



LM-79-08 TEST REPORT

for

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

WALLPACK

84176

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20040020d

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

Review by:

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Jun. 05, 2020

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Manager: Jim Zhang
Jun. 05, 2020

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: 84176

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
133.9	15667.0	117.04	0.9954
CCT (K)	CRI	Stabilization Time (Light & Power)	
3794	73.0	60	

Table 1: Executive Data Summary

Test specifications:

Date of Receipt : Apr. 15, 2020

Date of Test : May 26, 2020

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 PHOTO



Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: WALLPACK
Model	: 84176
Electrical Ratings	: 120-277V, 50/60Hz, 120W
Product Description	: 4000K
Manufacturer	: P.Q.L., Inc.
Address	: 2285 Ward Avenue / Simi Valley, CA 93065

TEST RESULTS

Test ambient temperature was 24.9°C.

Test orientation was base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 70 minutes, and the total operating time including stabilization was 90 minutes.

The photometric distance is 2.47 m.

Luminous data was taken at 0.5°vertical intervals and 10°horizontal intervals.

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.980	0.456
Power Factor	0.9954	0.9414
Test Power (W)	117.04	119.02
THD A%	5.51	9.22
Luminous Efficacy (lm/W)	133.9	134.4
Total Luminous Flux (lm)	15667.0	15993.0
Color Rendering Index (CRI)	73.0	
R9	-17	
Correlated Color Temperature (CCT) (K)	3794	
Chromaticity (Chroma x, Chroma y)	(0.3943, 0.3964)	
Chromaticity (Chroma u, Chroma v)	(0.2264, 0.3413)	
Chromaticity (Chroma u', Chroma v')	(0.2264, 0.5120)	
Duv	0.0051	
Average Beam Angle (°)	112.5	
Center Beam Candle Power (cd)	3333	
Spacing Criteria	0.79 (0°-180°)/ 1.19 (90°-270°)	
Zonal Lumens in the 0°-60°Zone	55.32%	
Zonal Lumens in the 60°-90°Zone	34.16%	
Zonal Lumens in the 90°-120°Zone	8.89%	
Zonal Lumens in the 120°-180°Zone	1.62%	

Special Color Rendering Indices	
R1	70
R2	79
R3	85
R4	72
R5	69
R6	69
R7	84
R8	57
R9	-17
R10	48
R11	66
R12	37
R13	71
R14	91

Table 2: Test data per Goniophotometer Method

Spectral Power Distribution- Goniophotometer Method

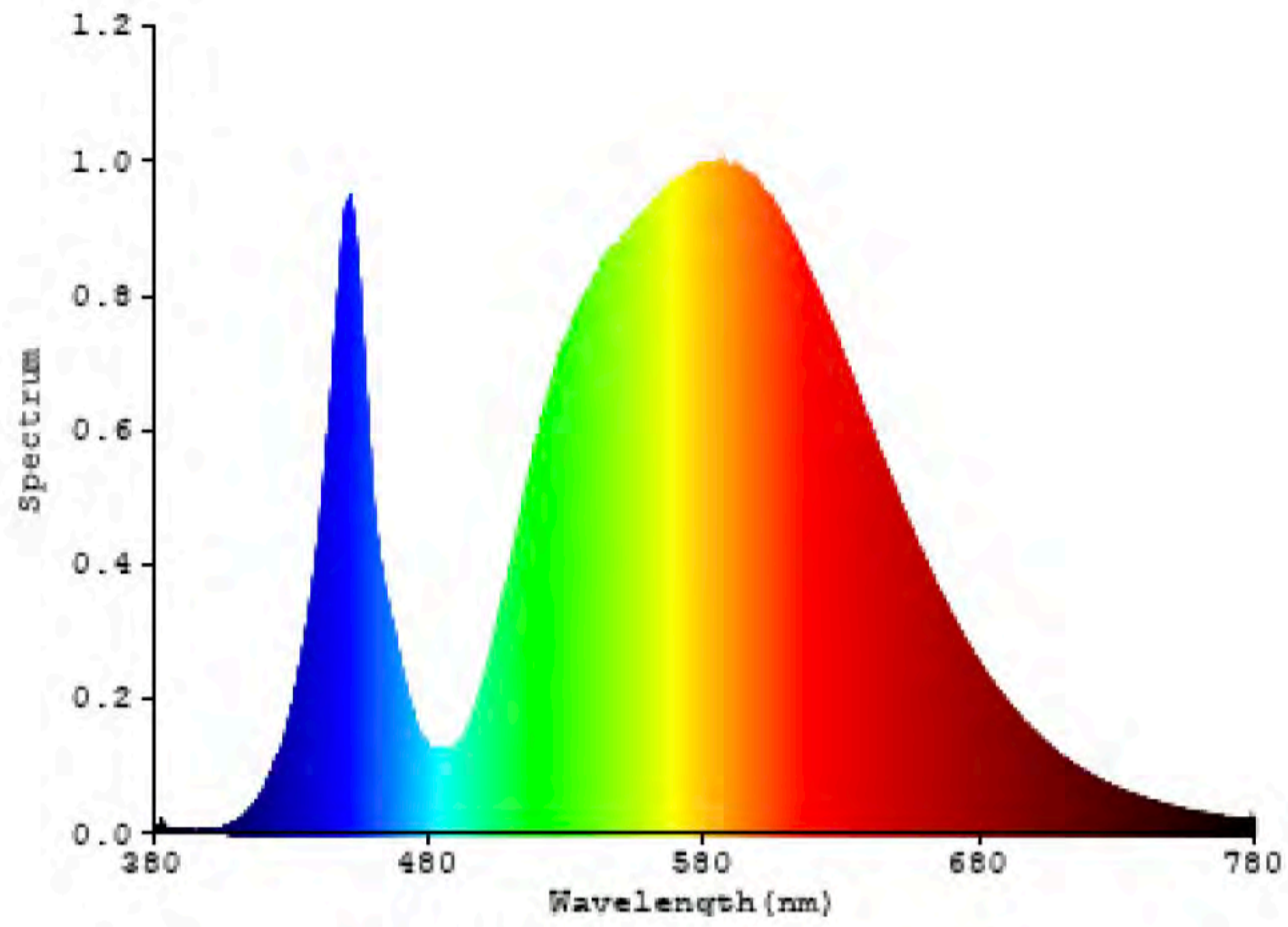


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	334.73	2.14%
10- 20	1009.683	6.44%
20- 30	1553.3	9.91%
30- 40	1810.324	11.56%
40- 50	1925.162	12.29%
50- 60	2034.274	12.98%
60- 70	2171.459	13.86%
70- 80	1973.039	12.59%
80- 90	1207.516	7.71%
90-100	671.863	4.29%
100-110	455.731	2.91%
110-120	265.364	1.69%
120-130	131.814	0.84%
130-140	68.036	0.43%
140-150	37.458	0.24%
150-160	13.873	0.09%
160-170	2.819	0.02%
170-180	0.402	0.00%
Total	15666.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	8667.473	55.32%
60- 90	5352.014	34.16%
0-90	14019.49	89.49%
90- 180	1647.36	10.51%
0- 180	15666.8	100%

Table 3: Zonal Lumen Data

Note: The Flux in this table might be a little different from the total flux in Table 2 due to rounding.

Illuminance Plots- Goniophotometer Method

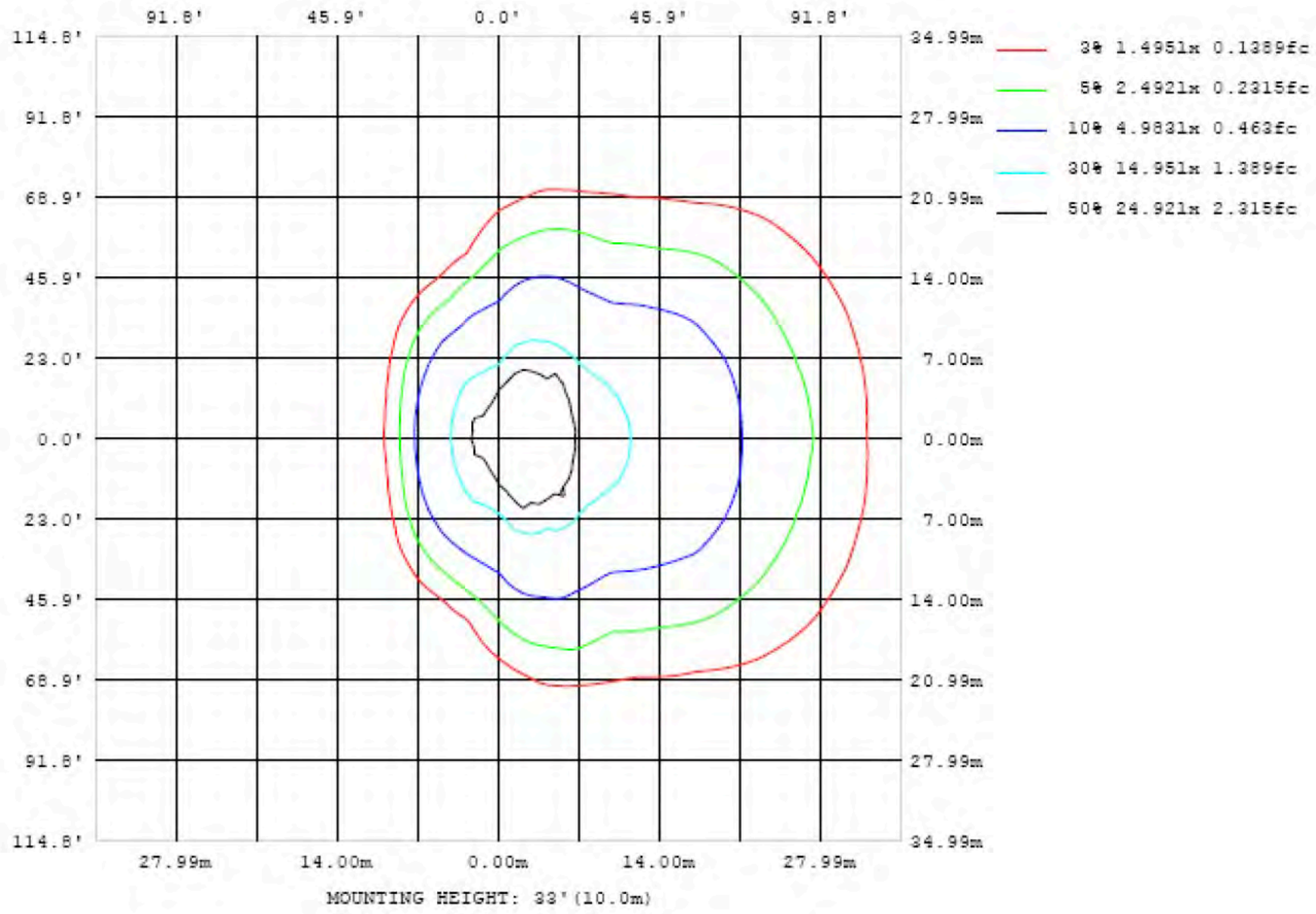


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

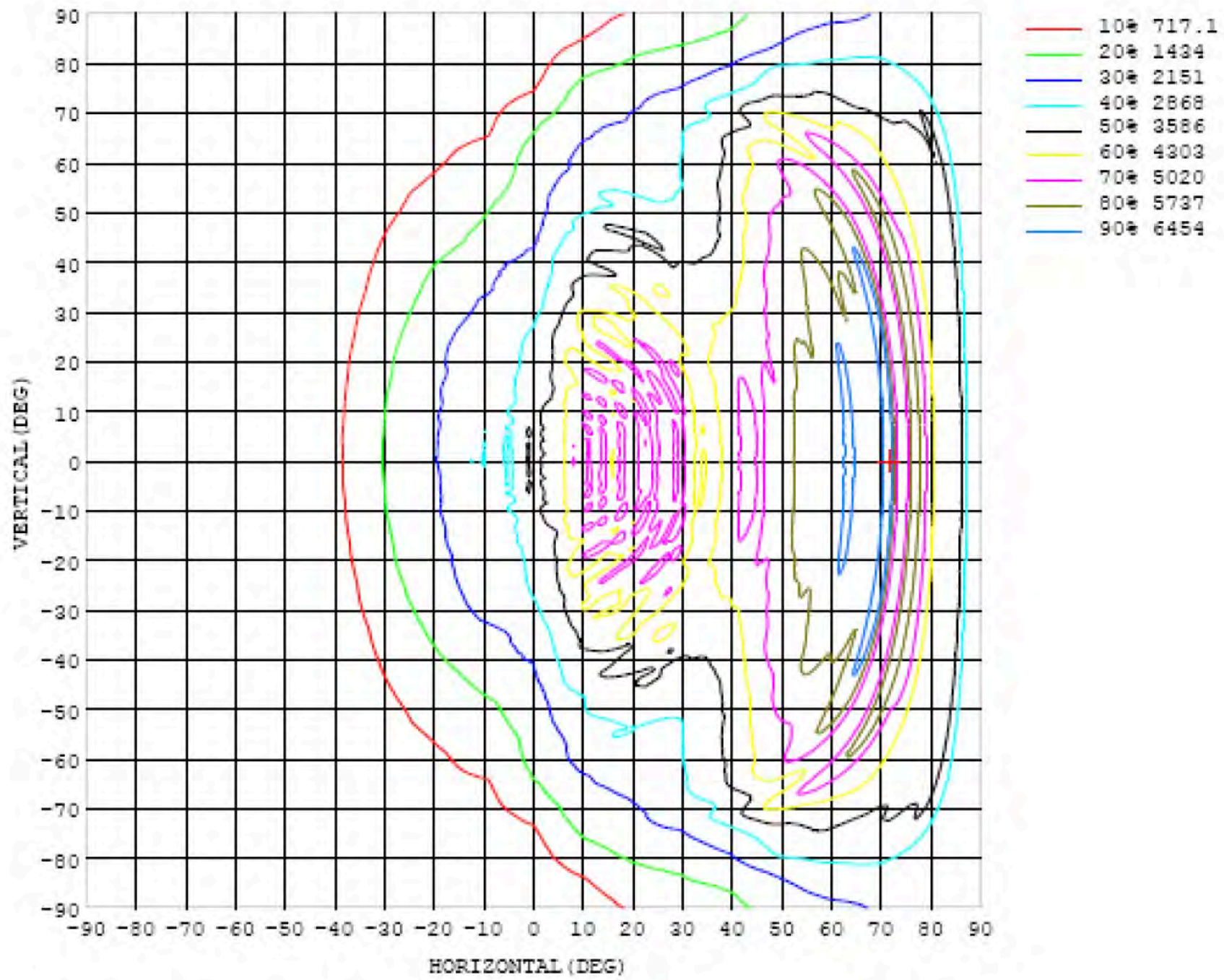


Chart 3: Isocandela Plot

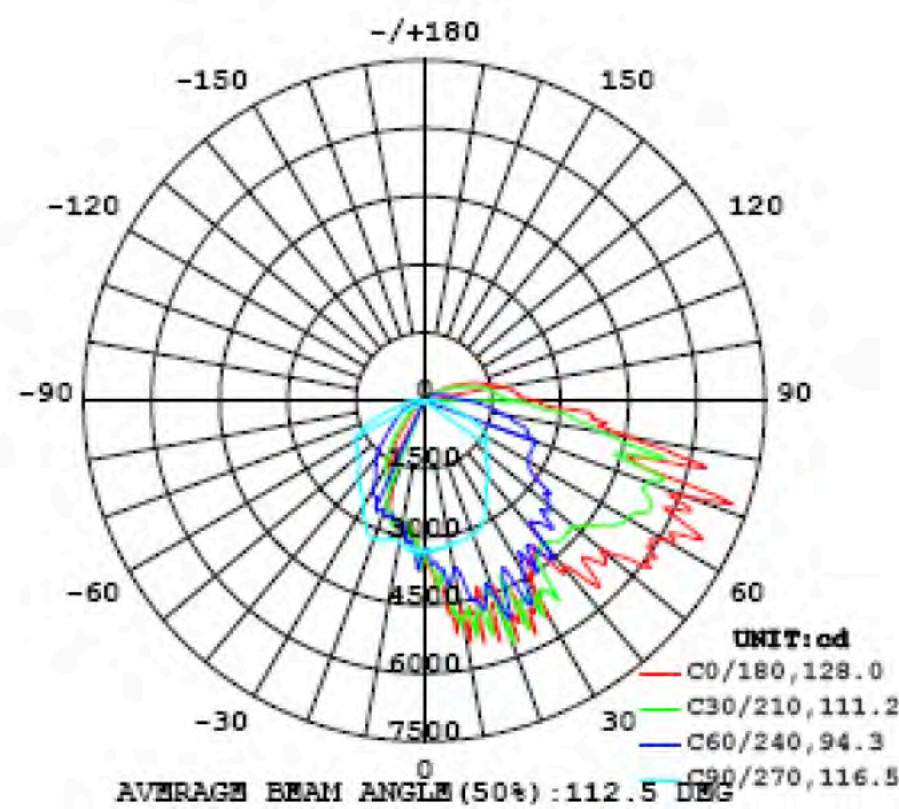


Chart 4: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

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	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333
5	3847	3791	3886	4057	4001	3814	3712	3731	3319	3306	3775	3295	3089	3066	3068	2810	2726	2795	2811
10	4620	4753	4925	4829	4696	4468	3808	3854	3724	3256	3216	3047	2836	2699	2701	2740	2778	2858	2910
15	4483	4744	5507	4707	4924	4637	4545	3617	3361	3183	2927	2707	2548	2667	2569	2783	2641	2588	2638
20	4545	4673	4721	5436	4471	4437	4601	4004	3374	3142	2664	2596	2576	2619	2405	2328	2114	2057	2137
25	4952	4669	5085	5440	4580	4208	4074	4228	3434	3006	2472	2395	2368	2204	1979	1889	1798	1819	1884
30	5510	5467	5052	4935	4467	4514	4369	4301	3362	2707	2325	2379	2155	1887	1707	1624	1526	1475	1473
35	4170	4267	4224	4500	4470	4232	3925	4017	3200	2380	2137	2022	1804	1637	1464	1284	1165	1050	1052
40	4779	4749	4455	4202	4049	4075	4130	3571	3141	2196	2023	1736	1542	1334	1103	872	711	628	612
45	4912	5113	4827	4317	3903	3647	4005	3633	2968	1947	1710	1456	1246	1014	762	576	459	415	417
50	5069	5172	4965	4326	3690	3388	3564	3267	2649	1783	1389	1149	961	758	541	410	337	294	290
55	6079	5934	5462	4774	3756	3021	3061	2830	2410	1668	1124	890	755	560	388	284	230	209	207
60	6066	6031	5642	5153	4036	3052	2665	2687	2295	1600	909	733	610	405	261	196	157	158	160
65	6188	6329	6062	5506	4324	3303	2612	2384	2037	1351	699	622	469	268	168	137	118	126	127
70	6206	6018	5769	5250	4541	3390	2580	2092	1802	946	573	496	324	177	115	89.7	81.9	76.8	73.5
75	4632	4773	4505	4459	4092	3132	2306	1894	1493	626	468	374	230	114	69.7	40.2	26.7	19.7	19.0
80	4559	4690	4535	3939	3298	2342	1796	1550	1072	459	369	274	149	71.3	30.4	7.04	1.24	1.27	2.05
85	3735	3703	3354	3023	2367	1671	1396	1198	629	347	283	195	102	52.7	24.8	4.88	1.50	1.54	2.53
90	2401	2387	2210	2003	1747	1272	1007	802	355	242	221	147	78.5	43.9	20.9	3.44	1.79	1.86	2.97
95	2042	2024	1805	1620	1357	1015	711	457	221	182	166	113	63.2	38.1	17.7	2.51	2.12	2.19	3.18
100	1745	1742	1633	1461	1187	866	580	325	171	153	126	87.5	53.4	33.2	14.5	2.20	2.40	2.50	3.37
105	1417	1421	1360	1205	992	709	492	258	143	137	102	67.5	46.3	28.4	11.4	2.45	2.66	2.78	3.62
110	1164	1145	1081	914	782	592	405	224	133	122	84.2	54.2	37.6	23.8	9.03	2.72	2.95	3.10	3.70
115	833	814	767	681	584	485	324	203	129	104	67.1	43.2	29.8	19.3	6.81	3.09	3.33	3.46	3.72
120	584	573	537	480	442	382	289	187	110	82.1	50.3	34.3	23.8	14.8	4.67	3.22	3.43	3.54	3.70
125	395	392	366	351	323	280	227	153	89.5	62.9	38.5	27.3	19.1	10.9	3.20	3.10	3.25	3.34	3.83
130	283	280	265	257	249	217	175	128	69.1	46.5	29.7	21.4	14.7	7.93	3.03	3.18	3.30	3.39	4.16
135	208	209	209	209	201	182	145	113	49.4	33.9	22.8	16.5	10.9	5.34	3.18	3.32	3.45	3.54	4.57
140	202	200	188	179	181	155	112	70.7	33.5	24.0	16.5	11.9	7.55	3.45	3.14	3.29	3.45	3.53	4.89
145	171	169	165	158	146	118	79.2	41.8	21.7	15.8	11.4	8.05	4.74	3.02	3.10	3.22	3.34	3.45	5.13
150	138	138	132	119	100	78.0	51.0	21.3	12.9	9.77	7.22	4.92	3.08	3.13	3.21	3.30	3.41	3.52	5.10
155	99.7	96.9	90.2	78.0	63.5	45.3	23.6	7.82	6.64	5.38	4.12	3.20	3.23	3.26	3.29	3.37	3.49	3.60	4.87
160	63.7	61.9	55.7	45.9	33.7	19.4	8.02	3.30	3.29	3.28	3.35	3.40	3.43	3.42	3.43	3.52	3.63	3.68	4.57
165	28.9	28.1	24.6	18.6	12.3	6.32	3.21	3.35	3.50	3.61	3.67	3.70	3.72	3.72	3.71	3.76	3.82	3.86	4.34
170	6.68	6.49	5.55	3.34	3.27	3.42	3.59	3.73	3.87	3.99	4.07	4.12	4.13	4.11	4.09	4.13	4.18	4.20	4.17
175	3.60	3.57	3.56	3.56	3.61	3.76	3.89	4.02	4.15	4.28	4.36	4.44	4.49	4.49	4.51	4.56	4.59	4.64	3.97
180	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.25	4.25	4.25	4.25

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	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333	3333		
5	2788	2746	2904	3189	3087	3136	3337	3679	3288	3349	3621	3576	3761	4194	3984	3856	3770		
10	2877	2794	2703	2744	2719	2788	3115	3325	3173	3633	3956	3767	4511	4547	4704	4997	4733		
15	2613	2633	2842	2637	2673	2625	2768	2980	3138	3375	3731	4697	4790	4697	4784	5584	4739		
20	2123	2159	2378	2435	2696	2571	2606	2785	3252	3502	4221	4831	4421	4500	5526	4623	4663		
25	1817	1808	1950	2011	2289	2516	2511	2601	3030	3641	4058	4244	4110	4427	4985	5058	4520		
30	1484	1520	1688	1802	1960	2234	2316	2419	2701	3415	4569	3977	4113	4710	4896	4863	5507		
35	1090	1206	1335	1502	1694	1874	2091	2219	2408	3371	3930	4131	4344	4776	4251	4202	4279		
40	635	746	928	1128	1372	1642	1826	2144	2248	3298	3450	3675	4206	4050	4166	4546	4744		
45	426	482	604	807	1044	1318	1491	1862	2062	3017	3428	3745	3662	3922	4362	4968	5086		
50	303	353	430	582	801	1004	1173	1534	1884	2698	3386	3585	3345	3801	4396	4990	5041		
55	213	237	301	420	609	790	932	1258	1779	2534	3100	2947	3082	3783	4808	5473	5870		
60	163	167	211	284	448	647	759	966	1741	2234	2751	2636	3115	4117	5216	5706	6004		
65	130	123	145	182	307	512	641	754	1509	2125	2363	2672	3324	4482	5488	6047	6200		
70	80.6	84.8	95.9	126	199	365	520	587	1076	1912	2150	2638	3502	4683	5415	5763	6050		
75	22.0	29.1	45.7	78.0	131	255	398	494	683	1644	1911	2394	3202	4194	4424	4393	4668		
80	2.02	1.92	10.8	36.0	80.4	170	290	378	474	1190	1549	1892	2355	3343	4020	4705	4643		
85	2.49	2.37	8.34	29.5	60.7	117	207	285	367	725	1198	1395	1670	2367	2969	3362	3632		
90	2.91	2.77	6.58	25.2	48.6	87.9	157	221	245	385	792	983	1298	1753	1959	2207	2358		
95	3.12	2.96	4.92	21.4	41.4	68.2	122	169	178	225	485	730	1015	1382	1642	1826	1987		
100	3.30	3.11	3.56	17.7	36.7	56.5	95.1	133	149	173	355	611	866	1185	1443	1629	1735		
105	3.57	3.37	3.03	14.3	31.3	49.6	74.0	111	136	147	280	507	722	987	1211	1357	1394		
110	3.64	3.43	3.11	11.8	26.4	41.6	58.3	93.2	126	140	240	416	602	780	911	1067	1143		
115	3.66	3.48	3.21	9.06	21.4	32.9	46.9	74.1	112	140	217	342	480	585	692	768	812		
120	3.66	3.51	3.32	6.48	17.1	26.3	36.8	56.6	90.8	123	200	291	381	451	481	539	572		
125	3.81	3.68	3.55	4.68	13.0	21.0	29.4	42.1	69.1	100	162	227	284	321	351	373	391		
130	4.16	4.06	3.95	3.92	9.91	16.7	23.2	32.5	50.1	76.0	132	181	224	250	254	264	283		
135	4.58	4.52	4.43	4.31	7.49	12.7	18.3	25.0	36.7	54.6	117	150	185	203	208	208	212		
140	4.91	4.86	4.75	4.63	5.52	9.54	13.8	18.7	26.3	36.0	79.5	121	162	177	178	187	201		
145	5.13	5.08	4.97	4.83	4.70	6.93	10.1	13.2	18.1	23.8	49.2	87.6	126	151	162	166	169		
150	5.08	5.01	4.92	4.81	4.72	4.81	6.78	8.98	11.5	14.7	25.6	55.6	82.5	105	124	134	139		
155	4.87	4.79	4.70	4.62	4.57	4.52	4.53	5.59	6.83	8.04	9.39	26.4	47.8	64.9	80.9	92.7	100		
160	4.58	4.53	4.45	4.37	4.38	4.41	4.43	4.45	4.42	4.53	4.61	8.11	19.7	33.6	46.5	57.1	63.7		
165	4.34	4.33	4.32	4.27	4.30	4.37	4.44	4.50	4.54	4.53	4.50	4.44	4.83	11.3	18.6	24.3	29.0		
170	4.19	4.14	4.14	4.13	4.18	4.30	4.41	4.52	4.62	4.67	4.69	4.67	4.63	4.53	4.44	4.90	6.95		
175	3.98	3.95	3.94	3.90	3.93	4.04	4.18	4.30	4.49	4.58	4.65	4.68	4.67	4.67	4.64	4.63	4.67		
180	4.25	4.25	4.25	4.25	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24		

Table 5: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	PF2010A	HZTE028-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	DPS1060	HZTE001-06	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	WY12010	HZTE004-03	Aug. 02, 2019	Aug. 01, 2020
Standard Source	D908	HZTE012-01	Aug. 02, 2019	Aug. 01, 2020
Standard source	SCL-1400	HZTE012-02	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 02, 2019	Aug. 01, 2020
Temperature recorder	JM624U	HZTE018-08	Aug. 02, 2019	Aug. 01, 2020

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 2.3% with a coverage factor k=2.

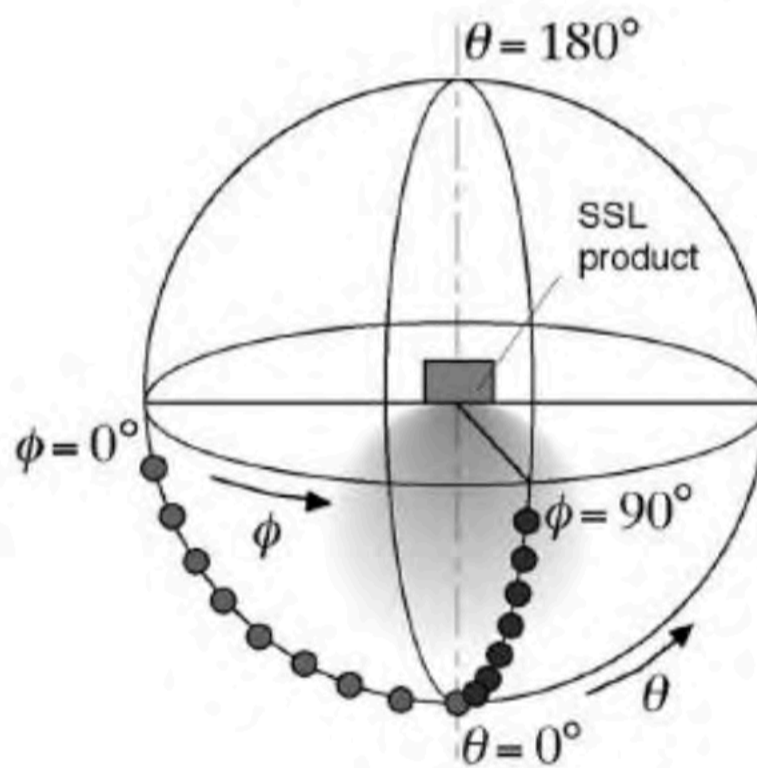
Color Characteristics Measurements

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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