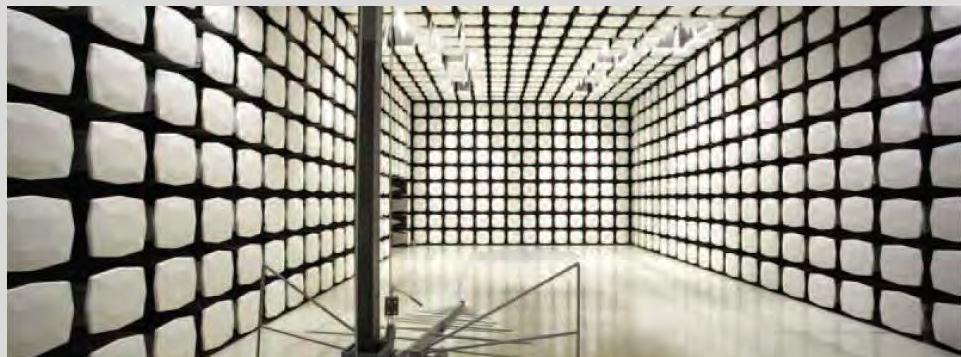


NORTHWEST EMC

Sunlight Supply, Inc.

Sun System 1. Part number: 902238

Report # SNSY0053



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. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST

Last Date of Test: October 08, 2015
Sunlight Supply, Inc.
Model: Sun System 1. Part number: 902238

Emissions

Standards

Specification	Method
FCC 18.305:2015 RF lighting - Consumer equipment	MP-5:1986
FCC 18.307:2015 RF lighting - Consumer equipment	MP-5:1986

Results

Test Description	Applied	Results	Comments
Radiated Emissions	Yes	Pass	
Radiated Emissions – High Frequency	No	N/A	Not required due to the maximum frequency generated: Assumes < 180 MHz
Conducted Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Kyle Holgate, Operations Manager

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. 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. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission - Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI - Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA - Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC - Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA - Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC - Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>

<http://gsi.nist.gov/global/docs/cabs/designations.html>

EMISSIONS MEASUREMENTS

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

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 (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

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.

Sample Calculations

Radiated Emissions:

Field Strength	=	Measured Level	+	Antenna Factor	+	Cable Factor	-	Amplifier Gain	+	Distance Adjustment Factor	+	External Attenuation
33.5	=	42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0

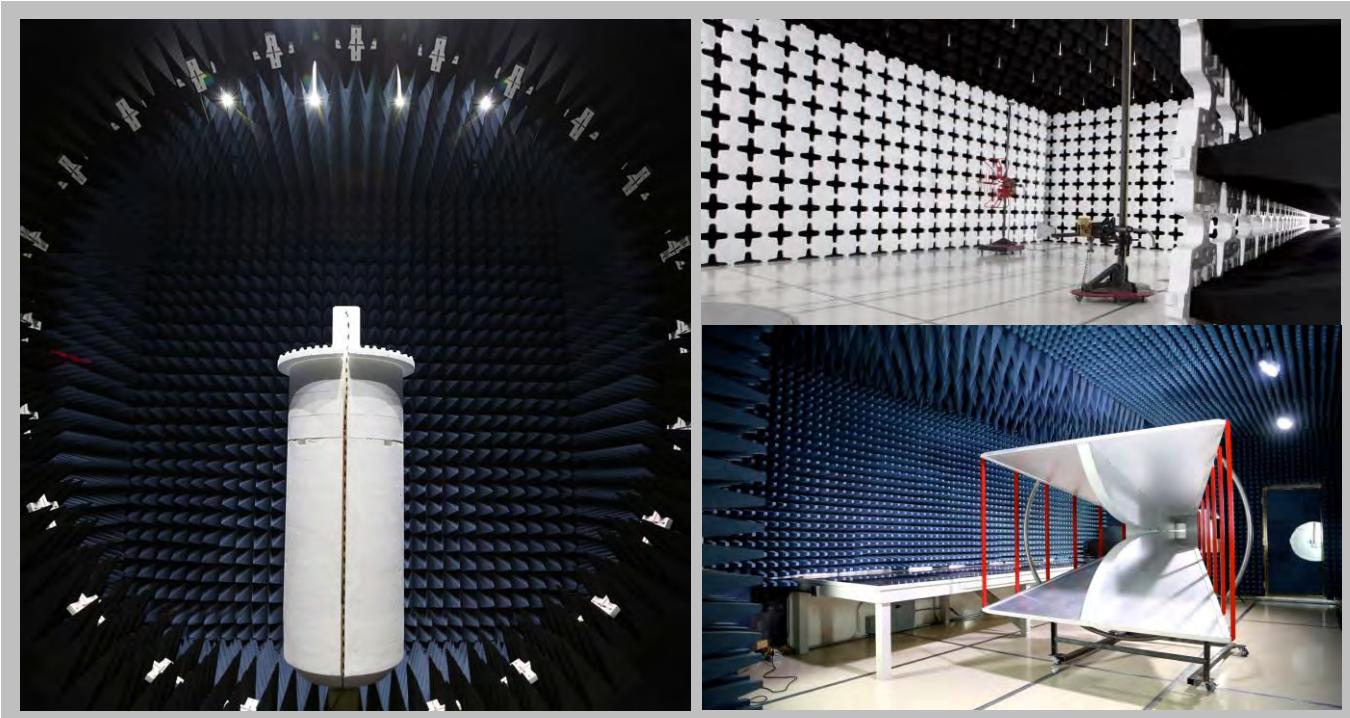
Conducted Emissions:

Adjusted Level	=	Measured Level	+	Transducer Factor	+	Cable Factor	+	External Attenuation
47.1	=	26.7	+	0.3	+	0.1	+	20.0

FACILITIES



California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code: 201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Sunlight Supply, Inc.
Address:	5408 NE 88th Street BLDG A, Suite 101
City, State, Zip:	Vancouver, WA 98665
Test Requested By:	Bruce LeBlanc
Model:	Sun System 1. Part number: 902238
First Date of Test:	October 07, 2015
Last Date of Test:	October 08, 2015
Receipt Date of Samples:	October 07, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

| **Functional Description of the EUT:** |
| Light ballast |
| **Highest frequency generated or used in the device:** |
| Assumes < 108 MHz |
| **Testing Objective:** |
| Provide the specific EMC testing requested by the customer |
| **EUT Photo** |


CONFIGURATIONS

Configuration SNSY0053- 1

EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Light Ballast	Sunlight Supply Inc.	Sun System 1 PN#:902238	None		

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
High pressure sodium lamp	Sunlight Supply Inc.	Sun System Magnum XXXL	None		

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power Cable	No	2.5m	Yes	AC Power	Ballast
Supply Cable	No	4.5m	No	Ballast	Lamp

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	10/7/2015	Radiated Emissions	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.
2	10/8/2015	Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

RADIATED EMISSIONS

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth and antenna height such that the maximum radiated emissions level was detected. This required the use of a turntable and an antenna positioner. The preferred method of a continuous azimuth search was utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna. A calibrated, linearly polarized antenna was positioned at the specified distance from the periphery of the EUT. Tests were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Though specified in the report, the measurement distance was 3 meters or 10 meters. At any measurement distance, the antenna height was varied from 1 meter to 4 meters. These height scans apply for both horizontal and vertical polarization, except that for vertical polarization the minimum height of the center of the antenna was increased so that the lowest point of the bottom of the antenna cleared the ground surface by at least 25 cm.

The EUT arrangement is configured as equivalent to that occurring in normal use. Tabletop equipment is placed on a 0.8 meter high non-conductive table & for Floor-standing equipment, it is placed on, but insulated from a ground reference plane by the use of its own rollers or stand-off supports. If measurements above 1 GHz were required, the test setup was modified to meet the regulatory requirements for higher frequency measurements. If required, RF absorber was placed on the floor between the measurement antenna and EUT.

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.

The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Amplifier - Pre-Amplifier	Miteq	AM-1551	AOY	5/11/2015	5/11/2016
Antenna - Biconilog	EMCO	3141	AXG	7/7/2015	7/7/2018
Cable	None	10m Test Distance Cable	EVL	5/11/2015	5/11/2016
Analyzer - Spectrum Analyzer	Agilent	E4443A	AFB	3/17/2015	3/17/2016

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	3.8 dB	-3.8 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 1000 MHz

POWER INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

SNSY0053-1

MODES INVESTIGATED

On, 1000 Watt setting

RADIATED EMISSIONS

EUT:	Sun System 1. Part number: 902238	Work Order:	SNSY0053
Serial Number:	None	Date:	10/07/2015
Customer:	Sunlight Supply, Inc.	Temperature:	23.8°C
Attendees:	None	Relative Humidity:	46.3%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Jeff Alcocke	Job Site:	EV11
Power:	110VAC/60Hz	Configuration:	SNSY0053-1

TEST SPECIFICATIONS

Specification: RF lighting - Consumer equipment	Method:
FCC 18.305:2015	MP-5:1986

TEST PARAMETERS

Run #:	1	Test Distance (m):	10	Ant. Height(s) (m):	1 to 4(m)
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COMMENTS

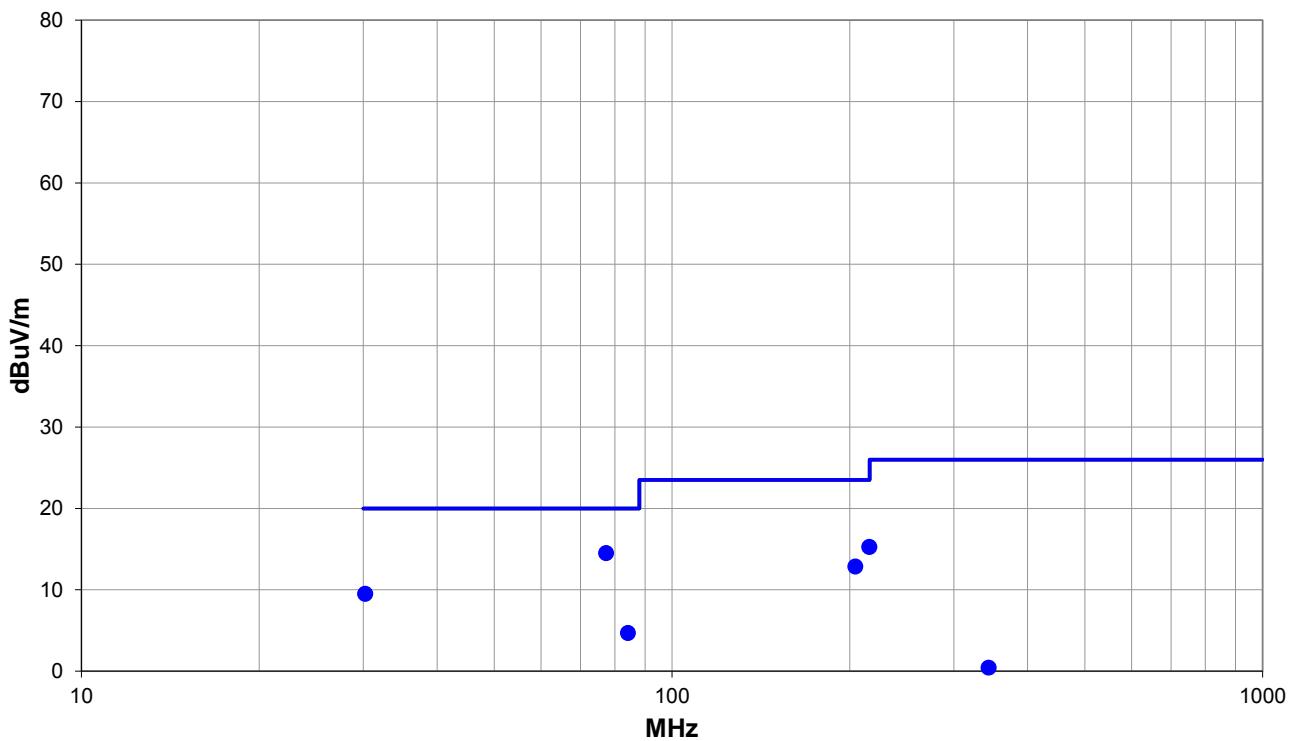
Testing began after 15min warm-up

EUT OPERATING MODES

On, 1000 Watt setting

DEVIATIONS FROM TEST STANDARD

None



Run #: 1

■ PK ♦ AV ● QP

RADIATED EMISSIONS

RESULTS - Run #1

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Ant. Height (m)	Azimuth (deg.)	Test Dist. (m)	Ext. Atten. (dB)	Polar. Trans. Type	Detec.	Dist. Adjust. (dB)	Adj. (dBuV/m)	Spec. Limit (dBuV/m)	Margin. (dB)
77.317	55.6	-31.6	4.0	139.0	10.0	0.0	Horz	QP	-9.5	14.5	20.0	-5.5
215.803	50.5	-25.7	3.4	113.0	10.0	0.0	Horz	QP	-9.5	15.3	23.5	-8.2
30.218	39.7	-20.7	1.0	14.0	10.0	0.0	Vert	QP	-9.5	9.5	20.0	-10.5
204.274	48.7	-26.3	3.0	169.0	10.0	0.0	Horz	QP	-9.5	12.9	23.5	-10.6
84.177	45.4	-31.2	3.8	83.0	10.0	0.0	Horz	QP	-9.5	4.7	20.0	-15.3
343.562	31.3	-21.3	2.5	26.0	10.0	0.0	Horz	QP	-9.5	0.4	26.0	-25.6

CONCLUSION

Pass



Tested By

CONDUCTED EMISSIONS

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50Ω.

The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESCI	ARH	3/11/2015	3/11/2016
Cable - Conducted Cable Assembly	Northwest EMC	EVG, HHD, TQQ	EVGA	5/12/2015	5/12/2016
LISN	Solar Electronics	9252-50-R-24-BNC	LIN	1/27/2015	1/27/2016

MEASUREMENT UNCERTAINTY

Description			
Expanded k=2	2.4 dB		-2.4 dB

CONFIGURATIONS INVESTIGATED

SNSY0053-1

MODES INVESTIGATED

On, 1000 Watt setting

CONDUCTED EMISSIONS

EUT:	Sun System 1. Part number: 902238	Work Order:	SNSY0053
Serial Number:	None	Date:	10/08/2015
Customer:	Sunlight Supply, Inc.	Temperature:	22.2°C
Attendees:	None	Relative Humidity:	47.4%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Jeff Alcocke	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	SNSY0053-1

TEST SPECIFICATIONS

Specification: RF Lighting, Consumer Equipment	Method:
FCC 18.307:2015	MP-5:1986

TEST PARAMETERS

Run #:	2	Line:	High Line	Add. Ext. Attenuation (dB):	0
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COMMENTS

Testing began after 15min warm-up

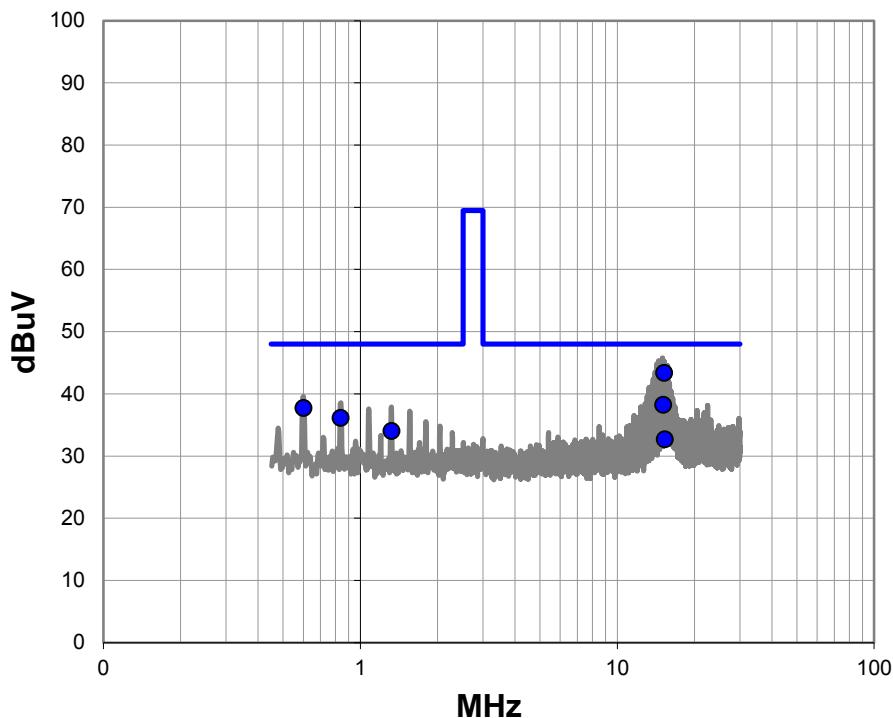
EUT OPERATING MODES

On, 1000 Watt setting

DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



CONDUCTED EMISSIONS

RESULTS - Run #2

Peak Data – vs – Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
15.228	22.3	21.0	43.3	48.0	-4.7
15.110	17.2	21.0	38.2	48.0	-9.8
0.601	17.7	20.0	37.7	48.0	-10.3
0.840	16.1	20.0	36.1	48.0	-11.9
1.323	13.9	20.1	34.0	48.0	-14.0
15.307	11.6	21.1	32.7	48.0	-15.3

CONCLUSION

Pass



Tested By

CONDUCTED EMISSIONS

EUT:	Sun System 1. Part number: 902238	Work Order:	SNSY0053
Serial Number:	None	Date:	10/08/2015
Customer:	Sunlight Supply, Inc.	Temperature:	22.2°C
Attendees:	None	Relative Humidity:	47.4%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Jeff Alcocke	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	SNSY0053-1

TEST SPECIFICATIONS

Specification: RF Lighting, Consumer Equipment	Method:
FCC 18.307:2015	MP-5:1986

TEST PARAMETERS

Run #:	3	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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COMMENTS

Testing began after 15min warm-up

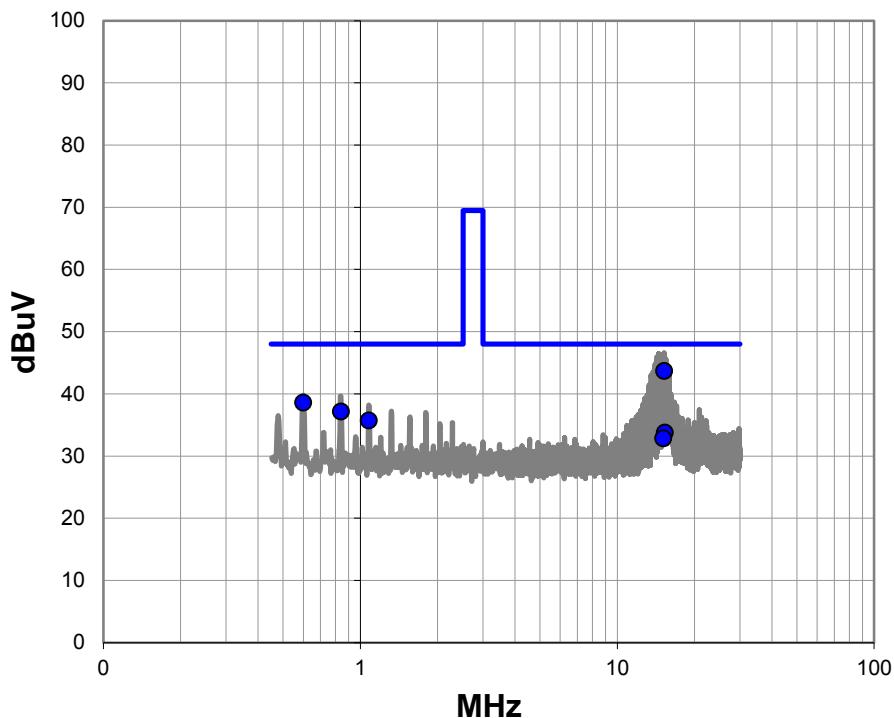
EUT OPERATING MODES

On, 1000 Watt setting

DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



CONDUCTED EMISSIONS

RESULTS - Run #3

Peak Data – vs – Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
15.231	22.6	21.0	43.6	48.0	-4.4
0.600	18.6	20.0	38.6	48.0	-9.4
0.841	17.1	20.0	37.1	48.0	-10.9
1.080	15.6	20.1	35.7	48.0	-12.3
15.332	12.7	21.1	33.8	48.0	-14.2
15.120	11.8	21.0	32.8	48.0	-15.2

CONCLUSION

Pass



Tested By