

## 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/835/BYP/R**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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Report No.: HZ22070025h

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/835/BYP/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
140.7	2045.3	14.54	0.9795
CCT (K)	CRI	Stabilization Time (Light & Power)	
3499	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/835/BYP/R
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz
<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)	0.124	0.057
Power Factor	0.9795	0.9364
Test Power (W)	14.54	14.76
THD A%	19.41	18.23
Luminous Efficacy (lm/W)	140.7	141.1
Total Luminous Flux (lm)	2045.3	2082.6
Color Rendering Index (CRI)	82.3	
R9	1.9	
Correlated Color Temperature (CCT)(K)	3499	
Chromaticity Chroma x	0.4065	
Chromaticity Chroma y	0.3939	
Chromaticity Chroma u	0.2351	
Chromaticity Chroma v	0.3418	
Duv	0.0011	
Chromaticity Chroma u'	0.2351	
Chromaticity Chroma v'	0.5128	

Special Color Rendering Indices	
R1	80.1
R2	89.5
R3	96.4
R4	80.9
R5	80.6
R6	86.6
R7	84
R8	59.8
R9	1.9
R10	76.1
R11	80.4
R12	67.2
R13	82.4
R14	98.4

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)	0.125
Power Factor	0.9772
Power (W)	14.67
Luminous Efficacy (lm/W)	140.8
Total Luminous Flux (lm)	2065.7
Beam Angle ( ° )	115.1 (0°-180°) / 233.0 (90°-270°)
Center Beam Candle Power (cd)	323
Maximum Beam Candle Power (cd)	325.2 (At: C=260.0, Gamma=11.0)
Spacing Criteria	1.32 (0°-180°) / 1.50 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	41.54%
Zonal Lumens in the 60 °-90 °Zone	26.94%
Zonal Lumens in the 90 °-120 °Zone	17.92%
Zonal Lumens in the 120 °-180 °Zone	13.60%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

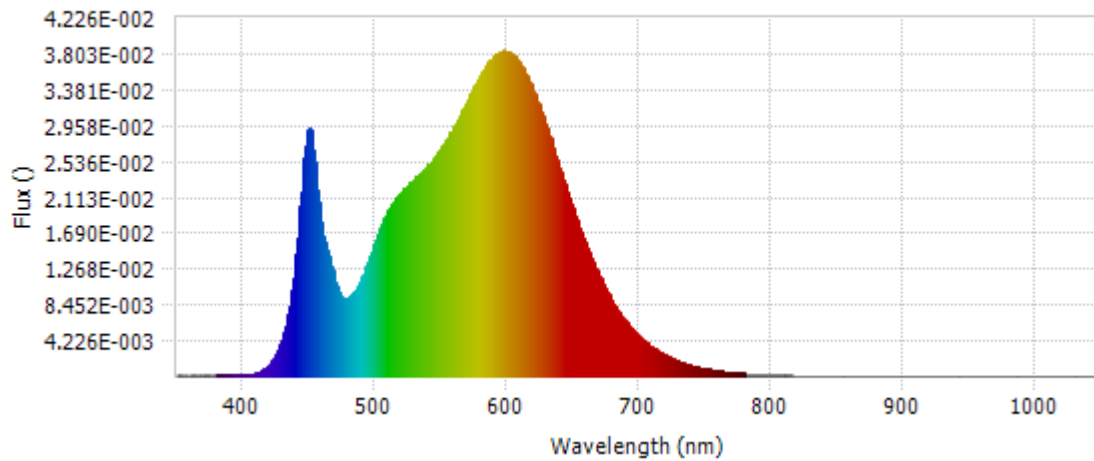
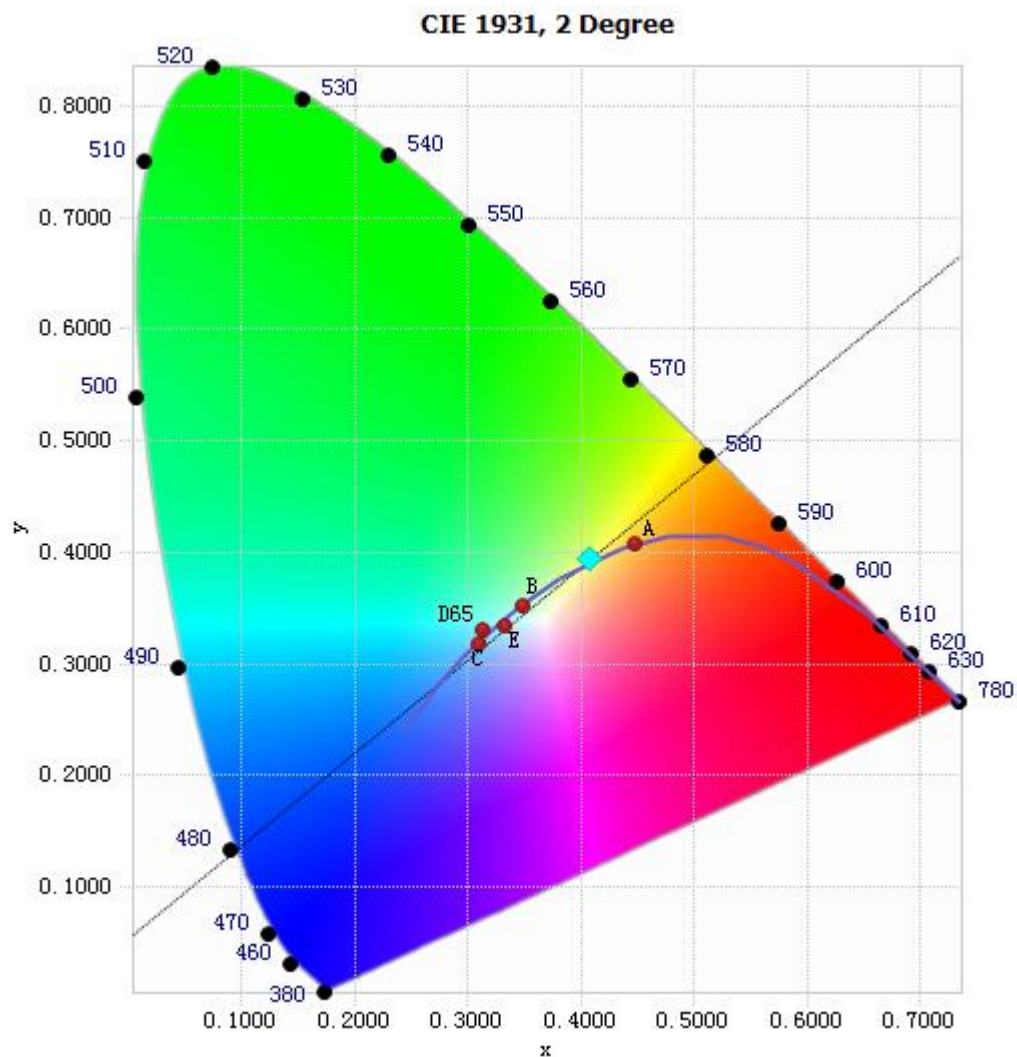


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.84E-04	485	1.02E-02	590	3.77E-02	695	5.56E-03
385	1.58E-04	490	1.17E-02	595	3.82E-02	700	4.73E-03
390	1.67E-04	495	1.39E-02	600	3.82E-02	705	4.07E-03
395	1.61E-04	500	1.60E-02	605	3.78E-02	710	3.42E-03
400	1.68E-04	505	1.79E-02	610	3.68E-02	715	2.92E-03
405	2.11E-04	510	1.96E-02	615	3.54E-02	720	2.50E-03
410	3.87E-04	515	2.09E-02	620	3.36E-02	725	2.13E-03
415	7.59E-04	520	2.18E-02	625	3.16E-02	730	1.79E-03
420	1.45E-03	525	2.25E-02	630	2.93E-02	735	1.52E-03
425	2.62E-03	530	2.33E-02	635	2.70E-02	740	1.28E-03
430	4.71E-03	535	2.40E-02	640	2.46E-02	745	1.10E-03
435	8.21E-03	540	2.49E-02	645	2.21E-02	750	9.25E-04
440	1.43E-02	545	2.59E-02	650	1.98E-02	755	7.91E-04
445	2.40E-02	550	2.69E-02	655	1.75E-02	760	6.62E-04
450	2.93E-02	555	2.81E-02	660	1.54E-02	765	5.69E-04
455	2.34E-02	560	2.94E-02	665	1.35E-02	770	4.81E-04
460	1.71E-02	565	3.10E-02	670	1.17E-02	775	4.12E-04
465	1.42E-02	570	3.25E-02	675	1.02E-02	780	3.51E-04
470	1.11E-02	575	3.42E-02	680	8.81E-03		
475	9.31E-03	580	3.57E-02	685	7.58E-03		
480	9.29E-03	585	3.70E-02	690	6.52E-03		

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

## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4065, 0.3939)

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

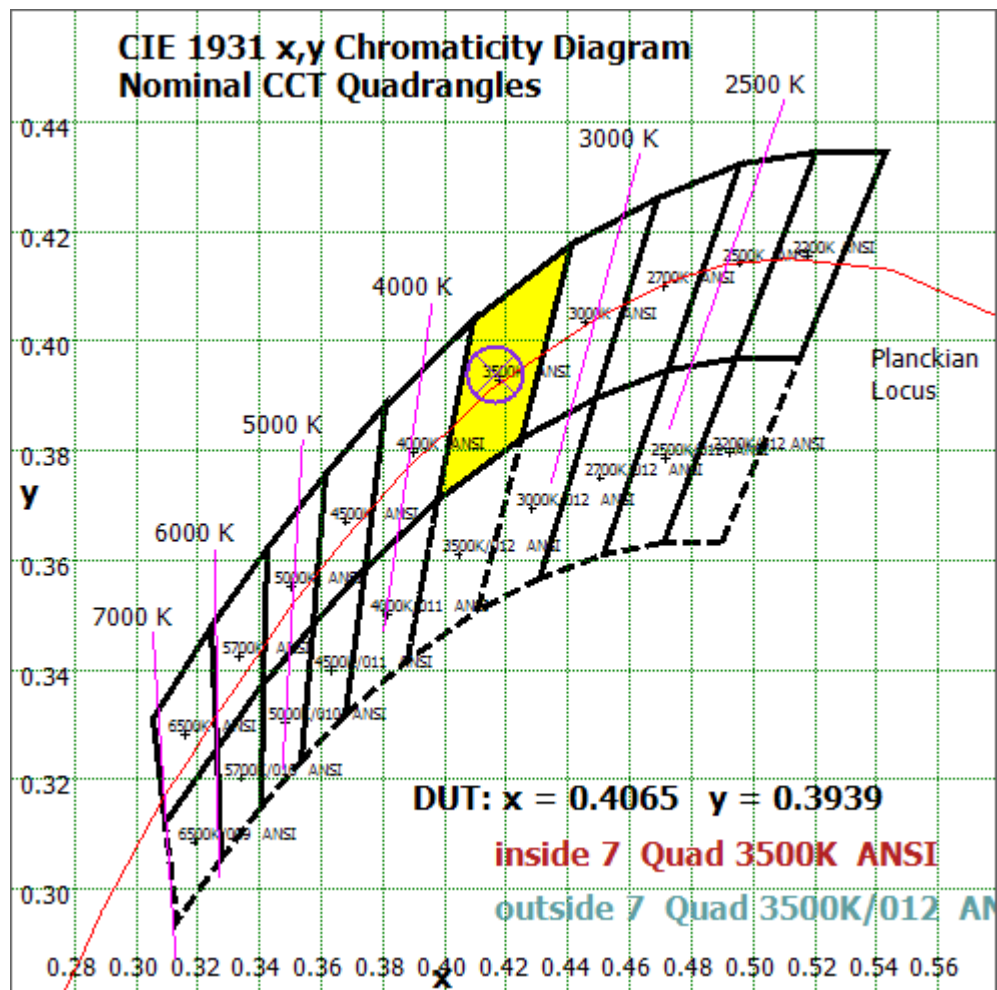


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

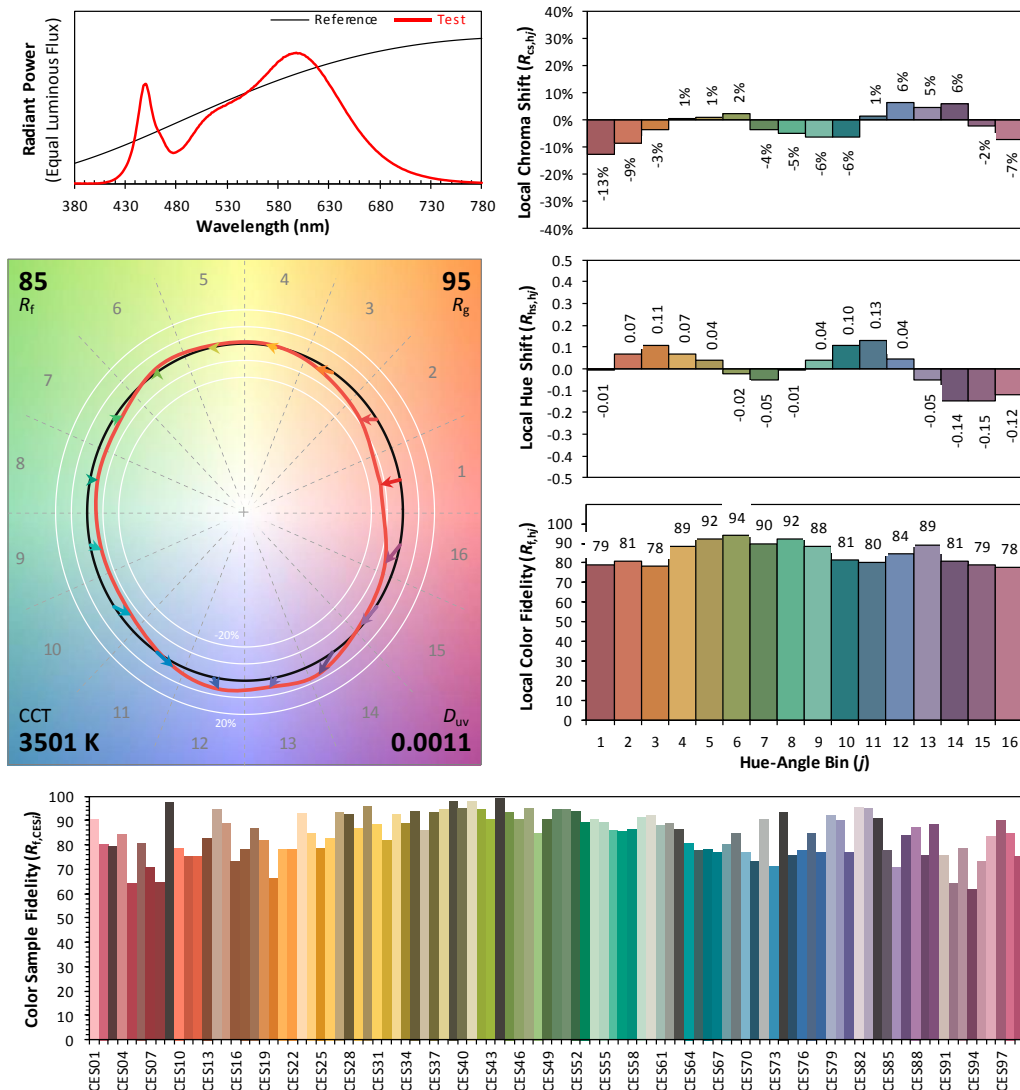
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/07/29

Model: 14.5T5HE/4F/835/BYP/R



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

$x$  0.4064  
 $y$  0.3939  
 $u'$  0.2351  
 $v'$  0.5128

CIE 13.3-1995  
(CRI)  
 $R_a$  82  
 $R_9$  2

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	30.733	1.49%
10- 20	89.591	4.34%
20- 30	140.772	6.81%
30- 40	180.061	8.72%
40- 50	204.393	9.89%
50- 60	212.545	10.29%
60- 70	205.563	9.95%
70- 80	187.098	9.06%
80- 90	163.88	7.93%
90-100	142.631	6.90%
100-110	122.837	5.95%
110-120	104.655	5.07%
120-130	87.775	4.25%
130-140	71.616	3.47%
140-150	55.381	2.68%
150-160	38.712	1.87%
160-170	21.031	1.02%
170-180	6.392	0.31%
Total	2065.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	858.095	41.54%
60- 90	556.541	26.94%
0-90	1414.64	68.48%
90- 180	651.03	31.52%
0- 180	2065.7	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

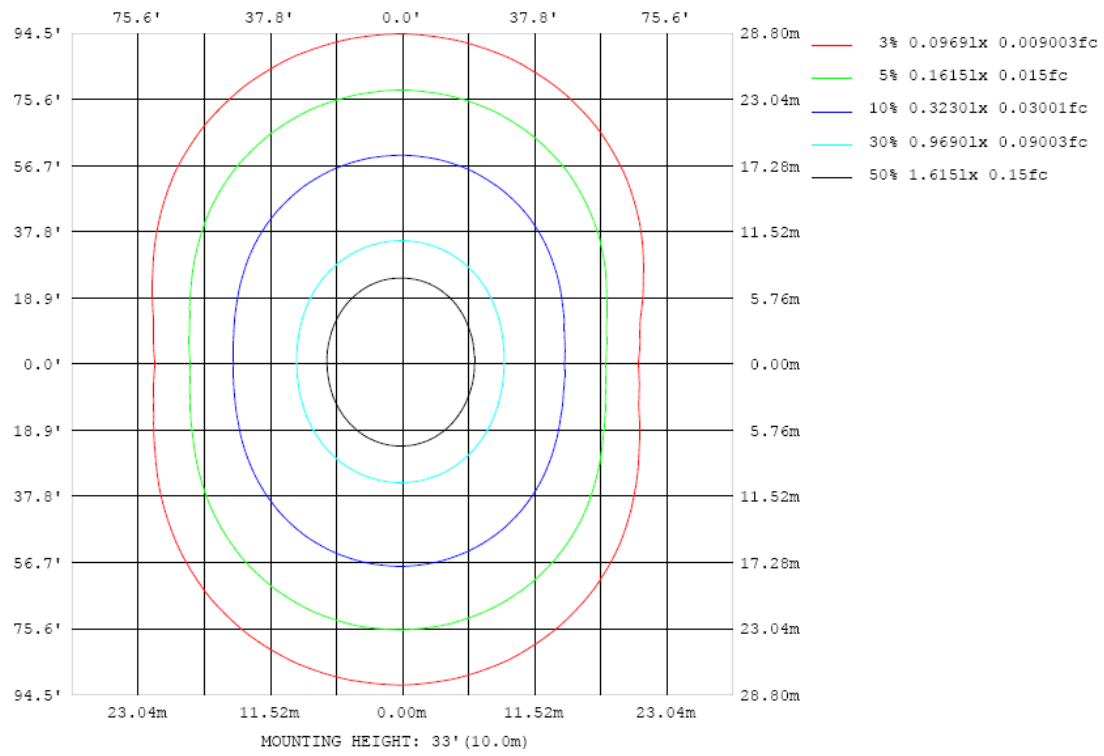


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

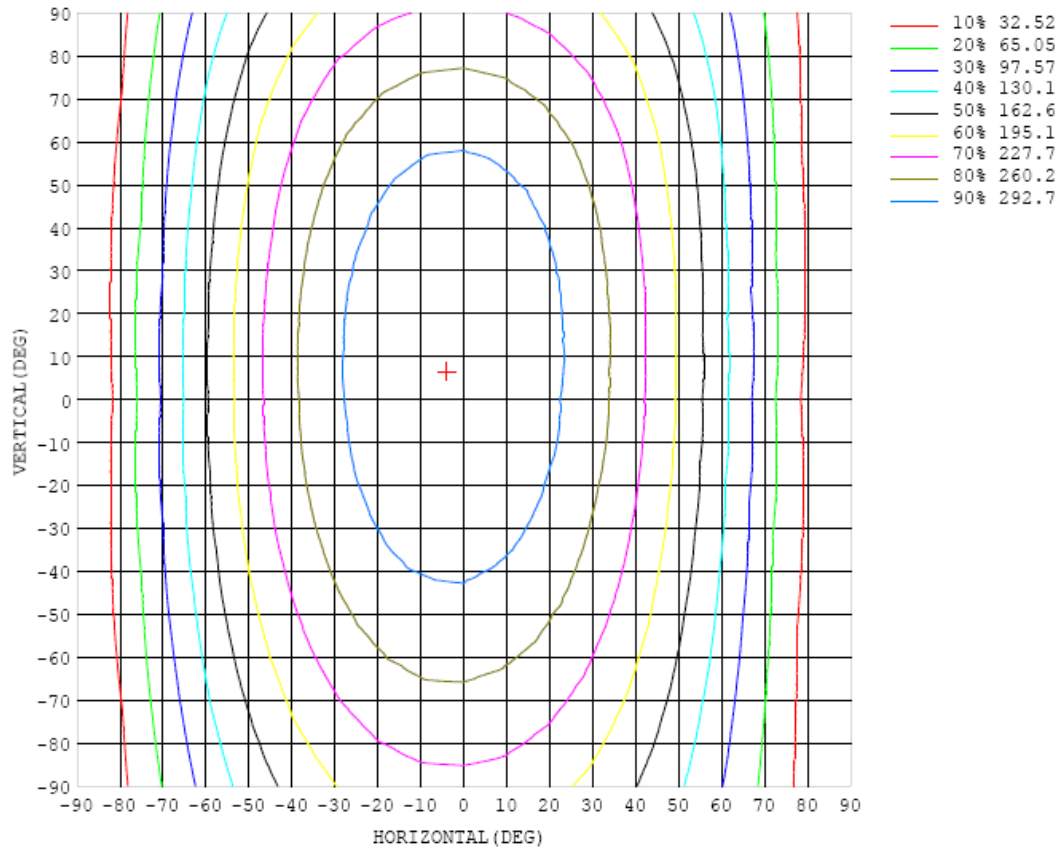


Chart 6: Isocandela Plot

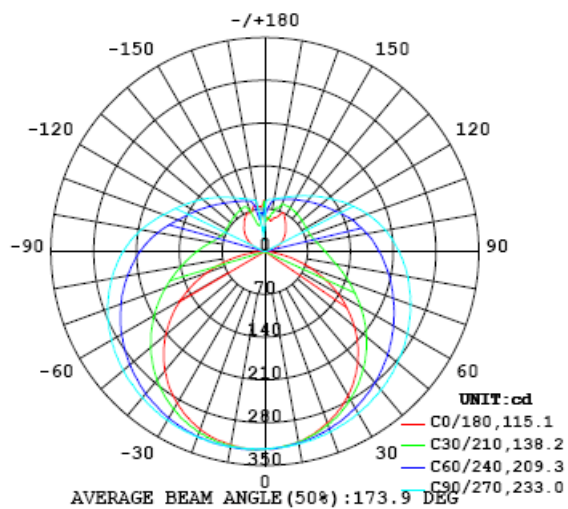


Chart 7: Polar Candela Distribution

## Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323
5	321	320	321	321	321	321	321	321	322	322	323	323	323	323	323	322	323	324	324
10	317	315	316	316	317	317	318	319	319	319	320	321	321	321	321	320	321	321	321
15	309	308	309	310	311	312	314	315	316	317	318	318	318	318	317	316	316	316	317
20	298	299	300	301	303	306	309	311	313	314	314	315	315	312	311	310	309	309	309
25	286	287	289	292	294	299	303	307	309	310	311	310	310	307	305	302	300	299	299
30	272	273	276	279	284	290	296	301	304	306	306	306	303	299	296	293	289	286	287
35	255	256	260	266	273	281	288	295	299	301	302	300	297	292	286	280	276	272	272
40	236	238	243	250	260	271	280	288	292	296	296	294	289	282	275	267	260	255	255
45	214	217	224	234	247	259	272	281	286	290	290	287	281	273	262	252	242	236	234
50	191	194	204	217	233	248	262	273	279	283	283	280	272	262	248	235	224	215	212
55	165	169	182	199	218	237	253	265	272	277	276	272	263	250	235	218	203	191	187
60	139	144	159	181	204	225	243	256	265	270	268	263	253	239	220	200	180	165	160
65	110	117	138	163	190	214	233	248	257	261	261	255	243	227	205	182	158	140	131
70	79.9	89.6	116	147	177	202	223	240	249	254	253	246	234	215	191	164	136	112	101
75	50.8	63.8	95.9	132	164	192	214	231	241	245	245	237	223	204	177	148	114	84.3	70.4
80	24.6	41.6	79.2	118	153	181	205	222	233	238	236	228	214	192	164	132	94.3	59.0	41.7
85	5.79	26.2	66.6	107	144	172	196	213	224	228	227	219	204	182	154	119	78.0	38.1	16.7
90	0.96	19.7	58.9	98.6	135	163	187	205	215	219	218	209	194	172	144	108	66.3	25.0	1.96
95	3.82	18.5	54.1	92.0	127	156	178	195	206	210	208	200	185	163	134	98.9	59.0	20.1	2.00
100	8.50	21.7	51.3	86.5	120	148	169	186	196	200	198	190	175	154	126	91.9	54.3	20.3	6.01
105	14.1	27.1	51.8	81.9	113	139	160	176	186	190	188	180	165	145	118	85.9	51.8	23.6	10.6
110	20.3	33.5	53.5	79.3	106	131	152	166	175	179	177	169	156	136	110	81.3	52.0	29.5	16.2
115	26.3	39.4	56.6	78.2	102	123	142	156	164	167	166	158	146	127	104	78.6	53.5	35.2	22.0
120	32.2	45.4	59.7	78.0	98.0	117	133	146	154	156	155	148	136	119	98.9	77.0	56.3	41.4	28.3
125	37.7	51.4	63.4	78.6	95.4	111	126	136	143	145	144	138	127	113	95.2	76.6	59.9	47.6	35.2
130	43.0	57.3	66.7	79.1	93.2	107	119	128	133	136	134	129	120	107	92.4	77.0	63.4	53.2	41.8
135	48.2	62.3	69.7	80.2	91.6	103	113	120	125	127	125	121	113	103	90.2	78.0	66.8	57.9	47.7
140	52.9	66.3	72.8	81.1	90.2	99.2	107	113	117	119	117	114	107	98.8	88.7	79.0	70.1	62.7	53.2
145	58.5	69.6	74.9	81.9	89.0	95.9	102	107	110	111	110	107	102	95.5	87.8	80.0	73.0	67.1	58.8
150	64.7	73.3	77.7	83.0	88.0	93.4	98.2	102	104	105	104	102	97.7	92.7	86.7	80.7	75.3	71.2	64.6
155	69.8	75.9	75.4	82.8	87.5	90.8	94.3	97.0	98.5	99.1	98.5	96.8	94.1	90.5	85.9	81.2	77.8	74.1	68.3
160	60.9	70.6	78.1	82.6	86.2	89.1	91.2	92.8	93.8	94.3	94.0	93.0	91.3	88.7	85.9	82.9	80.3	78.4	68.2
165	56.9	62.2	68.8	75.0	84.2	87.2	88.7	89.6	90.2	90.5	90.2	89.7	88.7	87.2	86.1	84.6	82.6	81.8	74.9
170	51.1	55.1	58.1	63.7	71.0	80.1	86.3	87.3	87.4	87.5	87.3	87.1	86.8	86.3	85.8	85.0	83.3	81.3	74.5
175	55.8	57.2	55.9	54.2	58.1	65.9	74.2	81.2	84.5	85.7	85.9	85.6	85.6	85.5	85.2	84.5	81.7	78.6	74.3
180	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1

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	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323	323		
5	323	324	324	325	325	325	325	325	324	324	323	324	323	323	322	322	322		
10	321	323	322	324	325	324	324	324	325	323	323	322	321	320	319	317	317		
15	317	319	320	321	323	324	324	325	324	323	322	320	319	316	313	311	310		
20	311	312	315	317	320	322	323	323	323	321	320	317	314	310	305	303	301		
25	301	303	307	311	315	319	320	322	321	319	317	313	308	302	296	293	288		
30	289	293	298	304	309	315	318	319	319	317	314	308	301	293	285	280	274		
35	275	279	287	295	303	309	313	316	316	314	309	302	294	283	273	265	258		
40	258	265	275	285	295	304	309	312	312	309	304	296	285	272	260	248	240		
45	238	248	260	273	285	296	303	307	307	304	299	288	276	260	245	230	219		
50	217	229	244	260	276	288	297	302	302	300	293	280	265	247	228	210	197		
55	193	208	227	247	265	280	290	296	297	293	285	272	255	234	211	190	172		
60	167	186	209	233	254	271	282	289	290	286	277	263	244	220	194	168	146		
65	140	163	191	218	242	261	274	280	282	279	269	254	233	205	176	146	119		
70	112	140	173	204	230	251	264	272	274	269	260	243	221	192	160	124	92.6		
75	84.3	118	155	190	218	240	255	263	265	260	250	232	209	179	144	105	67.7		
80	59.3	98.2	139	176	205	228	244	253	254	250	240	222	198	166	130	87.4	46.3		
85	38.3	81.3	124	162	193	216	233	242	244	239	229	211	186	155	117	73.9	31.0		
90	24.9	68.2	112	150	181	205	221	230	232	228	217	200	175	143	106	64.2	22.5		
95	18.2	58.3	99.6	137	168	192	208	217	220	215	205	187	162	131	95.4	55.7	19.9		
100	17.6	51.0	89.1	125	155	178	194	203	206	201	191	174	150	120	86.6	52.3	22.3		
105	22.1	48.6	81.2	114	142	164	180	189	191	187	177	161	139	112	81.6	50.9	26.2		
110	25.5	47.7	76.5	106	131	151	166	174	177	173	164	149	130	105	78.7	53.6	29.8		
115	32.7	51.4	73.7	99.2	122	141	154	162	164	161	153	140	122	99.8	76.0	55.8	35.9		
120	36.9	54.1	73.5	94.4	115	132	143	151	153	150	143	131	115	95.6	76.6	57.9	41.0		
125	41.5	56.2	73.1	91.1	108	123	134	140	143	140	134	124	109	93.6	75.8	60.2	45.5		
130	46.2	61.6	74.3	88.4	103	116	125	131	133	131	126	116	105	90.5	76.1	64.7	48.6		
135	50.6	65.6	75.1	86.9	98.7	109	117	122	124	122	118	110	100	87.5	76.1	68.4	50.4		
140	53.0	69.0	76.6	85.7	95.1	104	110	115	116	115	111	104	94.9	85.1	77.1	70.9	51.3		
145	52.1	72.4	78.0	84.9	92.2	98.7	104	107	109	107	104	98.2	91.5	84.7	78.4	74.1	51.2		
150	49.2	73.7	79.4	84.0	89.8	94.6	98.7	101	102	100	98.1	94.1	89.1	81.7	79.0	76.1	49.2		
155	47.4	63.0	80.6	83.5	87.7	91.3	94.3	95.8	96.1	95.4	93.8	90.7	78.5	78.4	74.5	69.2	48.1		
160	51.1	46.7	69.2	83.2	86.2	88.1	90.2	91.6	91.8	91.4	90.7	74.4	70.4	67.5	64.6	55.1	48.9		
165	51.7	43.6	45.8	57.5	79.1	83.9	87.0	88.2	87.9	86.0	65.2	60.0	59.7	57.2	50.8	46.5	48.6		
170	56.6	42.7	46.6	50.4	48.5	54.9	63.8	70.4	84.1	44.9	57.1	56.9	55.3	52.6	50.5	48.4	46.3		
175	67.1	60.9	60.3	58.5	60.0	63.4	65.8	68.1	40.8	69.5	70.0	68.0	65.1	61.0	57.0	56.4	55.8		
180	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1	61.1		

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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