LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED lamp

Model: 17T8/4F/840/DEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18100024q

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:

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: **17T8/4F/840/DEB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
135.5	2275.0	16.79	0.9761

CCT (K)	CRI	Stabilization Time (Light & Power)
4019	83.7	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

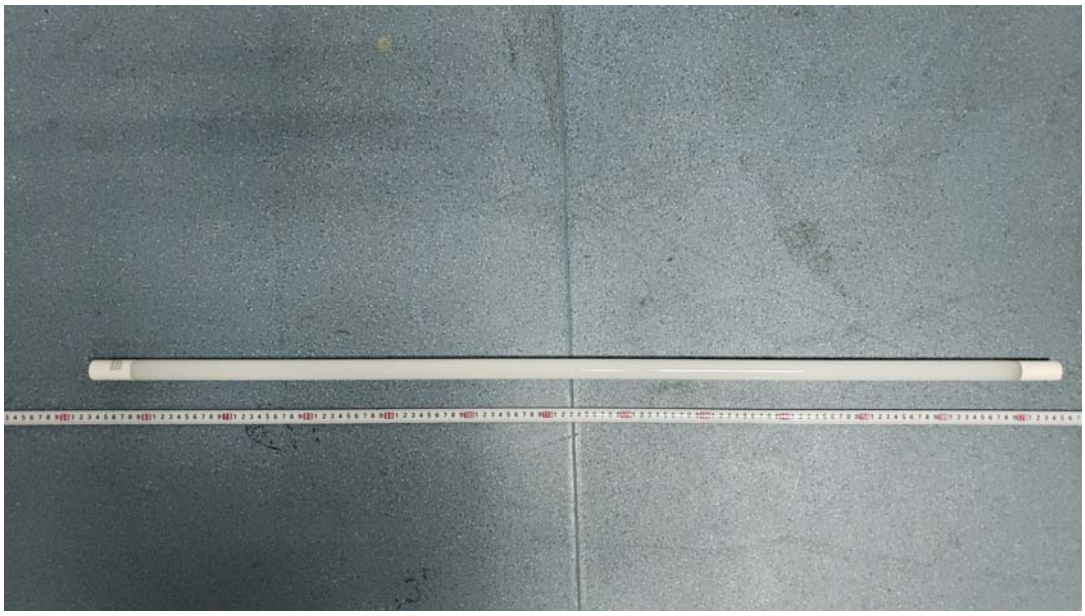


Figure 1- Overview of the sample

Equipment Under Test (EUT)	
Name	: LED lamp
Model	: 17T8/4F/840/DEB
Electrical Ratings	: 120-277V, 50/60Hz, 17W
Product Description	: 4000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.0℃.

Base orientation was light down. 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)	0.143	0.067
Power Factor	0.9761	0.9195
Test Power (W)	16.79	16.97
THD A%	20.79	27.40
Luminous Efficacy (lm/W)	135.5	134.4
Total Luminous Flux (lm)	2275.0	2281.0
Color Rendering Index (CRI)	83.7	
R9	7.6	
Correlated Color Temperature (CCT)(K)	4019	
Chromaticity Chroma x	0.3807	
Chromaticity Chroma y	0.3807	
Chromaticity Chroma u	0.2237	
Chromaticity Chroma v	0.3356	
Duv	0.0011	
Chromaticity Chroma u ’	0.2237	
Chromaticity Chroma v’	0.5034	

Special Color Rendering Indices	
R1	81.7
R2	91
R3	96.3
R4	81.4
R5	82.1
R6	87.7
R7	85.5
R8	63.6
R9	7.6
R10	78.8
R11	80.5
R12	67.1
R13	84.2
R14	98.4
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)	0.144
Power Factor	0.9762
Test Power (W)	16.86
Luminous Efficacy (lm/W)	133.0
Total Luminous Flux (lm)	2242.3
Beam Angle (°)	154.1
Center Beam Candle Power (cd)	404
Spacing Criteria	1.25 (0°-180°)/ 1.38 (90°-270°)
Zonal Lumens in the 0°-60°Zone	44.98%
Zonal Lumens in the 60°-90°Zone	26.45%
Zonal Lumens in the 90°-120°Zone	16.63%
Zonal Lumens in the 120°-180°Zone	11.94%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

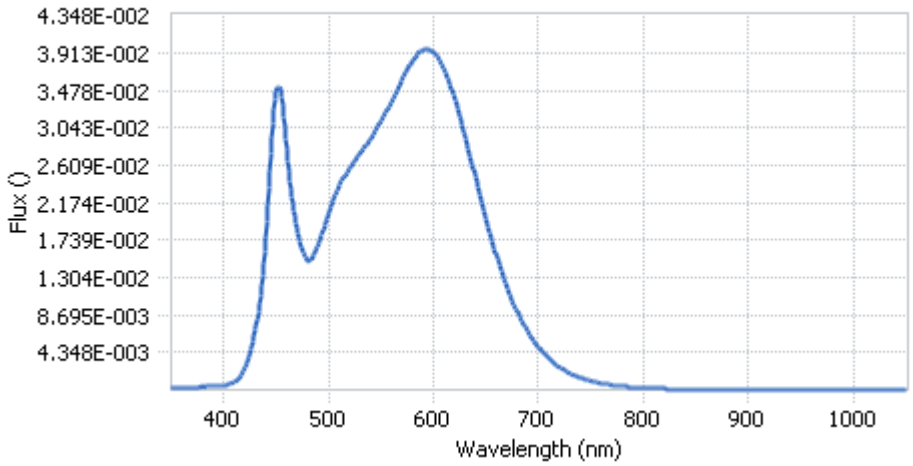
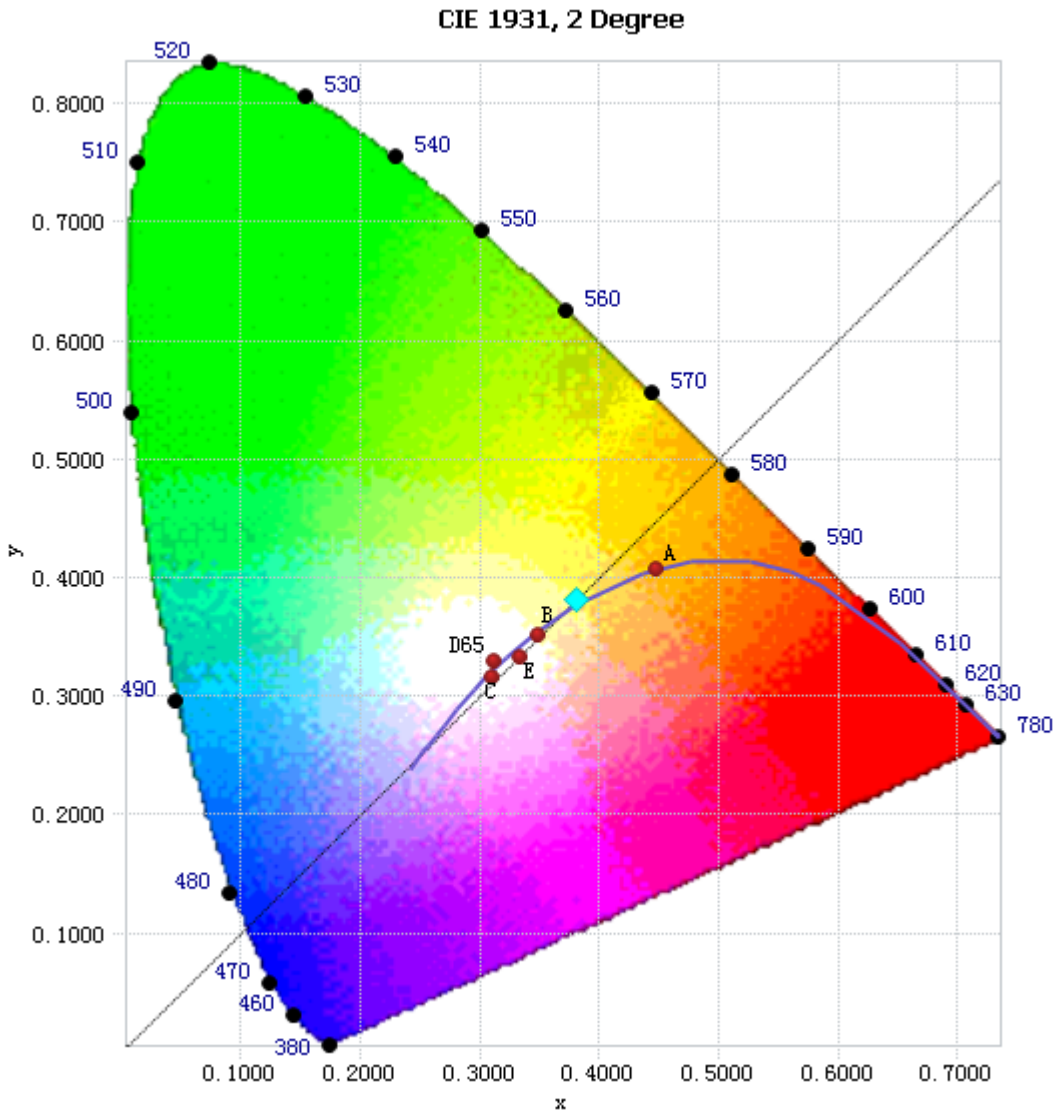


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	3.94E-04	485	1.55E-02	590	3.94E-02	695	5.77E-03
385	3.78E-04	490	1.69E-02	595	3.96E-02	700	4.97E-03
390	4.37E-04	495	1.86E-02	600	3.92E-02	705	4.25E-03
395	4.66E-04	500	2.05E-02	605	3.85E-02	710	3.64E-03
400	5.38E-04	505	2.23E-02	610	3.73E-02	715	3.10E-03
405	6.81E-04	510	2.37E-02	615	3.58E-02	720	2.66E-03
410	9.71E-04	515	2.49E-02	620	3.38E-02	725	2.28E-03
415	1.53E-03	520	2.58E-02	625	3.17E-02	730	1.95E-03
420	2.49E-03	525	2.66E-02	630	2.94E-02	735	1.66E-03
425	4.20E-03	530	2.74E-02	635	2.70E-02	740	1.42E-03
430	6.90E-03	535	2.83E-02	640	2.46E-02	745	1.22E-03
435	1.11E-02	540	2.92E-02	645	2.22E-02	750	1.05E-03
440	1.78E-02	545	3.02E-02	650	1.98E-02	755	9.05E-04
445	2.75E-02	550	3.12E-02	655	1.76E-02	760	7.80E-04
450	3.47E-02	555	3.24E-02	660	1.56E-02	765	6.72E-04
455	3.40E-02	560	3.35E-02	665	1.37E-02	770	5.79E-04
460	2.79E-02	565	3.47E-02	670	1.19E-02	775	5.03E-04
465	2.24E-02	570	3.60E-02	675	1.04E-02	780	4.30E-04
470	1.88E-02	575	3.71E-02	680	9.02E-03		
475	1.61E-02	580	3.82E-02	685	7.78E-03		
480	1.50E-02	585	3.90E-02	690	6.73E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3807, 0.3807)

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

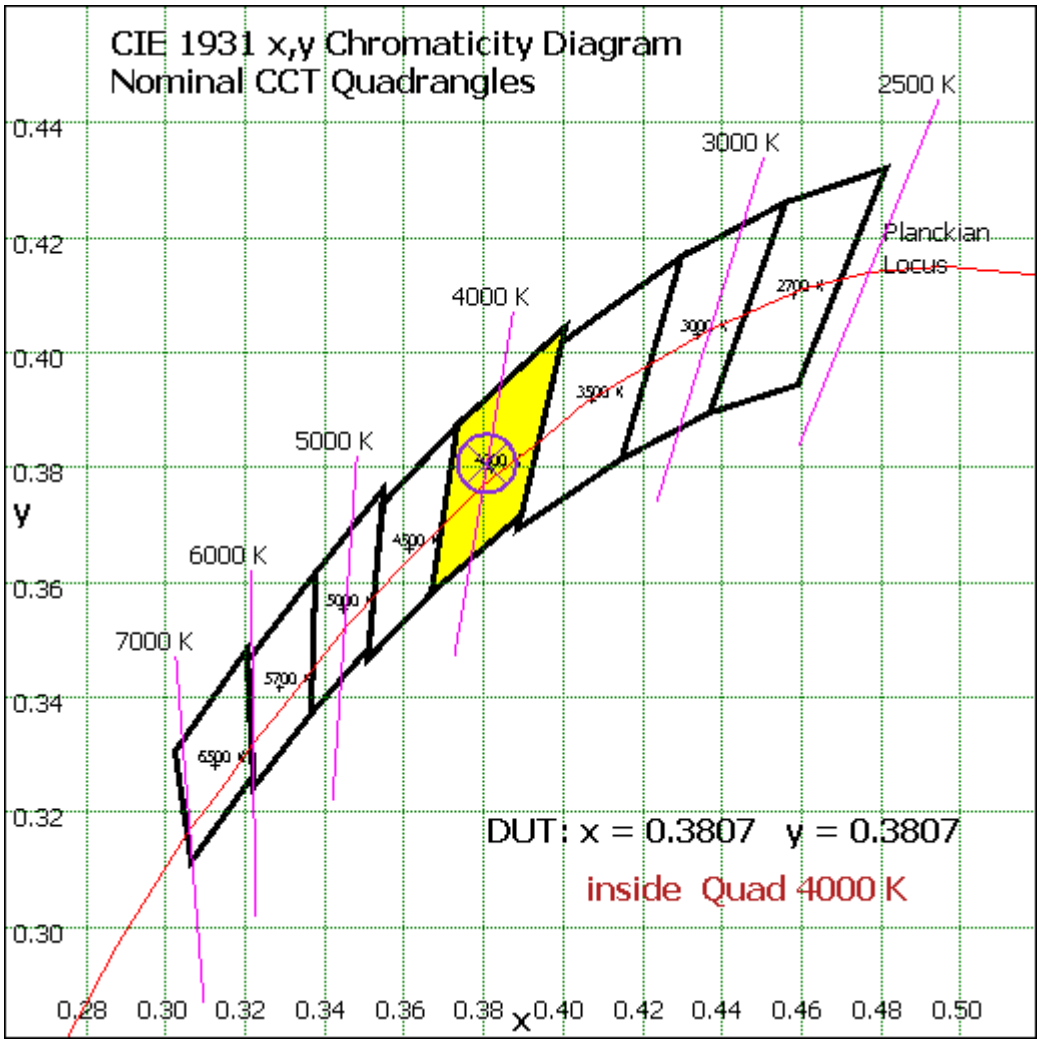


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	38.275	1.71%
10- 20	110.588	4.93%
20- 30	170.99	7.63%
30- 40	213.808	9.54%
40- 50	236.258	10.54%
50- 60	238.673	10.64%
60- 70	224.313	10.00%
70- 80	198.756	8.86%
80- 90	169.989	7.58%
90-100	145.518	6.49%
100-110	123.707	5.52%
110-120	103.72	4.63%
120-130	85.439	3.81%
130-140	68.658	3.06%
140-150	52.403	2.34%
150-160	36.215	1.62%
160-170	19.404	0.87%
170-180	5.552	0.25%
Total	2242.3	100%

γ(°)	Lumens	% Total
0- 60	1008.592	44.98%
60- 90	593.058	26.45%
0-90	1601.65	71.43%
90- 180	640.616	28.57%
0- 180	2242.3	100%

Table 5: Zonal Lumen Data

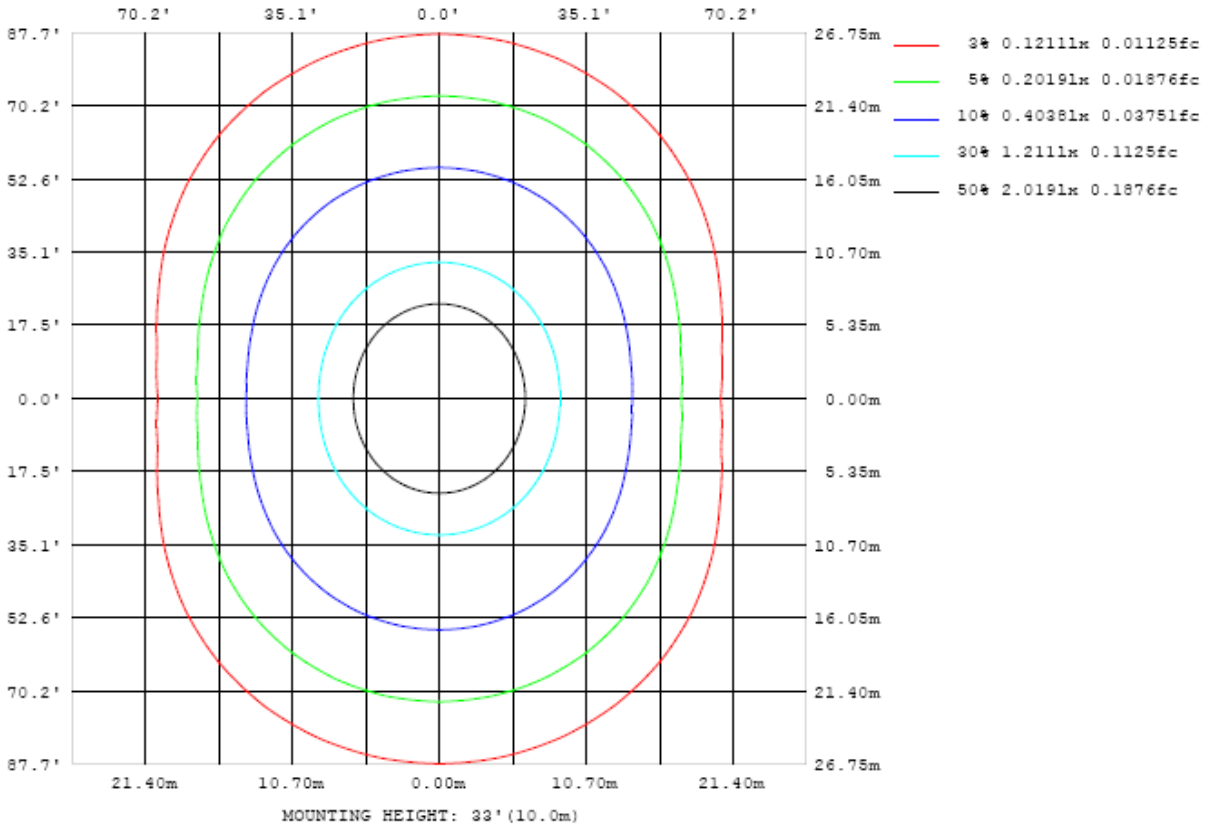


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

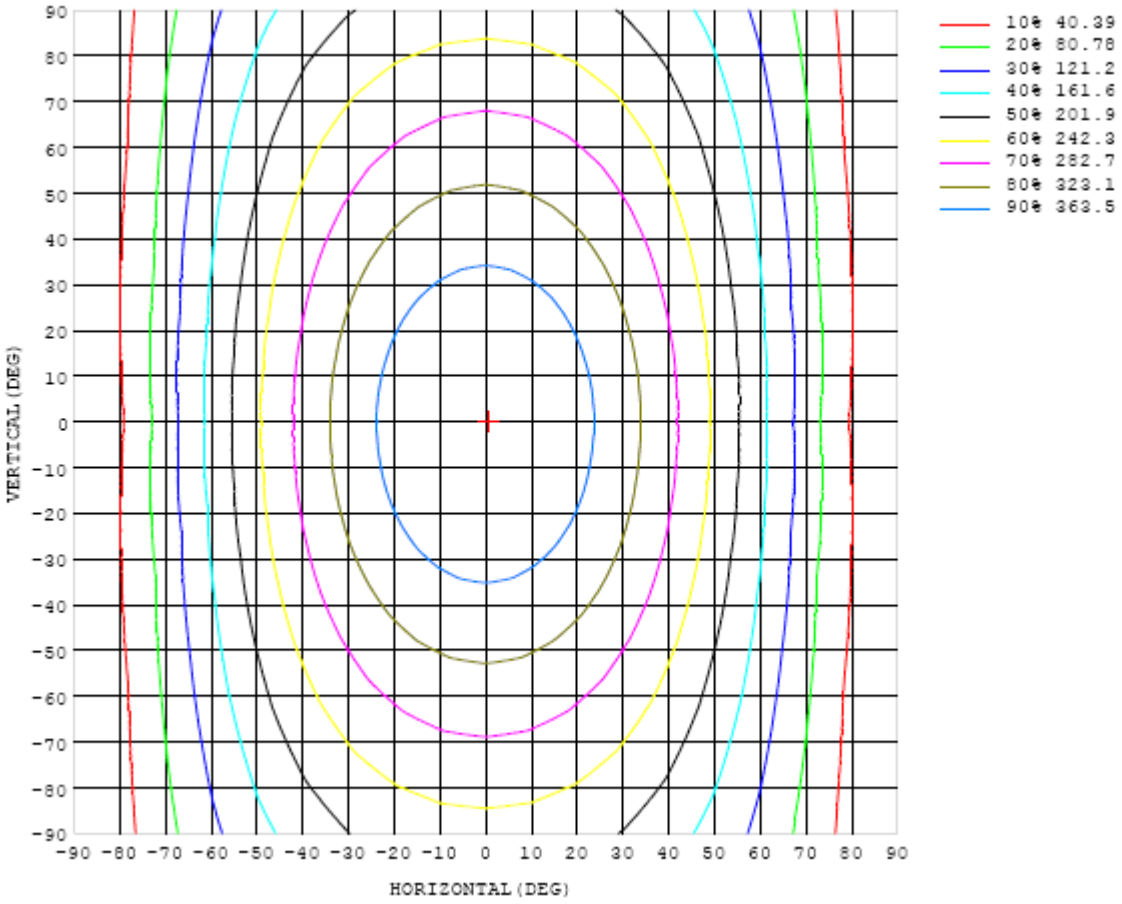


Chart 5: Isocandela Plot

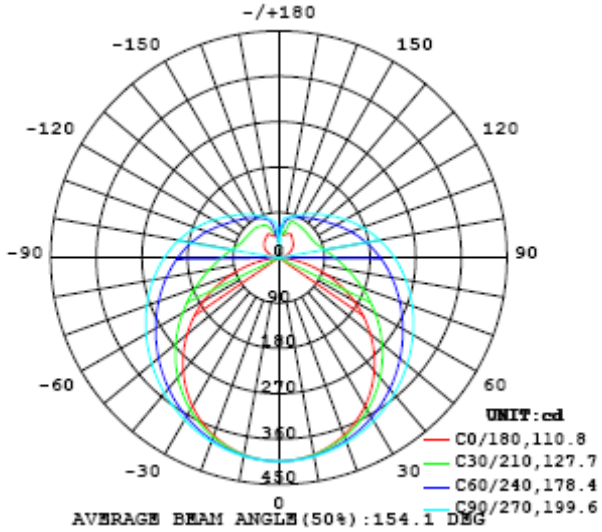


Chart 6: Polar Candela Distribution

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	404	404	404	404	404	404	404	404	404	404	404	404	404	404	404	404	404	404	404
5	402	402	402	402	402	402	402	403	403	403	403	403	403	403	402	402	402	402	402
10	396	396	397	397	398	398	399	400	400	400	400	400	399	399	398	398	397	397	397
15	387	387	388	389	391	392	394	395	396	396	396	395	394	393	391	390	389	388	388
20	375	375	376	379	381	384	386	388	389	390	390	388	387	384	382	379	377	376	375
25	359	359	362	365	369	373	377	380	382	383	382	380	377	374	370	366	363	360	360
30	340	341	344	349	355	361	366	370	373	374	373	370	366	361	355	350	345	342	341
35	318	319	324	331	339	346	354	359	363	364	363	359	354	347	339	332	325	320	319
40	293	295	301	310	321	331	340	347	352	353	352	348	341	332	322	311	302	296	294
45	265	268	276	289	302	315	326	335	340	342	340	335	327	315	303	290	278	269	266
50	236	240	250	266	283	298	312	322	328	330	328	322	312	299	283	267	251	240	236
55	204	209	223	243	263	282	297	308	315	318	316	309	298	282	264	243	224	210	205
60	171	178	196	219	243	265	283	295	303	305	303	296	283	265	244	220	196	178	171
65	137	145	168	197	224	249	268	282	290	293	290	282	269	249	225	197	169	145	137
70	102	113	142	175	207	233	254	268	277	280	277	269	254	234	207	176	142	113	101
75	68.3	83.1	117	155	190	218	240	255	264	267	264	256	241	219	191	156	118	82.2	67.1
80	37.2	56.5	96.5	138	175	204	226	242	251	254	251	242	227	205	176	139	97.0	55.9	35.3
85	12.3	35.9	79.8	123	160	190	213	229	238	241	239	229	214	192	162	124	80.8	36.0	10.7
90	0.54	24.5	68.8	111	148	178	200	216	225	228	226	217	202	179	150	112	69.2	25.4	0.55
95	2.03	20.3	59.8	100	136	165	188	203	212	215	213	204	189	167	138	102	61.7	21.7	2.48
100	5.99	21.0	54.5	91.7	126	154	175	190	199	202	199	191	176	155	128	94.1	56.8	22.9	6.60
105	10.9	24.3	51.9	84.8	116	143	163	177	186	189	186	178	164	144	119	87.5	54.6	26.4	12.0
110	16.9	28.6	51.8	79.7	108	132	151	165	173	176	174	166	153	134	110	82.7	54.9	31.1	18.1
115	22.5	34.0	53.1	76.5	101	123	141	153	161	164	162	154	142	125	104	79.7	56.5	36.1	24.3
120	27.8	39.3	55.2	74.9	95.4	114	130	142	149	152	150	143	132	117	98.3	78.2	58.6	40.8	29.8
125	32.6	44.1	57.7	74.0	91.6	108	121	132	138	141	139	133	123	110	94.3	77.2	60.8	45.2	34.6
130	36.8	48.2	60.4	73.8	88.5	102	114	123	128	130	129	124	116	104	91.1	76.8	63.0	48.5	38.4
135	40.1	51.9	63.4	74.0	86.1	97.5	107	115	119	121	120	116	109	99.5	88.5	76.7	65.3	51.0	41.4
140	43.1	55.2	66.3	74.5	84.2	93.5	102	108	112	113	112	109	103	95.2	86.2	76.5	67.0	53.2	43.7
145	46.4	57.5	68.8	75.0	82.6	90.1	96.5	102	105	106	105	102	97.7	91.5	84.3	76.0	67.8	55.0	46.0
150	50.1	58.5	71.0	75.6	81.4	87.0	92.1	95.9	98.4	99.3	98.7	96.5	92.9	88.2	82.5	75.6	69.5	55.1	48.8
155	52.4	54.6	70.2	76.4	80.2	84.4	88.0	90.9	92.8	93.5	93.1	91.5	88.7	85.3	78.2	71.1	68.0	52.3	51.5
160	50.5	47.3	63.1	76.8	79.2	82.1	84.6	86.4	87.7	88.2	87.9	86.8	85.2	78.7	69.8	63.9	59.5	47.7	49.0
165	47.7	43.7	50.8	62.1	77.3	79.0	81.1	82.9	83.5	83.8	83.8	81.3	71.2	60.9	56.8	53.5	48.5	43.6	45.4
170	45.4	43.7	46.7	48.1	53.7	65.7	74.0	76.9	80.0	80.5	74.9	54.9	53.9	56.4	53.3	50.3	45.2	44.0	43.6
175	54.5	52.4	54.5	59.3	60.8	60.8	60.9	64.4	58.1	50.7	47.6	58.6	61.9	60.7	60.5	58.8	57.4	55.6	53.0
180	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8

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	404	404	404	404	404	404	404	404	404	404	404	404	404	404	404	404	404		
5	402	402	402	402	402	403	403	403	403	402	402	402	402	402	402	402	402		
10	397	397	397	398	398	399	399	400	400	400	399	399	398	397	397	397	396		
15	388	389	389	391	392	393	394	395	395	395	394	393	392	390	389	388	387		
20	376	377	379	381	383	385	387	388	388	388	387	385	383	380	378	376	375		
25	360	362	365	369	372	376	378	380	381	380	378	375	372	368	364	361	359		
30	342	344	349	354	360	365	368	371	372	371	368	364	359	354	348	344	341		
35	320	324	330	338	345	352	357	361	362	360	357	352	345	337	330	323	319		
40	296	302	310	320	330	339	345	349	351	349	345	338	330	320	310	301	295		
45	269	277	289	302	314	325	332	338	339	338	332	324	313	301	288	276	268		
50	241	251	266	282	297	310	319	325	328	325	319	310	297	282	265	251	240		
55	210	224	243	262	281	295	306	313	315	313	306	295	280	262	242	223	210		
60	178	196	220	243	264	281	293	300	303	300	293	281	264	243	219	196	178		
65	147	169	197	224	248	266	279	288	290	288	280	266	248	224	197	169	147		
70	115	143	176	207	232	252	266	275	277	275	267	252	232	206	175	143	115		
75	84.0	119	157	190	218	239	253	262	265	262	253	239	217	190	156	119	84.6		
80	57.4	98.5	140	175	204	225	240	249	252	249	240	225	203	175	139	97.8	57.6		
85	37.5	82.3	126	161	190	212	227	236	239	236	227	212	190	161	124	81.1	36.9		
90	26.6	70.5	113	150	178	200	215	223	226	223	215	199	177	149	112	69.0	25.1		
95	22.1	62.3	103	139	166	188	202	211	214	211	202	187	165	138	102	60.5	20.4		
100	22.7	56.5	94.1	128	155	175	189	198	201	198	189	175	154	127	92.4	54.5	20.7		
105	25.9	53.9	86.8	118	144	163	176	185	188	185	176	162	143	116	84.8	51.6	24.1		
110	30.6	53.8	81.6	109	133	152	164	172	174	172	164	151	132	107	79.4	51.1	29.2		
115	35.7	55.2	78.5	102	123	140	152	159	161	159	152	140	122	100	76.0	52.2	34.2		
120	41.0	57.1	76.9	96.7	115	130	141	147	150	147	140	129	113	94.8	74.1	54.6	38.4		
125	45.4	59.3	76.0	92.9	108	121	130	136	138	136	130	120	107	90.8	73.1	57.6	43.0		
130	49.7	61.6	75.3	89.8	103	114	122	127	128	126	121	113	101	87.8	73.0	60.5	47.8		
135	53.1	63.8	75.1	87.0	98.2	107	114	118	120	118	113	106	96.9	85.0	73.6	63.1	51.2		
140	54.8	65.0	75.1	84.6	93.7	102	107	111	112	110	107	101	92.3	83.3	74.2	64.5	53.9		
145	58.0	67.4	74.9	82.6	89.8	95.8	101	104	105	103	100.0	94.9	88.9	81.8	74.6	66.1	57.4		
150	61.7	67.1	72.3	81.0	86.4	91.2	94.7	96.9	97.7	96.7	94.4	90.7	85.9	80.5	73.9	67.2	60.7		
155	62.7	66.7	71.8	78.6	83.1	86.7	89.4	91.2	91.9	91.2	89.4	86.7	83.3	78.8	73.6	67.8	62.0		
160	55.4	62.1	67.2	73.2	79.9	82.5	84.6	85.9	86.5	86.2	85.0	83.2	80.3	76.6	73.3	69.2	61.5		
165	51.4	52.5	57.5	62.3	71.6	78.0	79.0	80.4	81.0	80.9	79.9	78.4	76.8	75.1	72.5	68.6	62.9		
170	46.4	49.9	50.4	48.6	53.8	63.3	72.4	76.0	75.9	75.9	75.5	74.9	73.6	70.8	67.4	64.6	56.0		
175	52.7	52.4	52.1	50.8	45.6	40.9	43.3	54.7	68.7	70.0	69.2	68.9	66.5	64.1	62.4	58.6	54.9		
180	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8	31.8		

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

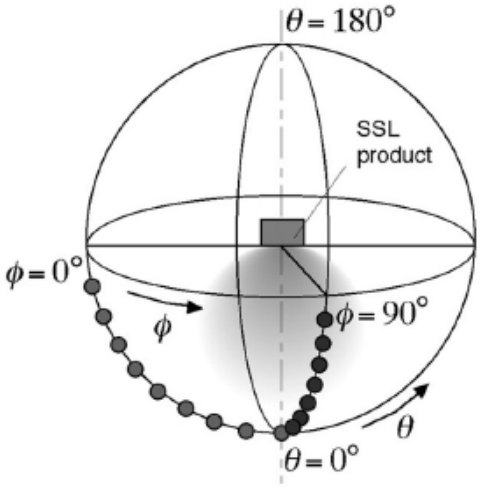
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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