

LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED lamp

Model: 14T8/4F/850/DEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Hangzhou, Zhejiang Province, China 311100

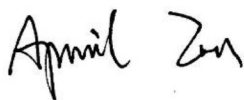
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Report No.: HZ18100024p

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

Review by:



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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/850/DEB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
138.0	1922.0	13.93	0.9821
CCT (K)	CRI	Stabilization Time (Light & Power)	
5041	83.9	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

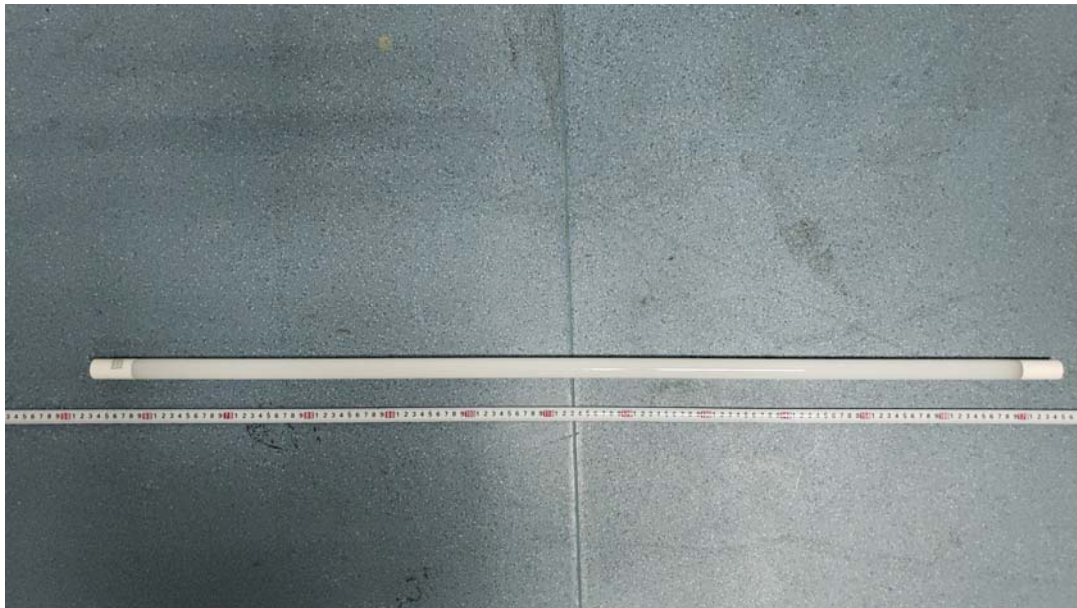


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED lamp
Model	: 14T8/4F/850/DEB
Electrical Ratings	: 120-277V, 50/60Hz, 14W
Product Description	: 5000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 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)	0.118	0.056
Power Factor	0.9821	0.9192
Test Power (W)	13.93	14.14
THD A%	17.19	24.22
Luminous Efficacy (lm/W)	138.0	136.8
Total Luminous Flux (lm)	1922.0	1935.0
Color Rendering Index (CRI)	83.9	
R9	7.7	
Correlated Color Temperature (CCT)(K)	5041	
Chromaticity Chroma x	0.3444	
Chromaticity Chroma y	0.3572	
Chromaticity Chroma u	0.2088	
Chromaticity Chroma v	0.3248	
Duv	0.0023	
Chromaticity Chroma u'	0.2088	
Chromaticity Chroma v'	0.4872	

Special Color Rendering Indices	
R1	81.9
R2	89.3
R3	94.3
R4	83.5
R5	83
R6	85.3
R7	86.9
R8	67
R9	7.7
R10	74.8
R11	83.1
R12	67
R13	83.8
R14	97.2
Rf	83
Rg	95

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)	0.119
Power Factor	0.9822
Test Power (W)	13.98
Luminous Efficacy (lm/W)	135.4
Total Luminous Flux (lm)	1892.5
Beam Angle (°)	153.9
Center Beam Candle Power (cd)	340
Spacing Criteria	1.25 (0°-180°)/ 1.38 (90°-270°)
Zonal Lumens in the 0°-60°Zone	44.99%
Zonal Lumens in the 60°-90°Zone	26.52%
Zonal Lumens in the 90°-120°Zone	16.63%
Zonal Lumens in the 120°-180°Zone	11.87%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

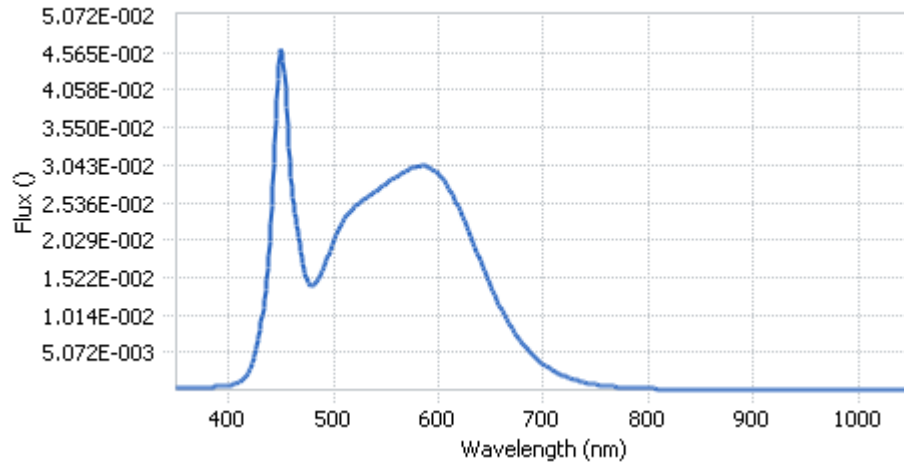
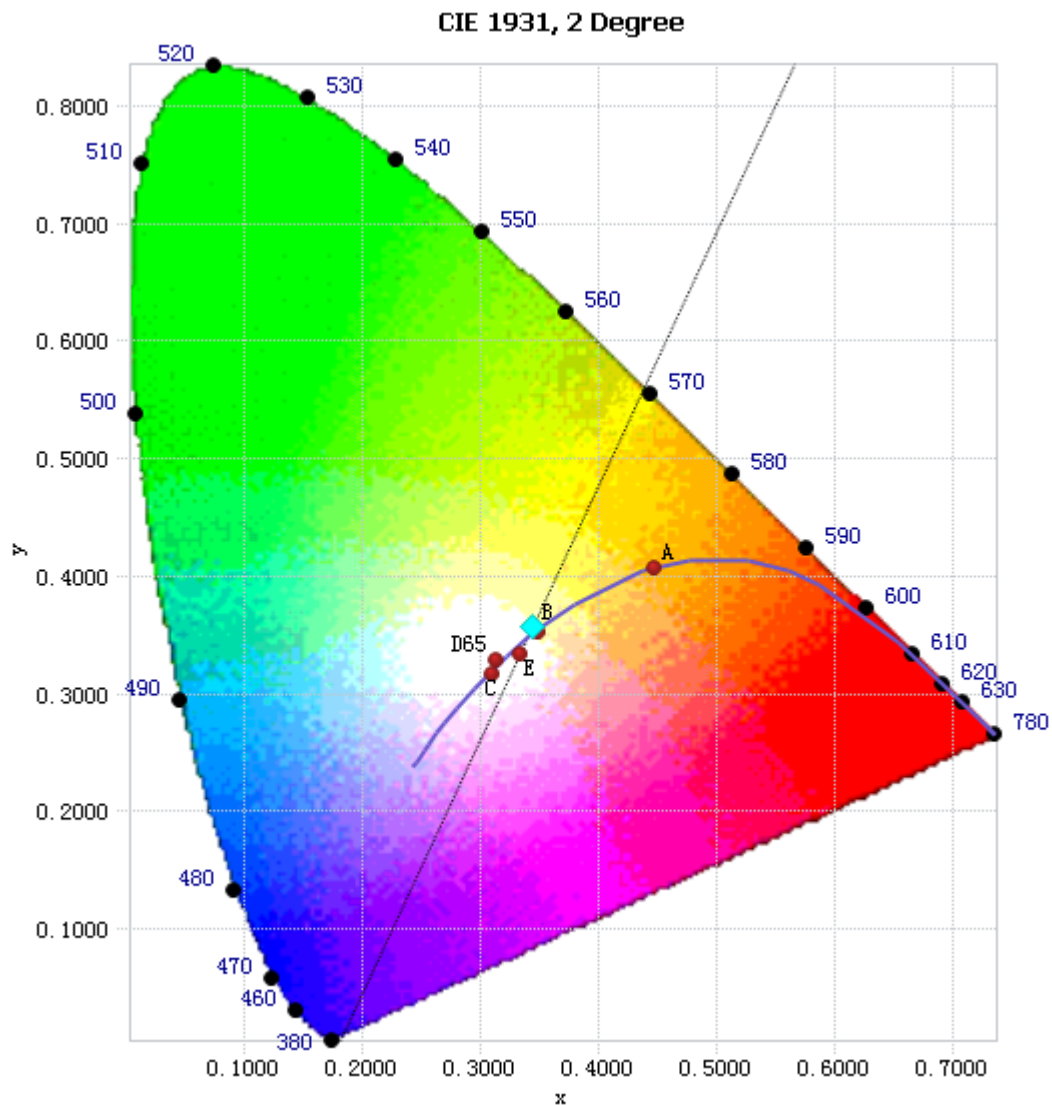


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.05E-04	485	1.50E-02	590	3.01E-02	695	4.02E-03
385	4.02E-04	490	1.64E-02	595	2.98E-02	700	3.46E-03
390	4.56E-04	495	1.82E-02	600	2.92E-02	705	2.96E-03
395	5.12E-04	500	2.02E-02	605	2.84E-02	710	2.53E-03
400	5.79E-04	505	2.18E-02	610	2.72E-02	715	2.17E-03
405	7.33E-04	510	2.31E-02	615	2.60E-02	720	1.86E-03
410	1.05E-03	515	2.41E-02	620	2.44E-02	725	1.60E-03
415	1.68E-03	520	2.48E-02	625	2.27E-02	730	1.36E-03
420	2.80E-03	525	2.53E-02	630	2.10E-02	735	1.16E-03
425	4.81E-03	530	2.59E-02	635	1.92E-02	740	1.00E-03
430	8.25E-03	535	2.64E-02	640	1.74E-02	745	8.48E-04
435	1.36E-02	540	2.69E-02	645	1.56E-02	750	7.37E-04
440	2.26E-02	545	2.75E-02	650	1.40E-02	755	6.26E-04
445	3.66E-02	550	2.80E-02	655	1.24E-02	760	5.44E-04
450	4.61E-02	555	2.85E-02	660	1.09E-02	765	4.75E-04
455	3.81E-02	560	2.89E-02	665	9.55E-03	770	4.08E-04
460	2.73E-02	565	2.93E-02	670	8.35E-03	775	3.52E-04
465	2.24E-02	570	2.97E-02	675	7.24E-03	780	3.06E-04
470	1.79E-02	575	3.00E-02	680	6.29E-03		
475	1.46E-02	580	3.02E-02	685	5.43E-03		
480	1.42E-02	585	3.04E-02	690	4.68E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3444, 0.3572)

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

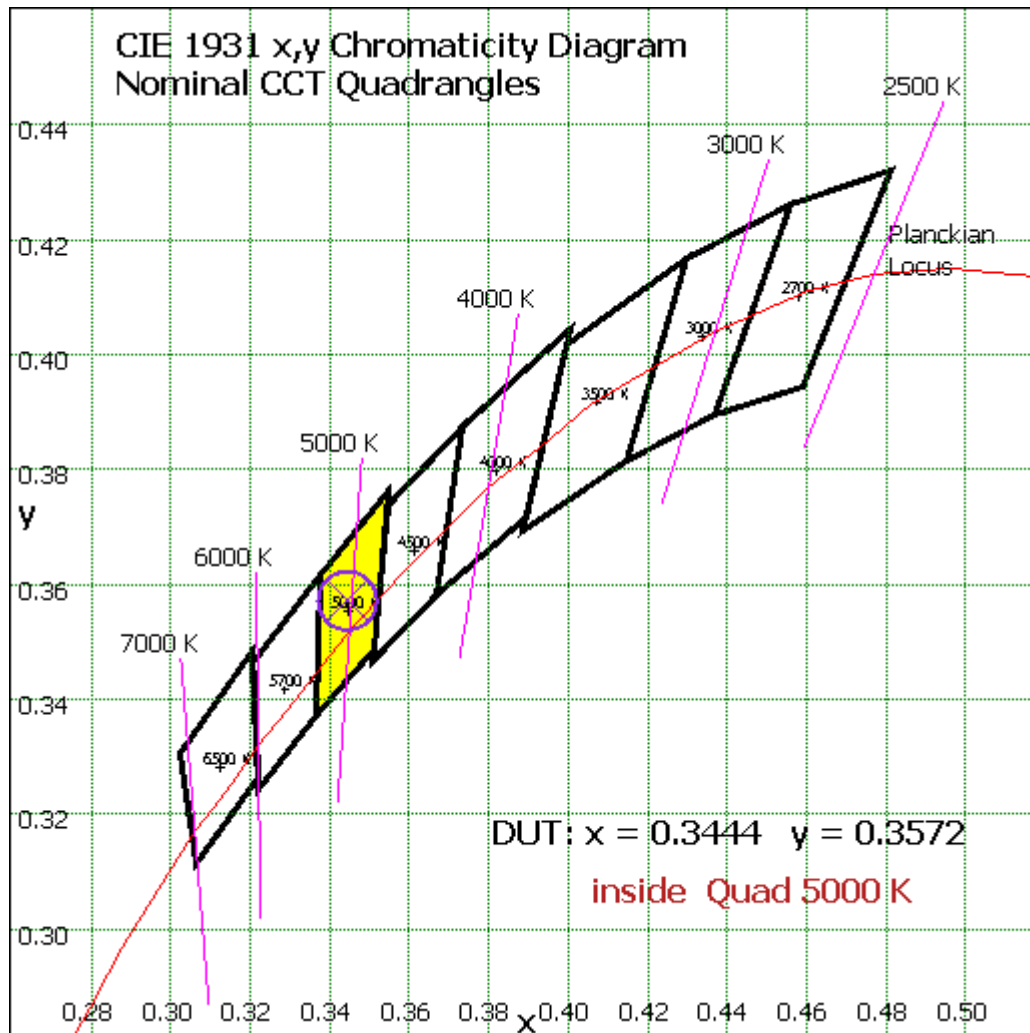


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	32.257	1.70%
10- 20	93.231	4.93%
20- 30	144.219	7.62%
30- 40	180.443	9.53%
40- 50	199.524	10.54%
50- 60	201.72	10.66%
60- 70	189.75	10.03%
70- 80	168.22	8.89%
80- 90	143.879	7.60%
90-100	123.057	6.50%
100-110	104.377	5.52%
110-120	87.215	4.61%
120-130	71.624	3.78%
130-140	57.426	3.03%
140-150	43.902	2.32%
150-160	30.429	1.61%
160-170	16.442	0.87%
170-180	4.739	0.25%
Total	1892.5	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	851.394	44.99%
60- 90	501.849	26.52%
0-90	1353.243	71.51%
90- 180	539.211	28.49%
0- 180	1892.5	100%

Table 5: Zonal Lumen Data

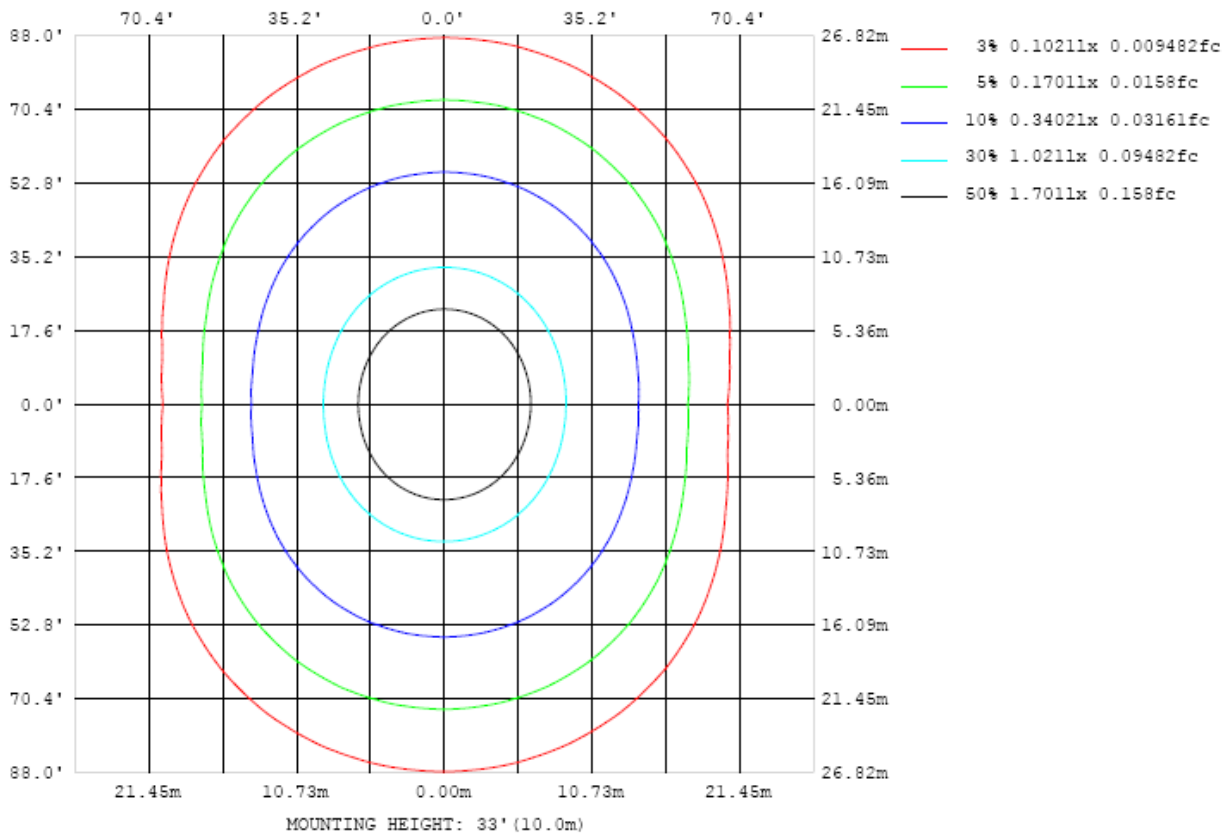


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

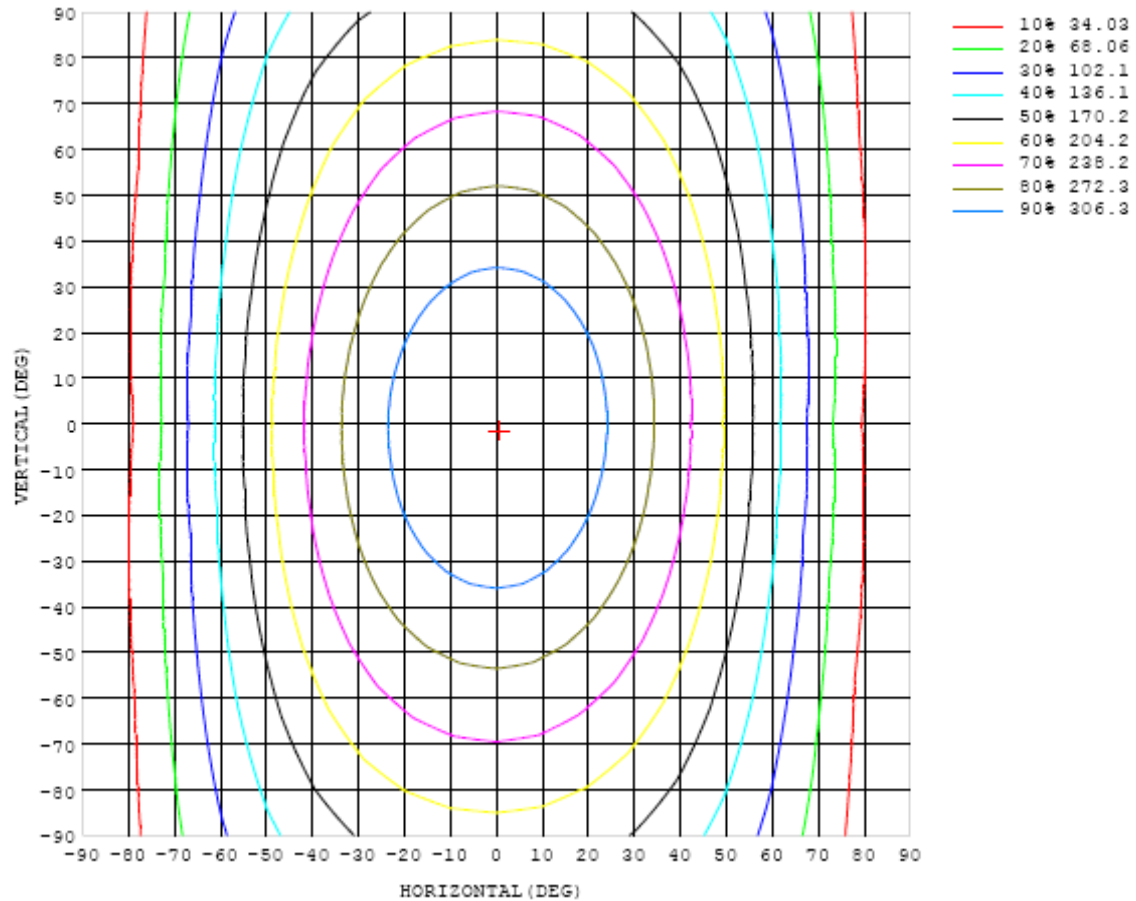


Chart 5: Isocandela Plot

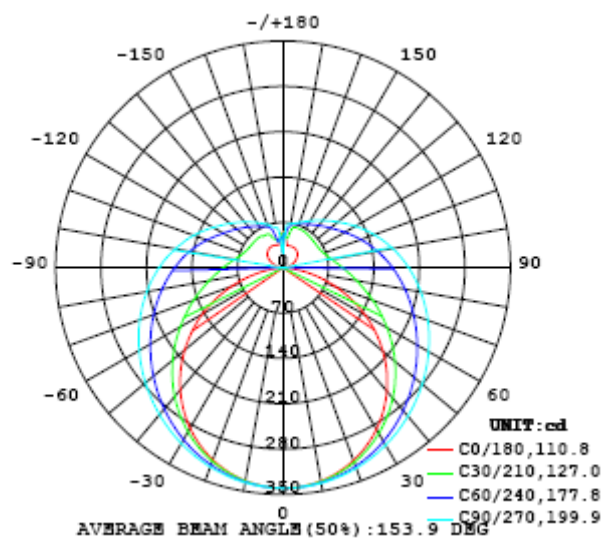


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DGG) γ (DGG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340
5	339	339	339	339	339	339	339	340	340	340	340	340	340	339	339	339	339	339	339
10	334	334	335	335	336	336	337	337	338	338	337	337	337	336	336	335	334	334	334
15	327	327	328	329	330	331	332	333	334	334	334	333	332	331	330	328	327	326	326
20	317	317	318	320	322	324	326	328	329	329	329	328	326	324	322	319	317	316	316
25	303	304	306	309	312	315	318	321	323	323	323	321	319	315	312	308	305	303	302
30	288	289	291	295	300	305	309	313	315	316	315	313	310	305	300	295	290	287	286
35	269	270	274	280	286	293	299	304	307	308	307	304	300	293	286	279	273	268	267
40	249	250	255	263	272	280	288	294	298	299	298	294	289	281	272	262	254	248	246
45	226	228	235	244	256	266	276	283	288	290	288	284	277	267	256	244	233	225	223
50	201	203	212	225	239	252	264	272	278	280	278	273	265	254	240	225	211	201	198
55	174	178	189	205	222	238	251	261	267	269	267	262	253	240	223	206	189	175	171
60	146	151	166	185	205	224	239	250	256	259	257	251	241	226	207	187	165	149	143
65	117	123	142	165	189	210	226	238	245	248	246	240	229	212	192	168	143	122	114
70	87.0	95.7	119	147	174	196	214	227	235	237	235	229	217	199	177	150	121	95.4	84.4
75	58.3	69.9	98.0	130	159	184	202	216	224	226	224	217	205	187	163	134	101	70.4	55.5
80	31.4	46.3	79.7	115	146	171	191	204	213	215	213	206	194	175	151	120	84.3	49.1	29.1
85	10.1	28.4	65.9	102	134	160	180	193	202	204	202	195	183	164	139	108	70.9	32.8	8.59
90	0.66	18.8	55.7	92.0	124	149	169	182	191	194	192	185	172	153	129	97.8	61.9	24.2	0.38
95	1.84	15.5	48.8	83.3	114	139	158	172	180	183	181	174	162	143	119	89.4	55.2	20.9	1.98
100	5.09	16.5	44.6	76.1	105	129	148	161	169	171	170	163	151	133	110	82.2	50.8	21.4	5.38
105	8.74	19.6	42.7	70.5	97.3	120	137	150	158	160	159	152	141	124	102	76.4	48.5	24.2	9.79
110	13.6	23.8	42.8	66.8	90.4	111	128	140	147	150	148	142	131	115	95.3	71.8	48.3	28.0	14.7
115	18.3	28.7	44.0	64.3	84.5	103	118	130	136	139	137	132	122	107	89.1	69.3	49.2	32.2	19.4
120	22.5	33.6	46.0	62.9	80.0	96.2	110	120	126	129	127	122	113	99.8	84.2	67.6	50.6	36.4	24.3
125	26.0	37.8	48.4	62.3	76.8	90.5	102	111	117	119	117	113	105	93.8	80.6	66.6	52.4	40.6	28.4
130	28.9	41.8	51.1	62.3	74.2	85.9	95.8	103	108	110	109	105	98.2	88.8	77.6	66.0	54.2	44.3	31.5
135	31.3	45.5	53.8	62.7	72.3	81.9	90.3	96.7	101	102	101	98.1	92.3	84.5	75.2	65.8	56.0	47.1	33.8
140	33.4	49.1	56.3	63.4	70.8	78.6	85.4	90.8	94.2	95.4	94.6	91.9	87.2	80.7	73.2	65.5	58.0	49.7	35.6
145	34.7	52.3	58.2	64.2	70.0	75.9	81.2	85.5	88.3	89.2	88.6	86.3	82.6	77.4	71.4	65.5	57.4	52.4	36.9
150	35.4	55.2	60.1	64.9	69.5	73.5	77.6	80.8	83.0	83.7	83.2	81.5	78.6	74.6	70.0	65.8	59.5	54.8	37.5
155	35.7	53.6	61.5	65.1	68.9	71.6	74.5	76.8	78.4	78.9	78.4	77.2	75.1	72.2	69.4	63.0	59.3	54.1	37.6
160	35.5	47.7	62.5	65.4	67.9	70.0	71.9	73.4	74.4	74.7	74.4	73.6	72.2	70.3	64.0	57.6	53.0	49.3	37.1
165	35.3	42.3	52.2	65.1	67.1	68.7	69.8	70.7	71.3	71.4	71.2	70.7	69.3	59.4	53.3	48.6	45.8	41.9	36.6
170	36.8	38.9	40.9	51.4	62.2	64.5	66.3	68.5	68.9	69.0	68.9	65.6	53.0	45.7	47.0	46.4	43.7	37.8	37.0
175	47.2	47.9	47.2	47.0	50.6	50.3	52.8	57.5	64.8	66.8	49.6	35.4	41.5	47.4	46.9	49.3	47.4	48.1	47.1
180	24.2	24.2	24.2	24.1	24.0	23.9	23.7	23.6	23.4	23.3	23.2	23.2	23.1	23.1	23.1	23.0	23.0	23.0	23.0

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (D5G) y (D5G)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340		
5	339	339	339	339	339	339	339	339	339	339	339	339	339	339	339	339	339		
10	334	334	334	335	335	336	336	336	337	337	336	336	336	335	335	335	334		
15	326	327	328	329	330	331	332	332	332	332	332	331	330	329	328	328	327		
20	316	317	318	320	322	324	325	327	327	327	326	325	323	321	319	318	317		
25	303	304	306	309	313	316	318	320	321	320	319	317	314	311	308	306	304		
30	287	289	293	297	302	306	310	312	313	313	311	308	304	299	295	291	289		
35	268	272	277	283	290	296	300	304	305	304	302	297	292	286	280	274	271		
40	247	252	260	268	277	284	290	294	296	295	292	286	279	271	263	256	251		
45	225	231	241	252	263	273	280	284	286	285	281	275	266	256	245	235	229		
50	201	209	222	236	249	260	269	274	276	275	270	263	252	240	226	214	205		
55	175	186	202	219	235	248	258	264	266	265	259	250	238	223	207	191	180		
60	149	163	183	203	221	236	247	253	256	254	248	238	225	207	188	168	154		
65	121	140	164	187	208	224	236	243	245	244	237	226	211	192	169	146	127		
70	94.0	118	146	172	195	212	224	232	235	233	226	214	198	177	152	124	99.9		
75	68.4	97.6	130	159	182	200	213	221	224	222	215	203	186	163	136	104	74.1		
80	45.8	80.2	115	146	170	189	202	210	213	211	204	192	174	151	121	86.1	51.5		
85	29.0	66.2	103	134	159	178	191	199	202	200	193	180	162	139	108	72.0	34.2		
90	19.9	56.4	92.4	124	149	167	180	188	191	189	182	169	152	128	97.5	61.5	24.2		
95	16.2	49.1	83.5	114	138	157	169	177	180	178	171	159	142	118	88.4	53.8	19.6		
100	16.6	44.3	75.7	104	128	146	158	166	168	167	160	149	131	108	80.2	48.3	19.2		
105	19.2	42.3	69.5	95.8	118	135	147	155	157	156	149	138	121	99.6	73.4	45.5	21.7		
110	23.2	42.1	65.4	88.3	109	125	137	144	146	145	138	127	112	91.8	68.6	44.6	25.7		
115	27.5	43.1	62.7	82.7	100	115	126	133	135	134	128	117	103	85.5	65.4	45.1	30.2		
120	31.4	44.7	61.1	78.3	93.9	107	116	122	124	123	118	108	96.0	80.7	63.3	46.9	34.5		
125	35.1	46.6	60.4	74.8	88.3	99.5	108	113	115	114	109	101	90.2	76.9	62.3	49.2	36.5		
130	38.9	48.6	60.0	72.1	83.5	93.1	100	105	107	106	101	94.5	85.3	74.0	62.1	51.7	40.8		
135	41.7	50.5	59.9	69.9	79.4	87.4	93.6	97.5	99.1	98.1	94.7	88.8	81.0	71.8	62.4	54.0	43.8		
140	44.3	51.9	60.0	68.1	75.8	82.5	87.6	90.9	92.3	91.5	88.6	83.7	77.4	70.1	62.7	54.4	46.1		
145	49.9	53.6	59.5	66.5	72.7	78.1	82.2	84.9	86.1	85.5	83.2	79.3	74.4	68.8	63.1	54.9	51.3		
150	53.1	54.9	57.5	65.1	69.9	74.2	77.4	79.6	80.6	80.2	78.4	75.5	71.8	67.7	61.9	57.3	53.7		
155	50.8	53.6	57.3	62.0	67.4	70.6	73.1	74.8	75.6	75.4	74.3	72.2	69.6	65.9	61.2	56.8	53.3		
160	42.2	51.5	50.8	56.0	62.8	66.9	69.2	70.6	71.3	71.3	70.7	69.3	66.1	63.6	62.0	59.0	48.4		
165	38.1	43.3	46.2	44.6	50.1	57.7	64.6	65.3	65.9	65.9	65.5	64.9	64.4	63.0	59.8	59.6	41.4		
170	37.1	38.3	43.1	45.0	44.2	40.3	43.9	58.1	62.7	62.8	62.5	61.5	59.6	60.6	58.2	46.1	34.1		
175	47.0	46.0	44.9	46.6	44.3	45.5	41.2	33.4	40.8	61.7	61.5	54.7	50.7	46.6	45.4	40.7	42.1		
180	23.0	23.0	23.0	23.1	23.1	23.1	23.2	23.2	23.3	23.4	23.6	23.7	23.9	24.0	24.1	24.2	24.2		

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 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

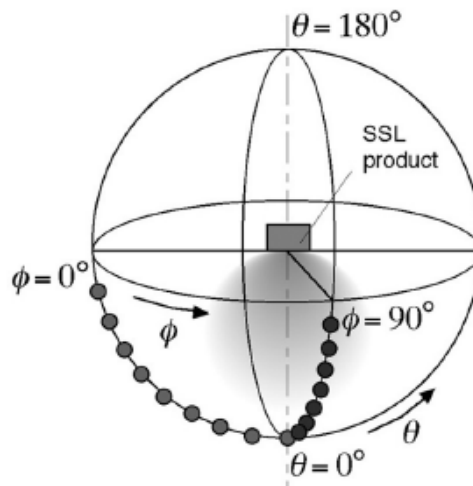
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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