

## LM-79-08 Test Report

for

### GREEN CREATIVE LTD

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

### LED lamp

**Model: 14T8/4F/840/DEB**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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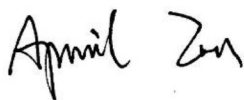
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Report No.: HZ18100024o

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

Review by:



Engineer: April Zou  
Nov. 02, 2018

Approved by:



Manager: Jim Zhang  
Nov. 02, 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: 14T8/4F/840/DEB

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
137.9	1936.0	14.04	0.9822
CCT (K)	CRI	Stabilization Time (Light & Power)	
4060	83.5	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** : Oct. 30, 2018

**Date of Test** : Oct. 31, 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

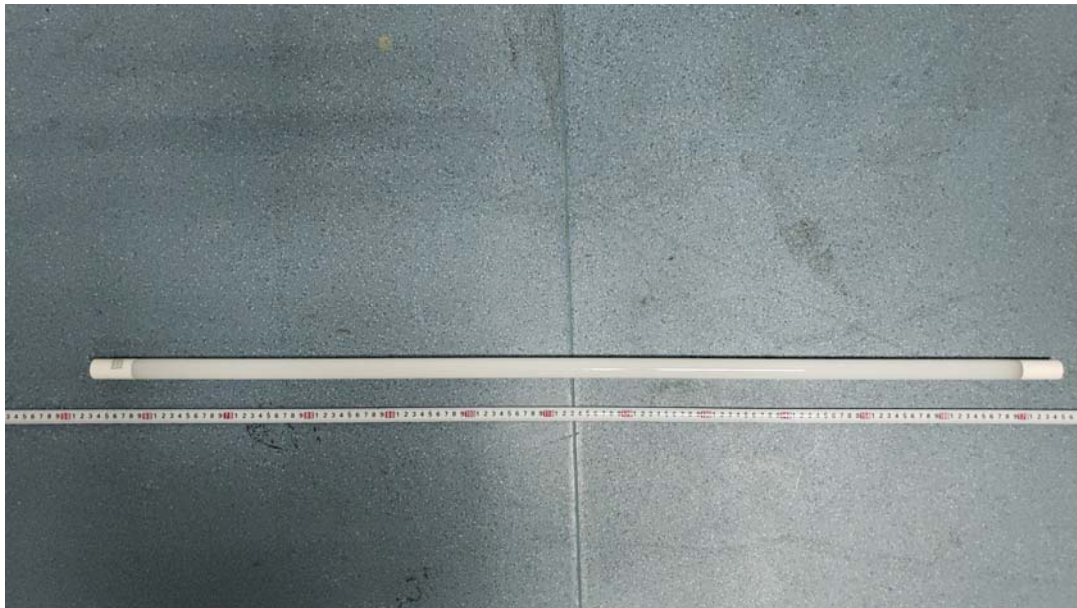


Figure 1- Overview of the sample

### Equipment Under Test (EUT)

<b>Name</b>	: LED lamp
<b>Model</b>	: 14T8/4F/840/DEB
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz, 14W
<b>Product Description</b>	: 4000K
<b>Manufacturer</b>	: GREEN CREATIVE LTD
<b>Address</b>	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

## TEST RESULTS

Test ambient temperature was 25.1 °C.

Base orientation was horizontal. 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)	0.119	0.056
Power Factor	0.9822	0.9194
Test Power (W)	14.04	14.20
THD A%	17.06	25.57
Luminous Efficacy (lm/W)	137.9	136.7
Total Luminous Flux (lm)	1936.0	1941.0
Color Rendering Index (CRI)	83.5	
R9	6.5	
Correlated Color Temperature (CCT)(K)	4060	
Chromaticity Chroma x	0.3789	
Chromaticity Chroma y	0.3796	
Chromaticity Chroma u	0.2230	
Chromaticity Chroma v	0.3351	
Duv	0.0012	
Chromaticity Chroma u'	0.2230	
Chromaticity Chroma v'	0.5026	

Special Color Rendering Indices	
R1	81.5
R2	91.1
R3	96.1
R4	81
R5	81.9
R6	87.7
R7	85.2
R8	63.1
R9	6.5
R10	79
R11	80.1
R12	65.5
R13	84.2
R14	98.3
Rf	83
Rg	93

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 25.1°C.

The photometric distance is 30m.

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)	0.120
Power Factor	0.9822
Test Power (W)	14.09
Luminous Efficacy (lm/W)	134.9
Total Luminous Flux (lm)	1901.1
Beam Angle (°)	152.8
Center Beam Candle Power (cd)	343
Spacing Criteria	1.24 (0°-180°)/ 1.38 (90°-270°)
Zonal Lumens in the 0°-60°Zone	45.07%
Zonal Lumens in the 60°-90°Zone	26.42%
Zonal Lumens in the 90°-120°Zone	16.50%
Zonal Lumens in the 120°-180°Zone	12.00%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

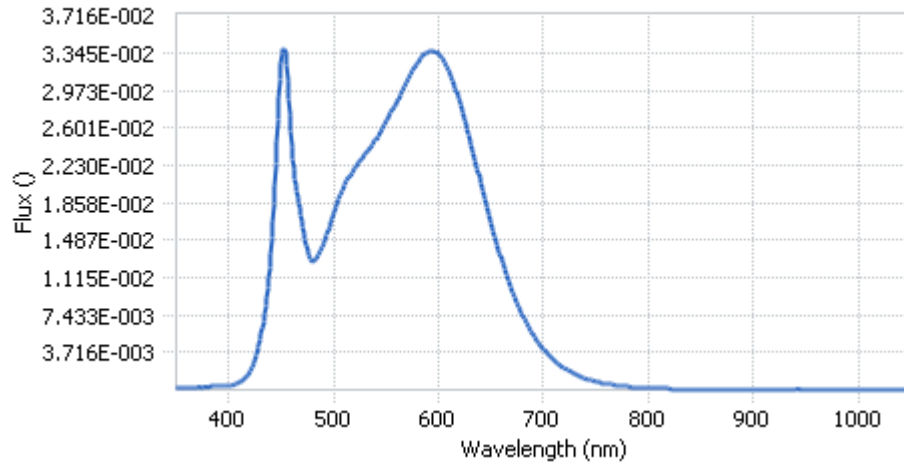
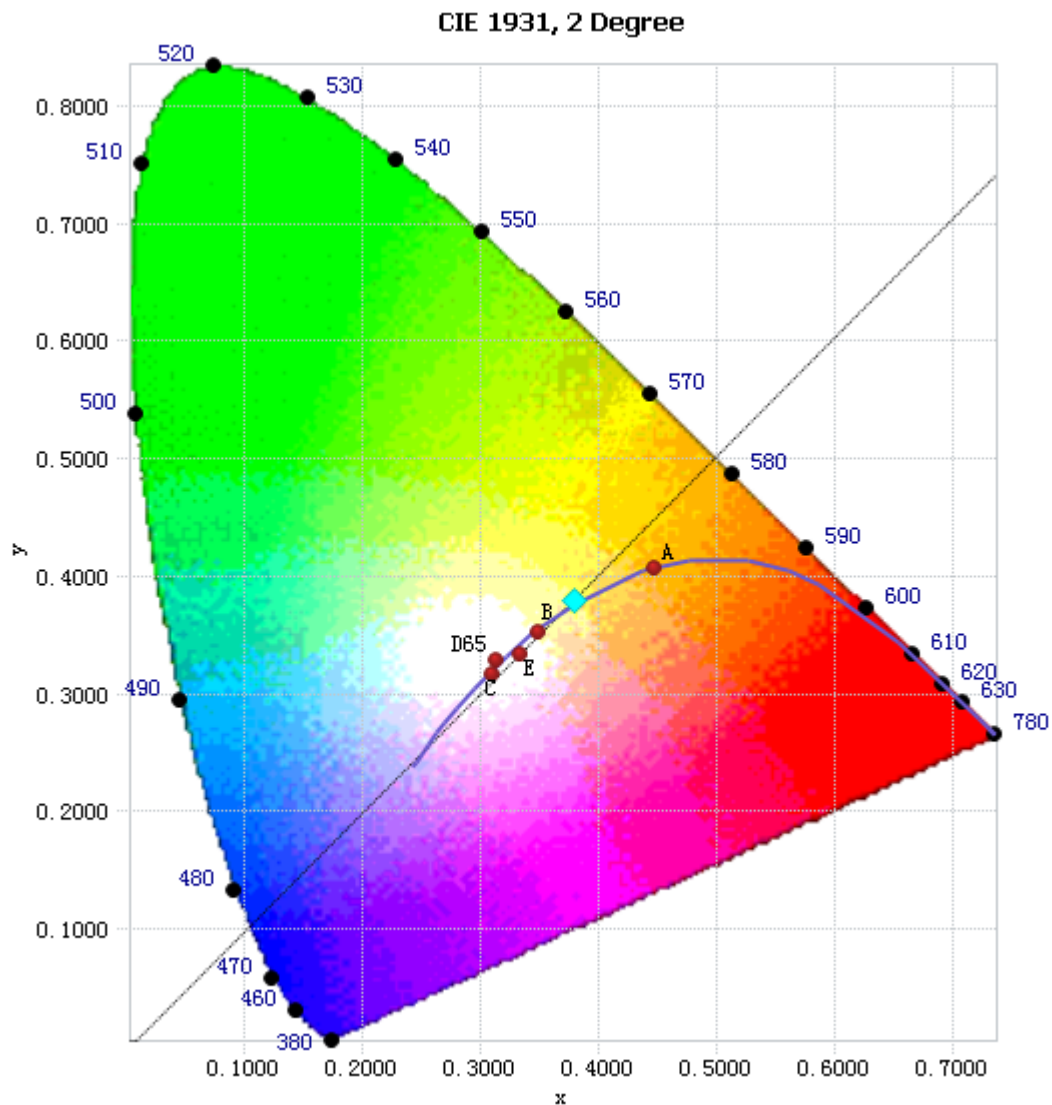


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.38E-04	485	1.33E-02	590	3.35E-02	695	4.72E-03
385	3.26E-04	490	1.44E-02	595	3.36E-02	700	4.05E-03
390	3.63E-04	495	1.58E-02	600	3.33E-02	705	3.46E-03
395	3.95E-04	500	1.76E-02	605	3.26E-02	710	2.94E-03
400	4.34E-04	505	1.91E-02	610	3.16E-02	715	2.53E-03
405	5.32E-04	510	2.02E-02	615	3.03E-02	720	2.16E-03
410	7.45E-04	515	2.12E-02	620	2.86E-02	725	1.85E-03
415	1.12E-03	520	2.20E-02	625	2.67E-02	730	1.58E-03
420	1.78E-03	525	2.27E-02	630	2.47E-02	735	1.34E-03
425	3.01E-03	530	2.34E-02	635	2.26E-02	740	1.15E-03
430	5.04E-03	535	2.41E-02	640	2.06E-02	745	9.83E-04
435	8.28E-03	540	2.49E-02	645	1.85E-02	750	8.43E-04
440	1.36E-02	545	2.57E-02	650	1.65E-02	755	7.17E-04
445	2.26E-02	550	2.66E-02	655	1.46E-02	760	6.26E-04
450	3.24E-02	555	2.76E-02	660	1.29E-02	765	5.35E-04
455	3.22E-02	560	2.86E-02	665	1.13E-02	770	4.61E-04
460	2.41E-02	565	2.95E-02	670	9.85E-03	775	3.97E-04
465	1.96E-02	570	3.07E-02	675	8.57E-03	780	3.48E-04
470	1.67E-02	575	3.16E-02	680	7.42E-03		
475	1.37E-02	580	3.25E-02	685	6.40E-03		
480	1.28E-02	585	3.32E-02	690	5.50E-03		

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

## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3789, 0.3796)

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

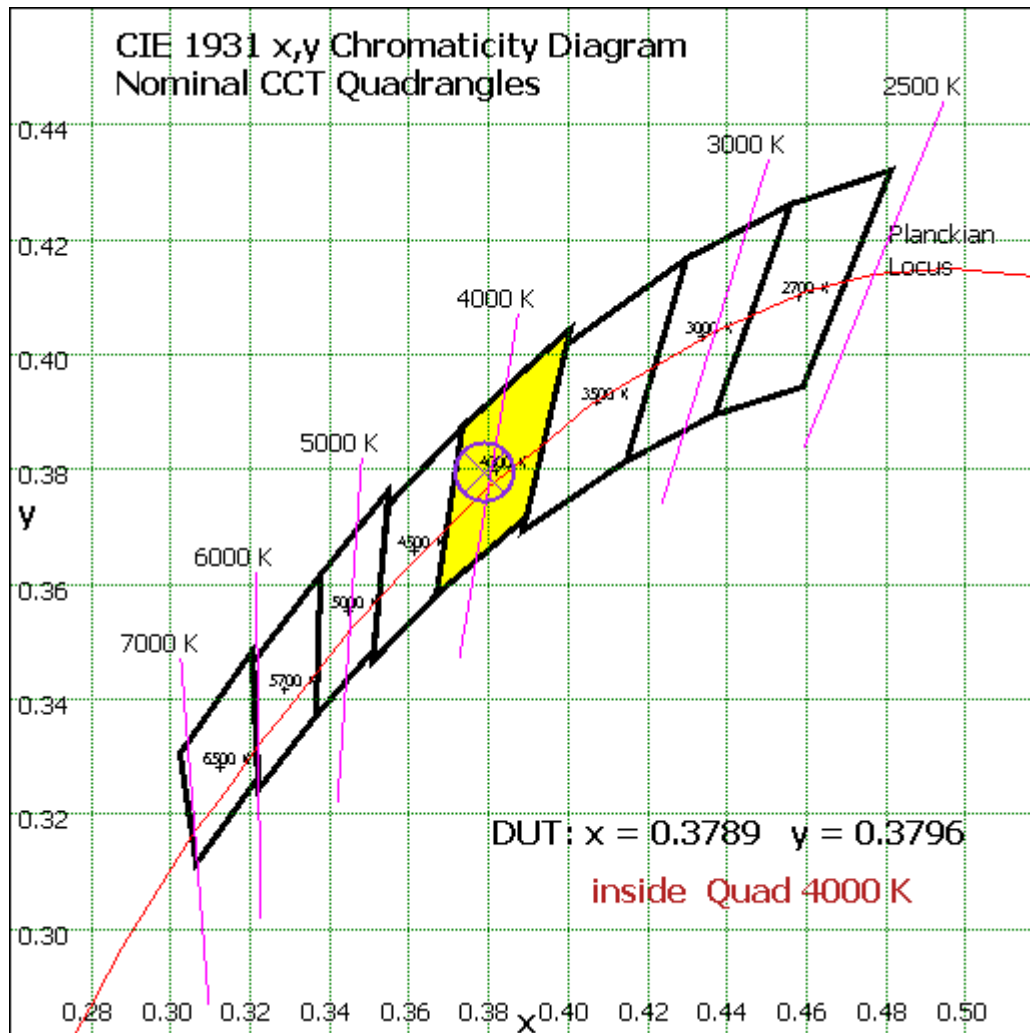


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

### Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	32.51	1.71%
10- 20	93.956	4.94%
20- 30	145.296	7.64%
30- 40	181.688	9.56%
40- 50	200.721	10.56%
50- 60	202.677	10.66%
60- 70	190.327	10.01%
70- 80	168.38	8.86%
80- 90	143.637	7.56%
90-100	122.326	6.43%
100-110	104.07	5.47%
110-120	87.383	4.60%
120-130	72.15	3.80%
130-140	57.985	3.05%
140-150	44.691	2.35%
150-160	30.921	1.63%
160-170	16.856	0.89%
170-180	5.551	0.29%
Total	1901.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	856.848	45.07%
60- 90	502.344	26.42%
0-90	1359.192	71.49%
90- 180	541.933	28.51%
0- 180	1901.1	100%

Table 5: Zonal Lumen Data

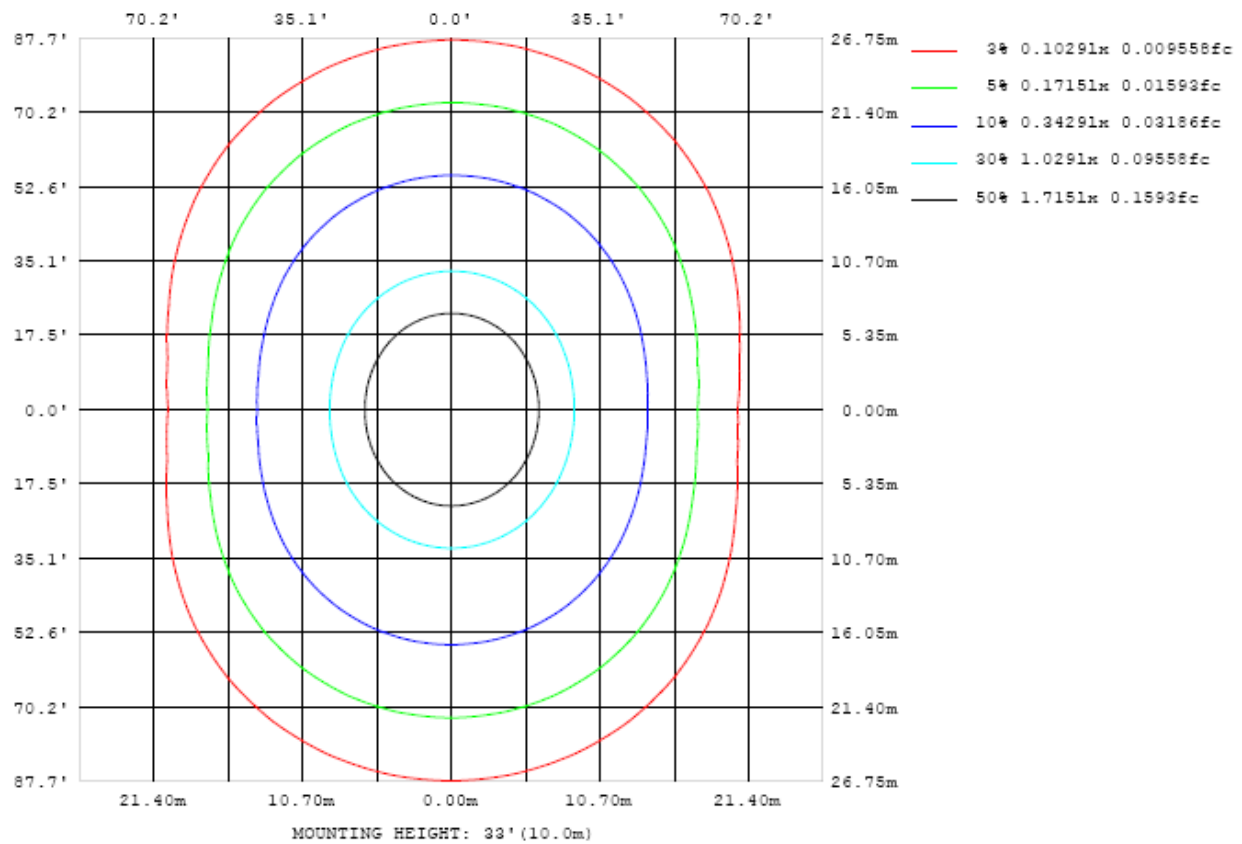


Chart 4: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

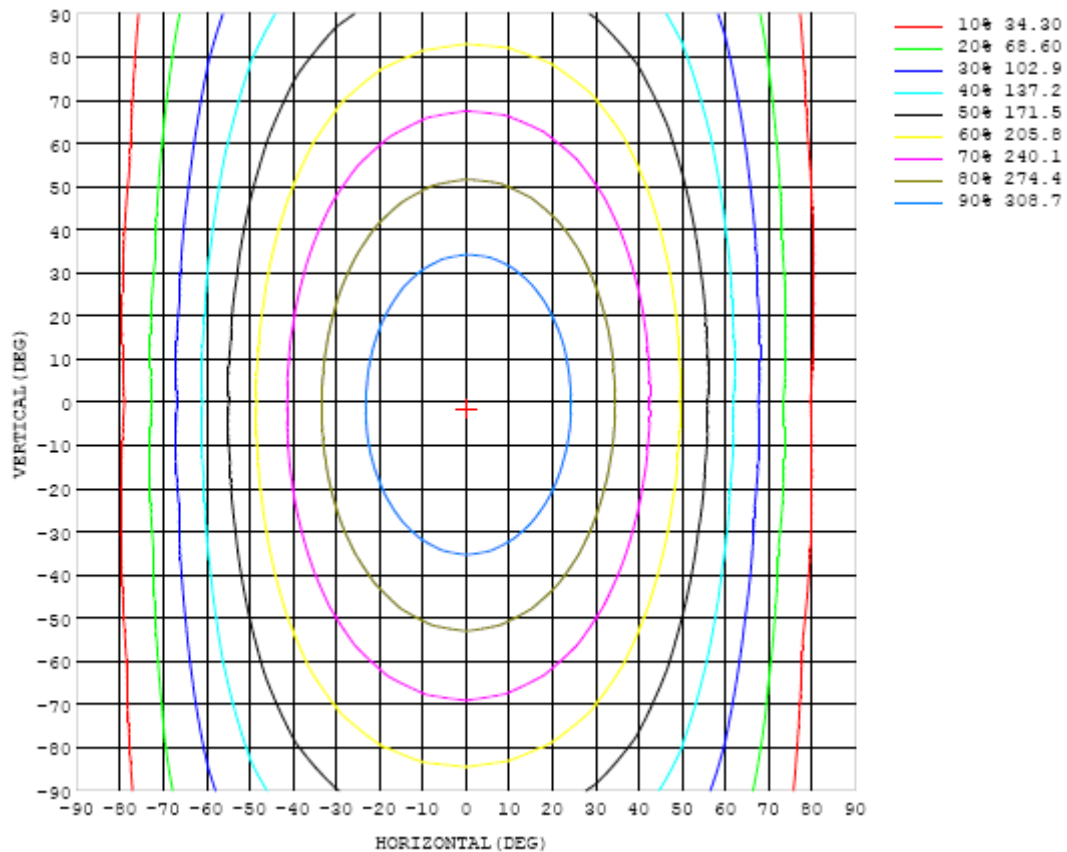


Chart 5: Isocandela Plot

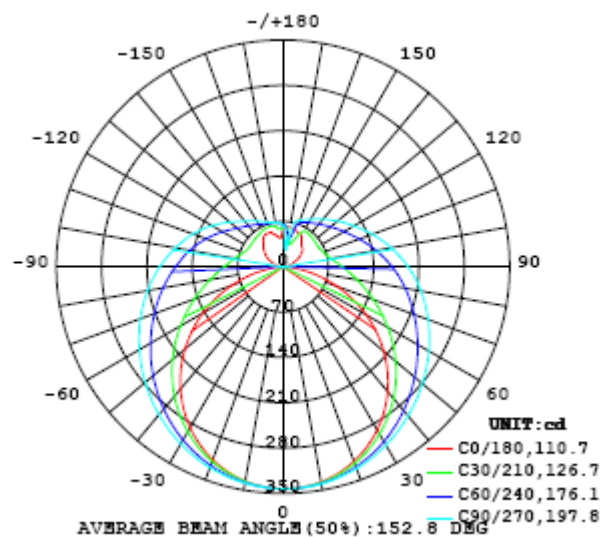


Chart 6: Polar Candela Distribution

## Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	343	343	343	343	343	343	343	343	343	343	343	343	343	343	343	343	343	343	343
5	342	342	342	342	342	342	342	342	342	342	342	342	342	342	342	341	341	341	341
10	337	338	338	338	339	339	340	340	340	340	340	340	339	339	338	337	337	336	336
15	330	330	331	332	333	334	335	336	336	336	336	335	334	333	332	330	329	329	328
20	320	320	321	323	325	327	329	330	331	331	331	330	328	326	323	321	319	318	317
25	306	307	309	312	315	318	321	323	325	325	324	323	320	317	313	310	307	304	303
30	291	292	294	298	303	307	312	315	317	318	317	314	311	306	301	296	291	288	287
35	272	273	277	282	289	295	301	306	308	309	308	305	300	294	287	280	274	270	268
40	251	253	258	265	274	282	290	295	299	300	299	295	289	281	272	263	255	249	246
45	228	230	237	247	258	268	278	285	289	291	289	284	277	267	256	244	234	226	223
50	203	206	215	227	241	254	265	274	279	280	279	273	265	253	240	225	212	202	198
55	176	180	191	207	224	240	253	262	268	270	268	262	253	239	223	206	189	176	171
60	148	152	167	187	207	225	240	251	257	260	258	251	240	225	207	186	165	149	143
65	118	124	143	167	190	211	228	239	246	249	247	240	228	212	191	167	143	122	114
70	88.3	96.5	120	148	175	198	215	228	235	238	236	229	216	199	176	150	121	95.3	84.5
75	59.3	69.8	98.5	131	160	185	203	216	224	227	225	217	205	187	163	134	101	70.5	55.8
80	32.4	46.2	80.1	116	147	172	192	205	213	216	214	206	193	175	150	119	83.9	48.7	29.6
85	11.0	28.3	66.0	103	135	161	180	194	202	205	202	195	182	163	138	107	70.9	32.7	9.03
90	0.77	18.6	55.3	91.7	123	149	168	182	190	193	191	183	171	152	127	96.7	61.0	23.7	0.40
95	2.14	15.3	47.9	82.3	113	138	157	170	178	181	179	172	159	141	117	87.6	53.8	20.3	2.27
100	5.45	16.5	43.8	74.8	104	128	146	159	166	169	167	160	148	131	108	80.2	49.5	21.1	6.20
105	10.2	19.5	42.4	69.3	95.5	118	135	148	155	158	156	149	138	121	100.0	74.6	48.1	23.6	11.0
110	15.8	23.8	42.9	65.7	88.9	109	125	137	144	147	145	139	128	113	93.2	71.0	48.3	27.2	16.7
115	22.0	28.0	44.6	63.5	83.8	102	116	127	134	136	135	129	119	105	88.2	68.7	49.4	31.1	22.7
120	28.3	31.5	46.9	62.5	79.7	95.7	109	118	124	126	125	120	111	99.0	83.9	67.3	51.2	34.7	28.6
125	33.7	33.6	49.3	62.4	76.6	90.4	102	110	116	118	116	112	104	93.6	80.6	66.6	53.3	37.5	33.4
130	39.2	34.9	51.4	62.9	74.4	86.0	96.0	103	108	110	109	105	98.0	88.9	77.9	66.4	54.9	39.1	38.3
135	41.9	35.2	52.9	63.6	72.8	82.4	90.7	97.0	101	103	102	98.2	92.5	84.9	75.7	66.4	55.9	39.7	43.0
140	44.4	36.6	54.0	64.1	71.8	79.4	86.1	91.3	94.5	95.9	95.2	92.4	87.6	81.4	74.0	64.4	55.4	40.4	47.3
145	50.3	40.3	53.4	64.8	70.9	76.9	82.2	86.3	88.9	90.0	89.5	87.2	83.4	78.4	72.4	64.9	52.7	43.6	53.3
150	55.8	47.7	47.8	63.7	69.9	74.6	78.8	82.0	83.9	84.8	84.4	82.6	79.8	74.7	68.0	64.5	48.3	48.3	56.6
155	56.9	53.8	37.0	53.1	68.5	72.2	75.6	78.2	79.6	80.3	80.0	78.7	73.2	64.6	59.9	56.2	41.6	53.4	57.0
160	59.6	54.9	43.8	39.6	50.7	63.9	71.2	74.0	75.7	76.3	76.3	73.0	64.2	52.1	49.7	44.0	41.8	50.6	57.1
165	61.2	60.8	50.8	39.1	36.5	40.4	48.5	59.3	65.6	72.8	46.3	51.8	49.4	45.3	40.1	40.0	43.1	49.5	51.6
170	61.9	60.4	58.4	51.4	46.7	45.0	48.7	53.7	56.1	25.9	56.1	54.3	50.8	47.8	44.7	44.1	45.8	47.3	47.5
175	63.1	62.1	62.0	61.6	59.6	58.0	58.1	61.6	61.5	34.3	39.0	46.6	48.4	47.9	47.9	46.7	45.2	43.5	44.1
180	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7

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	343	343	343	343	343	343	343	343	343	343	343	343	343	343	343	343	343		
5	341	341	341	341	341	342	342	342	342	342	342	342	342	342	342	342	342		
10	336	336	337	337	338	338	339	339	339	339	339	339	339	338	338	338	337		
15	328	329	330	331	332	333	334	335	335	335	335	334	333	332	331	331	330		
20	317	318	320	322	325	327	328	329	330	330	329	328	326	324	323	321	320		
25	304	306	308	312	315	318	321	323	324	323	322	320	317	314	311	309	307		
30	288	290	294	299	304	309	312	315	316	316	314	311	307	302	298	294	292		
35	269	273	279	285	292	298	303	306	307	307	304	300	295	289	283	277	273		
40	248	253	261	270	279	287	293	297	298	297	294	289	282	274	266	259	253		
45	225	232	242	254	265	274	282	286	288	287	284	277	269	258	248	238	231		
50	201	210	223	237	250	262	270	276	278	277	273	265	255	242	229	216	207		
55	175	187	203	220	236	249	259	265	267	266	261	252	240	225	209	194	181		
60	149	163	183	203	221	236	247	254	256	255	250	240	226	209	189	170	155		
65	121	141	164	187	207	224	235	243	246	244	238	228	212	193	170	148	128		
70	94.1	118	146	172	194	211	224	232	235	233	227	215	199	178	153	125	101		
75	68.2	96.9	129	157	181	200	213	221	223	222	215	204	186	164	136	104	75.2		
80	45.4	79.1	114	145	169	188	201	209	212	211	204	192	174	151	121	86.4	52.3		
85	28.3	65.2	102	133	158	177	190	198	202	200	193	181	163	139	108	71.9	34.5		
90	19.1	55.2	91.3	122	148	166	179	187	190	189	182	170	153	128	97.6	61.5	24.1		
95	15.8	48.7	82.8	113	138	156	169	177	180	178	171	159	142	118	88.7	54.4	20.0		
100	16.3	44.2	75.8	104	128	146	158	166	169	167	161	150	133	110	81.6	49.6	19.5		
105	19.0	41.5	69.9	96.4	119	136	149	156	159	157	151	140	123	102	75.2	46.3	21.8		
110	23.8	41.4	65.1	89.2	110	126	138	146	148	147	141	130	114	93.9	70.0	45.3	25.9		
115	29.1	42.7	62.0	83.0	102	117	128	135	138	136	130	120	106	87.3	66.3	45.8	30.7		
120	34.2	45.0	60.6	77.7	94.4	108	118	125	127	126	120	111	97.9	81.6	64.1	47.3	35.6		
125	38.7	47.7	60.3	74.2	87.8	99.8	109	115	117	116	111	102	91.0	77.4	63.1	49.6	40.4		
130	43.5	50.6	60.6	72.0	83.0	92.7	100	106	107	106	102	95.0	85.6	74.6	62.8	52.2	45.2		
135	48.0	53.3	61.2	70.4	79.3	87.1	93.3	97.4	99.0	98.2	94.7	89.0	81.5	72.6	63.0	54.9	49.6		
140	51.7	56.1	62.0	69.2	76.4	82.7	87.6	90.9	92.1	91.5	88.8	84.2	78.2	71.0	63.6	57.7	53.9		
145	55.5	58.9	62.9	68.3	73.9	78.9	82.9	85.5	86.5	85.9	83.8	80.1	75.4	69.8	64.3	60.3	57.1		
150	57.8	60.2	64.1	67.6	71.8	75.6	78.6	80.8	81.5	81.1	79.4	76.6	73.0	69.0	65.4	62.6	60.2		
155	58.6	62.0	65.4	67.6	70.2	72.8	75.0	76.5	77.1	76.8	75.6	73.6	71.2	68.8	66.5	64.4	61.5		
160	59.7	62.4	65.7	67.8	69.3	70.8	72.2	73.1	73.4	73.3	72.7	71.6	70.3	68.9	67.4	65.9	64.5		
165	55.3	61.0	66.1	67.8	68.7	69.7	70.5	71.0	71.2	71.2	71.0	70.4	69.7	68.9	67.9	66.9	65.4		
170	50.6	56.1	63.4	67.8	67.9	68.5	69.1	69.4	69.5	69.6	69.5	69.3	68.9	68.3	67.8	67.5	65.8		
175	47.6	53.0	58.2	63.7	66.8	67.6	67.8	67.9	67.9	67.9	67.9	67.9	67.8	67.5	66.8	65.7	64.5		
180	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7	62.7		

Table 7: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 14, 2018	Aug. 13, 2019
Digital Power Meter	PF2010A	HZTE028-01	Sep. 12, 2018	Sep. 11, 2019
AC Power Supply	DPS1060	HZTE001-06	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	WY12010	HZTE004-03	Aug. 09, 2018	Aug. 08, 2019
Temperature recorder	JM624U	HZTE018-08	Aug. 09, 2018	Aug. 08, 2019
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 09, 2018	Aug. 08, 2019
Standard source	D908	HZTE012-01	Aug. 14, 2018	Aug. 13, 2019
Integrate Sphere system	2M	HZTE015-01	Aug. 16, 2018	Aug. 15, 2019
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2018	Aug. 01, 2019
AC Power Supply	PCR 500L	HZTE001-07	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	IT6154	HZTE004-04	Aug. 09, 2018	Aug. 08, 2019
Standard source	SCL-1400	HZTE012-02	Aug. 16, 2018	Aug. 15, 2019
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 09, 2018	Aug. 08, 2019
Temperature Meter	TES1310	HZTE017-01	Aug. 09, 2018	Aug. 08, 2019

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  $4\pi$ . 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 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 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 expanded uncertainty is 2.1% 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 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**

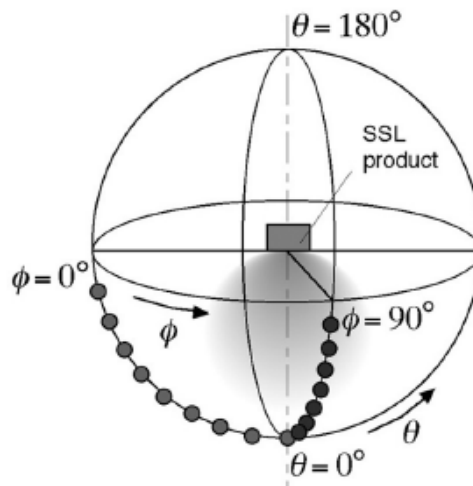
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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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