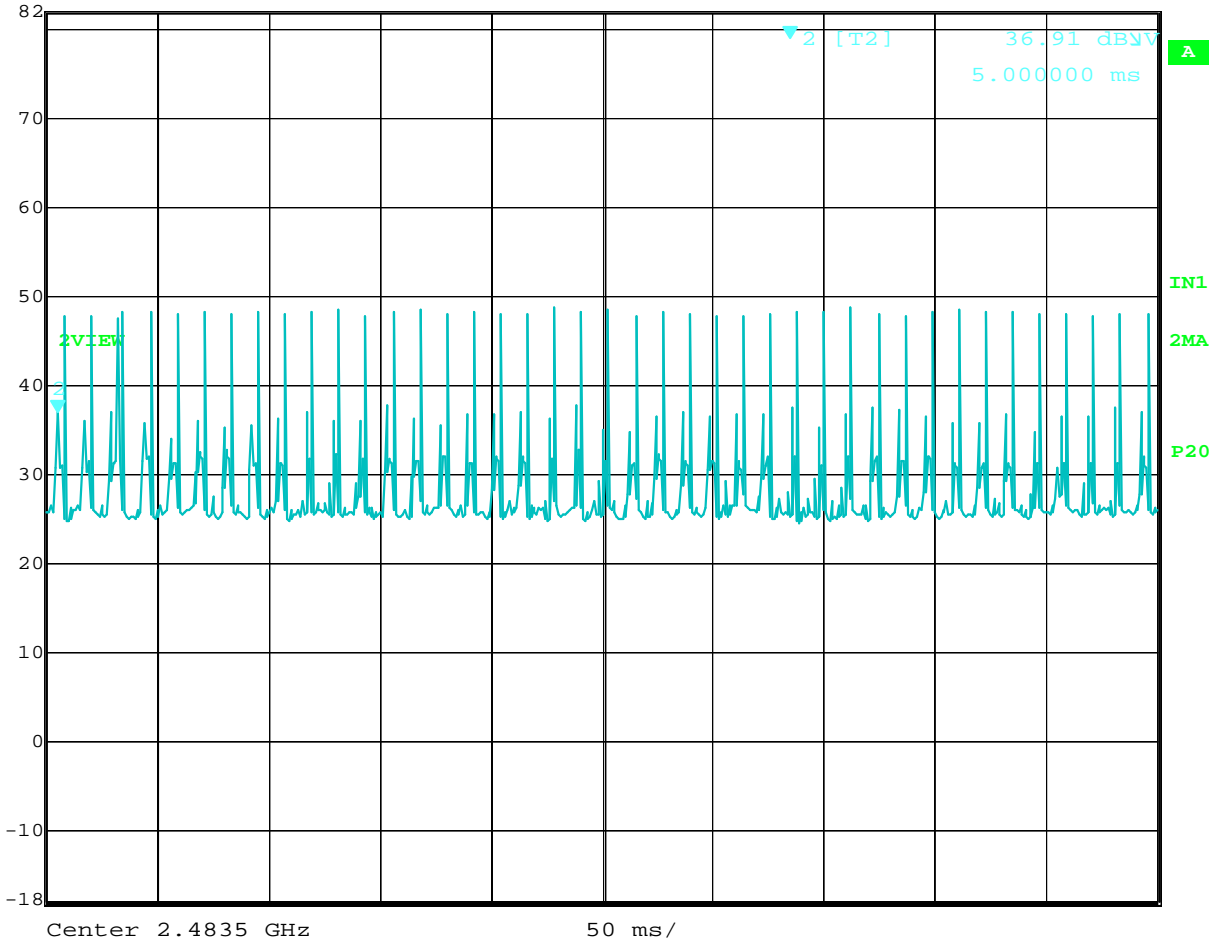
The distance, given a maximum EIRP of 3.52 dBm (2.249 mW), at which the radiated power density of the EUT is equal to the human RF exposure limit is 0.243 cm from the antenna. This result does not take averaging into account. The EUT is exempt from FCC SAR RF Exposure evaluation because the output power is below the 3 Watt average power exemption threshold for devices operating above 1.5 GHz of CFR47 Part 2.1091(c).

The EUT is exempt from Industry Canada SAR RF Exposure evaluation as referenced in RSS-102 because the operating frequency is between 2.2 and 3.0 GHz and the EIRP does not exceed 20 milliwatts.

Duty Cycle

The worst-case duty cycle for typical EUT operation is shown below. The pulse train repeats over a larger than 100ms period.

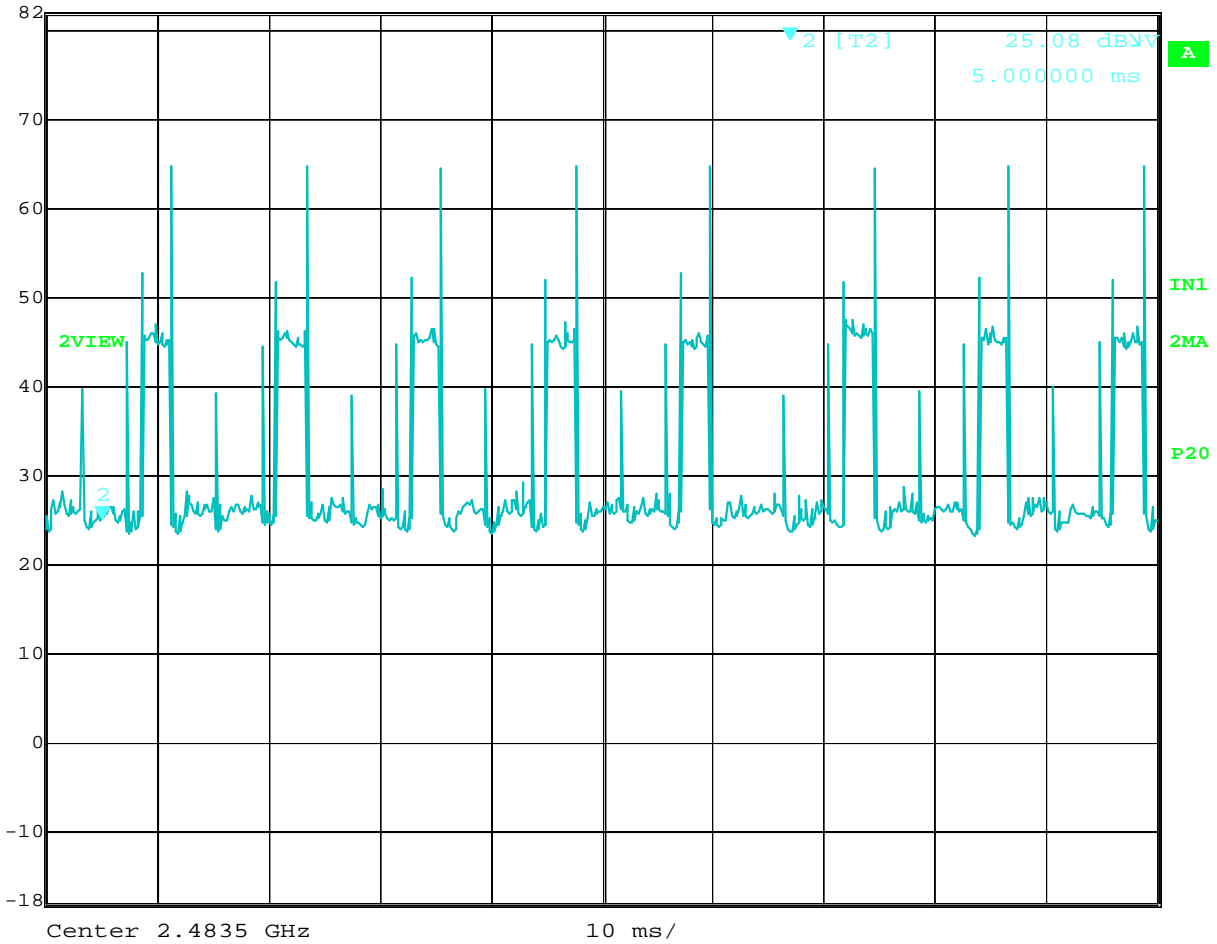
	Marker 2 [T2]	RBW	1 MHz	RF Att	10 dB
	Ref Lvl	36.91 dBμV	VBW	3 MHz	
	82 dBμV	5.000000 ms	SWT	500 ms	Unit dBμV



Date: 19.DEC.2013 23:50:50

The worst-case duty cycle for typical EUT operation is shown below. There are 8 pulse trains over 100ms period.

	Marker 2 [T2]	RBW	1 MHz	RF Att	10 dB
	Ref Lvl	25.08 dBμV	VBW	3 MHz	
	82 dBμV	5.000000 ms	SWT	100 ms	Unit dBμV

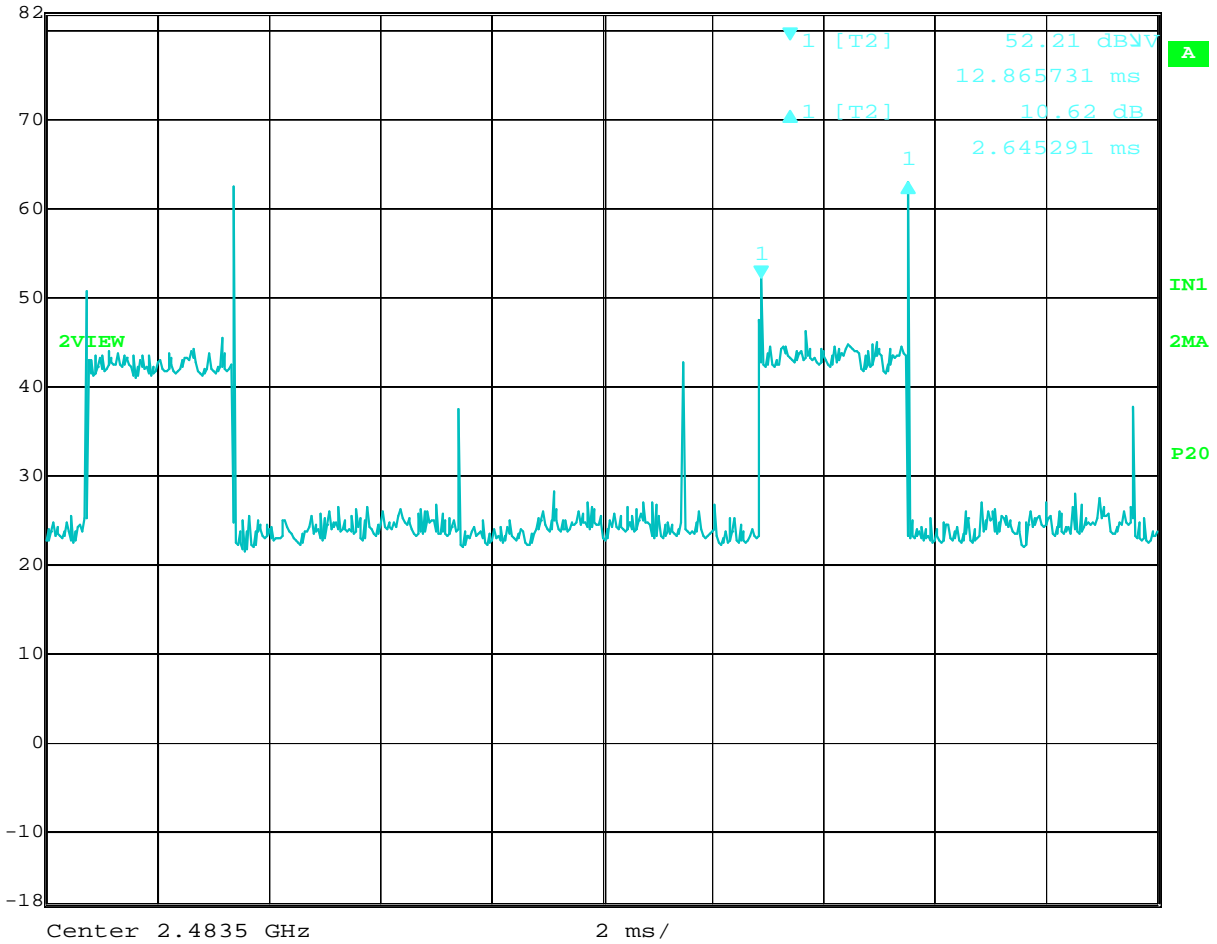


Date: 20.DEC.2013 00:00:33

On-time is 2.645 mS



	Delta 1 [T2]	RBW	1 MHz	RF Att	10 dB
Ref Lvl	10.62 dB	VBW	3 MHz		
82 dBμV	2.645291 ms	SWT	20 ms	Unit	dBμV



Date: 20.DEC.2013 00:03:23

For one 2.645 ms pulse train every 12 ms,
Average factor = $20 \cdot \text{LOG}((2.645)/12) = 13.1 \text{ dB}$

Test Personnel: Vathana Ven *VSV*
 Supervising/Reviewing Engineer: _____
 (Where Applicable)
 Product Standard: FCC 15.249, RSS-210
 Input Voltage: 3VDC
 Pretest Verification w/ Ambient Signals or BB Source: Yes

Test Date: 12/19/13
 Limit Applied: Below specified limits
 Ambient Temperature: 20 °C
 Relative Humidity: 16 %
 Atmospheric Pressure: 2005 mbars

Deviations, Additions, or Exclusions: None

7 Harmonic Field Strength

7.1 Method

Tests are performed in accordance with FCC Part 15:2013 Subpart C Section 15.249, 15.249(a), RSS-210 Issue 8 December 2010, A2.9(a), ANSI C63.4.

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

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

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

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

Where

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

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

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

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

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

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

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

Example:

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

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

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004	Weather Station	Davis Instruments	7400	PE80529A61 A	09/25/2012	09/25/2014
145128	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	10/01/2013	10/01/2014
EMC02	ANTENNA, RIDGED GUIDE, 1-18 GHZ	EMCO	3115	2784	02/12/2013	02/12/2014
145-416	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2013	10/04/2014
145128	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	10/01/2013	10/01/2014
ROS001	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwarz	FSEK-30	100225	04/25/2013	04/25/2014
145-014	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2013	10/04/2014
PRE9	100MHz-40GHz Preamp	MITEQ	NSP4000- NFG	1260417	09/06/2013	09/06/2014
EMC04	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	03/12/2013	03/12/2014

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

7.3 Results:

The sample tested was found to Comply.

(a) The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

FCC Part 15.249 (a) and RSS-210 A.9(a)

7.4 Plots/Data:

Model #: PINPOINT GPS fob
 Serial #: BOX1312161413-003 (INTERTEK ASSIGNED)
 Engineers: Vathana Ven Location: 10M Barometer: DAV004 Filter: NONE
 Project #: G101468944 Date(s): 12/18/13 12/19/13
 Standard: FCC Part 15.249/RSS-210 Temp/Humidity/Pressure: 20 deg C 16% 1005mB
 Receiver: R&S ESI (145-128) 10-01-2014 Limit Distance (m): 3
 PreAmp: PRE145014 12-13-2013.txt PRE8 Test Distance (m): 3
 PreAmp Used? (Y or N): Y Voltage/Frequency: 3V Battery Frequency Range: 1-25 GHz
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	
Spurious emissions F = 2424.5 MHz												
PK	V	4849.000	45.45	33.14	8.70	34.67	0.00	52.62	74.00	-21.38	1/3 MHz	RB
AVG	V	4849.000	32.35	33.14	8.70	34.67	0.00	39.52	54.00	-14.48	1/3 MHz	RB
PK	V	7273.500	43.05	36.24	11.07	34.56	0.00	55.79	74.00	-18.21	1/3 MHz	RB
AVG	V	7273.500	29.95	36.24	11.07	34.56	0.00	42.69	54.00	-11.31	1/3 MHz	RB
PK	V	9698.000	40.85	38.21	12.97	35.47	0.00	56.56	74.00	-17.44	1/3 MHz	
AVG	V	9698.000	27.75	38.21	12.97	35.47	0.00	43.46	54.00	-10.54	1/3 MHz	
PK	V	12122.500	36.00	38.98	14.86	36.35	0.00	53.49	74.00	-20.51	1/3 MHz	Noise Floor
AVG	V	12122.500	22.90	38.98	14.86	36.35	0.00	40.39	54.00	-13.61	1/3 MHz	Noise Floor
PK	V	14547.000	36.80	42.13	15.08	34.54	0.00	59.47	74.00	-14.53	1/3 MHz	Noise Floor
AVG	V	14547.000	23.70	42.13	15.08	34.54	0.00	46.37	54.00	-7.63	1/3 MHz	Noise Floor
PK	V	16971.500	33.40	40.80	20.65	34.50	0.00	60.35	74.00	-13.65	1/3 MHz	Noise Floor
AVG	V	16971.500	20.30	40.80	20.65	34.50	0.00	47.25	54.00	-6.75	1/3 MHz	Noise Floor
Spurious emissions F = 2449.5 MHz												
PK	V	4899.000	47.02	33.17	8.77	34.67	0.00	54.30	74.00	-19.70	1/3 MHz	RB
AVG	V	4899.000	33.92	33.17	8.77	34.67	0.00	41.20	54.00	-12.80	1/3 MHz	RB
PK	V	7348.500	44.27	36.44	11.12	34.52	0.00	57.31	74.00	-16.69	1/3 MHz	RB
AVG	V	7348.500	31.17	36.44	11.12	34.52	0.00	44.21	54.00	-9.79	1/3 MHz	RB
PK	V	9798.000	40.75	38.24	13.20	35.74	0.00	56.45	74.00	-17.55	1/3 MHz	
AVG	V	9798.000	27.65	38.24	13.20	35.74	0.00	43.35	54.00	-10.65	1/3 MHz	
PK	V	12247.500	36.90	38.85	14.77	36.48	0.00	54.04	74.00	-19.96	1/3 MHz	Noise Floor
AVG	V	12247.500	23.80	38.85	14.77	36.48	0.00	40.94	54.00	-13.06	1/3 MHz	Noise Floor
PK	V	14697.000	35.70	42.04	15.35	34.64	0.00	58.45	74.00	-15.55	1/3 MHz	Noise Floor
AVG	V	14697.000	22.60	42.04	15.35	34.64	0.00	45.35	54.00	-8.65	1/3 MHz	Noise Floor
PK	V	17146.500	33.60	41.63	18.88	34.34	0.00	59.78	74.00	-14.22	1/3 MHz	Noise Floor
AVG	V	17146.500	20.50	41.63	18.88	34.34	0.00	46.68	54.00	-7.32	1/3 MHz	Noise Floor
Spurious emissions F = 2480 MHz												
PK	V	4960.000	46.48	33.33	8.86	34.66	0.00	54.01	74.00	-19.99	1/3 MHz	RB
AVG	V	4960.000	33.38	33.33	8.86	34.66	0.00	40.91	54.00	-13.09	1/3 MHz	RB
PK	V	7440.000	43.97	36.53	11.19	34.47	0.00	57.21	74.00	-16.79	1/3 MHz	RB
AVG	V	7440.000	30.87	36.53	11.19	34.47	0.00	44.11	54.00	-9.89	1/3 MHz	RB
PK	V	9920.000	36.00	38.21	13.49	36.07	0.00	51.62	74.00	-22.38	1/3 MHz	Noise Floor
AVG	V	9920.000	22.90	38.21	13.49	36.07	0.00	38.52	54.00	-15.48	1/3 MHz	Noise Floor
PK	V	12400.000	36.92	38.73	14.65	36.64	0.00	53.67	74.00	-20.33	1/3 MHz	Noise Floor
AVG	V	12400.000	23.82	38.73	14.65	36.64	0.00	40.57	54.00	-13.43	1/3 MHz	Noise Floor
PK	V	14880.000	35.58	41.43	15.67	34.76	0.00	57.92	74.00	-16.08	1/3 MHz	Noise Floor
AVG	V	14880.000	22.48	41.43	15.67	34.76	0.00	44.82	54.00	-9.18	1/3 MHz	Noise Floor
PK	V	17360.000	35.60	42.50	20.94	34.13	0.00	64.91	74.00	-9.09	1/3 MHz	Noise Floor
AVG	V	17360.000	22.50	42.50	20.94	34.13	0.00	51.81	54.00	-2.19	1/3 MHz	Noise Floor

Hand scan. No emissions were detected from 18-25 GHz. Equipment used: EMC04, ROS001, CBLHF2012-2M, CBLHF2012-5M, PRE8

Test Personnel: Vathana Ven *VSV*
Supervising/Reviewing
Engineer:
(Where Applicable) _____
Product Standard: FCC 15.249, RSS-210, FCC
15B, RSS-Gen
Input Voltage: 3VDC
Pretest Verification w/
Ambient Signals or
BB Source: Yes

Test Date: 12/18/2013, 12/19/13

Limit Applied: Below specified limits

Ambient Temperature: 20, 21 °C
Relative Humidity: 16, 34 %
Atmospheric Pressure: 1005, 1008 mbars

Deviations, Additions, or Exclusions: None

8 Spurious Field Strength

8.1 Method

Tests are performed in accordance with FCC Part 15:2013 Subpart C Section 15.249, 15.249(a), FCC Part 15:2013 Subpart B, RSS-210 Issue 8 December 2010, RSS-Gen Issue 3 December 2010, A2.9(a), ANSI C63.4.

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

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

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

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

Where

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

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

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

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

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

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

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

Example:

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

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

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004	Weather Station	Davis Instruments	7400	PE80529A61 A	09/25/2012	09/25/2014
145128	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	10/01/2013	10/01/2014
EMC02	ANTENNA, RIDGED GUIDE, 1-18 GHZ	EMCO	3115	2784	02/12/2013	02/12/2014
145-416	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2013	10/04/2014
145106	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/01/2013	10/01/2014
145-410	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2013	10/04/2014
145003	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2443A04077	10/07/2013	10/07/2014
145128	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	10/01/2013	10/01/2014
ROS001	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwarz	FSEK-30	100225	04/25/2013	04/25/2014
145-014	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2013	10/04/2014
PRE9	100MHz-40GHz Preamp	MITEQ	NSP4000- NFG	1260417	09/06/2013	09/06/2014
EMC04	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	03/12/2013	03/12/2014

Software Utilized:

Name	Manufacturer	Version
C5	Teseq	Build 5.26.46.46
Excel 2003	Microsoft	(11.8231.8221) SP3
EMI Boxborough.xls	Intertek	08/27/10

8.3 Results:

The sample tested was found to Comply.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

FCC Part 15.209(a) & RSS-210 A8.5 – Restricted Band Radiated Spurious/Harmonics Limits

Frequency (MHz)	Field Strength		Test Distance (meters)
	µV/m	dBµV/m	
30–88	100	40.00	3
88–216	150	43.52	3
216–960	200	46.02	3
Above 960	500	53.98	3

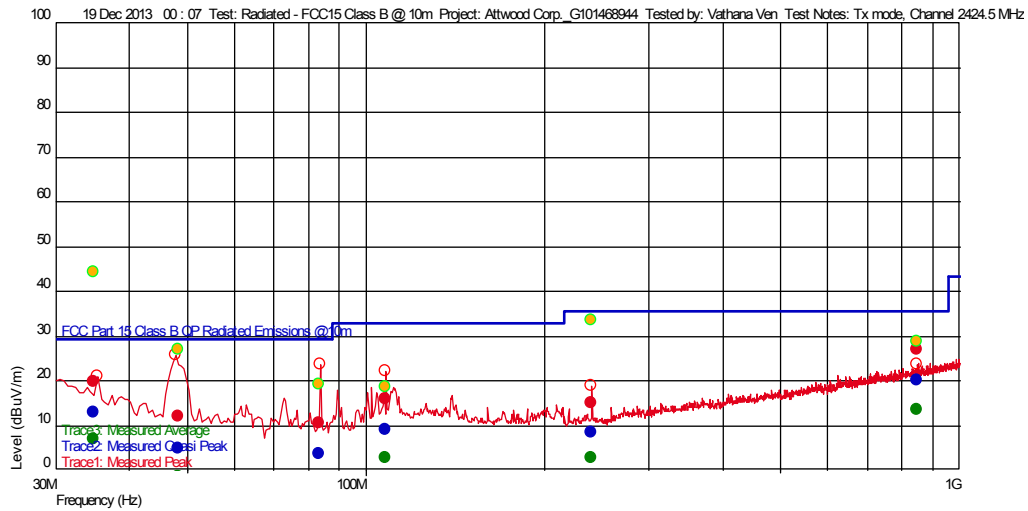
FCC Part 15.249(d) & RSS-210 A9.2(b) – Non Restricted Band Radiated Spurious/Harmonics Limits

8.4 Plots/Data:

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	Attwood Corp._G101468944	
Test Notes:	Tx mode, Channel 2424.5 MHz	
Temperature:	20 deg C	
Humidity:	16%, 1005mB	
Tested by:	Vathana Ven	
Test Started:	19 Dec 2013 00 : 07	

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

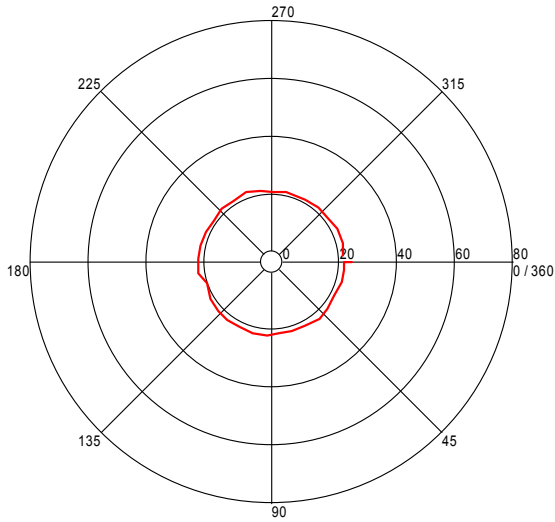
Trace2: Measured Quasi Peak

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
240.497996289 M	8.37	11.710	-23.760	35.540	-27.17		347	1.55	120 k	
83.414629487 M	3.73	7.359	-25.684	29.540	-25.81		86	1.55	120 k	
48.267935948 M	4.87	8.739	-25.920	29.540	-24.67		283	2.94	120 k	
108.00901807 M	9.23	12.401	-25.443	33.040	-23.81		311	2.72	120 k	
34.899999617 M	13.00	17.870	-26.206	29.540	-16.54		1	3.67	120 k	
849.363927461 M	20.29	21.900	-23.309	35.540	-15.25		347	2.88	120 k	

Azimuth Plots

Turntable Plot (34.899999617 MHz)

Level (dBuV/m)

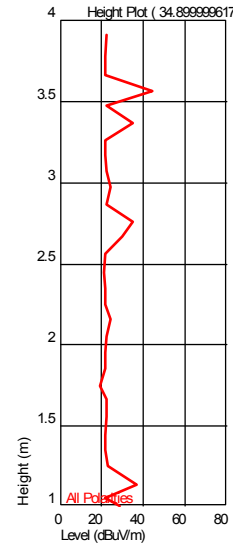


All Polarities

Azimuth (Degrees)

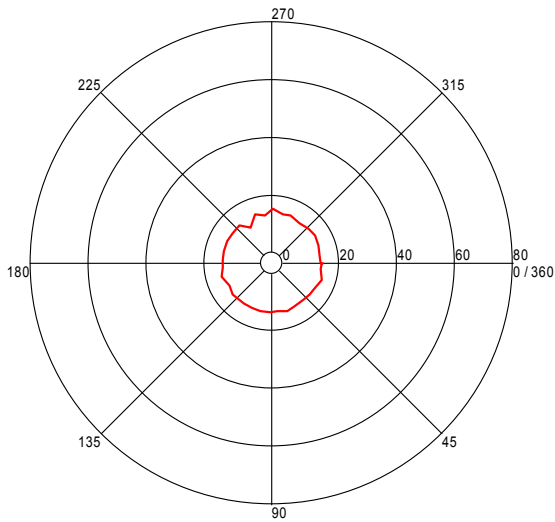
Turntable Plots

Height Plot (34.899999617 MHz)



Turntable Plot (48.267935948 MHz)

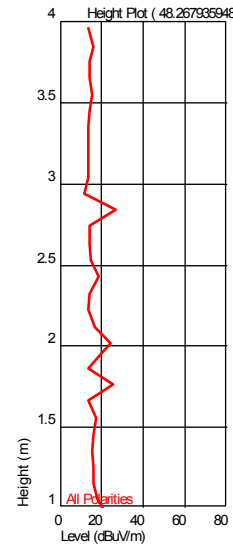
Level (dBuV/m)



All Polarities

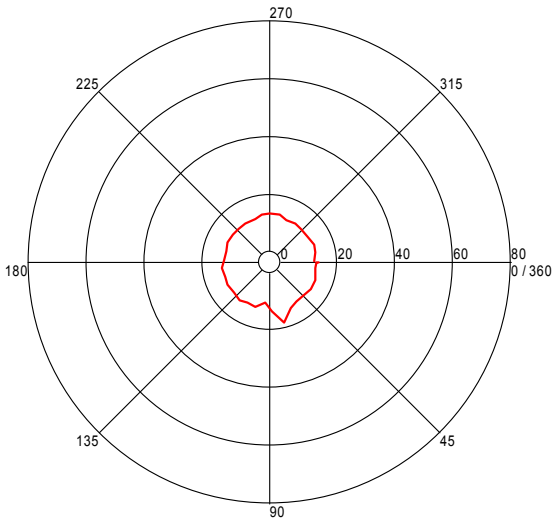
Azimuth (Degrees)

Height Plot (48.267935948 MHz)



Turntable Plot (83.414629487 MHz)

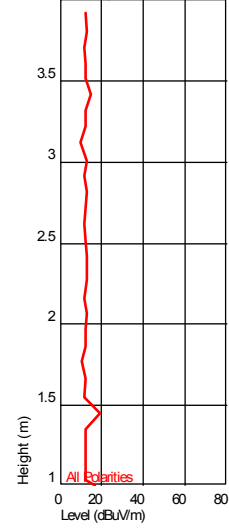
Level (dBuV/m)



All Polarities

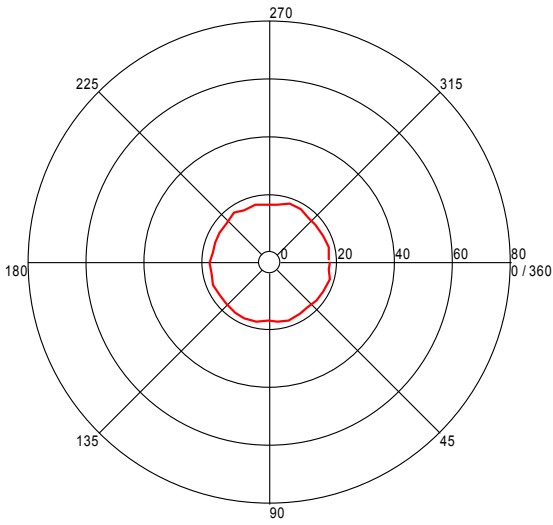
Azimuth (Degrees)

Height Plot (83.414629487 MHz)



Turntable Plot (108.00901807 MHz)

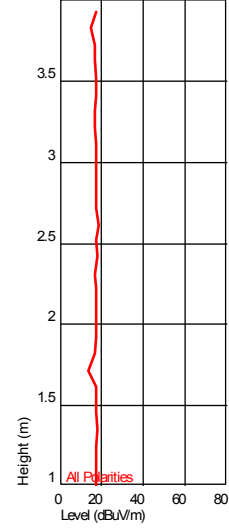
Level (dBuV/m)



All Polarities

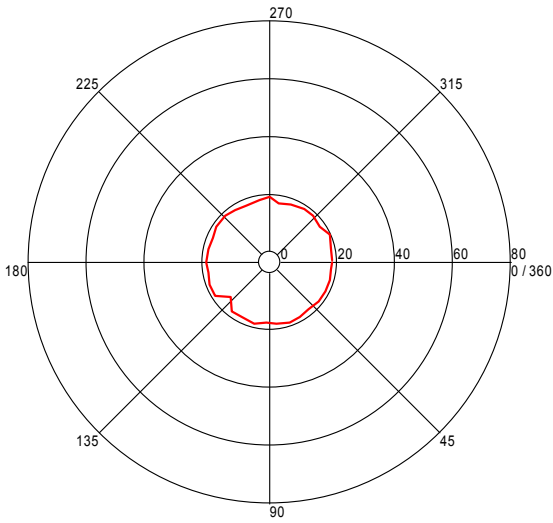
Azimuth (Degrees)

Height Plot (108.00901807 MHz)



Turntable Plot (240.497996289 MHz)

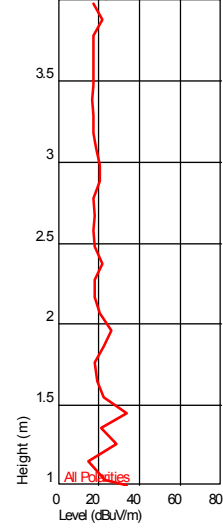
Level (dBuV/m)



All Polarities

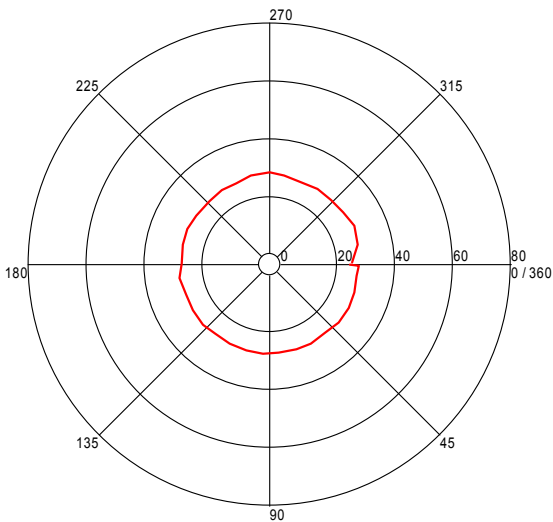
Azimuth (Degrees)

Height Plot (240.497996289 MHz)



Turntable Plot (849.363927461 MHz)

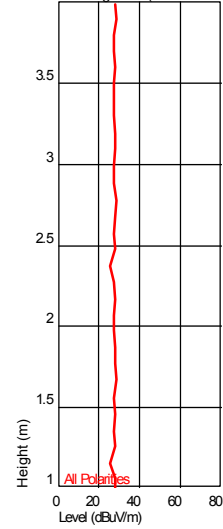
Level (dBuV/m)



All Polarities

Azimuth (Degrees)

Height Plot (849.363927461 MHz)



Test Information

Test Details

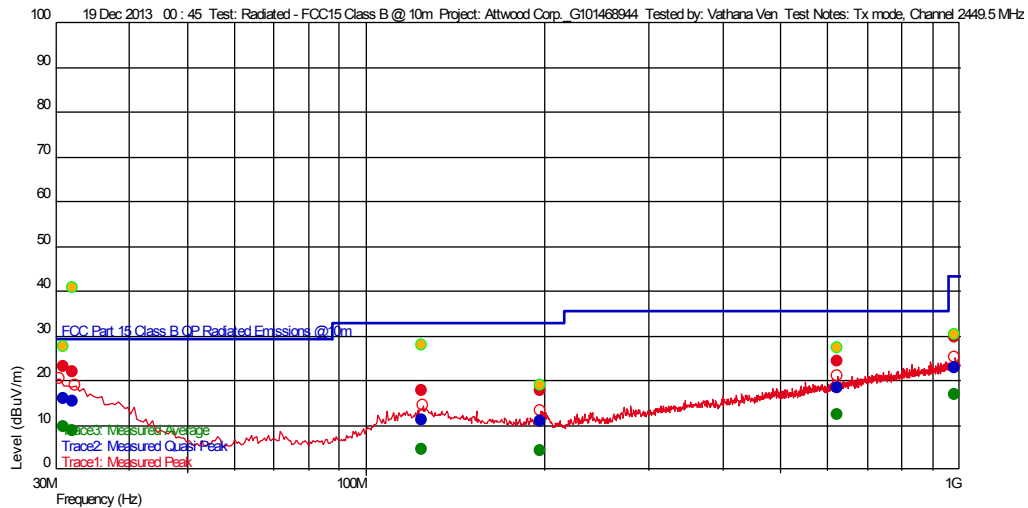
Test:
Project:
Test Notes:
Temperature:
Humidity:
Tested by:
Test Started:

User Entry

Radiated - FCC15 Class B @ 10m
Attwood Corp._G101468944
Tx mode, Channel 2449.5 MHz
20 deg C
16%, 1005mB
Vathana Ven
19 Dec 2013 00 : 45

Additional Information

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

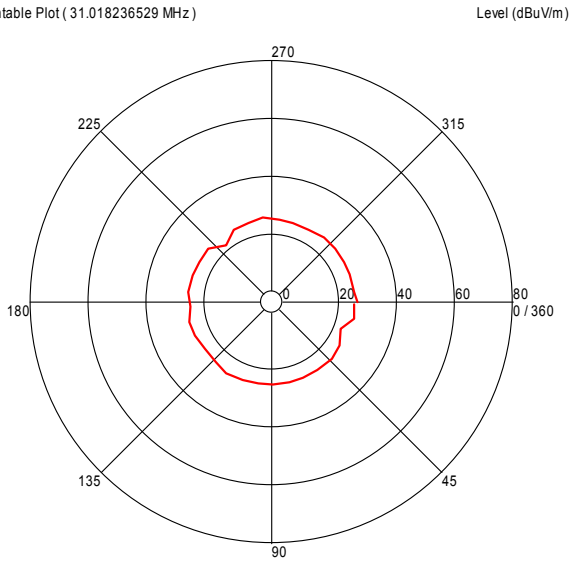
Emissions Test Data

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
196.857715733 M	10.80	12.386	-23.975	33.040	-22.24	--	103	4.00	120 k	
124.11202399 M	11.21	14.300	-25.369	33.040	-21.83	--	200	3.52	120 k	
981.371943756 M	22.74	22.727	-22.380	43.540	-20.80	--	0	3.60	120 k	
623.933867305 M	18.40	19.236	-24.057	35.540	-17.14	--	349	1.56	120 k	
32.119639559 M	15.30	19.828	-26.231	29.540	-14.24	--	51	1.85	120 k	
31.018236529 M	16.05	20.587	-26.241	29.540	-13.49	--	156	3.98	120 k	

Azimuth Plots

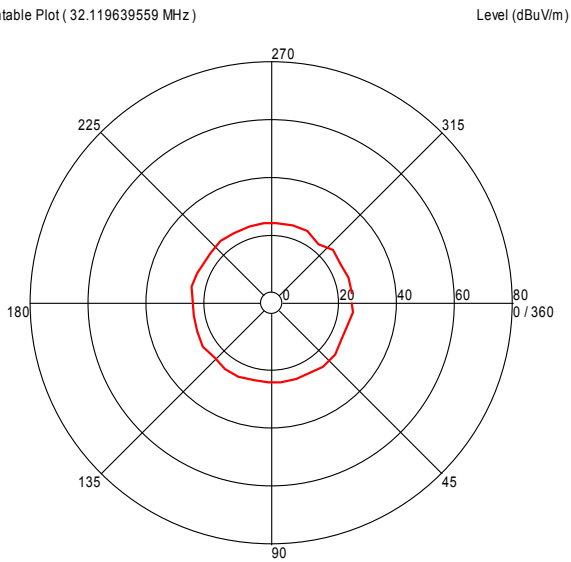
Turntable Plot (31.018236529 MHz)



All Polarities

Azimuth (Degrees)

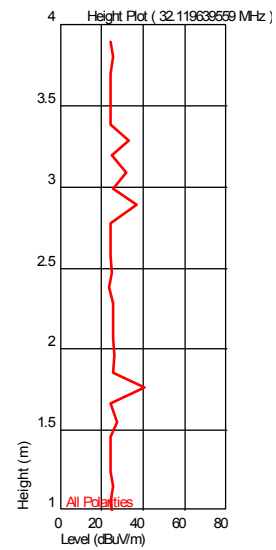
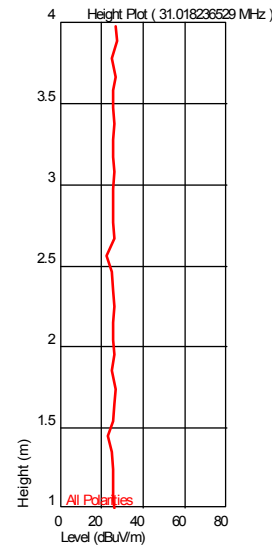
Turntable Plot (32.119639559 MHz)



All Polarities

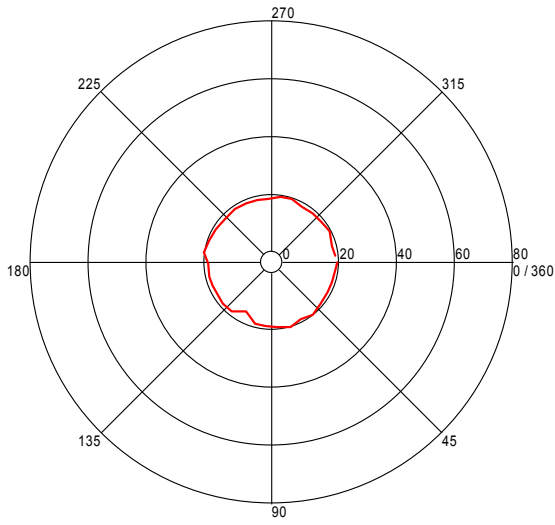
Azimuth (Degrees)

Turntable Plots



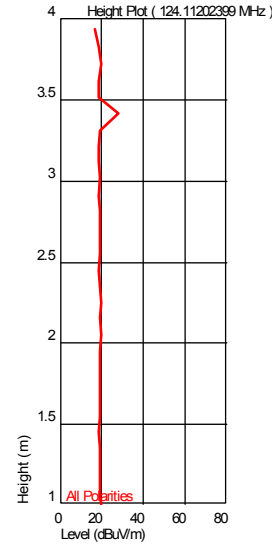
Turntable Plot (124.11202399 MHz)

Level (dBuV/m)



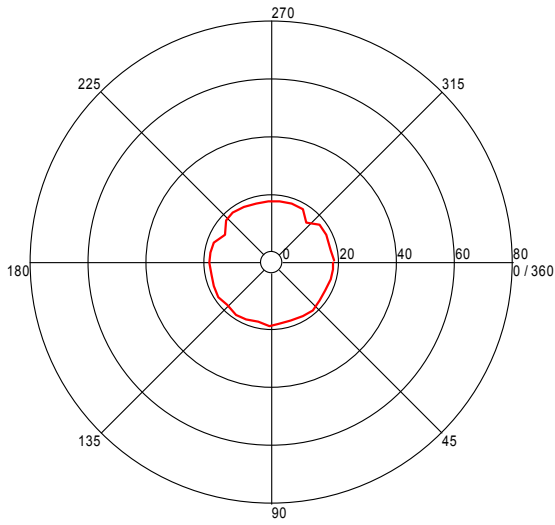
All Polarities

Azimuth (Degrees)



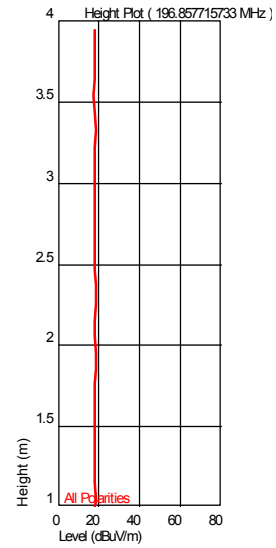
Turntable Plot (196.857715733 MHz)

Level (dBuV/m)



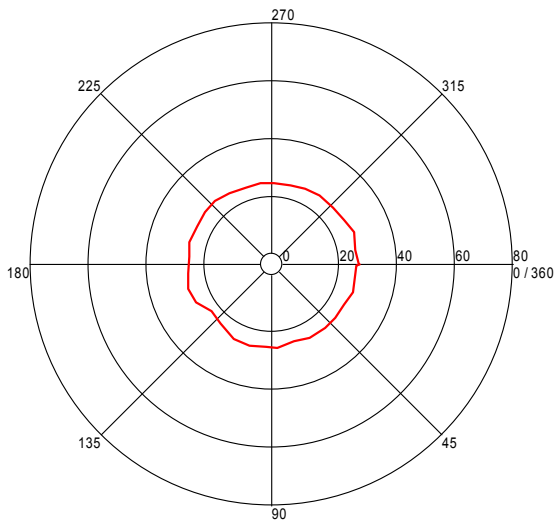
All Polarities

Azimuth (Degrees)



Turntable Plot (623.933867305 MHz)

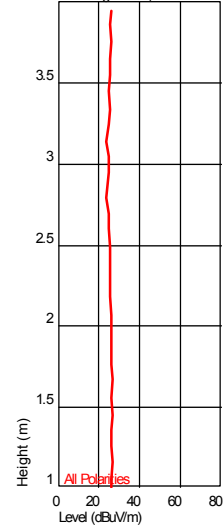
Level (dBuV/m)



All Polarities

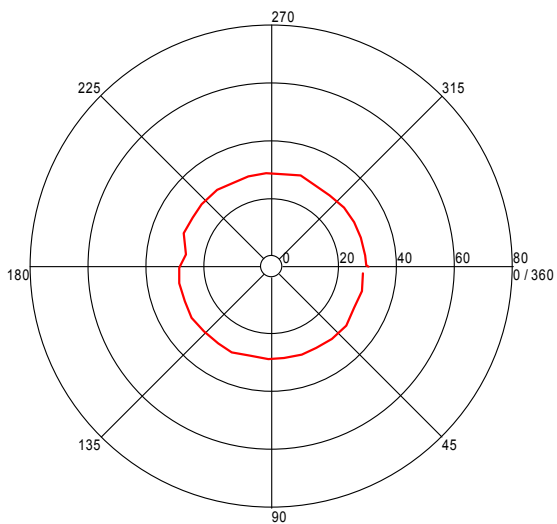
Azimuth (Degrees)

Height Plot (623.933867305 MHz)



Turntable Plot (981.371943756 MHz)

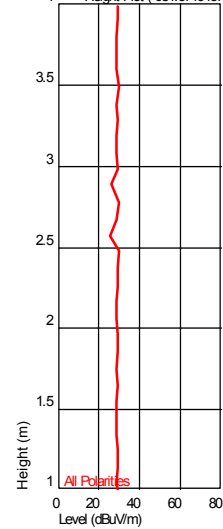
Level (dBuV/m)



All Polarities

Azimuth (Degrees)

Height Plot (981.371943756 MHz)



Test Information

Test Details

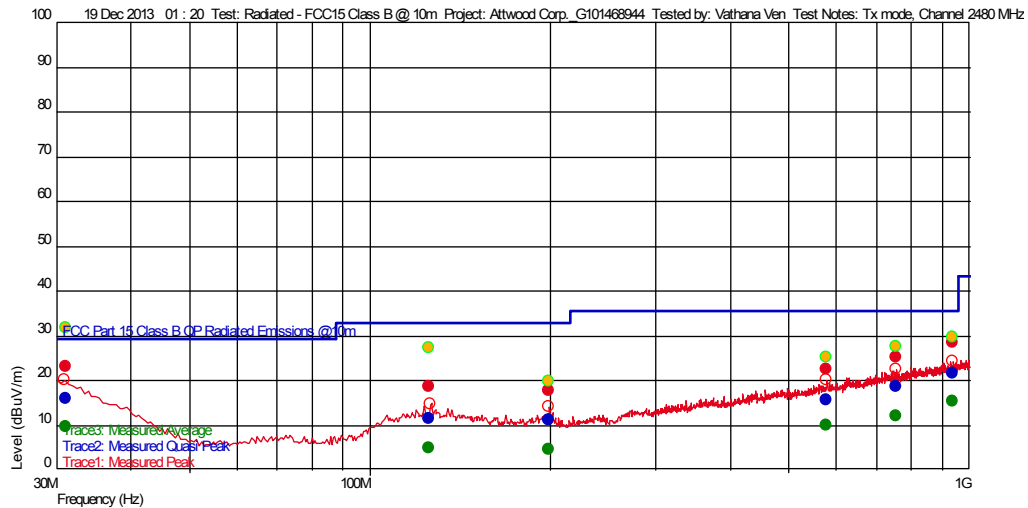
Test:
Project:
Test Notes:
Temperature:
Humidity:
Tested by:
Test Started:

User Entry

Radiated - FCC15 Class B @ 10m
Attwood Corp._G101468944
Tx mode, Channel 2480 MHz
20 deg C
16%, 1005mB
Vathana Ven
19 Dec 2013 01 : 20

Additional Information

Prescan Emission Graph



Emissions Test Data

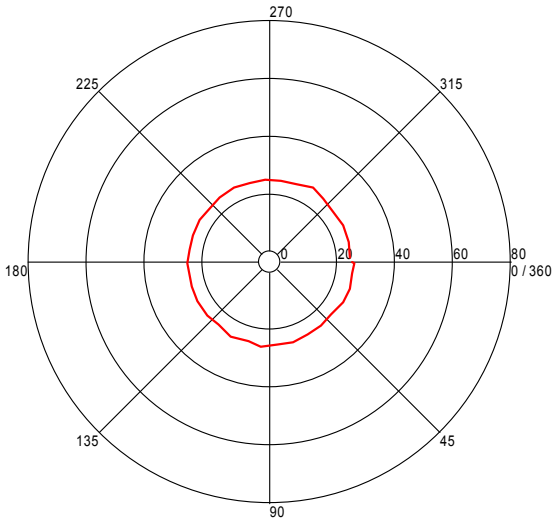
Trace2: Measured Quasi Peak

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
198.55070093 M	11.22	12.655	-23.929	33.040	-21.82	--	154	2.40	120 k	
125.905811733 M	11.40	14.481	-25.361	33.040	-21.64	--	359	1.04	120 k	
577.541082347 M	15.69	18.751	-24.271	35.540	-19.85		212	4.00	120 k	
754.902003784 M	18.70	20.700	-23.455	35.540	-16.84	--	268	4.00	120 k	
940.594388932 M	21.79	22.512	-22.546	35.540	-13.75	--	360	1.46	120 k	
31.203607327 M	15.92	20.457	-26.239	29.540	-13.62	--	310	3.24	120 k	

Azimuth Plots

Turntable Plot (31.203607327 MHz)

Level (dBuV/m)

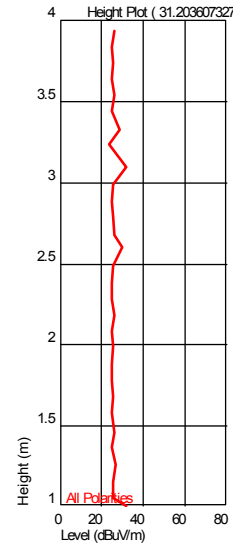


All Polarities

Azimuth (Degrees)

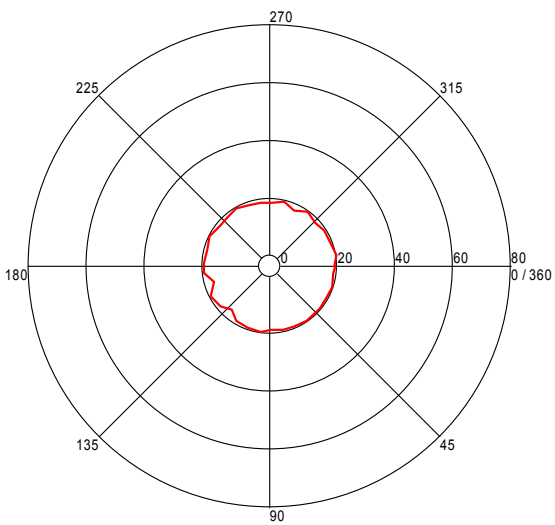
Turntable Plots

Height Plot (31.203607327 MHz)



Turntable Plot (125.905811733 MHz)

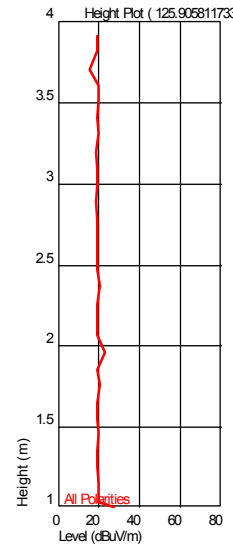
Level (dBuV/m)



All Polarities

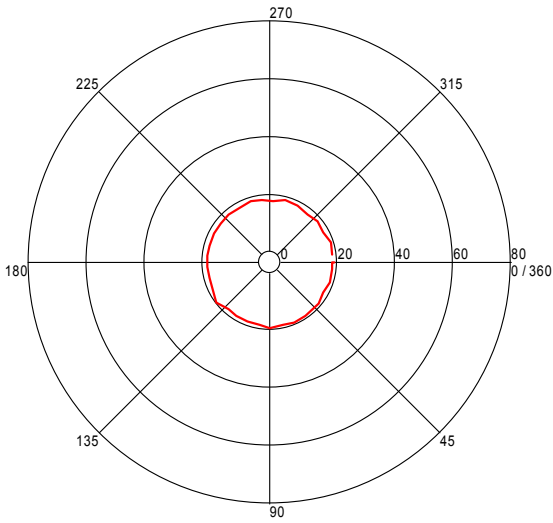
Azimuth (Degrees)

Height Plot (125.905811733 MHz)



Turntable Plot (198.55070093 MHz)

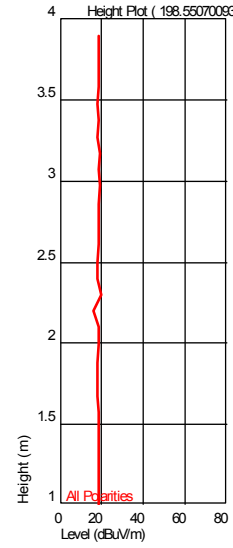
Level (dBuV/m)



All Polarities

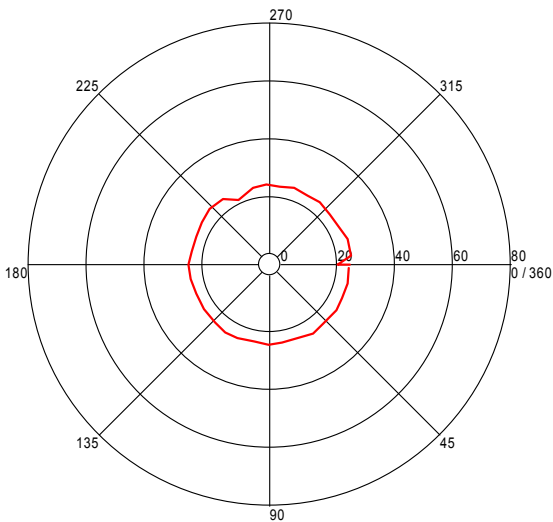
Azimuth (Degrees)

Height Plot (198.55070093 MHz)



Turntable Plot (577.541082347 MHz)

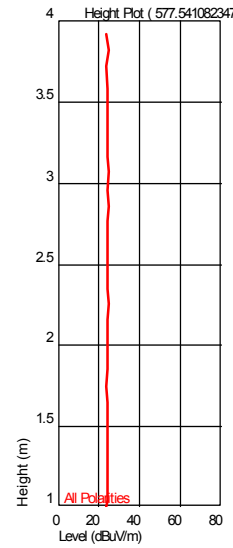
Level (dBuV/m)



All Polarities

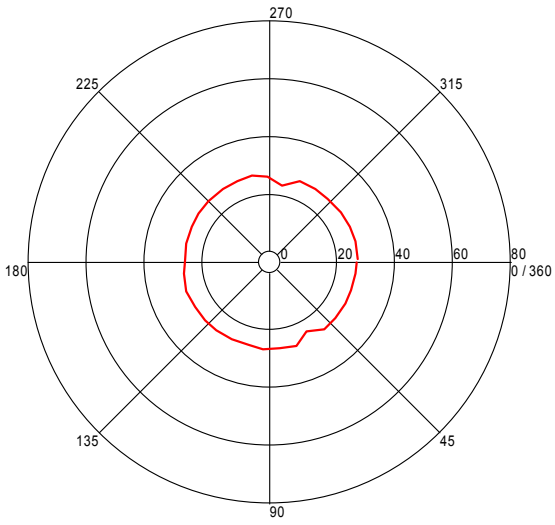
Azimuth (Degrees)

Height Plot (577.541082347 MHz)



Turntable Plot (754.902003784 MHz)

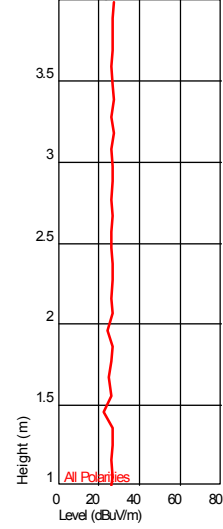
Level (dBuV/m)



All Polarities

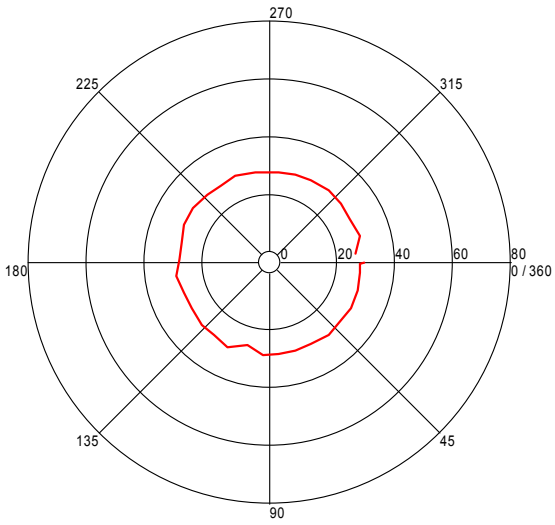
Azimuth (Degrees)

Height Plot (754.902003784 MHz)



Turntable Plot (940.594388932 MHz)

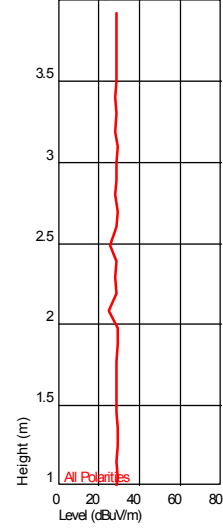
Level (dBuV/m)



All Polarities

Azimuth (Degrees)

Height Plot (940.594388932 MHz)



Radiated Emissions

Company: Attwood Corporation Antenna & Cables: HF Bands: N, LF, HF, SHF
 Model #: PINPOINT GPS fob Antenna: EMC02 V3m AF 02-12-14.txt EMC02 H3m AF 02-12-14.txt EMC04
 Serial #: BOX1312161413-003 (INTERTEK ASSIGNED) Cable(s): 145-416 3mTrkB 10-03-2014.txt CBLHF2012-2M CBLBNC2012-5M
 Engineers: Vathana Ven Location: 10M Barometer: DAV004 Filter: NONE
 Project #: G101468944 Date(s): 12/18/13 12/19/13
 Standard: FCC Part 15.249/RSS-210 Temp/Humidity/Pressure: 20 deg C 16% 1005mB
 Receiver: R&S ESI (145-128) 10-01-2014 Limit Distance (m): 3
 PreAmp: PRE145014 12-13-2013.txt PRE8 Test Distance (m): 3
 PreAmp Used? (Y or N): Y Voltage/Frequency: 3V Battery Frequency Range: 1-25 GHz
 Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
 Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Spurious emissions F = 2424.5 MHz													
PK	V	4849.000	45.45	33.14	8.70	34.67	0.00	52.62	74.00	-21.38	1/3 MHz	RB	
AVG	V	4849.000	32.35	33.14	8.70	34.67	0.00	39.52	54.00	-14.48	1/3 MHz	RB	
PK	V	7273.500	43.05	36.24	11.07	34.56	0.00	55.79	74.00	-18.21	1/3 MHz	RB	
AVG	V	7273.500	29.95	36.24	11.07	34.56	0.00	42.69	54.00	-11.31	1/3 MHz	RB	
PK	V	9698.000	40.85	38.21	12.97	35.47	0.00	56.56	74.00	-17.44	1/3 MHz		
AVG	V	9698.000	27.75	38.21	12.97	35.47	0.00	43.46	54.00	-10.54	1/3 MHz		
PK	V	12122.500	36.00	38.98	14.86	36.35	0.00	53.49	74.00	-20.51	1/3 MHz	RB	Noise Floor
AVG	V	12122.500	22.90	38.98	14.86	36.35	0.00	40.39	54.00	-13.61	1/3 MHz	RB	Noise Floor
PK	V	14547.000	36.80	42.13	15.08	34.54	0.00	59.47	74.00	-14.53	1/3 MHz		Noise Floor
AVG	V	14547.000	23.70	42.13	15.08	34.54	0.00	46.37	54.00	-7.63	1/3 MHz		Noise Floor
PK	V	16971.500	33.40	40.80	20.65	34.50	0.00	60.35	74.00	-13.65	1/3 MHz		Noise Floor
AVG	V	16971.500	20.30	40.80	20.65	34.50	0.00	47.25	54.00	-6.75	1/3 MHz		Noise Floor
Spurious emissions F = 2449.5 MHz													
PK	V	4899.000	47.02	33.17	8.77	34.67	0.00	54.30	74.00	-19.70	1/3 MHz	RB	
AVG	V	4899.000	33.92	33.17	8.77	34.67	0.00	41.20	54.00	-12.80	1/3 MHz	RB	
PK	V	7348.500	44.27	36.44	11.12	34.52	0.00	57.31	74.00	-16.69	1/3 MHz	RB	
AVG	V	7348.500	31.17	36.44	11.12	34.52	0.00	44.21	54.00	-9.79	1/3 MHz	RB	
PK	V	9798.000	40.75	38.24	13.20	35.74	0.00	56.45	74.00	-17.55	1/3 MHz		
AVG	V	9798.000	27.65	38.24	13.20	35.74	0.00	43.35	54.00	-10.65	1/3 MHz		
PK	V	12247.500	36.90	38.85	14.77	36.48	0.00	54.04	74.00	-19.96	1/3 MHz	RB	Noise Floor
AVG	V	12247.500	23.80	38.85	14.77	36.48	0.00	40.94	54.00	-13.06	1/3 MHz	RB	Noise Floor
PK	V	14697.000	35.70	42.04	15.35	34.64	0.00	58.45	74.00	-15.55	1/3 MHz		Noise Floor
AVG	V	14697.000	22.60	42.04	15.35	34.64	0.00	45.35	54.00	-8.65	1/3 MHz		Noise Floor
PK	V	17146.500	33.60	41.63	18.88	34.34	0.00	59.78	74.00	-14.22	1/3 MHz		Noise Floor
AVG	V	17146.500	20.50	41.63	18.88	34.34	0.00	46.68	54.00	-7.32	1/3 MHz		Noise Floor
Spurious emissions F = 2480 MHz													
PK	V	4960.000	46.48	33.33	8.86	34.66	0.00	54.01	74.00	-19.99	1/3 MHz	RB	
AVG	V	4960.000	33.38	33.33	8.86	34.66	0.00	40.91	54.00	-13.09	1/3 MHz	RB	
PK	V	7440.000	43.97	36.53	11.19	34.47	0.00	57.21	74.00	-16.79	1/3 MHz	RB	
AVG	V	7440.000	30.87	36.53	11.19	34.47	0.00	44.11	54.00	-9.89	1/3 MHz	RB	
PK	V	9920.000	36.00	38.21	13.49	36.07	0.00	51.62	74.00	-22.38	1/3 MHz		Noise Floor
AVG	V	9920.000	22.90	38.21	13.49	36.07	0.00	38.52	54.00	-15.48	1/3 MHz		Noise Floor
PK	V	12400.000	36.92	38.73	14.65	36.64	0.00	53.67	74.00	-20.33	1/3 MHz	RB	Noise Floor
AVG	V	12400.000	23.82	38.73	14.65	36.64	0.00	40.57	54.00	-13.43	1/3 MHz	RB	Noise Floor
PK	V	14880.000	35.58	41.43	15.67	34.76	0.00	57.92	74.00	-16.08	1/3 MHz		Noise Floor
AVG	V	14880.000	22.48	41.43	15.67	34.76	0.00	44.82	54.00	-9.18	1/3 MHz		Noise Floor
PK	V	17360.000	35.60	42.50	20.94	34.13	0.00	64.91	74.00	-9.09	1/3 MHz		Noise Floor
AVG	V	17360.000	22.50	42.50	20.94	34.13	0.00	51.81	54.00	-2.19	1/3 MHz		Noise Floor

Hand scan. No emissions were detected from 18-25 GHz. Equipment used: EMC04, ROS001, CBLHF2012-2M, CBLHF2012-5M, PRE8

Test Personnel: Vathana Ven *VSV*
Supervising/Reviewing
Engineer:
(Where Applicable) _____
Product Standard: FCC 15.249, RSS-210, FCC
15B, RSS-Gen
Input Voltage: 3VDC
Pretest Verification w/
Ambient Signals or
BB Source: Yes

Test Date: 12/18/2013, 12/19/13

Limit Applied: Below specified limits

Ambient Temperature: 20, 21 °C
Relative Humidity: 16, 34 %
Atmospheric Pressure: 1005, 1008 mbars

Deviations, Additions, or Exclusions: None

9 20dB Bandwidth

9.1 Method

Tests are performed in accordance with FCC Part 15:2013 Subpart C Section 15.249, 15.249(a), FCC Part 15:2013 Subpart B, RSS-210 Issue 8 December 2010, RSS-Gen Issue 3 December 2010, A2.9(a), ANSI C63.4.

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

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

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

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

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

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

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

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

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

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

NF = Net Reading in dB μ V

Example:

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

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

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004	Weather Station	Davis Instruments	7400	PE80529A61 A	09/25/2012	09/25/2014
145128	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	10/01/2013	10/01/2014
EMC02	ANTENNA, RIDGED GUIDE, 1-18 GHZ	EMCO	3115	2784	02/12/2013	02/12/2014

Software Utilized:

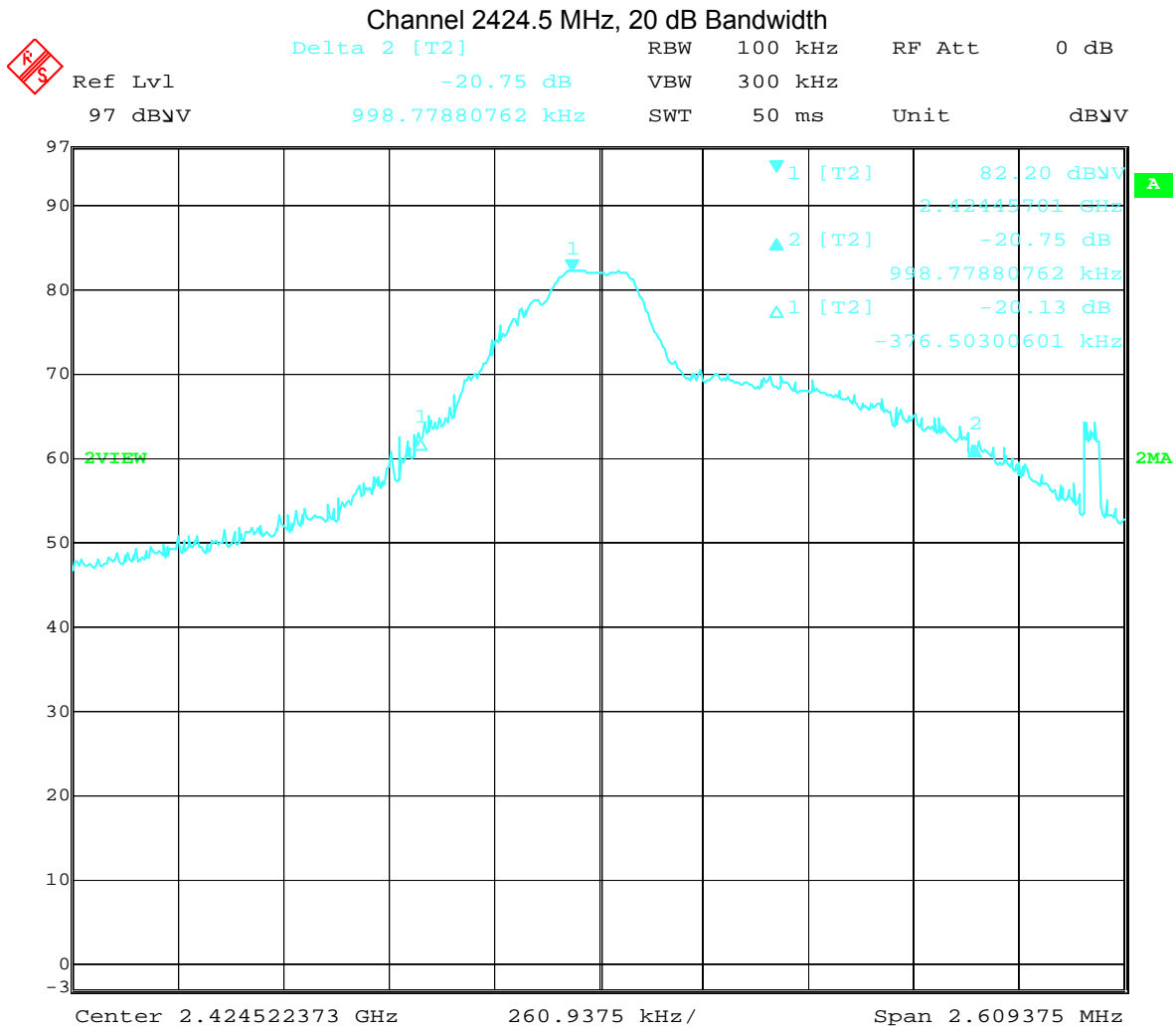
Name	Manufacturer	Version
None		

9.3 Results:

The sample tested was found to Comply.

The 20dB Bandwidth must remain within the assigned band.

9.4 Plots/Data:



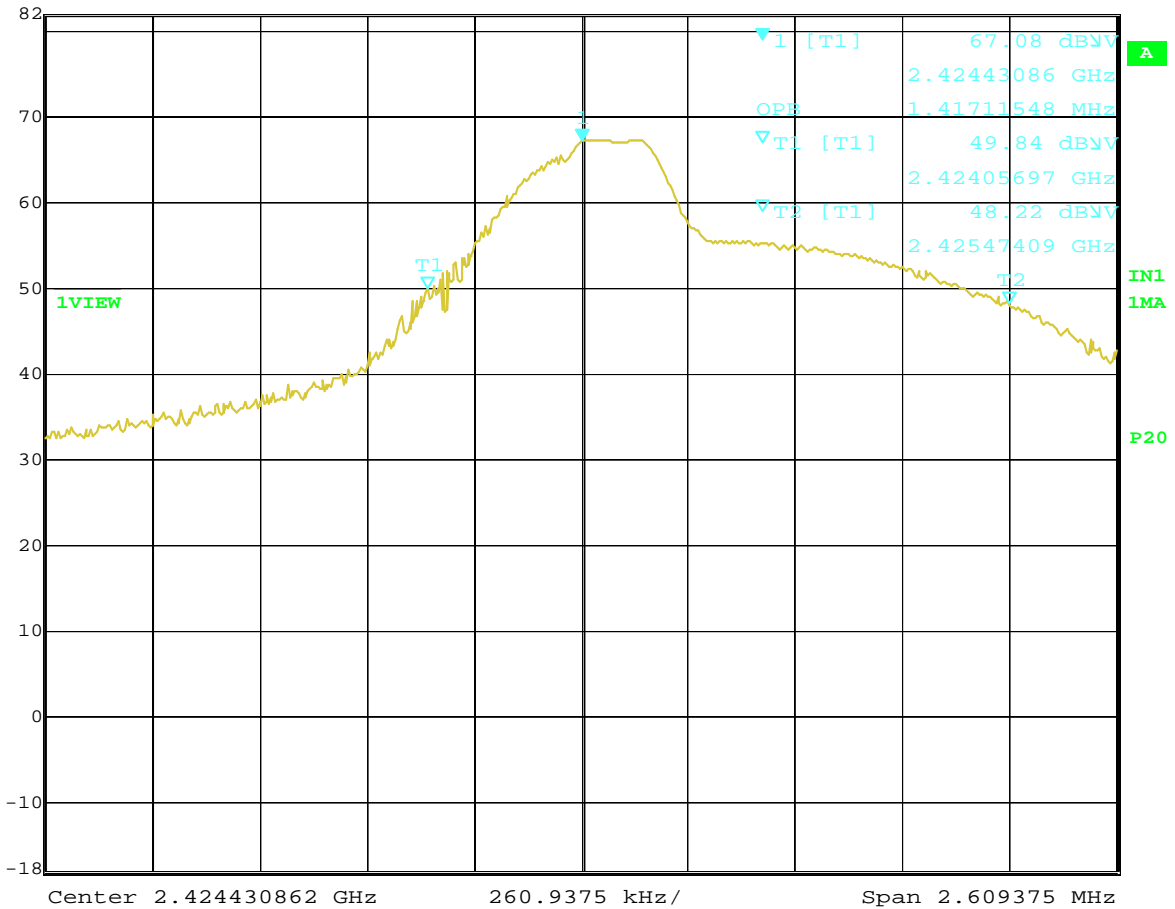
Date: 18.DEC.2013 21:29:35

20 dB Bandwidth is 1.377 MHz

Channel 2424.5 MHz, 99% Bandwidth



Marker 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl 67.08 dBμV VBW 300 kHz
82 dBμV 2.42443086 GHz SWT 300 ms Unit dBμV



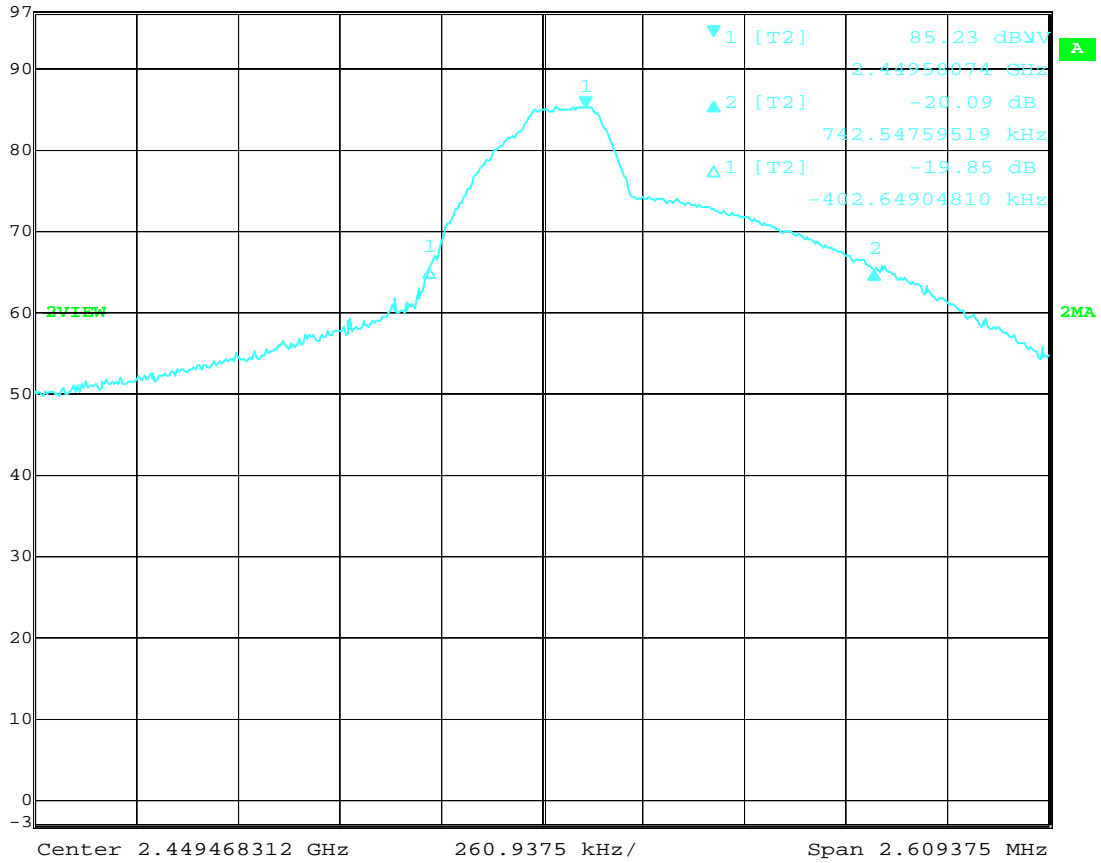
Date: 20.JAN.2014 22:35:53

99% Bandwidth is 1.417MHz

Channel 2445.5 MHz, 20dB Bandwidth



Delta 2 [T2] RBW 100 kHz RF Att 0 dB
Ref Lvl -20.09 dB VBW 300 kHz
97 dBμV 742.54759519 kHz SWT 50 ms Unit dBμV



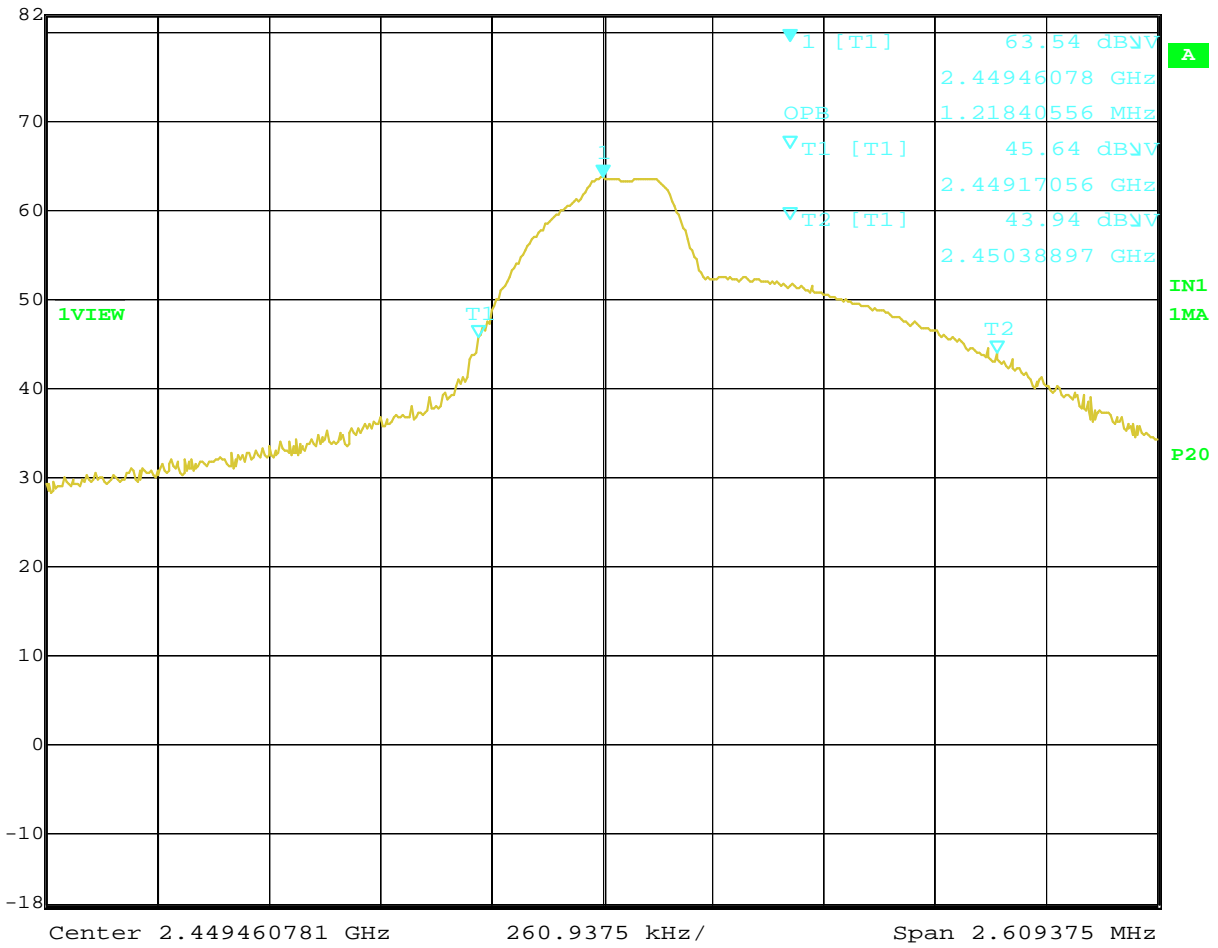
Date: 18.DEC.2013 21:56:08

20 dB Bandwidth is 1.146MHz

Channel 2445.5 MHz, 99% Bandwidth



Marker 1 [T1] RBW 100 kHz RF Att 10 dB
Ref Lvl 63.54 dBμV VBW 300 kHz
82 dBμV 2.44946078 GHz SWT 300 ms Unit dBμV



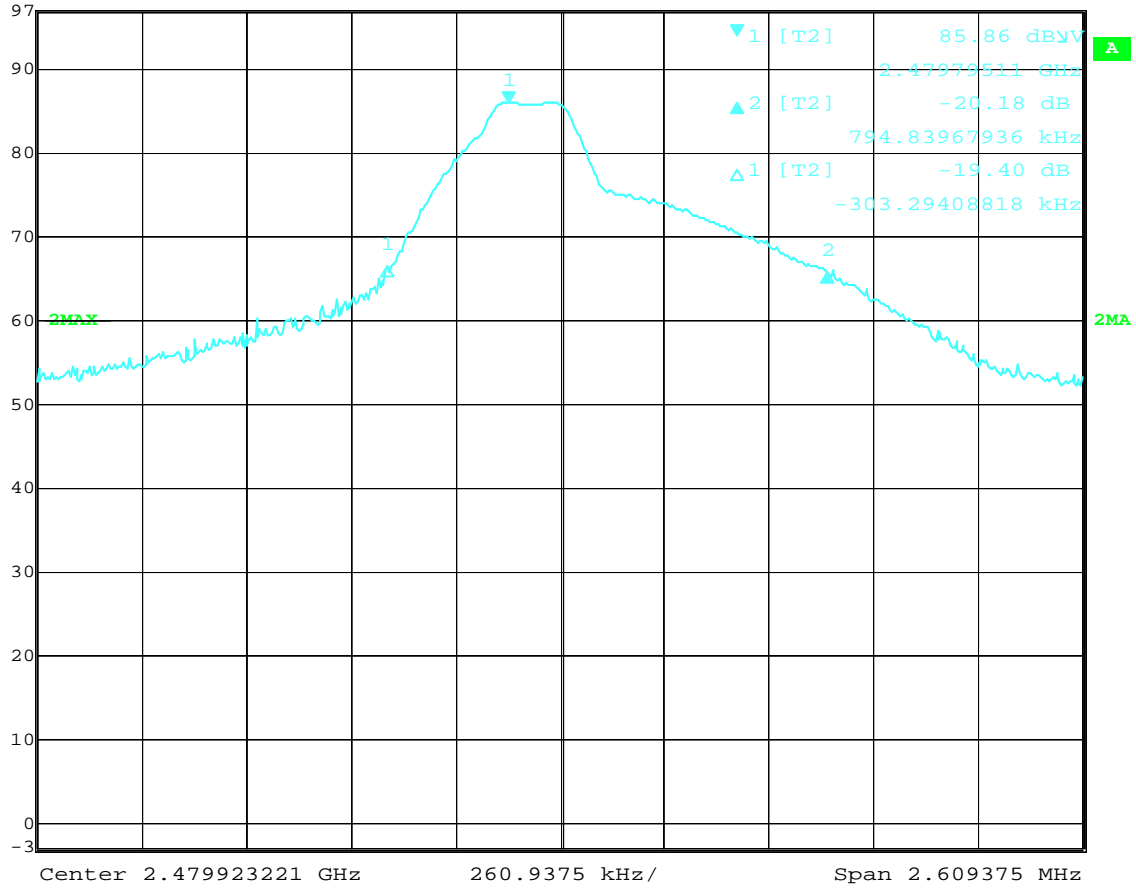
Date: 20.JAN.2014 22:38:21

99% Bandwidth is 1.218MHz

Channel 2480 MHz, 20dB Bandwidth



	Delta 2 [T2]	RBW	100 kHz	RF Att	0 dB
Ref Lvl	-20.18 dB	VBW	300 kHz		
97 dBμV	794.83967936 kHz	SWT	50 ms	Unit	dBμV



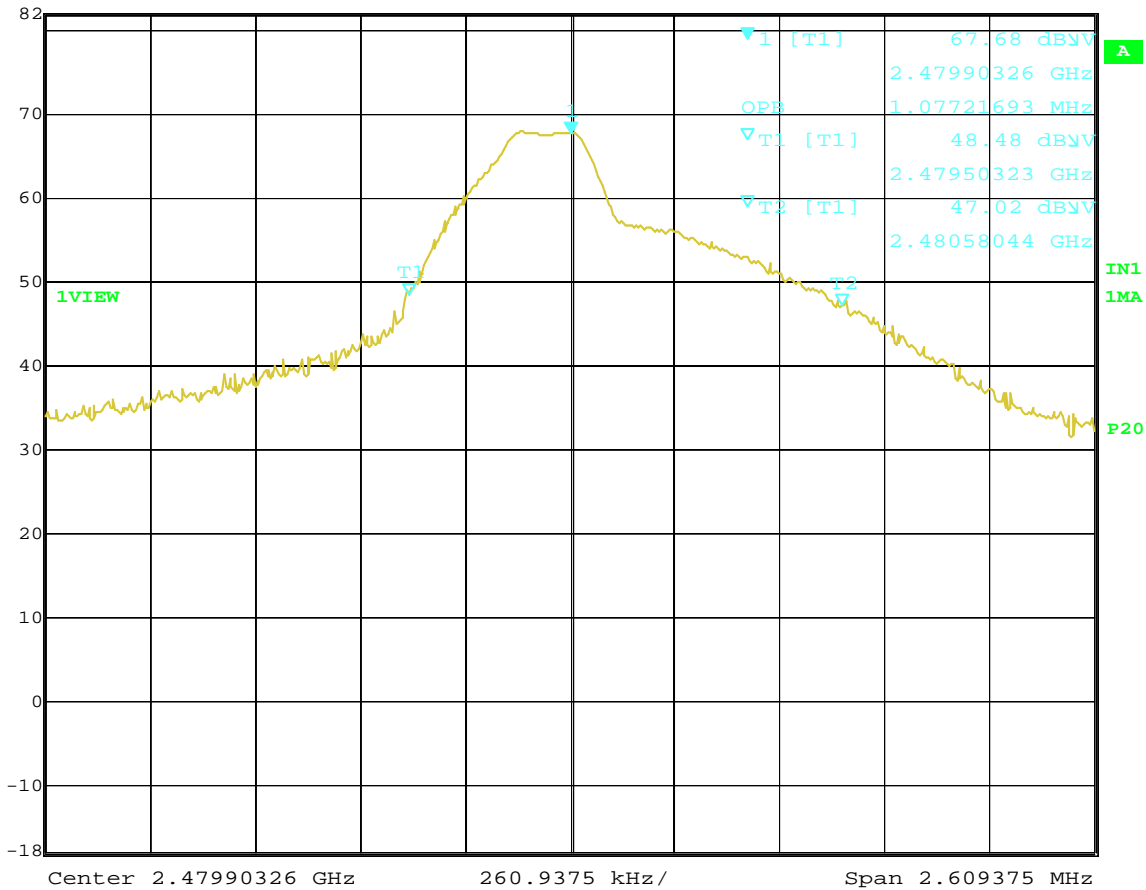
Date: 18.DEC.2013 22:00:16

20dB Bandwidth is 1.098 MHz

Channel 2480 MHz, 99% Bandwidth



Ref Lvl	67.68 dBμV	RBW	100 kHz	RF Att	10 dB
82 dBμV	2.47990326 GHz	VBW	300 kHz		
		SWT	300 ms	Unit	dBμV



Date: 20.JAN.2014 22:40:07

99% Bandwidth is 1.077MHz

Test Personnel: Vathana Ven *VSV*
 Supervising/Reviewing Engineer:
 (Where Applicable)
 Product Standard: FCC 15.249, RSS-210, FCC 15B, RSS-Gen
 Input Voltage: 3VDC
 Pretest Verification w/ Ambient Signals or BB Source: Yes

Test Date: 12/18/2013, 01/20/2014
 Limit Applied: 20 dB bandwidth must remain within the specified band
 Ambient Temperature: 20, 22°C
 Relative Humidity: 16, 9%
 Atmospheric Pressure: 1005, 1000 mbars

Deviations, Additions, or Exclusions: None

10 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	12/29/2013	101468644BOX-002	VSK	NZF	Original Issue
1	01/20/2014	101468644BOX-002	VSK	NZF	Setup pictures removed, fixed output power, added Occupied bandwidth