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Report No: L111503504

Date: 11/18/2015



NVLAP LAB CODE 200927-0

Report No: L111503504

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

Model Number: 202220-013

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 202220-013 . 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:	202220-013	
Driver Model Number:	OSRAM SYLVANIA QHE 3X32T8/UNV ISN-SC	
Total Lumens:	1276.26	
Input Voltage (VAC/60Hz):	120.00	
Input Current (Amp):	0.09	
Input Power (W):	11.12	
Input Power Factor:	1.00	
Current ATHD @ 120V(%):	6%	
Current ATHD @ 277V(%):	8% (0.04A, 11.22W, 0.97PF)	
Efficacy:	115	
Color Rendering Index (CRI):	82	
Correlated Color Temperature (K):	4051	
Chromaticity Coordinate x:	0.3786	
Chromaticity Coordinate y:	0.3767	
Ambient Temperature (°C):	25.0	
Stabilization Time (Hours):	0:35	
Total Operating Time (Hours):	1:05	
Off State Power(W):	0.00	

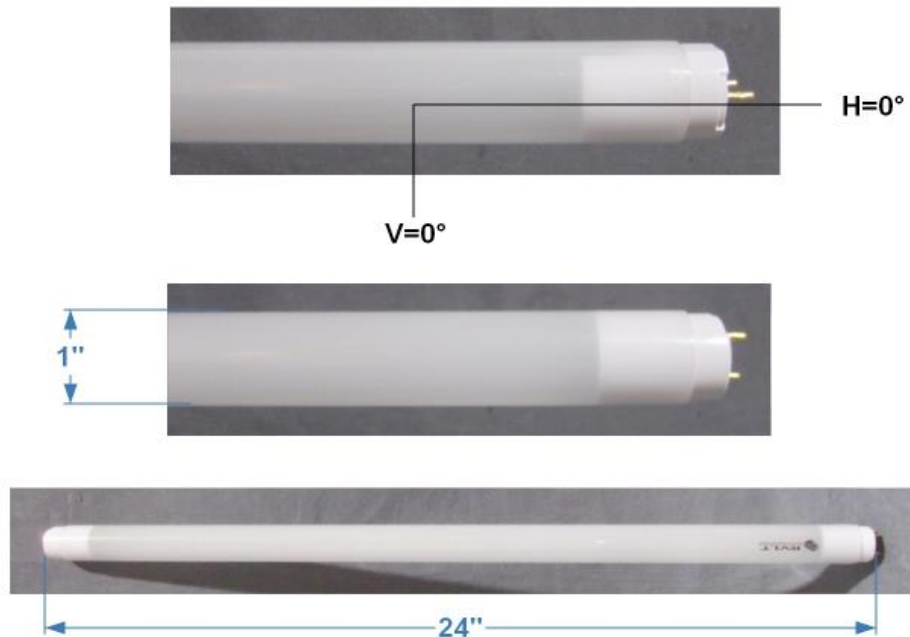
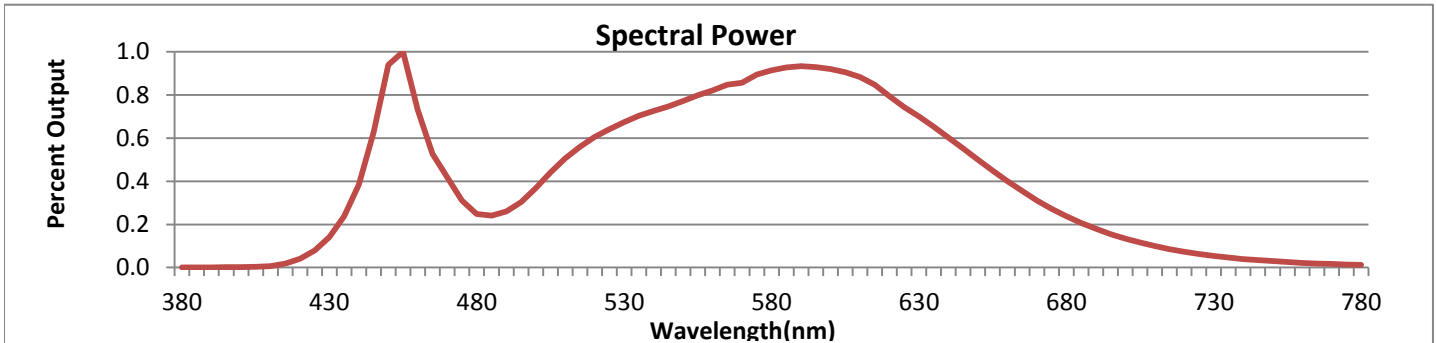


FIG. 1 LUMINAIRE

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



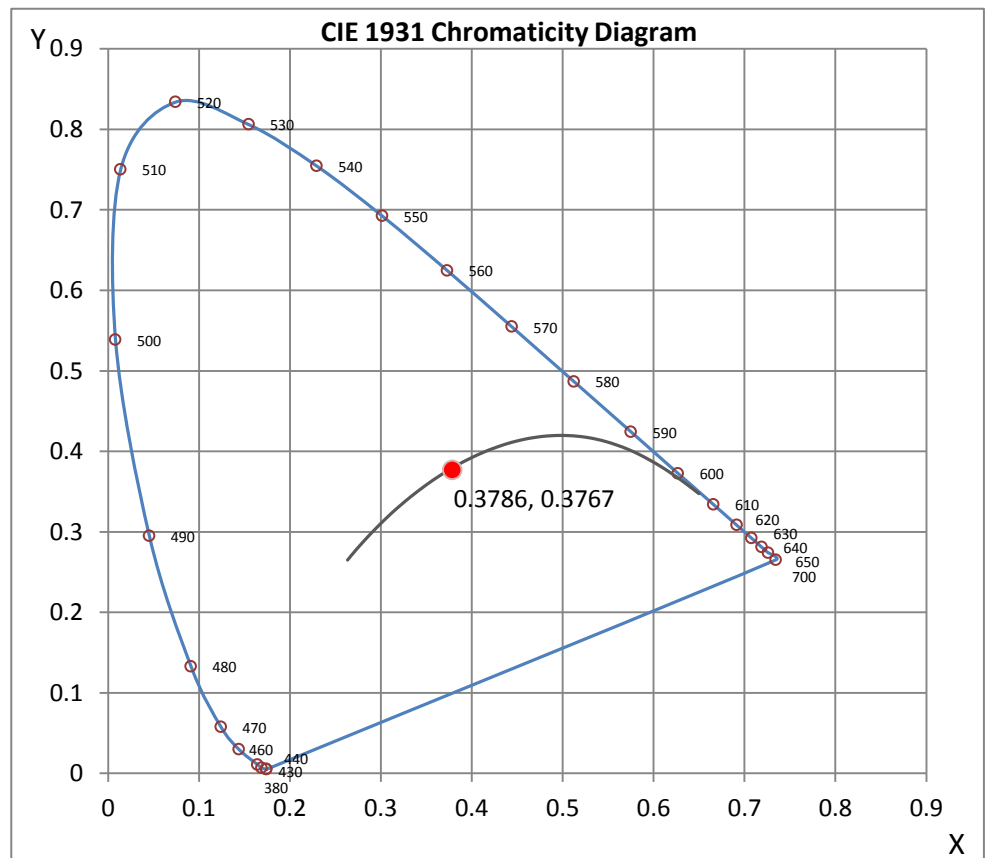
Wavelength	W/m ² nm	440	0.3852	510	0.5059	580	0.9153	650	0.5006	720	0.0726
380	0.0010	450	0.9391	520	0.6055	590	0.9332	660	0.4013	730	0.0536
390	0.0011	460	0.7300	530	0.6744	600	0.9198	670	0.3103	740	0.0397
400	0.0020	470	0.4185	540	0.7263	610	0.8833	680	0.2373	750	0.0295
410	0.0070	480	0.2486	550	0.7728	620	0.7948	690	0.1795	760	0.0217
420	0.0410	490	0.2602	560	0.8211	630	0.7005	700	0.1345	770	0.0164
430	0.1410	500	0.3692	570	0.8569	640	0.6024	710	0.1001	780	0.0122

CRI & CCT

x	0.3786
y	0.3767
u'	0.2239
v'	0.5013
CRI	82.30
CCT	4051
Duv	0.00052

R Values

R1	80.81
R2	88.14
R3	92.77
R4	80.86
R5	79.85
R6	82.42
R7	87.01
R8	66.23
R9	11.70
R10	70.59
R11	78.56
R12	56.21
R13	82.59
R14	95.62



*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 : L111503504.IES

DESCRIPTION INFORMATION (From Photometric File)

IESNA:LM-63-2002
 [TEST] L111503504
 [TESTLAB] LIGHT LABORATORY, INC.
 [ISSUEDATE] 11/18/2015
 [MANUFAC] REVOLUTION LIGHTING TECHNOLOGIES
 [LUMCAT] 202220-013
 [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, 11.12W
 [_ TEST PROCEDURE] IESNA:LM-79-08

CHARACTERISTICS

Lumens Per Lamp	N.A. (absolute)
Total Lamp Lumens	N.A. (absolute)
Luminaire Lumens	1276
Total Luminaire Efficiency	N.A.
Luminaire Efficacy Rating (LER)	115
Total Luminaire Watts	11.12
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 : L111503504.IES

LUMINANCE DATA (cd/sq.m)

Angle In Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	17265	12671	12738
55	15394	11310	11750
65	13103	10216	10996
75	9713	9435	10435
85	3707	9096	10154

IES INDOOR REPORT
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CANDELA TABULATION

	<u>0.0</u>	<u>22.5</u>	<u>45.0</u>	<u>67.5</u>	<u>90.0</u>
0	271.57	271.57	271.57	271.57	271.57
5	270.09	270.74	270.56	270.39	270.35
10	265.12	266.37	267.27	268.46	268.81
15	256.81	259.17	262.04	264.87	266.15
20	246.36	249.18	254.37	260.07	262.04
25	232.73	236.97	245.41	253.81	257.24
30	216.62	222.75	234.87	246.23	251.16
35	199.06	207.07	222.88	237.75	243.87
40	180.55	189.76	209.51	228.49	235.30
45	160.75	171.85	196.06	218.21	226.48
50	139.50	153.60	182.09	206.94	216.54
55	118.51	135.05	167.82	195.50	205.74
60	98.03	117.14	153.86	184.02	194.77
65	76.69	100.00	140.49	171.98	183.72
70	55.87	84.06	127.55	160.20	172.15
75	37.19	69.62	115.55	148.71	160.67
80	20.05	56.98	104.28	137.62	149.10
85	6.26	46.92	94.34	126.56	138.30
90	0.51	39.37	85.22	116.45	127.68
95	0.00	33.80	77.04	107.15	117.31
100	0.00	30.25	70.22	97.94	106.68
105	0.00	27.98	64.18	89.67	98.29
110	0.00	26.61	58.70	82.18	90.23
115	0.00	25.54	54.28	75.58	82.35
120	0.00	25.06	50.30	68.77	75.24
125	0.00	24.59	46.92	63.58	68.64
130	0.00	23.95	43.02	58.35	63.50
135	0.00	22.49	39.63	52.74	58.44
140	0.00	20.05	37.02	47.47	50.04
145	0.00	16.45	33.72	42.67	45.42
150	0.00	12.21	29.43	38.39	40.62
155	0.00	9.13	23.27	33.29	35.65
160	0.00	6.90	15.81	25.92	28.88
165	0.00	5.31	10.07	15.90	20.39
170	0.00	3.99	6.68	8.31	8.66
175	0.00	3.26	4.16	4.24	2.06
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	99.66	N.A.	7.80
0-30	212.78	N.A.	16.70
0-40	351.99	N.A.	27.60
0-60	650.55	N.A.	51.00
0-80	899.82	N.A.	70.50
0-90	993.14	N.A.	77.80
10-90	967.43	N.A.	75.80
20-40	252.33	N.A.	19.80
20-50	402.90	N.A.	31.60
40-70	433.21	N.A.	33.90
60-80	249.27	N.A.	19.50
70-80	114.63	N.A.	9.00
80-90	93.32	N.A.	7.30
90-110	137.00	N.A.	10.70
90-120	185.89	N.A.	14.60
90-130	223.93	N.A.	17.50
90-150	269.98	N.A.	21.20
90-180	283.12	N.A.	22.20
110-180	146.12	N.A.	11.40
0-180	1276.26	N.A.	100.00

Total Luminaire Efficiency = N.A.%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	25.72
10-20	73.94
20-30	113.12
30-40	139.20
40-50	150.57
50-60	148.00
60-70	134.64
70-80	114.63
80-90	93.32
90-100	75.72
100-110	61.28
110-120	48.89
120-130	38.04
130-140	27.88
140-150	18.17
150-160	9.66
160-170	3.11
170-180	0.36

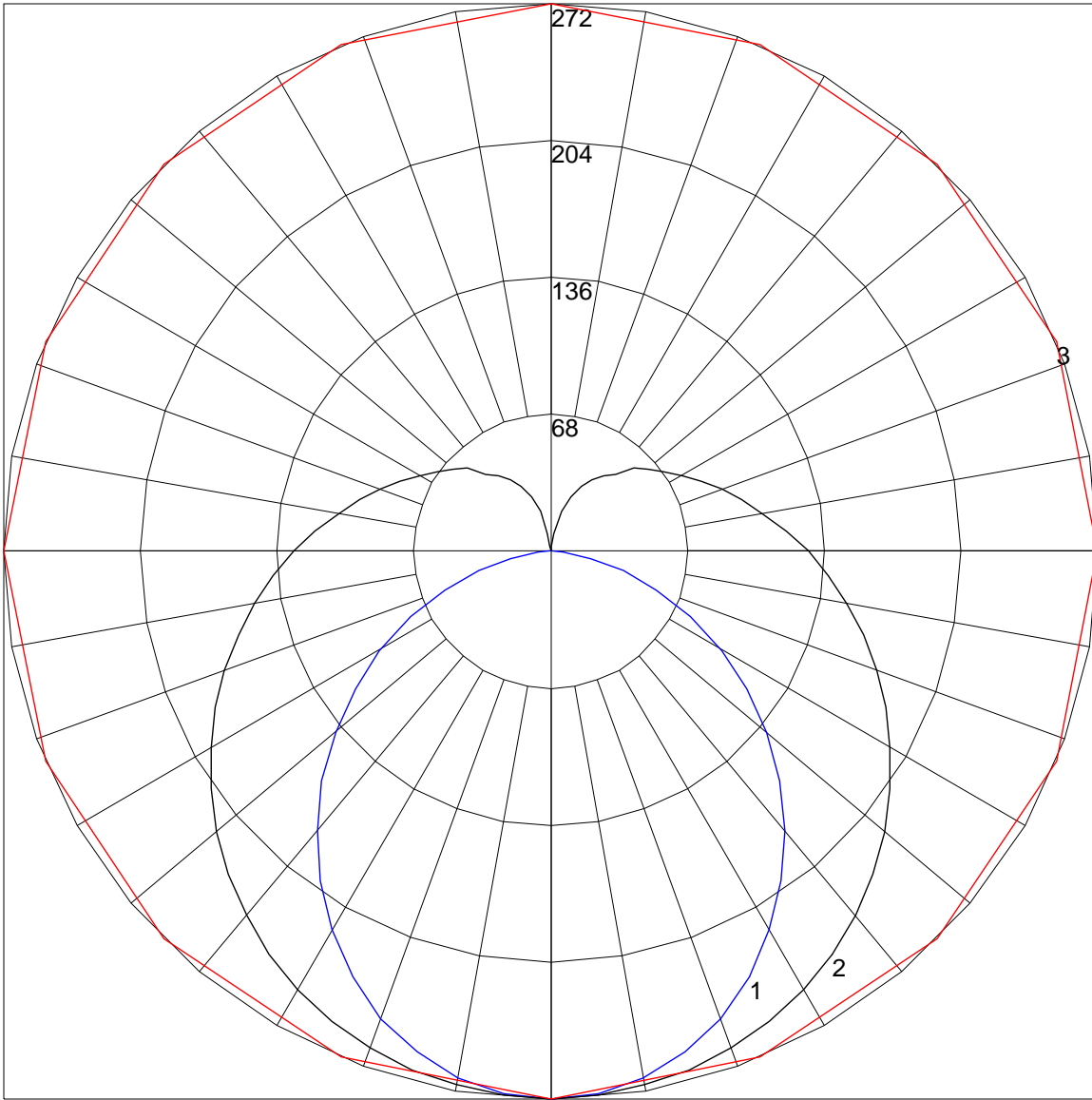
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COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

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	90	86	81	82	78	75	74	71	69	67	65	63	59
2	91	81	74	67	67	86	77	70	65	70	65	60	64	59	55	57	54	51	47
3	82	71	62	55	55	78	67	59	53	61	54	49	55	50	45	50	46	42	39
4	75	62	53	46	46	71	59	51	44	54	47	41	49	43	38	44	39	35	32
5	69	55	46	39	39	65	53	44	38	48	41	35	44	37	33	40	34	30	28
6	63	49	40	33	33	60	47	39	32	43	36	30	39	33	28	36	31	26	24
7	58	45	36	29	29	55	43	34	28	39	32	27	36	30	25	33	27	23	21
8	54	40	32	26	26	51	39	31	25	36	29	24	33	27	22	30	25	21	19
9	51	37	29	23	23	48	35	28	22	33	26	21	30	24	20	28	22	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 = 271.57 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.)