

## 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: 15T8/4F/840/HYB/R**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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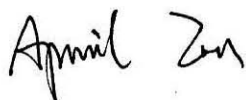
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[www.ledtestlab.com](http://www.ledtestlab.com)

Report No.: HZ22120037e

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

Review by:



Engineer: April Zou  
Jan. 05, 2023

Approved by:



Manager: Jim Zhang  
Jan. 05, 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: 15T8/4F/840/HYB/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)/2	Power Factor
130.5	2310.5	17.71	0.9949
CCT (K)	CRI	Stabilization Time (Light & Power)	
4054	82.8	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** : Dec. 27, 2022

**Date of Test** : Dec. 28, 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

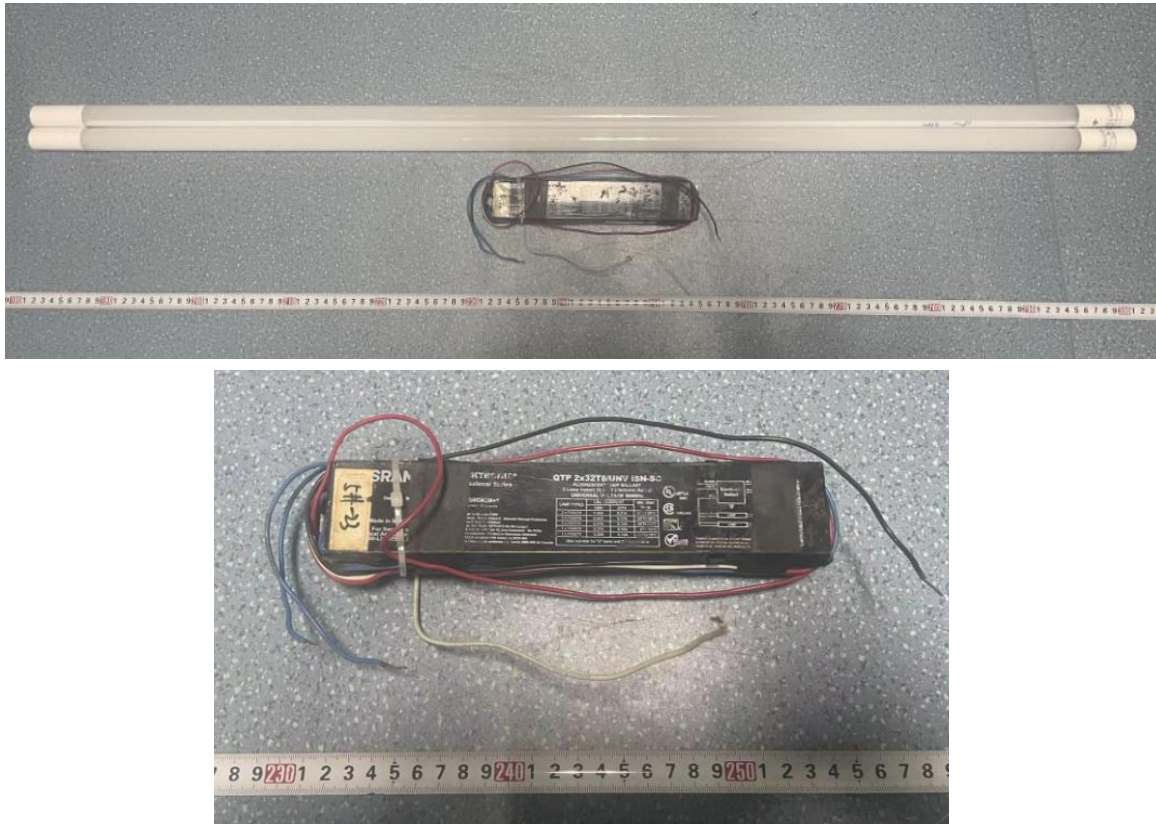


Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: 15T8/4F/840/HYB/R
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz
<b>Product Description</b>	: 4000K LED Tubes supplied by a high frequency fluorescent lamp ballast: QTP 2x32T8/UNV ISN-SC
<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)	0.297	0.131
Power Factor	0.9949	0.9682
Test Power (W)/2	17.71	17.58
THD A%	7.87	11.82
Luminous Efficacy (lm/W)	130.5	131.4
Total Luminous Flux (lm)	2310.5	2310.0
Color Rendering Index (CRI)	82.8	
R9	7	
Correlated Color Temperature (CCT)(K)	4054	
Chromaticity Chroma x	0.3789	
Chromaticity Chroma y	0.3786	
Chromaticity Chroma u	0.2233	
Chromaticity Chroma v	0.3348	
Duv	0.0013	
Chromaticity Chroma u'	0.2233	
Chromaticity Chroma v'	0.5022	

Special Color Rendering Indices	
R1	80.9
R2	87.9
R3	94
R4	83.1
R5	81.5
R6	84
R7	86.3
R8	64.9
R9	7
R10	72
R11	82.8
R12	65.2
R13	82.4
R14	96.8

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)	0.297
Power Factor	0.9954
Power (W)/2	17.73
Luminous Efficacy (lm/W)	131.2
Total Luminous Flux (lm)	2325.6
Beam Angle ( ° )	110.8 (0°-180°) / 207.9 (90°-270°)
Center Beam Candle Power (cd)	411
Maximum Beam Candle Power (cd)	411.6 (At: C=110.0, Gamma=5.0)
Spacing Criteria	1.28 (0°-180°) / 1.42 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.53%
Zonal Lumens in the 60 °-90 °Zone	26.64%
Zonal Lumens in the 90 °-120 °Zone	17.25%
Zonal Lumens in the 120 °-180 °Zone	11.59%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

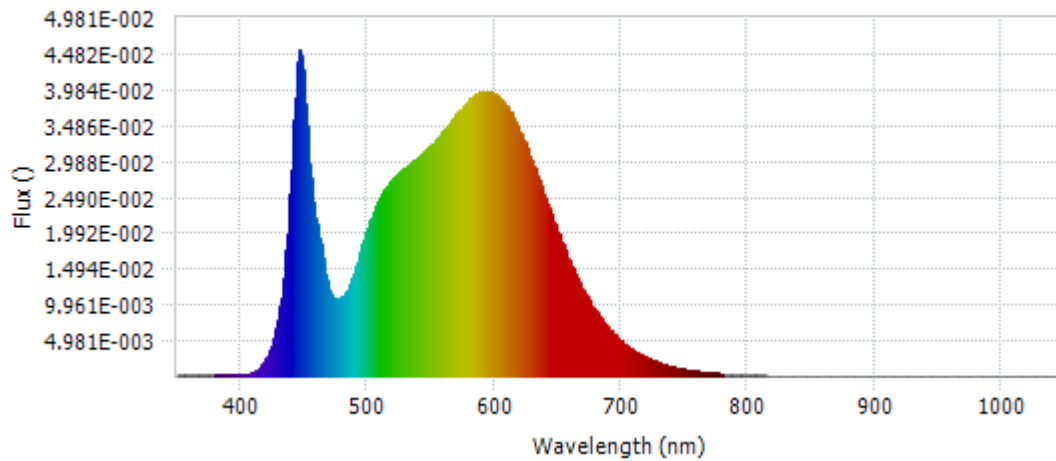


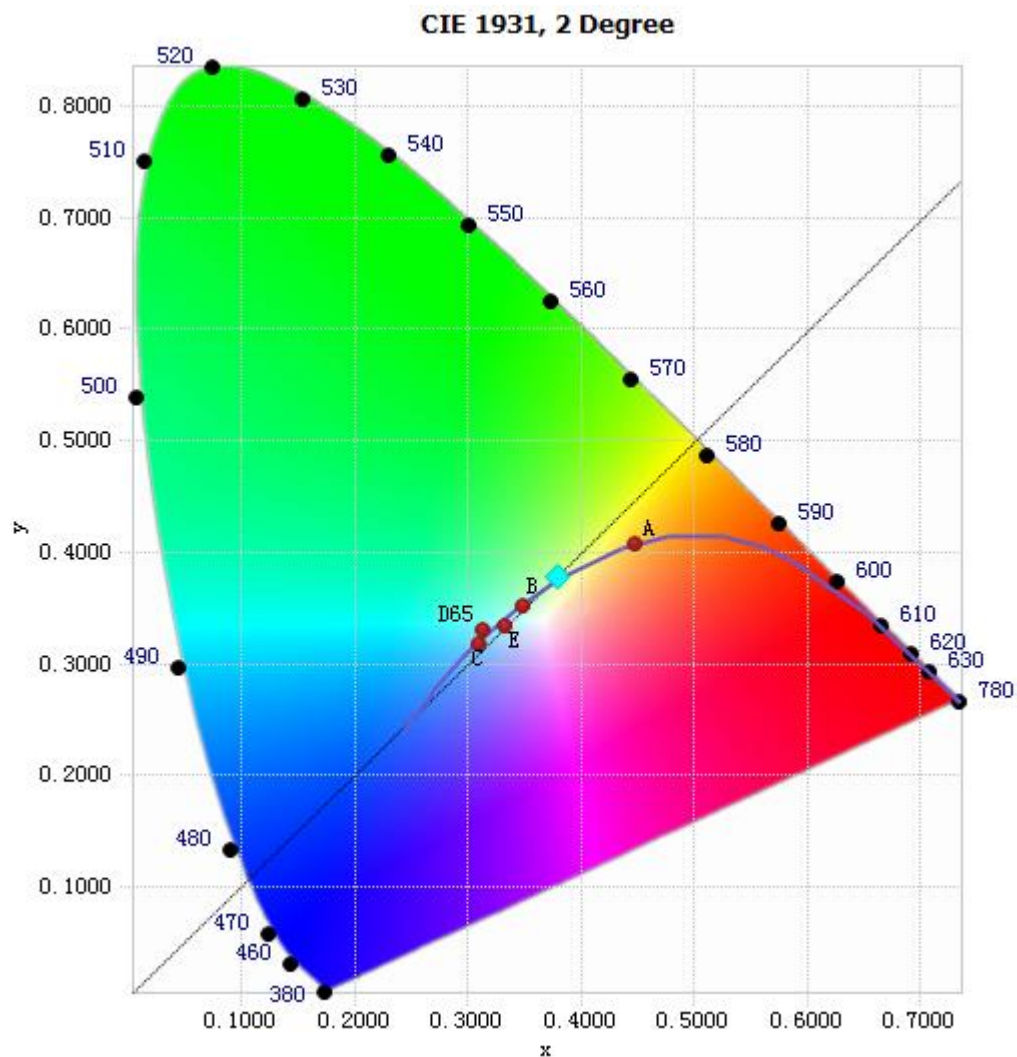
Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.28E-04	485	1.24E-02	590	3.94E-02	695	5.75E-03
385	2.08E-04	490	1.48E-02	595	3.95E-02	700	4.91E-03
390	1.94E-04	495	1.77E-02	600	3.93E-02	705	4.20E-03
395	1.96E-04	500	2.06E-02	605	3.85E-02	710	3.55E-03
400	1.49E-04	505	2.30E-02	610	3.75E-02	715	3.05E-03
405	2.72E-04	510	2.49E-02	615	3.60E-02	720	2.63E-03
410	5.97E-04	515	2.64E-02	620	3.40E-02	725	2.22E-03
415	1.21E-03	520	2.74E-02	625	3.20E-02	730	1.89E-03
420	2.38E-03	525	2.83E-02	630	2.97E-02	735	1.60E-03
425	4.68E-03	530	2.89E-02	635	2.73E-02	740	1.36E-03
430	8.67E-03	535	2.97E-02	640	2.49E-02	745	1.16E-03
435	1.56E-02	540	3.03E-02	645	2.25E-02	750	9.82E-04
440	2.87E-02	545	3.12E-02	650	2.01E-02	755	8.43E-04
445	4.37E-02	550	3.21E-02	655	1.78E-02	760	7.20E-04
450	4.04E-02	555	3.31E-02	660	1.57E-02	765	6.15E-04
455	2.75E-02	560	3.41E-02	665	1.38E-02	770	5.31E-04
460	2.11E-02	565	3.52E-02	670	1.21E-02	775	4.37E-04
465	1.63E-02	570	3.64E-02	675	1.05E-02	780	3.82E-04
470	1.19E-02	575	3.72E-02	680	9.07E-03		
475	1.07E-02	580	3.84E-02	685	7.82E-03		
480	1.10E-02	585	3.91E-02	690	6.70E-03		

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



## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3789, 0.3786)

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

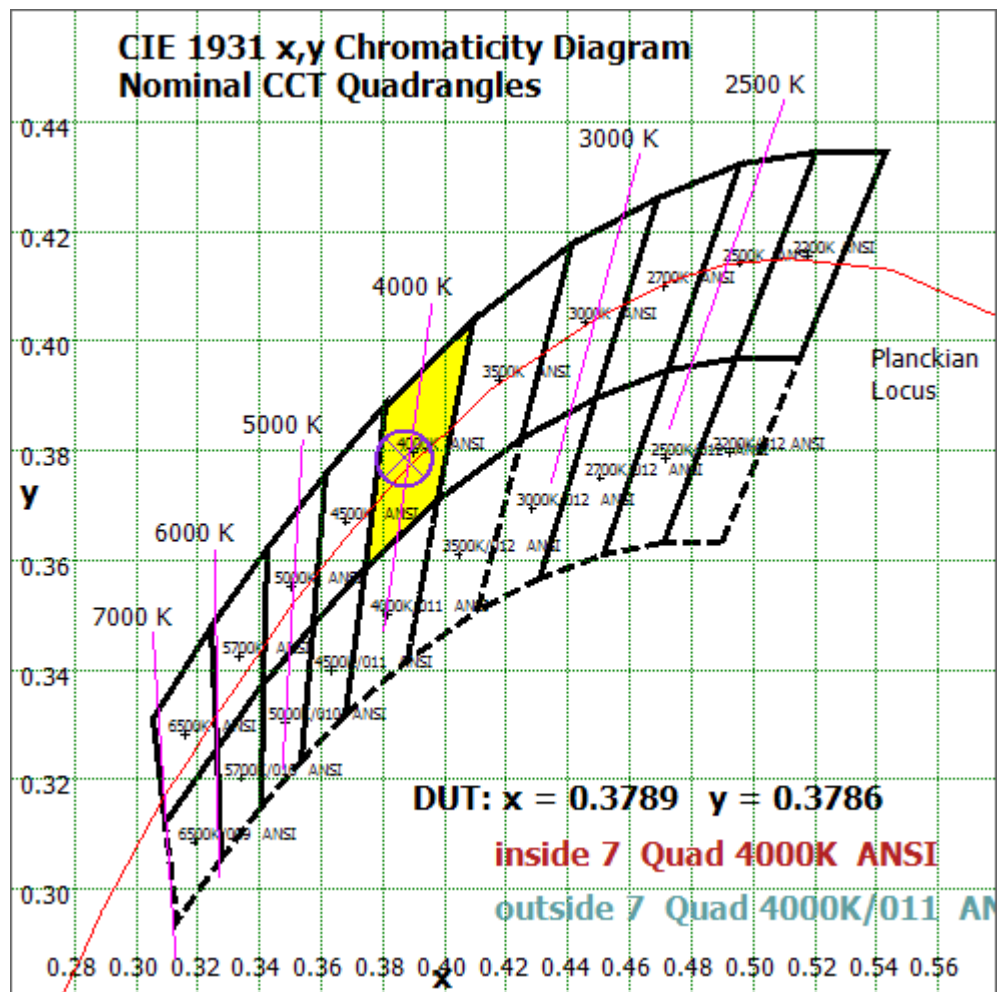


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

## Color Rendition Report – Sphere Spectroradiometer Method

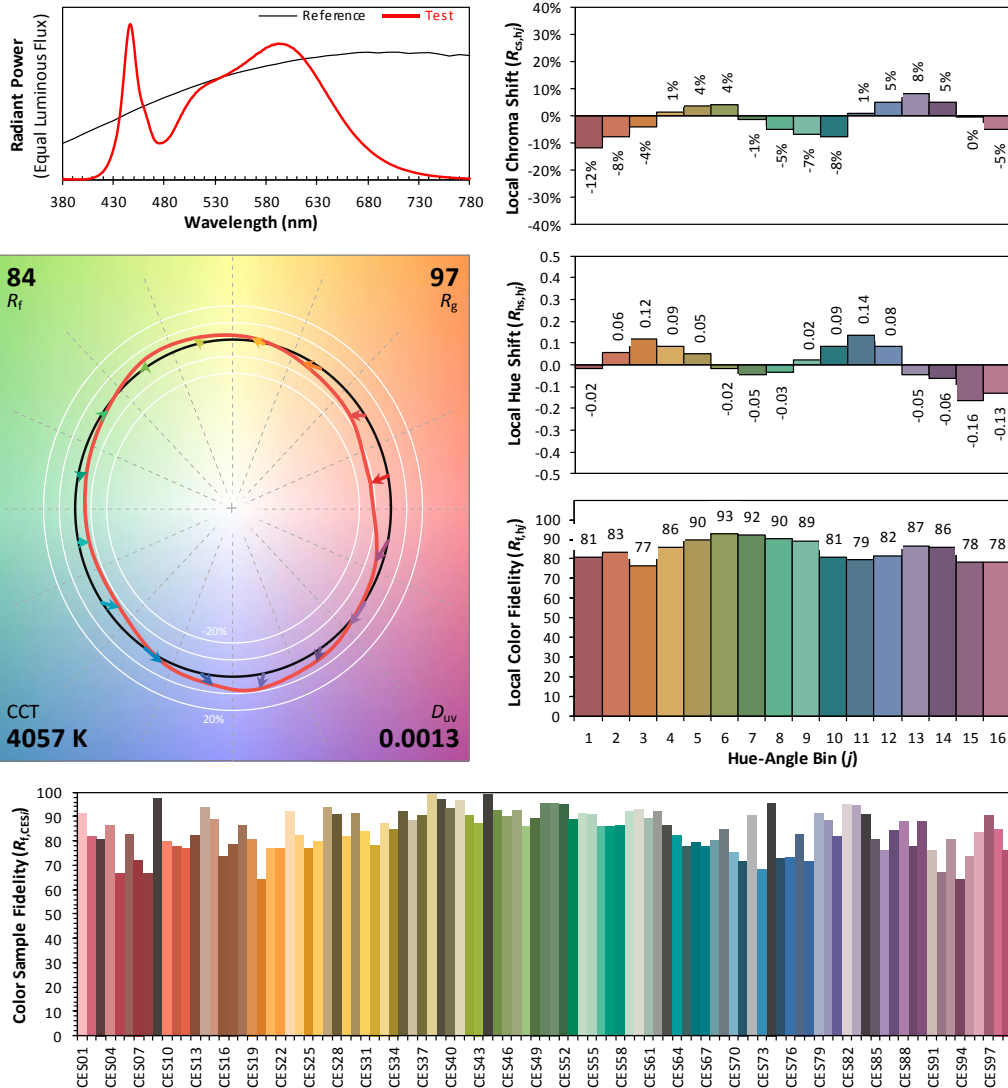
### ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/12/28

Model: 15T8/4F/840/HYB/R



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

$x$  0.3789  
 $y$  0.3786  
 $u'$  0.2233  
 $v'$  0.5022

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 2.00.

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	38.988	1.68%
10- 20	112.77	4.85%
20- 30	174.727	7.51%
30- 40	219.187	9.43%
40- 50	243.156	10.46%
50- 60	246.756	10.61%
60- 70	233.093	10.02%
70- 80	207.659	8.93%
80- 90	178.668	7.68%
90-100	154.278	6.63%
100-110	133.294	5.73%
110-120	113.482	4.88%
120-130	93.597	4.02%
130-140	73.79	3.17%
140-150	53.475	2.30%
150-160	33.16	1.43%
160-170	13.377	0.58%
170-180	2.111	0.09%
Total	2325.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1035.58	44.53%
60- 90	619.42	26.64%
0-90	1655	71.17%
90- 180	670.564	28.83%
0- 180	2325.6	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

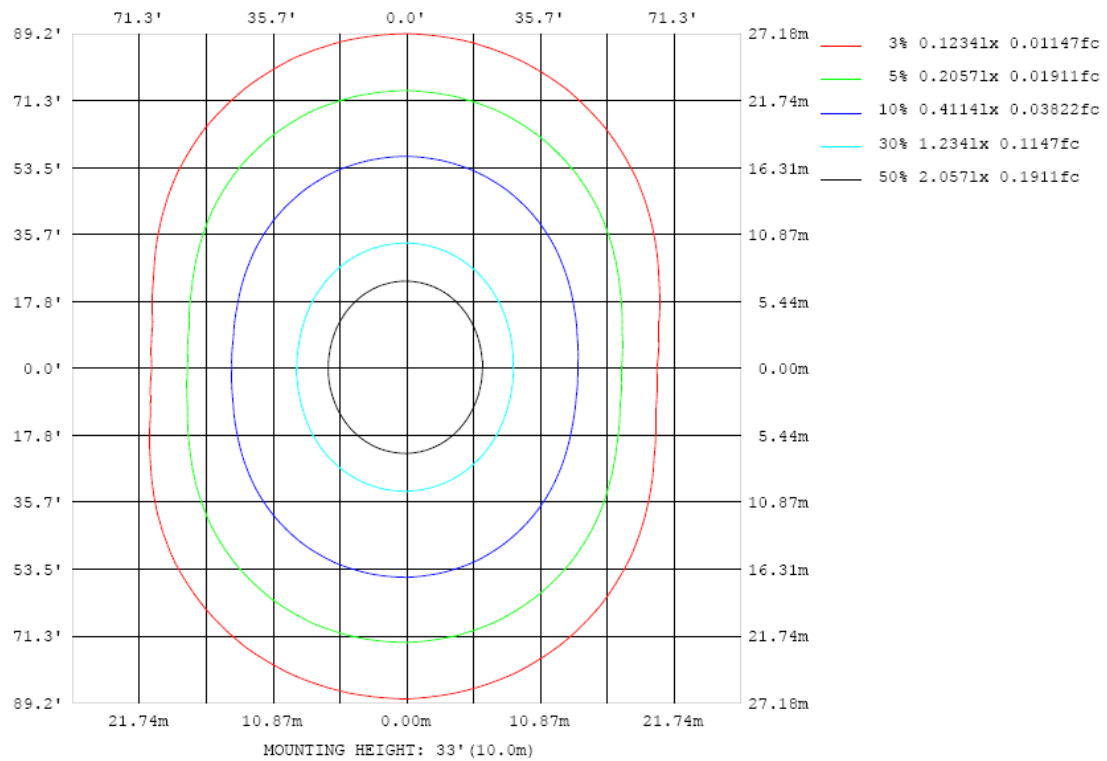


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

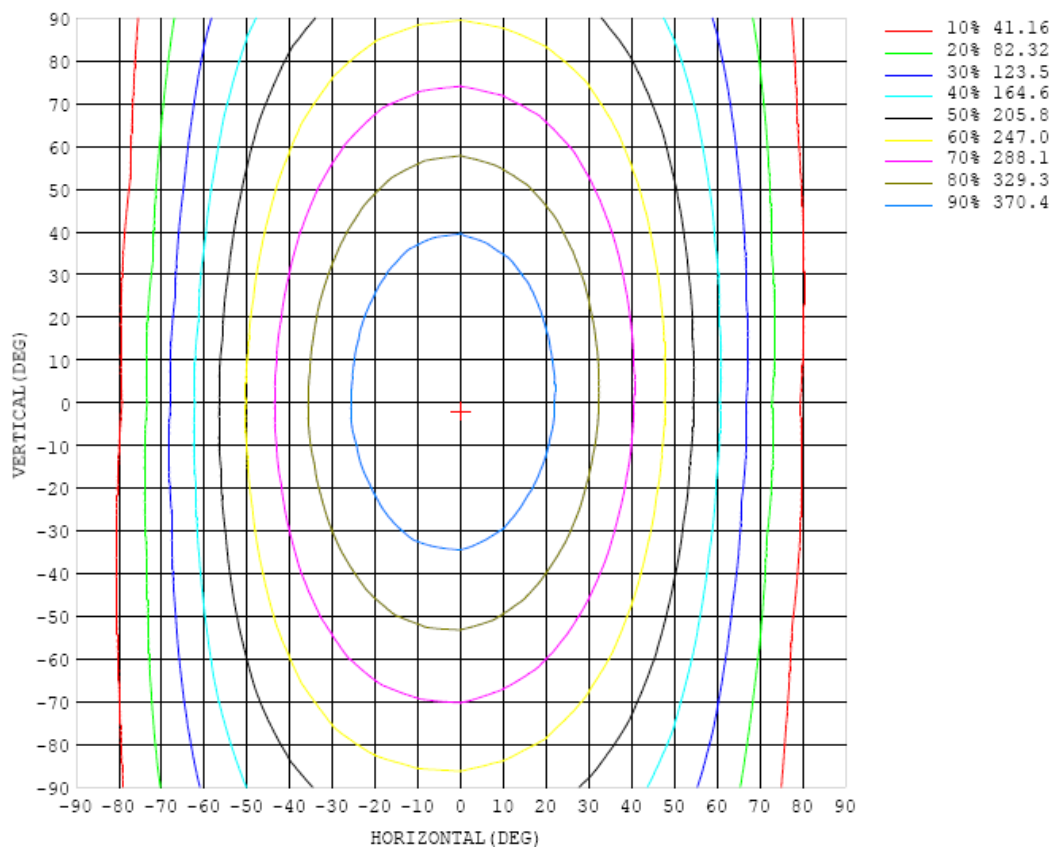


Chart 6: Isocandela Plot

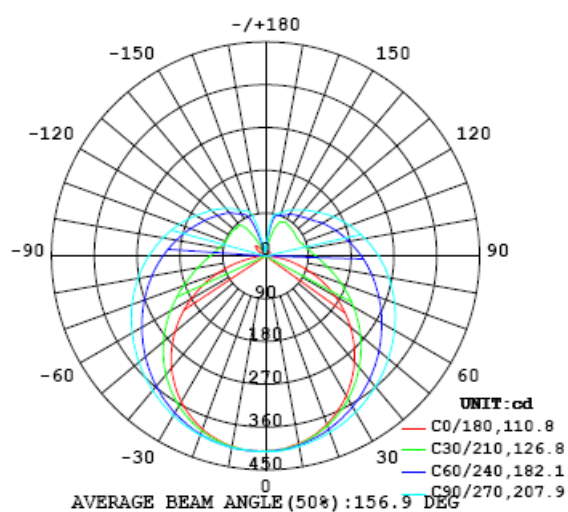


Chart 7: Polar Candela Distribution

## 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	411	411	411	411	411	411	411	411	411	411	411	411	411	411	411	411	411	411	411
5	408	408	408	408	409	409	410	410	410	411	411	412	412	411	411	411	411	411	410
10	401	402	402	403	403	403	404	405	406	407	407	406	407	408	408	408	407	407	407
15	391	391	392	393	394	396	397	398	400	401	401	402	401	401	401	400	400	400	399
20	377	377	378	380	382	385	388	391	393	395	395	396	393	393	391	390	389	389	388
25	359	360	361	365	369	374	378	382	385	388	387	388	385	383	379	377	374	374	373
30	340	340	343	348	354	360	366	372	376	379	379	378	375	371	366	362	357	356	354
35	316	317	321	328	336	345	353	361	365	369	369	368	363	358	350	344	337	334	332
40	290	292	297	306	318	329	340	349	355	359	359	357	351	343	334	324	315	310	308
45	263	265	272	284	298	313	326	337	344	349	348	345	338	328	316	302	290	283	280
50	233	236	245	261	278	296	311	324	332	337	337	333	324	312	297	280	264	253	249
55	202	205	218	237	259	279	297	311	320	325	324	320	310	296	278	258	237	222	216
60	169	173	190	214	239	262	282	298	307	313	312	307	297	280	259	235	209	189	181
65	136	141	162	191	220	246	268	285	295	301	300	295	283	264	241	212	182	156	145
70	101	109	136	169	202	230	253	272	283	289	287	281	269	249	223	191	156	123	108
75	67.8	78.9	111	149	185	216	240	259	270	276	275	269	255	235	207	172	132	92.0	70.6
80	37.9	52.6	89.9	132	170	202	227	245	257	263	262	255	242	220	192	155	111	65.6	36.6
85	12.8	31.4	73.4	117	156	188	214	233	244	250	249	242	228	207	178	140	95.4	47.1	10.3
90	0.79	19.8	62.6	105	144	176	201	220	232	238	236	230	216	194	165	128	83.8	36.6	1.04
95	0.95	15.6	55.5	96.3	134	165	189	208	219	225	223	217	203	182	154	118	76.0	32.9	1.84
100	2.54	16.5	52.0	89.3	124	154	178	195	207	212	211	204	191	171	144	110	71.3	33.7	3.32
105	5.83	20.2	50.0	84.4	117	145	167	184	194	200	199	192	180	160	135	104	69.8	37.5	5.06
110	8.99	25.4	50.6	79.5	110	136	157	173	183	188	187	181	169	151	127	98.9	69.4	42.7	6.30
115	12.0	31.5	53.2	77.1	103	128	147	162	171	176	175	170	158	142	121	95.5	70.3	49.1	7.88
120	11.8	33.8	57.1	76.2	98.1	119	138	152	160	165	164	159	149	134	115	93.4	72.3	55.8	12.4
125	5.74	28.6	61.9	76.6	95.1	112	128	141	150	154	153	149	140	127	110	92.1	74.5	61.8	19.5
130	2.44	29.0	67.3	77.8	92.6	108	121	131	138	143	142	139	132	120	107	91.7	75.4	64.5	26.5
135	2.67	34.4	69.2	78.6	91.5	104	115	124	131	134	133	130	124	115	103	91.2	79.0	66.3	30.1
140	3.87	34.3	68.0	80.0	91.1	101	110	118	123	126	125	123	117	110	101	89.4	80.1	62.4	24.5
145	6.20	24.6	63.7	80.3	88.5	98.8	106	112	116	118	118	116	112	106	97.3	87.8	83.4	62.7	19.3
150	9.26	14.2	61.7	83.0	86.3	93.9	102	107	110	112	112	110	107	101	93.1	87.6	82.3	60.8	14.9
155	13.0	16.9	51.1	79.0	86.8	90.0	94.2	99.5	103	105	105	103	98.9	95.1	91.2	86.3	78.6	44.4	14.0
160	11.3	13.7	30.8	67.8	84.1	88.6	91.2	93.4	95.6	96.6	96.6	95.9	94.6	92.1	88.1	81.8	65.1	32.9	13.3
165	7.93	13.8	22.4	42.2	68.8	84.7	88.4	89.3	90.6	91.8	91.6	90.9	90.1	88.3	80.8	64.4	42.2	21.4	12.6
170	10.3	11.1	18.5	20.2	33.6	51.8	66.7	74.1	78.5	81.0	81.0	79.1	74.7	65.8	50.0	33.1	23.8	14.6	12.1
175	12.3	8.14	12.3	17.3	18.9	19.5	21.7	24.6	27.0	28.4	28.5	27.4	25.3	22.2	17.8	13.5	11.3	11.4	11.6
180	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8

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	411	411	411	411	411	411	411	411	411	411	411	411	411	411	411	411	411		
5	410	410	410	411	411	411	410	411	411	410	409	409	409	409	408	408	407		
10	407	407	408	408	409	410	409	409	409	408	406	406	405	404	402	402	401		
15	399	400	401	402	404	405	406	406	406	404	402	401	399	396	394	392	391		
20	388	390	392	394	396	400	401	401	401	399	397	394	390	386	383	380	378		
25	374	376	380	384	387	391	394	395	395	392	389	385	380	374	369	364	361		
30	355	359	364	370	376	381	386	387	388	384	380	375	368	360	352	346	342		
35	334	339	346	354	363	370	376	378	379	375	371	363	354	344	334	325	319		
40	309	316	326	337	348	358	365	369	370	365	360	351	339	327	314	303	295		
45	282	291	304	319	332	344	353	358	359	355	348	338	323	308	292	278	268		
50	252	263	280	299	316	330	341	346	348	343	336	324	307	289	270	252	239		
55	219	235	256	278	299	315	328	334	336	332	323	309	291	270	247	225	209		
60	186	205	231	258	282	301	315	322	324	319	310	295	275	251	224	199	178		
65	152	175	207	238	265	286	301	309	312	306	297	281	258	232	202	172	148		
70	117	147	184	219	249	271	288	296	299	294	284	267	243	215	181	148	117		
75	82.5	120	162	201	233	257	274	283	286	281	270	253	228	198	162	124	87.6		
80	52.4	97.4	145	185	218	243	261	269	272	268	257	239	214	183	146	103	61.4		
85	30.4	79.8	129	171	204	229	247	256	259	254	244	226	201	169	131	87.0	41.4		
90	19.5	67.7	117	158	191	216	233	243	246	241	230	213	188	157	119	75.0	29.8		
95	15.8	60.3	107	148	179	203	220	229	232	228	218	200	176	147	109	67.1	25.8		
100	17.4	56.6	99.1	138	168	191	207	216	219	215	205	188	165	137	101	62.6	26.1		
105	20.4	56.3	93.7	129	157	179	195	204	206	202	193	177	155	128	95.1	60.5	28.8		
110	23.1	57.7	90.4	122	149	168	183	191	194	189	181	166	146	121	90.7	60.6	32.6		
115	26.2	60.5	88.4	116	140	158	171	179	182	178	169	155	137	114	87.5	62.3	36.7		
120	26.8	62.4	87.6	111	132	149	160	167	170	166	159	147	129	109	85.9	65.2	40.1		
125	19.6	58.2	87.5	107	125	140	151	156	158	156	150	138	123	105	85.2	68.5	42.6		
130	8.40	50.4	86.4	103	120	132	142	147	149	146	140	130	117	101	84.1	70.0	42.7		
135	3.92	45.1	84.8	98.5	114	125	133	138	139	137	131	123	112	96.6	82.1	69.2	37.5		
140	7.73	39.5	83.7	94.9	107	118	126	129	131	128	124	117	105	92.9	84.7	59.2	24.7		
145	9.72	27.0	69.6	93.5	100	109	116	121	122	120	115	107	99.3	92.2	84.7	45.4	13.1		
150	12.0	14.2	39.0	86.5	94.3	101	108	110	111	110	107	102	97.2	91.6	77.1	29.1	8.16		
155	13.1	10.5	16.7	46.7	81.7	94.5	99.8	104	104	103	102	98.8	95.3	84.0	46.2	13.1	8.71		
160	12.7	14.0	15.1	12.1	28.1	58.4	80.2	93.2	97.7	98.9	97.7	91.5	79.2	52.9	23.3	8.39	9.66		
165	13.8	13.9	13.5	11.3	15.8	15.6	13.8	34.8	53.7	54.6	52.5	40.8	31.3	20.6	14.4	8.23	10.5		
170	15.2	11.2	13.5	14.2	16.7	13.0	9.09	11.6	14.0	19.4	14.7	13.0	14.7	17.2	11.1	14.7	12.8		
175	14.8	17.6	13.8	12.6	15.7	19.4	20.1	17.0	10.4	14.3	15.6	17.8	19.5	16.0	10.9	13.3	16.3		
180	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8		

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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