

## 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: 14.5T5HO/3F/840/BYP/R**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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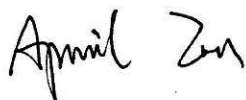
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[www.ledtestlab.com](http://www.ledtestlab.com)

Report No.: HZ22070025r

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

Review by:



Engineer: April Zou  
Aug. 16, 2022

Approved by:



Manager: Jim Zhang  
Aug. 16, 2022

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: 14.5T5HO/3F/840/BYP/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
139.9	2071.3	14.81	0.9699
CCT (K)	CRI	Stabilization Time (Light & Power)	
4094	82.5	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>	: Jul. 20, 2022
<b>Date of Test</b>	: Aug. 15, 2022
<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>	: 14.5T5HO/3F/840/BYP/R
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz
<b>Product Description</b>	: 4000K
<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)	0.127	0.058
Power Factor	0.9699	0.9289
Test Power (W)	14.81	14.91
THD A%	21.77	17.57
Luminous Efficacy (lm/W)	139.9	140.3
Total Luminous Flux (lm)	2071.3	2091.2
Color Rendering Index (CRI)	82.5	
R9	4.4	
Correlated Color Temperature (CCT)(K)	4094	
Chromaticity Chroma x	0.3769	
Chromaticity Chroma y	0.3767	
Chromaticity Chroma u	0.2228	
Chromaticity Chroma v	0.3340	
Duv	0.0010	
Chromaticity Chroma u'	0.2228	
Chromaticity Chroma v'	0.5010	

Special Color Rendering Indices	
R1	80.4
R2	88.4
R3	94.6
R4	81.8
R5	80.9
R6	84.2
R7	85.8
R8	63.6
R9	4.4
R10	72.8
R11	81
R12	63.2
R13	82.3
R14	97.2

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)	0.128
Power Factor	0.9701
Power (W)	14.88
Luminous Efficacy (lm/W)	140.5
Total Luminous Flux (lm)	2091.1
Beam Angle (°)	112.8 (0°-180°) / 234.8 (90°-270°)
Center Beam Candle Power (cd)	334
Maximum Beam Candle Power (cd)	335.2 (At: C=280.0, Gamma=10.0)
Spacing Criteria	1.24 (0°-180°) / 1.50 (90°-270°)
Zonal Lumens in the 0°-60°Zone	41.89%
Zonal Lumens in the 60°-90°Zone	26.87%
Zonal Lumens in the 90°-120°Zone	17.69%
Zonal Lumens in the 120°-180°Zone	13.55%

Table 3: Test data per Goniophotometer Method

### Spectral Power Distribution - Sphere Spectroradiometer Method

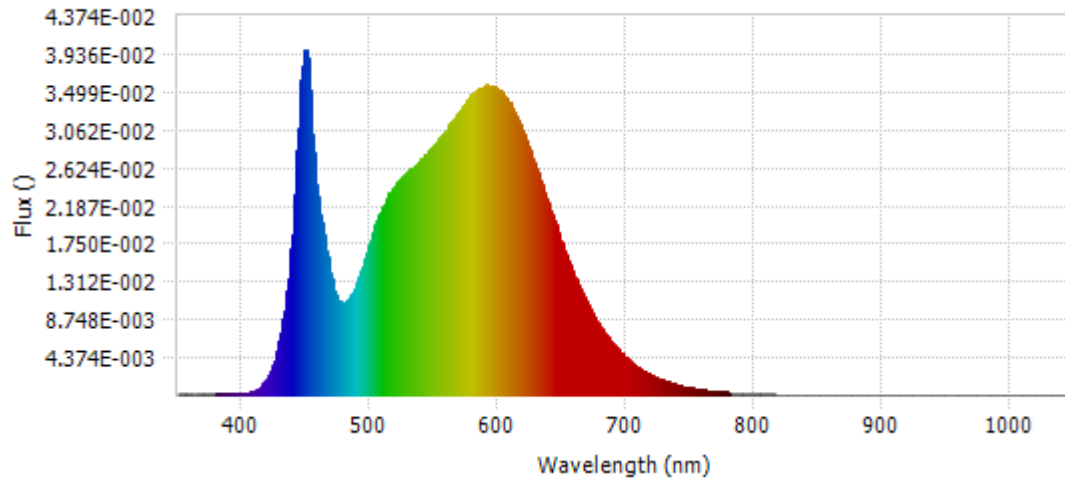
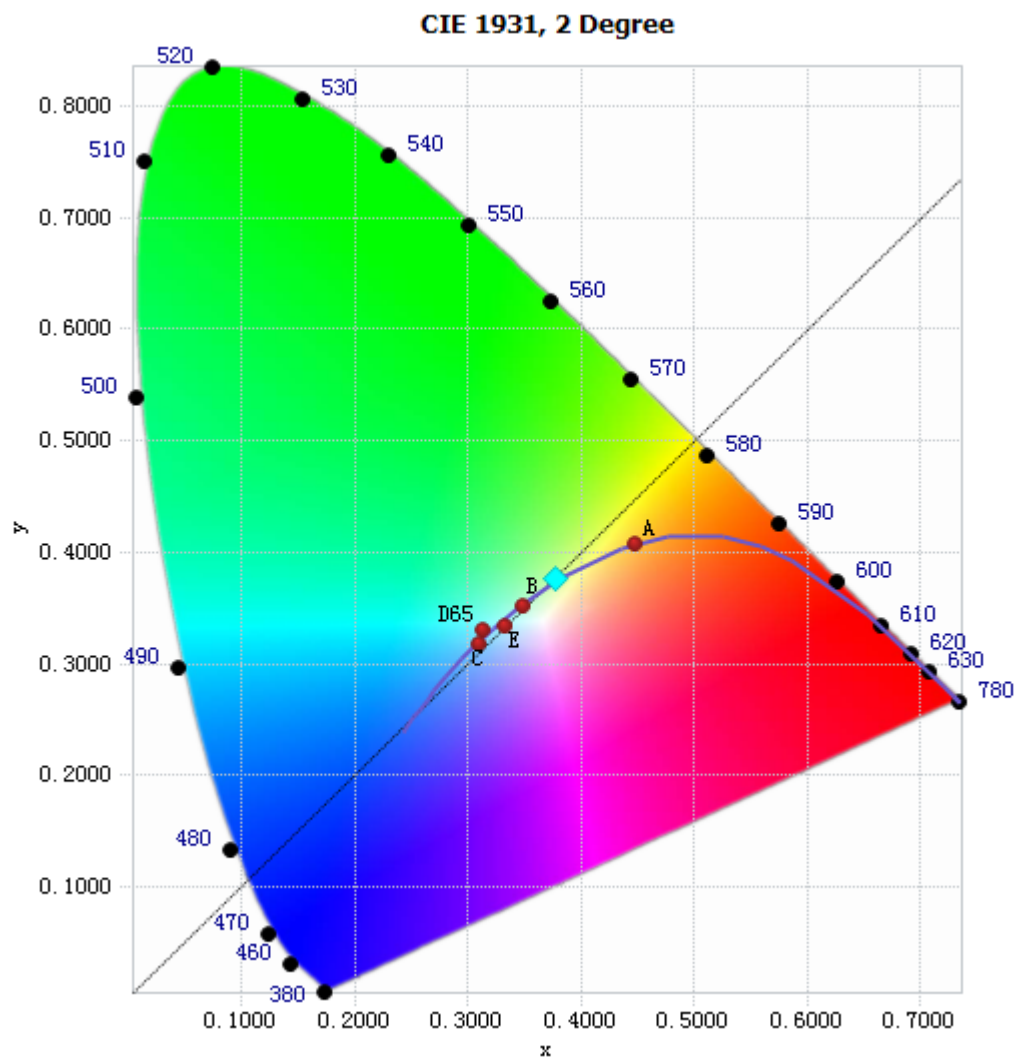


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.82E-04	485	1.15E-02	590	3.57E-02	695	5.07E-03
385	1.85E-04	490	1.31E-02	595	3.57E-02	700	4.31E-03
390	1.79E-04	495	1.54E-02	600	3.53E-02	705	3.69E-03
395	1.92E-04	500	1.78E-02	605	3.46E-02	710	3.14E-03
400	1.76E-04	505	2.00E-02	610	3.34E-02	715	2.68E-03
405	2.64E-04	510	2.18E-02	615	3.19E-02	720	2.31E-03
410	5.63E-04	515	2.33E-02	620	3.01E-02	725	1.97E-03
415	1.10E-03	520	2.43E-02	625	2.83E-02	730	1.67E-03
420	2.11E-03	525	2.51E-02	630	2.61E-02	735	1.41E-03
425	3.98E-03	530	2.58E-02	635	2.39E-02	740	1.20E-03
430	7.07E-03	535	2.65E-02	640	2.17E-02	745	1.03E-03
435	1.21E-02	540	2.72E-02	645	1.96E-02	750	8.71E-04
440	2.07E-02	545	2.80E-02	650	1.75E-02	755	7.50E-04
445	3.37E-02	550	2.89E-02	655	1.55E-02	760	6.39E-04
450	3.97E-02	555	2.98E-02	660	1.37E-02	765	5.44E-04
455	3.00E-02	560	3.07E-02	665	1.20E-02	770	4.70E-04
460	2.19E-02	565	3.18E-02	670	1.05E-02	775	3.91E-04
465	1.76E-02	570	3.28E-02	675	9.14E-03	780	3.46E-04
470	1.34E-02	575	3.38E-02	680	7.92E-03		
475	1.09E-02	580	3.47E-02	685	6.83E-03		
480	1.07E-02	585	3.54E-02	690	5.89E-03		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3769, 0.3767)

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

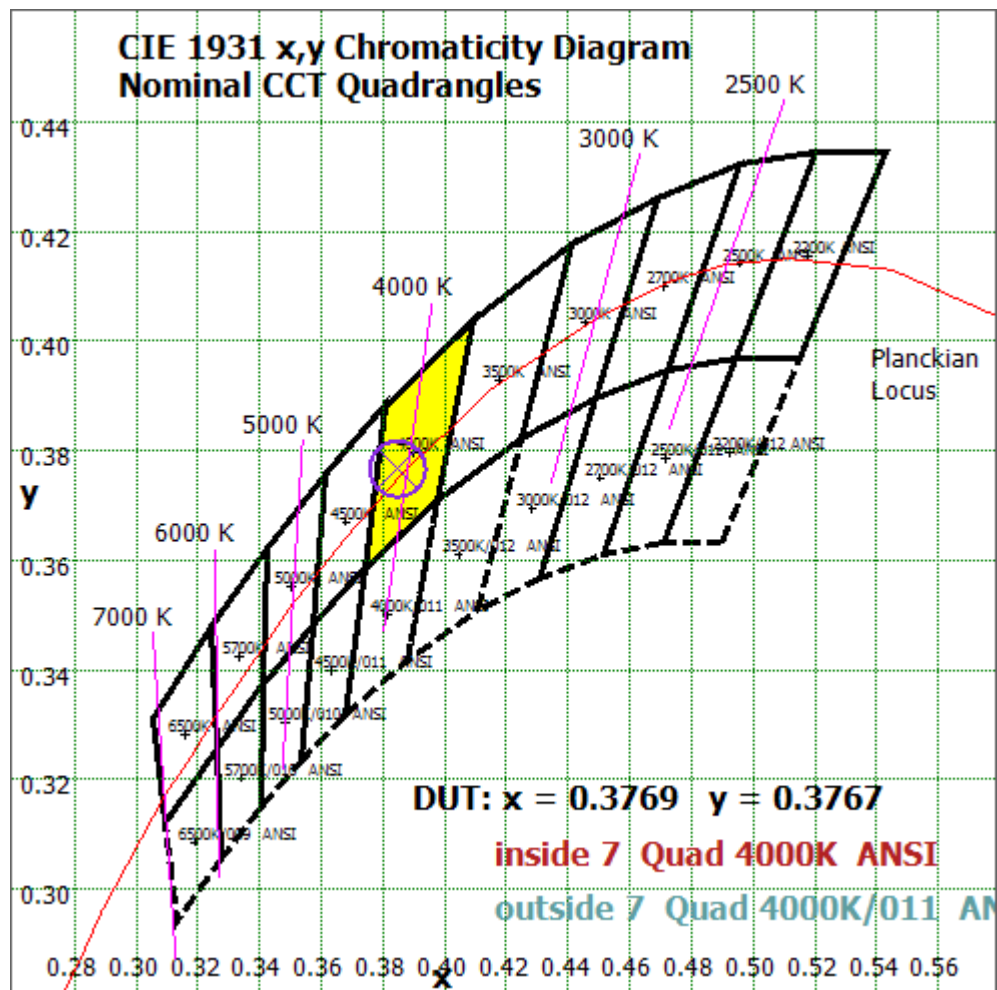


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

## Color Rendition Report – Sphere Spectroradiometer Method

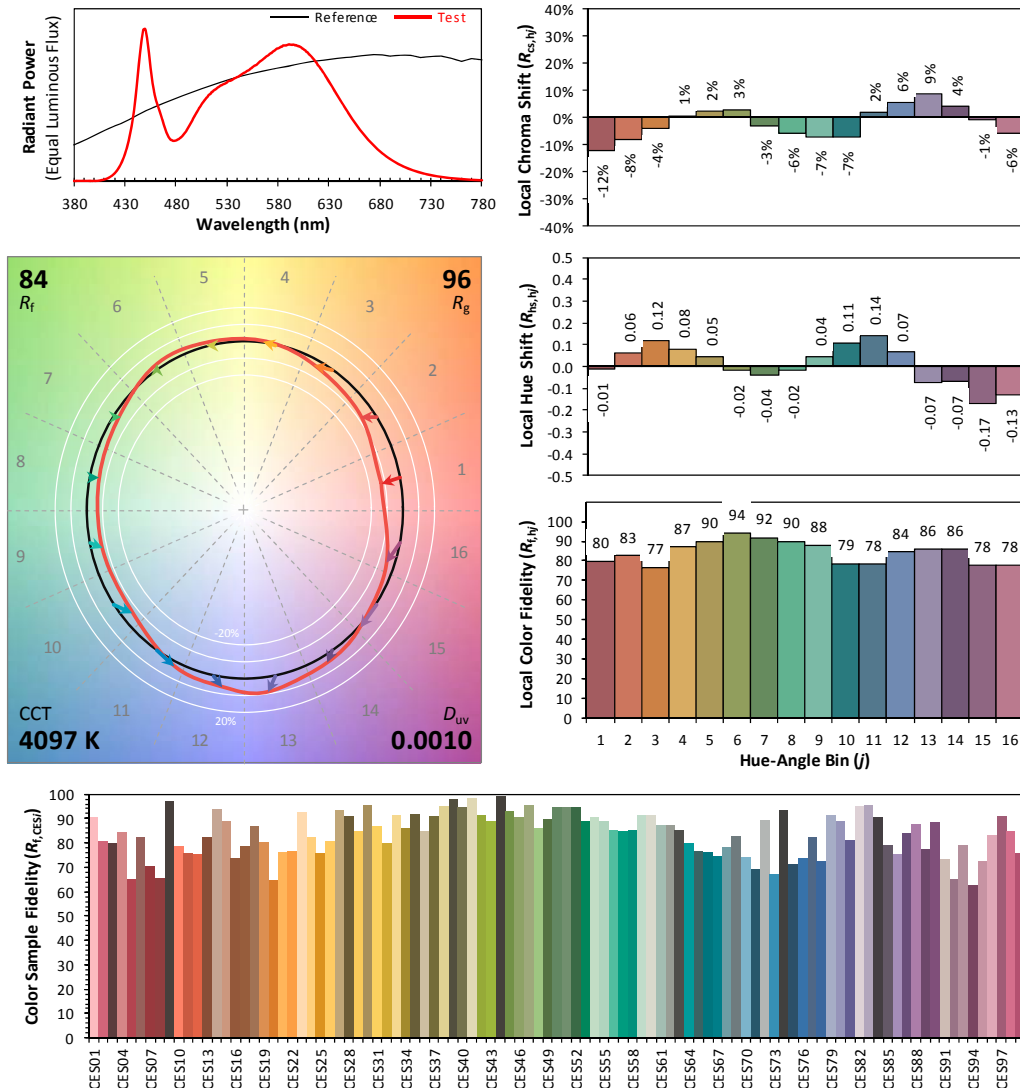
### ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/08/15

Model: 14.5T5HO/3F/840/BYP/R



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

$x$  0.3769  
 $y$  0.3767  
 $u'$  0.2228  
 $v'$  0.5010

CIE 13.3-1995  
(CRI)  
 $R_a$  83  
 $R_9$  5

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	31.701	1.52%
10- 20	92.242	4.41%
20- 30	144.455	6.91%
30- 40	183.902	8.79%
40- 50	207.959	9.95%
50- 60	215.73	10.32%
60- 70	208.664	9.98%
70- 80	189.55	9.06%
80- 90	163.579	7.82%
90-100	140.502	6.72%
100-110	122.964	5.88%
110-120	106.533	5.09%
120-130	89.276	4.27%
130-140	71.445	3.42%
140-150	53.588	2.56%
150-160	36.253	1.73%
160-170	24.31	1.16%
170-180	8.41	0.40%
Total	2091.1	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	875.989	41.89%
60- 90	561.793	26.87%
0-90	1437.782	68.76%
90- 180	653.281	31.24%
0- 180	2091.1	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

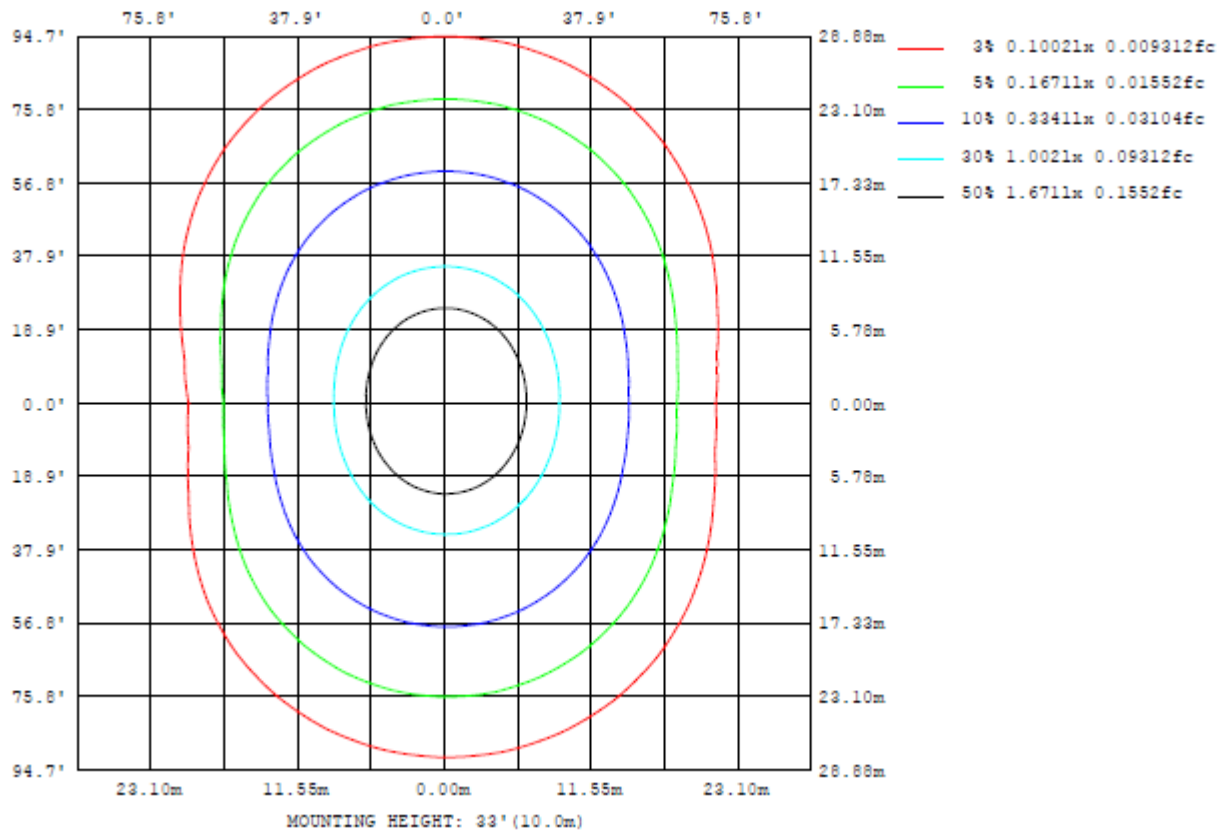


Chart 5: Illuminance Plot (Footcandles)

### Luminous Intensity Distribution Plots- Goniophotometer Method

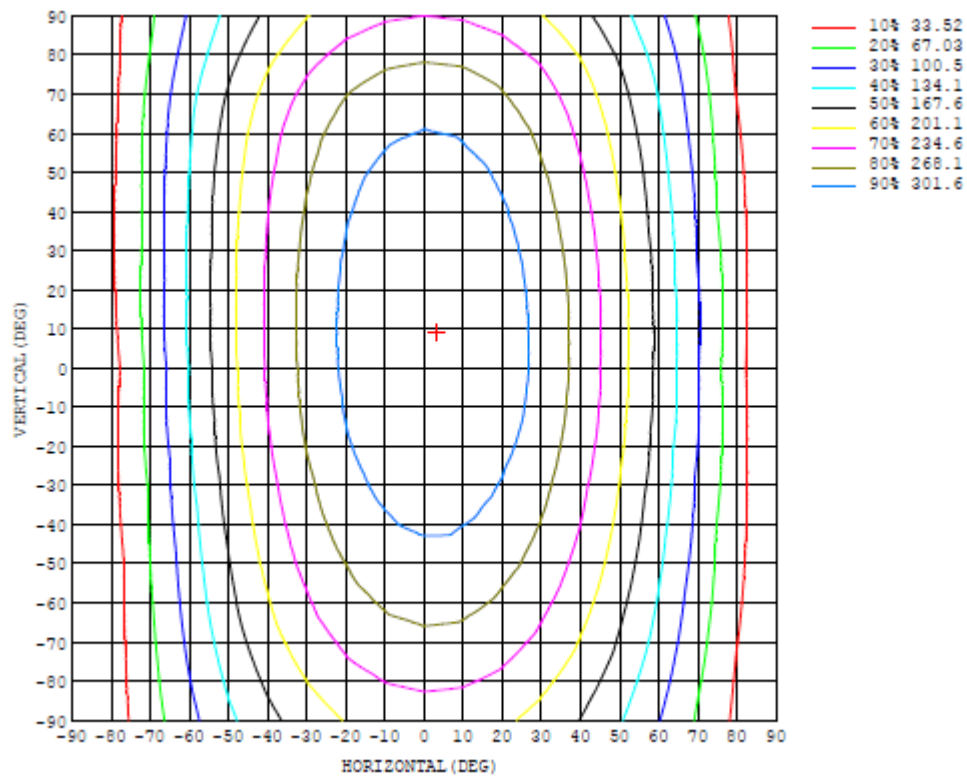


Chart 6: Isocandela Plot

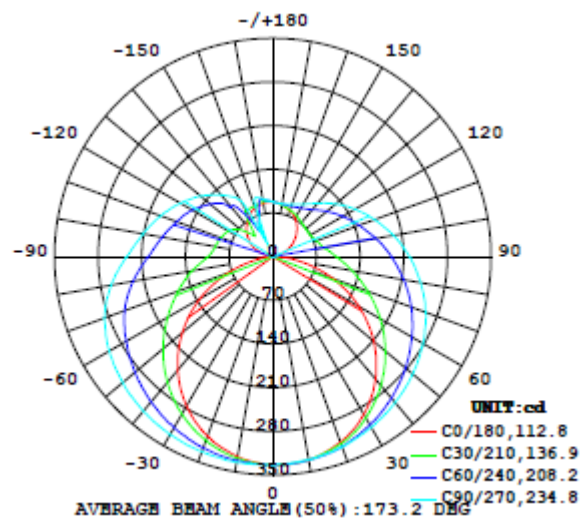


Chart 7: Polar Candela Distribution

## 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	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334
5	334	333	333	333	334	333	333	333	333	332	332	332	332	331	331	331	331	331	331
10	331	330	330	331	331	331	331	331	331	330	330	329	329	328	327	326	325	325	326
15	325	325	325	325	326	328	328	328	329	328	327	325	323	322	320	319	318	317	317
20	317	316	318	319	322	323	324	326	325	325	323	321	318	315	313	310	307	306	306
25	306	306	307	310	313	315	318	320	321	320	319	316	312	307	303	299	295	293	293
30	292	292	294	298	303	307	311	314	316	316	313	310	304	298	291	285	280	277	277
35	275	276	279	285	291	298	304	309	311	311	308	303	296	287	278	270	263	259	258
40	256	257	262	270	278	288	296	302	305	305	302	295	287	276	264	253	245	239	237
45	235	237	244	253	265	277	287	295	299	299	296	288	278	265	250	236	224	216	214
50	211	214	223	235	251	265	278	287	292	293	289	280	268	253	235	216	202	192	189
55	186	190	201	218	236	253	268	278	285	286	281	272	258	240	219	197	179	166	163
60	160	164	178	199	221	241	257	270	277	278	274	263	248	228	204	178	155	140	135
65	131	137	155	180	206	228	247	261	269	270	265	254	237	216	189	160	132	112	105
70	102	109	133	162	191	216	237	251	259	261	256	245	227	204	175	142	109	84.2	75.9
75	72.6	83.6	111	145	176	204	225	241	250	251	247	235	216	192	162	127	89.8	58.9	47.7
80	44.9	60.0	92.3	129	163	191	213	230	239	241	236	224	205	180	149	113	73.6	38.0	23.3
85	20.6	40.6	76.2	114	149	178	201	218	228	230	225	213	194	169	138	101	61.4	23.8	5.91
90	3.87	26.7	63.6	102	137	167	190	207	217	219	214	203	184	159	127	91.4	53.2	17.5	1.48
95	2.78	19.7	55.2	92.1	127	156	179	196	206	208	204	192	174	149	119	83.3	47.9	16.9	4.27
100	5.75	18.6	49.5	83.4	117	145	168	185	194	197	192	182	164	139	110	78.5	46.5	19.5	9.06
105	10.9	20.9	47.6	78.1	108	135	157	173	182	185	181	171	154	131	105	75.6	46.3	24.1	15.4
110	18.1	25.2	47.0	74.7	102	127	147	162	171	174	170	160	145	124	99.4	73.2	47.7	30.2	22.5
115	25.7	30.6	47.9	71.9	96.5	119	138	152	160	163	160	151	136	117	95.1	71.4	50.1	36.4	32.8
120	33.5	36.5	49.9	69.7	91.7	112	129	142	150	152	149	141	128	111	91.2	70.4	53.7	43.0	40.7
125	40.4	42.4	53.1	68.8	87.6	106	121	133	140	142	139	132	120	105	87.6	70.5	57.7	48.5	46.9
130	47.4	48.6	57.1	69.2	83.8	99.5	113	123	130	132	130	123	113	99.6	84.7	72.2	62.0	54.7	53.7
135	54.2	54.6	61.1	70.2	81.4	93.9	105	114	120	122	120	114	106	94.5	83.2	73.6	66.2	60.2	59.9
140	60.2	60.0	65.3	71.8	80.3	89.7	98.5	106	110	112	110	106	99.0	91.0	82.7	75.4	70.1	64.6	65.1
145	66.2	65.7	68.9	73.6	80.2	87.1	93.6	98.7	102	103	102	99.2	94.5	88.8	82.5	77.1	73.0	69.3	70.4
150	71.2	70.2	72.3	76.1	80.5	85.5	90.0	93.8	96.3	97.2	96.6	94.4	91.2	87.0	83.0	79.2	75.4	73.1	75.6
155	76.1	74.2	75.5	78.2	81.3	84.5	87.6	90.1	91.7	92.4	92.2	90.9	88.6	86.1	83.5	80.8	78.4	78.0	80.4
160	79.1	77.7	78.1	80.0	82.1	84.3	86.1	87.6	88.7	89.1	89.0	88.4	87.2	85.8	84.2	83.0	81.7	81.7	83.0
165	81.9	80.5	80.7	81.7	83.1	84.5	85.5	86.3	86.8	87.0	87.1	86.8	86.4	85.7	85.1	84.6	84.2	84.3	85.3
170	84.7	84.0	83.7	84.1	84.7	85.2	85.7	86.0	86.2	86.3	86.4	86.4	86.2	86.1	85.9	86.0	86.0	86.5	87.1
175	87.0	86.6	86.6	86.5	86.4	86.4	86.6	86.7	86.7	86.8	86.9	86.9	87.0	87.1	87.3	87.4	87.6	87.9	88.3
180	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3

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	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	
5	331	331	332	333	333	333	334	334	334	334	334	335	335	335	334	334	334	
10	326	327	328	330	330	332	333	334	335	335	335	335	334	333	333	332	331	
15	318	320	322	325	327	330	332	333	333	334	334	333	332	330	328	327	326	
20	308	310	313	318	322	326	330	332	333	333	332	331	328	325	322	319	318	
25	294	298	304	310	316	322	326	330	332	332	330	327	323	318	314	310	307	
30	279	284	292	300	309	317	323	327	329	329	327	322	316	310	303	297	294	
35	261	268	278	289	300	310	319	324	326	326	323	317	309	300	291	283	278	
40	241	251	263	277	291	304	314	320	323	322	318	310	300	288	277	267	260	
45	220	231	247	264	281	296	308	316	319	318	312	303	290	276	261	249	239	
50	196	210	230	251	271	288	302	311	314	313	306	295	280	262	245	229	217	
55	171	189	212	237	260	280	296	305	309	307	299	286	269	248	227	207	192	
60	145	167	195	223	250	271	288	299	303	301	292	277	257	233	209	185	167	
65	119	146	178	210	239	263	281	292	296	293	283	267	246	219	190	162	140	
70	92.1	125	161	196	228	253	272	283	288	285	274	257	234	205	173	140	113	
75	67.1	106	146	183	215	241	260	272	276	273	263	246	221	190	155	118	85.3	
80	46.3	89.3	131	169	201	227	247	259	263	261	250	233	208	176	139	97.8	59.9	
85	31.5	73.5	116	155	187	214	233	245	249	246	236	218	192	160	123	80.7	39.1	
90	23.2	62.7	104	143	174	200	219	230	235	231	221	202	177	146	107	64.5	25.0	
95	22.0	58.6	97.4	134	165	189	207	218	222	218	207	189	164	133	94.9	54.0	17.8	
100	23.8	57.9	93.9	128	157	180	197	208	211	208	197	179	154	124	87.2	51.3	18.3	
105	24.3	57.8	91.4	123	150	172	188	198	201	198	187	169	146	116	83.3	51.4	21.6	
110	24.1	57.0	88.7	118	144	164	179	189	191	188	177	161	138	111	82.1	52.6	23.0	
115	26.6	53.7	85.8	113	137	157	170	179	181	178	168	153	132	108	81.4	53.0	26.6	
120	33.4	48.1	82.3	108	130	149	161	169	171	168	160	146	127	104	80.1	51.9	34.7	
125	43.6	41.4	76.6	103	123	140	153	159	161	159	151	137	120	100	77.1	48.4	43.4	
130	56.8	39.0	66.6	96.3	115	131	142	149	151	149	141	129	114	96.1	70.6	46.1	52.2	
135	65.4	51.4	53.3	87.4	103	121	132	138	140	138	132	122	108	91.2	63.3	57.9	59.8	
140	70.6	71.5	43.8	75.8	95.4	103	120	127	129	128	123	115	100	84.5	53.9	69.8	65.6	
145	74.3	80.0	66.3	50.8	82.7	91.4	93.2	93.7	118	118	115	106	91.2	65.7	74.2	76.6	69.6	
150	78.6	80.1	86.1	69.6	48.7	58.5	61.0	59.4	104	108	103	82.6	65.5	75.5	86.6	79.5	74.7	
155	82.4	82.4	85.8	87.3	70.0	51.5	46.9	58.2	26.8	63.5	58.4	60.9	72.5	88.8	88.7	83.3	79.2	
160	85.0	86.6	84.8	85.8	77.2	64.9	57.4	60.3	56.1	69.0	59.3	80.4	95.1	92.8	88.5	85.2	82.0	
165	86.0	87.2	88.6	90.0	84.3	87.2	79.8	96.6	98.2	97.9	96.4	95.0	93.0	90.8	88.1	85.7	83.6	
170	87.8	88.6	89.4	90.7	91.8	93.1	93.7	94.3	94.3	93.8	92.9	91.9	90.8	89.5	88.1	86.9	85.5	
175	88.6	88.9	89.3	89.8	90.3	90.6	90.8	90.7	90.6	90.4	90.0	89.6	89.2	88.8	88.2	87.8	87.4	
180	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	88.3	

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 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 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 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 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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