



Report of Test LLI-19244-7

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 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 1050ma.
Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	6984 lm	Min Power Factor	0.96 @ 277 V
Luminaire Power	57.8 W	Max THD(i)*	8.4 % @ 277 V
Luminous Efficacy	120.8 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3010 K	80-90° Zonal Flux %	0.6 %
CIE(x,y) 1931	(0.437, 0.405)	BUG Rating*	B2-U0-G2
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.

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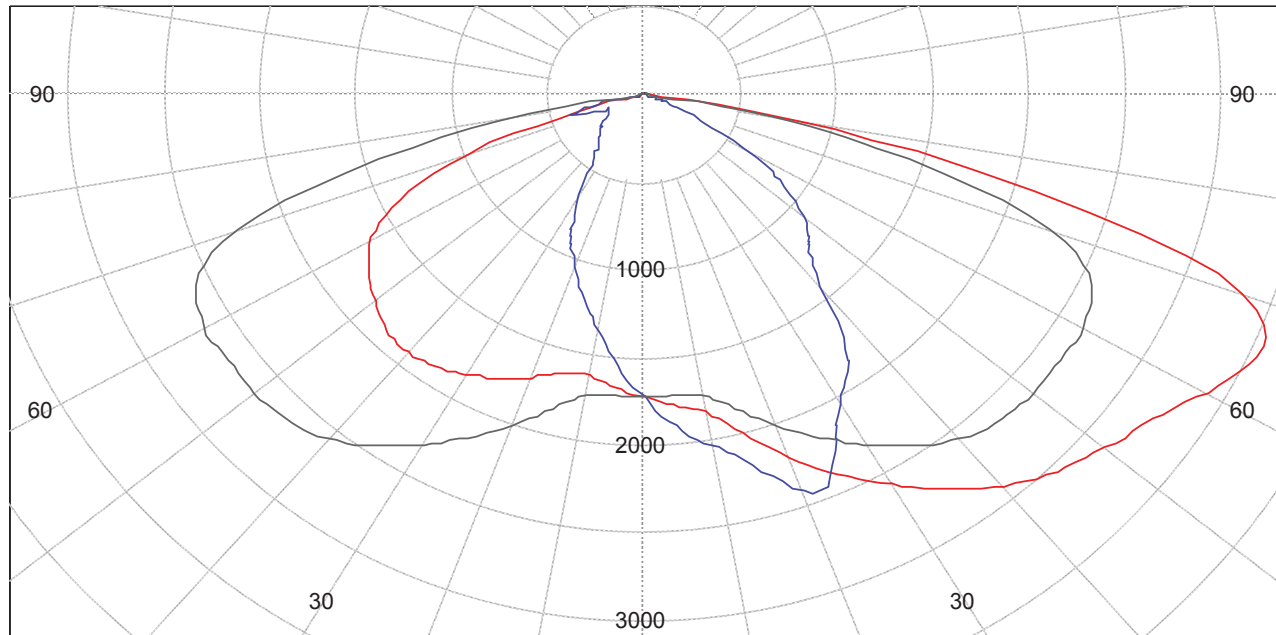
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Polar Light Distribution Curves



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

19-Sep-2019
23-Sep-2019



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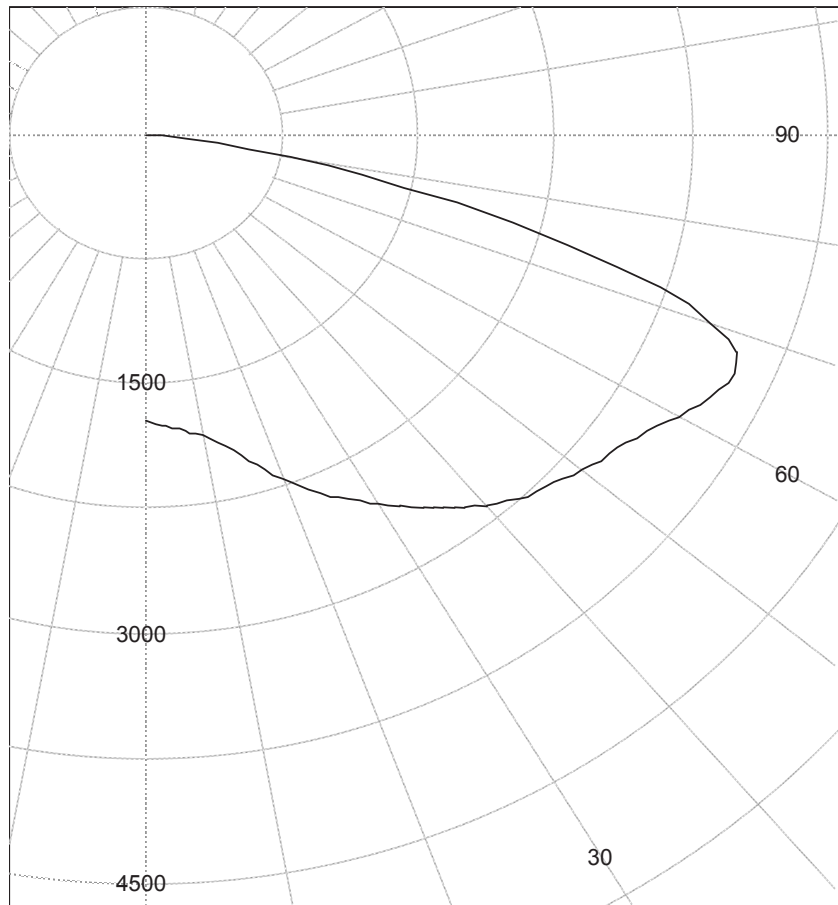
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Operating at 120v AC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1729.6
10.0	1841.2
20.0	2202.2
30.0	2567.6
35.0	2746.8
40.0	2912.6
45.0	3036.5
47.5	3080.4
50.0	3128.4
52.5	3183.2
55.0	3226.8
57.5	3306.0
60.0	3383.6
62.5	3462.4
65.0	3530.6
67.5	3519.1
70.0	3304.1
72.5	2851.4
75.0	2093.2
77.5	1335.1
80.0	809.3
82.5	314.8
85.0	12.9
87.5	6.0
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
2655.7 cd @ (90.0°, 58.0°)

Street side max intensity
3542.5 cd @ (72.5°, 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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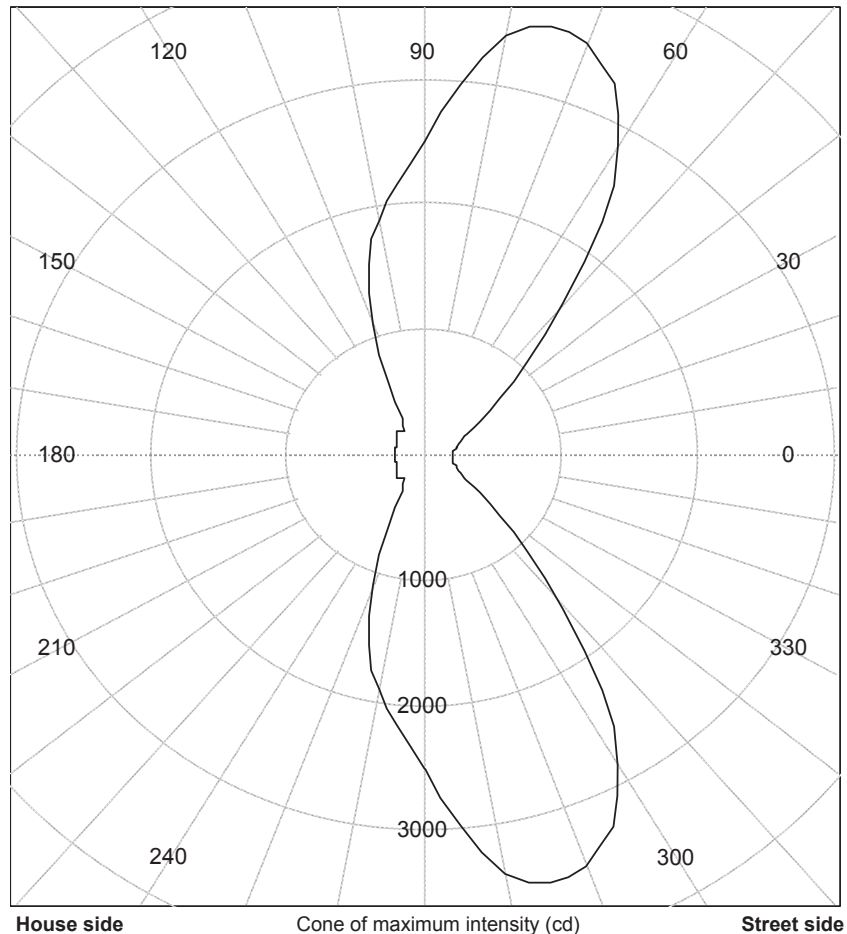
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Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V66.5) (cd)
0	212.3
15	225.7
30	357.4
40	713.9
45	1055.0
50	1586.3
55	2284.0
60	2853.3
65	3282.3
70	3491.8
75	3540.9
80	3385.8
85	2971.8
90	2512.5
95	2172.1
100	1910.3
105	1579.5
110	1108.1
115	617.5
120	324.6
125	247.2
130	257.0
135	267.7
140	259.5
150	228.9
165	215.7
180	208.4

Principal Conical Surface



House side max intensity
2655.7 cd @ (90.0°, 58.0°)

Street side max intensity
3542.5 cd @ (72.5°, 66.5°)

Coordinates expressed in the C Type coordinate system

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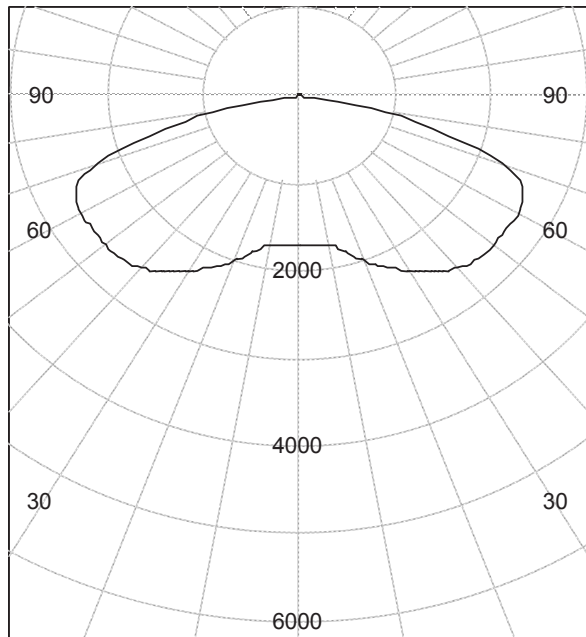
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Polar curve through L90 / L270

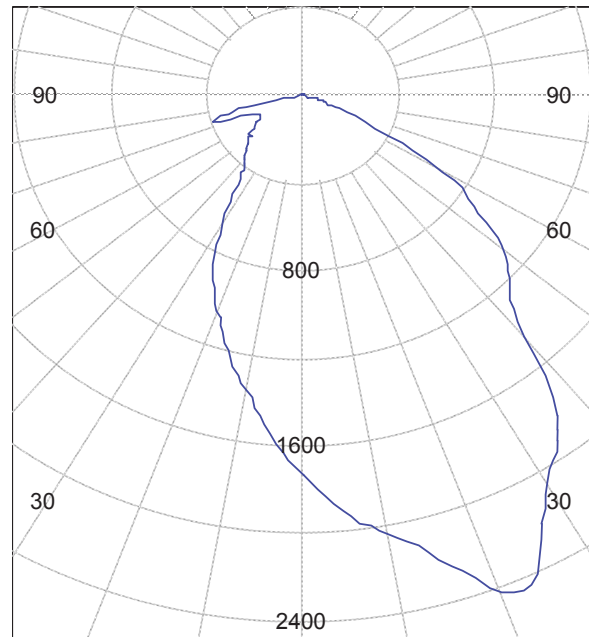


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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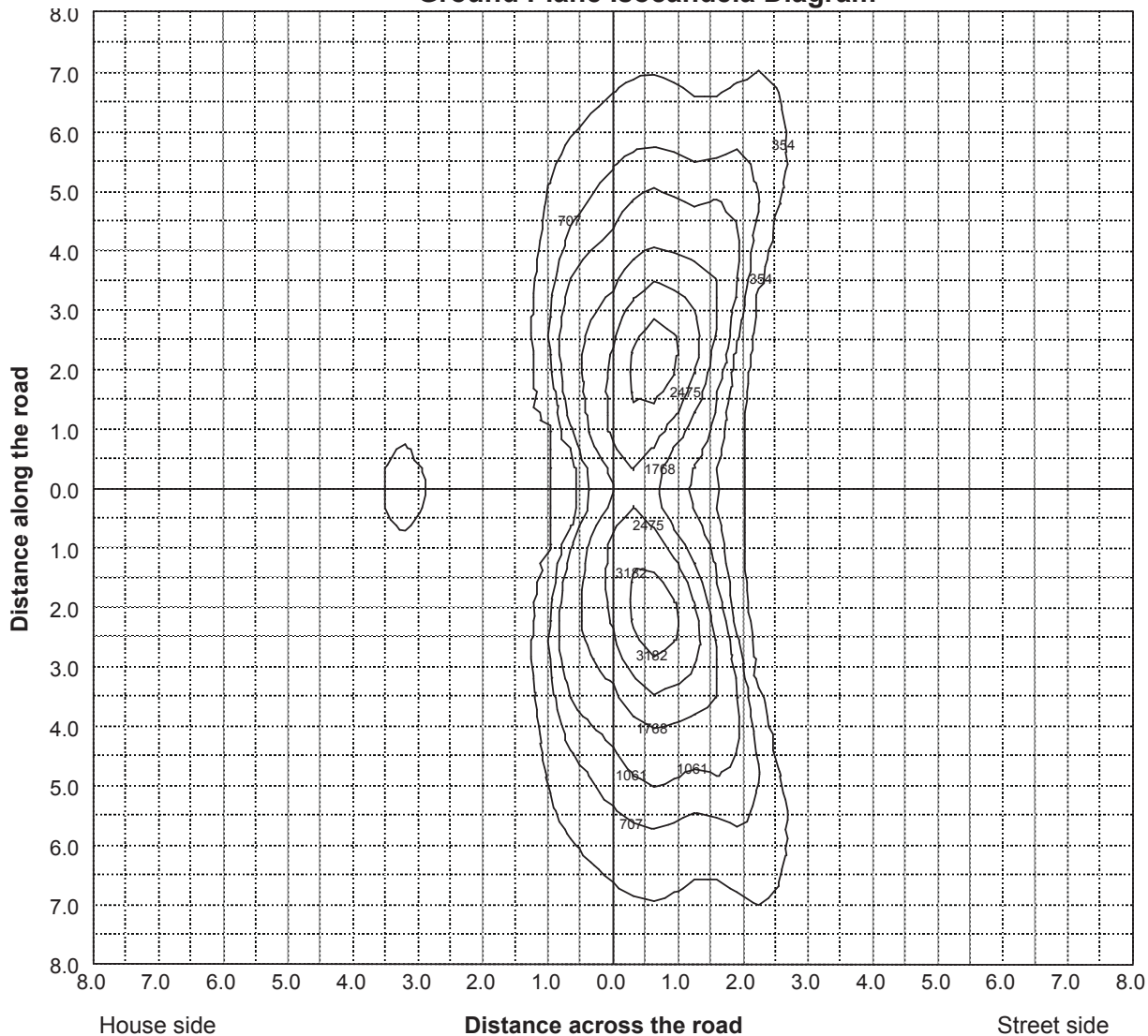
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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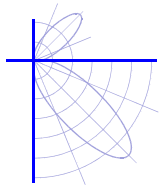
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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1730	1730	1730	1730	1730	1730	1730	1730	1730
10.0	2035	2019	1996	1973	1962	1947	1927	1904	1877
20.0	2411	2384	2323	2295	2273	2265	2259	2257	2242
30.0	2036	2094	2357	2614	2679	2693	2660	2629	2602
35.0	1857	1915	2130	2455	2634	2767	2823	2822	2798
40.0	1428	1602	1950	2277	2478	2695	2875	2965	2968
45.0	1222	1319	1716	2124	2350	2596	2826	2995	3070
47.5	1157	1251	1609	2043	2293	2553	2788	2981	3094
50.0	1077	1170	1518	1957	2234	2512	2749	2965	3109
52.5	975	1059	1430	1860	2181	2478	2733	2961	3133
55.0	864	935	1308	1749	2121	2443	2718	2962	3148
57.5	765	809	1151	1618	2021	2405	2729	2999	3195
60.0	595	657	980	1452	1860	2337	2735	3039	3255
62.5	431	476	755	1236	1611	2152	2653	3032	3304
65.0	279	304	498	934	1286	1840	2451	2941	3323
67.5	177	193	272	572	892	1398	2134	2776	3209
70.0	124	147	167	267	499	895	1639	2437	2952
72.5	94	117	132	138	209	425	995	1877	2456
75.0	75	92	103	102	105	155	387	1157	1879
77.5	60	75	72	78	74	78	100	489	1166
80.0	49	59	44	51	50	48	53	150	574
82.5	21	30	22	25	26	27	27	39	151
85.0	8	8	9	10	10	11	11	12	14
87.5	4	4	5	5	5	5	5	6	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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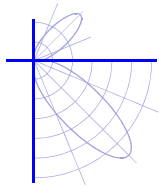
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Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1730	1730	1730	1730	1730	1730	1730	1730	1730
10.0	1854	1828	1798	1769	1739	1707	1675	1644	1613
20.0	2220	2178	2122	2070	2007	1938	1861	1771	1675
30.0	2583	2549	2487	2397	2302	2196	2067	1927	1787
35.0	2766	2727	2667	2556	2447	2315	2159	1993	1824
40.0	2941	2885	2816	2693	2563	2406	2220	2032	1839
45.0	3059	2998	2912	2778	2624	2436	2224	2018	1813
47.5	3102	3046	2946	2801	2635	2432	2207	1992	1785
50.0	3149	3095	2986	2827	2647	2427	2183	1957	1742
52.5	3194	3151	3031	2850	2642	2405	2152	1929	1703
55.0	3228	3198	3077	2877	2638	2381	2116	1891	1649
57.5	3300	3283	3157	2923	2652	2374	2100	1864	1592
60.0	3380	3365	3224	2960	2641	2334	2057	1813	1503
62.5	3445	3448	3294	2982	2616	2291	2016	1744	1373
65.0	3498	3524	3370	2994	2569	2236	1970	1657	1217
67.5	3455	3527	3371	2935	2456	2112	1853	1507	1021
70.0	3223	3343	3230	2758	2238	1904	1654	1267	762
72.5	2761	2891	2860	2404	1880	1593	1362	929	483
75.0	2059	2151	2236	1894	1426	1202	990	562	250
77.5	1406	1304	1394	1287	990	795	597	267	114
80.0	876	700	715	745	608	458	282	97	56
82.5	298	251	194	241	214	141	65	26	25
85.0	13	13	12	12	12	12	12	12	11
87.5	6	6	6	6	6	6	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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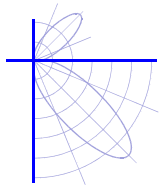
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Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1730	1730	1730	1730	1730	1730	1730	1730	1730
10.0	1579	1546	1513	1487	1464	1439	1405	1374	1369
20.0	1576	1486	1398	1317	1246	1190	1117	1060	1045
30.0	1644	1505	1365	1227	1094	979	829	713	668
35.0	1653	1489	1322	1153	982	821	617	492	460
40.0	1650	1457	1241	1021	792	598	432	388	380
45.0	1605	1371	1103	793	530	400	364	342	329
47.5	1556	1309	997	651	431	361	351	322	303
50.0	1502	1224	862	525	369	345	334	309	288
52.5	1438	1103	718	429	346	339	322	299	279
55.0	1345	947	569	362	332	331	308	291	254
57.5	1222	787	452	324	323	324	294	259	225
60.0	1071	641	370	302	313	311	275	237	212
62.5	900	504	309	285	301	292	256	225	201
65.0	727	388	266	268	283	274	237	220	199
67.5	543	287	235	250	254	249	223	219	226
70.0	373	215	205	230	226	226	206	256	316
72.5	228	162	174	197	189	193	174	336	396
75.0	137	124	142	149	151	154	183	289	322
77.5	87	90	102	100	103	112	141	222	260
80.0	51	54	57	57	60	67	76	105	141
82.5	24	23	23	21	22	21	15	26	45
85.0	10	8	7	5	4	4	4	3	2
87.5	4	3	3	2	2	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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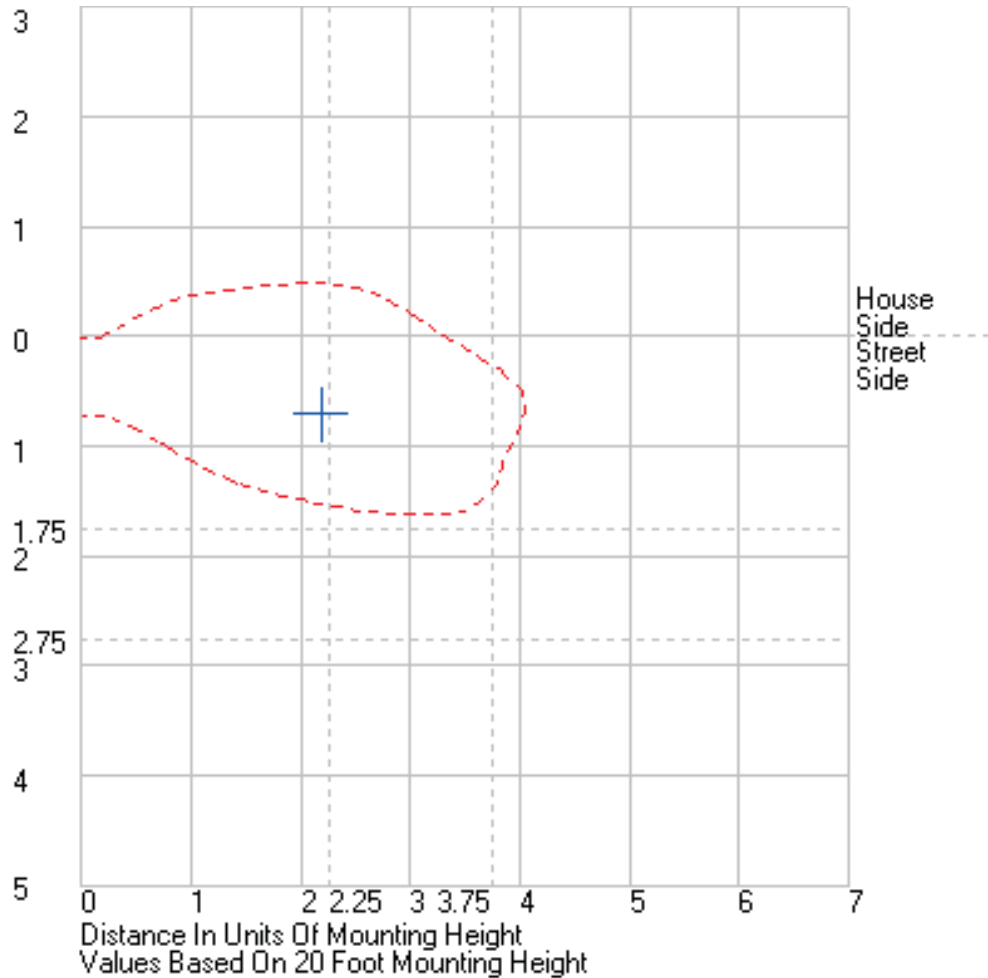
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.437, 0.405)
	CIE 1976 (u', v') ⁽¹⁾	(0.250, 0.522)
	Correlated Color Temperature (CCT) ⁽¹⁾	3010 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.59E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.0
	Special CRI 9 (R ₉) ^{(1),(3)}	-41.9
	Distance from Planckian Locus (Duv) ^{(1),(3)}	5.45E-04
	Scotopic/Photopic Ratio ^{(1),(3)}	1.22

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.499 A	
	Power	57.8 W	
	Power Factor	0.97	
	Current THD	3.2 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.212 A	
	Power	56.5 W	
	Power Factor	0.96	
	Current THD	8.4 %	

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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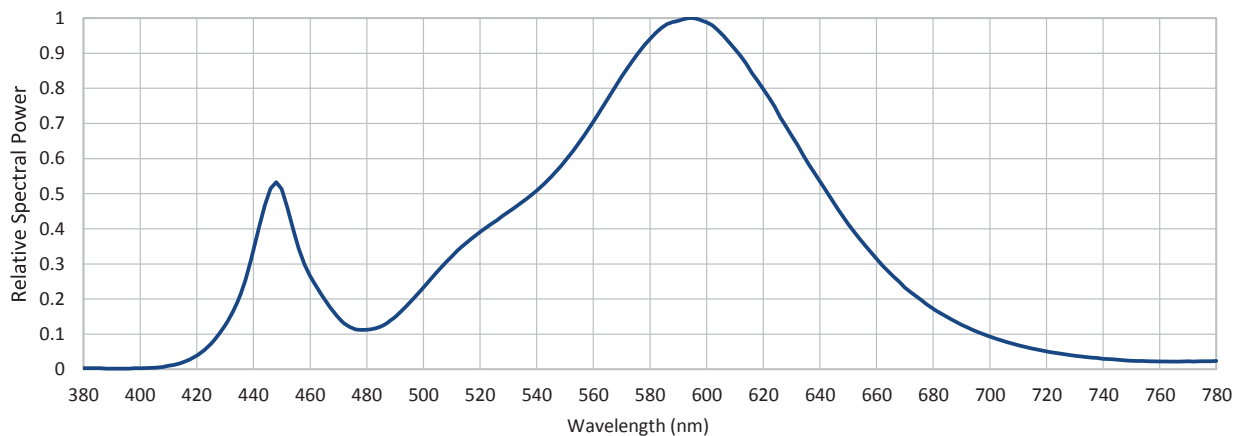
Operating at 120v AC and 60 Hz.

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	0.003	460	0.265	540	0.508	620	0.798	700	0.093
385	0.003	465	0.201	545	0.548	625	0.733	705	0.080
390	0.002	470	0.146	550	0.593	630	0.666	710	0.069
395	0.002	475	0.117	555	0.646	635	0.598	715	0.059
400	0.003	480	0.113	560	0.705	640	0.536	720	0.051
405	0.005	485	0.123	565	0.769	645	0.472	725	0.044
410	0.010	490	0.149	570	0.833	650	0.415	730	0.039
415	0.020	495	0.188	575	0.891	655	0.362	735	0.034
420	0.039	500	0.234	580	0.941	660	0.315	740	0.030
425	0.073	505	0.279	585	0.978	665	0.272	745	0.027
430	0.125	510	0.321	590	0.992	670	0.233	750	0.025
435	0.206	515	0.359	595	0.999	675	0.202	755	0.023
440	0.339	520	0.391	600	0.988	680	0.172	760	0.022
445	0.491	525	0.420	605	0.958	685	0.149	765	0.022
450	0.513	530	0.448	610	0.912	690	0.127	770	0.023
455	0.371	535	0.477	615	0.858	695	0.108	775	0.023
								780	0.024





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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	(0.248, 0.520)	(0.249, 0.520)
10.0	(0.249, 0.520)	(0.250, 0.521)
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)	(0.249, 0.522)
60.0	(0.251, 0.523)	(0.250, 0.523)
70.0	(0.251, 0.523)	I <= 10% peak
80.0	(0.249, 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 0.5 / 2.75 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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Test Report No. LLI-19244-7

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 X 3G2S XXXX XXXX

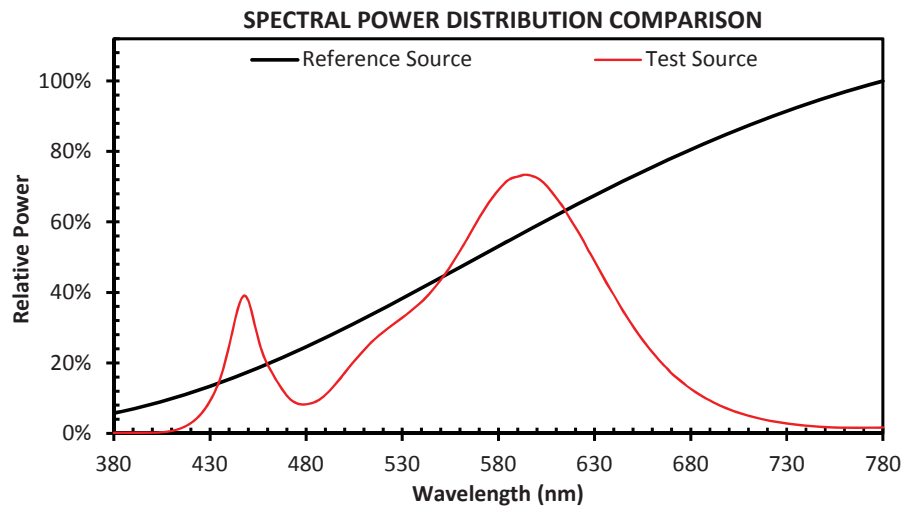
Grey cast aluminum top housing and white plastic bottom housing with clear flat glass lens.

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

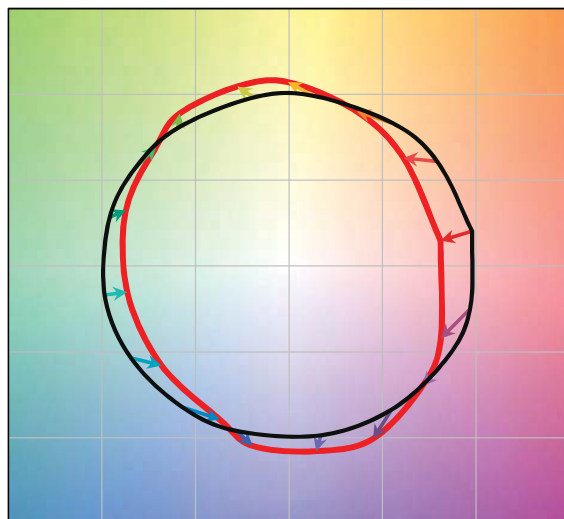
One Osram Optotronic LED driver. Model: QT50W/UNV/1250C/2DIMLT2/P6 set to 1050ma.

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-19244-7

LED Roadway Lighting - Roadway luminaire. Product ID: QB 00 616S X 5 53 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 1050ma.
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.

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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.

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