

## **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: 14T8/4F/835/UEB**

### **Laboratory: Leading Testing Laboratories**

**NVLAP CODE: 200960-0**

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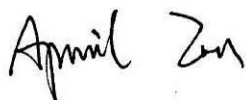
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Report No.: HZ23030039k

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: **14T8/4F/835/UEB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
163.5	2298.5	14.06	0.9849
CCT (K)	CRI	Stabilization Time (Light & Power)	
3507	82.6	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

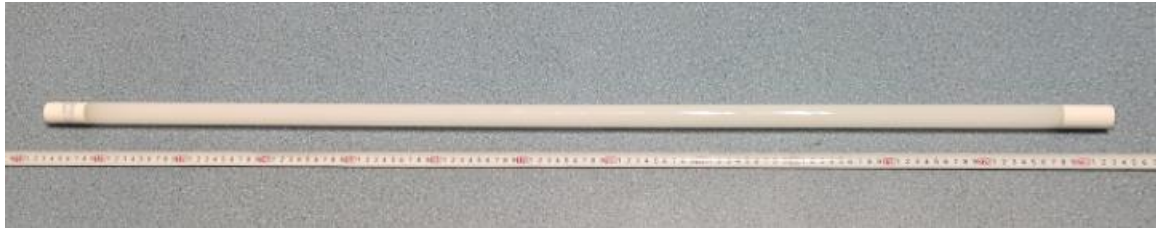


Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: 14T8/4F/835/UEB
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz, 14W
<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)	0.119	0.056
Power Factor	0.9849	0.9207
Test Power (W)	14.06	14.21
THD A%	15.18	16.02
Luminous Efficacy (lm/W)	163.5	164.2
Total Luminous Flux (lm)	2298.5	2333.6
Color Rendering Index (CRI)	82.6	
R9	6.8	
Correlated Color Temperature (CCT)(K)	3507	
Chromaticity Chroma x	0.4050	
Chromaticity Chroma y	0.3911	
Chromaticity Chroma u	0.2354	
Chromaticity Chroma v	0.3409	
Duv	0.0002	
Chromaticity Chroma u'	0.2354	
Chromaticity Chroma v'	0.5114	

Special Color Rendering Indices	
R1	80.8
R2	89.6
R3	96
R4	81.2
R5	81
R6	86.2
R7	84.6
R8	61.7
R9	6.8
R10	75.8
R11	80.4
R12	64.5
R13	82.9
R14	98.1

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)	0.119
Power Factor	0.9849
Power (W)	14.09
Luminous Efficacy (lm/W)	163.4
Total Luminous Flux (lm)	2302.3
Beam Angle (°)	112.8 (0°-180°) / 217.4 (90°-270°)
Center Beam Candle Power (cd)	393
Maximum Beam Candle Power (cd)	395.7 (At: C=280.0, Gamma=9.5)
Spacing Criteria	1.24 (0°-180°) / 1.45 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	43.51%
Zonal Lumens in the 60 °-90 °Zone	26.79%
Zonal Lumens in the 90 °-120 °Zone	17.70%
Zonal Lumens in the 120 °-180 °Zone	12.00%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

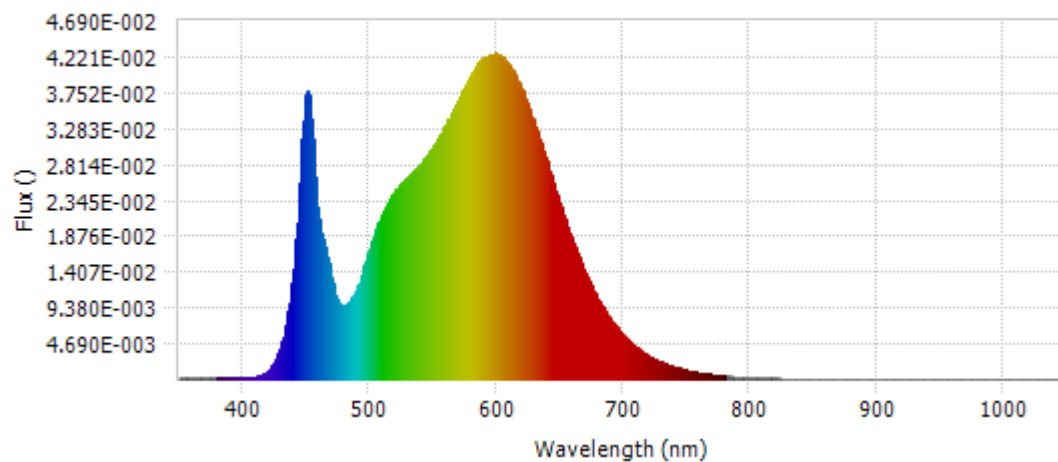
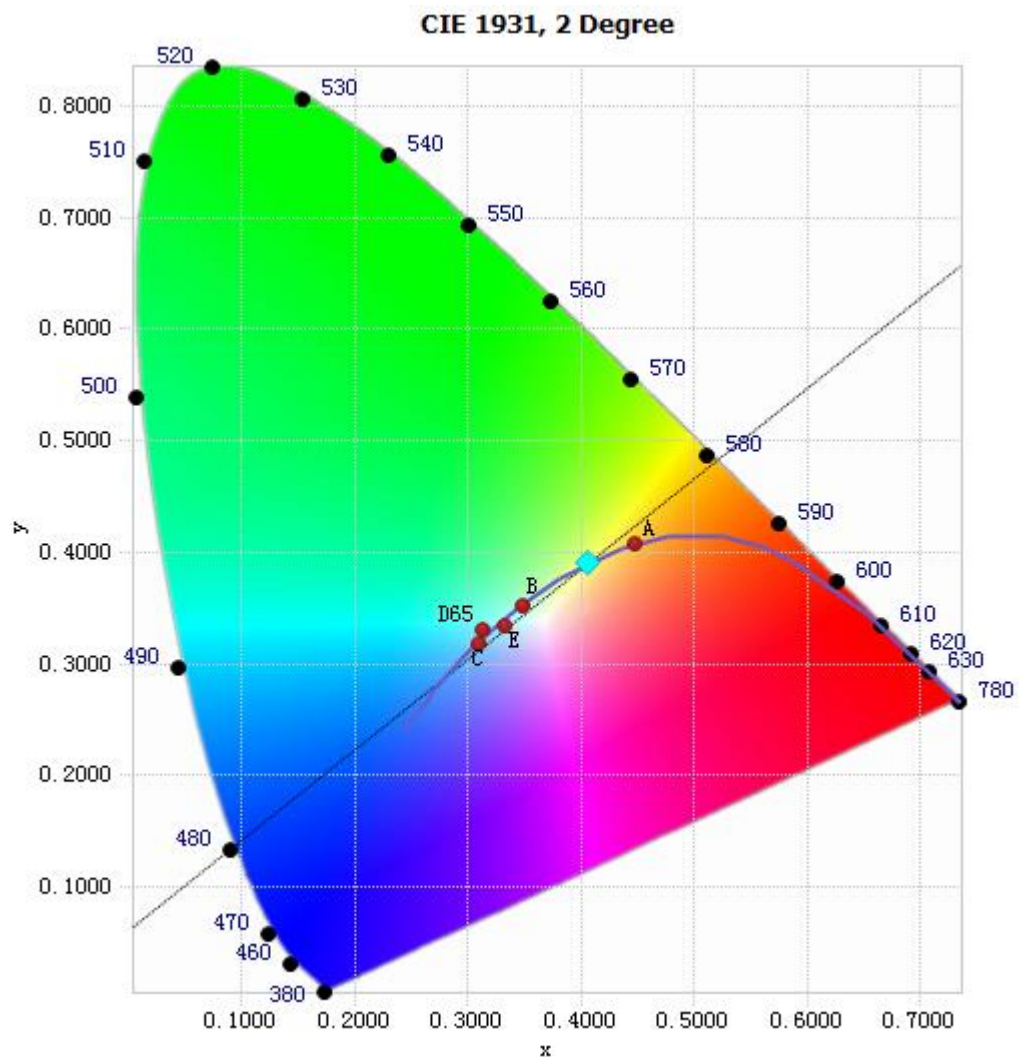


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.80E-04	485	1.04E-02	590	4.22E-02	695	6.79E-03
385	1.74E-04	490	1.19E-02	595	4.25E-02	700	5.83E-03
390	1.82E-04	495	1.44E-02	600	4.26E-02	705	4.96E-03
395	1.50E-04	500	1.71E-02	605	4.21E-02	710	4.23E-03
400	1.56E-04	505	1.96E-02	610	4.12E-02	715	3.63E-03
405	1.91E-04	510	2.16E-02	615	3.98E-02	720	3.10E-03
410	2.93E-04	515	2.34E-02	620	3.79E-02	725	2.66E-03
415	5.85E-04	520	2.45E-02	625	3.59E-02	730	2.27E-03
420	1.17E-03	525	2.56E-02	630	3.35E-02	735	1.91E-03
425	2.30E-03	530	2.64E-02	635	3.09E-02	740	1.64E-03
430	4.35E-03	535	2.72E-02	640	2.85E-02	745	1.41E-03
435	8.04E-03	540	2.82E-02	645	2.56E-02	750	1.19E-03
440	1.44E-02	545	2.93E-02	650	2.30E-02	755	1.02E-03
445	2.58E-02	550	3.04E-02	655	2.06E-02	760	8.78E-04
450	3.72E-02	555	3.17E-02	660	1.82E-02	765	7.45E-04
455	3.15E-02	560	3.33E-02	665	1.60E-02	770	6.43E-04
460	2.11E-02	565	3.49E-02	670	1.39E-02	775	5.49E-04
465	1.73E-02	570	3.65E-02	675	1.22E-02	780	4.74E-04
470	1.34E-02	575	3.82E-02	680	1.06E-02		
475	1.01E-02	580	3.97E-02	685	9.16E-03		
480	9.62E-03	585	4.13E-02	690	7.94E-03		

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

## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4050, 0.3911)

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

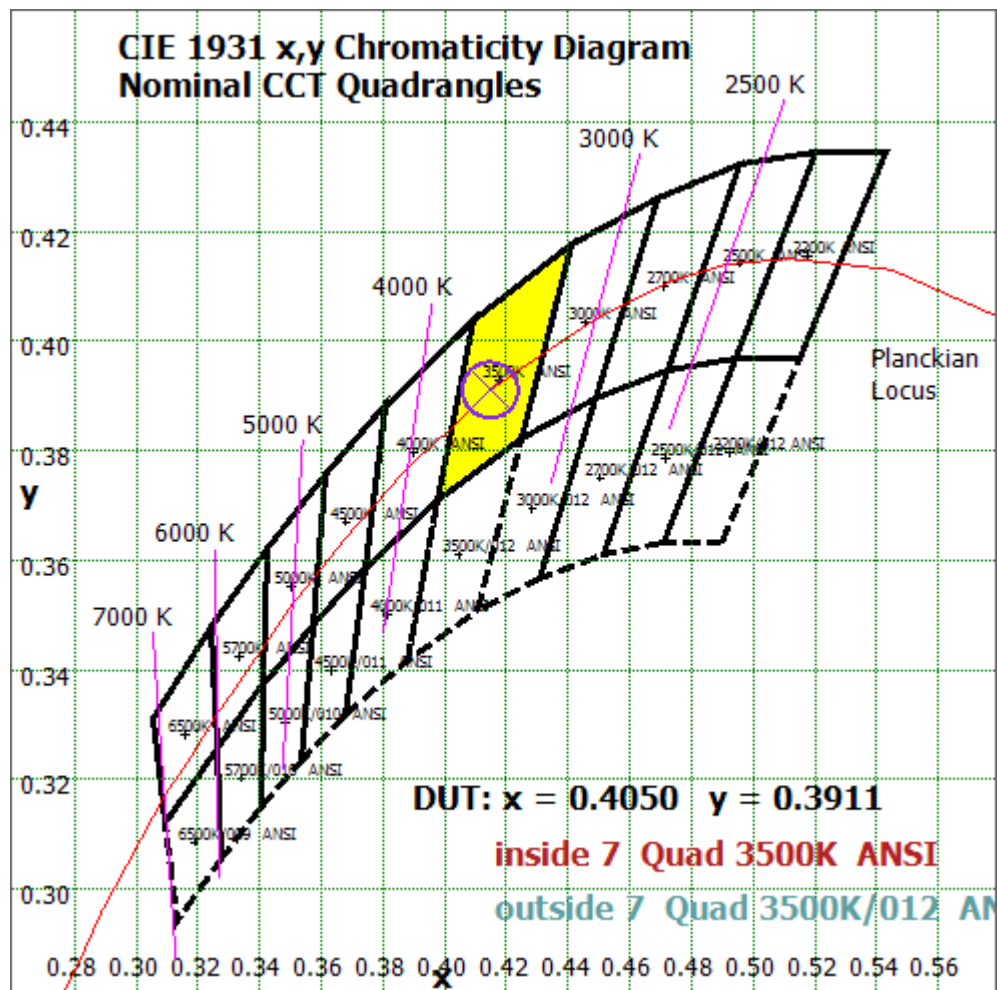


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

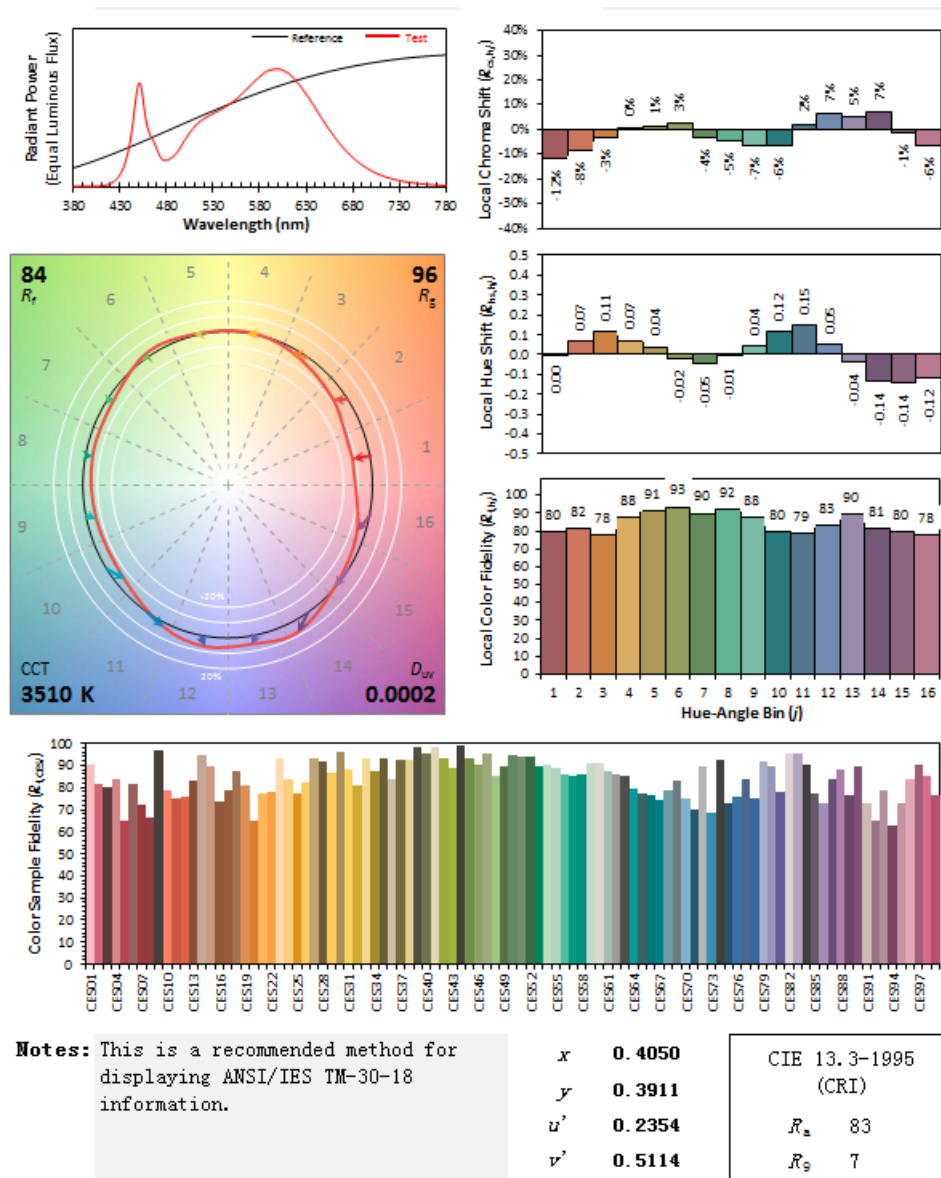
## ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/03/30

Model: 14T8/4F/835/UEB



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	37.316	1.62%
10- 20	108.112	4.70%
20- 30	167.853	7.29%
30- 40	211.374	9.18%
40- 50	235.886	10.25%
50- 60	241.206	10.48%
60- 70	229.928	9.99%
70- 80	206.938	8.99%
80- 90	179.823	7.81%
90-100	155.922	6.77%
100-110	135.393	5.88%
110-120	116.264	5.05%
120-130	96.77	4.20%
130-140	75.571	3.28%
140-150	55.101	2.39%
150-160	33.297	1.45%
160-170	13.173	0.57%
170-180	2.366	0.10%
Total	2302.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1001.75	43.51%
60- 90	616.689	26.79%
0-90	1618.44	70.30%
90- 180	683.857	29.70%
0- 180	2302.3	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

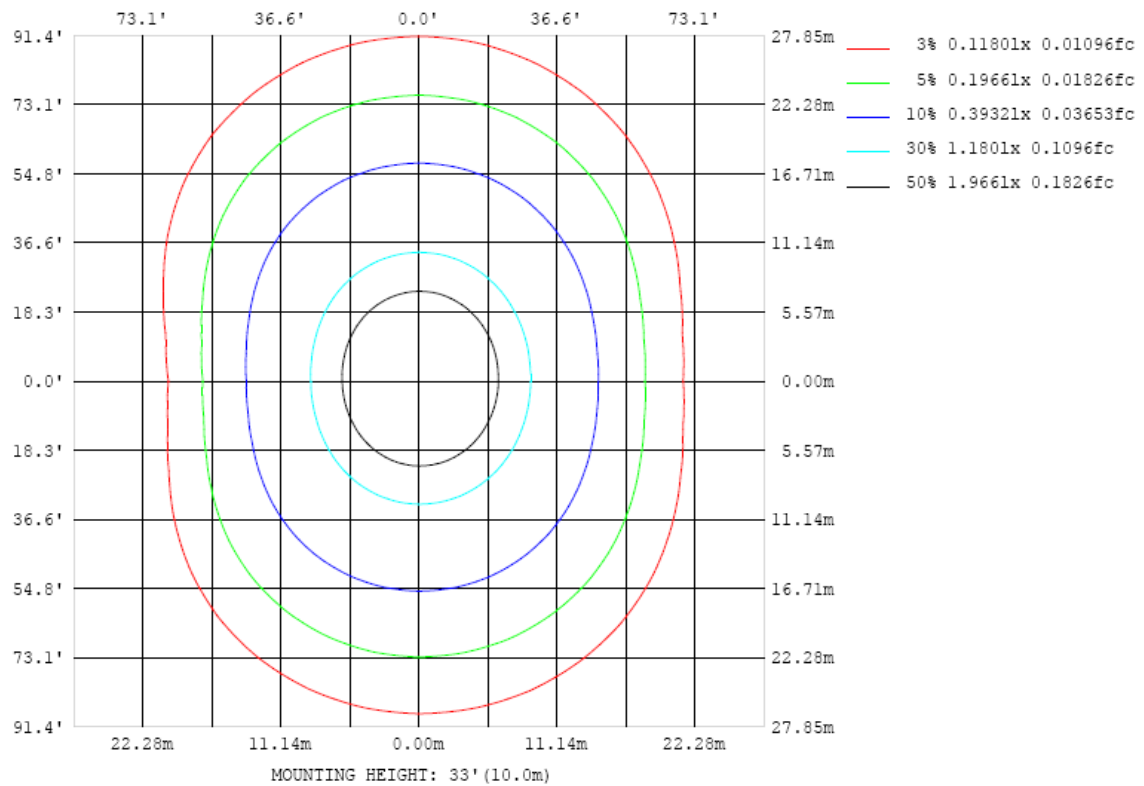


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

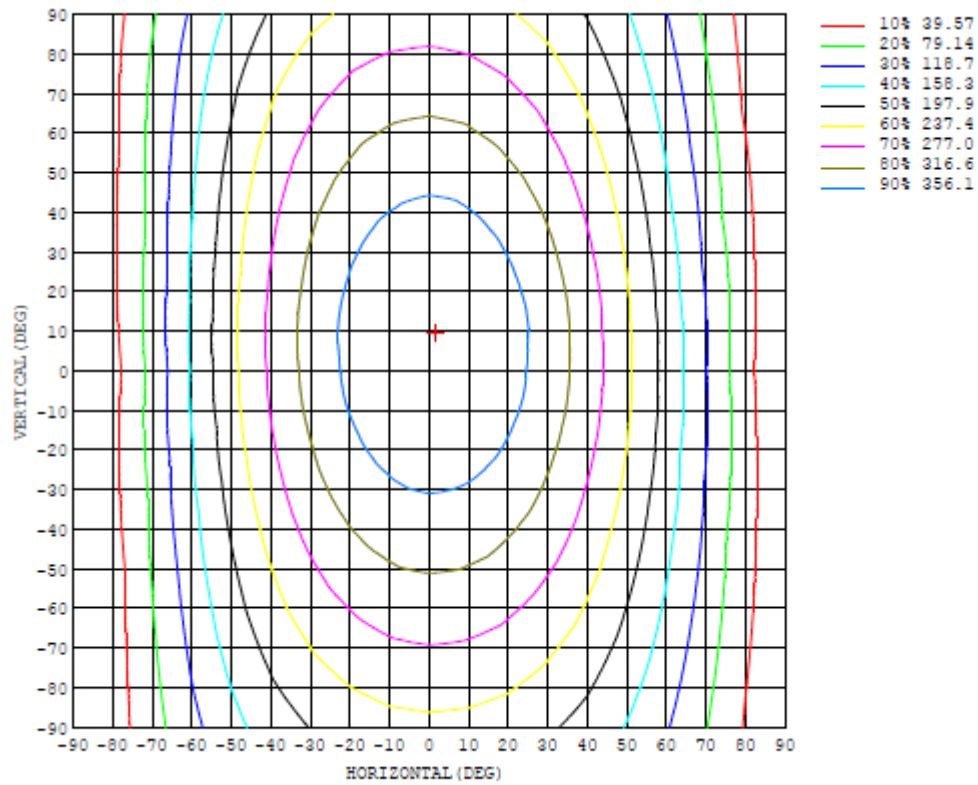


Chart 6: Isocandela Plot

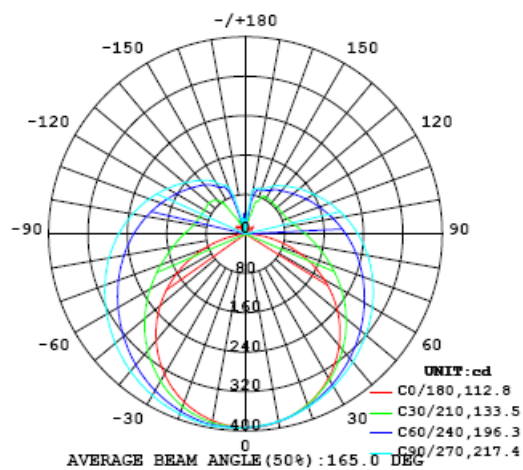


Chart 7: Polar Candela Distribution

## 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	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393
5	392	392	391	391	391	391	391	391	391	391	391	390	390	390	390	391	390	390	391
10	388	387	387	387	387	387	387	386	386	387	386	386	386	385	384	384	384	384	385
15	379	379	380	380	379	380	380	380	380	381	380	379	378	377	376	376	376	375	376
20	369	369	369	369	370	371	372	373	374	374	373	371	369	368	366	364	363	363	363
25	355	355	355	356	358	361	363	365	366	366	365	363	360	357	354	350	348	347	348
30	338	338	339	342	345	350	353	356	357	358	357	353	349	344	339	334	330	328	329
35	318	319	321	325	331	337	341	346	348	349	347	343	338	331	323	315	310	307	307
40	296	297	300	307	315	323	330	336	339	339	337	332	325	316	306	296	288	283	283
45	271	273	279	287	298	309	318	325	328	329	327	321	312	301	288	275	264	257	256
50	244	247	255	267	281	294	305	313	318	319	317	310	299	286	270	253	238	228	226
55	215	219	230	246	264	279	292	302	307	309	306	298	286	270	252	230	211	198	195
60	184	190	205	225	246	265	279	290	296	298	295	286	273	255	233	208	184	167	161
65	153	160	180	205	229	250	266	278	285	287	284	275	260	241	216	186	157	135	126
70	119	131	155	185	212	236	253	266	273	276	272	263	248	226	199	166	132	103	91.4
75	85.5	101	133	166	197	222	241	254	262	264	261	251	235	213	184	149	109	72.5	57.6
80	52.8	74.1	112	150	182	209	228	242	250	252	249	239	223	200	170	133	88.9	46.4	27.0
85	24.2	51.6	94.2	135	168	196	216	230	238	240	237	227	211	188	157	119	73.9	28.4	5.69
90	5.00	36.4	80.5	122	156	184	204	218	226	229	225	215	199	176	147	108	64.0	20.5	0.29
95	1.82	29.0	70.9	111	146	172	192	206	214	217	214	204	188	165	137	99.8	58.3	20.0	0.49
100	4.71	27.3	64.7	103	136	161	181	195	203	205	202	192	177	155	128	93.3	55.8	23.4	1.11
105	7.94	29.5	61.3	95.7	127	152	170	184	191	194	190	181	167	147	120	88.8	55.9	26.5	1.74
110	11.3	34.2	60.3	90.6	119	143	160	173	180	182	179	171	157	139	114	86.1	57.8	35.7	4.82
115	12.0	40.5	61.1	87.3	113	134	151	162	169	171	168	161	149	131	109	84.9	60.5	42.5	9.58
120	13.0	47.8	63.3	85.4	108	127	142	153	159	161	158	152	141	125	106	84.5	61.7	48.2	16.6
125	16.6	54.1	65.8	84.7	103	120	134	144	150	152	150	143	133	119	103	85.2	63.5	51.6	22.1
130	19.7	59.4	68.7	85.0	100	115	127	136	141	143	141	135	126	114	101	84.1	72.6	45.4	24.1
135	18.4	59.2	71.4	83.5	98.6	110	120	128	132	134	133	128	120	110	98.7	79.9	73.5	36.9	18.4
140	16.1	52.5	75.7	84.1	95.4	107	115	121	125	126	125	121	115	107	92.9	82.9	80.1	41.7	15.9
145	8.51	49.1	80.3	85.1	92.4	102	110	115	118	120	119	115	110	100	88.8	84.4	82.6	39.3	7.81
150	6.21	52.2	78.2	84.3	91.5	97.2	102	108	111	112	111	107	102	93.7	90.9	90.1	70.3	30.9	19.0
155	15.4	30.7	67.9	85.8	91.2	93.8	97.3	101	103	103	103	99.2	94.9	94.4	93.3	88.8	70.4	21.7	19.6
160	10.3	14.5	38.1	69.7	86.1	93.8	95.6	96.3	96.3	96.4	96.3	97.3	97.1	94.9	92.7	83.8	46.8	24.3	15.5
165	10.5	15.8	19.5	39.2	66.8	82.1	91.9	94.9	95.8	96.4	96.3	95.3	94.4	93.4	88.0	58.8	34.8	12.0	7.14
170	13.9	18.6	7.82	17.5	30.8	38.7	62.1	83.1	90.0	90.1	90.0	90.4	87.8	67.0	49.9	37.8	20.5	7.27	19.4
175	16.9	20.8	14.7	3.62	2.03	8.48	13.6	17.8	24.9	31.8	32.3	29.6	25.7	24.8	24.5	12.4	4.86	15.3	21.8
180	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2

Table 6: Luminous Intensity Data

Table--2		UNIT: cd																
$\gamma$ (DEG)	C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350
0		393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393	393
5		392	392	392	392	393	394	394	394	395	395	395	394	394	394	393	393	393
10		386	388	389	390	391	393	394	395	395	396	395	394	393	392	390	389	389
15		377	379	382	385	387	389	391	392	393	393	393	391	390	388	385	383	381
20		365	369	373	377	380	383	386	388	389	389	388	386	383	381	377	374	370
25		350	355	360	366	371	376	380	383	384	384	382	379	375	370	366	362	357
30		332	338	345	353	361	367	373	376	378	378	375	370	364	358	352	346	340
35		312	319	328	339	349	358	365	369	371	371	366	360	353	344	335	328	321
40		288	297	309	323	336	347	356	361	364	362	357	349	339	328	317	307	299
45		262	273	289	306	322	336	346	352	355	353	347	337	325	311	297	285	275
50		234	248	267	288	308	323	336	343	346	343	336	325	310	293	275	260	249
55		204	221	246	271	293	311	325	333	336	333	325	312	294	274	253	234	220
60		172	195	224	253	279	299	314	323	326	322	313	299	279	255	230	207	190
65		140	169	203	236	265	286	303	312	315	312	301	286	264	237	208	179	159
70		108	143	183	220	251	274	291	301	304	300	290	272	248	219	186	152	127
75		78.3	121	165	205	238	263	280	290	293	289	278	259	234	203	166	127	95.3
80		54.0	102	150	191	226	251	268	279	282	277	265	247	220	187	148	104	65.8
85		36.9	87.4	137	179	214	239	257	267	270	265	253	234	208	173	132	85.5	41.6
90		24.8	74.8	124	167	202	227	245	255	257	253	242	222	195	161	119	71.9	25.7
95		20.8	65.0	114	157	191	216	233	242	245	241	229	210	184	150	109	63.1	18.4
100		23.1	63.2	107	147	180	204	221	230	233	228	217	198	173	140	100	56.6	15.4
105		26.8	63.1	102	139	170	193	209	218	220	216	205	187	162	131	93.6	53.2	17.5
110		29.7	64.4	99.3	133	161	182	197	206	208	204	193	176	153	123	89.0	53.1	21.3
115		33.7	66.7	97.4	127	153	172	186	194	196	192	182	166	144	117	86.4	54.9	24.9
120		38.5	69.1	96.4	122	145	162	175	182	184	180	171	156	136	112	85.3	57.9	27.5
125		32.9	67.2	96.5	118	138	153	165	171	172	169	160	147	130	109	84.5	57.2	24.2
130		2.23	55.9	97.5	115	132	145	155	160	162	158	151	139	124	106	85.2	47.0	7.25
135		1.60	49.8	94.7	110	126	137	145	150	151	148	142	132	119	102	84.0	44.5	0.01
140		18.4	50.0	87.4	106	120	130	137	141	142	139	134	126	114	97.7	82.7	44.0	0.05
145		23.0	27.1	68.8	103	110	121	128	132	133	131	126	118	105	92.9	72.8	37.2	11.5
150		26.3	2.68	35.4	93.2	105	110	115	120	122	119	113	106	99.5	89.4	32.3	5.17	14.0
155		31.4	9.80	24.5	34.4	94.8	106	107	110	110	109	106	100	86.6	54.4	13.7	3.30	19.4
160		30.9	28.7	16.2	10.2	20.8	73.4	91.1	100.0	103	101	89.5	69.5	31.0	9.18	24.2	9.97	25.4
165		19.3	20.6	6.42	14.3	29.8	9.67	9.90	22.6	25.5	21.8	12.2	7.47	17.2	20.0	16.2	32.5	17.8
170		12.6	23.0	16.0	21.1	26.0	8.35	6.00	11.5	16.2	12.2	10.4	7.44	12.8	29.8	26.7	37.2	23.1
175		15.9	10.7	7.16	24.8	39.7	42.4	38.2	27.1	0.00	2.48	12.9	26.3	48.4	42.7	18.6	8.98	13.4
180		10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2

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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