LM-79-08 Test Report

for

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

FLOOD light

84140

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18050002o

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

Review by: April Zou

Engineer: April Zou

May 14, 2018

Approved by: Jim Zhang

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: **84140**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
133.7	19545.0	146.22	0.9983

CCT (K)	CRI	Stabilization Time (Light & Power)
3929	71.1	60

Table 1: Executive Data Summary

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

Test specifications:	
Date of Receipt	: May 04, 2018
Date of Test	: May 04, 2018
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

Overview of the sample

Equipment Under Test (EUT)	
Name	: FLOOD light
Model	: 84140
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: 4000K
Manufacturer	: P.Q.L., Inc.
Address	: 2285 Ward Avenue / Simi Valley, CA 93065

TEST RESULTS

Test ambient temperature was 24.9℃.

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)	1.220	0.532
Power Factor	0.9983	0.9741
Test Power (W)	146.22	143.65
THD A%	4.42	5.44
Luminous Efficacy (lm/W)	133.7	135.4
Total Luminous Flux (lm)	19545.0	19449.0
Color Rendering Index (CRI)	71.1	
R9	-19	
Correlated Color Temperature (CCT) (K)	3929	
Chromaticity (Chroma x, Chroma y)	(0.3846, 0.3820)	
Chromaticity (Chroma u, Chroma v)	(0.2257, 0.3363)	
Chromaticity (Chroma u', Chroma v')	(0.2257, 0.5045)	
Duv	0.0013	
Average Beam Angle (°)	88.1	
Center Beam Candle Power (cd)	10710	
Spacing Criteria	1.02 (0°-180°)/ 1.27 (90°-270°)	
Zonal Lumens in the 0°-60°Zone	96.66%	
Zonal Lumens in the 60°-90°Zone	3.25%	
Zonal Lumens in the 90°-120°Zone	0.01%	
Zonal Lumens in the 120°-180°Zone	0.08%	

Special Color Rendering Indices	
R1	69
R2	77
R3	80
R4	70
R5	67
R6	65
R7	83
R8	57
R9	-19
R10	42
R11	61
R12	31
R13	70
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

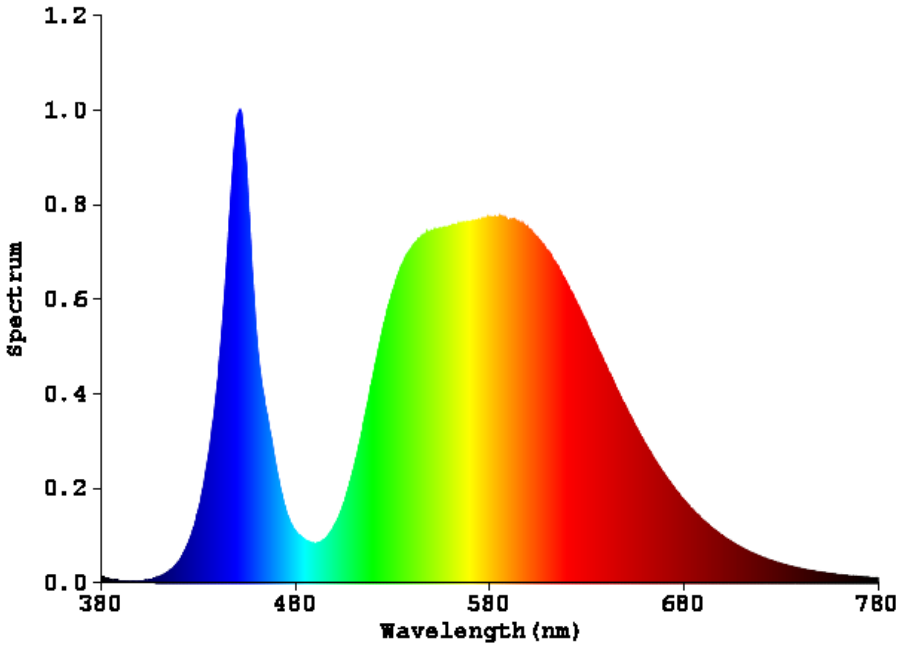


Chart 1: Spectral Power Distribution

Zonal Lumen Tabulation

γ(°)	Lumens	% Total
0- 10	1026.649	5.25%
10- 20	2929.466	14.99%
20- 30	4264.825	21.82%
30- 40	4747.141	24.29%
40- 50	3944.513	20.18%
50- 60	1979.289	10.13%
60- 70	583.255	2.98%
70- 80	50.313	0.26%
80- 90	1.688	0.01%
90-100	0.217	0.00%
100-110	0.605	0.00%
110-120	1.208	0.01%
120-130	2.108	0.01%
130-140	3.224	0.02%
140-150	3.758	0.02%
150-160	3.343	0.02%
160-170	2.27	0.01%
170-180	0.819	0.00%
Total	19544.7	100%

γ(°)	Lumens	% Total
0- 60	18891.88	96.66%
60- 90	635.256	3.25%
0-90	19527.14	99.91%
90- 180	17.552	0.09%
0- 180	19544.7	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.

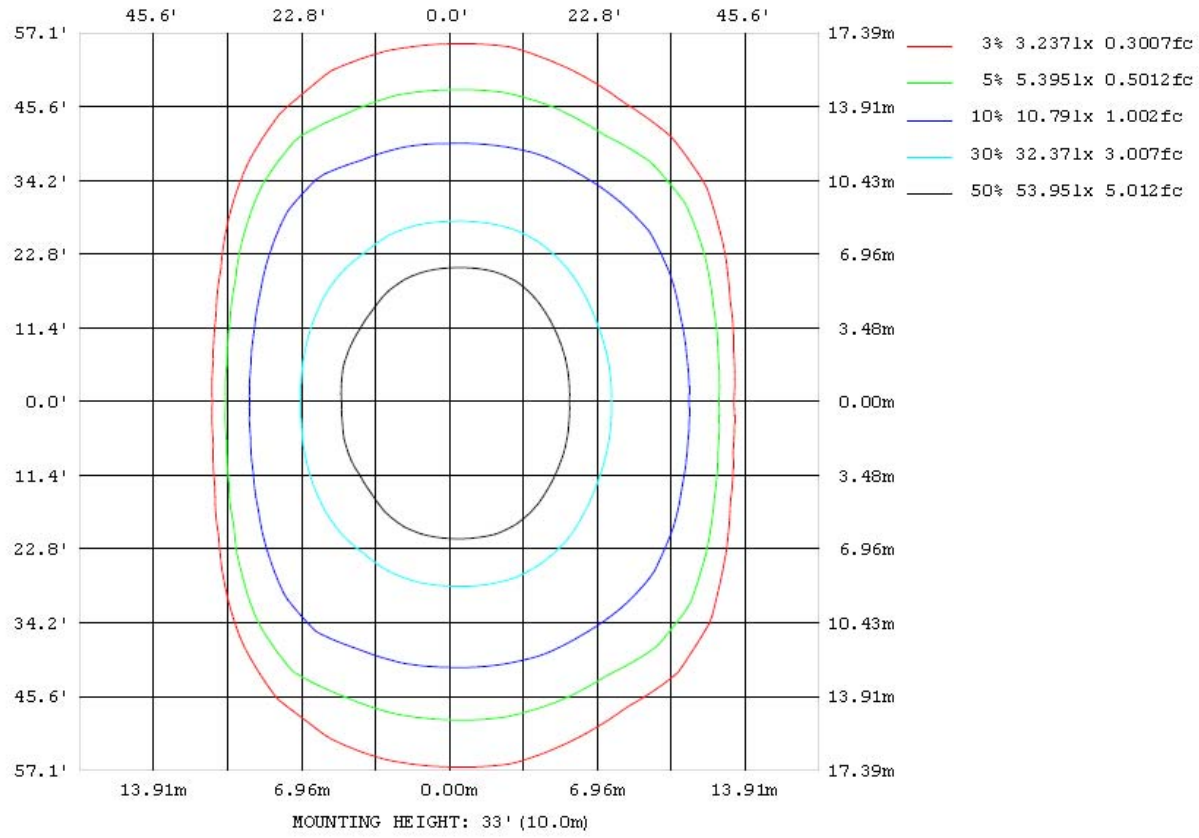


Chart 2: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots

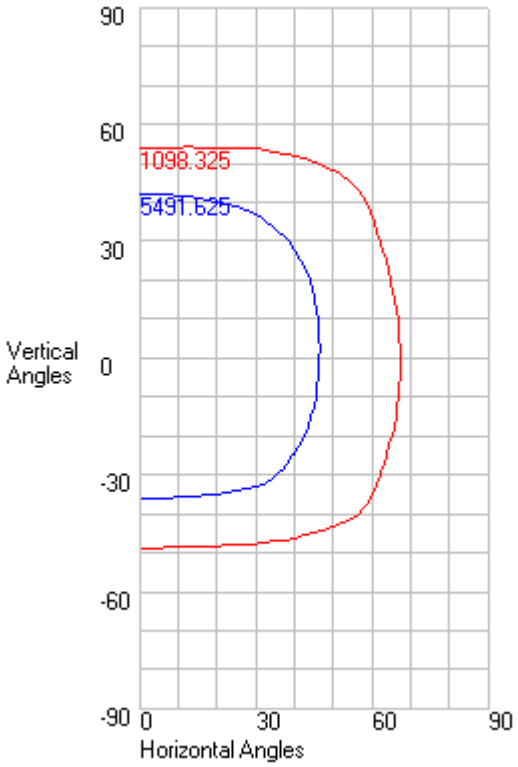


Chart 3: Isocandela Plot

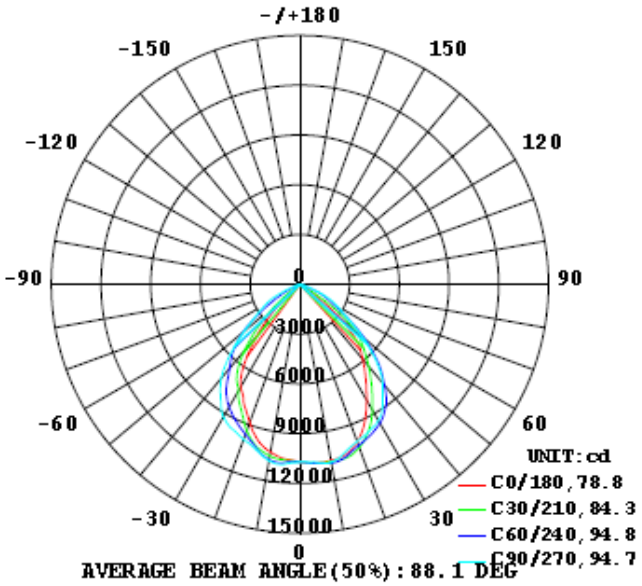


Chart 4: Polar Candela Distribution

Luminous Intensity Data

Table--1 UNIT: ×10cd

C(DEG) / γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071
5	1079	1078	1078	1082	1082	1083	1081	1080	1079	1075	1072	1068	1065	1064	1060	1058	1055	1054	1056
10	1077	1077	1082	1084	1090	1094	1095	1094	1092	1088	1083	1081	1076	1064	1051	1038	1030	1025	1027
15	1063	1067	1072	1082	1086	1082	1075	1064	1057	1049	1045	1044	1039	1034	1026	1009	990	978	975
20	1010	1016	1030	1047	1053	1045	1034	1025	1016	1007	1000	991	980	974	963	943	914	890	886
25	922	932	954	977	988	998	1004	999	989	981	971	952	931	900	868	847	825	802	798
30	805	817	844	875	908	941	966	970	956	946	933	915	873	815	777	754	739	722	717
35	693	704	726	756	804	866	903	909	888	869	860	848	799	740	693	672	637	600	586
40	591	600	615	646	694	755	794	807	793	775	765	740	687	664	614	533	462	415	399
45	488	500	519	542	587	619	670	688	667	649	644	629	593	560	468	358	276	229	215
50	308	327	370	435	473	499	510	521	503	490	488	477	485	419	292	180	103	66.7	54.4
55	63.4	79.3	144	250	342	363	345	357	355	345	342	329	331	239	123	37.4	18.9	9.30	8.53
60	0.92	2.56	3.62	34.7	131	210	220	240	260	254	249	234	176	82.1	18.4	2.78	0.89	0.82	0.78
65	0.67	0.69	0.76	0.85	5.40	64.2	145	156	172	172	172	163	70.0	7.36	0.82	0.70	0.68	0.63	0.60
70	0.51	0.52	0.56	0.63	0.73	0.86	37.9	73.3	67.0	65.2	70.8	58.2	6.91	0.66	0.58	0.50	0.47	0.44	0.43
75	0.34	0.35	0.38	0.42	0.48	0.56	0.68	11.6	13.9	12.8	16.1	6.49	0.53	0.45	0.39	0.38	0.37	0.36	0.34
80	0.24	0.24	0.23	0.23	0.24	0.29	0.40	0.54	1.27	0.64	0.88	0.43	0.34	0.30	0.28	0.28	0.28	0.28	0.28
85	0.01	0.01	0.01	0.01	0.01	0.01	0.11	0.18	0.34	0.29	0.28	0.23	0.18	0.18	0.19	0.20	0.22	0.22	0.22
90	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.04	0.03	0.02	0.01	0.01
95	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.01	0.01	0.01	0.01	0.01
100	0.01	0.01	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.04	0.04	0.04	0.03	0.03	0.02	0.02	0.01	0.01
105	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.07	0.07	0.07	0.06	0.05	0.05	0.04	0.03	0.02	0.03
110	0.02	0.02	0.03	0.03	0.05	0.06	0.08	0.09	0.10	0.10	0.10	0.10	0.09	0.08	0.07	0.06	0.05	0.05	0.07
115	0.03	0.04	0.05	0.06	0.07	0.09	0.11	0.13	0.14	0.14	0.14	0.13	0.12	0.11	0.10	0.09	0.08	0.08	0.11
120	0.07	0.07	0.08	0.10	0.11	0.14	0.16	0.17	0.18	0.19	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.13	0.17
125	0.12	0.13	0.13	0.15	0.17	0.19	0.21	0.22	0.24	0.25	0.25	0.24	0.22	0.21	0.20	0.19	0.18	0.18	0.24
130	0.18	0.19	0.20	0.22	0.23	0.25	0.28	0.30	0.30	0.32	0.31	0.30	0.29	0.28	0.26	0.26	0.25	0.25	0.34
135	0.26	0.27	0.28	0.29	0.30	0.33	0.35	0.38	0.38	0.40	0.40	0.39	0.37	0.35	0.35	0.34	0.34	0.34	0.47
140	0.33	0.34	0.35	0.36	0.38	0.41	0.43	0.45	0.46	0.46	0.47	0.46	0.45	0.44	0.42	0.41	0.41	0.42	0.59
145	0.40	0.42	0.43	0.43	0.45	0.47	0.50	0.51	0.54	0.54	0.54	0.53	0.51	0.50	0.48	0.48	0.49	0.48	0.70
150	0.49	0.51	0.52	0.52	0.51	0.52	0.53	0.56	0.57	0.57	0.58	0.57	0.55	0.54	0.54	0.54	0.56	0.55	0.78
155	0.57	0.60	0.60	0.61	0.58	0.57	0.58	0.59	0.59	0.58	0.60	0.60	0.60	0.60	0.60	0.62	0.62	0.61	0.85
160	0.66	0.68	0.68	0.68	0.66	0.63	0.61	0.61	0.62	0.60	0.65	0.66	0.66	0.66	0.67	0.67	0.67	0.68	0.89
165	0.70	0.72	0.73	0.72	0.72	0.69	0.67	0.67	0.66	0.66	0.70	0.71	0.71	0.72	0.72	0.72	0.73	0.72	0.90
170	0.77	0.78	0.79	0.79	0.77	0.74	0.73	0.72	0.74	0.74	0.74	0.77	0.76	0.76	0.76	0.77	0.78	0.78	0.90
175	0.87	0.88	0.90	0.89	0.88	0.85	0.84	0.84	0.82	0.80	0.84	0.85	0.84	0.84	0.85	0.86	0.86	0.86	0.89
180	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83

Table 4: Luminous Intensity Data

Table--2 UNIT: ×10cd

C(DEG) / γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071	1071		
5	1058	1062	1064	1068	1073	1078	1081	1085	1088	1092	1093	1091	1089	1087	1085	1085	1082		
10	1031	1039	1051	1062	1069	1073	1075	1076	1080	1085	1090	1093	1096	1096	1093	1085	1082		
15	983	999	1013	1017	1019	1021	1023	1027	1031	1041	1049	1061	1071	1080	1083	1078	1069		
20	898	922	938	946	954	963	976	987	995	1006	1015	1022	1031	1040	1041	1033	1018		
25	811	830	838	853	884	912	931	952	964	978	984	990	987	976	966	952	934		
30	728	738	744	771	802	855	886	909	924	938	948	951	926	895	865	839	817		
35	601	631	663	686	726	778	809	823	834	850	873	879	845	790	745	718	703		
40	412	455	521	600	644	662	711	733	740	755	770	760	723	676	632	610	598		
45	227	268	344	449	543	570	584	594	593	608	630	627	590	564	529	511	496		
50	63.0	98.4	168	272	386	448	430	440	438	450	468	464	463	452	417	359	324		
55	9.56	18.2	30.5	106	208	291	296	313	316	323	322	308	326	310	235	145	85.4		
60	0.74	0.77	0.81	15.0	59.9	155	217	231	235	240	218	203	180	114	31.5	4.67	0.93		
65	0.58	0.60	0.62	0.68	5.41	55.4	138	144	141	141	132	124	43.3	3.47	0.79	0.73	0.68		
70	0.41	0.42	0.43	0.49	0.57	4.68	36.2	46.0	38.5	41.0	55.2	25.0	0.75	0.65	0.58	0.54	0.51		
75	0.33	0.33	0.33	0.34	0.38	0.45	3.97	8.43	4.28	6.54	5.65	0.60	0.48	0.42	0.39	0.37	0.35		
80	0.27	0.26	0.24	0.24	0.25	0.27	0.37	0.41	0.50	0.86	0.49	0.32	0.24	0.21	0.22	0.24	0.24		
85	0.21	0.20	0.18	0.16	0.15	0.15	0.17	0.23	0.25	0.27	0.12	0.04	0.01	0.01	0.01	0.01	0.01		
90	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01		
95	0.01	0.01	0.01	0.02	0.03	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.02	0.01	0.01	0.01	0.01		
100	0.02	0.02	0.03	0.05	0.06	0.07	0.07	0.08	0.08	0.07	0.06	0.05	0.04	0.02	0.01	0.01	0.01		
105	0.04	0.05	0.07	0.08	0.10	0.11	0.11	0.12	0.12	0.11	0.10	0.08	0.06	0.04	0.03	0.02	0.01		
110	0.07	0.09	0.10	0.12	0.14	0.15	0.16	0.16	0.16	0.15	0.14	0.12	0.10	0.07	0.05	0.03	0.02		
115	0.11	0.13	0.14	0.16	0.18	0.19	0.20	0.20	0.20	0.19	0.18	0.16	0.13	0.11	0.08	0.06	0.05		
120	0.17	0.18	0.20	0.21	0.23	0.25	0.26	0.26	0.26	0.25	0.23	0.21	0.18	0.16	0.13	0.11	0.10		
125	0.24	0.25	0.27	0.29	0.31	0.33	0.34	0.35	0.34	0.33	0.31	0.28	0.25	0.23	0.20	0.18	0.17		
130	0.35	0.35	0.37	0.39	0.41	0.44	0.46	0.46	0.46	0.44	0.41	0.38	0.35	0.32	0.30	0.28	0.26		
135	0.48	0.48	0.50	0.52	0.54	0.57	0.59	0.59	0.59	0.57	0.53	0.50	0.47	0.45	0.42	0.40	0.38		
140	0.60	0.61	0.62	0.64	0.67	0.69	0.71	0.71	0.70	0.68	0.64	0.62	0.59	0.56	0.53	0.51	0.48		
145	0.71	0.72	0.73	0.74	0.77	0.79	0.81	0.80	0.80	0.77	0.75	0.73	0.70	0.66	0.64	0.63	0.60		
150	0.79	0.81	0.82	0.82	0.83	0.85	0.86	0.86	0.84	0.84	0.83	0.80	0.79	0.76	0.76	0.75	0.72		
155	0.86	0.87	0.88	0.88	0.87	0.88	0.89	0.88	0.87	0.87	0.85	0.84	0.83	0.84	0.85	0.81	0.79		
160	0.90	0.90	0.91	0.92	0.92	0.91	0.91	0.90	0.88	0.88	0.87	0.87	0.87	0.88	0.89	0.89	0.88		
165	0.90	0.92	0.92	0.93	0.94	0.93	0.93	0.91	0.90	0.88	0.88	0.88	0.88	0.88	0.88	0.90	0.89		
170	0.90	0.92	0.93	0.93	0.93	0.93	0.92	0.90	0.90	0.89	0.89	0.88	0.86	0.88	0.90	0.91	0.91		
175	0.90	0.91	0.91	0.92	0.91	0.91	0.91	0.90	0.89	0.87	0.90	0.90	0.88	0.90	0.93	0.93	0.94		
180	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83		

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

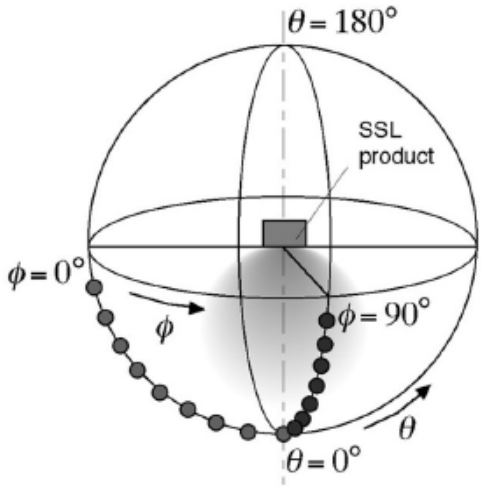
An EVERFINE Type C Model GO-R5000 Goniophotometer was used to measure the intensity at each angle of distribution for each sample. The photometric distance is 2.475m for near-field measurement or 30m for far-field measurement. Bandwidth of spectroradiometer is 380nm-780nm.
Ambient temperature was measured 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 expended 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°/180° and C=90°/270°) 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, Δu'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 ***