European Union (EU) Council Directive 2004/108/EC Electromagnetic Compatibility (EMC) and FCC Part 15 Subpart B Class B Test Report for Information Technology Equipment

Sensoray

Model 826-PCI Express Analog and Digital I/O Module

June 14, 2013

Tests Conducted by:

ElectroMagnetic Investigations, LLC

20811 NW Cornell Road, Suite 600, Hillsboro, Oregon 97124, USA
Tele (503) 466-1160 Fax (503) 466-1170 **support@emicomply.com**

Test Summary Information

Report Number: **SEN20130412**
Issue Date: **June 14, 2013**
Test Item: **Model 826 – PCI Express Analog and Digital I/O Module**
Serial Number: **519698**

Emissions:

Result	Product Standard	Test Standard	Description
Pass	EN55022:2010/CISPR 22Ed6:2008 Class B/FCC Part 15 Subpart B Class B	EN55022:2010/CISPR 22Ed6:2008 Class B/FCC Part 15 Subpart B Class B	Radiated Emissions
Pass	EN55022:2010/CISPR 22Ed6:2008 Class B/FCC Part 15 Subpart B Class B	EN55022:2010/CISPR 22Ed6:2008 Class B/FCC Part 15 Subpart B Class B	Conducted Emissions
Pass	EN61000-3-2:2006 +A1:2009+A2:2009	EN61000-3-2:2006 +A1:2009+A2:2009 Class A	Power line Harmonics
Pass	EN61000-3-3:2008/IEC 61000-3-3:2008	EN 61000-3-3:2008/IEC 61000-3-3:2008 Class A	Power line Voltage Fluctuation & Flicker

Immunity:

Result	Product Standard	Test Standard	Description	Performance Criteria	Test Levels
Pass	EN55024:2010 (CISPR 24 Ed2:2010)	IEC 61000-4-2:2010	Electrostatic Discharge Immunity	Criteria B	4 kV Contact Discharge 8 kV Air Discharge
Pass	EN55024:2010 (CISPR 24 Ed2:2010)	IEC 61000-4-3:2010	RF Field Immunity	Criteria A	3 V/m, 80-1000 MHz 3 V/m, 1.4-2 GHz 1 V/m, 2-2.7 GHz
Pass	EN55024:2010 (CISPR 24 Ed2:2010)	IEC 61000-4-4:2010	Electrical Fast Transient/Burst (EFT) Immunity	Criteria B	1 kV peak
Pass	EN55024:2010 (CISPR 24 Ed2:2010)	IEC 61000-4-5:2005	Electrical Slow Transient (Surge) Immunity	Criteria B	1 kV peak – DM 2 kV peak - CM
Pass	EN55024:2010 (CISPR 24 Ed2:2010)	IEC 61000-4-6:2008	RF Conducted Immunity	Criteria A	3 Vrms, 150 kHz to 80 MHz
N/A	EN55024:2010 (CISPR 24 Ed2:2010)	IEC 61000-4-8:2009	Magnetic Field Immunity	Criteria A	3 A/m, 50 & 60 Hz
Pass	EN55024:2010 (CISPR 24 Ed2:2010)	EN61000-4-11:2004	Voltage Interruption Immunity	Various	>95% drop, 10 mS - Perf. B 30% dip 0.5 S - Perf. C >95% drop, 5 S - Perf. C

- **The Equipment was tested in the configuration and modes of operation provided by the client. Test levels were specified by the client within the test plan. Any additional tests not reported herein are the responsibility of the client as the overall product compliance is the responsibility of the client**
- **This report may only be reproduced in its entirety. To reproduce this report in part, specific written permission must be obtained from ElectroMagnetic Investigations.**
- **The results presented in this test report pertain only to the test items described within this report.**
- **Specific test descriptions can be found in the specific individual section of the test report.**

Deviations to the Test Standard

No Deviations were made to the standard test methods

Revision History

Version	Date Issued	Description of Revision

Authorizations

FCC: The 3-meter Semi-Anechoic Chamber and Conducted Emissions facilities are fully described in reports filed with the Federal Communications Commission. Corresponding letters of acceptance are maintained in our files.

Industry Canada: Accepted by Industry Canada for performance of radiated emissions measurements.

European Union (CE): ElectroMagnetic Investigations, LLC is equipped and capable of performing EMC CE compliance testing to European Union EMC CE requirements for Information Technology Equipment (ITE), Measurement, Control and Laboratory Equipment (MCL), and other equipment.

American Association of Lab Accreditations (A2LA): ElectroMagnetic Investigations is accredited to perform the tests contained within this report to the standards listed.

ACCREDITED
Testing Cert#2569.01

Report Approved By:

Signature	17 June 2013	Henry Benitez
	Date	Name

Report Written By:

Signature	14 June 2013	Jackie Benitez
	Date	Name

Testing Performed By:

Signature	25 April 2013	Ryan Benitez
	Date	Name

Signature	31 May 2013	Henry Benitez
	Date	Name

Signature		
	Date	Name

Testing requested by:

Company Name:	**Sensoray**
Company Address:	**7313 SW Tech Center Drive**
City, State Zip:	**Portland, OR. 97223**
Test Requested By:	**Alexander Kostromitin**
Model:	**Model 826**
First Date of Test:	**April 15, 2013**
Last Date of Test:	**April 25, 2013**
Date Samples Received:	**April 15, 2013**
Equipment Design Stage:	**Production**
Equipment Condition:	**Good**

Device Under Test Information

Device Under Test	**Model 826 – PCI Express Analog and Digital I/O Module**
Functional Description of DUT	**Versatile analog and digital I/O system on a PCI Express board**
I/O Ports	**5**
Clock Frequencies (>9kHz)	**50 MHz**
Modes of Operation	**Sending and receiving analog and digital signals**
Operating System	**Windows**
Exercising Software	**826 Test Application S/W**
Power Supply Voltage, Frequency	**120 V 60 Hz / 230 V 50 Hz**

Device Under Test Selection Justification

- **Sensoray certifies that product tested is a representative sample of unit to be sold.**

I, _Bill Tanner, Jr.__, representative for Sensoray verify that the product tested is representative of units to be sold.

Bill Tanner Jr

(Signature)

Emissions Test Report

Radiated Emissions Information

The client provided the test modes, configurations, and operational settings for the DUT and any supporting equipment.

The DUT and the AE that is designated to be placed in the measurement area were placed on a non-conducting tabletop 80 cm tall. Each device is placed on the tabletop 10 cm from its neighboring device. The excess cable length was draped off of the rear of the table. If the excess cable fell closer than 40 cm from the ground plane, the cable were bundled in non-inductive bundles of 30-40 cm loops (when possible) to maintain 40 cm in height. The measurement antenna was then placed 3 m from the closest approach of the DUT/AE system. Any AE that had to be placed outside the measurement area was setup either outside of the chamber or under the floor, depending on size and convenience.

The DUT and the AE were operated in the modes specified by the client while the emissions were measured.

To measure the emissions at the frequency range specified in this report, a preliminary scan was performed with a linearly polarized antenna while the turntable was rotated 360 degrees and the antenna mast was raised from 1 meter height to 4 meters in height in both a horizontal polarization and a vertical polarization. Any emissions that were found to be within 6 dB of the specified limit were then maximized to find the level that was recorded.

The maximization process included manual manipulation of the cables, continuous height scanning, and continuous azimuth scanning.

Device Under Test	Model 826
Functional Description of DUT	Versatile analog and digital I/O system on a PCI Express board
Serial Number	519698
I/O Ports Populated for test	5
Clock Frequencies (>9kHz)	50 MHz
Modes of Operation	Sending and receiving analog and digital signals
Operating System (Version)	Windows
Exercising Software (Version)	826 Test Application S/W
Power Supply Voltage, Frequency	120 V 60 Hz / 230 V 50 Hz
Frequency Range Tested	30 MHz to 1 GHz

Purpose

The purpose of the testing is to determine if the Model 826 is compliant to electromagnetic emission limits as specified by EN55022: 2010 / CISPR 22 Ed.6: 2008 Class B Information technology equipment – Radio disturbance charateristics - Limits and Methods of Measurements to support compliance to the European Union EMC Directive 2004/108/EC, FCC Part 15 Subpart B Class B, and other regulations based on this standard.

The radiated emissions test was performed using the parameters above. If any work was done to investigate a worst-case setup, the worst-case setup would be listed. The testing was performed at a facility which meets the requirements set forth by ANSI C63.4, including but not limited to mains impedance, cable bundling, and Volumetric Normalized Site Attenuation. The emissions reported were maximized through a combination of turntable (or azimuth) maximization, tower (or height) maximization, and cable maximization.

DUT Modifications

No modifications were done to the DUT. No EMI suppression was added to the cabling. The DUT was tested as delivered to EMI.

Radiated Emissions Results

Test Standards: EN55022: 2010 / CISPR 22 Ed.6: 2008 Class B and FCC Part 15 Subpart B Class B

Radiated Emissions: ……Emissions are within specification limits.
Least Margin: ……..……1 dB at 114 MHz.
Test Measurement uncertainties (k=2.05) :
Radiated Field strength at 3m measured with:
Chase Bicon (30 MHz – 1 GHz).…….. ±5.6 dB
Sample radiated emissions field strength measurement:
RF Reading from Spectrum Analyzer (dBuV) + Cable Loss Factor (dB) + Antenna Factor (dB) – Pre-Amplifier Amplification (dB) = Final Radiated Emission Level (dBuV/m).

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Computer	HP	DC7900	C1292386
Keyboard	Dell	N/A	N/A
Mouse	Dell	N/A	N/A
Test Box	Sensoray	826TA	N/A

** Note: This includes all equipment connected to the DUT and located within the measurement area. Emissions from this equipment could increase the emissions measured.*

Auxiliary Equipment outside measurement area

Device	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

** Note: This includes all equipment isolated from the DUT and the measurement area. Emissions from this equipment will not increase the emissions measured.*

Cables

Type of Cable	Shield?	Length (m)	Ferrite?	Shipped with Product?	Connection 1	Connection 2
Flat Ribbon 50	Yes	0.45m	No	No	826 J3	Test Box D1
Flat Ribbon 50	Yes	0.45m	No	No	826 J2	Test Box D2
Flat Ribbon 26	Yes	0.45m	No	No	826 J5	Test Box C1
Flat Ribbon 26	Yes	0.45m	No	No	826 J4	Test Box C1
Flat Ribbon 50	Yes	0.45m	No	No	826 J1	Test Box A

Measurement Bandwidths

Frequency (MHz)	Peak (kHz)	Quasi-Peak (kHz)	Average (kHz)
0.15 – 30	9.0	9.0	9.0
30 – 1000	120	120	120
>1000	1000	N/A	1000

Radiated Emission Plots

ElectroMagnetic Investigations, LLC

Radiated Emissions Test Sheet

Revision 08

Job Reference Number:	SEN20130412	Temperature (ºF):	71	Device Under Test (DUT):	Model 826 PCI Express Analog and Digital I/O Board
Test Date:	18-Apr-2013	Relative Humidity (%):	30	Serial Number:	519698
Location:	Hillsboro	Barometric Pressure:	29	Test Filename:	SEN_RE_
Profile Version:	2.1	Test Distance (m):	3	Test Operator:	Ryan Benitez

Product Standard:	EN55022:2010/CISPR 22Ed6:2008 Class B
Test: Standard:	EN55022:2010/CISPR 22Ed6:2008 Class B

	Test Equipment	Manufacturer	Model Number	Calibration Due	Serial Number
Analyzer:	E4443A	Agilent	E4443A	18-Oct-2017	MY45300803
Pre-Amp:	LN1000	Amplifier Research	LN1000	12-Dec-2013	13993
Pre-Amp2:	HF-Preamp	MiteQ	AMF-4D-01001800-34-10P-GS	29-May-2014	1260489
Antenna:	Lab Chase	Chase	CBL 6112A	31-Mar-2014	2203
Antenna2:	Horn	ETS Lindgren	3117	7-May-2015	S009842
Pre-Selector	N/A	N/A	N/A	N/A	N/A
Site Source	EMISS01	EMI	N/A	N/A	SS01

Run	Description
1	Class B;
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

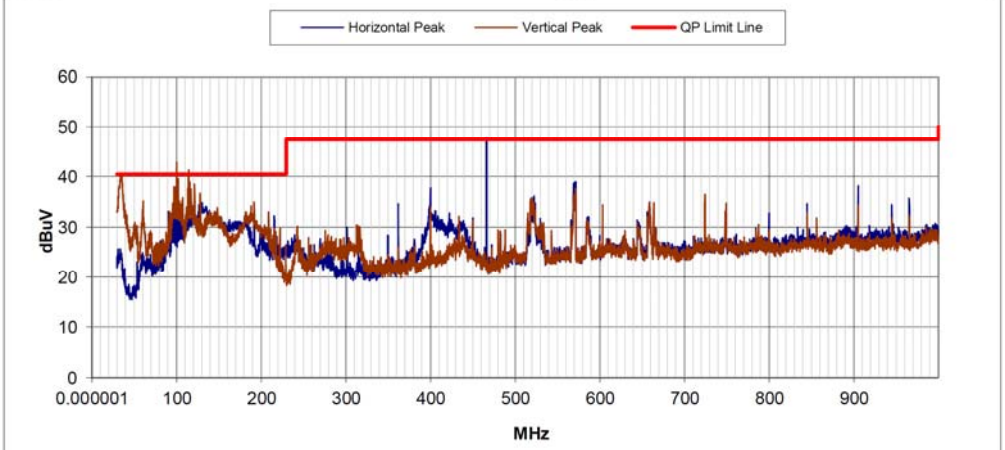
Deviations from Standard: None

RADIATED EMISSIONS DATA SHEET

Revision 08
2/10/2012

Customer:	Sensoray	Job Reference#:	SEN20130412
Contact:	Alexander (Sasha) Kostromitin	Date:	4/18/2013
DUT:	Model 826 PCI Express Analog and Digital I/O Board	Temperature:	71°F
Serial Number:	519698	Humidity:	30%
Voltage/Freq:	120 V 60 Hz	Barometric Pressure:	29 inHg
Tested by:	Ryan Benitez	Location:	Hillsboro
Product Standards:	EN55022:2010/CISPR 22Ed6:2008 Class B		
	FCC Part 15 Subpart B Class B		
Test Standard:	CISPR 22 B		

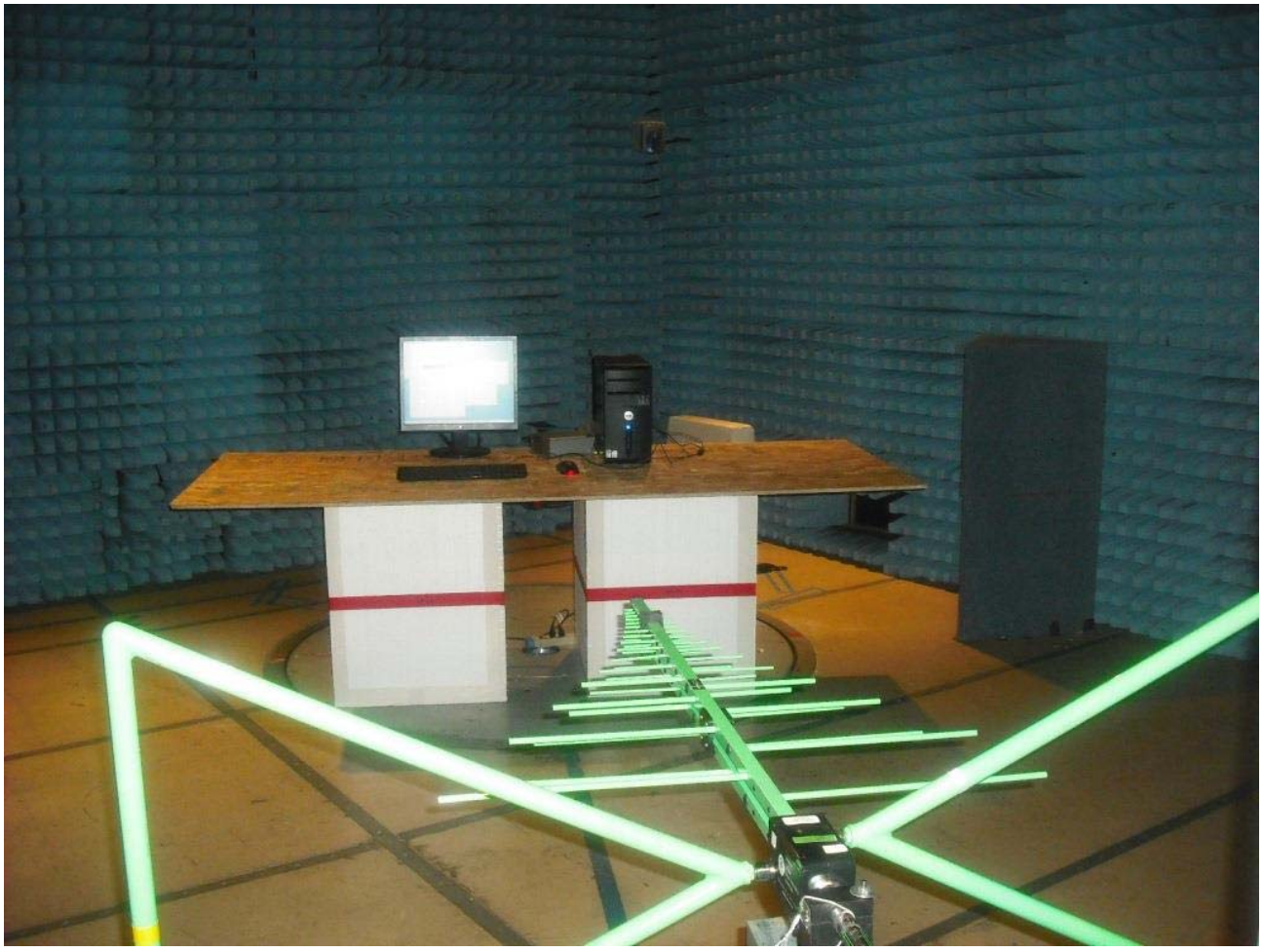
TEST RESULTS	Distance	RUN #
Pass	3m	1

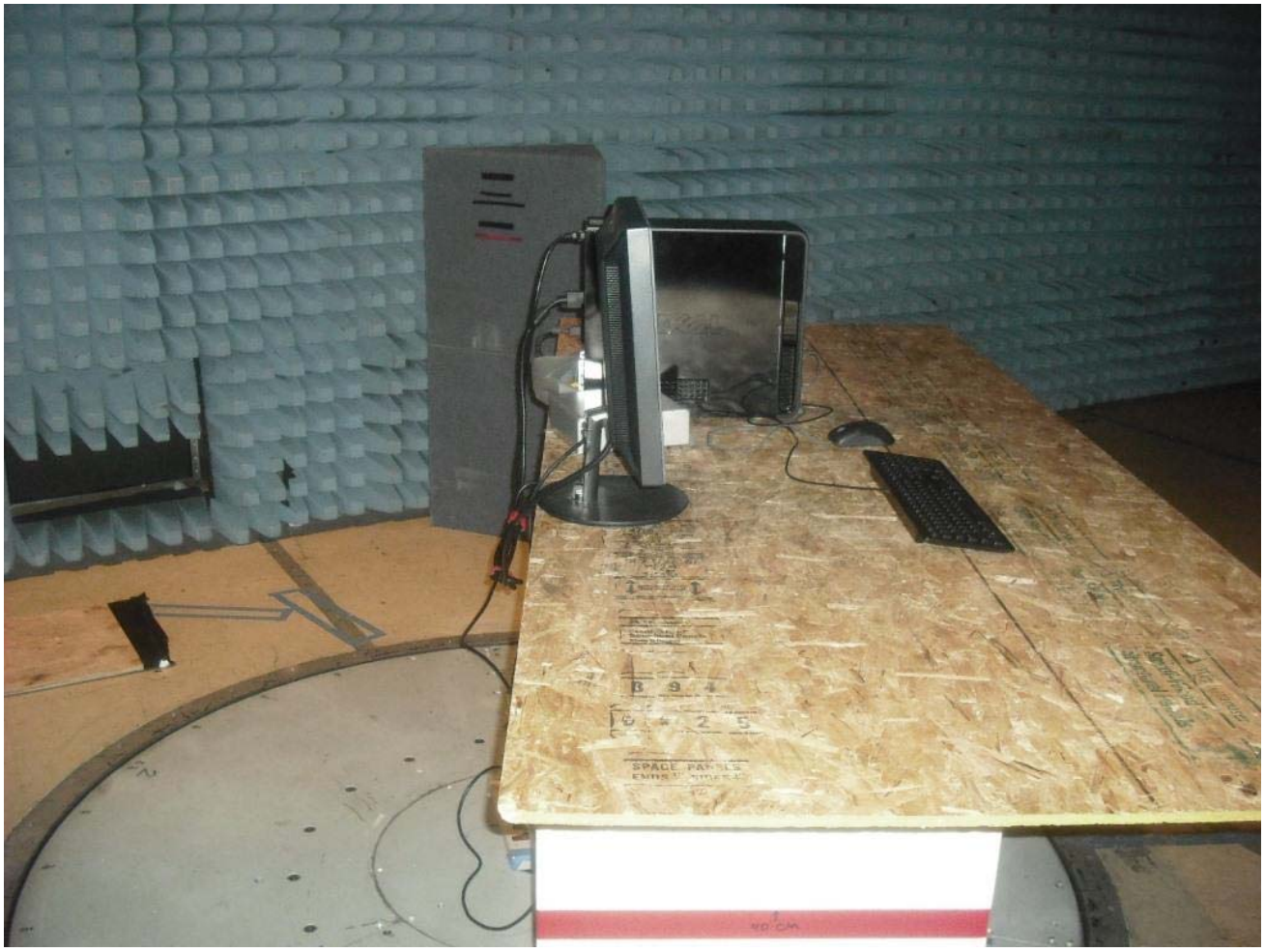


COMMENTS	SIGNATURE
Class B;	Ryan Benitez

Peak Data				Final Data				
Freq (MHz)	Amplitude (dBµV)	Limit (dBµV)	Margin (dB) / Orientation	Freq (MHz)	Peak (dBµV)	QP (dBµV)	Limit (dBµV)	Margin (dB) / Orientation
97.124	38.012	40.46	2.448	34.921	41.202	35.552	40.46	4.908
98.676	35.811	40.46	4.649	98.685	36.553	32.233	40.46	8.227
101.198	37.53	40.46	2.93	101.16	37.118	28.818	40.46	11.642
101.78	39.646	40.46	0.814					
101.974	39.285	40.46	1.175	114.645	44.943	39.413	40.46	1.047
107.406	34.931	40.46	5.529	116.036	39.612	30.932	40.46	9.528
114.584	41.357	40.46	-0.897	466.395	33.687	16.147	40.46	24.313
115.942	38.984	40.46	1.476					
121.374	38.553	40.46	1.907					
466.5	47.73	47.46	-0.27					

Radiated Emissions Photographs





Conducted Emissions Information

The client provided the test modes, configurations, and operational settings for the DUT and any supporting equipment.

The DUT and the AE that is designated to be placed in the measurement area were placed on a non-conducting tabletop 80 cm tall. Each device is placed on the tabletop 10 cm from its neighboring device. The excess cable length was draped off of the rear of the table. If the excess cable fell closer than 40 cm from the ground plane, the cable were bundled in non-inductive bundles of 30-40 cm loops (when possible) to maintain 40 cm in height. The measurement LISN was located on the floor at least 80 cm from the nearest approach of the DUT.

The DUT and the AE were operated in the modes specified by the client while the emissions were measured.

To measure the emissions at the frequency range specified in this report, cables were arranged in a manner to maximize emissions and a preliminary peak scan was performed. Any emissions that were found to be within 6 dB of the average limit were remeasured with the average detector. Any peaks found to be within 6 dB of the QP limit were remeasured using the QP detector. If there were no peaks found to be within 6 dB of the average limit, then the measurement was considered complete, and the data recorded was peak data as compared to the average limit.

Device Under Test	Model 826
Functional Description of DUT	Versatile analog and digital I/O system on a PCI Express board
Serial Number	519698
I/O Ports Populated for test	5
Clock Frequencies (>9kHz)	50 MHz
Modes of Operation	Sending and receiving analog and digital signals
Operating System (Version)	Windows
Exercising Software (version)	826 Test Application S/W
Power Supply Voltage, Frequency	120 V 60 Hz / 230 V 50 Hz
Frequency Range Tested	150 kHz to 80 MHz

Purpose

The purpose of the testing is to determine if the Model 826 is compliant to electromagnetic emission limits as specified by EN55022: 2010 / CISPR 22 Ed.6: 2008 Class B Information technology equipment – Radio disturbance charateristics - Limits and Methods of Measurements to support compliance to the European Union EMC Directive 2004/108/EC, FCC Part 15 Subpart B Class B, and other regulations based on this standard.

The conducted emissions test was performed using the parameters above. If any work was done to investigate a worst-case setup, the worst-case setup would be listed. The testing was performed at a facility which meets the requirements set forth by ANSI C63.4, including but not limited to mains impedance and cable bundling. The emissions reported were maximized through cable maximization.

DUT Modifications

No modifications were done to the DUT. No EMI suppression was added to the cabling. The DUT was tested as delivered to EMI.

Conducted Emissions Results

Test Standard: EN55022: 2010 / CISPR 22 Ed.6: 2008 Class B

Conducted Emissions: …… Emissions are within specification limits.
Least Margin: ……..……...12 dB at 207 kHz.
Conducted Emissions Measurement System uncertainty (k=2.05)…..…..…..…... ±3.7 dB
Sample conducted emissions measurement:
RF Reading from Spectrum Analyzer (dBuV) + Cable Loss Factor (dB) +LISN Factor (dB) = Final Conducted Emission Level (dBuV).

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Computer	HP	DC7900	C1292386
Keyboard	Dell	N/A	N/A
Mouse	Dell	N/A	N/A
Test Box	Sensoray	826TA	N/A

***** *Note: This includes all equipment connected to the DUT and located within the measurement area. Emissions from this equipment could increase the emissions measured.*

Auxiliary Equipment outside measurement area

Device	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

***** *Note: This includes all equipment isolated from the DUT and the measurement area. Emissions from this equipment will not increase the emissions measured.*

Cables

Type of Cable	Shield?	Length (m)	Ferrite?	Shipped with Product?	Connection 1	Connection 2
Flat Ribbon 50	Yes	0.45m	No	No	826 J3	Test Box D1
Flat Ribbon 50	Yes	0.45m	No	No	826 J2	Test Box D2
Flat Ribbon 26	Yes	0.45m	No	No	826 J5	Test Box C1
Flat Ribbon 26	Yes	0.45m	No	No	826 J4	Test Box C1
Flat Ribbon 50	Yes	0.45m	No	No	826 J1	Test Box A

Measurement Bandwidths

Frequency (MHz)	Peak (kHz)	Quasi-Peak (kHz)	Average (kHz)
0.15 – 30	9.0	9.0	9.0
30 – 1000	120	120	120
>1000	1000	N/A	1000

Conducted Emission Plots

ElectroMagnetic Investigations, LLC

Conducted Emissions Test Sheet

Revision 08

Job Reference Number:	SEN20130412	Temperature (°F):	70	Device Under Test (DUT):	Model 826 PCI Express Analog and Digital I/O Board
Test Date:	18-Apr-2013	Relative Humidity (%):	30	Serial Number:	519698
Location:	Hillsboro	Barometric Pressure:	29.9	Test Filename:	SEN_CE_
Profile Version:	4.1			Test Operator:	Ryan Benitez

Product Standard:	EN55022:2010/CISPR 22Ed6:2008 Class B
Test: Standard:	EN55022:2010/CISPR 22Ed6:2008 Class B

	Test Equipment	Manufacturer	Model Number	Calibration Due	Serial Number
Analyzer:	8566	Hewlett Packard (Agilent)	85650A	20-Feb-2018	2637A04105
Pre-Selector	2706	Tektronix	2706	15-Jun-2015	B010476
LISN 1	Main	FCC	FCC-LISN-50-50-4-02	19-Apr-2015	6105
LISN 2	N/A	N/A	N/A	N/A	N/A
TLISN	N/A	N/A	N/A	N/A	N/A
Site Source	EMISS01	EMI	N/A	N/A	SS01

Run	Description
1	Class B;
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

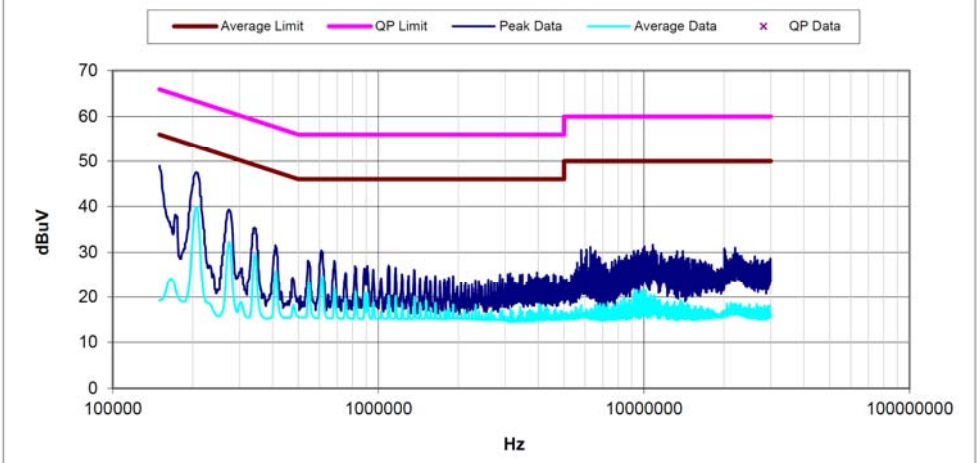
Deviations from Standard: None

CONDUCTED EMISSIONS DATA SHEET

Revision 08
2/10/2012

Customer:	Sensoray	Job Reference#:	SEN20130412
Contact:	Alexander (Sasha) Kostromitin	Date:	4/18/2013
DUT:	Model 826 PCI Express Analog and Digital I/O Board	Temperature:	70ºF
Serial Number:	519698	Humidity:	30%
Voltage/Freq:	230 V 50 Hz	Barometric Pressure:	29.9 inHg
Tested by:	Ryan Benitez	Location:	Hillsboro
Product Standards:	EN55022:2010/CISPR 22Ed6:2008 Class B		
	N/A		
Test Standard:	CISPR 22 B		

TEST RESULTS	LCL Adapter	LINE	RUN #
Pass	N/A	Line	1



COMMENTS	SIGNATURE
CISPR B- 230 VAC; 50 Hz;	Ryan Benitez

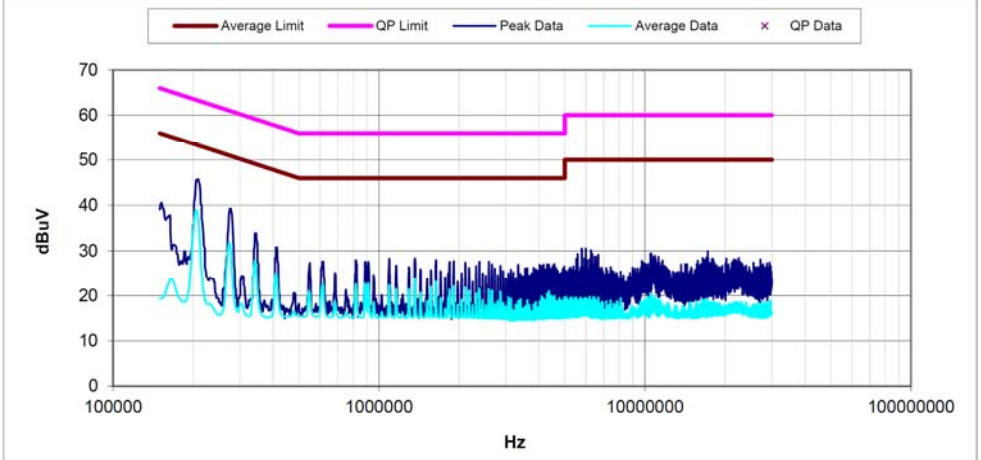
Peak Data			Average Data			QP Data		
Freq (MHz)	Amplitude (dBµV)	Margin (dB)	Freq (MHz)	Amplitude (dBµV)	Margin (dB)	Freq (MHz)	Amplitude (dBµV)	Margin (dB)
0.15	49.19	16.81	0.2013	35.92	17.636747			
0.207	47.528	15.796827	0.20415	39.12	14.319978			
0.2754	39.316	21.637463	0.207	39.928	13.396827			
0.3438	35.466	23.644934	0.20985	38.528	14.683252			
0.4122	31.573	26.030852	0.2127	32.32	20.779208			
			0.27255	31.914	19.125865			
0.54615	28.156	27.844	0.2754	32.316	18.637463			
0.6117	30.422	25.578	0.27825	30.515	20.352951			
0.6858	28.096	27.904	0.34095	29.149	20.031074			
0.81975	26.93	29.07	0.3438	29.554	19.556934			
0.91095	26.999	29.001	0.34665	27.957	21.085365			
1.0962	27.1	28.9	0.4122	25.847	21.756852			
			0.6117	24.098	21.902			
			0.61455	24.595	21.405			
6.288	31.174	28.826	0.6174	24.692	21.308			

CONDUCTED EMISSIONS DATA SHEET

Revision 08
2/10/2012

Customer:	Sensoray	Job Reference#:	SEN20130412
Contact:	Alexander (Sasha) Kostromitin	Date:	4/18/2013
DUT:	Model 826 PCI Express Analog and Digital I/O Board	Temperature:	70°F
Serial Number:	519698	Humidity:	30%
Voltage/Freq:	230 V 50 Hz	Barometric Pressure:	29.9 inHg
Tested by:	Ryan Benitez	Location:	Hillsboro
Product Standards:	EN55022:2010/CISPR 22Ed6:2008 Class B		
	N/A		
Test Standard:	CISPR 22 B		

TEST RESULTS	LCL Adapter	LINE	RUN #
Pass	N/A	Neutral	1



COMMENTS	SIGNATURE
CISPR B- 230 VAC; 50 Hz;	Ryan Benitez

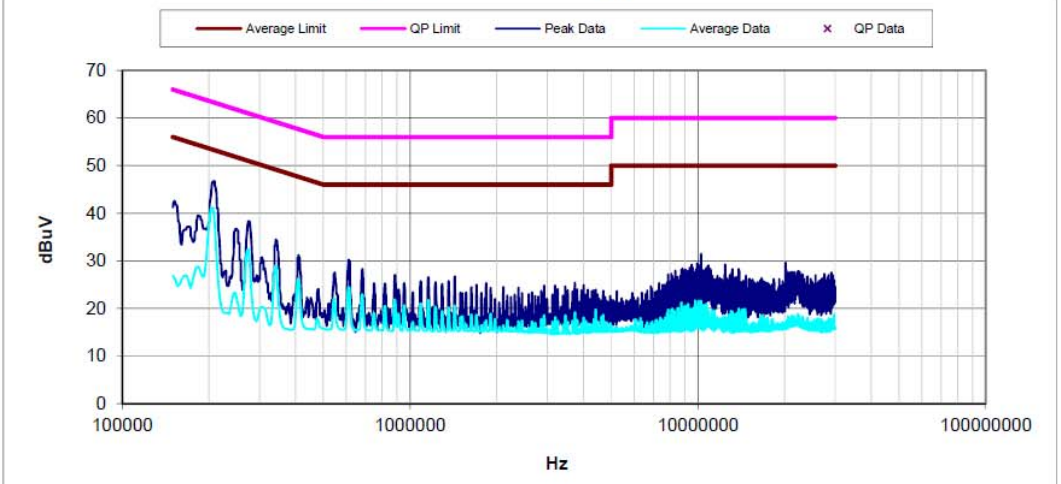
Peak Data			Average Data			QP Data		
Freq (MHz)	Amplitude (dBµV)	Margin (dB)	Freq (MHz)	Amplitude (dBµV)	Margin (dB)	Freq (MHz)	Amplitude (dBµV)	Margin (dB)
0.15285	40.597	25.24667	0.19845	31.328	22.347181			
0.20985	45.738	17.473252	0.2013	35.94	17.616747			
0.27825	39.325	21.542951	0.20415	38.736	14.703978			
0.3438	33.886	25.224934	0.207	38.938	14.386827			
0.4122	30.783	26.820852	0.20985	36.738	16.473252			
			0.2697	29.53	21.597175			
0.62025	27.635	28.365	0.27255	31.726	19.313865			
0.8226	27.943	28.057	0.2754	31.724	19.229463			
0.891	27.611	28.389	0.27825	28.725	22.142951			
0.9138	27.606	28.394	0.34095	27.769	21.411074			
1.0962	28.32	27.68	0.3438	27.774	21.336934			
1.36695	28.353	27.647	0.40935	24.948	22.713479			
1.64055	27.96	28.04	0.4122	24.857	22.746852			
1.9113	27.72	28.28	1.3641	23.884	22.116			
2.3901	27.6	28.4	1.36695	23.187	22.813			

CONDUCTED EMISSIONS DATA SHEET

Revision 08
2/10/2012

Customer:	Sensoray	Job Reference#:	SEN20130412
Contact:	Alexander (Sasha) Kostromitin	Date:	4/18/2013
DUT:	Model 826 PCI Express Analog and Digital I/O Board	Temperature:	70ºF
Serial Number:	519698	Humidity:	30%
Voltage/Freq:	120 V 60 Hz	Barometric Pressure:	29.9 inHg
Tested by:	Ryan Benitez	Location:	Hillsboro
Product Standards:	FCC Part 15 Subpart B Class B		
	N/A		
Test Standard:	CISPR 22 B		

TEST RESULTS	LCL Adapter	LINE	RUN #
Pass	N/A	Line	1



COMMENTS	SIGNATURE
CISPR B- 120 VAC; 60 Hz;	Ryan Benitez

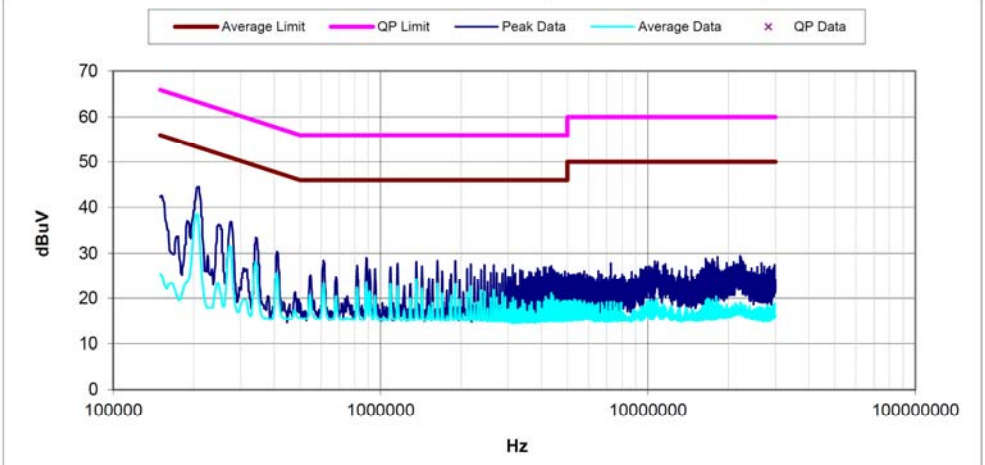
Peak Data			Average Data			QP Data		
Freq (MHz)	Amplitude (dBµV)	Margin (dB)	Freq (MHz)	Amplitude (dBµV)	Margin (dB)	Freq (MHz)	Amplitude (dBµV)	Margin (dB)
0.15285	42.587	23.25667	0.19845	35.124	18.551181			
0.20985	46.728	16.483252	0.2013	39.12	14.436747			
0.24975	36.72	25.045476	0.20415	41.12	12.319978			
0.2754	38.316	22.637463	0.207	41.128	12.196827			
0.3438	34.466	24.644934	0.20985	37.728	15.483252			
0.4122	31.173	26.430852	0.2697	30.717	20.410175			
			0.27255	32.314	18.725865			
0.549	27.559	28.441	0.2754	32.316	18.637463			
0.61455	30.225	25.775	0.3381	27.738	21.511794			
0.6858	28.296	27.704	0.34095	28.949	20.231074			
0.891	26.999	29.001	0.3438	28.754	20.356934			
1.0905	25.701	30.299	0.40935	26.238	21.423479			
1.1589	26.559	29.441	0.4122	25.447	22.156852			
1.3641	25.746	30.254	0.6117	24.398	21.602			
1.4325	26.741	29.259	0.61455	24.395	21.605			

CONDUCTED EMISSIONS DATA SHEET

Revision 08
2/10/2012

Customer:	Sensoray	Job Reference#:	SEN20130412
Contact:	Alexander (Sasha) Kostromitin	Date:	4/18/2013
DUT:	Model 826 PCI Express Analog and Digital I/O Board	Temperature:	70°F
Serial Number:	519698	Humidity:	30%
Voltage/Freq:	120 V 60 Hz	Barometric Pressure:	29.9 inHg
Tested by:	Ryan Benitez	Location:	Hillsboro
Product Standards:	FCC Part 15 Subpart B Class B		
	N/A		
Test Standard:	CISPR 22 B		

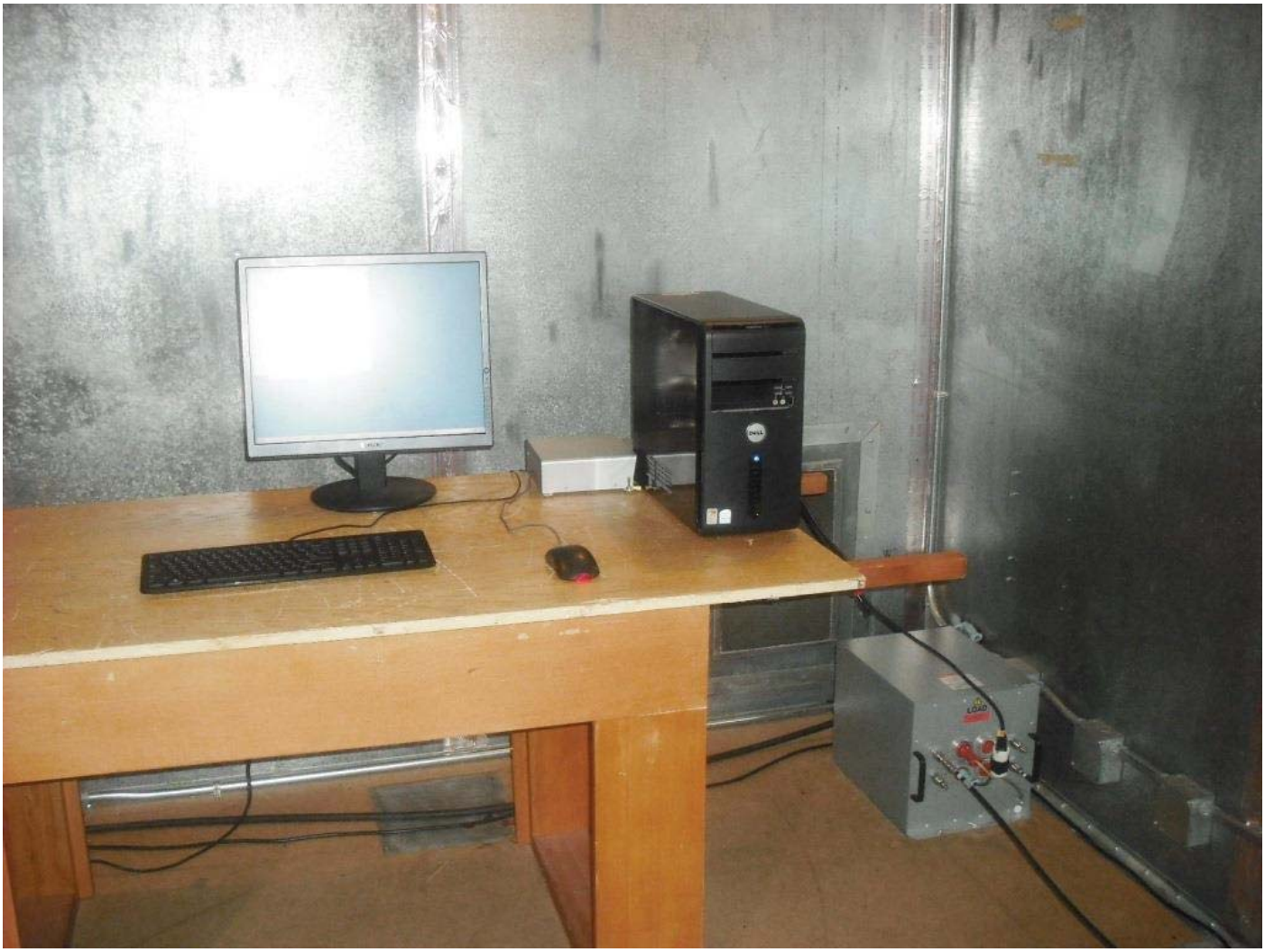
TEST RESULTS	LCL Adapter	LINE	RUN #
Pass	N/A	Neutral	1



COMMENTS	SIGNATURE
CISPR B- 120 VAC; 60 Hz;	Ryan Benitez

Peak Data			Average Data			QP Data		
Freq (MHz)	Amplitude (dBµV)	Margin (dB)	Freq (MHz)	Amplitude (dBµV)	Margin (dB)	Freq (MHz)	Amplitude (dBµV)	Margin (dB)
0.15285	42.597	23.24667	0.19845	32.728	20.947181			
0.20985	44.538	18.673252	0.2013	36.54	17.016747			
0.24975	36.33	25.435476	0.20415	38.536	14.903978			
0.276957	36.93	23.976638	0.207	38.538	14.786827			
0.3438	33.486	25.624934	0.20985	34.938	18.273252			
0.4122	30.383	27.220852	0.2697	30.13	20.997175			
			0.27255	31.726	19.313865			
0.61455	28.429	27.571	0.2754	31.524	19.429463			
0.88815	29.008	26.992	0.3381	26.958	22.291794			
1.1589	27.769	28.231	0.34095	28.169	21.011074			
1.3641	28.156	27.844	0.3438	27.774	21.336934			
1.63485	28.355	27.645	0.40935	25.648	22.013479			
1.9056	28.32	27.68	0.8853	23.535	22.465			
2.1792	27.62	28.38	1.3584	23.778	22.222			
2.65515	27.42	28.58	1.36125	24.281	21.719			

Conducted Emissions Photographs



Power Line Harmonics and Voltage Fluctuations Information

The test measures to amount of fluctuation and flicker on an AC mains caused by the Device Under Test. This test is applicable to all electrical and electronic equipment that has an input current not exceeding 16A per phase and is designed to be placed on a low voltage (between 220 V and 250 V) AC mains distribution network.

The supply voltage was voltage specified rated voltage of the DUT. If a range was specified for the DUT, the voltage was 230 V for a single phase system.

Device Under Test	Model 826
Functional Description of DUT	Versatile analog and digital I/O system on a PCI Express board
Serial Number	519698
I/O Ports Populated for test	5
Clock Frequencies (>9kHz)	50 MHz
Modes of Operation	Sending and receiving analog and digital signals
Operating System (Version)	Windows
Exercising Software (version)	826 Test Application S/W
Power Supply Voltage, Frequency	120 V 60 Hz / 230 V 50 Hz

Purpose

The purpose of the testing is to determine if the Model 826 is compliant to electromagnetic emission limits as specified by EN61000-3-2:+A1:2009+A2:2009, limits for harmonic current emissions (equipment input current ≤ 16 A per phase) and EN61000-3-3:2008, limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment rated < 16 A to support compliance to the European Union EMC Directive 2004/108/EC.

The emissions test was performed using the parameters above. If any work was done to investigate a worst-case setup, the worst-case setup would be listed.

DUT Modifications

No modifications were done to the DUT. No EMI suppression was added to the cabling. The DUT was tested as delivered to EMI.

Power Line Harmonics and Voltage Fluctuation Results

Test Standard: EN61000-3-2:2006+A1:2009+A2:2009 Class A

Emissions: …… Emissions are within specification limits.

Test Standard: EN61000-3-3:2008 Class A

Emissions: …… Emissions are within specification limits.

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Computer	HP	DC7900	C1292386
Keyboard	Dell	N/A	N/A
Mouse	Dell	N/A	N/A
Test Box	Sensoray	826TA	N/A

** Note: This includes all equipment connected to the DUT and located within the measurement area. Emissions from this equipment could increase the emissions measured.*

Auxiliary Equipment outside measurement area

Device	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

** Note: This includes all equipment isolated from the DUT and the measurement area. Emissions from this equipment will not increase the emissions measured.*

Cables

Type of Cable	Shield?	Length (m)	Ferrite?	Shipped with Product?	Connection 1	Connection 2
Flat Ribbon 50	Yes	0.45m	No	No	826 J3	Test Box D1
Flat Ribbon 50	Yes	0.45m	No	No	826 J2	Test Box D2
Flat Ribbon 26	Yes	0.45m	No	No	826 J5	Test Box C1
Flat Ribbon 26	Yes	0.45m	No	No	826 J4	Test Box C1
Flat Ribbon 50	Yes	0.45m	No	No	826 J1	Test Box A

Power Line Harmonics and Voltage Fluctuation Data Sheet

ElectroMagnetic Investigations, LLC

Flicker & Harmonics Test Sheet

Revision 08

Job Reference Number:	SEN20130412	Temperature (°F):	70	Device Under Test (DUT):	Model 826 PCI Express Analog and Digital I/O Board
Test Date:	19-Apr-2013	Relative Humidity (%):	30	Serial Number:	519698
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	230 V 50 Hz
				Test Operator:	Ryan Benitez

		Manufacturer	Model Number	Calibration Due	Serial Number
Analyzer:	Voltech	N/A	N/A	N/A	N/A
Impedance:	Ref impedance	N/A	N/A	N/A	N/A

		Classification		
Harmonics Filename:			Test: Standard:	EN61000-3-2:2006+A1:2009+A2:2009 (IEC61000-3-2:2005+A1:2008+A2:2009)
	Harm1	A	Product Standard:	EN61000-3-2:2006+A1:2009+A2:2009 (IEC61000-3-2:2005+A1:2008+A2:2009)
Flicker Filename:			Test: Standard:	EN61000-3-3:2008 (IEC61000-3-3Ed2:2008)
	Flicker	A	Product Standard:	EN61000-3-3:2008 (IEC61000-3-2Ed2:2008)
Deviations from Standard:	None			

Product:	826 Board	Apr 22 2013 9:09am
Serial no:		Page 1 of 1
Description:		
Test Date:	Apr 22 2013 9:03am	
Result Name:	SENS	

Type of Test:	Fluctuating Harmonics Test
Limits:	Class A
Power Analyzer:	Voltech PM6000 SN: 100006700076 Firmware version: v1.22.07RC5
	Channel(s):
	1. SN: 090015501444, 28 Adjusted Date: 30 OCT 2012. 2. SN: 090015500178, 28 Adjusted Date: 31 OCT 2012.
	3. SN: 090015500067, 28 Adjusted Date: 31 OCT 2012. 4. SN:None Adjusted Date:None
	5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None
	Shunt(s):
	1. SN: 091024300282, 4 Adjusted Date: 31 OCT 2012. 2. SN: 091024300284, 4 Adjusted Date: 31 OCT 2012.
	3. SN: 091024300289, 4 Adjusted Date: 31 OCT 2012. 4. SN:None Adjusted Date:None
	5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None
AC Source:	Mains / Manual Source

Harmonic Results Against Chosen Limits:	**Notes:**
PASS	

Test Parameter Details	**User Entered**	**Measured**
Operating Frequency:	50	49.9840
Operating Voltage:	230	229.5792
Specified Power:	0.0000	49.3756
Fundamental Current:	0.0000	0.2187
Power Factor:	0.0000	0.4815
Average Input Current:		0.4478
Maximum POHC:		0.0352
POHC Limit:		0.2514
Maximum THC:		0.3970
Minimum Power:	75	
Class Multiplier:	1.0000	
Test Duration:	00:02:30	

Product:	826 Board	Apr 22 2013 9:09am
Serial no:		Page 1 of 1
Description:		
Result Name:	SENS	
Voltech IEC61000-3 Windows Software 1.14.06RC1		Test Date: Apr 22 2013 9:03am
Type of Test:	Fluctuating Harmonics Test - Worst Case Table (2006)	
Power Analyzer:	Voltech PM6000 SN: 100006700076 Firmware version: v1.22.07RC5 Channel(s): 1. SN: 090015501444, 28 Adjusted Date: 30 OCT 2012. 2. SN: 090015500178, 28 Adjusted Date: 31 OCT 2012. 3. SN: 090015500067, 28 Adjusted Date: 31 OCT 2012. 4. SN:None Adjusted Date:None 5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None Shunt(s): 1. SN: 091024300282, 4 Adjusted Date: 31 OCT 2012. 2. SN: 091024300284, 4 Adjusted Date: 31 OCT 2012. 3. SN: 091024300289, 4 Adjusted Date: 31 OCT 2012. 4. SN:None Adjusted Date:None 5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None	
AC Source:	Mains / Manual Source	
Overall Result: **PASS**	Notes:	

Class	Class A
Class Multiplier	1

Harm	Limit 1	Limit 2	Average Reading	<L1	<L2	Max Reading	<L2	Pass FAIL	Harm	Limit 1	Limit 2	Average Reading	<L1	<L2	Max Reading	<L2	Pass FAIL
2	1.0800A	1.6200A	6.975mA	✓	✓	7.265mA	✓	N/A	3	2.3000A	3.4500A	206.5mA	✓	✓	207.1mA	✓	N/A
4	430.0mA	645.0mA	6.035mA	✓	✓	6.317mA	✓	N/A	5	1.1400A	1.7100A	190.2mA	✓	✓	191.3mA	✓	N/A
6	300.0mA	450.0mA	4.856mA	✓	✓	5.134mA	✓	N/A	7	770.0mA	1.1550A	168.1mA	✓	✓	170.0mA	✓	N/A
8	230.0mA	345.0mA	3.523mA	✓	✓	3.774mA	✓	N/A	9	400.0mA	600.0mA	141.5mA	✓	✓	144.5mA	✓	N/A
10	184.0mA	276.0mA	2.368mA	✓	✓	2.569mA	✓	N/A	11	330.0mA	495.0mA	112.6mA	✓	✓	116.6mA	✓	N/A
12	153.3mA	230.0mA	1.857mA	✓	✓	2.043mA	✓	N/A	13	210.0mA	315.0mA	83.50mA	✓	✓	88.29mA	✓	N/A
14	131.4mA	197.1mA	2.382mA	✓	✓	2.691mA	✓	N/A	15	150.0mA	225.0mA	56.52mA	✓	✓	61.78mA	✓	N/A
16	115.0mA	172.5mA	3.173mA	✓	✓	3.525mA	✓	N/A	17	132.3mA	198.5mA	33.24mA	✓	✓	38.41mA	✓	N/A
18	102.2mA	153.3mA	3.912mA	✓	✓	4.244mA	✓	N/A	19	118.4mA	177.6mA	16.93mA	✓	✓	20.19mA	✓	N/A
20	92.00mA	138.0mA	4.089mA	✓	✓	4.332mA	✓	N/A	21	107.1mA	160.7mA	11.83mA	✓	✓	12.92mA	✓	N/A
22	83.63mA	125.4mA	3.342mA	✓	✓	3.604mA	✓	N/A	23	97.82mA	146.7mA	12.30mA	✓	✓	13.05mA	✓	N/A
24	76.66mA	115.0mA	3.394mA	✓	✓	3.574mA	✓	N/A	25	90.00mA	135.0mA	16.31mA	✓	✓	17.32mA	✓	N/A
26	70.76mA	106.1mA	2.640mA	✓	✓	2.881mA	✓	N/A	27	83.33mA	125.0mA	14.51mA	✓	✓	15.19mA	✓	N/A
28	65.71mA	98.57mA	1.709mA	✓	✓	1.889mA	✓	N/A	29	77.58mA	116.3mA	10.87mA	✓	✓	11.51mA	✓	N/A
30	61.33mA	92.00mA	1.461mA	✓	✓	1.612mA	✓	N/A	31	72.58mA	108.8mA	6.161mA	✓	✓	7.133mA	✓	N/A
32	57.50mA	86.25mA	1.150mA	✓	✓	1.259mA	✓	N/A	33	68.18mA	102.2mA	3.086mA	✓	✓	3.849mA	✓	N/A
34	54.11mA	81.17mA	1.105mA	✓	✓	1.330mA	✓	N/A	35	64.28mA	96.42mA	5.484mA	✓	✓	6.043mA	✓	N/A
36	51.11mA	76.66mA	1.354mA	✓	✓	1.474mA	✓	N/A	37	60.81mA	91.21mA	8.190mA	✓	✓	8.847mA	✓	N/A
38	48.42mA	72.63mA	1.376mA	✓	✓	1.558mA	✓	N/A	39	57.69mA	86.53mA	9.681mA	✓	✓	10.27mA	✓	N/A
40	46.00mA	69.00mA	1.524mA	✓	✓	1.755mA	✓	N/A									

Product:	826 Board	Apr 22 2013 9:00am
Serial no:		Page 1 of 1
Description:		
Result Name:	SENS	
Voltech IEC61000-3 Windows Software 1.14.06RC1		Test Date: Apr 19 2013 5:05pm
Type of Test:	Flickermeter Test - Table	
Power Analyzer:	Voltech PM6000 SN: 100006700076 Firmware Version: v1.22.07RC5	
	Channel(s):	
	1. SN: 090015501444, 28 Adjusted Date: 30 OCT 2012. 2. SN: 090015500178, 28 Adjusted Date: 31 OCT 2012.	
	3. SN: 090015500067, 28 Adjusted Date: 31 OCT 2012. 4. SN:None Adjusted Date:None	
	5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None	
	Shunt(s):	
	1. SN: 091024300282, 4 Adjusted Date: 31 OCT 2012. 2. SN: 091024300284, 4 Adjusted Date: 31 OCT 2012.	
	3. SN: 091024300289, 4 Adjusted Date: 31 OCT 2012. 4. SN:None Adjusted Date:None	
	5. SN:None Adjusted Date:None 6. SN:None Adjusted Date:None	
AC Source:	Mains / Manual Source	
Overall Result: **PASS**	Notes:	

	Plt
Limit	0.650
Reading	0.071

	Pst	dc (%)	dmax (%)	d(t) > 3.3%(ms)
Limit	1.000	3.300	4.000	500
Reading 1	0.071	0.000	0.000	0
Reading 2	0.071	0.000	0.000	0
Reading 3	0.071	0.000	0.000	0
Reading 4	0.071	0.000	0.000	0
Reading 5	0.071	0.000	0.000	0
Reading 6	0.071	0.000	0.000	0
Reading 7	0.071	0.000	0.000	0
Reading 8	0.071	0.000	0.000	0
Reading 9	0.071	0.000	0.000	0
Reading 10	0.071	0.000	0.000	0
Reading 11	0.071	0.000	0.000	0
Reading 12	0.071	0.000	0.000	0

Power Line Harmonics and Voltage Fluctuation Photographs

Immunity Test Report

ElectroStatic Discharge (ESD) Information

The client provided the test modes, configurations, and operational settings for the DUT and any supporting equipment.

Table-top DUTs and the AE that is designated to be placed in the measurement area were placed on a non-conducting tabletop 80 cm tall with a horizontal coupling plane. The DUT and AE were isolated from the horizontal coupling plane by a thin non-conducting surface 0.5 mm thick. The horizontal coupling plane was attached to the a ground plane on the floor by two 470 Ω resistors. A vertical coupling plane was placed on the table-top for vertical coupling plane tests. The vertical coupling plane was also terminated to the ground plane on the floor by two 470 Ω resistors.

Floor standing DUTs and AE were placed on the ground plane with a 10 cm thick insulator isolating the equipment from the ground plane. The only ground connection allowed was the ground connection that was created by the power connector, or that which would normally be present in the application of the DUT.

The ground plane on the floor extended past the edge of the tabletop or the DUT by at least one half a meter on all sides. The DUT was placed at least 1 meter from all conducting surfaces.

The DUT and the AE were operated in the modes specified by the client while the ESD test was performed. The DUT was subjected to both air and contact discharges. The specific number of discharges at each voltage level is specified within this report. Any contact discharges were applied to all conductive surfaces as specified in the test standard. Any air discharges were applied to non-conducting surfaces as specified in the test standard. If any response was seen within the DUT system, it was noted in the report. The testing was performed with the DUT fully configured with appropriate AE and connecting cables.

All targets tested were recorded along with the type of discharge, the number of discharges, voltage level, polarity, and the reaction of the DUT system.

Device Under Test	Model 826
Functional Description of DUT	Versatile analog and digital I/O system on a PCI Express board
Serial Number	519698
I/O Ports Populated for test	5
Clock Frequencies (>9kHz)	50 MHz
Modes of Operation	Sending and receiving analog and digital signals
Operating System (Version)	Windows
Exercising Software (version)	826 Test Application S/W
Power Supply Voltage, Frequency	120 V 60 Hz / 230 V 50 Hz
Test Level	4 kV contact discharge, 8 kV air discharge

Purpose

The purpose of the testing is to determine if the Model 826 is compliant to electromagnetic immunity requirements as specified by EN55024:2010 (CISPR 24 Ed2:2010) to support compliance to the European Union EMC Directive 2004/108/EC.

The ESD test was performed using the parameters above. If any work was done to investigate a worst-case setup, the worst-case setup would be listed.

DUT Modifications

No modifications were done to the DUT. No EMI suppression was added to the cabling. The DUT was tested as delivered to EMI.

ElectroStatic Discharge Results

Test Standard: IEC 61000-4-2:2010

ElectroStatic Discharge: ……..……DUT performed to Criteria B

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Computer	Dell	Vostro 200	625VGG1
Keyboard	Dell	N/A	N/A
Mouse	Dell	N/A	N/A
Test Box	Sensoray	826TA	N/A

** Note: This includes all equipment connected to the DUT and located within the measurement/testing area.*

Auxiliary Equipment outside measurement area

Device	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

** Note: This includes all equipment isolated from the DUT and the measurement/testing area.*

Cables

Type of Cable	Shield?	Length (m)	Ferrite?	Shipped with Product?	Connection 1	Connection 2
Flat Ribbon 50	Yes	0.45m	No	No	826 J3	Test Box D1
Flat Ribbon 50	Yes	0.45m	No	No	826 J2	Test Box D2
Flat Ribbon 26	Yes	0.45m	No	No	826 J5	Test Box C1
Flat Ribbon 26	Yes	0.45m	No	No	826 J4	Test Box C1
Flat Ribbon 50	Yes	0.45m	No	No	826 J1	Test Box A

ElectroStatic Discharge Data Sheet

ElectroMagnetic Investigations, LLC

ESD Test Sheet

Revision 08

Job Reference Number:	SEN20130412	Temperature (ºF):	70	Device Under Test (DUT):	Model 826 PCI Express Analog and Digital I/O Board
Test Date:	23-Apr-2013	Relative Humidity (%):	30	Serial Number:	519698
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	120 V 60 Hz
				Test Operator:	Ryan Benitez

Product Standard: EN55024:2010(CISPR 24Ed2:2010)

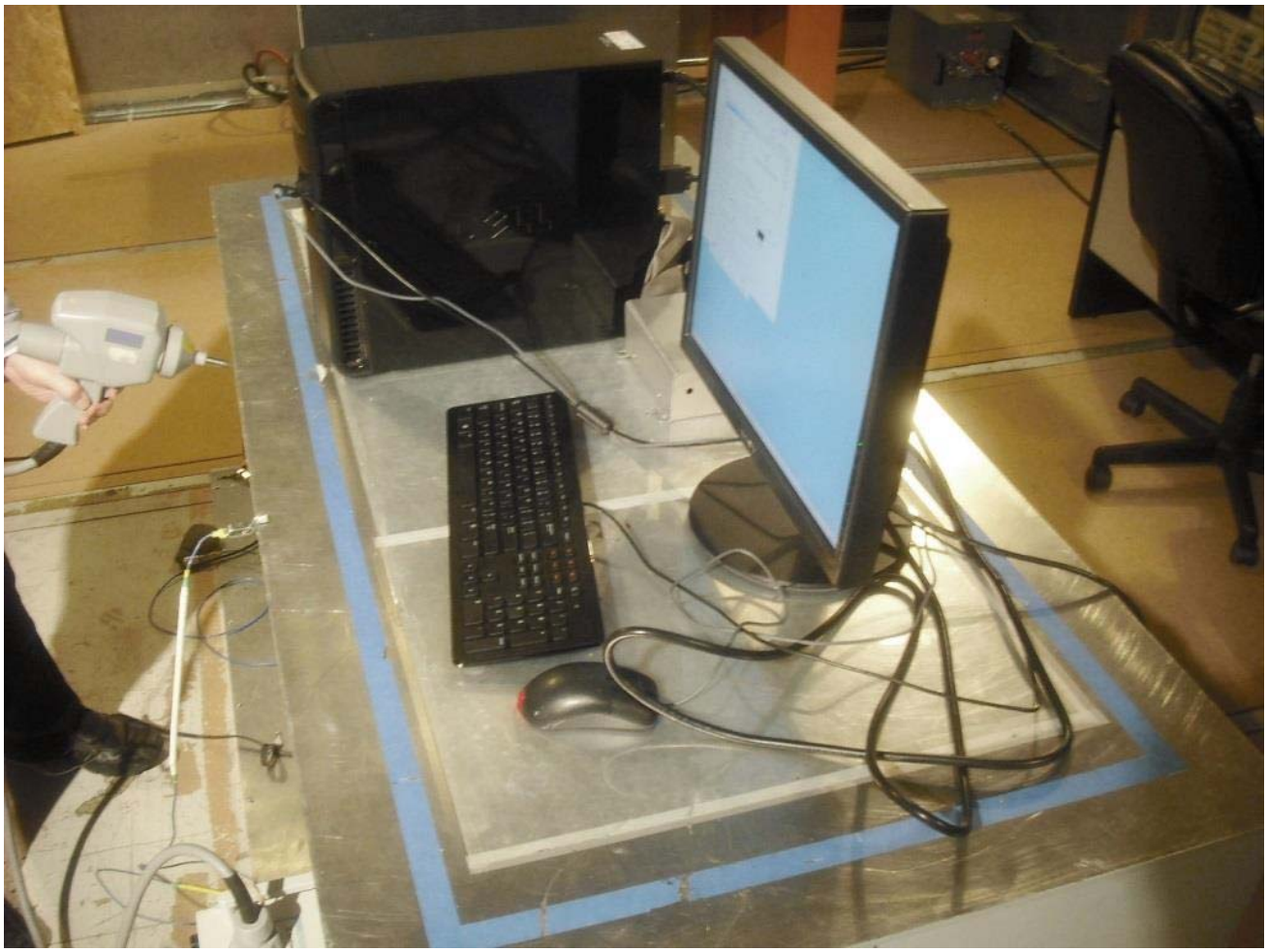
Test: Standard: EN61000-4-2:2008(IEC 61000-4-2:2008Ed.2)
±4kV Contact / ±8kV Air
Performance Class B

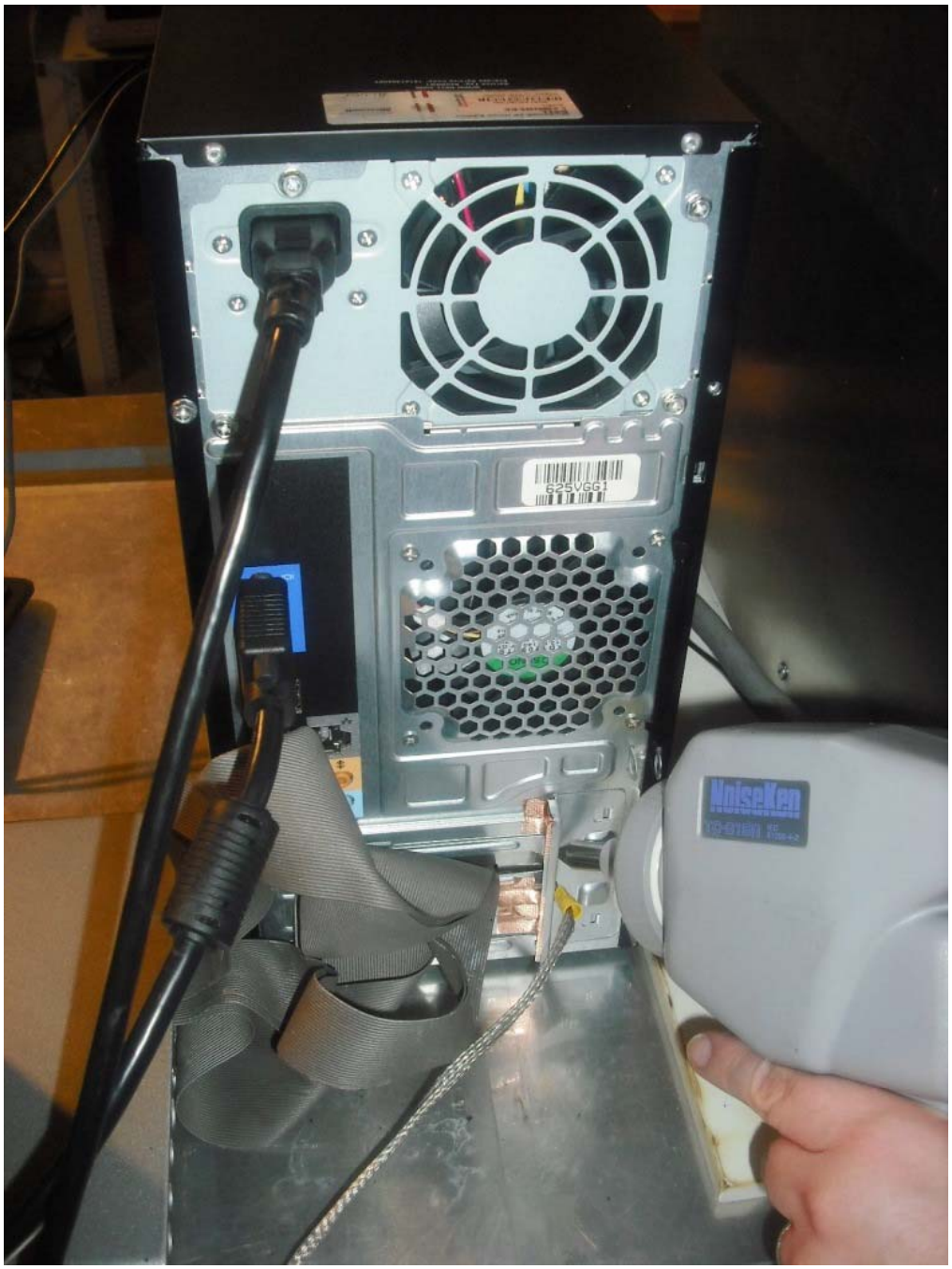
	Test Equipment	Manufacturer	Model Number	Calibration Due	Serial Number
ESD Generator	ESD	Noiseken	ES2002 & TC815R	September 30, 2016	ESS0827941 & ESS0817835

Test Location	Discharge Type	Voltage Level	Voltage Polarity	Number of Events	Comments / DUT Response	Stated Criteria	Pass / Fail	Picture
Computer rear panel near 826 I/O Board.	Contact	2 kV	±	10 Each	No degradation of performance beyond manuafacturer specifications.	B	Pass	Yes
Computer rear panel near 826 I/O Board.	Contact	4 kV	±	10 Each	No degradation of performance beyond manuafacturer specifications.	B	Pass	
Horizontal Coupling Plane	Contact	2 kV	±	10 Each	No degradation of performance observed.	B	Pass	
Horizontal Coupling Plane	Contact	4 kV	±	10 Each	No degradation of performance observed.	B	Pass	
Vertical Coupling Plane	Contact	2 kV	±	10 Each	No degradation of performance observed.	B	Pass	
Vertical Coupling Plane	Contact	4 kV	±	10 Each	No degradation of performance observed.	B	Pass	

Deviations from Standard:

ElectroStatic Discharge Photographs




625VGG
NoiseKen

Radiated Immunity Information

The client provided the test modes, configurations, and operational settings for the DUT and any supporting equipment.

The DUT and the AE that is designated to be placed in the measurement area were placed on a non-conducting tabletop 80 cm tall. Each device is placed on the tabletop 10 cm from its neighboring device. The excess cable length was draped off of the rear of the table. If the excess cable fell closer than 40 cm from the ground plane, the cable were bundled in non-inductive bundles of 30-40 cm loops (when possible) to maintain 40 cm in height. The transmit antenna was then placed 3 m from the DUT/AE system. Any AE that had to be placed outside the measurement area was setup either outside of the chamber or under the floor, depending on size and convenience.

The DUT and the AE were operated in the modes specified by the client while the susceptibility was measured.

The field was calibrated to a uniform field in a fully anechoic chamber as per the requirements within IEC61000-4-3 using an empty room. The power required to produce this field was recorded for playback when the DUT is placed within the chamber. The uniform field was created over a vertical plane of dimensions 1.5 m by 1.5 m placed 0.8 m above the floor. If the DUT can be completely exposed to the field using a smaller uniform surface, the surface was reduced to meet the appropriate size of the DUT, but the surface would never be smaller than 0.5 m by 0.5 m.

The face of the DUT and it corresponding system was placed at vertical surface used for calibration.

Device Under Test	Model 826
Functional Description of DUT	Versatile analog and digital I/O system on a PCI Express board
Serial Number	519698
I/O Ports Populated for test	5
Clock Frequencies (>9kHz)	50 MHz
Modes of Operation	Sending and receiving analog and digital signals
Operating System (Version)	Windows
Exercising Software (version)	826 Test Application S/W
Power Supply Voltage, Frequency	120 V 60 Hz / 230 V 50 Hz
Test Level	3 V/m, 80-1000 MHz, 3V/m, 1-2.7 GHz

Purpose

The purpose of the testing is to determine if the Model 826 is compliant to electromagnetic immunity limits as specified by EN55024:2010 (CISPR 24 Ed2:2010) to support compliance to the European Union EMC Directive 2004/108/EC.

The radiated immunity test was performed using the parameters above. If any work was done to investigate a worst-case setup, the worst-case setup would be listed.

DUT Modifications

No modifications were done to the DUT. No EMI suppression was added to the cabling. The DUT was tested as delivered to EMI.

Radiated Immunity Results

Test Standard: IEC 61000-4-3:2010

Radiated Immunity: ……DUT performed to Criteria A

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Computer	HP	DC7900	C1292386
Keyboard	Dell	N/A	N/A
Mouse	Dell	N/A	N/A
Test Box	Sensoray	826TA	N/A

** Note: This includes all equipment connected to the DUT and located within the measurement/testing area.*

Auxiliary Equipment outside measurement area

Device	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

** Note: This includes all equipment isolated from the DUT and the measurement/testing area.*

Cables

Type of Cable	Shield?	Length (m)	Ferrite?	Shipped with Product?	Connection 1	Connection 2
Flat Ribbon 50	Yes	0.45m	No	No	826 J3	Test Box D1
Flat Ribbon 50	Yes	0.45m	No	No	826 J2	Test Box D2
Flat Ribbon 26	Yes	0.45m	No	No	826 J5	Test Box C1
Flat Ribbon 26	Yes	0.45m	No	No	826 J4	Test Box C1
Flat Ribbon 50	Yes	0.45m	No	No	826 J1	Test Box A

Radiated Immunity Data Sheet

ElectroMagnetic Investigations, LLC

Radiated Immunity Test Sheet

Revision 08

Job Reference Number:	SEN20130412	Temperature (°F):	70	Device Under Test (DUT):	Model 826 PCI Express Analog and Digital I/O Board
Test Date:	18-Apr-2013	Relative Humidity (%):	30	Serial Number:	519698
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	120V 60 Hz
Test Level (V/m) <= 1 GHz:	3 V/m	Calibration Points:	8 pt	Test Filename:	SENI_RI_
Test Level (V/m) 1 to 2 GHz:	3 V/m			Test Operator:	Ryan Benitez
Test Level (V/m) >= 2 GHz:	3 V/m				Ryan Benitez

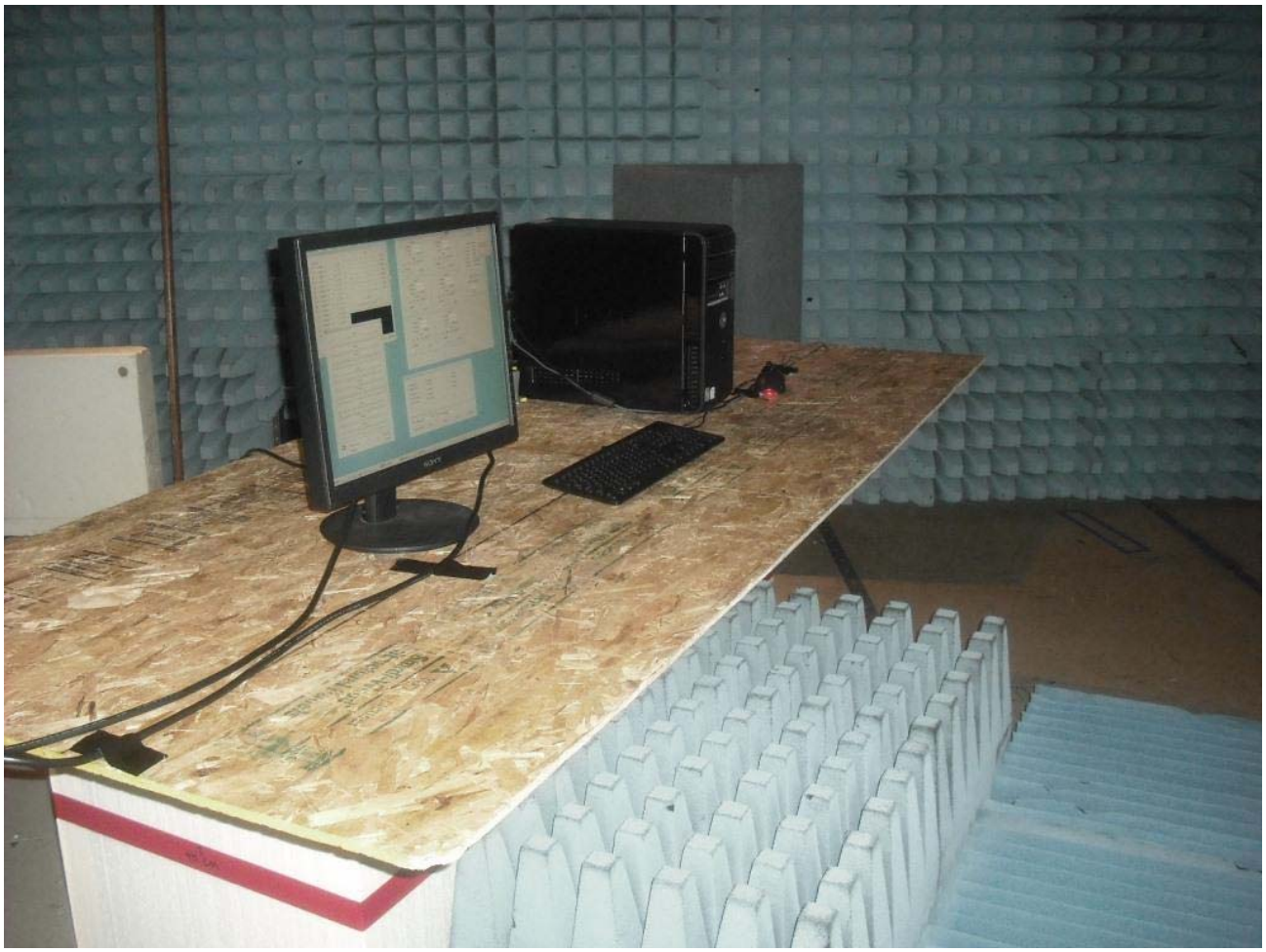
Product Standard:	EN55024:2010(CISPR 24Ed2:2010)
	EN61000-4-3:2006+A1:2008+A2:2010(IEC 61000-4-3:2006+A1:2007+A2:2010)
	3 V/m, 80% AM (1 kHz), 80 to 2700 MHz
Test: Standard:	Performance Class A

	Test Equipment	Manufacturer	Model Number	Calibration Due	Serial Number
Antenna	3141	EMCO	3141	N/A	1204
Antenna 2	3117	ETS Lindgren	3117	7-May-2015	S009842
Probe	Probe	EMCO	HI 6005	30-Aug-2016	33983
Signal Generator	Sig Gen	Rohde & Schwarz	SME 03	21-Feb-2018	DE14511
Signal Generator 2	8673	HP	8673D	26-Oct-2015	2938A01008
Amplifier	Amp	IFI	CMX5001	N/A	2151-1196
Amplifier 2	AR Amp	AR	25S1G4A	N/A	300668

Test Details	Polarization	Azimuth	Start (MHz)	Stop (MHz)	Criteria	Comments / DUT Response	Pass / Fail	Picture
Front	Horizontal	0°	80	2700	A	No degradation of performance observed	Pass	Yes
	Vertical	0°	80	2700	A	No degradation of performance observed	Pass	
Left side	Horizontal	90°	80	2700	A	No degradation of performance observed	Pass	
	Vertical	90°	80	2700	A	No degradation of performance observed	Pass	
Back	Horizontal	180°	80	2700	A	No degradation of performance observed	Pass	
	Vertical	180°	80	2700	A	No degradation of performance observed	Pass	
Right side	Horizontal	270°	80	2700	A	No degradation of performance observed	Pass	
	Vertical	270°	80	2700	A	No degradation of performance observed	Pass	

Deviations from Standard: None

Radiated Immunity Photographs



Electrical Fast Transients (burst) Immunity Information

The client provided the test modes, configurations, and operational settings for the DUT and any supporting equipment.

The DUT and the AE that is designated to be placed in the measurement area were placed 10 cm above a conducting surface. Each device is placed on the tabletop 10 cm from its neighboring device. The excess cable length was serpentined (not coiled) on the tabletop 10 cm above the ground plane. The power lines subjected to the transient were plugged directly into the generator. I/O's that were greater than 3 m in length were passed through a capacitive clamp, and also exposed to the transient.

The waveform of the transient can be seen in the following figure.

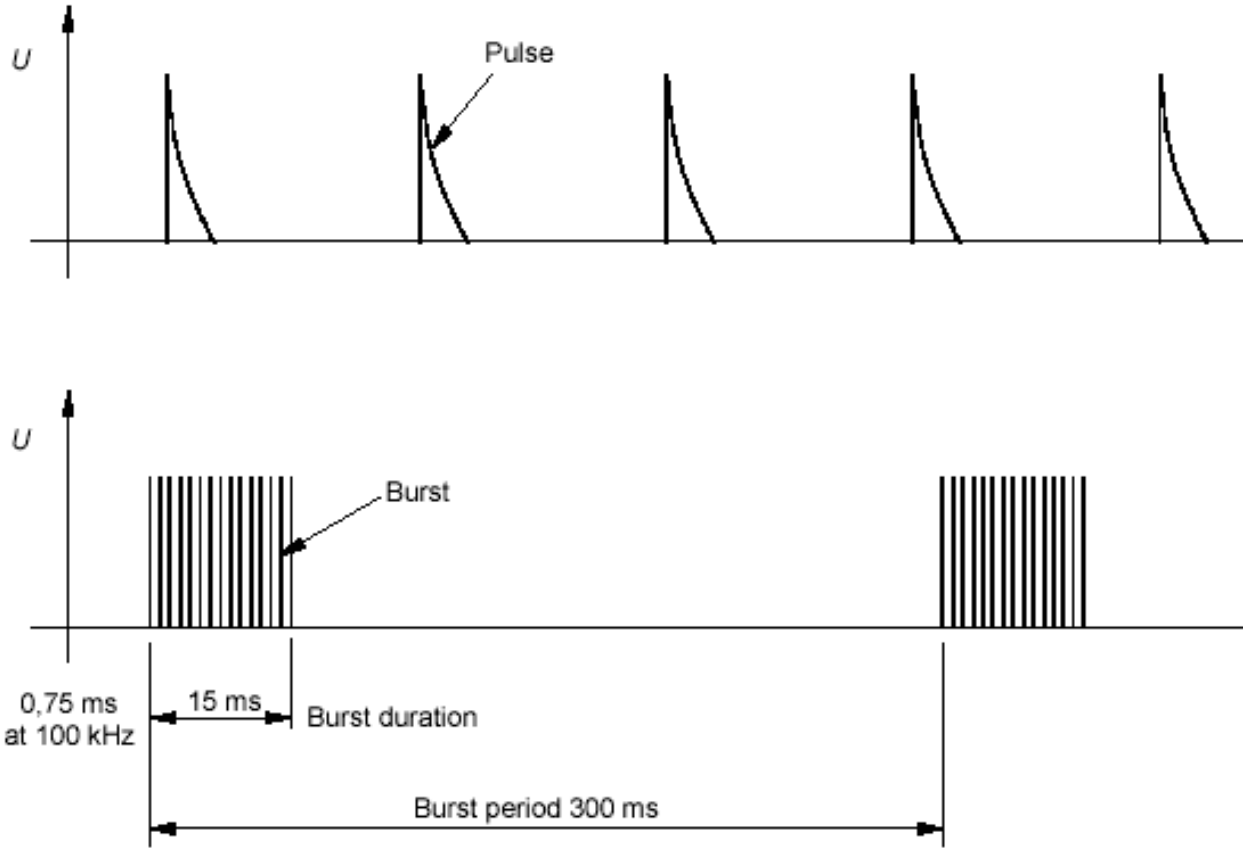


Figure: EFT/Burst Waveform

The DUT and the AE were operated in the modes specified by the client while the susceptibility was measured.

Device Under Test	Model 826
Functional Description of DUT	Versatile analog and digital I/O system on a PCI Express board
Serial Number	519698
I/O Ports Populated for test	5
Clock Frequencies (>9kHz)	50 MHz
Modes of Operation	Sending and receiving analog and digital signals
Operating System (Version)	Windows
Exercising Software (version)	826 Test Application S/W
Power Supply Voltage, Frequency	120 V 60 Hz / 230 V 50 Hz
Test Level	1 kV Peak

Purpose

The purpose of the testing is to determine if the Model 826 is compliant to electromagnetic immunity limits as specified by EN55024:2010 (CISPR 24 Ed2:2010) Section 10 to support compliance to the European Union EMC Directive 2004/108/EC.

The electrical fast transient immunity test was performed using the parameters above. If any work was done to investigate a worst-case setup, the worst-case setup would be listed.

DUT Modifications

No modifications were done to the DUT. No EMI suppression was added to the cabling. The DUT was tested as delivered to EMI.

Electrical Fast Transient (burst) Immunity Results

Test Standard: IEC 61000-4-4:2010

EFT / Burst Immunity: ……DUT performed to Criteria B

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Computer	HP	DC7900	C1292386
Keyboard	Dell	N/A	N/A
Mouse	Dell	N/A	N/A
Test Box	Sensoray	826TA	N/A

** Note: This includes all equipment connected to the DUT and located within the measurement/testing area.*

Auxiliary Equipment outside measurement area

Device	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

** Note: This includes all equipment isolated from the DUT and the measurement/testing area.*

Cables

Type of Cable	Shield?	Length (m)	Ferrite?	Shipped with Product?	Connection 1	Connection 2
Flat Ribbon 50	Yes	0.45m	No	No	826 J3	Test Box D1
Flat Ribbon 50	Yes	0.45m	No	No	826 J2	Test Box D2
Flat Ribbon 26	Yes	0.45m	No	No	826 J5	Test Box C1
Flat Ribbon 26	Yes	0.45m	No	No	826 J4	Test Box C1
Flat Ribbon 50	Yes	0.45m	No	No	826 J1	Test Box A

Electrical Fast Transient (burst) Immunity Data Sheet

ElectroMagnetic Investigations, LLC

Burst Test Sheet

Revision 08

Job Reference Number:	SEN20130412	Temperature (ºF):	70	Device Under Test (DUT):	Model 826 PCI Express Analog and Digital I/O Board
Test Date:	19-Apr-2013	Relative Humidity (%):	30	Serial Number:	519698
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	230 V 50 Hz
				Test Operator:	Ryan Benitez

Product Standard: EN55024:2010(CISPR 24Ed2:2010)

EN61000-4-4:2004+A1:2010(IEC 61000-4-4:2004+A1:2010)
±1 kV Pk AC Ports
±0.5 kV Pk DC Ports
±0.5 kV Pk Signal & I/O

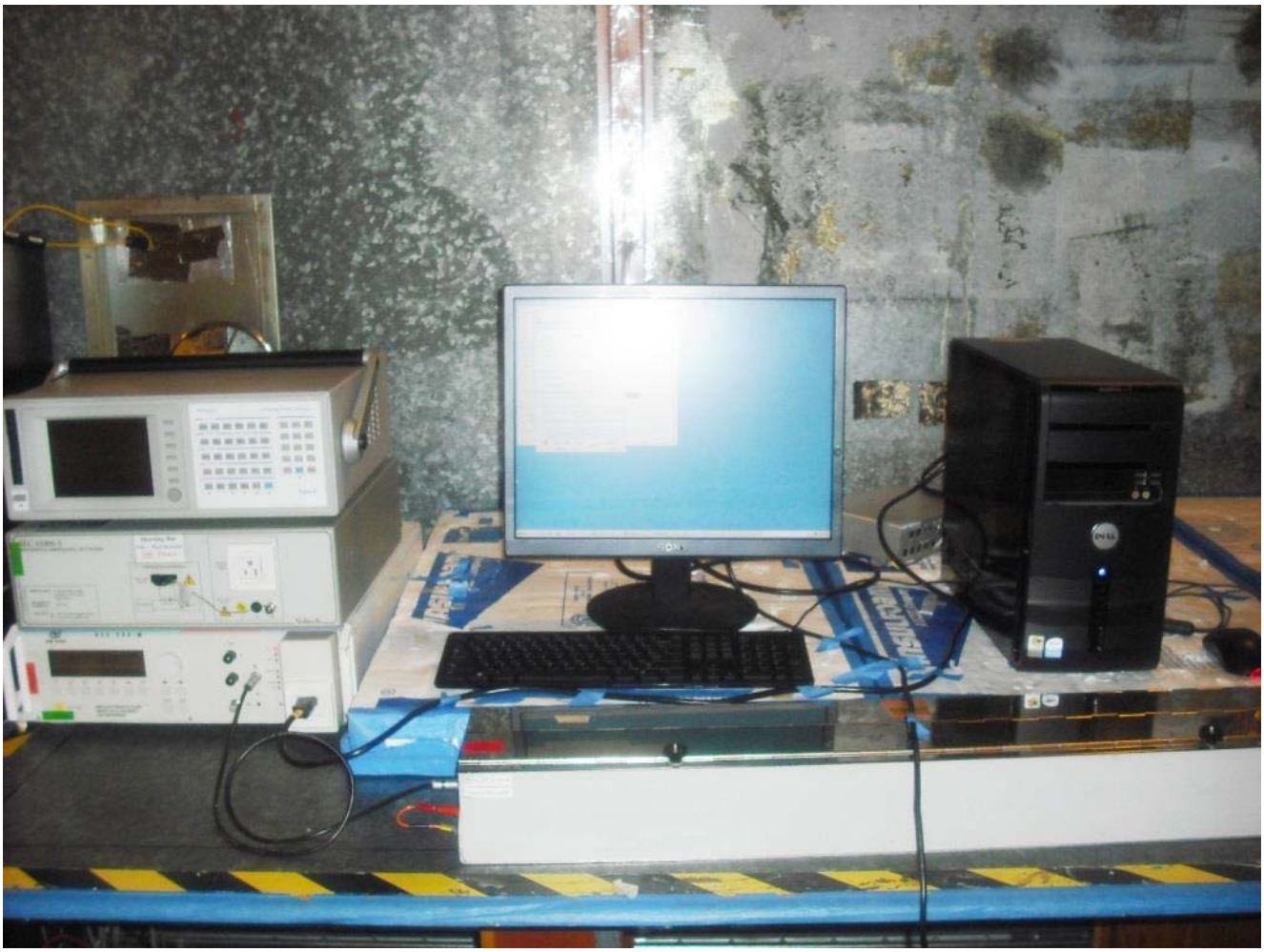
Test: Standard: Performance B

	Test Equipment	Manufacturer	Model Number	Calibration Due	Serial Number
Generator	UCS	EMTest	UCS 500M4	N/A	0800-45
Injection Clamp	C Clamp	EMTest	Coupling	N/A	0105-09

Injection Line	Test Number	Injection Method	Level	Stated Criteria	Comments / DUT Response	Pass / Fail	Filename	Picture
Power line	1	Direct Inject	1000 V	B	No degradation of performance observed	Pass		Yes

Deviations from Standard: None

Electrical Fast Transient (burst) Immunity Photographs

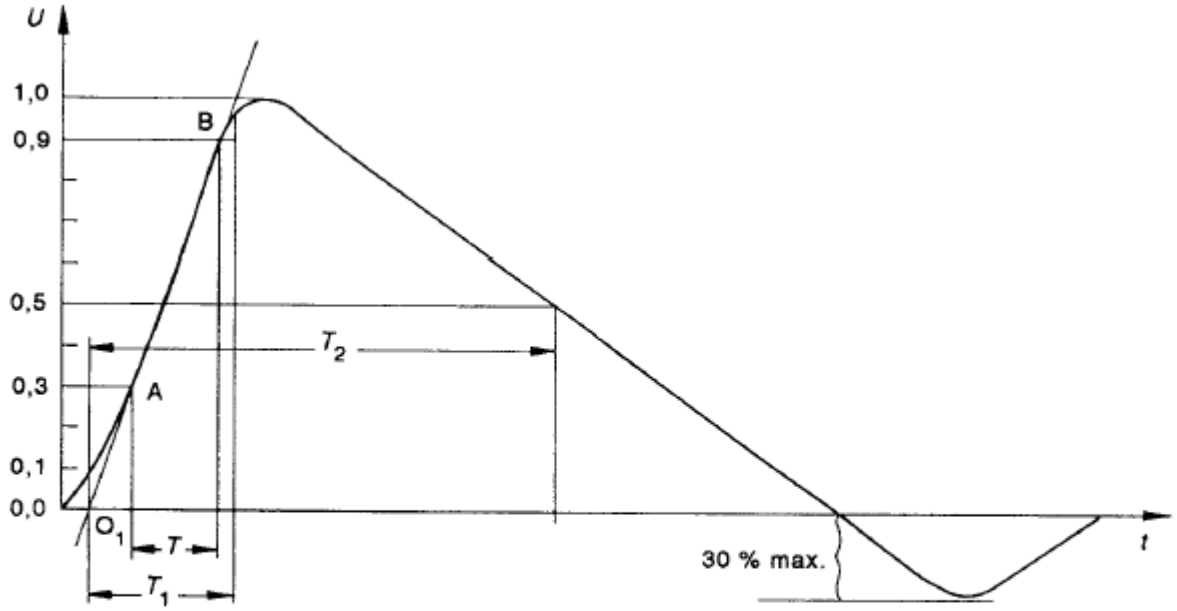


Surge Immunity Information

The client provided the test modes, configurations, and operational settings for the DUT and any supporting equipment.

The DUT and the AE that is designated to be placed in the measurement area were placed on a non-conductive table. Each device is placed on the tabletop 10 cm from its neighboring device. The excess cable length was serpentined (not coiled) on the tabletop. The power lines subjected to the transient were plugged directly into the generator. I/O's that were subjected to the surge transient were listed on the surge data sheet.

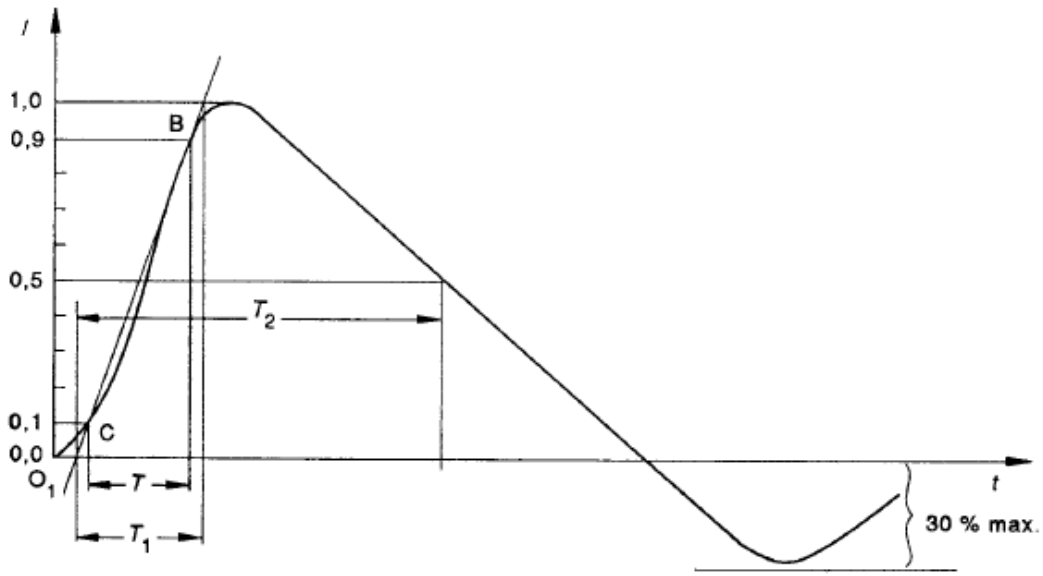
The waveform of the transient can be seen in the following figures.



Front time: $T_1 = 1{,}67 \times T = 1{,}2\ \mu s \pm 30\ \%$

Time to half-value: $T_2 = 50\ \mu s \pm 20\ \%$

Figure: Surge Open Circuit Waveform



Front time: $T_1 = 1{,}25 \times T = 8\ \mu s \pm 20\ \%$

Time to half-value: $T_2 = 20\ \mu s \pm 20\ \%$

Figure: Surge Short Circuit Waveform

The DUT and the AE were operated in the modes specified by the client while the susceptibility was measured.

Device Under Test	Model 826
Functional Description of DUT	Versatile analog and digital I/O system on a PCI Express board
Serial Number	519698
I/O Ports Populated for test	5
Clock Frequencies (>9kHz)	50 MHz
Modes of Operation	Sending and receiving analog and digital signals
Operating System (Version)	Windows
Exercising Software (version)	826 Test Application S/W
Power Supply Voltage, Frequency	120 V 60 Hz / 230 V 50 Hz
Test Level	1 kV DM, 2 kV CM

Purpose

The purpose of the testing is to determine if the Model 826 is compliant to electromagnetic immunity limits as specified by EN EN55024:2010 (CISPR 24 Ed2:2010) to support compliance to the European Union EMC Directive 2004/108/EC.

The surge immunity test was performed using the parameters above. If any work was done to investigate a worst-case setup, the worst-case setup would be listed.

DUT Modifications

No modifications were done to the DUT. No EMI suppression was added to the cabling. The DUT was tested as delivered to EMI.

Surge Immunity Results

Test Standard: IEC 61000-4-5:2005

Surge Immunity: ……DUT performed to Criteria B

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Computer	HP	DC7900	C1292386
Keyboard	Dell	N/A	N/A
Mouse	Dell	N/A	N/A
Test Box	Sensoray	826TA	N/A

** Note: This includes all equipment connected to the DUT and located within the measurement/testing area.*

Auxiliary Equipment outside measurement area

Device	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

** Note: This includes all equipment isolated from the DUT and the measurement/testing area.*

Cables

Type of Cable	Shield?	Length (m)	Ferrite?	Shipped with Product?	Connection 1	Connection 2
Flat Ribbon 50	Yes	0.45m	No	No	826 J3	Test Box D1
Flat Ribbon 50	Yes	0.45m	No	No	826 J2	Test Box D2
Flat Ribbon 26	Yes	0.45m	No	No	826 J5	Test Box C1
Flat Ribbon 26	Yes	0.45m	No	No	826 J4	Test Box C1
Flat Ribbon 50	Yes	0.45m	No	No	826 J1	Test Box A

Surge Immunity Data Sheet

ElectroMagnetic Investigations, LLC

Surge Test Sheet

Revision 08

Job Reference Number:	SEN20130412	Temperature (°F):	70	Device Under Test (DUT):	Model 826 PCI Express Analog and Digital I/O Board
Test Date:	19-Apr-2013	Relative Humidity (%):	30	Serial Number:	519698
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	230 V 50 Hz
				Test Operator:	Ryan Benitez

Ryan Benitez

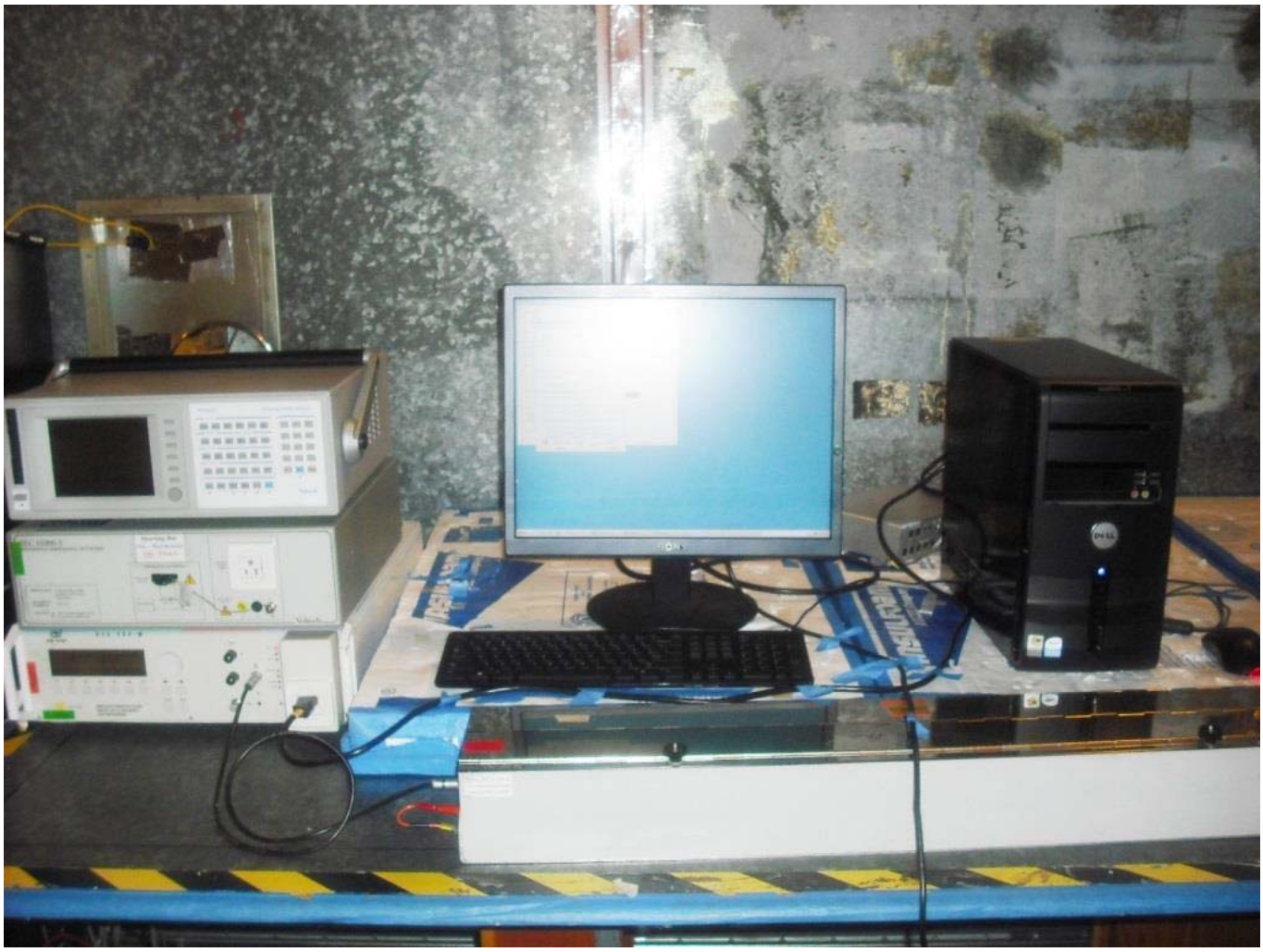
Product Standard:	EN55024:2010(CISPR 24Ed2:2010)
Test: Standard:	EN61000-4-5:2006(IEC 61000-4-5:2005) ±1 kV peak DM - AC ±2 kV peak CM - AC ±0.5 kV peak DM - DC,telcom*

	Test Equipment	Manufacturer	Model Number	Calibration Due	Serial Number
Generator	UCS	EMTest	UCS 500M4	N/A	0800-45

Injection Line	Test Number	Injection Method	Level	Stated Criteria	Comments / DUT Response	Pass / Fail	Filename	Picture
Power line - AC - DM	1	Direct Inject	500 V	A	No degradation of performance observed.	Pass		Yes
Power line - AC - DM	1	Direct Inject	1000 V	A	No degradation of performance observed.	Pass		
Power line - AC - CM	2	Direct Inject	500 V	A	No degradation of performance observed.	Pass		
Power line - AC - CM	2	Direct Inject	1000 V	A	No degradation of performance observed.	Pass		
Power line - AC - CM	2	Direct Inject	2000 V	A	No degradation of performance observed.	Pass		

Deviations from Standard: None

Surge Immunity Photographs



RF Conducted Immunity Information

The client provided the test modes, configurations, and operational settings for the DUT and any supporting equipment.

The DUT and the AE that is designated to be placed in the measurement area were placed on a non-conducting surface 10 cm above a ground plane. Each device is placed on the tabletop 10 cm from its neighboring device. The cables were serpentined 3 cm above the ground plane. Any cables not being tested were fitted with a decoupling device. Power entered the DUT and the AE through a coupling decoupling network which was bonded to the ground plane.

The DUT and the AE were operated in the modes specified by the client while the susceptibility was measured.

The RF field was calibrated with a 150 Ω calibration jig as specified within IEC 61000-4-6. The power required to produce the required field strength was recorded for playback when the DUT is placed within the test fixture.

The power lines of the DUT were tested with the appropriate CDN. The power passed through the CDN and the RF was coupled onto the power line.

The I/O cables greater than 3 m were tested with either a CDN designed for the specific I/O or a current clamp. The I/O specific CDN was placed in series with the system and tested like the power CDN. The clamp was placed around the I/O line being tested and placed as close to the DUT as possible, but no more than 30 cm away.

Device Under Test	Model 826
Functional Description of DUT	Versatile analog and digital I/O system on a PCI Express board
Serial Number	519698
I/O Ports Populated for test	5
Clock Frequencies (>9kHz)	50 MHz
Modes of Operation	Sending and receiving analog and digital signals
Operating System (Version)	Windows
Exercising Software (version)	826 Test Application S/W
Power Supply Voltage, Frequency	120 V 60 Hz / 230 V 50 Hz
Test Level	3 Vrms, 150 kHz to 80 MHz

Purpose

The purpose of the testing is to determine if the Model 826 is compliant to electromagnetic immunity limits as specified by EN55024:2010 (CISPR 24 Ed2:2010) to support compliance to the European Union EMC Directive 2004/108/EC.

The RF conducted immunity test was performed using the parameters above. If any work was done to investigate a worst-case setup, the worst-case setup would be listed.

DUT Modifications

No modifications were done to the DUT. No EMI suppression was added to the cabling. The DUT was tested as delivered to EMI.

Conducted Immunity Results

Test Standard: IEC 61000-4-6:2008

Radiated Immunity: ……DUT performed to Criteria A

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Computer	HP	DC7900	C1292386
Keyboard	Dell	N/A	N/A
Mouse	Dell	N/A	N/A
Test Box	Sensoray	826TA	N/A

** Note: This includes all equipment connected to the DUT and located within the measurement/testing area.*

Auxiliary Equipment outside measurement area

Device	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

** Note: This includes all equipment isolated from the DUT and the measurement/testing area.*

Cables

Type of Cable	Shield?	Length	Ferrite?	Shipped with Product?	Connection 1	Connection 2
Flat Ribbon 50	Yes	0.45m	No	No	826 J3	Test Box D1
Flat Ribbon 50	Yes	0.45m	No	No	826 J2	Test Box D2
Flat Ribbon 26	Yes	0.45m	No	No	826 J5	Test Box C1
Flat Ribbon 26	Yes	0.45m	No	No	826 J4	Test Box C1
Flat Ribbon 50	Yes	0.45m	No	No	826 J1	Test Box A

Conducted Immunity Data Sheet

ElectroMagnetic Investigations, LLC

Conducted Immunity Test Sheet

Revision 08

Job Reference Number:	SEN20130412	Temperature (°F):	70	Device Under Test (DUT):	Model 826 PCI Express Analog and Digital I/O Board
Test Date:	18-Apr-2013	Relative Humidity (%):	30	Serial Number:	519698
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	120 V 60 Hz
Test Level (V/m):	3 Vrms			Test Filename:	SEN_CI_
				Test Operator:	Ryan Benitez

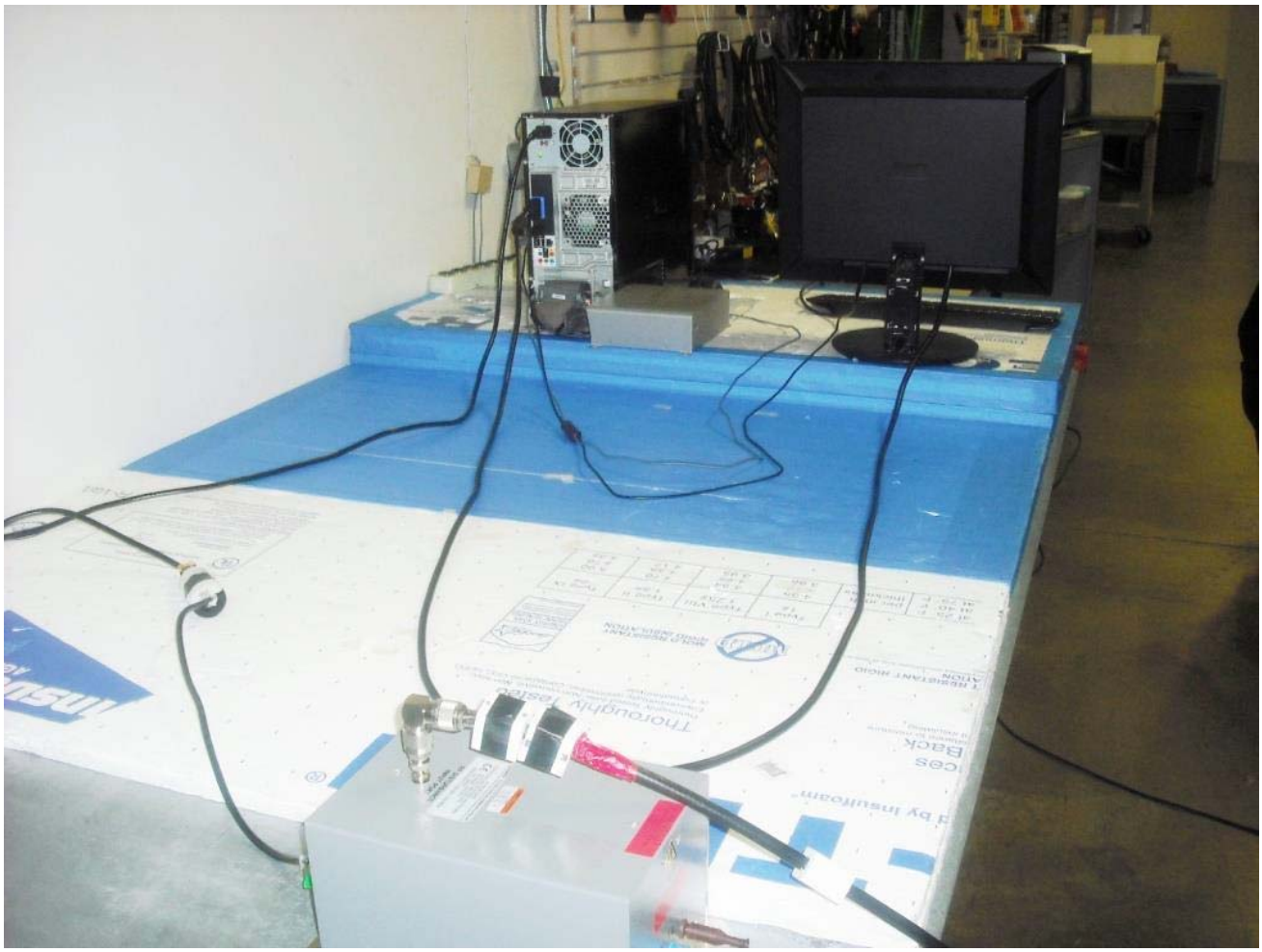
Product Standard:	EN55024:2010(CISPR 24Ed2:2010)
	EN61000-4-6:2009(IEC 61000-4-6:2008Ed.3)
	3 Vrms AC/DC/ Telcom
	3 Vrms I/O (>3m)
Test: Standard:	Performance A

	Test Equipment	Manufacturer	Model Number	Calibration Due	Serial Number
Analyzer	8566	Hewlett Packard (Agilent)	85650A	20-Feb-2018	2637A04105
Injection Probe 1	M3	FCC	FCC-801-M3-25A	20-Sep-2015	4054
Injection Probe 2	BCI	FCC	F-120-9A	N/A	401
Injection Probe 3	N/A	N/A	N/A	N/A	N/A
Monitor Probe	Current Probe	FCC	F-33-1	10-Feb-2015	908
Amplifier	Amp	IFI	CMX5001	N/A	2151-1196
Signal Generator	Sig Gen	Rohde & Schwarz	SME 03	21-Feb-2018	DE14511
6 dB Pad	Pad6b	JFW	250N	24-Jan-2014	N/A

Injection line	Test Number	Injection Method	Start (MHz)	Stop (MHz)	Criteria	Comments / DUT Response	Pass / Fail	Picture
Power Line	1	M3 - CDN	0.15	80	A	No degradation of performance observed.	Pass	Yes

Deviations from Standard: None

Conducted Immunity Photographs




SONY
Thoroughly Tested

Voltage Sag and Interrupts Immunity Information

The client provided the test modes, configurations, and operational settings for the DUT and any supporting equipment.

The DUT and the AE that is designated to be placed in the measurement area

The DUT and the AE were operated in the modes specified by the client while the susceptibility was monitored.

During the voltage sag immunity, the mains were subjected to the specified percent voltage levels less than the rated voltage for the specified duration. Each specified sag percentage, and time were recorded with the performance of the DUT.

During the voltage interruption, the mains were reduced to less than five percent the nominal voltage for the specified duration. The specified duration was recorded with the performance of the DUT.

Device Under Test	Model 826
Functional Description of DUT	Versatile analog and digital I/O system on a PCI Express board
Serial Number	519698
I/O Ports Populated for test	5
Clock Frequencies (>9kHz)	50 MHz
Modes of Operation	Sending and receiving analog and digital signals
Operating System (Version)	Windows
Exercising Software (version)	826 Test Application S/W
Power Supply Voltage, Frequency	120 V 60 Hz / 230 V 50 Hz
Test Level	>95% drop, 10 mS - Perf. B 30% dip 0.5 S - Perf. C >95% drop, 5 S - Perf. C

Purpose

The purpose of the testing is to determine if the Model 826 is compliant to electromagnetic immunity limits as specified by EN55024:2010 (CISPR 24 Ed2:2010) to support compliance to the European Union EMC Directive 2004/108/EC.

The voltage sag and interrupts immunity test was performed using the parameters above. If any work was done to investigate a worst-case setup, the worst-case setup would be listed.

DUT Modifications

No modifications were done to the DUT. No EMI suppression was added to the cabling. The DUT was tested as delivered to EMI.

Voltage Sag and Interrupts Immunity Results

Test Standard: EN61000-4-11:2004

Voltage Sag and Interrupts Immunity: ……DUT performed to Criteria B

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Computer	HP	DC7900	C1292386
Keyboard	Dell	N/A	N/A
Mouse	Dell	N/A	N/A
Test Box	Sensoray	826TA	N/A

** Note: This includes all equipment connected to the DUT and located within the measurement/testing area.*

Auxiliary Equipment outside measurement area

Device	Manufacturer	Model Number	Serial Number
N/A	N/A	N/A	N/A

** Note: This includes all equipment isolated from the DUT and the measurement/testing area.*

Cables

Type of Cable	Shield?	Length (m)	Ferrite?	Shipped with Product?	Connection 1	Connection 2
Flat Ribbon 50	Yes	0.45m	No	No	826 J3	Test Box D1
Flat Ribbon 50	Yes	0.45m	No	No	826 J2	Test Box D2
Flat Ribbon 26	Yes	0.45m	No	No	826 J5	Test Box C1
Flat Ribbon 26	Yes	0.45m	No	No	826 J4	Test Box C1
Flat Ribbon 50	Yes	0.45m	No	No	826 J1	Test Box A

Voltage Sag and Interrupts Immunity Data Sheet

ElectroMagnetic Investigations, LLC

Dips, Interrupts Test Sheet

Revision 08

Job Reference Number:	SEN20130412	Temperature (ºF):	70	Device Under Test (DUT):	Model 826 PCI Express Analog and Digital I/O Board
Test Date:	19-Apr-2013	Relative Humidity (%):	30	Serial Number:	519698
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	230 V 50 Hz
				Test Operator:	Ryan Benitez

Ryan Benitez

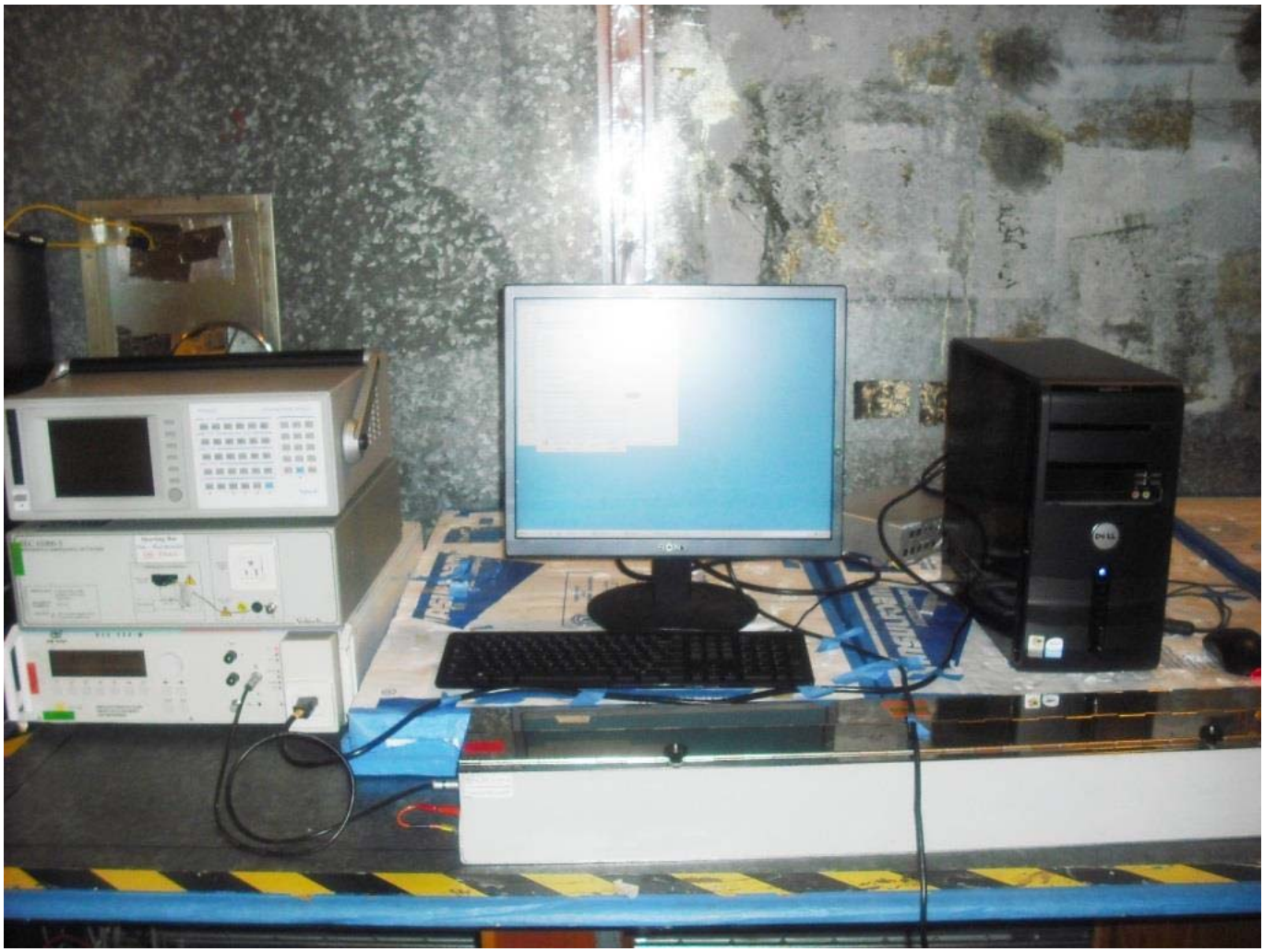
Product Standard:	EN55024:2010(CISPR 24Ed2:2010)
Test: Standard:	EN61000-4-11:2004(IEC61000-4-11:2004Ed.2) >95% drop, 10 mS - Perf. B 30% dip 0.5 S - Perf. C >95% drop, 5 S - Perf. C

	Test Equipment	Manufacturer	Model Number	Calibration Due	Serial Number
Generator	UCS	EMTest	UCS 500M4	N/A	0800-45

Injection Line	Test Number	DIP	Time	Stated Criteria	Comments / DUT Response	Pass / Fail	Filename	Picture
Power Line	1	100% 0 V	10 ms	B	No degradation of perfomance observed.	Pass		Yes
Power Line	2	30% 161 V	500 ms	C	No degradation of perfomance observed.	Pass		Yes
Power Line	3	100% 0 V	5 second	C	Computer can be turned back on after test.	Pass		Yes

Deviations from Standard: None

Voltage Sag and Interrupts Immunity Photographs



Appendix A: Performance Criteria

During the immunity testing, the Device under test is observed for variances beyond what is considered normal. The client is ultimately responsible for the compliance of the DUT and its supporting system. However, ElectroMagnetic Investigations tries to indicate to the client the performance of the product. In the case where the referenced standard specifies the acceptable deviations, the performance criteria noted within this report corresponds to it. In the case that the customer specifies the acceptable performance, ElectroMagnetic Investigations simply reports as per the test plan.

In general, the test performance criteria follows the pattern listed.

Performance Criteria A

- The DUT does not have any noticeable deviations in it performance before, during or after the application of the EMC test.
- If a range of performance is specified as normal operation, the DUT did not have any readings outside of this range before, during or after the application of the EMC test.

Performance Criteria B

- The DUT does not have any deviations of performance before or after the application of the EMC test, but during the application a deviation is noted that is not considered normal operation. When the EMC test is paused or completed the DUT recovered on its own and did not require any user intervention to return it to normal operation.
- If a range of performance is specified as normal operation, the DUT's performance was outside of this range during the application of the test, but recovered on its own and operated within its normal range after the application of the EMC test.
- No permanent damage occurred to the DUT or any AE as a result of the disturbance.

Performance Criteria C

- The DUT was operating normally before the application of the EMC test, but during the application, the DUT stopped operating normally, and did not recover after the application of the EMC test until an operator intervened. This includes but is not limited to:
    - Power cycling the DUT,
    - Restarting the exercising software on the DUT, and

- Unplugging and replugging the DUT or any AE.

- The act of "recovering" the DUT must be something that could be accomplished by the customer with little training.
- No permanent damage occurred to the DUT or any AE as a result of the disturbance.

Performance Criteria D

- The DUT was operating normally before the application of the EMC test, but could not be made to function normally after the completion of the test.
- The recovery of the DUT took significant expertise to return to normal operation.
- There was permanent damage to the DUT during the application of the EMC test.