EMISSIONS TEST REPORT

Report Number: 101158115BOX-001d
Project Number: G101158115

Report Issue Date: 01/13/2014

Product Designation: ADSS Radar Module

Standards: FCC 47CFR PT 90 Subpart F (2013): 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

Kouma Sinn / Senior Project Engineer, EMC

Report reviewed by

Jason Centers / Senior Project Engineer, EMC

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 15.209)	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
Pulse Doppler Radar	Laufer Wind	ADSS Radar Module	004

Receive Date:	06/03/2013 & 12/13/2013
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
The purpose of the ADSS Pulse Doppler Radar is to detect and track aircraft and other objects that are flying within specified ranges of a Wind Turbine Park. Doppler Radar measurements are used by the ADSS Central Controller to determine if aircraft are approaching the Wind Park, and to turn- on Obstruction Light Modules to warn-off incoming aircraft that are approaching too close to the Wind Park.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
100-240 VAC	5 A	50/60 Hz	1

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Transmitting at full power, 12 kW (peak), 9.4 GHz nominal (X-Band)

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	Windows 7 Product code: C4P3Y-RRMCG-4MFJB-383GF-M47F8 Radar Controller version: LW-r3157

5 System Setup and Method

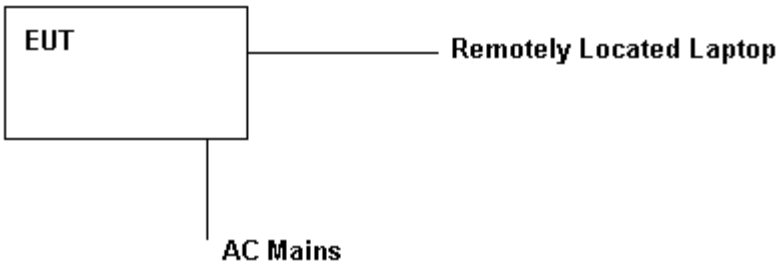
Cables					
ID	Description	Length (ft)	Shielding	Ferrites	Termination
--	Ethernet Cable	50	Braid	None	Laptop
--	AC Mains Cable	10	Braid	None	AC Mains

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	Samsung	Samsung NP-R540JA08US	HGSF63AB703209K

5.1 Method:

Configuration as required by FCC 47CFR PT 90 Subpart F (2013), FCC Public Notice DA:04-3946, Agilent Application Note 150-2, and ANSI C63.10:2009 Annex C.

5.2 EUT Block Diagram:



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: 10m Chamber Building, Bench

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	09/25/2012	09/25/2014
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	04/25/2013	04/25/2014
CBLHF2012-2M-1'	2m 40GHz Coaxial Cable	Huber & Suhner	SF102	252675001	12/18/2012	12/18/2013
None	Waveguide Directional Coupler	Connecticut Microwave Corp.	334031	A771A	07/05/2013	07/05/2014
None	20 dB Attenuator	Pasternack	SA18E-20	Not Labeled	Verified 07/17/2013	Verified 07/17/2014

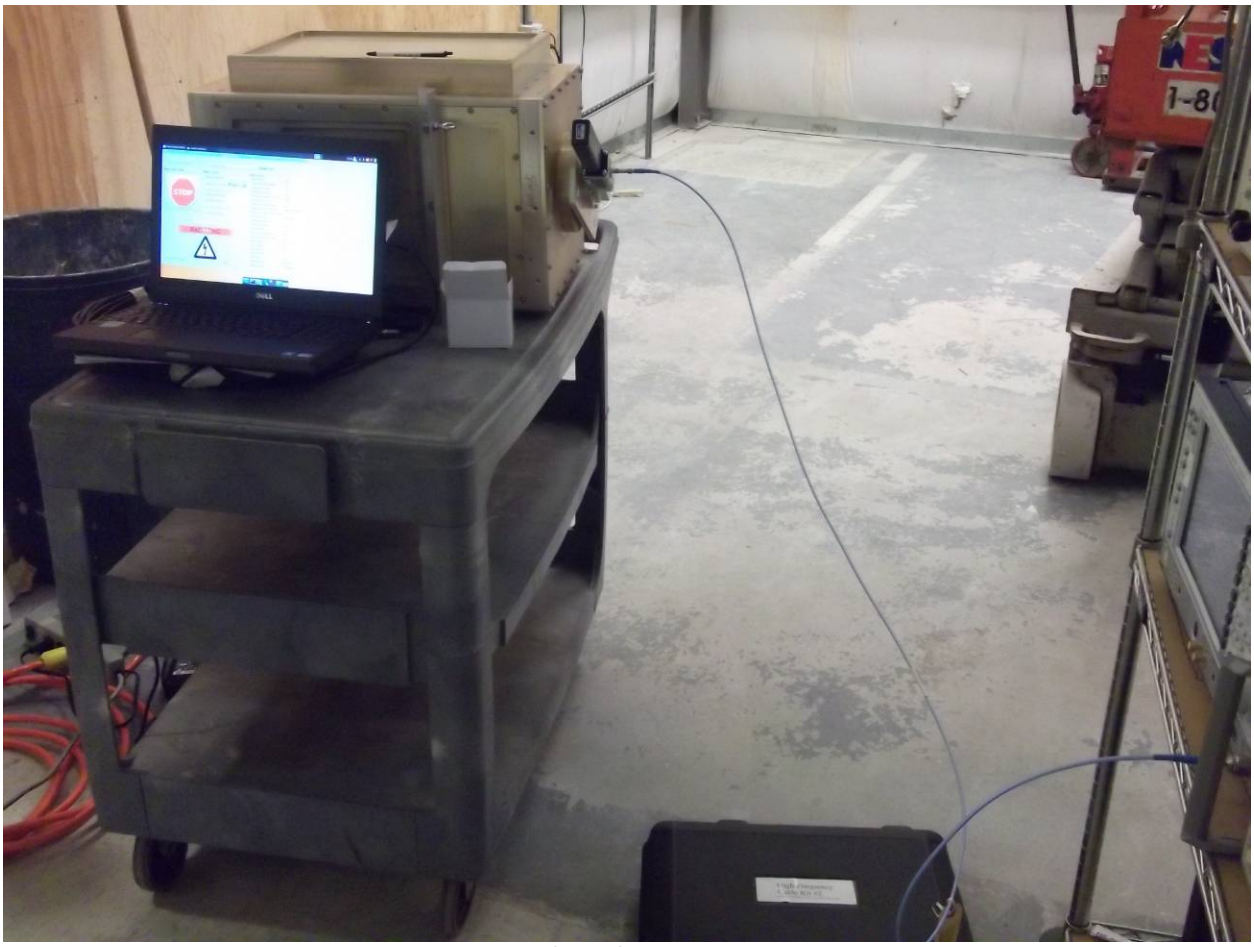
Software Utilized:

Name	Manufacturer	Version
None		

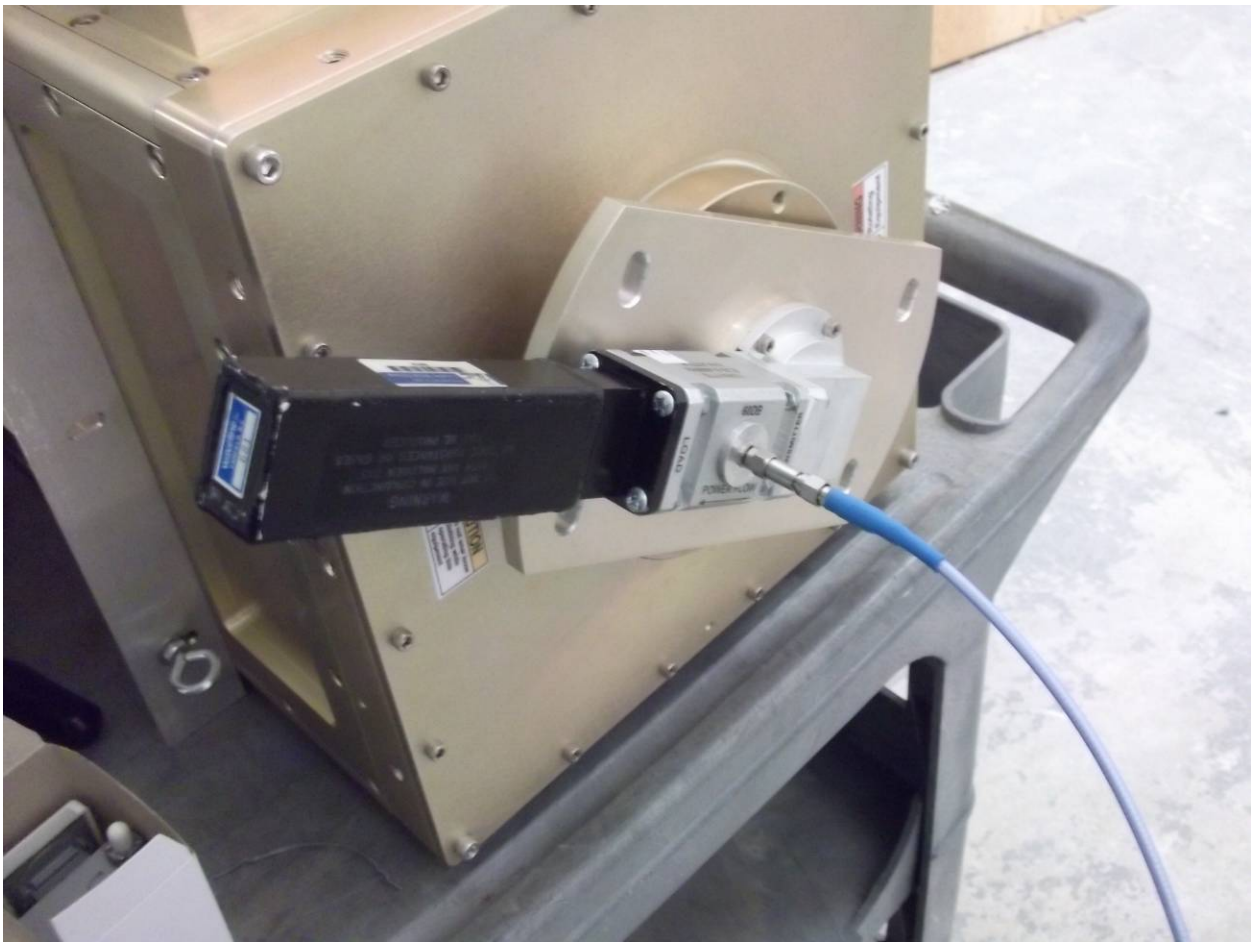
6.3 Results:

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

6.4 Setup Photographs:



Conducted Test Setup



Conducted Test Setup

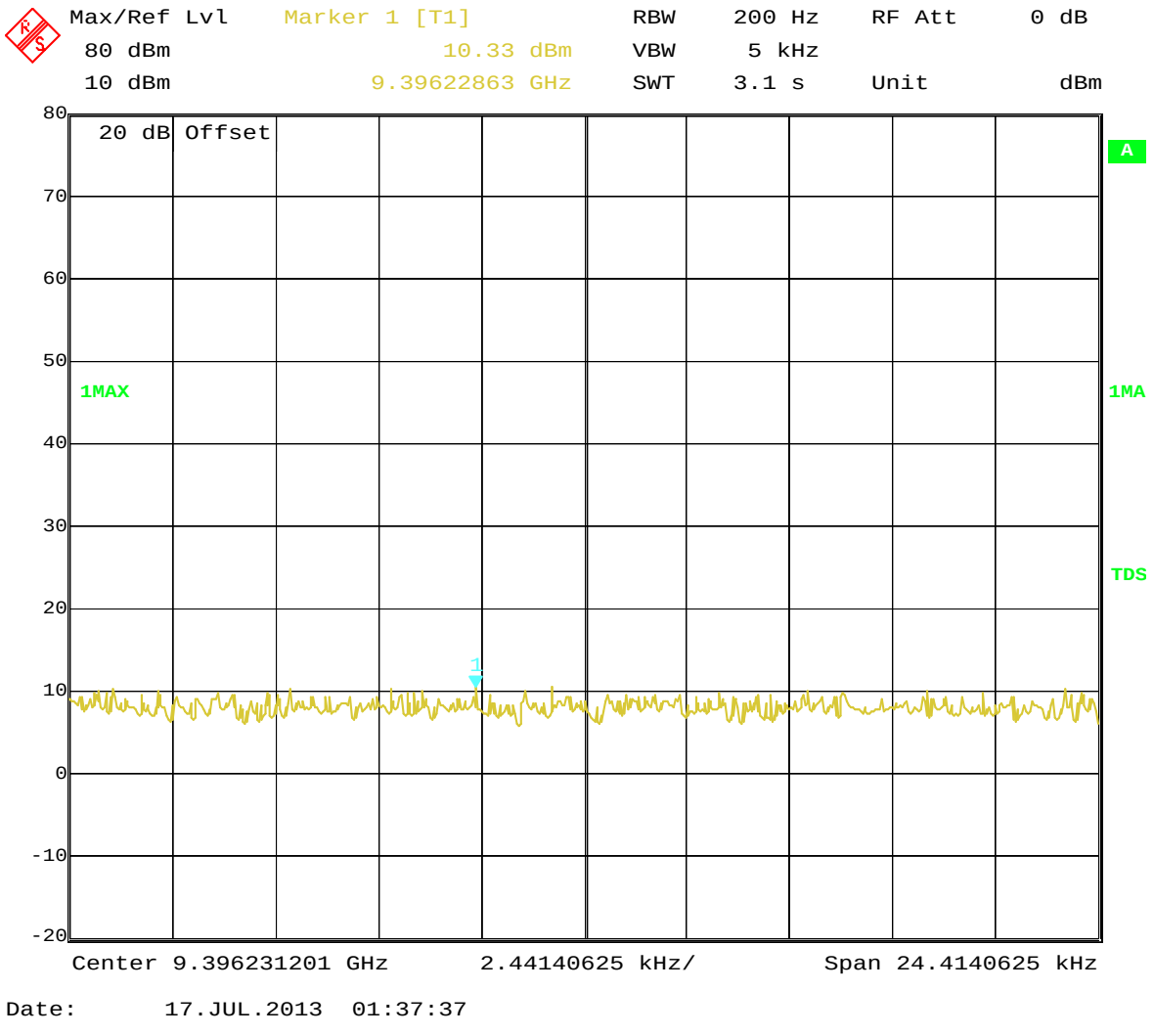
6.5 Plots/Data:

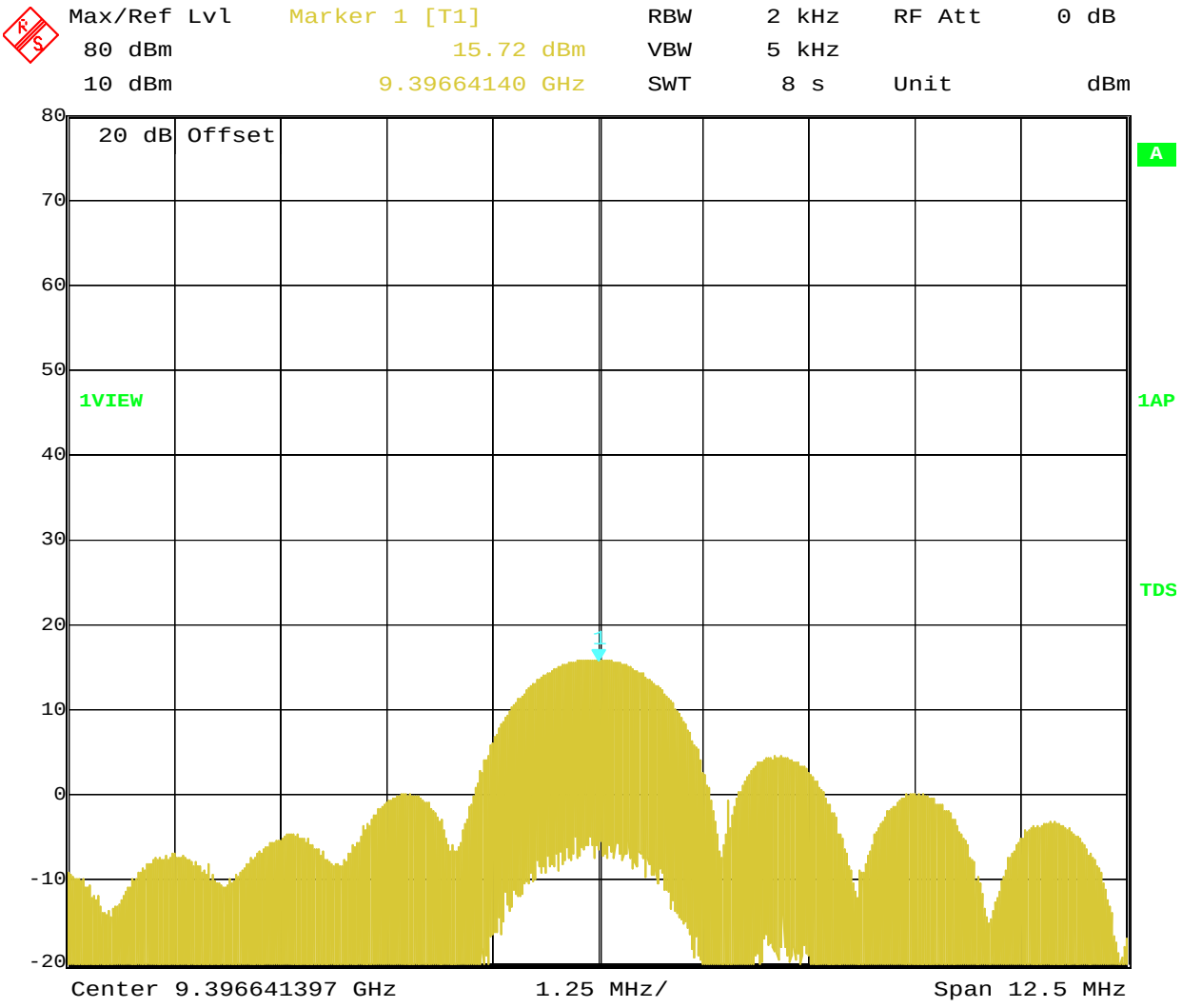
Pulse Characteristics
PRF: 2 kHz
Pulse Width: 500 ns

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: 10.33 dBm + 1.74 dB + 60 dB = 72.07 dBm (16.1 kW)
Average Power: Peak Output Power – Average Factor, where calculated average factor equal to 10*log(duty cycle) or 30 dB.
Average Power: 72.07 dBm – 30 dB = 42.07 dBm (16.1 Watts)





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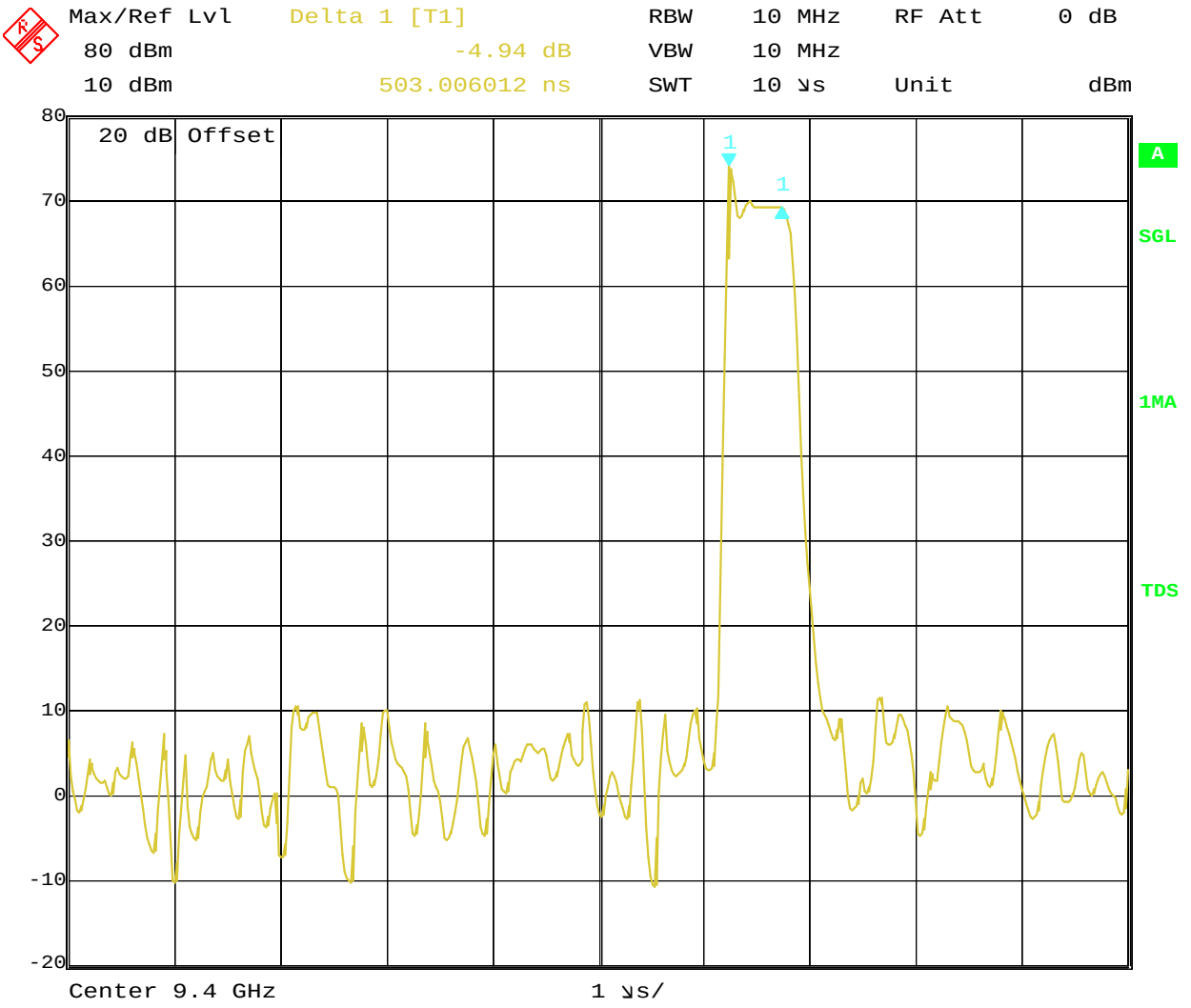
Wide span of line spectrum (RBW not fully reduced to 0.1*PRF yet)



Pulse width

Test Personnel:	Nicholas Abbondante	Test Date:	07/16/2013
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	Part 90 Subpart F	Limit Applied:	No limit, case by case authorization
Input Voltage:	120V/60Hz	Ambient Temperature:	24 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Yes**	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: 10m Chamber Building, Bench

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	09/25/2012	09/25/2014
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	04/25/2013	04/25/2014
CBLHF201 2-2M-1'	2m 40GHz Coaxial Cable	Huber & Suhner	SF102	252675001	12/18/2012	12/18/2013
None	Waveguide Directional Coupler	Connecticut Microwave Corp.	334031	A771A	07/05/2013	07/05/2014
None	20 dB Attenuator	Pasternack	SA18E-20	Not Labeled	Verified 07/17/2013	Verified 07/17/2014

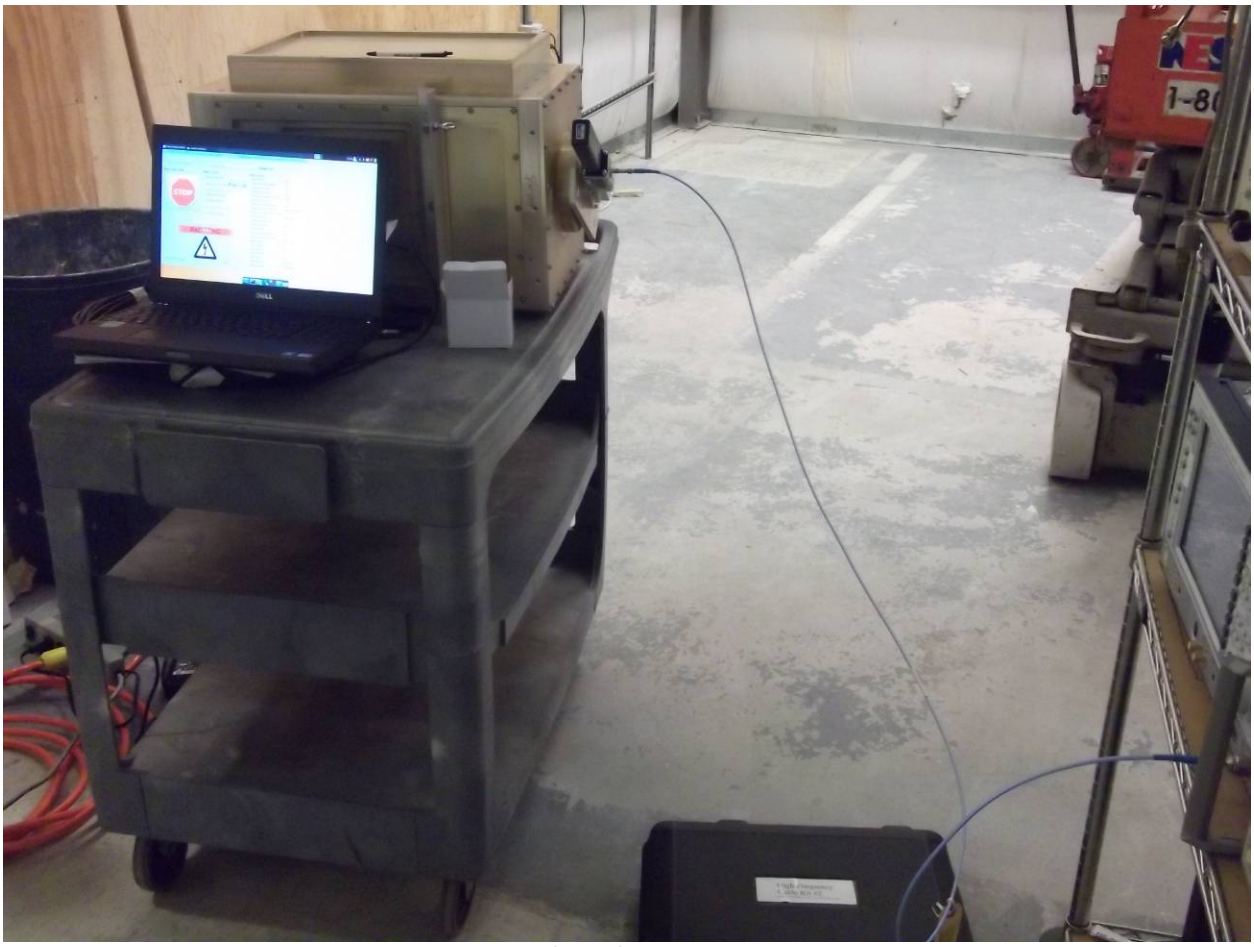
Software Utilized:

Name	Manufacturer	Version
None		

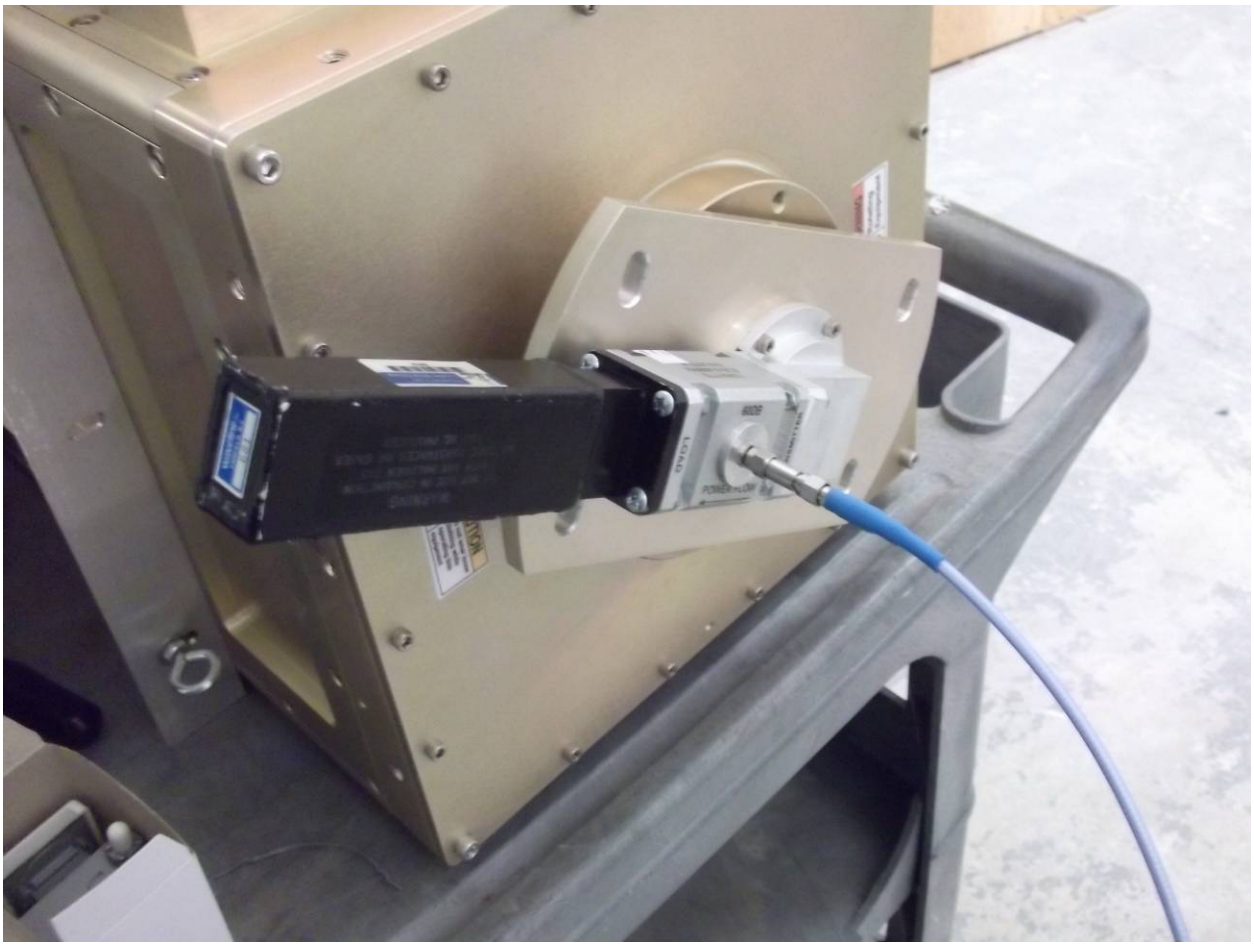
7.3 Results:

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

7.4 Setup Photographs:

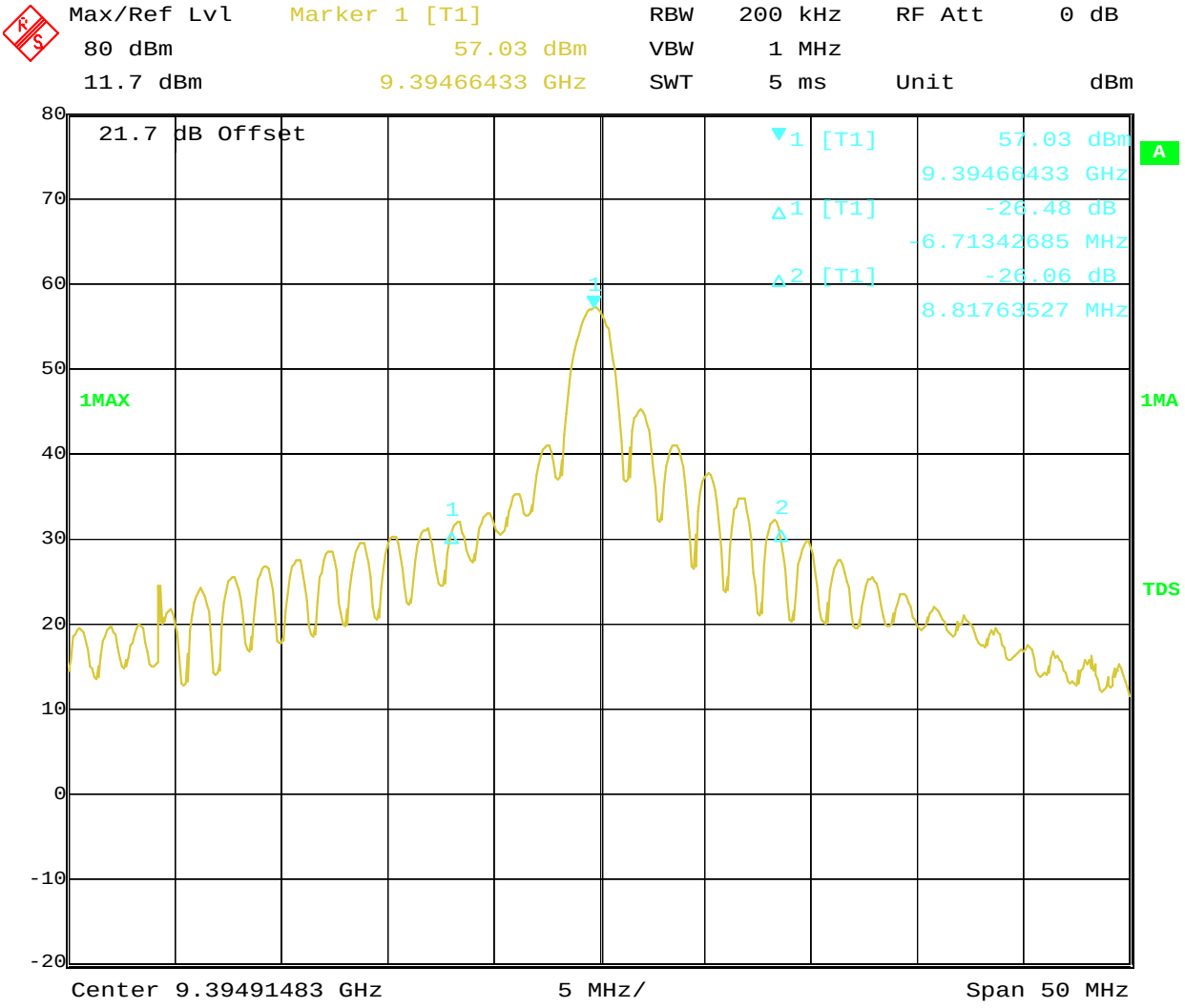


Conducted Test Setup



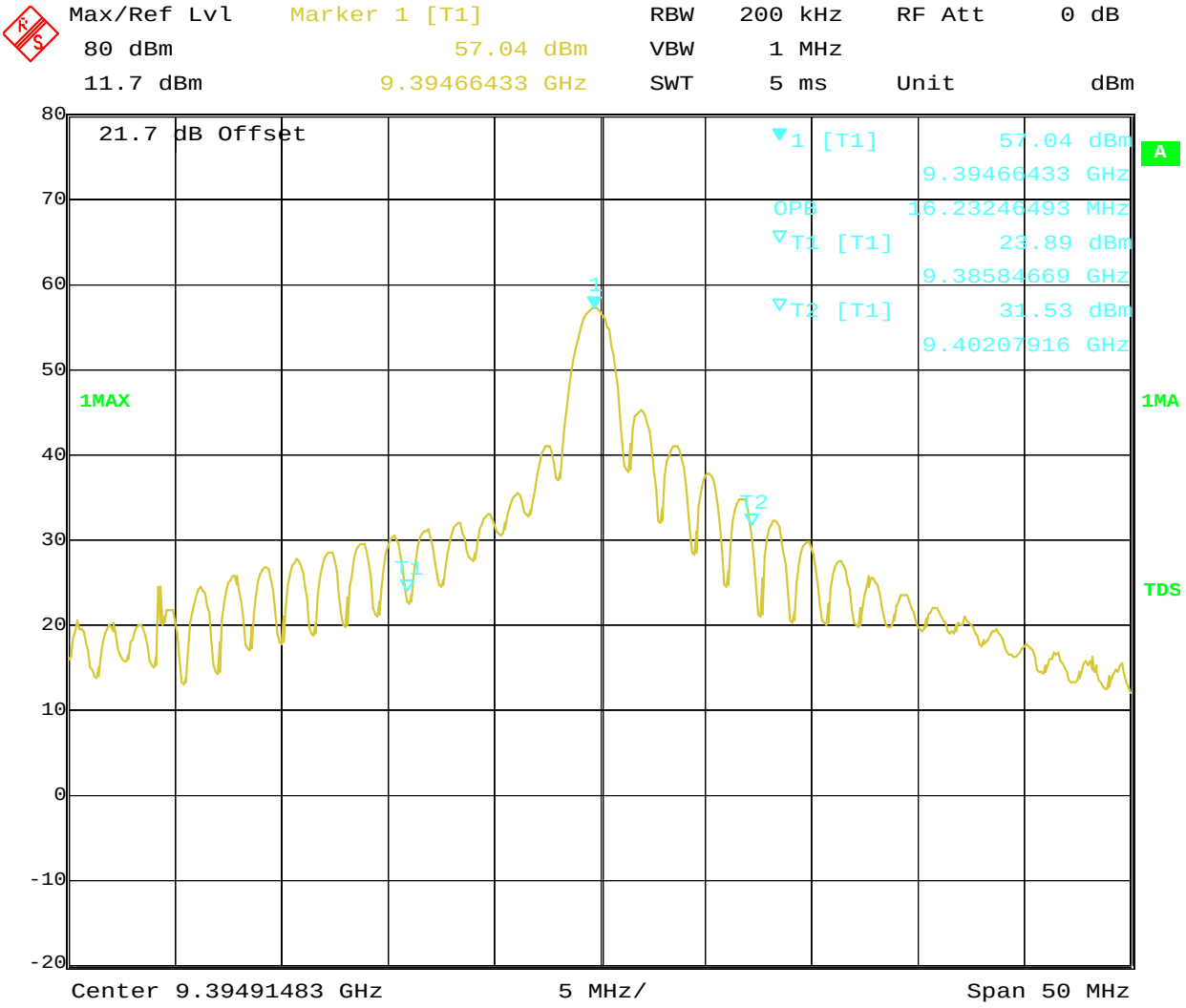
Conducted Test Setup

7.5 Plots/Data:



Date: 17.JUL.2013 23:56:02

26 dB Bandwidth = 15.53 MHz



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99% Power Bandwidth = 16.23 MHz

Test Personnel:	Nicholas Abbondante	Test Date:	07/17/2013
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	Part 90 Subpart F	Limit Applied:	No limit, case by case authorization
Input Voltage:	120V/60Hz	Ambient Temperature:	24 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Yes**	Relative Humidity:	49 %
		Atmospheric Pressure:	1006 mbars

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: 10m Chamber Building, Bench

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	09/25/2012	09/25/2014
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	04/25/2013	04/25/2014
CBLHF201 2-2M-1'	2m 40GHz Coaxial Cable	Huber & Suhner	SF102	252675001	12/18/2012	12/18/2013
None	Waveguide Directional Coupler	Connecticut Microwave Corp.	334031	A771A	07/05/2013	07/05/2014
None	20 dB Attenuator	Pasternack	SA18E-20	Not Labeled	Verified 07/17/2013	Verified 07/17/2014

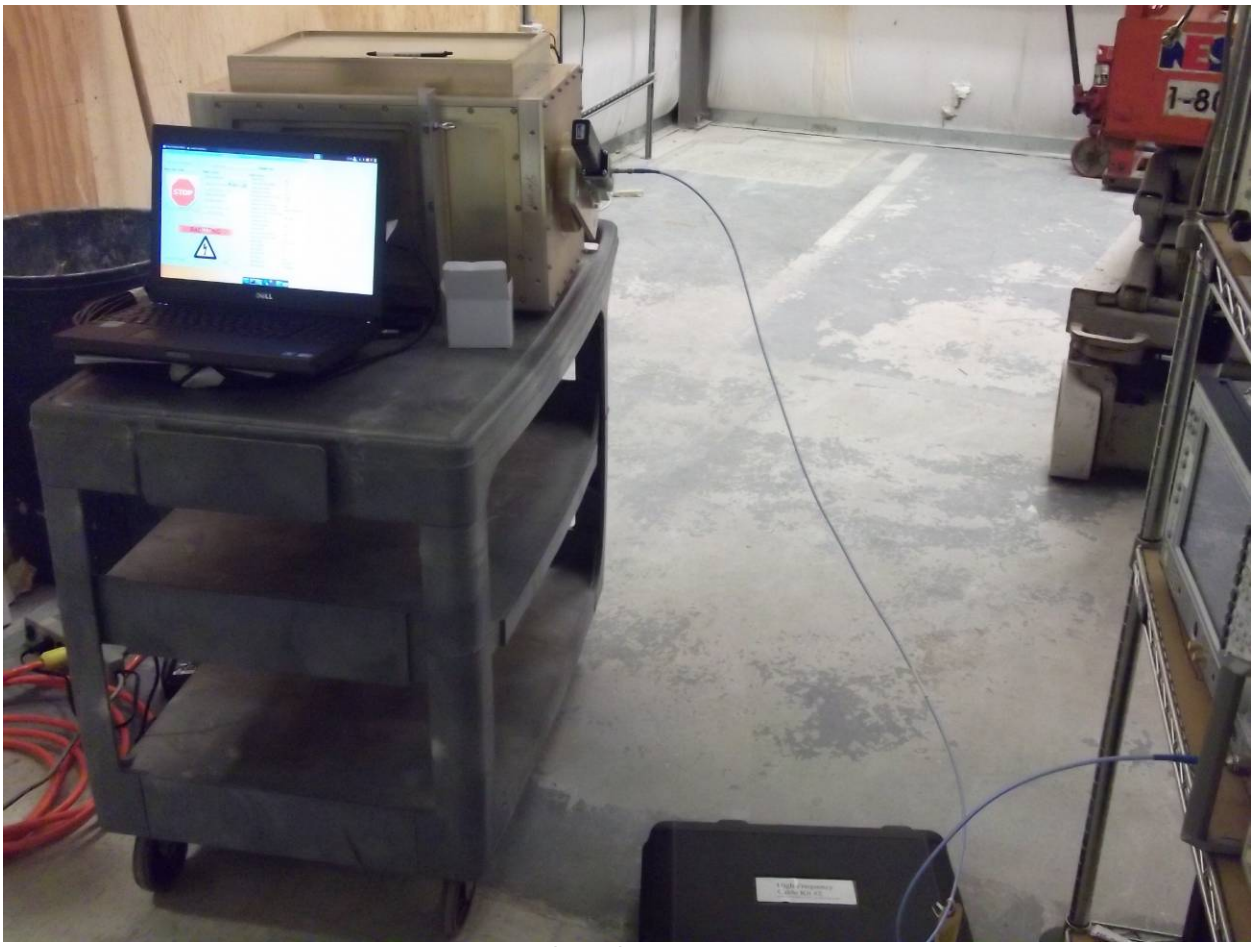
Software Utilized:

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

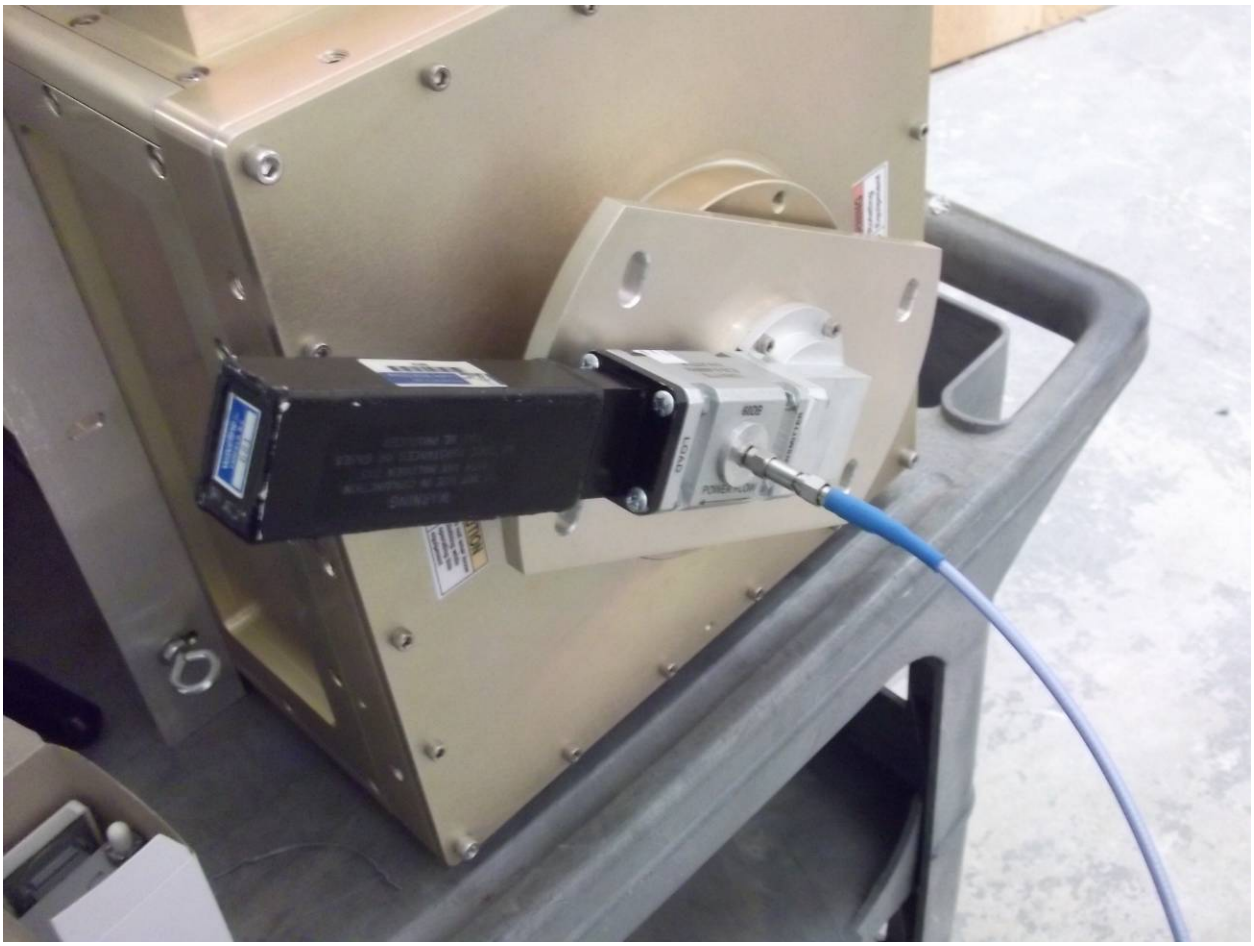
8.3 Results:

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.

8.4 Setup Photographs:

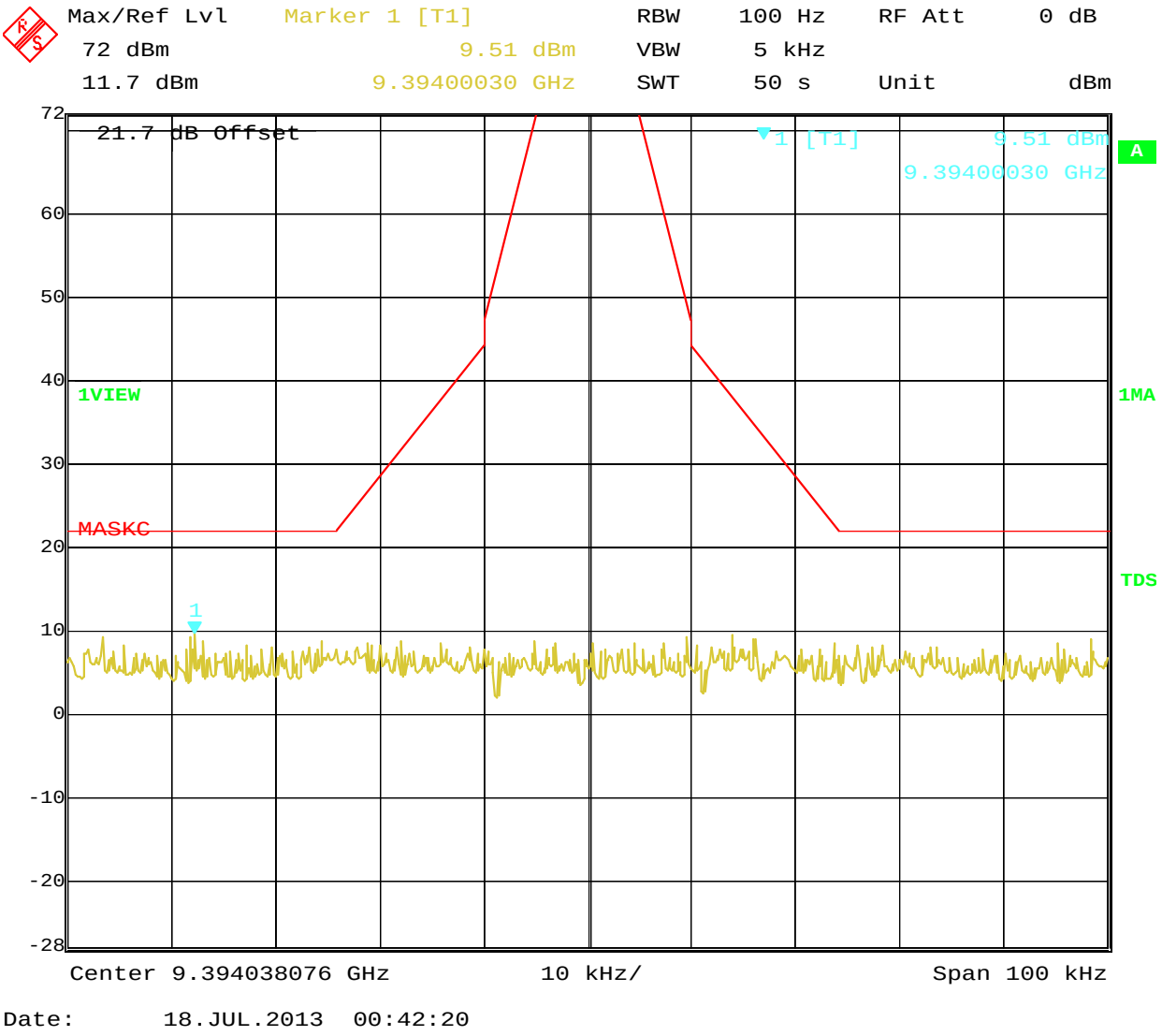


Conducted Test Setup

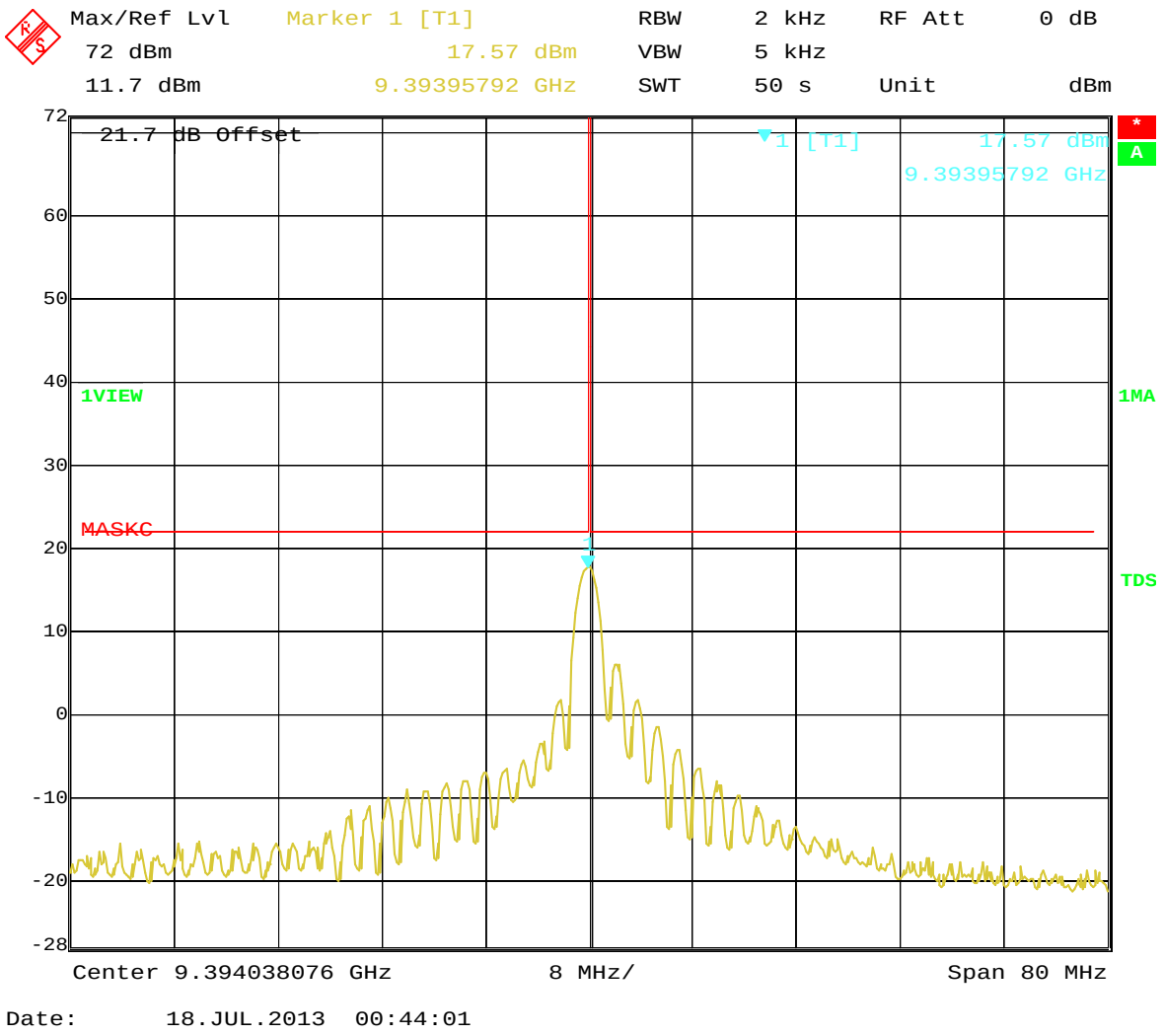


Conducted Test Setup

8.5 Plots/Data:



Emissions Mask C, 100 kHz Span, Referenced to 72.07 dBm Output Power, 100 Hz RBW



Emissions Mask C, 80 MHz Span (250% bandwidth), Referenced to 72.07 dBm Output Power, 2 kHz RBW used for plot generation purposes, compliance is still demonstrated

Test Personnel:	Nicholas Abbondante	Test Date:	07/17/2013
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	Part 90 Subpart F	Limit Applied:	No limit, case by case authorization
Input Voltage:	120V/60Hz	Ambient Temperature:	24 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Yes**	Relative Humidity:	49 %
		Atmospheric Pressure:	1006 mbars

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 wooden 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 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

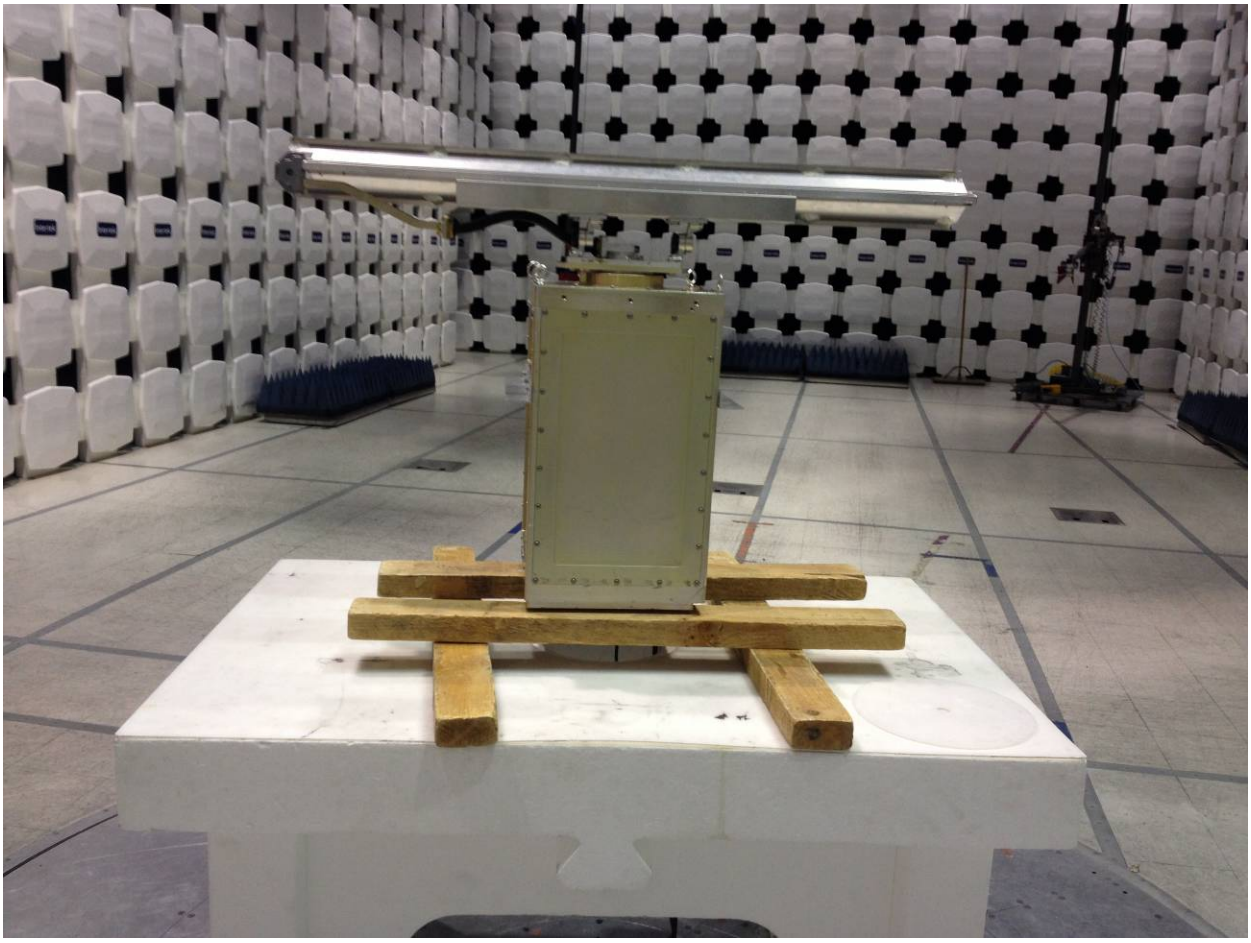
9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
None	Notch Filter	K & L Microwave	5NSL11-00002	1	Verified 12/13/2013	Verified 12/13/2013
None	High Pass Filter	K & L Microwave	11SH01-00384	1	Verified 12/13/2013	Verified 12/13/2013
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
145128'	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	10/01/2013	10/01/2014
ANT1A'	BROADBAND ANTENNA	Compliance Design	B100	1649	09/13/2013	09/13/2014
ANT1B'	BROADBAND ANTENNA	Compliance Design	B200	1650	09/13/2013	09/13/2014
HEW62'	Synthesized Sweep Generator	Hewlett Packard	83620A	3213A01244	04/22/2013	04/22/2015
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	12/17/2012	12/17/2013
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
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	12/19/2012	12/19/2013
CBLHF2012-2M-1'	2m 40GHz Coaxial Cable	Huber & Suhner	SF102	252675001	12/18/2012	12/18/2013
CBLHF2012-5M-1'	5m 40GHz Coaxial Cable	Huber & Suhner	SF102	252676001	12/18/2012	12/18/2013

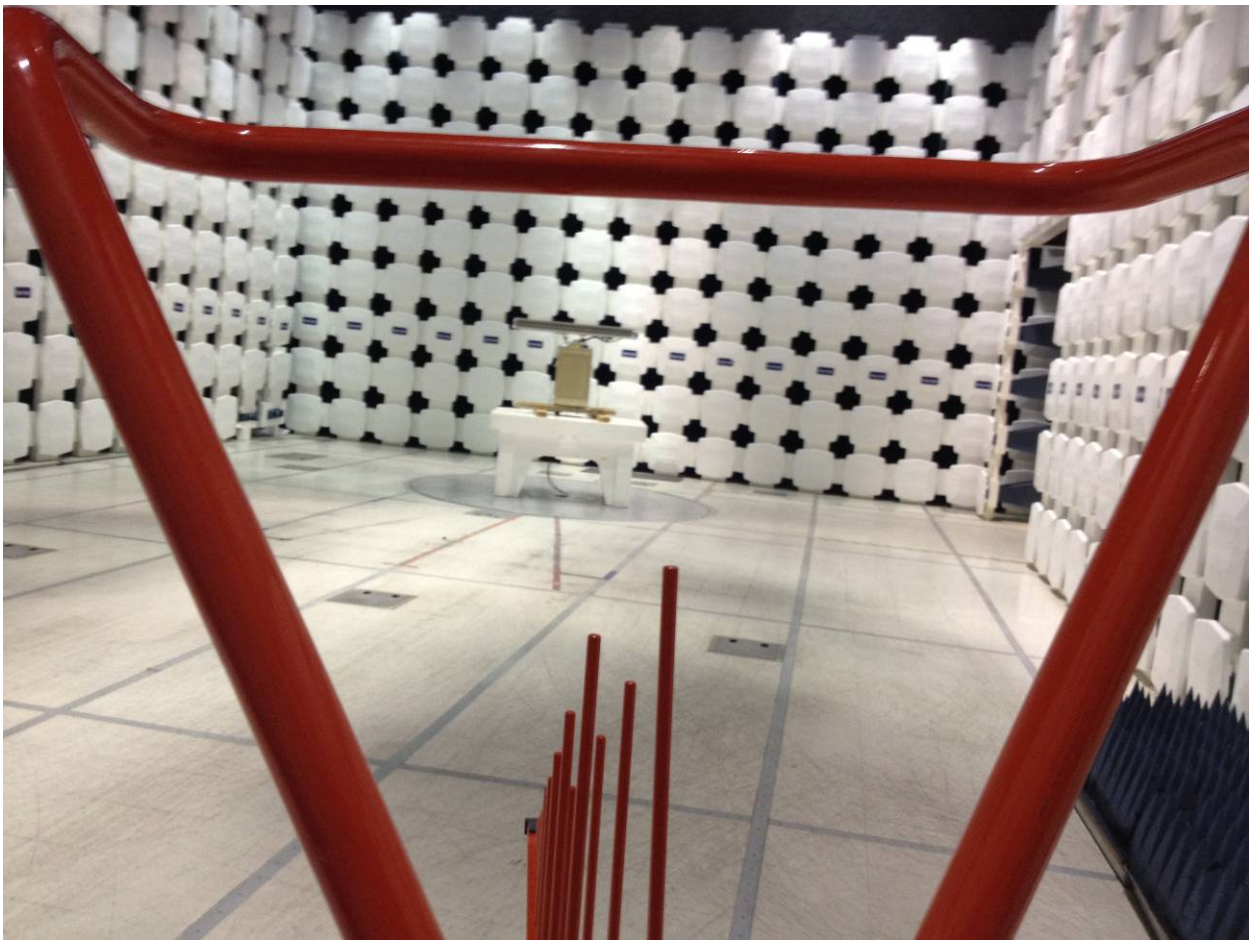
9.3 Results:

The sample tested was found to Comply.

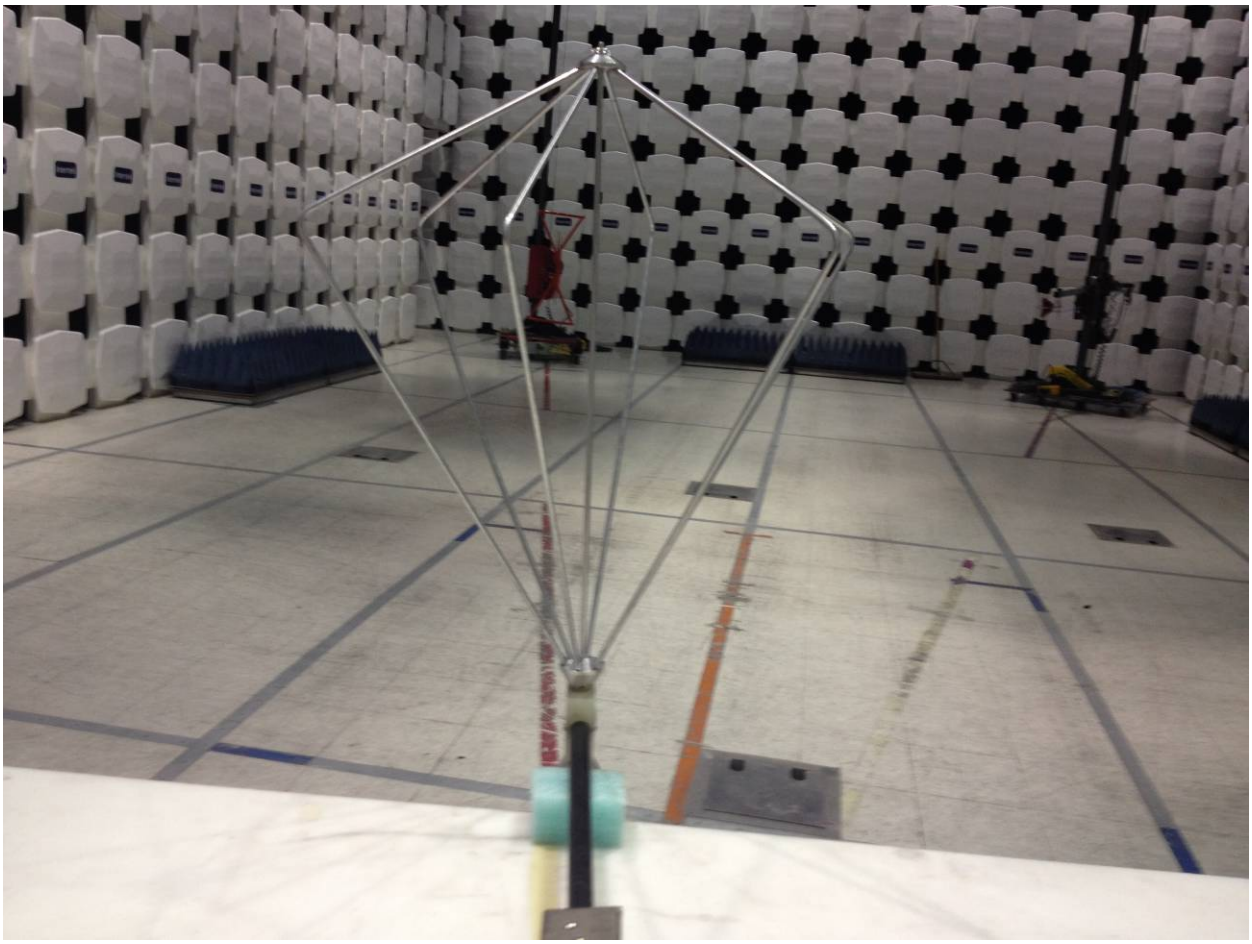
9.4 Setup Photographs:



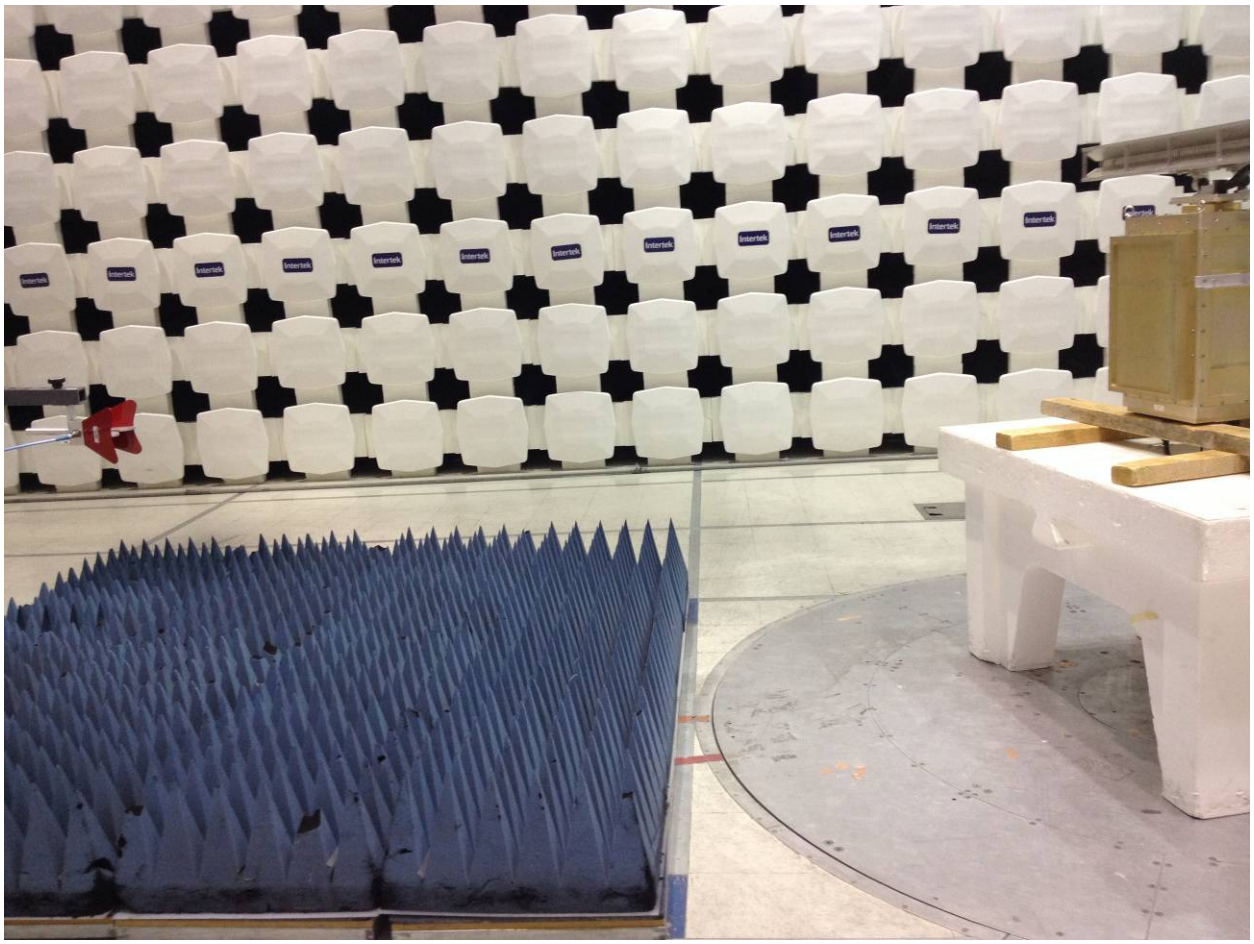
30-1000 MHz Radiated Test Setup



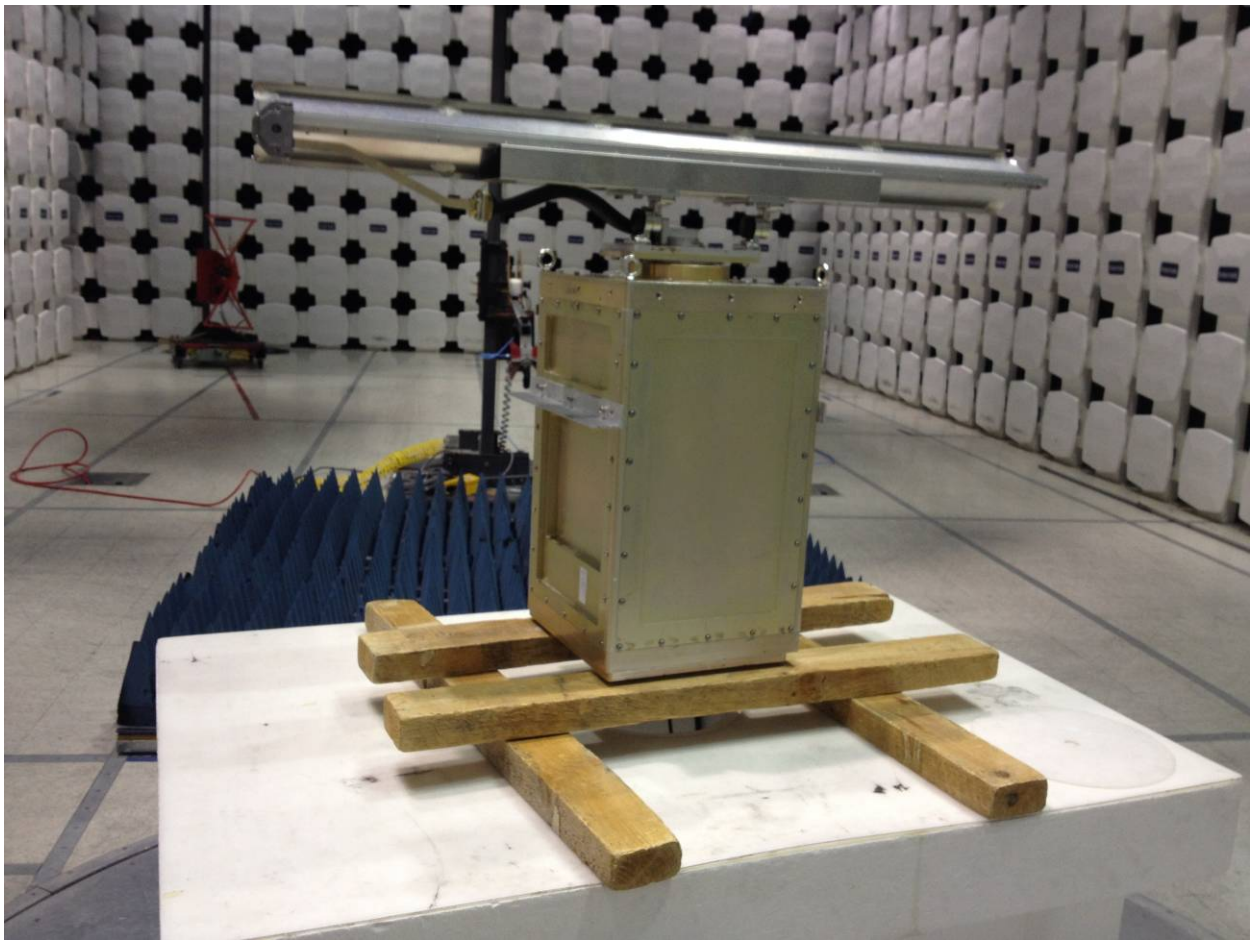
30-1000 MHz Radiated Test Setup



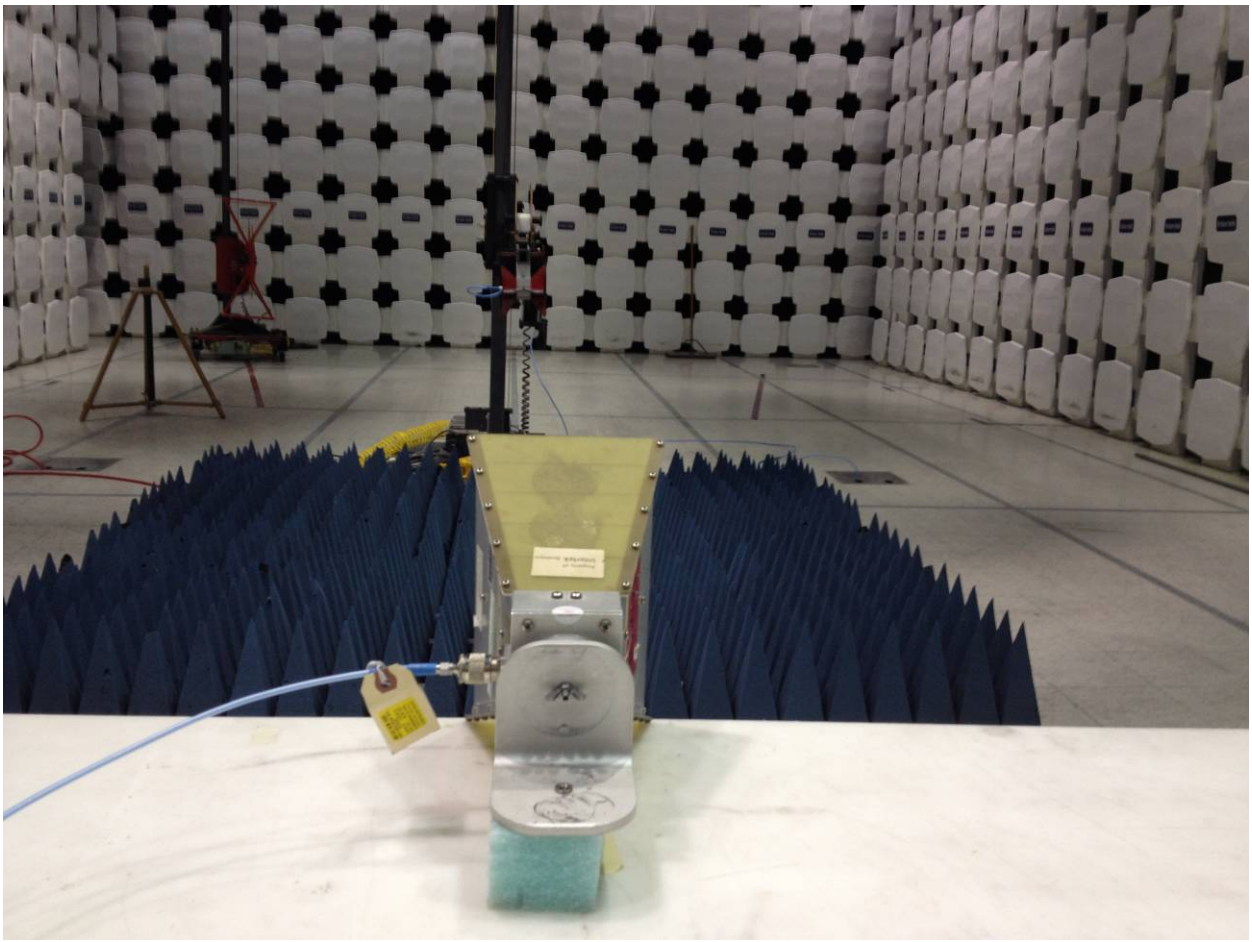
30-1000 MHz Substitution Method Test Setup



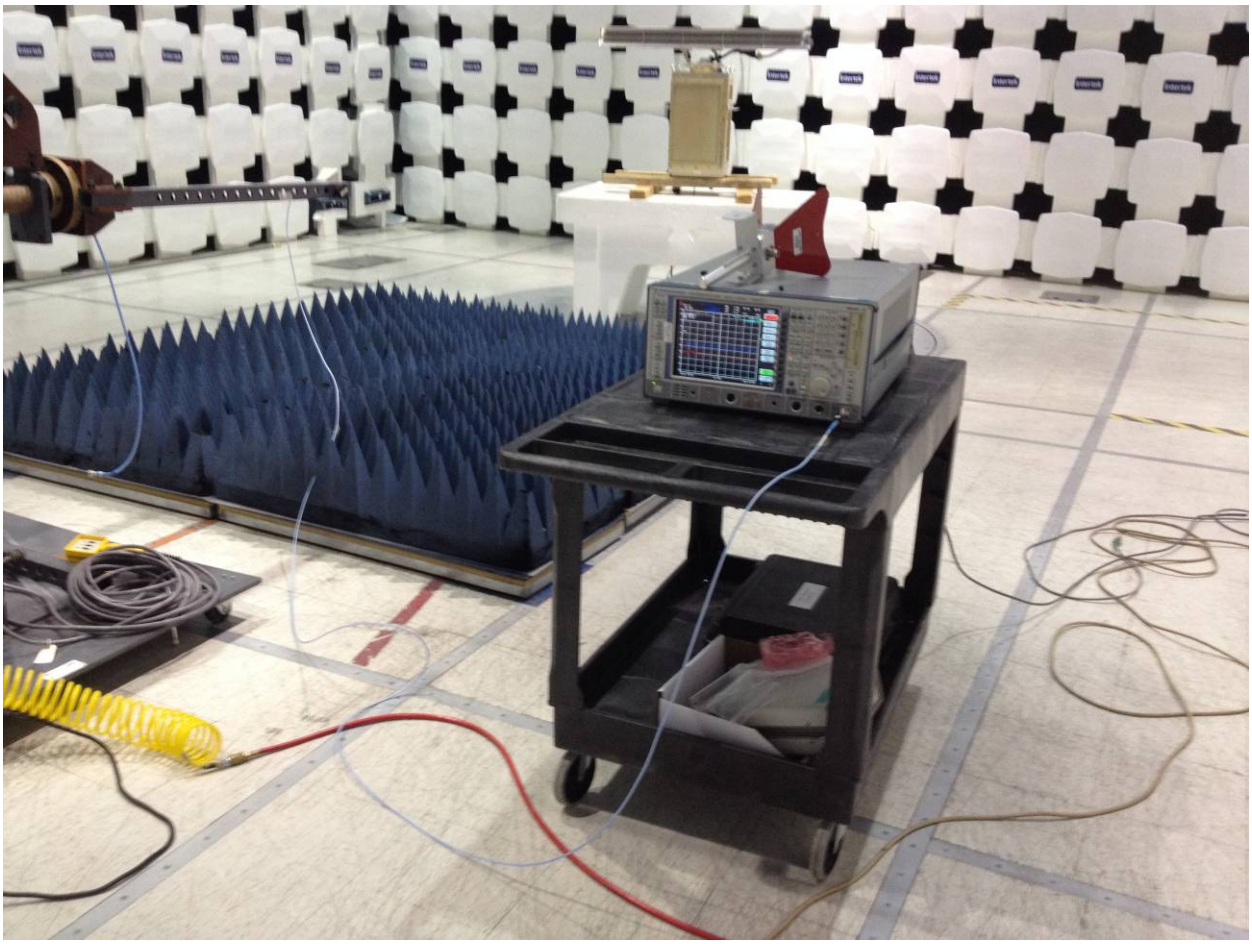
1-18GHz Radiated Test Setup



1-18GHz Radiated Test Setup



1-18GHz Substitution Method Test Setup



18-40GHz Radiated Test Setup

9.5 Test Data:

Radiated Emissions, Substitution (30-1000 MHz)

							K & L Microwave Notch Filer, M/N: 5NSL11-00002, S/N:1				
Company:	Laufer Wind						Rx Antenna:	145-106			
Model #:	ADSS-Radar						Rx Cable(s):	145-410			
Serial #:	004						Rx Preamp:	NONE	Receiver:	145-128	
Engineer(s):	Kouma Sinn			Location:	10m		Tx Antenna:	ANT1A	ANT1B		
Project #:	G101158115	Date(s):	12/13/13				Tx Cable(s):	CBLHF2012-2M-1			
Standard:	FCC Part 90						Tx Signal Generator:	HEW62			
Barometer:	DAV003	Temp/Humidity/Pressure:	20%	12%	1007mbar		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
AVG Reading = EUT Peak Readings - Average Factor, where Average Factor = 60 dB											
AVG	V	37.750	-30.32	62.77	0.30	-8.68	0.00	-104.22	-13.00	-91.22	120/300 kHz
AVG	V	55.591	-33.67	78.54	0.33	-4.74	0.00	-119.43	-13.00	-106.43	120/300 kHz
AVG	V	64.797	-31.75	79.77	0.37	-1.80	0.00	-115.84	-13.00	-102.84	120/300 kHz
AVG	V	66.270	-32.90	79.72	0.38	-1.29	0.00	-116.44	-13.00	-103.44	120/300 kHz
AVG	V	75.590	-30.57	81.39	0.40	1.06	0.00	-113.45	-13.00	-100.45	120/300 kHz

Radiated Emissions, Substitution (1-40GHz)

HP filter (Manufacturer: K & L Microwave, P/N: 11SH01-00384, S/N:1)
K & L Microwave Notch Filer, M/N: 5NSL11-00002, S/N:1

Company:	Laufer Wind						Rx Antenna:	ETS001			
Model #:	ADSS-Radar						Rx Cable(s):	145-416			
Serial #:	004						Rx Preamp:	NONE	Receiver:	145-128	
Engineer(s):	Kouma Sinn			Location:	10m		Tx Antenna:	HORN2			
Project #:	G101158115	Date(s):	12/13/13				Tx Cable(s):	CBLHF2012-2M-1			
Standard:	FCC Part 90						Tx Signal Generator:	HEW62			
Barometer:	DAV003	Temp/Humidity/Pressure:	20%	12%	1007mbar		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												
3 meters with Notch filter and no pre-amp, AVG Reading = EUT Peak Readings - Average Factor, where Average Factor = 60 dB												
AVG	V	2013.000	-20.57	66.65	0.74	8.74	0.00	-81.38	-13.00	-68.38	1/3MHz	Spurious
AVG	V	6100.000	-17.11	59.49	1.67	11.53	0.00	-68.89	-13.00	-55.89	1/3MHz	Spurious
AVG	V	6764.000	-13.70	57.56	1.77	11.80	0.00	-63.38	-13.00	-50.38	1/3MHz	Spurious
AVG	H	9183.000	-1.22	54.82	2.17	11.73	0.00	-48.63	-13.00	-35.63	1/3MHz	+/- 40MHz
AVG	H	9275.000	6.85	54.92	2.18	11.78	0.00	-40.62	-13.00	-27.62	1/3MHz	+/- 40MHz
AVG	H	9342.000	9.75	52.00	2.19	11.79	0.00	-34.80	-13.00	-21.80	1/3MHz	+/- 40MHz
AVG	H	9360.000	-0.46	44.00	2.19	11.80	0.00	-37.01	-13.00	-24.01	1/3MHz	+/- 40MHz
AVG	H	9440.000	3.96	46.26	2.21	11.88	0.00	-34.78	-13.00	-21.78	1/3MHz	+/- 40MHz
AVG	H	9461.000	8.18	53.34	2.21	11.92	0.00	-37.60	-13.00	-24.60	1/3MHz	+/- 40MHz
AVG	H	9506.000	6.57	54.04	2.22	12.00	0.00	-39.83	-13.00	-26.83	1/3MHz	+/- 40MHz
AVG	H	9548.000	-1.33	53.74	2.22	12.09	0.00	-47.36	-13.00	-34.36	1/3MHz	+/- 40MHz

No emissions were detected from 15-18GHz. Test equipment used: HP filter, 145-128, ETS001, CBLHF2012-5M-1, and no pre-amp

No emissions were detected from 18-40 GHz. Test equipment used: HP filter, 145-128, EMC04, CBLHF2012-5M-1 and no pre-amp

Test Personnel:	Kouma Sinn KPS	Test Date:	12/13/2013
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	Part 90 Subpart F	Limit Applied:	-13 dBm
Input Voltage:	120V/60Hz	Ambient Temperature:	20 ºC
Pretest Verification w/ Ambient Signals or BB Source:	BB Source and Ambient Signals	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 15.209 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 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

10.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV001'	Weather Station	Davis Instruments	7400	PE80519A61	08/28/2012	08/28/2014
ROS002'	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	06/18/2013	06/18/2014
DS26A'	Attenuator, 20dB	Mini Circuits	20dB, 50 ohm	DS26A	10/04/2012	10/04/2013
145015'	LISN: 50 Ohm/50 microHenry	Solar Electronics	9252-50-R-24-BNC	971617	03/07/2013	03/07/2014
CBLBNC2012-2'	50 Ohm Coaxial Cable	Pomona	RG-58 C/U	CBLBNC2012-2	09/14/2012	09/14/2013

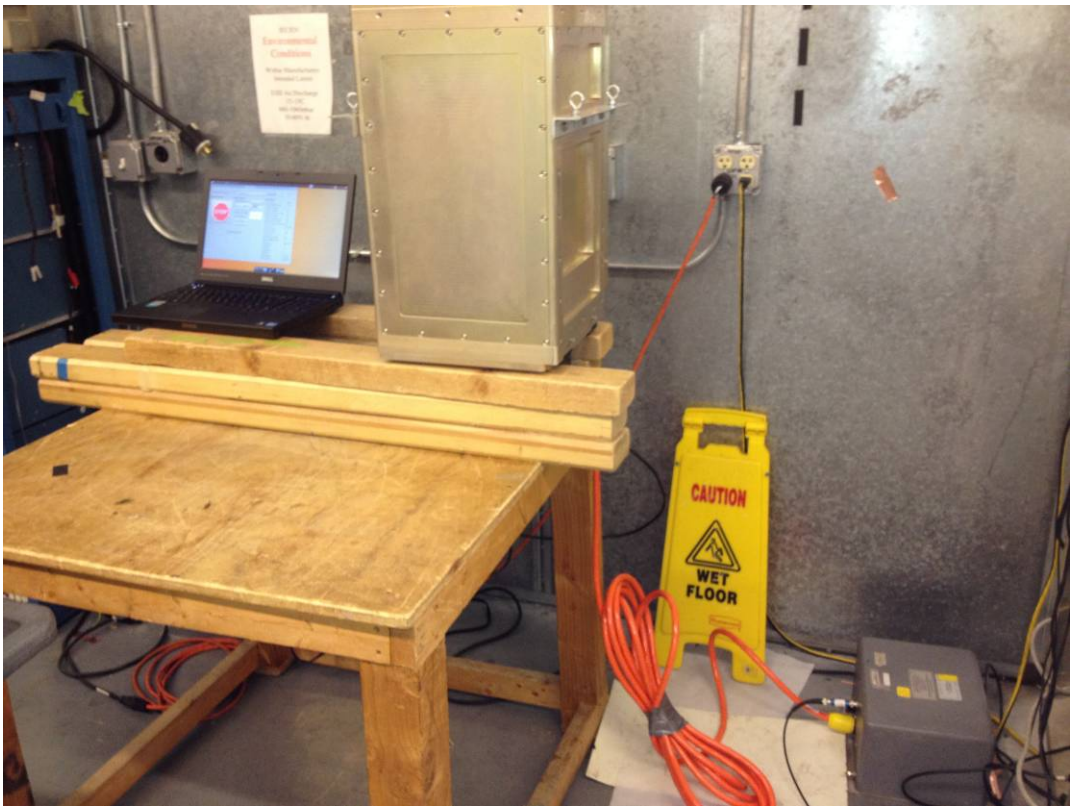
Software Utilized:

Name	Manufacturer	Version
C5	Teseq	5.26.46.46

10.3 Results:

The sample tested was found to Comply.

10.4 Setup Photograph:

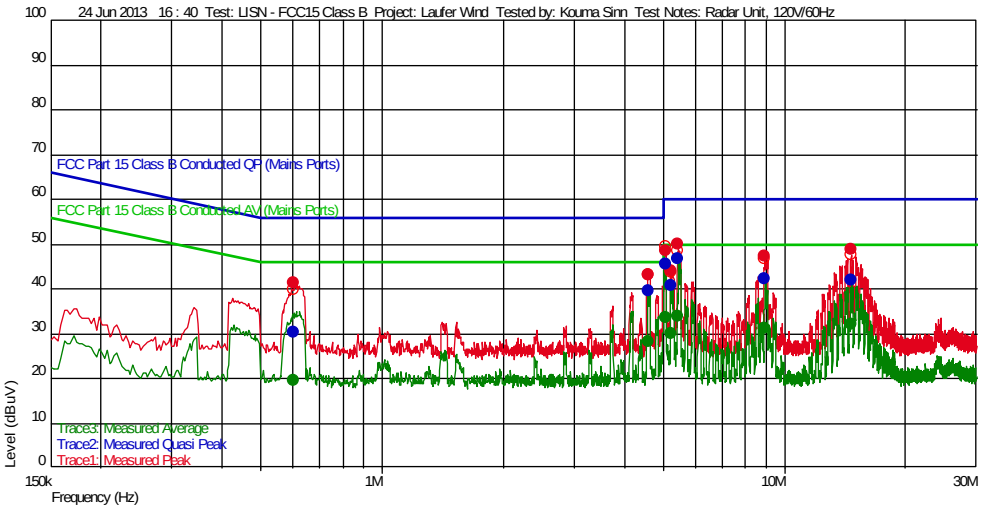


10.5 Plots/Data:

Test Information

Test Details	User Entry	Additional Information
Test:	LISN - FCC15 Class B	
Project:	Laufer Wind	
Test Notes:	Radar Unit, 120V/60Hz	
Temperature:	21C	
Humidity:	60%, 1002mbar	
Tested by:	Kouma Sinn	
Test Started:	24 Jun 2013 16 : 40	

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	Losses	Gains	Limit(dBuV)	Margin(dBuV)	LINE	Comment
603.0 k	30.33	0.108	0.000	0.000	56.000	-25.67	N	
5.232 M	40.73	0.173	0.000	0.000	60.000	-19.27	L1	
14.64 M	41.96	0.440	0.000	0.000	60.000	-18.04	N	
8.955 M	42.19	0.212	0.000	0.000	60.000	-17.81	L1	
4.617 M	39.69	0.166	0.000	0.000	56.000	-16.31	N	
5.073 M	45.54	0.171	0.000	0.000	60.000	-14.46	L1	
5.442 M	46.71	0.176	0.000	0.000	60.000	-13.29	L1	

Trace3: Measured Average

Frequency(Hz)	Level(dBuV)	TF	Losses	Gains	Limit(dBuV)	Margin(dBuV)	LINE	Comment
603.0 k	19.61	0.108	0.000	0.000	46.000	-26.39	N	
5.232 M	29.90	0.173	0.000	0.000	50.000	-20.10	L1	
8.955 M	31.15	0.212	0.000	0.000	50.000	-18.85	L1	
14.64 M	32.05	0.440	0.000	0.000	50.000	-17.95	N	
4.617 M	28.29	0.166	0.000	0.000	46.000	-17.71	N	
5.073 M	33.70	0.171	0.000	0.000	50.000	-16.30	L1	
5.442 M	33.99	0.176	0.000	0.000	50.000	-16.01	L1	

Test Personnel:	Kouma Sinn KPS	Test Date:	06/24/2013
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 90 Subpart F	Limit Applied:	FCC Part 15 Subpart C, 15.209
Input Voltage:	120VAC/60Hz	Ambient Temperature:	21 ºC
Pretest Verification w/ Ambient Signals or BB Source:	Ambient Signals	Relative Humidity:	60 %
		Atmospheric Pressure:	1002 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
SAF288'	AC Power Source	Behlman	P1351	P1166	10/16/2013	10/16/2014
MET1'	Digital Multimeter	Meterman	15XP	050407785	04/24/2013	04/24/2014
148012'	Temp/Humidity Chamber	Envirotronics	SH27C	08015563S11263	09/20/2013	09/20/2014
ROS002'	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	06/18/2013	06/18/2014
CBLHF2012-5M-1'	5m 40GHz Coaxial Cable	Huber & Suhner	SF102	252676001	12/18/2012	12/18/2013

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: Laufer Wind
Model #: Radar Unit
Serial #: 4
Engineer(s): Kouma Sinn
Project #: G101158115
Standard: FCC Part 90

Date(s): 06/25/13
Location: Safety

Test Equipment Used:
SAF288 MET1 148-012
ROS002 CBLHF2012-5M-1

Limit: No limit PPM

Nominal f: 9400 MHz

Voltage: 120 VDC

%	Voltage Volts	Frequency MHz	Deviation kHz	Limit kHz
-15%	102	9396.21643	-28.57	No limit
-10%	108	9396.37675	131.75	No limit
-5%	114	9396.34469	99.69	No limit
+0%	120	9396.24500	0	No limit
+5%	126	9396.24850	3.5	No limit
+10%	132	9396.28956	44.56	No limit
+15%	138	9396.24850	3.5	No limit

Temp Celsius	Frequency MHz	Deviation kHz	Limit kHz
-30	9401.69940	5454.4	No limit
-20	9400.08016	3835.16	No limit
-10	9398.63727	2392.27	No limit
0	9397.43487	1189.87	No limit
10	9394.72950	-1515.5	No limit
20	9396.24500	0	No limit
30	9401.17034	4925.34	No limit
40	9399.56713	3322.13	No limit
50	9397.94790	1702.9	No limit

Test Personnel: Kouma Sinn KPS
Test Date: 06/25/2013
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: FCC Part 90 Subpart F
Limit Applied: FCC Part 90.213
Input Voltage: 120VAC/60Hz
Ambient Temperature: N/A
Pretest Verification w/ Ambient Signals or BB Source: Ambient Signals
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	01/13/2014	101158115BOX-001d	KPS	JC	Original Issue