

## 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/835/UEB**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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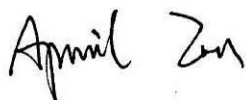
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Report No.: HZ23030039f

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

Review by:



Engineer: April Zou  
Apr. 04, 2023

Approved by:



Manager: Jim Zhang  
Apr. 04, 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/835/UEB

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
169.7	1712.1	10.09	0.9847
CCT (K)	CRI	Stabilization Time (Light & Power)	
3487	82.8	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. 28, 2023
<b>Date of Test</b>	: Mar. 30, 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

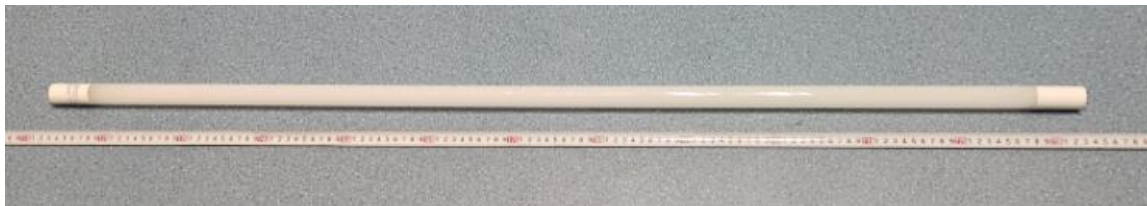


Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: 10T8/4F/835/UEB
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz, 10W
<b>Product Description</b>	: 3500K
<b>Manufacturer</b>	: GREEN CREATIVE LTD
<b>Address</b>	: Room 3603, Level 36, Tower 1, Enterprise Square Five, 38 Wang Chiu Road, Kowloon Bay, KL, Hong Kong

## 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)	0.085	0.041
Power Factor	0.9847	0.9271
Test Power (W)	10.09	10.39
THD A%	14.61	15.98
Luminous Efficacy (lm/W)	169.7	168.2
Total Luminous Flux (lm)	1712.1	1747.6
Color Rendering Index (CRI)	82.8	
R9	7.2	
Correlated Color Temperature (CCT)(K)	3487	
Chromaticity Chroma x	0.4064	
Chromaticity Chroma y	0.3924	
Chromaticity Chroma u	0.2357	
Chromaticity Chroma v	0.3414	
Duv	0.0005	
Chromaticity Chroma u'	0.2357	
Chromaticity Chroma v'	0.5121	

Special Color Rendering Indices	
R1	81
R2	89.6
R3	96.1
R4	81.4
R5	81
R6	86.3
R7	84.7
R8	61.9
R9	7.2
R10	76
R11	80.8
R12	64.2
R13	83
R14	98.1

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)	0.086
Power Factor	0.9849
Power (W)	10.11
Luminous Efficacy (lm/W)	170.8
Total Luminous Flux (lm)	1727.2
Beam Angle (°)	112.0 (0°-180°) / 216.9(90°-270°)
Center Beam Candle Power (cd)	293
Maximum Beam Candle Power (cd)	295.5 (At: C=30.0, Gamma=6.5)
Spacing Criteria	1.19 (0°-180°) / 1.42 (90°-270°)
Zonal Lumens in the 0°-60° Zone	43.43%
Zonal Lumens in the 60°-90° Zone	26.85%
Zonal Lumens in the 90°-120° Zone	17.72%
Zonal Lumens in the 120°-180° Zone	11.99%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

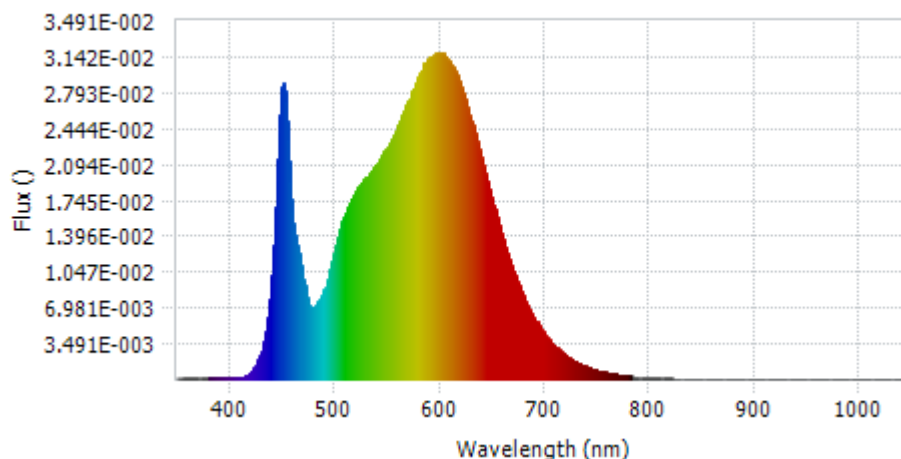
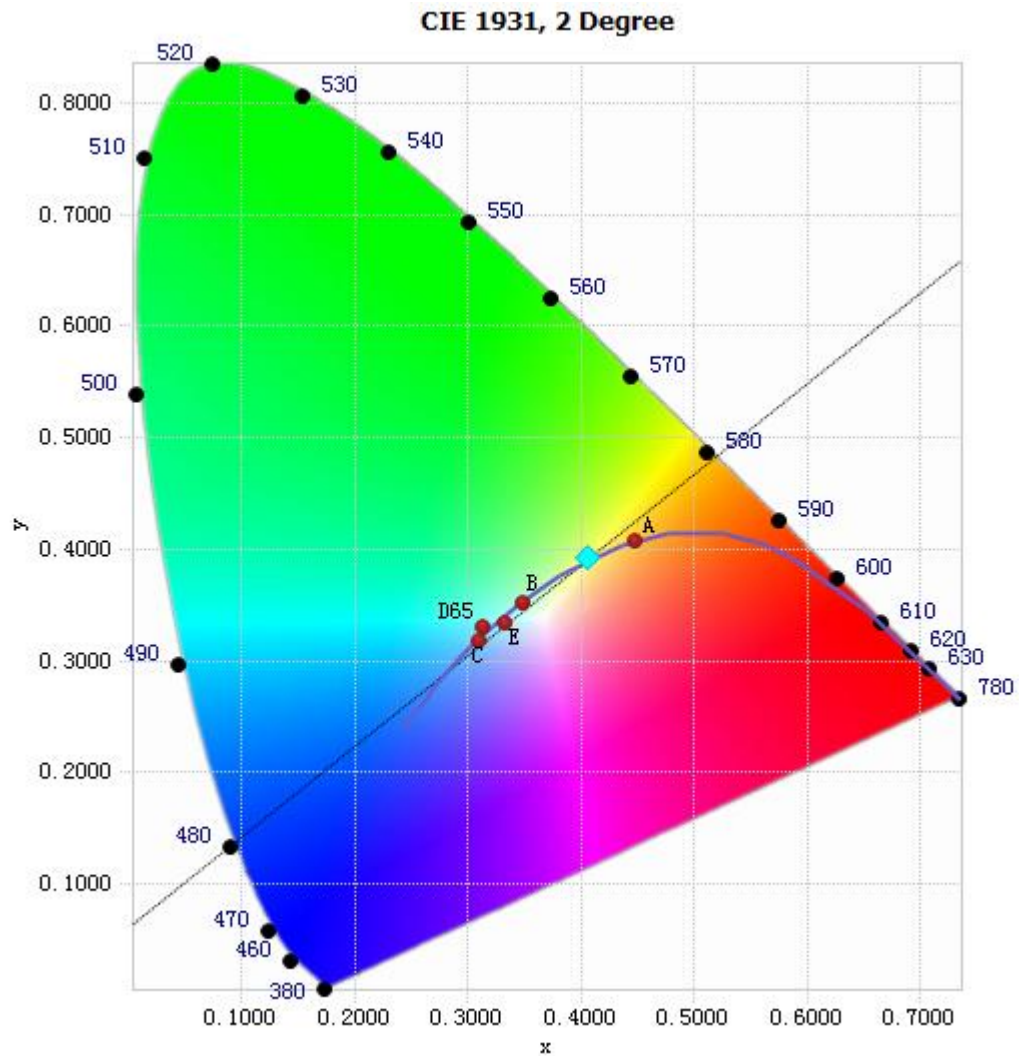


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.25E-04	485	7.65E-03	590	3.14E-02	695	5.06E-03
385	1.44E-04	490	8.78E-03	595	3.17E-02	700	4.31E-03
390	1.23E-04	495	1.07E-02	600	3.17E-02	705	3.68E-03
395	1.33E-04	500	1.27E-02	605	3.14E-02	710	3.14E-03
400	1.01E-04	505	1.46E-02	610	3.08E-02	715	2.68E-03
405	1.28E-04	510	1.61E-02	615	2.98E-02	720	2.29E-03
410	2.10E-04	515	1.75E-02	620	2.84E-02	725	1.95E-03
415	3.71E-04	520	1.83E-02	625	2.69E-02	730	1.67E-03
420	7.17E-04	525	1.90E-02	630	2.51E-02	735	1.41E-03
425	1.43E-03	530	1.97E-02	635	2.32E-02	740	1.21E-03
430	2.81E-03	535	2.02E-02	640	2.13E-02	745	1.03E-03
435	5.39E-03	540	2.10E-02	645	1.93E-02	750	8.72E-04
440	1.01E-02	545	2.18E-02	650	1.73E-02	755	7.40E-04
445	1.92E-02	550	2.26E-02	655	1.55E-02	760	6.36E-04
450	2.84E-02	555	2.36E-02	660	1.37E-02	765	5.46E-04
455	2.32E-02	560	2.48E-02	665	1.20E-02	770	4.69E-04
460	1.52E-02	565	2.60E-02	670	1.05E-02	775	3.95E-04
465	1.27E-02	570	2.71E-02	675	9.10E-03	780	3.41E-04
470	9.70E-03	575	2.84E-02	680	7.93E-03		
475	7.24E-03	580	2.95E-02	685	6.85E-03		
480	6.98E-03	585	3.07E-02	690	5.90E-03		

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

## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4064, 0.3924)

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

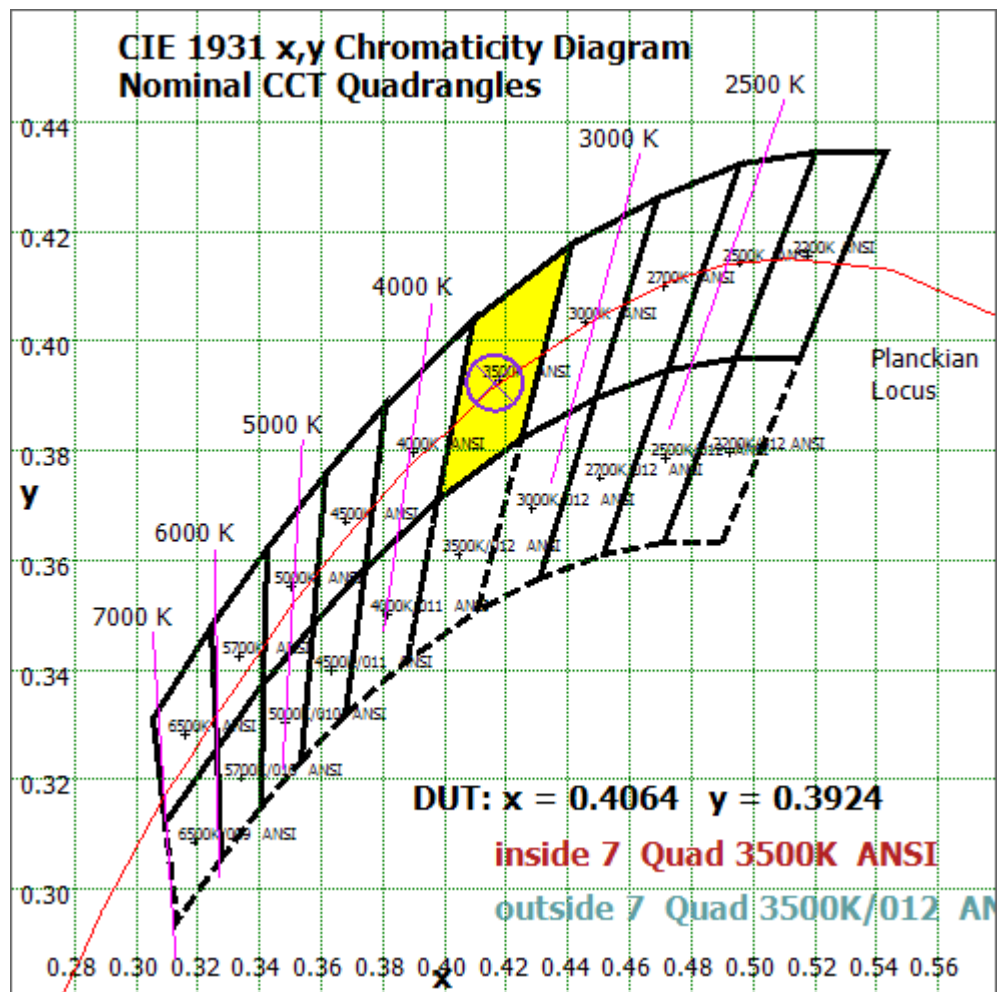


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

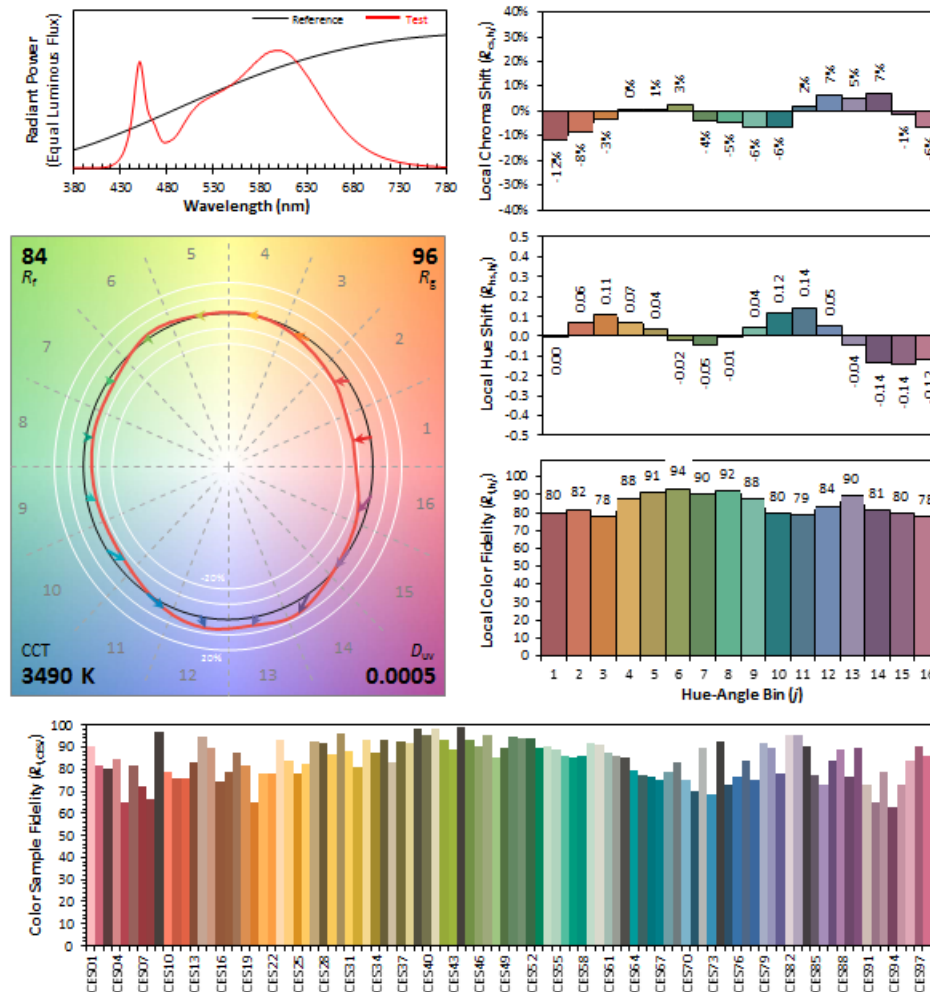
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/03/30

Model: 10T8/4F/835/UEB



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

$x$  0.4064  
 $y$  0.3924  
 $u'$  0.2357  
 $v'$  0.5121

CIE 13.3-1995  
(CRI)  
 $R_a$  83  
 $R_g$  7

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.0C

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	27.861	1.61%
10- 20	80.752	4.68%
20- 30	125.521	7.27%
30- 40	158.263	9.16%
40- 50	176.775	10.23%
50- 60	180.962	10.48%
60- 70	172.697	10.00%
70- 80	155.648	9.01%
80- 90	135.478	7.84%
90-100	117.642	6.81%
100-110	101.716	5.89%
110-120	86.777	5.02%
120-130	72.324	4.19%
130-140	56.61	3.28%
140-150	40.916	2.37%
150-160	25.694	1.49%
160-170	10.327	0.60%
170-180	1.212	0.07%
Total	1727.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	750.134	43.43%
60- 90	463.823	26.85%
0-90	1213.96	70.29%
90- 180	513.218	29.71%
0- 180	1727.2	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

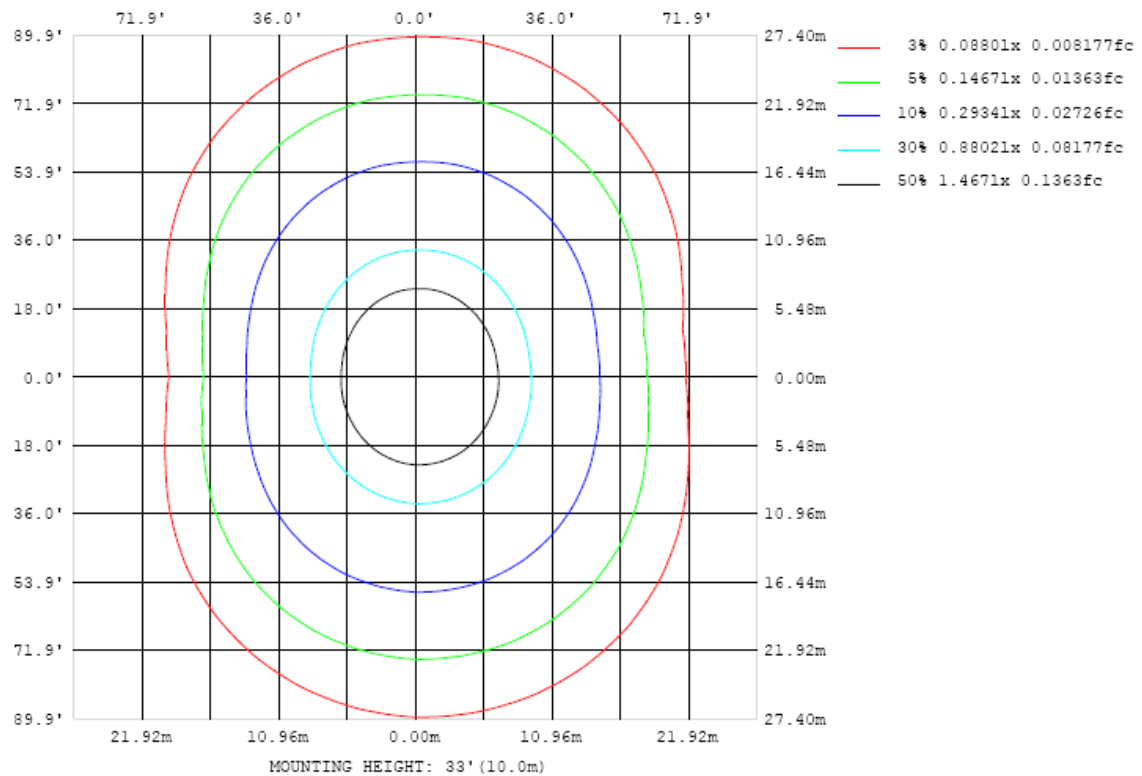


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

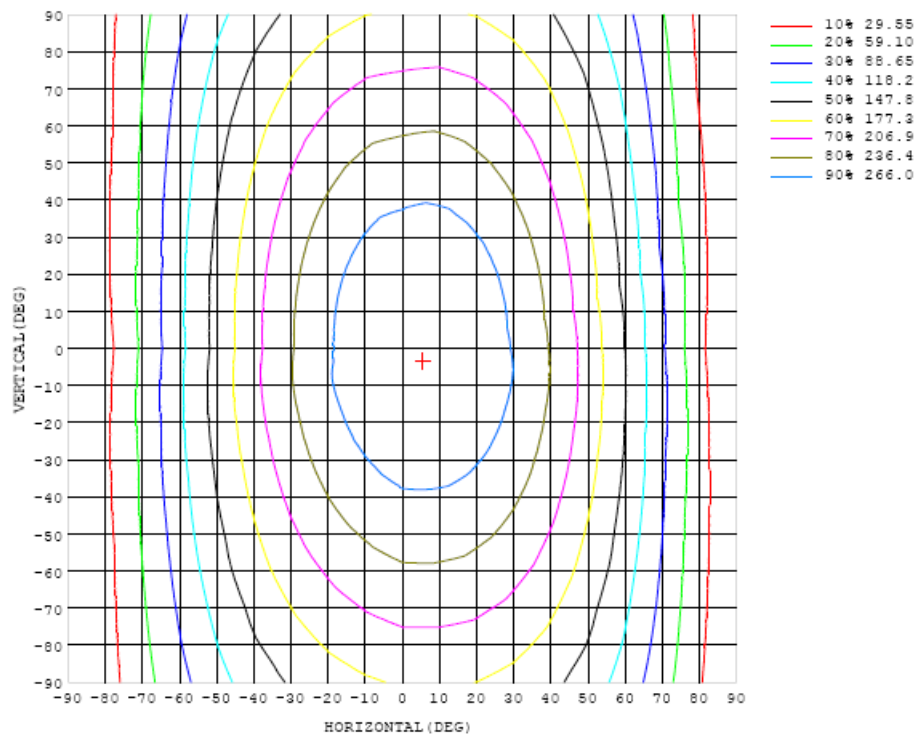


Chart 6: Isocandela Plot

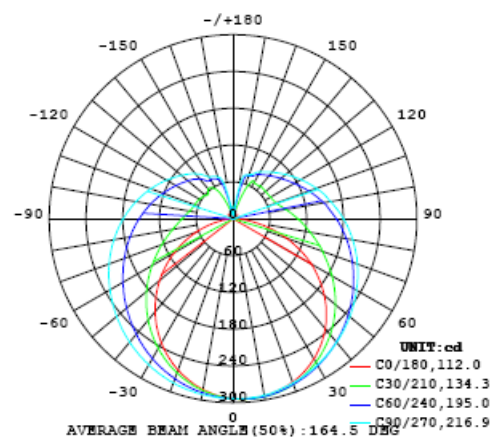


Chart 7: Polar Candela Distribution

## 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	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293
5	295	295	295	295	295	295	295	294	294	293	293	293	292	291	291	290	290	290	289
10	293	294	295	295	295	295	294	294	293	292	291	290	289	288	287	285	284	283	283
15	290	291	291	292	293	292	292	291	290	289	287	285	283	282	280	278	277	274	274
20	284	285	286	287	288	288	287	287	286	285	283	280	277	274	271	269	267	264	263
25	275	277	279	280	281	282	283	283	281	281	278	274	270	265	261	257	254	251	249
30	264	267	268	270	273	275	277	277	276	275	271	267	262	256	250	244	240	237	234
35	250	253	256	259	264	267	270	271	271	269	265	259	253	245	238	230	224	221	217
40	234	238	241	247	253	258	262	264	264	263	258	252	243	234	224	215	208	202	198
45	215	220	225	233	241	249	254	257	257	256	251	243	234	223	211	199	190	183	178
50	194	199	207	218	229	238	245	249	250	248	243	235	224	212	198	183	171	162	156
55	171	177	188	202	216	228	236	241	242	241	235	226	214	200	184	167	153	142	134
60	147	155	168	186	203	217	226	232	234	233	226	217	204	189	171	152	134	120	111
65	121	131	150	170	190	206	217	223	225	225	218	208	195	178	158	137	115	97.4	87.2
70	92.6	106	130	155	177	195	207	214	217	216	209	199	185	167	147	122	96.8	75.4	64.0
75	64.4	81.5	111	141	165	184	197	205	208	207	201	190	176	157	136	109	80.6	55.0	41.4
80	37.6	59.8	94.6	128	155	174	188	196	198	198	192	182	167	149	125	97.6	66.7	37.2	20.8
85	15.0	42.7	81.1	116	145	164	178	187	189	189	183	173	158	140	116	88.0	56.1	24.2	5.47
90	2.26	31.8	70.6	106	134	155	168	177	180	180	174	164	151	132	108	80.1	48.6	17.4	0.50
95	0.58	24.5	61.5	96.1	124	146	159	168	171	171	165	156	143	124	101	74.0	43.8	14.6	0.75
100	0.72	21.8	54.5	87.5	115	136	150	158	162	162	157	148	135	117	94.9	69.1	40.9	15.4	1.55
105	1.14	23.5	50.4	80.4	107	127	141	150	154	154	149	140	127	110	89.5	65.6	40.4	18.1	1.66
110	1.52	26.9	49.7	75.1	99.0	118	132	141	144	145	140	132	120	104	84.9	63.3	41.5	22.0	1.18
115	2.81	31.2	50.4	72.4	93.0	110	123	132	135	136	132	124	113	98.5	81.2	62.1	43.3	26.4	2.74
120	6.38	35.8	51.9	70.7	88.7	104	115	123	127	128	124	117	107	93.6	78.2	61.6	45.7	31.1	6.31
125	9.43	40.8	54.0	69.7	85.1	98.2	108	115	119	120	116	110	101	89.2	75.8	61.8	46.7	32.4	9.71
130	9.06	37.7	56.8	69.4	82.3	93.5	102	108	111	112	109	104	95.6	85.6	74.1	62.4	50.3	26.4	10.2
135	4.62	25.7	60.6	69.4	79.9	89.2	96.8	102	104	105	102	97.7	90.9	82.5	73.0	61.7	54.2	17.9	7.78
140	2.58	19.6	62.9	69.1	78.1	85.7	91.8	96.1	98.2	99.0	96.5	92.6	86.8	79.9	72.1	62.0	57.3	18.4	6.94
145	5.68	22.1	59.0	68.0	75.9	82.7	87.4	90.9	92.6	93.2	91.1	87.9	83.3	77.8	69.4	63.2	53.6	19.1	7.65
150	9.24	16.3	45.2	68.4	72.4	78.6	83.6	86.2	87.6	88.0	86.3	83.9	79.9	73.4	68.2	66.3	41.1	14.6	9.79
155	7.76	3.07	27.6	62.3	70.8	74.1	77.1	80.2	82.2	81.6	79.9	77.4	74.4	71.5	69.0	62.3	29.9	6.79	8.98
160	13.4	13.4	11.4	34.1	62.6	72.6	74.3	75.2	76.0	76.0	75.5	74.2	72.5	71.0	66.7	45.7	18.4	8.08	6.75
165	9.13	5.43	12.3	8.07	23.2	47.4	64.9	72.8	73.2	73.3	73.0	72.4	69.2	60.8	44.0	21.9	10.3	11.5	5.37
170	13.0	11.2	6.79	10.8	9.74	6.14	15.0	27.0	33.6	37.3	40.7	36.3	28.8	20.0	11.5	12.3	11.9	10.8	8.95
175	12.5	12.4	12.9	6.47	6.62	7.84	8.36	10.6	11.9	12.3	13.2	13.4	12.6	12.9	12.9	11.1	10.2	11.1	11.1
180	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48

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	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	293	
5	290	290	290	290	291	292	292	292	293	293	294	294	294	294	295	295	295	
10	283	284	285	286	287	288	289	290	291	292	293	293	293	294	294	294	293	
15	274	275	277	279	281	284	286	288	289	290	291	291	291	291	290	290	290	
20	263	265	268	271	274	278	281	284	285	287	288	287	287	286	285	284	283	
25	250	253	257	261	266	271	276	279	280	283	283	283	282	280	277	276	274	
30	235	239	244	250	257	263	269	273	275	278	278	277	275	272	268	265	263	
35	219	223	230	239	247	255	262	267	269	272	272	270	266	262	257	253	249	
40	201	207	216	226	236	246	254	260	262	265	265	262	257	251	244	238	233	
45	181	189	200	213	225	236	246	253	256	258	257	253	247	238	229	221	214	
50	161	171	184	199	214	227	238	246	248	251	249	244	236	225	214	202	194	
55	139	152	168	186	203	217	229	237	240	243	240	234	225	212	197	182	171	
60	118	133	153	173	192	208	220	229	232	235	232	224	213	198	180	162	147	
65	96.0	115	138	161	181	198	211	221	224	226	223	215	202	184	163	141	122	
70	74.7	97.6	124	149	171	189	203	212	215	218	214	205	191	171	147	120	96.7	
75	55.7	82.1	111	138	161	180	194	204	206	209	204	195	180	158	132	101	71.9	
80	38.9	70.0	100	128	152	171	185	195	197	200	195	185	169	147	118	83.5	50.2	
85	26.8	59.6	90.8	119	143	162	176	186	188	190	186	175	159	136	106	69.6	32.7	
90	20.7	52.4	83.2	111	135	153	168	177	179	181	176	166	149	126	96.2	60.8	22.7	
95	19.2	47.9	77.0	104	127	145	159	168	170	172	167	156	140	117	88.1	54.4	19.6	
100	20.3	45.5	72.2	97.5	119	137	150	159	161	162	158	147	131	110	81.9	50.8	20.5	
105	21.8	44.7	68.6	92.0	112	129	142	150	152	153	149	139	123	103	77.1	49.6	23.3	
110	23.2	45.0	66.8	87.2	106	122	133	141	143	144	140	130	116	96.6	73.7	50.0	26.8	
115	28.7	45.7	65.1	83.3	100	114	125	133	134	135	131	122	109	91.6	71.5	51.3	30.9	
120	32.1	44.8	63.7	80.0	95.1	108	118	125	126	127	123	115	103	87.5	70.0	52.7	34.5	
125	33.8	43.9	61.7	77.1	90.6	102	111	117	118	119	115	108	97.4	84.0	68.8	55.0	37.7	
130	30.0	48.9	59.0	73.2	86.4	96.4	104	109	110	111	108	102	92.5	80.5	67.5	58.7	39.4	
135	20.8	48.2	57.2	68.9	81.2	91.2	97.9	102	103	104	101	95.9	87.3	76.9	66.1	58.4	35.4	
140	9.86	44.1	62.8	65.2	74.8	84.8	91.1	95.6	95.8	96.8	94.1	89.4	81.4	72.3	68.2	54.4	24.5	
145	4.34	36.7	62.1	68.4	69.6	74.8	82.9	87.8	87.8	89.2	86.2	80.8	75.1	72.5	68.6	49.4	16.1	
150	7.64	27.6	54.9	67.9	71.6	73.7	74.9	77.6	78.3	79.6	78.3	76.8	74.6	70.8	65.2	39.1	10.1	
155	9.74	15.2	38.5	62.3	69.2	72.0	74.6	76.1	76.4	76.9	76.5	74.7	71.1	66.3	50.0	21.8	9.79	
160	8.09	6.47	18.1	40.7	61.1	68.0	70.2	72.1	71.9	72.6	72.0	69.2	62.0	48.9	28.2	12.3	11.1	
165	8.81	7.10	11.6	14.5	28.5	43.7	55.2	61.1	60.5	62.3	58.6	48.0	34.8	21.8	8.94	11.9	13.3	
170	9.00	16.4	12.7	8.72	13.3	14.8	13.6	17.4	15.8	19.3	15.6	12.9	9.98	8.62	11.7	12.9	14.4	
175	17.7	20.3	11.9	13.8	19.0	17.3	13.6	10.3	7.99	10.7	12.2	13.5	15.0	13.6	15.2	15.4	17.0	
180	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	8.48	

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 7: 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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