LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED lamp

Model: 14T8/4F/830/DEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18100024m

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

Review by: April Zou

Engineer: April Zou
Nov. 02, 2018

Approved by: Zhang

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/830/DEB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
128.0	1787.0	13.96	0.9818

CCT (K)	CRI	Stabilization Time (Light & Power)
3065	82.2	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

TABLE OF CONTENT

Sample Photos

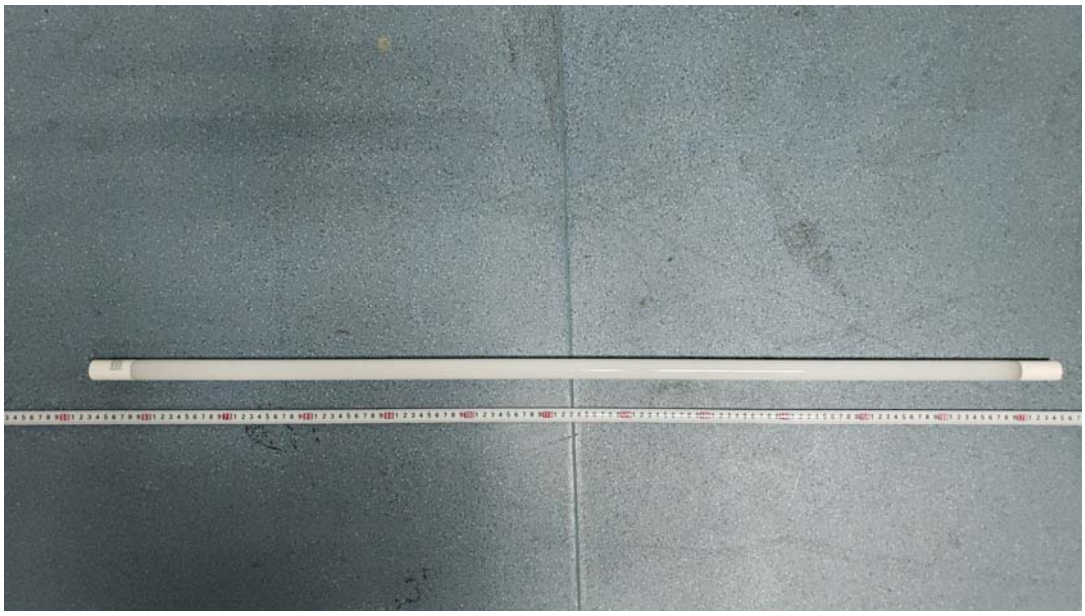


Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: LED lamp
Model	: 14T8/4F/830/DEB
Electrical Ratings	: 120-277V, 50/60Hz, 14W
Product Description	: 3000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.1℃.

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	0.057
Power Factor	0.9818	0.9177
Test Power (W)	13.96	14.46
THD A%	17.26	25.76
Luminous Efficacy (lm/W)	128.0	124.9
Total Luminous Flux (lm)	1787.0	1806.0
Color Rendering Index (CRI)	82.2	
R9	4.3	
Correlated Color Temperature (CCT)(K)	3065	
Chromaticity Chroma x	0.4322	
Chromaticity Chroma y	0.4024	
Chromaticity Chroma u	0.2482	
Chromaticity Chroma v	0.3467	
Duv	0	
Chromaticity Chroma u ’	0.2482	
Chromaticity Chroma v’	0.5200	

Special Color Rendering Indices	
R1	80.7
R2	92
R3	94.7
R4	79.3
R5	81.2
R6	90.5
R7	81.6
R8	57.4
R9	4.3
R10	81.9
R11	78.4
R12	73.6
R13	83.5
R14	97.7
Rf	83
Rg	94

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℃.

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)	0.119
Power Factor	0.9818
Test Power (W)	14.02
Luminous Efficacy (lm/W)	125.4
Total Luminous Flux (lm)	1757.6
Beam Angle (°)	153.6
Center Beam Candle Power (cd)	316
Spacing Criteria	1.25 (0°-180°)/ 1.38 (90°-270°)
Zonal Lumens in the 0°-60°Zone	45.07%
Zonal Lumens in the 60°-90°Zone	26.54%
Zonal Lumens in the 90°-120°Zone	16.58%
Zonal Lumens in the 120°-180°Zone	11.82%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

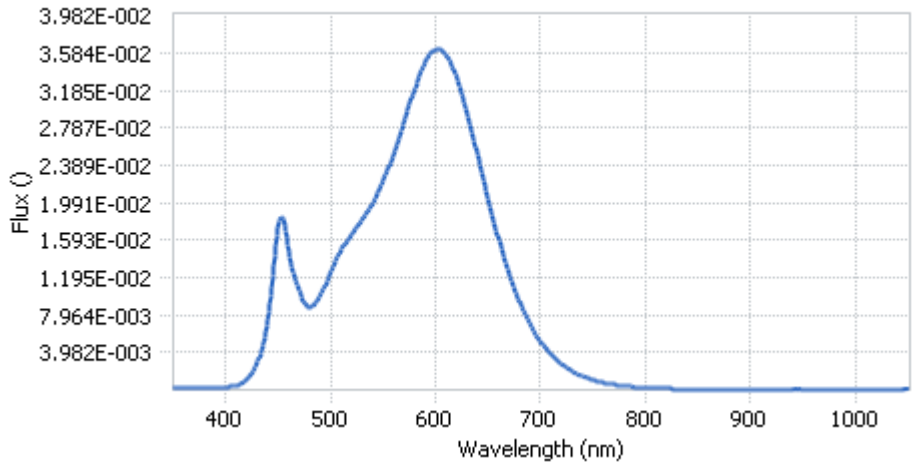
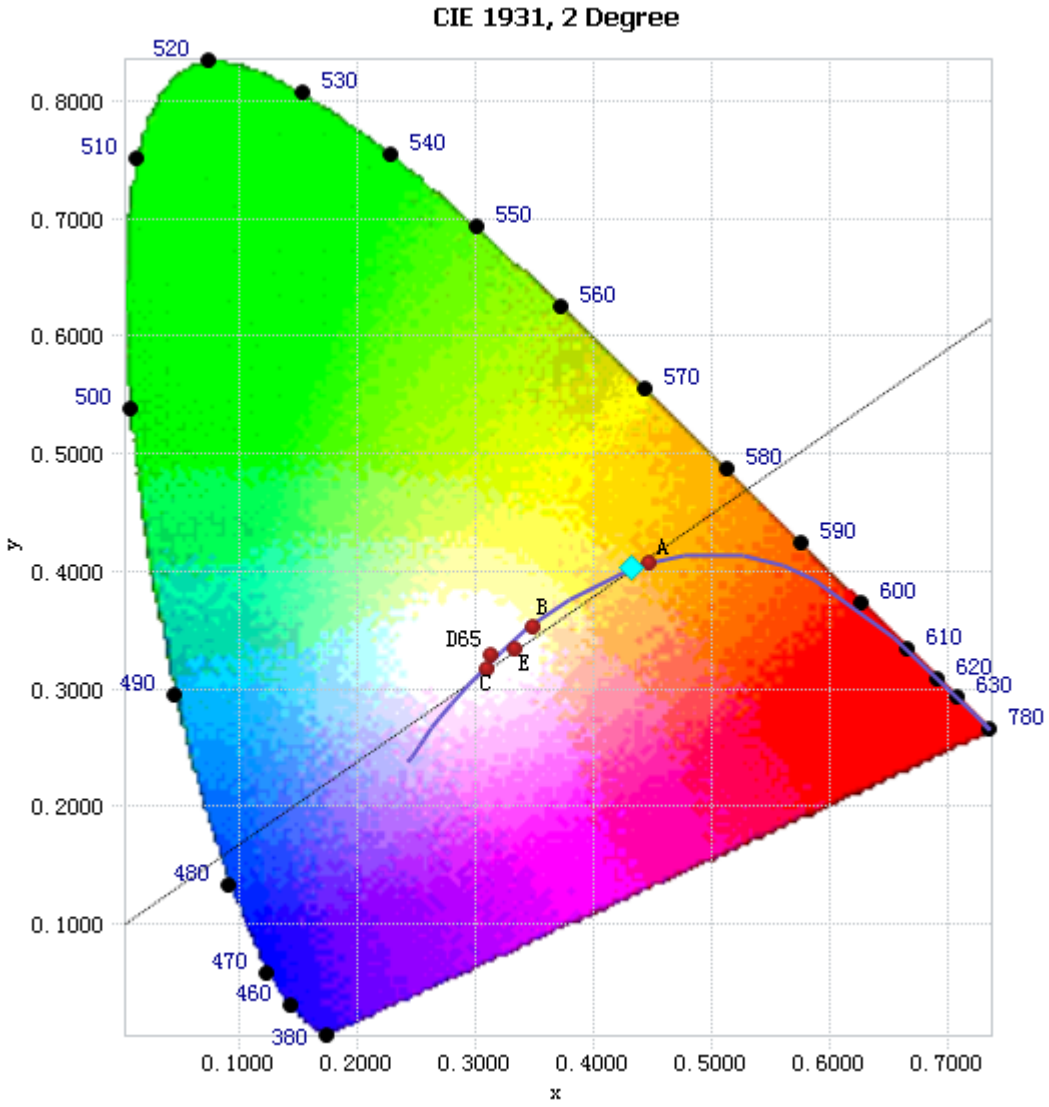


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.31E-04	485	9.20E-03	590	3.48E-02	695	6.03E-03
385	2.36E-04	490	1.01E-02	595	3.58E-02	700	5.17E-03
390	2.54E-04	495	1.12E-02	600	3.62E-02	705	4.41E-03
395	2.76E-04	500	1.26E-02	605	3.61E-02	710	3.78E-03
400	3.03E-04	505	1.38E-02	610	3.56E-02	715	3.22E-03
405	3.56E-04	510	1.49E-02	615	3.47E-02	720	2.76E-03
410	4.69E-04	515	1.58E-02	620	3.31E-02	725	2.37E-03
415	7.19E-04	520	1.66E-02	625	3.13E-02	730	2.01E-03
420	1.12E-03	525	1.73E-02	630	2.94E-02	735	1.71E-03
425	1.82E-03	530	1.81E-02	635	2.72E-02	740	1.46E-03
430	2.94E-03	535	1.90E-02	640	2.49E-02	745	1.25E-03
435	4.67E-03	540	1.99E-02	645	2.26E-02	750	1.06E-03
440	7.50E-03	545	2.10E-02	650	2.03E-02	755	9.08E-04
445	1.21E-02	550	2.22E-02	655	1.82E-02	760	7.85E-04
450	1.73E-02	555	2.36E-02	660	1.61E-02	765	6.73E-04
455	1.80E-02	560	2.51E-02	665	1.42E-02	770	5.77E-04
460	1.47E-02	565	2.67E-02	670	1.24E-02	775	4.98E-04
465	1.23E-02	570	2.85E-02	675	1.08E-02	780	4.26E-04
470	1.07E-02	575	3.03E-02	680	9.38E-03		
475	9.25E-03	580	3.20E-02	685	8.12E-03		
480	8.73E-03	585	3.37E-02	690	6.99E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4322, 0.4024)

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

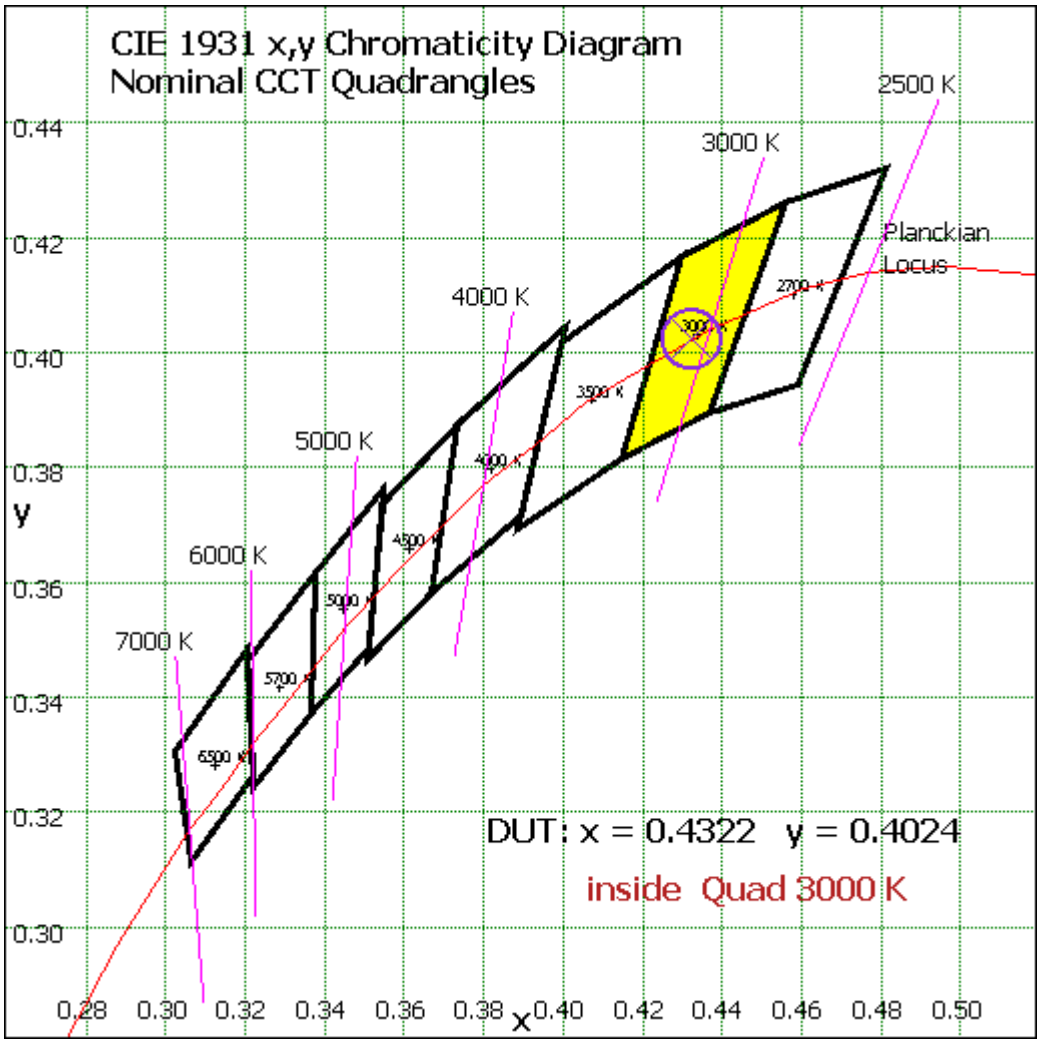


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	29.96	1.70%
10- 20	86.639	4.93%
20- 30	134.105	7.63%
30- 40	167.874	9.55%
40- 50	185.695	10.57%
50- 60	187.792	10.68%
60- 70	176.608	10.05%
70- 80	156.4	8.90%
80- 90	133.512	7.60%
90-100	113.812	6.48%
100-110	96.675	5.50%
110-120	80.844	4.60%
120-130	66.417	3.78%
130-140	53.226	3.03%
140-150	40.567	2.31%
150-160	27.912	1.59%
160-170	14.926	0.85%
170-180	4.61	0.26%
Total	1757.6	100%

γ(°)	Lumens	% Total
0- 60	792.065	45.07%
60- 90	466.52	26.54%
0-90	1258.585	71.61%
90- 180	498.989	28.39%
0- 180	1757.6	100%

Table 5: Zonal Lumen Data

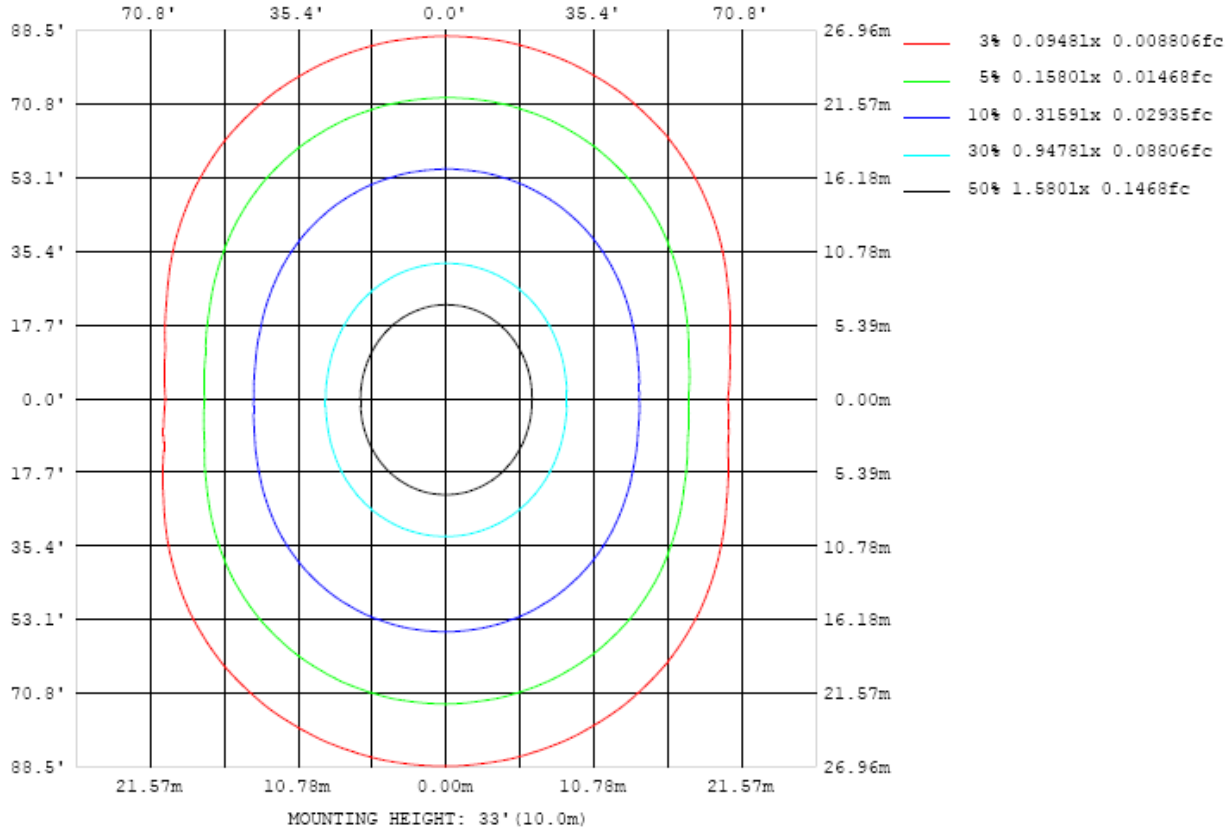


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

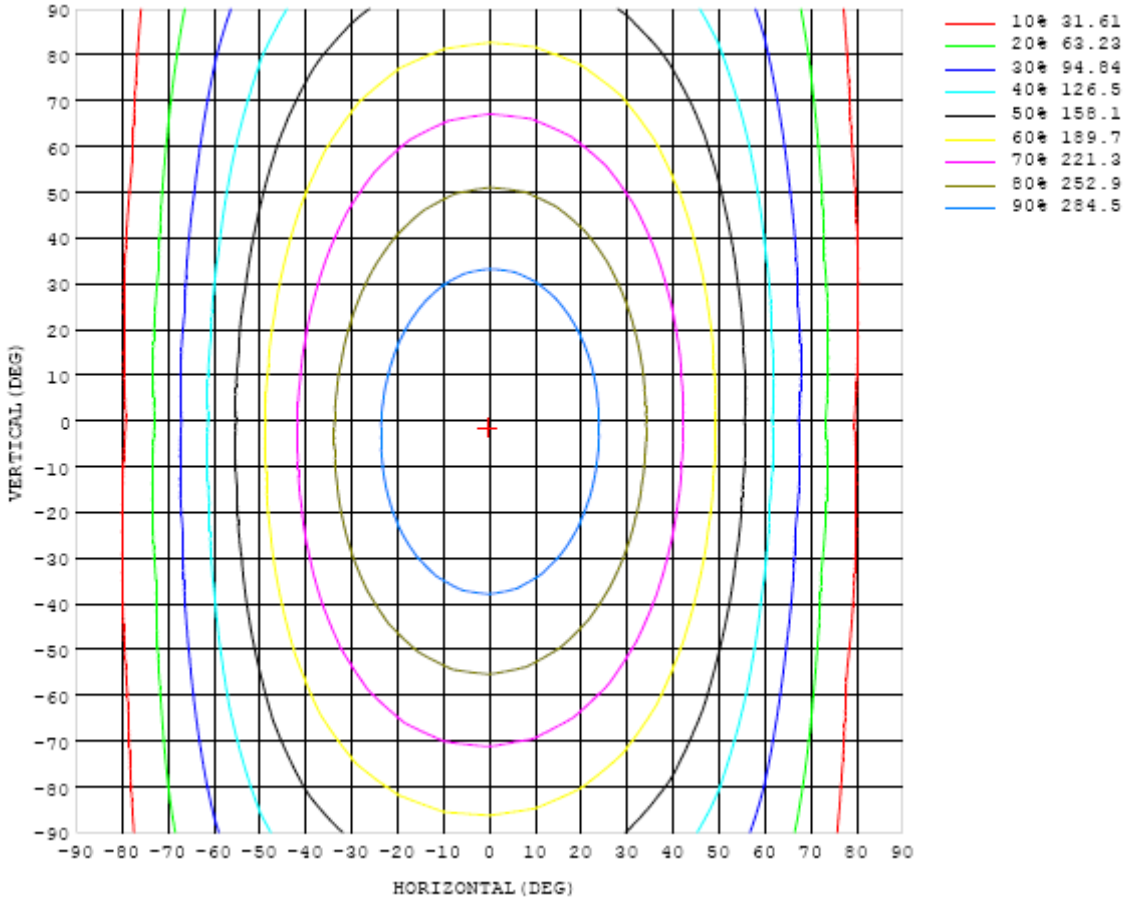


Chart 5: Isocandela Plot

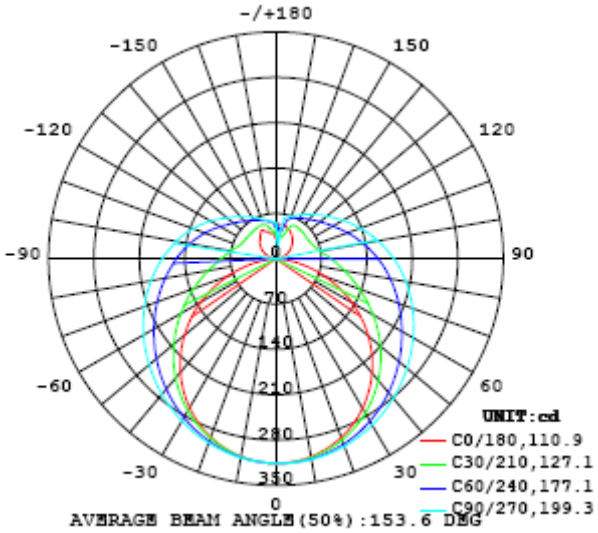


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316
5	314	315	315	315	315	316	316	316	316	316	316	316	316	315	315	315	315	315	315
10	310	311	311	312	312	313	314	314	315	315	315	314	314	313	313	312	311	311	310
15	303	304	305	306	307	309	310	311	312	312	312	311	310	309	308	306	305	304	303
20	294	294	296	298	300	302	305	306	308	308	308	307	305	303	300	298	296	294	293
25	281	282	284	288	291	294	298	300	302	303	302	301	298	295	292	288	284	282	281
30	267	268	271	275	280	285	289	293	295	296	296	294	290	286	281	276	271	267	266
35	249	251	255	261	267	274	280	285	288	289	289	286	281	275	269	261	255	250	248
40	230	232	237	245	254	262	270	276	279	281	280	277	271	264	255	246	238	231	229
45	209	211	218	228	239	249	259	266	271	272	271	267	261	252	241	229	219	211	207
50	186	189	198	210	223	236	247	256	261	263	262	257	250	239	226	212	198	188	184
55	161	165	176	191	208	223	236	245	251	254	252	247	238	226	211	194	177	164	159
60	135	140	154	173	192	210	224	235	241	244	243	237	227	213	196	176	156	140	133
65	108	114	132	155	177	197	212	224	231	234	233	226	216	201	181	158	135	115	106
70	80.5	88.4	111	137	163	184	201	213	221	224	222	216	205	189	167	142	114	89.8	79.2
75	54.1	64.3	90.9	121	149	172	190	203	210	214	212	205	194	177	154	127	95.6	66.7	52.6
80	29.3	42.4	74.0	107	137	161	179	192	200	203	201	195	183	166	142	113	79.7	46.3	28.1
85	9.78	26.0	61.1	95.3	125	150	168	181	189	192	191	184	172	155	131	102	67.5	31.1	8.71
90	0.67	17.1	51.3	85.1	115	139	157	170	179	182	180	173	162	144	121	91.9	58.1	22.7	0.36
95	1.90	13.9	44.3	76.4	105	129	147	160	167	171	169	162	151	134	111	83.4	51.3	19.3	1.95
100	5.05	15.0	40.3	69.4	96.6	119	137	149	157	160	158	152	141	124	103	76.3	47.0	19.7	5.12
105	9.34	17.8	38.9	64.4	89.0	110	127	139	146	149	147	141	131	115	95.0	70.8	45.2	21.9	9.26
110	14.2	21.7	39.2	61.1	82.7	102	117	129	136	138	137	131	121	107	88.3	66.9	45.2	25.1	13.8
115	19.3	25.9	40.6	59.0	77.7	94.7	109	119	126	128	127	122	112	99.2	82.9	64.5	46.1	28.4	18.5
120	24.1	29.6	42.5	57.8	74.0	88.8	101	110	116	119	117	113	104	93.0	78.9	63.2	47.5	31.5	23.4
125	28.1	32.6	44.7	57.5	71.0	83.9	94.7	103	108	110	109	105	97.7	87.6	75.5	62.2	49.1	34.1	27.5
130	32.1	34.6	47.0	57.6	68.8	79.6	89.0	96.0	101	103	102	97.9	91.6	83.0	72.8	61.7	50.4	35.7	31.5
135	36.4	35.5	49.0	58.2	67.3	76.0	84.0	89.9	93.9	95.5	94.7	91.5	86.2	79.0	70.6	61.5	51.6	36.4	35.2
140	39.8	35.4	50.7	58.6	66.1	73.1	79.5	84.5	87.8	89.1	88.5	85.8	81.4	75.4	68.8	60.6	52.0	36.6	38.1
145	43.0	34.7	51.8	58.9	65.2	70.8	75.7	79.6	82.3	83.4	82.9	80.7	77.2	72.4	67.2	59.1	52.0	35.9	41.8
150	46.3	36.7	51.0	58.9	64.1	68.9	72.3	75.4	77.4	78.3	77.8	76.2	73.5	69.9	63.7	59.2	49.7	37.7	46.9
155	48.7	40.6	42.9	55.6	63.3	66.6	70.5	71.5	73.1	73.8	73.5	72.2	70.2	63.2	57.0	53.7	42.4	39.7	48.7
160	50.6	41.3	34.9	43.6	57.0	64.8	66.5	68.5	69.3	69.7	69.7	66.8	56.0	50.4	47.8	44.8	35.6	38.7	44.4
165	53.9	46.0	34.6	35.4	38.0	46.9	58.6	62.3	65.5	66.4	58.4	45.4	46.3	44.7	38.5	35.0	34.9	38.8	42.3
170	53.0	49.5	40.4	36.0	38.8	42.8	44.5	47.7	49.4	46.3	45.5	47.8	45.0	42.3	39.3	37.0	35.7	38.3	39.3
175	52.7	51.6	50.3	47.6	44.2	43.8	45.2	45.2	37.5	23.8	44.8	46.6	45.6	44.2	42.4	41.0	41.3	40.9	38.5
180	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316		
5	314	314	314	314	314	314	315	315	315	315	315	315	315	314	314	314	314		
10	310	310	310	311	311	311	312	312	312	312	312	311	311	311	311	310	310		
15	303	303	304	304	305	306	307	308	308	308	307	307	306	305	304	304	303		
20	293	294	295	296	298	300	301	302	303	303	302	301	299	297	296	294	294		
25	281	282	284	287	289	292	294	296	297	296	295	293	291	288	285	283	282		
30	266	268	271	275	279	283	286	289	289	289	287	285	281	277	273	270	267		
35	249	251	256	262	268	273	278	280	282	281	279	275	270	265	259	254	251		
40	230	234	240	248	256	263	268	272	273	272	269	265	258	251	243	237	232		
45	209	214	223	233	243	251	258	262	264	263	260	254	246	236	227	218	211		
50	186	194	205	218	230	240	248	253	255	254	250	243	233	221	209	198	189		
55	162	173	187	202	217	228	237	243	245	244	239	231	220	206	191	177	166		
60	138	151	169	187	204	217	227	233	235	234	229	220	207	191	173	156	142		
65	113	130	151	172	191	206	216	223	225	224	218	208	194	176	156	135	117		
70	87.6	109	135	158	179	194	206	213	215	214	208	197	182	163	140	114	92.0		
75	63.6	89.9	119	146	167	184	196	203	205	203	197	186	171	150	124	95.2	68.4		
80	42.5	73.5	106	134	156	173	185	192	195	193	187	176	159	138	111	78.8	47.4		
85	26.6	60.6	94.1	123	146	163	175	182	185	183	177	165	149	127	98.8	65.6	31.3		
90	18.1	51.4	84.5	113	136	154	165	172	175	173	167	156	139	117	89.0	56.0	21.9		
95	14.8	45.3	76.7	104	127	144	156	162	165	163	157	146	130	108	81.0	49.6	18.1		
100	15.3	40.9	70.1	96.3	118	135	147	154	156	154	148	137	121	100	74.2	44.9	17.8		
105	17.5	38.8	64.5	88.9	109	125	137	144	146	144	138	128	112	92.5	68.3	42.1	19.9		
110	21.2	38.5	60.1	82.2	101	116	127	134	136	134	129	119	104	85.4	63.6	41.3	23.3		
115	25.4	39.5	57.6	76.3	93.6	108	118	124	126	125	119	110	96.3	79.3	60.4	41.7	27.4		
120	29.7	41.1	56.2	72.0	86.7	99.3	109	114	116	115	110	101	89.2	74.5	58.5	42.9	31.3		
125	33.4	42.9	55.5	68.9	81.3	91.8	100	105	107	106	101	93.6	83.3	71.0	57.5	44.7	34.8		
130	37.1	45.0	55.3	66.4	76.9	85.8	92.6	97.0	98.6	97.5	93.6	87.3	78.6	68.3	57.0	46.8	38.7		
135	40.8	47.0	55.3	64.5	73.2	80.7	86.4	90.1	91.4	90.5	87.3	82.0	74.7	66.2	56.9	48.9	42.8		
140	43.3	49.0	55.5	62.9	70.0	76.2	80.9	84.0	85.1	84.3	81.7	77.3	71.5	64.3	56.9	51.0	45.9		
145	46.8	50.9	55.9	61.4	67.1	72.2	76.0	78.5	79.4	78.8	76.7	73.3	68.4	62.7	57.4	52.8	47.6		
150	49.4	51.2	56.2	60.4	64.6	68.4	71.6	73.6	74.3	73.9	72.2	69.3	65.6	61.6	57.8	54.4	50.0		
155	50.4	52.0	56.8	59.6	62.5	65.3	67.4	68.9	69.5	69.1	68.0	66.0	63.6	60.9	58.2	54.9	52.2		
160	49.7	51.6	55.2	59.0	60.9	62.7	64.2	65.2	65.6	65.4	64.8	63.7	62.2	60.4	58.2	55.7	53.9		
165	44.2	48.8	53.3	57.5	59.5	60.7	61.7	62.3	62.6	62.6	62.3	61.7	60.8	59.4	57.6	56.3	55.2		
170	39.0	42.7	46.9	53.6	57.2	58.2	58.9	59.5	59.8	59.8	59.5	59.1	58.5	57.9	57.4	56.7	54.8		
175	35.8	36.1	39.1	43.2	50.0	55.5	57.8	57.8	57.4	57.3	57.3	57.3	57.2	57.0	56.8	56.2	54.7		
180	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3	50.3		

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 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 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 expended 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 expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

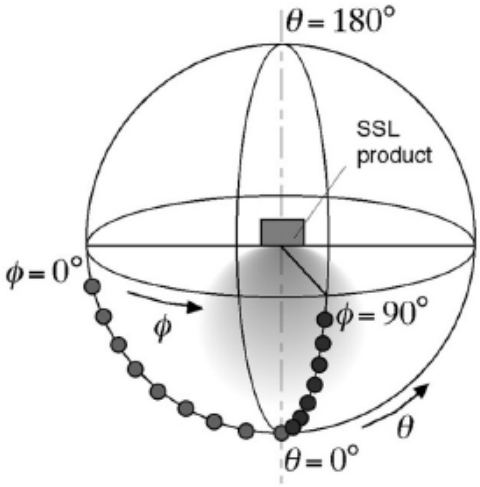
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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