

Report of Test

LLI-19090-1

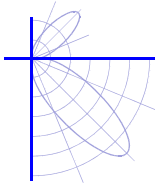
Optolum - Linear strip luminaire. Product ID: OPRR---H--409--C--D-A-48
Extruded aluminum housing with clear plastic curved lens.
336 LEDs mounted in single row.
No driver.
Operating at 24v DC.



Performance Summary

Total Light Output	1681 lm
Luminaire Power	22.6 W
Luminous Efficacy	74.4 lm/W
CCT	4140 K
CIE(x,y) 1931	(0.374, 0.372)
CRI	94

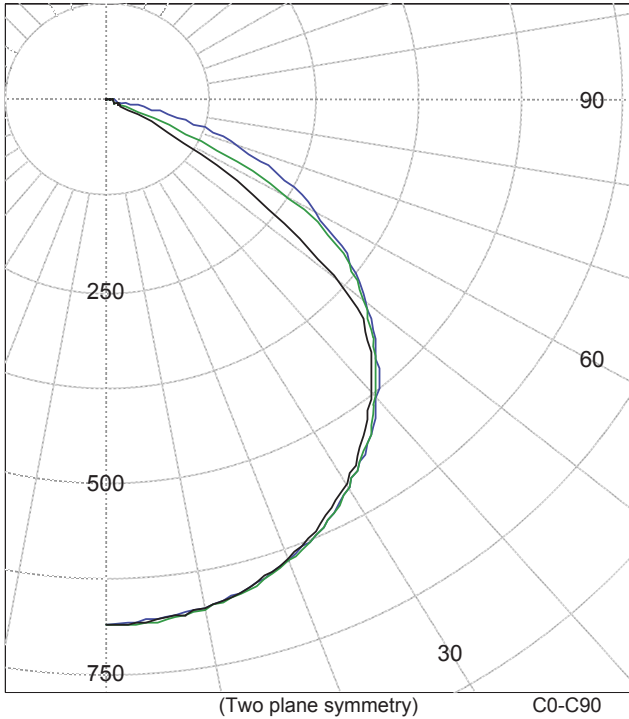
PREPARED FOR : Optolum, Tempe, AZ 85281



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



INTENSITY SUMMARY (cd)


Gamma	C-Plane					Flux (lm)
	C0	C22.5	C45	C67.5	C90	
0.0	685	685	685	685	685	
5.0	682	682	683	682	680	65
10.0	673	674	675	674	672	
15.0	659	660	661	660	659	186
20.0	637	640	642	640	639	
25.0	610	613	616	615	614	283
30.0	577	580	584	585	584	
35.0	538	542	547	549	548	341
40.0	495	499	504	507	507	
45.0	446	452	456	460	459	350
50.0	356	392	405	408	408	
55.0	215	259	348	351	352	276
60.0	83	134	251	292	290	
65.0	16	26	127	230	226	131
70.0	15	14	24	168	160	
75.0	13	13	10	72	98	41
80.0	10	10	9	6	46	
85.0	5	5	5	4	12	7
90.0	1	2	2	1	0	

ZONAL FLUX AND PERCENTAGES

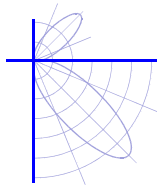
Zone	Flux (lm)	% Lamp	% Luminaire
0-30	534	N / A	31.8
0-40	875	N / A	52.1
0-60	1501	N / A	89.3
0-90	1680	N / A	100.0
40-90	805	N / A	47.9
60-90	179	N / A	10.7
90-180	0	N / A	0.0
0-180	1681	N / A	100.0

Total Light Output = 1,681 lm

Signed:


Ryder Tunney
Authorized Signatory

Date of test 4-Apr-2019
Date of report 5-Apr-2019

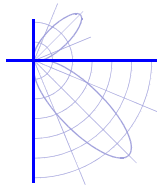


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Intensity data (cd)

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
0.0	685	685	685	685	685
2.5	684	685	685	684	682
5.0	682	682	683	682	680
7.5	678	679	680	679	677
10.0	673	674	675	674	672
12.5	667	668	669	668	667
15.0	659	660	661	660	659
17.5	649	651	652	651	650
20.0	637	640	642	640	639
22.5	625	627	629	628	627
25.0	610	613	616	615	614
27.5	594	597	600	601	600
30.0	577	580	584	585	584
32.5	558	562	566	567	567
35.0	538	542	547	549	548
37.5	517	521	526	529	529
40.0	495	499	504	507	507
42.5	471	476	481	485	484
45.0	446	452	456	460	459
47.5	414	425	431	435	434
50.0	356	392	405	408	408
52.5	282	332	377	380	381
55.0	215	259	348	351	352
57.5	147	195	311	322	321
60.0	83	134	251	292	290
62.5	33	73	185	261	259
65.0	16	26	127	230	226
67.5	15	14	70	199	193
70.0	15	14	24	168	160
72.5	14	13	11	124	129
75.0	13	13	10	72	98
77.5	12	11	10	30	70
80.0	10	10	9	6	46
82.5	7	8	7	5	26
85.0	5	5	5	4	12
87.5	2	3	4	3	3
90.0	1	2	2	1	0

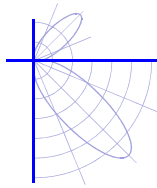


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Intensity data (cd)

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
90.0	1	2	2	1	0
92.5	0	0	0	0	0
95.0	0	0	0	0	0
97.5	0	0	0	0	0
100.0	0	0	0	0	0
102.5	0	0	0	0	0
105.0	0	0	0	0	0
107.5	0	0	0	0	0
110.0	0	0	0	0	0
112.5	0	0	0	0	0
115.0	0	0	0	0	0
117.5	0	0	0	0	0
120.0	0	0	0	0	0
122.5	0	0	0	0	0
125.0	0	0	0	0	0
127.5	0	0	0	0	0
130.0	0	0	0	0	0
132.5	0	0	0	0	0
135.0	0	0	0	0	0
137.5	0	0	0	0	0
140.0	0	0	0	0	0
142.5	0	0	0	0	0
145.0	0	0	0	0	0
147.5	0	0	0	0	0
150.0	0	0	0	0	0
152.5	0	0	0	0	0
155.0	0	0	0	0	0
157.5	0	0	0	0	0
160.0	0	0	0	0	0
162.5	0	0	0	0	0
165.0	0	0	0	0	0
167.5	0	0	0	0	0
170.0	0	0	0	0	0
172.5	0	0	0	0	0
175.0	0	0	0	0	0
177.5	0	0	0	0	0
180.0	0	0	0	0	0



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LM-79 Performance Data

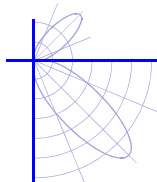
Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.374, 0.372)
	CIE 1976 (u', v') ⁽¹⁾	(0.223, 0.498)
	Correlated Color Temperature (CCT) ⁽¹⁾	4140 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	0.0142
	Color Rendering Index (Ra) ⁽¹⁾	94.2
	Special CRI 9 (R ₉) ^{(1),(3)}	83.1
	Distance from Planckian Locus (Duv) ^{(1),(3)}	-4.31E-04
	Scotopic/Photopic Ratio ^{(1),(3)}	1.84
Electrical	Voltage	24.00 V
	Current	0.941 A
	Power	22.6 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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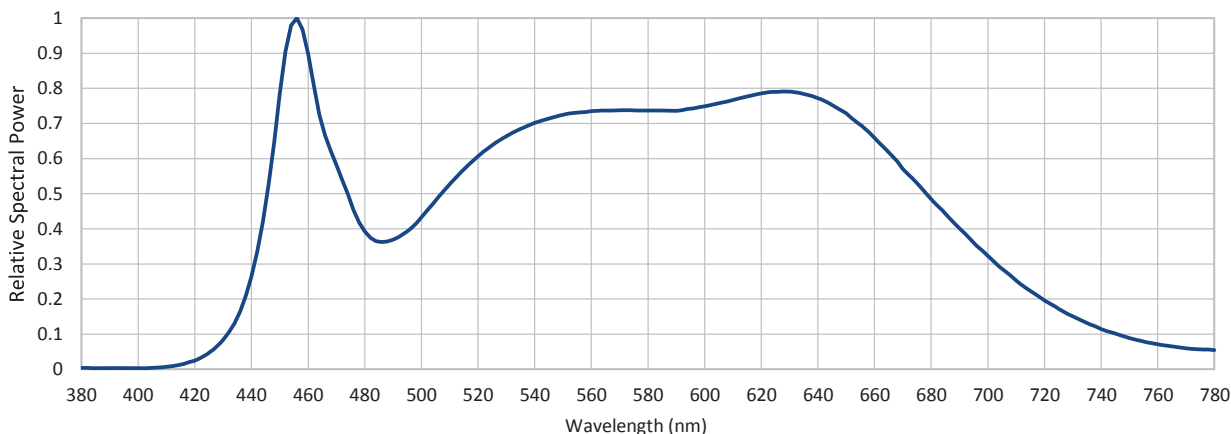
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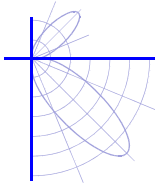
LM-79 Performance Data

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	0.896	540	0.702	620	0.786	700	0.323
385	0.003	465	0.695	545	0.714	625	0.790	705	0.286
390	0.003	470	0.581	550	0.725	630	0.791	710	0.253
395	0.003	475	0.477	555	0.731	635	0.784	715	0.224
400	0.003	480	0.392	560	0.735	640	0.772	720	0.196
405	0.004	485	0.364	565	0.737	645	0.753	725	0.172
410	0.007	490	0.369	570	0.738	650	0.729	730	0.151
415	0.014	495	0.393	575	0.738	655	0.696	735	0.132
420	0.025	500	0.433	580	0.737	660	0.660	740	0.115
425	0.047	505	0.480	585	0.737	665	0.618	745	0.101
430	0.084	510	0.527	590	0.736	670	0.571	750	0.089
435	0.148	515	0.570	595	0.742	675	0.530	755	0.079
440	0.264	520	0.607	600	0.749	680	0.485	760	0.071
445	0.472	525	0.638	605	0.757	685	0.443	765	0.065
450	0.783	530	0.664	610	0.767	690	0.401	770	0.060
455	0.989	535	0.685	615	0.777	695	0.360	775	0.057
								780	0.055





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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, 0.491)	(0.221, 0.491)
10.0	(0.222, 0.491)	(0.221, 0.491)
20.0	(0.222, 0.492)	(0.221, 0.493)
30.0	(0.222, 0.493)	(0.222, 0.495)
40.0	(0.222, 0.495)	(0.223, 0.498)
50.0	(0.223, 0.498)	(0.224, 0.502)
60.0	(0.225, 0.513)	(0.225, 0.506)
70.0	I <= 10% peak	(0.227, 0.512)
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 1.75 / 2.5 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.

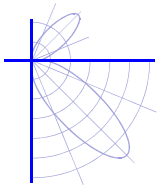
CIE (x, y) coordinates	± 0.003	CCT	± 100 K
CIE (u', v') coordinates	± 0.002	CRI (Ra)	± 2
Spatial Δ (u', v') uniformity	± 0.001	Scotopic / Photopic Ratio *	± 0.02
Rel. Spectral Irradiance *	± 2 %	R9 *	± 2
Duv *	± 5E-04		

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.

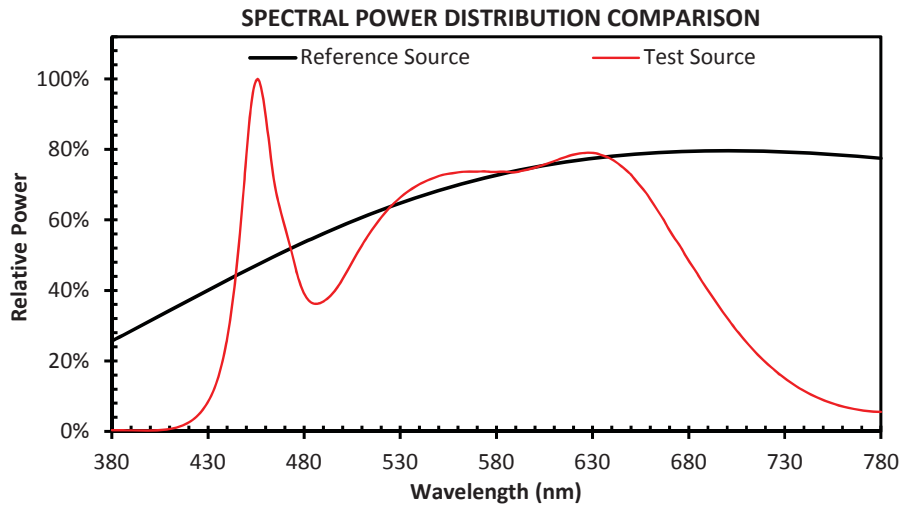
Calculator / report version 1.0.10 / 5.9 (14th Dec 2017)



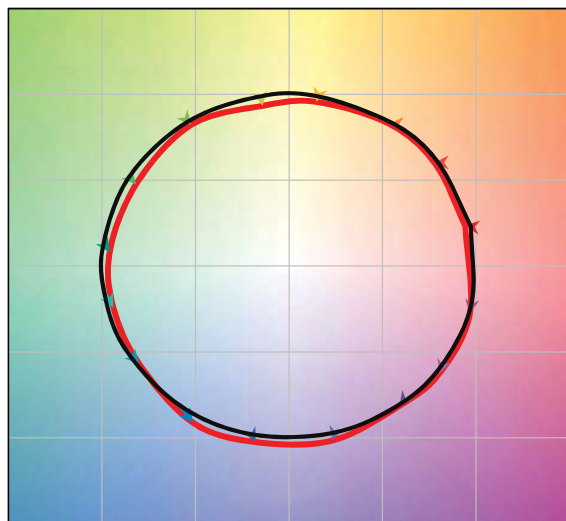
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R_f	88
R_g	98

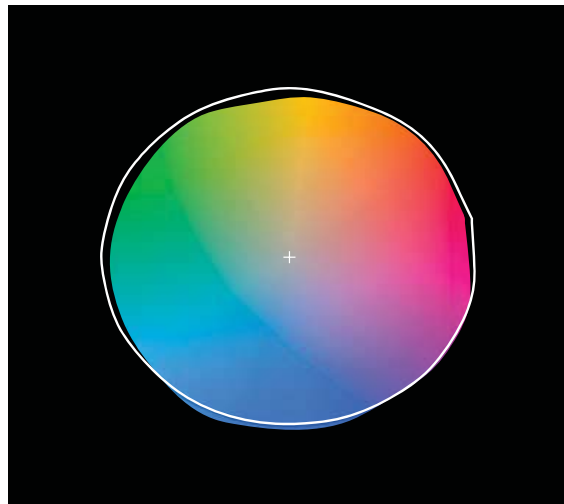


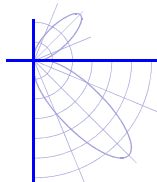
COLOR VECTOR GRAPHIC



— Test Source → Series1

COLOR DISTORTION GRAPHIC





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Test Distance 8.0 m
Test Temperature 25.3 °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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