For The Scope of Accreditation Under Lab Code 200612-0

Excellence in Compliance Testing

EMC Technical Dossier

In Accordance with the:

Electromagnetic Compatibility Directive 2004/108/EC

Model Covered: SM125v2
Model Variants: N/A

Immunity Product Standard:
EN 61326-1:2006

Emissions Product Standard(s):
EN 55011:2007 w/A1 and A2, EN 61000-3-2:2006, EN 61000-3-3:1995 w/A1 and A2

ACS Report: 08-0245
Report Revision: A
Report Issue Date: October 9, 2008

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This report contains 56 pages

REVISION HISTORY Report Number: 08-0245 Manufacturer: Micron Optics Inc. Model: SM125v2					
DATE	**OLD REVISION**	**NEW REVISION**	**REASON**	**PAGES AFFECTED**	**APPROVED BY**
October 9, 2008	---	A	Initial Release	All	Forrest Duncan

Project Information Sheet

ACS Project: 08-0245

Applicant Details

Manufacturer: Micron Optics Inc.
Street Address: 1852 Century Place, NE
City, State/Province and Postal Code: Atlanta, Ga. 30345
Country: USA
Contact: Joel Mock
Phone: (404) 325-0005 x260
Fax:
Email: joelmock@micronoptics.com

Sample Information

Model: SM125v2
Model Variant(s): N/A
Product Description: The sm125 Optical Sensing Interrogator measures strain, pressure and temperature in civil, downhole oil and pipeline applications. The sm125 combines an Industrial PC with Micron Optics' robust, high-power, low-noise swept laser source.
Environment of Use: Light Industrial
Sample Receive Date: 6/13/08
Sample Receive Condition: Good
Test Mode Description: Data Transfer with ENLIGHT Sensor Systems Software
Failure Mode (Provided by Mfg.): Loss of Data
Highest Data Rate: 500MHz Source: Microproccessor
Power Interfaces (Check all that apply and enter power info):
☒ AC Mains Input 230VAC/50Hz
☐ AC Output N/A
☐ DC Input N/A
☐ DC Output N/A
☐ Battery N/A
☐ Other N/A

I/O Interfaces:

Interface Type	Quantity	Length (m)	Shielded?
USB	1	3	Yes
Fiber Optic	4	1.5	No
			Please Select
			Please Select
			Please Select

Test Information

Test Start Date: 6/13/08
Test End Date: 8/3/08
Emissions Pre-scan Site: SAC
Final Emissions Site: SAC
EMI Freq. Band: 0.15-2500MHz
RFI Site: SAC
Radiated Emissions Equipment Class: Class B
Harmonic Current EMI Class: Class A
Test Methods Applied:

☒ IEC 61000-4-2 Ed. 1.2	☒ IEC 61000-4-6 Ed. 2.2	☐
☒ IEC 61000-4-3 3rd Ed.	☒ IEC 61000-4-8 Ed. 1.1	☐
☒ IEC 61000-4-4 2nd Ed.	☒ IEC 61000-4-11 2nd Ed.	☐
☒ IEC 61000-4-5 2nd Ed.	☐	☐

Table of Contents

SECTION A: GENERAL INFORMATION

1.0 Introduction

1.1 Scope

This report documents conformance with the requirements set forth in the Electromagnetic Compatibility Directive 2004/108/EC and details the results of testing performed on 6/13/08 through 8/3/08 on the model SM125v2 manufactured by Micron Optics Inc..

1.2 Purpose

Testing was performed to evaluate the EUT with regard to EMC regulatory requirements in accordance with the European Unions CE Marking arrangements.

1.3 Test Methods, Limits & Levels

Standard	Test Description	Severity Level	Test Levels/Limits	Performance Criteria	Result
Emissions Product Standards					
EN 55011:2007 w/A1 and A2	Radiated Emissions	N/A	Class B	N/A	Pass
EN 55011:2007 w/A1 and A2	Conducted Emissions	N/A	Class B	N/A	Pass
EN 55011:2007 w/A1 and A2	Telecom Port Conducted Emissions	N/A	Class B	N/A	N/A
EN 61000-3-2:2006	Harmonic Current Emissions	N/A	Class A	N/A	Pass
EN 61000-3-3:2006	Voltage Fluctuations and Flicker	N/A	P_{st} <=1.0 P_{lt} < =.65 d_c <= 3.3% d_{max} <= 4%	N/A	Pass
Basic Immunity Standards per EN 61326-1:2006					
IEC 61000-4-4 2nd Ed.	Electrostatic discharge	Level 2 – Contact Level 3 – Air	4kV 8kV	B	Pass
IEC 61000-4-3 3rd Ed.	Radio-frequency electromagnetic field Amplitude modulated	Level 3 –	80 to 2700MHz 10V/m 80% AM1kHz	A	Pass
IEC 61000-4-4 2nd Ed.	Electrical Fast transients	Level 3 – Level 3 –	1kV - I/O Lines 2kV - AC Power	B	Pass
IEC 61000-4-5 2nd Ed.	Surge	Level 2 – Level 3 – Level 2 –	1kV - Line to Line 2kV - Line to PE 1kV - I/O Interfaces	B	Pass
IEC 61000-4-6 Ed. 2.2	Radio-frequency common mode	Level 2 –	.15 to 80MHz 3Vrms 80% AM1kHz	A	Pass
IEC 61000-4-8 Ed. 1.1	Power-frequency magnetic field	Level 1 –	1A/m 50Hz	A	Pass
IEC 61000-4-11 2nd Ed.	Voltage dips and Interruptions	Choose Level Voltage Dip	0% of Vnom 1 Cycle	B	Pass
		Choose Level Voltage Dip	40% of Vnom 10 Cycles	B	
		Choose Level Voltage Dip	70% of Vnom 25 Cycles	B	
		Choose Level Voltage Interruption	95% of Vnom 250 Cycles	C	

N/A = Test Not Applicable to this EUT N/P = Not Performed. See Test Justification for Details

1.4 Performance Criteria

1.4.1 Emissions Performance Criteria

For model SM125v2 the limits which apply are EN 55011:2007 w/A1 and A2 Class B. These limits are found in Table 1.4.1-1below:

Table 1.4.1-1 Emissions Limits EN 55011:2007 w/A1 and A2 Class B

Emission Type	Frequency Range (MHz)	Quasi-Peak/Peak[4] Limits	Average Limits
Conducted Class B (Mains Port) (dBµV)	0.15 to 0.50	66 to 56[1]	56 to 46[1]
	0.50 to 5.00	56	46
	5.00 to 30.0	60	50
Conducted Class B (Telecom Ports)	0.15 to 5.00	84 to 74 (V)[1,2] 40 to 30 (I)[1,3]	74 to 64 (V)[1,2] 30 to 20 (I)[1,3]
	5.00 to 30	87 (V)[2] 43 (I)[3]	74 (V)[2] 30 (I)[3]
Radiated Class B at 3 Meters (dBµV/m)	30.0 to 230.0	40.5	
	230.0 to 1000.0	47.5	
	1000 to 3000	70	50
	3000 to 6000	74	54

1 - Decreases Linearly with Logarithm of Frequency **Note: Lower Limit Applies at Transition Frequency**

2 – (V) Indicates voltage limits in dBµV

3 – (I) Indicates current limits in dBµA

4 – Limits <1GHz are Quasi-Peak and Peak >1GHz

1.4.2 Harmonic Current Emissions Criteria

Harmonic current emissions for Class A equipment must not exceed the levels as given in table 1.4.2-1 below:

Table 1.4.2-1

Harmonic Order (n)	Maximum Permissible Harmonic Current (A)
Odd Harmonics	
3	**2.30**
5	**1.14**
7	**0.77**
9	**0.40**
11	**0.33**
13	**0.21**
15 ≤ n ≤ 39	**0.15(15/n)**
Even Harmonics	
2	**1.08**
4	**0.43**
6	**0.30**
8 ≤ n ≤ 40	**0.23(8/n)**

1.4.3 Voltage Fluctuations & Flicker Criteria

The following limits apply:

- The value of P_{ST} shall not be greater than 1.0
- The value of P_{LT} shall not be greater than .65
- The relative steady-state voltage change, d_c, shall not exceed 3.3%
- The maximum voltage change, d_{max}, shall not exceed 4%
- The relative voltage change characteristics value of d(t) during a voltage change shall not exceed 3.3% for more that 200mS.

Where:

- P_{ST} is the short term flicker indicator. The flicker severity is evaluated over a short period (in minutes). P_{ST} = 1 is the conventional threshold of irritability.
- P_{LT} is the long term flicker indicator. The flicker severity is evaluated over a long period (in hours) using successive P_{ST} values.
- d(t), d_{max} and d_c are ratios of the absolute magnitudes to the phase-to-neutral values of the nominal voltages.

1.4.4 Immunity Performance Criteria

Each immunity test requires 1 of 3 performance criteria to be met. Below are descriptions of each.

Performance Criterion A: The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance Criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Performance Criterion C: Temporary loss of function is allowed, provided the function is self recoverable or can be restored by the operation of the controls

Medical Devices

Under the test conditions specified in 36.202 [of EN 60601-1-2], the EQUIPMENT OR SYSTEM shall be able to provide the ESSENTIAL PERFOMRANCE and remain safe. The following DEGRADATIONS associated with ESSENTIAL PERFORMANCE and safety shall not be allowed:

- component failures;
- changes in programmable parameters;
- reset to factory defaults (manufacture's presets);
- changes of operating modes;
- false alarms;
- cessation or interruption of any intended operation, even if accompanied by an alarm;
- initiation of any unintended operation, including unintended or uncontrolled motion, even if accompanied by an alarm;
- error of a displayed numerical value sufficiently large to affect diagnosis or treatment;

- noise on a waveform in which the noise is indistinguishable from physiologically-produced signals or the distortion interferes with interpretation of the physiologically-produced signals;
- artifact or distortion in an image in which the artifact is indistinguishable from physiologically-produced signals or the distortion interferes with the interpretation of physiologically-produced signals;
- failure of automatic diagnosis or treatment EQUIPMENT or SYSTEMS to diagnose or treat, even if accompanied by an alarm.

For EQUIPMENT and SYSTEMS with multiple FUNCTIONS, the criteria apply to each FUNCTION, parameter or control.

The EQUIPMENT or SYSTEM may exhibit DEGRADATION of performance (e.g. deviation from the manufactures specifications) that does not affect ESSENTIAL PERFORMANCE or safety.

2.0 Test Facilities & Environment

2.1 Test Facilities

All testing was performed at the following address:

Advanced Compliance Solutions, Inc.
5015 B.U. Bowman Drive
Buford GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598
www.acstestlab.com

The laboratory is fully equipped to carry out the tests outlined in section 1.0

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP). Unless otherwise specified, all tests methods described within this report are covered under the ISO 17025 scope of accreditation.

2.3 Test Environment

Unless otherwise specified by the generic or product standard, the EUT was evaluated within the climate conditions of the EUT as specified by the manufacturer.

Where the manufacturer does not specify climate parameters for the EUT, all test are performed within the climate parameters given below:

- Ambient temperature 15° to 35° C
- Relative Humidity 30% to 60%
- Atmospheric Pressure 860mbar to 1060mbar

All test equipment was operated within climate specifications as defined by the manufacturer.

3.0 Equipment Under Test (EUT)

3.1 Manufacturer

Micron Optics Inc.
1852 Century Place, NE
Atlanta, Ga. 30345
Joel Mock
(404) 325-0005 x260
joelmock@micronoptics.com

3.2 Modifications

Table 3.2-1 below describes any modification required to bring the EUT into compliance with the test standard. Photographs of the modifications, if any, are contained in appendix a.

Table 3.2-1: EUT Modifications

☒ **Modifications were not required to bring the EUT into compliance with the requirements.**
☐ **Modifications were required to bring the EUT into compliance with the requirements.**

Modification Type	Component/Material Description (Model)	Location	Test Required For	Photograph Designation
				Photo Number:
				Photo Number:
				Photo Number:
				Photo Number:
				Photo Number:
				Photo Number:
				Photo Number:
				Photo Number:
				Photo Number:
				Photo Number:
				Photo Number:

3.3 System Block Diagram and Support Equipment

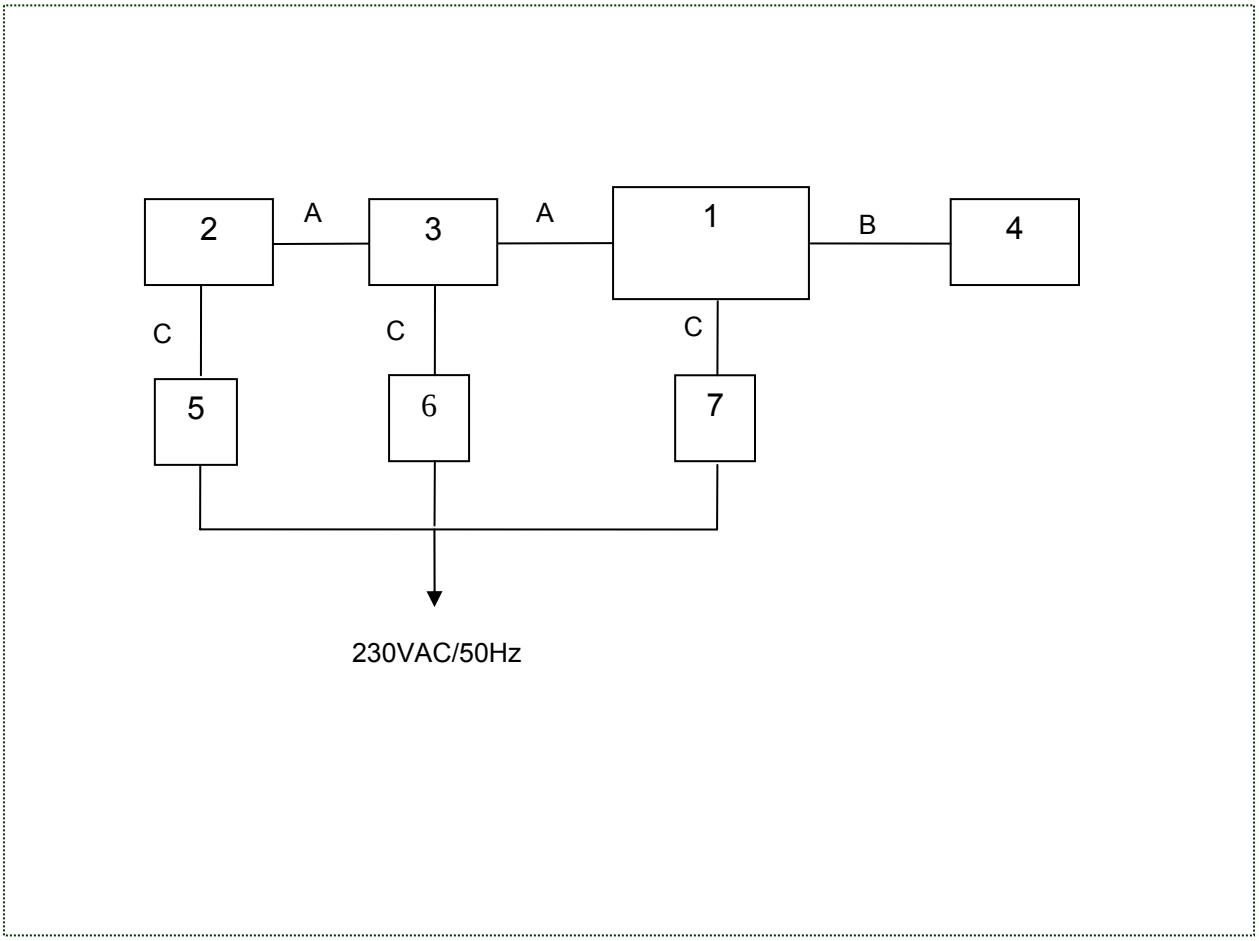


Table 3.3-1: EUT and Support Equipment Description

Item #	Type Device	Manufacturer	Model/Part #	Serial #
1	EUT	Micron Optics	SM125v2	N/A
2	Laptop	Gateway	200STM	HST03410301
3	Ethernet Hub	DLink	D1704P	001346-561C06
4	Optical Etalon	Micron Optics	130-REF-001	N/A
5	AC Adapter	Gateway	AD-4212	6506645
6	AC Adapter	DLink	JTA0302A	N/A
7	AC Adapter	Astrodyne	SPU50-3	028170620652

Table 3.3-2: Cable Description

Cable #	Cable Type	Length	Shield	Termination
A	Ethernet	4 m	No	Peripheral
B	Fiber-Optic	1.5 m	No	Peripheral
C	DC Power	2	No	Peripheral

3.4 Observations

Any general observations regarding any part of the evaluation are given in table 3.4-1.

Table 3.4-1: Observations

Observation No.	Description
NA	**None**

SECTION B: EMISSIONS – TEST INFORMATION AND RESULTS

4.0 Radiated and Conducted Emissions

4.1 Radiated Emissions

4.1.1 Test Site Description

4.1.1.1 Open Area Test Site
The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 4.1.1.1-1 below:

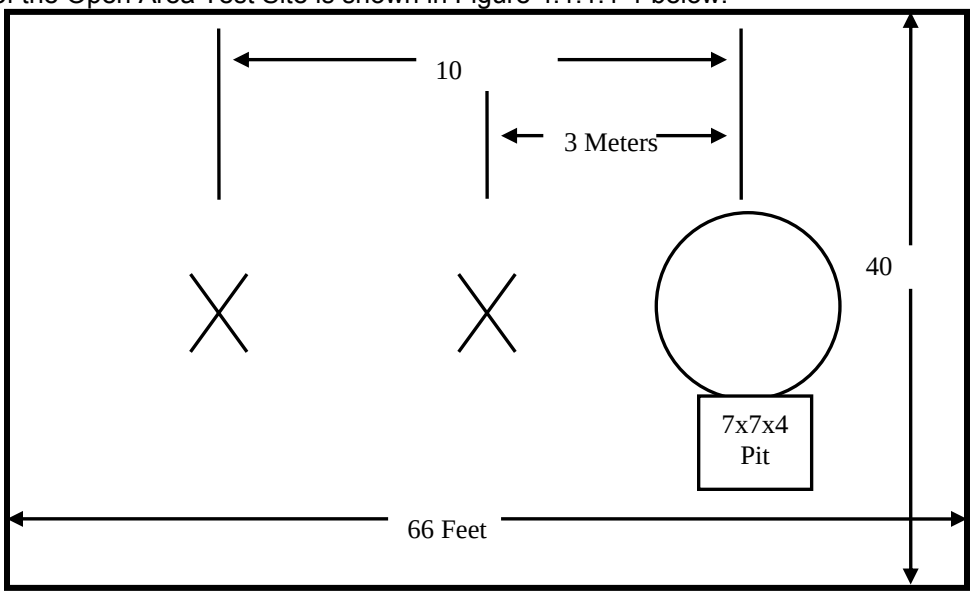


Figure 4.1.1.1-1: Open Area Test Site

4.1.1.2 Semi-Anechoic Chamber

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 4" x 4" x ¾" thick and weighs approximately 1.4lbs. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the turntable. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chase from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 4.1.1.2-1 below:

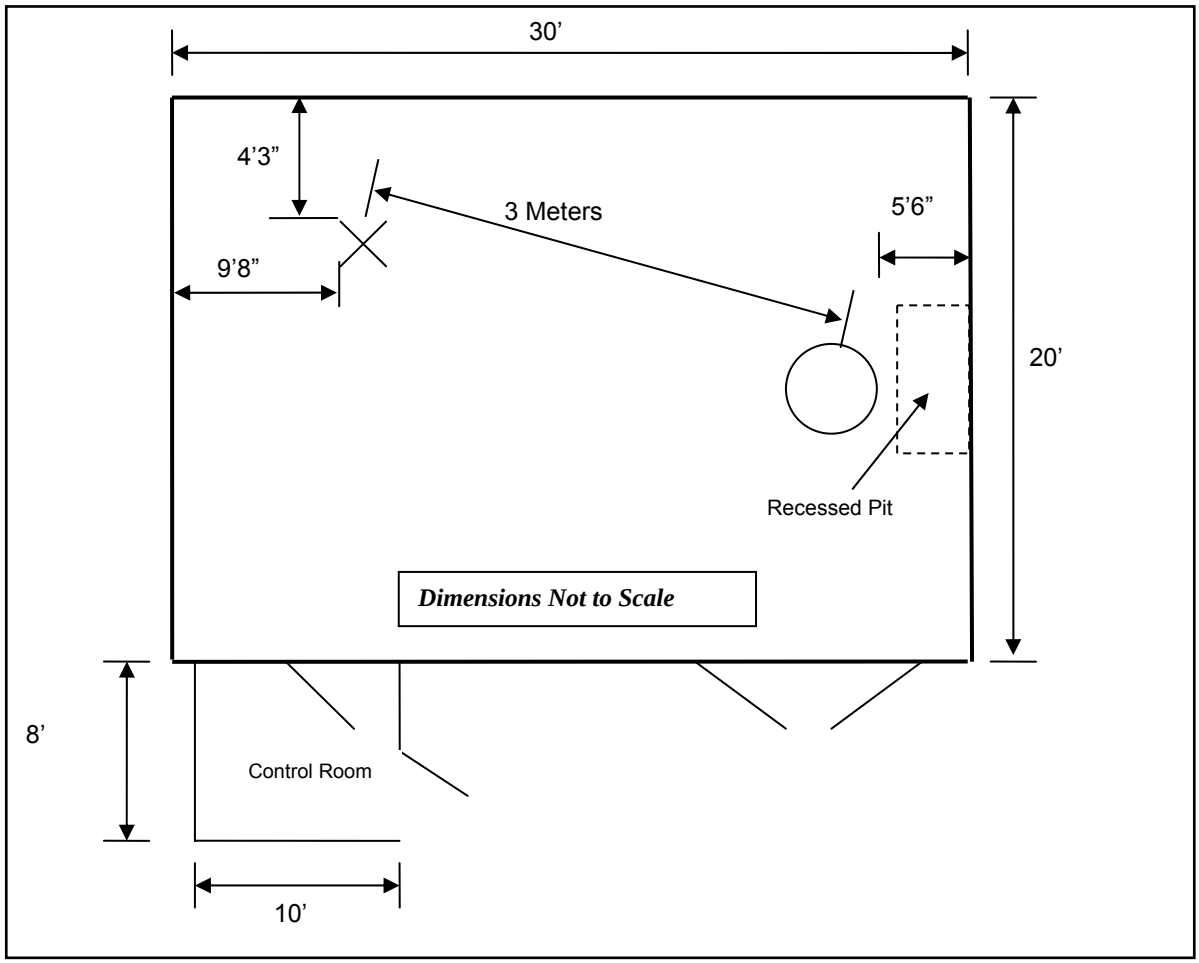


Figure 4.1.1.2-1: Semi-Anechoic Chamber Test Site

4.1.1.3 Fully Anechoic Chamber

The 3m fully anechoic chamber is used for pre-screening the EUT for emissions only. Final screening is performed on the OATS or in case of Class B EUT's, in the 3m semi-anechoic chamber. The Fully Anechoic Chamber has been characterized for field uniformity in accordance with IEC 61000-4-3 and can be used for final radiated fields immunity testing.

The Fully-Anechoic Chamber Test Site consists of a 24'L x 16'W x 12'H shielded enclosure. The chamber is fully lined with RF absorbing foam. The foam ranges in type from 8-24" conventional pyramidal cones, 8-12" conventional wedges and 6" and 16" Hybrid Foam over ferrite tile. The Hybrid material is placed in the 6 specular regions of the chamber for better low-frequency performance. The specular regions are 1) directly behind the receiving antenna, 2) on the floor between the receiving antenna and the EUT table, 3) the wall directly behind the EUT, 4&5) the side walls between the receiving antenna and the EUT table and 6) the ceiling between the receiving antenna and the EUT. The specular regions are 6' x 4' in size.

The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the shield using 3/4" stainless steel braided cable.

The turntable is a remotely controlled EMCO Model 1060 and is 150cm in diameter and is located 1m from the absorber on the back wall of the chamber.

A diagram of the Fully Anechoic Chamber Test Site is shown in Figure 4.1.1.3-1 below:

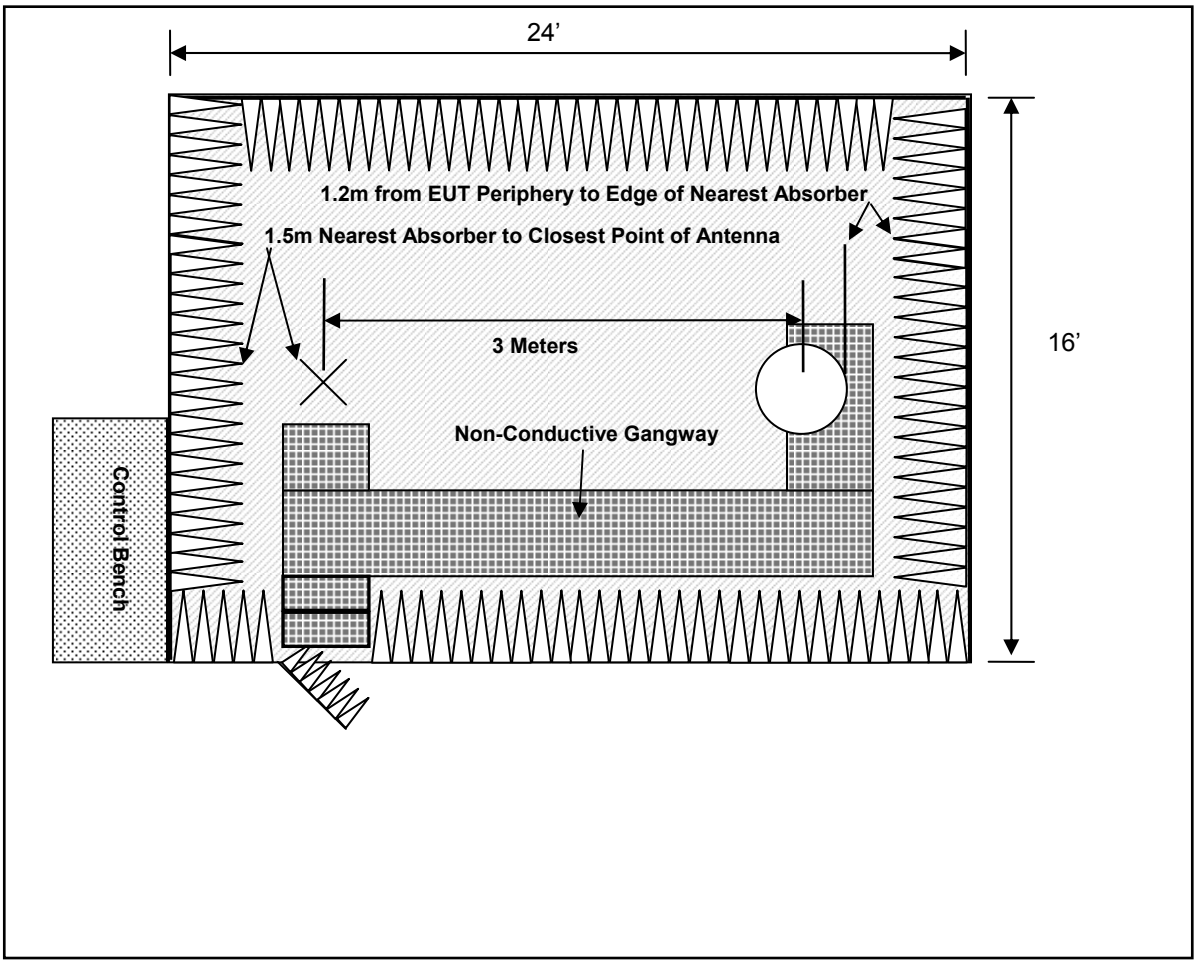


Figure 4.1.1.3-1: Fully Anechoic Chamber Test Site

4.1.2 Test Equipment

Table 4.1.2-1 identifies all equipment used for radiated and conducted emissions respectively.

Table 4.1.2-1 Test Equipment – Radiated Emissions

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
1	Rohde & Schwarz	ESMI - Display	833771/007	Spectrum Analyzers	Active	10/26/2008
2	Rohde & Schwarz	ESMI-Receiver	839587/003	Spectrum Analyzers	Active	10/26/2008
25	Chase	CBL6111	1043	Antennas	Active	8/8/2008
30	Spectrum Technologies	DRH-0118	970102	Antennas	Active	5/7/2009
73	Agilent	8447D	2727A05624	Amplifiers	Active	12/19/2008
167	ACS	Chamber EMI Cable Set	167	Cable Set	Active	1/4/2009
338	Hewlett Packard	8449B	3008A01111	Amplifiers	Active	10/24/2008

4.1.3 Test Methodology

4.1.3.1 Pre-Scans

Radiated pre-scans are performed on all EUT's in either the 3m Semi-Anechoic or the 3m Fully-Anechoic Chamber. Final emission testing for Class A equipment is performed on the 3/10m Open Area Test Site (OATS) as described in section 4.1.1. Final emission testing on Class B equipment can be performed either in the 3m Semi-Anechoic chamber described in section 4.1.2 or on the OATS.

Pre-scans are a method by which the 10 highest emissions can be identified for final evaluation. This is achieved by taking automated emission snapshots of the EUT at various azimuths and antenna heights. The software is programmed to perform a peak sweep of the band using the maxhold function. This sweep is performed every 90º in both horizontal and vertical polarities and at antenna heights of 100cm and 300cm. Although not a fully maximized scan, the pre-scan gives a good indication of pass or fail.

4.1.3.2 Final Scans

Radiated emissions measurements were made over the frequency range of 30MHz to 1000MHz. Quasi-Peak measurements are taken with the Spectrum Analyzer's resolution bandwidth was set to 120KHz and video bandwidth set to 300 kHz for measurements below 1000MHz. Average measurements are taken with the RBW and VBW were set to 1MHz and 10 Hz for measurements above 1000MHz. The calculation for the radiated emissions field strength is as follows:

Corrected Reading = Analyzer Reading + Cable Loss + Antenna Factor
Margin(dB) = Applicable Limit - Corrected Reading

4.1.3.3 Test Criteria

The EUT must meet the Class B Limits as given in section 1.4.1.

4.1.3.4 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

4.1.4 Test Setup Photographs

Figure 4.1.4-1: Radiated Emissions - Front View

Figure 4.1.4-2: Radiated Emissions - Rear View

4.1.5 Test Data
Final tabulated radiated emissions data are reported in the Test Data Table below:

Test Parameters:

Test Date:	**8/3/08**	**Temperature (ºC)**	**26**
Technician:	**Jaime Smith**	**Humidity (%)**	**37**
Equipment Class:	**Class B**	**Barometric Pressure (mBar)**	**1013**
Tested Modes:	**Data Transfer with ENLIGHT Sensor Systems Software**		
AC Input Power:	**230VAC/50Hz**		
DC Input Power:	**N/A**		

Test Data Table:

Pre-scan Plot Reference: B.1

Measurement Distance:

☐ 1 Meter ☒ 3 Meter ☐ 10 Meter

Frequency (MHz)	Measured Level (dBuV)		Antenna Polarity (H/V)	Antenna Height (cm)	Turntable Position (o)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	Pk	Qpk/Av					Pk	Qpk/Av	Pk	Qpk/Av	Pk	Qpk/Av
33.233		39.69	V	100	90	-10.88	--------	28.81	--------	40.5	--------	11.65
153.944		40.43	H	100	90	-15.16	--------	25.27	--------	40.5	--------	15.19
200.044		54.02	H	100	92	-15.40	--------	38.62	--------	40.5	--------	1.84
265.612		57.49	H	100	271	-12.28	--------	45.21	--------	47.5	--------	2.25
312.474		53.25	H	100	264	-11.58	--------	41.67	--------	47.5	--------	5.78
331.228		52.37	H	100	270	-10.96	--------	41.41	--------	47.5	--------	6.05
400.035		46.09	H	100	302	-8.50	--------	37.59	--------	47.5	--------	9.87
432.066		53.03	H	100	319	-8.28	--------	44.75	--------	47.5	--------	2.71
449.991		48.68	H	100	117	-7.90	--------	40.78	--------	47.5	--------	6.68
700.014		40.07	V	100	0	-2.60	--------	37.47	--------	47.5	--------	9.99

Qpk = Quasi-Peak Measurement or Limit (< 1GHz)
AV = Average Measurement or Limit (>1GHz)

Notes:

4.2 Conducted Emissions

4.2.1 Conducted Emissions Test Site

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

A diagram of the room is shown below in figure 4.1.4-1:

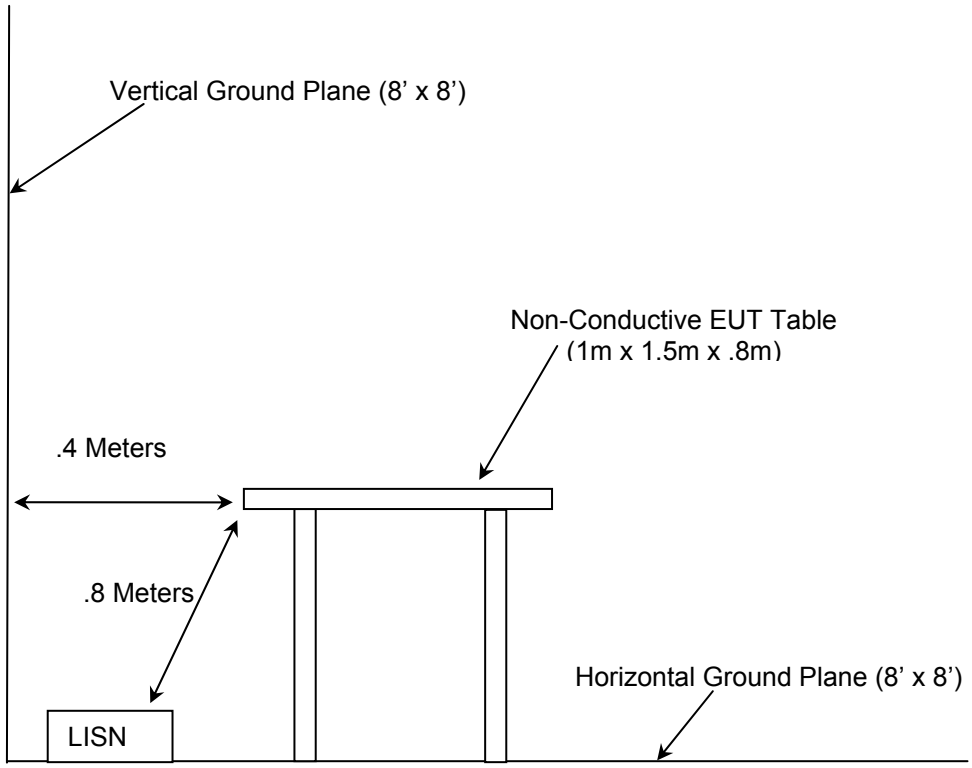


Figure 4.2-1: AC Mains Conducted EMI Site

4.2.2 Test Equipment

Table 4.2.2-1 Test Equipment – Conducted Emissions

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
70	Rohde & Schwarz	ESH-3	879676/050	Spectrum Analyzers	Active	10/24/2008
153	EMCO	3825/2	9411-2268	LISN	Active	11/27/2008
168	Hewlett Packard	11947A	44829	Attenuators	Active	2/18/2009
324	ACS	Belden	8214	Cables	Active	7/28/2009
16	ACS	Cable	16	Cables	No Cal Req	

4.2.3 Test Methodology

Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer's resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss
Margin = Applicable Limit - Corrected Reading

4.2.3.1 Test Criteria

The EUT must meet the Class B Limits as given in section 1.4.1.

4.2.3.2 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

4.2.4 Test Setup Photographs

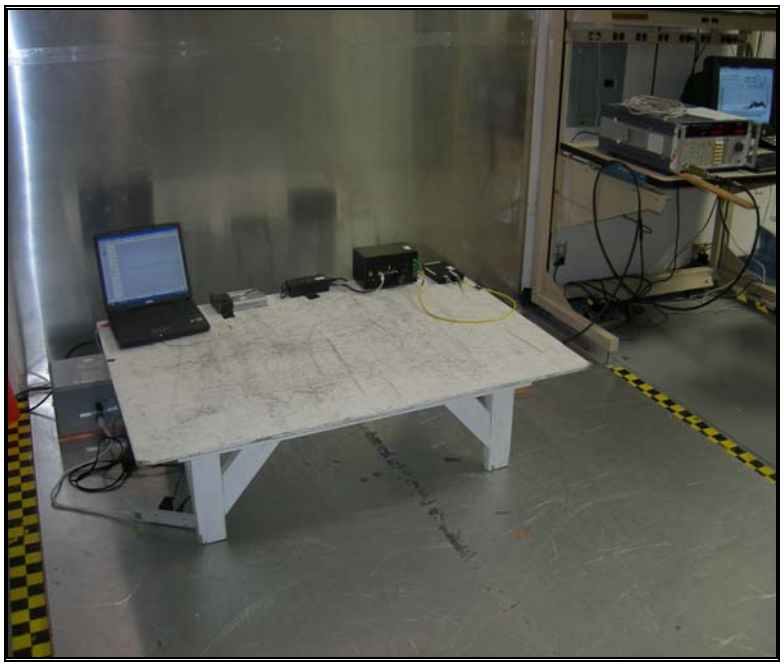


Figure 4.2.4-1: Conducted Emissions Test Setup – Front View

Figure 4.2.4-2: Conducted Emissions Test Setup – Side View

4.2.5 Test Data

Tabulated data is given in the Test Data Tables below. Plots of each tested line are provided in appendix b.

Test Parameters:

Test Date:	**6/26/08**	**Temperature (ºC)**	**23**
Technician:	**Austin Thompson**	**Humidity (%)**	**31**
Equipment Class:	**Class B**	**Barometric Pressure (mBar)**	**1019**
Tested Modes:	**Data Transfer with ENLIGHT Sensor Systems Software**		
AC Input Power:	**230VAC/50Hz**		
DC Input Power:	**N/A**		

Tested Leads:

☒ **AC Mains – Number of Lines: 2**
☐ **DC Mains – Number of Lines:**
☐ **Telecom Port – Quantity:**

Test Data Tables:

Check All That Apply to This Data
☒ Line 1 ☐ Line 2 ☐ Line 3 ☐ Line 4
☒ To Ground ☐ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

Plot Number: B.2
Power Supply Description: PS1

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.1977	34.5	22.2	9.80	44.30	32.00	63.71	53.71	19.4	21.7
0.2636	28.1	15.7	9.80	37.90	25.50	61.32	51.32	23.4	25.8
0.3296	22.9	10.2	9.80	32.70	20.00	59.46	49.46	26.8	29.5
5.5277	26.2	24.6	9.81	36.01	34.41	60.00	50.00	24.0	15.6
6.1892	28.9	25.2	9.80	38.70	35.00	60.00	50.00	21.3	15.0
14.9022	25.3	22.5	10.02	35.32	32.52	60.00	50.00	24.7	17.5

Notes:

Check All That Apply to This Data
☐ Line 1 ☒ Line 2 ☐ Line 3 ☐ Line 4
☒ To Ground ☐ Floating
☐ Telecom Port _____
☒ dBµV ☐ dBµA

Plot Number: B.3
Power Supply Description: PS1

Frequency (MHz)	Uncorrected Reading		Total Correction Factor (dB)	Corrected Level		Limit		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.1988	34.7	25.3	9.80	44.50	35.10	63.66	53.66	19.2	18.6
0.2651	28.5	18.1	9.80	38.30	27.90	61.27	51.27	23.0	23.4
0.3315	22.8	13.5	9.80	32.60	23.30	59.41	49.41	26.8	26.1
5.4202	26.2	23.5	9.81	36.01	33.31	60.00	50.00	24.0	16.7
6.0831	27.6	24.1	9.80	37.40	33.90	60.00	50.00	22.6	16.1
6.626	28.2	24.3	9.81	38.01	34.11	60.00	50.00	22.0	15.9

Notes:

5.0 Harmonic Current Emissions

5.1 Test Site Description

The harmonic current emissions test site consists of a nonconductive table 80 cm high placed above a nonconductive concrete floor.

5.2 Test Equipment

Table 5.2-1 Test Equipment

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
91	Pacific Power	360AMX-UPC32	0152	Power Supplies	Active, No Cal Req	
421	California Instruments	PACS-1	X71918	Analyzers	Active	1/22/2009

5.3 Test Methodology

The EUT is considered quasi-stationary equipment according to table section 6.2.4 of EN 61000-3-2 and the test was conducted according to the general requirements given in section 6.2.3 and Annex B.

5.3.1 Test Criteria

Harmonic current emissions for Class A equipment must not exceed the levels as given in section 1.4.2.

5.3.2 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

5.4 Test Setup Photographs

Figure 5.4-1: Harmonic Current Emissions Setup Photograph

5.5 Harmonic Current Emissions Data Sheet

Test Parameters:

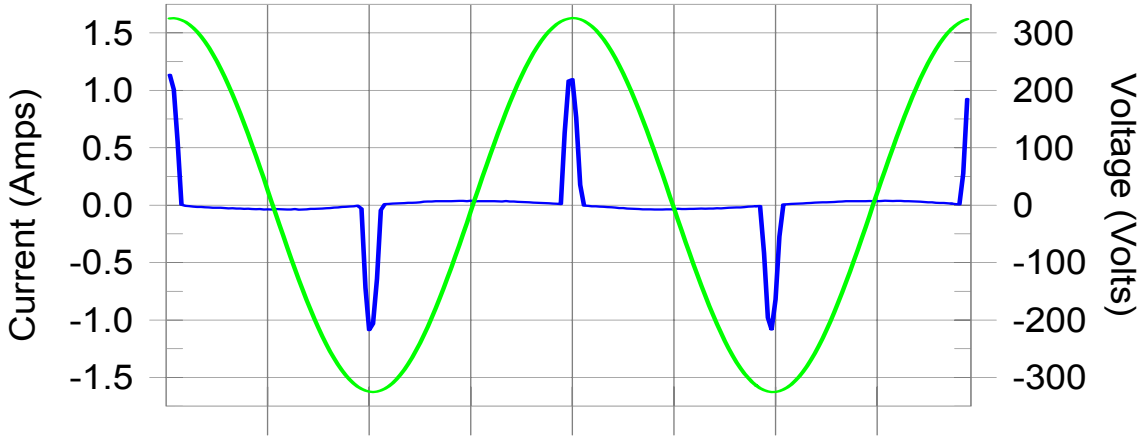
Test Date:	**8/3/08**	**Temperature (ºC)**	**26**
Technician:	**Jaime Smith**	**Humidity (%)**	**27**
HCE Equipment Class:	**Class A**	**Barometric Pressure (mBar)**	**1013**
Tested Modes:	**Data Transfer with ENLIGHT Sensor Systems Software**		
AC Input Power:	**230VAC/50Hz**		
DC Input Power:	**N/A**		

Test Data: Harmonics – Class-A per Ed. 3.0 (2005-11)(Run time) incl. inter-harmonics

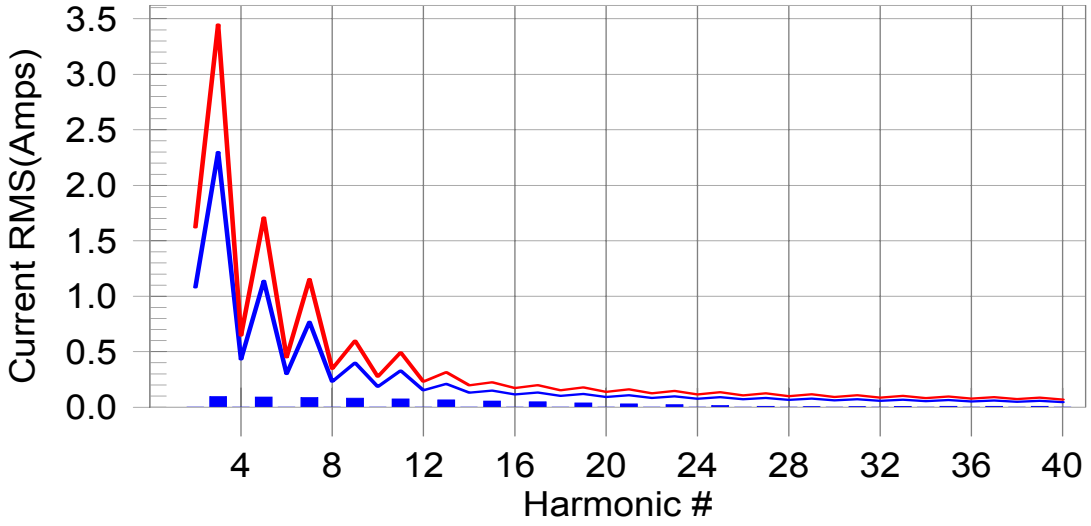
EUT: SM125v2 **Tested by: Jaime Smith**
Test category: Class-A per Ed. 3.0 (2005-11) (European limits) **Test Margin: 100**
Test date: 8/3/2008 **Start time: 11:14:11 AM** **End time: 11:24:31 AM**
Test duration (min): 10 **Data file name: H-000116.cts_data**
Comment: 08-0245
Customer: Micron Optics

Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class A limit line **European Limits**



Test result: Pass Worst harmonic was #15 with 36.77% of the limit.

Current Test Result Summary (Run time)

Test Result: Pass Source qualification: Normal
THC(A): 0.22 I-THD(%): 221.30 POHC(A): 0.041 POHC Limit(A): 0.251
Highest parameter values during test:

V_RMS (Volts):	230.21	Frequency(Hz):	50.00
I_Peak (Amps):	1.150	I_RMS (Amps):	0.252
I_Fund (Amps):	0.101	Crest Factor:	4.623
Power (Watts):	23.3	Power Factor:	0.408

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.002	1.080	0.1	0.002	1.620	0.10	Pass
3	0.095	2.300	4.1	0.096	3.450	2.77	Pass
4	0.001	0.430	0.3	0.002	0.645	0.23	Pass
5	0.091	1.140	8.0	0.092	1.710	5.40	Pass
6	0.001	0.300	0.3	0.001	0.450	0.28	Pass
7	0.086	0.770	11.2	0.087	1.155	7.57	Pass
8	0.001	0.230	0.4	0.001	0.345	0.30	Pass
9	0.080	0.400	20.0	0.081	0.600	13.53	Pass
10	0.001	0.184	0.5	0.001	0.276	0.34	Pass
11	0.072	0.330	21.9	0.074	0.495	14.91	Pass
12	0.001	0.153	0.5	0.001	0.230	0.41	Pass
13	0.064	0.210	30.5	0.066	0.315	20.82	Pass
14	0.001	0.131	0.5	0.001	0.197	0.38	Pass
15	0.055	0.150	36.8	0.057	0.225	25.27	Pass
16	0.001	0.115	0.5	0.001	0.173	0.37	Pass
17	0.046	0.132	34.9	0.048	0.199	24.04	Pass
18	0.000	0.102	0.5	0.001	0.153	0.38	Pass
19	0.037	0.118	31.3	0.039	0.178	21.86	Pass
20	0.000	0.092	0.4	0.000	0.138	0.34	Pass
21	0.028	0.107	26.6	0.030	0.161	18.81	Pass
22	0.000	0.084	0.4	0.000	0.125	0.35	Pass
23	0.021	0.098	21.0	0.022	0.147	15.19	Pass
24	0.000	0.077	0.5	0.000	0.115	0.40	Pass
25	0.013	0.090	14.9	0.015	0.135	11.21	Pass
26	0.000	0.071	0.5	0.000	0.106	0.43	Pass
27	0.007	0.083	8.9	0.009	0.125	7.16	Pass
28	0.000	0.066	0.5	0.000	0.099	0.45	Pass
29	0.003	0.078	4.1	0.004	0.116	3.54	Pass
30	0.000	0.061	0.6	0.000	0.092	0.50	Pass
31	0.004	0.073	5.3	0.004	0.109	3.75	Pass
32	0.000	0.058	0.6	0.000	0.086	0.46	Pass
33	0.006	0.068	8.8	0.006	0.102	6.15	Pass
34	0.000	0.054	0.6	0.000	0.081	0.48	Pass
35	0.007	0.064	11.4	0.008	0.096	7.88	Pass
36	0.000	0.051	0.6	0.000	0.077	0.45	Pass
37	0.008	0.061	13.0	0.008	0.091	8.78	Pass
38	0.000	0.048	0.6	0.000	0.073	0.44	Pass
39	0.008	0.058	13.5	0.008	0.087	9.14	Pass
40	0.000	0.046	0.6	0.000	0.069	0.47	Pass

Voltage Source Verification Data (Run time)

EUT: SM125v2 Tested by: Jaime Smith
Test category: Class-A per Ed. 3.0 (2005-11) (European limits) Test Margin: 100
Test date: 8/3/2008 Start time: 11:14:11 AM End time: 11:24:31 AM
Test duration (min): 10 Data file name: H-000116.cts_data
Comment: 08-0245
Customer: Micron Optics

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms):	230.21	Frequency(Hz):	50.00
I_Peak (Amps):	1.150	I_RMS (Amps):	0.252
I_Fund (Amps):	0.101	Crest Factor:	4.623
Power (Watts):	23.3	Power Factor:	0.408

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.037	0.460	8.03	OK
3	0.064	2.072	3.07	OK
4	0.010	0.460	2.24	OK
5	0.023	0.921	2.55	OK
6	0.016	0.460	3.50	OK
7	0.018	0.691	2.56	OK
8	0.007	0.460	1.59	OK
9	0.005	0.460	1.03	OK
10	0.004	0.460	0.90	OK
11	0.008	0.230	3.47	OK
12	0.011	0.230	4.98	OK
13	0.005	0.230	1.97	OK
14	0.003	0.230	1.44	OK
15	0.008	0.230	3.34	OK
16	0.003	0.230	1.38	OK
17	0.006	0.230	2.47	OK
18	0.006	0.230	2.70	OK
19	0.005	0.230	2.20	OK
20	0.004	0.230	1.56	OK
21	0.003	0.230	1.16	OK
22	0.002	0.230	1.05	OK
23	0.004	0.230	1.83	OK
24	0.004	0.230	1.64	OK
25	0.003	0.230	1.52	OK
26	0.002	0.230	0.91	OK
27	0.005	0.230	2.39	OK
28	0.002	0.230	0.86	OK
29	0.003	0.230	1.34	OK
30	0.003	0.230	1.32	OK
31	0.002	0.230	0.90	OK
32	0.002	0.230	0.78	OK
33	0.003	0.230	1.15	OK
34	0.002	0.230	0.69	OK
35	0.004	0.230	1.61	OK
36	0.002	0.230	1.01	OK
37	0.003	0.230	1.09	OK
38	0.002	0.230	0.78	OK
39	0.004	0.230	1.66	OK
40	0.001	0.230	0.65	OK

6.0 Voltage Fluctuations & Flicker

6.1 Test Site Description

The Voltage Fluctuations & Flicker test site consists of a nonconductive table 80 cm high placed above a nonconductive concrete floor.

6.2 Test Equipment

Table 6.2-1 Test Equipment

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
91	Pacific Power	360AMX-UPC32	0152	Power Supplies	Active, No Cal Req	
421	California Instruments	PACS-1	X71918	Analyzers	Active	1/22/2009

6.3 Test Methodology

The EUT was setup to satisfy its normal operating condition and functional requirements and in accordance with Annex A of EN 61000-3-3.

6.3.1 Test Criteria

The EUT must meet the Voltage Fluctuations & Flicker Criteria given in section 1.4.3.

6.3.2 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

6.4 Test Setup Photographs

Figure 6.4-1: Voltage Fluctuations & Flicker Test Setup

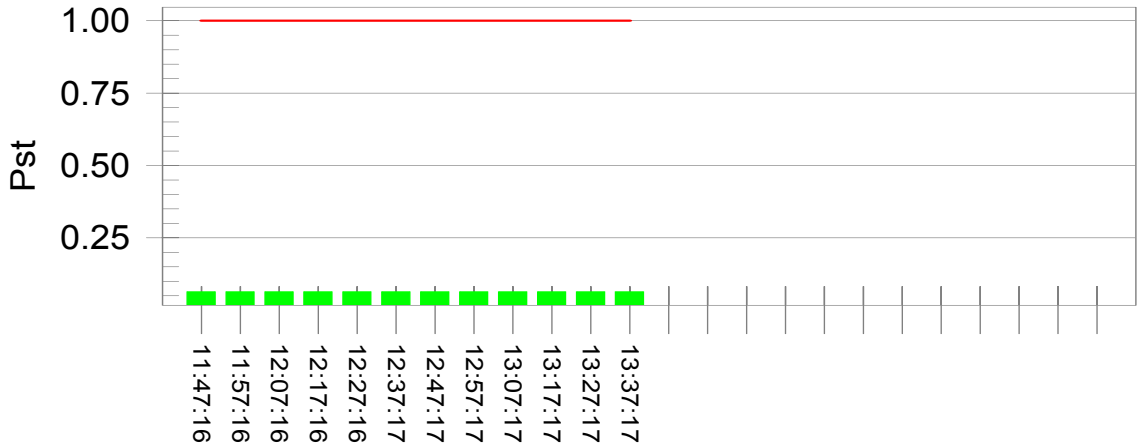
6.5 Voltage Fluctuations & Flicker Data Sheet

Test Parameters:

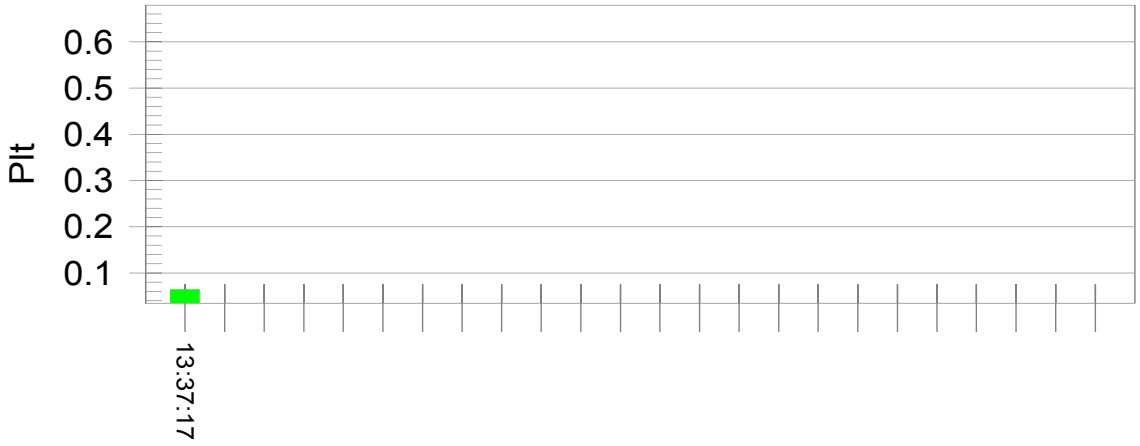
Test Date:	**8/3/07**	**Temperature (ºC)**	**26**
Technician:	**Jaime Smith**	**Humidity (%)**	**37**
Equipment Class:	**Class B**	**Barometric Pressure (mBar)**	**1013**
Tested Modes:	**Data Transfer with ENLIGHT Sensor Systems Software**		
AC Input Power:	**230VAC/50Hz**		
DC Input Power:	**N/A**		

Graphical Data:

Pst_i and limit line **European Limits**



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	**230.16**			
Highest dt (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Time(mS) > dt:	**0.0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.00**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.064**	**Test limit:**	**1.000**	**Pass**
Highest Plt (2 hr. period):	**0.064**	**Test limit:**	**0.650**	**Pass**

SECTION C: IMMUNITY – TEST INFORMATION AND RESULTS

7.0 Electrostatic Discharge Immunity

7.1 Test Site Description

The EUT was configured and connected to satisfy its functional requirements.

For a table top configuration, the EUT was placed on an insulating support of 0.5mm in the center of the Horizontal Coupling Plane (HCP). The HCP laid flat on a non-conductive table measuring 1.6 meters x 0.8 meters x 0.8 meters. The non-conductive table was placed on a 16 feet x 8 feet Ground Reference Plane (GRP). The Vertical Coupling Plane was placed 10cm from the EUT and insulated from the HCP.

For a floor standing configuration the EUT was placed on a 10cm insulated support. The non-conductive spacer was placed on a 16 feet x 8 feet Ground Reference Plane (GRP). The Vertical Coupling Plane was placed 10cm from the EUT.

Both the HCP and the VCP were connected to the GRP via cables with 470kΩ resistors located at each end. The ground lead of the ESD generator was also connected to the GRP.

7.2 Test Equipment

Table 7.2-1: Test Equipment List

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
47	Keytek	PSC-1	8504238	Immunity Equipment	Active	10/25/2008
59	Keytek	MZ-15/EC	9502245	Immunity Equipment	Active	10/26/2008

7.3 Test Methodology

IEC 61000-4-2 Ed. 1.2 - Electromagnetic compatibility (EMC) - Part 4. Testing and measurement techniques - Section 4.2 Electrostatic discharge immunity test - Basic EMC Publication, was the guiding document for this test. The purpose of this test is to verify the immunity of single devices or systems against electrostatic discharges (ESD) generated by an operator or object touching the equipment, or by objects or persons coming into contact in the vicinity of the equipment.

Only areas of the EUT that are accessible to the user are considered for the evaluation.

Direct Contact Discharge

Devices with accessible conductive surfaces are subject to direct contact discharges. Each test point identified was subjected to 10 discharges of both positive and negatives impulses.

Indirect Contact Discharge

The EUT was subjected to indirect contact discharges to a horizontal coupling plane (HCP). At least 10 single discharges in both polarities were applied to the EUT via the HCP on all sides and at a separation distance of 10cm. In addition the EUT was subjected indirect discharges to a vertical coupling plane (VCP). At least 10 single discharges in both polarities were applied to the EUT via the VCP on all sides and at a separation distance of 10cm.

Air Discharge

Insulated surfaces of the EUT that are accessible were subjected to air discharges. Each test point is subjected to 10 discharges of each polarity.

7.3.1 Test Criteria

EN 61326-1:2006 requires performance criterion B to be met as described in section 1.4.4

7.3.2 Test Justification

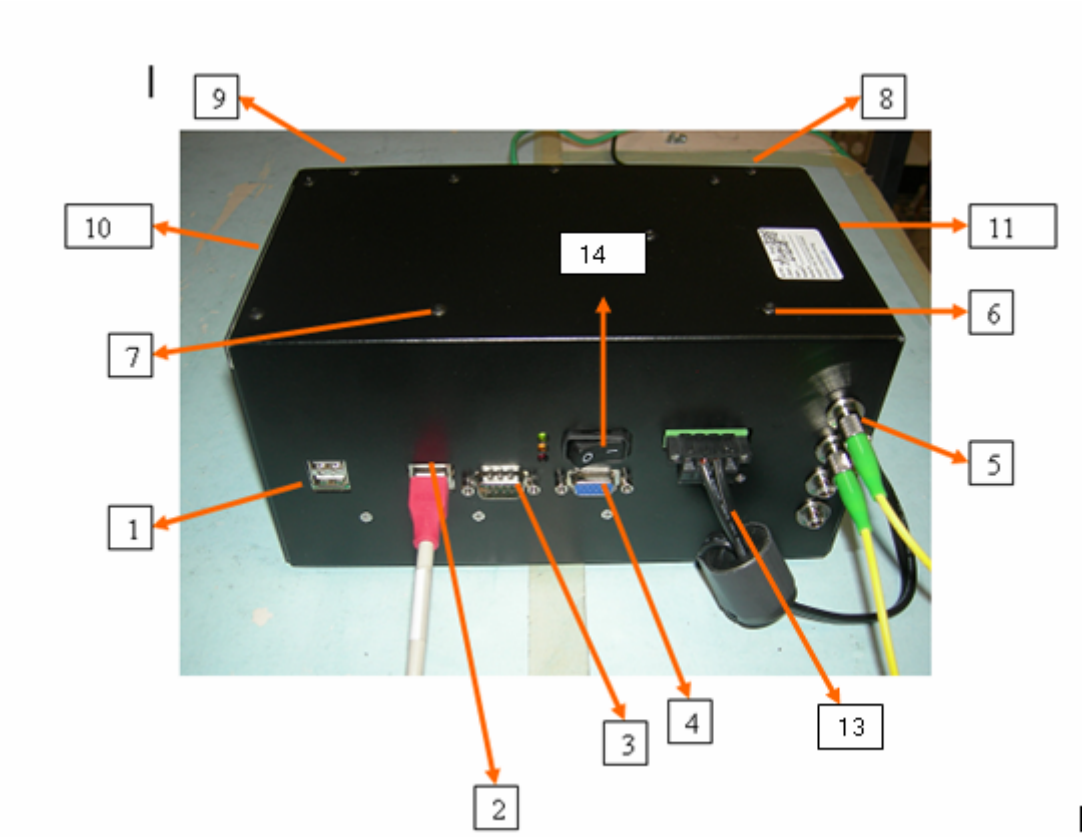
☒ No justification - The EUT was tested per the appropriate test methods and test plan.
☐ The test method, standard, and/or test plan was deviated from for the following reason:

7.4 Set-up Photograph

Figure 7.4-1: Test Set-up Photograph

7.5 ESD Data Sheet

Test Point Photograph:



Test Point Selection:

TEST POINT #	DESCRIPTION	TYPE (C/A)	TEST POINT #	DESCRIPTION	TYPE (C/A)
1	USB	**Contact**	10	Left Side	**Contact**
2	Ethernet	**Contact**	11	Right Side	**Contact**
3	I/O	**Contact**	12	Back Screw	**Contact**
4	Video I/O	**Contact**	13	DC Input Cord	**Air**
5	Fiber Connector	**Contact**	14	On/Off Switch	**Air**
6	Screw	**Contact**			**Select**
7	Screw	**Contact**			**Select**
8	Screw	**Contact**			**Select**
9	Screw	**Contact**			**Select**

7.5.3 Test Data

Test Parameters:

Test Date:	**07-07-08**	**Temperature (ºC)**	**26**
Technician:	**Yuneush Khan**	**Humidity (%)**	**34**
Equipment Class:	**Class B**	**Barometric Pressure (mBar)**	**1020**
Tested Modes:	**Data Transfer with ENLIGHT Sensor Systems Software**		
AC Input Power:	**230VAC/50Hz**		
DC Input Power:	**N/A**		

Indirect Contact Discharge:

Check All That Apply to This Data

Plane:	Polarity:	Tested Levels:	
☐ Vertical Coupling Plane	☐ Positive	☐ 2kV	☐ 8kV
☐ Horizontal Coupling Plane	☐ Negative	☒ 4kV	☐ 15kV
☒ Both	☒ Both	☐ 6kV	☐ Enter Other Level Here

Side	Result	Observation (Describe any detectable event)
Front	Pass	There was no detectable event.
Rear	Pass	There was no detectable event.
Left	Pass	There was no detectable event.
Right	Pass	There was no detectable event.

Notes:

Air and Direct Contact Discharge:

Check All That Apply to This Data		
Polarity:	**Tested Levels:**	
☐ Positive	☒ 2kV	☒ 8kV
☐ Negative	☒ 4kV	☐ 15kV
☒ Both	☐ 6kV	☐ Enter Other Level Here

Test Point	Discharge Type	Result	Observation (Describe any detectable event)
1	Contact	Pass	There was no detectable event.
2	Contact	Pass	There was no detectable event.
3	Contact	Pass	There was no detectable event.
4	Contact	Pass	There was no detectable event.
5	Contact	Pass	There was no detectable event.
6	Contact	Pass	There was no detectable event.
7	Contact	Pass	There was no detectable event.
8	Contact	Pass	There was no detectable event.
9	Contact	Pass	There was no detectable event.
10	Contact	Pass	There was no detectable event.
11	Contact	Pass	There was no detectable event.
12	Contact	Pass	There was no detectable event.
13	Air	Pass	No Air discharge found
14	Air	Pass	No Air discharge found

Notes:

8.0 Radio-Frequency Electromagnetic Fields

8.1 Test Site Description

The radiated fields test was performed in the semi or fully-anechoic chamber described in section 4.1.2 or 4.1.3 respectively.

8.2 Test Equipment

Table 8.2-1: Test Equipment List

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
25	Chase	CBL6111	1043	Antennas	Active	8/8/2008
30	Spectrum Technologies	DRH-0118	970102	Antennas	Active	5/7/2009
40	EMCO	3104	3211	Antennas	Active	1/10/2009
41	Electro-Metrics	BIA-25	2925	Antennas	Active	6/5/2009
77	Agilent	8560E	3240A00285	Spectrum Analyzers	Active	10/24/2008
111	IFI	EFG-3	275	Antennas	Active, No Cal Req	
189	Holaday Industries	HI-4422	89865	Probes	Active	9/28/2008
192	ACS	RFI Cable Set		Cables	Active, No Cal Req	
214	Holaday	HI-4433-GRE	00034096	Probes	Active	1/3/2009
251	Rohde & Schwarz	SML03	102116	Signal Generators	Active	10/26/2008
253	Florida RF Labs	Lab-Flex 290	253	Cables	Active, No Cal Req	
277	Emco	93146	9904-5199	Antennas	Active	8/15/2008
326	ACS	EMI Cable Set-FAC	326	Cables	Active	1/4/2009
329	A.H.Systems	SAS-571	721	Antennas	Active	
354	ETS Lindgren	3142C	00078838	Antennas	Active	6/11/2009
363	IFI	S41-25	L365-0407	Amplifier	Active, No Cal Req	
364	Amplfier Research	DC2600A	0322466	Coupler	Active, No Cal Req	
365	Amplifier Research	DC6180A	0322945	Coupler	Active, No Cal Req	
366	Amplifier Research	DC7420	0323705	Coupler	Active, No Cal Req	
370	IFI	CMX5002	L364-0407	Amplifier	Active, No Cal Req	

8.3 Test Methodology

IEC 61000-4-3 3rd Ed. - Electromagnetic compatibility (EMC) - Part 4. Testing and measurement techniques - Section 3: Radiated, radio-frequency, electromagnetic field immunity test, was the guiding document for this test. The purpose of this test is to verify the immunity of single devices or systems when subjected to radio-frequency electromagnetic field.

The EUT was configured and connected to satisfy its functional requirements. One representative sample was placed on the table and rotated 90° to expose all side of the EUT to the radiofrequency electromagnetic field. The table is non-conductive measuring 1.5 meters x 1.0 meters x 0.8 meters. The non-conductive table was placed 3 meters from the radiating antenna.

The frequency ranges to be considered are swept with the signal 80% amplitude modulated with the signal 80% amplitude modulated with a 1kHz sine wave, pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. Where the frequency range is swept incrementally, the step size shall not exceed 1% of fundamental with linear interpolation between calibrated points.

The test shall normally be performed with the generating antenna facing each of the four sides of the EUT, however if the equipment can be used in different orientations, the test shall be performed on all sides, 6 total.

The polarization of the field generated by each antenna necessitates testing each side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.

8.3.1 Test Criteria

EN 61326-1:2006 requires criterion A to be met as described in section 1.5.4.

8.3.2 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

8.4 Test Setup Photographs

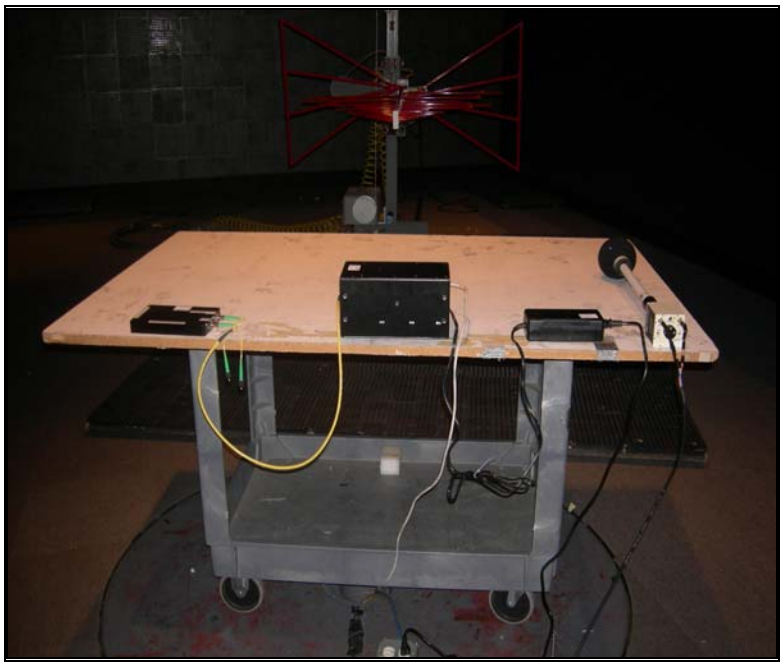


Figure 8.4-1: Test Set-up Photograph

8.5 Test Results

Test Parameters:

Test Date:	**6/26/08**	**Temperature (ºC)**	**24**
Technician:	**Ray Verar**	**Humidity (%)**	**40**
Equipment Class:	**Class B**	**Barometric Pressure (mBar)**	**1018**
Tested Modes:	**Data Transfer with ENLIGHT Sensor Systems Software**		
AC Input Power:	**230VAC/50Hz**		
DC Input Power:	**N/A**		

Test Data:

Check All That Apply to This Data

Polarity	Field Strength:	Freq. Band:	Dwell Time
☐ Horizontal	☒ 3V/m	☒ 80-1000MHz	☐ 1 Second
☐ Vertical	☒ 10V/m	☒ 1400-2000MHz	☒ 3 Seconds
☒ Both	☐ 15V/m	☒ 2000-2700MHz	☐ Enter Other
	☒ 1V/m		

Azimuth	Result	Observation (Describe any detectable event)
0	Pass	There was no detectable event.
90	Pass	There was no detectable event.
180	Pass	There was no detectable event.
270	Pass	There was no detectable event.

Notes:

9.0 Electrical Fast Transient/Bursts

9.1 Test Site Description

The EUT was configured and connected to satisfy its functional requirements. The EUT was placed in the center of a non-conductive support measuring 125cm x 96cm x 10 cm. The non-conductive support is placed on a 8 feet x 8 feet Ground Reference Plane (GRP). A minimum distance of 50 cm between the EUT and all other conductive structures was maintained. A minimum distance of 50 cm between the coupling clamp and all other conductive structures, except the GRP, was maintained. A 10 cm insulated support was placed between the capacitive coupling clamp and the GRP. The GRP was bonded to the EFT/B generator.

The input power port of the EUT was tested using the coupling/decoupling network. The +/-1kV bursts were applied to all lines individually as well as simultaneously.

The bursts were applied to the signal/control line ports, if present, using the capacitive coupling clamp.

9.2 Test Equipment

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
62	Haefely Trench	EFT Clamp	None	munity Equipme	Active, No Cal Req	
206	Haefely Test AG	Pat 1000	151366	Attenuators	Active	3/10/2010
238	Haefely	PB50	N/A	Attenuators	Active	3/10/2009
248	Keytek	EMC PRO	9803353	EMC Tester	Active	9/30/2008

9.3 Test Methodology

IEC 61000-4-4 2nd Ed. - Electromagnetic compatibility (EMC) - Part 4. Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test - Basic EMC Publication., was the guiding document for this test. The purpose of this test is to verify the immunity of single devices or systems when subjected to types of transient disturbances such as those originating from switching transients such as interruption of inductive loads or relay contact bounce.

9.3.1 Test Criteria

EN 61326-1:2006 requires criterion B to be met as described in section 1.5.4.

9.3.2 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

9.4 Test Setup Photographs

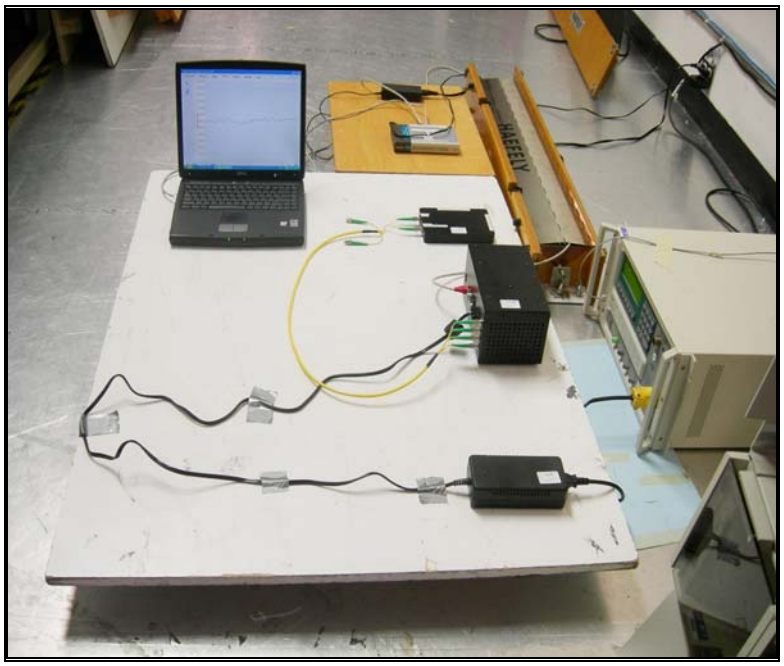


Figure 9.4-1: Test Set-up Photograph

9.5 Test Results

Test Parameters:

Test Date:	6-26-2008	Temperature (ºC)	22
Technician:	Thanh Phan	Humidity (%)	37
Equipment Class:	Class B	Barometric Pressure (mBar)	1019
Tested Modes:	Data Transfer with ENLIGHT Sensor Systems Software		
AC Input Power:	230VAC/50Hz		
DC Input Power:	N/A		

Mains Test Data:

Check All That Apply to This Data

Polarity:	Tested Levels:	Interface Type:
☐ Positive	☐ .5kV	☒ Input
☐ Negative	☐ 1kV	☐ Output
☒ Both	☒ 2kV	☐ Both
	☐ Enter Other Level Here	

Coupling Mode	Result	Observation (Describe any detectable event)
L1	Pass	There was no detectable event.
L2	Pass	There was no detectable event.
PE	Pass	There was no detectable event.
L1-L2	Pass	There was no detectable event.
L1-PE	Pass	There was no detectable event.
L2-PE	Pass	There was no detectable event.
L1, L2, PE	Pass	There was no detectable event.

Notes:

Signal Line Test Data:

Check All That Apply to This Data

Polarity:	Tested Levels:
☐ Positive	☐ .25kV
☒ .5kV	☐ .5kV
☐ Negative	☒ 1kV
☒ Both	☐ 2kV
	☐ Enter Other Level Here

Signal Line	Result	Observation (Describe any detectable event)
Ethernet	Pass	There was no detectable event.

Notes:

10.0 Surge Immunity

10.1 Test Site Description
The EUT was placed on a non-conductive table .8m above a non-conductive concrete floor.

10.2 Test Equipment

Table 10.2-1: Test Equipment List

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
248	Keytek	EMC PRO	9803353	EMC Tester	Active	7/18/2008

10.3 Test Methodology
IEC 61000-4-5 2nd Ed. - Electromagnetic compatibility (EMC) - Part 4. Testing and measurement techniques -Section 5. Surge immunity test, was the guiding document for this test. The purpose of this test is to find the reaction of the EUT under specified operational conditions caused by surge voltages from switching and lightning effects at certain threat levels.

The EUT was operated as intended and monitored for changes in performance. The surge pulses were applied with the appropriate coupling device for each port under test. Each port was subjected to surge pulses starting from the lowest test level to the highest test level as dictated by EN 61326-1:2006. All test levels are completed in three phase angles, with a minimum of ten pulses (5-positve and 5-negative) per angle.

10.3.1 Test Criteria
EN 61326-1:2006 requires criterion B to be met as described in section 1.5.4.

10.3.2 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

10.4 Test Setup Photographs

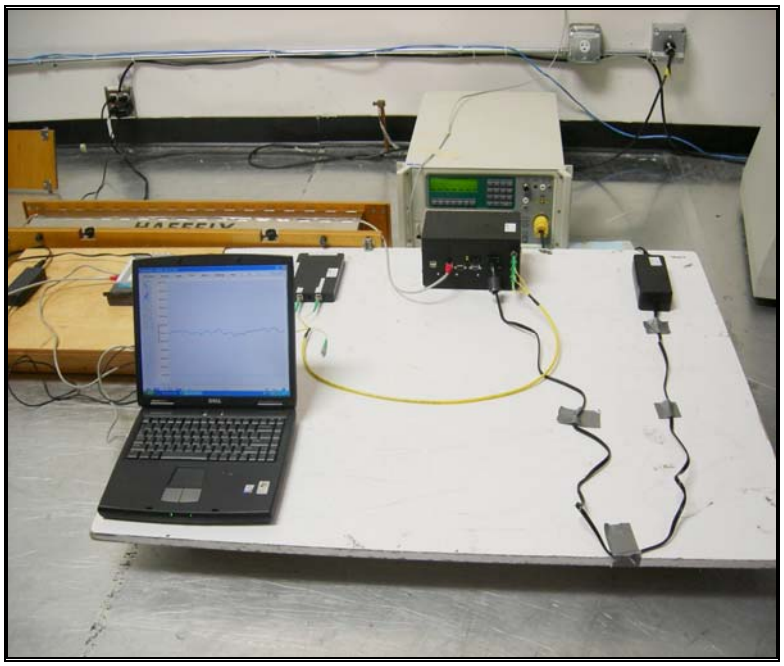


Figure 10.4-1: Test Set-up Photograph

10.5 Test Results

Test Parameters:

Test Date:	6-26-2008	Temperature (ºC)	22
Technician:	Thanh Phan	Humidity (%)	37
Equipment Class:	Class B	Barometric Pressure (mBar)	1019
Tested Modes:	Data Transfer with ENLIGHT Sensor Systems Software		
AC Input Power:	230VAC/50Hz		
DC Input Power:	N/A		

Test Data: Surge Immunity - Input AC power port

Check All That Apply to This Data

Polarity:	Tested Levels:	Interface Type:	Phase Angles:
☐ Positive	☐ .5kV	☒ Input	☐ 90º
☐ Negative	☒ 1kV	☐ Output	☐ 180 º
☒ Both	☒ 2kV	☐ Both	☐ 270 º
	☐ Enter Other Level Here		☒ All

Coupling Mode	Result	Observation (Describe any detectable event)
L1 to N	Pass	There was no detectable event.
L1 to PE	Pass	There was no detectable event.
N to PE	Pass	There was no detectable event.

Notes:

11.0 Radio-Frequency Common-Mode Immunity

11.1 Test Site Description

The EUT was configured and connected to satisfy its functional requirements. The EUT was placed on an insulating support of 0.1m height above a ground reference plane. All relevant cables were provided with the appropriate coupling and decoupling devices at a distance between 0.1m and 0.3m from the projected geometry of the EUT on the Ground Reference Plane (GRP).

11.2 Test Equipment

Table 11.2-1: Test Equipment List

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
5	Chase	CSP-8441	19	Probe	Active	1/15/2010
77	Agilent	8560E	3240A00285	Spectrum Analyzers	Active	10/24/2008
93	Chase	8101	65	Clamp	Active	1/16/2010
96	Chase	1000-M3-25	9806	CDN's	Active	3/10/2010
181	COM-POWER	m1-25	501001	CDN's	Active	11/27/2009
189	Holaday Industries	HI-4422	89865	Probes	Active	9/28/2008
251	Rohde & Schwarz	SML03	102116	Signal Generators	Active	10/26/2008
280	Fischer Custom Comm.	F-203I-23MM-CF	462	General Lab Equipment	Active	2/25/2010
363	IFI	S41-25	L365-0407	Amplifier	Active, No Cal Req	
364	Amplfier Research	DC2600A	0322466	Coupler	Active, No Cal Req	
365	Amplifier Research	DC6180A	0322945	Coupler	Active, No Cal Req	
366	Amplifier Research	DC7420	0323705	Coupler	Active, No Cal Req	
370	IFI	CMX5002	L364-0407	Amplifier	Active, No Cal Req	
424	Amplifier Research	100A100	10265	Amplifier	Active, No Cal Req	
425	ACS	EMC Cable Set	425	Cable Set	Active, No Cal Req	

11.3 Test Methodology

IEC 61000-4-6 Ed. 2.2 - Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 6: Immunity to conducted disturbances, induced by radio- frequency fields, was the guiding document for this test. The purpose of this test is to verify the immunity of single devices or systems when subjected to radio-frequency electromagnetic field.

The EUT was caused to operate as intended and monitored for changes in performance. The frequency range is swept from 150 kHz to 80MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to switch coupling devices as necessary. The rate of sweep shall not exceed 1.5 x 10^{-3} decades. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.

11.3.1 Test Criteria

EN 61326-1:2006 requires criterion A to be met as described in section 1.5.4.

11.3.2 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

11.4 Test Setup Photographs

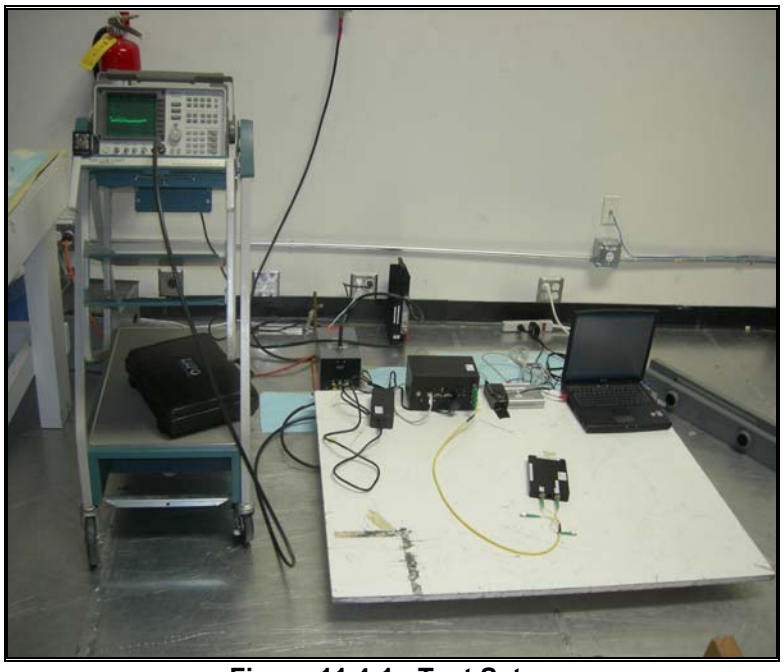


Figure 11.4-1: Test Setup

11.5 Test Results

Test Parameters:

Test Date:	6/27/08	Temperature (ºC)	22
Technician:	Austin Thompson	Humidity (%)	37
Equipment Class:	Class B	Barometric Pressure (mBar)	1019
Tested Modes:	Data Transfer with ENLIGHT Sensor Systems Software		
AC Input Power:	230VAC/50Hz		
DC Input Power:	N/A		

Mains Test Data:

Check All That Apply to This Data

Test Level:
☒ 3Vrms
☐ 10Vrms
☐ 15Vrms
☐ Enter Other Level Here

Freq. Band:
☒ .150-80MHz
☐ Enter Other Band Here

Coupling Mode	Result	Observation (Describe any detectable event)
CDN	Pass	There were no detectable events.

Notes:

Signal Line Test Data:

Check All That Apply to This Data

Test Level:
☒ 3Vrms
☐ 10Vrms
☐ 15Vrms
☐ Enter Other Level Here

Freq. Band:
☒ .150-80MHz
☐ Enter Other Band Here

Signal Line	Result	Observation (Describe any detectable event)
Ethernet	Pass	There were no detectable events.
Describe	Pass	
Describe	Pass	
Describe	Pass	
Describe	Pass	
Describe	Pass	

Notes:

12.0 Power Frequency Magnetic Fields Immunity

12.1 Test Site Description

The EUT was configured and connected to satisfy its functional requirements. The EUT was set on insulating supports 10cm in height at the center of the Ground Reference plane (GRP) such that 1m of any associated cable was exposed to the magnetic field. The GRP shall be connected to the safety earth system of the laboratory

12.2 Test Equipment

Table 12.2-1: Test Equipment List

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
108	ACS	ACSPFMF	108	Antennas	Active, No Cal Req	
239	Walker Scientific	ELF-50D	K72387-4	Sensors	Active	1/15/2009

12.3 Test Methodology

IEC 61000-4-8 Ed. 1.1 - Electromagnetic compatibility (EMC) – Part 3: Testing and measurement techniques – Section 8: Power Frequency Magnetic Fields was the guiding document for this test. The purpose of this test is to verify the immunity of single devices or systems when subjected to power frequency magnetic field.

The EUT shall be caused to operate as intended and monitored for changes in performance. The test magnetic field shall be applied by the immersion method. The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimensions (1m x 1m). The induction coil shall then be rotated by 90° in order to expose the EUT to the test field with different orientations.

12.3.1 Test Criteria

EN 61326-1:2006 requires criterion A to be met as described in section 1.5.4.

12.3.2 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

12.4 Test Setup Photographs

Figure 12.4-1: Test Set-up Photograph

12.5 Test Results

Test Parameters:

Test Date:	6/27/08	Temperature (ºC)	23
Technician:	Austin Thompson	Humidity (%)	37
Equipment Class:	Class B	Barometric Pressure (mBar)	1019
Tested Modes:	Data Transfer with ENLIGHT Sensor Systems Software		
AC Input Power:	230VAC/50Hz		
DC Input Power:	N/A		

Test Data:

Position	Magnetic Field Level (A/m)	Duration (min)	Result	Observation (Describe any detectable event)
X Axis	1	1	Pass	There were no detectable events.
Y Axis	1	1	Pass	There were no detectable events.
Z Axis	1	1	Pass	There were no detectable events.

Notes:

13.0 Voltage Dips and Interruptions

13.1 Test Site Description

13.2 Test Equipment

Table 13.2-1: Test Equipment List

Asset ID	Manufacturer	Model	Serial Number	Eq Type	Status	Next Cal.
248	Keytek	EMC PRO	9803353	EMC Tester	Active	7/18/2008

13.3 Test Methodology

IEC 61000-4-11 2nd Ed. - Electromagnetic compatibility (EMC) - Part 4: Testing and measuring techniques - Section 11: Voltage dips, short interruptions and voltage variations immunity tests, was the guiding document for this test. The purpose of this test is to verify the immunity of single devices or systems against voltage dips, short interruptions and voltage variations.

The EUT shall be tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10s minimum (between each test event). Each mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage, and at additional angles considered critical by product committees or individual product specifications preferably selected from 45˚, 90˚, 135˚, 180˚, 225˚, 270˚ and 315˚ on each phase.

13.3.1 Test Criteria

EN 61326-1:2006 requires criterion B to be met for voltage dips and criterion C for the interruptions as described in section 1.5.4.

13.3.2 Test Justification

☒ **No justification - The EUT was tested per the appropriate test methods and test plan.**
☐ **The test method, standard, and/or test plan was deviated from for the following reason:**

13.4 Test Setup Photographs

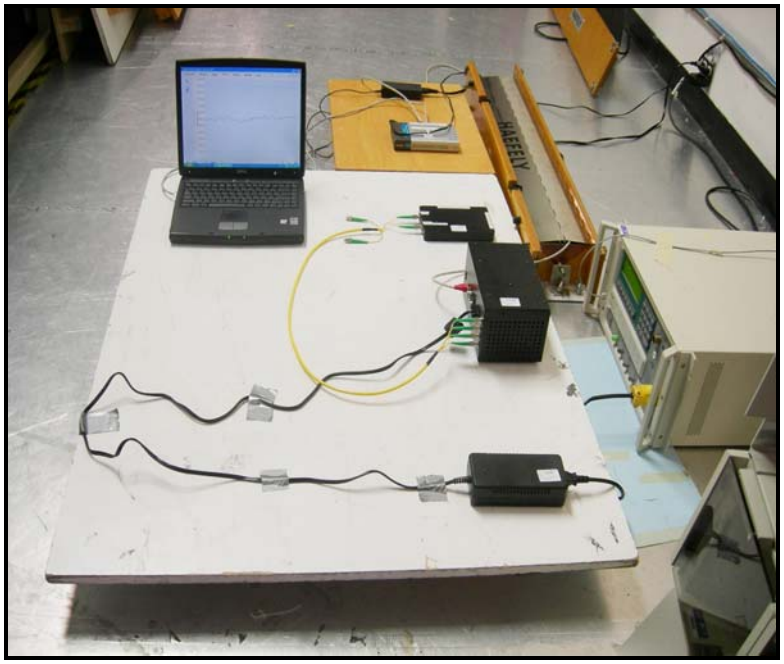


Figure 13.4-1: Test Set-up Photograph

13.5 Test Results

Test Parameters:

Test Date:	**6-26-2008**	**Temperature (ºC)**	**22**
Technician:	**Thanh Phan**	**Humidity (%)**	**37**
Equipment Class:	**Class B**	**Barometric Pressure (mBar)**	**1019**
Tested Modes:	**Data Transfer with ENLIGHT Sensor Systems Software**		
AC Input Power:	**230VAC/50Hz**		
DC Input Power:	**N/A**		

Test Data:

Phenomena*	% Voltage Reduction	Duration (Periods)	Result	Observation (Describe any detectable event)
Voltage Dip	**0**	**1**	**Pass**	**No detectable event.**
Voltage Dip	**40**	**10**	**Pass**	**No detectable event.**
Voltage Dip	**70**	**25**	**Pass**	**No detectable event.**
Voltage Interruption	**0**	**250**	**Pass**	**No detectable event.**

* Each phenomenon repeated 3 times

Notes:

SECTION D: MEASUREMENT UNCERTAINTY

Emissions:

Test Method	Expanded Measurement Uncertainty (+/-U)	Uncertainty Units
Chamber Radiated Emissions 30MHz-1000MHz	3.96	dB
Chamber Radiated Emissions 1GHz–5GHz	3.55	dB
OATS Radiated Emissions 30MHz - 250MHz	3.94	dB
OATS Radiated Emissions 250 - 1000MHz	3.56	dB
OATS Radiated Emissions 1GHz - 5GHz	3.91	dB
AC Mains Conducted Emissions 150k - 30MHz	3.66	dB
Chamber/OATS Radiated Emissions 1-18GHz	4.48	dB
Radiated Disturbances 5MHz - 30MHz	3.88	dB
Radiated Disturbances 30MHz - 950MHz	3.52	dB
Harmonic Current Emissions	2.02	%
Voltage Fluctuations & Flicker	2.02	%

Immunity
The EUT was subjected to the appropriate test levels required by the standard with a confidence level of 95%(k=2).

General
Measurement Uncertainty is based the following publications:

- The Guide to the Expression of Uncertainty in Measurement(GUM): 1993
- UKAS Document - Lab 34: The Expression of Measurement Uncertainty in EMC Testing (Edition 1: August 2002)

Calculations for measurement uncertainty are available upon request.

SECTION E: CONCLUSION

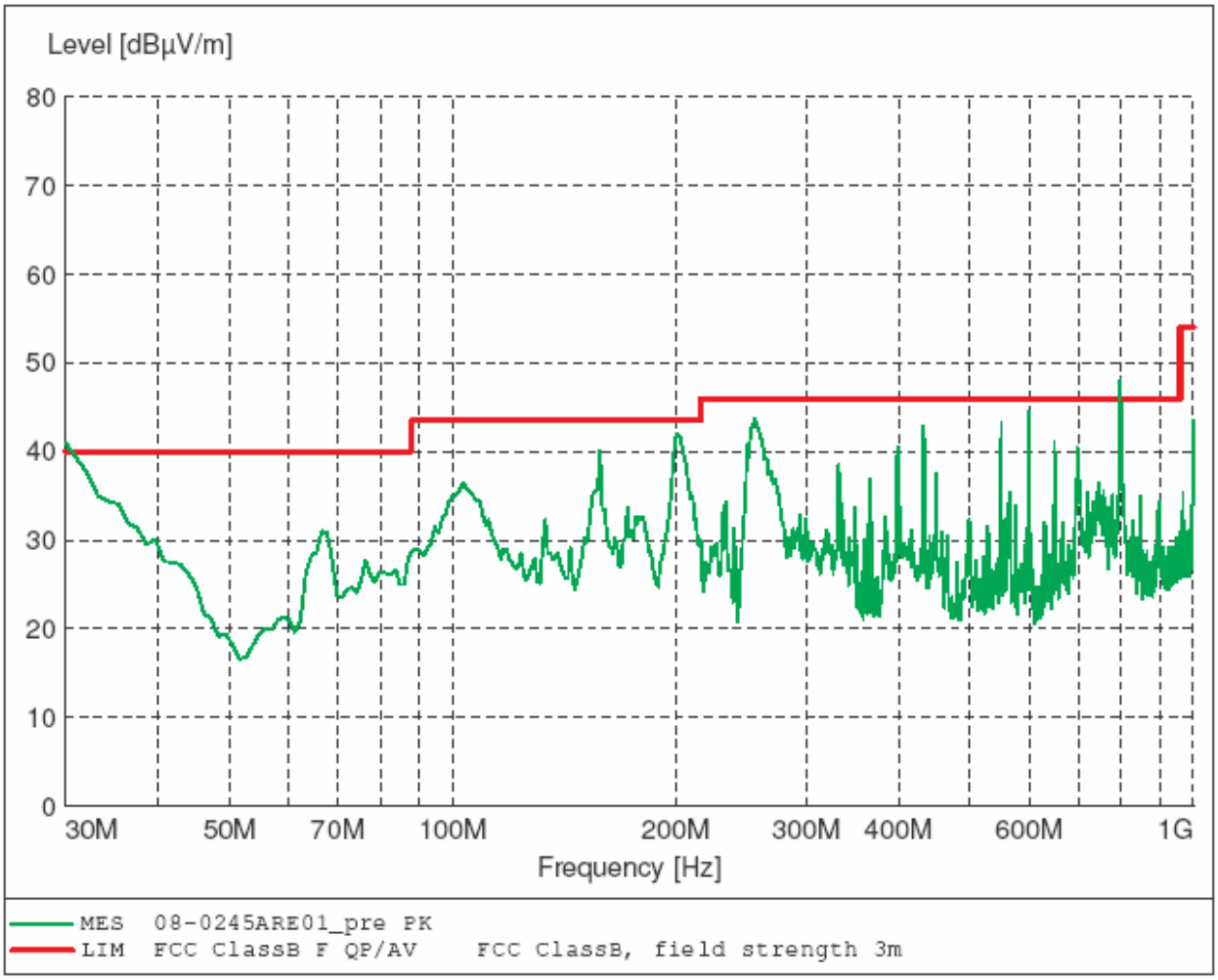
When tested as described in section A, subsection 3.0 and passing with margin ≥ to the measurement uncertainty values specified in section D, the EUT is determined to meet the requirements as defined in the applicable regulations with a confidence level of 95% (k=2).

Appendix A: Equipment Modification Photos

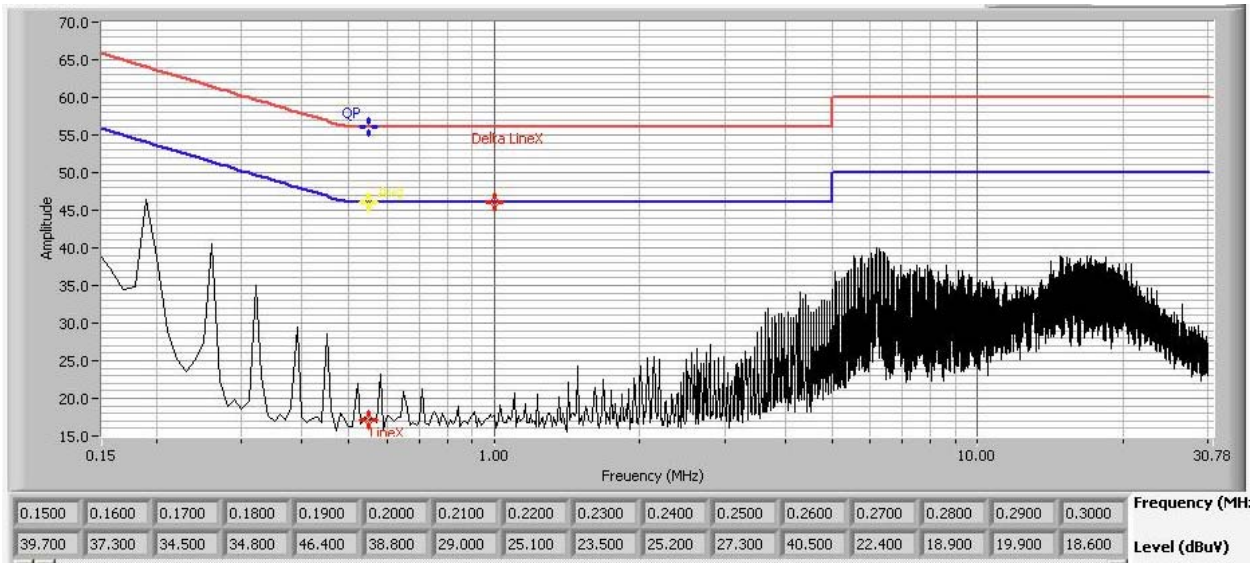
ACS Report: 08-0245
Report Revision: A
Report Issue Date: October 9, 2008

Appendix B: Data Plots

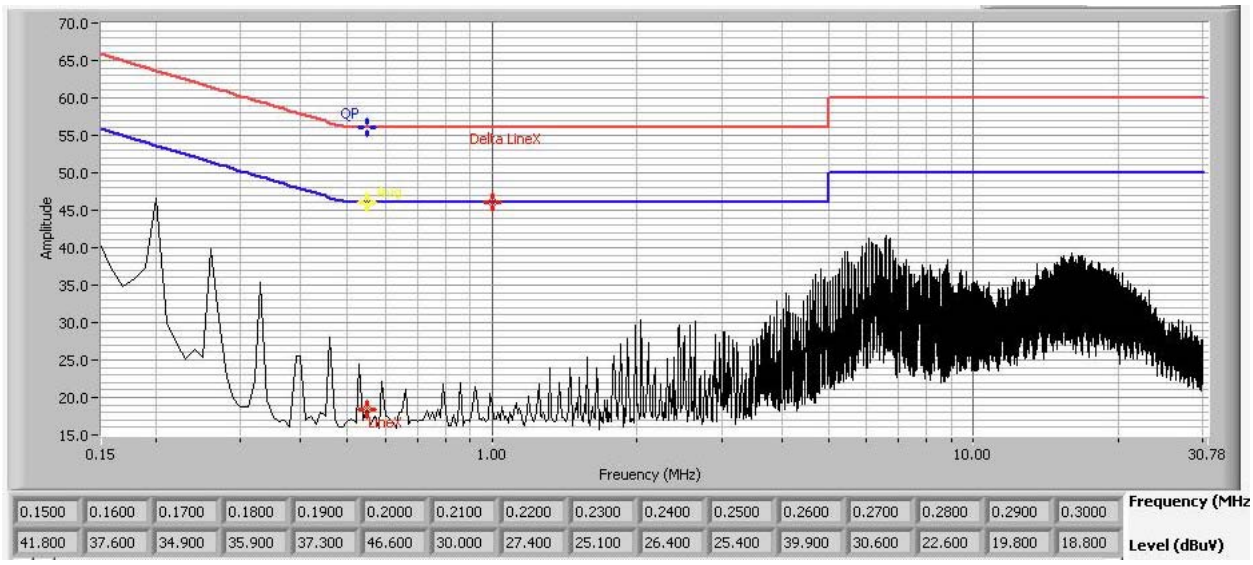
ACS Report: 08-0245
Report Revision: A
Report Issue Date: October 9, 2008



B.1 Radiated Emission Pre-scan Plot



B.2 Conducted Emissions Line 1



B.2 Conducted Emissions Line 2