



LM-79-08 Test Report

for

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

PLH LAMP

Model: 9.5PLH/827/BYP

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist,
Hangzhou, Zhejiang Province, China 311100

Tel: +86 571 86376106

www.ledtestlab.com

Report No.: HZ17030069d

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

Review by:

Engineer: April Zou
Mar. 24, 2017

Approved by:



Manager: Jim Zhang
Mar. 24, 2017

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: **9.5PLH/827/BYP**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
109.1	1032.0	9.46	0.9730
CCT (K)	CRI	Stabilization Time (Light & Power)	
2735	81.8	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 : Mar. 21, 2017

Date of Test : Mar. 23, 2017

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

TABLE OF CONTENT

LM-79-08 Test Report.....	1
Test Summary.....	2
Sample Photos.....	4
TEST RESULTS	5
Goniophotometer Method	6
Spectral Power Distribution - Sphere Spectroradiometer Method	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	9
Zonal Lumen Tabulation- Goniophotometer Method	10
Luminous Intensity Distribution Plots- Goniophotometer Method.....	12
Luminous Intensity Data- Goniophotometer Method.....	13
EQUIPMENT LIST	15
TEST METHODS	15
Seasoning of SSL Product.....	15
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	15
Goniophotometer Method	16
Photometric and Electrical Measurements.....	16
Color Characteristics Measurements.....	16
Color Spatial Uniformity	16

Sample Photos



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: PLH LAMP
Model	: 9.5PLH/827/BYP
Electrical Ratings	: 120-277Vac, 60Hz, 9.5W
Product Description	: G24D base, 2700K, CRI80
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.0°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 70 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.081	0.039
Power Factor	0.9730	0.8848
Test Power (W)	9.46	9.49
THD A%	21.53	26.66
Luminous Efficacy (lm/W)	109.1	108.6
Total Luminous Flux (lm)	1032.0	1031.0
Color Rendering Index (CRI)	81.8	
R9	2.9	
Correlated Color Temperature (CCT)(K)	2735	
Chromaticity Chroma x	0.4630	
Chromaticity Chroma y	0.4211	
Chromaticity Chroma u	0.2598	
Chromaticity Chroma v	0.3545	
Duv	0.0033	
Chromaticity Chroma u'	0.2598	
Chromaticity Chroma v'	0.5317	

Special Color Rendering Indices	
R1	80.2
R2	91.7
R3	94.5
R4	79.2
R5	80.5
R6	91.7
R7	81.3
R8	55.6
R9	2.9
R10	82.1
R11	79.1
R12	74.2
R13	82.9
R14	97.4
Rf	83
Rg	91

Table 2: Test data per Sphere-Spectroradiometer Method

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

Goniophotometer Method

Test ambient temperature was 24.6°C.

The photometric distance is 2.47m.

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

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.081
Power Factor	0.9722
Test Power (W)	9.48
Luminous Efficacy (lm/W)	112.0
Total Luminous Flux (lm)	1061.9
Beam Angle (°)	110.0
Center Beam Candle Power (cd)	333
Spacing Criteria	1.15 (0°-180°)/ 1.23 (90°-270°)
Zonal Lumens in the 0°-60°Zone	67.84%
Zonal Lumens in the 60°-90°Zone	24.40%
Zonal Lumens in the 90°-120°Zone	6.46%
Zonal Lumens in the 120°-180°Zone	1.30%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

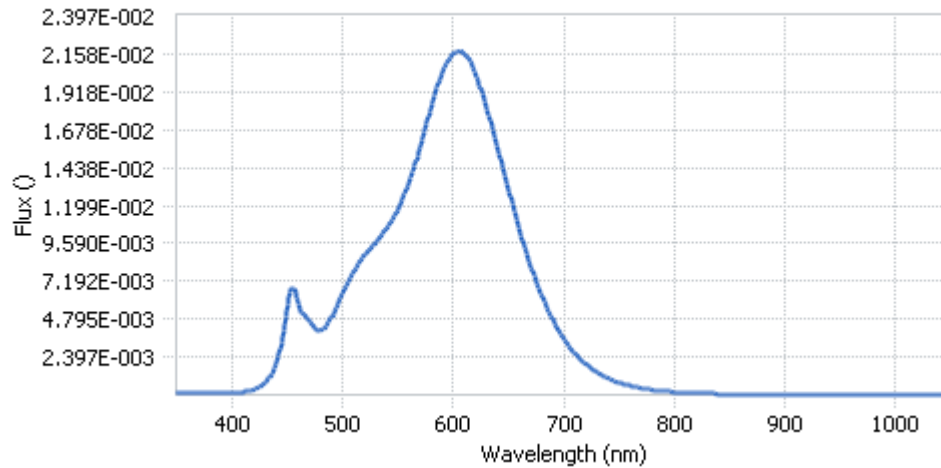
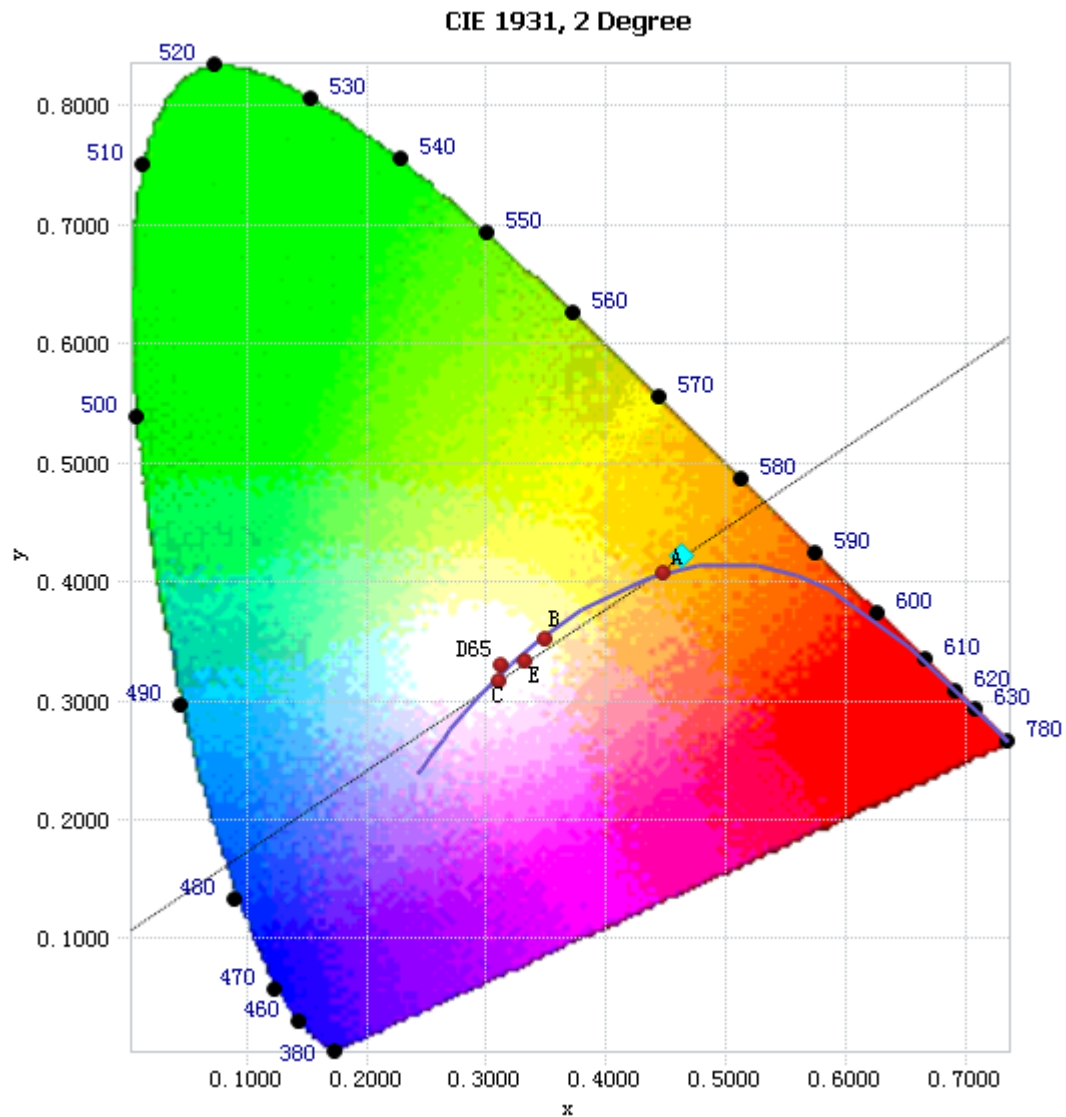


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.23E-04	485	4.35E-03	590	2.03E-02	695	4.11E-03
385	1.00E-04	490	4.90E-03	595	2.11E-02	700	3.55E-03
390	1.20E-04	495	5.60E-03	600	2.16E-02	705	3.06E-03
395	1.20E-04	500	6.35E-03	605	2.17E-02	710	2.63E-03
400	1.28E-04	505	7.10E-03	610	2.16E-02	715	2.25E-03
405	1.49E-04	510	7.75E-03	615	2.12E-02	720	1.95E-03
410	1.84E-04	515	8.34E-03	620	2.04E-02	725	1.67E-03
415	2.40E-04	520	8.82E-03	625	1.94E-02	730	1.44E-03
420	3.40E-04	525	9.26E-03	630	1.83E-02	735	1.23E-03
425	4.90E-04	530	9.64E-03	635	1.70E-02	740	1.04E-03
430	7.48E-04	535	1.01E-02	640	1.57E-02	745	8.94E-04
435	1.19E-03	540	1.06E-02	645	1.44E-02	750	7.74E-04
440	1.92E-03	545	1.11E-02	650	1.30E-02	755	6.59E-04
445	3.25E-03	550	1.17E-02	655	1.17E-02	760	5.75E-04
450	5.32E-03	555	1.25E-02	660	1.05E-02	765	4.90E-04
455	6.78E-03	560	1.34E-02	665	9.31E-03	770	4.25E-04
460	5.91E-03	565	1.44E-02	670	8.20E-03	775	3.62E-04
465	5.08E-03	570	1.56E-02	675	7.23E-03	780	3.13E-04
470	4.73E-03	575	1.69E-02	680	6.35E-03		
475	4.21E-03	580	1.81E-02	685	5.52E-03		
480	4.01E-03	585	1.93E-02	690	4.79E-03		

Table 4: Spectral Power Distribution Numerical Data per Sphere - Spectroradiometer Method

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4630, 0.4211)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

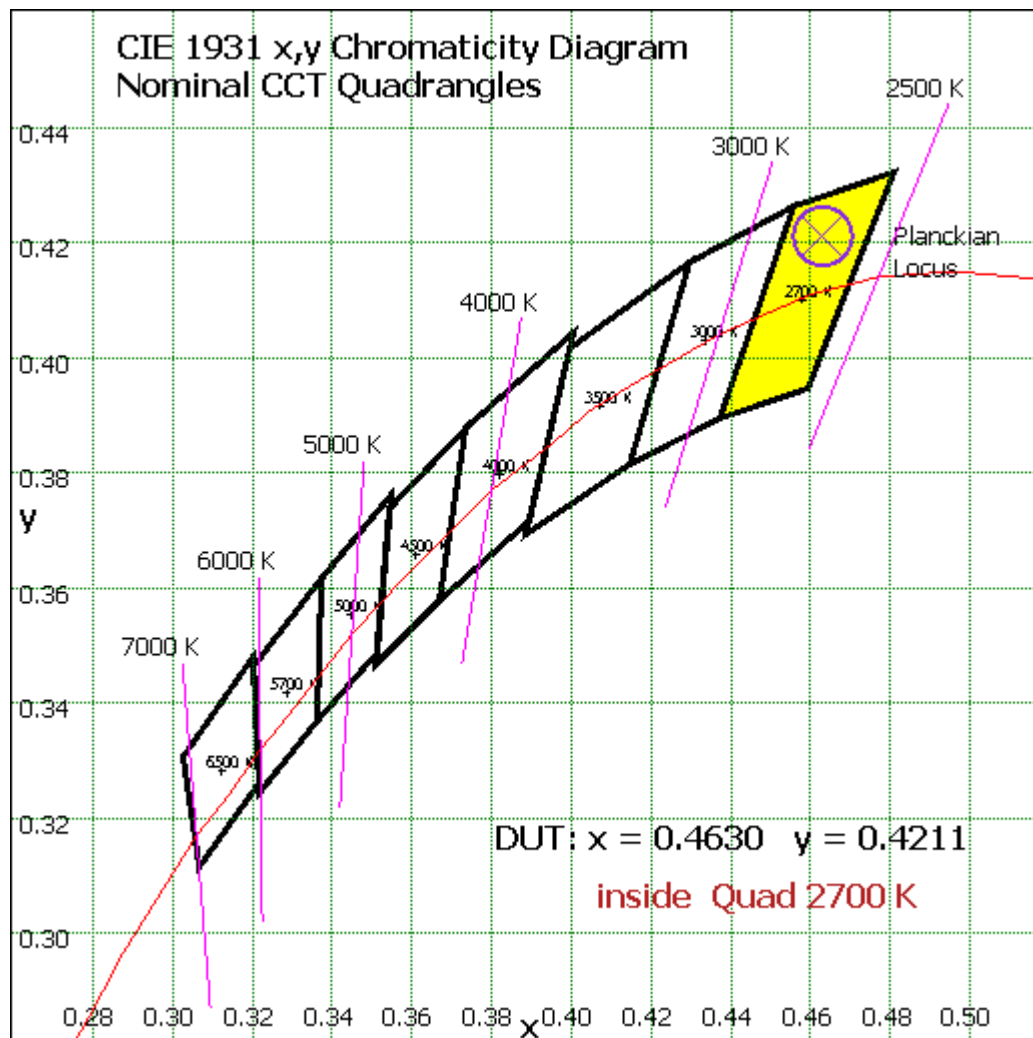


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	31.402	2.96%
10- 20	89.124	8.39%
20- 30	132.876	12.51%
30- 40	157.347	14.82%
40- 50	161.578	15.22%
50- 60	148.076	13.94%
60- 70	120.961	11.39%
70- 80	85.692	8.07%
80- 90	52.484	4.94%
90-100	32.802	3.09%
100-110	22.035	2.07%
110-120	13.752	1.29%
120-130	7.363	0.69%
130-140	3.705	0.35%
140-150	1.698	0.16%
150-160	0.731	0.07%
160-170	0.264	0.02%
170-180	0.055	0.01%
Total	1061.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	720.403	67.84%
60- 90	259.137	24.40%
0-90	979.54	92.24%
90- 180	82.405	7.76%
0- 180	1061.9	100%

Table 5: Zonal Lumen Data

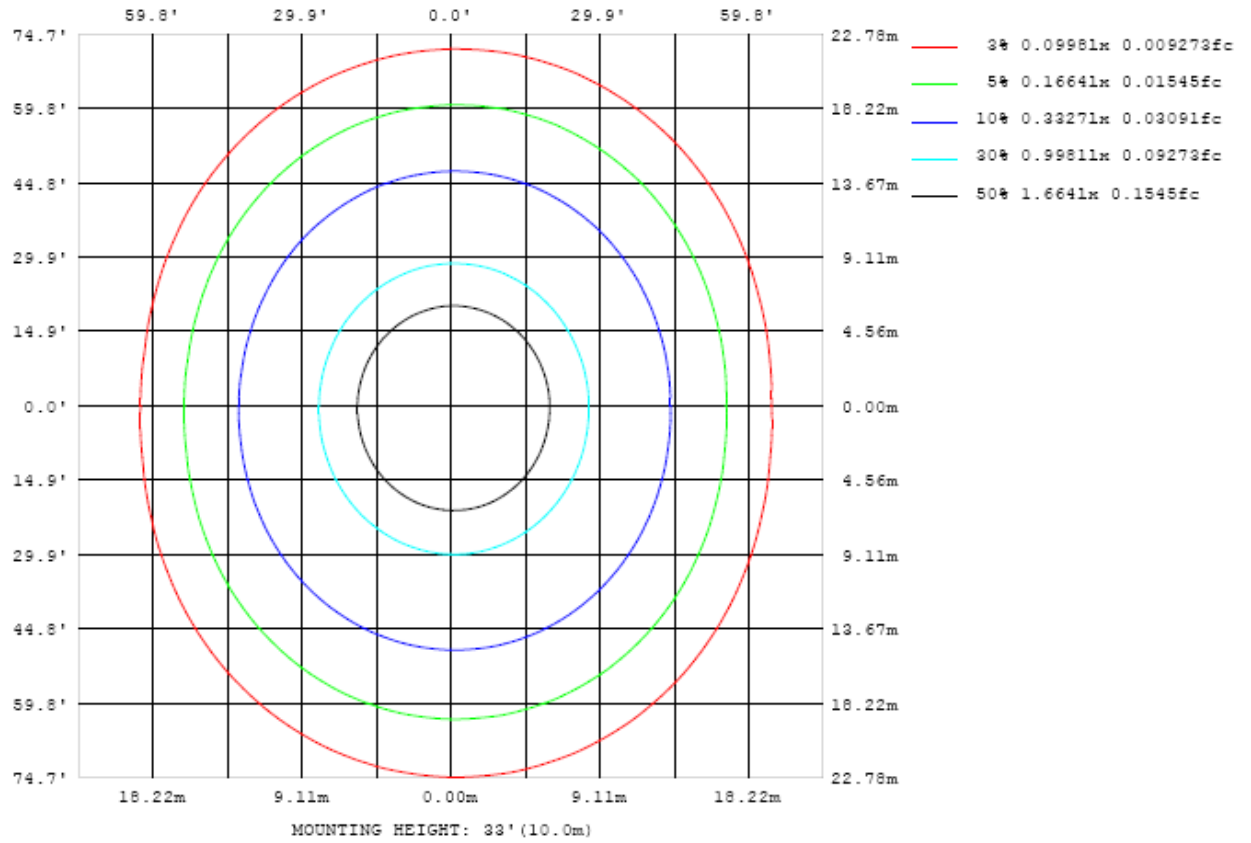


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

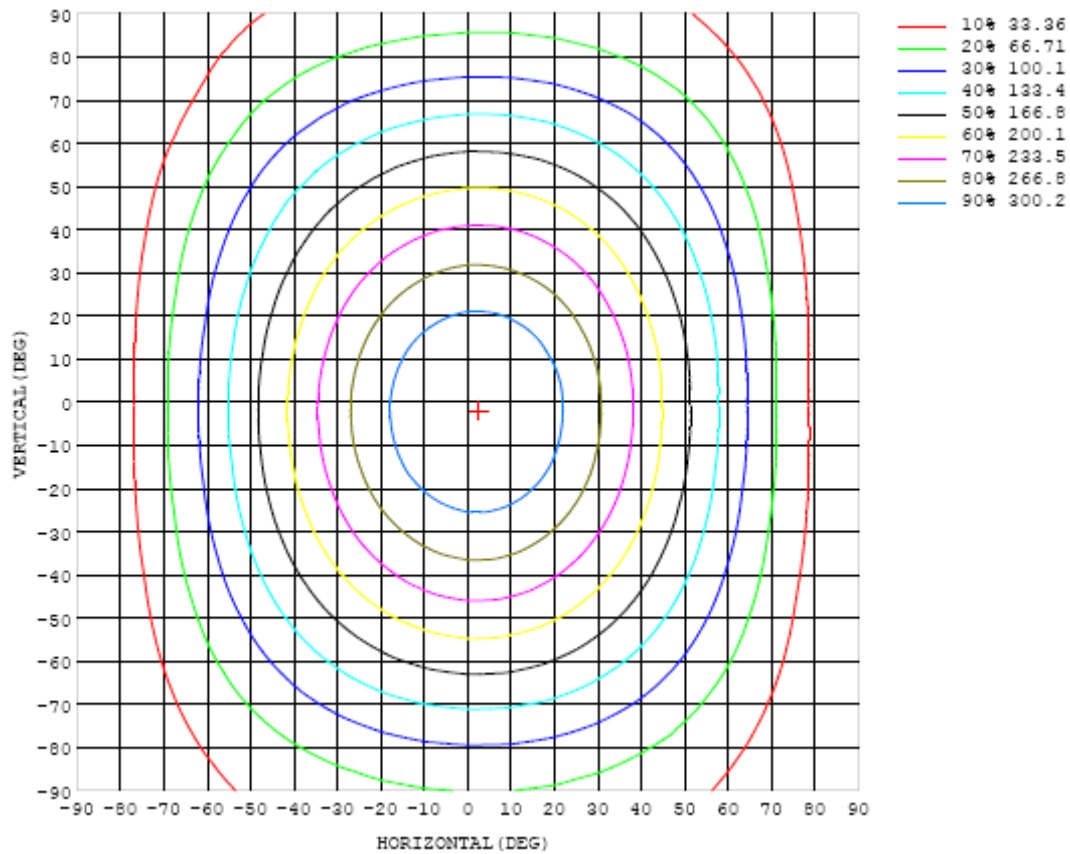


Chart 5: Isocandela Plot

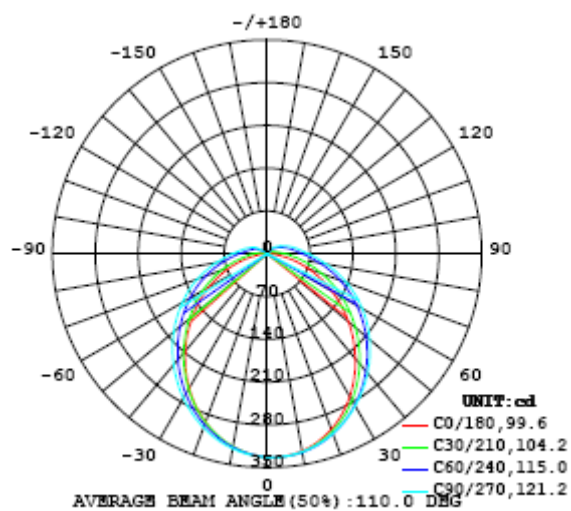


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

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	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333
5	333	332	333	333	333	333	333	333	333	333	332	332	331	331	330	329	329	329	329
10	327	328	328	329	330	330	330	330	330	329	328	327	326	325	324	323	322	321	321
15	319	319	320	322	322	323	323	323	324	323	321	320	318	316	314	312	310	309	309
20	306	307	308	310	311	312	313	314	314	313	311	309	307	304	301	298	296	294	293
25	289	290	293	294	297	299	301	302	302	301	299	297	293	289	285	281	278	276	275
30	270	271	274	277	280	283	286	288	288	288	285	281	277	272	267	262	258	255	254
35	248	249	253	257	261	265	269	272	273	272	269	265	260	254	247	241	237	233	231
40	224	226	230	235	240	246	250	254	256	255	252	247	241	234	226	219	214	209	208
45	199	201	206	212	218	225	231	235	238	237	234	228	221	213	205	197	190	185	183
50	173	176	181	188	196	204	211	216	219	219	215	209	201	192	183	174	166	161	158
55	148	151	156	164	173	182	190	196	199	199	195	189	181	171	161	151	143	136	134
60	122	125	132	141	150	160	169	176	179	179	176	169	160	150	139	128	119	112	110
65	96.6	100	108	117	128	139	148	155	159	159	155	149	140	129	118	107	96.8	89.0	85.9
70	71.8	75.9	84.6	95.2	107	117	127	134	138	138	135	129	120	109	97.7	86.1	75.2	66.5	62.8
75	48.8	53.4	62.9	74.2	86.0	97.1	107	113	117	118	115	109	100	90.2	78.7	66.6	55.5	45.8	41.1
80	28.0	32.9	43.4	55.5	67.2	78.2	87.4	94.1	97.7	98.2	95.5	90.3	82.2	72.6	61.8	50.0	38.0	27.4	21.8
85	11.9	17.0	27.9	39.9	51.8	62.4	70.9	77.2	80.7	81.0	78.8	74.2	66.8	58.2	47.6	36.1	24.4	13.5	7.05
90	0.83	7.15	17.6	29.2	40.2	50.2	58.3	63.8	67.0	67.3	65.6	61.6	55.1	46.8	37.0	26.6	15.7	6.11	0.18
95	0.31	3.47	11.8	22.1	32.3	41.3	48.7	54.1	57.0	57.4	55.7	52.1	46.2	38.7	29.9	20.3	10.9	3.26	0.18
100	0.34	2.21	8.56	17.3	26.4	34.6	41.4	46.2	49.0	49.5	47.9	44.6	39.3	32.6	24.6	16.0	7.96	1.91	0.20
105	0.34	1.71	6.31	13.7	21.6	29.1	35.1	39.6	42.2	42.7	41.4	38.4	33.6	27.4	20.1	12.7	5.80	1.41	0.21
110	0.29	1.13	4.50	10.9	17.8	24.3	29.7	33.9	36.2	36.7	35.2	32.3	28.0	22.6	16.4	10.0	3.90	0.90	0.23
115	0.27	0.80	3.08	8.45	14.5	20.3	25.1	28.7	30.7	30.3	29.5	27.3	23.6	18.9	13.5	7.74	2.64	0.75	0.33
120	0.33	0.63	2.08	5.67	11.5	16.6	20.8	23.8	25.1	25.7	25.1	23.1	19.9	15.8	10.9	5.05	2.23	0.75	0.45
125	0.38	0.59	1.58	3.71	8.05	12.9	16.7	19.5	21.2	21.7	21.2	19.4	16.6	12.7	7.76	4.03	1.87	0.83	0.56
130	0.42	0.57	1.30	2.99	5.38	9.15	13.1	15.9	17.5	17.9	17.6	15.8	13.0	9.09	5.43	3.24	1.61	0.87	0.63
135	0.46	0.57	1.10	2.44	4.25	6.26	8.74	11.5	13.3	13.9	13.5	11.6	8.74	6.33	4.41	2.59	1.43	0.83	0.67
140	0.51	0.58	0.94	1.97	3.30	4.81	6.29	7.63	8.65	9.08	8.74	7.69	6.41	4.97	3.39	2.14	1.28	0.80	0.57
145	0.55	0.60	0.84	1.53	2.52	3.57	4.65	5.55	6.16	6.40	6.21	5.64	4.75	3.71	2.65	1.77	1.14	0.73	0.52
150	0.59	0.62	0.80	1.27	1.93	2.64	3.32	3.91	4.32	4.43	4.29	3.95	3.40	2.74	2.03	1.38	0.90	0.60	0.52
155	0.61	0.67	0.82	1.08	1.44	1.95	2.37	2.73	2.97	3.04	2.95	2.72	2.38	1.91	1.49	1.05	0.76	0.59	0.52
160	0.62	0.66	0.76	0.91	1.13	1.36	1.61	1.88	2.03	2.07	2.02	1.84	1.68	1.38	1.15	0.88	0.70	0.57	0.53
165	0.66	0.66	0.71	0.78	0.85	1.00	1.11	1.20	1.27	1.35	1.32	1.27	1.16	0.99	0.86	0.77	0.63	0.56	0.54
170	0.62	0.63	0.64	0.68	0.73	0.78	0.82	0.85	0.86	0.84	0.86	0.83	0.79	0.76	0.70	0.67	0.65	0.54	0.46
175	0.49	0.50	0.53	0.54	0.55	0.60	0.64	0.65	0.68	0.68	0.67	0.62	0.59	0.52	0.48	0.45	0.44	0.43	0.44
180	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26

Table 6: 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	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333		
5	329	329	328	329	329	329	329	330	330	330	330	330	331	332	332	332	332		
10	320	320	320	321	321	322	322	323	324	324	325	325	326	326	326	327	328		
15	308	308	309	309	310	311	312	314	315	315	316	316	317	317	317	318	319		
20	293	293	294	295	297	298	300	301	303	304	304	305	305	305	305	305	306		
25	274	275	276	278	280	282	285	287	289	290	290	290	290	290	289	289	289		
30	254	254	256	259	262	265	268	271	273	274	274	274	273	271	270	270	270		
35	231	232	234	238	242	246	250	253	255	256	256	255	254	252	249	248	248		
40	207	209	212	216	221	226	231	235	237	238	238	236	233	230	227	225	224		
45	183	185	189	194	200	206	211	216	218	219	218	215	212	208	204	201	200		
50	158	161	166	172	179	185	191	196	198	199	198	195	190	185	180	176	174		
55	134	138	144	151	158	165	172	176	179	180	178	174	169	163	157	152	149		
60	111	115	121	129	137	145	151	156	159	159	158	154	148	141	134	128	124		
65	87.2	92.5	100	109	117	126	132	138	141	141	138	133	127	120	111	105	99.3		
70	64.9	70.9	79.4	89.2	97.9	106	113	118	120	121	118	114	107	98.7	89.9	81.7	75.4		
75	44.0	50.6	59.5	70.6	79.9	88.0	94.7	99.0	102	102	99.4	94.2	87.5	78.9	69.6	60.3	52.8		
80	25.3	32.0	41.7	53.8	63.5	71.3	77.5	81.9	83.8	83.9	81.6	76.5	69.4	60.9	51.5	41.3	32.8		
85	10.1	19.1	30.1	40.9	49.4	57.0	62.7	66.7	68.6	68.4	66.0	61.3	54.4	46.0	36.2	26.2	17.1		
90	4.53	12.1	21.2	30.8	39.0	45.9	51.2	54.7	56.3	56.1	53.8	49.3	43.0	35.0	25.8	16.2	7.10		
95	2.26	7.94	15.6	24.3	31.7	37.9	42.7	46.0	47.3	47.1	45.0	40.8	34.9	27.5	19.2	10.5	3.47		
100	1.78	5.31	12.0	19.6	26.3	32.0	36.4	39.3	40.6	40.2	38.2	34.3	28.9	22.2	14.7	7.53	2.50		
105	1.06	3.67	8.72	15.6	21.8	27.0	31.1	33.7	34.8	34.5	32.5	29.0	23.9	17.8	11.1	5.57	1.70		
110	0.71	2.18	4.85	11.2	17.6	22.5	26.3	28.7	29.7	29.3	27.5	24.2	19.5	13.4	7.77	3.69	1.15		
115	0.65	1.62	3.67	5.99	12.0	17.8	21.7	24.0	25.0	24.5	22.7	19.2	14.0	8.65	5.18	2.42	0.76		
120	0.64	1.37	2.65	4.87	7.16	10.5	15.2	18.1	19.2	18.6	16.2	12.2	8.39	5.92	3.71	1.84	0.66		
125	0.62	1.17	2.14	3.70	5.62	7.67	9.28	10.8	11.6	11.1	9.94	8.20	6.07	4.42	2.84	1.48	0.60		
130	0.59	1.08	1.88	2.99	4.35	5.74	6.93	7.78	8.17	7.99	7.24	6.09	4.61	3.42	2.26	1.23	0.59		
135	0.69	1.04	1.66	2.48	3.44	4.38	5.12	5.77	6.07	5.98	5.49	4.73	3.63	2.71	1.84	1.06	0.60		
140	0.50	0.64	1.29	1.90	2.61	3.39	3.98	4.44	4.68	4.62	4.29	3.74	2.93	2.18	1.52	0.94	0.63		
145	0.50	0.54	1.09	1.58	2.13	2.69	3.14	3.47	3.70	3.66	3.40	2.97	2.40	1.80	1.28	0.86	0.67		
150	0.53	0.58	0.97	1.33	1.73	2.13	2.46	2.69	2.80	2.78	2.60	2.32	1.96	1.51	1.10	0.80	0.71		
155	0.55	0.66	0.81	1.04	1.27	1.58	1.83	2.02	2.11	2.10	1.99	1.80	1.55	1.29	0.98	0.77	0.73		
160	0.58	0.62	0.71	0.89	1.08	1.26	1.41	1.51	1.43	1.36	1.45	1.37	1.23	1.07	0.92	0.78	0.75		
165	0.58	0.51	0.64	0.72	0.84	0.94	1.02	1.07	1.07	0.95	0.88	0.95	0.97	0.89	0.82	0.74	0.76		
170	0.46	0.53	0.55	0.57	0.61	0.68	0.74	0.79	0.82	0.79	0.70	0.70	0.76	0.75	0.71	0.67	0.67		
175	0.44	0.46	0.47	0.45	0.39	0.36	0.40	0.48	0.52	0.47	0.51	0.55	0.49	0.50	0.50	0.50	0.51		
180	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 27, 2016	Jul. 26, 2017
Digital Power Meter	PF2010A	HZTE028-01	Jul. 27, 2016	Jul. 26, 2017
AC Power Supply	PCR 500L	HZTE001-08	Jul. 27, 2016	Jul. 26, 2017
DC Power Supply	WY12010	HZTE004-03	Jul. 27, 2016	Jul. 26, 2017
Temperature Meter	TES1310	HZTE017-01	Jul. 27, 2016	Jul. 26, 2017
Standard source	D908	HZTE012-01	Jul. 27, 2016	Jul. 26, 2017
Integrate Sphere system	2M	HZTE015-01	Jul. 27, 2016	Jul. 26, 2017
Digital Power Meter	WT210	HZTE008-01	Jul. 27, 2016	Jul. 26, 2017
AC Power Supply	PCR 500L	HZTE001-07	Jul. 27, 2016	Jul. 26, 2017
DC Power Supply	6154	HZTE004-04	Jul. 27, 2016	Jul. 26, 2017
Temperature and humidity recorder	JR900	HZTE018-01	Jul. 27, 2016	Jul. 26, 2017
Standard source	SCL-1400	HZTE012-02	Jul. 27, 2016	Jul. 26, 2017

Table 8: 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.

Sphere-Spectroradiometer Method- Photometric and Electrical Measurements

A Labsphere Model CDS 2100 Spectroradiometer and Two Meter Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit. The coating reflectance of each sphere is 98%. The measure geometry is 4π . Self-absorption correction is conducted in testing. Bandwidth of spectroradiometer is 350nm-1050nm.

Ambient temperature was measured at a position inside the sphere. 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 FA19 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 Yokogawa Power Analyzer.

The standard reference of the integrated sphere system is halogen incandescent lamp, the intensity distribution type is omni-directional, and is traceable to the National Institute of Standards and Technology.

The uncertainty of integrating sphere system reported in this document is expended uncertainty is 1.06% with a coverage factor $k=2$.

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 FA19 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 ***

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.