

## 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: 14.5T5HE/4F/840/BYP/R**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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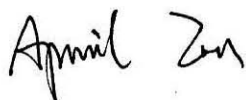
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[www.ledtestlab.com](http://www.ledtestlab.com)

Report No.: HZ22070025i

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

Review by:



Engineer: April Zou  
Aug. 02, 2022

Approved by:



Manager: Jim Zhang  
Aug. 02, 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: 14.5T5HE/4F/840/BYP/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
142.2	2135.6	15.02	0.9806
CCT (K)	CRI	Stabilization Time (Light & Power)	
4092	82.3	50	

Table 1: Executive Data Summary

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

### Test specifications:

**Date of Receipt** : Jul. 20, 2022

**Date of Test** : Jul. 29, 2022

**Test item** : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters

**Reference Standard** : IESNA LM-79-2019 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>	: 14.5T5HE/4F/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)	0.128	0.058
Power Factor	0.9806	0.9398
Test Power (W)	15.02	15.13
THD A%	19.03	17.58
Luminous Efficacy (lm/W)	142.2	143.1
Total Luminous Flux (lm)	2135.6	2165.8
Color Rendering Index (CRI)	82.3	
R9	3.9	
Correlated Color Temperature (CCT)(K)	4092	
Chromaticity Chroma x	0.3770	
Chromaticity Chroma y	0.3766	
Chromaticity Chroma u	0.2229	
Chromaticity Chroma v	0.3340	
Duv	0.0009	
Chromaticity Chroma u'	0.2229	
Chromaticity Chroma v'	0.5010	

Special Color Rendering Indices	
R1	80.3
R2	88.1
R3	94.3
R4	81.7
R5	80.7
R6	83.8
R7	85.8
R8	63.5
R9	3.9
R10	72.2
R11	80.9
R12	62.3
R13	82.1
R14	97

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)	0.129
Power Factor	0.9781
Power (W)	15.09
Luminous Efficacy (lm/W)	143.3
Total Luminous Flux (lm)	2162.4
Beam Angle ( ° )	115.2 (0°-180°) / 229.6 (90°-270°)
Center Beam Candle Power (cd)	341
Maximum Beam Candle Power (cd)	343.2 (At: C=290.0, Gamma=7.0)
Spacing Criteria	1.27 (0°-180°) / 1.49 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	41.84%
Zonal Lumens in the 60 °-90 °Zone	27.01%
Zonal Lumens in the 90 °-120 °Zone	17.77%
Zonal Lumens in the 120 °-180 °Zone	13.38%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

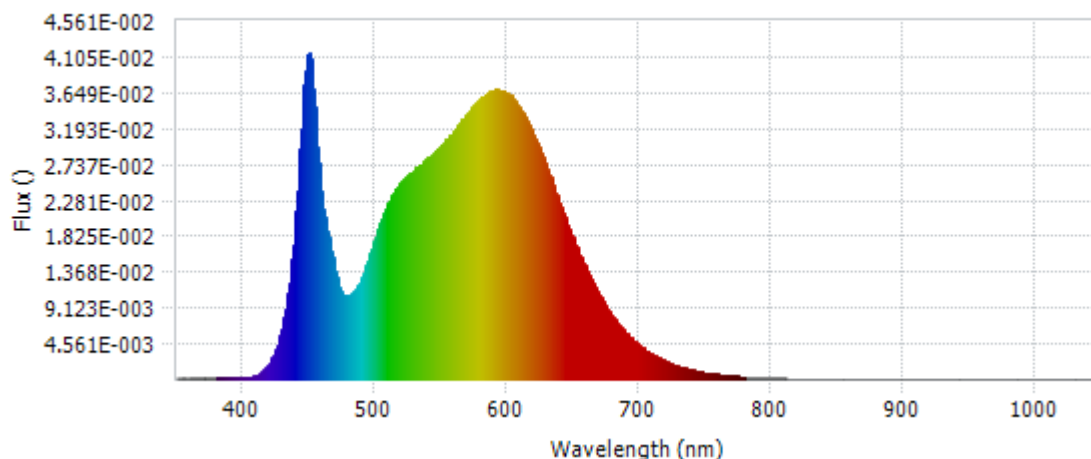
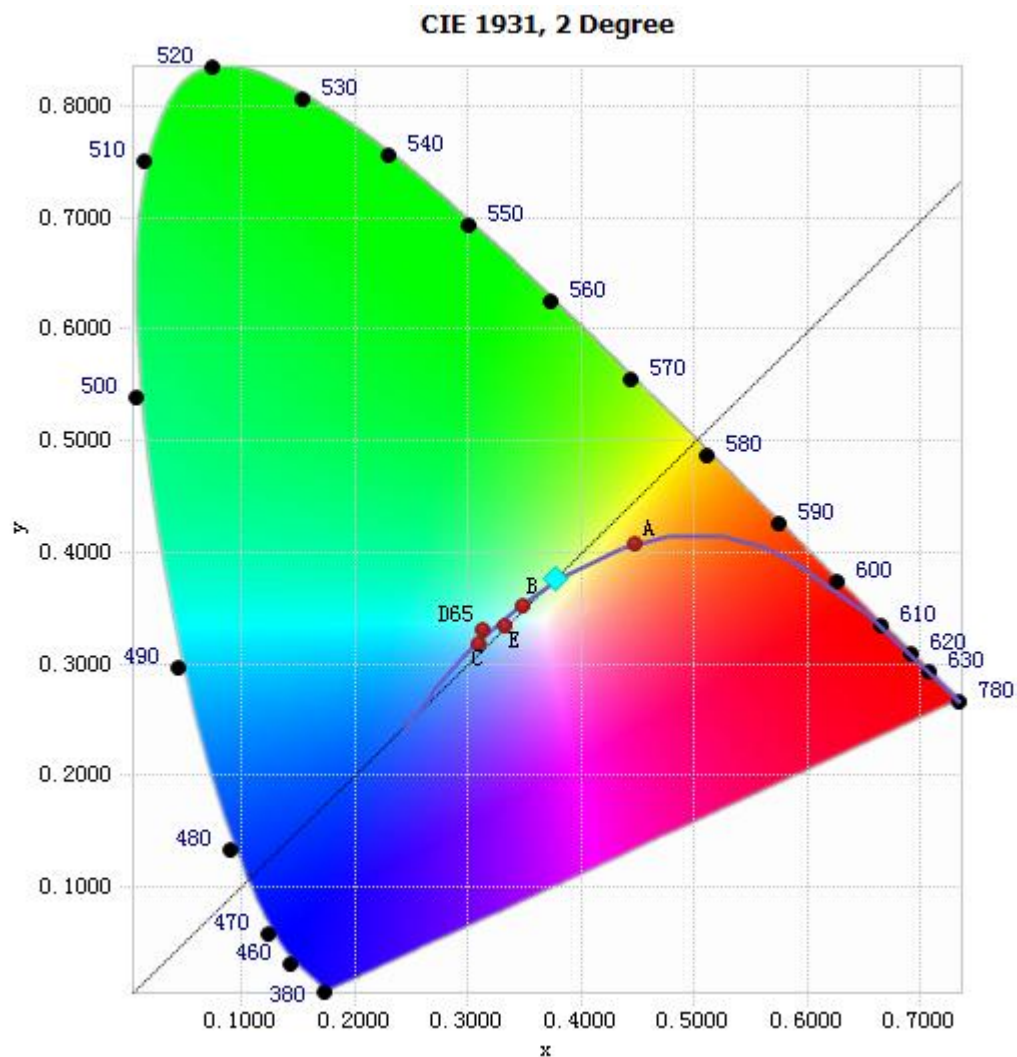


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.81E-04	485	1.15E-02	590	3.68E-02	695	5.07E-03
385	1.69E-04	490	1.31E-02	595	3.68E-02	700	4.34E-03
390	1.72E-04	495	1.55E-02	600	3.63E-02	705	3.70E-03
395	1.94E-04	500	1.81E-02	605	3.57E-02	710	3.14E-03
400	2.07E-04	505	2.05E-02	610	3.45E-02	715	2.69E-03
405	3.18E-04	510	2.25E-02	615	3.29E-02	720	2.31E-03
410	5.80E-04	515	2.41E-02	620	3.11E-02	725	1.97E-03
415	1.11E-03	520	2.52E-02	625	2.92E-02	730	1.66E-03
420	2.06E-03	525	2.60E-02	630	2.68E-02	735	1.41E-03
425	3.91E-03	530	2.68E-02	635	2.47E-02	740	1.19E-03
430	7.13E-03	535	2.74E-02	640	2.24E-02	745	1.01E-03
435	1.23E-02	540	2.82E-02	645	2.02E-02	750	8.59E-04
440	2.14E-02	545	2.90E-02	650	1.80E-02	755	7.35E-04
445	3.52E-02	550	2.99E-02	655	1.59E-02	760	6.28E-04
450	4.15E-02	555	3.07E-02	660	1.40E-02	765	5.32E-04
455	3.18E-02	560	3.16E-02	665	1.23E-02	770	4.59E-04
460	2.26E-02	565	3.28E-02	670	1.07E-02	775	3.97E-04
465	1.81E-02	570	3.38E-02	675	9.28E-03	780	3.28E-04
470	1.36E-02	575	3.49E-02	680	8.02E-03		
475	1.09E-02	580	3.59E-02	685	6.93E-03		
480	1.06E-02	585	3.65E-02	690	5.93E-03		

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

## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3770, 0.3766)

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

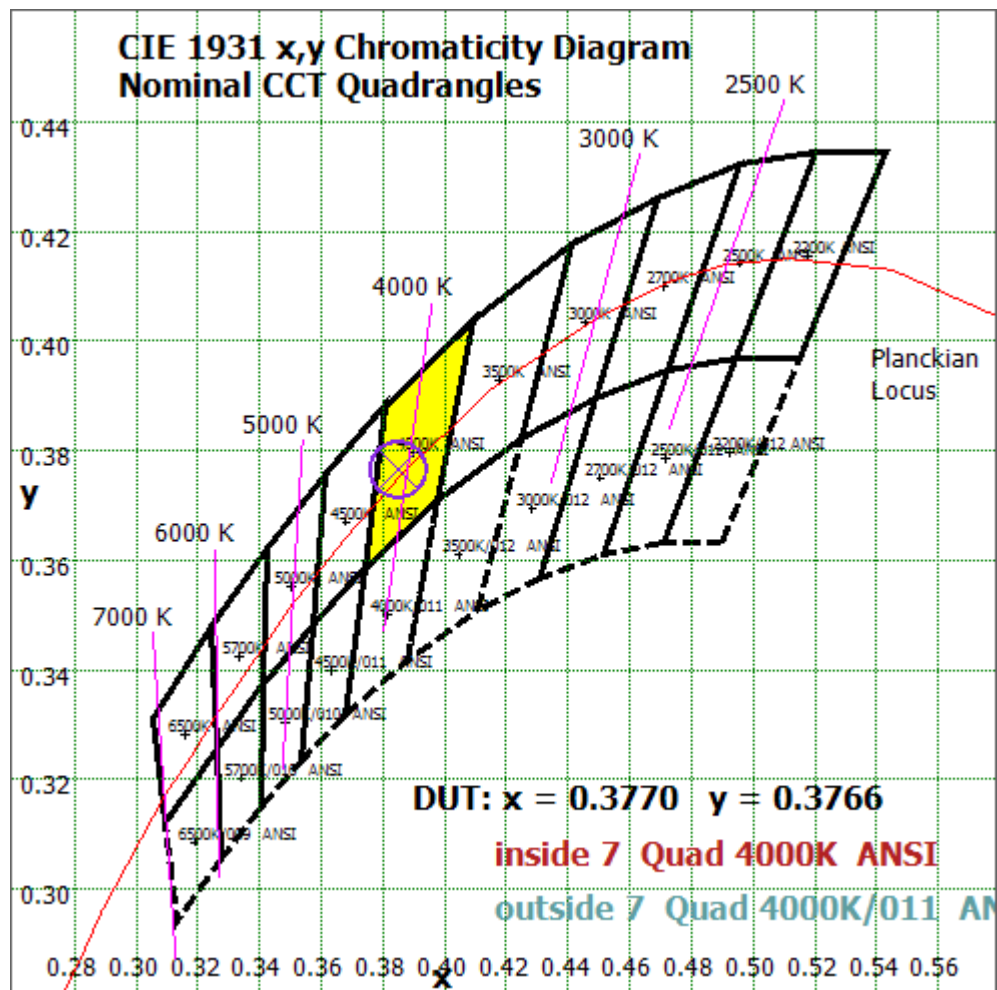


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

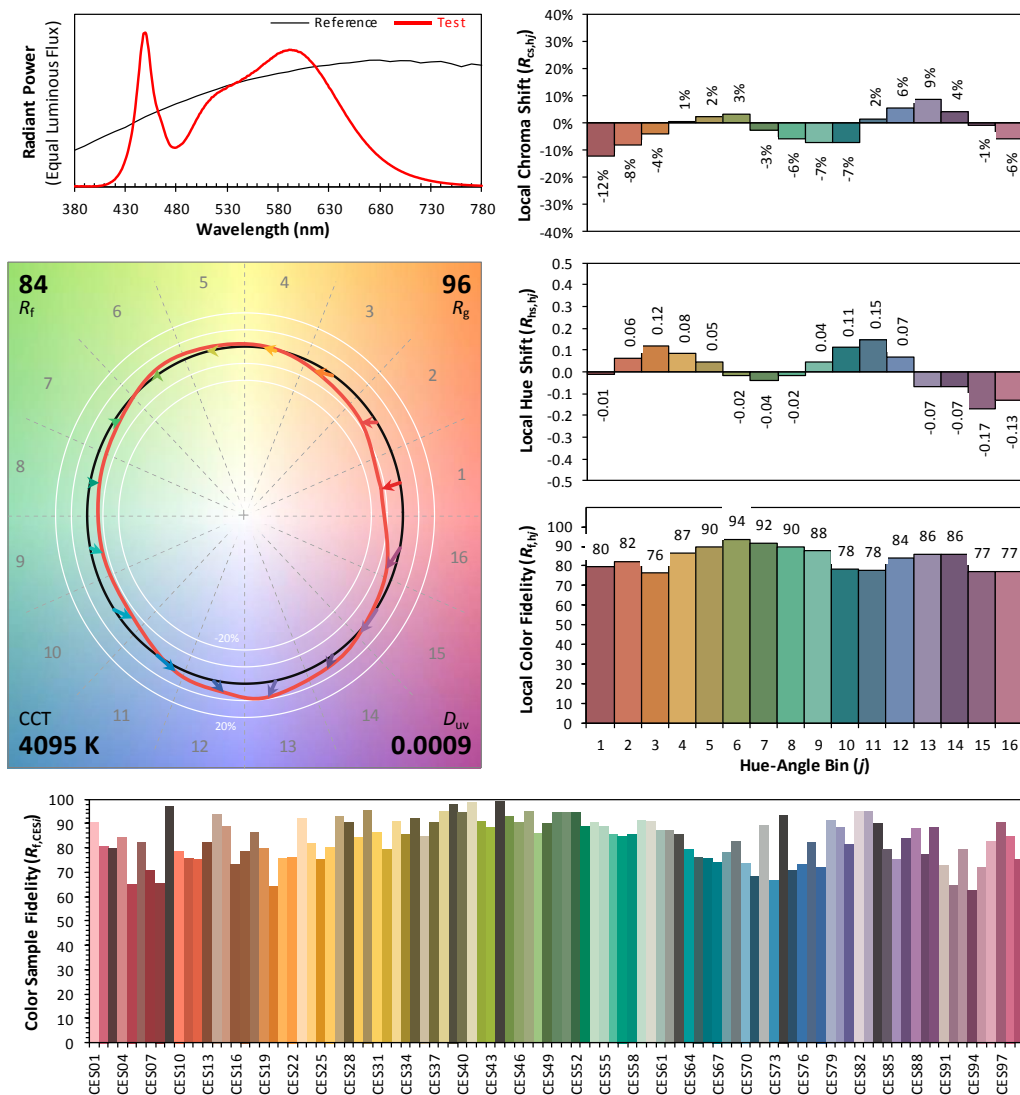
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/07/29

Model: 14.5T5HE/4F/840/BYP/R



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

$x$  0.3770  
 $y$  0.3766  
 $u'$  0.2229  
 $v'$  0.5010

CIE 13.3-1995  
(CRI)  
 $R_a$  82  
 $R_9$  4

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	32.504	1.50%
10- 20	94.699	4.38%
20- 30	148.668	6.88%
30- 40	189.897	8.78%
40- 50	215.267	9.96%
50- 60	223.599	10.34%
60- 70	216.081	9.99%
70- 80	196.392	9.08%
80- 90	171.582	7.93%
90-100	148.285	6.86%
100-110	127.343	5.89%
110-120	108.703	5.03%
120-130	91.131	4.21%
130-140	73.738	3.41%
140-150	56.758	2.62%
150-160	39.452	1.82%
160-170	21.336	0.99%
170-180	6.944	0.32%
Total	2162.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	904.634	41.84%
60- 90	584.055	27.01%
0-90	1488.69	68.84%
90- 180	673.69	31.16%
0- 180	2162.4	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

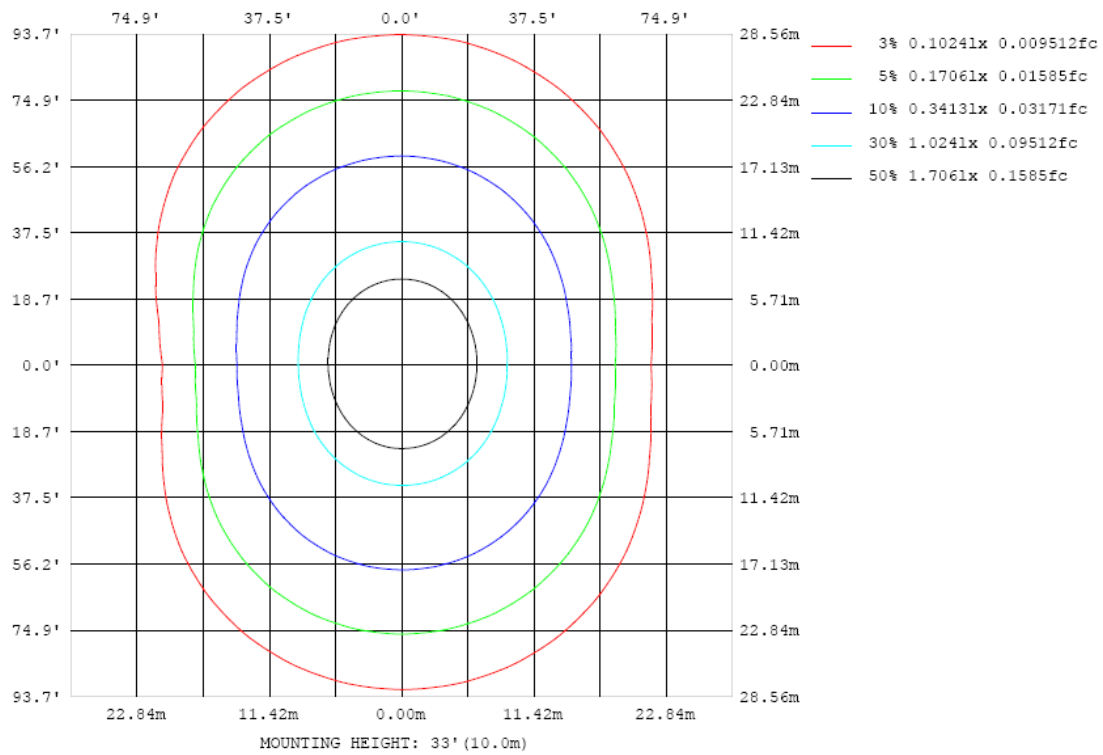


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

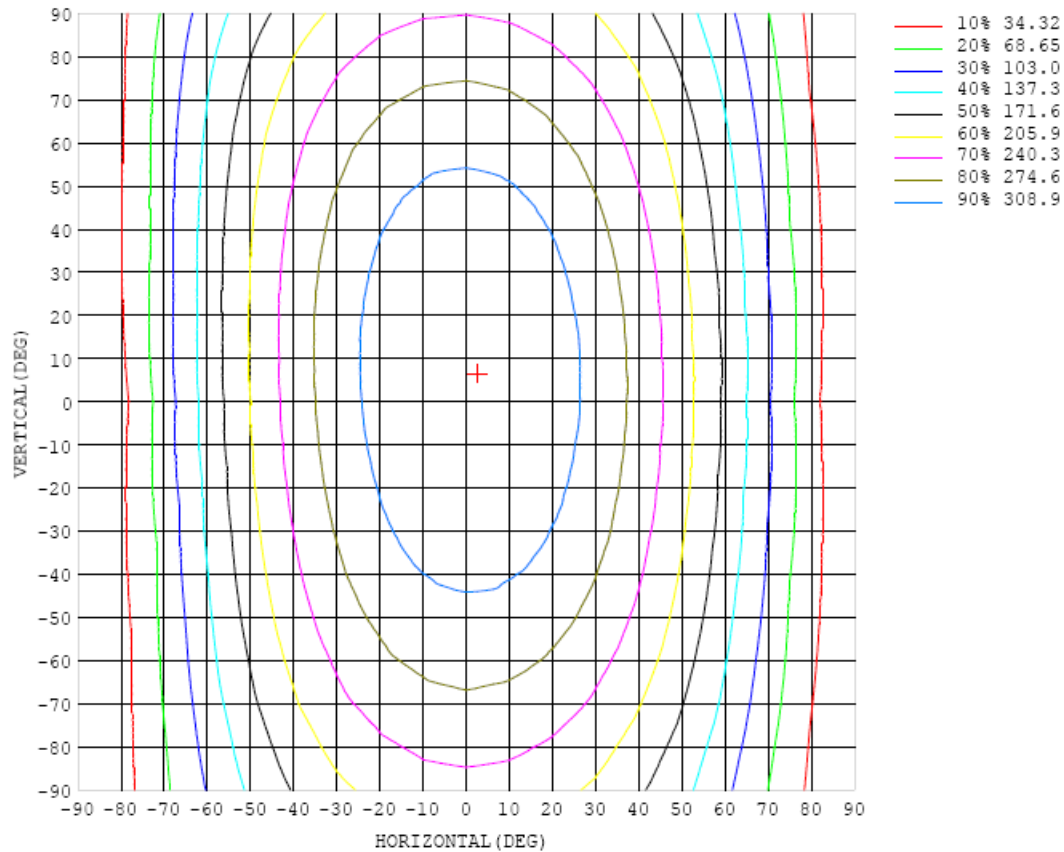


Chart 6: Isocandela Plot

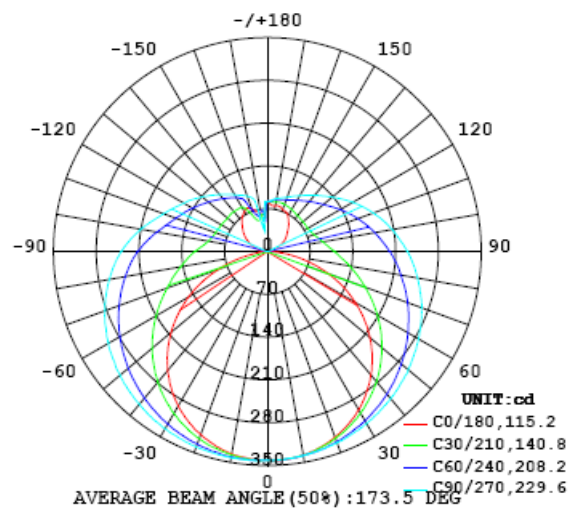


Chart 7: Polar Candela Distribution

## 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	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341
5	341	341	341	341	341	341	341	341	341	341	340	341	340	340	340	340	340	340	340
10	338	338	338	338	339	339	339	339	339	339	338	338	338	337	337	336	335	336	336
15	332	332	333	333	333	335	336	336	337	336	336	335	334	332	331	330	329	329	329
20	323	324	324	325	327	330	331	333	333	333	333	331	329	326	324	321	320	319	318
25	312	313	314	316	319	323	326	329	329	329	329	326	323	319	315	311	308	307	306
30	299	299	301	305	310	316	320	323	325	325	324	321	316	311	304	299	295	292	292
35	282	283	286	292	299	306	312	317	319	320	319	315	308	302	293	285	278	275	274
40	264	265	270	278	287	297	305	311	313	314	312	308	300	291	279	269	260	255	254
45	243	244	252	262	274	286	296	303	308	308	306	300	291	279	265	252	240	233	231
50	219	222	231	245	260	274	286	295	300	301	299	292	281	267	251	233	218	208	206
55	193	197	210	227	245	262	276	286	292	293	291	284	271	255	235	214	195	182	178
60	166	171	187	208	230	250	265	277	284	286	283	275	261	242	220	195	171	154	149
65	137	144	163	189	215	237	255	268	275	277	274	265	251	230	205	176	147	124	118
70	106	116	140	171	200	224	244	259	267	269	266	256	241	218	190	158	124	94.7	85.5
75	75.2	88.1	118	153	185	212	233	248	257	259	256	246	230	207	177	141	102	67.0	53.5
80	45.8	62.4	98.1	137	171	199	222	238	247	250	246	236	219	194	164	127	84.6	44.1	25.0
85	19.8	42.1	81.6	122	158	187	212	228	237	240	236	226	209	184	153	114	70.7	28.2	5.33
90	2.91	27.8	68.3	110	147	176	200	217	226	230	226	216	198	174	143	105	62.9	21.2	1.37
95	2.06	21.3	60.3	99.8	136	165	189	205	215	218	215	205	188	164	134	97.6	58.0	20.9	5.02
100	5.43	20.9	55.3	92.3	127	155	179	195	204	208	204	195	178	155	126	91.8	55.6	24.5	10.9
105	10.1	23.9	52.5	86.3	118	146	168	184	193	196	193	184	169	146	119	87.5	55.6	30.0	17.5
110	15.7	28.4	52.1	81.4	111	137	158	173	182	184	182	173	158	138	113	84.0	57.3	36.5	24.7
115	22.4	34.0	53.4	78.0	104	128	147	162	170	173	171	162	149	130	107	82.4	60.2	42.9	31.8
120	29.5	39.8	55.5	76.5	98.6	120	138	151	159	161	159	152	139	122	103	81.9	63.4	49.4	38.8
125	35.9	45.4	58.4	76.2	94.6	112	128	140	147	150	148	141	130	116	99.4	82.1	66.9	55.7	45.7
130	41.2	50.8	61.7	76.1	91.5	107	120	130	136	138	137	131	122	110	96.7	82.4	69.8	61.0	51.9
135	46.8	56.5	64.9	76.1	89.1	102	113	121	127	129	128	123	116	106	94.6	83.0	72.8	65.8	58.1
140	54.0	62.4	68.8	76.7	87.2	97.7	107	114	118	120	119	116	110	102	92.8	83.4	75.4	70.3	64.7
145	60.5	67.1	72.3	77.9	85.7	94.3	102	107	111	113	112	109	105	98.2	91.2	84.1	77.7	72.9	71.2
150	67.4	70.4	75.5	79.6	84.8	91.0	96.9	101	104	106	105	103	99.8	95.1	89.8	84.6	79.7	75.9	75.4
155	71.6	73.7	78.3	81.0	84.8	88.9	92.8	96.1	98.4	99.6	99.6	98.3	95.7	92.3	88.6	84.7	78.8	77.4	78.5
160	73.5	76.4	79.7	82.3	84.6	87.6	90.0	92.3	93.9	94.8	94.8	94.0	92.5	90.0	87.4	85.2	81.6	76.4	73.5
165	76.2	78.7	80.4	83.0	85.0	86.5	88.1	89.2	90.2	90.9	91.0	90.6	89.7	88.5	86.8	83.8	79.6	73.1	68.0
170	76.7	78.4	80.3	82.2	84.2	85.7	86.6	87.2	87.7	87.9	88.1	88.1	87.7	87.3	85.7	83.4	78.5	70.9	67.8
175	76.0	78.6	80.1	81.4	82.2	82.9	83.5	84.0	84.4	84.6	84.8	84.7	84.6	84.5	83.4	81.3	77.6	70.7	64.3
180	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3

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	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341		
5	340	341	341	341	342	342	342	342	342	343	343	343	343	342	342	342	342		
10	337	337	338	340	340	341	342	342	342	343	343	342	342	341	339	339	338		
15	330	331	333	335	337	339	340	341	341	342	341	340	339	337	335	334	333		
20	321	323	326	329	332	335	337	339	340	340	339	337	335	331	329	327	325		
25	308	312	317	321	327	331	334	336	338	338	336	333	329	324	320	316	314		
30	294	299	306	313	320	326	331	334	335	334	331	327	322	316	310	304	300		
35	277	284	293	302	312	320	326	329	331	330	326	321	313	305	297	290	285		
40	258	267	279	291	302	313	320	325	326	325	321	314	304	293	283	273	266		
45	236	248	263	279	293	305	314	319	321	319	314	305	294	280	267	255	246		
50	213	227	246	265	282	297	307	313	315	314	306	296	282	267	250	234	223		
55	187	205	228	251	271	288	299	306	308	306	299	286	270	252	232	213	199		
60	160	182	210	237	260	279	291	298	300	298	289	276	258	236	213	190	173		
65	132	160	192	223	248	269	283	290	292	289	280	265	245	221	193	167	146		
70	103	138	175	209	236	258	273	281	283	280	270	254	232	206	175	144	118		
75	75.8	117	159	195	225	248	263	271	273	269	259	242	219	191	158	121	89.1		
80	52.6	99.3	144	182	212	236	252	261	263	259	248	230	207	176	141	101	62.6		
85	36.6	84.9	131	169	201	225	240	249	251	247	236	218	194	163	126	83.1	40.5		
90	27.3	73.3	119	157	188	212	228	237	239	235	224	206	181	151	113	69.4	26.4		
95	25.2	64.6	107	145	175	198	214	223	225	221	210	192	168	138	99.9	58.1	19.0		
100	27.7	61.3	98.3	133	161	184	199	208	210	206	195	178	154	124	88.6	50.5	18.1		
105	32.4	60.9	93.3	124	150	170	185	193	195	191	180	163	142	114	81.2	48.2	21.9		
110	36.3	61.9	90.4	118	141	159	172	179	181	177	167	152	132	106	76.6	48.2	25.9		
115	40.6	63.8	88.4	113	134	151	161	168	169	165	156	143	123	99.6	74.3	50.5	29.7		
120	45.5	66.2	87.1	108	127	142	152	157	158	155	147	134	116	95.1	73.6	53.6	34.6		
125	49.5	68.7	86.0	104	120	134	143	148	149	146	138	126	110	92.3	73.6	56.3	38.6		
130	51.9	70.8	85.1	101	115	126	134	138	139	136	129	119	105	90.3	73.7	57.8	40.6		
135	53.2	72.3	85.7	97.9	110	119	126	130	130	128	121	112	101	87.8	74.7	59.0	41.3		
140	53.4	73.9	85.2	95.9	105	113	118	121	122	120	114	107	97.3	85.7	75.6	62.8	41.0		
145	54.7	71.5	84.7	93.7	101	107	112	114	114	113	108	102	93.2	85.0	75.5	63.8	42.8		
150	59.4	68.4	83.6	89.5	97.9	102	106	107	107	106	103	98.1	91.7	84.7	75.1	60.5	52.3		
155	67.4	58.5	71.9	81.0	83.8	94.9	100	102	101	101	98.6	95.3	89.9	83.9	67.4	49.8	61.0		
160	71.4	55.7	57.5	66.9	70.0	73.6	80.9	95.7	96.5	96.1	94.1	90.7	86.2	80.8	50.0	45.1	62.3		
165	64.7	59.5	53.0	52.8	54.7	59.8	61.7	61.2	89.3	89.9	83.8	79.3	63.4	46.0	42.4	50.2	64.8		
170	61.2	59.7	58.3	56.8	61.3	65.1	67.2	68.1	39.9	65.1	64.9	59.2	56.5	52.6	49.7	56.4	69.9		
175	58.0	58.4	59.7	60.2	62.3	63.5	62.9	50.0	56.5	61.6	66.8	65.6	66.0	66.0	67.6	72.2	74.5		
180	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3	81.3		

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, 2021	Aug. 04, 2022
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2021	Aug. 04, 2022
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2021	Aug. 04, 2022
Standard source	D908	HZTE012-01	Aug. 05, 2021	Aug. 04, 2022
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2021	Aug. 04, 2022
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2021	Aug. 04, 2022
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2021	Aug. 04, 2022
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2021	Aug. 04, 2022

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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