

Report of Test LLI-19090-3

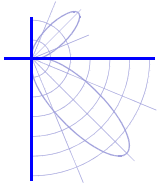
Optolum - Linear strip luminaire. Product ID: OPMT---H--409--C--D-A-48
Extruded aluminum housing with clear plastic flat lens.
336 LEDs mounted in single row.
No driver.
Operating at 24v DC.



Performance Summary

Total Light Output	1719 lm
Luminaire Power	22.8 W
Luminous Efficacy	75.4 lm/W
CCT	4160 K
CIE(x,y) 1931	(0.373, 0.370)
CRI	95

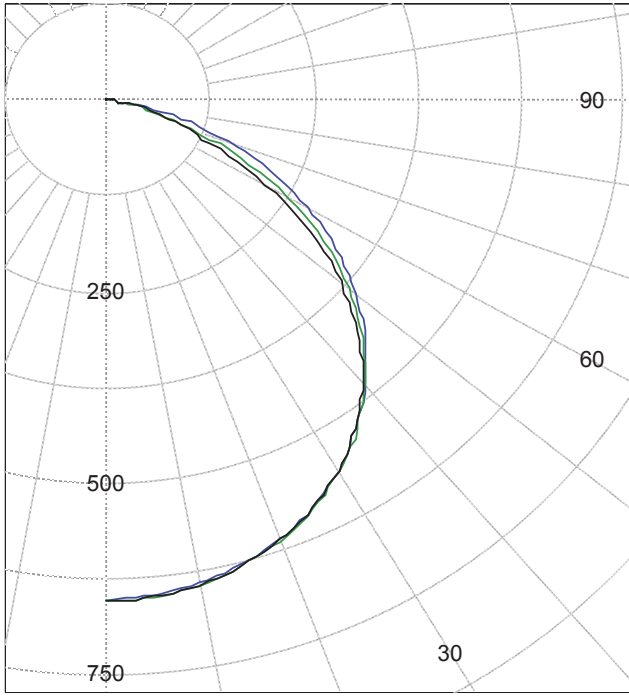
PREPARED FOR : Optolum, Tempe, AZ 85281



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



(Two plane symmetry) C0-C90

INTENSITY SUMMARY (cd)

Gamma	C-Plane					Flux (lm)
	C0	C22.5	C45	C67.5	C90	
0.0	653	653	653	653	653	
5.0	650	651	652	651	648	62
10.0	643	643	644	643	641	
15.0	630	630	631	629	628	178
20.0	611	612	613	611	610	
25.0	588	588	589	588	587	271
30.0	559	559	560	560	558	
35.0	523	524	525	525	524	328
40.0	479	481	483	484	485	
45.0	428	431	435	438	441	335
50.0	369	373	381	387	392	
55.0	298	306	320	329	337	283
60.0	221	230	252	268	279	
65.0	149	155	178	203	218	179
70.0	96	96	106	138	154	
75.0	58	56	55	77	92	72
80.0	31	28	25	31	40	
85.0	11	10	8	9	9	13
90.0	0	0	0	0	0	

ZONAL FLUX AND PERCENTAGES

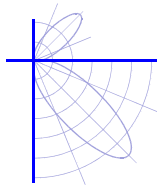
Zone	Flux (lm)	% Lamp	% Luminaire
0-30	511	N/A	29.7
0-40	838	N/A	48.8
0-60	1456	N/A	84.7
0-90	1719	N/A	100.0
40-90	881	N/A	51.2
60-90	263	N/A	15.3
90-180	0	N/A	0.0
0-180	1719	N/A	100.0

Total Light Output = 1,719 lm

Signed:

Ryder Tunney
Ryder Tunney
Authorized Signatory

Date of test 5-Apr-2019
Date of report 5-Apr-2019

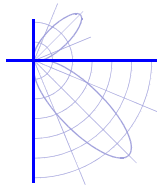


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Intensity data (cd)

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
0.0	653	653	653	653	653
2.5	653	653	654	652	650
5.0	650	651	652	651	648
7.5	647	648	648	647	645
10.0	643	643	644	643	641
12.5	637	638	638	637	635
15.0	630	630	631	629	628
17.5	621	622	622	621	620
20.0	611	612	613	611	610
22.5	600	601	602	600	599
25.0	588	588	589	588	587
27.5	575	575	575	575	573
30.0	559	559	560	560	558
32.5	542	543	543	543	542
35.0	523	524	525	525	524
37.5	502	503	504	505	505
40.0	479	481	483	484	485
42.5	455	457	460	462	464
45.0	428	431	435	438	441
47.5	400	403	409	413	417
50.0	369	373	381	387	392
52.5	335	341	351	359	365
55.0	298	306	320	329	337
57.5	260	269	287	299	308
60.0	221	230	252	268	279
62.5	184	192	215	236	249
65.0	149	155	178	203	218
67.5	120	123	140	171	186
70.0	96	96	106	138	154
72.5	76	74	78	107	123
75.0	58	56	55	77	92
77.5	44	41	38	51	64
80.0	31	28	25	31	40
82.5	20	18	16	18	22
85.0	11	10	8	9	9
87.5	6	5	4	4	3
90.0	0	0	0	0	0



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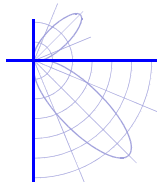
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.373, 0.370)
	CIE 1976 (u', v') ⁽¹⁾	(0.223, 0.497)
	Correlated Color Temperature (CCT) ⁽¹⁾	4160 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	0.0136
	Color Rendering Index (Ra) ⁽¹⁾	94.7
	Special CRI 9 (R ₉) ^{(1),(3)}	85.4
	Distance from Planckian Locus (Duv) ^{(1),(3)}	-1.03E-03
	Scotopic/Photopic Ratio ^{(1),(3)}	1.86
Electrical	Voltage	24.00 V
	Current	0.950 A
	Power	22.8 W

Performance data in accordance with IESNA LM-79-08. Spectral calculations are for a CIE 2° observer

- (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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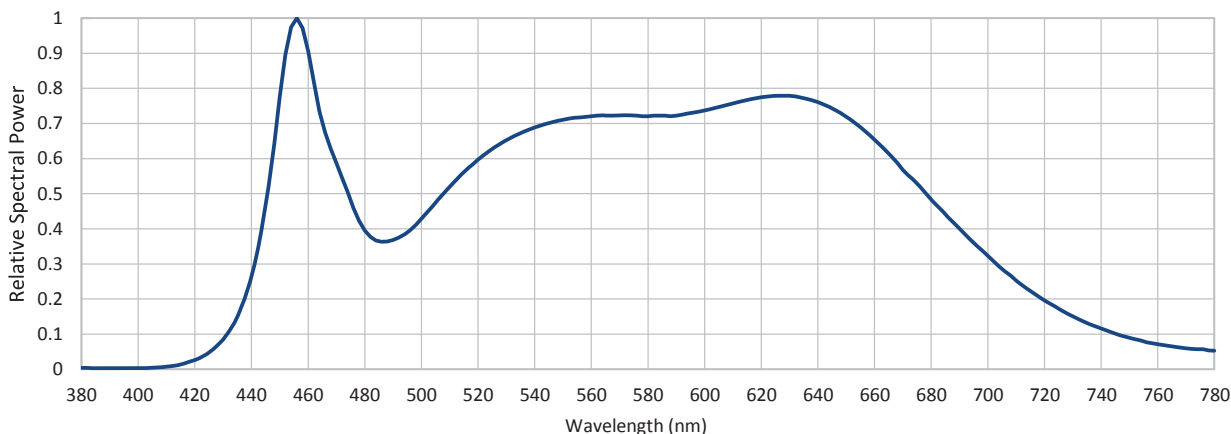
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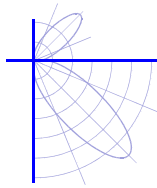
LM-79 Performance Data

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	0.905	540	0.689	620	0.775	700	0.323
385	0.003	465	0.704	545	0.701	625	0.779	705	0.286
390	0.003	470	0.586	550	0.711	630	0.779	710	0.253
395	0.003	475	0.482	555	0.717	635	0.772	715	0.223
400	0.003	480	0.395	560	0.721	640	0.761	720	0.196
405	0.004	485	0.365	565	0.722	645	0.743	725	0.173
410	0.007	490	0.368	570	0.723	650	0.720	730	0.151
415	0.014	495	0.390	575	0.722	655	0.689	735	0.132
420	0.026	500	0.428	580	0.721	660	0.655	740	0.116
425	0.049	505	0.474	585	0.722	665	0.614	745	0.102
430	0.085	510	0.520	590	0.722	670	0.568	750	0.089
435	0.150	515	0.561	595	0.730	675	0.529	755	0.079
440	0.265	520	0.597	600	0.737	680	0.484	760	0.072
445	0.469	525	0.628	605	0.747	685	0.442	765	0.065
450	0.775	530	0.653	610	0.757	690	0.400	770	0.060
455	0.987	535	0.673	615	0.767	695	0.360	775	0.057
								780	0.053





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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	(0.221, 0.489)	(0.221, 0.489)
10.0	(0.222, 0.490)	(0.221, 0.489)
20.0	(0.222, 0.491)	(0.221, 0.491)
30.0	(0.222, 0.493)	(0.222, 0.493)
40.0	(0.222, 0.495)	(0.222, 0.497)
50.0	(0.223, 0.499)	(0.223, 0.500)
60.0	(0.224, 0.503)	(0.225, 0.505)
70.0	(0.224, 0.502)	(0.227, 0.510)
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 10° 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 1.5 / 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	± 0.25°		

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.

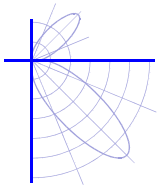
CIE (x, y) coordinates	± 0.003	CCT	± 100 K
CIE (u', v') coordinates	± 0.002	CRI (Ra)	± 2
Spatial Δ (u', v') uniformity	± 0.001	Scotopic / Photopic Ratio *	± 0.02
Rel. Spectral Irradiance *	± 2 %	R9 *	± 2
Duv *	± 5E-04		

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.

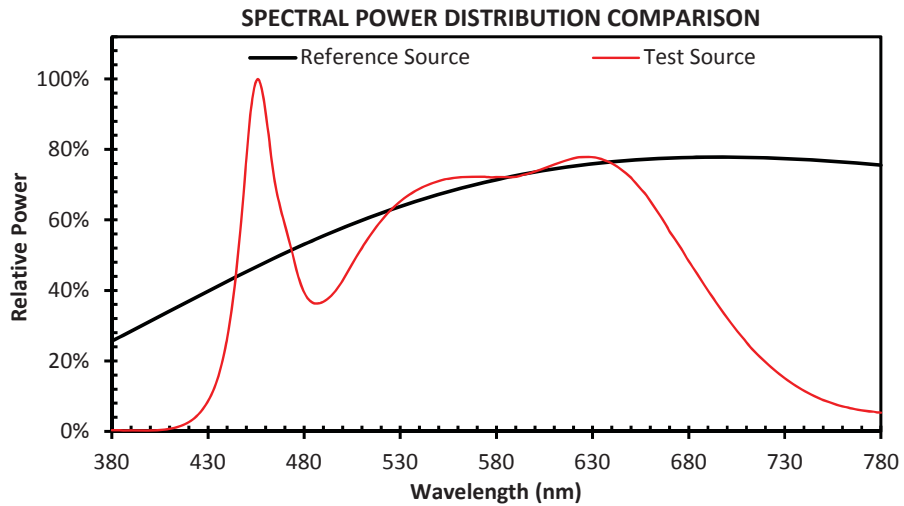
Calculator / report version 1.0.10 / 5.9 (14th Dec 2017)



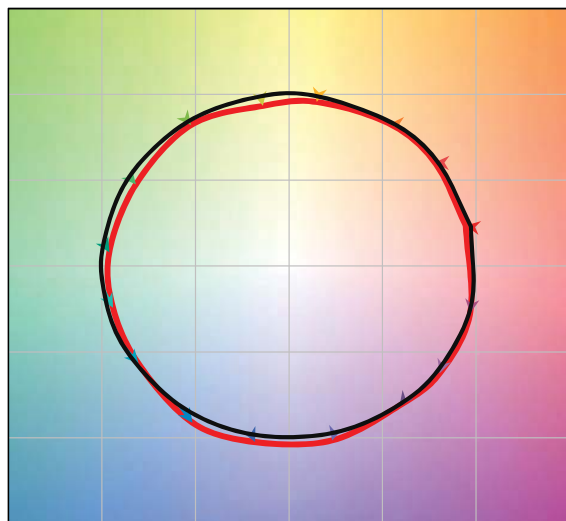
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R_f	88
R_g	98



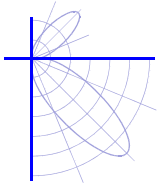
COLOR VECTOR GRAPHIC



— Test Source → Series1

COLOR DISTORTION GRAPHIC





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Test Distance 8.0 m
Test Temperature 25.4 °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.