LightLab
INTERNATIONAL

LightLab International, LLC
Phoenix AZ 85085

NVLAP TESTING
Lab Code 200989-0

This document is issued in accordance with the accreditation requirements of NVLAP. The laboratory is accredited for compliance with ISO/IEC 17025. The results of the tests, calibrations and/or measurements included in this document are traceable to the SI system of units.

Report of Test

LLI-19091-6

Optolum - Linear luminaire. Product ID: OLM-010VH-H-01--35--014800
Extruded aluminum housing with clear plastic flat lens.
48 LEDs mounted in single row.
Two Harvard Technology LED drivers. Model: CLS50-1400A-UNI-B-I/F
Operating at 277v AC an 60 Hz,

Performance Summary

Total Light Output	4270 lm	Min Power Factor	0.86 @ 277 V
Luminaire Power	70.6 W	Max THD(i)*	13.0 % @ 277 V
Luminous Efficacy	60.5 lm/W		
CCT	3470 K		
CIE(x,y) 1931	(0.401, 0.375)		
CRI	95		

PREPARED FOR : Optolum, Tempe, AZ 85281

USA west coast LightLab International, LLC, 24825 N. 16th Avenue, Suite 125, Phoenix, AZ, 85085 — Ph : +1 623-434-1499, Fx : +1 623-434-1492, www.lightlabint.com (issuing laboratory)

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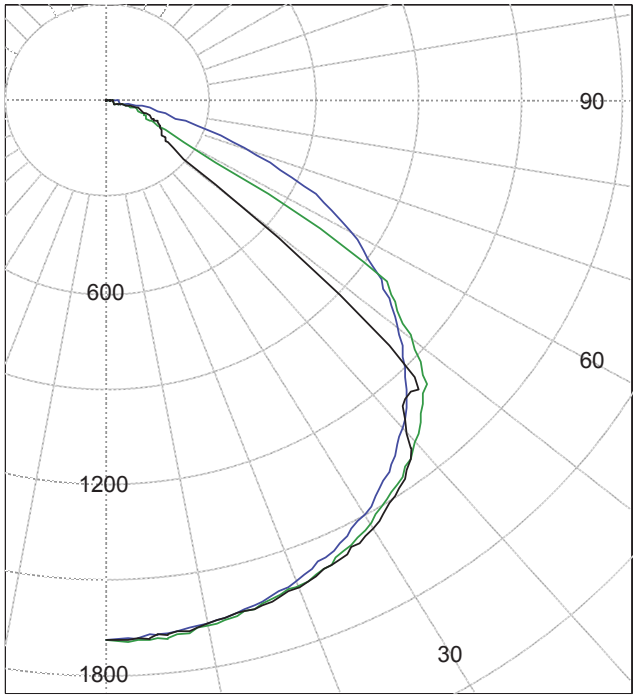
Legend: C0-Black, C45-Green, C90-Blue (cd)



(Two plane symmetry) C0-C90

INTENSITY SUMMARY (cd)

	C-Plane					Flux
Gamma	C0	C22.5	C45	C67.5	C90	(lm)
0.0	1690	1690	1690	1690	1690	
5.0	1685	1688	1689	1688	1678	160
10.0	1663	1669	1671	1671	1663	
15.0	1647	1647	1646	1643	1636	465
20.0	1622	1625	1615	1605	1600	
25.0	1583	1580	1580	1555	1551	725
30.0	1543	1540	1524	1496	1490	
35.0	1479	1478	1462	1431	1419	911
40.0	1356	1395	1392	1357	1336	
45.0	1279	1231	1300	1260	1226	955
50.0	406	909	1144	1125	1097	
55.0	199	206	991	1002	966	610
60.0	181	172	251	836	810	
65.0	161	152	132	619	629	318
70.0	126	121	105	298	425	
75.0	82	77	70	81	232	109
80.0	35	34	33	35	99	
85.0	10	10	9	10	26	16
90.0	0	0	0	0	0	

ZONAL FLUX AND PERCENTAGES

Zone	Flux (lm)	% Lamp	% Luminaire
0-30	1351	N / A	31.6
0-40	2261	N / A	53.0
0-60	3826	N / A	89.6
0-90	4270	N / A	100.0
40-90	2008	N / A	47.0
60-90	444	N / A	10.4
90-180	0	N / A	0.0
0-180	4270	N / A	100.0

Total Light Output = 4,270 lm

Signed:

Ryder Tunney
Authorized Signatory

Date of test 8-Apr-2019
Date of report 8-Apr-2019

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Intensity data (cd)

	C-Plane				
Gamma	**C0**	**C22.5**	**C45**	**C67.5**	**C90**
0.0	1690	1690	1690	1690	1690
2.5	1689	1692	1695	1691	1683
5.0	1685	1688	1689	1688	1678
7.5	1674	1678	1684	1680	1673
10.0	1663	1669	1671	1671	1663
12.5	1652	1659	1660	1659	1651
15.0	1647	1647	1646	1643	1636
17.5	1638	1639	1629	1623	1619
20.0	1622	1625	1615	1605	1600
22.5	1603	1607	1601	1582	1576
25.0	1583	1580	1580	1555	1551
27.5	1568	1560	1553	1529	1523
30.0	1543	1540	1524	1496	1490
32.5	1513	1513	1491	1463	1456
35.0	1479	1478	1462	1431	1419
37.5	1436	1443	1430	1396	1379
40.0	1356	1395	1392	1357	1336
42.5	1275	1307	1345	1309	1286
45.0	1279	1231	1300	1260	1226
47.5	1015	1227	1241	1195	1160
50.0	406	909	1144	1125	1097
52.5	224	348	1055	1062	1035
55.0	199	206	991	1002	966
57.5	189	183	640	924	888
60.0	181	172	251	836	810
62.5	172	163	157	740	721
65.0	161	152	132	619	629
67.5	147	139	118	479	528
70.0	126	121	105	298	425
72.5	103	99	89	138	323
75.0	82	77	70	81	232
77.5	57	55	50	54	159
80.0	35	34	33	35	99
82.5	19	19	19	21	56
85.0	10	10	9	10	26
87.5	4	4	4	4	7
90.0	0	0	0	0	0

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Operating at 277v AC an 60 Hz,

LM-79 Performance Data

Spectral	CIE 1931 (x, y) (1)	(0.401, 0.375)	
	CIE 1976 (u', v') (1)	(0.239, 0.504)	
	Correlated Color Temperature (CCT) (1)	3470	K
	Spatial Δ (u', v') Uniformity (2)	0.0138	
	Color Rendering Index (Ra) (1)	95.3	
	Special CRI 9 (R_9) (1),(3)	80.1	
	Distance from Planckian Locus (Duv) (1),(3)	-6.10E-03	
	Scotopic/Photopic Ratio (1),(3)	1.66	

Electrical	Voltage	277.0	V	(Setpoint 1)
	Frequency	60.0	Hz	
	Current	0.295	A	
	Power	70.6	W	
	Power Factor	0.86		
	Current THD	13	%	
	Voltage	120.0	V	(Setpoint 2)
	Frequency	60.0	Hz	
	Current	0.615	A	
	Power	72.0	W	
	Power Factor	0.98		
	Current THD	2.4	%	

Performance data in accordance with IESNA LM-79-08. Spectral calculations are for a CIE 2° observer
Photometric and spectral values were measured at Setpoint 1
(1) Value is computed from the weighted average of the spatial measurements
(2) Value is the maximum deviation of the spatial u' and v' measurements from the weighted average
(3) Quantity is in addition to the scope of IESNA LM-79-08

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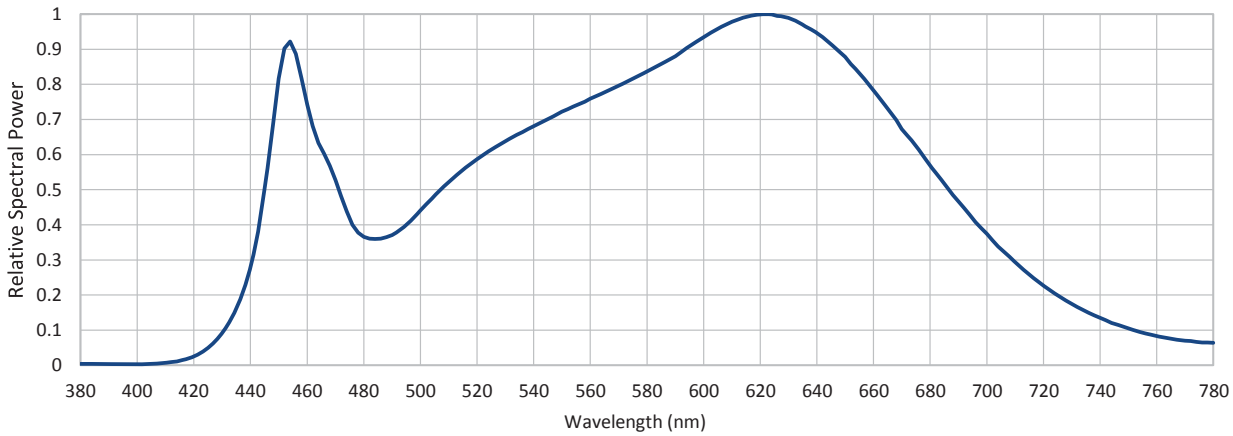
LM-79 Performance Data

Relative spectral power distribution (Relative to peak = 1, weighted average of spatial measurements)

λ (nm)	Relative Power	λ (nm)	Relative Power	λ (nm)	Relative Power	λ (nm)	Relative Power	λ (nm)	Relative Power
380	0.004	460	0.742	540	0.681	620	1.000	700	0.374
385	0.004	465	0.618	545	0.701	625	0.997	705	0.331
390	0.003	470	0.527	550	0.722	630	0.989	710	0.293
395	0.003	475	0.420	555	0.740	635	0.969	715	0.259
400	0.003	480	0.366	560	0.759	640	0.946	720	0.227
405	0.004	485	0.361	565	0.778	645	0.914	725	0.200
410	0.007	490	0.371	570	0.796	650	0.878	730	0.175
415	0.013	495	0.399	575	0.816	655	0.831	735	0.153
420	0.025	500	0.441	580	0.836	660	0.784	740	0.135
425	0.050	505	0.483	585	0.859	665	0.731	745	0.119
430	0.092	510	0.522	590	0.880	670	0.673	750	0.105
435	0.162	515	0.556	595	0.908	675	0.624	755	0.093
440	0.280	520	0.587	600	0.935	680	0.569	760	0.083
445	0.503	525	0.614	605	0.958	685	0.517	765	0.076
450	0.817	530	0.638	610	0.978	690	0.466	770	0.070
455	0.904	535	0.660	615	0.992	695	0.418	775	0.066
								780	0.064



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LM-79 Performance Data

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates Horiz. 0.0° plane	Horiz. ° plane
0.0	(0.238, 0.496)	(0.237, 0.495)
10.0	(0.238, 0.497)	(0.237, 0.495)
20.0	(0.238, 0.498)	(0.237, 0.497)
30.0	(0.239, 0.501)	(0.238, 0.500)
40.0	(0.240, 0.505)	(0.239, 0.503)
50.0	(0.239, 0.506)	(0.240, 0.507)
60.0	(0.241, 0.512)	(0.242, 0.512)
70.0	I < = 10% peak	(0.245, 0.516)
80.0	I < = 10% peak	I <= 10% peak
-	-	-

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates Horiz. 0.0° plane	Horiz. ° plane
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Test procedure

All measurements were performed in an environmentally controlled laboratory employing suitable baffling to minimize stray light. The sample was mounted in its normal operating orientation on a rotating mirror goniophotometer and operated from a stabilized supply. The photometric output was monitored and measurements were performed once stability was achieved.

The goniophotometer was used to measure the spatial distribution of both luminous intensity and, in conjunction with a spectroradiometer, spectral irradiance. The distribution locus comprises points in two or more planes (as indicated in the table above) at no more than 10º vertical intervals. The CIE (x,y) coordinates and other derived metrics (CIE (u', v'), CCT and CRI) are calculated from the weighted sum (weighted for intensity and represented solid angle) of the measured spectral irradiances.

Sample Orientation	Horizontal	Stabilization & total operation time	1.25 / 2.25 hours

Equipment and uncertainties

LightLab International R80A C-gamma rotating mirror goniophotometer with a test distance of 8 m.

Luminous Intensity	± 4 %	Temperature	± 1 °C
Luminous Flux	± 4 %	Luminous Efficacy	± 4.5 %
Horiz., Vert. Angles	± 0.25º		

PhotoResearch PR-670 spectroradiometer (grating with 380 - 780 nm range, 2 nm / pixel, 5 nm bandwidth, incandescent/halogen calibration source). Measured at a distance from the sample deemed >5 times the maximum observed luminous opening dimension.

CIE (x, y) coordinates	± 0.003	CCT	± 100 K
CIE (u', v') coordinates	± 0.002	CRI (Ra)	± 2
Spatial Δ (u', v') uniformity	± 0.001	Scotopic / Photopic Ratio *	± 0.02
Rel. Spectral Irradiance *	± 2 %	R9 *	± 2
Duv *	± 5E-04		

Yokogawa WT210 power meter connected in circuit to the sample electrical supply

Voltage	± 0.5 %	Frequency *	± 0.1 Hz
Current	± 0.5 %	Power	± 0.5 %
Current THD *	± 3 %	Power Factor	± 0.02

This report contains data that are not covered by the NVLAP accreditation. Quantities marked with * are not covered.

Calculator / report version 1.0.10 / 5.9 (14th Dec 2017)

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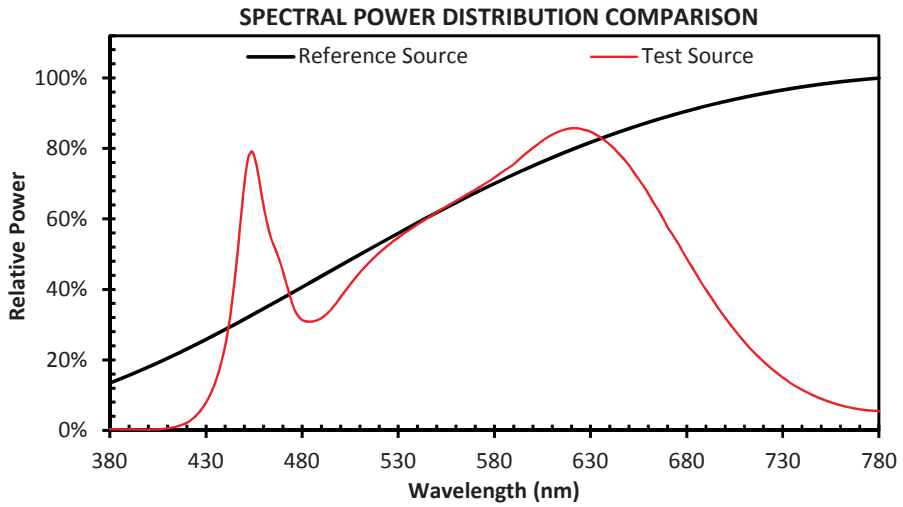
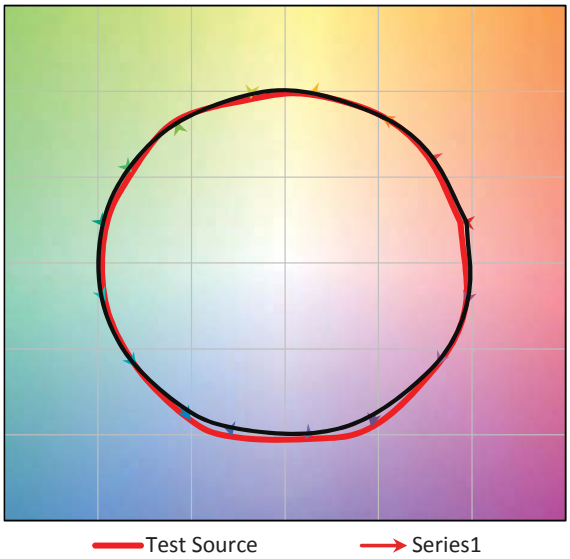
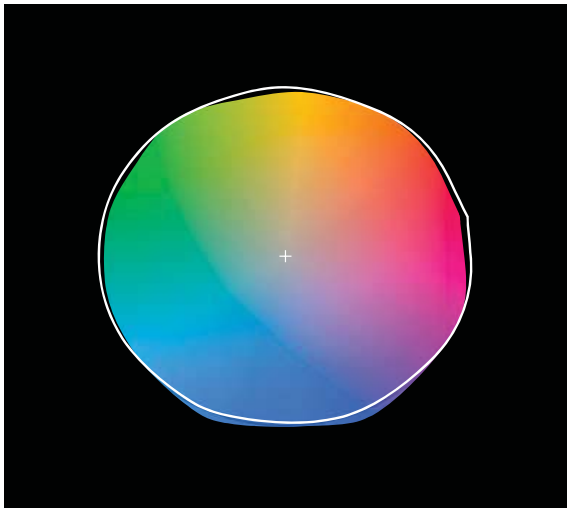
R_f	90
R_g	100



COLOR VECTOR GRAPHIC



COLOR DISTORTION GRAPHIC



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Test Distance	8.0 m
Test Temperature	25.2 °C

Notes

The laboratory has not participated in the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent that the test sample is representative of production units.

Tested in accordance with the applicable sections of publications: IES LM-79-08 (Sec. 12), IES LM-16-93, IES LM-58-13, CIE 13.3:1995, CIE 15:2004, ANSI C78.377:2015, ANSI C82.77-10:2014.

The luminous intensity values, and other derived quantities, contained in this report are based on the absolute data, as measured.

Prorating the performance of the sample for the use of other component combinations (such as lamp / LED / Ballast / driver), or for use in different environmental conditions than that tested, may produce erroneous results.

This report is free of erasures and corrections.

Photometric intensity values are reported using the CIE Gamma coordinate system as defined in CIE publication number 121.

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

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