

LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED lamp

Model: 14T8/4F/835/DEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Hangzhou, Zhejiang Province, China 311100

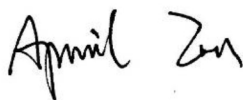
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Report No.: HZ18100024n

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/835/DEB

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
138.3	1866.0	13.49	0.9821
CCT (K)	CRI	Stabilization Time (Light & Power)	
3493	83.1	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

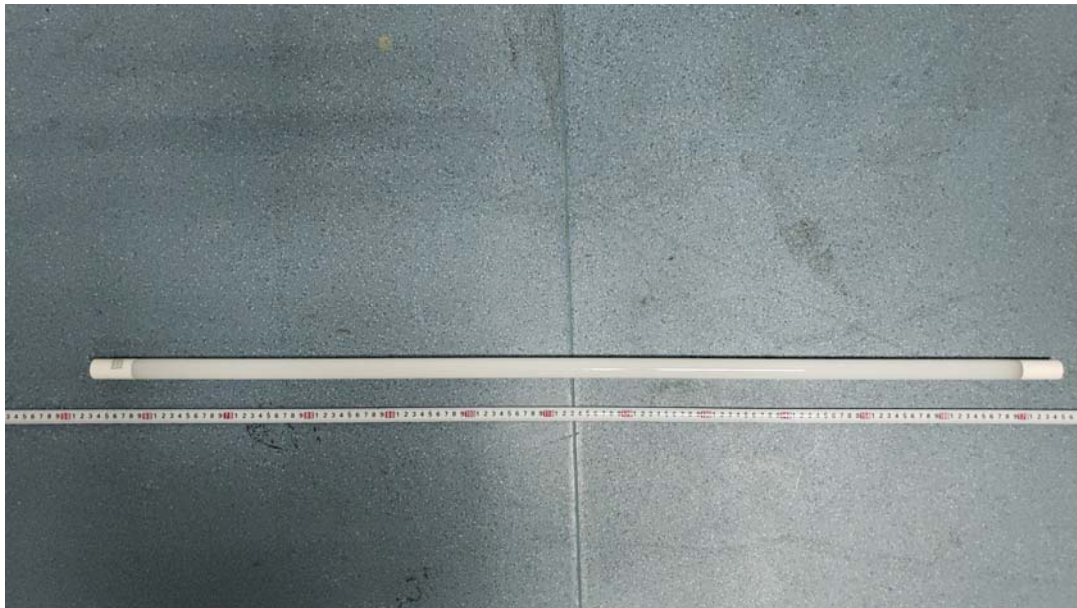


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED lamp
Model	: 14T8/4F/835/DEB
Electrical Ratings	: 120-277V, 50/60Hz, 14W
Product Description	: 3500K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.2°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)	0.114	0.055
Power Factor	0.9821	0.9135
Test Power (W)	13.49	13.84
THD A%	17.21	26.90
Luminous Efficacy (lm/W)	138.3	136.2
Total Luminous Flux (lm)	1866.0	1885.0
Color Rendering Index (CRI)	83.1	
R9	7.5	
Correlated Color Temperature (CCT)(K)	3493	
Chromaticity Chroma x	0.4062	
Chromaticity Chroma y	0.3926	
Chromaticity Chroma u	0.2355	
Chromaticity Chroma v	0.3415	
Duv	0.0004	
Chromaticity Chroma u'	0.2355	
Chromaticity Chroma v'	0.5122	

Special Color Rendering Indices	
R1	82
R2	93
R3	94.5
R4	79.6
R5	82.2
R6	90.7
R7	82.7
R8	60.3
R9	7.5
R10	83.5
R11	78.7
R12	69.3
R13	85.1
R14	97.5
Rf	82
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)	0.115
Power Factor	0.9820
Test Power (W)/2	13.54
Luminous Efficacy (lm/W)	135.6
Total Luminous Flux (lm)	1835.8
Beam Angle (°)	157.5
Center Beam Candle Power (cd)	322
Spacing Criteria	1.26 (0°-180°)/ 1.41 (90°-270°)
Zonal Lumens in the 0°-60°Zone	44.33%
Zonal Lumens in the 60°-90°Zone	26.61%
Zonal Lumens in the 90°-120°Zone	16.89%
Zonal Lumens in the 120°-180°Zone	12.17%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

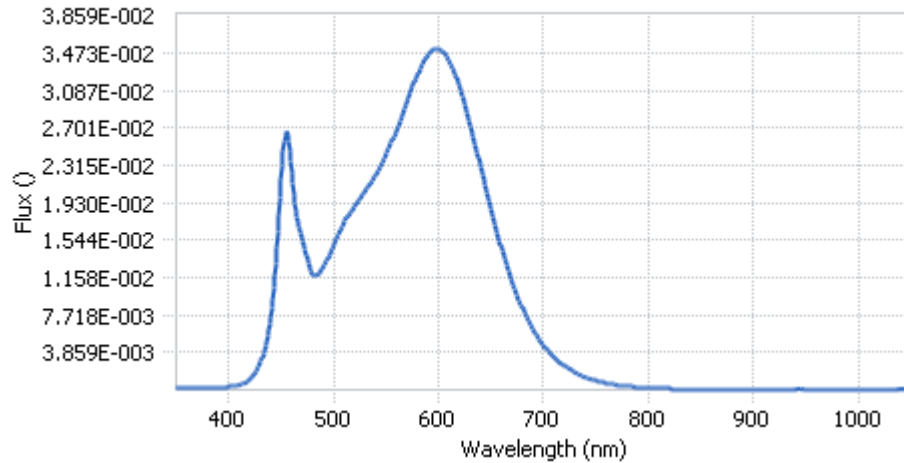
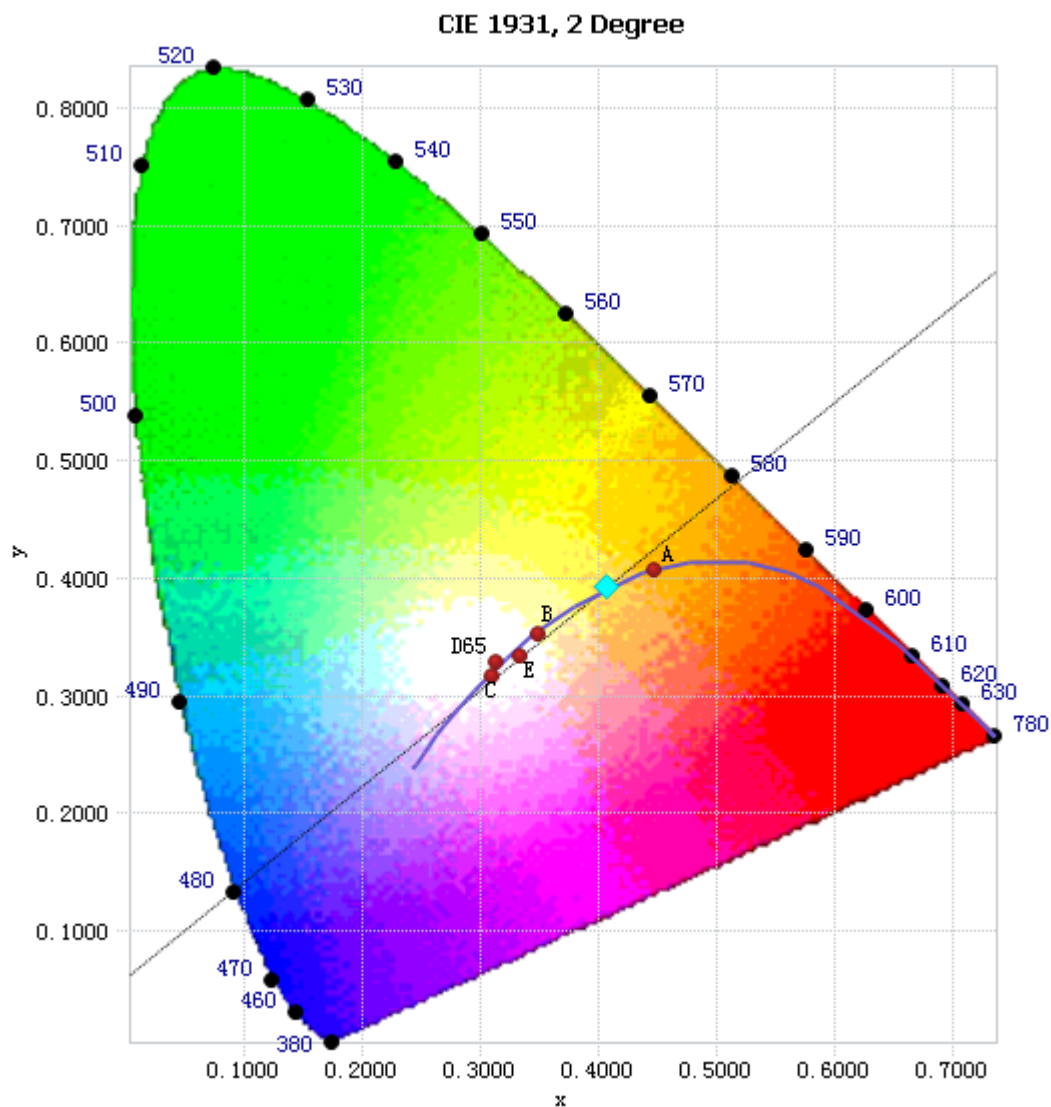


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.66E-04	485	1.19E-02	590	3.45E-02	695	5.38E-03
385	2.60E-04	490	1.27E-02	595	3.50E-02	700	4.62E-03
390	2.93E-04	495	1.36E-02	600	3.51E-02	705	3.94E-03
395	3.02E-04	500	1.49E-02	605	3.47E-02	710	3.35E-03
400	3.34E-04	505	1.62E-02	610	3.39E-02	715	2.89E-03
405	3.91E-04	510	1.73E-02	615	3.28E-02	720	2.48E-03
410	4.98E-04	515	1.82E-02	620	3.12E-02	725	2.12E-03
415	7.20E-04	520	1.90E-02	625	2.93E-02	730	1.80E-03
420	1.10E-03	525	1.97E-02	630	2.73E-02	735	1.54E-03
425	1.77E-03	530	2.05E-02	635	2.51E-02	740	1.31E-03
430	2.83E-03	535	2.13E-02	640	2.30E-02	745	1.12E-03
435	4.58E-03	540	2.22E-02	645	2.07E-02	750	9.59E-04
440	7.55E-03	545	2.32E-02	650	1.86E-02	755	8.21E-04
445	1.31E-02	550	2.43E-02	655	1.65E-02	760	7.09E-04
450	2.17E-02	555	2.55E-02	660	1.46E-02	765	6.03E-04
455	2.66E-02	560	2.68E-02	665	1.28E-02	770	5.25E-04
460	2.23E-02	565	2.82E-02	670	1.12E-02	775	4.49E-04
465	1.78E-02	570	2.97E-02	675	9.69E-03	780	3.90E-04
470	1.58E-02	575	3.12E-02	680	8.43E-03		
475	1.34E-02	580	3.25E-02	685	7.26E-03		
480	1.18E-02	585	3.37E-02	690	6.27E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4062, 0.3926)

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

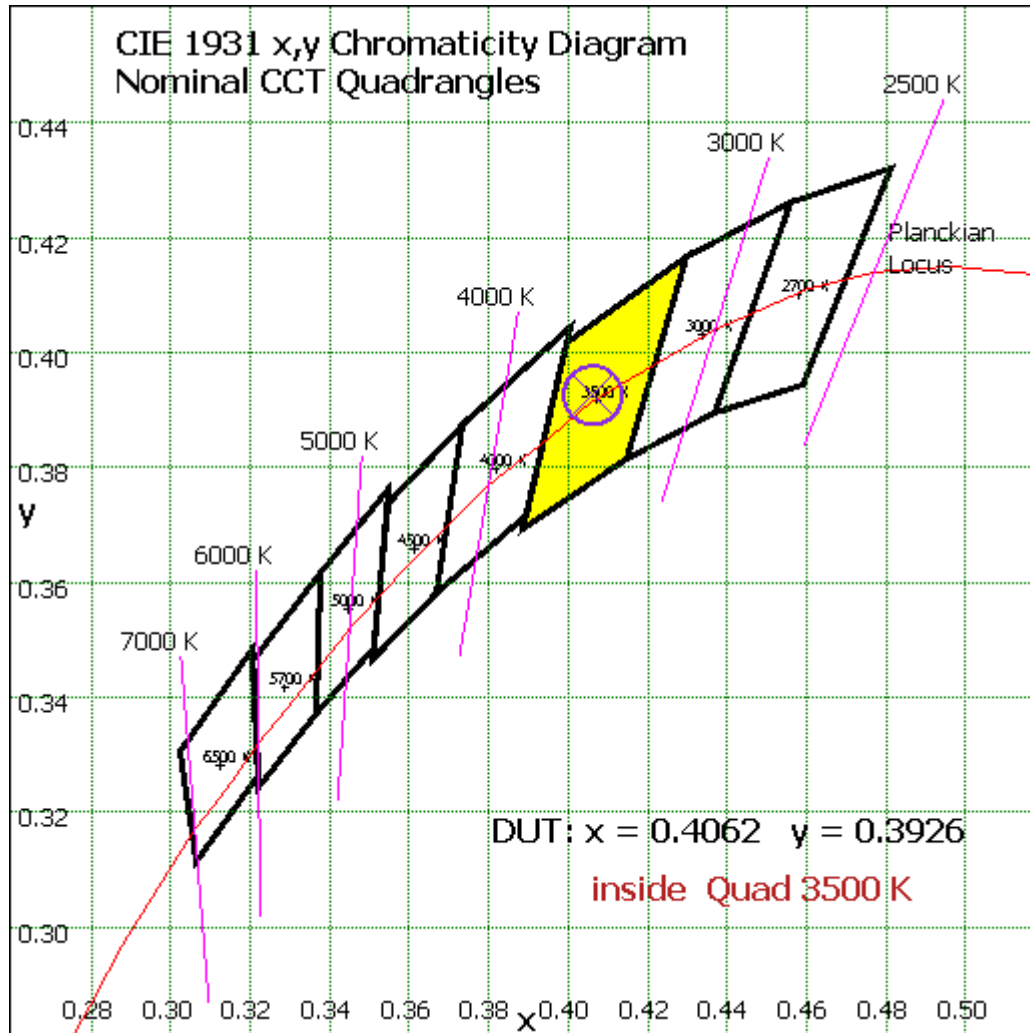


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	30.557	1.66%
10- 20	88.421	4.82%
20- 30	137.101	7.47%
30- 40	172.14	9.38%
40- 50	191.203	10.42%
50- 60	194.338	10.59%
60- 70	183.814	10.01%
70- 80	163.84	8.92%
80- 90	140.837	7.67%
90-100	120.899	6.59%
100-110	102.952	5.61%
110-120	86.294	4.70%
120-130	71.031	3.87%
130-140	57.069	3.11%
140-150	43.685	2.38%
150-160	30.355	1.65%
160-170	16.511	0.90%
170-180	4.717	0.26%
Total	1835.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	813.76	44.33%
60- 90	488.491	26.61%
0-90	1302.251	70.94%
90- 180	533.513	29.06%
0- 180	1835.8	100%

Table 5: Zonal Lumen Data

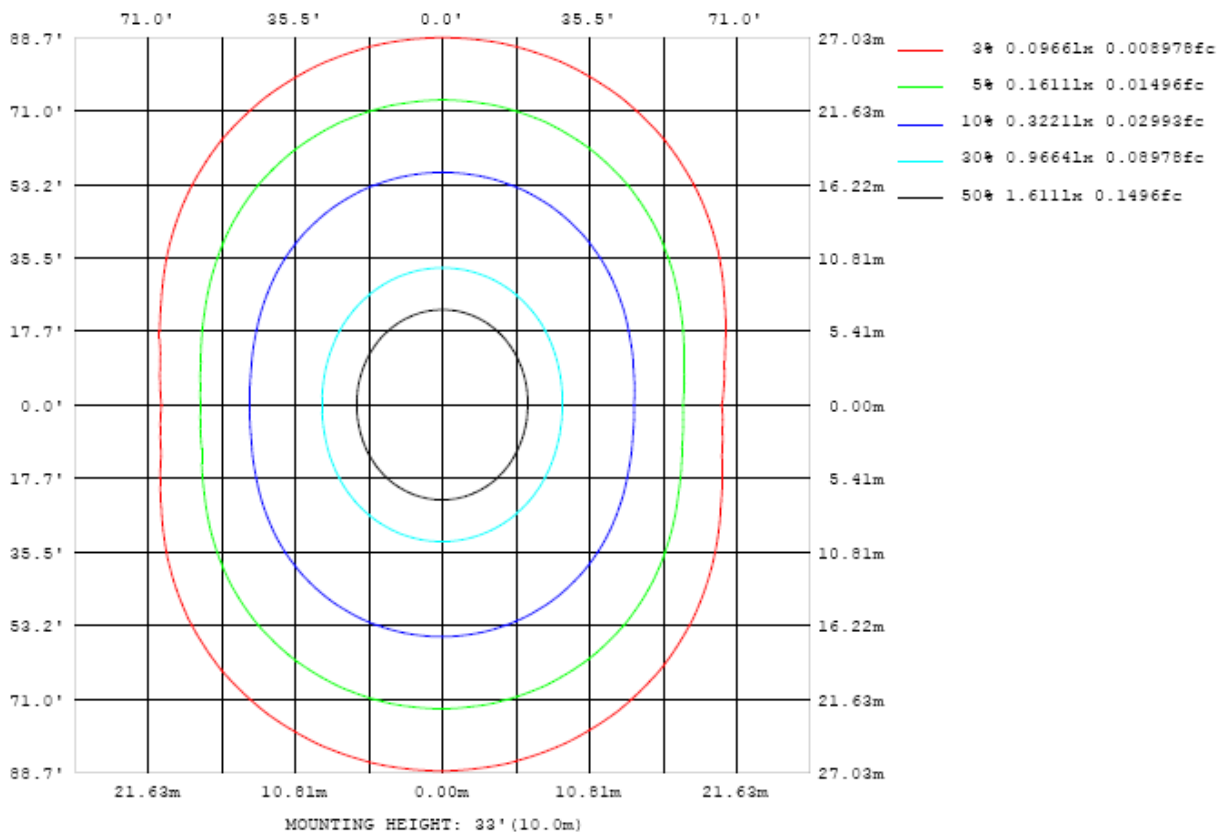


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

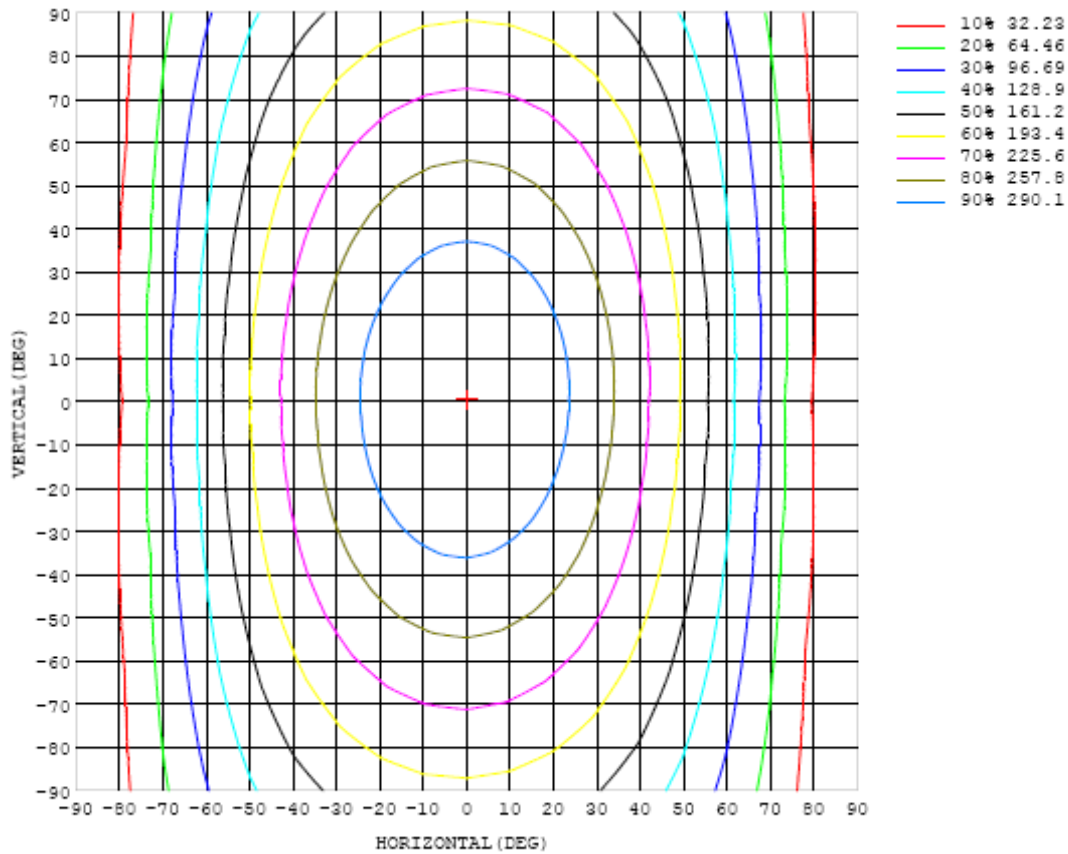


Chart 5: Isocandela Plot

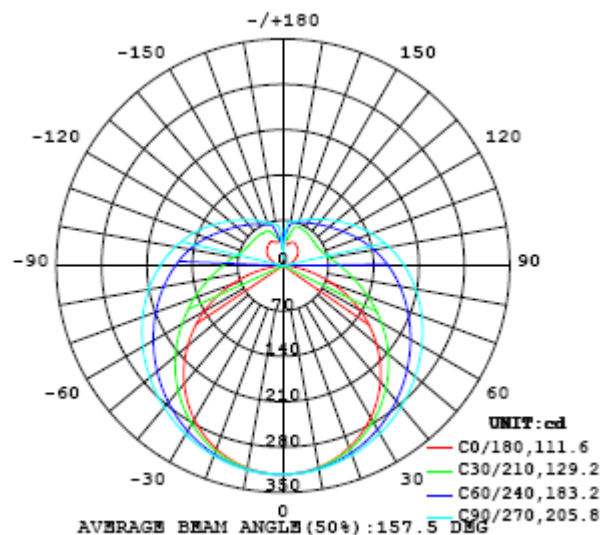


Chart 6: Polar Candela Distribution

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	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322
5	320	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321
10	316	316	316	317	317	318	318	319	319	319	319	319	319	318	318	318	317	317	317
15	309	309	309	310	311	312	314	315	315	316	316	315	315	314	313	312	311	310	310
20	299	299	300	301	303	305	307	309	310	311	311	310	309	307	306	304	302	301	301
25	286	286	288	291	294	297	300	303	305	306	305	304	302	299	296	293	291	289	289
30	271	272	274	278	282	287	292	295	298	299	299	297	294	290	286	281	277	275	274
35	253	255	258	263	270	276	282	287	290	292	291	289	285	279	273	267	261	258	257
40	234	235	240	247	256	264	272	278	282	284	283	280	275	268	260	252	244	239	237
45	212	214	221	230	241	252	261	269	273	275	274	271	264	256	246	235	225	218	216
50	189	191	200	212	226	239	250	259	264	266	265	261	253	243	231	217	204	195	192
55	164	167	178	194	210	226	239	248	255	257	256	251	242	230	215	199	183	171	167
60	137	142	156	175	195	213	227	238	245	248	246	241	231	217	200	181	161	146	141
65	110	116	134	157	180	200	216	228	235	238	236	230	220	205	186	163	139	119	113
70	82.0	90.5	113	140	166	188	205	217	225	228	226	220	209	193	171	146	118	93.7	83.9
75	55.1	66.2	93.5	124	152	176	194	207	215	218	216	210	198	181	158	130	98.9	69.6	55.7
80	29.7	44.5	76.4	110	140	165	183	197	205	208	206	199	187	170	146	117	82.3	48.2	29.6
85	9.64	27.8	63.5	98.3	129	154	173	186	195	198	196	189	177	159	135	105	69.5	32.2	9.22
90	0.47	18.6	53.6	88.3	119	144	163	176	184	188	186	179	167	149	125	95.0	60.1	23.4	0.46
95	1.89	15.4	46.9	79.9	109	134	153	166	174	177	175	169	157	139	116	86.7	53.5	20.1	1.94
100	5.01	16.2	42.8	72.9	101	124	143	155	163	166	165	158	146	130	107	79.7	49.2	20.8	5.43
105	9.12	19.0	41.0	68.0	93.3	115	133	145	153	156	154	148	137	121	99.6	74.2	47.1	23.5	10.1
110	13.7	23.1	41.2	64.2	86.8	107	124	135	143	145	144	138	127	112	92.7	70.0	47.2	27.5	15.2
115	18.5	27.9	42.5	61.9	81.5	99.7	115	126	132	135	134	128	118	104	87.0	67.9	48.2	31.9	20.2
120	23.2	32.5	44.4	60.7	77.4	93.2	106	116	123	125	124	119	110	97.5	82.6	66.3	50.0	36.2	25.2
125	27.2	36.6	46.8	60.3	74.3	87.9	99.3	108	114	116	115	110	102	91.9	79.2	65.5	52.1	40.3	29.4
130	30.4	40.4	49.6	60.5	72.0	83.5	93.4	101	106	108	107	103	96.2	87.2	76.5	65.3	54.1	43.6	32.6
135	33.1	44.0	52.5	61.1	70.4	79.9	88.1	94.4	98.6	100	99.3	96.1	90.6	83.2	74.4	65.3	56.3	45.9	35.3
140	35.2	47.2	55.2	62.0	69.5	76.9	83.6	88.7	92.2	93.6	93.0	90.2	85.8	79.7	72.6	65.5	58.1	48.0	37.4
145	36.9	49.8	57.3	62.8	68.9	74.6	79.8	83.8	86.6	87.8	87.2	85.1	81.5	76.8	71.3	65.4	57.9	49.9	39.3
150	38.6	51.8	59.3	63.6	68.4	72.5	76.5	79.5	81.7	82.6	82.2	80.5	77.9	74.3	70.2	65.6	59.7	50.8	41.2
155	39.5	48.8	59.8	64.1	67.8	70.8	73.6	75.8	77.5	78.2	77.9	76.7	74.8	72.4	68.6	62.1	59.3	49.2	41.5
160	38.7	42.0	56.6	64.9	67.0	69.5	71.2	72.7	73.8	74.3	74.1	73.2	72.2	68.8	61.6	57.3	52.9	44.9	38.9
165	35.7	37.7	45.1	57.3	66.2	67.6	69.4	69.8	70.6	71.0	70.9	70.0	65.5	56.0	51.3	47.9	44.7	39.4	37.7
170	33.0	38.1	39.5	41.8	51.3	61.7	64.4	66.9	68.5	68.8	67.8	57.0	47.7	47.3	46.7	45.2	40.0	37.6	37.2
175	42.3	45.5	49.1	49.4	48.7	50.3	52.6	51.2	51.8	55.6	32.3	44.7	49.6	50.3	50.1	49.4	48.3	47.4	46.5
180	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8

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	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322		
5	321	321	321	322	322	322	322	322	322	322	322	321	321	321	321	321	321		
10	317	318	318	319	319	319	320	320	320	320	319	319	318	318	317	317	316		
15	311	312	312	313	314	315	316	317	317	317	316	315	314	312	311	310	309		
20	302	303	304	306	308	310	311	312	312	312	311	309	307	305	303	301	299		
25	290	291	294	297	300	303	305	306	307	306	305	302	299	296	292	289	287		
30	275	278	282	286	291	295	298	300	300	300	298	294	290	285	280	276	273		
35	259	262	268	274	280	285	290	292	293	292	290	285	279	272	266	260	256		
40	240	245	252	260	268	275	281	284	285	284	281	275	268	259	250	243	237		
45	219	225	235	246	256	265	272	276	277	276	272	265	256	245	234	224	216		
50	196	205	217	230	243	254	262	267	268	267	262	254	243	230	216	203	194		
55	172	183	199	215	230	243	252	257	259	258	252	243	230	215	198	182	170		
60	147	161	180	200	217	231	242	248	250	248	242	232	218	200	180	161	146		
65	120	139	162	185	205	220	231	238	240	238	232	221	205	186	163	140	120		
70	94.1	118	146	171	192	209	221	228	231	229	222	210	193	172	147	119	95.1		
75	69.0	98.0	130	158	180	198	211	218	221	218	211	199	182	159	132	100	70.9		
80	46.9	80.7	116	146	169	187	200	208	211	208	201	189	171	147	118	83.3	49.5		
85	30.2	67.1	103	134	158	177	190	197	200	198	191	178	160	136	106	70.0	33.0		
90	21.0	57.2	93.1	124	148	166	179	187	190	188	180	168	150	126	95.7	60.1	23.4		
95	17.1	50.2	84.4	114	138	157	169	177	179	177	170	158	141	117	87.2	53.1	19.3		
100	17.2	45.3	76.9	105	129	146	159	166	169	166	160	148	131	108	79.5	47.9	19.1		
105	19.6	43.0	70.7	96.9	119	136	148	156	158	156	150	138	121	99.3	73.2	45.2	21.5		
110	23.4	42.6	66.3	89.5	110	126	138	145	147	145	139	128	112	91.8	68.4	44.5	25.3		
115	27.9	43.5	63.4	83.5	102	116	127	134	136	135	129	118	104	85.4	65.3	44.9	29.6		
120	32.6	45.1	61.8	78.9	94.6	108	117	124	126	124	119	109	96.3	80.7	63.3	46.6	34.1		
125	36.8	46.7	60.9	75.3	88.8	100	109	114	116	114	110	101	90.3	76.8	62.1	48.3	37.7		
130	40.6	48.8	60.4	72.5	84.0	93.6	101	106	107	106	102	94.9	85.3	73.9	61.9	50.8	41.3		
135	44.1	50.9	60.1	70.3	79.7	87.9	94.2	98.1	99.5	98.5	95.0	89.1	81.1	71.6	61.5	53.2	45.3		
140	46.4	52.7	60.1	68.3	76.1	82.8	88.1	91.4	92.6	91.7	88.8	83.9	77.4	69.7	61.7	55.1	48.0		
145	49.6	55.4	60.3	66.4	72.9	78.3	82.6	85.3	86.3	85.6	83.3	79.4	74.1	67.7	62.2	56.6	50.2		
150	53.9	56.3	58.7	65.4	69.7	74.0	77.6	79.9	80.7	80.2	78.3	75.0	70.8	66.7	62.6	58.0	52.4		
155	53.5	56.3	59.4	64.0	67.5	70.4	72.8	74.4	75.0	74.7	73.5	71.5	68.9	66.1	62.7	59.1	52.3		
160	46.7	52.5	56.1	59.8	65.7	67.6	69.3	70.4	70.9	70.8	70.3	69.1	67.3	65.1	62.9	59.9	50.4		
165	42.5	46.0	47.1	50.5	56.9	65.1	66.3	67.0	67.5	67.5	67.2	66.6	65.5	64.1	62.2	60.1	49.0		
170	38.0	41.9	45.0	42.7	42.6	48.0	56.6	64.7	64.5	64.5	64.4	64.1	62.6	60.1	58.1	54.3	42.2		
175	44.8	44.6	44.7	43.7	44.3	39.9	35.9	40.4	54.5	60.5	62.1	60.0	55.9	53.7	48.4	44.8	43.0		
180	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.8		

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 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

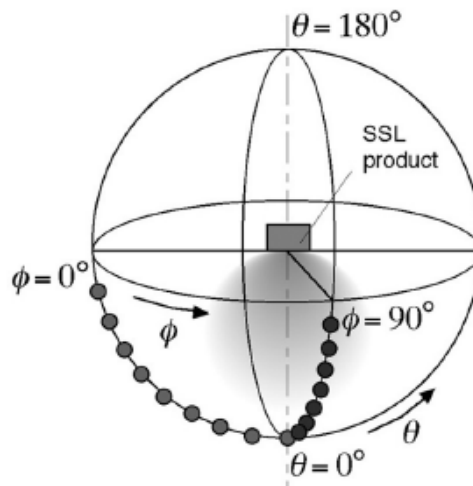
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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