

Report of Test LLI-18230-13

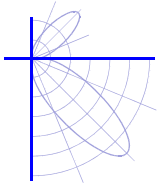
Optolum - Linear strip luminaire. Product ID: CL-----409-D-A060000
Extruded aluminum housing with linear clear plastic convex lens.
140 LEDs mounted in single row.
No driver.
Operating at 24v DC.



Performance Summary

Total Light Output	2176 lm
Luminaire Power	21.2 W
Luminous Efficacy	102.6 lm/W
CCT	4020 K
CIE(x,y) 1931	(0.380, 0.378)
CRI	93

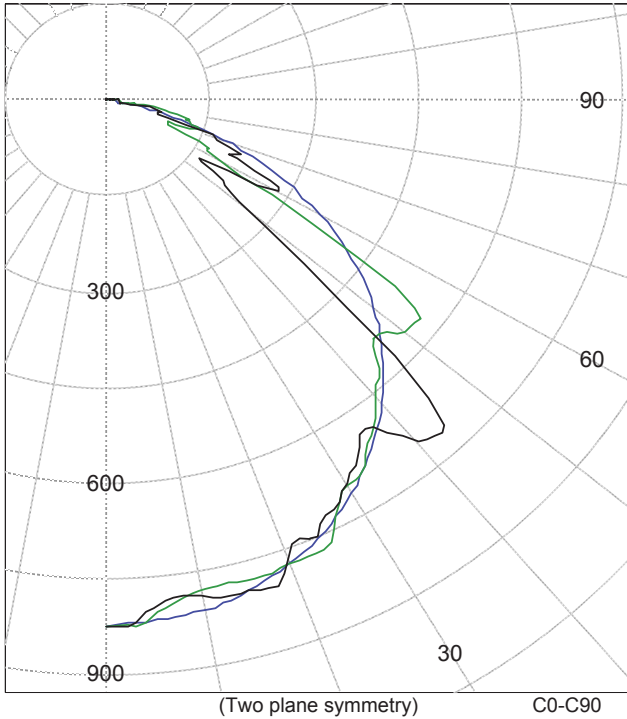
PREPARED FOR : Optolum, Tempe, AZ 85281



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



INTENSITY SUMMARY (cd)

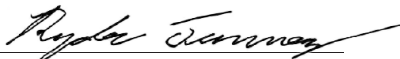
Gamma	C-Plane					Flux (lm)
	C0	C22.5	C45	C67.5	C90	
0.0	826	826	826	826	826	
5.0	797	798	806	824	818	77
10.0	789	781	780	797	812	
15.0	796	791	780	769	796	222
20.0	765	785	774	745	774	
25.0	734	739	764	727	746	340
30.0	691	700	696	708	710	
35.0	641	652	656	677	669	415
40.0	699	630	605	638	620	
45.0	660	685	545	557	563	446
50.0	249	390	565	491	503	
55.0	165	202	507	436	436	313
60.0	284	170	184	356	355	
65.0	195	224	124	303	265	218
70.0	171	178	127	207	178	
75.0	76	85	120	86	97	110
80.0	23	55	84	34	44	
85.0	17	16	37	26	12	26
90.0	10	11	11	18	0	

ZONAL FLUX AND PERCENTAGES

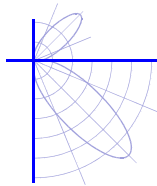
Zone	Flux (lm)	% Lamp	% Luminaire
0-30	638	N / A	29.3
0-40	1054	N / A	48.4
0-60	1813	N / A	83.3
0-90	2167	N / A	99.6
40-90	1114	N / A	51.2
60-90	354	N / A	16.3
90-180	9	N / A	0.4
0-180	2176	N / A	100.0

Total Light Output = 2,176 lm

Signed:


Ryder Tunney
Authorized Signatory

Date of test 22-Aug-2018
Date of report 22-Aug-2018

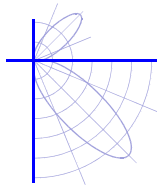


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Intensity data (cd)

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
0.0	826	826	826	826	826
2.5	825	825	824	824	820
5.0	797	798	806	824	818
7.5	785	783	791	817	816
10.0	789	781	780	797	812
12.5	796	790	776	786	804
15.0	796	791	780	769	796
17.5	798	791	779	756	786
20.0	765	785	774	745	774
22.5	747	736	771	733	761
25.0	734	739	764	727	746
27.5	719	713	722	720	729
30.0	691	700	696	708	710
32.5	673	672	689	693	690
35.0	641	652	656	677	669
37.5	648	620	638	661	645
40.0	699	630	605	638	620
42.5	710	676	581	601	593
45.0	660	685	545	557	563
47.5	428	618	541	518	533
50.0	249	390	565	491	503
52.5	213	227	570	466	472
55.0	165	202	507	436	436
57.5	186	156	319	396	397
60.0	284	170	184	356	355
62.5	256	242	167	330	311
65.0	195	224	124	303	265
67.5	202	182	92	270	219
70.0	171	178	127	207	178
72.5	105	150	132	136	135
75.0	76	85	120	86	97
77.5	74	67	111	57	66
80.0	23	55	84	34	44
82.5	17	19	46	25	25
85.0	17	16	37	26	12
87.5	14	14	18	22	4
90.0	10	11	11	18	0

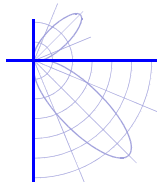


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Intensity data (cd)

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
90.0	10	11	11	18	0
92.5	7	7	8	14	0
95.0	5	5	6	9	0
97.5	5	4	4	4	0
100.0	4	4	3	2	0
102.5	3	3	2	0	0
105.0	3	3	2	0	0
107.5	2	2	1	0	0
110.0	2	2	0	0	0
112.5	2	2	0	0	0
115.0	2	2	0	0	0
117.5	2	1	0	0	0
120.0	2	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

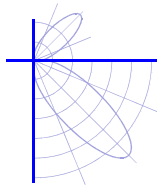
Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.380, 0.378)
	CIE 1976 (u', v') ⁽¹⁾	(0.224, 0.502)
	Correlated Color Temperature (CCT) ⁽¹⁾	4020 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	3.14E-03
	Color Rendering Index (Ra) ⁽¹⁾	93.1
	Special CRI 9 (R ₉) ^{(1),(3)}	73.2
	Distance from Planckian Locus (Duv) ^{(1),(3)}	6.93E-04
	Scotopic/Photopic Ratio ^{(1),(3)}	1.75
Electrical	Voltage	24.00 V
	Current	0.882 A
	Power	21.2 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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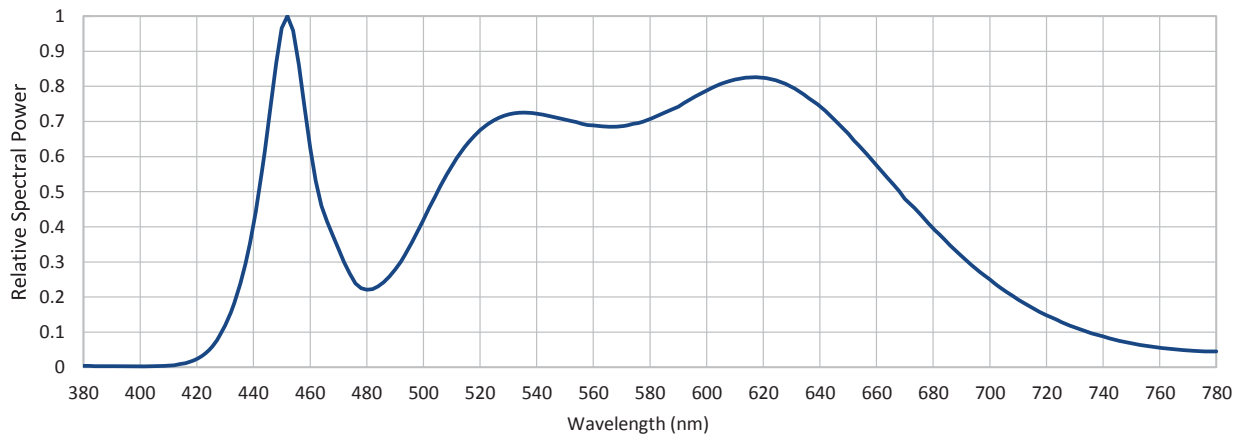
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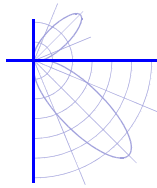
LM-79 Performance Data

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	0.624	540	0.723	620	0.825	700	0.250
385	0.003	465	0.437	545	0.714	625	0.815	705	0.220
390	0.003	470	0.337	550	0.705	630	0.799	710	0.193
395	0.003	475	0.253	555	0.696	635	0.772	715	0.170
400	0.002	480	0.221	560	0.689	640	0.744	720	0.148
405	0.003	485	0.236	565	0.686	645	0.705	725	0.130
410	0.005	490	0.278	570	0.687	650	0.666	730	0.114
415	0.010	495	0.341	575	0.694	655	0.620	735	0.099
420	0.024	500	0.421	580	0.707	660	0.576	740	0.088
425	0.056	505	0.501	585	0.724	665	0.529	745	0.077
430	0.119	510	0.573	590	0.742	670	0.480	750	0.068
435	0.230	515	0.631	595	0.766	675	0.440	755	0.061
440	0.406	520	0.675	600	0.788	680	0.396	760	0.056
445	0.678	525	0.704	605	0.807	685	0.356	765	0.051
450	0.966	530	0.720	610	0.819	690	0.317	770	0.048
455	0.911	535	0.725	615	0.825	695	0.281	775	0.046
								780	0.045





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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	(0.225, 0.502)	(0.224, 0.502)
10.0	(0.226, 0.504)	(0.224, 0.502)
20.0	(0.225, 0.502)	(0.224, 0.502)
30.0	(0.224, 0.501)	(0.224, 0.501)
40.0	(0.223, 0.499)	(0.225, 0.503)
50.0	(0.226, 0.504)	(0.225, 0.503)
60.0	(0.224, 0.501)	(0.224, 0.503)
70.0	(0.226, 0.505)	(0.224, 0.503)
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 1.0 / 1.75 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.

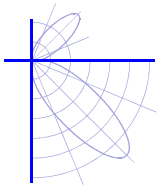
CIE (x, y) coordinates	± 0.003	CCT	± 100 K
CIE (u', v') coordinates	± 0.002	CRI (Ra)	± 2
Spatial Δ (u', v') uniformity	± 0.001	Scotopic / Photopic Ratio *	± 0.02
Rel. Spectral Irradiance *	± 2 %	R9 *	± 2
Duv *	± 5E-04		

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.

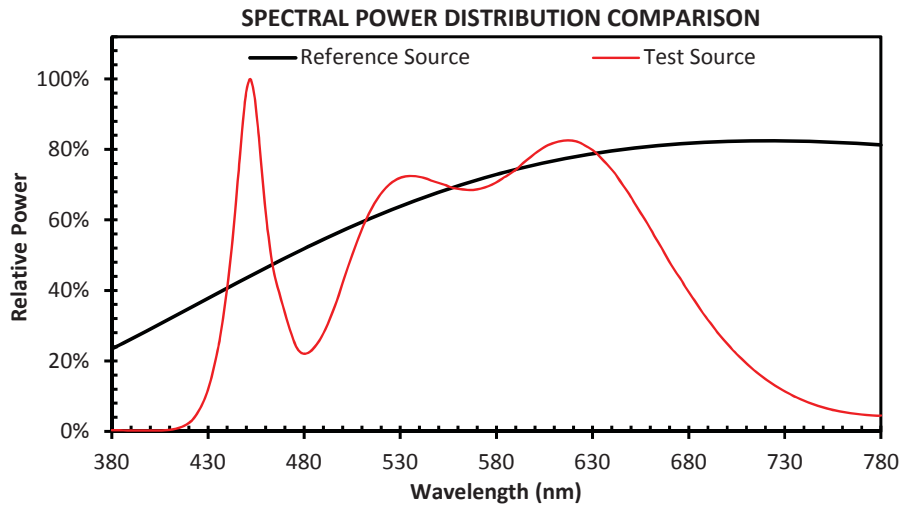
Calculator / report version 1.0.10 / 5.9 (14th Dec 2017)



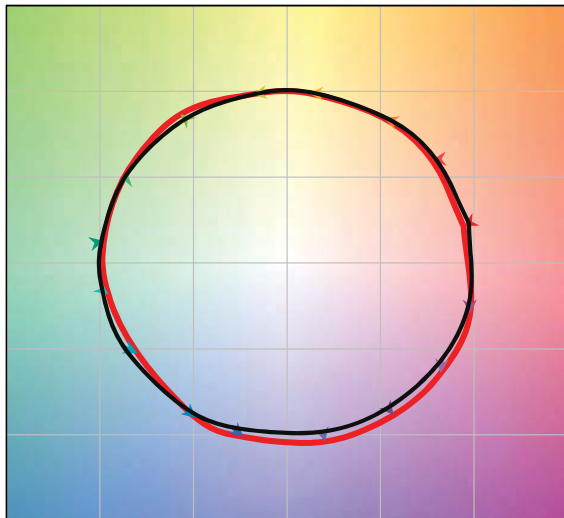
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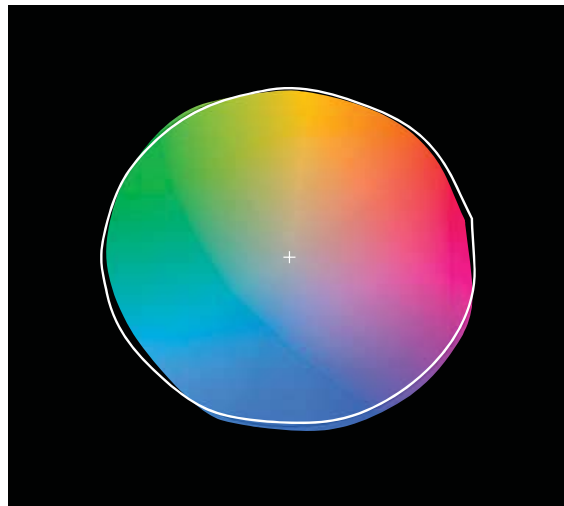
R_f	90
R_g	101

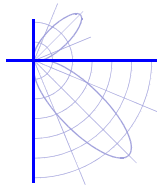


COLOR VECTOR GRAPHIC



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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