



Sunlight Supply, Inc.

902232 Digital Ballast

FCC 18.305:2014

FCC 18.307:2014

Report #: SNSY0011



Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California – Minnesota – Oregon – New York – Washington

CERTIFICATE OF TEST

Last Date of Test: August 06, 2014
Sunlight Supply, Inc.
Model: 902232 Digital Ballast

Emissions

Test Description	Specification	Test Method	Pass/Fail
Radiated Emissions	FCC 18.305:2014 Consumer equipment	MP-5:1986	Pass
Conducted Emissions	FCC 18.307:2014 Consumer equipment	MP-5:1986	Pass

Deviations From Test Standards

None

Approved By:



Kyle Holgate, 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 HISTORY

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

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 Guide 65 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

KCC / 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

OFTA – Recognized by OFTA 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/>

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 16-4-1 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:

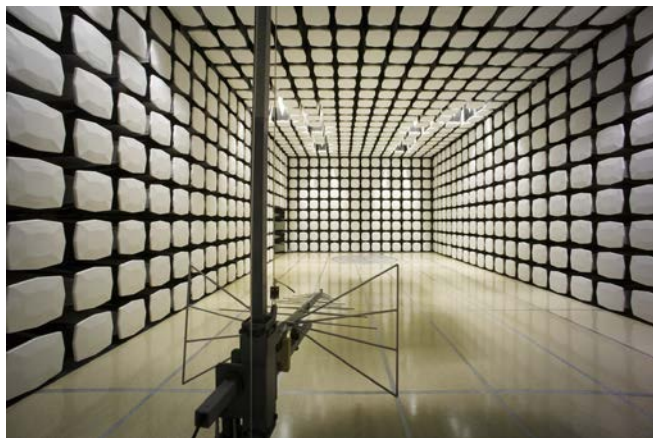
Field Strength		Measured Level		Antenna Factor		Cable Factor		Amplifier Gain		Distance Adjustment Factor		External Attenuation
33.5	=	42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0

Conducted Emissions:

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



Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Minnesota Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Washington Labs NC01-05, SU02, SU07 19201 120 th Ave. NE Bothell, WA 98011 (425) 984-6600
VCCI				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834F-1
NVLAP				
NVLAP Lab Code: 200630-0	NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200629-0



Client and Equipment Under Test (EUT) Information

Company Name:	Sunlight Supply, Inc.
Address:	5408 NE 88th Street Bldg A101
City, State, Zip:	Vancouver, WA 98665
Test Requested By:	Ken Garver
Model:	902232 Digital Ballast
First Date of Test:	August 06, 2014
Last Date of Test:	August 06, 2014
Receipt Date of Samples:	August 06, 2014
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
Digital Ballast
Testing Objective:
To demonstrate compliance to FCC Part 18 consumer equipment requirements.

Configuration SNSY0011- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Digital Ballast	Sunlight Supply Inc.	902232	None

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Reflector	Sunlight Supply Inc.	Sun System Yield Master II 904665	None
1000w HPS Lamp	Sunlight Supply Inc.	Ultra Sun 901531	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Power	No	2m	No	AC Mains	Digital Ballast
AC Power	No	4.5m	No	Digital Ballast	Reflector
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	8/6/2014	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	8/6/2014	Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Antenna, Biconilog	EMCO	3141	AXE	03/07/2012	36 mo
Pre-Amplifier	Miteq	AM-1551	AOY	09/03/2013	12 mo
EV11 Cables	N/A	10m Test Distance Cables	EVL	09/03/2013	12 mo
Spectrum Analyzer	Agilent	E4443A	AFB	02/12/2014	12 mo

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	4.3 dB	-4.3 dB

FREQUENCY RANGE INVESTIGATED

30 MHz TO 1000 MHz

POWER INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

SNSY0011-1

MODES INVESTIGATED

On, 1000 watt setting as requested by client.

EUT:	902232 Digital Ballast	Work Order:	SNSY0011
Serial Number:	None	Date:	08/06/2014
Customer:	Sunlight Supply, Inc.	Temperature:	25°C
Attendees:	None	Relative Humidity:	45%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Carl Engholm	Job Site:	EV11
Power:	110VAC/60Hz	Configuration:	SNSY0011-1

TEST SPECIFICATIONS

Specification: Consumer equipment	Method:
FCC 18.305:2014	MP-5:1986

TEST PARAMETERS

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

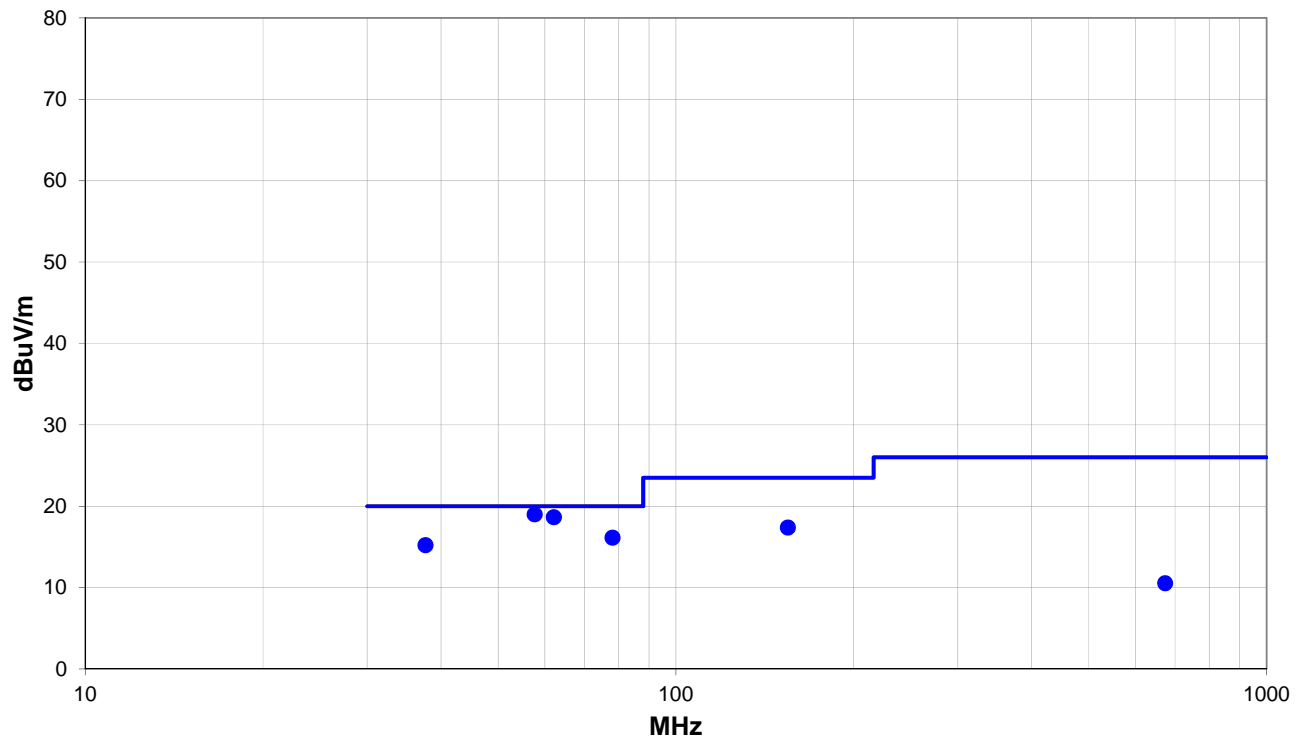
Testing started after 15 minute warm-up period.

EUT OPERATING MODES

On, 1000 watt setting as requested by client.

DEVIATIONS FROM TEST STANDARD

None



Run #: 1

■ PK ◆ AV ● QP

RESULTS - Run #1

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Ant. Height (m)	Azimuth (deg.)	Test Dist. (m)	Ext. Atten. (dB)	Polar. Trans. Type	Detect.	Dist. Adjust. (dB)	Adj. (dBuV/m)	Spec. Limit (dBuV/m)	Margin. (dB)
57.655	56.0	-27.5	3.8	137.0	10.0	0.0	Horz	QP	-9.5	19.0	20.0	-1.0
62.137	56.0	-27.9	3.3	54.0	10.0	0.0	Vert	QP	-9.5	18.6	20.0	-1.4
78.071	53.9	-28.3	3.8	326.0	10.0	0.0	Horz	QP	-9.5	16.1	20.0	-3.9
37.658	47.1	-22.4	1.0	123.0	10.0	0.0	Vert	QP	-9.5	15.2	20.0	-4.8
154.705	51.0	-24.1	3.8	51.0	10.0	0.0	Horz	QP	-9.5	17.4	23.5	-6.1
673.327	30.8	-10.8	2.4	328.0	10.0	0.0	Vert	QP	-9.5	10.5	20.0	-9.5

CONCLUSION

Pass



Tested By

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 50 Ω .

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Receiver	Rohde & Schwarz	ESCI	ARH	02/05/2014	12 mo
High Pass Filter	TTE	H97-100K-50-720B	HHD	01/22/2014	12 mo
EV07 Cables	N/A	Conducted Cables	EVG	03/07/2014	12 mo
Attenuator	Fairview Microwave	SA6B10W-20	RKA	10/24/2013	12 mo
LISN	Solar	9252-50-R-24-BNC	LIR	10/09/2013	12 mo

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.94 dB	-2.94 dB

CONFIGURATIONS INVESTIGATED

SNSY0011-1

MODES INVESTIGATED

On, 1000 watt setting as requested by client.

EUT:	902232 Digital Ballast	Work Order:	SNSY0011
Serial Number:	None	Date:	08/06/2014
Customer:	Sunlight Supply Inc.	Temperature:	25°C
Attendees:	None	Relative Humidity:	45%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Carl Engholm	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	SNSY0011-1

TEST SPECIFICATIONS

Specification: Consumer equipment	Method:
FCC 18.307:2014	MP-5:1986

TEST PARAMETERS

Run #:	4	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

Testing started after 15 minute warm-up period.

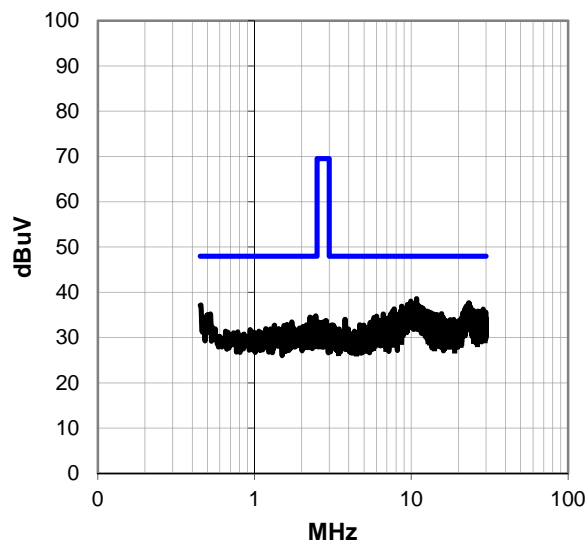
EUT OPERATING MODES

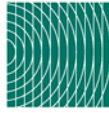
On, 1000 watt setting as requested by client.

DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit





CONDUCTED EMISSIONS

RESULTS - Run #4

Peak Data - vs - Quasi Peak Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
10.810	19.1	19.5	38.6	48.0	-9.4
9.949	18.5	19.5	38.0	48.0	-10.0
10.732	18.2	19.5	37.7	48.0	-10.3
23.323	18.0	19.6	37.6	48.0	-10.4
23.552	17.8	19.6	37.4	48.0	-10.6
23.230	17.8	19.6	37.4	48.0	-10.6
23.138	17.7	19.6	37.3	48.0	-10.7
9.484	17.8	19.5	37.3	48.0	-10.7
10.027	17.8	19.5	37.3	48.0	-10.7
10.374	17.8	19.5	37.3	48.0	-10.7
10.429	17.8	19.5	37.3	48.0	-10.7
10.854	17.8	19.5	37.3	48.0	-10.7
9.798	17.7	19.5	37.2	48.0	-10.8
10.056	17.7	19.5	37.2	48.0	-10.8
10.263	17.7	19.5	37.2	48.0	-10.8
0.454	17.4	19.8	37.2	48.0	-10.8
11.028	17.7	19.5	37.2	48.0	-10.8
10.001	17.6	19.5	37.1	48.0	-10.9
10.330	17.6	19.5	37.1	48.0	-10.9
10.603	17.6	19.5	37.1	48.0	-10.9
10.691	17.6	19.5	37.1	48.0	-10.9
11.002	17.6	19.5	37.1	48.0	-10.9
23.581	17.4	19.7	37.1	48.0	-10.9
23.212	17.4	19.6	37.0	48.0	-11.0
23.086	17.4	19.6	37.0	48.0	-11.0
22.887	17.4	19.6	37.0	48.0	-11.0

CONCLUSION

Pass

Tested By

EUT:	902232 Digital Ballast	Work Order:	SNSY0011
Serial Number:	None	Date:	08/06/2014
Customer:	Sunlight Supply Inc.	Temperature:	25°C
Attendees:	None	Relative Humidity:	45%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Carl Engholm	Job Site:	EV07
Power:	110VAC/60Hz	Configuration:	SNSY0011-1

TEST SPECIFICATIONS

Specification: Consumer equipment	Method:
FCC 18.307:2014	MP-5:1986

TEST PARAMETERS

Run #:	5	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

Testing started after 15 minute warm-up period.

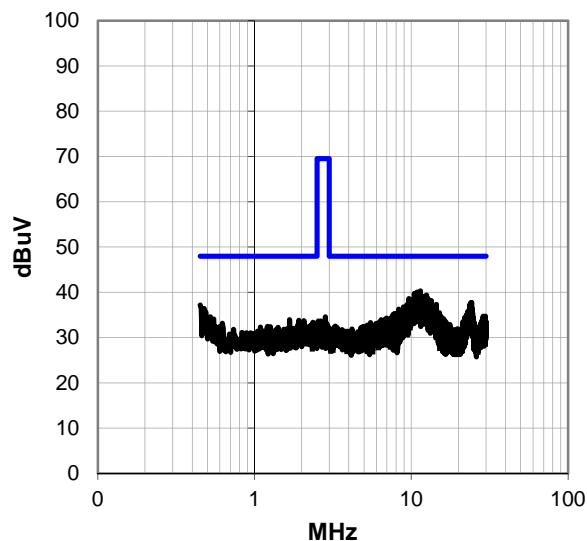
EUT OPERATING MODES

On, 1000 watt setting as requested by client.

DEVIATIONS FROM TEST STANDARD

None

Peak Data - vs - Quasi Peak Limit



RESULTS - Run #5

Peak Data - vs -Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
11.456	20.8	19.5	40.3	48.0	-7.7
10.880	20.5	19.5	40.0	48.0	-8.0
11.087	20.5	19.5	40.0	48.0	-8.0
11.271	20.4	19.5	39.9	48.0	-8.1
10.496	20.2	19.5	39.7	48.0	-8.3
10.529	19.9	19.5	39.4	48.0	-8.6
11.194	19.9	19.5	39.4	48.0	-8.6
12.501	19.9	19.5	39.4	48.0	-8.6
12.265	19.6	19.5	39.1	48.0	-8.9
10.932	19.5	19.5	39.0	48.0	-9.0
10.957	19.5	19.5	39.0	48.0	-9.0
11.375	19.4	19.5	38.9	48.0	-9.1
11.958	19.4	19.5	38.9	48.0	-9.1
10.784	19.3	19.5	38.8	48.0	-9.2
10.551	19.2	19.5	38.7	48.0	-9.3
10.747	19.2	19.5	38.7	48.0	-9.3
12.793	19.2	19.5	38.7	48.0	-9.3
12.409	19.2	19.5	38.7	48.0	-9.3
9.661	19.1	19.5	38.6	48.0	-9.4
11.408	19.1	19.5	38.6	48.0	-9.4
11.545	19.1	19.5	38.6	48.0	-9.4
12.036	19.1	19.5	38.6	48.0	-9.4
11.334	19.0	19.5	38.5	48.0	-9.5
11.441	19.0	19.5	38.5	48.0	-9.5
12.394	19.0	19.5	38.5	48.0	-9.5
11.740	19.0	19.5	38.5	48.0	-9.5

CONCLUSION

Pass



Tested By