

EMISSIONS TEST REPORT

Report Number: 101812529BOX-012a
Project Number: G101812529

Report Issue Date: 01/27/2015

Product Designation: Model C

Standards: FCC 47CFR PT 90 Subpart F (2015): Private Land Mobile Radio Services

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

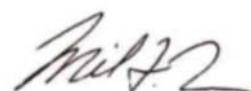
Client:
Laufer Wind
10 Commerce Park North, Unit 12
Bedford, NH 03110
USA

Report prepared by



Vathana Ven / Staff Engineer, EMC

Report reviewed by



Michael Murphy / Sr. Staff Engineer, EMC

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1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 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	Power (CFR47 FCC Part 90.205)	No Limit
7	Bandwidth (CFR47 FCC Part 90.209)	No Limit
8	Emissions Mask (CFR47 FCC Part 90.210)	Pass
9	Radiated Spurious Emissions (CFR47 FCC Part 90.210)	Pass
10	AC Mains Conducted Emissions (CFR47 FCC Part 15.207)	Pass
11	Frequency Stability (CFR47 FCC Part 90.213)	No Limit
12	Revision History	--

3 Client Information

This EUT was tested at the request of:

Company: Laufer Wind
 10 Commerce Park North, Unit 12
 Bedford, NH 03110 USA

Contact: Rod Petr
Telephone: (603) 232-0226 ext. 313
Fax: (603) 232-0337
Email: rpetr@lauferwind.com

4 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Aircraft Detection Sight Solution Doppler Radar System	Eric Laufer, dba Laufer Wind Group LLC	Model C	91-10001-002

Receive Date:	10/21/2014, 01/15/2015
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)	
The EUT is an Aircraft Detection Sight Solution Doppler Radar System	

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
100-240 VAC	550 VA / 500 W (Max)	50 / 60 Hz	Single w/ Ground

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmitting at full power, 9.4 GHz nominal (X-Band)

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	Central Controller: 1.0.3927

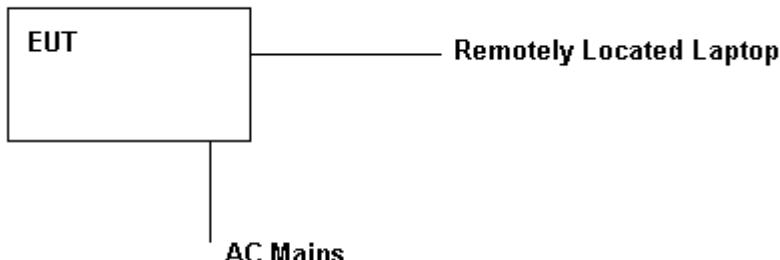
5 System Setup and Method

Cables					
ID	Description	Length	Shielding	Ferrites	Termination
1	AC Mains	4.42 m	None	None	AC Mains
2	RJ 45	50 ft	None	None	Laptop
3	RJ 45	50 ft	None	None	None

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Mouse	HP	Not Labeled	Not Labeled
Laptop	HP	TPN-C111 (Touch Smart)	CND3420N46

5.1 Method:**5.1**

Configuration as required by FCC 47CFR PT 90 Subpart F (2015), FCC Public Notice DA:04-3946, Agilent Application Note 150-2, and ANSI C63.10:2009 Annex C.

5.1 EUT Block Diagram:**5.1****5.1****5.1**

6 Power

6.1 Method

Tests are performed in accordance with FCC CFR47 Part 90, and using the guidance of FCC Public Notice DA:04-3946, Agilent Application Note 150-2, and ANSI C63.10:2009 Annex C.

TEST SITE: Immunity

6.2 Test Equipment Used:

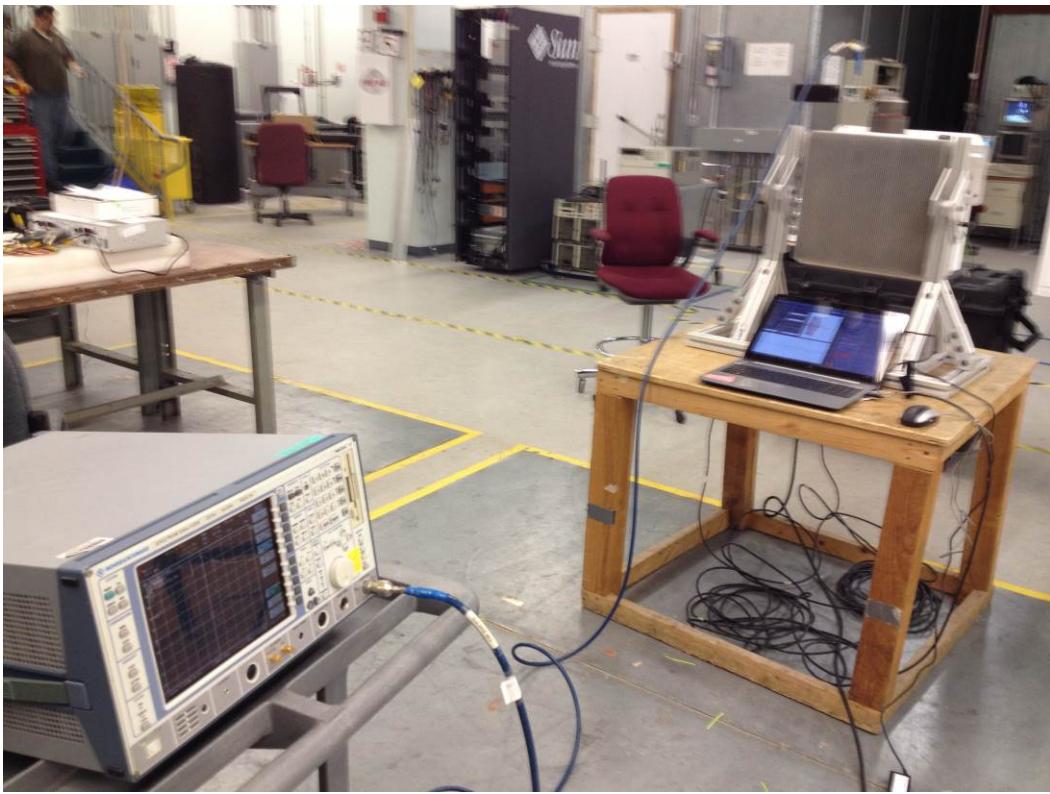
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	05/19/2014	05/19/2015
CBLSHF2 03'	Cable, SMA - SMA, < 18GHz	Sucoflex (Huber Suhner)	104PE	CBLSHF203	05/05/2014	05/05/2015
None'	Waveguide Directional Coupler	Connecticut Microwave Corp.	334031	A771A	Verified	Verified
None'	10 dB Attenuator	Pasermack	SA18E-20	Not Labeled	Verified	Verified

Software Utilized:

Name	Manufacturer	Version
None		

6.3 Results:

There is no limit specified for Power. Power is authorized on a case-by-case basis.

6.4 Setup Photographs:

Conducted Test Setup

6.5 Plots/Data:

Pulse Characteristics

PRF: 2 kHz

Pulse Width: 500 ns

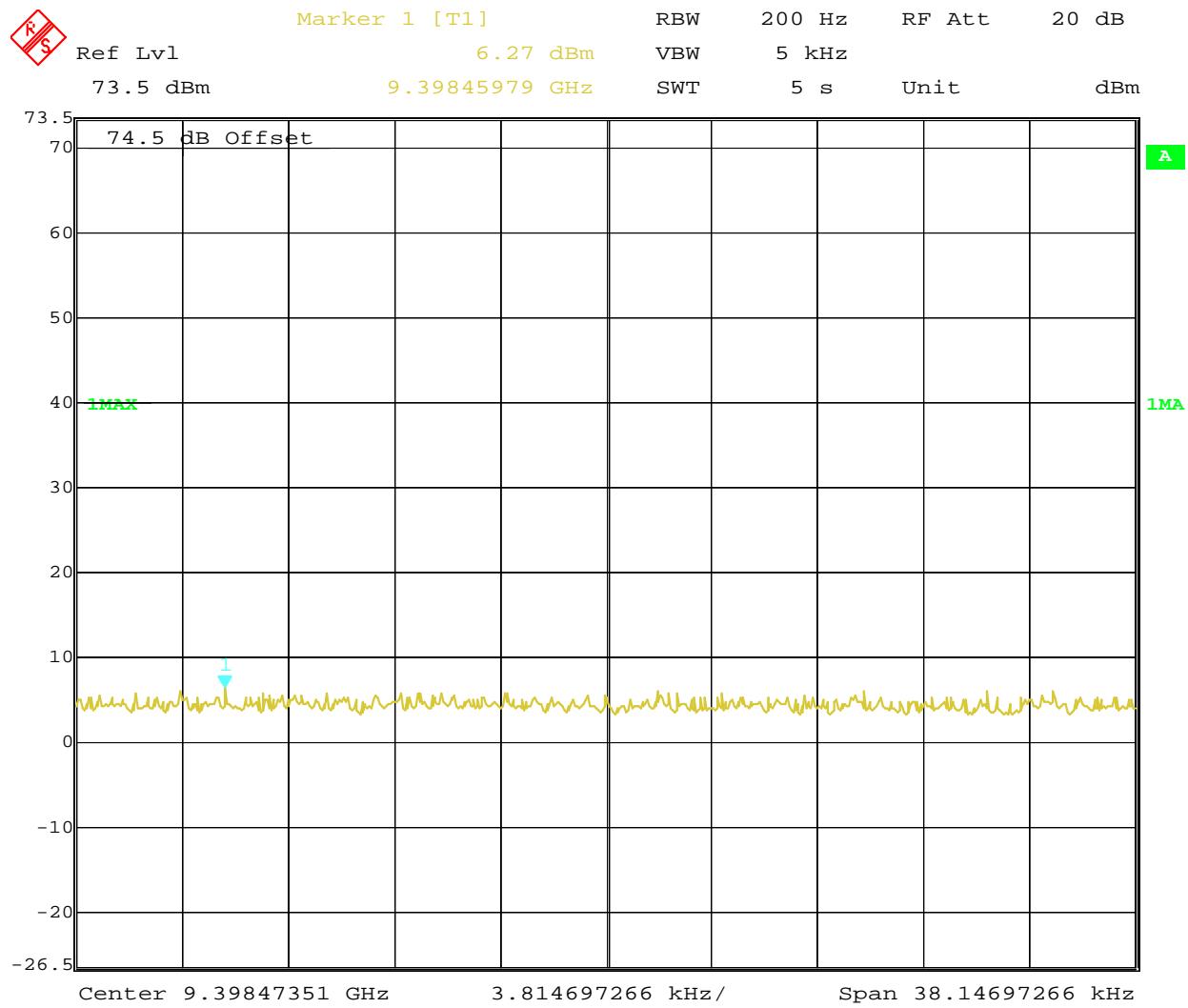
To obtain the true peak value of the emission, a Resolution Bandwidth of 200 Hz, which was equal to 0.1 * PRF was used to obtain a line spectrum of the pulsed emission. Once the line spectrum was obtained, the maximum value, 10.33 dBm, was recorded and is shown in the plot below. This value was obtained using a 20 dB offset for the attenuator pad, which was subsequently verified and found to be 21.74 dB at the fundamental. Coupler and cable attenuation were programmed into the spectrum analyzer. A pulse desensitization factor was then calculated based on the following equation:

PDCF = 20 * LOG(PW/T) where PW is the pulse width in seconds, and T is the period in seconds, obtained by taking the inverse of the PRF. The calculated PDCF was therefore 60 dB.

Final Peak Output Power is therefore: 6.27 dBm + 60 dB = 66.27 dBm (4.326 kW)

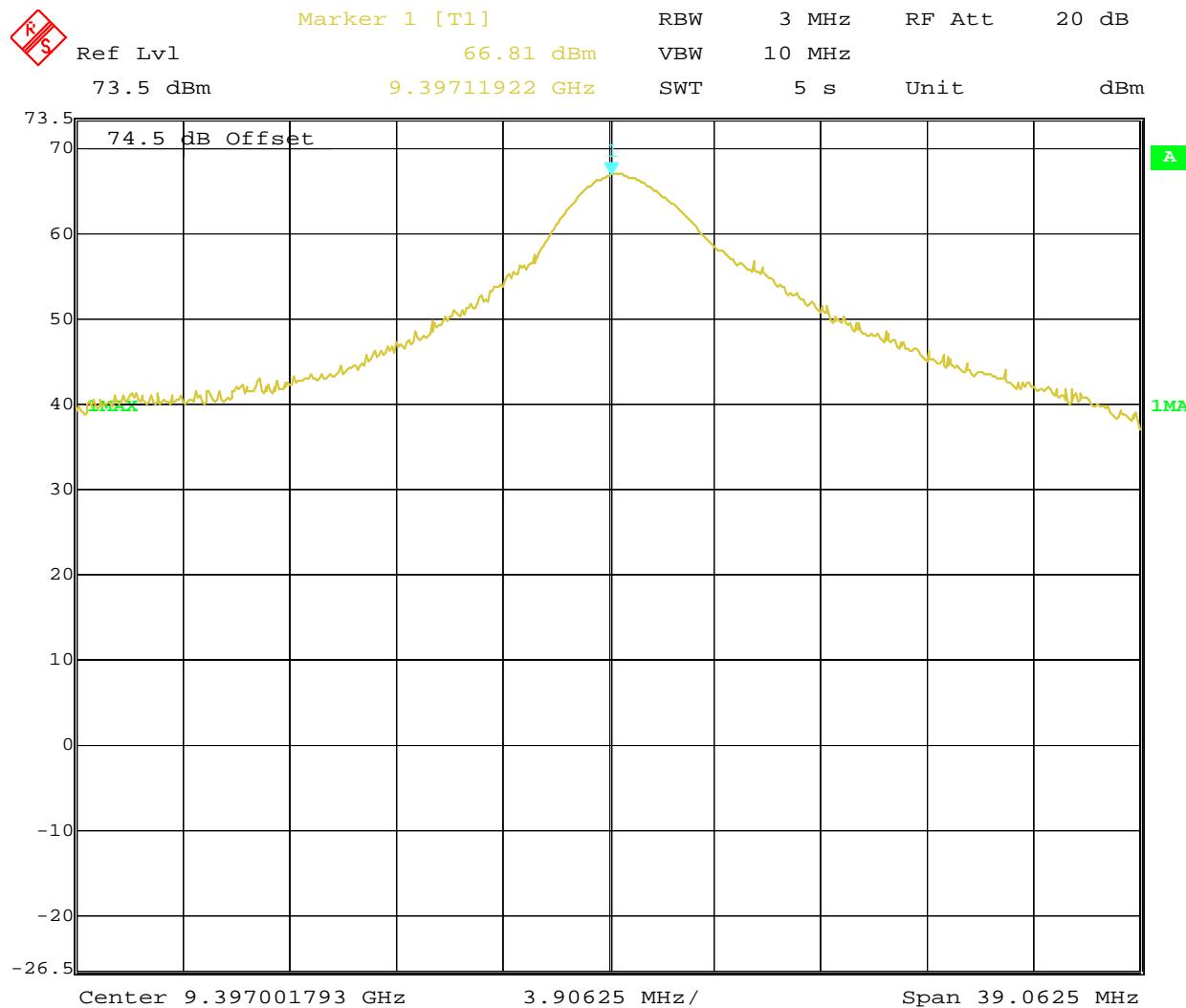
Average Power: Peak Output Power – Average Factor, where calculated average factor equal to $10^{\log(\text{duty cycle})}$ or 30 dB.

Average Power: 66.27 dBm – 30 dB = 36.27 dBm (4.326 Watts)



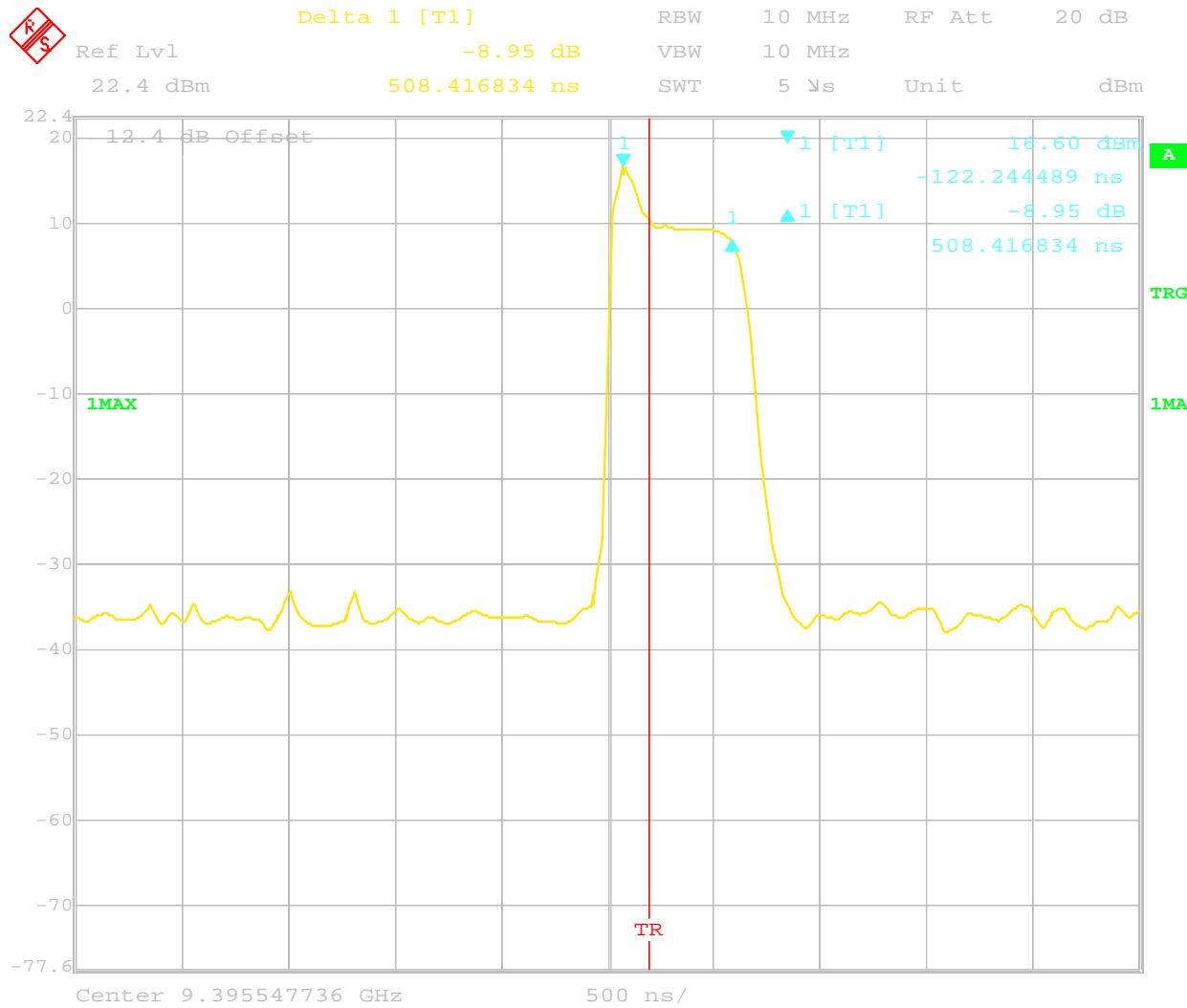
Date: 1.JAN.1997 00:41:02

70 dB external attenuation and cable loss included in the reading



Date: 1.JAN.1997 00:43:53

Wide span of line spectrum (RBW not fully reduced to 0.1*PRF yet)



Date: 20.NOV.2014 20:39:37

Pulse width

Test Personnel: Vathana Ven *VJV*
 Supervising/Reviewing
 Engineer:
 (Where Applicable) N/A

Product Standard: Part 90 Subpart F
 Input Voltage: 120V/60Hz

Pretest Verification w/
 Ambient Signals or
 BB Source: Yes

Test Date: 11/20/2014

Limit Applied: No limit, case by case authorization

Ambient Temperature: 24 °C

Relative Humidity: 54 %

Atmospheric Pressure: 1003 mbars

Deviations, Additions, or Exclusions: None

7 Bandwidth

7.1 Method

Tests are performed in accordance with Part 90 and KDB200443.

TEST SITE: Immunity

7.2 Test Equipment Used:

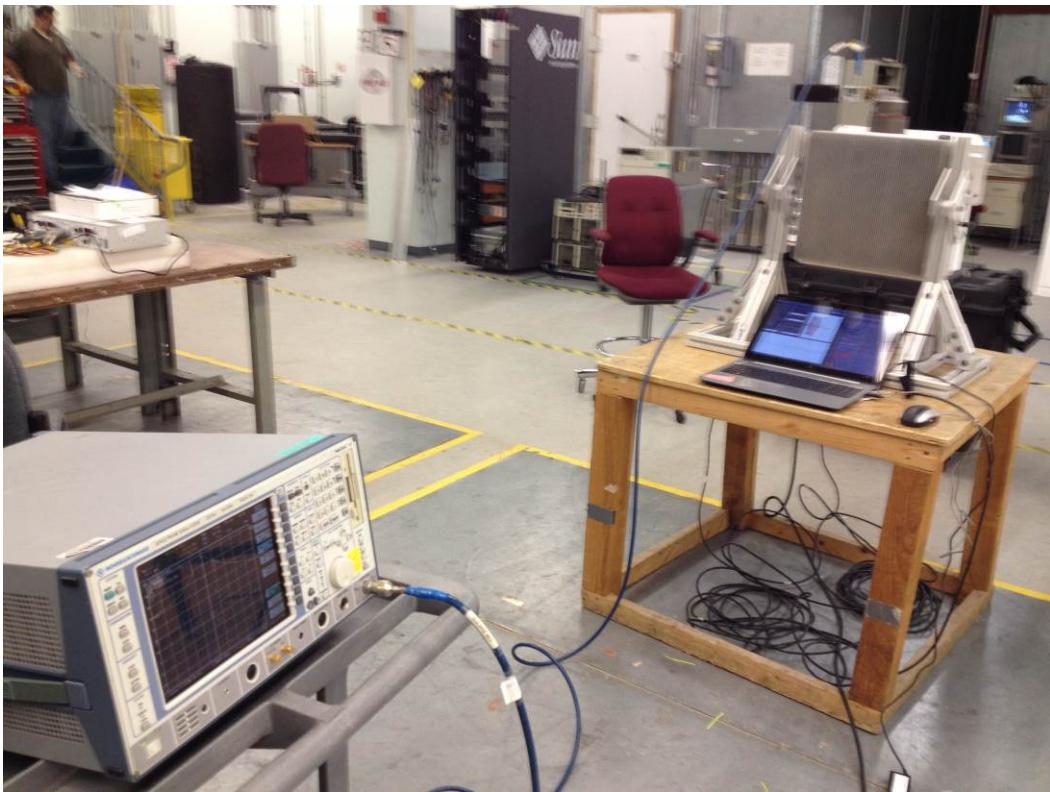
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	05/19/2014	05/19/2015
CBLSHF2 03'	Cable, SMA - SMA, < 18GHz	Sucoflex (Huber Suhner)	104PE	CBLSHF203	05/05/2014	05/05/2015
None'	Waveguide Directional Coupler	Connecticut Microwave Corp.	334031	A771A	Verified	Verified
None'	10 dB Attenuator	Pasternack	SA18E-20	Not Labeled	Verified	Verified

Software Utilized:

Name	Manufacturer	Version
None		

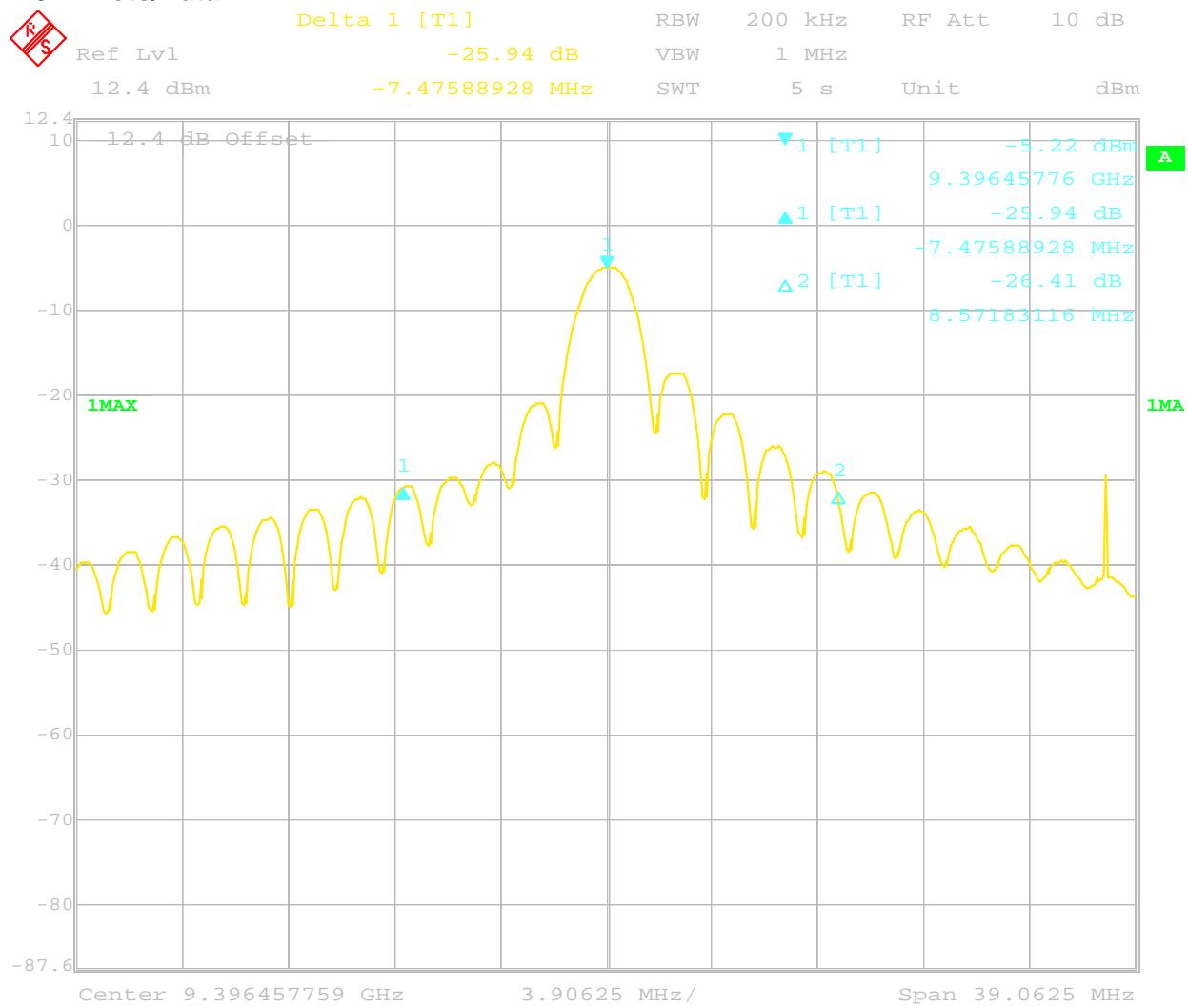
7.3 Results:

There is no limit specified for Bandwidth. Bandwidth is authorized on a case-by-case basis.

7.4 Setup Photographs:

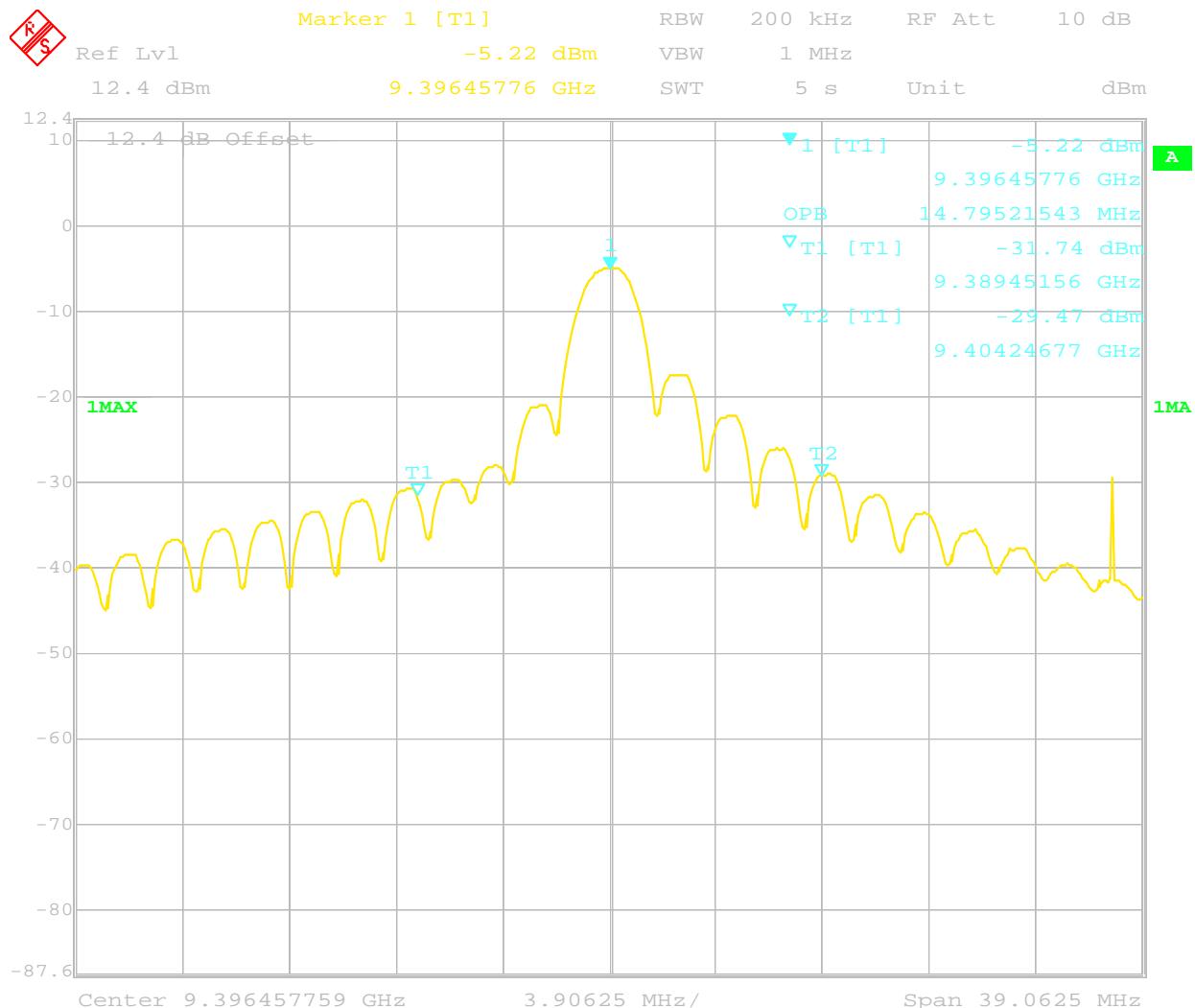
Conducted Test Setup

7.5 Plots/Data:



Date: 20.NOV.2014 20:07:53

26 dB Bandwidth = 16.04 MHz



Date: 20.NOV.2014 20:08:45
99% Power Bandwidth = 14.80 MHz

Test Personnel: Vathana Ven *VJV*
 Supervising/Reviewing
 Engineer:
 (Where Applicable) N/A

Product Standard: Part 90 Subpart F
 Input Voltage: 120V/60Hz

Pretest Verification w/
 Ambient Signals or
 BB Source: Yes

Test Date: 11/20/2014

Limit Applied: No limit, case by case
authorization

Ambient Temperature: 24 °C

Relative Humidity: 54 %

Deviations, Additions, or Exclusions: None

8 Emissions Mask

8.1 Method

Tests are performed in accordance with Part 90 Subpart F and TIA-603C-2004.

TEST SITE: Immunity

8.2 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
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	05/19/2014	05/19/2015
CBLSHF2 03'	Cable, SMA - SMA, < 18GHz	Sucoflex (Huber Suhner)	104PE	CBLSHF203	05/05/2014	05/05/2015
None'	Waveguide Directional Coupler	Connecticut Microwave Corp.	334031	A771A	Verified	Verified
None'	10 dB Attenuator	Pasternack	SA18E-20	Not Labeled	Verified	Verified

Software Utilized:

Name	Manufacturer	Version
None		

8.3 Results:

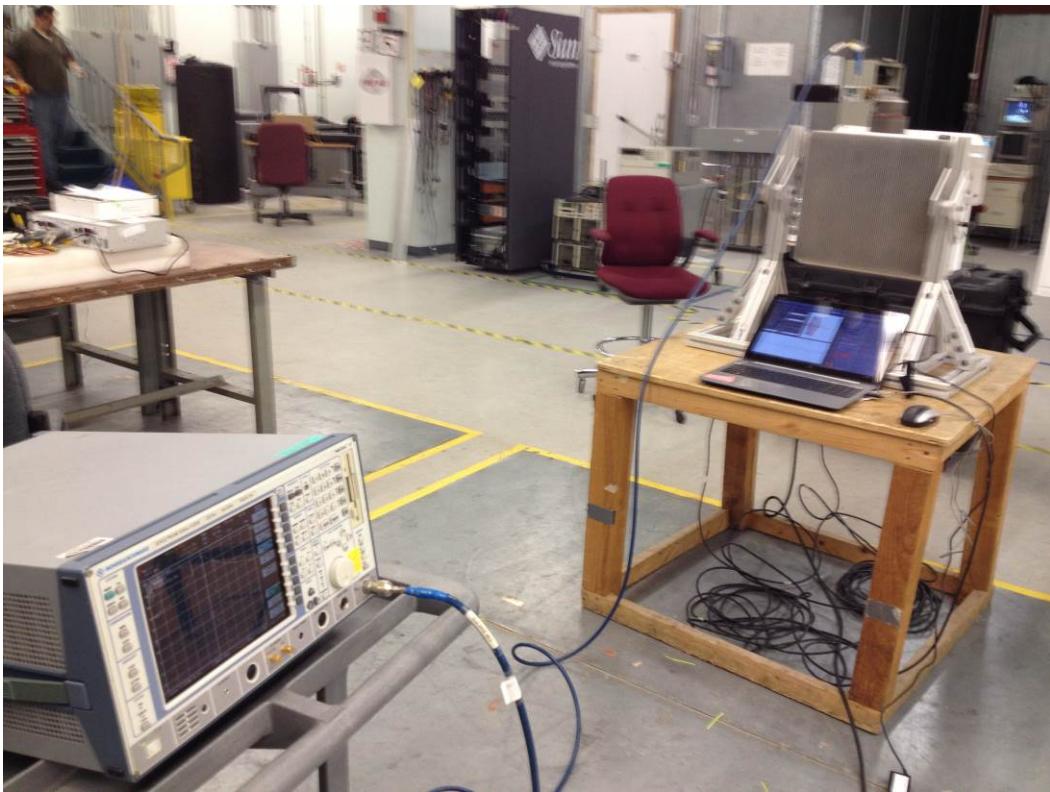
8.3

The sample tested was found to Comply. Mask C was applied using an authorized bandwidth equal to the 26-dB bandwidth. The spectral components of the pulse meet the mask requirements without need to aggregate mask channels.

8.3

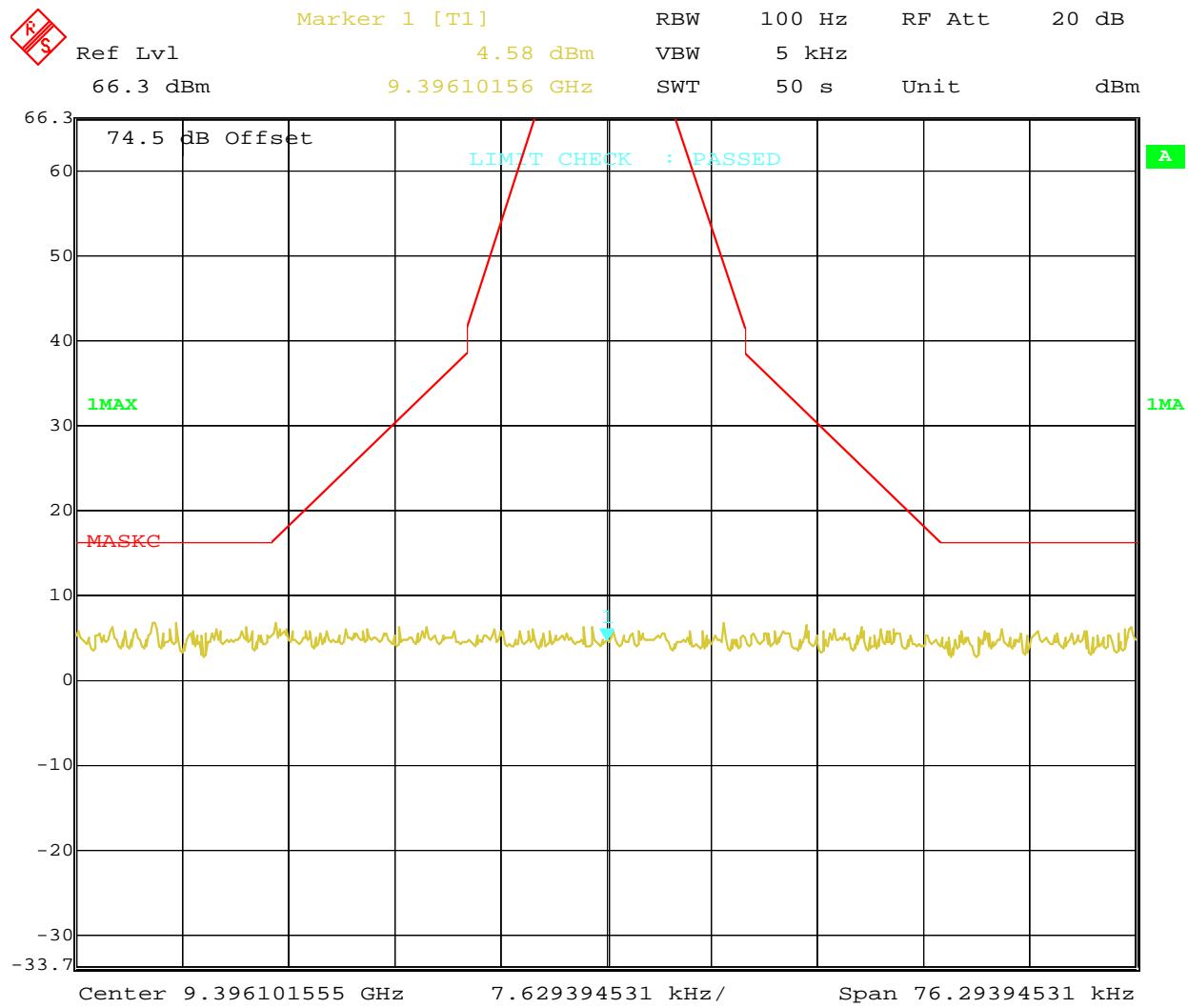
8.3

8.3

8.4 Setup Photographs:

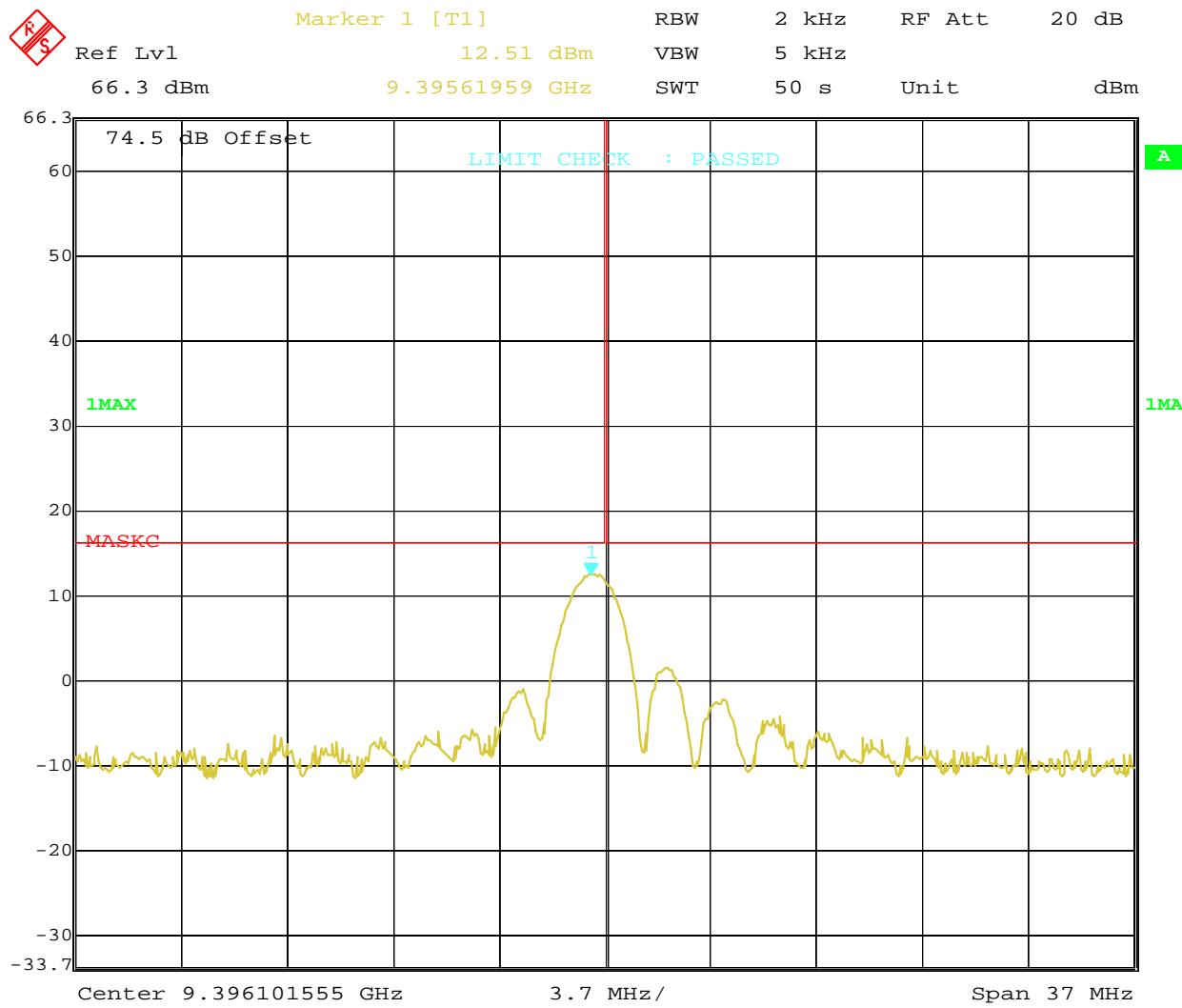
Conducted Test Setup

8.5 Plots/Data:



Date: 1.JAN.1997 01:12:27

Emissions Mask C, 100 kHz Span, Referenced to 66.3 dBm Output Power, 100 Hz RBW



Date: 1.JAN.1997 01:14:17

Emissions Mask C, 80 MHz Span (250% bandwidth), Referenced to 66.3 dBm Output Power,
 2 kHz RBW used for plot generation purposes, compliance is still demonstrated

Test Personnel: Vathana Ven *VJV*
 Supervising/Reviewing
 Engineer:
 (Where Applicable) N/A
 Product Standard: Part 90 Subpart F
 Input Voltage: 120V/60Hz
 Pretest Verification w/
 Ambient Signals or
 BB Source: Yes

Test Date: 11/20/2014
 Limit Applied: No limit, case by case authorization
 Ambient Temperature: 24 °C
 Relative Humidity: 54 %

Notes: The plot does not include the 30 dB for average factor adjustment. The plot would be shifted by 30 dB for an average result.

Deviations, Additions, or Exclusions: None

9 Radiated Emissions

9.1 Method

Tests are performed in accordance with Tests are performed in accordance with Part 90 Subpart F, and ANSI C63.4:2009.

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 $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in $\text{dB}\mu\text{V}$

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 $\text{dB}\mu\text{V}$ 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 $\text{dB}\mu\text{V}/\text{m}$. This value in $\text{dB}\mu\text{V}/\text{m}$ was converted to its corresponding level in $\mu\text{V}/\text{m}$.

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

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

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

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

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

To convert from $\text{dB}\mu\text{V}$ to μV or mV the following was used:

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

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

Example:

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

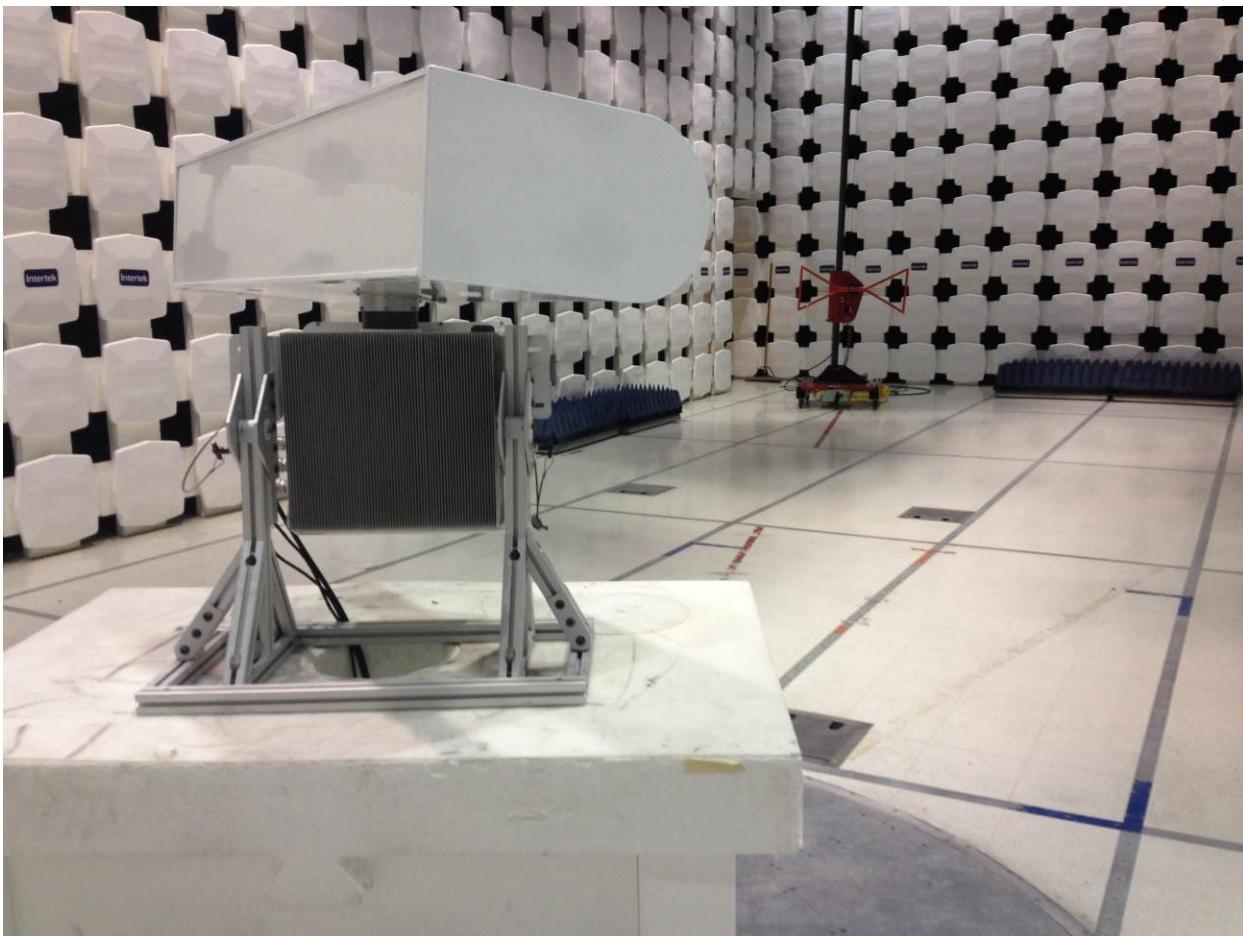
$$UF = 10^{(32 \text{ dB}\mu\text{V}/20)} = 39.8 \mu\text{V}/\text{m}$$

9.2 Test Equipment Used:

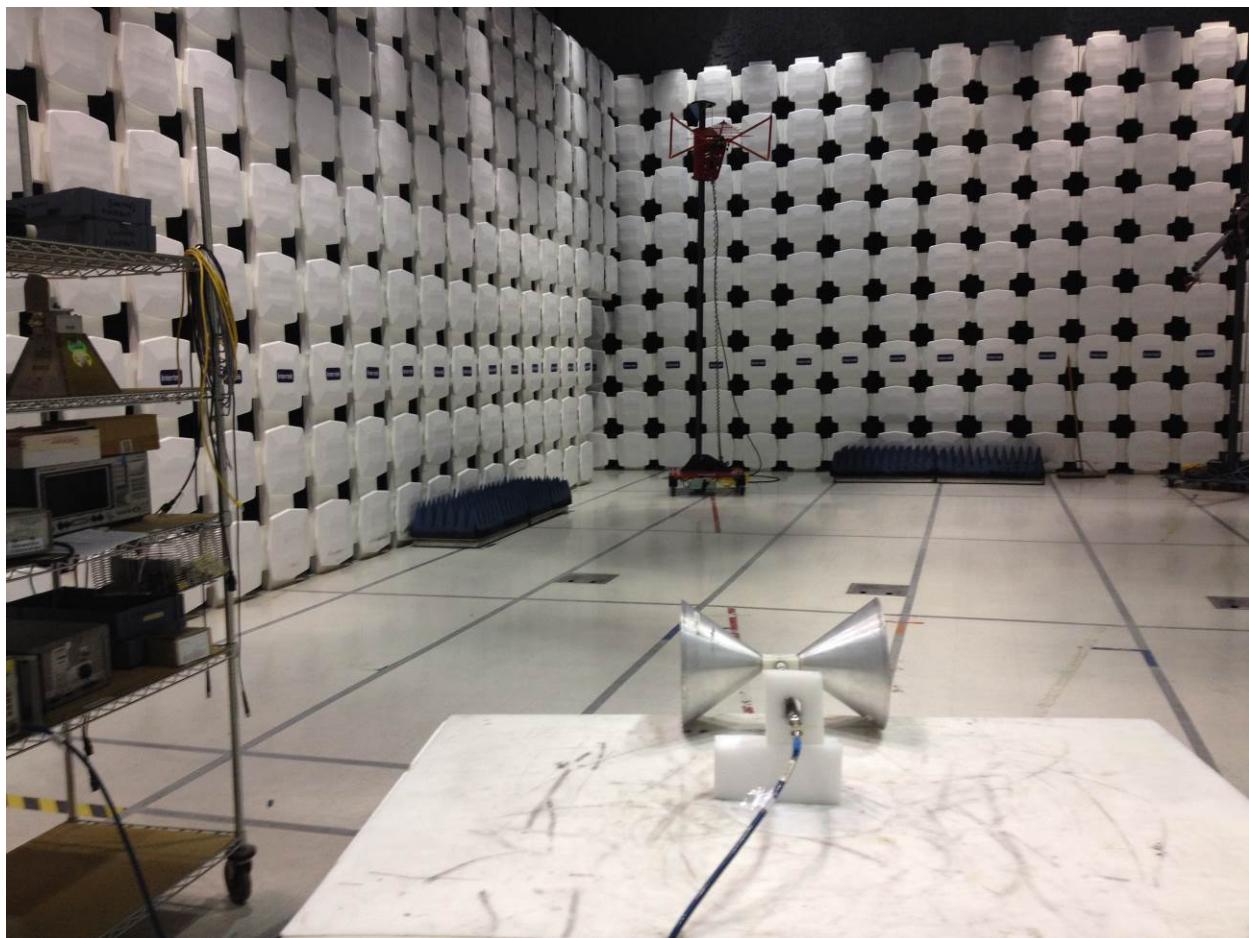
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
None'	Notch Filter	K & L Microwave	5NSL11-00002	1	Verified	Verified
None'	High Pass Filter	K & L Microwave	11SH01-00384	1	Verified	Verified
145106'	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	10/24/2014	10/24/2015
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	10/04/2014	10/04/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/17/2014	03/17/2015
ANT4A'	BROADBAND ANTENNA	Compliance Design	B100	3317	01/29/2014	01/29/2015
ANT4B'	BROADBAND ANTENNA	Compliance Design	B200	3245	01/29/2014	01/29/2015
HEW62'	Synthesized Sweep Generator	Hewlett Packard	83620A	3213A01244	04/22/2013	04/22/2015
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/06/2014	01/06/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/17/2014	03/17/2015
HORN3'	HORN ANTENNA	EMCO	3115	9610-4980	06/03/2014	06/03/2015
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015
CBLSHF2 03'	Cable, SMA - SMA, < 18GHz	Sucoflex (Huber Suhner)	104PE	CBLSHF203	05/05/2014	05/05/2015
EMC04'	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	03/31/2014	03/31/2015

9.3 Results:

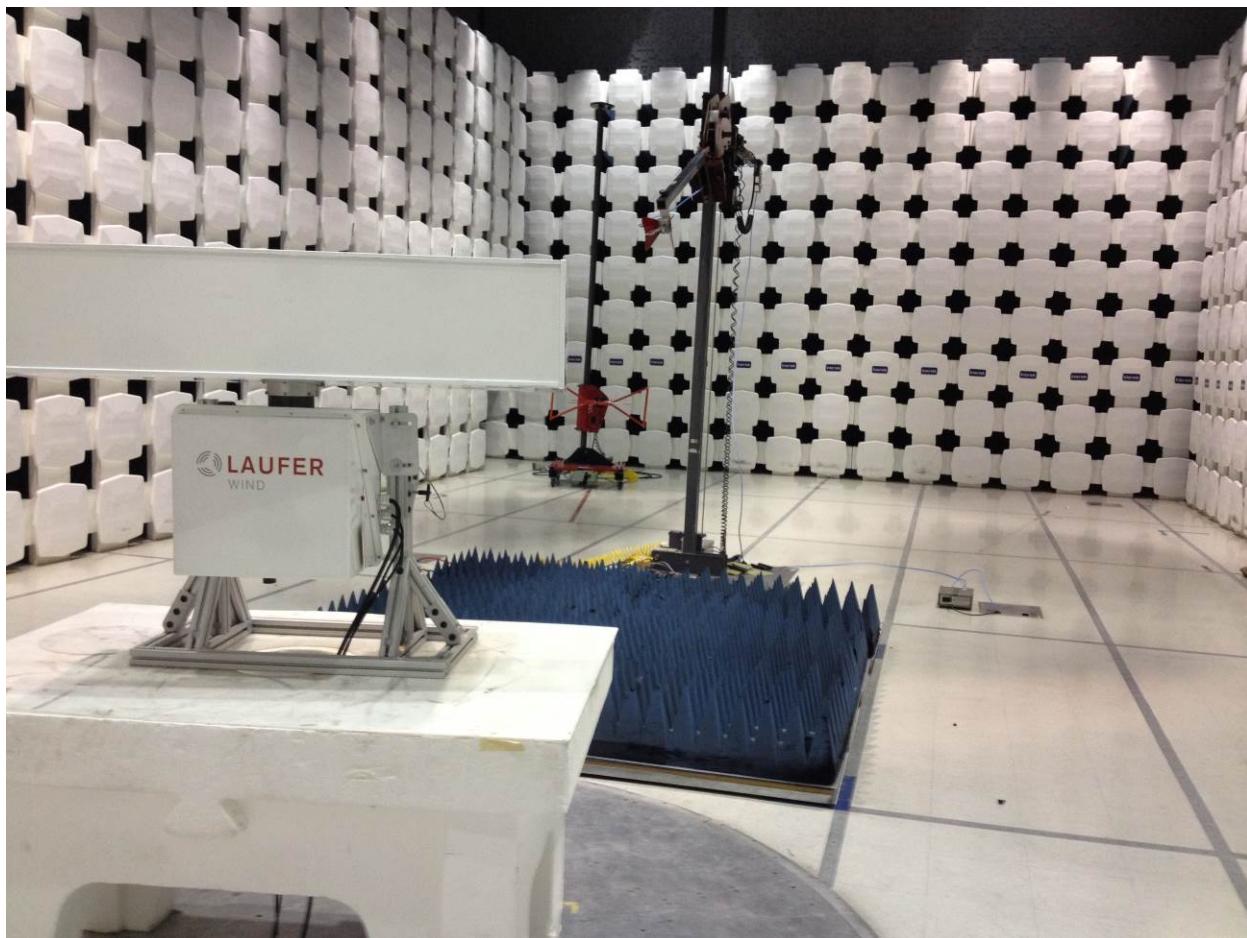
The sample tested was found to Comply.

9.4 Setup Photographs:

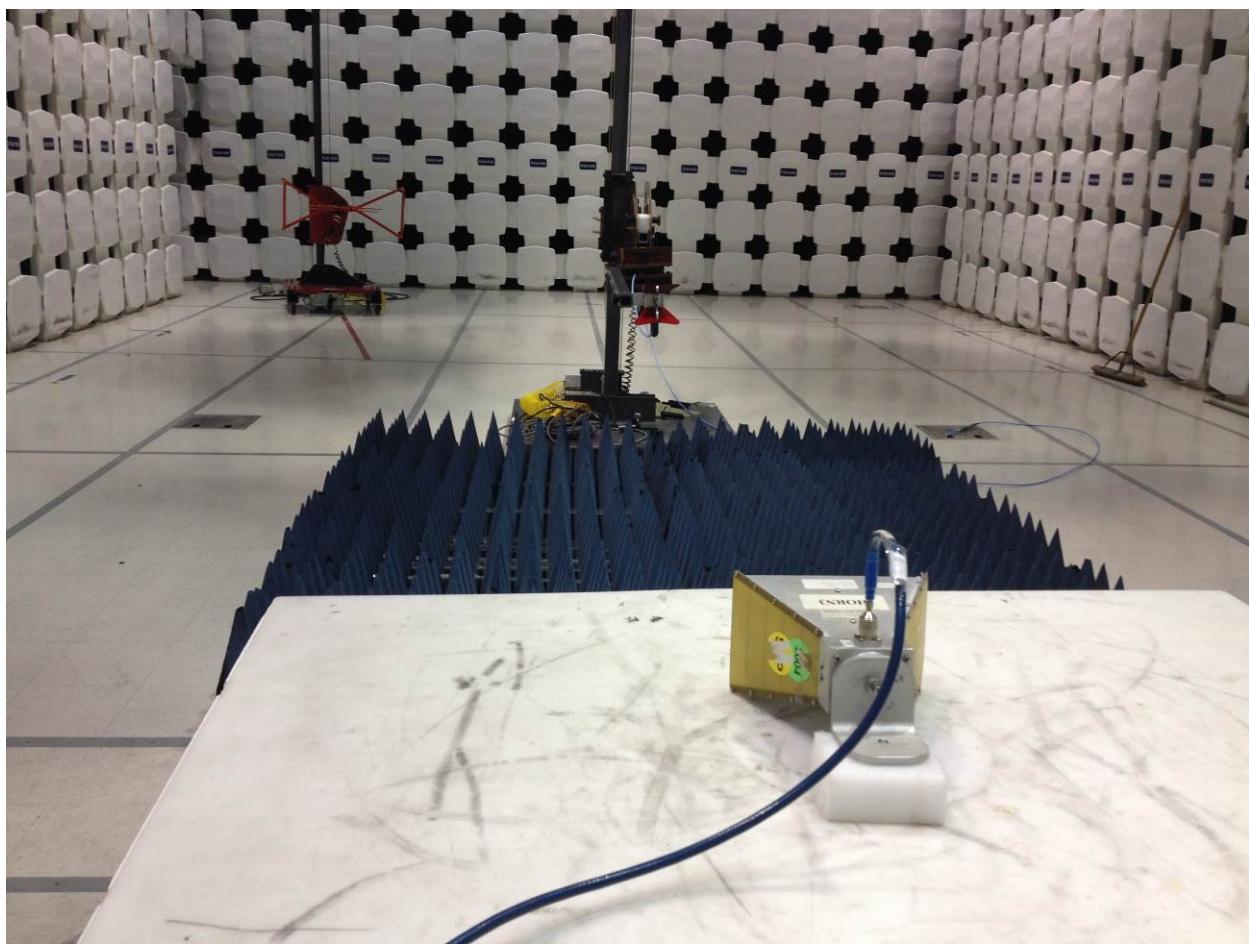
30-1000 MHz Radiated Test Setup



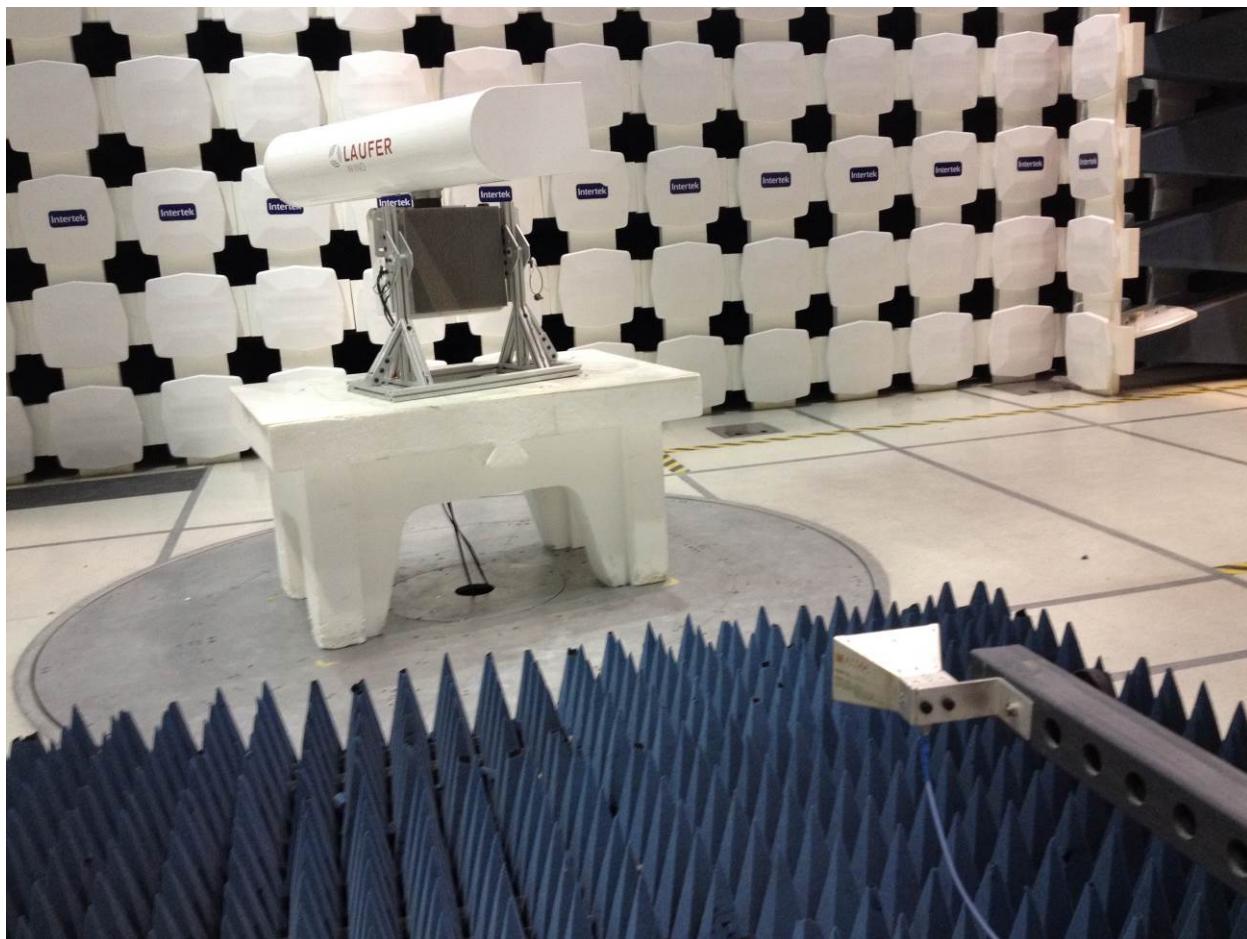
30-1000 MHz Substitution Method Test Setup



1-18GHz Radiated Test Setup



1-18GHz Substitution Method Test Setup



18-40GHz Radiated Test Setup

9.5 Test Data:**Radiated Emissions, Substitution**

Company: Eric Laufer Wind
 Model #: Model C
 Serial #: C001
 Engineer(s): Vathana Ven
 Project #: G101812529 Date(s): 01/16/15
 Standard: FCC Part 90, Subpart F
 Barometer: DAV004 Temp/Humidity/Pressure: 22 deg C 10% 1001mbar
 Rx Antenna: 145-106
 Rx Cable(s): 145-410
 Rx Preamp: 145-003 Receiver: 145-128
 Tx Antenna: ANT4A ANT4B ANT4C
 Tx Cable(s): CBLSHF203
 Tx Signal Generator: HEW62
 ERP or EIRP?: ERP
 Test Distance (m): 10 Voltage/Frequency: 120VAC/60Hz Frequency Range: 30-1000 MHz
 Net = Generator Level (0.00 dBm) + (EUT reading - Generator reading) - Cable Loss + Antenna Gain (dBi or dBd)

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	EUT Reading dB(uV)	Generator Reading dB(uV)	Transmit Cable Loss dB	Transmit Antenna dBi	Generator Level dBm	Net dBm	Limit dBm	Margin dB	Bandwidth
PK	H	301.118	49.07	73.59	1.01	-4.69	-20.00	-52.37	-13.00	-39.37	120/300 kHz
PK	H	615.069	45.67	75.01	1.56	1.60	-20.00	-51.45	-13.00	-38.45	120/300 kHz
PK	H	381.247	51.34	72.44	1.15	-4.20	-20.00	-48.61	-13.00	-35.61	120/300 kHz
PK	H	33.548	43.98	57.49	0.34	-8.99	-20.00	-44.99	-13.00	-31.99	120/300 kHz
PK	V	104.003	59.41	84.19	0.60	-1.40	-20.00	-48.93	-13.00	-35.93	120/300 kHz
PK	V	124.845	60.48	84.75	0.61	0.68	-20.00	-46.35	-13.00	-33.35	120/300 kHz
PK	V	155.749	63.17	84.43	0.66	1.10	-20.00	-42.97	-13.00	-29.97	120/300 kHz
PK	V	152.642	67.24	85.33	0.65	1.44	-20.00	-39.45	-13.00	-26.45	120/300 kHz
PK	V	146.525	67.93	85.46	0.63	1.70	-20.00	-38.61	-13.00	-25.61	120/300 kHz

Radiated Emissions, Substitution

Company: Eric Laufer Wind
 Model #: Model C
 Serial #: C001
 Engineer(s): Vathana Ven
 Location: 10m Chamber
 Project #: G101812529 Date(s): 01/16/15
 Standard: FCC Part 90, Subpart F
 Barometer: DAV002 Temp/Humidity/Pressure: 22 deg C 10% 1001mbar
 Rx Antenna: ETS001
 Rx Cable(s): 145-416
 Rx Preamp: NONE
 Rx Preamplifier: 145-128
 Tx Antenna: HORN3
 Tx Cable(s): CBLSHF203
 Tx Signal Generator: HEW62
 ERP or EIRP?: ERP
 Test Distance (m): 3 Voltage/Frequency: 120VAC/60Hz Frequency Range: 1-40 GHz
 Net = Generator Level (0.00 dBm) + (EUT reading - Generator reading) - Cable Loss + Antenna Gain (dBi or dBd)
 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	EUT Reading dB(uV)	Generator Reading dB(uV)	Transmit Cable Loss dB	Transmit Antenna dBi	Generator Level dBm	Net dBm	Limit dBm	Margin dB	Bandwidth
1-9.360 GHz (9400-40 = 9360 MHz) & 9.440 (9400+40 = 9440 MHz) - 15 GHz											
With Notch filter and no pre-amp, AVG reading = EUT Peak Reading - Average Factor of 60 dB											
PK	V	1072.144	-32.49	48.57	2.98	2.79	-20.00	-103.40	-13.00	-90.40	1/3 MHz
PK	V	1446.894	-32.37	48.74	3.55	4.92	-20.00	-101.89	-13.00	-88.89	1/3 MHz
PK	V	1909.820	-27.90	43.19	4.19	4.68	-20.00	-92.75	-13.00	-79.75	1/3 MHz
PK	V	6771.543	-22.00	40.59	6.41	11.02	-20.00	-80.13	-13.00	-67.13	1/3 MHz
PK	V	9183.000	-13.97	35.57	7.24	12.47	-20.00	-66.46	-13.00	-53.46	1/3 MHz
PK	V	9275.000	-12.61	35.98	7.38	12.49	-20.00	-65.63	-13.00	-52.63	1/3 MHz
PK	V	9342.000	2.96	32.86	7.37	12.46	-20.00	-46.96	-13.00	-33.96	1/3 MHz
PK	V	9360.000	-2.83	30.52	7.36	12.46	-20.00	-50.41	-13.00	-37.41	1/3 MHz
PK	V	9440.000	-8.09	30.84	7.36	12.42	-20.00	-56.02	-13.00	-43.02	1/3 MHz
PK	V	9461.000	-1.80	34.23	7.35	12.42	-20.00	-53.12	-13.00	-40.12	1/3 MHz
PK	V	9506.000	-8.58	34.09	7.36	12.40	-20.00	-59.78	-13.00	-46.78	1/3 MHz
PK	V	9548.000	-12.04	35.25	7.40	12.40	-20.00	-64.44	-13.00	-51.44	1/3 MHz

No emissions were detected from 15-18GHz. Test equipment used: HP filter, 145-128, ETS001, CBLSHF203, and no pre-amp
No emissions were detected from 18-40 GHz. Test equipment used: HP filter, 145-128, EMC04, CBLSHF203 and no pre-amp

Test Personnel: Vathana Ven *VSV*
 Supervising/Reviewing
 Engineer:
 (Where Applicable) N/A
 Product Standard: Part 90 Subpart F
 Input Voltage: 120V/60Hz
 Pretest Verification w/
 Ambient Signals or
 BB Source: BB Source and Ambient
 Signals

Test Date: 01/16/2015
 Limit Applied: -13 dBm
 Ambient Temperature: 20 °C
 Relative Humidity: 12 %
 Atmospheric Pressure: 1007 mbars

Deviations, Additions, or Exclusions: None

10 AC Mains Conducted Emissions

10.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C 15.207 and ANSI C63.4:2009.

TEST SITE: EMC Lab

The EMC Lab has two Semi-anechoic Chambers and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

The AMAP Building and Lab includes general lab space that can be used for testing where a shielded/enclosed environment is not required.

Measurement Uncertainty

For conducted emissions, U_{lab} (3.1 dB in worst case) $< U_{CISPR}$ (3.6 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 Calculations

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

$$NF = RF + LF + CF + AF$$

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

RF = Reading from receiver in $\text{dB}\mu\text{V}$

LF = LISN or ISN Correction Factor in dB

CF = Cable Correction Factor in dB

AF = Attenuator Loss Factor in dB

To convert from $\text{dB}\mu\text{V}$ to μV or mV the following was used:

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

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

Example:

$$NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 \text{ dB}\mu\text{V}$$

$$UF = 10^{(49.1 \text{ dB}\mu\text{V}/20)} = 285.1 \mu\text{V}/\text{m}$$

10.2 Test Equipment Used:

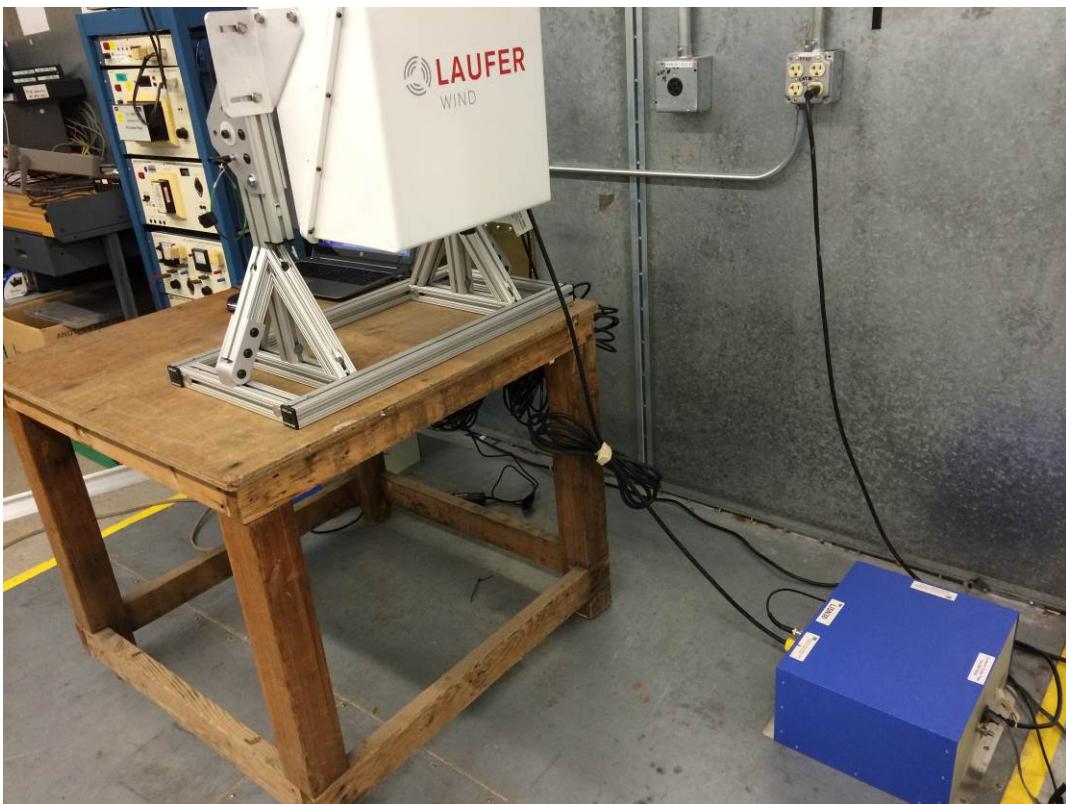
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
SAF1081'	Weather condition station	Davis Instruments	Vue / 6351	G120425D113	01/31/2014	01/31/2015
ROS002'	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	07/22/2014	07/22/2015
DS26A'	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS26A	10/09/2014	10/09/2015
LISN30'	CISPR 16 LISN	Com-Power	LI-215A	191961	02/26/2014	02/26/2015
CBLBNC2012-5'	50 Ohm Coaxial Cable	Pomona	RG58C/U	CBLBNC2012-5	12/26/2013	12/26/2014

Software Utilized:

Name	Manufacturer	Version
C5	Teseq	5.26.46.46

10.3 Results:

The sample tested was found to Comply.

10.4 Setup Photographs:

10.5 Plots/Data:

Standby/Idle Mode, 120VAC/60Hz

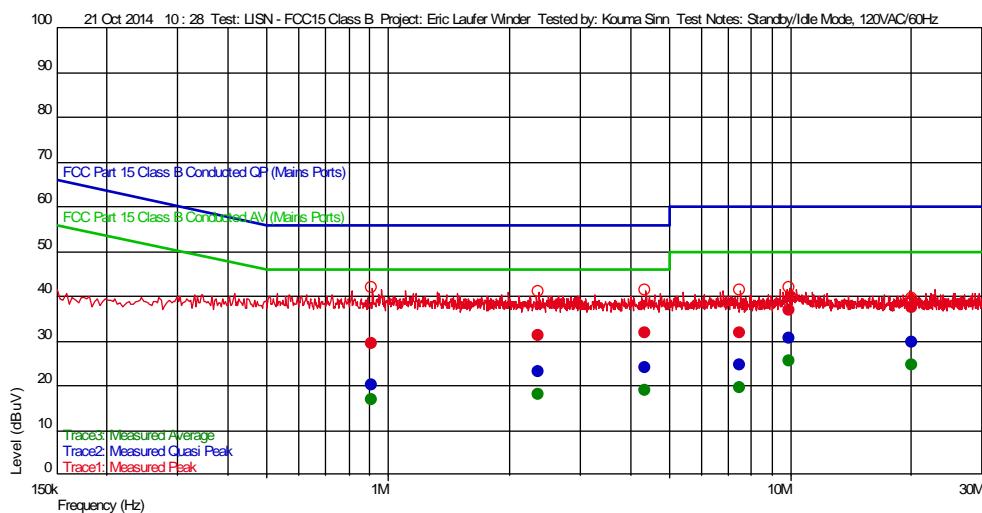
Test Information

Test Details
 Test: LISN - FCC15 Class B
 Project: Eric Laufer Winder
 Test Notes: Standby/Idle Mode, 120VAC/60Hz
 Temperature: 22C
 Humidity: 34%, 1006
 Tested by: Kouma Sinn
 Test Started: 21 Oct 2014 10 : 28

User Entry
 LISN - FCC15 Class B
 Eric Laufer Winder
 Standby/Idle Mode, 120VAC/60Hz
 22C
 34%, 1006
 Kouma Sinn
 21 Oct 2014 10 : 28

Additional Information

Prescan Emission Graph



Emissions Test Data

Trace2: Measured Quasi Peak

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	Comment	LINE
913.8 k	20.13	0.030	20.860	56.000	-35.87	9 k		L1
7.515 M	24.70	0.030	20.903	60.000	-35.30	9 k		L1
2.3787 M	23.21	0.030	20.829	56.000	-32.79	9 k		N
4.372 M	23.92	0.037	20.764	56.000	-32.08	9 k		L1
20.04 M	29.69	0.070	21.061	60.000	-30.31	9 k		L1
9.979 M	30.61	0.060	20.860	60.000	-29.39	9 k		N

Trace3: Measured Average

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	Comment	LINE
7.515 M	19.63	0.030	20.903	50.000	-30.37	9 k		L1
913.8 k	16.95	0.030	20.860	46.000	-29.05	9 k		L1
2.3787 M	18.11	0.030	20.829	46.000	-27.89	9 k		N
4.372 M	18.82	0.037	20.764	46.000	-27.18	9 k		L1
20.04 M	24.60	0.070	21.061	50.000	-25.40	9 k		L1
9.979 M	25.49	0.060	20.860	50.000	-24.51	9 k		N

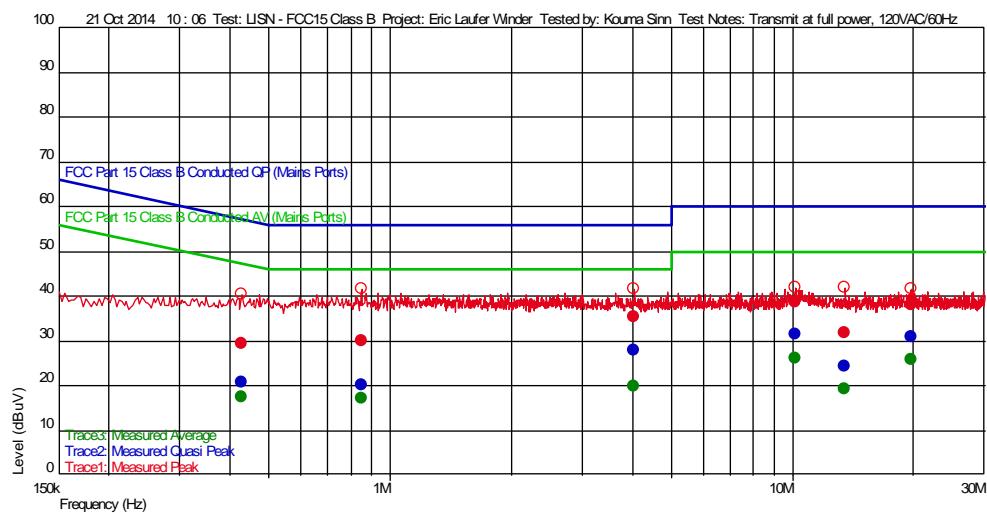
Transmit and Receive at full power, 120VAC/60Hz

Test Information

Test Details
 Test: LISN - FCC15 Class B
 Project: Eric Laufer Winder
 Test Notes: Transmit at full power, 120VAC/60Hz
 Temperature: 22C
 Humidity: 34%, 1006
 Tested by: Kouma Sinn
 Test Started: 21 Oct 2014 10 : 06

Additional Information

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

Trace2: Measured Quasi Peak

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	Comment	LINE
429.3 k	20.62	0.021	20.819	57.266	-36.64	9 k	N	
851.1 k	20.12	0.030	20.853	56.000	-35.88	9 k	L1	
13.56 M	24.29	0.060	20.931	60.000	-35.71	9 k	L1	
19.72 M	31.02	0.070	21.054	60.000	-28.98	9 k	L1	
10.22 M	31.62	0.060	20.864	60.000	-28.38	9 k	N	
4.05 M	28.05	0.034	20.771	56.000	-27.95	9 k	N	

Trace3: Measured Average

Frequency(Hz)	Level(dBuV)	TF	PA+CL	Limit(dBuV)	Margin(dBuV)	RBW(Hz)	Comment	LINE
13.56 M	19.28	0.060	20.931	50.000	-30.72	9 k	L1	
429.3 k	17.37	0.021	20.819	47.266	-29.89	9 k	N	
851.1 k	17.12	0.030	20.853	46.000	-28.88	9 k	L1	
4.05 M	19.87	0.034	20.771	46.000	-26.13	9 k	N	
19.72 M	25.82	0.070	21.054	50.000	-24.18	9 k	L1	
10.22 M	26.02	0.060	20.864	50.000	-23.98	9 k	N	

Test Personnel: Kouma Sinn KPS
Supervising/Reviewing
Engineer:
(Where Applicable) N/A
Product Standard: FCC Part 15 Subpart B
Input Voltage: EN 55022
120VAC/60Hz, 230VAC/50Hz
Pretest Verification w/
Ambient Signals or
BB Source: Ambient Signals

Test Date: 10/21/2014
Limit Applied: All Class B
Ambient Temperature: 22 °C
Relative Humidity: 34 %
Atmospheric Pressure: 1006 mbars

Deviations, Additions, or Exclusions: None

11 Frequency Stability

11.1 Method

Tests are performed in accordance with FCC 47CFR PT 90 Subpart F.

TEST SITE: Safety Lab

The EMC Lab has two Semi-anechoic Chambers and one Shielded Chamber. AC Mains Power is available at 120, 230, and 277 Single Phase; 208, 400, and 480 3-Phase. Large reference ground-planes are installed in the general lab area to facilitate EMC work not requiring a shielded environment.

The AMAP Building and Lab includes general lab space that can be used for testing where a shielded/enclosed environment is not required.

11.2 Test Equipment Used:

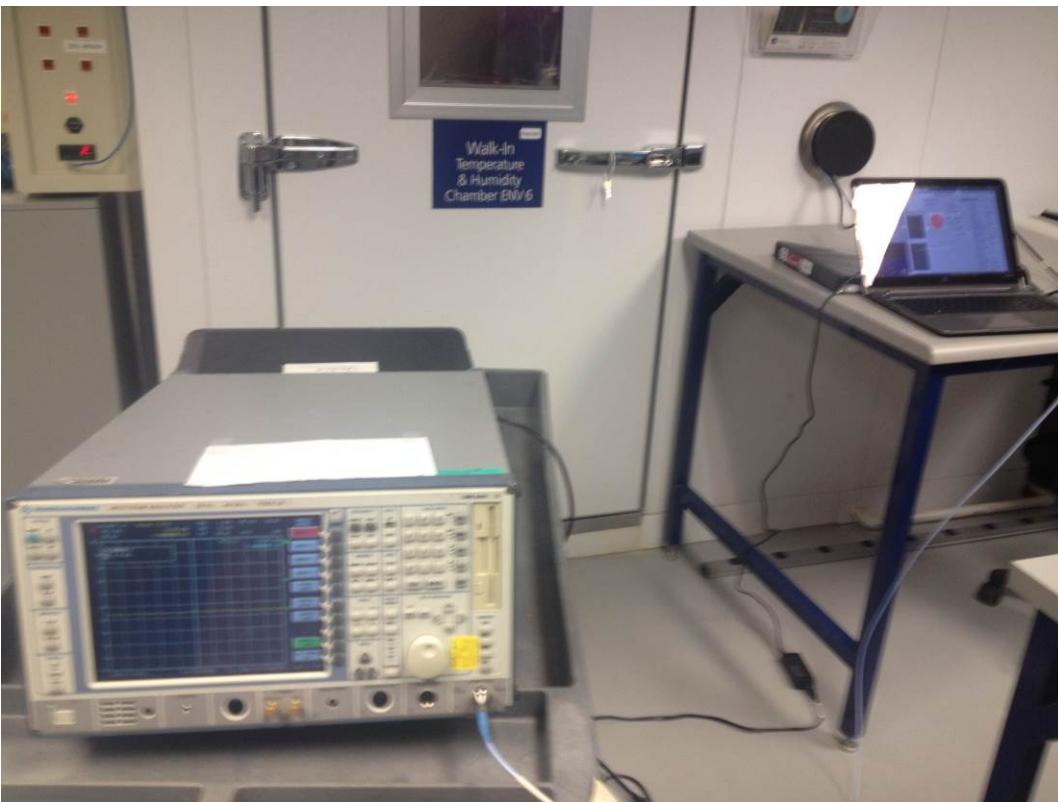
Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	05/19/2014	05/19/2015
SAF279'	Variac, 0-280VAC	Staco Energy	3PN2520B	SAF279	VBU	Verified
SAF881'	Walk-In Humidity Chamber/Controller	Associated Env. Sys.	WR-601	8769	02/10/2014	02/10/2015
CBLHF201 2-5M-2'	5m 40GHz Coaxial Cable	Huber & Suhner	SF102	252676002	01/14/2014	01/14/2015
MET1'	Digital Multimeter	Meterman	15XP	050407785	05/05/2014	05/05/2015

Software Utilized:

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

11.3 Results:

The sample tested was found to Comply.

11.4 Setup Photograph:

11.5 Test Data:**Frequency Stability**

Company: Eric Laufer Wind

Model #: Model C

Serial #: C001

Engineer(s): Vathana Ven

Project #: G101812529

Date(s): 10/28/14

Location: Safety

Standard: FCC Part 90

Limit:

PPM

Nominal f: 9400 MHz

Test Equipment Used:

SAF279 ROS001 MET1

SAF881 CBLHF2012-5M-2

%	Voltage Volts	Frequency MHz	Deviation kHz	Limit kHz
-15%	102	9405.303580	195.68	No limit
-10%	108	9405.284010	176.11	No limit
-5%	114	9405.323150	215.25	No limit
+0%	120	9405.107900	0	No limit
+5%	126	9405.303580	195.68	No limit
+10%	132	9405.342720	234.82	No limit
+15%	138	9405.342720	234.82	No limit

Voltage: 120 VAC

Temp Celsius	Frequency MHz	Deviation kHz	Limit kHz
-30	9407.182330	3248.68	No limit
-20	9406.164670	2231.02	No limit
-10	9402.446300	-1487.35	No limit
0	9405.108000	1174.35	No limit
10	9405.264440	1330.79	No limit
20	9403.933650	0	No limit
30	9403.561810	-371.84	No limit
40	9402.661570	-1272.08	No limit
50	9401.585200	-2348.45	No limit

Test Personnel: Vathana Ven
 Supervising/Reviewing
 Engineer:
 (Where Applicable) N/A
 Product Standard: FCC Part 90 Subpart F
 Input Voltage: 120VAC/60Hz
 Pretest Verification w/
 Ambient Signals or
 BB Source: Ambient Signals

Test Date: 10/28/2014
 Limit Applied: FCC Part 90.213
 Ambient Temperature: N/A
 Relative Humidity: N/A
 Atmospheric Pressure: N/A

Deviations, Additions, or Exclusions: None

12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	01/28/2015	101812529BOX-012a	VFV/ <i>VSF</i>	MFM <i>AB</i>	Original Issue