



Report of Test LLI-19038-10

LED Roadway Lighting - Roadway luminaire. Product ID: L 616S 5 X G2S 4 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 900ma.

Operating at 120 VAC and 60 Hz.



Performance Summary

Total Light Output	6361 lm	Min Power Factor	0.93 @ 277 V
Luminaire Power	49.6 W	Max THD(i)*	12.0 % @ 277 V
Luminous Efficacy	128.2 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3860 K	80-90° Zonal Flux %	1.0 %
CIE(x,y) 1931	(0.388, 0.386)	BUG Rating*	B2-U0-G1
CRI	71	Street Classification*	Type II Short

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



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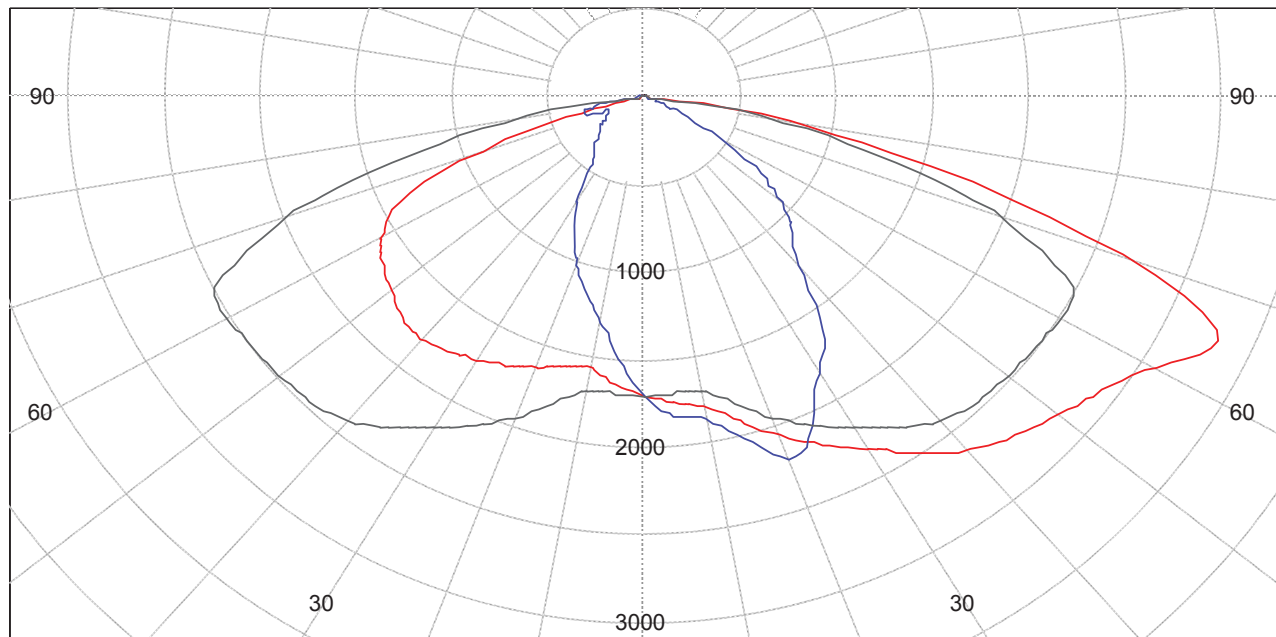
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Polar Light Distribution Curves



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 %	65.5 %	65.5 %
House Side	0.0 %	34.5 %	34.5 %
	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

15-Feb-2019
18-Feb-2019



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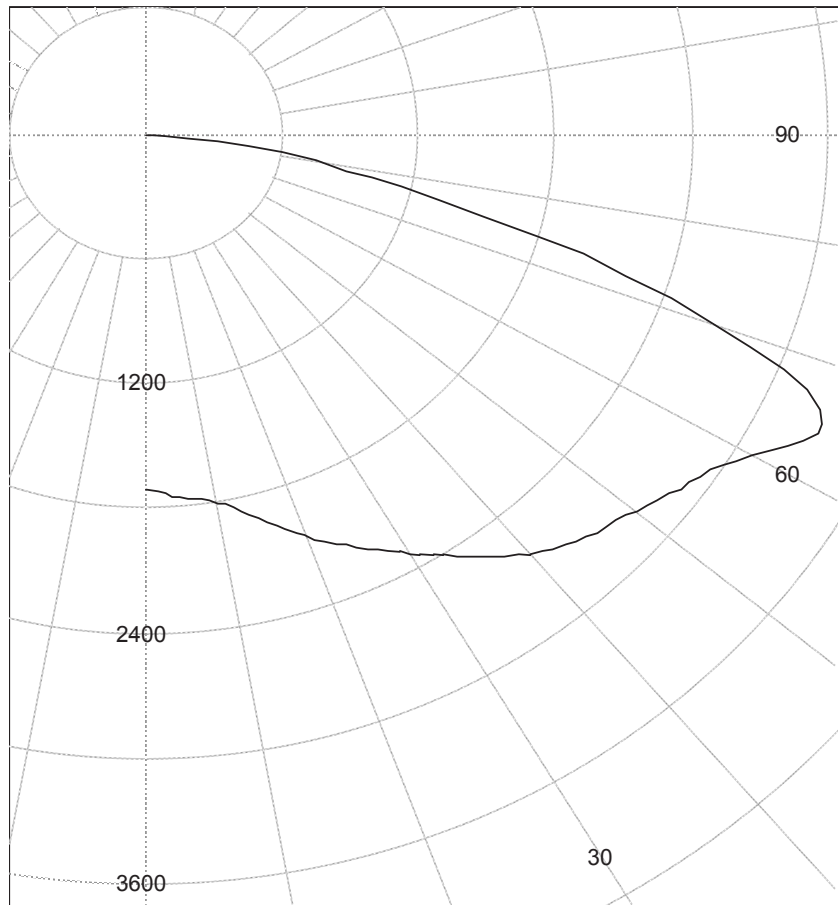
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Operating at 120 VAC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1705.7
10.0	1796.5
20.0	2053.3
30.0	2323.3
35.0	2475.5
40.0	2628.7
45.0	2733.8
47.5	2769.8
50.0	2821.2
52.5	2867.7
55.0	2915.0
57.5	2978.2
60.0	3083.7
62.5	3213.9
65.0	3289.2
67.5	3098.8
70.0	2646.6
72.5	2117.8
75.0	1540.5
77.5	1089.2
80.0	769.7
82.5	384.2
85.0	98.5
87.5	6.5
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
2519.0 cd @ (90.0°, 61.5°)

Street side max intensity
3292.7 cd @ (72.5°, 64.5°)

Coordinates expressed in the C Type coordinate system

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



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Grey painted cast aluminum housing with clear flat glass lens.

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

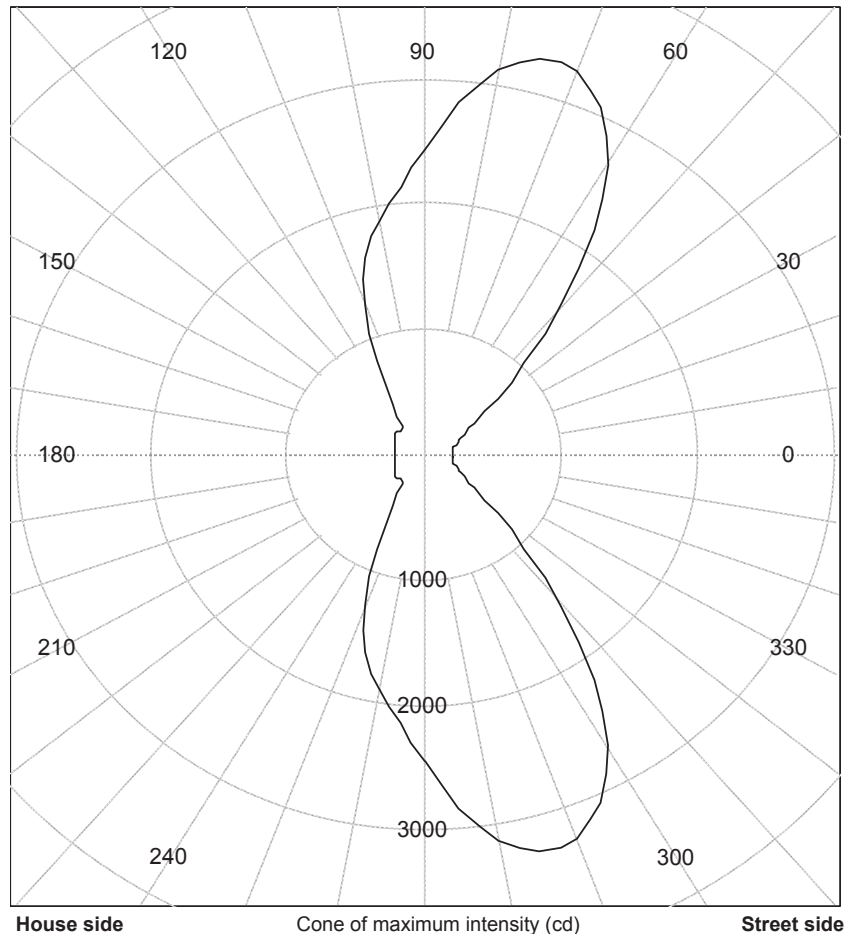
One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 900ma.

Operating at 120 VAC and 60 Hz.

Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V64.5) (cd)
0	203.3
15	219.1
30	322.9
40	691.7
45	1040.8
50	1551.6
55	2180.8
60	2683.7
65	3066.5
70	3256.4
75	3280.9
80	3134.2
85	2823.2
90	2453.8
95	2150.9
100	1906.9
105	1645.9
110	1265.9
115	835.4
120	459.4
125	278.9
130	263.8
135	278.1
140	275.8
150	249.5
165	231.2
180	210.5

Principal Conical Surface



House side

Cone of maximum intensity (cd)

Street side

House side max intensity
2519.0 cd @ (90.0°, 61.5°)

Street side max intensity
3292.7 cd @ (72.5°, 64.5°)

Coordinates expressed in the C Type coordinate system

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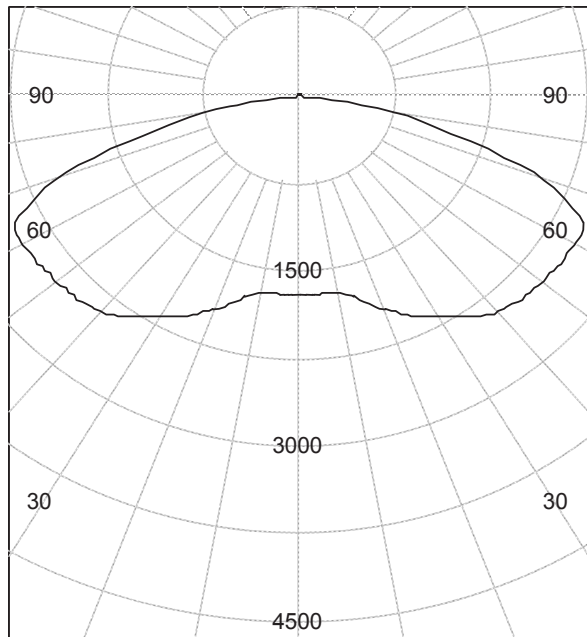
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Operating at 120 VAC and 60 Hz.

Polar curve through L90 / L270

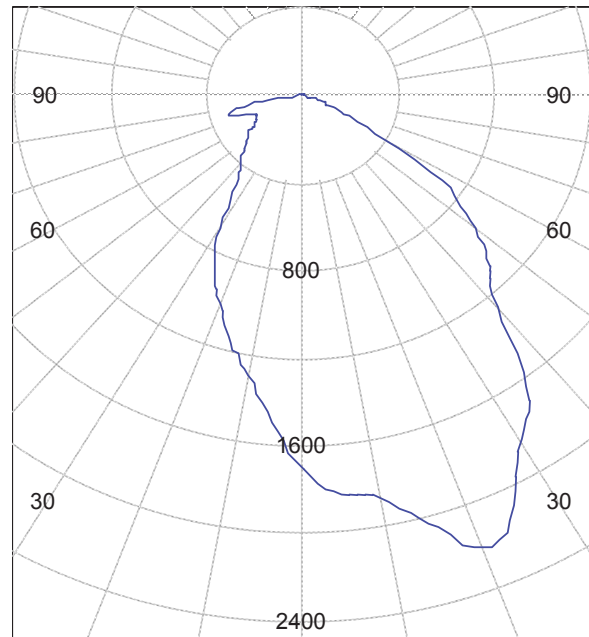


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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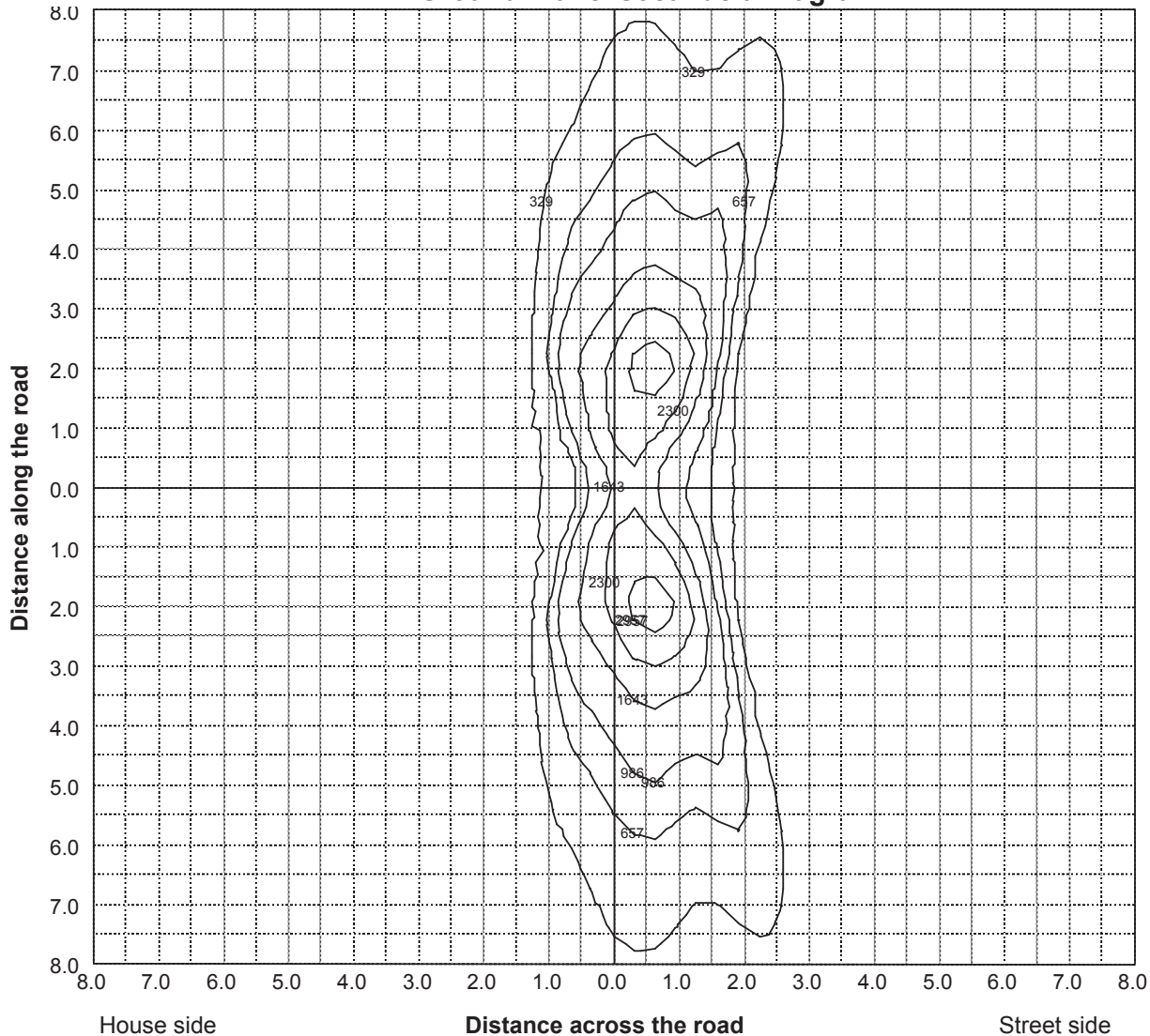
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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Operating at 120 VAC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1706	1706	1706	1706	1706	1706	1706	1706	1706
10.0	1866	1849	1833	1824	1821	1822	1820	1820	1812
20.0	2195	2176	2128	2091	2078	2070	2057	2050	2047
30.0	1814	1851	2071	2321	2408	2445	2418	2375	2350
35.0	1622	1684	1875	2141	2310	2465	2553	2554	2508
40.0	1251	1389	1698	1977	2153	2356	2552	2672	2680
45.0	1092	1166	1470	1831	2037	2264	2486	2673	2768
47.5	1025	1102	1382	1767	1986	2230	2451	2645	2771
50.0	938	1009	1318	1710	1961	2212	2429	2621	2775
52.5	843	901	1235	1634	1933	2193	2419	2626	2795
55.0	746	784	1108	1539	1878	2159	2403	2615	2795
57.5	597	648	951	1397	1753	2129	2426	2654	2834
60.0	401	461	759	1207	1547	2015	2424	2730	2932
62.5	273	319	504	978	1309	1802	2321	2751	3043
65.0	192	205	287	616	959	1474	2134	2659	3056
67.5	140	156	177	304	553	993	1748	2419	2825
70.0	105	124	146	152	250	520	1162	1921	2388
72.5	83	97	118	120	129	215	517	1289	1836
75.0	66	76	86	94	96	113	153	708	1335
77.5	56	65	59	71	71	74	87	242	801
80.0	38	47	39	46	48	49	56	76	386
82.5	20	26	23	27	28	31	33	40	135
85.0	10	11	12	13	14	15	17	19	34
87.5	2	3	3	3	3	4	4	5	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



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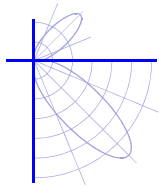
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Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1706	1706	1706	1706	1706	1706	1706	1706	1706
10.0	1804	1790	1768	1741	1709	1680	1650	1601	1558
20.0	2050	2052	2039	2001	1946	1881	1785	1695	1599
30.0	2331	2319	2311	2263	2186	2073	1948	1811	1680
35.0	2484	2466	2447	2387	2304	2175	2022	1865	1712
40.0	2642	2613	2575	2500	2409	2262	2080	1906	1730
45.0	2748	2712	2655	2570	2459	2287	2080	1892	1707
47.5	2784	2748	2686	2589	2464	2282	2067	1866	1678
50.0	2828	2798	2731	2623	2478	2279	2049	1836	1638
52.5	2873	2850	2776	2651	2478	2268	2027	1810	1610
55.0	2905	2905	2837	2692	2493	2261	2007	1787	1565
57.5	2961	2967	2895	2724	2495	2240	1979	1753	1511
60.0	3062	3069	2983	2785	2514	2234	1965	1731	1448
62.5	3191	3202	3089	2836	2516	2218	1952	1697	1359
65.0	3253	3277	3126	2805	2422	2120	1882	1623	1237
67.5	3029	3121	2976	2620	2195	1891	1693	1426	1026
70.0	2579	2688	2662	2351	1931	1629	1429	1122	725
72.5	2080	2159	2214	1973	1608	1334	1138	798	439
75.0	1549	1570	1681	1551	1231	995	832	511	253
77.5	1153	1028	1166	1156	920	724	554	284	129
80.0	770	650	659	738	618	426	289	112	72
82.5	317	336	260	352	323	179	88	42	38
85.0	71	96	68	99	91	53	23	18	16
87.5	6	7	8	8	8	7	6	6	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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Operating at 120 VAC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1706	1706	1706	1706	1706	1706	1706	1706	1706
10.0	1519	1487	1458	1429	1399	1376	1342	1309	1302
20.0	1504	1422	1347	1272	1203	1150	1083	1032	1015
30.0	1555	1437	1318	1194	1075	967	825	730	689
35.0	1565	1419	1277	1130	980	834	638	523	494
40.0	1557	1393	1212	1021	824	638	459	406	402
45.0	1527	1324	1103	837	584	430	375	357	352
47.5	1486	1272	1015	704	466	371	356	332	321
50.0	1430	1200	895	573	388	356	342	317	299
52.5	1380	1104	756	469	351	348	328	305	282
55.0	1302	965	608	371	333	337	316	291	267
57.5	1200	818	482	322	317	326	299	269	244
60.0	1074	681	390	296	303	313	283	247	228
62.5	943	555	327	276	290	293	266	237	219
65.0	803	435	269	261	275	271	245	228	211
67.5	589	304	232	245	251	246	229	221	204
70.0	372	210	202	224	225	222	214	224	256
72.5	220	162	173	199	194	195	188	277	321
75.0	143	128	143	159	157	164	160	286	321
77.5	98	98	113	117	122	125	157	238	282
80.0	64	70	77	80	83	97	116	194	228
82.5	37	40	44	45	52	60	77	135	162
85.0	17	18	19	22	25	27	33	60	70
87.5	4	4	4	5	5	6	8	10	10
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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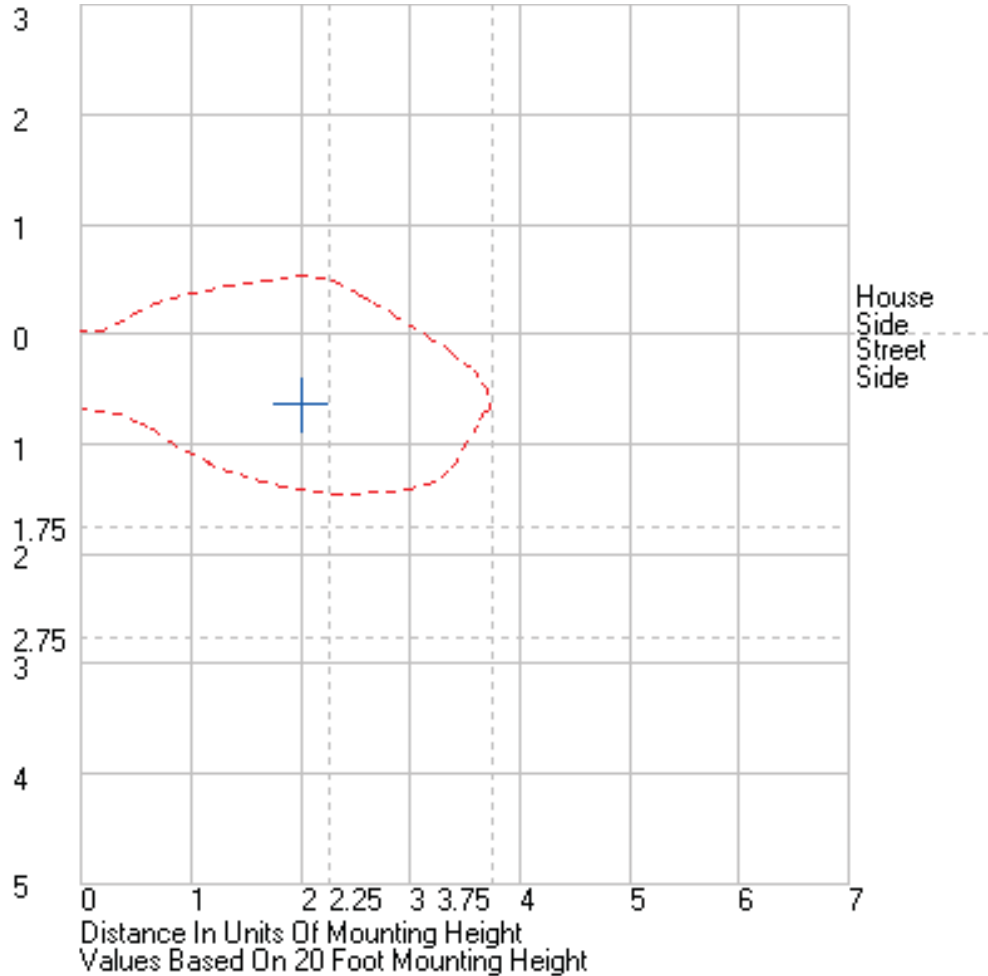
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.388, 0.386)
	CIE 1976 (u', v') ⁽¹⁾	(0.227, 0.507)
	Correlated Color Temperature (CCT) ⁽¹⁾	3860 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.39E-03
	Color Rendering Index (Ra) ⁽¹⁾	70.6
	Special CRI 9 (R ₉) ^{(1),(3)}	-38.9
	Distance from Planckian Locus (Duv) ^{(1),(3)}	2.01E-03
	Scotopic/Photopic Ratio ^{(1),(3)}	1.47

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.415 A	
	Power	49.6 W	
	Power Factor	1.00	
	Current THD	5.1 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.186 A	
	Power	48.2 W	
	Power Factor	0.93	
	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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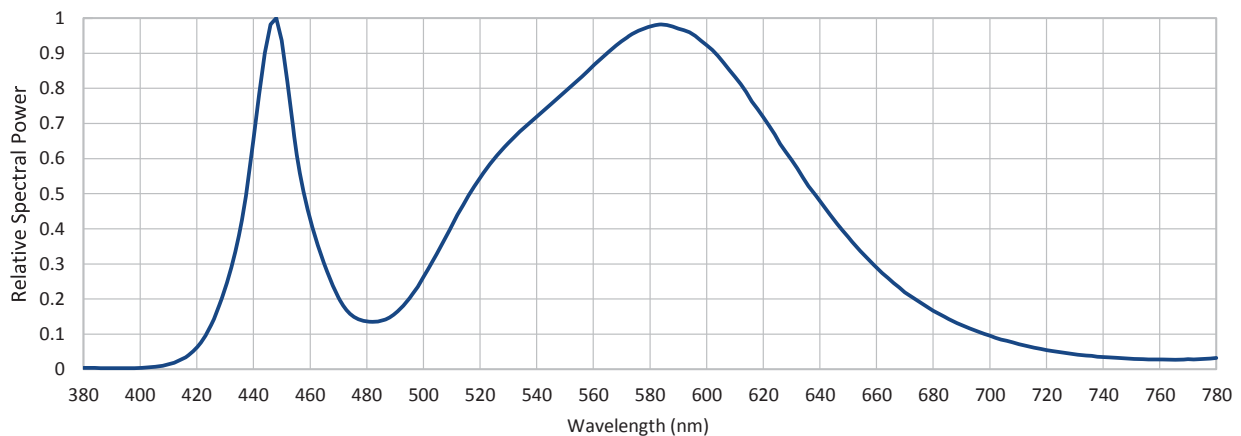
Operating at 120 VAC and 60 Hz.

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	0.426	540	0.720	620	0.718	700	0.096
385	0.004	465	0.300	545	0.754	625	0.656	705	0.083
390	0.003	470	0.204	550	0.790	630	0.596	710	0.072
395	0.003	475	0.153	555	0.827	635	0.534	715	0.063
400	0.004	480	0.136	560	0.865	640	0.479	720	0.055
405	0.007	485	0.138	565	0.901	645	0.425	725	0.049
410	0.014	490	0.159	570	0.934	650	0.377	730	0.043
415	0.030	495	0.202	575	0.960	655	0.330	735	0.039
420	0.062	500	0.263	580	0.976	660	0.290	740	0.035
425	0.127	505	0.334	585	0.981	665	0.253	745	0.033
430	0.229	510	0.408	590	0.970	670	0.219	750	0.030
435	0.390	515	0.482	595	0.954	675	0.193	755	0.029
440	0.653	520	0.545	600	0.923	680	0.167	760	0.028
445	0.942	525	0.600	605	0.883	685	0.146	765	0.027
450	0.937	530	0.644	610	0.833	690	0.126	770	0.029
455	0.634	535	0.684	615	0.777	695	0.110	775	0.029
								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, 0.505)
10.0	(0.226, 0.505)	(0.227, 0.508)
20.0	(0.227, 0.507)	(0.226, 0.505)
30.0	(0.227, 0.507)	(0.227, 0.508)
40.0	(0.227, 0.507)	(0.225, 0.505)
50.0	(0.227, 0.507)	(0.226, 0.507)
60.0	(0.227, 0.507)	(0.226, 0.509)
70.0	(0.227, 0.506)	I <= 10% peak
80.0	(0.226, 0.507)	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 3.75 / 64.75 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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RT



Test Report No. LLI-19038-10

LED Roadway Lighting - Roadway luminaire. Product ID: L 616S 5 X G2S 4 X XX 4 XX X X X

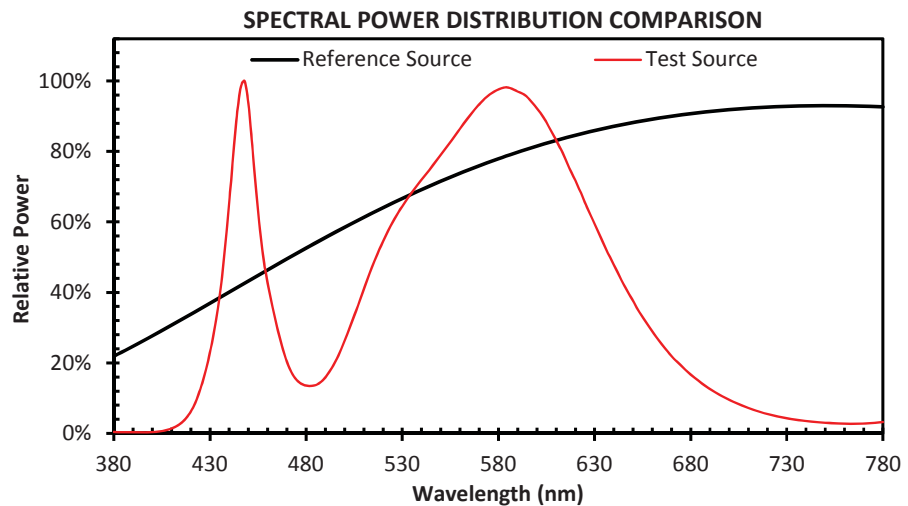
Grey painted cast aluminum housing with clear flat glass lens.

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

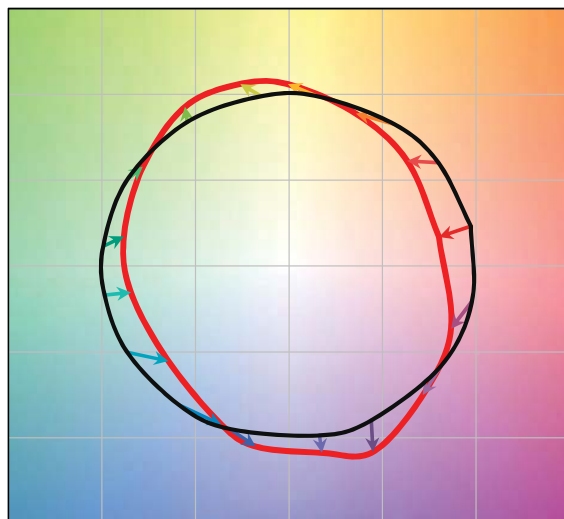
One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 900ma.

Operating at 120 VAC and 60 Hz.

R_f	70
R_g	93



COLOR VECTOR GRAPHIC

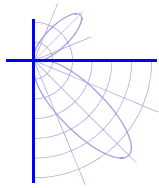


— Test Source

→ Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-19038-10

LED Roadway Lighting - Roadway luminaire. Product ID: L 616S 5 X G2S 4 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 900ma.
Operating at 120 VAC and 60 Hz.

Test Distance 8.0 m
Test Temperature 25.1 °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.