

## 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/850/UEB/C**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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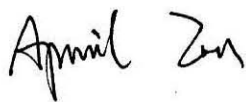
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Report No.: HZ23030039i

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/850/UEB/C

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
164.8	1687.1	10.24	0.9842
CCT (K)	CRI	Stabilization Time (Light & Power)	
5107	84.0	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/850/UEB/C
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz, 10W
<b>Product Description</b>	: 5000K
<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)	0.086	0.041
Power Factor	0.9842	0.9229
Test Power (W)	10.24	10.53
THD A%	14.56	16.45
Luminous Efficacy (lm/W)	164.8	163.2
Total Luminous Flux (lm)	1687.1	1718.3
Color Rendering Index (CRI)	84.0	
R9	11.8	
Correlated Color Temperature (CCT)(K)	5107	
Chromaticity Chroma x	0.3424	
Chromaticity Chroma y	0.3534	
Chromaticity Chroma u	0.2089	
Chromaticity Chroma v	0.3234	
Duv	0.0020	
Chromaticity Chroma u'	0.2089	
Chromaticity Chroma v'	0.4851	

Special Color Rendering Indices	
R1	82.4
R2	89.3
R3	93.3
R4	83.6
R5	83
R6	84.3
R7	87.3
R8	68.6
R9	11.8
R10	74.1
R11	83.1
R12	61.4
R13	84.4
R14	96.6

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	0.9842
Power (W)	10.27
Luminous Efficacy (lm/W)	165.0
Total Luminous Flux (lm)	1694.7
Beam Angle (°)	106.2 (0°-180°) / 172.6 (90°-270°)
Center Beam Candle Power (cd)	347
Maximum Beam Candle Power (cd)	347.7 (At: C=90.0, Gamma=1.5)
Spacing Criteria	1.22 (0°-180°) / 1.32 (90°-270°)
Zonal Lumens in the 0°-60° Zone	48.29%
Zonal Lumens in the 60°-90° Zone	26.32%
Zonal Lumens in the 90°-120° Zone	15.58%
Zonal Lumens in the 120°-180° Zone	9.81%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

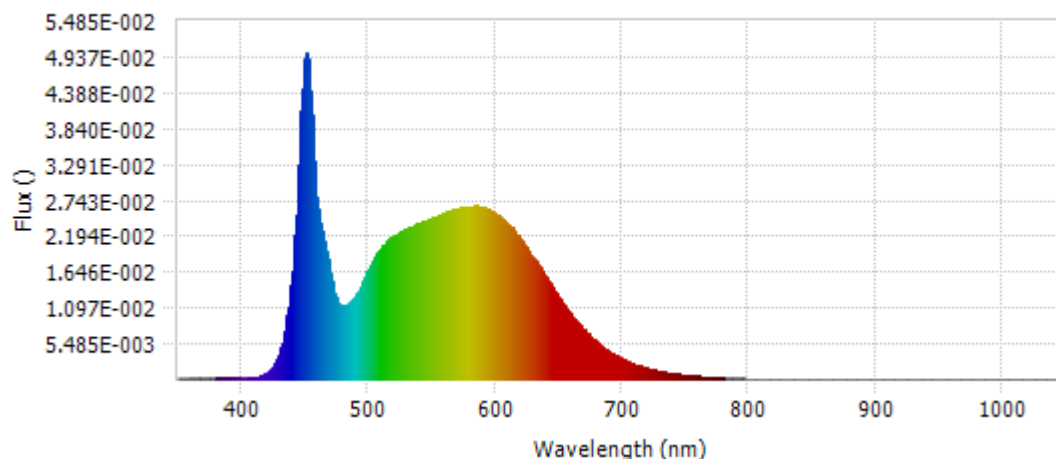
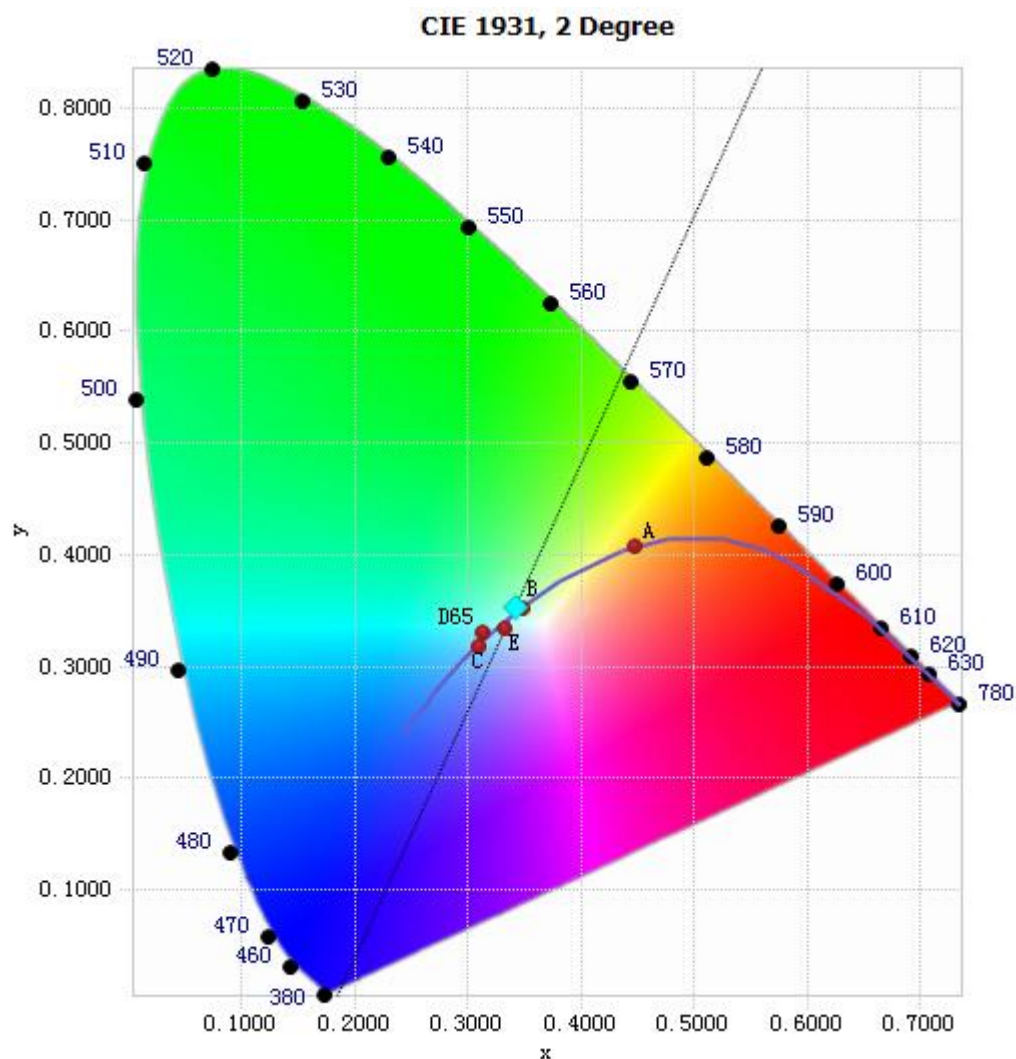


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.91E-04	485	1.18E-02	590	2.64E-02	695	3.65E-03
385	1.94E-04	490	1.28E-02	595	2.60E-02	700	3.12E-03
390	1.96E-04	495	1.47E-02	600	2.54E-02	705	2.69E-03
395	1.72E-04	500	1.68E-02	605	2.47E-02	710	2.28E-03
400	1.51E-04	505	1.86E-02	610	2.37E-02	715	1.95E-03
405	1.88E-04	510	1.99E-02	615	2.27E-02	720	1.67E-03
410	2.89E-04	515	2.13E-02	620	2.13E-02	725	1.43E-03
415	5.32E-04	520	2.19E-02	625	2.00E-02	730	1.22E-03
420	1.02E-03	525	2.25E-02	630	1.85E-02	735	1.04E-03
425	2.04E-03	530	2.30E-02	635	1.70E-02	740	9.00E-04
430	4.16E-03	535	2.34E-02	640	1.55E-02	745	7.74E-04
435	8.48E-03	540	2.38E-02	645	1.40E-02	750	6.59E-04
440	1.67E-02	545	2.43E-02	650	1.25E-02	755	5.69E-04
445	3.28E-02	550	2.46E-02	655	1.11E-02	760	4.88E-04
450	4.92E-02	555	2.50E-02	660	9.85E-03	765	4.19E-04
455	4.04E-02	560	2.54E-02	665	8.66E-03	770	3.60E-04
460	2.62E-02	565	2.58E-02	670	7.53E-03	775	3.05E-04
465	2.13E-02	570	2.60E-02	675	6.56E-03	780	2.67E-04
470	1.61E-02	575	2.63E-02	680	5.68E-03		
475	1.19E-02	580	2.64E-02	685	4.94E-03		
480	1.12E-02	585	2.66E-02	690	4.25E-03		

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

## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3424, 0.3534)

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

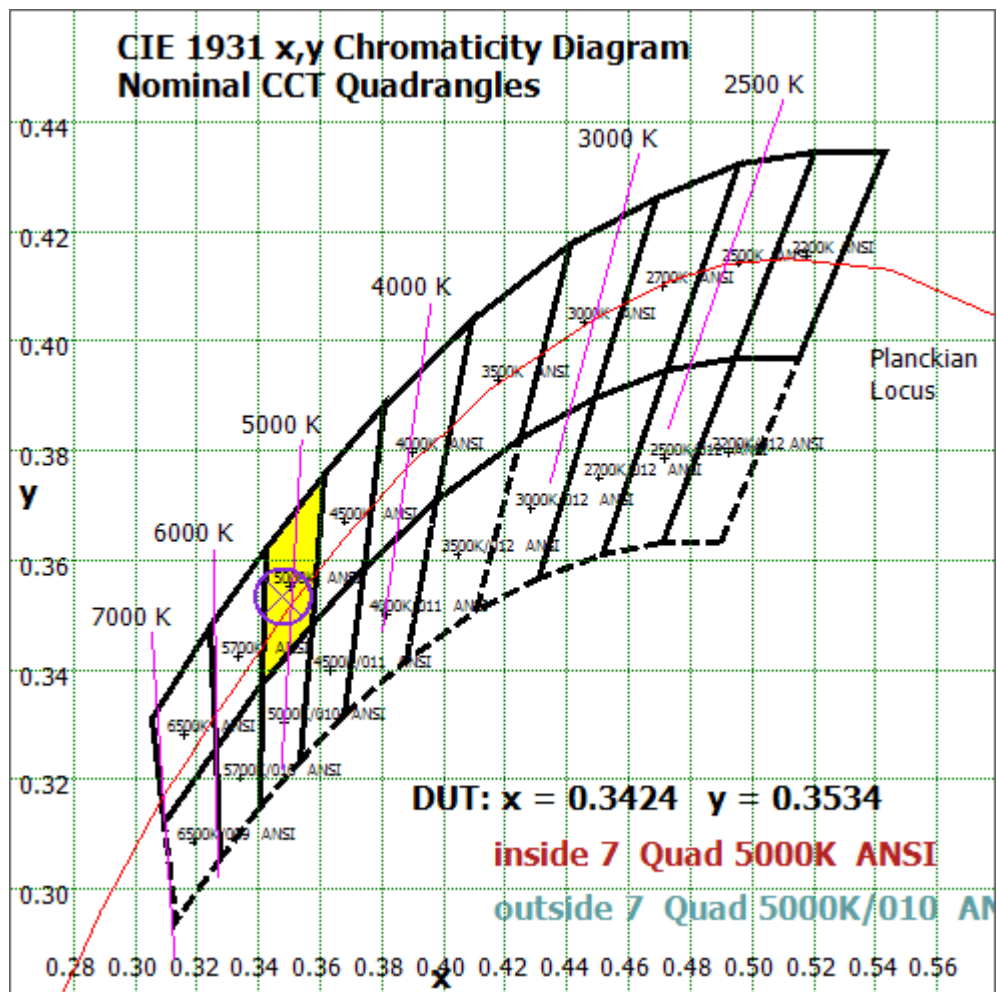


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

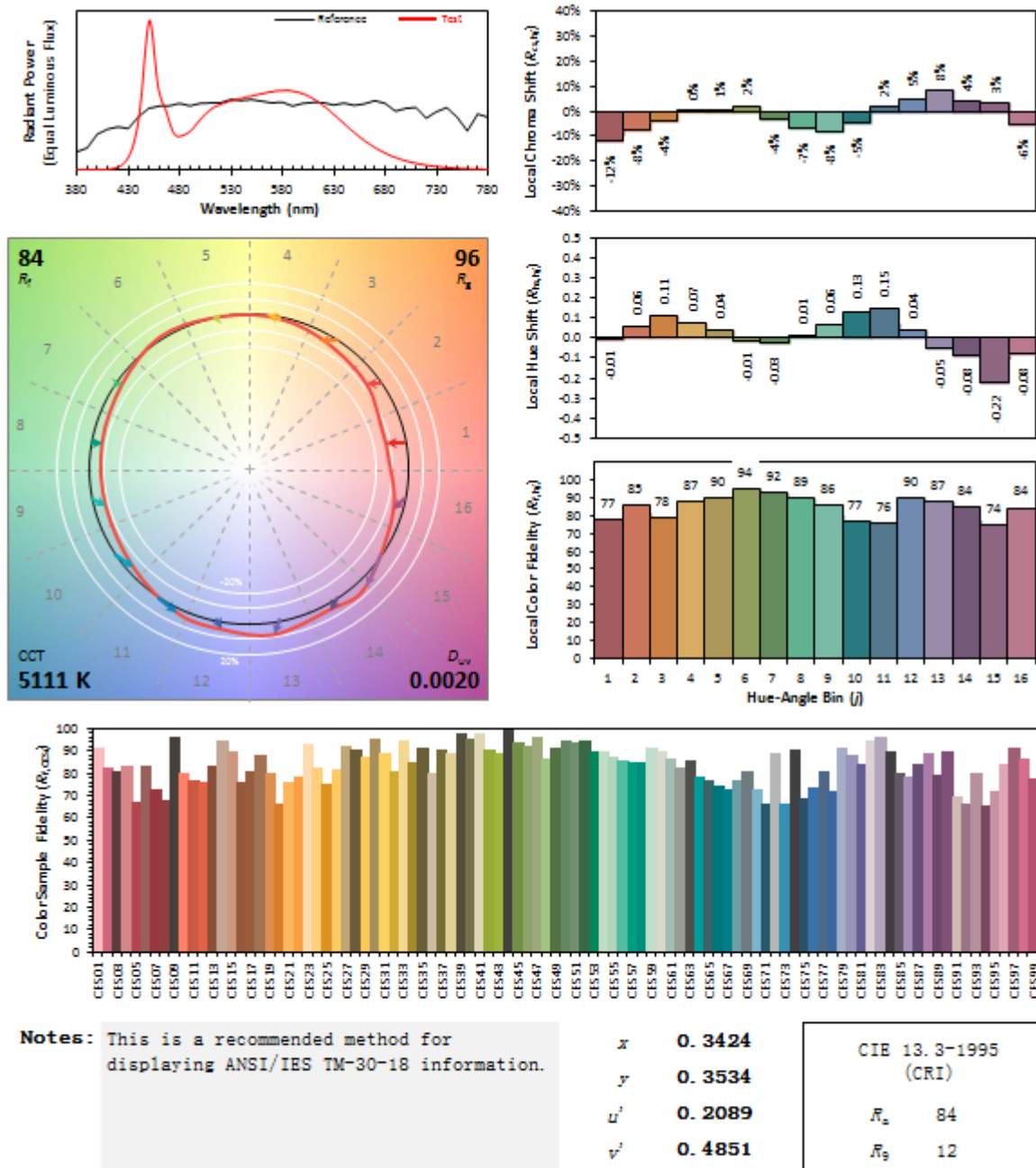
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/03/30

Model: 10T8/4F/850/UEB/C



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	32.818	1.94%
10- 20	93.937	5.54%
20- 30	142.625	8.42%
30- 40	174.397	10.29%
40- 50	188.348	11.11%
50- 60	186.281	10.99%
60- 70	171.783	10.14%
70- 80	149.33	8.81%
80- 90	124.867	7.37%
90-100	104.217	6.15%
100-110	87.201	5.15%
110-120	72.585	4.28%
120-130	59.187	3.49%
130-140	45.797	2.70%
140-150	32.846	1.94%
150-160	19.837	1.17%
160-170	7.418	0.44%
170-180	1.179	0.07%
Total	1694.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	818.406	48.29%
60- 90	445.98	26.32%
0-90	1264.386	74.61%
90- 180	430.267	25.39%
0- 180	1694.7	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

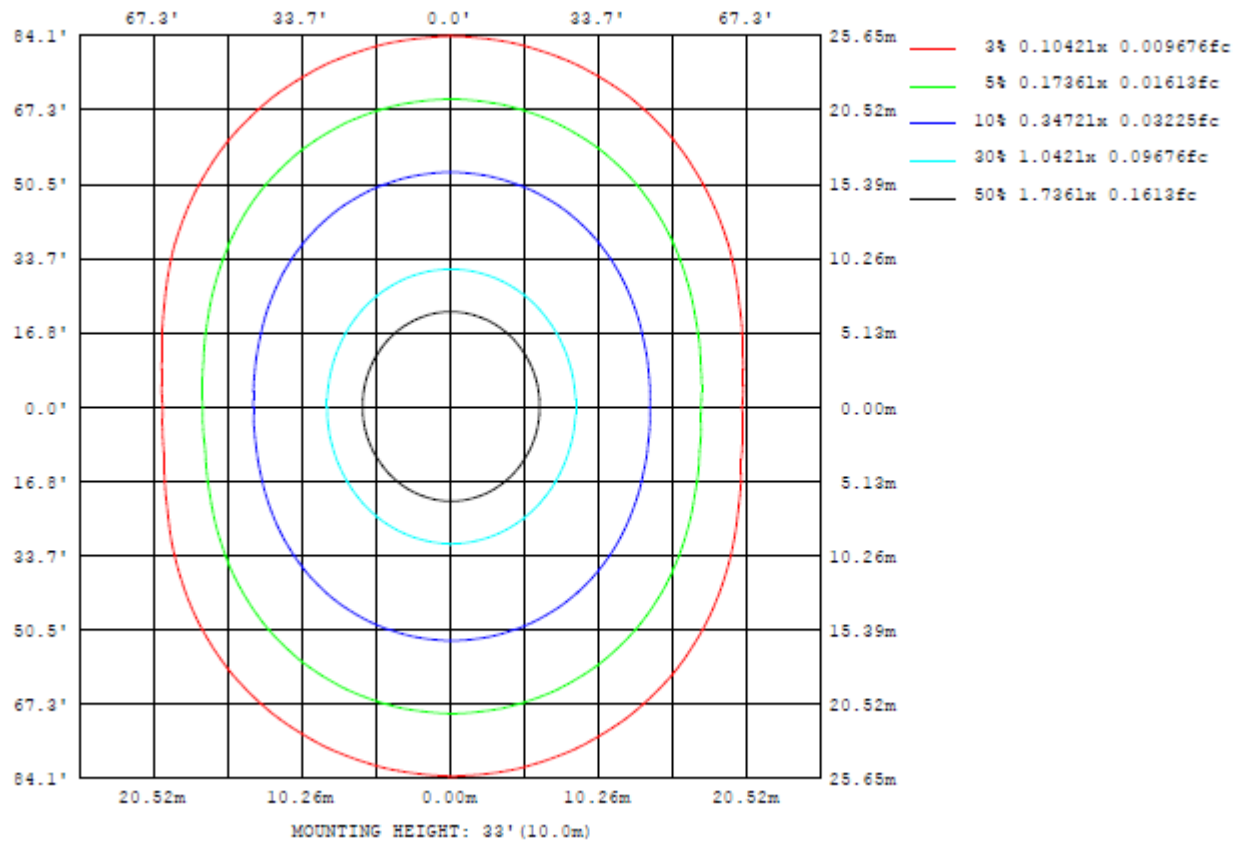


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

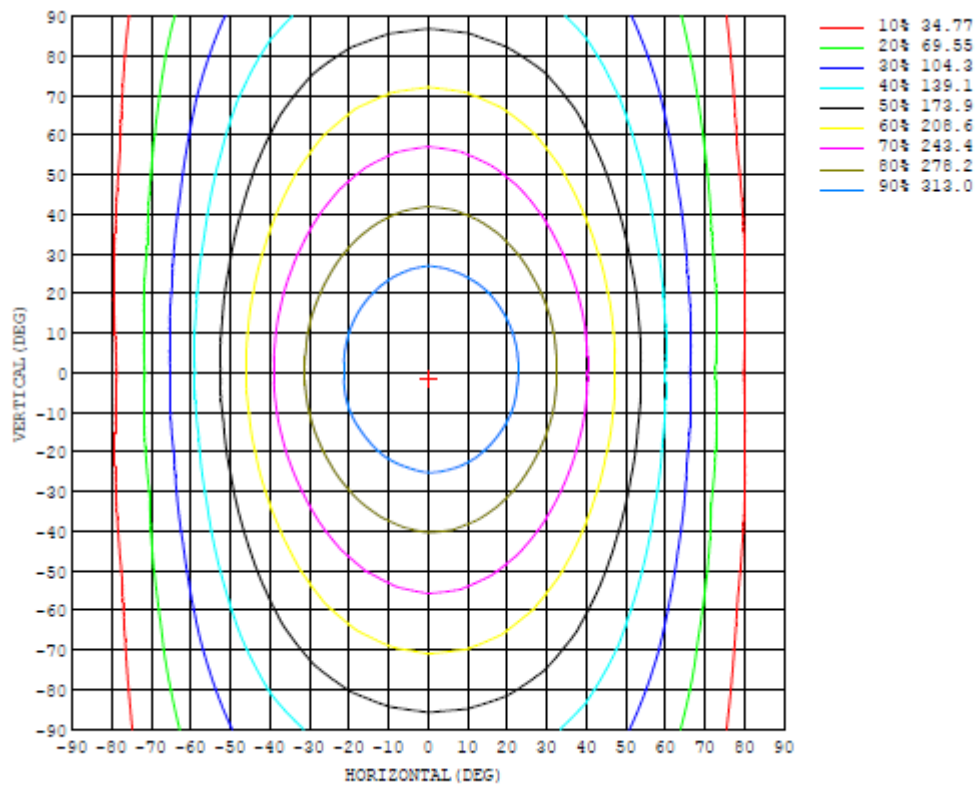


Chart 6: Isocandela Plot

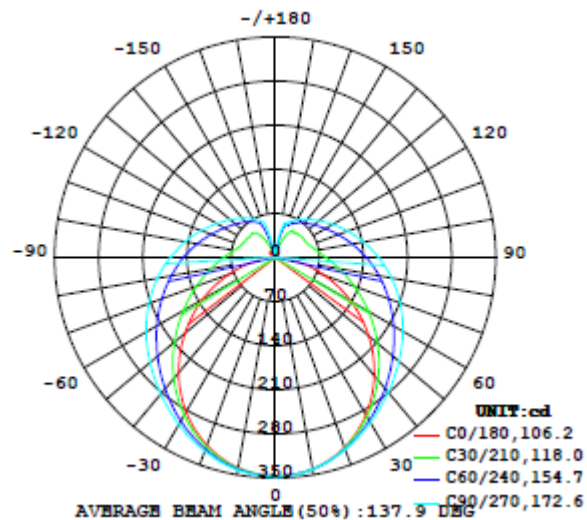


Chart 7: Polar Candela Distribution

# Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347
5	346	345	345	345	346	345	345	346	345	346	345	345	345	345	345	345	344	344	344
10	341	341	341	341	341	341	341	341	341	342	341	341	341	340	340	339	339	339	339
15	333	332	333	333	333	333	334	333	333	334	333	333	332	331	331	331	330	330	330
20	321	321	321	322	322	323	323	324	324	324	323	322	321	320	319	319	318	317	317
25	306	306	307	308	309	310	311	313	313	314	312	311	309	307	305	304	303	302	301
30	288	288	290	291	294	296	299	300	302	302	301	298	296	293	289	287	285	284	283
35	268	268	270	273	277	281	285	288	290	291	289	286	282	277	272	268	265	263	262
40	245	246	249	253	259	266	271	275	278	279	277	273	268	261	254	248	243	240	239
45	220	222	226	233	241	250	257	263	267	268	265	261	254	245	236	227	219	215	214
50	194	196	202	212	223	234	244	251	255	256	254	248	240	230	218	206	196	189	187
55	166	170	178	191	205	219	230	239	244	245	242	236	227	214	200	185	172	162	160
60	139	143	155	171	188	204	217	227	232	234	231	224	213	199	182	165	148	136	133
65	111	117	132	152	172	190	204	214	221	222	219	212	200	185	166	146	125	110	106
70	83.4	91.3	110	134	156	176	192	203	209	211	208	200	188	171	151	128	104	84.6	78.3
75	57.9	67.5	90.8	117	142	163	180	191	198	199	196	188	176	159	137	112	85.3	62.0	52.4
80	33.4	47.4	74.1	103	129	151	167	179	186	187	184	176	164	147	124	98.5	69.5	42.3	29.8
85	12.2	30.8	61.5	90.8	117	139	156	167	174	176	173	165	153	135	113	87.0	57.9	27.3	8.79
90	0.28	20.7	51.4	80.6	107	128	145	156	162	164	161	154	142	125	103	77.6	49.1	19.3	0.28
95	0.41	14.9	44.3	72.3	97.4	118	134	145	151	153	150	143	132	115	94.7	70.2	43.4	16.8	0.33
100	0.56	13.7	39.3	66.4	89.5	109	124	135	141	142	140	133	122	107	87.3	65.3	40.2	17.6	0.42
105	0.96	15.4	37.0	61.2	82.6	101	115	125	131	132	130	123	113	99.1	81.0	60.9	38.9	19.2	0.61
110	1.68	17.9	36.6	57.7	76.7	93.5	106	116	121	123	120	115	105	92.2	75.7	58.0	39.1	22.4	1.35
115	2.60	18.5	37.5	55.4	72.0	87.0	98.8	107	112	114	112	106	97.7	86.0	71.4	56.0	39.9	26.9	3.70
120	4.26	20.6	39.1	54.2	68.7	81.3	91.9	99.5	104	105	104	98.8	91.2	80.9	68.7	55.0	39.2	30.1	6.83
125	3.62	15.3	41.1	53.6	66.1	76.5	85.9	92.6	96.7	98.0	96.3	92.2	85.4	76.4	66.2	54.5	40.1	33.3	10.2
130	2.78	10.7	39.8	52.6	63.9	72.6	80.5	86.4	90.0	91.1	89.8	86.1	80.3	72.6	64.2	51.6	43.6	32.2	12.3
135	3.47	13.2	41.9	52.2	62.1	69.3	76.0	80.9	84.0	85.1	83.9	80.9	75.9	69.5	62.0	49.5	44.6	25.4	12.3
140	4.67	13.1	38.0	51.3	59.1	67.2	71.9	76.1	78.7	79.6	78.7	76.1	72.0	67.0	56.4	51.9	46.9	20.9	11.7
145	5.98	8.42	28.6	50.6	56.0	62.5	68.1	71.7	73.9	74.7	74.0	71.3	68.1	60.7	55.9	52.3	45.8	18.3	10.8
150	10.2	9.06	22.3	46.4	51.5	58.8	62.8	65.6	67.1	68.7	68.3	65.2	61.2	58.8	55.1	51.1	38.3	14.7	11.2
155	11.8	11.5	16.1	37.0	52.2	53.5	59.7	61.7	63.6	63.6	63.0	61.6	60.2	56.5	54.4	46.8	27.1	10.0	11.7
160	13.6	10.2	10.4	22.4	41.8	54.0	55.8	54.0	56.4	57.8	57.2	55.5	57.0	55.7	46.8	32.6	15.9	6.72	10.6
165	14.5	13.6	11.0	12.3	20.5	34.7	45.8	51.3	54.8	56.0	55.5	53.6	48.5	40.7	29.4	16.7	8.66	7.68	7.05
170	14.1	14.3	11.6	9.93	12.3	13.7	17.3	22.3	26.3	28.5	28.5	25.5	20.7	15.8	11.1	7.91	7.40	10.7	10.5
175	14.0	14.8	15.8	14.5	11.8	9.95	10.0	10.9	11.6	11.6	10.6	8.90	7.39	6.95	7.85	10.8	13.6	11.6	9.20
180	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15

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	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347		
5	345	344	345	345	345	345	346	346	346	346	346	346	346	346	346	345	345		
10	339	339	339	340	340	341	341	342	343	342	342	342	342	342	341	341	341		
15	330	330	331	332	333	334	335	335	336	336	335	335	335	334	333	333	333		
20	317	319	320	321	323	324	325	326	327	327	326	326	325	324	323	322	321		
25	302	304	306	308	310	312	314	316	317	317	315	314	313	311	309	308	307		
30	284	286	289	292	296	300	302	305	306	305	304	302	299	296	293	291	289		
35	263	266	270	275	281	286	290	293	294	294	291	288	284	279	275	272	269		
40	241	245	251	257	265	272	277	281	283	281	279	274	268	261	255	250	247		
45	216	222	230	239	249	258	264	269	271	270	266	260	252	243	235	227	222		
50	191	198	209	221	233	244	252	257	260	258	253	246	236	225	214	204	197		
55	164	174	188	204	218	230	239	245	248	246	241	232	221	207	193	180	170		
60	139	152	168	186	203	217	227	234	237	234	228	219	206	189	172	156	145		
65	113	129	150	170	189	204	215	222	225	223	216	206	191	172	154	134	118		
70	87.7	108	133	156	175	192	203	211	214	211	204	193	177	157	135	112	92.5		
75	64.6	89.6	117	142	162	179	191	199	202	199	192	181	164	144	119	91.8	68.2		
80	45.0	73.8	103	130	152	167	180	187	190	187	180	168	152	130	104	74.9	47.0		
85	30.3	61.5	91.7	118	140	156	168	175	178	176	169	157	141	119	91.9	61.4	30.5		
90	21.4	52.0	81.7	108	129	146	157	164	167	164	157	147	130	108	81.7	51.5	20.6		
95	15.5	44.5	73.2	98.4	119	136	147	153	155	153	147	136	120	98.8	73.5	44.9	17.1		
100	14.7	39.4	66.2	90.3	110	126	136	143	146	143	137	126	111	90.8	67.2	41.2	17.2		
105	16.0	37.4	60.9	83.2	102	117	127	133	135	133	127	117	102	83.9	62.4	39.5	19.3		
110	17.5	37.2	57.6	77.4	94.6	108	117	123	125	123	118	108	95.2	78.3	59.1	39.4	22.2		
115	19.6	37.9	55.6	73.0	88.2	100	109	114	116	114	109	101	88.6	73.6	56.9	40.4	25.3		
120	21.8	37.0	54.2	69.6	82.9	93.7	101	106	108	106	101	93.7	83.1	70.0	55.3	40.4	28.4		
125	18.9	38.3	53.8	66.8	78.4	87.8	94.5	98.5	100	98.5	94.3	87.7	78.4	67.0	54.7	42.8	29.6		
130	8.82	35.4	51.9	64.4	74.6	82.6	88.4	92.0	93.3	91.8	88.2	82.4	74.5	64.6	53.7	44.1	27.0		
135	4.75	33.3	52.9	61.9	71.2	78.2	83.1	86.1	87.2	85.9	82.7	77.8	71.0	62.5	54.6	41.9	18.6		
140	5.88	31.8	51.5	60.2	67.4	73.8	78.3	80.8	81.7	80.6	77.9	73.7	67.7	60.5	53.4	38.6	10.6		
145	8.87	22.7	43.7	57.7	64.8	69.1	73.0	75.6	76.6	75.5	73.0	69.5	64.7	58.5	51.6	31.1	6.05		
150	10.3	7.01	32.4	54.1	60.5	65.5	68.7	70.5	71.2	70.6	68.8	65.6	60.6	56.6	44.8	18.9	4.18		
155	12.0	5.40	14.3	34.2	53.7	60.8	62.7	64.3	65.0	64.5	62.8	61.0	58.5	51.1	30.7	10.7	6.23		
160	15.3	10.9	6.02	10.1	24.2	43.3	56.9	60.3	60.7	60.3	59.4	56.7	48.4	32.7	16.8	8.26	7.80		
165	15.2	13.7	9.35	8.40	9.13	7.83	15.3	30.2	39.7	40.5	36.9	29.9	21.2	14.4	7.06	7.86	9.40		
170	13.1	14.9	14.7	13.1	7.59	7.73	9.18	7.59	9.82	12.7	11.8	10.3	7.81	8.00	9.67	11.1	13.3		
175	13.0	19.0	14.3	14.3	13.3	14.3	15.3	15.1	10.5	10.4	13.5	10.9	8.75	10.7	15.0	20.0	16.9		
180	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15	9.15		

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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