



LM-79-08 Test Report

for

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

Outdoor Wall-mounted Area Luminaires

Model: 83732

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15120035f

The laboratory that conducted the testing detailed in this report has been accredited for SSL by NVLAP.

Reviewed by:

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May. 06, 2016

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May. 06, 2016

Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Test Summary

Sample Tested: 83732

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
103.8	3507.2	33.78	0.9808
CCT (K)	CRI	Stabilization Time (Light & Power)	
3895	73.2	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt	: Mar. 14, 2016
Date of Test	: Mar. 15, 2016
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
Reference Standard	: IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

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Sample Photos



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: OUTDOOR WALL-MOUNTED AREA LUMINAIRES
Model	: 83732
Electrical Ratings	: 100~277Vac, 60Hz
Product Description	: 4000K, with photocell sensor, Dimmable Manufacturer of light source: NICHIA Model of light source: NF2W757DRT-V1
Manufacturer	: P.Q.L., Inc.
Address	: 2285 Ward Avenue / Simi Valley, CA 93065

TEST RESULTS

Test ambient temperature was 24.3°C.

Base orientation was Light down. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 85 minutes.

Parameter	Result		
Test Voltage (V)	120.0	100.0	277.1
Voltage frequency (Hz)	60	60	60
Test Current (A)	0.287	0.344	0.138
Power Factor	0.9808	0.9866	0.8975
Test Power (W)	33.78	33.97	34.23
THD A%	17.98	15.50	20.27
Luminous Efficacy (lm/W)	103.8	103.1	101.3
Total Luminous Flux (lm)	3507.2	3504.0	3467.9
Color Rendering Index (CRI)	73.2		
R9	-18.9		
Correlated Color Temperature (CCT) (K)	3895		
Chromaticity (Chroma x, Chroma y)	(0.3866, 0.3845)		
Chromaticity (Chroma u, Chroma v)	(0.2261, 0.3372)		
Chromaticity (Chroma u', Chroma v')	(0.2261, 0.5058)		
Duv	0.0018		
Average Beam Angle (°)	52.2		
Center Beam Candle Power (cd)	2567		
Spacing Criteria	0.73 (0°-180°)/ 0.73(90°-270°)		
Zonal Lumens in the 0°-60°Zone	81.62%		
Zonal Lumens in the 60°-90°Zone	15.87%		
Zonal Lumens in the 90°-120°Zone	2.13%		
Zonal Lumens in the 120°-180°Zone	0.39%		

Special Color Rendering Indices	
R1	71.1
R2	79.6
R3	85.1
R4	72
R5	69.3
R6	69.5
R7	83.1
R8	56.3
R9	-18.9
R10	49.9
R11	66.5
R12	38.2
R13	72.4
R14	91.2

Table 2: Test data per Goniophotometer Method

Note: According to CIE 1976 (u',v') diagram, $u' = u = 4x/(-2x+12y+3)$, $v' = 3v/2 = 9y/(-2x+12y+3)$.

Spectral Power Distribution

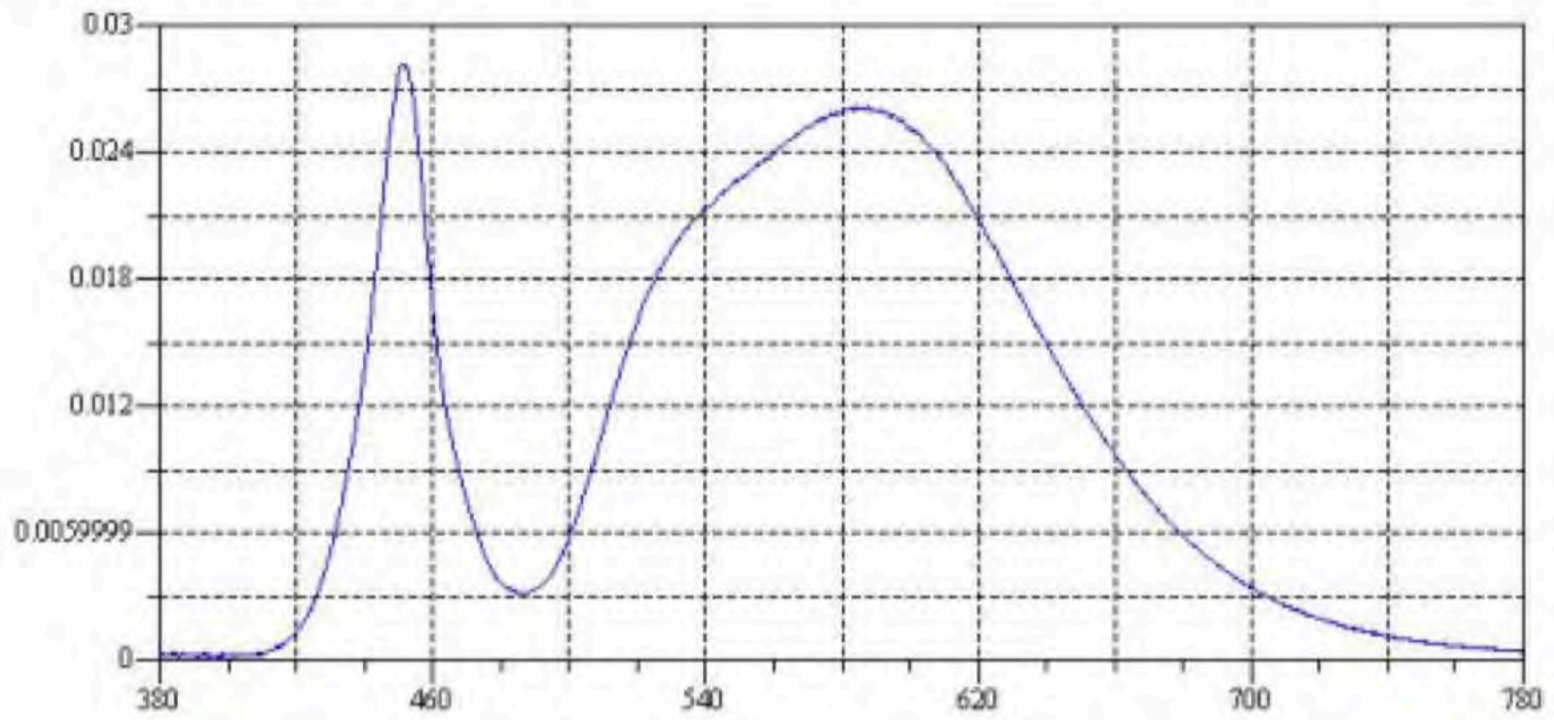


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

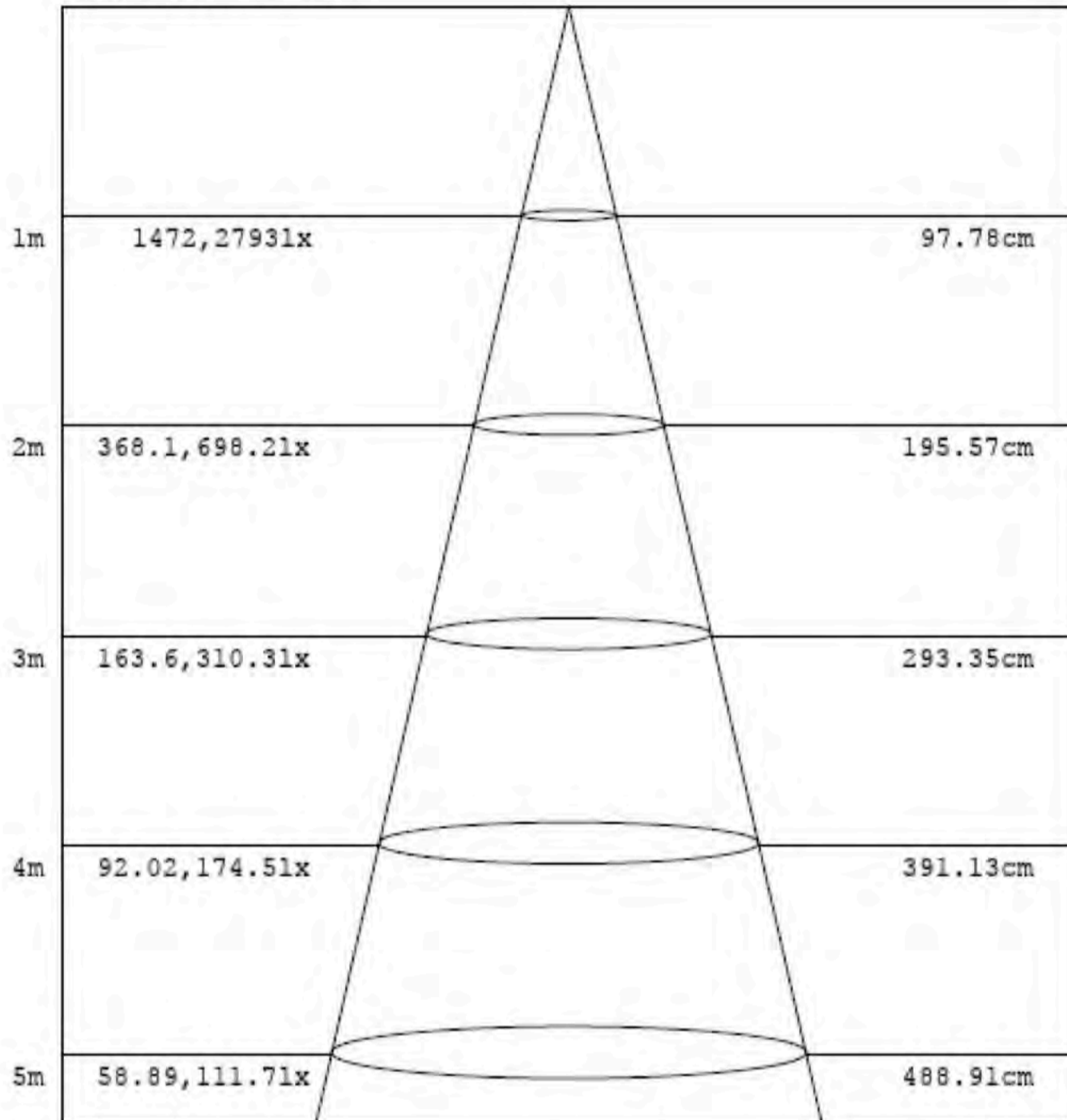
$\gamma(^{\circ})$	Lumens	% Total
0- 10	222.015	6.33%
10- 20	520.817	14.85%
20- 30	621.961	17.73%
30- 40	563.222	16.06%
40- 50	486.093	13.86%
50- 60	448.338	12.78%
60- 70	318.066	9.07%
70- 80	159.261	4.54%
80- 90	79.195	2.26%
90-100	37.459	1.07%
100-110	23.737	0.68%
110-120	13.346	0.38%
120-130	7.116	0.20%
130-140	4.288	0.12%
140-150	1.612	0.05%
150-160	0.383	0.01%
160-170	0.229	0.01%
170-180	0.079	0.00%
Total	3507.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2862.446	81.62%
60- 90	556.522	15.87%
0-90	3418.968	97.48%
90- 180	88.249	2.52%
0- 180	3507.2	100%

Table 3: Zonal Lumen Data

Illuminance Plots

Flux out: 1150 lm



Height Eavg, Emax Angle: 52.11deg Diameter

Note: The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

Chart 2: Beam Angle

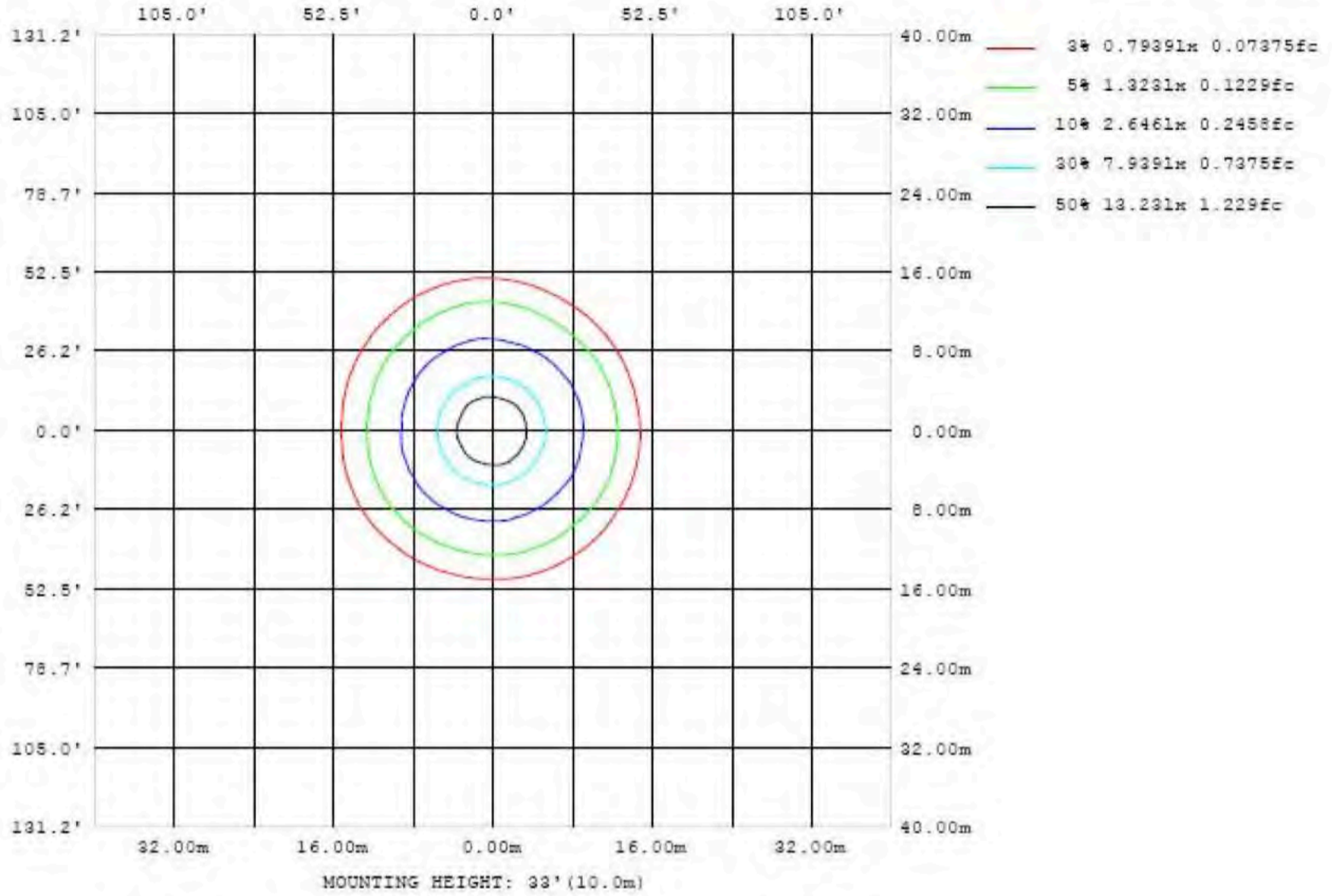


Chart 3: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

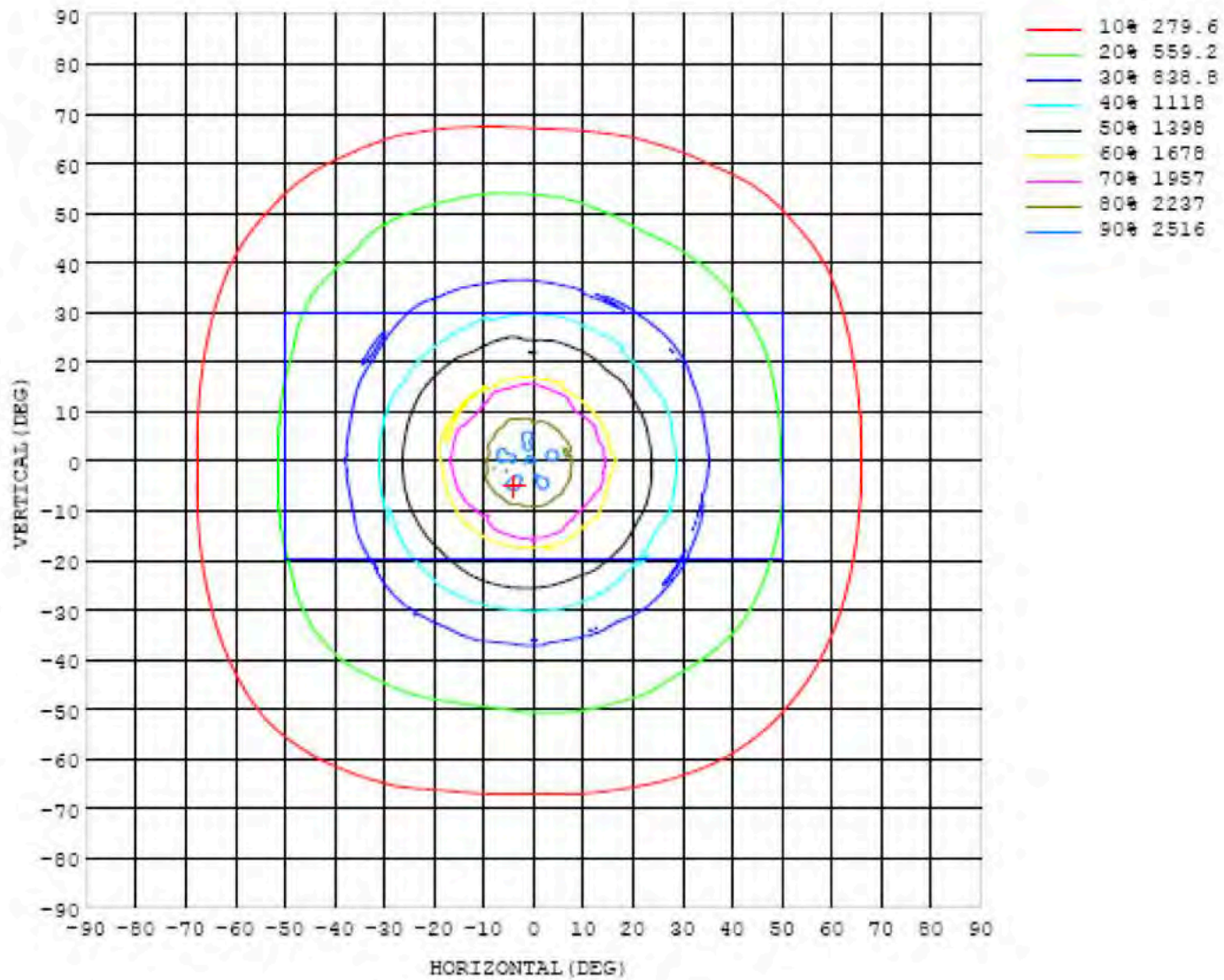


Chart 4: Isocandela Plot

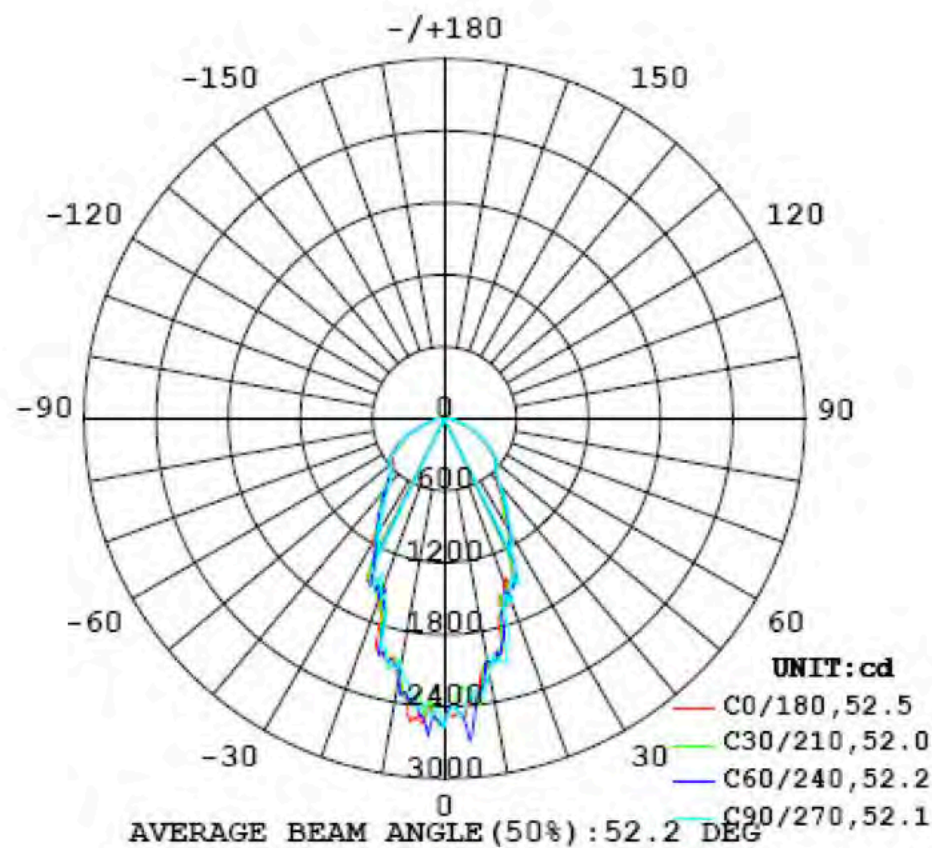


Chart 5: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567
5	2342	2265	2325	2269	2308	2397	2638	2707	2530	2327	2309	2306	2473	2611	2510	2383	2295	2358	2468
10	2090	2123	2054	2032	2142	2094	2055	2057	2098	2149	2161	2126	2202	2184	2234	2239	2262	2186	2202
15	1723	1797	1904	1869	1881	1871	1911	1983	1957	2006	2067	2049	2015	1955	1984	2067	2085	2054	2039
20	1518	1504	1485	1523	1541	1531	1600	1587	1613	1622	1538	1591	1562	1506	1537	1554	1556	1599	1552
25	1292	1313	1298	1308	1358	1370	1397	1383	1410	1456	1437	1456	1451	1464	1502	1491	1529	1512	1504
30	1056	1018	1045	1051	1081	1084	1077	1093	1142	1137	1120	1143	1174	1160	1179	1170	1149	1175	1184
35	857	835	859	831	842	883	889	885	885	921	917	912	945	921	955	951	929	923	941
40	693	689	701	722	728	719	725	719	702	711	750	748	766	800	788	771	755	744	753
45	604	605	607	611	598	596	589	598	601	597	606	620	621	620	624	626	629	631	636
50	556	571	570	576	569	562	564	567	571	565	560	564	573	571	586	589	582	570	568
55	464	468	478	480	488	494	491	495	496	494	497	504	517	523	529	538	533	525	513
60	381	383	382	382	386	396	394	403	408	401	406	415	432	434	443	440	431	417	414
65	299	298	295	296	303	314	317	317	324	318	324	327	346	350	351	347	346	341	326
70	212	206	203	202	216	222	227	230	234	231	232	233	247	250	252	254	248	242	240
75	133	133	134	136	143	145	149	152	155	155	155	156	161	164	166	167	164	161	161
80	85.4	86.3	86.2	87.4	89.1	89.6	90.5	92.5	94.8	95.9	95.4	96.7	97.9	101	104	103	101	99.8	99.9
85	70.2	71.1	70.2	69.9	69.7	69.4	69.3	70.7	71.2	70.8	71.6	71.6	72.1	72.5	73.4	73.1	73.4	72.9	73.1
90	62.8	63.6	63.9	63.9	63.5	64.6	65.7	64.9	65.1	64.2	63.5	62.1	60.8	60.4	60.0	59.8	59.1	59.6	59.0
95	27.1	27.1	25.6	23.0	19.2	8.51	4.17	2.74	3.60	0.17	0.17	9.38	0.55	16.3	26.0	36.7	44.0	46.0	46.8
100	20.1	21.4	19.7	9.01	7.24	20.2	32.4	30.8	30.5	36.4	29.4	32.8	30.5	16.1	5.46	7.16	6.81	6.89	7.92
105	23.7	25.9	27.0	16.9	13.0	20.2	27.4	29.7	30.1	32.8	26.1	29.6	26.4	20.9	13.3	13.3	16.9	16.6	16.1
110	39.0	39.7	37.2	27.8	15.4	9.64	11.5	14.4	17.4	18.8	15.6	15.9	12.6	9.63	12.6	21.8	26.2	27.4	28.7
115	21.9	22.3	20.8	18.2	11.7	7.30	6.15	6.43	6.85	7.34	6.88	7.20	6.84	8.01	11.8	17.1	16.1	17.1	17.1
120	17.6	17.7	17.3	15.9	13.2	8.04	4.34	3.21	2.75	3.49	3.40	3.04	4.36	7.29	10.7	11.7	12.6	11.2	10.7
125	14.4	14.4	14.3	13.4	12.0	9.16	5.38	3.03	0.84	0.81	0.73	2.89	4.48	7.19	9.44	10.4	10.2	7.71	6.69
130	11.1	11.1	11.1	10.8	10.0	8.22	6.14	3.81	2.53	2.12	1.68	3.88	5.26	5.52	6.52	8.17	8.32	6.24	5.28
135	8.30	8.33	8.44	8.45	7.92	6.73	5.13	2.62	2.73	2.52	2.82	3.32	5.04	5.49	4.49	5.20	5.19	4.83	4.51
140	5.97	5.98	5.95	6.00	5.81	5.26	4.12	0.94	0.98	1.36	0.77	1.14	4.27	4.90	4.52	4.20	4.09	3.71	3.47
145	3.15	3.13	3.09	3.10	3.18	3.06	1.93	1.85	1.63	1.46	1.69	1.64	2.22	2.95	2.96	3.04	2.85	2.29	2.15
150	1.08	1.04	1.07	1.07	1.08	1.08	0.97	1.05	1.00	0.74	0.85	1.02	0.71	1.05	1.16	1.30	1.18	0.94	0.88
155	0.96	0.97	0.97	0.95	0.93	0.91	0.93	0.89	0.90	0.64	0.65	0.59	0.63	0.61	0.62	0.64	0.63	0.64	0.66
160	0.91	0.90	0.91	0.90	0.90	0.91	0.90	0.93	0.93	0.69	0.69	0.67	0.63	0.66	0.64	0.62	0.63	0.65	0.64
165	0.87	0.86	0.85	0.87	0.85	0.85	0.89	0.93	0.93	0.74	0.75	0.74	0.73	0.66	0.64	0.65	0.65	0.65	0.64
170	0.86	0.86	0.85	0.84	0.84	0.87	0.89	0.91	0.91	0.78	0.78	0.76	0.76	0.74	0.70	0.66	0.65	0.69	0.68
175	0.85	0.83	0.85	0.84	0.82	0.84	0.87	0.89	0.91	0.85	0.85	0.83	0.81	0.81	0.78	0.77	0.75	0.74	0.72
180	0.83	0.83	0.78	0.79	0.81	0.83	0.84	0.83	0.84	0.86	0.87	0.88	0.89	0.89	0.87	0.83	0.82	0.84	0.76

Table 4: Luminous Intensity Data

Table--2 UNIT: cd

C (DEG) y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567	2567		
5	2588	2460	2343	2276	2308	2453	2681	2685	2416	2261	2291	2290	2268	2374	2460	2535	2510		
10	2181	2233	2191	2180	2132	2199	2128	2156	2079	2029	2023	2022	2054	2105	2037	2104	2190		
15	2030	1995	1997	1950	2018	2018	1976	2004	1991	1979	1880	1843	1798	1770	1741	1791	1785		
20	1501	1524	1532	1568	1493	1587	1595	1546	1553	1470	1465	1470	1498	1540	1526	1534	1493		
25	1433	1465	1448	1510	1473	1405	1412	1433	1342	1360	1326	1334	1283	1321	1307	1299	1345		
30	1175	1129	1167	1138	1120	1117	1123	1100	1100	1071	1118	1044	1061	1037	1015	1077	1026		
35	926	930	933	946	944	944	915	921	872	876	824	818	866	831	834	873	841		
40	756	768	788	795	783	754	752	729	699	713	700	711	700	710	715	705	695		
45	630	629	636	628	637	630	644	645	625	619	611	602	599	608	610	613	597		
50	566	578	589	588	593	598	606	609	597	581	572	560	560	563	565	568	559		
55	520	533	539	539	549	551	545	545	523	510	494	482	479	475	471	459	459		
60	424	432	440	451	456	469	452	443	431	418	409	389	377	383	378	381	380		
65	338	341	332	344	348	358	349	341	329	326	320	306	295	301	297	306	301		
70	236	239	231	234	234	241	235	227	218	216	214	211	203	208	209	213	214		
75	155	150	148	148	150	153	150	144	140	139	139	135	132	134	134	131	132		
80	98.7	97.8	96.5	95.5	94.4	94.1	92.4	89.8	87.5	86.7	87.0	86.1	84.4	85.7	85.1	83.9	84.9		
85	74.0	74.2	73.3	71.8	70.8	70.7	69.5	70.3	70.2	69.5	69.3	69.3	68.9	70.0	68.8	68.0	68.7		
90	60.8	61.6	61.3	61.0	60.3	60.6	61.5	62.4	62.4	62.1	61.9	62.2	62.7	62.0	61.1	61.0	61.3		
95	47.4	42.9	35.6	27.3	17.1	0.47	0.20	0.14	4.33	3.51	20.7	5.84	11.4	18.8	22.1	24.7	26.4		
100	8.08	6.60	5.49	5.74	17.7	33.0	30.3	31.9	36.8	26.5	33.6	30.6	16.9	8.21	14.6	20.4	20.3		
105	16.5	17.4	12.5	15.3	22.0	27.0	28.3	29.9	33.1	23.0	30.3	25.3	17.9	13.3	20.7	28.2	25.2		
110	32.8	32.9	20.5	11.3	10.6	14.1	17.0	19.3	20.4	13.2	15.0	11.0	10.7	18.7	31.5	37.2	38.9		
115	17.5	18.1	16.2	10.3	7.52	6.83	6.96	7.15	7.45	5.71	6.73	6.49	8.46	14.4	19.0	21.7	22.2		
120	11.4	12.6	12.7	10.3	6.19	4.04	3.54	3.07	3.90	3.45	3.64	5.06	9.27	13.9	16.2	17.8	17.7		
125	7.96	10.9	11.2	10.4	7.36	4.48	2.55	0.88	1.45	1.50	3.45	6.61	9.79	12.2	13.5	14.4	14.4		
130	6.60	8.48	9.32	9.20	7.61	5.63	3.56	1.96	2.14	1.53	4.30	6.47	8.51	9.96	10.7	10.9	10.9		
135	4.97	6.08	7.02	7.11	6.24	4.94	3.03	2.69	2.65	2.79	3.83	5.53	7.03	7.87	8.29	8.25	8.27		
140	3.67	4.42	5.17	5.35	5.03	4.13	1.10	1.60	2.11	1.91	1.91	4.70	5.57	6.03	6.03	6.01	6.00		
145	2.32	2.79	3.28	3.54	3.44	2.39	1.58	1.65	1.77	2.01	1.61	2.75	3.37	3.37	3.27	3.22	3.18		
150	1.02	1.25	1.41	1.43	1.33	0.77	0.99	0.85	1.04	1.14	1.22	1.05	1.31	1.28	1.25	1.21	1.15		
155	0.68	0.70	0.70	0.68	0.65	0.63	0.58	0.62	0.88	0.90	0.89	0.93	0.95	0.97	0.99	0.97	0.95		
160	0.67	0.68	0.68	0.69	0.70	0.66	0.67	0.68	0.91	0.91	0.92	0.91	0.94	0.94	0.94	0.94	0.93		
165	0.68	0.72	0.74	0.74	0.73	0.77	0.78	0.76	0.92	0.93	0.94	0.95	0.94	0.94	0.93	0.92	0.89		
170	0.68	0.75	0.76	0.80	0.82	0.82	0.83	0.84	0.95	0.96	0.96	0.97	0.98	0.97	0.96	0.92	0.89		
175	0.76	0.79	0.80	0.81	0.83	0.84	0.85	0.85	0.90	0.90	0.92	0.92	0.93	0.91	0.91	0.88	0.85		
180	0.75	0.76	0.79	0.83	0.80	0.81	0.78	0.80	0.85	0.86	0.86	0.86	0.88	0.88	0.87	0.85	0.84		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 17, 2015	Jul. 16, 2016
Digital Power Meter	PF2010A	HZTE028-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-08	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	WY12010	HZTE004-03	Jul. 17, 2015	Jul. 16, 2016
Temperature Meter	TES1310	HZTE017-01	Jul. 17, 2015	Jul. 16, 2016
Standard source	D908	HZTE012-01	Jul. 23, 2015	Jul. 22, 2016
Standard source	SCL-1400	HZTE012-02	Oct. 21, 2015	Oct. 20, 2016

Table 6: Test Equipment List

TEST METHODS

Seasoning of SSL Product

For the purpose of rating new SSL products, SSL products shall be tested with no seasoning. Therefore, no seasoning was performed.

Goniophotometer Method

Photometric and Electrical Measurements

An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.

Ambient temperature was measured at the same height of the sample mounted on the Goniophotometer equipment. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation.

The stabilization time typically ranges from 30 min (small integrated LED lamps) to 2 or more hours for large SSL luminaires). It can be judged that stability is reached when the variation (maximum – minimum) of at least 3 readings of the light output and electrical power over a period of 30 min, taken 15 minutes apart, is less than 0.5 %.

Electrical measurements including voltage, current, and power were measured using the Everfine Digital Power Meter.

Some graphics were created with Photometric Plus software.

The standard reference of the Goniophotometer system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Metrology P.R. China.

The uncertainty of goniophotometer system reported in this document is expanded uncertainty is 1.94% with a coverage factor $k=2$.

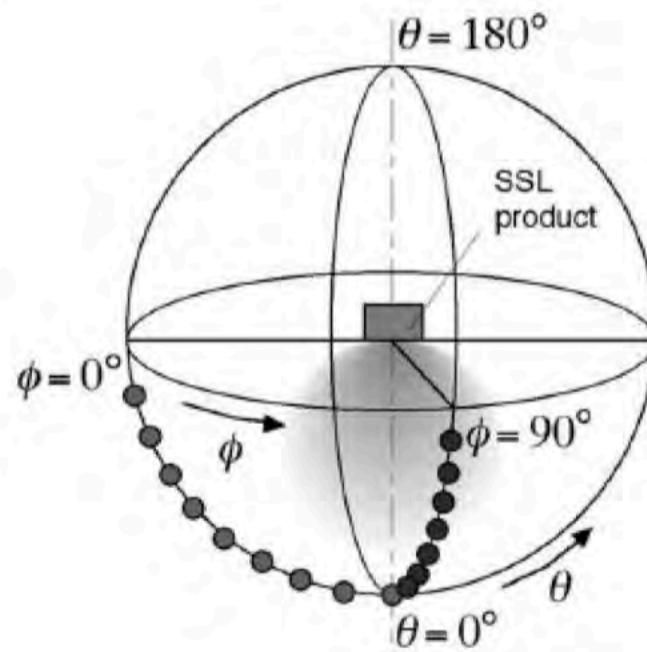
Color Characteristics Measurements

The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as values that are spatially average, weighted to intensity, over the angular range where light is intentionally emitted from the SSL product. The color characteristics measurements are using gonio-spectroradiometer.

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ($C=0^\circ/180^\circ$ and $C=90^\circ/270^\circ$) and at 10° or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate was calculated from these points. The data was then analyzed to check for delta color differences of the u' , v' chromaticity coordinates. The spatial non-uniformity of chromaticity, $\Delta u'v'$, is determined as the maximum deviation (distance on the CIE (u' , v') diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



*** End of Report ***

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