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Report No: L111503503

Date: 11/18/2015



NVLAP LAB CODE 200927-0

Report No: L111503503

Report Prepared For: Revolution Lighting Technologies
 4139 Guardian Street, Simi Valley, CA 93063

Model Number: 202220-012

Test: Electrical and Photometric tests

Standards Used: Appropriate part or all test guidelines were used for test performed:
IESNA LM79: 2008 Approved Methods for Electrical and Photometric Measurements of Solid-State Lighting Products
ANSI NEMA ANSLG C78.377: 2008 Specification of the Chromaticity of Solid State Lighting Products
ANSI C82.77:2002: Harmonic Emission Limits-Related Quality Requirements for Lighting Equipment

Description of Sample: Client submitted the sample. Catalog number is 202220-012. Received in working and undamaged condition. No modifications were necessary.

Testing Condition: OSRAM SYLVANIA QHE 3X32T8/UNV ISN-SC driver was connected to three LED tubes from driver output. Photometric measurements were measured from a single LED tube while other two lamps were powered and covered with black velvet to prevent light pollution.
 Input power of single measured lamp is calculated from total power divided by three.

Sample Arrival Date: 11/13/15

Date of Tests: 11/17/15 - 11/18/15

Seasoning of Sample: No seasoning was performed in accordance with IESNA LM-79.

Equipment List

Equipment Used	Model No	Stock No	Calibration Due Date
Chroma Programmable AC Source	61604	PS-AC02	--
Yokogawa Digital Power Meter	WT210	MT-EL06-S1	11/10/15
Xitron Power Analyzer	2801	MT-EL02-1	12/9/15
BK Precision DC Power Supply	1747	PSDC-04	01/08/16
Fluke Digital Thermometer	52k/J	MT-TP02-GC	01/05/16
LLI Type C Goniophotometer System	RMG-C-MKII	CD-LL04-GC	--
LLI 2M Sphere	2MR97	CD-SN03-S2	--
LLI Spectroradiometer	SPR-3000	MT-SC01-S2	Before Use

*All Results in accordance to IESNA LM-79-2008: Approved Method for the Electrical and Photometric Testing of Solid-State Lighting.

Test Summary

Manufacturer:	Revolution Lighting Technologies	
Model Number:	202220-012	
Driver Model Number:	OSRAM SYLVANIA QHE 3X32T8/UNV ISN-SC	
Total Lumens:	1264.56	
Input Voltage (VAC/60Hz):	120.00	
Input Current (Amp):	0.09	
Input Power (W):	11.10	
Input Power Factor:	1.00	
Current ATHD @ 120V(%):	6%	
Current ATHD @ 277V(%):	8% (0.04A, 11.19W, 0.97PF)	
Efficacy:	114	
Color Rendering Index (CRI):	84	
Correlated Color Temperature (K):	3550	
Chromaticity Coordinate x:	0.4019	
Chromaticity Coordinate y:	0.3876	
Ambient Temperature (°C):	25.0	
Stabilization Time (Hours):	0:30	
Total Operating Time (Hours):	1:05	
Off State Power(W):	0.00	

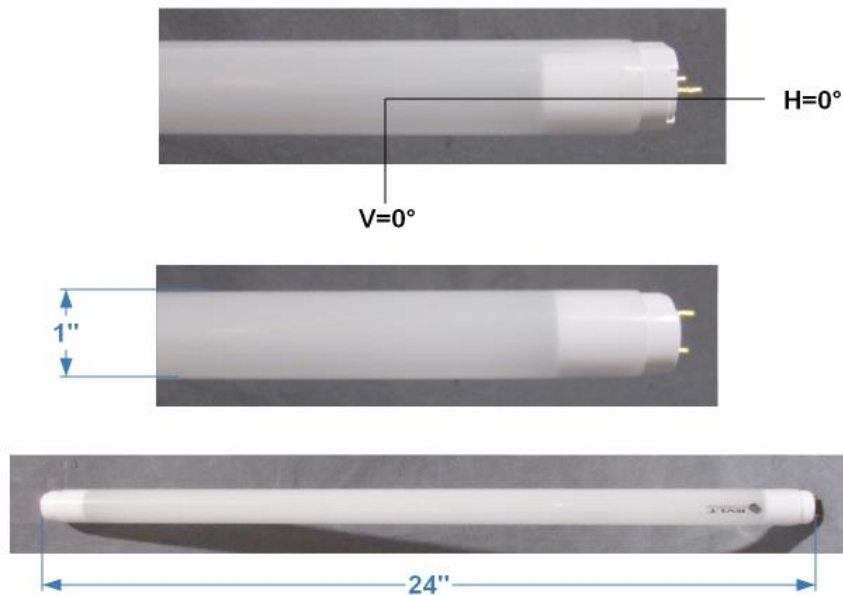
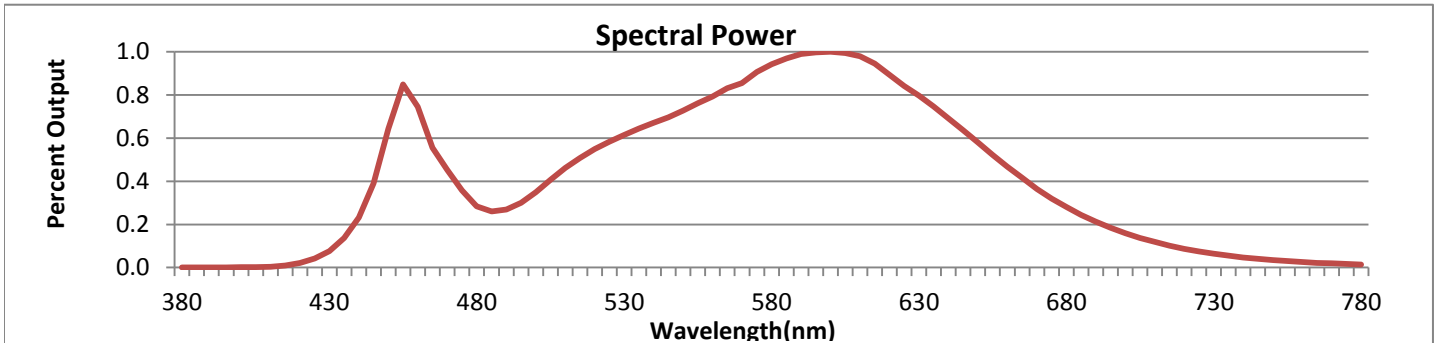


FIG. 1 LUMINAIRE

*All Results in accordance to IESNA LM-79-2008: Approved Method for the Electrical and Photometric Testing of Solid-State Lighting.



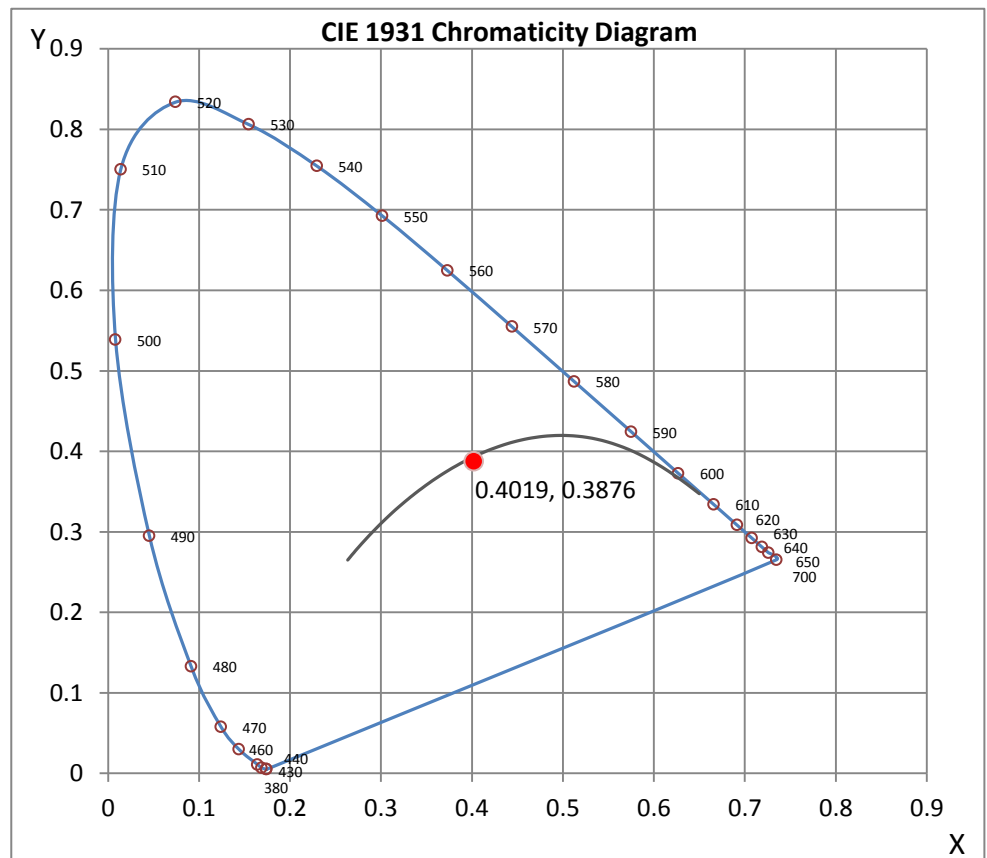
Wavelength	W/m ² nm	440	0.2322	510	0.4624	580	0.9423	650	0.5802	720	0.0860
380	0.0009	450	0.6434	520	0.5495	590	0.9899	660	0.4680	730	0.0637
390	0.0011	460	0.7454	530	0.6154	600	1.0000	670	0.3645	740	0.0470
400	0.0014	470	0.4525	540	0.6706	610	0.9793	680	0.2803	750	0.0347
410	0.0041	480	0.2836	550	0.7281	620	0.8945	690	0.2124	760	0.0255
420	0.0208	490	0.2692	560	0.7932	630	0.7977	700	0.1592	770	0.0192
430	0.0765	500	0.3491	570	0.8550	640	0.6923	710	0.1190	780	0.0142

CRI & CCT

x	0.4019
y	0.3876
u'	0.2348
v'	0.5094
CRI	83.90
CCT	3550
Duv	-0.00062

R Values

R1	82.88
R2	91.74
R3	96.16
R4	80.77
R5	81.91
R6	87.75
R7	85.21
R8	64.98
R9	16.70
R10	79.11
R11	78.87
R12	62.93
R13	85.31
R14	98.12



*All Results in accordance to IESNA LM-79-2008: Approved Method for the Electrical and Photometric Testing of Solid-State Lighting.

Test Methods

Photometric Measurements - Goniophotometer

A Custom Light Laboratory Type C Rotating Mirror Goniophotometer was used to measure candelas(intensity) at each angle of distribution as defined by IESNA for the appropriate fixture type.

Ambient temperature is set to 25°C and is measured from the center of the fixture, within 1ft from the outside of the fixture. Temperature is maintained at 25°C throughout the testing process and the sample is stabilized for at least 30mins and longer as necessary for the sample to achieve stabilization.

Electrical measurements are measured using the listed equipment.

Spectral Measurements - Integrating Sphere

A Sensing Spectroradiometer SPR-3000, in conjunction with Light Laboratory 2 meter integrating sphere was used to measure chromaticity coordinates, correlated color temperature(CCT) and the color rendering index(CRI) for each sample.

Ambient temperature is set to 25°C and is measured from the center of the fixture, within 1ft from the outside of the fixture. Temperature is maintained at 25°C throughout the testing process and the sample is stabilized for at least 30mins and longer as necessary for the sample to achieve stabilization.

Electrical measurements are measured using the listed equipment.

Disclaimers:

This report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST or any agency of Federal Government.

Report Prepared by : Keyur Patel

Test Report Released by:



Jeff Ahn
Engineering Manager

Test Report Reviewed by:



Steve Kang
Quality Assurance

**Attached are photometric data reports. Total number of pages: 10*



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Photometric Test Report

IES INDOOR REPORT
PHOTOMETRIC FILENAME : L111503503.IES

DESCRIPTION INFORMATION (From Photometric File)

IESNA:LM-63-2002
 [TEST] L111503503
 [TESTLAB] LIGHT LABORATORY, INC.
 [ISSUEDATE] 11/18/2015
 [MANUFAC] REVOLUTION LIGHTING TECHNOLOGIES
 [LUMCAT] 202220-012
 [LUMINAIRE] 1"DIA. X 24"L. LED TUBE, DIFFUSED LENS
 [BALLASTCAT] OSRAM SYLVANIA QHE 3X32T8/UNV ISN-SC
 [LAMPPOSITION] 0,0
 [LAMPCAT] N/A
 [OTHER] INDICATING THE CANDELA VALUES ARE ABSOLUTE AND
 [MORE] SHOULD NOT BE FACTORED FOR DIFFERENT LAMP RATINGS.
 [_ TEST CONDITION] OSRAM SYLVANIA QHE 3X32T8/UNV ISN-SC DRIVER WAS CONNECTED
 [MORE] TO THREE LED TUBES FROM DRIVER OUTPUT.
 [MORE] PHOTOMETRIC MEASUREMENTS WERE MEASURED FROM A
 [MORE] SINGLE LED TUBE WHILE OTHER TWO LAMPS WERE POWERED
 [MORE] AND COVERED WITH BLACK VELVET TO PREVENT LIGHT POLLUTION.
 [MORE] INPUT POWER OF SINGLE MEASURED LAMP IS CALCULATED FROM
 [MORE] TOTAL POWER DIVIDED BY THREE.
 [_ INPUT] 120VAC, 11.10W
 [_ TEST PROCEDURE] IESNA:LM-79-08

CHARACTERISTICS

Lumens Per Lamp	N.A. (absolute)
Total Lamp Lumens	N.A. (absolute)
Luminaire Lumens	1265
Total Luminaire Efficiency	N.A.
Luminaire Efficacy Rating (LER)	114
Total Luminaire Watts	11.1
Ballast Factor	1.00
CIE Type	Semi-Direct
Spacing Criterion (0-180)	1.20
Spacing Criterion (90-270)	1.40
Spacing Criterion (Diagonal)	1.44
Basic Luminous Shape	Rectangular w/Sides
Luminous Length (0-180)	1.69 ft
Luminous Width (90-270)	0.08 ft
Luminous Height	0.08 ft

IES INDOOR REPORT
PHOTOMETRIC FILENAME : L111503503.IES

LUMINANCE DATA (cd/sq.m)

Angle In Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	17247	12660	12714
55	15360	11261	11691
65	13061	10141	10883
75	9669	9319	10296
85	3654	8948	9947

**IES INDOOR REPORT
PHOTOMETRIC FILENAME : L111503503.IES**

CANDELA TABULATION

	<u>0.0</u>	<u>22.5</u>	<u>45.0</u>	<u>67.5</u>	<u>90.0</u>
0	272.11	272.11	272.11	272.11	272.11
5	270.95	270.91	271.16	271.12	270.69
10	266.07	266.58	267.95	269.06	269.24
15	257.75	259.34	262.60	265.51	266.49
20	247.13	249.31	254.93	260.71	262.55
25	233.42	236.93	245.89	254.37	257.41
30	217.05	222.75	235.22	246.66	251.16
35	199.23	206.77	222.96	238.00	243.79
40	180.63	189.59	209.55	228.41	235.39
45	160.58	171.55	195.89	217.82	226.05
50	139.25	153.13	181.79	206.21	215.85
55	118.25	134.53	167.09	194.69	204.71
60	97.86	116.75	152.96	182.82	193.74
65	76.44	99.40	139.46	170.48	181.83
70	55.61	83.42	126.31	158.35	170.09
75	37.02	68.94	114.14	146.96	158.53
80	19.79	56.34	102.91	135.43	147.04
85	6.17	46.27	92.80	124.34	135.48
90	0.51	38.73	83.72	114.22	125.02
95	0.00	33.33	75.54	104.84	114.65
100	0.00	29.61	68.89	95.93	105.31
105	0.00	27.34	62.81	87.96	96.74
110	0.00	26.48	56.64	80.33	88.69
115	0.00	25.32	52.36	73.14	80.21
120	0.00	24.21	48.89	66.54	73.35
125	0.00	23.86	46.44	61.57	66.75
130	0.00	22.41	42.46	57.11	61.01
135	0.00	20.52	39.16	52.14	56.56
140	0.00	17.87	36.29	46.49	48.16
145	0.00	14.27	32.91	42.12	44.47
150	0.00	11.01	27.98	37.66	39.50
155	0.00	8.61	21.08	32.31	34.19
160	0.00	6.81	13.75	23.82	27.34
165	0.00	5.36	8.91	13.67	17.65
170	0.00	4.11	6.30	7.28	8.57
175	0.00	3.09	3.99	4.11	2.49
180	0.00	0.00	0.00	0.00	0.00

IES INDOOR REPORT
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ZONAL LUMEN SUMMARY

Zone	Lumens	%Lamp	%Fixt
0-20	99.86	N.A.	7.90
0-30	213.15	N.A.	16.90
0-40	352.38	N.A.	27.90
0-60	650.15	N.A.	51.40
0-80	897.06	N.A.	70.90
0-90	988.82	N.A.	78.20
10-90	963.06	N.A.	76.20
20-40	252.53	N.A.	20.00
20-50	402.88	N.A.	31.90
40-70	431.38	N.A.	34.10
60-80	246.91	N.A.	19.50
70-80	113.29	N.A.	9.00
80-90	91.77	N.A.	7.30
90-110	134.30	N.A.	10.60
90-120	181.86	N.A.	14.40
90-130	218.87	N.A.	17.30
90-150	263.42	N.A.	20.80
90-180	275.74	N.A.	21.80
110-180	141.43	N.A.	11.20
0-180	1264.56	N.A.	100.00

Total Luminaire Efficiency = N.A.%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	25.77
10-20	74.09
20-30	113.29
30-40	139.24
40-50	150.35
50-60	147.41
60-70	133.62
70-80	113.29
80-90	91.77
90-100	74.25
100-110	60.06
110-120	47.56
120-130	37.01
130-140	27.04
140-150	17.51
150-160	9.15
160-170	2.82
170-180	0.34

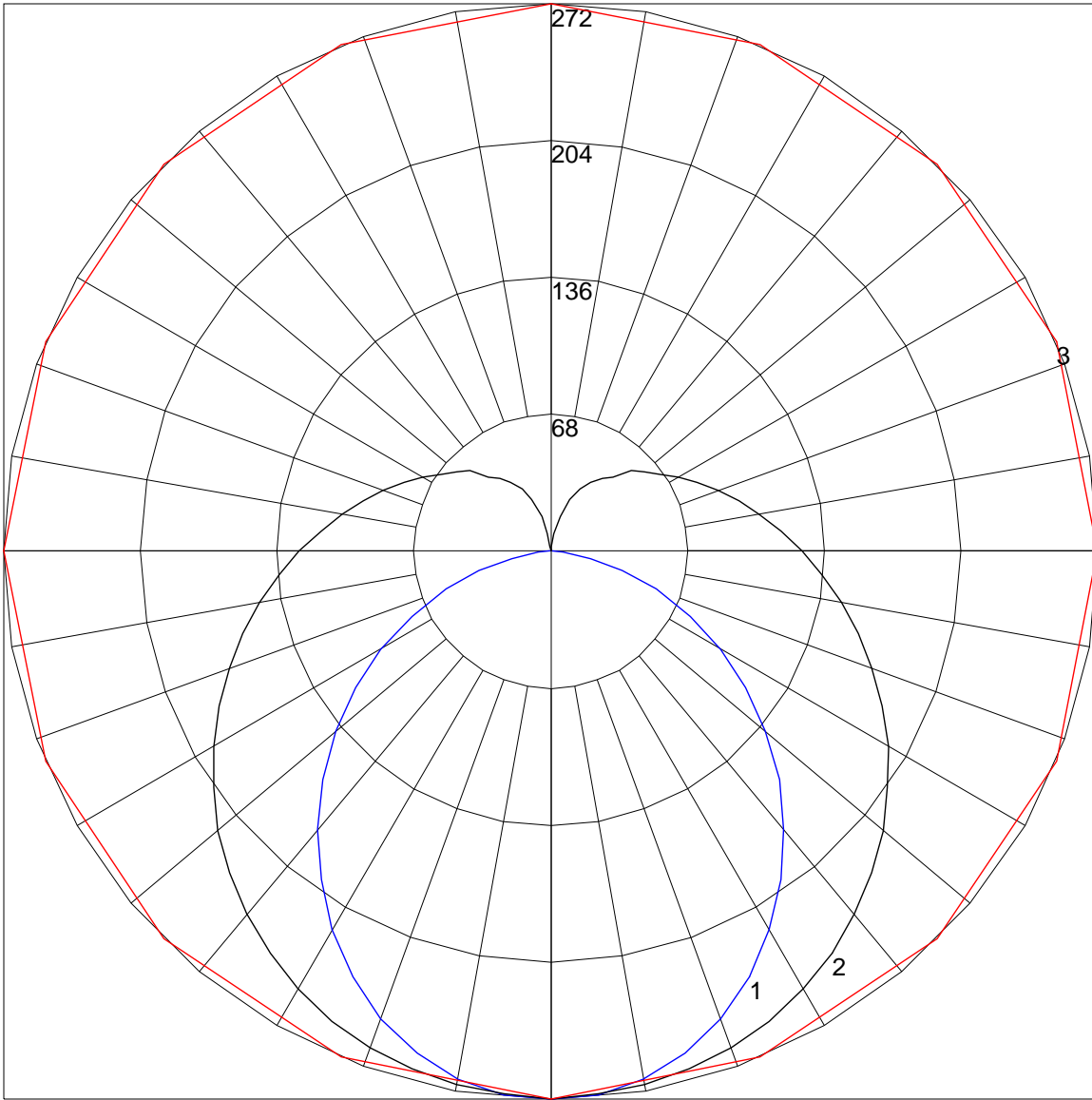
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COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30			10			0	
	RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	114	114	114	114	114	109	109	109	109	99	99	99	90	90	90	82	82	82	78
1	101	95	90	85	85	96	91	86	82	82	78	75	75	72	69	68	65	63	59
2	91	81	74	67	67	86	78	71	65	70	65	60	64	59	55	58	54	51	47
3	82	71	62	55	55	78	67	59	53	61	55	49	56	50	46	50	46	42	39
4	75	62	53	46	46	71	59	51	44	54	47	41	49	43	38	44	40	36	33
5	69	55	46	39	39	65	53	44	38	48	41	35	44	38	33	40	35	31	28
6	63	49	40	34	34	60	47	39	33	43	36	31	39	33	29	36	31	27	24
7	58	45	36	29	29	55	43	34	28	39	32	27	36	30	25	33	28	24	21
8	54	41	32	26	26	51	39	31	25	36	29	24	33	27	22	30	25	21	19
9	51	37	29	23	23	48	36	28	23	33	26	21	30	24	20	28	23	19	17
10	47	34	26	21	21	45	33	25	20	30	24	19	28	22	18	26	21	17	15

POLAR GRAPH



Maximum Candela = 272.11 Located At Horizontal Angle = 0, Vertical Angle = 0
1 - Vertical Plane Through Horizontal Angles (0 - 180) (Through Max. Cd.)
2 - Vertical Plane Through Horizontal Angles (90 - 270)
3 - Horizontal Cone Through Vertical Angle (0) (Through Max. Cd.)