



## LM-79-08 Test Report

for

**P.Q.L., Inc.**

2285 Ward Avenue / Simi Valley, CA 93065

**FLOOD light**

**Model: 84138**

**Laboratory: Leading Testing Laboratories**

**NVLAP CODE: 200960-0**

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Report No.: HZ18050002g

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

Review by:

Engineer: April Zou  
May 14, 2018

Approved by



Manager: Jim Zhang  
May 14, 2018

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: **84138**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
125.8	9101.6	72.35	0.9950
CCT (K)	CRI	Stabilization Time (Light & Power)	
3917	70.4	60	

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

**Test specifications:**

<b>Date of Receipt</b>	: May 04, 2018
<b>Date of Test</b>	: May 10, 2018
<b>Test item</b>	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
<b>Reference Standard</b>	: IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

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## Sample Photos



Overview of the sample

### Equipment Under Test (EUT)

<b>Name</b>	: FLOOD light
<b>Model</b>	: 84138
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz
<b>Product Description</b>	: 4000K
<b>Manufacturer</b>	: P.Q.L., Inc.
<b>Address</b>	: 2285 Ward Avenue / Simi Valley, CA 93065

**TEST RESULTS**

Test ambient temperature was 24.8°C.

Base orientation was base up. 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 95 minutes.

The photometric distance of Goniophotometer is 2.47 m.

Luminous data was taken at 0.5° vertical intervals and 10.0° horizontal intervals.

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.606	0.265
Power Factor	0.9950	0.9630
Test Power (W)	72.35	70.62
THD A%	6.90	7.86
Luminous Efficacy (lm/W)	125.8	128.7
Total Luminous Flux (lm)	9101.6	9087.3
Color Rendering Index (CRI)	70.4	
R9	-21	
Correlated Color Temperature (CCT) (K)	3917	
Chromaticity (Chroma x, Chroma y)	(0.3855, 0.3836)	
Chromaticity (Chroma u, Chroma v)	(0.2257, 0.3369)	
Chromaticity (Chroma u', Chroma v')	(0.2257, 0.5053)	
Duv	0.0017	
Average Beam Angle (°)	90.9	
Center Beam Candle Power (cd)	4527	
Spacing Criteria	1.00 (0°-180°) 1.23 (90°-270°)	
Zonal Lumens in the 0°-60°Zone	96.76%	
Zonal Lumens in the 60°-90°Zone	3.15%	
Zonal Lumens in the 90°-120°Zone	0.01%	
Zonal Lumens in the 120°-180°Zone	0.08%	

Special Color Rendering Indices	
R1	68
R2	77
R3	80
R4	69
R5	66
R6	64
R7	82
R8	56
R9	-21
R10	41
R11	60
R12	30
R13	69
R14	88

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

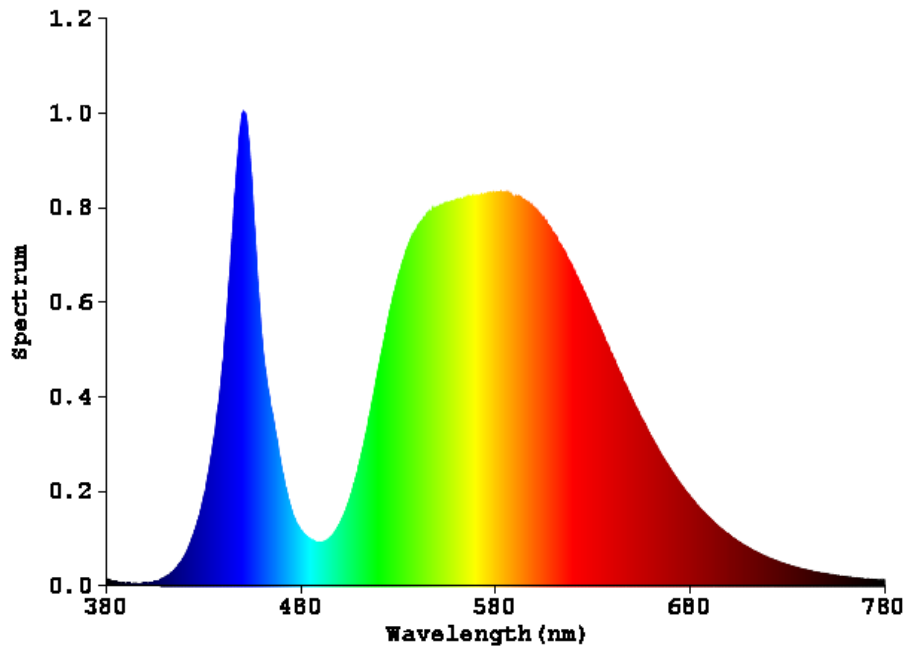


Chart 1: Spectral Power Distribution

### Zonal Lumen Tabulation

$\gamma(^{\circ})$	Lumens	% Total
0- 10	434.928	4.78%
10- 20	1274.07	14.00%
20- 30	1906.484	20.95%
30- 40	2153.73	23.66%
40- 50	1884.832	20.71%
50- 60	1152.402	12.66%
60- 70	273.235	3.00%
70- 80	13.435	0.15%
80- 90	0.15	0.00%
90-100	0.104	0.00%
100-110	0.318	0.00%
110-120	0.619	0.01%
120-130	1.021	0.01%
130-140	1.519	0.02%
140-150	1.753	0.02%
150-160	1.542	0.02%
160-170	1.042	0.01%
170-180	0.373	0.00%
Total	9101.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	8806.446	96.76%
60- 90	286.82	3.15%
0-90	9093.266	99.91%
90- 180	8.291	0.09%
0- 180	9101.6	100%

Table 3: Zonal Lumen Data

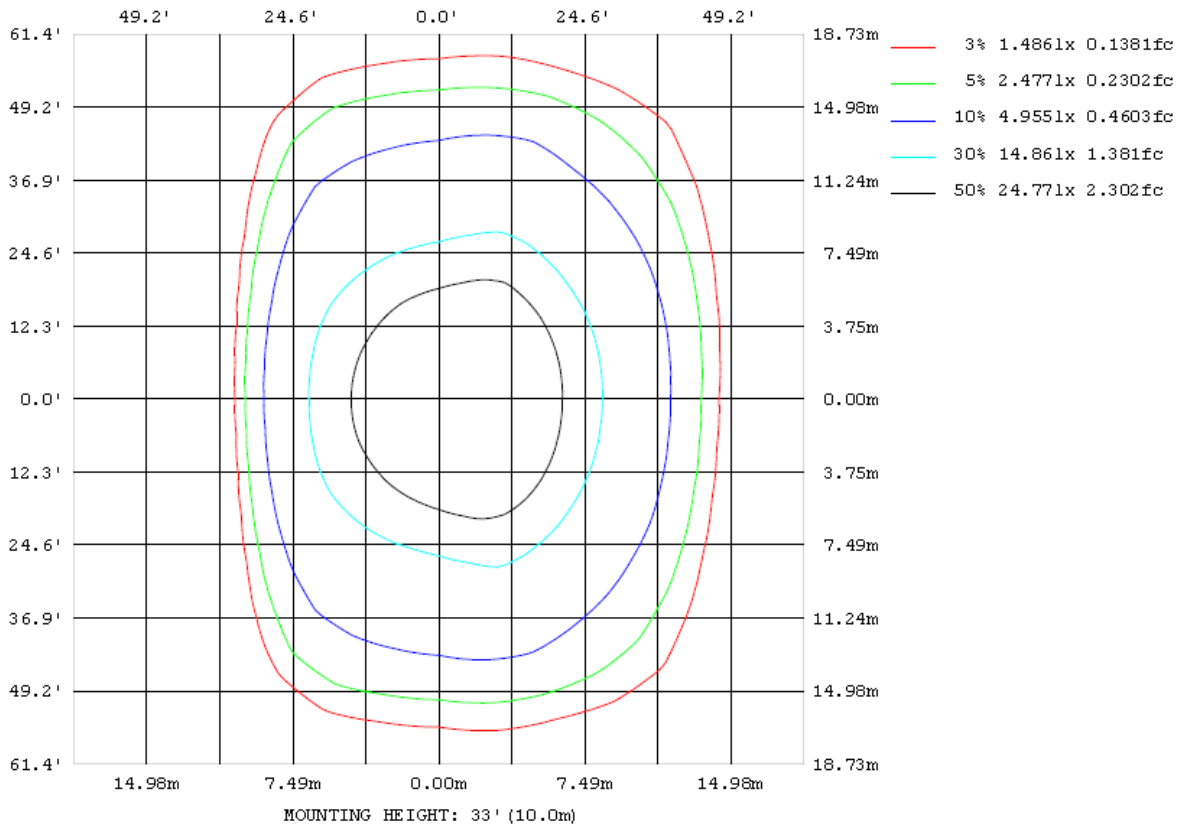


Chart 2: Illuminance Plot (Footcandles)



### Luminous Intensity Distribution Plots

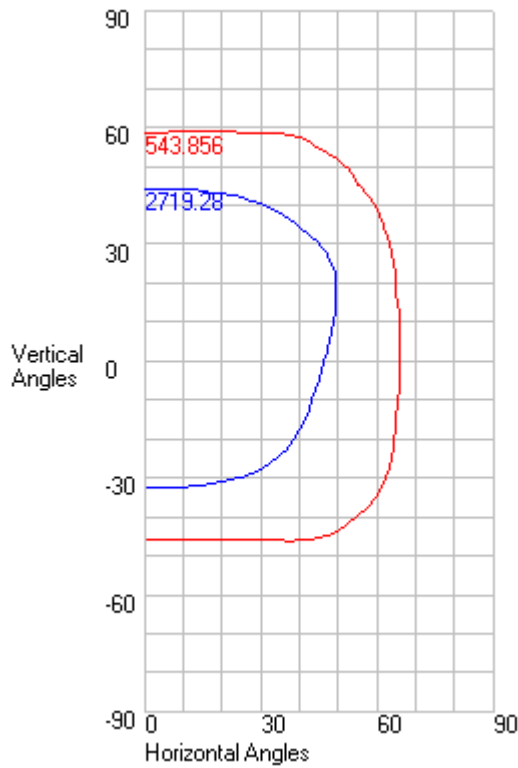


Chart 3: Isocandela Plot

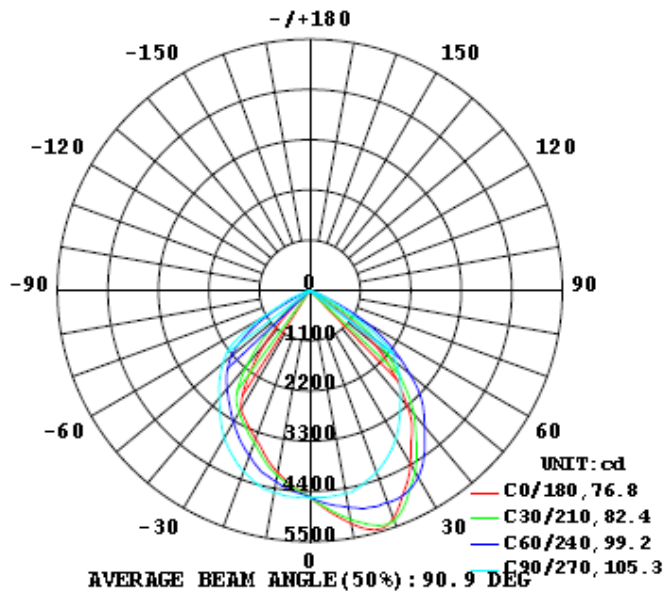


Chart 4: Polar Candela Distribution

### Luminous Intensity Data

Table--1 UNIT: cd

C (DEG) \ γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527
5	4856	4851	4837	4812	4778	4738	4694	4643	4588	4537	4486	4441	4404	4372	4341	4319	4303	4294	4292
10	5179	5165	5136	5086	5011	4918	4819	4715	4603	4501	4405	4325	4258	4196	4146	4108	4075	4057	4048
15	5422	5410	5379	5317	5216	5084	4920	4738	4572	4412	4281	4170	4079	4006	3914	3840	3787	3757	3746
20	5306	5318	5345	5362	5325	5183	4943	4694	4447	4236	4064	3939	3820	3734	3650	3561	3498	3468	3456
25	4852	4866	4920	5014	5095	5093	4911	4598	4270	4011	3830	3695	3581	3458	3376	3329	3276	3240	3229
30	4381	4410	4485	4583	4673	4760	4720	4409	4027	3740	3546	3420	3302	3223	3157	3093	3048	3006	2990
35	3868	3884	3934	4050	4212	4324	4348	4128	3723	3406	3227	3135	3049	2979	2922	2780	2581	2429	2385
40	3307	3333	3418	3530	3647	3808	3891	3872	3398	3070	2916	2856	2802	2741	2497	2124	1798	1590	1537
45	2575	2611	2740	2880	3099	3260	3460	3551	3093	2772	2655	2607	2554	2330	1806	1290	915	701	651
50	1841	1886	2038	2230	2457	2677	2839	3110	2755	2451	2360	2314	2219	1665	985	456	161	65.5	48.9
55	822	880	1095	1444	1810	2015	2188	2346	2164	1911	1884	1926	1647	901	229	38.9	8.84	5.59	2.75
60	38.8	45.2	151	461	952	1421	1440	1269	1168	988	985	1067	781	169	17.6	6.11	4.26	1.79	1.40
65	1.22	1.40	2.35	7.20	89.4	484	559	467	491	466	454	395	110	14.5	8.60	1.21	0.69	0.69	0.68
70	0.54	0.56	0.58	0.76	6.23	29.1	121	120	106	76.8	70.0	63.1	14.9	4.47	0.87	0.62	0.56	0.49	0.49
75	0.19	0.20	0.23	0.28	0.37	0.56	4.05	19.8	11.2	7.75	7.21	3.13	0.70	0.57	0.48	0.39	0.33	0.30	0.30
80	0.07	0.07	0.07	0.07	0.08	0.14	0.26	0.32	1.04	0.88	0.60	0.50	0.35	0.24	0.19	0.15	0.13	0.11	0.11
85	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.06	0.13	0.17	0.17	0.12	0.08	0.09	0.09	0.09	0.09	0.09	0.09
90	0.03	0.03	0.03	0.03	0.03	0.04	0.05	0.06	0.07	0.07	0.07	0.08	0.07	0.07	0.05	0.04	0.03	0.03	0.03
95	0.03	0.03	0.03	0.03	0.04	0.06	0.08	0.11	0.13	0.14	0.14	0.14	0.14	0.13	0.11	0.08	0.05	0.04	0.04
100	0.02	0.03	0.03	0.04	0.07	0.10	0.14	0.18	0.22	0.25	0.25	0.25	0.24	0.22	0.19	0.15	0.11	0.08	0.11
105	0.03	0.03	0.05	0.09	0.12	0.17	0.23	0.30	0.36	0.40	0.41	0.40	0.38	0.35	0.30	0.26	0.21	0.18	0.25
110	0.05	0.06	0.10	0.15	0.20	0.27	0.36	0.46	0.53	0.58	0.59	0.57	0.55	0.51	0.46	0.40	0.34	0.31	0.44
115	0.11	0.13	0.17	0.24	0.31	0.43	0.51	0.64	0.71	0.78	0.79	0.77	0.74	0.71	0.66	0.60	0.54	0.51	0.66
120	0.25	0.27	0.32	0.39	0.50	0.65	0.76	0.79	0.94	1.02	1.03	1.01	0.99	0.96	0.90	0.83	0.78	0.78	0.98
125	0.46	0.49	0.55	0.62	0.72	0.88	1.00	1.09	1.22	1.32	1.33	1.30	1.27	1.25	1.19	1.13	1.09	1.13	1.36
130	0.74	0.76	0.84	0.93	0.97	1.11	1.29	1.45	1.49	1.64	1.66	1.66	1.63	1.57	1.55	1.57	1.48	1.53	1.92
135	1.09	1.10	1.16	1.22	1.29	1.41	1.55	1.74	1.81	1.95	1.98	1.99	1.97	1.98	2.00	1.96	1.92	2.03	2.59
140	1.42	1.37	1.42	1.51	1.61	1.80	1.93	2.04	2.18	2.26	2.32	2.38	2.37	2.38	2.34	2.30	2.28	2.47	3.21
145	1.78	1.67	1.75	1.80	1.90	2.00	2.18	2.33	2.50	2.59	2.65	2.67	2.62	2.59	2.59	2.58	2.62	2.84	3.76
150	2.24	2.02	2.12	2.19	2.17	2.23	2.31	2.48	2.58	2.62	2.74	2.76	2.76	2.78	2.81	2.84	2.84	3.14	4.14
155	2.69	2.42	2.51	2.61	2.53	2.48	2.53	2.62	2.72	2.65	2.85	2.91	2.92	2.97	3.06	3.14	3.05	3.43	4.29
160	3.23	2.78	2.83	2.85	2.86	2.80	2.73	2.74	2.79	2.73	3.01	3.09	3.13	3.22	3.31	3.30	3.23	3.75	4.44
165	3.57	2.97	3.11	3.19	3.22	3.15	3.11	3.09	3.12	3.11	3.30	3.40	3.42	3.45	3.47	3.47	3.39	3.88	4.29
170	3.96	3.31	3.40	3.48	3.51	3.43	3.29	3.27	3.35	3.29	3.42	3.52	3.53	3.55	3.58	3.61	3.56	4.00	4.09
175	4.21	4.17	3.82	3.91	3.97	3.96	3.84	3.76	3.79	3.63	3.80	3.93	3.95	4.01	4.04	4.02	3.98	4.00	4.04
180	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80

Table 4: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527	4527		
5	4290	4297	4315	4341	4368	4399	4439	4487	4536	4586	4639	4684	4733	4778	4807	4832	4849		
10	4056	4082	4114	4159	4202	4248	4316	4395	4487	4580	4683	4790	4906	5000	5083	5133	5162		
15	3758	3798	3850	3917	4007	4105	4175	4257	4383	4528	4712	4899	5050	5187	5297	5370	5410		
20	3464	3494	3552	3643	3760	3857	3957	4066	4221	4419	4659	4910	5141	5288	5350	5342	5322		
25	3235	3265	3314	3376	3478	3608	3733	3840	3991	4238	4551	4870	5080	5103	5025	4933	4873		
30	3008	3043	3082	3144	3220	3331	3470	3582	3730	3988	4363	4698	4771	4660	4560	4475	4412		
35	2442	2590	2784	2904	2983	3054	3172	3271	3400	3689	4096	4397	4293	4200	4062	3950	3888		
40	1613	1816	2137	2516	2726	2809	2876	2949	3071	3385	3790	3921	3818	3674	3559	3462	3362		
45	731	952	1329	1833	2353	2560	2626	2682	2786	3097	3561	3499	3299	3151	2951	2788	2673		
50	71.8	216	510	1036	1698	2232	2338	2389	2477	2770	3155	2969	2727	2519	2298	2121	1937		
55	4.57	18.6	36.0	294	957	1690	1983	2025	2071	2305	2482	2254	2091	1882	1573	1218	956		
60	1.98	4.74	8.49	20.8	282	930	1282	1239	1242	1412	1522	1583	1523	1138	628	263	79.5		
65	0.69	0.76	2.60	12.0	20.0	217	504	584	602	651	624	740	706	295	32.6	4.32	2.11		
70	0.51	0.58	0.69	0.68	9.10	29.5	153	189	209	234	251	217	70.7	14.5	1.24	0.69	0.57		
75	0.31	0.36	0.43	0.53	0.64	1.06	5.94	29.4	28.5	30.3	40.5	18.7	0.59	0.45	0.34	0.25	0.22		
80	0.13	0.15	0.20	0.24	0.30	0.40	0.51	1.18	1.34	2.75	1.90	0.33	0.20	0.13	0.09	0.07	0.07		
85	0.09	0.09	0.09	0.09	0.09	0.12	0.23	0.31	0.35	0.20	0.13	0.06	0.06	0.05	0.04	0.04	0.03		
90	0.03	0.04	0.05	0.07	0.08	0.09	0.09	0.08	0.06	0.06	0.05	0.04	0.04	0.03	0.03	0.03	0.03		
95	0.04	0.05	0.09	0.12	0.16	0.17	0.18	0.16	0.15	0.14	0.12	0.10	0.06	0.04	0.03	0.02	0.02		
100	0.12	0.15	0.21	0.27	0.32	0.35	0.36	0.34	0.32	0.29	0.26	0.21	0.14	0.07	0.04	0.03	0.02		
105	0.27	0.32	0.40	0.47	0.54	0.59	0.60	0.58	0.54	0.49	0.43	0.36	0.26	0.16	0.08	0.04	0.03		
110	0.46	0.52	0.60	0.69	0.78	0.84	0.85	0.83	0.78	0.71	0.62	0.52	0.40	0.28	0.17	0.10	0.07		
115	0.68	0.74	0.83	0.92	0.98	1.03	1.05	1.03	0.98	0.89	0.78	0.66	0.54	0.42	0.30	0.22	0.17		
120	0.98	1.03	1.10	1.17	1.24	1.28	1.27	1.25	1.20	1.09	0.96	0.85	0.73	0.61	0.50	0.41	0.36		
125	1.36	1.39	1.44	1.52	1.57	1.61	1.59	1.56	1.51	1.39	1.24	1.09	0.96	0.87	0.76	0.68	0.63		
130	1.91	1.93	1.98	2.01	2.08	2.10	2.07	2.05	1.98	1.84	1.65	1.47	1.33	1.23	1.18	1.09	1.02		
135	2.59	2.59	2.64	2.68	2.68	2.65	2.66	2.63	2.56	2.39	2.17	1.91	1.80	1.73	1.65	1.57	1.50		
140	3.21	3.22	3.26	3.34	3.30	3.25	3.21	3.14	3.03	2.88	2.62	2.49	2.32	2.22	2.10	2.01	1.94		
145	3.74	3.80	3.78	3.81	3.83	3.77	3.70	3.60	3.51	3.36	3.17	3.01	2.86	2.69	2.57	2.52	2.43		
150	4.09	4.14	4.12	4.12	4.11	4.07	4.03	3.95	3.88	3.63	3.60	3.40	3.26	3.10	3.07	3.04	2.97		
155	4.24	4.35	4.39	4.30	4.23	4.18	4.12	4.00	3.97	3.90	3.81	3.64	3.53	3.46	3.51	3.41	3.31		
160	4.37	4.40	4.46	4.43	4.33	4.22	4.14	4.11	3.91	3.93	3.84	3.82	3.73	3.73	3.77	3.75	3.74		
165	4.29	4.30	4.34	4.40	4.38	4.29	4.22	4.12	3.99	3.92	3.88	3.91	3.89	3.85	3.84	3.87	3.92		
170	4.17	4.23	4.26	4.27	4.26	4.24	4.18	4.07	4.03	4.02	3.98	3.99	3.93	3.90	3.99	4.05	4.08		
175	4.08	4.12	4.12	4.09	4.08	4.07	4.03	4.00	3.98	3.84	3.95	4.08	4.02	3.96	4.01	4.13	4.21		
180	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80		

Table 5: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	PF2010A	HZTE028-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	DPS1060	HZTE001-06	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	WY12010	HZTE004-03	Aug. 10, 2017	Aug. 09, 2018
Standard Source	D908	HZTE012-01	Aug. 20, 2017	Aug. 19, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 16, 2017	Aug. 15, 2018
Temperature recorder	JM624U	HZTE018-08	Aug. 17, 2017	Aug. 16, 2018

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.

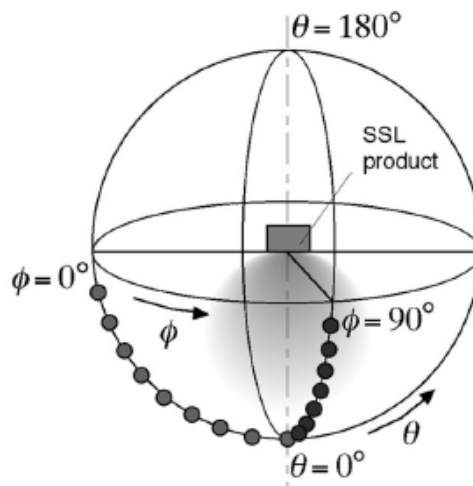
## Color Characteristics Measurements

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  $10^\circ$  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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