MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
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May 10, 2016

Dakota Ultrasonics
1500 Green Hills Road #107
Scotts Valley, CA 95066

Dear William Holt,

Enclosed is the EMC test report for compliance testing of the Dakota Ultrasonics, DFX-8 and Max II, tested to the requirements of:

Emission Tests: FCC Part 15 Subpart B (per ANSI C63.4: 2014)
for a Class A Device

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Sofia Cordova
Documentation Department

Reference: (\Dakota Ultrasonics\EMCS88356-FCC)

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Electromagnetic Compatibility Test Report

for the

Dakota Ultrasonics
DFX-8 and Max II

Tested under

FCC Part 15 Subpart B (per ANSI C63.4: 2014)
for a Class A Device

MET Report: EMCS88356-FCC
May 10, 2016

Prepared for:
Dakota Ultrasonics
1500 Green Hills Road #107
Scotts Valley, CA 95066

ACCREDITED
TESTING CERT #0591.02

Prepared by:
MET Laboratories, Inc.
3162 Belick Street
Santa Clara, CA 95054

Electromagnetic Compatibility
Test Report

For the

Dakota Ultrasonics
DFX-8 and Max II

Tested under

FCC Part 15 Subpart B (per ANSI C63.4: 2014)
for a Class A Device

MET Report: EMCS88356-FCC

Jeremy Chinn
Project Engineer, Electromagnetic Compatibility Lab

Sofia Cordova
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the applicable limits. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements per Test Summary (Section 1.0).

Asad Bajwa
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	May 10, 2016	Initial Issue.

Table of Contents

1.0 Testing Summary **1**
2.0 Equipment Configuration **2**
2.1 Overview 2
2.1.1 Test Site 2
2.1.2 Measurement Uncertainty 2
2.2 Detailed EUT Description and Test Setup 3
2.2.1 Description of Test Sample 3
2.2.2 Photograph(s) of Test Sample 3
2.2.3 Block Diagram 10
2.2.4 Equipment Configuration 11
2.2.5 Support Equipment 11
2.2.6 Ports and Cabling Information 11
2.2.7 Mode of Operation & Method of Monitoring EUT Operation 12
2.2.8 Modifications to EUT 12
2.2.9 Test Software Used 12
2.2.10 Disposition of EUT 12
3.0 Electromagnetic Compatibility Emission Criteria **13**
3.1 Limits for Conducted Disturbance at (AC) Mains Terminals 13
3.2 Radiated Emission: Limits of Electromagnetic Radiation Disturbance 21
4.0 FCC Part 15 Subpart B Compliance Information **28**
4.1 Verification Information 28
4.2 Label and User's Manual Information 33

List of Tables

Table 1: Uncertainty Calculations Summary 2
Table 2. Equipment Configuration 11
Table 3. Support Equipment 11
Table 4. Ports and Cabling Information 11
Table 5. Conducted Emissions - AC Voltage (CE-V) limits Annex A of EN 55032 13
Table 6. CE Voltage - (120 VAC, 60 Hz), Phase Line Test Results (DFX-8) 15
Table 7. CE Voltage - (120 VAC, 60 Hz), Neutral Line Test Results (DFX-8) 16
Table 8. CE Voltage - (120 VAC, 60 Hz), Phase Line Test Results (MaxII) 17
Table 9. CE Voltage - (120 VAC, 60 Hz), Neutral Line Test Results (MaxII) 18
Table 10. CE Voltage Test Equipment List 20
Table 11. Radiated Emissions Limits calculated per FCC Part 15, §15.109 (a) (b) 21
Table 12. RE - (30 MHz – 1 GHz) Test Results (DFX-8) 23
Table 13. RE - (30 MHz – 1 GHz) Test Results (MaxII) 24
Table 14. RE Test Equipment List 27

List of Figures

Figure 1. Block Diagram of Test Configuration 10

List of Photographs

Photograph 1. DFX-8 Front 3
Photograph 2. DFX-8 Rear 4
Photograph 3. DFX-8 Right 4
Photograph 4. DFX-8 Left 5
Photograph 5. DFX-8 Top 5
Photograph 6. DFX-8 Bottom 6
Photograph 7. Max II Front 7
Photograph 8. Max II Rear 7
Photograph 9. Max II Right 8
Photograph 10. Max II Left 8
Photograph 11. Max II Top 9
Photograph 12. Max II Bottom 9
Photograph 13. CE Voltage Test Setup (DFX8) 19
Photograph 14. CE Voltage Test Setup (MaxII) 20
Photograph 15. RE Test Setup (DFX-8) 25
Photograph 16. RE, Test Setup (MaxII) 26

List of Terms and Abbreviations

AC	**A**lternating **C**urrent	**FOKI**	**F**requency **o**f **K**ey **I**nterest
µF	**microf**arad	**GRP**	**G**round **R**eference **P**lane
µH	**microh**enry	**H**	Magnetic Field
µs	**micros**econds	**HCP**	**H**orizontal **C**oupling **P**lane
ACF	**A**ntenna **C**orrection **F**actor	**Hz**	**H**er**z**
AV	**Av**erage	**IEC**	**I**nternational **E**lectrotechnical **C**ommission
Cal	**Cal**ibration	**kHz**	**k**ilo**h**er**z**
CE	**C**onducted **E**missions	**kPa**	**k**ilo**pa**scal
CI	**C**onducted **I**mmunity	**kV**	**k**ilo**v**olt
CISPR	**C**omite **I**nternational **S**pecial des **P**erturbations **R**adioelectriques (International Special Committee on Radio Interference)	**LISN**	**L**ine **I**mpedance **S**tabilization **N**etwork
d	**M**easurement **D**istance	**MHz**	**M**ega**h**ertz
dB	**D**eci**b**els	**MI**	**M**agnetic **I**mmunity
dBµA	**D**eci**b**els above one **micro**amp	**PRF**	**P**ulse **R**epetition **F**requency
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter	**QP**	**Q**uasi **P**eak
dBµV	**D**eci**b**els above one **micro**volt	**RE**	**R**adiated **E**missions
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter	**RF**	**R**adio **F**requency
DC	**D**irect **C**urrent	**RI**	**R**adiated **I**mmunity
E	**E**lectric Field	**RMS**	**R**oot-**M**ean-**S**quare
EFT/B	**E**lectrical **F**ast **T**ransient/**B**urst	**V/m**	**V**olts **per m**eter
ESD	**E**lectro**s**tatic **D**ischarge	**VCP**	**V**ertical **C**oupling **P**lane
EUT	**E**quipment **U**nder **T**est	**VDI**	**V**oltage **D**ips **I**nterruptions
f	**F**requency	**VF**	**V**oltage **F**luctuations

1.0 Testing Summary

The emissions tests specified below were performed with the following results:

DFX8					
Conducted Emissions (Mains)					
Frequency Range	**Specification**	**Measurement (MHz)**	**Margin (dBµV)**	**Class**	**Compliance**
0.15 – 30 MHz (120 VAC, 60 Hz)	FCC Part 15 Subpart B (per ANSI C63.4: 2014)	1.505	-21.35	A	**Compliant**
Radiated Emissions					
30 MHz – 1 GHz	FCC Part 15 Subpart B (per ANSI C63.4: 2014)	287.98	-0.479	A	**Compliant**

MaxII					
Conducted Emissions (Mains)					
Frequency Range	**Specification**	**Measurement (MHz)**	**Margin (dBµV)**	**Class**	**Compliance**
0.15 – 30 MHz (120 VAC, 60 Hz)	FCC Part 15 Subpart B (per ANSI C63.4: 2014)	1.585	-21.31	A	**Compliant**
Radiated Emissions					
30 MHz – 1 GHz	FCC Part 15 Subpart B (per ANSI C63.4: 2014)	767.979	-1.38	A	**Compliant**

2.0 Equipment Configuration

2.1. Overview

MET Laboratories, Inc. was contracted by Dakota Ultrasonics to perform testing on the DFX-8 and Max II, under Dakota Ultrasonics, Quote number JT1DAK2210R1.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Dakota Ultrasonics, DFX-8 and Max II.

In accordance with §2.955(a) (3), the following data is presented in support of the verification of the Dakota Ultrasonics, DFX-8 and Max II. Dakota Ultrasonics should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the DFX-8 and Max II has been **permanently** discontinued, as per §2.955(b).

The results obtained relate only to the item(s) tested.

Model(s) Tested:	DFX-8 and Max II
Model(s) Covered:	DFX-8 and Max II
Primary Power as Tested:	100 – 240
Equipment Emissions Class:	A
Highest frequency generated or used by the EUT:	96 MHz
Evaluated by:	Jeremy Chinn
Report Date:	May 10, 2016

2.1.1. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick St., Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

MET Laboratories is a ISO/IEC 17025 accredited site by A2LA, California #0591.02

Radiated Emissions measurements were performed in a semi anechoic chamber. In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

2.1.2. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty (dB)	K	Confidence Level
Radiated Emissions, (30 MHz – 1 GHz)	±3.24	2	95%
Conducted Emission	±3.53	2	95%

Table 1: Uncertainty Calculations Summary

2.2. Detailed EUT Description and Test Setup

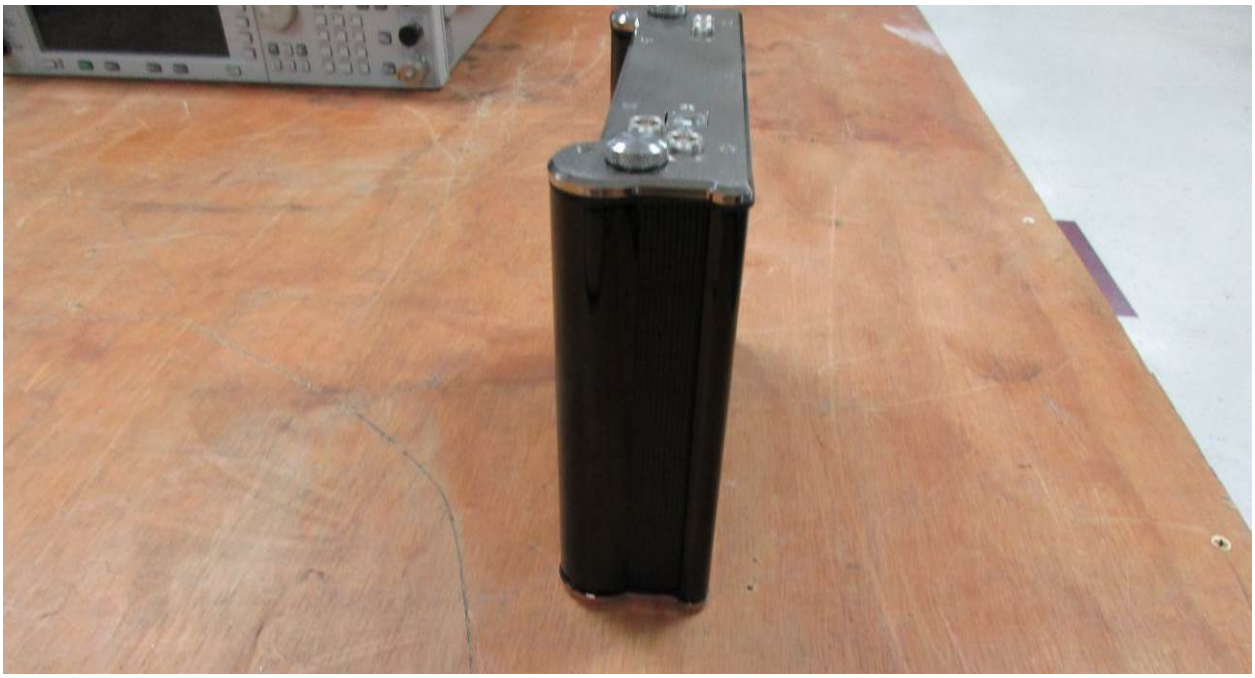
2.2.1. Description of Test Sample

The DFX-8 and Max II, Equipment Under Test (EUT), are two products that use the same circuit board and case, the only difference is the type of measurement performed. The DFX-8 flaw detector is typically used to measure the amplitude of echos returned from a weld. A high value of return signal indicates a large flaw or gap in the weld. Since transducers vary in performance, test blocks with known defect sizes are used to calibrate the system. The MAX II bolt gauge, measures the time between the driving pulse and the receipt of the echo. This time, after compensation for temperature, is used in a difference mode to determine the change in length of a bolt. This change is length is proportional to the tightness of the bolt, and is generally much more accurate than torque.

2.2.2. Photograph(s) of Test Sample

Photograph 1. DFX-8 Front

Photograph 2. DFX-8 Rear



Photograph 3. DFX-8 Right

Photograph 4. DFX-8 Left

Photograph 5. DFX-8 Top

Photograph 6. DFX-8 Bottom

Photograph 7. Max II Front

Photograph 8. Max II Rear

Photograph 9. Max II Right

Photograph 10. Max II Left

Photograph 11. Max II Top

Photograph 12. Max II Bottom

2.2.3. Block Diagram

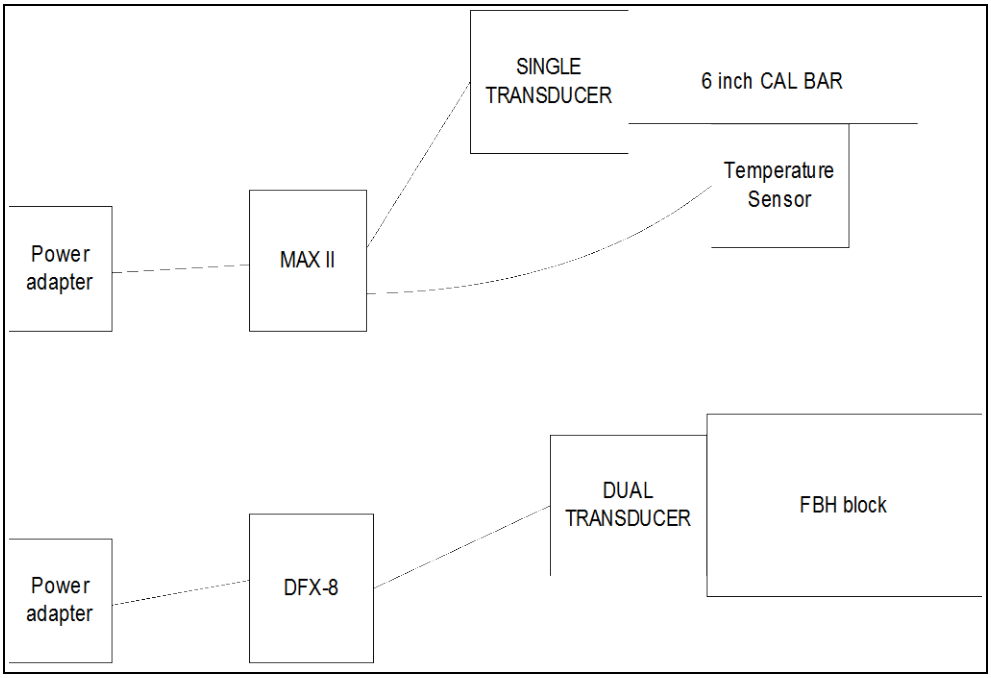


Figure 1. Block Diagram of Test Configuration

2.2.4. Equipment Configuration

The EUT was setup as outlined in Figure 1. All equipment incorporated as part of the EUT is included in the following list.

Name / Description	Model Number	Part Number	Serial Number
DFX-8	Z-251-0001	--	--
MAX II	Z-197-0001	--	--

Table 2. Equipment Configuration

2.2.5. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Name / Description	Manufacturer	Model Number	Customer Supplied Calibration Data
5 MHz Dual Transducer	Dakota	T-102-2900	N/A
5 MHz Single Transducer	Dakota	T-702-2405	N/A
Flat bottom hole Cal block	Dakota	custom	N/A
6 inch Cal Bar	Dakota	X-000-0010	N/A
Temperature sensor	Dakota	A-156-8001	N/A

Table 3. Support Equipment

2.2.6. Ports and Cabling Information

Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded (Y/N)	Termination Box ID & Port Name
USB	USB Cable with ferrite	2	1.5	2	no	--
12 volt input power	12 volt power supply	2	1.5	2	no	--
AUX	Not normally used	0	--	--	--	--

Table 4. Ports and Cabling Information

2.2.7. Mode of Operation & Method of Monitoring EUT Operation

The EUT was operated in the following manner:
Flaw detection (DFX8) test: The DFX-8 is connected to a standard 5 MHz Dual Element transducer. The transducer is coupled to a test block with a small defect. The gain is adjusted so 80% screen height is displayed. This amplitude should remain constant + or – 1 dB.

Bolting TOF test: The Max II is connected to a 5 MHz Single Element transducer and temperature sensor. The transducer is coupled to a 6 inch calibration bar and the temperature sensor is placed on the side of the calibration bar. The length of the bar is displayed with resolution of 0.0001 inch. The length of the bar should be remain constant within + or - 0.0003 inch.

Performance of the EUT was monitored in the following manner:
1.) DFX-8 should indicate a peak of 80% and a value of 80% on the display. The stability indicator in the upper left of the display (like a cell phone bar graph) should display all bars.

Max II should display a waveform showing the echo from the calibration bar and a thickness reading of approximately 6 inches (the actual value is not important, but is should not change more than 0.0003 inches.) The stability indicator in the upper left of the display (like a cell phone bar graph) should display all bars.

2.) DFX-8 amplitude display height and numeric value changes more than 1 dB (measures outside of 89.8% and 71.3%). No stability is shown, or MEM appears instead of stability (indicating it's displaying a reading from memory.)

MAX II length reading changes more than 0.0003 inch or no stability is shown, or MEM appears instead of stability (indicating it's displaying a reading from memory.)

2.2.8. Modifications to EUT

No modifications were made to the EUT.

2.2.9. Test Software Used

MET Labs uses software to gather information from test instrumentation.

For Conducted Emissions, the current version is: PMM Release 2.00 January 2012 and Jamila CE Rev 2.04.
For Radiated Emissions testing, the current version is: Jamila RS 1.006.

2.2.10. Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Dakota Ultrasonics upon completion of testing.

3.0 Electromagnetic Compatibility Emission Criteria

3.1. Limits for Conducted Disturbance at (AC) Mains Terminals

3.1.1. Test Method, Test Requirements, and Test Procedures

3.1.1.1. Test Method

The following standards specified below are covered in the scope of this test report:

Standard	Region
FCC Part 15 Subpart B, Section 15.107(a) (b) (per ANSI C63.4: 2014)	United States

3.1.1.2. Test Requirements

The EUT shall meet the Class A limits shown in Table 5:

Frequency Range (MHz)	Class A Limits dB(µV)		Class B Limits dB(µV)	
	Quasi-Peak	Average	Quasi- Peak	Average
0.15 - 0.5	79	66	66 to 56	56 to 46
0.5 - 5	73	60	56	46
5 - 30	73	60	60	50
Note 1 — The lower limit shall apply at the transition frequencies. Note 2 — The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Table 5. Conducted Emissions - AC Voltage (CE-V) limits Annex A of EN 55032

Sample Calculation:

$$R_f - S = M$$

where:

R_f = Receiver Reading in dBuV
S = Specification Limit in dBuV
M = Margin to Specification in +/- dB

3.1.1.3. Test Procedure

The EUT was placed on a wooden table top located in a screen room. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50Ω/50µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were remeasured using a quasi-peak and/or average detector as appropriate.

3.1.2. Test Results, Test Data, Test Setup, and Test Equipment List

3.1.2.1. Test Results

The EUT was **compliant** with the Class A requirement(s) of this section. Measured emissions were below applicable limits.

Environmental Conditions for Conducted Emissions (AC)	
Ambient Temperature:	22 °C
Relative Humidity:	43 %
Atmospheric Pressure:	100 kPa

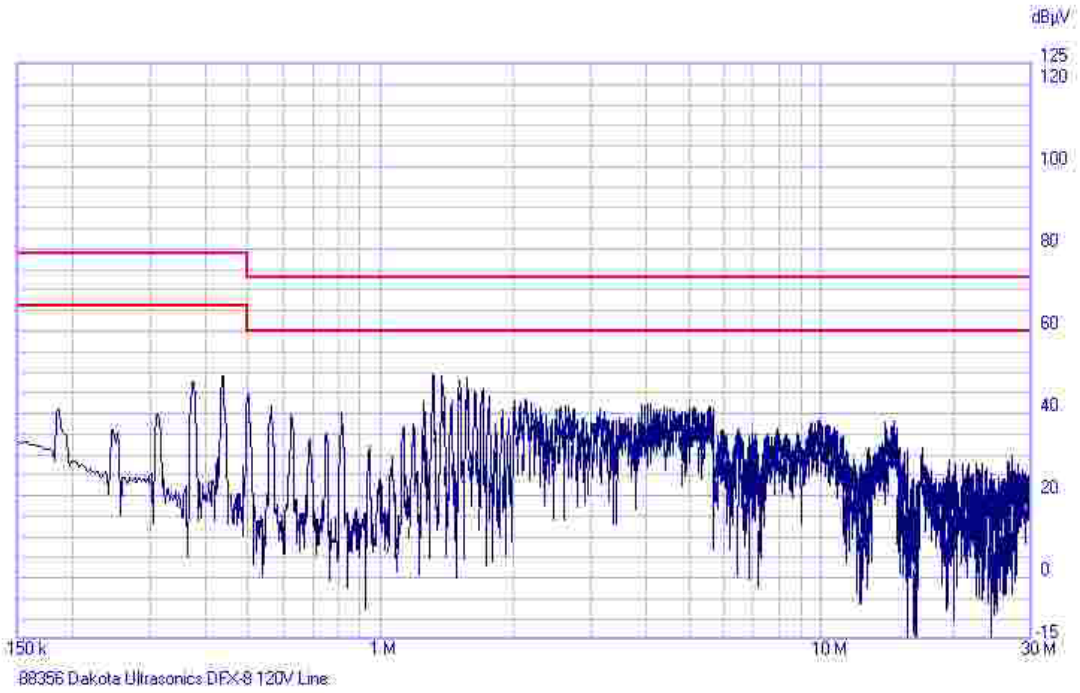
Test Engineer(s): Danny Alvendia

Test Date(s): 03/07/2016

3.1.2.2. Test Data

Freq (MHz)	QP Amplitude	QP Limit	Delta	Results	Average Amplitude	Average Limit	Delta	Results
0.375	52.98	79	-26.02	Pass	40.02	66	-25.98	Pass
0.438	55.07	79	-23.93	Pass	41.04	66	-24.96	Pass
1.313	46.07	73	-26.93	Pass	31.87	60	-28.13	Pass
1.377	48.31	73	-24.69	Pass	34.99	60	-25.01	Pass
1.505	48.79	73	-24.21	Pass	38.65	60	-21.35	Pass
1.569	46.83	73	-26.17	Pass	38.21	60	-21.79	Pass

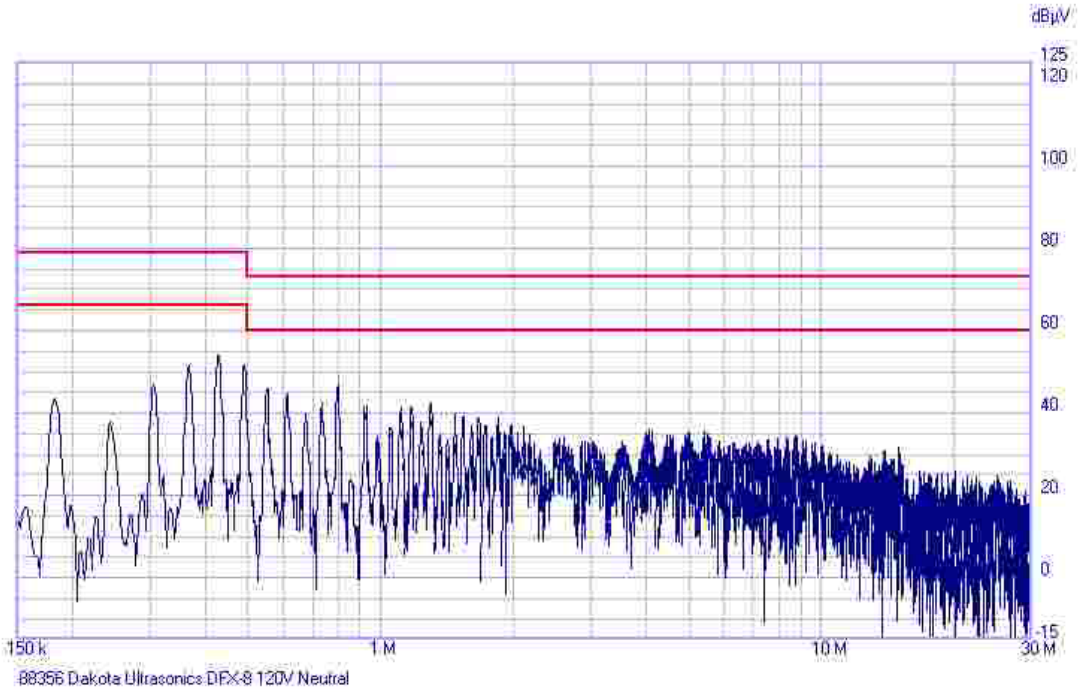
Table 6. CE Voltage - (120 VAC, 60 Hz), Phase Line Test Results (DFX-8)



Plot 1. CE Voltage, Phase Line Plot (DFX-8)

Freq (MHz)	QP Amplitude	QP Limit	Delta	Results	Average Amplitude	Average Limit	Delta	Results
0.305	52.55	79	-26.45	Pass	34.76	66	-31.24	Pass
0.366	54	79	-25	Pass	39.71	66	-26.29	Pass
0.428	53.01	79	-25.99	Pass	41.52	66	-24.48	Pass
0.492	50.27	79	-28.73	Pass	38.3	66	-27.7	Pass
0.552	44.63	73	-28.37	Pass	31.15	60	-28.85	Pass
0.798	48.82	73	-24.18	Pass	34.03	60	-25.97	Pass

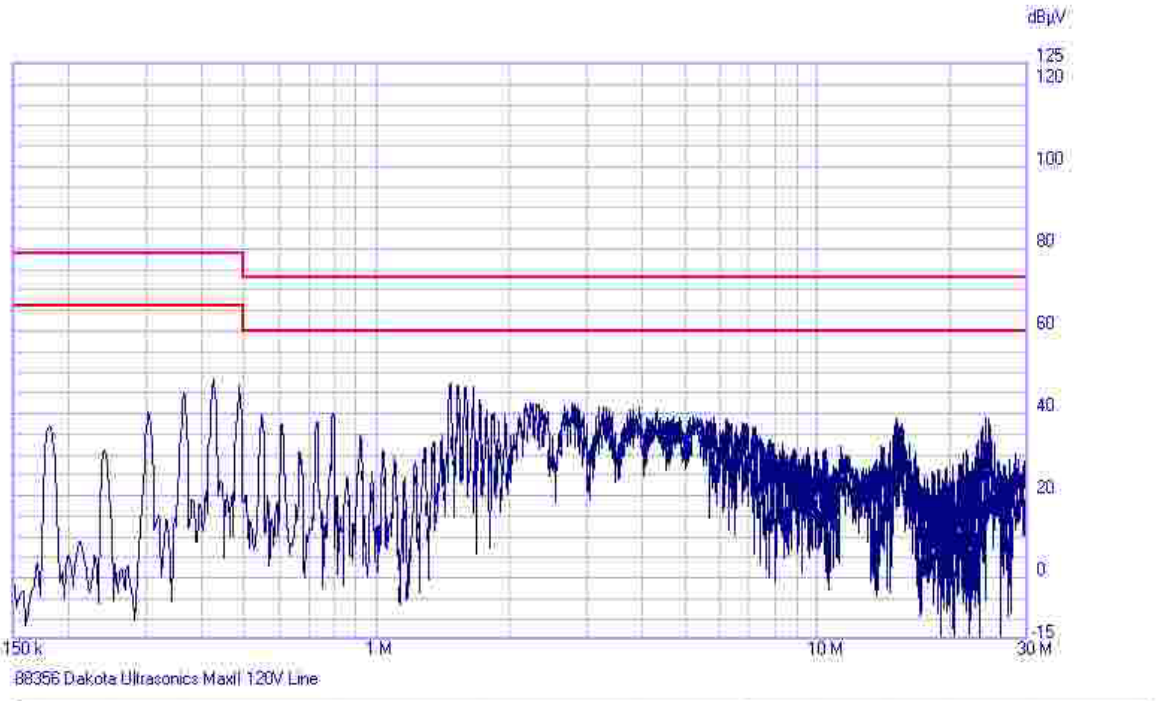
Table 7. CE Voltage - (120 VAC, 60 Hz), Neutral Line Test Results (DFX-8)



Plot 2. CE Voltage, Neutral Line Plot (DFX-8)

Freq (MHz)	QP Amplitude	QP Limit	Delta	Results	Average Amplitude	Average Limit	Delta	Results
0.426	55.75	79	-23.25	Pass	41.73	66	-24.27	Pass
0.487	54.68	79	-24.32	Pass	38.52	66	-27.48	Pass
1.466	41.38	73	-31.62	Pass	28.59	60	-31.41	Pass
1.524	45.58	73	-27.42	Pass	34.63	60	-25.37	Pass
1.585	47.72	73	-25.28	Pass	38.69	60	-21.31	Pass
1.651	45.84	73	-27.16	Pass	36.48	60	-23.52	Pass

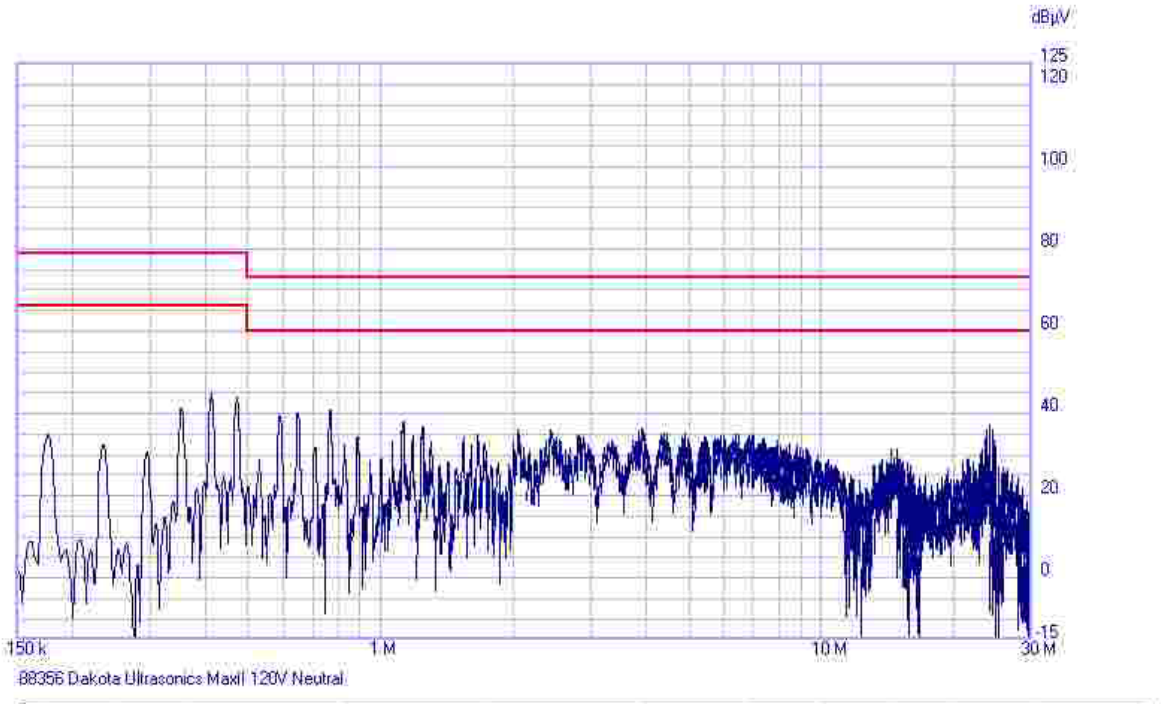
Table 8. CE Voltage - (120 VAC, 60 Hz), Phase Line Test Results (MaxII)



Plot 3. CE Voltage, Phase Line Plot (MaxII)

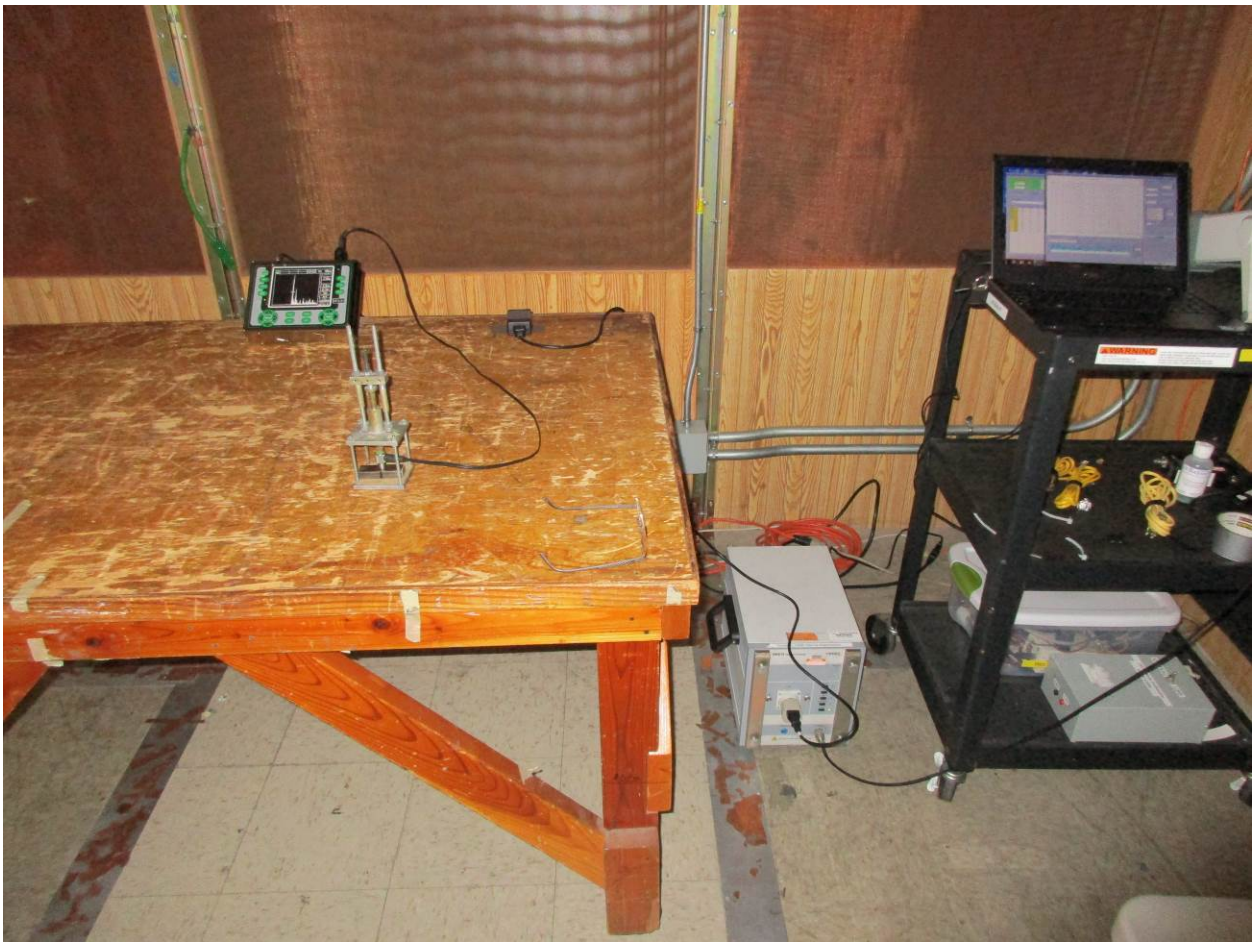
Freq (MHz)	QP Amplitude	QP Limit	Delta	Results	Average Amplitude	Average Limit	Delta	Results
0.354	54.43	79	-24.57	Pass	34.36	66	-31.64	Pass
0.412	52.73	79	-26.27	Pass	35.48	66	-30.52	Pass
0.471	50.95	79	-28.05	Pass	33.85	66	-32.15	Pass
0.589	47.17	73	-25.83	Pass	31.11	60	-28.89	Pass
0.648	45.93	73	-27.07	Pass	32.26	60	-27.74	Pass
0.767	44.06	73	-28.94	Pass	30.62	60	-29.38	Pass

Table 9. CE Voltage - (120 VAC, 60 Hz), Neutral Line Test Results (MaxII)



Plot 4. CE Voltage, Neutral Line Plot (MaxII)

3.1.2.3. Test Setup Photograph



Photograph 13. CE Voltage Test Setup (DFX8)

Photograph 14. CE Voltage Test Setup (MaxII)

3.1.2.4. Test Equipment List

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

Test Name: Conducted Disturbance at (AC) Mains Terminals			**Test Date(s):** 03/07/2016		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2657	Screen Room	ETS Lindgren	14w-2/2-0	See Note	
1S2678	LISN, Dual-Line V-Network	Teseq	NNB 51	03/03/2015	04/03/2016
1S3809	EMI Receiver	Narda Safety Test Solutions	PMM 9010F	02/01/2016	02/01/2017
Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.					

Table 10. CE Voltage Test Equipment List

3.2. Radiated Emission: Limits of Electromagnetic Radiation Disturbance

3.2.1. Test Method, Test Requirements, and Test Procedures

3.2.1.1. Test Method

FCC Part 15 Section 15.109(a) (b) (per ANSI C63.4: 2014)

The following standards specified below are covered in the scope of this test report:

Standard	Region	Applicability	
		30 - 1000 MHz *Semi-anechoic test environment*	**> 1 GHz** *Free-Space test environment*
FCC Part 15 Subpart B, Section 15.109(a) (b) (per ANSI C63.4: 2014)	United States	Yes	Yes

3.2.1.2. Test Requirements

For radiated emission, the EUT shall meet the Class A radiated emission limits shown in Table 11.

Frequency (MHz)	Field Strength dB(µV/m)			
	§15.109 (b), Class A Limit dB(µV/m) @ 10m		§15.109 (a),Class B Limit dB(µV/m) @ 3m	
30 – 88	39.00		40.00	
88 – 216	43.50		43.50	
216 – 230	46.40		46.00	
230 – 960	46.40		46.00	
960 – 1000	49.50		54.00	
Above 1 GHz				
	Linear Average Detector	**Peak Detector**	**Linear Average Detector**	**Peak Detector**
1000 – 3000	49.50	69.5	54.00	74
3000 – 6000	49.50	69.5	54.00	74
6000 – 40000	49.50	69.5	54.00	74

If the highest frequency generated or used in the device or on which the device operates or tunes is:

- less than 108 MHz, the upper frequency of measurement range is 1000 MHz
- between 108 MHz – 500 MHz, the upper frequency of measurement range in 2000 MHz
- between 500 – 1000 MHz, the upper frequency of measurement range is 5000 MHz
- above 1000 MHz, the upper frequency of measurement range is the 5th harmonic of the highest frequency or 40 GHz, whichever is lower

Table 11. Radiated Emissions Limits calculated per FCC Part 15, §15.109 (a) (b)

Sample Calculation for Distance Correction factor (DCF) measurement:

$F_d = 20*LOG_{10} (D_m/D_s)$

where:

F_d = Distance Factor in dB
D_m = Measurement Distance in meters
D_s = Specification Distance in meters

Sample formula for calculating the Corrected Data for the Radiated Emissions Measurements:

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m) (+)	Pre Amp Gain (dB)(-)	CBL (dB) (+)	DCF (dB) (+)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
249.99	V	359.9	240.7	55.46	11.4	28.335	0	0	***38.525***	47	-8.475

*Corrected Amplitude (dBµV/m) = Uncorrected Amplitude (dBµV) +ACF (dB) - Preamp Gain (dB) + CBL (dB) +DCF (dB) ** = 55.46 + 11.4 - 28.355 + 0 + 0 =* ***38.525***

3.2.1.3. Test Procedure

The EUT was placed on a non metallic table top located inside a semi-anechoic chamber. Various antennas were placed near the EUT and measurements were taken of the field strengths and frequencies. For final radiated measurements, the EUT was placed in semi anechoic chamber, and located 5 m away from an adjustable antenna mast.

For pre-scanning, the spectrum analyzer scanned the frequency range from 30 MHz to 1 GHz to obtain an emission profile of the EUT. For each point of measurement, the turntable was rotated, and the antenna height was varied between 1 m and 4 m, in order to find the maximum radiated emissions. Measurements above 30 MHz were taken using this technique with the antenna in two polarizations: horizontal and vertical. Unless otherwise specified, measurements were made using a peak detector with a 120 kHz bandwidth (30 MHz – 1 GHz).

3.2.2. Test Results, Test Data, Test Setup, and Test Equipment List

3.2.2.1. Test Result

The EUT was **compliant** with the Class A requirement(s) of this section. Measured emissions were below applicable limits.

Environmental Conditions for Radiated Emission	
Ambient Temperature:	20.9 °C
Relative Humidity:	28 %
Atmospheric Pressure:	101.9 kPa

Test Engineer(s): Mario Garcia

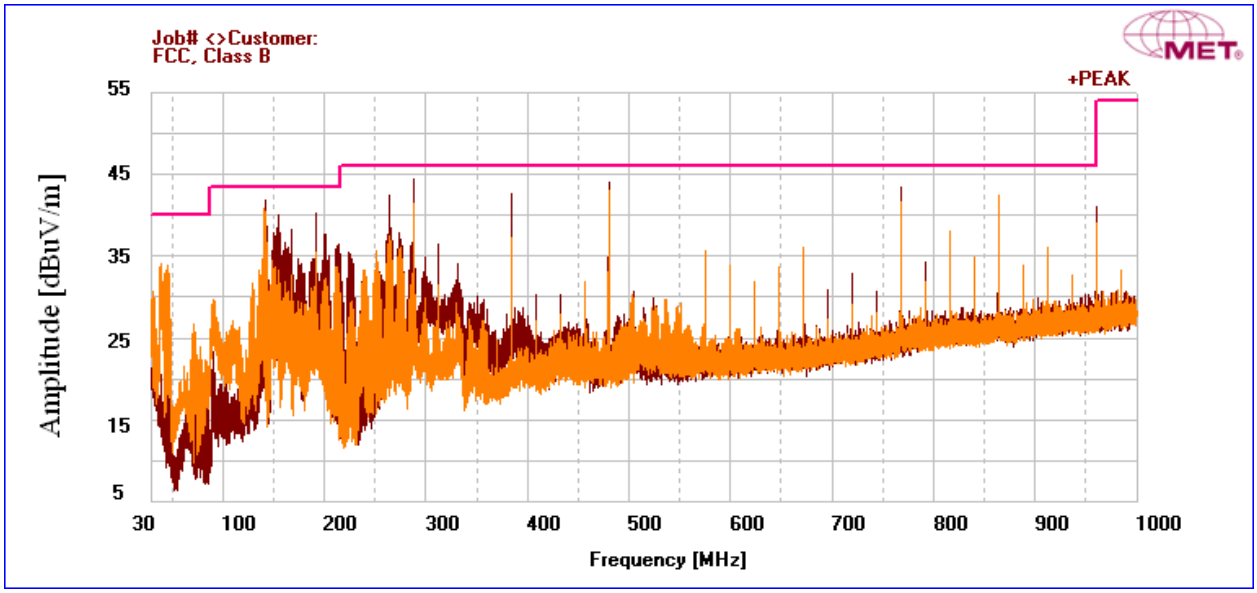
Test Date(s): 02/02/2016

3.2.2.2. Test Data

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
142.08	H	105	208.58	22.09	13.292	0	2.122	0	37.504	43.5	-5.996
142.08	V	70	100	22.15	13.192	0	2.122	0	37.464	43.5	-6.036
155.08	H	88	212.82	21.79	12.9	0	2.228	0	36.918	43.5	-6.582
191.98	V	78	127.41	25.23	11.698	0	2.461	0	39.389	43.5	-4.111
***287.98**	**H**	**311**	**100**	**28.64**	**13.8**	**0**	**3.081**	**0**	**45.521**	**46**	**-0.479**
479.98	H	181	100	17.36	18	0	3.928	0	39.288	46	-6.712

Table 12. RE - (30 MHz – 1 GHz) Test Results (DFX-8)

Note: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, have at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.



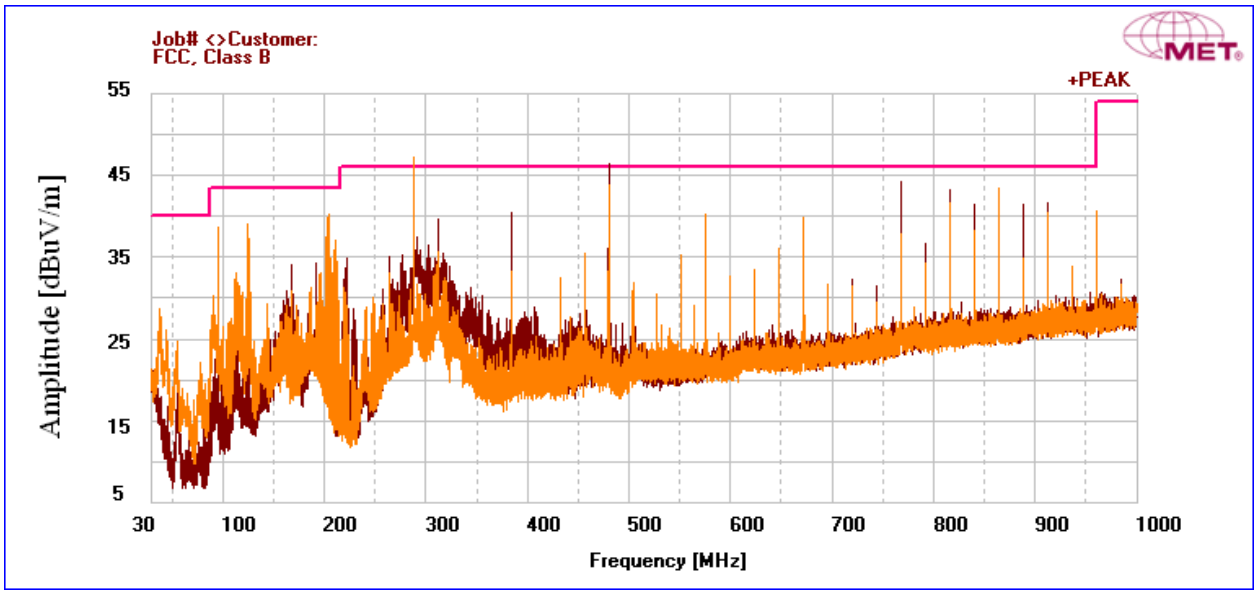
Plot 5. RE - (30 MHz –1 GHz), Plot (DFX-8)

= Vertical Polarization
= Horizontal Polarization

Frequency (MHz)	Antenna Polarity	EUT Azimuth (Degrees)	Antenna Height (cm)	Uncorrected Amplitude (dBuV)	ACF (dB/m)	Pre Amp Gain (dB)	CBL (dB)	DCF (dB)	Corrected Amplitude (dBuV)	Limit (dBuV)	Margin (dB)
95.98	V	159	100	26.28	10.298	0	1.724	0	38.302	43.5	-5.198
124.44	V	112	108.70	15.33	14.9	0	1.958	0	32.188	43.5	-11.312
203.56	V	42	100	18.19	12.43	0	2.538	0	33.158	43.5	-10.342
287.97	V	230	197.76	23.67	13.381	0	3.081	0	40.132	46	-5.868
479.98	H	192	100	20.92	18	0	3.928	0	42.848	46	-3.152
***767.979**	**H**	**36**	**100**	**18.16**	**21.4**	**0**	**5.06**	**0**	**44.62**	**46**	**-1.38**

Table 13. RE - (30 MHz – 1 GHz) Test Results (MaxII)

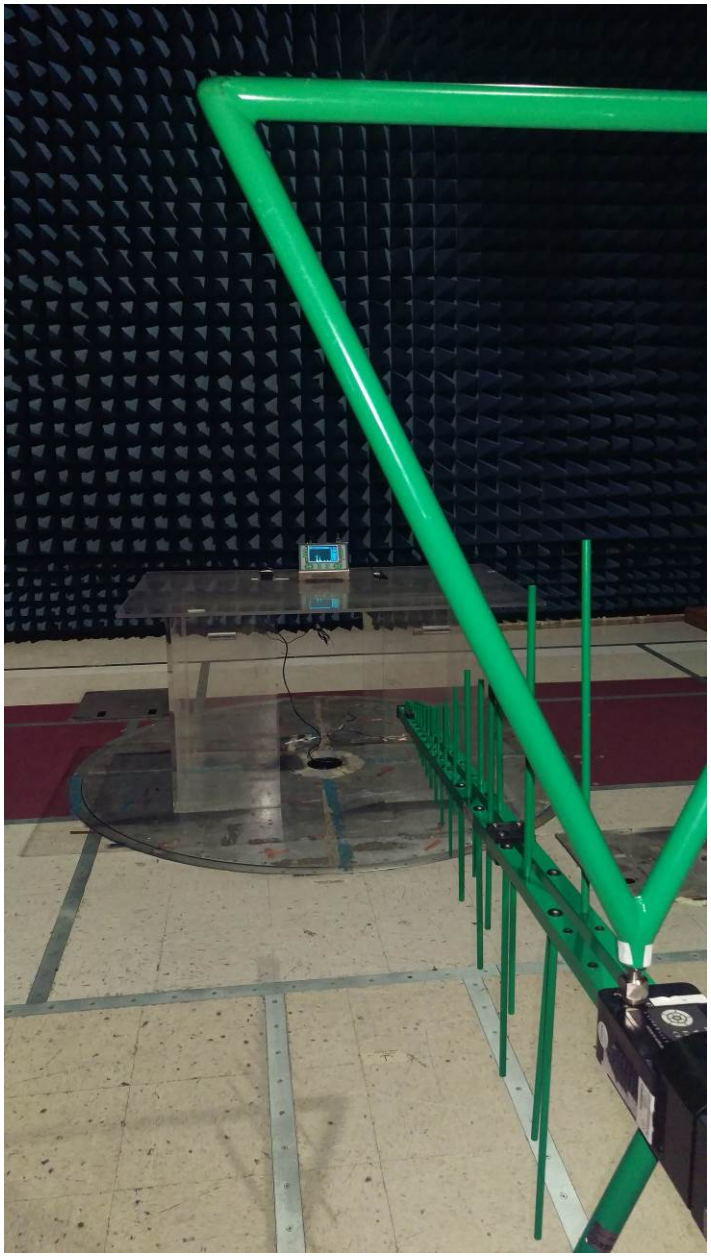
Note: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, have at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.



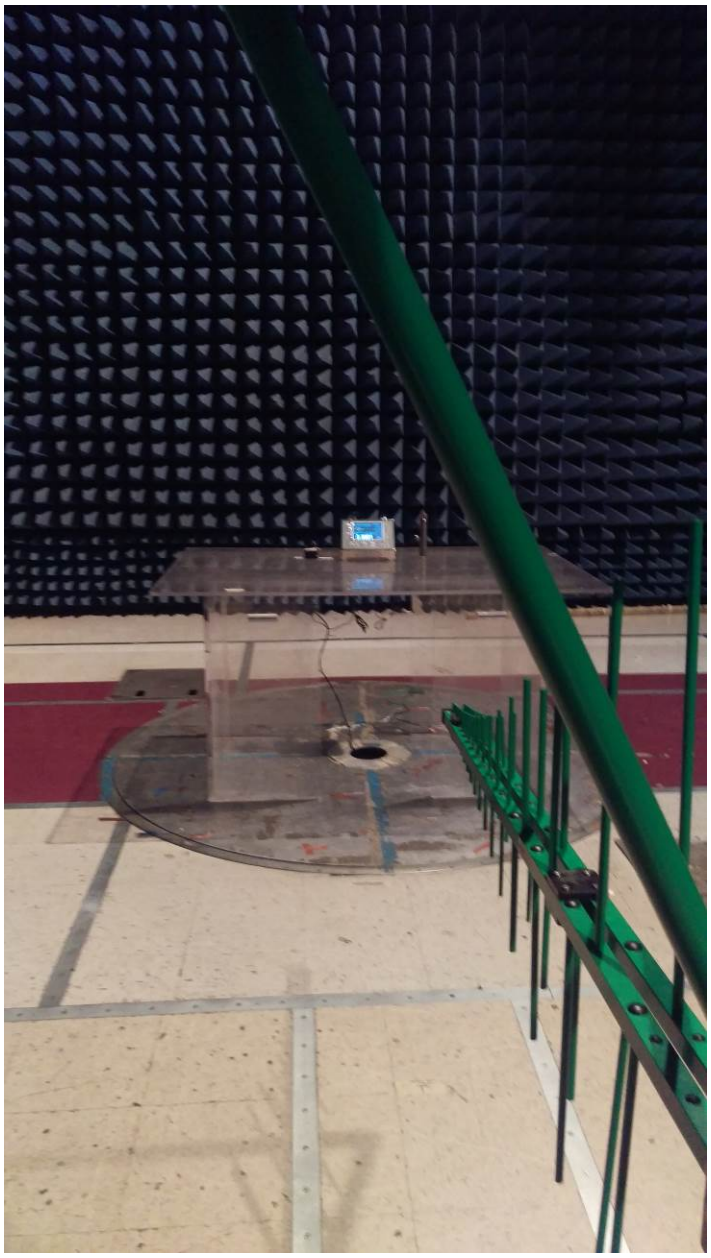
Plot 6. RE - (30 MHz – 1 GHz), Plot (MaxII)

= Vertical Polarization
= Horizontal Polarization

3.2.2.3. Test Setup Photograph



Photograph 15. RE Test Setup (DFX-8)



Photograph 16. RE, Test Setup (MaxII)

3.2.2.4. Test Equipment List

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

Test Name: Radiated Emissions Electric Field			**Test Date(s):** 02/02/2016		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2482	5 Meter Chamber (NSA)	Panashield	5 Meter Semi-Anechoic Chamber	03/12/2015	09/12/2016
1S2600	Bilog Antenna	Teseq	CBL6112D	10/05/2015	10/05/2016
1S3826	DRG Horn Antenna	ETS-Lindgren	3117	04/22/2015	04/22/2017
1S2587	Preamplifier	AML Communications	AML0126L3801	See Note	
1S3835	PSA Spectrum Analyzer	Agilent Technologies	E4448A	11/20/2015	11/20/2017
1S2421	EMI Test Receiver	Rohde & Schwarz	ESIB7	12/31/2015	12/31/2016
1S2399	Turntable Controller	SUNOL SCIENCE	SC99V	See Note	
Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.					

Table 14. RE Test Equipment List

4.0 FCC Part 15 Subpart B Compliance Information

4.1. Verification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a provision that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart J — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant.

§ 2.902 Verification.

(a) *Verification is a procedure where the manufacturer*[2] makes measurements or *takes the necessary steps to insure that the equipment complies with the appropriate technical standards.* Submission of a sample unit or representative data to the Commission demonstrating compliance is not required unless specifically requested by the Commission pursuant to § 2.957, of this part.

(b) Verification attaches to all items subsequently marketed by the manufacturer or importer which are identical as defined in § 2.908 to the sample tested and found acceptable by the manufacturer.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

[2] In this case, MET Laboratories, Inc. is acting as an agent of the manufacturer.

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

§ 2.952 Limitation on verification.

(a) Verification signifies that the manufacturer or importer has determined that the equipment has been shown to be capable of compliance with the applicable technical standards if no unauthorized change is made in the equipment and if the equipment is properly maintained and operated. Compliance with these standards shall not be construed to be a finding by the manufacturer or importer with respect to matters not encompassed by the Commission's rules.

(b) Verification of the equipment by the manufacturer or importer is effective until a termination date is otherwise established by the Commission.

(c) No person shall, in any advertising matter, brochure, etc., use or make reference to a verification in a deceptive or misleading manner or convey the impression that such verification reflects more than a determination by the manufacturer or importer that the device or product has been shown to be capable of compliance with the applicable technical standards of the Commission's rules.

§ 2.953 Responsibility for compliance.

(a) In verifying compliance, the responsible party, as defined in §2.909 warrants that each unit of equipment marketed under the verification procedure will be identical to the unit tested and found acceptable with the standards and that the records maintained by the responsible party continue to reflect the equipment being produced under such verification within the variation that can be expected due to quantity production and testing on a statistical basis.

(b) The importer of equipment subject to verification may upon receiving a written statement from the manufacturer that the equipment complies with the appropriate technical standards rely on the manufacturer or independent testing agency to verify compliance. The test records required by §2.955 however should be in the English language and made available to the Commission upon a reasonable request, in accordance with §2.956.

(c) In the case of transfer of control of equipment, as in the case of sale or merger of the grantee, the new manufacturer or importer shall bear the responsibility of continued compliance of the equipment.

(d) Verified equipment shall be re-verified if any modification or change adversely affects the emanation characteristics of the modified equipment. The party designated in §2.909 bears responsibility for continued compliance of subsequently produced equipment.

§ 2.954 Identification.

Devices subject only to verification shall be uniquely identified by the person responsible for marketing or importing the equipment within the United States. However, the identification shall not be of a format which could be confused with the FCC Identifier required on certified, notified or type accepted equipment. The importer or manufacturer shall maintain adequate identification records to facilitate positive identification for each verified device.

§ 2.955 Retention of records.

(a) For each equipment subject to verification, the responsible party, as shown in §2.909 shall maintain the records listed as follows:

(1) A record of the original design drawings and specifications and all changes that have been made that may affect compliance with the requirements of §2.953.

(2) A record of the procedures used for production inspection and testing (if tests were performed) to insure the conformance required by §2.953. (Statistical production line Emission testing is not required.)

(b) The records listed in paragraph (a) of this section shall be retained for two years after the manufacture of said equipment item has been permanently discontinued, or until the conclusion of an investigation or a proceeding if the manufacturer or importer is officially notified that an investigation or any other administrative proceeding involving his equipment has been instituted.

§ 2.956 FCC inspection and submission of equipment for testing.

(a) Each responsible party shall upon receipt of reasonable request:

(1) Submit to the Commission the records required by §2.955.

(2) Submit one or more sample units for measurements at the Commission's Laboratory.

(i) Shipping costs to the Commission's Laboratory and return shall be borne by the responsible party.

(ii) In the event the responsible party believes that shipment of the sample to the Commission's Laboratory is impractical because of the size or weight of the equipment, or the power requirement or for any other reason, the responsible party may submit a written explanation why such shipment is impractical and should not be required.

Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of theFCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/ TV technician for help.

