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Report No: L111503505

Date: 11/18/2015



NVLAP LAB CODE 200927-0

Report No: L111503505

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

Model Number: 202220-015

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 202220-015 . 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:	202220-015	
Driver Model Number:	OSRAM SYLVANIA QHE 3X32T8/UNV ISN-SC	
Total Lumens:	1323.40	
Input Voltage (VAC/60Hz):	120.00	
Input Current (Amp):	0.09	
Input Power (W):	11.09	
Input Power Factor:	1.00	
Current ATHD @ 120V(%):	6%	
Current ATHD @ 277V(%):	8% (0.04A, 11.19W, 0.97PF)	
Efficacy:	119	
Color Rendering Index (CRI):	83	
Correlated Color Temperature (K):	5110	
Chromaticity Coordinate x:	0.3426	
Chromaticity Coordinate y:	0.3562	
Ambient Temperature (°C):	25.0	
Stabilization Time (Hours):	0:35	
Total Operating Time (Hours):	1:10	
Off State Power(W):	0.00	

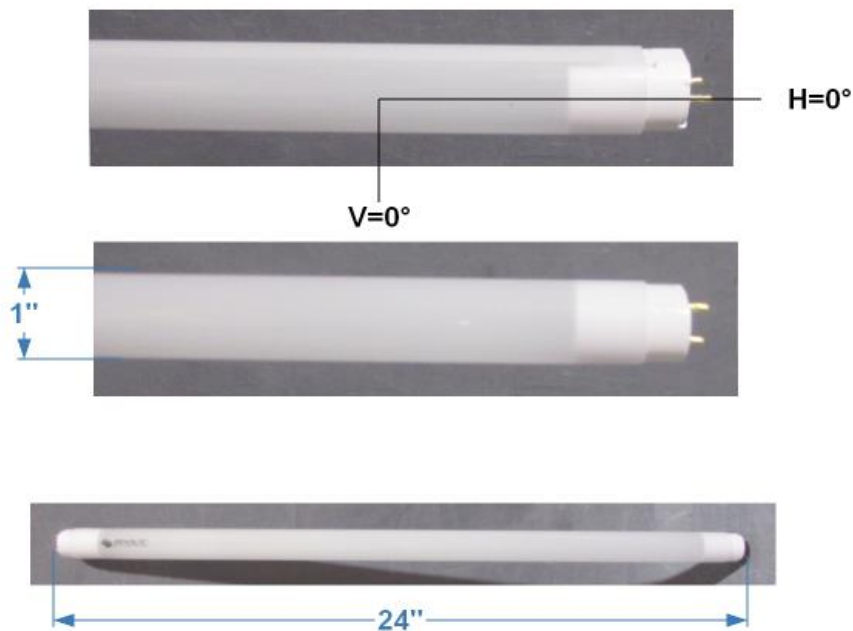
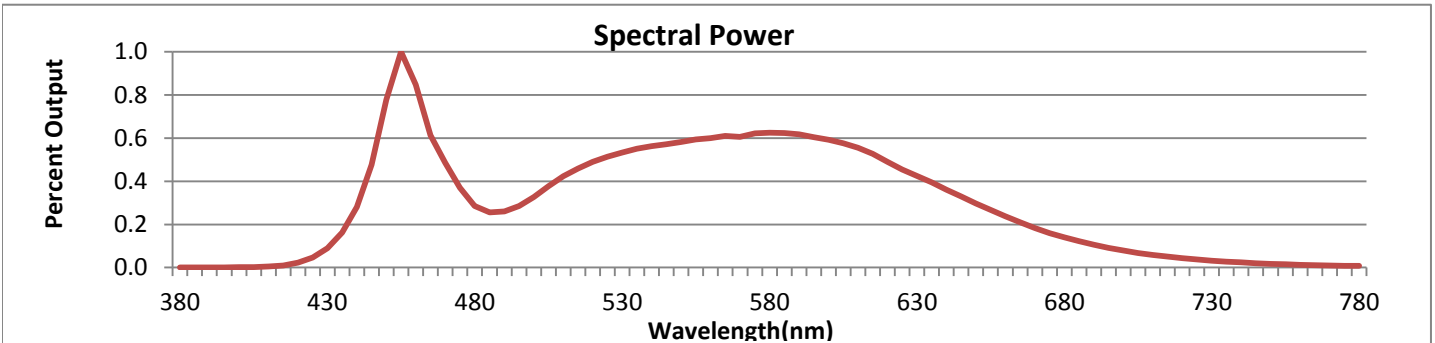


FIG. 1 LUMINAIRE

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



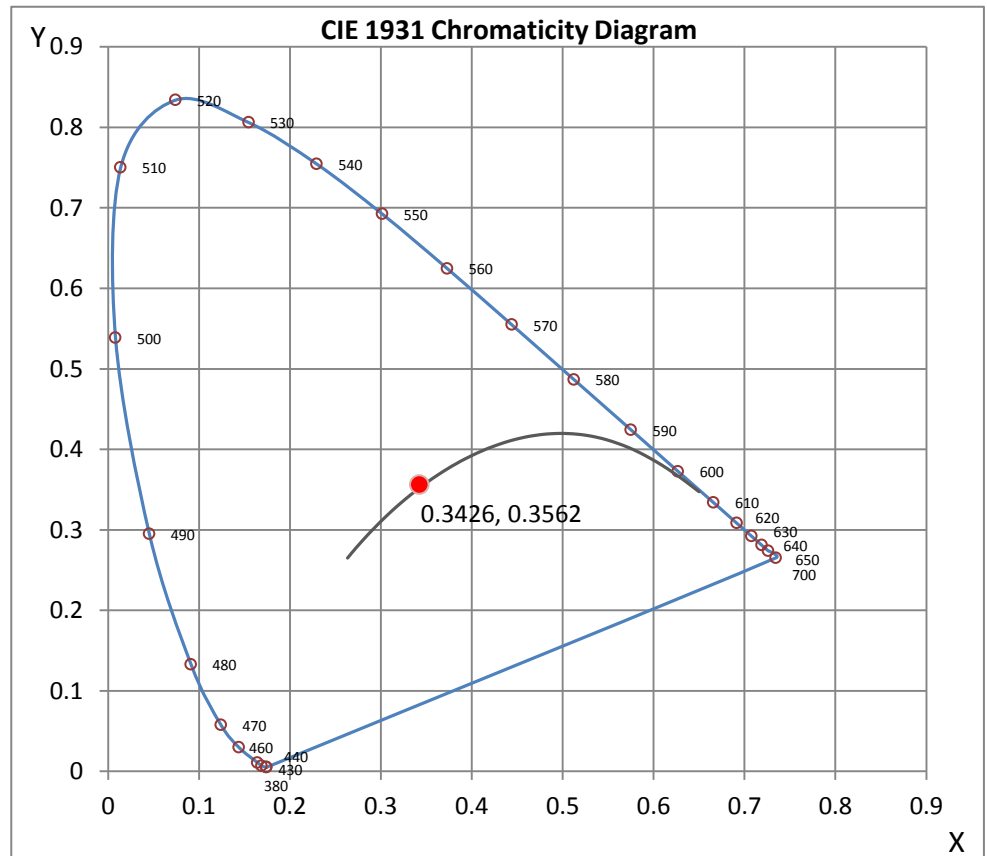
Wavelength	W/m ² nm	440	0.2811	510	0.4233	580	0.6246	650	0.2977	720	0.0428
380	0.0008	450	0.7784	520	0.4904	590	0.6171	660	0.2372	730	0.0318
390	0.0010	460	0.8473	530	0.5338	600	0.5921	670	0.1834	740	0.0235
400	0.0013	470	0.4851	540	0.5627	610	0.5558	680	0.1399	750	0.0174
410	0.0043	480	0.2858	550	0.5827	620	0.4909	690	0.1057	760	0.0130
420	0.0231	490	0.2600	560	0.6006	630	0.4256	700	0.0790	770	0.0098
430	0.0891	500	0.3276	570	0.6054	640	0.3611	710	0.0587	780	0.0074

CRI & CCT

x	0.3426
y	0.3562
u'	0.2080
v'	0.4865
CRI	83.40
CCT	5110
Duv	0.00332

R Values

R1	81.94
R2	90.05
R3	93.71
R4	80.85
R5	81.21
R6	84.43
R7	87.16
R8	67.88
R9	11.87
R10	74.54
R11	79.14
R12	57.75
R13	84.50
R14	96.50



*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 : L111503505.IES

DESCRIPTION INFORMATION (From Photometric File)

IESNA:LM-63-2002
 [TEST] L111503505
 [TESTLAB] LIGHT LABORATORY, INC.
 [ISSUEDATE] 11/18/2015
 [MANUFAC] REVOLUTION LIGHTING TECHNOLOGIES
 [LUMCAT] 202220-015
 [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, 11.09W
 [_ TEST PROCEDURE] IESNA:LM-79-08

CHARACTERISTICS

Lumens Per Lamp	N.A. (absolute)
Total Lamp Lumens	N.A. (absolute)
Luminaire Lumens	1323
Total Luminaire Efficiency	N.A.
Luminaire Efficacy Rating (LER)	119
Total Luminaire Watts	11.09
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
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LUMINANCE DATA (cd/sq.m)

Angle In Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	17661	13027	13104
55	15772	11669	12181
65	13426	10593	11468
75	9959	9813	10946
85	3808	9498	10714

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	276.62	276.62	276.62	276.62	276.62
5	275.58	275.66	275.62	275.19	274.81
10	270.61	271.25	272.41	273.14	273.35
15	262.21	264.01	267.18	269.79	270.69
20	251.41	253.73	259.64	265.08	266.84
25	237.79	241.56	250.68	259.12	262.30
30	221.42	227.25	240.02	251.76	256.55
35	203.60	211.48	228.11	243.66	249.78
40	184.83	193.74	214.99	234.62	241.73
45	164.44	175.92	201.58	224.51	232.99
50	142.76	157.41	187.53	213.54	223.82
55	121.42	138.52	173.14	202.48	213.28
60	100.51	120.31	159.13	191.04	202.66
65	78.58	102.87	145.67	179.01	191.60
70	57.33	86.50	132.39	167.01	180.12
75	38.13	71.72	120.18	155.70	168.55
80	20.39	58.83	108.61	144.09	156.73
85	6.43	48.50	98.50	132.86	145.93
90	0.60	40.92	89.29	122.62	135.13
95	0.00	35.43	80.93	112.98	124.34
100	0.00	31.88	73.91	103.60	114.40
105	0.00	29.82	67.74	94.94	105.31
110	0.00	28.83	62.51	87.28	96.57
115	0.00	27.76	57.41	80.25	88.26
120	0.00	26.86	53.77	73.65	80.21
125	0.00	26.22	50.64	67.57	74.38
130	0.00	25.02	46.83	62.51	67.44
135	0.00	22.24	42.55	57.67	62.64
140	0.00	19.28	39.33	50.81	56.13
145	0.00	16.02	35.65	45.46	47.64
150	0.00	12.73	29.82	40.66	43.02
155	0.00	9.73	22.32	34.15	37.45
160	0.00	7.37	15.72	24.34	28.54
165	0.00	5.66	10.80	15.94	19.45
170	0.00	4.37	7.03	9.00	9.25
175	0.00	3.34	4.37	4.37	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	101.54	N.A.	7.70
0-30	216.99	N.A.	16.40
0-40	359.44	N.A.	27.20
0-60	666.78	N.A.	50.40
0-80	925.71	N.A.	69.90
0-90	1023.4	N.A.	77.30
10-90	997.21	N.A.	75.40
20-40	257.91	N.A.	19.50
20-50	412.55	N.A.	31.20
40-70	446.89	N.A.	33.80
60-80	258.93	N.A.	19.60
70-80	119.37	N.A.	9.00
80-90	97.69	N.A.	7.40
90-110	144.90	N.A.	10.90
90-120	197.08	N.A.	14.90
90-130	237.81	N.A.	18.00
90-150	286.64	N.A.	21.70
90-180	300.00	N.A.	22.70
110-180	155.10	N.A.	11.70
0-180	1323.4	N.A.	100.00

Total Luminaire Efficiency = N.A.%

ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	26.19
10-20	75.35
20-30	115.45
30-40	142.45
40-50	154.64
50-60	152.69
60-70	139.56
70-80	119.37
80-90	97.69
90-100	79.82
100-110	65.08
110-120	52.18
120-130	40.74
130-140	29.74
140-150	19.09
150-160	9.84
160-170	3.13
170-180	0.38

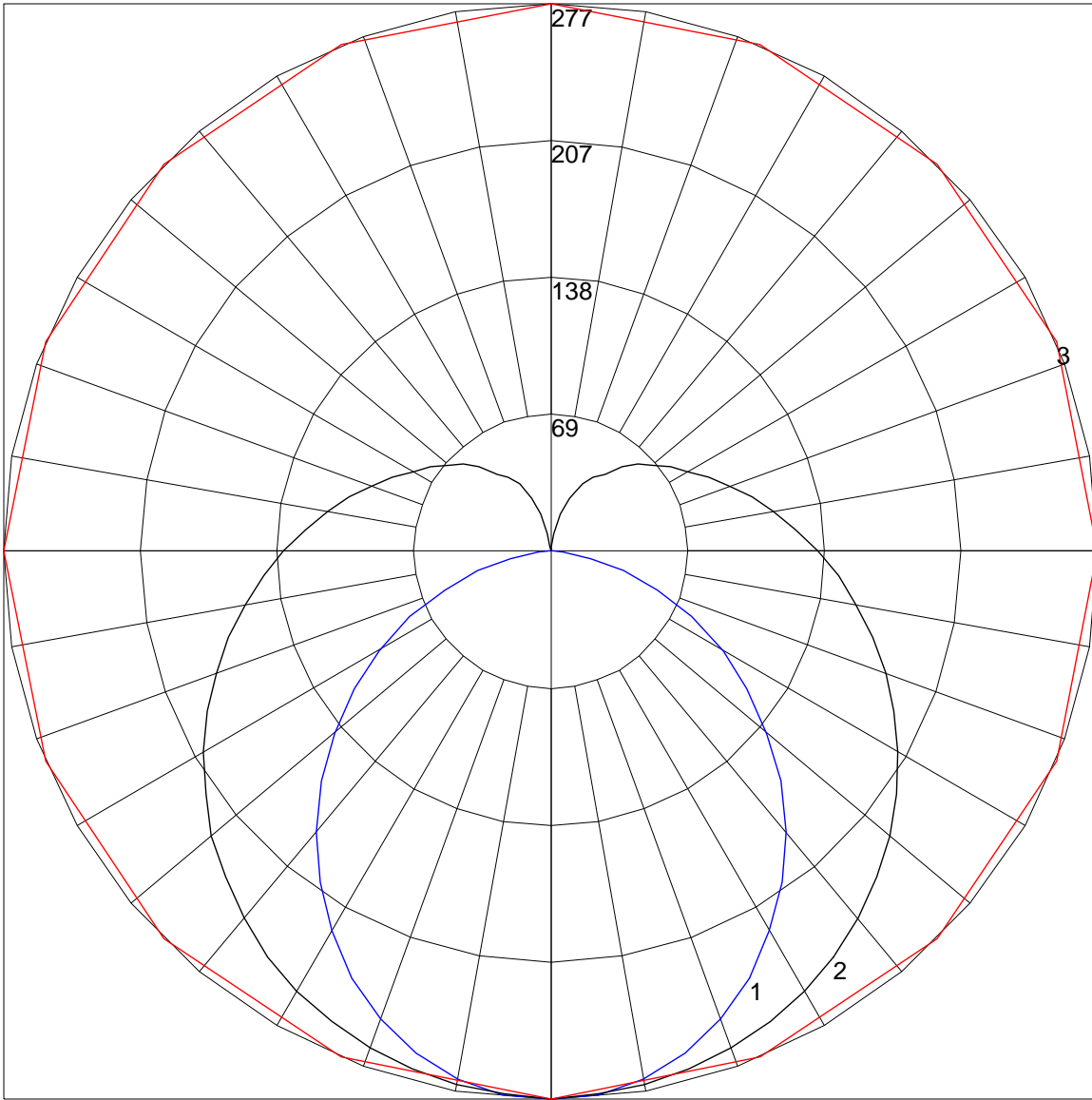
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COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

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	108	108	108	108	99	99	99	90	90	90	81	81	81	77
1	101	95	89	85	85	95	90	85	81	82	78	74	74	71	68	67	64	62	58
2	90	81	73	67	67	86	77	70	64	70	64	59	63	59	55	57	53	50	47
3	82	70	61	54	54	77	67	59	52	61	54	49	55	50	45	50	45	41	38
4	75	62	53	45	45	70	59	50	44	54	46	41	49	43	38	44	39	35	32
5	68	55	46	39	39	65	52	44	37	48	40	35	43	37	32	39	34	30	27
6	63	49	40	33	33	59	47	38	32	43	36	30	39	33	28	35	30	26	24
7	58	44	35	29	29	55	42	34	28	39	32	26	35	29	25	32	27	23	21
8	54	40	32	26	26	51	39	31	25	35	28	23	32	26	22	30	24	21	18
9	50	37	29	23	23	48	35	28	22	32	26	21	30	24	20	27	22	18	16
10	47	34	26	21	21	45	33	25	20	30	23	19	28	22	18	25	20	17	15

POLAR GRAPH



Maximum Candela = 276.62 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.)