



Report of Test LLI-19070-4

LED Roadway Lighting - Roadway luminaire. Product ID: L 616S 5 X G3M 5 X XX 4 XX X X X
Grey painted cast aluminum housing with clear flat glass 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	7098 lm	Min Power Factor	0.95 @ 277 V
Luminaire Power	58.3 W	Max THD(i)*	10.0 % @ 277 V
Luminous Efficacy	121.7 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3890 K	80-90° Zonal Flux %	0.9 %
CIE(x,y) 1931	(0.387, 0.385)	BUG Rating*	B2-U0-G2
CRI	71	Street Classification*	Type II Very Short

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



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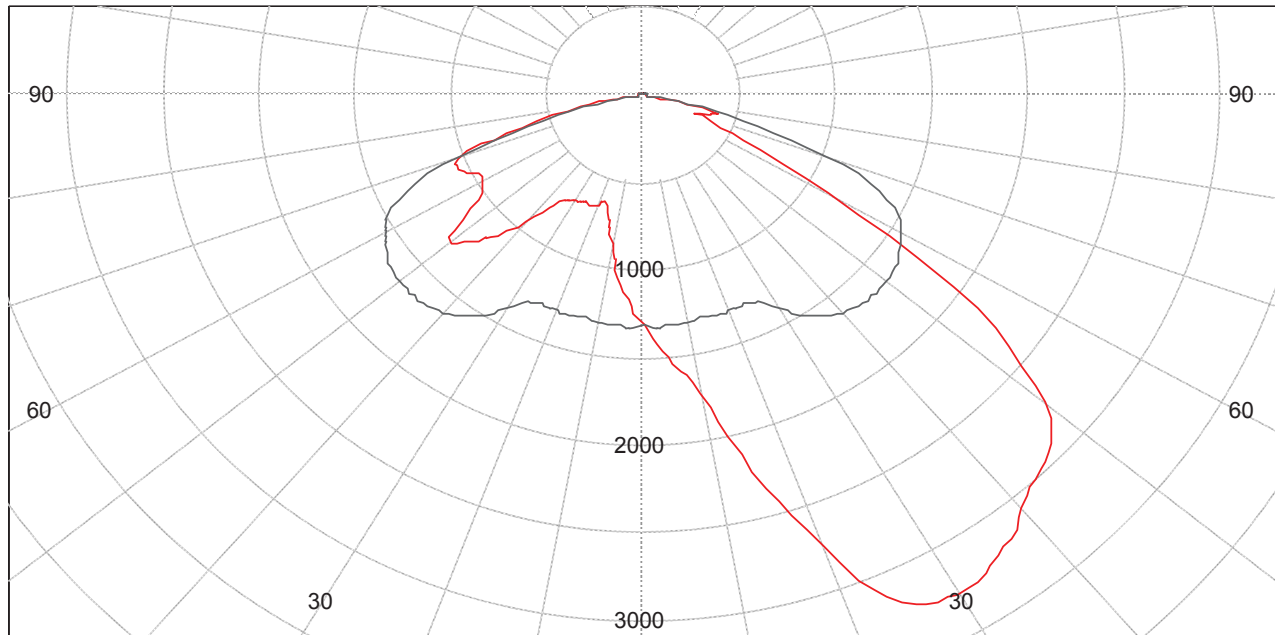
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Polar Light Distribution Curves



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 %	72.8 %	72.8 %
House Side	0.0 %	27.2 %	27.2 %
	0.0 %	100.0 %	100.0 %

Report data based on absolute values as measured.

Signed:

Ryder Tunney
Ryder Tunney
Authorized Signatory

Date of test
Date of report

27-Mar-2019
28-Mar-2019



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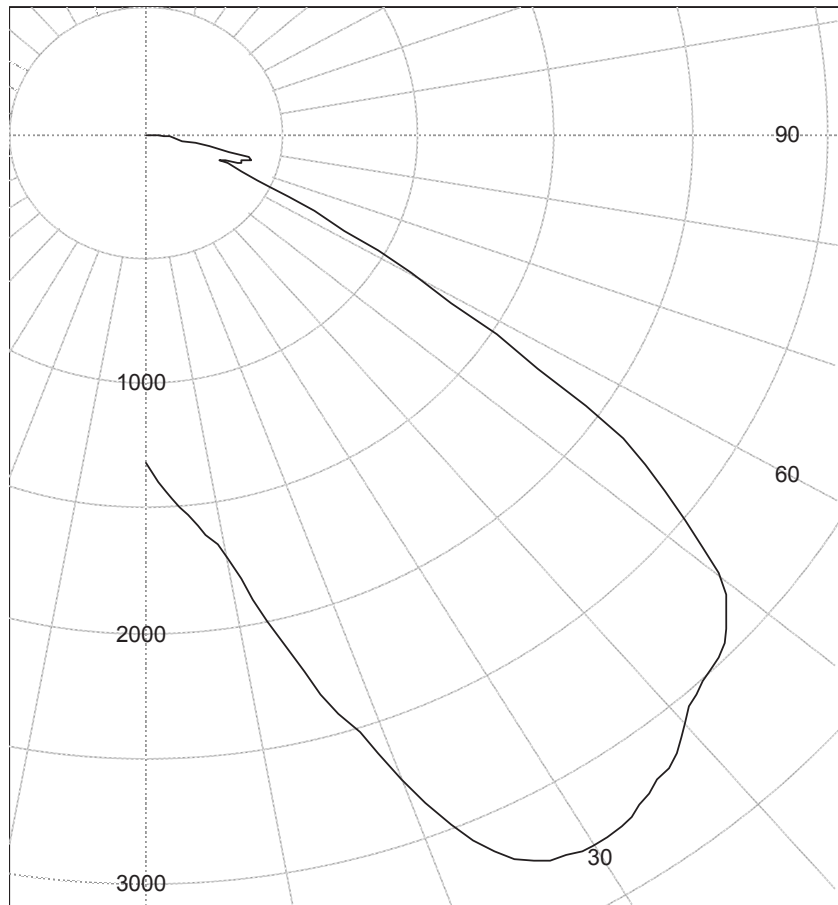
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Operating at 120v AC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1319.3
10.0	1727.5
20.0	2745.2
30.0	3287.0
35.0	3213.8
40.0	3071.0
45.0	2961.7
47.5	2882.9
50.0	2737.3
52.5	2445.8
55.0	2129.5
57.5	1616.6
60.0	1125.2
62.5	756.7
65.0	507.0
67.5	350.7
70.0	309.0
72.5	364.0
75.0	393.9
77.5	212.1
80.0	90.3
82.5	38.1
85.0	8.4
87.5	1.0
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
1659.4 cd @ (90.0°, 47.5°)

Street side max intensity
3287.7 cd @ (0.0°, 29.5°)

Coordinates expressed in the C Type coordinate system

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



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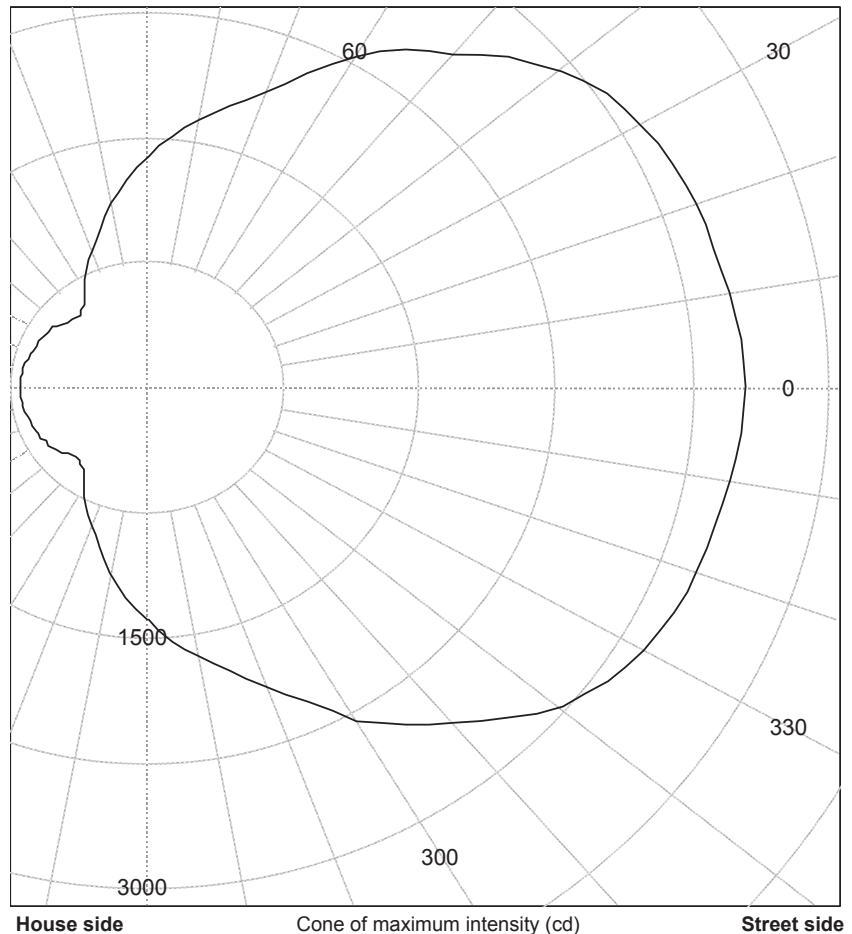
One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 1050ma.

Operating at 120v AC and 60 Hz.

Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V29.5) (cd)
0	3287.7
15	3228.7
30	3144.1
40	2964.9
45	2804.5
50	2618.6
55	2470.8
60	2299.7
65	2079.2
70	1890.7
75	1751.4
80	1629.8
85	1517.0
90	1391.9
95	1254.3
100	1124.1
105	988.1
110	877.5
115	780.7
120	681.9
125	601.2
130	565.3
135	569.4
140	595.2
150	637.9
165	677.2
180	696.2

Principal Conical Surface



House side max intensity
1659.4 cd @ (90.0°, 47.5°)

Street side max intensity
3287.7 cd @ (0.0°, 29.5°)

Coordinates expressed in the C Type coordinate system

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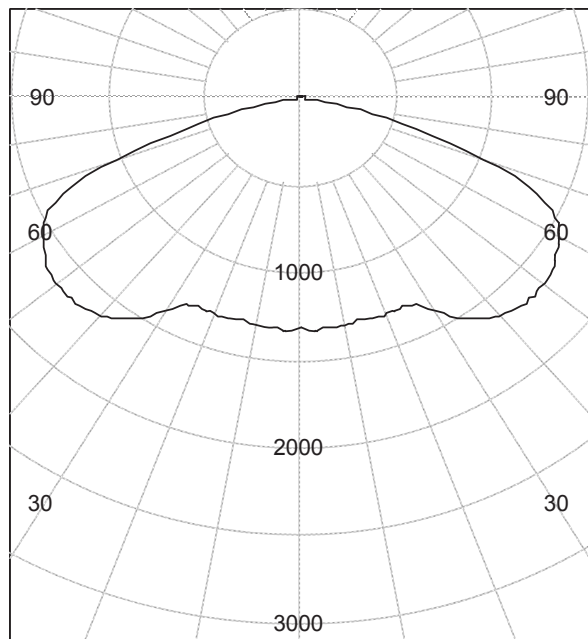
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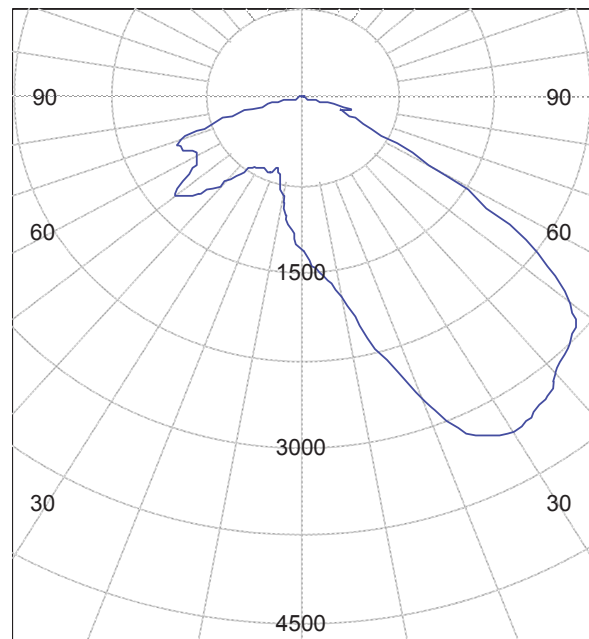
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Polar curve through L90 / L270



(L90) (cd) (L270)

Polar curve through L0 / L180



House side (L180) (cd) Street side (L0)



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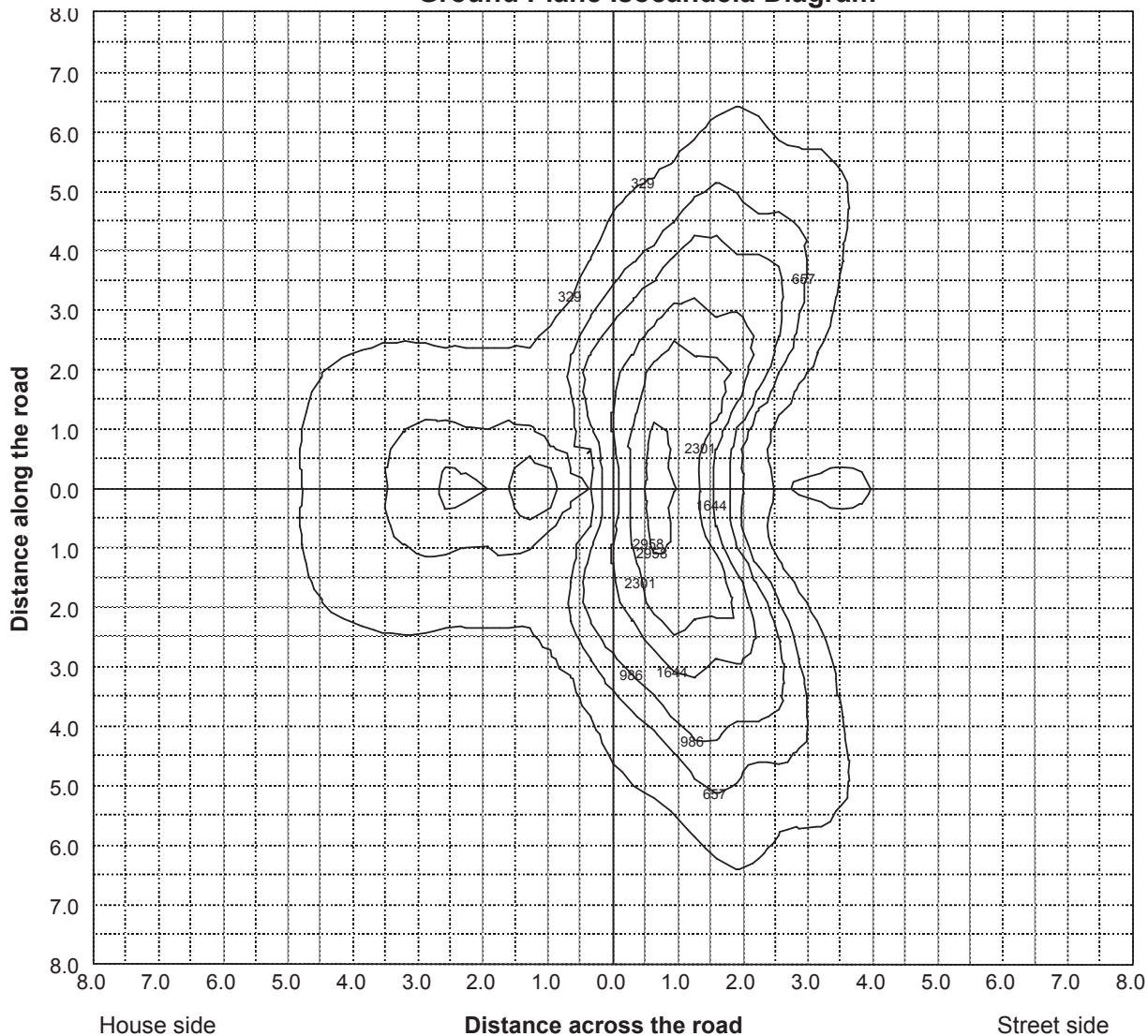
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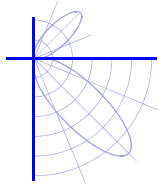
Operating at 120v AC and 60 Hz.

Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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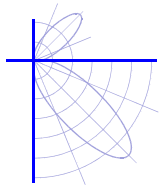
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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1319	1319	1319	1319	1319	1319	1319	1319	1319
10.0	1727	1698	1653	1611	1586	1561	1534	1504	1470
20.0	2745	2639	2463	2289	2156	2017	1891	1760	1658
30.0	3287	3231	3159	2995	2842	2652	2499	2332	2105
35.0	3214	3182	3208	3190	3118	2998	2796	2592	2377
40.0	3071	3031	3083	3197	3186	3145	3021	2796	2561
45.0	2962	2909	2925	3098	3124	3134	3095	2955	2698
47.5	2883	2839	2872	3021	3062	3095	3087	2986	2745
50.0	2737	2729	2837	2958	2987	3040	3063	2990	2762
52.5	2446	2528	2813	2918	2925	2970	3021	2978	2784
55.0	2130	2241	2749	2912	2877	2887	2945	2954	2807
57.5	1617	1863	2570	2946	2847	2811	2862	2922	2827
60.0	1125	1299	2244	2959	2869	2749	2767	2865	2833
62.5	757	841	1775	2846	2880	2706	2668	2785	2821
65.0	507	504	1204	2538	2793	2673	2562	2664	2765
67.5	351	339	790	2076	2564	2630	2439	2452	2585
70.0	309	241	507	1466	2138	2482	2222	2084	2239
72.5	364	195	337	899	1485	1980	1978	1708	1813
75.0	394	133	225	534	903	1323	1562	1375	1354
77.5	212	87	144	293	445	717	1016	990	902
80.0	90	45	73	134	197	304	481	554	462
82.5	38	22	32	55	80	117	163	181	168
85.0	8	9	11	14	18	24	36	43	41
87.5	1	1	2	2	2	3	3	4	5
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	1319	1319	1319	1319	1319	1319	1319	1319	1319
10.0	1439	1410	1377	1347	1315	1282	1248	1211	1177
20.0	1579	1505	1438	1375	1311	1245	1174	1096	1017
30.0	1915	1770	1647	1535	1408	1266	1126	986	871
35.0	2129	1933	1785	1660	1535	1401	1227	999	833
40.0	2306	2076	1898	1753	1618	1480	1306	1086	836
45.0	2425	2163	1963	1800	1654	1507	1334	1117	869
47.5	2460	2187	1976	1810	1659	1506	1326	1113	859
50.0	2484	2198	1975	1803	1653	1499	1315	1095	837
52.5	2512	2208	1967	1791	1642	1485	1304	1075	811
55.0	2537	2215	1955	1769	1616	1456	1279	1048	782
57.5	2557	2223	1936	1743	1584	1421	1241	1011	752
60.0	2589	2235	1931	1716	1552	1385	1197	967	715
62.5	2613	2243	1911	1680	1503	1339	1145	897	659
65.0	2587	2191	1827	1577	1402	1240	1014	788	575
67.5	2448	2053	1669	1434	1244	1027	821	633	456
70.0	2213	1836	1462	1237	1009	799	611	442	361
72.5	1865	1526	1159	958	762	583	386	280	283
75.0	1465	1210	856	687	544	362	220	199	218
77.5	1019	862	571	446	350	189	132	142	153
80.0	558	508	314	246	185	93	84	89	92
82.5	181	191	128	110	72	43	47	51	52
85.0	36	38	32	34	25	20	20	21	21
87.5	6	6	7	8	8	7	7	7	6
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

RT



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Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1319	1319	1319	1319	1319	1319	1319	1319	1319
10.0	1147	1116	1088	1059	1030	1008	967	924	909
20.0	942	872	814	757	707	669	635	646	659
30.0	772	673	594	561	569	598	635	679	698
35.0	699	597	545	548	587	603	630	711	750
40.0	649	549	532	572	586	603	652	856	944
45.0	616	524	538	565	583	608	702	1047	1163
47.5	610	517	542	560	580	608	741	1112	1234
50.0	593	510	535	554	575	604	777	1157	1307
52.5	572	500	521	545	567	602	807	1144	1219
55.0	559	494	505	533	560	614	836	1004	1046
57.5	543	482	487	516	551	625	823	904	982
60.0	521	469	465	495	538	628	767	851	958
62.5	487	446	440	467	522	618	712	809	984
65.0	439	412	418	434	499	574	650	805	1029
67.5	380	367	386	403	461	517	585	849	1056
70.0	320	320	346	365	409	456	559	847	966
72.5	267	266	294	318	345	394	528	727	775
75.0	211	207	227	248	278	334	448	569	571
77.5	150	153	164	183	212	261	335	385	368
80.0	97	102	113	125	147	177	225	249	237
82.5	53	57	65	73	86	107	145	156	147
85.0	23	25	29	34	42	50	77	84	80
87.5	6	6	7	9	11	13	18	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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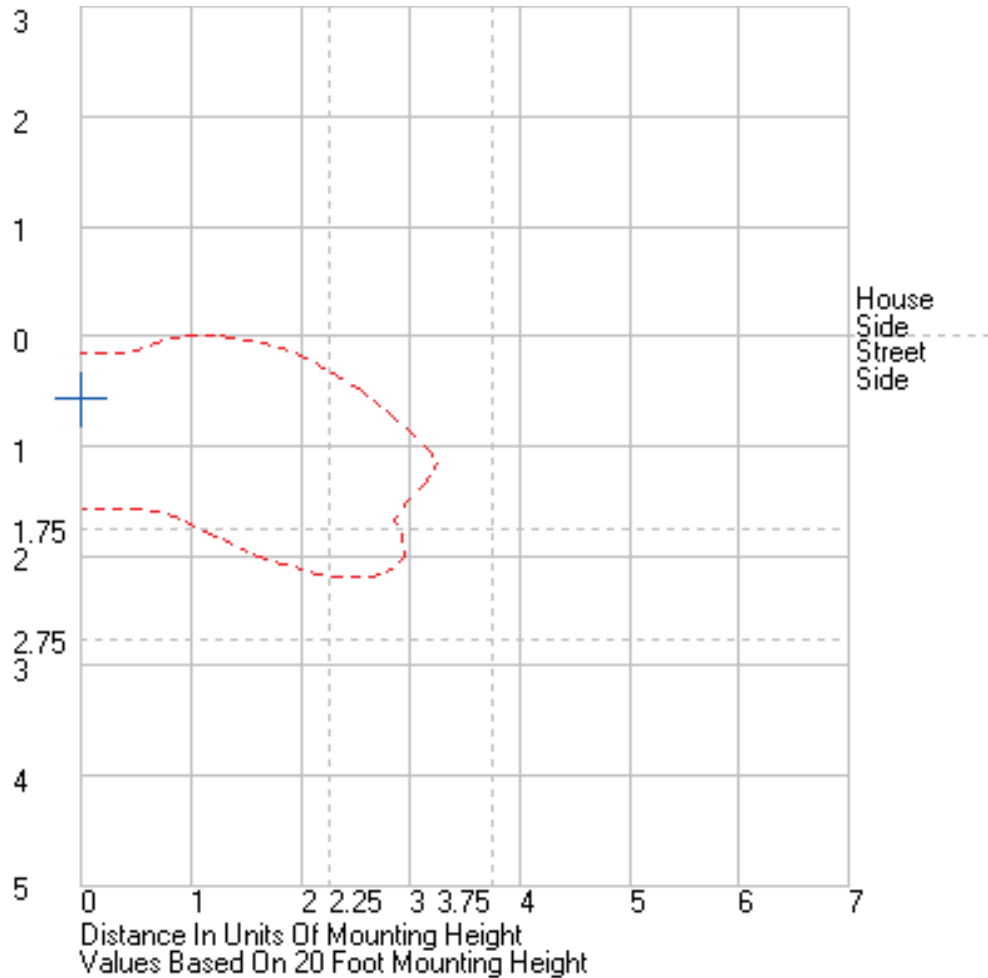
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.387, 0.385)
	CIE 1976 (u', v') ⁽¹⁾	(0.226, 0.506)
	Correlated Color Temperature (CCT) ⁽¹⁾	3890 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.51E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.0
	Special CRI 9 (R ₉) ^{(1),(3)}	-36.7
	Distance from Planckian Locus (Duv) ^{(1),(3)}	1.92E-03
	Scotopic/Photopic Ratio ^{(1),(3)}	1.48

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	4.6 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.214 A	
	Power	56.3 W	
	Power Factor	0.95	
	Current THD	10 %	

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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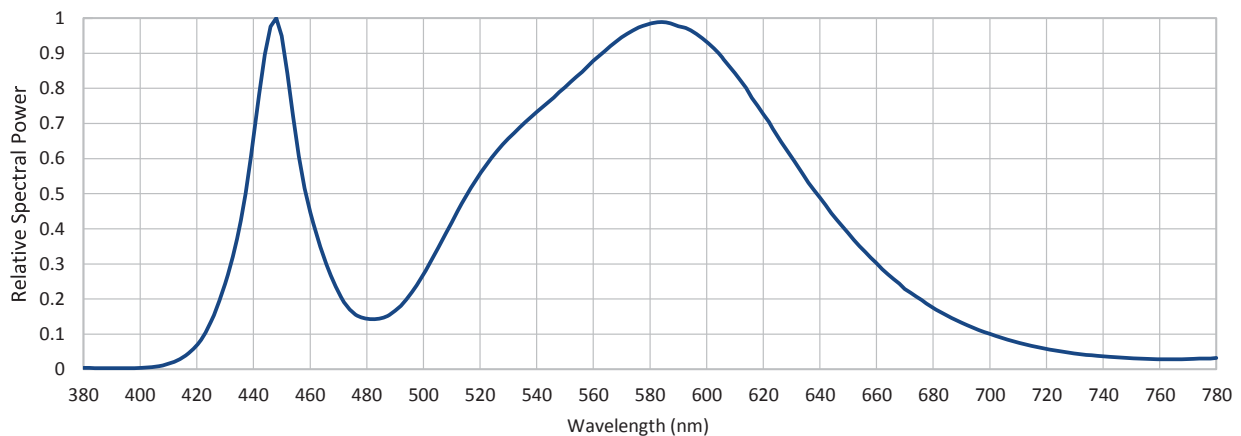
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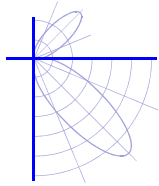
LM-79 Performance Data

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	0.447	540	0.733	620	0.727	700	0.101
385	0.003	465	0.317	545	0.767	625	0.665	705	0.087
390	0.003	470	0.218	550	0.803	630	0.604	710	0.076
395	0.003	475	0.163	555	0.840	635	0.543	715	0.066
400	0.004	480	0.144	560	0.878	640	0.489	720	0.058
405	0.007	485	0.146	565	0.913	645	0.435	725	0.051
410	0.016	490	0.167	570	0.945	650	0.388	730	0.045
415	0.034	495	0.209	575	0.969	655	0.342	735	0.040
420	0.068	500	0.271	580	0.984	660	0.302	740	0.037
425	0.137	505	0.342	585	0.988	665	0.264	745	0.034
430	0.243	510	0.418	590	0.977	670	0.229	750	0.032
435	0.405	515	0.492	595	0.962	675	0.202	755	0.030
440	0.659	520	0.556	600	0.932	680	0.175	760	0.029
445	0.936	525	0.612	605	0.893	685	0.153	765	0.028
450	0.949	530	0.657	610	0.843	690	0.133	770	0.029
455	0.663	535	0.697	615	0.787	695	0.115	775	0.031
								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	(0.226, 0.505)	(0.226, 0.506)
10.0	(0.226, 0.505)	(0.227, 0.508)
20.0	(0.226, 0.506)	(0.226, 0.505)
30.0	(0.227, 0.508)	(0.226, 0.505)
40.0	(0.227, 0.509)	(0.227, 0.507)
50.0	(0.226, 0.506)	(0.226, 0.505)
60.0	(0.227, 0.506)	(0.225, 0.505)
70.0	(0.227, 0.507)	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
-	-	-
-	-	-
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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 3.25 / 5.5 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
CIE (u', v') coordinates ± 0.002
Spatial Δ (u', v') uniformity ± 0.001
Rel. Spectral Irradiance * ± 2 %
Duv * ± 5E-04

CCT ± 100 K
CRI (Ra) ± 2
Scotopic / Photopic Ratio * ± 0.02
R9 * ± 2

Yokogawa WT210 power meter connected in circuit to the sample electrical supply

Voltage ± 0.5 %
Current ± 0.5 %
Current THD * ± 3 %
Frequency * ± 0.1 Hz
Power ± 0.5 %
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)

Page 14 of 16 *RT*



Test Report No. LLI-19070-4

LED Roadway Lighting - Roadway luminaire. Product ID: L 616S 5 X G3M 5 X XX 4 XX X X X

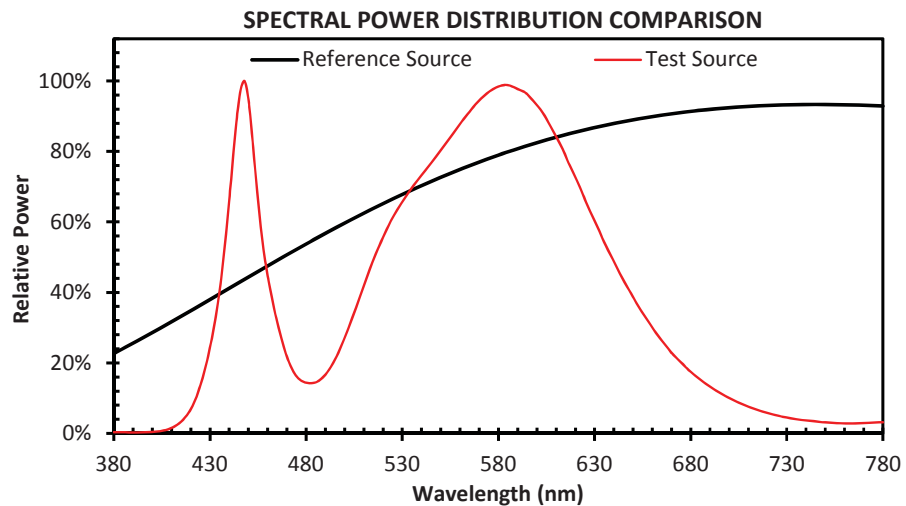
Grey painted cast aluminum housing with clear flat glass lens.

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

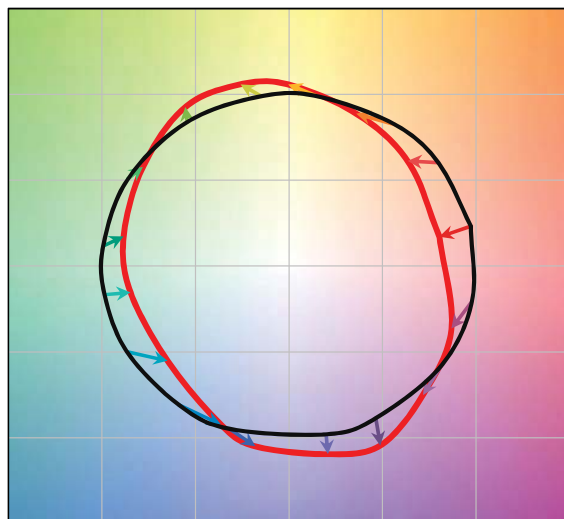
One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 1050ma.

Operating at 120v AC and 60 Hz.

R_f	71
R_g	94



COLOR VECTOR GRAPHIC



— Test Source

— Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-19070-4

LED Roadway Lighting - Roadway luminaire. Product ID: L 616S 5 X G3M 5 X XX 4 XX X X X
Grey painted cast aluminum housing with clear flat glass 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.