



Report of Test LLI-19070-3

LED Roadway Lighting - Roadway luminaire. Product ID: L 616S 5 X 3LM 5 X XX 4 XX X X X
Grey painted cast aluminum housing with no lens.
16 LEDs in 4 x 4 array with clear plastic sheet of individual lenses.
One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 1050ma.
Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	7468 lm	Min Power Factor	0.95 @ 277 V
Luminaire Power	58.3 W	Max THD(i)*	12.0 % @ 277 V
Luminous Efficacy	128.1 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3870 K	80-90° Zonal Flux %	1.4 %
CIE(x,y) 1931	(0.388, 0.384)	BUG Rating*	B2-U0-G2
CRI	71	Street Classification*	Type III Medium

PREPARED FOR : LED Roadway Lighting Ltd, Halifax. NS Canada



LightLab
INTERNATIONAL

LightLab International, LLC
Phoenix AZ 85085



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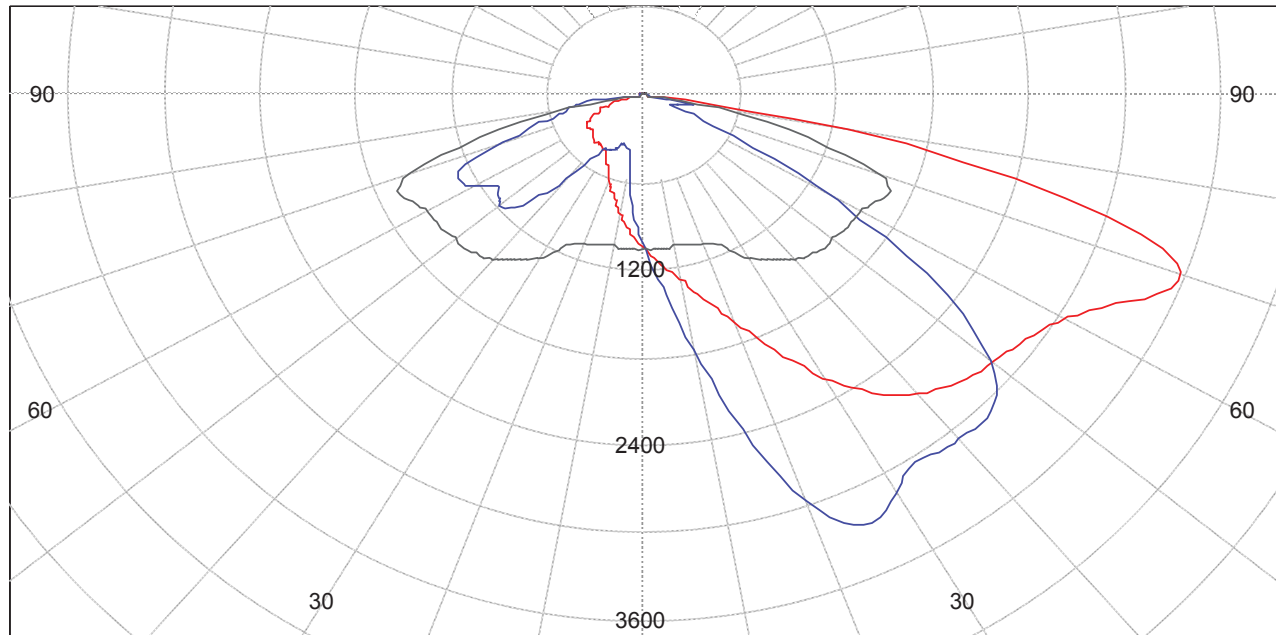
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Polar Light Distribution Curves



House side / L270

L90 / 270 - Black, Plane of maximum - Red, L0 / 180 - Blue (cd)

Street side / L90

Percentage Outputs

	Upward	Downward	Total
Street Side	0.0 %	76.3 %	76.3 %
House Side	0.0 %	23.7 %	23.7 %
	0.0 %	100.0 %	100.0 %

Report data based on absolute values as measured.

Signed:


Ryder Tunney
Authorized Signatory

Date of test
Date of report

27-Mar-2019
27-Mar-2019



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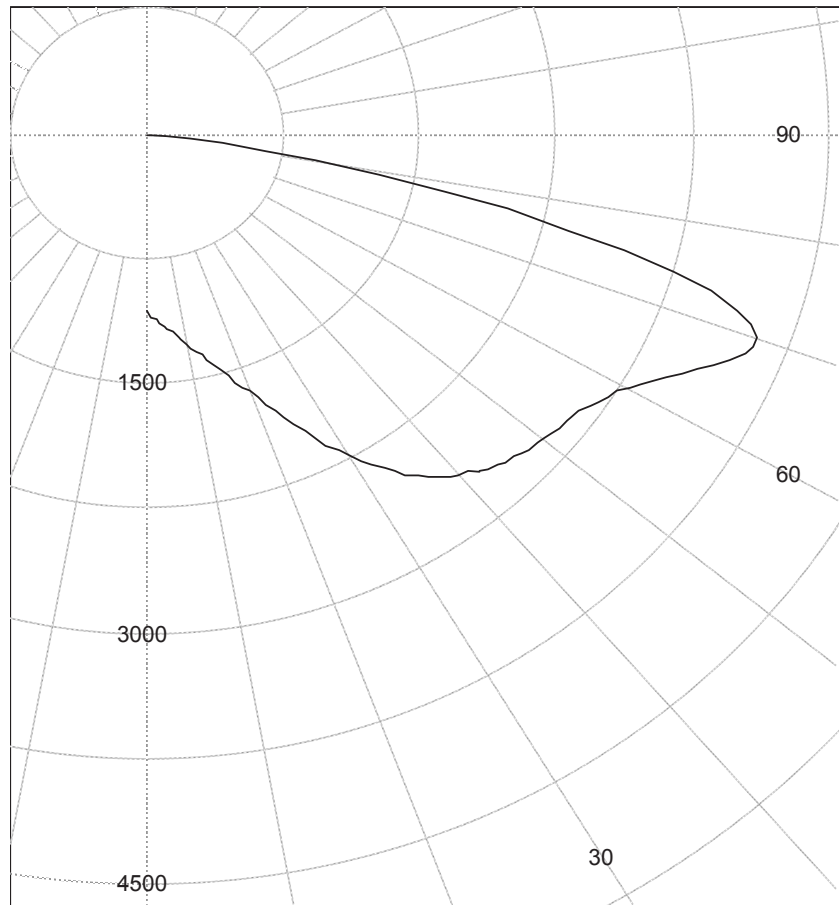
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Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1055.9
10.0	1278.3
20.0	1653.0
30.0	2233.7
35.0	2490.8
40.0	2669.7
45.0	2786.1
47.5	2824.6
50.0	2845.8
52.5	2872.9
55.0	2910.5
57.5	2970.8
60.0	3056.8
62.5	3181.5
65.0	3341.8
67.5	3516.1
70.0	3567.9
72.5	3331.8
75.0	2722.4
77.5	1856.3
80.0	949.2
82.5	336.2
85.0	31.3
87.5	4.1
90.0	0.0
92.5	0.0
95.0	0.0
97.5	0.0
100.0	0.0
102.5	0.0
105.0	0.0
120.0	0.0
135.0	0.0
150.0	0.0
165.0	0.0
180.0	0.0

Principal Vertical Plane



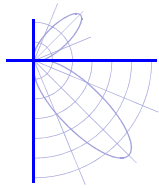
Plane of maximum intensity (cd)

House side max intensity
1672.6 cd @ (90.0°, 66.5°)

Street side max intensity
3574.3 cd @ (65.0°, 69.5°)

Coordinates expressed in the C Type coordinate system

Data for the two symmetric halves of the luminaire has been averaged.



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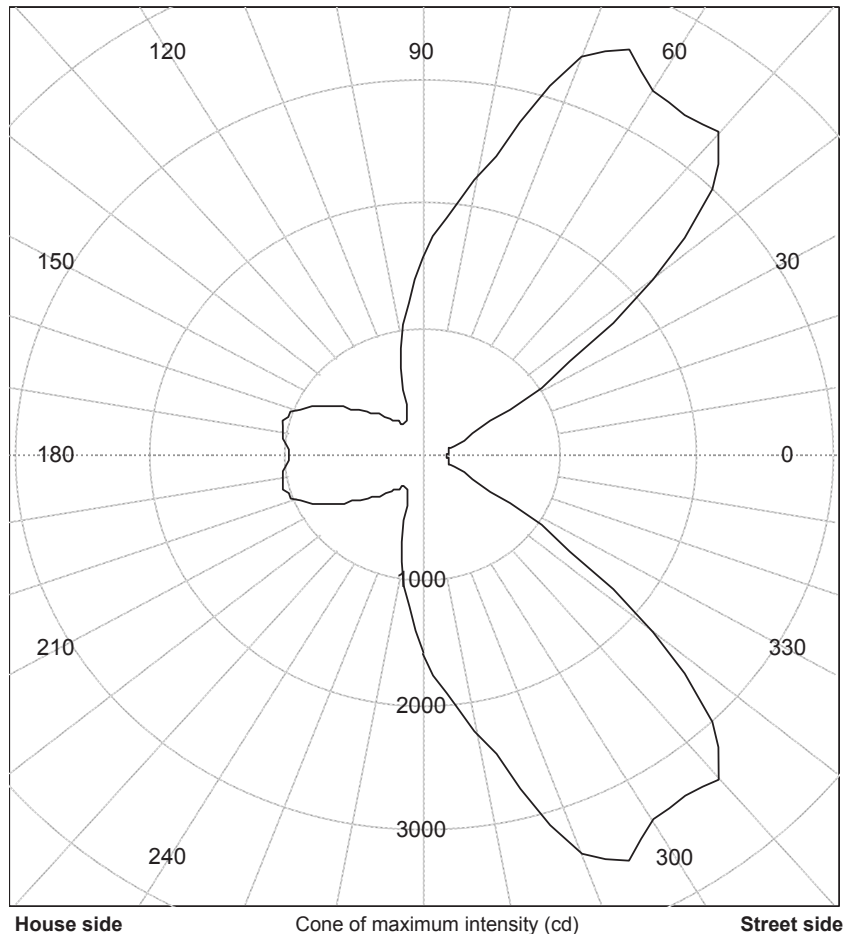
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Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V69.5) (cd)
0	175.6
15	192.0
30	733.8
40	2179.0
45	2992.1
50	3367.6
55	3318.8
60	3362.0
65	3574.3
70	3397.2
75	2756.6
80	2226.0
85	1898.2
90	1584.2
95	1230.3
100	869.7
105	545.2
110	353.1
115	290.3
120	286.2
125	321.8
130	380.9
135	453.9
140	539.1
150	761.8
165	1061.9
180	984.9

Principal Conical Surface



House side max intensity
1672.6 cd @ (90.0°, 66.5°)

Street side max intensity
3574.3 cd @ (65.0°, 69.5°)

Coordinates expressed in the C Type coordinate system

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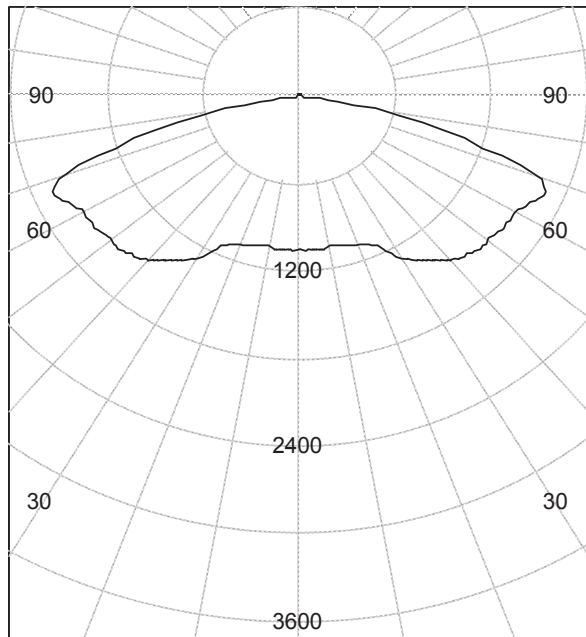
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Operating at 120v AC and 60 Hz.

Polar curve through L90 / L270

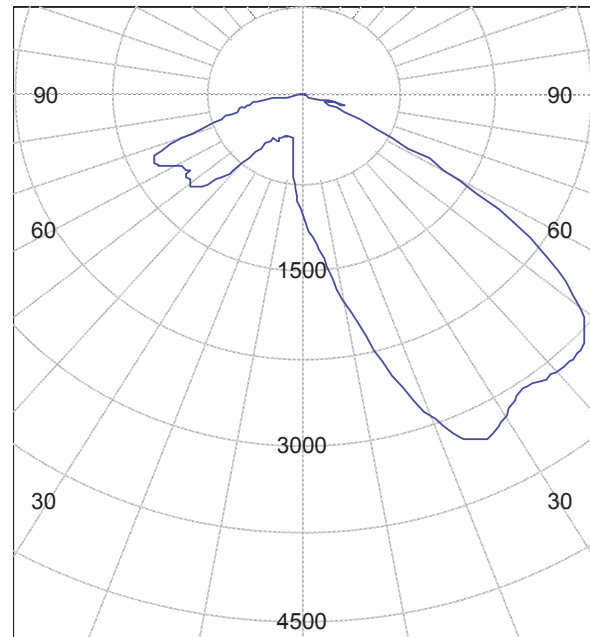


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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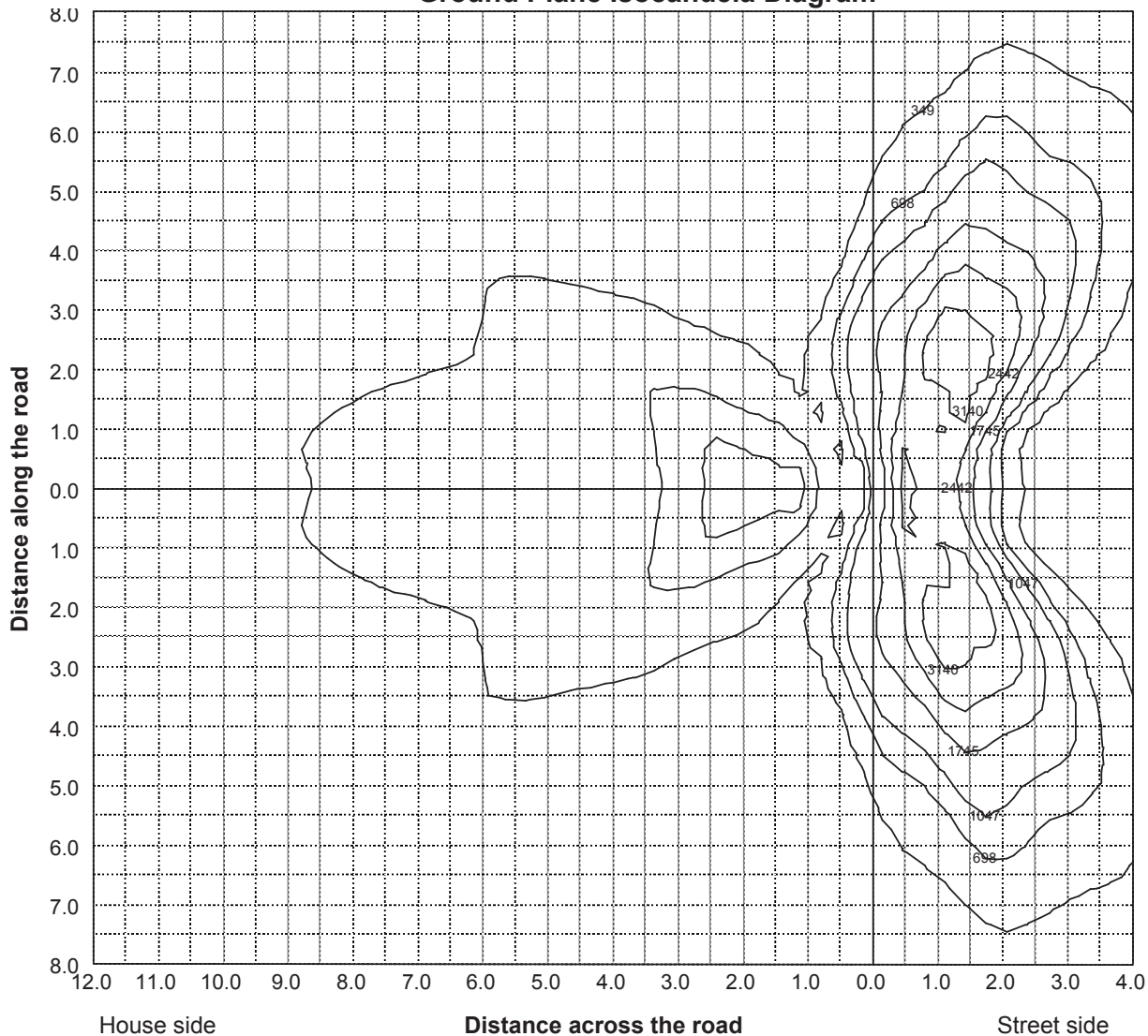
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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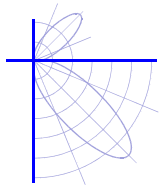
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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1056	1056	1056	1056	1056	1056	1056	1056	1056
10.0	1767	1725	1629	1540	1481	1428	1379	1327	1278
20.0	2959	2890	2697	2459	2298	2139	1972	1808	1653
30.0	3146	3131	3209	3181	3090	2948	2745	2497	2234
35.0	3032	3016	3140	3267	3243	3163	3009	2783	2491
40.0	3077	2991	3025	3212	3232	3230	3142	2953	2670
45.0	3064	3008	2960	3122	3170	3209	3179	3036	2786
47.5	2990	2970	2959	3079	3125	3186	3185	3067	2825
50.0	2826	2885	2992	3045	3081	3151	3181	3083	2846
52.5	2551	2716	3026	3055	3048	3108	3160	3101	2873
55.0	2156	2463	3015	3119	3061	3071	3129	3117	2911
57.5	1693	2036	2906	3237	3120	3065	3099	3133	2971
60.0	1250	1409	2680	3332	3218	3081	3079	3147	3057
62.5	853	879	2135	3307	3352	3153	3093	3200	3182
65.0	486	478	1503	3066	3372	3285	3174	3290	3342
67.5	302	286	1020	2680	3230	3377	3289	3383	3516
70.0	166	175	679	2038	2910	3354	3319	3341	3568
72.5	215	122	470	1396	2347	3067	3226	3074	3332
75.0	210	87	317	918	1585	2295	2722	2601	2722
77.5	314	56	211	537	821	1336	1811	1873	1856
80.0	156	36	83	226	398	625	894	943	949
82.5	13	14	22	69	116	176	285	352	336
85.0	4	4	5	6	8	13	21	33	31
87.5	2	2	2	2	2	3	3	4	4
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1056	1056	1056	1056	1056	1056	1056	1056	1056
10.0	1235	1190	1145	1101	1056	1011	965	921	875
20.0	1501	1372	1269	1179	1087	997	906	811	713
30.0	1983	1760	1563	1414	1278	1134	963	777	609
35.0	2187	1921	1696	1530	1386	1239	1064	851	624
40.0	2336	2040	1794	1617	1466	1314	1131	906	653
45.0	2444	2122	1861	1675	1520	1362	1168	933	664
47.5	2478	2144	1882	1689	1534	1374	1181	934	658
50.0	2508	2160	1897	1701	1535	1372	1169	922	648
52.5	2544	2188	1910	1713	1549	1372	1162	906	629
55.0	2590	2224	1931	1725	1557	1363	1153	895	623
57.5	2646	2270	1953	1734	1560	1363	1152	889	624
60.0	2734	2334	1992	1761	1574	1366	1143	869	611
62.5	2876	2439	2061	1809	1608	1380	1115	823	573
65.0	3057	2569	2150	1875	1654	1373	1045	764	525
67.5	3272	2715	2230	1932	1659	1307	969	688	435
70.0	3404	2740	2204	1870	1548	1193	828	491	332
72.5	3242	2524	1927	1609	1266	881	491	280	265
75.0	2747	2118	1520	1244	933	509	234	199	215
77.5	1969	1544	1009	807	551	225	118	136	157
80.0	1109	942	546	424	246	85	79	92	100
82.5	362	380	250	213	92	47	50	53	59
85.0	30	38	33	26	19	16	19	23	22
87.5	5	5	6	7	8	9	9	9	9
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1056	1056	1056	1056	1056	1056	1056	1056	1056
10.0	832	792	754	719	686	656	609	559	543
20.0	627	545	478	427	394	375	365	363	365
30.0	475	383	334	323	326	336	373	422	436
35.0	440	339	308	310	334	358	396	431	456
40.0	440	329	296	334	368	386	414	660	755
45.0	436	317	299	364	393	402	591	955	1057
47.5	432	313	308	371	397	441	691	1061	1151
50.0	424	308	318	373	405	490	763	1105	1175
52.5	413	303	323	376	435	534	807	1082	1146
55.0	411	301	327	376	463	581	845	1065	1106
57.5	414	308	336	385	486	619	857	1057	1153
60.0	407	319	340	395	508	633	853	1072	1232
62.5	391	322	332	397	522	626	826	1106	1291
65.0	370	313	320	394	516	608	787	1136	1290
67.5	324	296	319	388	489	572	769	1155	1170
70.0	283	284	321	378	445	530	761	1023	933
72.5	242	261	321	346	399	500	729	807	713
75.0	195	213	265	301	351	461	657	628	582
77.5	147	165	202	237	295	398	583	500	509
80.0	105	119	145	168	223	300	456	407	452
82.5	68	78	93	107	152	205	312	337	384
85.0	29	36	41	46	59	97	145	215	241
87.5	9	10	11	12	14	16	20	25	28
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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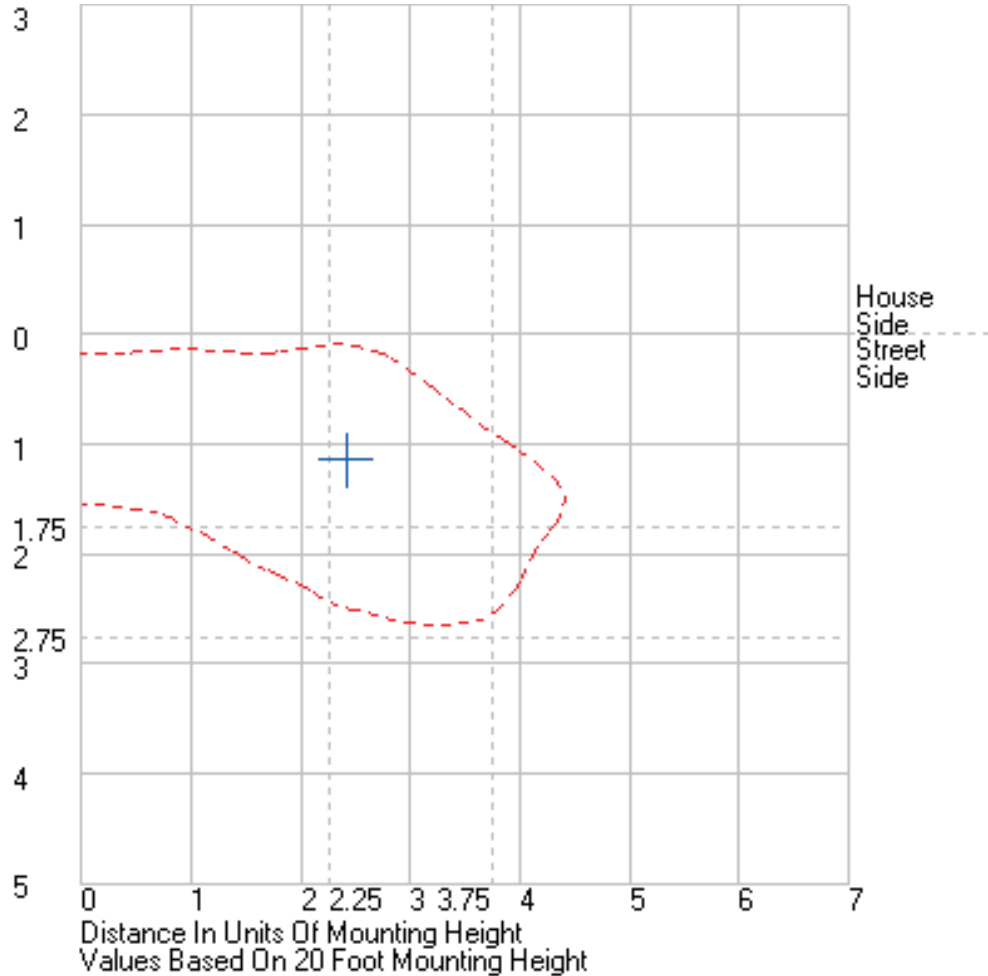
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.388, 0.384)
	CIE 1976 (u', v') ⁽¹⁾	(0.227, 0.506)
	Correlated Color Temperature (CCT) ⁽¹⁾	3870 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	3.75E-03
	Color Rendering Index (Ra) ⁽¹⁾	70.8
	Special CRI 9 (R ₉) ^{(1),(3)}	-37.5
	Distance from Planckian Locus (Duv) ^{(1),(3)}	1.55E-03
	Scotopic/Photopic Ratio ^{(1),(3)}	1.47

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.488 A	
	Power	58.3 W	
	Power Factor	1.00	
	Current THD	5.2 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.214 A	
	Power	56.3 W	
	Power Factor	0.95	
	Current THD	12 %	

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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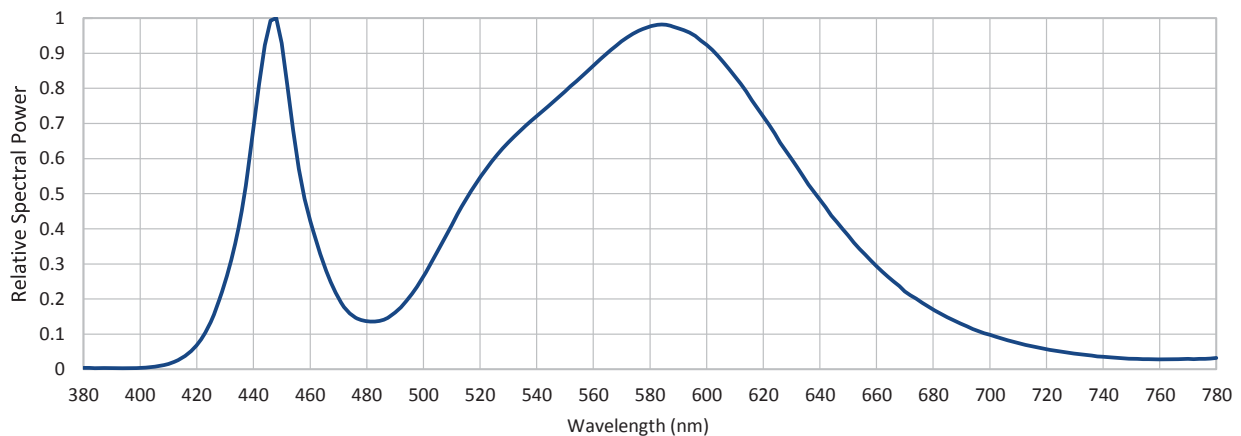
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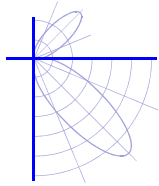
LM-79 Performance Data

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	0.422	540	0.721	620	0.720	700	0.098
385	0.003	465	0.296	545	0.755	625	0.659	705	0.085
390	0.003	470	0.202	550	0.791	630	0.599	710	0.075
395	0.003	475	0.153	555	0.828	635	0.538	715	0.065
400	0.004	480	0.137	560	0.865	640	0.483	720	0.057
405	0.007	485	0.139	565	0.901	645	0.429	725	0.050
410	0.015	490	0.162	570	0.934	650	0.381	730	0.044
415	0.034	495	0.205	575	0.959	655	0.334	735	0.040
420	0.069	500	0.265	580	0.976	660	0.294	740	0.036
425	0.139	505	0.336	585	0.981	665	0.257	745	0.033
430	0.248	510	0.410	590	0.971	670	0.222	750	0.030
435	0.417	515	0.483	595	0.954	675	0.196	755	0.029
440	0.686	520	0.546	600	0.924	680	0.170	760	0.028
445	0.958	525	0.601	605	0.883	685	0.148	765	0.029
450	0.929	530	0.646	610	0.834	690	0.129	770	0.030
455	0.626	535	0.685	615	0.779	695	0.112	775	0.030
								780	0.032





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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, 0.506)	(0.227, 0.506)
10.0	(0.227, 0.506)	(0.228, 0.509)
20.0	(0.227, 0.507)	(0.226, 0.503)
30.0	(0.228, 0.509)	(0.226, 0.506)
40.0	(0.228, 0.508)	(0.228, 0.508)
50.0	(0.227, 0.507)	(0.225, 0.503)
60.0	(0.227, 0.506)	(0.227, 0.507)
70.0	(0.226, 0.504)	I <= 10% peak
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 / 3.25 hours

Equipment and uncertainties

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

Luminous Intensity ± 4 %
Luminous Flux ± 4 %
Horiz., Vert. Angles ± 0.25°

Temperature ± 1 °C
Luminous Efficacy ± 4.5 %

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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Test Report No. LLI-19070-3

LED Roadway Lighting - Roadway luminaire. Product ID: L 616S 5 X 3LM 5 X XX 4 XX X X X

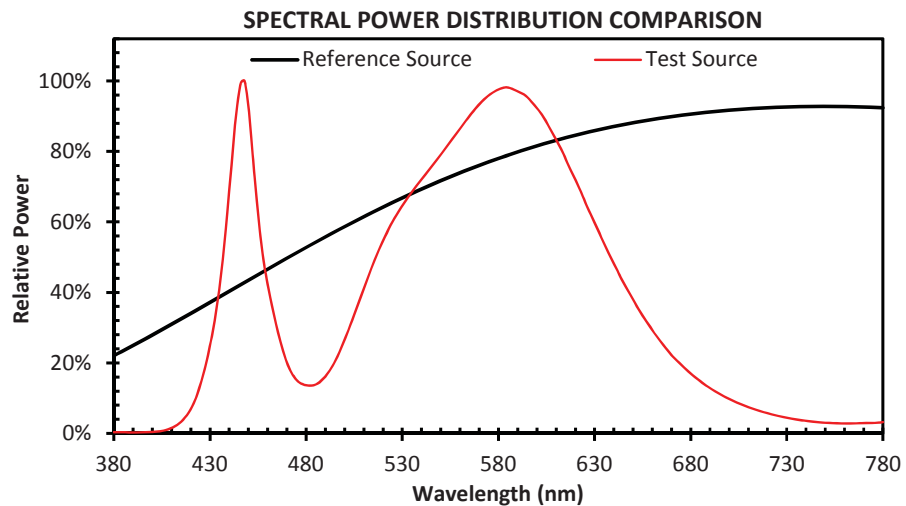
Grey painted cast aluminum housing with no lens.

16 LEDs in 4 x 4 array with clear plastic sheet of individual lenses.

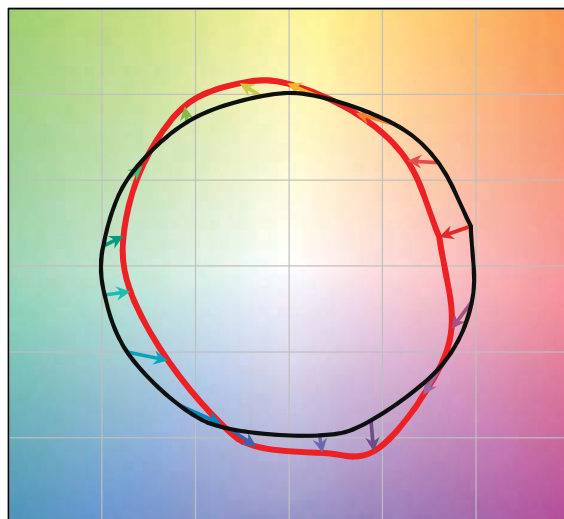
One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 1050ma.

Operating at 120v AC and 60 Hz.

R_f	70
R_g	94



COLOR VECTOR GRAPHIC



— Test Source

→ Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-19070-3

LED Roadway Lighting - Roadway luminaire. Product ID: L 616S 5 X 3LM 5 X XX 4 XX X X X

Grey painted cast aluminum housing with no lens.

16 LEDs in 4 x 4 array with clear plastic sheet of individual lenses.

One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 1050ma.

Operating at 120v AC and 60 Hz.

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 IESNA Type C coordinate system (L, V) as defined in IESNA publication LM-75.

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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.