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

2253S

April 18, 2012

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: **SEN20130325**
Issue Date: **April 18, 2013**
Test Item: **2253S**
Serial Number: **513194**

Emissions:

Result	Product Standard	Test Standard	Description
Pass	EN 61000-6-3:2007+A1:2011 (IEC 61000-6-3:2006Ed2+A1:2010)/FCC Part 15 Subpart B Class B	EN55022:2010/CISPR 22Ed6:2008 Class B/FCC Part 15 Subpart B Class B	Radiated Emissions
N/A	EN 61000-6-3:2007+A1:2011 (IEC 61000-6-3:2006Ed2+A1:2010)/FCC Part 15 Subpart B Class B	EN55022:2010/CISPR 22Ed6:2008 Class B/FCC Part 15 Subpart B Class B	Conducted Emissions
N/A	EN61000-3-2:2006 +A1:2009+A2:2009	EN61000-3-2:2006+A1:2009+A2:2009 Class A/IEC61000-3-2:2005+A1:2008+A2:2009 Class A	Power line Harmonics
N/A	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	EN 61000-6-1:2007 (IEC 61000-6-1:2005)	EN61000-4-2:2008(IEC 61000-4-2:2008Ed.2)	Electrostatic Discharge Immunity	Criteria B	4 kV Contact Discharge 8 kV Air Discharge
Pass	EN 61000-6-1:2007 (IEC 61000-6-1:2005)	EN61000-4-3:2006+A1:2008+A2:2010(IEC61000-4-3:2006+A1:2007+A2:2010	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	EN 61000-6-1:2007 (IEC 61000-6-1:2005)	EN61000-4-4:2004+A1:2010 (IEC61000-4-4:2004+A1:2010)	Electrical Fast Transient/Burst (EFT) Immunity	Criteria B	1 kV peak
N/A	EN 61000-6-1:2007 (IEC 61000-6-1:2005)	EN61000-4-4:2006(IEC61000-4-5:2005)	Electrical Slow Transient (Surge) Immunity	Criteria B	1 kV peak – DM 2 kV peak - CM
Pass	EN 61000-6-1:2007 (IEC 61000-6-1:2005)	EN61000-4-6:2009(IEC61000-4-6:2008Ed.3)	RF Conducted Immunity	Criteria A	3 Vrms, 150 kHz to 80 MHz
N/A	EN 61000-6-1:2007 (IEC 61000-6-1:2005)	EN61000-4-8:2010(IEC 61000-4-8:2009Ed.2)	Magnetic Field Immunity	Criteria A	3 A/m, 50 & 60 Hz
N/A	EN 61000-6-1:2007 (IEC 61000-6-1:2005)	EN61000-4-11:2004(IEC61000-4-11:2004Ed.2)	Voltage Interruption Immunity	Various	30% dip, 10 mS, Perf. B; 60% dip, 100 mS, Perf. B; >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.**
- **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
01	5-20-13	Added approval signature. Updated basic standard dates.

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	Date	Name
	19 April 2012	Henry Benitez

Report Written By:

Signature	Date	Name
	18 April 2012	Jackie Benitez

Testing Performed By:

Signature	Date	Name
	05 April 2013	Ryan Benitez
Signature	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:	**2253S**
First Date of Test:	**March 28, 2013**
Last Date of Test:	**April 5, 2013**
Date Samples Received:	**March 28, 2013**
Equipment Design Stage:	**Production**
Equipment Condition:	**Good**

Device Under Test Information

Device Under Test	**2253S**
Functional Description of DUT	**Std Definition H.264 Encoder / Decoder**
I/O Ports	**Video in, Video out, Audio Line in, Audio Mic in, Audio out, GPIO, USB**
Clock Frequencies (>9kHz)	**24 MHz, 27 MHz**
Modes of Operation	**Sending and receiving video, audio and GPIO signals**
Operating System	**MS Windows**
Exercising Software	**2253 Demo Application**
Power Supply Voltage, Frequency	**5V,USB**

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	2253S
Functional Description of DUT	Std Definition H.264 Encoder / Decoder
Serial Number	513194
I/O Ports Populated for test	Video in, Video out, Audio Line in, Audio Mic in, Audio out, GPIO, USB
Clock Frequencies (>9kHz)	24 MHz, 27 MHz
Modes of Operation	Sending and receiving video, audio and GPIO signals
Operating System (Version)	MS Windows
Exercising Software (Version)	2253 Demo Application
Power Supply Voltage, Frequency	5V,USB
Frequency Range Tested	30 MHz to 1 GHz

Purpose

The purpose of the testing is to determine if the 2253S is compliant to electromagnetic emission limits as specified by EN 61000-6-3:2007+A1:2011 (IEC 61000-6-3:2006Ed2+A1:2010)/FCC Part 15 Subpart B Class B 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 22Ed6:2008 Class B/FCC Part 15 Subpart B Class B

Radiated Emissions: …… Emissions are within specification limits.
Least Margin: ……..……3.4 dB at 803 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
Video, audio and GPIO generator, GPIO monitor	Sensoray	2253S	513157
Video and audio monitor	Sony	PVM-14N6U	6009034
Laptop PC	Compaq	Presario V6000	CFN630001RP

** 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
Video in	Yes	3M	N/A	No	EUT	2253S, Video out
Video out	Yes	3M	N/A	No	EUT	Monitor, Video in
Audio in	Yes	3M	N/A	No	EUT	2253S, Audio out
Audio out	Yes	3M	N/A	No	EUT	Monitor, Audio in
Mic	Yes	3M	N/A	No	EUT	2253S, Audio out
GPIO	Yes	3M	N/A	No	EUT	2253S, GPIO
USB	Yes	3M	N/A	No	EUT	Laptop

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:	SEN20130325	Temperature (°F):	71	Device Under Test (DUT):	2253S
Test Date:	28-Mar-2013	Relative Humidity (%):	30	Serial Number:	513194
Location:	Hillsboro	Barometric Pressure:	29	Test Filename:	SEN_RE_
Profile Version:	2.1	Test Distance (m):	3	Test Operator:	Ryan Benitez

Product Standard:	EN 61000-6-3:2007+A1:2011 (IEC 61000-6-3:2006Ed2+A1:2010)
Test: Standard:	EN55022:2010/CISPR 22Ed6:2008 Class B

		Manufacturer	Model Number	Calibration Due	Serial Number
Analyzer:	8566	Hewlett Packard (Agilent)	8566B & 85650A	15-Jun-2017	3407A08563 & 3303A01823
Pre-Amp:	LN1000	Amplifier Research	LN1000	12-Dec-2013	13993
Pre-Amp2:	HF-Preamp	MiteQ	AMF-4D-01001800-34-10P-GS	19-May-2013	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	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

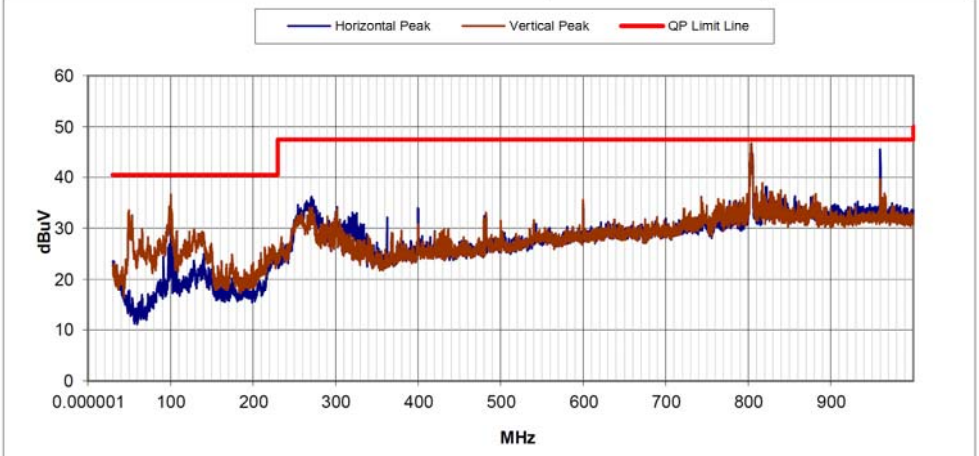
Deviations from Standard: None

RADIATED EMISSIONS DATA SHEET

Revision 08
2/10/2012

Customer:	Sensoray	Job Reference#:	SEN20130325
Contact:	Alexander (Sasha) Kostromitin	Date:	3/28/2013
DUT:	2253S	Temperature:	71ºF
Serial Number:	513194	Humidity:	30%
Voltage/Freq:	120 V 60 Hz	Barometric Pressure:	29 inHg
Tested by:	Ryan Benitez	Location:	Hillsboro
Product Standards:	EN 61000-6-3:2007+A1:2011 (IEC 61000-6-3:2006Ed2+A1:2010)		
	EN55022:2010/CISPR 22Ed6:2008 Class B		
Test Standard:	CISPR 22 B		

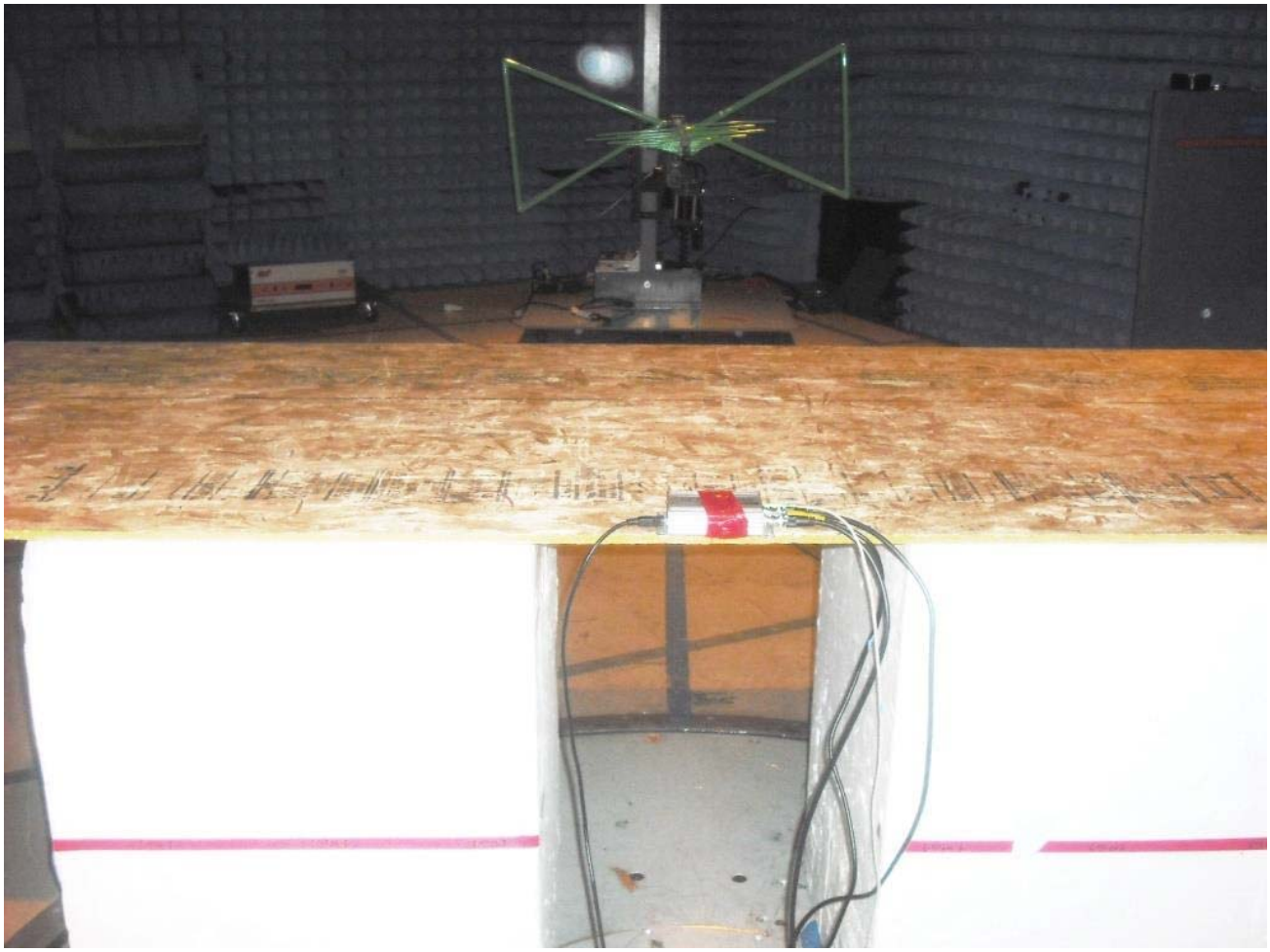
TEST RESULTS	Distance	RUN #
No QP Performed	3m	1



COMMENTS	SIGNATURE
Monitor and computer on ground;	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
53.474	32.512	40.46	7.948	49.594	31.767	33.137	40.46	7.323
100.422	36.641	40.46	3.819	100.304	35.238	27.768	40.46	12.692
101.198	31.734	40.46	8.726	803.931	44.952	37.012	40.46	3.448
101.974	33.027	40.46	7.433	805.034	44.011	36.541	40.46	3.919
804.06	46.777	47.46	0.683	960.038	45.249	31.929	40.46	8.531
805.418	44.69	47.46	2.77					
816.864	38.853	47.46	8.607					
821.52	38.072	47.46	9.388					
822.102	38.142	47.46	9.318					
960.036	45.589	47.46	1.871					

Radiated Emissions 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	2253S
Functional Description of DUT	Std Definition H.264 Encoder / Decoder
Serial Number	513194
I/O Ports Populated for test	Video in, Video out, Audio Line in, Audio Mic in, Audio out, GPIO, USB
Clock Frequencies (>9kHz)	24 MHz, 27 MHz
Modes of Operation	Sending and receiving video, audio and GPIO signals
Operating System (Version)	MS Windows
Exercising Software (version)	2253 Demo Application
Power Supply Voltage, Frequency	5V,USB
Test Level	4 kV contact discharge, 8 kV air discharge

Purpose

The purpose of the testing is to determine if the 2253S is compliant to electromagnetic immunity requirements as specified by EN 61000-6-1:2007 (IEC 61000-6-1:2005) to support compliance to the European Union EMC Directive 2004/108/EC and other regulations based on this standard.

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: EN61000-4-2:2008(IEC 61000-4-2:2008Ed.2)

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

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Video, audio and GPIO generator, GPIO monitor	Sensoray	2253S	513157
Video and audio monitor	Sony	PVM-14N6U	6009034
Laptop PC	Compaq	Presario V6000	CFN630001RP

** 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
Video in	Yes	3M	N/A	No	EUT	2253S, Video out
Video out	Yes	3M	N/A	No	EUT	Monitor, Video in
Audio in	Yes	3M	N/A	No	EUT	2253S, Audio out
Audio out	Yes	3M	N/A	No	EUT	Monitor, Audio in
Mic	Yes	3M	N/A	No	EUT	2253S, Audio out
GPIO	Yes	3M	N/A	No	EUT	2253S, GPIO
USB	Yes	3M	N/A	No	EUT	Laptop

ElectroStatic Discharge Data Sheet

ElectroMagnetic Investigations, LLC

ESD Test Sheet

Revision 08

Job Reference Number:	SEN20130325	Temperature (°F):	70	Device Under Test (DUT):	2253S
Test Date:	1-Apr-2013	Relative Humidity (%):	30	Serial Number:	513194
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	5 V DC
				Test Operator:	Ryan Benitez

Product Standard: EN 61000-6-1:2007 (IEC 61000-6-1:2005)

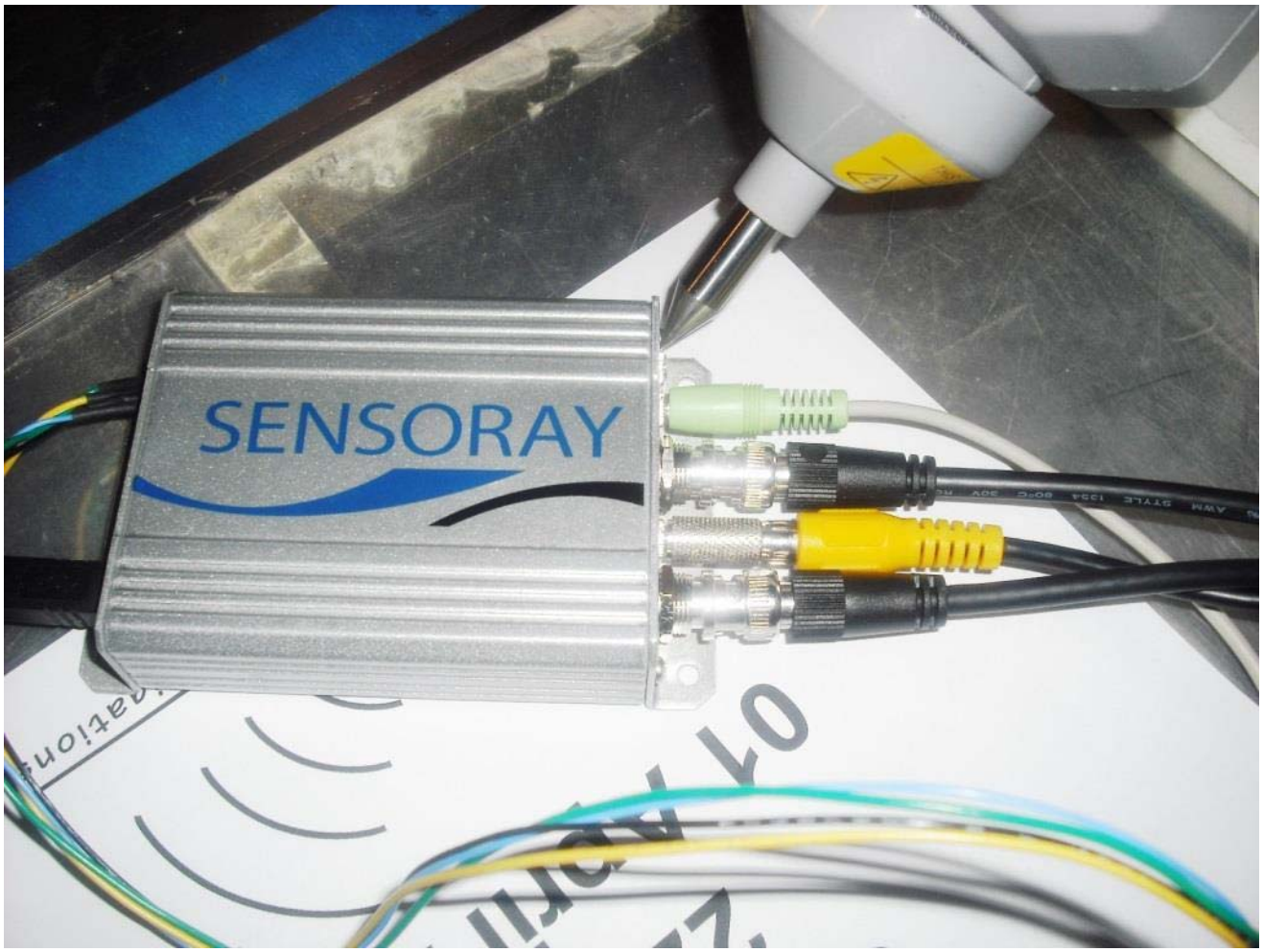
Test: Standard: EN61000-4-2:2008(IEC 61000-4-2:2008Ed.2)
±4kV Contact / ±8kV Air
Performance Class B

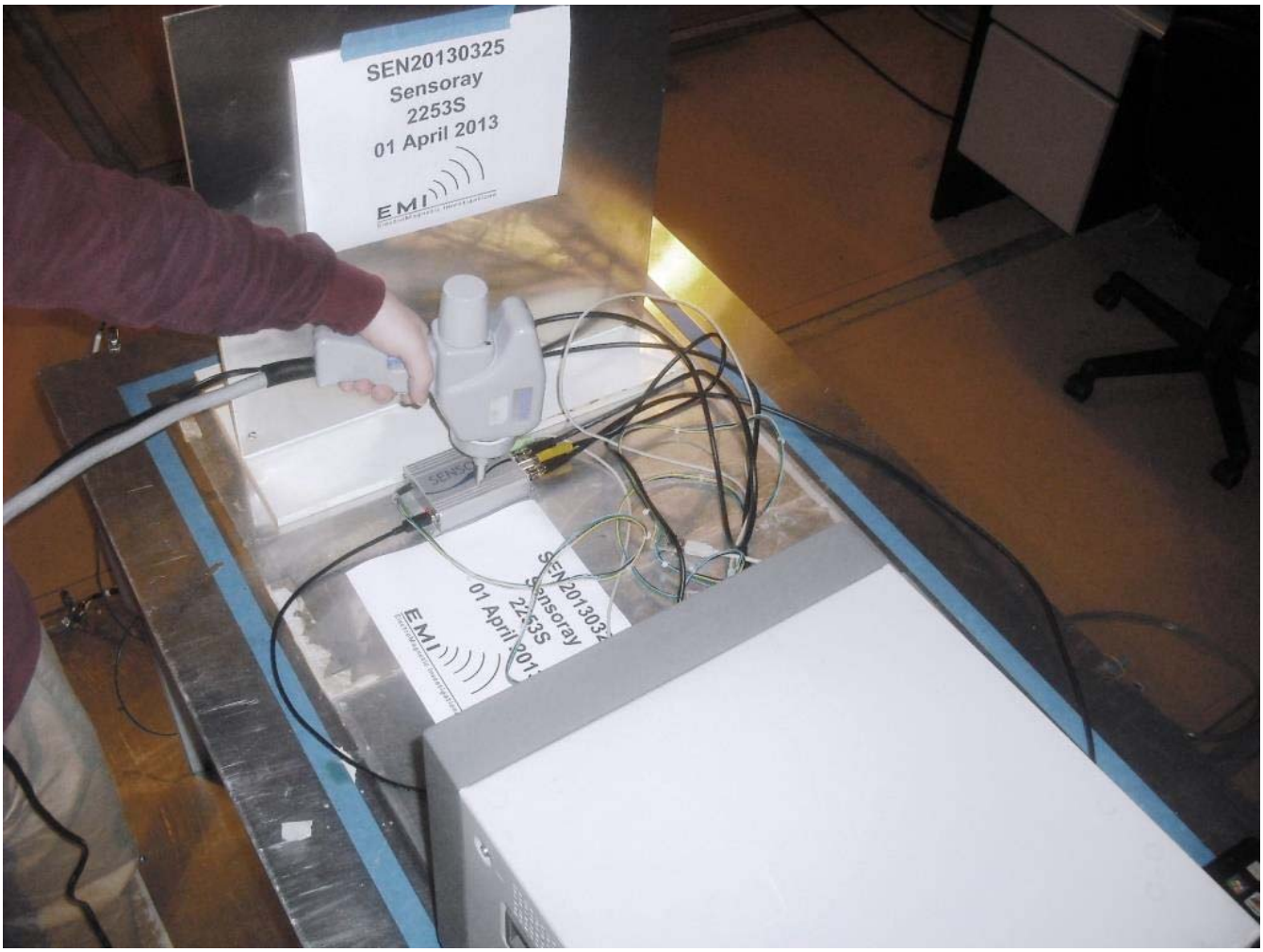
		Manufacturer	Model Number	Calibration Due	Serial Number
ESD Generator	ESD	Noiseken	ES2002 & TC815R	September 30, 2016	ESS0827941 & ESS0817835

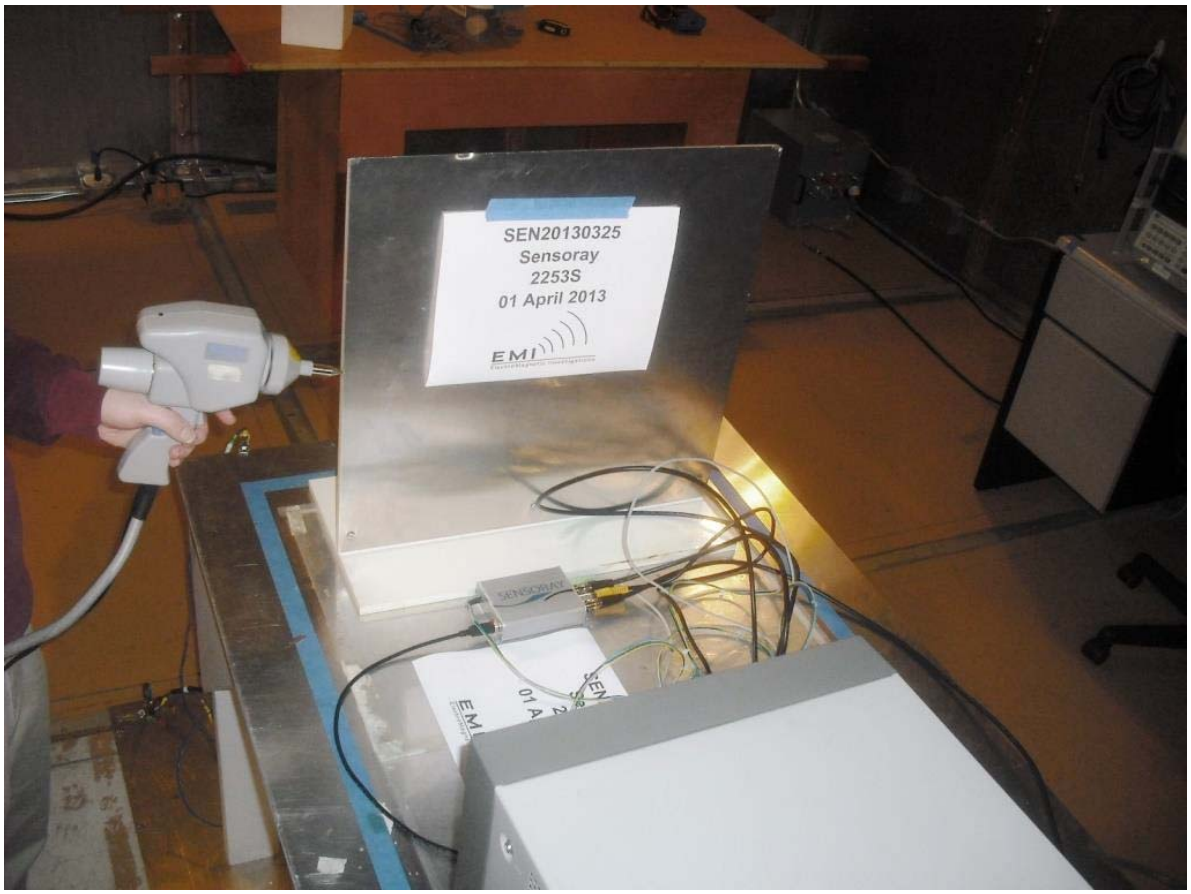
Test Location	Discharge Type	Voltage Level	Voltage Polarity	Number of Events	Comments / DUT Response	Stated Criteria	Pass / Fail	Picture
Metallic Areas to include; enclosure, screws, connectors.	Contact	2 kV	±	10 Each	No degradation of performance observed.	B	Pass	Yes
Metallic Areas to include; enclosure, screws, connectors.	Contact	4 kV	±	10 Each	No degradation of performance observed.	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	
Non-metallic areas to include; cables and LED.	Air	2 kV	±	10 Each	No degradation of performance observed.	B	Pass	
Non-metallic areas to include; cables and LED.	Air	4 kV	±	10 Each	No degradation of performance observed.	B	Pass	
Non-metallic areas to include; cables and LED.	Air	8 kV	±	10 Each	No degradation of performance observed.	B	Pass	

Deviations from Standard:

ElectroStatic Discharge Photographs




SEN20130325
Sensoray
2253S
01 April 2013
EMI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Sensoray
2253S
01 April 2013
EMI

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	2253S
Functional Description of DUT	Std Definition H.264 Encoder / Decoder
Serial Number	513194
I/O Ports Populated for test	Video in, Video out, Audio Line in, Audio Mic in, Audio out, GPIO, USB
Clock Frequencies (>9kHz)	24 MHz, 27 MHz
Modes of Operation	Sending and receiving video, audio and GPIO signals
Operating System (Version)	MS Windows
Exercising Software (version)	2253 Demo Application
Power Supply Voltage, Frequency	5V,USB
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 2253S is compliant to electromagnetic immunity limits as specified by EN 61000-6-1:2007 (IEC 61000-6-1:2005) to support compliance to the European Union EMC Directive 2004/108/EC and other regulations based on this standard.

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: EN61000-4-3:2006+A1:2008+A2:2010(IEC61000-4-3:2006+A1:2007+A2:2010

Radiated Immunity: ……DUT performed to Criteria A

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Video, audio and GPIO generator, GPIO monitor	Sensoray	2253S	513157
Video and audio monitor	Sony	PVM-14N6U	6009034
Laptop PC	Compaq	Presario V6000	CFN630001RP

** 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
Video in	Yes	3M	N/A	No	EUT	2253S, Video out
Video out	Yes	3M	N/A	No	EUT	Monitor, Video in
Audio in	Yes	3M	N/A	No	EUT	2253S, Audio out
Audio out	Yes	3M	N/A	No	EUT	Monitor, Audio in
Mic	Yes	3M	N/A	No	EUT	2253S, Audio out
GPIO	Yes	3M	N/A	No	EUT	2253S, GPIO
USB	Yes	3M	N/A	No	EUT	Laptop

Radiated Immunity Data Sheet

ElectroMagnetic Investigations, LLC

Radiated Immunity Test Sheet

Revision 08

Job Reference Number:	SEN20130325	Temperature (ºF):	70	Device Under Test (DUT):	2253S
Test Date:	28-Mar-2013	Relative Humidity (%):	30	Serial Number:	513194
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:	SEN_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:	EN 61000-6-1:2007 (IEC 61000-6-1:2005)
Test: Standard:	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 Performance Class A

		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	8-Nov-2015	33983
Signal Generator	Sig Gen	Marconi	2024	26-Oct-2015	112282/239
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	0º	80	2700	A	No degradation of performance observed	Pass	Yes
	Vertical	0º	80	2700	A	No degradation of performance observed	Pass	
Right side	Horizontal	90º	80	2700	A	No degradation of performance observed	Pass	
	Vertical	90º	80	2700	A	No degradation of performance observed	Pass	
Back	Horizontal	180º	80	2700	A	No degradation of performance observed	Pass	
	Vertical	180º	80	2700	A	No degradation of performance observed	Pass	
Left side	Horizontal	270º	80	2700	A	No degradation of performance observed	Pass	
	Vertical	270º	80	2700	A	No degradation of performance observed	Pass	

Deviations from Standard: None

Radiated Immunity Photographs


SEN20130325
Sensoray
2253S
28 March 2013
EMI


COMPAQ

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.

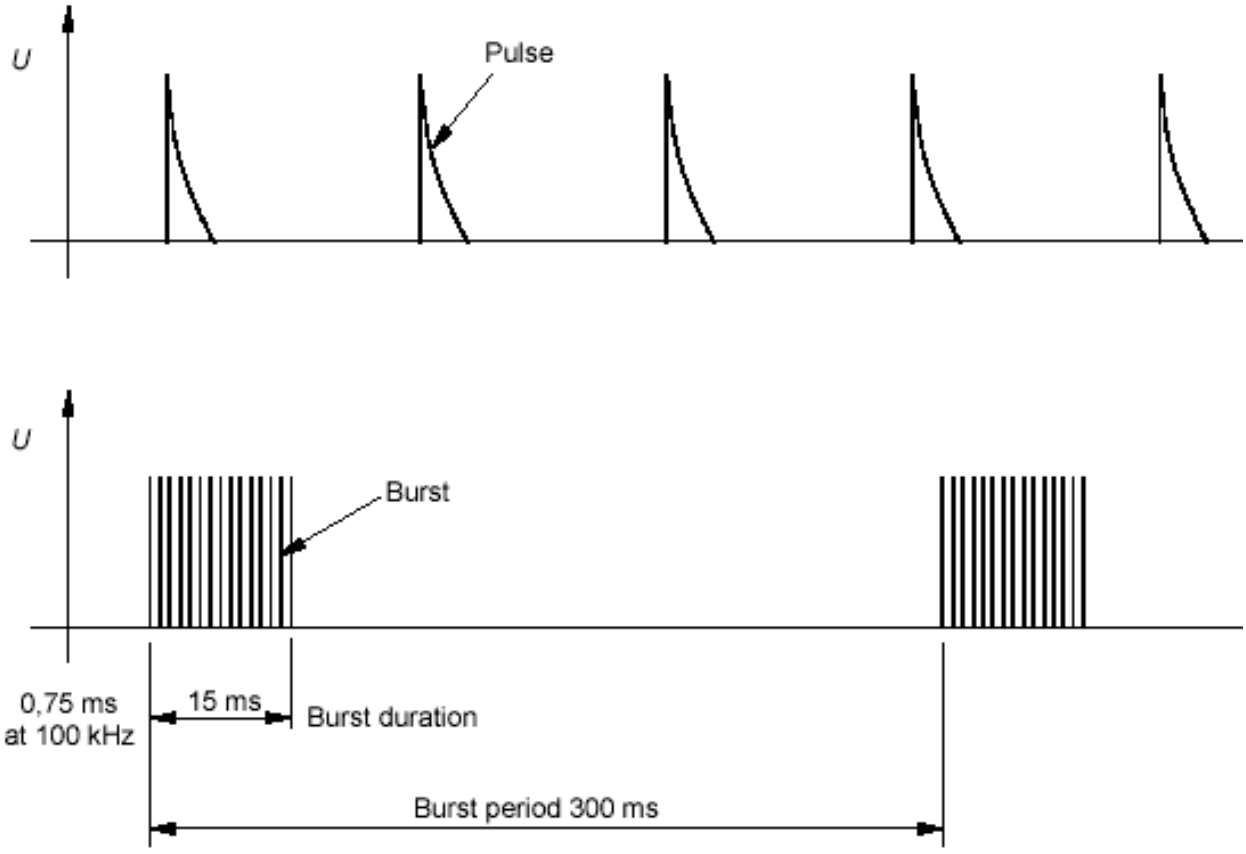


Figure: EFT/Burst Waveform

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

Device Under Test	2253S
Functional Description of DUT	Std Definition H.264 Encoder / Decoder
Serial Number	513194
I/O Ports Populated for test	Video in, Video out, Audio Line in, Audio Mic in, Audio out, GPIO, USB
Clock Frequencies (>9kHz)	24 MHz, 27 MHz
Modes of Operation	Sending and receiving video, audio and GPIO signals
Operating System (Version)	MS Windows
Exercising Software (version)	2253 Demo Application
Power Supply Voltage, Frequency	5V,USB
Test Level	1 kV Peak

Purpose

The purpose of the testing is to determine if the 2253S is compliant to electromagnetic immunity limits as specified by EN 61000-6-1:2007 (IEC 61000-6-1:2005) to support compliance to the European Union EMC Directive 2004/108/EC and other regulations based on this standard.

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: EN61000-4-4:2004+A1:2010 (IEC61000-4-4:2004+A1:2010)

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

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Video, audio and GPIO generator, GPIO monitor	Sensoray	2253S	513157
Video and audio monitor	Sony	PVM-14N6U	6009034
Laptop PC	Compaq	Presario V6000	CFN630001RP

** 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
Video in	Yes	3M	N/A	No	EUT	2253S, Video out
Video out	Yes	3M	N/A	No	EUT	Monitor, Video in
Audio in	Yes	3M	N/A	No	EUT	2253S, Audio out
Audio out	Yes	3M	N/A	No	EUT	Monitor, Audio in
Mic	Yes	3M	N/A	No	EUT	2253S, Audio out
GPIO	Yes	3M	N/A	No	EUT	2253S, GPIO
USB	Yes	3M	N/A	No	EUT	Laptop

Electrical Fast Transient (burst) Immunity Data Sheet

ElectroMagnetic Investigations, LLC

Burst Test Sheet

Revision 08

Job Reference Number:	SEN20130325	Temperature (ºF):	70	Device Under Test (DUT):	2253S
Test Date:	29-Mar-2013	Relative Humidity (%):	30	Serial Number:	513194
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	5 V DC
				Test Operator:	Ryan Benitez

Product Standard: EN 61000-6-3:2007+A1:2011 (IEC 61000-6-3:2006Ed2+A1:2010)

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
±0.5 kV Pk Functional Earth

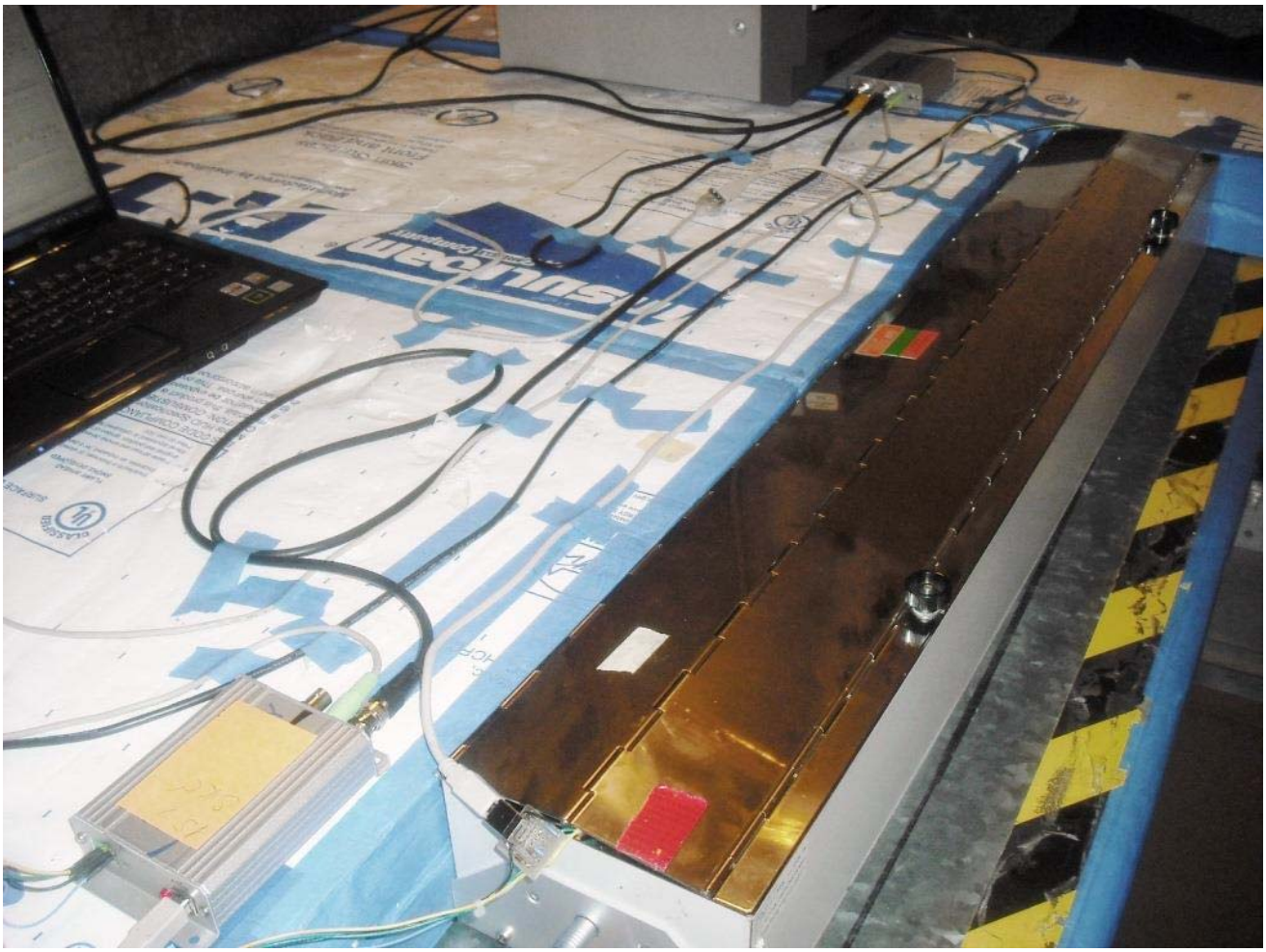
Test: Standard: Performance B

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

Injection Line	Test Number	Injection Method	Level	Stated Criteria	Comments / DUT Response	Pass / Fail	Filename	Picture
Video in	1	C. Clamp	1000 V	B	Minor screen distortion during test	Pass		Yes
Video out	2	C. Clamp	1000 V	B	Minor screen distortion during test	Pass		
Mic	3	C. Clamp	1000 V	B	Minor screen distortion during test	Pass		
Audio out	4	C. Clamp	1000 V	B	Minor screen distortion during test	Pass		
USB	5	C. Clamp	1000 V	B	Minor screen distortion during test	Pass		
GPIO	6	C. Clamp	1000 V	B	Minor screen distortion during test	Pass		

Deviations from Standard: None

Electrical Fast Transient (burst) 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	2253S
Functional Description of DUT	Std Definition H.264 Encoder / Decoder
Serial Number	513194
I/O Ports Populated for test	Video in, Video out, Audio Line in, Audio Mic in, Audio out, GPIO, USB
Clock Frequencies (>9kHz)	24 MHz, 27 MHz
Modes of Operation	Sending and receiving video, audio and GPIO signals
Operating System (Version)	MS Windows
Exercising Software (version)	2253 Demo Application
Power Supply Voltage, Frequency	5V,USB
Test Level	3 Vrms, 150 kHz to 80 MHz

Purpose

The purpose of the testing is to determine if the 2253S is compliant to electromagnetic immunity limits as specified by EN 61000-6-1:2007 (IEC 61000-6-1:2005) to support compliance to the European Union EMC Directive 2004/108/EC and other regulations based on this standard.

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: EN61000-4-6:2009(IEC61000-4-6:2008Ed.3)

Radiated Immunity: ……DUT performed to Criteria A

Auxiliary Equipment in measurement area

Device	Manufacturer	Model Number	Serial Number
Video, audio and GPIO generator, GPIO monitor	Sensoray	2253S	513157
Video and audio monitor	Sony	PVM-14N6U	6009034
Laptop PC	Compaq	Presario V6000	CFN630001RP

** 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
Video in	Yes	3M	N/A	No	EUT	2253S, Video out
Video out	Yes	3M	N/A	No	EUT	Monitor, Video in
Audio in	Yes	3M	N/A	No	EUT	2253S, Audio out
Audio out	Yes	3M	N/A	No	EUT	Monitor, Audio in
Mic	Yes	3M	N/A	No	EUT	2253S, Audio out
GPIO	Yes	3M	N/A	No	EUT	2253S, GPIO
USB	Yes	3M	N/A	No	EUT	Laptop

Conducted Immunity Data Sheet

ElectroMagnetic Investigations, LLC

Conducted Immunity Test Sheet

Revision 08

Job Reference Number:	SEN20130325	Temperature (ºF):	70	Device Under Test (DUT):	2253S
Test Date:	29-Mar-2013	Relative Humidity (%):	30	Serial Number:	513194
Location:	Hillsboro	Barometric Pressure:	30	Voltage/Freq:	5 V DC
Test Level (V/m):	3 Vrms			Test Filename:	SEN_CI_
				Test Operator:	Ryan Benitez

Ryan Benitez

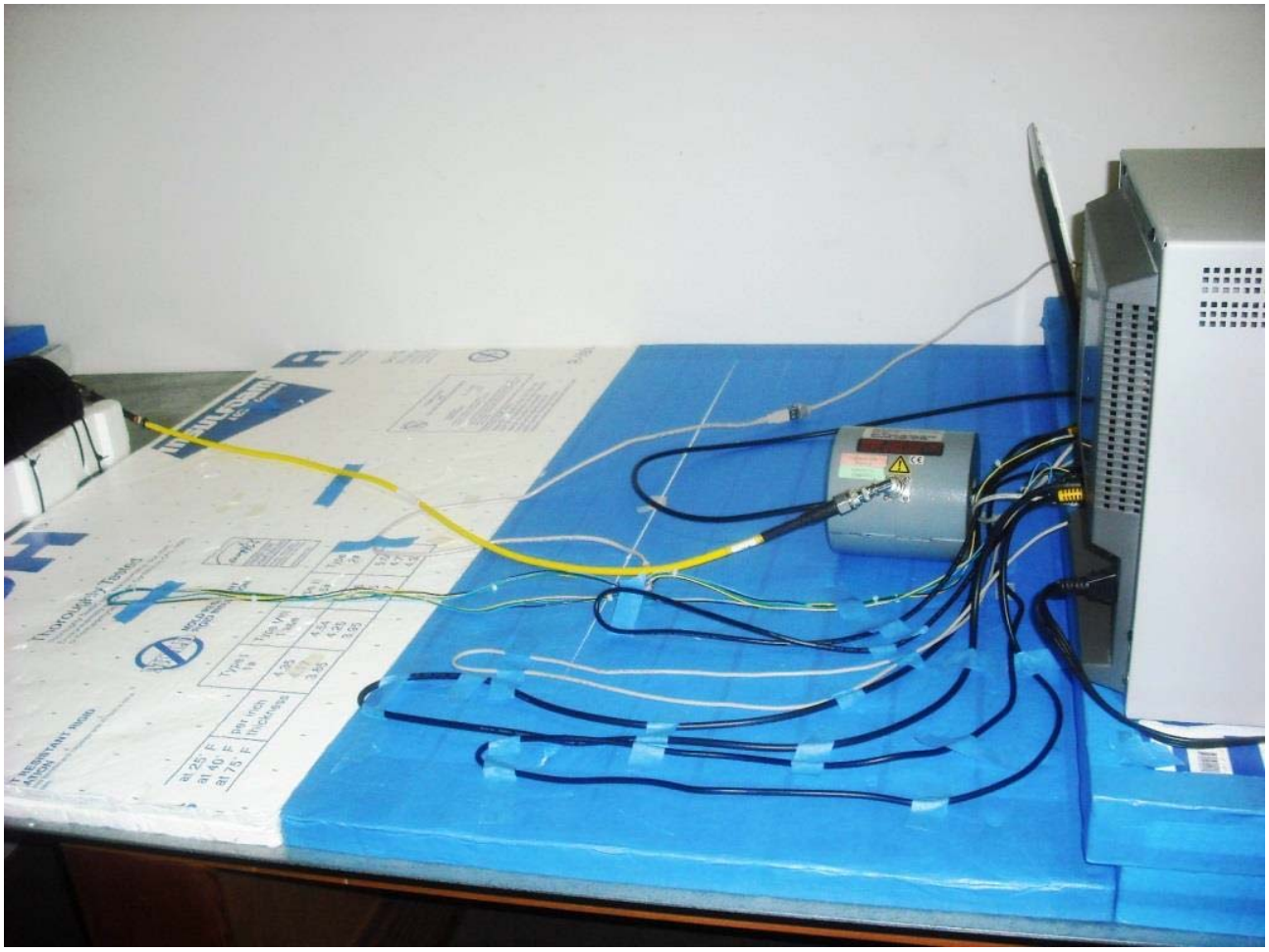
Product Standard:	EN 61000-6-1:2007 (IEC 61000-6-1:2005)
	EN61000-4-6:2009(IEC 61000-6-1:2008Ed.3)
	3 Vrms AC/DC/ Earth
	3 Vrms I/O (>3m)
Test: Standard:	Performance A

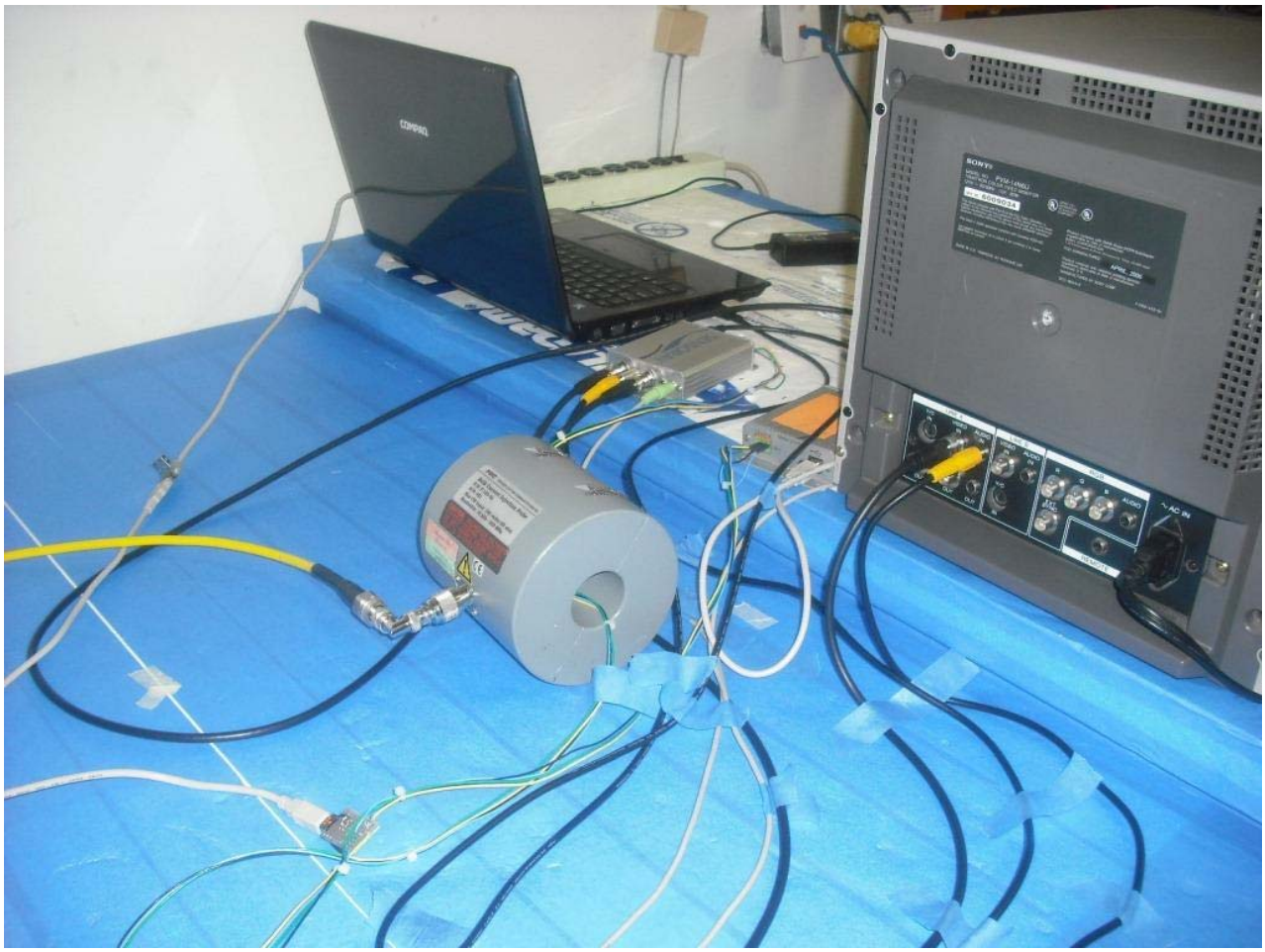
		Manufacturer	Model Number	Calibration Due	Serial Number
Analyzer	8566	Hewlett Packard (Agilent)	8566B & 85650A	15-Jun-2017	3407A08563 & 3303A01823
Injection Probe 1	M3	FCC	FCC-801-M3-25A	20-Sep-2015	4054
Injection Probe 2	BCI	FCC	F-120-9A	N/A	401
Injection Probe 3	N/A	N/A	N/A	N/A	N/A
Monitor Probe	Current Probe	FCC	F-33-1	10-Feb-2015	908
Amplifier	Amp	IFI	CMX5001	N/A	2151-1196
Signal Generator	Sig Gen	Marconi	2024	26-Oct-2015	112282/239
6 dB Pad	Pad6b	SMElectronics	SA3N100	24-Jan-2014	6

Injection line	Test Number	Injection Method	Start (MHz)	Stop (MHz)	Criteria	Comments / DUT Response	Pass / Fail	Picture
Video in	1	Bulk Current	0.15	80	A	Minor tone at 17.6 MHz, 25 - 29 MHz. Within acceptable manufacturer specifications.	Pass	Yes
Video out	2	Bulk Current	0.15	80	A	MHz. Within acceptable manufacturer specifications.	Pass	
Mic	3	Bulk Current	0.15	80	A	Minor tone at 48 - 64 MHz. Within acceptable manufacturer specifications.	Pass	
GPIO	4	Bulk Current	0.15	80	A	Minor tone at 26.5 - 31 MHz. Within acceptable manufacturer specificaitons.	Pass	
USB	5	Bulk Current	0.15	80	A	No degradation of performance observed.	Pass	
Audio out	6	Bulk Current	0.15	80	A	No degradation of performance observed.	Pass	

Deviations from Standard: None

Conducted Immunity Photographs




COMPAQ
SONY
AC IN


SONY

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.