GSL Solutions, Inc.

INTCV01

Report No. GSLS0002

Report Prepared By

www.nwemc.com
1-888-EMI-CERT

EMC Test Report

NORTHWEST EMC

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Last Date of Test: December 2, 2011
GSL Solutions, Inc.
Model: INTCV01

Emissions			
Test Description	**Specification**	**Test Method**	**Pass/Fail**
Field Strength of Fundamental	FCC 15.225:2011	ANSI C63.10:2009	**Pass**
Frequency Stability	FCC 15.225:2011	ANSI C63.10:2009	**Pass**
Field Strength of Spurious Emissions	FCC 15.225:2011	ANSI C63.10:2009	**Pass**
AC Powerline Conducted Emissions	FCC 15.225:2011	ANSI C63.10:2009	**Pass**

Modifications made to the product
See the Modifications section of this report

Test Facility

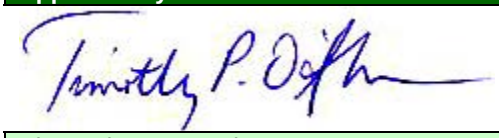
The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124

Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834D-1).

Approved By:



Tim O'Shea, Operations Manager

NVLAP Lab Code: 200630-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

Accreditations and Authorizations

FCC

Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP

Northwest EMC, Inc. is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. NVLAP is administered by the National Institute of Standards and Technology (NIST), an agency of the U.S. Commerce Department. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 2004/108/EC, and ANSI C63.4. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

Industry Canada

Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS-Gen, Issue 2 and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements. (*Site Filing Numbers - Hillsboro: 2834D-1, 2834D-2, Sultan: 2834C-1, Irvine: 2834B-1, 2834B-2, Brooklyn Park: 2834E-1)*

CAB

Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

Australia/New Zealand

The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).

Accreditations and Authorizations

VCCI

Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. *(Registration Numbers. - Hillsboro: C-1071, R-1025, G-84, C-2687, T-1658, and R-2318, Irvine: R-1943, G-85, C-2766, and T-1659, Sultan: R-871, G-83, C-3265, and T-1511, Brooklyn Park: R-3125, G-86, G-141, C-3464, and T-1634).*

BSMI

Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement (US0017).

GOST

Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

KCC

Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (*Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157, Brooklyn Park: US0175)*

VIETNAM

Vietnam MIC has approved Northwest EMC as an accredited test lab. Per Decision No. 194/QD-QLCL (dated December 15, 2009), Northwest EMC test reports can be used for Vietnam approval submissions.

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/

Northwest EMC Locations

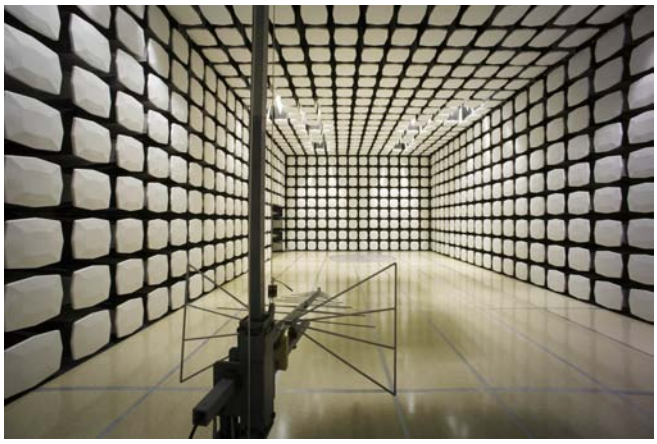
Oregon
Labs EV01-EV12
22975 NW Evergreen Pkwy
Suite 400
Hillsboro, OR 97124
(503) 844-4066

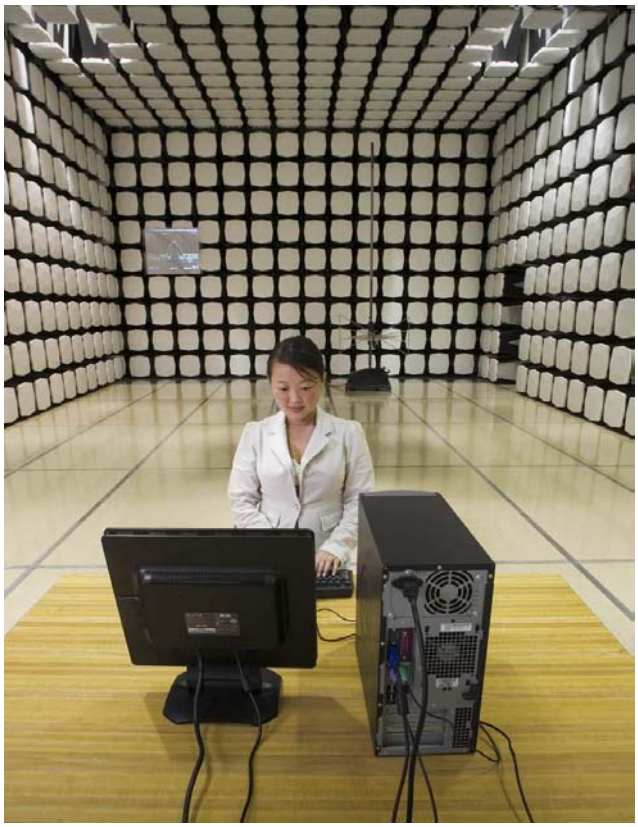
California
Labs OC01-OC13
41 Tesla
Irvine, CA 92618
(949) 861-8918

Minnesota
Labs MN01-MN08
9349 W Broadway Ave.
Brooklyn Park,
MN 55445
(763) 425-2281

Washington
Labs SU01-SU07
14128 339th Ave. SE
Sultan, WA 98294
(360) 793-8675

New York
Labs WA01-WA04
4939 Jordan Rd.
Elbridge, NY 13060
(315) 685-0796





Party Requesting the Test

Company Name:	GSL Solutions, Inc.
Address:	2414 SE 125th Avenue
City, State, Zip:	Vancouver, WA 98683
Test Requested By:	Steve Garrett
Model:	INTCV01
First Date of Test:	November 8, 2011
Last Date of Test:	December 2, 2011
Receipt Date of Samples:	October 17, 2011
Equipment Design Stage:	Prototype
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
Intelligent storage and retrieval system containing a 13.56 MHz radio.

Testing Objective:
RFID seeking TCB certification under FCC 15.225

CONFIGURATION 3 GSLS0002

Software/Firmware Running during test	
Description	**Version**
Standard Firmware	N/A

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Storage and Retrieval System	GSL Solutions, Inc.	890-0601-0/INTCV01	IC0900198

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Power Supply	GlobTek, Inc.	GTM21089-1512-T3	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Hub	D-Link	DGS-1005D	DR8V259001633

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	2.1m	No	AC Mains	Power Supply
Ethernet	No	5.0m	No	Storage and Retrieval System	Hub
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

CONFIGURATION 4 GSLS0002

Software/Firmware Running during test	
Description	**Version**
Standard Firmware	N/A

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Storage and Retrieval System - Right Side MotherBoard	GSL Solutions, Inc.	890-0864-0/ INTCV01	00036401518A

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Power Supply	GlobTek, Inc.	GTM21089-1512-T3	None
Ethernet Switch	NetGear	FS105 V2	1D5189320922D

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	2.1m	No	AC Mains	Power Supply
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	11/8/2011	AC Powerline Conducted Emissions	Modified from delivered configuration.	Grounded cabinet to ESD pad and grounded pad. This is in keeping with their normal installation procedure in the field for ESD requirements. Modification authorized by Steve Garrett.	EUT remained at Northwest EMC following the test.
2	11/8/2011	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	12/2/2011	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	12/2/2011	Field Strength of Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Field Strength of Fundamental

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Continuous Tx

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

GSLS0002 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	12.5 MHz	Stop Frequency	14.5 MHz

CLOCKS AND OSCILLATORS

13.561MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4443A	AFB	1/24/2011	12 mo
Antenna, Loop	EMCO	6502	AOA	6/28/2011	24 mo
EV11 Cables	N/A	3m Test Distance Cables	EVM	3/17/2011	12 mo
EV11 Cables	N/A	10m Test Distance Cables	EVL	8/3/2011	12 mo

MEASUREMENT BANDWIDTHS

	Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The single antenna to be used with the EUT was tested. The EUT was transmitting and receiving while set at its single channel. While scanning, emissons from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes (per ANSI C63.10:2009). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

NORTHWEST

EMC

Field Strength of Fundamental

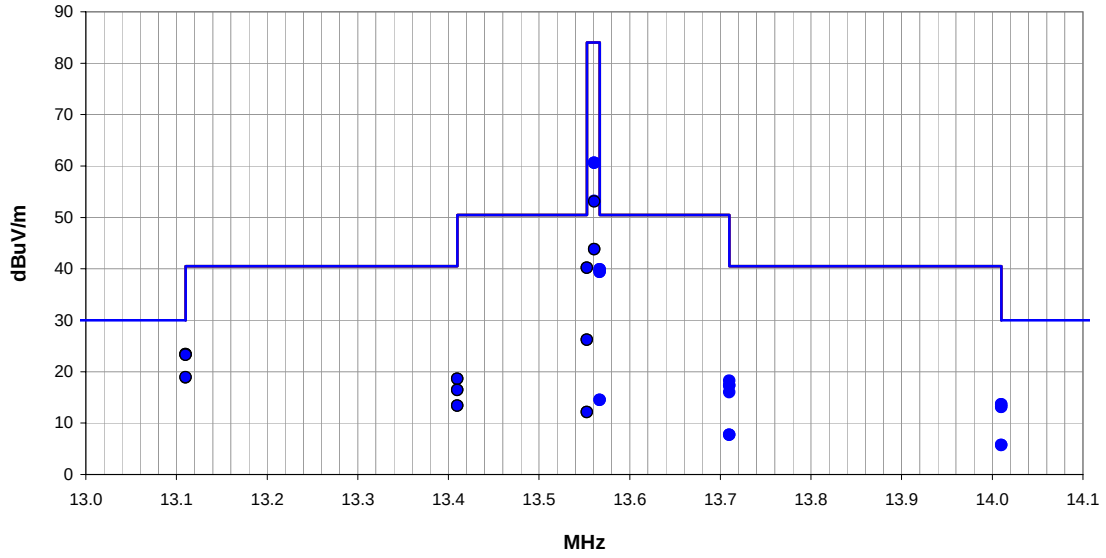
PSA-ESCI 2011.07.26
PSA-ESCI Version 2011.06.23

Work Order:	GSLS0002	**Date:**	12/02/11		
Project:	None	**Temperature:**	21.9 °C		
Job Site:	EV11	**Humidity:**	32% RH		
Serial Number:	IC0900198	**Barometric Pres.:**	1031.4 mbar	**Tested by:**	Dan Haas

EUT:	INTCV01
Configuration:	3
Customer:	GSL Solutions, INC.
Attendees:	Steve Garrett
EUT Power:	120VAC/60Hz
Operating Mode:	Continuous Tx
Deviations:	None
Comments:	Fully populated with 4 drawers powered.

Test Specifications	**Test Method**
FCC 15.225:2011	ANSI C63.10:2009

Run #	7	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**Results**	Pass



13.11 (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity: GND/EUT	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
14.010	26.1	11.3	1.8	8.0	3.0	0.0	Par/Perp	QP	24.3	13.1	30.0	-16.9
14.010	13.4	11.3	1.8	12.0	10.0	0.0	Par/Perp	QP	11.6	13.1	30.0	-16.9
14.010	22.9	11.1	1.9	2.0	3.0	0.0	Perp/Perp	QP	28.3	5.7	30.0	-24.3
14.010	7.9	11.3	2.0	12.0	10.0	0.0	Perp/Perp	QP	13.5	5.7	30.0	-24.3
14.010	9.8	11.3	1.7	137.0	3.0	0.0	Perp/Par	QP	7.5	13.6	30.0	-16.4
14.010	5.9	11.3	1.8	142.0	10.0	0.0	Perp/Par	QP	3.6	13.6	30.0	-16.4
13.710	31.2	11.3	2.3	71.0	3.0	0.0	Par/Perp	QP	34.8	7.7	40.5	-32.8
13.710	13.0	11.3	2.3	71.0	10.0	0.0	Par/Perp	QP	16.6	7.7	40.5	-32.8
13.710	26.7	11.1	2.1	70.0	3.0	0.0	Perp/Perp	QP	20.5	17.3	40.5	-23.2
13.710	15.8	11.3	2.0	72.0	10.0	0.0	Perp/Perp	QP	9.8	17.3	40.5	-23.2
13.710	6.8	11.3	1.8	-5.0	3.0	0.0	Perp/Par	QP	2.1	16.0	40.5	-24.5
13.710	7.9	11.3	1.8	1.0	10.0	0.0	Perp/Par	QP	1.0	18.2	40.5	-22.3
13.567	54.3	11.3	2.3	345.0	3.0	0.0	Par/Perp	QP	26.2	39.4	50.5	-11.1
13.567	40.6	11.3	2.3	348.0	10.0	0.0	Par/Perp	QP	12.5	39.4	50.5	-11.1
13.567	50.8	11.1	2.1	340.0	3.0	0.0	Perp/Perp	QP	22.0	39.9	50.5	-10.6
13.567	39.1	11.3	2.1	355.0	10.0	0.0	Perp/Perp	QP	10.5	39.9	50.5	-10.6
13.567	40.7	11.3	2.4	38.0	3.0	0.0	Perp/Par	QP	37.5	14.5	50.5	-36.0
13.567	21.1	11.3	2.4	49.0	10.0	0.0	Perp/Par	QP	17.9	14.5	50.5	-36.0
13.561	65.9	11.1	2.0	-1.0	3.0	0.0	Par/Perp	QP	16.4	60.6	84.0	-23.4
13.561	57.1	11.3	2.0	0.0	10.0	0.0	Par/Perp	QP	7.8	60.6	84.0	-23.4
13.561	64.2	11.1	2.3	35.0	3.0	0.0	Perp/Perp	QP	22.1	53.2	84.0	-30.8
13.561	52.4	11.3	2.0	39.0	10.0	0.0	Perp/Perp	QP	10.6	53.1	84.0	-30.9
13.561	50.5	11.1	2.1	-5.0	3.0	0.0	Perp/Par	QP	17.8	43.8	84.0	-40.2
13.561	41.0	11.3	2.0	-1.0	10.0	0.0	Perp/Par	QP	8.5	43.8	84.0	-40.2
13.553	46.1	11.1	2.4	50.0	3.0	0.0	Perp/Perp	QP	31.0	26.2	50.5	-24.3
13.553	29.7	11.3	2.4	53.0	10.0	0.0	Perp/Perp	QP	14.8	26.2	50.5	-24.3
13.553	44.2	11.3	1.8	344.0	3.0	0.0	Par/Perp	QP	15.3	40.2	50.5	-10.3

Distance Adjustment Factor for Emissions below 30 MHz

Method: Per 47 CFR 15.31(f)(2), the data was extrapolated based upon a the measured fall-off (at each frequency / polarity).

EUT: INTCV01
S/N: None
Date:

Frequency (MHz)	EUT and Loop Antenna Polarity	Test Distance (meters)	Adjusted Level (dBuV/m)	Fall-Off from 3 to 10 m (dB)	Extrapolation Factor for Specification Limit (dB / decade)	Test Distance of Spec. Limit (meters)	Distance Adjustment Factor (dB)
13.561	Ant Par to ground, Perp to EUT	3	77.0	8.6	16.4	30.0	16.4
13.561	Ant Par to ground, Perp to EUT	10	68.4				7.8
13.561	Ant Perp to ground, Par to EUT	3	61.6	9.3	17.8	30.0	17.8
13.561	Ant Perp to ground, Par to EUT	10	52.3				8.5
13.561	Ant Perp to ground, Perp to EUT	3	75.3	11.6	22.2	30.0	22.2
13.561	Ant Perp to ground, Perp to EUT	10	63.7				10.6
13.553	Ant Par to ground, Perp to EUT	3	55.5	8.0	15.3	30.0	15.3
13.553	Ant Par to ground, Perp to EUT	10	47.5				7.3
13.553	Ant Perp to ground, Par to EUT	3	46.1	17.8	34.0	30.0	34.0
13.553	Ant Perp to ground, Par to EUT	10	28.3				16.2
13.553	Ant Perp to ground, Perp to EUT	3	57.2	16.2	31.0	30.0	31.0
13.553	Ant Perp to ground, Perp to EUT	10	41.0				14.8
13.567	Ant Par to ground, Perp to EUT	3	65.6	13.7	26.2	30.0	26.2
13.567	Ant Par to ground, Perp to EUT	10	51.9				12.5
13.567	Ant Perp to ground, Par to EUT	3	52.0	19.6	37.5	30.0	37.5
13.567	Ant Perp to ground, Par to EUT	10	32.4				17.9
13.567	Ant Perp to ground, Perp to EUT	3	61.9	11.5	22.0	30.0	22.0
13.567	Ant Perp to ground, Perp to EUT	10	50.4				10.5
13.410	Ant Par to ground, Perp to EUT	3	38.6	13.2	25.2	30.0	25.2
13.410	Ant Par to ground, Perp to EUT	10	25.4				12.0
13.410	Ant Perp to ground, Par to EUT	3	18.9	1.3	2.5	30.0	2.5
13.410	Ant Perp to ground, Par to EUT	10	17.6				1.2
13.410	Ant Perp to ground, Perp to EUT	3	34.7	8.4	16.1	30.0	16.1
13.410	Ant Perp to ground, Perp to EUT	10	26.3				7.7
13.710	Ant Par to ground, Perp to EUT	3	42.5	18.2	34.8	30.0	34.8
13.710	Ant Par to ground, Perp to EUT	10	24.3				16.6
13.710	Ant Perp to ground, Par to EUT	3	18.1	-1.1	-2.1	30.0	-2.1
13.710	Ant Perp to ground, Par to EUT	10	19.2				-1.0
13.710	Ant Perp to ground, Perp to EUT	3	37.8	10.7	20.5	30.0	20.5
13.710	Ant Perp to ground, Perp to EUT	10	27.1				9.8
13.110	Ant Par to ground, Perp to EUT	3	28.2	2.5	4.8	30.0	4.8
13.110	Ant Par to ground, Perp to EUT	10	25.7				2.3
13.110	Ant Perp to ground, Par to EUT	3	17.0	-1.0	-1.9	30.0	-1.9
13.110	Ant Perp to ground, Par to EUT	10	18.0				-0.9
13.110	Ant Perp to ground, Perp to EUT	3	24.1	0.4	0.8	30.0	0.8
13.110	Ant Perp to ground, Perp to EUT	10	23.7				0.4
14.010	Ant Par to ground, Perp to EUT	3	37.4	12.7	24.3	30.0	24.3
14.010	Ant Par to ground, Perp to EUT	10	24.7				11.6
14.010	Ant Perp to ground, Par to EUT	3	21.1	3.9	7.5	30.0	7.5
14.010	Ant Perp to ground, Par to EUT	10	17.2				3.6
14.010	Ant Perp to ground, Perp to EUT	3	34.0	14.8	28.3	30.0	28.3
14.010	Ant Perp to ground, Perp to EUT	10	19.2				13.5

FREQUENCY STABILITY

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
Chamber Temp. & Humidity Controller	ESZ / Eurotherm	Dimension II	TBC	NCR	0
Chamber, Temp./Humidity Chamber	Cincinnati Sub Zero (CSZ)	ZH-32-2-2-H/AC	TBA	8/20/2010	24
AC Power Source	Instek	APS-9050	TPK	NCR	0
Near Field Probe	EMCO	7405	IPD	NCR	0

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

Variation of Supply Voltage

The primary supply voltage was varied from 85% to 115% of nominal. The EUT can only be operated from the public AC mains, so an AC lab supply was used to vary the supply voltage from 115% to 85% of 120 V, 60 Hz.

Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (-20° to +50° C) and at 10°C intervals.

Measurements were made at the single transmit frequency. The antenna is integral to the EUT, so a radiated measurement was made using a spectrum analyzer and a near field probe. The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

NORTHWEST EMC

FREQUENCY STABILITY

XMit 2010.11.03

EUT:	INTCV01			**Work Order:**	GSLS0002
Serial Number:	IC0900198			**Date:**	11/08/11
Customer:	GSL Solutions, INC.			**Temperature:**	22°C
Attendees:	Steve Garrett			**Humidity:**	38%
Project:	None			**Barometric Pres.:**	1025 mb
Tested by:	Rod Peloquin	**Power:**	120VAC/60Hz	**Job Site:**	EV06

TEST SPECIFICATIONS	Test Method
FCC 15.225:2011	ANSI C63.10:2009

COMMENTS

Primary board only with power from system POE Ethernet Switch

DEVIATIONS FROM TEST STANDARD

No Deviations

Configuration #	4	Signature

FREQUENCY STABILITY

Frequency Stability with Variation of AC Voltage (Ambient Temperature = 20°C)

Voltage (VDC)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (%)	Specification (± %)
138 (115%)	13.560000	13.560514	0.000038	0.01%
120 (100%)	13.560000	13.560514	0.000038	0.01%
102 (85%)	13.560000	13.560514	0.000038	0.01%

Frequency Stability with Variation of Ambient Temperature (Primary Supply = 120 VAC)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (%)	Specification (± %)
50	13.560000	13.560424	0.000031	0.01%
40	13.560000	13.560449	0.000033	0.01%
30	13.560000	13.560482	0.000036	0.01%
20	13.560000	13.560514	0.000038	0.01%
10	13.560000	13.560524	0.000039	0.01%
0	13.560000	13.560502	0.000037	0.01%
-10	13.560000	13.560497	0.000037	0.01%
-20	13.560000	13.560466	0.000034	0.01%

Field Strength of Spurious Emissions < 30 MHz

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Continuous Tx

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

GSLS0002 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	490 kHz	Stop Frequency	30 MHz

CLOCKS AND OSCILLATORS

13.561 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4443A	AFB	1/24/2011	12 mo
EV11 Cables	N/A	10m Test Distance Cables	EVL	8/3/2011	12 mo
Antenna, Loop	EMCO	6502	AOA	6/28/2011	24 mo

MEASUREMENT BANDWIDTHS

	Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and receiving while set at the channel available. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes (per ANSI C63.10:2009). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

NORTHWEST

EMC

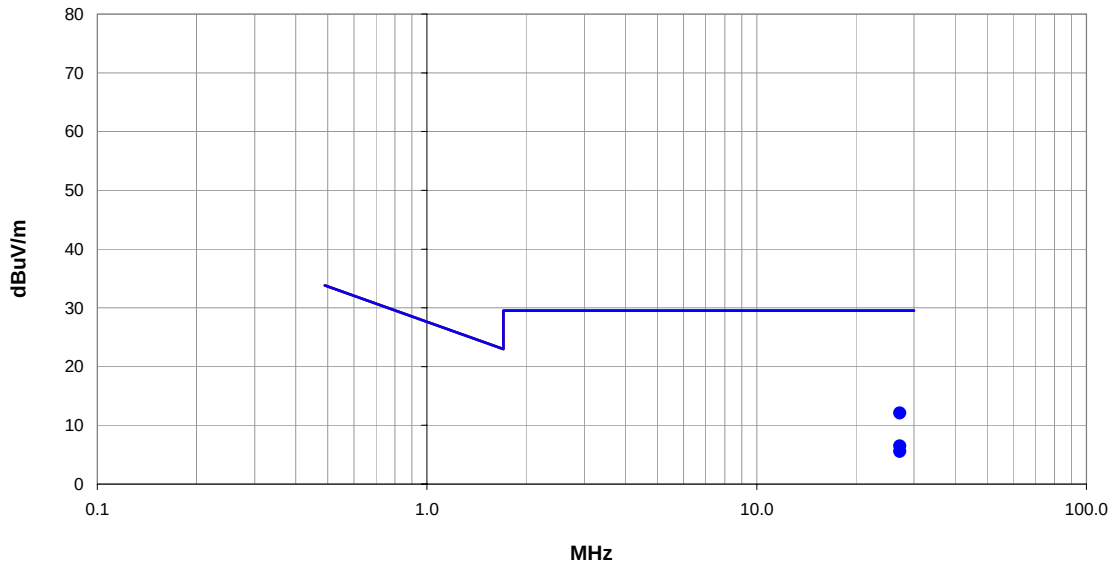
Field Strength of Spurious Emissions < 30 MHz

PSA-ESCI 2011.07.26
PSA-ESCI Version 2011.06.23

Work Order:	GSLS0002	**Date:**	12/02/11		
Project:	None	**Temperature:**	21.3 °C		
Job Site:	EV11	**Humidity:**	32.2% RH		
Serial Number:	IC0900198	**Barometric Pres.:**	1031.7 mbar	**Tested by:**	Dan Haas
EUT:	INTCV01				
Configuration:	3				
Customer:	GSL Solutions, INC.				
Attendees:	Steve Garrett				
EUT Power:	120VAC/60Hz				
Operating Mode:	Continuous Tx				
Deviations:	None				
Comments:	Fully populated with 4 drawers powered.				

Test Specifications	**Test Method**
FCC 15.225:2011	ANSI C63.10:2009

Run #	10	**Test Distance (m)**	10	**Antenna Height(s)**	1-4m	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
27.157	12.1	9.5	1.8	345.0	10.0	0.0	Horz	QP	-9.5	12.1	29.5	-17.4	Antenna Perp to GND/Perp to EUT
27.156	6.5	9.5	1.9	3.0	10.0	0.0	Vert	QP	-9.5	6.5	29.5	-23.0	Antenna Par to GND/Perp to EUT
27.201	5.6	9.5	2.2	266.0	10.0	0.0	Horz	QP	-9.5	5.6	29.5	-23.9	Antenna Perp to GND/Par to EUT

Field Strength of Spurious Emissions > 30 MHz

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION

Continuous Tx

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATION INVESTIGATED

GSLS0002 - 3

FREQUENCY RANGE INVESTIGATED

Start Frequency	30MHz	Stop Frequency	1000MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4446A	AAQ	6/24/2011	12
EV01 Cables	N/A	Bilog Cables	EVA	6/28/2011	12
Pre-Amplifier	Miteq	AM-1616-1000	AOL	6/28/2011	12
Antenna, Bilog	Teseq	CBL 6141B	AXR	11/29/2010	12

MEASUREMENT BANDWIDTHS

	Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4. The measurement uncertainty estimation is available upon request.

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was transmitting and receiving while set at the lowest channel, a middle channel, and the highest channel available. While scanning, emissions from the EUT were maximized by rotating the EUT and adjusting the measurement antenna height and polarization in 3 orthogonal planes (per ANSI C63.10:2009).

NORTHWEST EMC

Field Strength of Spurious Emissions > 30 MHz

PSA 2011.05.11
EMI 2008.1.9

EUT:	INTCV01			Work Order:	GSLS0002
Serial Number:	IC0900198			Date:	11/07/11
Customer:	GSL Solutions, INC.			Temperature:	21.6
Attendees:	None			Humidity:	41%
Project:	None			Barometric Pres.:	1024.4
Tested by:	Travis Rychener	Power:	120VAC/60Hz	Job Site:	EV01

TEST SPECIFICATIONS	Test Method
FCC 15.225:2011	ANSI C63.10:2009

TEST PARAMETERS			
Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

4 Drawer Unit

EUT OPERATING MODES

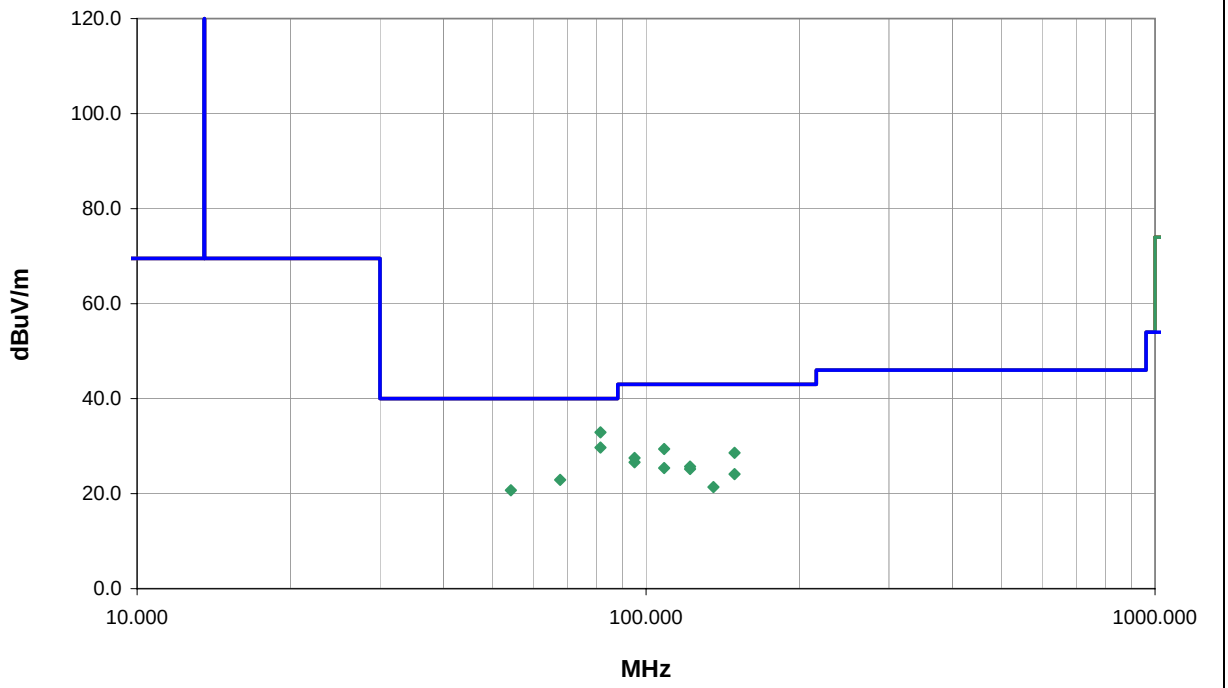
Continuous Tx

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	1
Configuration #	3
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
81.369	46.0	-13.1	359.0	1.0	3.0	0.0	V-Bilog	QP	0.0	32.9	40.0	-7.1
81.369	42.8	-13.1	349.0	1.0	3.0	0.0	H-Bilog	QP	0.0	29.7	40.0	-10.3
108.490	39.4	-10.0	360.0	1.5	3.0	0.0	H-Bilog	QP	0.0	29.4	43.0	-13.6
149.174	36.8	-8.2	145.0	1.0	3.0	0.0	V-Bilog	QP	0.0	28.6	43.0	-14.4
94.933	39.2	-11.7	360.0	1.6	3.0	0.0	H-Bilog	QP	0.0	27.5	43.0	-15.5
94.939	38.3	-11.7	36.0	2.0	3.0	0.0	V-Bilog	QP	0.0	26.6	43.0	-16.4
67.812	36.4	-13.5	360.0	1.2	3.0	0.0	V-Bilog	QP	0.0	22.9	40.0	-17.1
122.051	34.5	-8.8	360.0	1.2	3.0	0.0	H-Bilog	QP	0.0	25.7	43.0	-17.3
108.491	35.4	-10.0	2.0	1.0	3.0	0.0	V-Bilog	QP	0.0	25.4	43.0	-17.6
122.048	34.0	-8.8	14.0	1.5	3.0	0.0	V-Bilog	QP	0.0	25.2	43.0	-17.8
149.173	32.3	-8.2	220.0	1.5	3.0	0.0	H-Bilog	QP	0.0	24.1	43.0	-18.9
54.259	30.7	-10.0	358.0	1.0	3.0	0.0	V-Bilog	QP	0.0	20.7	40.0	-19.3
135.614	29.4	-8.0	0.0	1.0	3.0	0.0	H-Bilog	QP	0.0	21.4	43.0	-21.6
67.811	31.0	-13.5	269.0	1.5	3.0	0.0	H-Bilog	QP	0.0	17.5	40.0	-22.5
40.690	19.3	-3.8	255.0	1.2	3.0	0.0	V-Bilog	QP	0.0	15.5	40.0	-24.5
135.614	26.2	-8.0	135.0	1.0	3.0	0.0	V-Bilog	QP	0.0	18.2	43.0	-24.8
40.156	17.7	-3.6	118.0	1.0	3.0	0.0	H-Bilog	QP	0.0	14.1	40.0	-25.9
54.249	24.0	-10.0	286.0	1.0	3.0	0.0	H-Bilog	QP	0.0	14.0	40.0	-26.0

AC POWERLINE CONDUCTED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

MODES OF OPERATION

Continuous Tx

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

GSLS0002 - 3

SAMPLE CALCULATIONS

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Receiver	Rohde & Schwarz	ESCI	ARH	3/30/2011	12 mo
LISN	Solar	9252-50-R-24-BNC	LIN	5/9/2011	12 mo
Attenuator, 20 dB, 'BNC'	SM Electronics	SA01B-20	REY	1/10/2011	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HFX	2/9/2011	24 mo
LISN	Solar	9252-50-R-24-BNC	LIP	5/9/2011	12 mo
EV07 Cables	N/A	Conducted Cables	EVG	6/17/2011	12 mo

MEASUREMENT BANDWIDTHS

	Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
	0.01 - 0.15	1.0	0.2	0.2
	0.15 - 30.0	10.0	9.0	9.0
	30.0 - 1000	100.0	120.0	120.0
	Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The EUT will be powered either directly or indirectly from the AC power line. Therefore, conducted emissions measurements were made on the AC input of the EUT, or on the AC input of the device used to power the EUT. The AC power line conducted emissions were measured with the EUT operating at its single operating channel. The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.10-2009.

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

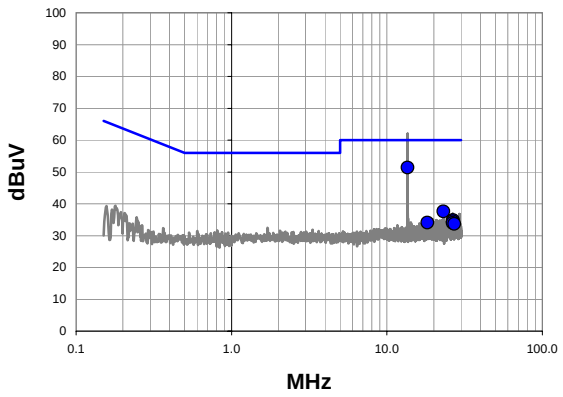
PSA-ESCI 2011.07.26
PSA-ESCI Version 2011.06.23

Work Order:	GSLS0002	**Date:**	11/08/11		
Project:	None	**Temperature:**	21 °C		
Job Site:	EV07	**Humidity:**	38% RH		
Serial Number:	IC0900198	**Barometric Pres.:**	1023 mbar	**Tested by:**	Rod Peloquin
EUT:	INTCV01				
Configuration:	3				
Customer:	GSL Solutions, INC.				
Attendees:	Steve Garrett				
EUT Power:	120VAC/60Hz				
Operating Mode:	Continuous Tx				
Deviations:	None				
Comments:	Fully populated with 4 drawers powered: re-routed DC lead directly behind unit: Grounded unit to ground plane of lab				

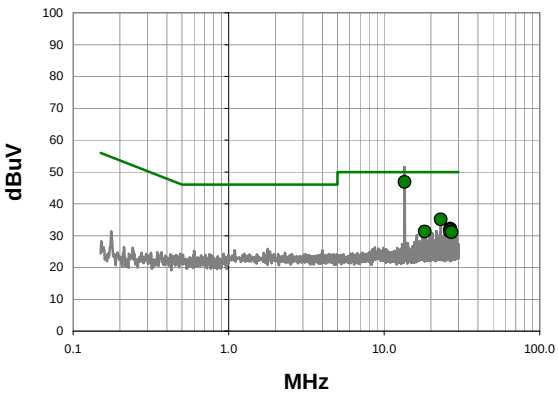
Test Specifications	**Test Method**
FCC 15.207:2011	ANSI C63.10:2009

Run #	10	**Line:**	High Line	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
13.560	30.9	20.5	51.4	60.0	-8.6
23.126	16.7	20.9	37.6	60.0	-22.4
26.610	13.8	21.0	34.8	60.0	-25.2
26.488	13.5	21.0	34.5	60.0	-25.5
18.244	13.4	20.6	34.0	60.0	-26.0
26.548	12.9	21.0	33.9	60.0	-26.1
27.160	12.6	21.0	33.6	60.0	-26.4

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
13.560	26.3	20.5	46.8	50.0	-3.2
23.126	14.2	20.9	35.1	50.0	-14.9
26.610	11.1	21.0	32.1	50.0	-17.9
26.488	10.7	21.0	31.7	50.0	-18.3
18.244	10.6	20.6	31.2	50.0	-18.8
26.548	10.2	21.0	31.2	50.0	-18.8
27.160	10.0	21.0	31.0	50.0	-19.0

NORTHWEST

EMC

AC POWERLINE CONDUCTED EMISSIONS

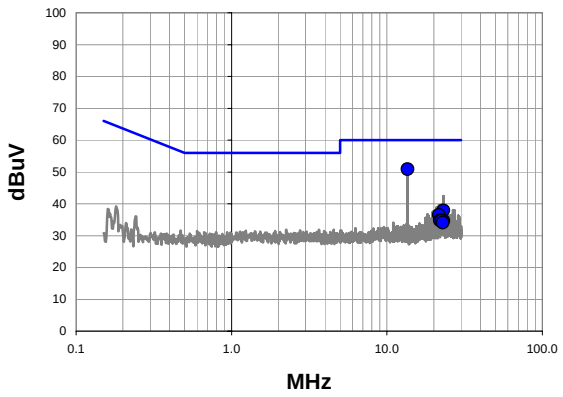
PSA-ESCI 2011.07.26
PSA-ESCI Version 2011.06.23

Work Order:	GSLS0002	**Date:**	11/08/11		
Project:	None	**Temperature:**	21 °C		
Job Site:	EV07	**Humidity:**	38% RH		
Serial Number:	IC0900198	**Barometric Pres.:**	1023 mbar	**Tested by:**	Rod Peloquin
EUT:	INTCV01				
Configuration:	3				
Customer:	GSL Solutions, Inc.				
Attendees:	Steve Garrett				
EUT Power:	120VAC/60Hz				
Operating Mode:	Continuous Tx				
Deviations:	None				
Comments:	Fully populated with 4 drawers powered: re-routed DC lead directly behind unit: Grounded unit to ground plane of lab				

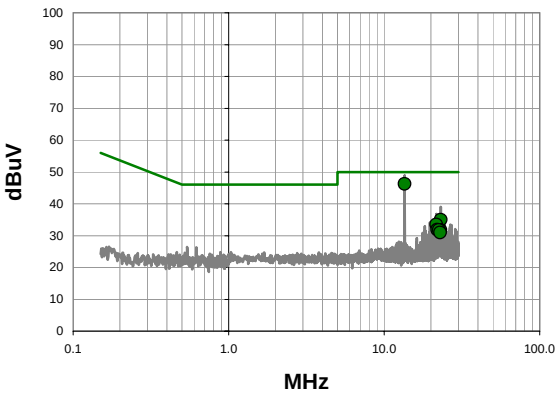
Test Specifications	**Test Method**
FCC 15.207:2011	ANSI C63.10:2009

Run #	11	**Line:**	Neutral	**Ext. Attenuation:**	20	**Results**	Pass

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
13.560	30.4	20.5	50.9	60.0	-9.1
23.126	17.0	20.9	37.9	60.0	-22.1
21.664	15.7	20.8	36.5	60.0	-23.5
21.908	14.0	20.8	34.8	60.0	-25.2
23.066	13.8	20.9	34.7	60.0	-25.3
22.456	13.8	20.8	34.6	60.0	-25.4
22.884	13.2	20.9	34.1	60.0	-25.9

Average Data - vs - Average Limit

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)
13.560	25.7	20.5	46.2	50.0	-3.8
23.126	14.1	20.9	35.0	50.0	-15.0
21.664	12.7	20.8	33.5	50.0	-16.5
21.908	11.0	20.8	31.8	50.0	-18.2
23.066	10.9	20.9	31.8	50.0	-18.2
22.456	10.9	20.8	31.7	50.0	-18.3
22.884	10.1	20.9	31.0	50.0	-19.0