



LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED tube

Model: 8T8/2F/830/BYP/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ18040014a

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

Review by:

Engineer: April Zou
Apr. 27, 2018

Approved by:



Manager: Jim Zhang
Apr. 27, 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: **8T8/2F/830/BYP/R**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
122.4	1044.0	8.53	0.9883
CCT (K)	CRI	Stabilization Time (Light & Power)	
3174	81.5	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 : Apr. 09, 2018

Date of Test : Apr. 12, 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 tube
Model	: 8T8/2F/830/BYP/R
Electrical Ratings	: 120-277V, 50/60Hz, 8W
Product Description	: 3000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 24.9°C.

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)	0.072	0.033
Power Factor	0.9883	0.9405
Test Power (W)	8.53	8.61
THD A%	14.01	16.99
Luminous Efficacy (lm/W)	122.4	122.1
Total Luminous Flux (lm)	1044.0	1051.0
Color Rendering Index (CRI)	81.5	
R9	3	
Correlated Color Temperature (CCT)(K)	3174	
Chromaticity Chroma x	0.4285	
Chromaticity Chroma y	0.4076	
Chromaticity Chroma u	0.2436	
Chromaticity Chroma v	0.3477	
Duv	0.0024	
Chromaticity Chroma u'	0.2436	
Chromaticity Chroma v'	0.5215	

Special Color Rendering Indices	
R1	78.9
R2	88.4
R3	96.7
R4	79.9
R5	78.9
R6	85.2
R7	84.3
R8	59.2
R9	3
R10	73.5
R11	78.6
R12	65.6
R13	80.9
R14	98.3
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 24.9°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)	0.072
Power Factor	0.9854
Test Power (W)	8.53
Luminous Efficacy (lm/W)	119.8
Total Luminous Flux (lm)	1021.5
Beam Angle (°)	170.2
Center Beam Candle Power (cd)	164
Spacing Criteria	1.25 (0°-180°)/ 1.45 (90°-270°)
Zonal Lumens in the 0°-60°Zone	41.84%
Zonal Lumens in the 60°-90°Zone	26.89%
Zonal Lumens in the 90°-120°Zone	17.97%
Zonal Lumens in the 120°-180°Zone	13.30%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

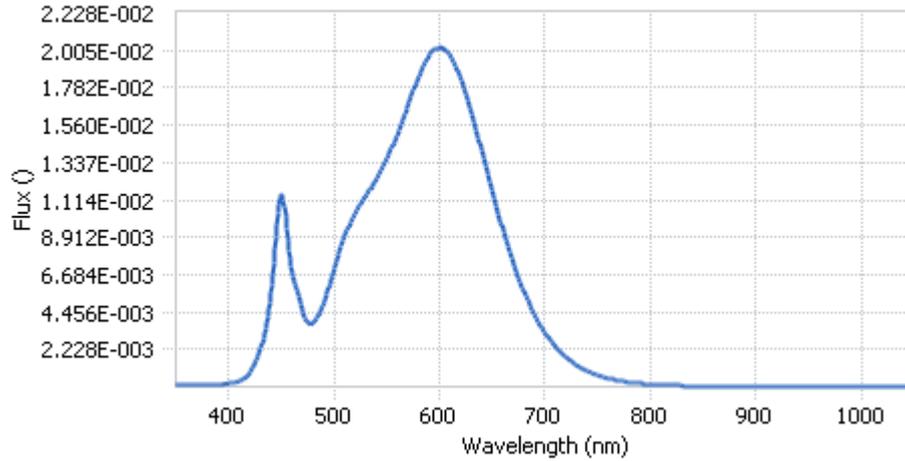
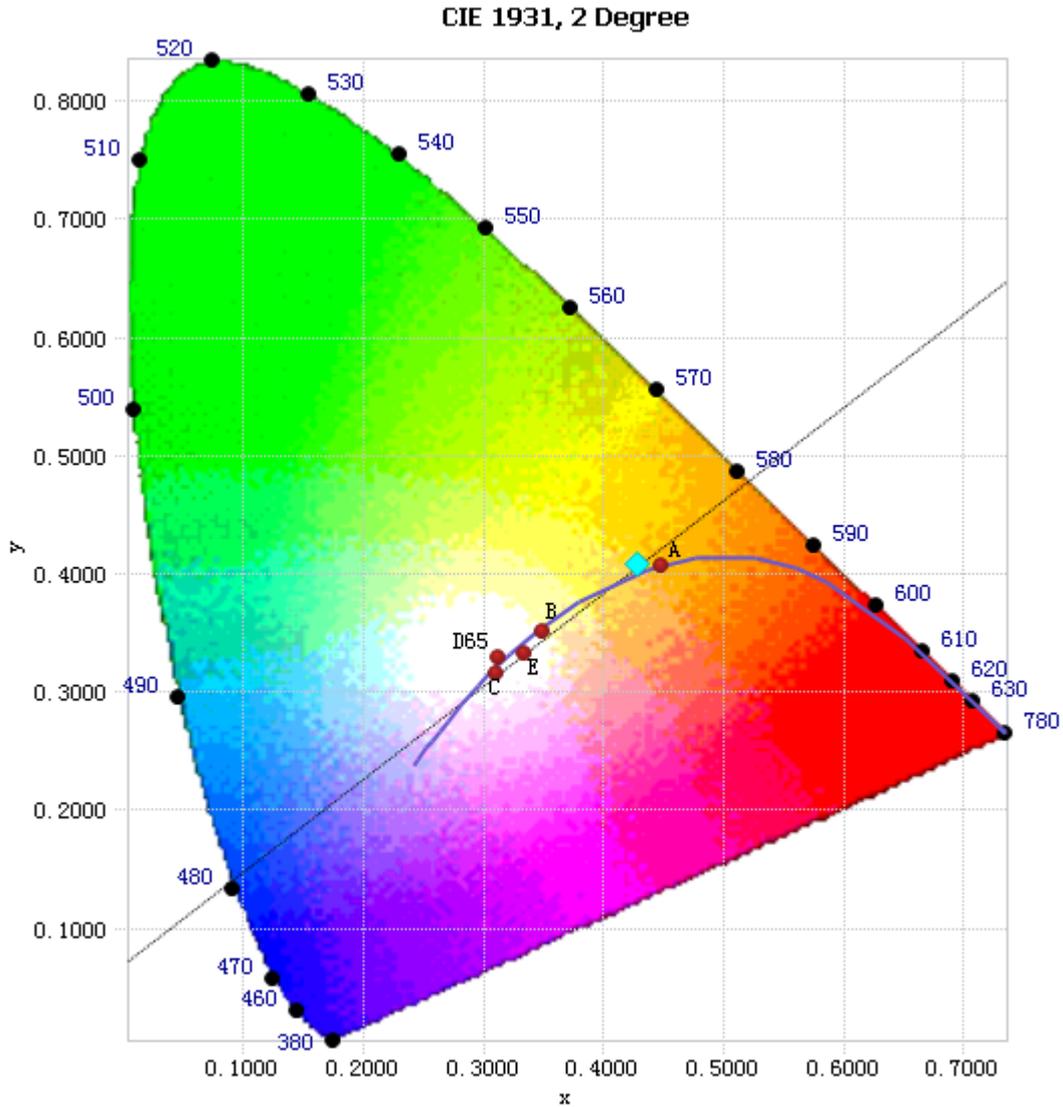


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.64E-04	485	4.25E-03	590	1.97E-02	695	3.73E-03
385	1.60E-04	490	4.93E-03	595	2.01E-02	700	3.22E-03
390	1.66E-04	495	5.94E-03	600	2.02E-02	705	2.77E-03
395	1.79E-04	500	7.06E-03	605	2.01E-02	710	2.39E-03
400	1.98E-04	505	8.07E-03	610	1.97E-02	715	2.04E-03
405	2.49E-04	510	8.99E-03	615	1.92E-02	720	1.76E-03
410	3.49E-04	515	9.72E-03	620	1.84E-02	725	1.51E-03
415	5.41E-04	520	1.04E-02	625	1.74E-02	730	1.29E-03
420	8.56E-04	525	1.09E-02	630	1.64E-02	735	1.10E-03
425	1.39E-03	530	1.14E-02	635	1.53E-02	740	9.41E-04
430	2.24E-03	535	1.18E-02	640	1.40E-02	745	8.04E-04
435	3.50E-03	540	1.24E-02	645	1.28E-02	750	6.94E-04
440	5.55E-03	545	1.29E-02	650	1.17E-02	755	5.87E-04
445	8.93E-03	550	1.35E-02	655	1.05E-02	760	5.05E-04
450	1.15E-02	555	1.43E-02	660	9.39E-03	765	4.31E-04
455	9.44E-03	560	1.50E-02	665	8.36E-03	770	3.70E-04
460	6.83E-03	565	1.59E-02	670	7.39E-03	775	3.14E-04
465	5.76E-03	570	1.68E-02	675	6.50E-03	780	2.67E-04
470	4.64E-03	575	1.76E-02	680	5.72E-03		
475	3.81E-03	580	1.85E-02	685	4.98E-03		
480	3.82E-03	585	1.92E-02	690	4.32E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4285, 0.4076)

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

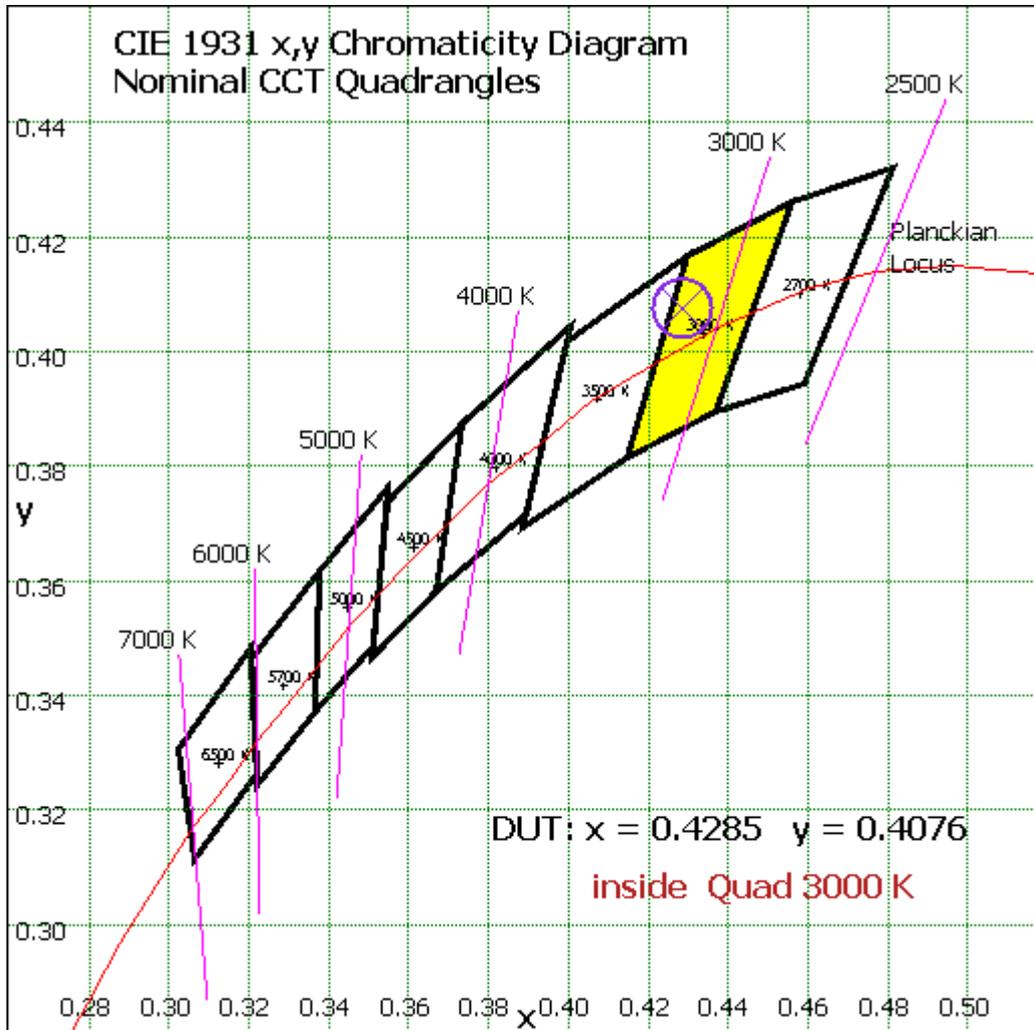


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	15.607	1.53%
10- 20	45.325	4.44%
20- 30	70.811	6.93%
30- 40	89.868	8.80%
40- 50	101.205	9.91%
50- 60	104.579	10.24%
60- 70	100.922	9.88%
70- 80	92.224	9.03%
80- 90	81.5	7.98%
90-100	71.362	6.99%
100-110	61.04	5.98%
110-120	51.172	5.01%
120-130	42.345	4.15%
130-140	34.563	3.38%
140-150	26.805	2.62%
150-160	18.858	1.85%
160-170	10.661	1.04%
170-180	2.643	0.26%
Total	1021.5	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	427.395	41.84%
60- 90	274.646	26.89%
0-90	702.041	68.73%
90- 180	319.449	31.27%
0- 180	1021.5	100%

Table 5: Zonal Lumen Data

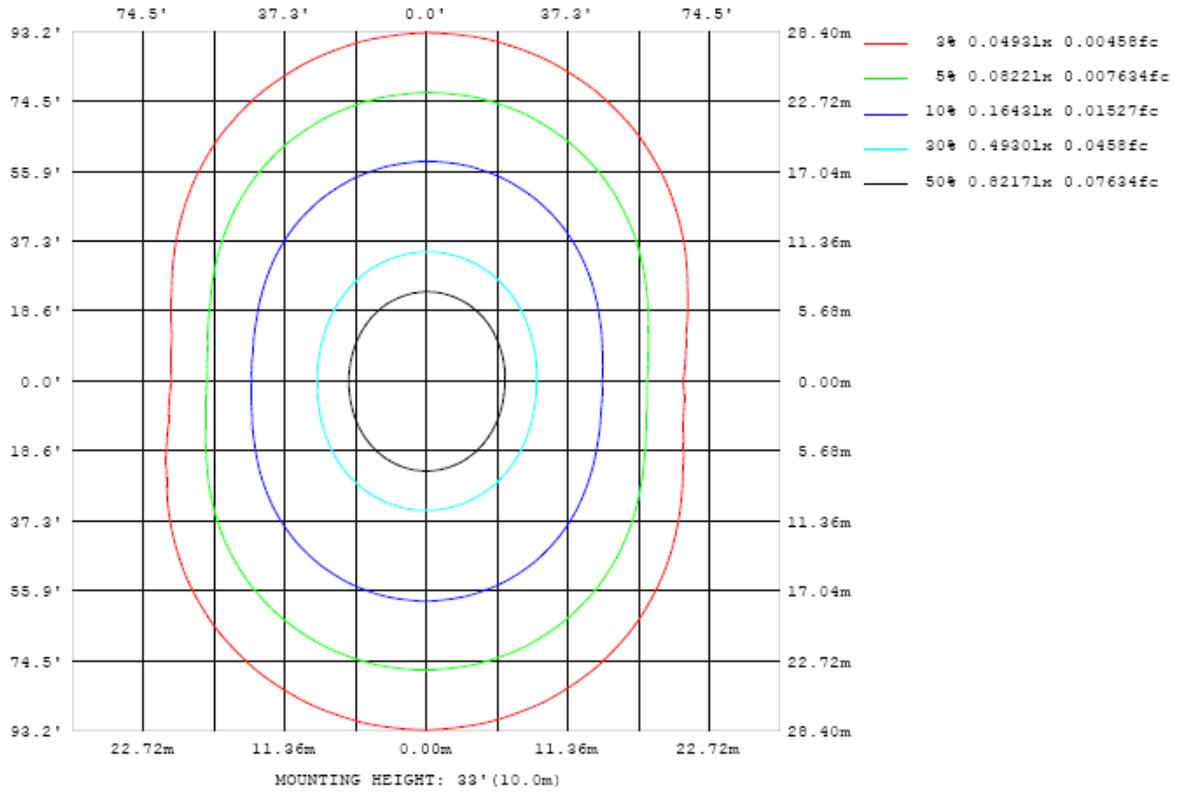


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

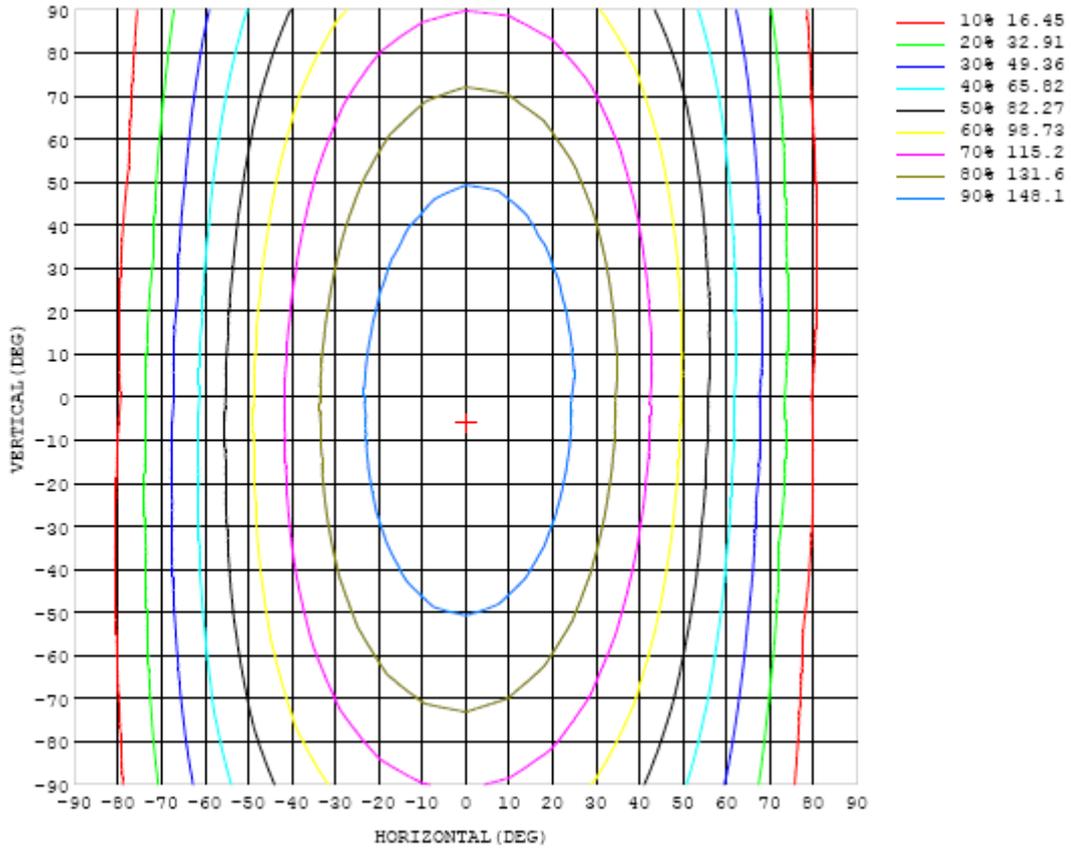


Chart 5: Isocandela Plot

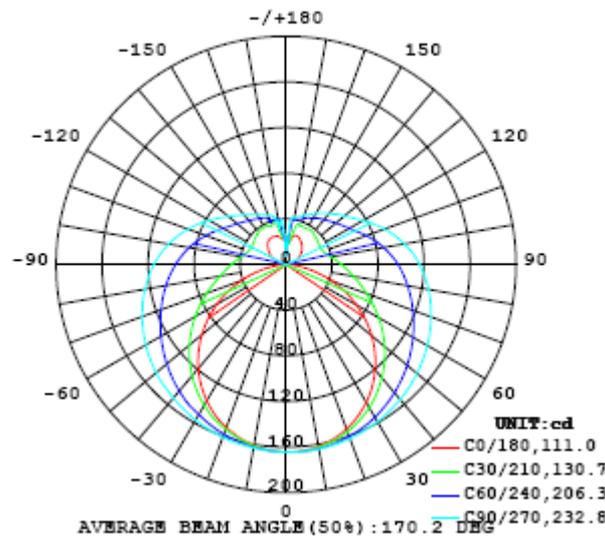


Chart 6: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) \ y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	164	164	164	164	164	164	164	164	164	164	164	164	164	164	164	164	164	164	164
5	164	164	164	164	164	164	165	164	164	164	164	164	164	164	164	164	164	163	163
10	162	162	162	163	163	163	164	164	164	164	164	164	163	163	162	162	161	161	161
15	158	159	159	160	161	162	162	163	163	163	163	163	162	161	160	159	158	157	157
20	154	154	155	156	157	159	160	162	162	162	162	161	160	158	156	155	153	152	152
25	147	148	149	151	153	155	158	159	160	161	160	159	157	155	152	150	147	146	146
30	139	140	142	145	148	151	155	157	158	159	158	157	154	151	147	144	140	138	138
35	131	131	134	138	142	147	151	154	156	157	156	154	151	146	142	137	133	130	129
40	120	121	125	130	135	141	147	151	153	154	154	151	147	141	135	129	124	120	119
45	109	111	115	121	128	136	142	147	150	152	151	148	143	136	129	121	114	109	108
50	97.2	98.9	104	112	121	130	137	143	147	149	148	144	138	131	122	113	104	98.1	95.6
55	84.2	86.3	92.9	103	113	124	133	139	144	145	144	140	134	125	115	104	93.9	86.1	82.9
60	70.6	73.1	81.4	93.0	105	117	127	135	140	142	141	136	129	120	108	95.6	83.3	73.6	69.4
65	56.9	60.0	69.9	83.7	98.0	111	122	131	136	138	137	132	124	114	101	87.2	72.8	61.3	55.5
70	42.5	46.4	59.0	74.7	90.7	105	117	126	132	134	133	128	120	109	94.8	79.0	63.1	48.8	41.8
75	28.4	33.3	48.6	66.5	84.0	99.6	112	122	128	130	129	124	115	103	88.6	71.7	53.8	37.0	27.7
80	15.5	21.7	39.4	59.5	77.8	94.2	107	117	123	126	124	119	110	98.3	82.9	65.4	45.7	26.7	15.1
85	5.64	12.8	32.3	53.3	72.3	89.0	102	112	119	121	120	115	106	93.3	77.7	59.8	39.3	18.8	5.20
90	1.00	8.13	27.4	48.4	67.3	84.0	97.4	107	114	116	115	110	101	88.5	73.0	55.1	34.6	14.3	0.86
95	1.29	5.98	23.6	43.7	62.6	78.6	91.9	102	108	111	109	104	95.5	83.3	68.1	50.5	30.6	11.6	1.38
100	3.12	6.77	20.9	39.6	57.6	73.2	86.1	95.9	102	105	103	98.4	89.8	77.9	63.5	46.2	27.6	11.5	3.18
105	5.49	8.95	20.5	36.2	53.0	67.7	80.2	89.6	95.5	97.9	96.7	92.1	83.8	72.4	58.7	42.5	26.2	12.8	5.79
110	7.93	11.7	21.0	34.5	48.9	62.9	74.2	83.1	88.6	91.1	90.0	85.5	77.7	67.0	54.3	39.9	26.4	15.2	8.87
115	10.5	15.0	22.3	33.6	46.0	58.1	68.4	76.6	81.8	84.1	83.2	78.9	71.6	62.2	50.7	38.9	27.4	18.1	12.0
120	12.9	18.1	24.2	33.5	44.2	54.6	63.6	70.5	75.2	77.3	76.4	72.5	66.1	58.3	48.7	38.4	28.7	20.8	15.0
125	15.4	20.8	26.1	33.9	43.0	52.0	59.8	65.4	69.4	71.0	70.3	67.2	62.3	55.3	47.1	38.4	30.2	23.6	17.8
130	17.7	22.2	28.6	34.8	42.3	49.9	56.6	61.7	65.0	66.0	66.4	63.4	58.8	52.8	45.8	38.6	31.7	26.1	20.1
135	19.8	23.4	30.6	35.3	41.9	48.2	53.8	58.2	61.0	62.2	61.7	59.4	55.7	50.7	44.9	38.9	33.0	26.9	22.7
140	21.5	25.4	31.0	36.6	41.4	46.9	51.5	55.0	57.3	58.4	58.0	56.1	52.9	48.9	44.2	39.0	33.7	27.9	24.8
145	23.3	25.8	31.6	37.0	41.1	45.4	49.4	52.2	54.1	54.9	54.6	53.1	50.6	47.3	43.3	39.2	33.8	28.0	26.3
150	24.8	26.9	32.6	36.1	40.8	44.1	46.8	49.4	51.1	51.8	51.5	50.3	48.2	45.5	42.6	38.7	34.7	30.1	26.9
155	26.2	27.8	32.6	36.3	39.2	42.9	45.3	46.8	47.8	48.4	48.3	47.5	46.1	44.4	41.7	38.1	34.8	31.1	26.9
160	26.9	26.8	33.5	35.9	38.4	40.6	42.5	44.4	45.4	45.9	46.1	45.6	44.6	43.3	40.9	37.6	35.1	32.1	26.3
165	25.9	21.9	29.3	35.9	38.9	40.1	41.0	41.7	42.0	43.2	44.0	43.4	42.5	41.0	38.5	36.8	34.1	29.0	25.2
170	21.8	19.6	20.0	22.4	29.3	37.9	41.0	41.1	41.2	41.9	42.2	41.6	38.7	33.2	30.2	28.2	26.0	24.0	23.3
175	18.4	18.1	18.0	18.0	18.0	18.1	20.2	25.3	30.4	32.0	23.0	21.7	21.9	22.0	22.1	22.2	22.2	22.3	22.3
180	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51

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	164	164	164	164	164	164	164	164	164	164	164	164	164	164	164	164	164		
5	163	163	163	163	164	164	164	164	164	164	164	164	164	164	164	164	164		
10	161	161	161	162	162	163	163	163	163	163	163	163	163	163	162	162	162		
15	157	157	158	159	160	161	161	162	162	162	162	162	161	160	160	159	159		
20	152	153	154	155	157	158	160	160	161	161	160	159	158	157	156	155	154		
25	146	147	149	151	153	155	157	159	159	159	158	157	155	153	151	150	148		
30	138	140	142	146	149	152	155	156	157	157	156	154	151	149	145	143	141		
35	129	132	135	140	144	149	152	154	155	155	153	151	147	143	139	135	132		
40	119	123	127	133	139	145	149	151	153	152	150	147	143	137	131	126	123		
45	109	113	119	126	133	140	145	149	150	150	148	143	137	130	123	117	112		
50	96.9	102	110	119	128	135	142	146	148	147	144	139	132	123	114	106	100		
55	84.5	91.2	101	111	122	131	138	142	144	144	140	134	126	116	106	95.7	88.2		
60	71.6	79.8	91.3	104	116	126	134	139	141	140	136	129	120	109	96.7	84.8	75.4		
65	58.4	68.5	82.2	96.5	110	121	129	135	137	136	132	125	114	102	88.0	74.0	62.5		
70	45.1	57.6	73.5	89.4	104	116	125	131	133	132	128	120	109	95.1	79.7	63.5	49.6		
75	32.4	47.5	65.4	82.8	98.4	111	121	127	129	128	123	115	103	88.7	71.8	53.8	37.4		
80	21.2	38.7	58.4	76.8	93.0	106	116	122	125	123	118	110	97.9	82.7	64.9	45.4	26.6		
85	12.7	31.9	52.5	71.4	87.8	101	111	117	120	119	114	105	92.7	77.2	59.0	38.6	18.4		
90	8.22	27.2	47.6	66.5	82.8	96.2	106	112	115	114	109	99.8	87.6	72.1	53.8	33.6	13.5		
95	6.46	23.9	43.5	61.9	78.0	91.1	101	107	110	108	103	94.6	82.6	67.3	49.4	29.9	11.0		
100	7.25	21.7	39.8	57.3	72.8	85.6	95.2	101	104	102	97.5	88.9	77.1	62.4	45.2	26.8	10.4		
105	9.30	21.0	36.8	53.1	67.8	80.0	89.2	95.0	97.5	96.2	91.3	83.1	71.9	57.8	41.6	24.9	11.5		
110	12.5	21.7	34.7	49.3	62.9	74.4	83.0	88.5	90.8	89.6	85.0	77.3	66.6	53.4	38.7	24.5	13.7		
115	15.7	23.3	34.0	46.2	58.3	68.8	76.9	82.1	84.2	83.1	78.8	71.4	61.6	49.5	36.8	24.9	16.8		
120	18.9	25.2	34.0	44.2	54.3	63.6	70.9	75.6	77.6	76.5	72.6	65.9	56.9	46.7	36.0	26.0	19.9		
125	22.0	27.3	34.5	43.0	51.5	59.1	65.2	69.4	71.2	70.1	66.6	60.8	53.4	44.8	35.9	27.8	23.0		
130	24.5	29.4	35.3	42.3	49.3	55.7	60.7	64.0	65.4	64.5	61.7	57.0	50.9	43.7	36.2	30.0	26.0		
135	27.3	31.4	36.3	41.9	47.6	52.8	57.0	59.7	60.9	60.1	57.7	53.8	48.9	42.9	36.9	32.1	28.7		
140	29.7	32.7	37.3	41.7	46.2	50.5	53.8	56.0	56.9	56.3	54.4	51.2	47.2	42.5	37.9	34.1	30.7		
145	31.7	33.2	38.1	41.6	45.1	48.4	51.0	52.8	53.5	53.1	51.5	49.1	45.9	42.3	38.9	35.4	32.7		
150	32.9	31.4	38.0	40.5	44.3	46.7	48.7	50.0	50.6	50.2	49.1	47.3	44.9	42.3	39.6	35.6	33.6		
155	33.7	34.4	37.8	40.1	41.2	45.3	46.7	47.7	48.1	47.9	47.1	45.9	44.2	42.5	39.1	38.0	34.6		
160	32.7	35.9	36.8	40.4	40.8	40.3	45.2	45.7	46.1	46.0	45.5	44.8	43.4	41.2	37.7	36.3	35.0		
165	29.5	35.0	38.0	40.3	41.2	40.6	36.7	41.8	43.8	43.8	43.6	42.7	41.4	39.1	37.9	36.0	33.7		
170	23.8	25.2	28.8	32.8	36.6	40.4	40.6	37.1	32.9	36.7	38.7	39.6	39.2	39.2	37.5	30.7	24.9		
175	22.3	22.3	22.2	22.2	22.7	23.5	25.2	29.7	38.3	38.2	37.9	36.3	33.2	28.1	22.1	19.1	18.8		
180	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51	8.51		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	PF2010A	HZTE028-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	DPS1060	HZTE001-06	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	WY12010	HZTE004-03	Aug. 10, 2017	Aug. 09, 2018
Temperature recorder	JM624U	HZTE018-08	Aug. 17, 2017	Aug. 16, 2018
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 16, 2017	Aug. 15, 2018
Standard source	D908	HZTE012-01	Aug. 20, 2017	Aug. 19, 2018
Integrate Sphere system	2M	HZTE015-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	WT210	HZTE008-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	PCR 500L	HZTE001-07	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	IT6154	HZTE004-04	Aug. 10, 2017	Aug. 09, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 16, 2017	Aug. 15, 2018
Temperature Meter	TES1310	HZTE017-01	Aug. 17, 2017	Aug. 16, 2018

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

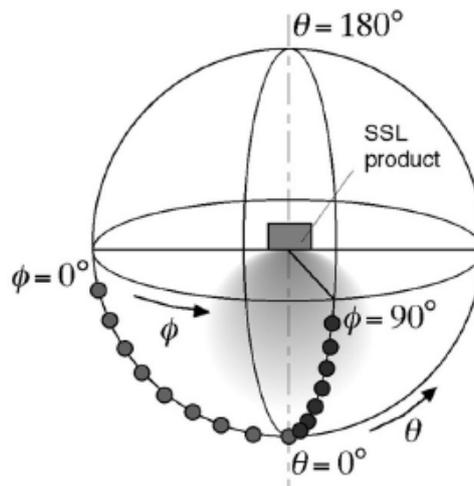
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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