



Report of Test LLI-19244-6

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 45 X 3G2S XXXX XXXX
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.
16 LEDs in 4 x 4 array with clear plastic sheet of individual lenses.
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 900ma.
Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	6131 lm	Min Power Factor	0.95 @ 277 V
Luminaire Power	49.0 W	Max THD(i)*	9.6 % @ 277 V
Luminous Efficacy	125.1 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3000 K	80-90° Zonal Flux %	0.6 %
CIE(x,y) 1931	(0.438, 0.406)	BUG Rating*	B2-U0-G1
CRI	71	Street Classification*	Type II Short

PREPARED FOR : LED Roadway Lighting Ltd, 115 Chain Lake Drive, Halifax. NS Canada



LightLab
INTERNATIONAL

LightLab International, LLC
Phoenix AZ 85085



This document is issued in accordance with the accreditation requirements of NVLAP. The laboratory is accredited for compliance with ISO/IEC 17025. The results of the tests, calibrations and/or measurements included in this document are traceable to the SI system of units.

Test Report No. LLI-19244-6

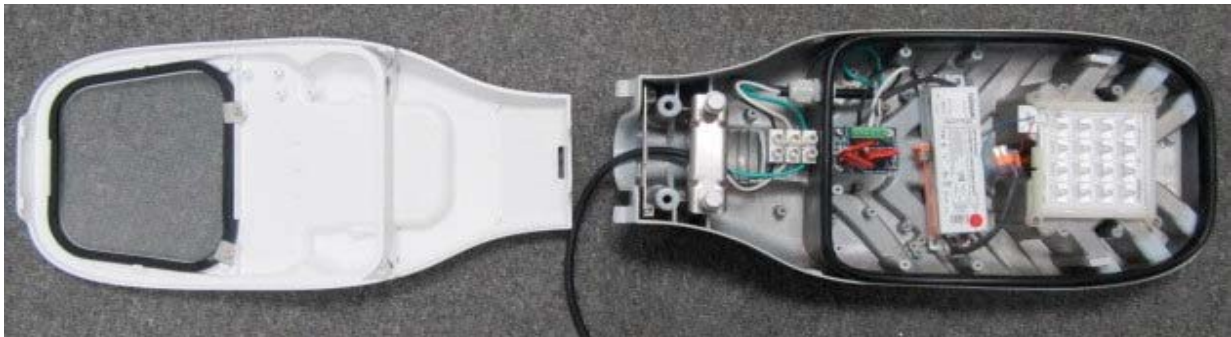
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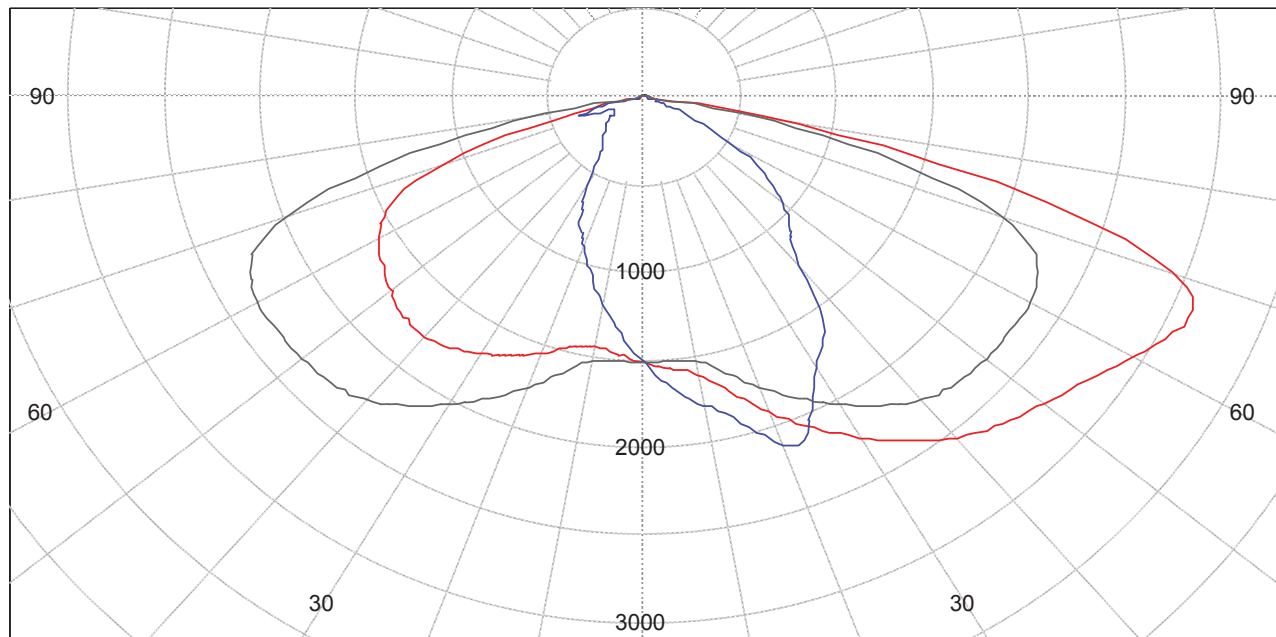




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Polar Light Distribution Curves



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 %	67.7 %	67.7 %
House Side	0.0 %	32.3 %	32.3 %
	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

18-Sep-2019
23-Sep-2019



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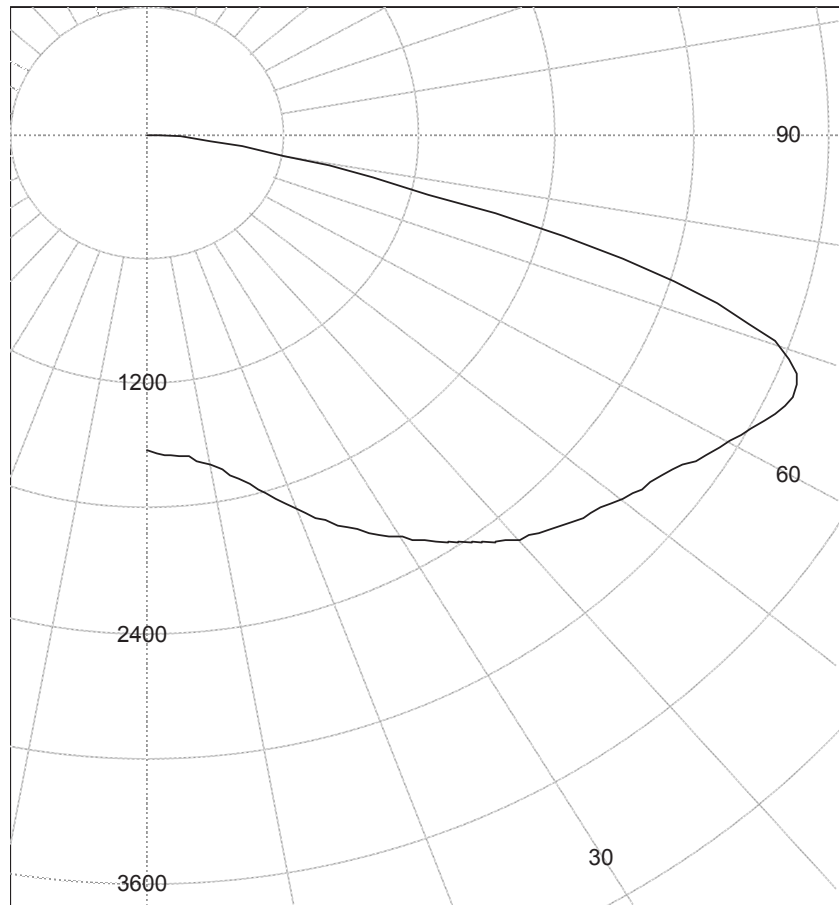
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Operating at 120v AC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1520.1
10.0	1609.0
20.0	1915.1
30.0	2241.3
35.0	2396.7
40.0	2536.1
45.0	2635.8
47.5	2675.2
50.0	2719.2
52.5	2766.7
55.0	2810.7
57.5	2885.5
60.0	2955.5
62.5	3024.8
65.0	3093.5
67.5	3095.5
70.0	2932.3
72.5	2536.9
75.0	1891.8
77.5	1147.3
80.0	616.9
82.5	221.9
85.0	11.1
87.5	5.3
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
2335.4 cd @ (90.0°, 58.0°)

Street side max intensity
3107.7 cd @ (75.0°, 66.5°)

Coordinates expressed in the C Type coordinate system

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



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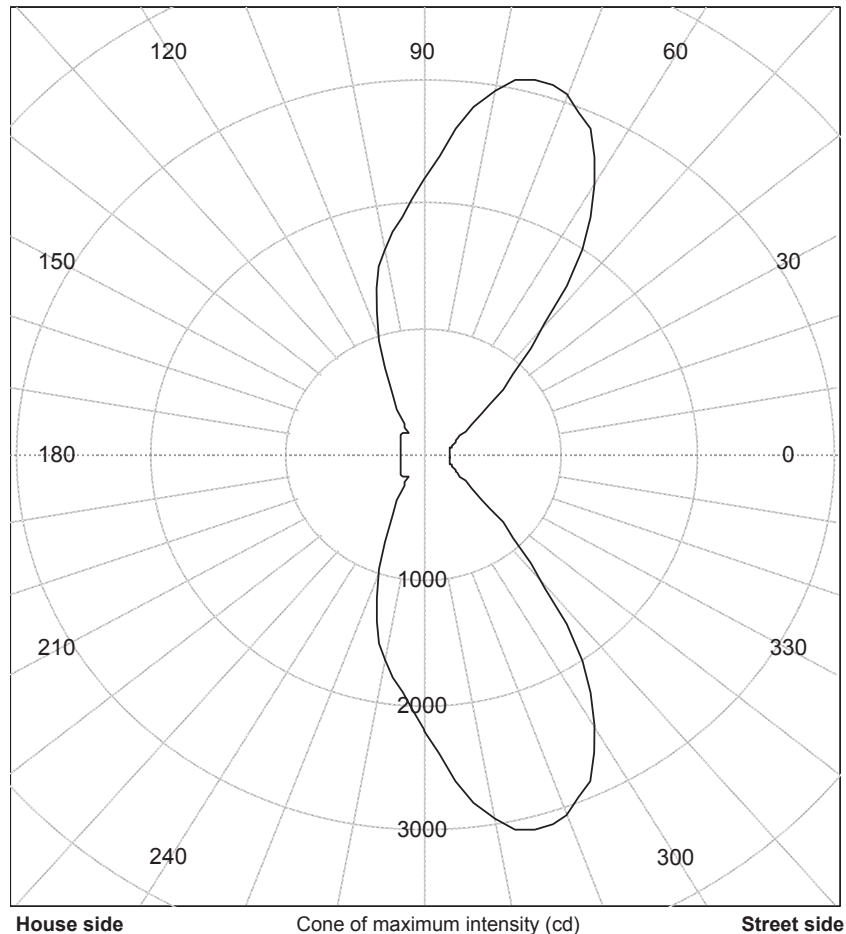
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Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V66.5) (cd)
0	185.9
15	197.4
30	313.8
40	624.1
45	921.3
50	1388.1
55	2001.1
60	2499.9
65	2874.4
70	3061.2
75	3107.7
80	2968.9
85	2606.7
90	2206.4
95	1905.1
100	1675.5
105	1384.1
110	970.1
115	541.8
120	284.6
125	216.3
130	224.7
135	234.7
140	227.4
150	200.8
165	188.8
180	182.9

Principal Conical Surface

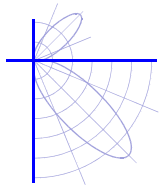


House side max intensity
2335.4 cd @ (90.0°, 58.0°)

Street side max intensity
3107.7 cd @ (75.0°, 66.5°)

Coordinates expressed in the C Type coordinate system
Data for the two symmetric halves of the luminaire has been averaged.

RT



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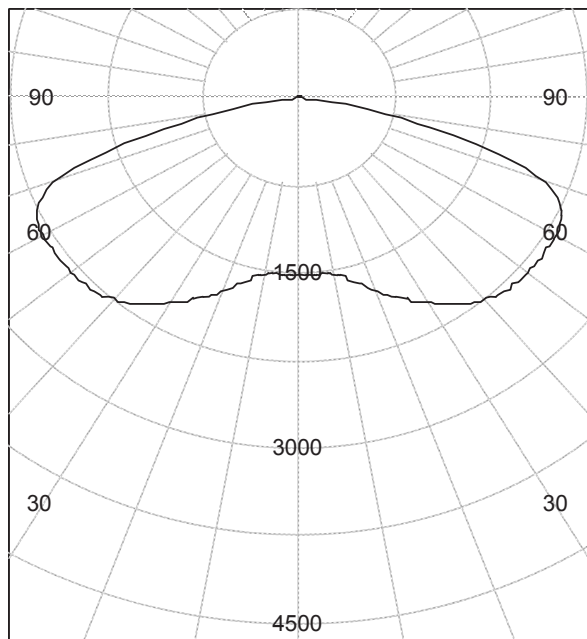
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Operating at 120v AC and 60 Hz.

Polar curve through L90 / L270

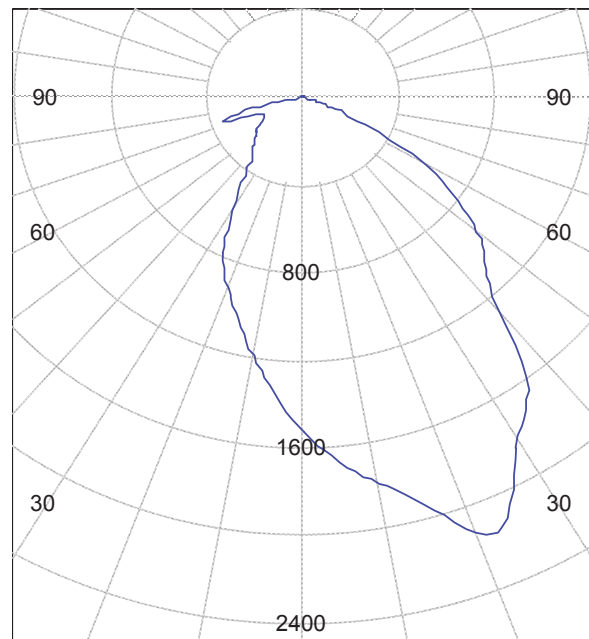


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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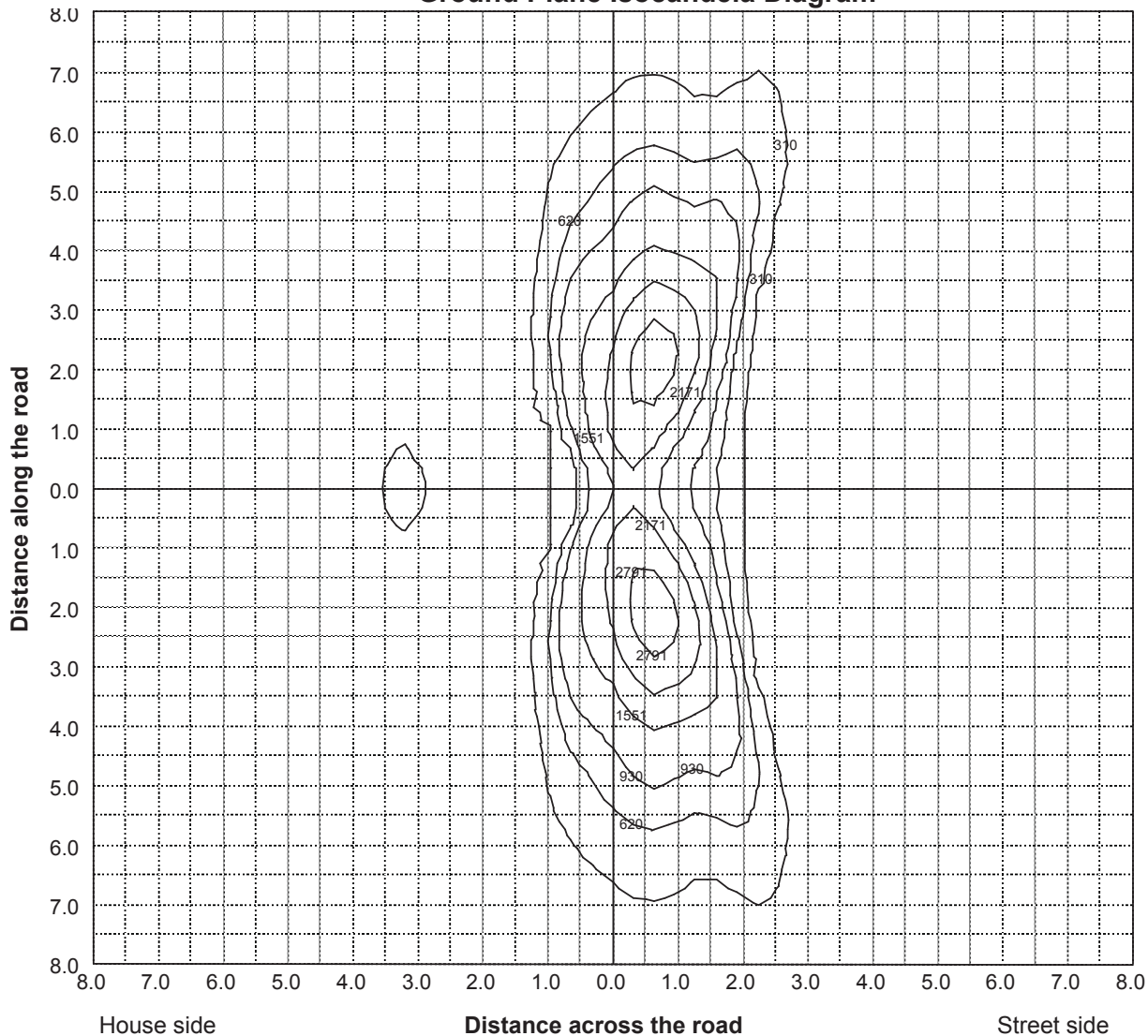
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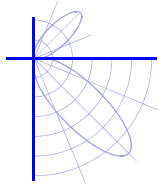
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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Operating at 120v AC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1520	1520	1520	1520	1520	1520	1520	1520	1520
10.0	1788	1772	1755	1735	1724	1712	1693	1673	1650
20.0	2116	2092	2041	2016	1997	1989	1985	1983	1970
30.0	1788	1836	2069	2291	2350	2363	2336	2308	2285
35.0	1629	1677	1871	2152	2312	2427	2478	2476	2458
40.0	1256	1406	1710	1997	2177	2366	2524	2603	2609
45.0	1072	1155	1507	1862	2063	2281	2482	2630	2696
47.5	1015	1096	1413	1790	2014	2243	2450	2618	2716
50.0	945	1024	1332	1717	1961	2206	2417	2606	2730
52.5	855	928	1255	1632	1915	2178	2402	2603	2753
55.0	759	818	1147	1532	1862	2144	2389	2603	2765
57.5	671	708	1010	1416	1772	2111	2396	2636	2807
60.0	522	575	859	1271	1631	2050	2401	2668	2857
62.5	379	416	661	1081	1409	1887	2328	2661	2898
65.0	245	265	437	815	1124	1610	2149	2578	2910
67.5	155	168	239	499	779	1223	1869	2433	2814
70.0	109	129	147	233	436	783	1434	2136	2587
72.5	82	102	116	122	183	372	872	1647	2156
75.0	66	81	90	89	92	136	341	1020	1653
77.5	53	66	63	69	65	68	89	434	1028
80.0	42	52	39	44	44	42	47	134	508
82.5	19	26	19	21	22	23	24	35	135
85.0	7	7	8	8	9	9	10	10	12
87.5	3	3	4	4	4	4	5	5	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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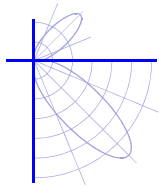
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Vertical	Intensity data (cd)								
	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1520	1520	1520	1520	1520	1520	1520	1520	1520
10.0	1631	1609	1582	1556	1530	1502	1473	1446	1417
20.0	1952	1915	1866	1820	1765	1704	1636	1557	1471
30.0	2270	2241	2186	2107	2024	1929	1817	1692	1568
35.0	2429	2397	2343	2248	2152	2035	1898	1750	1600
40.0	2582	2536	2472	2366	2254	2115	1951	1784	1613
45.0	2686	2636	2559	2441	2307	2140	1954	1771	1590
47.5	2724	2675	2589	2461	2317	2138	1939	1748	1566
50.0	2767	2719	2625	2485	2329	2133	1918	1719	1529
52.5	2806	2767	2665	2504	2324	2114	1891	1693	1495
55.0	2836	2811	2706	2527	2321	2091	1858	1660	1448
57.5	2898	2885	2771	2568	2333	2086	1844	1636	1398
60.0	2964	2956	2830	2598	2322	2049	1805	1590	1318
62.5	3024	3025	2892	2616	2298	2011	1769	1530	1203
65.0	3065	3093	2956	2626	2257	1962	1727	1453	1065
67.5	3028	3095	2954	2574	2156	1853	1625	1320	894
70.0	2821	2932	2831	2420	1966	1670	1452	1110	667
72.5	2418	2537	2510	2110	1653	1399	1197	817	424
75.0	1808	1892	1965	1667	1256	1058	871	496	220
77.5	1237	1147	1226	1132	873	701	527	235	101
80.0	772	617	633	658	539	406	251	86	49
82.5	263	222	173	214	191	127	59	23	22
85.0	12	11	11	11	11	11	11	11	10
87.5	5	5	5	5	5	5	5	5	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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Operating at 120v AC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1520	1520	1520	1520	1520	1520	1520	1520	1520
10.0	1386	1358	1329	1305	1284	1263	1234	1208	1202
20.0	1383	1306	1227	1156	1094	1044	982	931	918
30.0	1442	1322	1198	1076	960	860	728	626	586
35.0	1450	1307	1162	1012	862	721	542	432	403
40.0	1447	1279	1090	896	695	525	379	341	333
45.0	1408	1204	968	695	466	351	320	300	289
47.5	1366	1150	874	570	378	316	308	282	267
50.0	1318	1075	756	460	324	303	293	271	253
52.5	1262	969	630	377	303	297	282	263	245
55.0	1181	832	500	318	291	290	270	255	223
57.5	1073	692	397	284	283	283	258	227	198
60.0	941	564	324	264	275	273	241	209	186
62.5	790	443	270	250	264	257	225	198	176
65.0	637	341	233	234	248	240	208	193	175
67.5	476	252	205	218	223	218	195	192	197
70.0	328	189	179	201	198	198	181	224	275
72.5	201	142	152	172	166	169	153	294	345
75.0	121	109	124	131	132	135	160	253	283
77.5	76	78	88	88	90	97	124	194	229
80.0	45	47	50	49	52	57	67	93	125
82.5	21	20	19	18	19	18	13	24	41
85.0	8	7	6	4	4	4	3	2	2
87.5	4	3	2	2	1	1	0	0	0
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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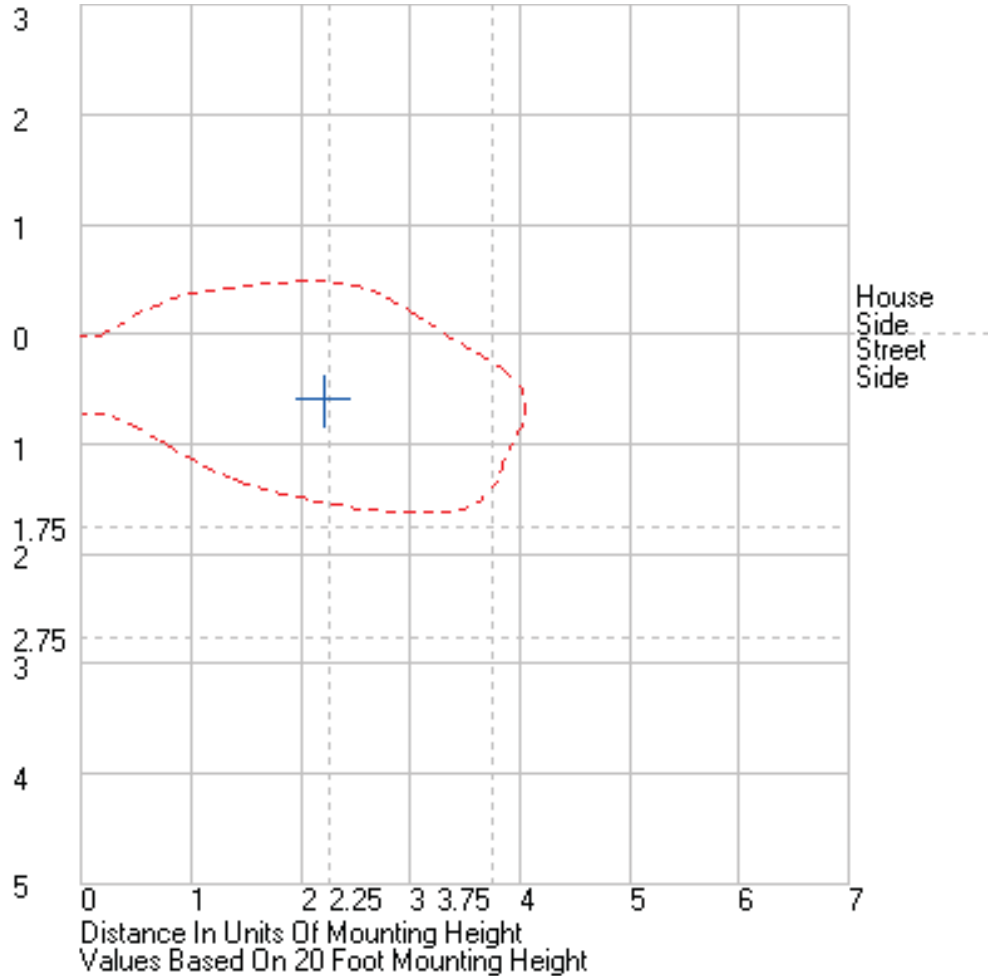
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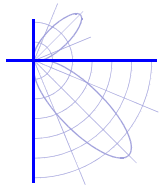
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.438, 0.406)
	CIE 1976 (u', v') ⁽¹⁾	(0.250, 0.522)
	Correlated Color Temperature (CCT) ⁽¹⁾	3000 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.58E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.0
	Special CRI 9 (R ₉) ^{(1),(3)}	-42.2
	Distance from Planckian Locus (Duv) ^{(1),(3)}	5.59E-04
	Scotopic/Photopic Ratio ^{(1),(3)}	1.22
Electrical	Voltage	120.0 V (Setpoint 1)
	Frequency	60.0 Hz
	Current	0.420 A
	Power	49.0 W
	Power Factor	0.97
	Current THD	3.5 %
	Voltage	277.0 V (Setpoint 2)
	Frequency	60.0 Hz
	Current	0.183 A
	Power	48.2 W
	Power Factor	0.95
	Current THD	9.6 %

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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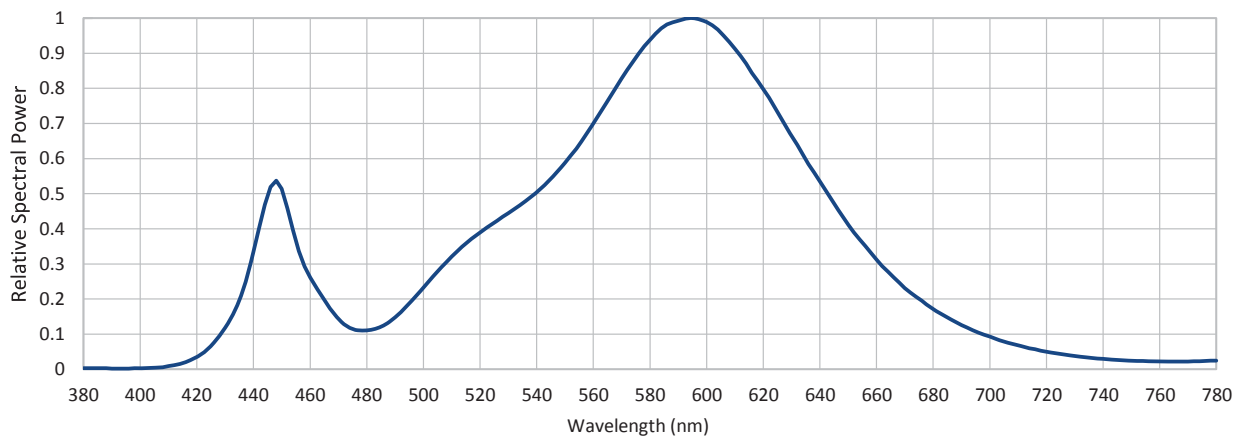
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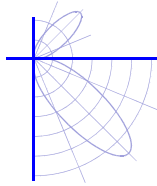
LM-79 Performance Data

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	0.003	460	0.261	540	0.504	620	0.798	700	0.093
385	0.003	465	0.198	545	0.543	625	0.733	705	0.079
390	0.002	470	0.143	550	0.588	630	0.665	710	0.068
395	0.002	475	0.115	555	0.640	635	0.597	715	0.058
400	0.003	480	0.111	560	0.700	640	0.536	720	0.050
405	0.004	485	0.121	565	0.764	645	0.471	725	0.043
410	0.009	490	0.148	570	0.828	650	0.413	730	0.038
415	0.018	495	0.187	575	0.888	655	0.360	735	0.033
420	0.035	500	0.233	580	0.938	660	0.313	740	0.030
425	0.068	505	0.279	585	0.976	665	0.270	745	0.027
430	0.118	510	0.321	590	0.992	670	0.231	750	0.025
435	0.198	515	0.359	595	0.999	675	0.201	755	0.023
440	0.334	520	0.390	600	0.989	680	0.171	760	0.022
445	0.494	525	0.418	605	0.958	685	0.148	765	0.022
450	0.514	530	0.445	610	0.913	690	0.126	770	0.022
455	0.366	535	0.473	615	0.858	695	0.108	775	0.024
								780	0.025





Test Report No. LLI-19244-6

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 45 X 3G2S XXXX XXXX
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.
16 LEDs in 4 x 4 array with clear plastic sheet of individual lenses.
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 900ma.
Operating at 120v AC and 60 Hz.

LM-79 Performance Data

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates	
	Horiz. 0.0° plane	Horiz. ° plane
0.0	(0.249, 0.520)	(0.249, 0.521)
10.0	(0.249, 0.521)	(0.250, 0.522)
20.0	(0.250, 0.522)	(0.249, 0.520)
30.0	(0.250, 0.522)	(0.251, 0.523)
40.0	(0.250, 0.522)	(0.249, 0.521)
50.0	(0.250, 0.522)	(0.250, 0.522)
60.0	(0.251, 0.523)	(0.251, 0.524)
70.0	(0.252, 0.523)	I <= 10% peak
80.0	(0.250, 0.521)	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 0.75 / 16.5 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-19244-6

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 45 X 3G2S XXXX XXXX

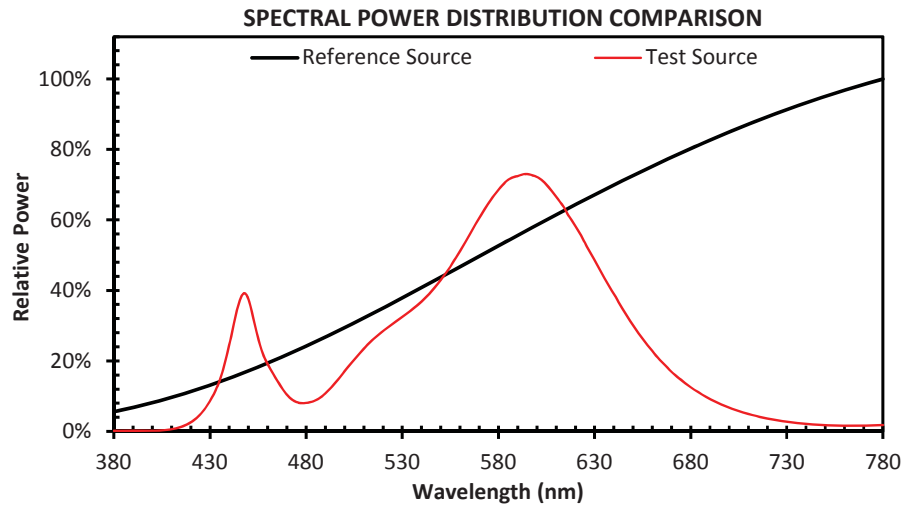
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.

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

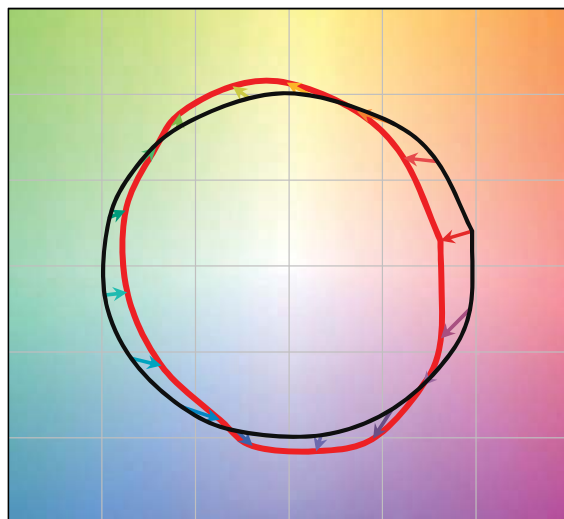
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 900ma.

Operating at 120v AC and 60 Hz.

R_f	72
R_g	93



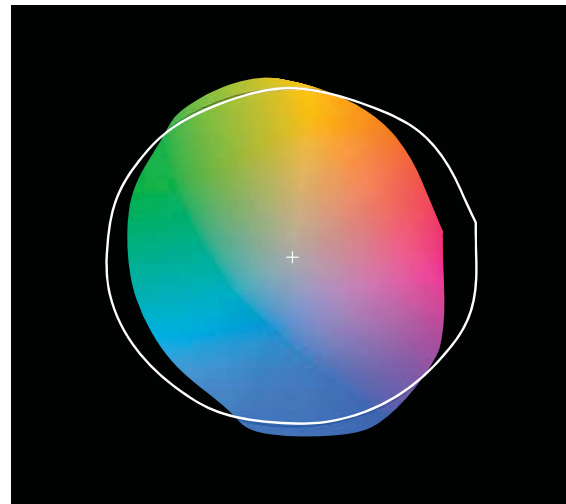
COLOR VECTOR GRAPHIC



— Test Source

→ Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-19244-6

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 45 X 3G2S XXXX XXXX
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.
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One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 900ma.
Operating at 120v AC and 60 Hz.

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

This report may contain data that are not covered by the NVLAP accreditation. Quantities marked with * are not covered.

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