

## LM-79-19 TEST REPORT

for

### GREEN CREATIVE LTD

Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL,  
Hong Kong

### LED Tube

**Model: 10T8/4F/830/UEB**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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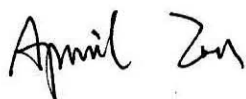
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Report No.: HZ23030039r

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

Review by:



Engineer: April Zou  
Apr. 06, 2023

Approved by:



Manager: Jim Zhang  
Apr. 06, 2023

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: **10T8/4F/830/UEB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
165.4	1683.5	10.18	0.9841
CCT (K)	CRI	Stabilization Time (Light & Power)	
3043	82.7	50	

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

### Test specifications:

<b>Date of Receipt</b>	: Mar. 13, 2023
<b>Date of Test</b>	: Mar. 14, 2023
<b>Test item</b>	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
<b>Reference Standard</b>	: IESNA LM-79-2019 Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

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## SAMPLE PHOTO



Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: 10T8/4F/830/UEB
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz, 10W
<b>Product Description</b>	: 3000K

## TEST RESULTS

Test ambient temperature was 26.0 °C.

Base orientation was base up. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 50 minutes, and the total operating time including stabilization was 55 minutes.

### Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.086	0.041
Power Factor	0.9841	0.9223
Test Power (W)	10.18	10.50
THD A%	15.06	18.32
Luminous Efficacy (lm/W)	165.4	163.6
Total Luminous Flux (lm)	1683.5	1717.6
Color Rendering Index (CRI)	82.7	
R9	5.8	
Correlated Color Temperature (CCT)(K)	3043	
Chromaticity Chroma x	0.4337	
Chromaticity Chroma y	0.4028	
Chromaticity Chroma u	0.2490	
Chromaticity Chroma v	0.3469	
Duv	0	
Chromaticity Chroma u'	0.2490	
Chromaticity Chroma v'	0.5204	

Special Color Rendering Indices	
R1	81.3
R2	91.7
R3	95.6
R4	80.8
R5	81.8
R6	90.2
R7	82.2
R8	58.3
R9	5.8
R10	81.4
R11	80.7
R12	72.2
R13	83.9
R14	98.2

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 24.8 °C.

The photometric distance is 30 m.

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)	0.087
Power Factor	0.9844
Power (W)	10.22
Luminous Efficacy (lm/W)	166.2
Total Luminous Flux (lm)	1698.5
Beam Angle ( ° )	111.9 (0°-180°) / 212.6 (90°-270°)
Center Beam Candle Power (cd)	296
Maximum Beam Candle Power (cd)	296.9 (At: C=260.0, Gamma=2.5)
Spacing Criteria	1.26 (0°-180°) / 1.43 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.11%
Zonal Lumens in the 60 °-90 °Zone	26.73%
Zonal Lumens in the 90 °-120 °Zone	17.47%
Zonal Lumens in the 120 °-180 °Zone	11.69%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

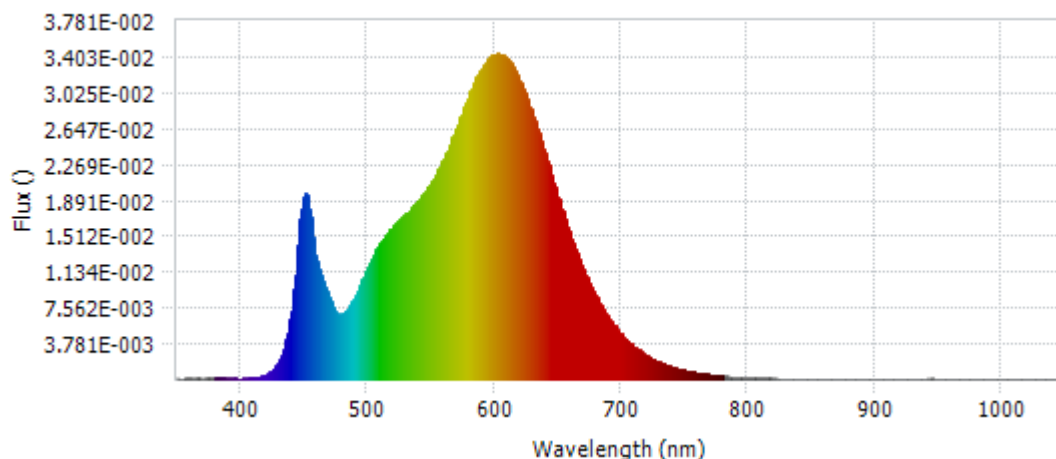
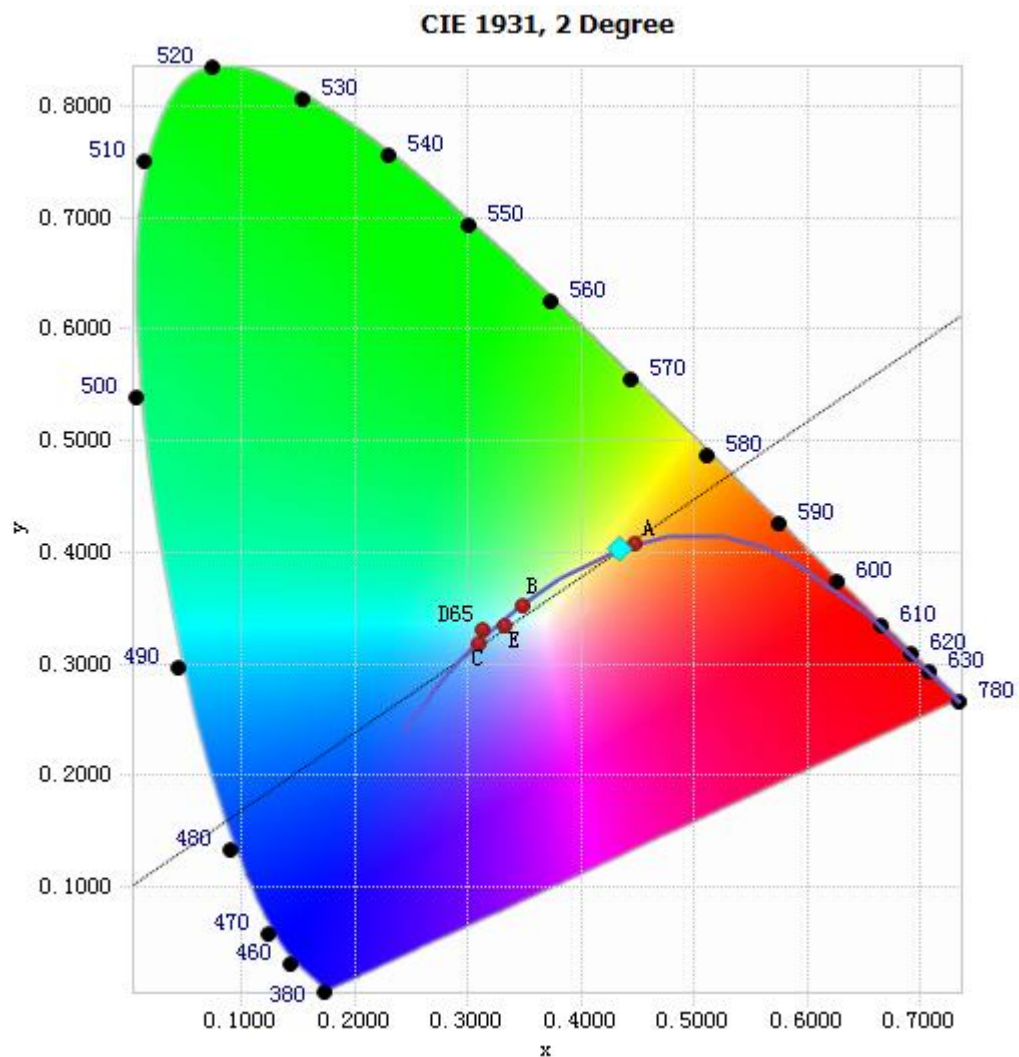


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.23E-04	485	7.62E-03	590	3.28E-02	695	5.63E-03
385	1.16E-04	490	8.71E-03	595	3.38E-02	700	4.78E-03
390	1.06E-04	495	1.02E-02	600	3.43E-02	705	4.06E-03
395	1.11E-04	500	1.17E-02	605	3.43E-02	710	3.48E-03
400	9.41E-05	505	1.32E-02	610	3.37E-02	715	2.94E-03
405	1.09E-04	510	1.43E-02	615	3.29E-02	720	2.52E-03
410	1.79E-04	515	1.53E-02	620	3.15E-02	725	2.14E-03
415	2.84E-04	520	1.60E-02	625	3.00E-02	730	1.83E-03
420	5.32E-04	525	1.68E-02	630	2.81E-02	735	1.55E-03
425	9.90E-04	530	1.75E-02	635	2.60E-02	740	1.32E-03
430	1.94E-03	535	1.81E-02	640	2.38E-02	745	1.13E-03
435	3.69E-03	540	1.88E-02	645	2.16E-02	750	9.63E-04
440	7.25E-03	545	1.97E-02	650	1.93E-02	755	8.20E-04
445	1.41E-02	550	2.07E-02	655	1.73E-02	760	6.98E-04
450	1.93E-02	555	2.20E-02	660	1.53E-02	765	6.03E-04
455	1.70E-02	560	2.33E-02	665	1.34E-02	770	5.07E-04
460	1.25E-02	565	2.48E-02	670	1.17E-02	775	4.41E-04
465	1.05E-02	570	2.64E-02	675	1.02E-02	780	3.73E-04
470	8.59E-03	575	2.82E-02	680	8.85E-03		
475	7.01E-03	580	2.99E-02	685	7.62E-03		
480	6.90E-03	585	3.16E-02	690	6.56E-03		

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

## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4337, 0.4028)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

**CIE 1931 x,y Chromaticity Diagram**  
**Nominal CCT Quadrangles**

2500 K  
 3000 K  
 4000 K  
 5000 K  
 6000 K  
 7000 K

Planckian Locus

3000K ANSI  
 3000K/012 ANSI  
 3500K/012 ANSI  
 4000K/011 ANSI  
 4500K/011 ANSI  
 5000K/010 ANSI  
 5700K/009 ANSI

DUT:  $x = 0.4337$   $y = 0.4028$

inside 7 Quad 3000K ANSI  
 outside 7 Quad 3000K/012 ANSI

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

# Color Rendition Report – Sphere Spectroradiometer Method

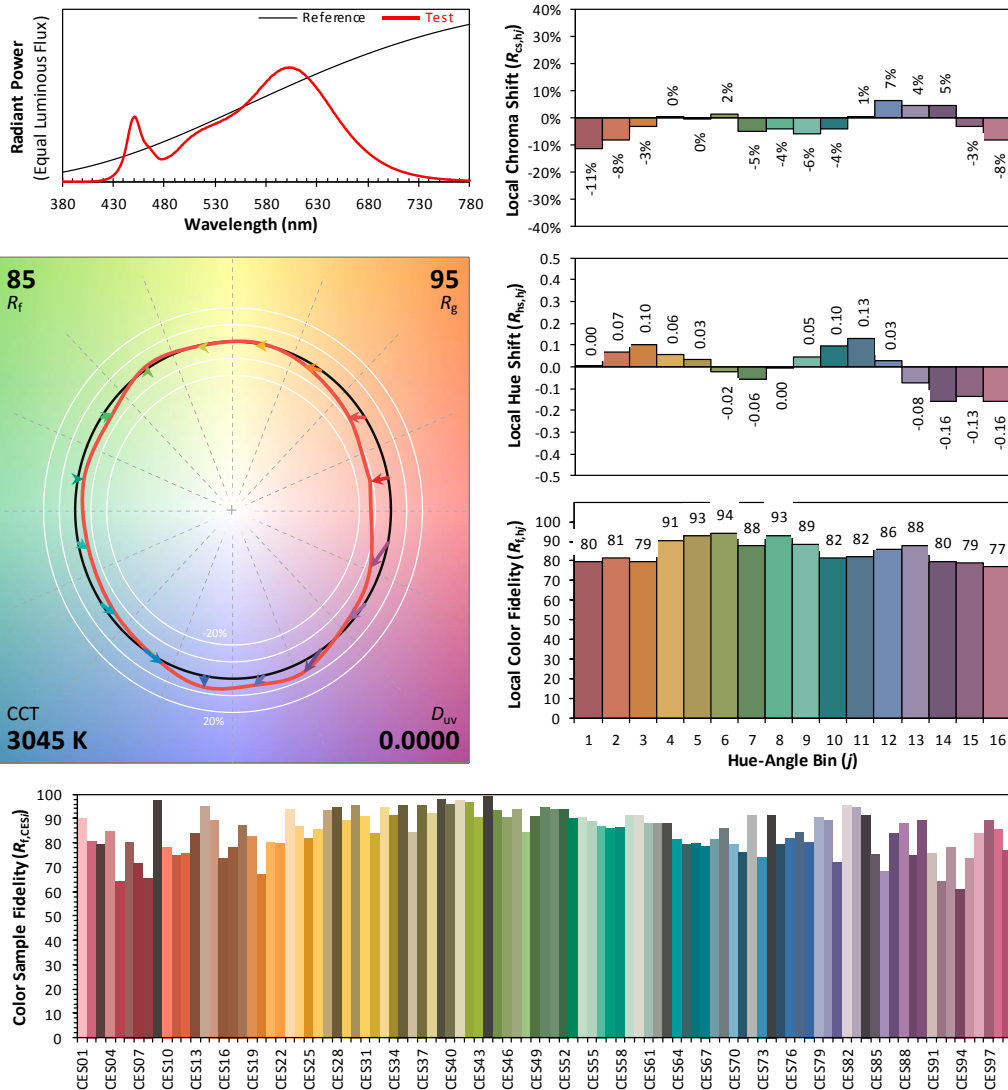
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/03/14

Model: 10T8/4F/830/UEB



**Notes:** This is a recommended method for displaying ANSI/IES TM-30-18 information.

$x$  0.4337  
 $y$  0.4028  
 $u'$  0.2490  
 $v'$  0.5204

CIE 13.3-1995  
(CRI)  
 $R_a$  83  
 $R_9$  6

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

Chart 4: Full Report Created with the IES TM-30 Calculator

Note: The values in this diagram might be a little different from the values in Table 2 due to rounding.

### Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	28.086	1.65%
10- 20	81.264	4.78%
20- 30	126.028	7.42%
30- 40	158.337	9.32%
40- 50	176.096	10.37%
50- 60	179.368	10.56%
60- 70	170.166	10.02%
70- 80	152.265	8.96%
80- 90	131.568	7.75%
90-100	113.935	6.71%
100-110	98.619	5.81%
110-120	84.205	4.96%
120-130	69.488	4.09%
130-140	54.476	3.21%
140-150	39.642	2.33%
150-160	24.463	1.44%
160-170	9.052	0.53%
170-180	1.412	0.08%
Total	1698.5	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	749.179	44.11%
60- 90	453.999	26.73%
0-90	1203.18	70.84%
90- 180	495.292	29.16%
0- 180	1698.5	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

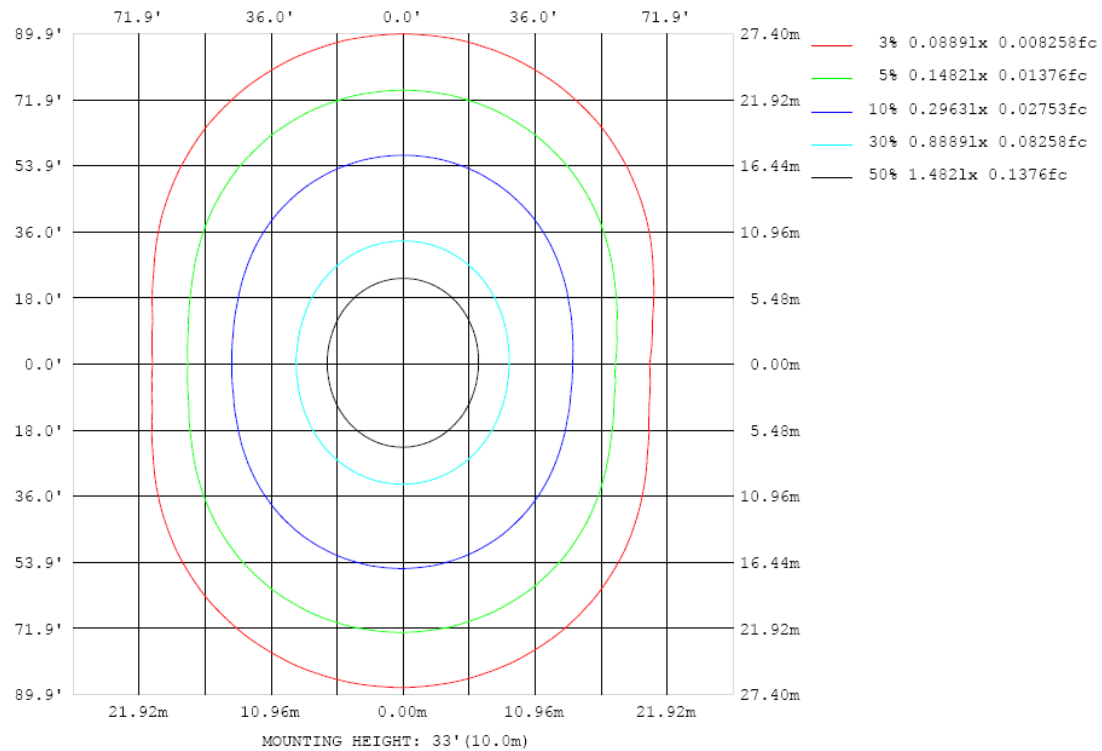


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

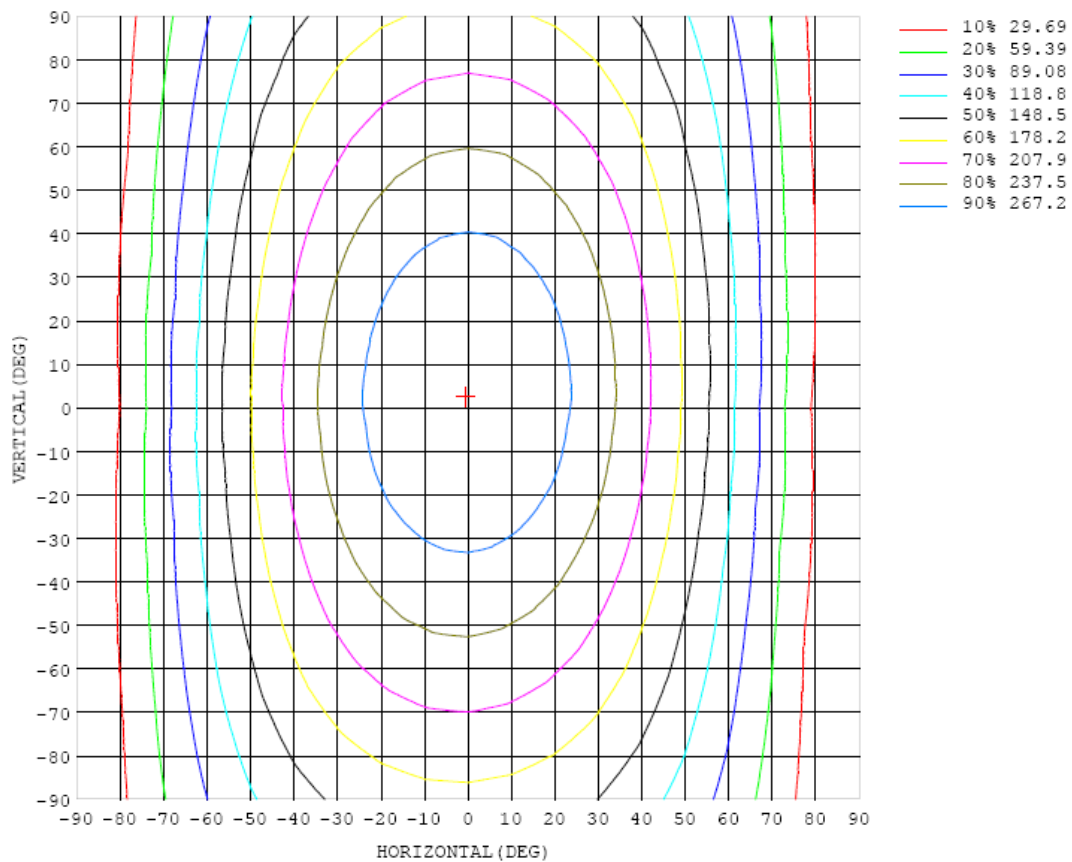


Chart 6: Isocandela Plot

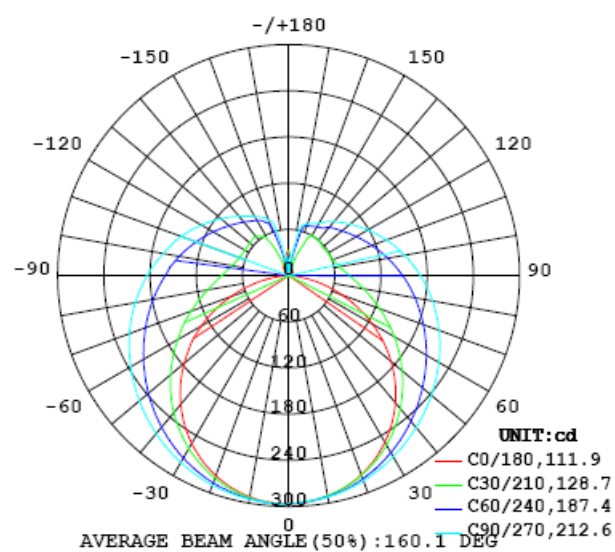


Chart 7: Polar Candela Distribution

## Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	296	296	296	296	296	296	296	296	296	296	296	296	296	296	296	296	296	296	296
5	295	295	294	294	294	294	294	294	294	294	294	294	294	294	294	295	295	295	295
10	291	290	290	290	291	291	292	292	292	292	292	292	292	291	291	291	290	291	292
15	284	284	284	284	285	286	287	288	288	289	289	288	288	286	286	285	284	284	286
20	275	274	275	276	278	279	281	282	283	284	283	283	282	280	279	278	276	276	277
25	264	263	264	266	269	271	274	276	277	278	278	277	275	273	271	268	266	265	266
30	250	249	251	254	258	261	266	268	271	272	271	270	267	264	260	257	253	251	252
35	234	234	236	240	246	251	257	261	263	265	264	262	259	254	249	244	239	236	236
40	216	216	220	226	233	240	247	252	256	258	257	254	250	244	237	229	223	219	218
45	196	196	201	209	219	228	237	243	248	250	249	246	240	233	224	214	206	200	199
50	174	175	182	192	205	217	227	234	240	242	241	237	231	221	210	199	187	180	177
55	150	152	162	175	190	205	217	225	231	234	233	229	221	210	197	182	168	158	155
60	125	129	141	158	176	193	206	216	222	225	224	219	211	199	183	166	149	136	131
65	99.4	104	120	142	163	181	196	207	214	217	215	210	201	188	170	150	129	112	106
70	73.5	80.2	101	126	150	170	186	198	205	208	206	201	191	177	158	135	111	89.1	79.9
75	48.6	57.7	82.5	111	138	160	176	188	195	199	197	192	182	166	146	122	93.5	67.4	54.3
80	25.1	37.3	67.4	98.7	126	149	167	179	186	190	188	182	172	156	135	109	78.5	48.4	30.3
85	6.97	22.3	55.7	88.0	116	139	157	169	177	180	179	173	162	146	125	98.1	66.9	33.3	10.5
90	0.34	14.8	47.2	79.1	107	130	148	160	168	171	170	164	153	137	116	88.9	58.0	24.3	0.53
95	0.19	12.9	41.9	72.1	99.3	122	139	151	159	162	161	155	144	128	107	81.5	51.8	20.7	0.27
100	0.15	13.9	39.1	67.5	92.4	114	131	143	150	153	151	146	135	120	100	75.3	47.9	20.8	0.45
105	0.15	16.7	38.3	63.6	86.4	107	123	134	141	144	143	137	127	112	93.5	70.5	46.1	23.0	1.17
110	0.48	20.6	39.0	60.9	81.5	100	115	126	132	135	134	129	119	106	87.9	68.0	45.9	26.5	1.65
115	3.21	24.8	40.7	59.5	77.5	94.2	108	118	124	127	126	121	112	99.2	83.3	65.9	46.9	30.9	1.86
120	5.77	27.6	43.3	59.0	74.4	89.2	101	110	116	119	118	113	105	93.7	79.6	64.6	48.7	34.8	1.65
125	6.74	22.2	46.1	58.8	72.1	84.8	95.7	104	109	111	110	106	98.9	88.8	76.6	64.0	50.0	39.0	1.99
130	6.57	10.8	47.1	57.5	70.4	81.2	90.5	97.4	102	104	103	99.5	93.4	84.6	74.3	62.1	52.0	40.3	3.50
135	7.00	7.84	49.5	59.4	67.8	78.2	86.0	91.9	95.8	97.6	96.8	93.7	88.4	81.1	71.6	62.2	53.4	37.4	5.74
140	7.27	4.30	50.4	59.9	67.3	73.2	81.7	86.8	90.3	91.7	91.0	88.4	84.2	76.6	69.2	63.2	55.1	26.0	8.36
145	7.49	9.29	36.9	60.0	66.8	71.3	75.5	80.0	84.4	86.0	85.5	82.4	77.6	73.0	68.9	62.9	54.8	13.6	11.2
150	8.28	13.1	22.5	60.1	65.5	69.6	73.2	75.9	78.0	78.9	78.5	77.1	74.7	71.1	67.4	60.5	48.0	10.6	14.2
155	9.48	8.25	12.3	43.1	64.5	68.2	70.9	72.9	74.4	75.1	74.8	73.8	72.0	69.0	64.5	54.1	27.2	4.82	16.9
160	10.9	4.99	5.15	18.4	48.3	66.3	69.1	69.7	70.8	71.5	71.2	70.2	68.3	63.7	51.7	32.1	10.1	9.64	18.9
165	12.5	4.16	12.3	7.59	13.9	36.6	52.9	65.0	67.7	67.8	67.6	65.8	56.5	40.9	25.7	11.2	6.73	12.6	20.5
170	18.0	16.5	6.79	12.9	8.99	11.2	12.0	15.5	25.5	29.5	29.2	22.1	14.5	9.60	11.0	7.18	13.8	8.95	24.5
175	25.6	26.1	14.7	5.77	8.09	11.6	12.9	14.1	14.0	13.4	7.85	9.08	10.8	13.9	14.2	11.8	8.39	9.42	29.5
180	31.9	31.8	31.8	31.7	31.1	31.0	9.18	17.8	2.74	5.26	6.08	16.6	3.90	8.28	13.3	18.0	18.4	24.0	31.8

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	296	296	296	296	296	296	296	296	296	296	296	296	296	296	296	296	296		
5	295	296	296	296	296	296	297	296	297	296	296	296	296	296	296	295	295		
10	292	292	293	293	294	294	294	295	295	295	294	294	293	293	293	291	292		
15	286	287	287	289	290	291	292	293	293	293	292	291	289	288	287	286	285		
20	278	278	280	282	285	286	288	289	290	289	289	287	284	282	280	278	277		
25	266	268	271	274	278	281	283	285	285	285	283	281	277	274	270	267	265		
30	253	255	259	264	269	274	277	280	280	280	278	274	269	264	259	254	252		
35	238	241	246	253	260	266	270	273	274	273	271	266	260	253	247	240	236		
40	220	225	232	241	249	257	263	266	268	267	263	257	250	241	232	224	218		
45	201	207	217	228	238	248	255	259	261	259	255	248	239	228	217	207	199		
50	180	188	200	214	227	238	246	251	253	252	247	238	228	215	201	188	178		
55	158	168	183	200	215	228	237	243	245	243	238	228	216	201	184	168	157		
60	136	149	166	186	203	218	228	235	237	235	229	219	205	187	168	150	134		
65	112	129	151	172	192	208	219	226	229	227	220	209	193	174	153	130	110		
70	87.4	109	135	159	181	198	210	218	220	218	210	199	182	161	137	110	86.3		
75	63.9	89.9	120	148	170	188	201	209	211	209	202	190	172	151	123	92.5	63.8		
80	42.9	73.7	107	137	160	179	192	200	202	200	193	180	162	140	111	77.4	44.3		
85	26.4	60.8	96.0	127	152	169	182	191	193	191	183	171	154	130	100	65.7	29.8		
90	17.1	51.8	87.0	118	143	161	173	182	184	181	174	162	145	121	91.6	57.3	22.2		
95	13.1	46.3	80.1	110	134	153	164	172	175	172	165	154	136	113	84.3	51.6	18.8		
100	13.6	43.2	74.7	103	126	144	156	163	166	163	157	145	128	106	78.6	47.9	18.3		
105	16.1	42.4	71.0	97.0	119	136	148	155	157	155	149	137	120	99.3	73.9	45.9	20.5		
110	19.6	43.1	68.3	91.8	112	128	139	146	149	146	140	129	113	93.7	70.4	45.6	23.8		
115	23.5	44.7	66.8	87.5	106	121	131	138	140	138	132	121	107	88.9	68.1	46.7	27.8		
120	23.8	47.0	66.0	84.0	100	114	123	129	131	129	124	114	101	85.0	66.8	48.6	32.0		
125	8.80	49.7	65.8	81.2	95.3	107	116	121	123	121	116	108	95.9	81.9	66.3	50.8	33.0		
130	3.91	51.5	66.0	78.9	90.9	101	109	113	115	113	109	101	91.3	79.3	66.3	53.2	21.4		
135	10.5	51.3	66.6	77.1	87.1	95.6	102	106	107	106	102	96.0	87.4	77.4	66.7	55.3	5.05		
140	7.21	46.1	66.7	75.7	83.7	90.8	96.2	99.6	101	99.6	96.3	91.1	84.1	75.9	66.9	55.3	6.35		
145	3.97	22.7	61.4	74.4	80.9	86.5	90.8	93.6	94.5	93.5	91.0	86.8	81.2	74.7	64.8	42.2	12.8		
150	8.41	6.09	52.2	70.0	78.1	82.7	86.0	88.2	88.9	88.3	86.3	83.0	78.6	71.3	63.7	14.6	6.84		
155	22.0	14.4	20.9	54.5	72.4	78.0	81.4	83.3	84.0	83.5	82.0	78.9	73.7	69.1	44.5	8.44	4.53		
160	11.1	4.69	12.2	19.0	45.7	69.3	74.0	75.7	76.5	76.2	74.9	73.2	67.3	48.1	10.6	15.7	3.84		
165	25.8	22.7	6.82	11.9	8.11	19.8	38.5	54.7	59.1	59.3	55.0	46.6	28.0	8.23	13.0	10.2	8.49		
170	26.2	15.4	22.3	7.16	8.51	13.7	13.7	9.01	9.33	8.96	9.99	12.0	15.0	16.0	7.52	9.46	21.0		
175	29.8	26.2	21.3	21.1	22.5	20.5	18.1	14.4	11.2	13.2	12.5	13.1	15.7	20.8	22.9	21.7	18.2		
180	31.7	31.6	31.1	30.4	29.4	28.4	25.6	22.9	21.8	21.7	17.5	31.3	32.5	28.0	28.5	27.6	24.5		

Table 7: Luminous Intensity Data

## EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 05, 2022	Aug. 04, 2023
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2022	Aug. 04, 2023
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2022	Aug. 04, 2023
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2022	Aug. 04, 2023
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2022	Aug. 04, 2023
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2022	Aug. 04, 2023
Standard source	D908	HZTE012-01	Aug. 05, 2022	Aug. 04, 2023
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2022	Aug. 04, 2023
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2022	Aug. 04, 2023
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2022	Aug. 04, 2023
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2022	Aug. 04, 2023
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2022	Aug. 04, 2023
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2022	Aug. 04, 2023
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2022	Aug. 04, 2023

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 3 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  $4\pi$ . 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 Tubes) 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 20 min, taken 10 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 Tubes) 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 20 min, taken 10 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.

\*\*\* End of Report \*\*\*

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