

Report of Test

LLI-18230-8

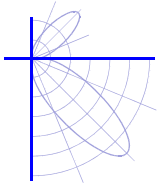
Optolum - Linear strip luminaire. Product ID: FL-RD-H--409USD-A059220
Extruded aluminum housing with linear clear plastic convex lens.
329 LEDs mounted in single row.
No driver.
Operating at 24v DC.



Performance Summary

Total Light Output	3531 lm
Luminaire Power	36.0 W
Luminous Efficacy	98.1 lm/W
CCT	3960 K
CIE(x,y) 1931	(0.382, 0.377)
CRI	94

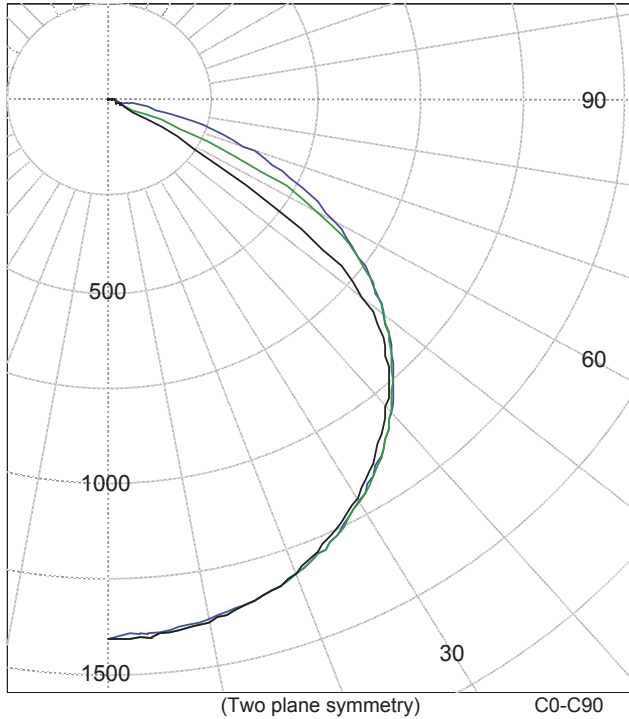
PREPARED FOR : Optolum, Tempe, AZ 85281



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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	1407	1407	1407	1407	1407	
5.0	1401	1399	1402	1404	1394	133
10.0	1384	1381	1384	1385	1376	
15.0	1355	1352	1355	1358	1350	382
20.0	1314	1312	1318	1323	1316	
25.0	1261	1260	1270	1276	1270	584
30.0	1198	1200	1212	1215	1209	
35.0	1126	1129	1140	1143	1139	711
40.0	1044	1047	1058	1062	1060	
45.0	948	954	966	973	969	741
50.0	801	838	863	872	867	
55.0	487	620	748	759	751	601
60.0	144	228	582	635	625	
65.0	29	37	257	503	487	276
70.0	27	25	35	365	345	
75.0	26	25	20	166	207	87
80.0	21	20	18	13	93	
85.0	7	9	12	10	22	14
90.0	3	3	3	3	0	

ZONAL FLUX AND PERCENTAGES

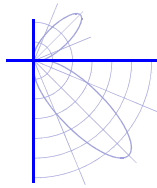
Zone	Flux (lm)	% Lamp	% Luminaire
0-30	1100	N/A	31.2
0-40	1811	N/A	51.3
0-60	3153	N/A	89.3
0-90	3530	N/A	100.0
40-90	1719	N/A	48.7
60-90	377	N/A	10.7
90-180	1	N/A	0.0
0-180	3531	N/A	100.0

Total Light Output = 3,531 lm

Signed:

Ryder Tunney
Ryder Tunney
Authorized Signatory

Date of test 21-Aug-2018
Date of report 21-Aug-2018

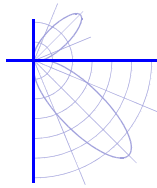


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Intensity data (cd)

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
0.0	1407	1407	1407	1407	1407
2.5	1405	1403	1407	1409	1399
5.0	1401	1399	1402	1404	1394
7.5	1394	1392	1394	1396	1386
10.0	1384	1381	1384	1385	1376
12.5	1371	1368	1370	1373	1364
15.0	1355	1352	1355	1358	1350
17.5	1336	1333	1337	1342	1334
20.0	1314	1312	1318	1323	1316
22.5	1289	1287	1295	1301	1295
25.0	1261	1260	1270	1276	1270
27.5	1231	1231	1243	1248	1241
30.0	1198	1200	1212	1215	1209
32.5	1163	1165	1178	1181	1175
35.0	1126	1129	1140	1143	1139
37.5	1086	1089	1101	1104	1101
40.0	1044	1047	1058	1062	1060
42.5	998	1003	1013	1019	1016
45.0	948	954	966	973	969
47.5	887	902	916	924	919
50.0	801	838	863	872	867
52.5	678	748	808	817	812
55.0	487	620	748	759	751
57.5	276	425	677	698	688
60.0	144	228	582	635	625
62.5	53	112	448	570	557
65.0	29	37	257	503	487
67.5	28	26	114	435	415
70.0	27	25	35	365	345
72.5	27	25	20	282	274
75.0	26	25	20	166	207
77.5	24	23	19	48	146
80.0	21	20	18	13	93
82.5	17	17	16	11	51
85.0	7	9	12	10	22
87.5	3	4	4	6	6
90.0	3	3	3	3	0



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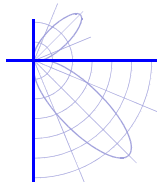
329 LEDs mounted in single row.

No driver.

Operating at 24v DC.

Intensity data (cd)

Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
90.0	3	3	3	3	0
92.5	2	2	2	2	0
95.0	2	2	2	0	0
97.5	1	1	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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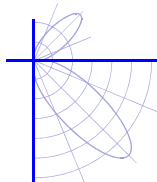
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.382, 0.377)
	CIE 1976 (u', v') ⁽¹⁾	(0.226, 0.502)
	Correlated Color Temperature (CCT) ⁽¹⁾	3960 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	3.56E-03
	Color Rendering Index (Ra) ⁽¹⁾	94.1
	Special CRI 9 (R ₉) ^{(1),(3)}	73.4
	Distance from Planckian Locus (Duv) ^{(1),(3)}	-4.86E-04
	Scotopic/Photopic Ratio ^{(1),(3)}	1.75
Electrical	Voltage	24.00 V
	Current	1.502 A
	Power	36.0 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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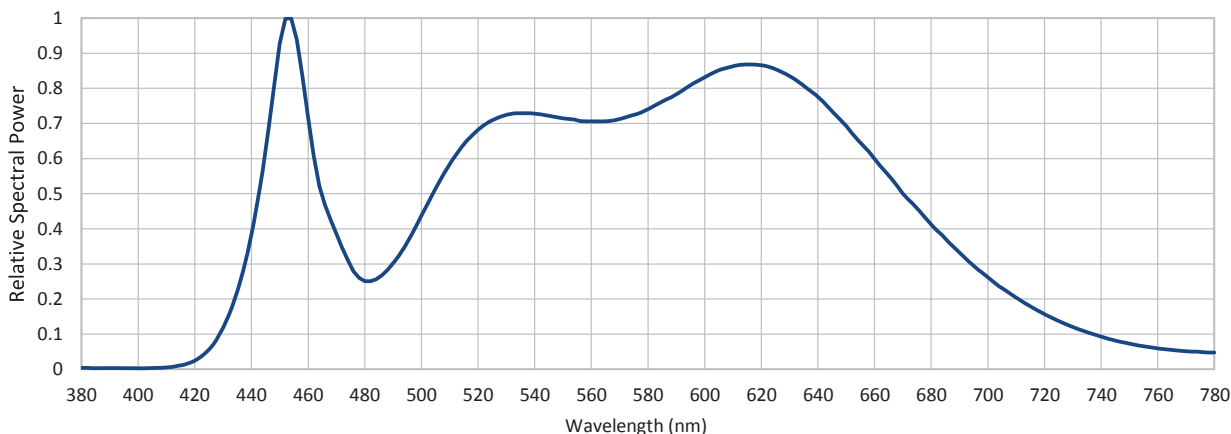
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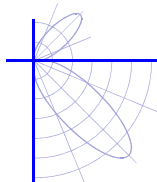
LM-79 Performance Data

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	0.714	540	0.728	620	0.866	700	0.262
385	0.003	465	0.494	545	0.722	625	0.854	705	0.231
390	0.003	470	0.385	550	0.715	630	0.835	710	0.204
395	0.003	475	0.296	555	0.709	635	0.807	715	0.179
400	0.003	480	0.251	560	0.706	640	0.776	720	0.157
405	0.003	485	0.262	565	0.707	645	0.735	725	0.138
410	0.005	490	0.302	570	0.713	650	0.693	730	0.121
415	0.011	495	0.361	575	0.724	655	0.646	735	0.105
420	0.025	500	0.438	580	0.741	660	0.600	740	0.093
425	0.057	505	0.515	585	0.762	665	0.551	745	0.082
430	0.118	510	0.584	590	0.783	670	0.500	750	0.073
435	0.223	515	0.640	595	0.809	675	0.458	755	0.065
440	0.384	520	0.682	600	0.832	680	0.413	760	0.059
445	0.626	525	0.709	605	0.851	685	0.372	765	0.055
450	0.927	530	0.724	610	0.863	690	0.332	770	0.052
455	0.969	535	0.729	615	0.868	695	0.295	775	0.050
								780	0.048





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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	(0.227, 0.503)	(0.227, 0.502)
10.0	(0.227, 0.503)	(0.227, 0.502)
20.0	(0.227, 0.502)	(0.227, 0.502)
30.0	(0.226, 0.502)	(0.227, 0.502)
40.0	(0.226, 0.501)	(0.226, 0.502)
50.0	(0.224, 0.499)	(0.226, 0.502)
60.0	I <= 10% peak	(0.226, 0.503)
70.0	I <= 10% peak	(0.226, 0.503)
80.0	I <= 10% peak	I <= 10% peak
90.0	I <= 10% peak	I <= 10% peak

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates	
	Horiz. 0.0° plane	Horiz. ° plane
90.0	I <= 10% peak	I <= 10% peak
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

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 0.75 / 1.5 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.

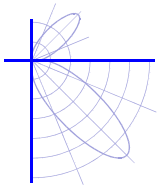
CIE (x, y) coordinates	± 0.003	CCT	± 100 K
CIE (u', v') coordinates	± 0.002	CRI (Ra)	± 2
Spatial Δ (u', v') uniformity	± 0.001	Scotopic / Photopic Ratio *	± 0.02
Rel. Spectral Irradiance *	± 2 %	R9 *	± 2
Duv *	± 5E-04		

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.

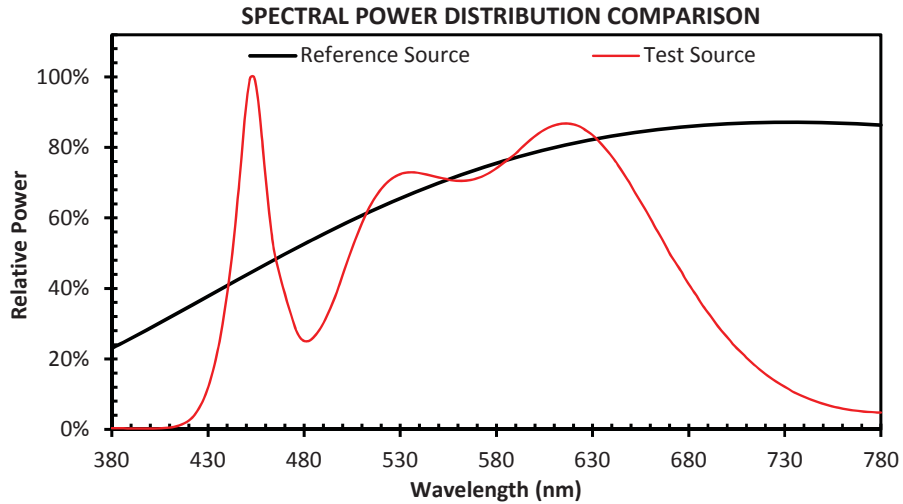
Calculator / report version 1.0.10 / 5.9 (14th Dec 2017)



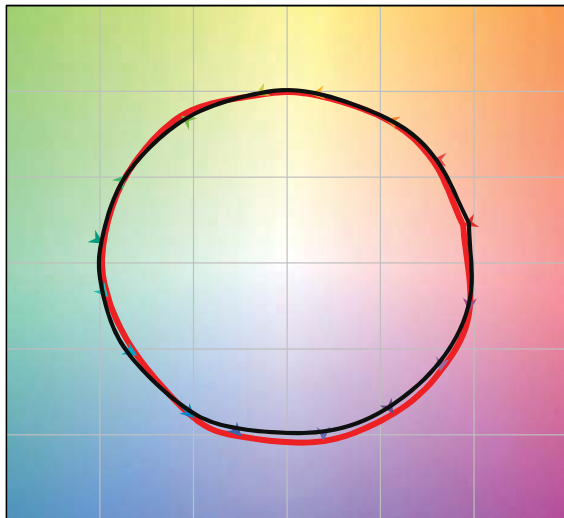
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R_f	90
R_g	101

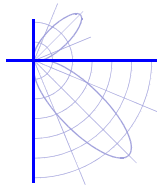


COLOR VECTOR GRAPHIC



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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