

## 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: 12T8/4F/830/HYB/R**

### Laboratory: Leading Testing Laboratories

**NVLAP CODE: 200960-0**

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Report No.: HZ22120037g

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: 12T8/4F/830/HYB/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)/2	Power Factor
120.2	1684.0	14.01	0.9943
CCT (K)	CRI	Stabilization Time (Light & Power)	
3082	83.0	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>	: Oct. 13, 2022
<b>Date of Test</b>	: Oct. 14, 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

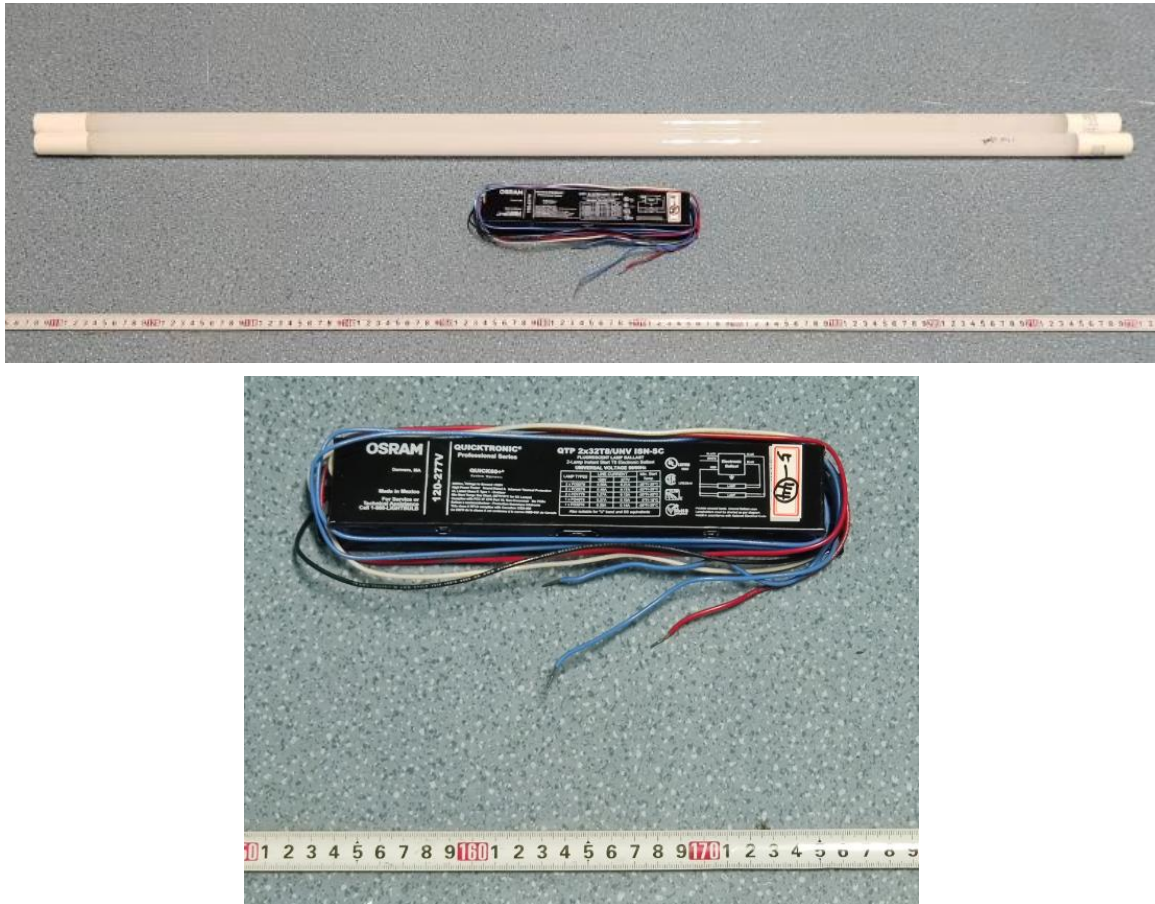


Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: 12T8/4F/830/HYB/R
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz
<b>Product Description</b>	: 3000K 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)	0.235	0.106
Power Factor	0.9943	0.9562
Test Power (W)/2	14.01	14.04
THD A%	8.57	13.75
Luminous Efficacy (lm/W)	120.2	119.9
Total Luminous Flux (lm)	1684.0	1684.0
Color Rendering Index (CRI)	83.0	
R9	9.5	
Correlated Color Temperature (CCT)(K)	3082	
Chromaticity Chroma x	0.4300	
Chromaticity Chroma y	0.3996	
Chromaticity Chroma u	0.2480	
Chromaticity Chroma v	0.3457	
Duv	-0.0008	
Chromaticity Chroma u'	0.2480	
Chromaticity Chroma v'	0.5186	

Special Color Rendering Indices	
R1	82.3
R2	93.4
R3	94.1
R4	79.6
R5	82.4
R6	91.6
R7	81.5
R8	59.1
R9	9.5
R10	84.4
R11	78.9
R12	71
R13	85.3
R14	97.5

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)	0.235
Power Factor	0.9945
Power (W)/2	14.02
Luminous Efficacy (lm/W)	120.5
Total Luminous Flux (lm)	1690.0
Beam Angle ( ° )	110.8 (0°-180°) / 201.0 (90°-270°)
Center Beam Candle Power (cd)	305
Maximum Beam Candle Power (cd)	306.1 (At: C=240.0, Gamma=6.0)
Spacing Criteria	1.29 (0°-180°) / 1.42 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	45.17%
Zonal Lumens in the 60 °-90 °Zone	26.64%
Zonal Lumens in the 90 °-120 °Zone	16.93%
Zonal Lumens in the 120 °-180 °Zone	11.25%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

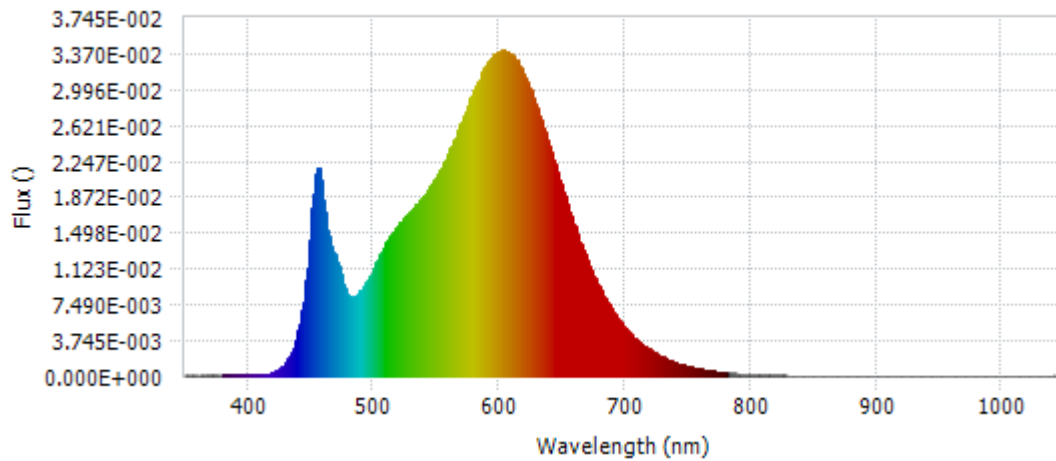


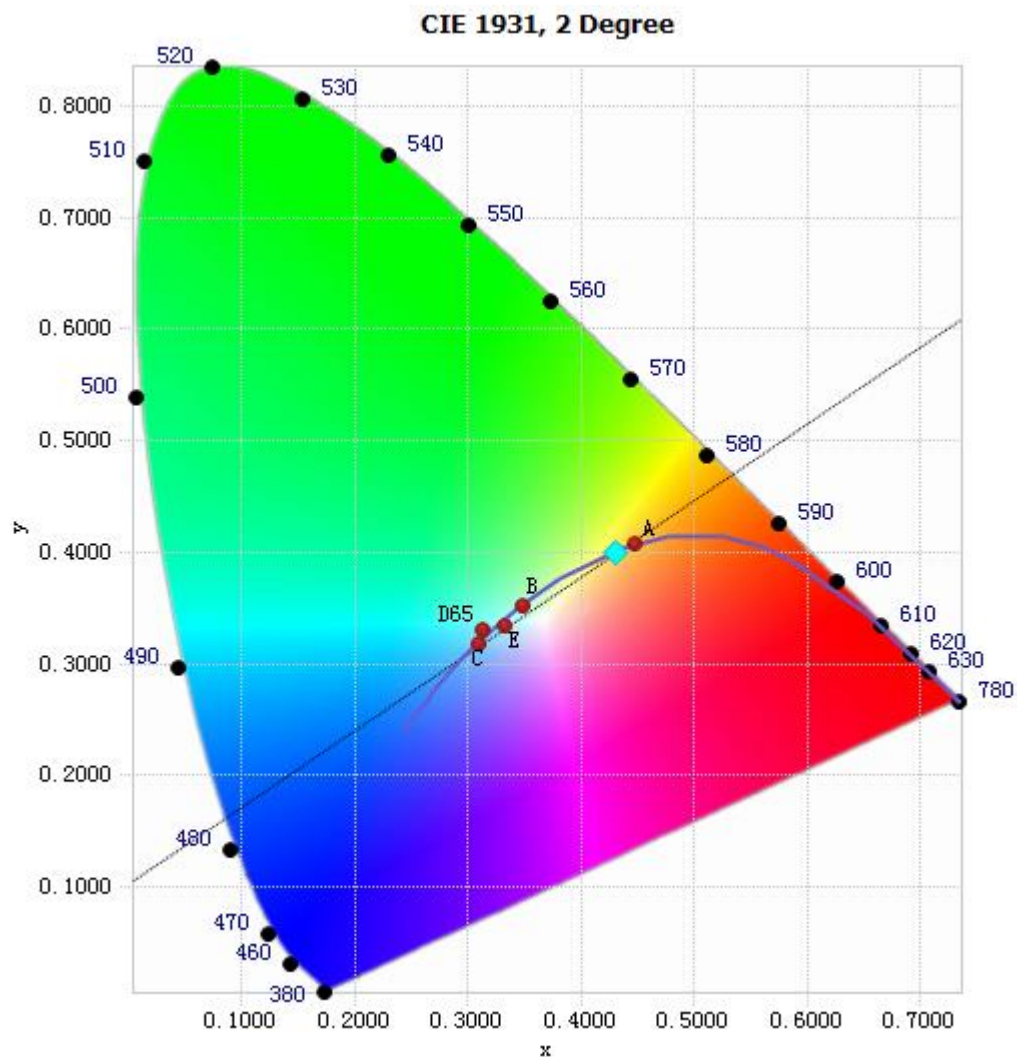
Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.27E-04	485	8.35E-03	590	3.26E-02	695	5.90E-03
385	1.16E-04	490	8.99E-03	595	3.35E-02	700	5.07E-03
390	1.16E-04	495	9.96E-03	600	3.40E-02	705	4.36E-03
395	1.22E-04	500	1.13E-02	605	3.40E-02	710	3.70E-03
400	1.20E-04	505	1.27E-02	610	3.36E-02	715	3.17E-03
405	1.28E-04	510	1.39E-02	615	3.26E-02	720	2.74E-03
410	1.65E-04	515	1.50E-02	620	3.14E-02	725	2.33E-03
415	2.57E-04	520	1.59E-02	625	2.98E-02	730	2.00E-03
420	4.46E-04	525	1.66E-02	630	2.80E-02	735	1.70E-03
425	7.58E-04	530	1.74E-02	635	2.60E-02	740	1.43E-03
430	1.40E-03	535	1.80E-02	640	2.40E-02	745	1.23E-03
435	2.56E-03	540	1.88E-02	645	2.17E-02	750	1.05E-03
440	4.77E-03	545	1.98E-02	650	1.96E-02	755	9.05E-04
445	8.84E-03	550	2.09E-02	655	1.75E-02	760	7.71E-04
450	1.60E-02	555	2.21E-02	660	1.56E-02	765	6.54E-04
455	2.17E-02	560	2.34E-02	665	1.38E-02	770	5.61E-04
460	1.85E-02	565	2.49E-02	670	1.21E-02	775	4.79E-04
465	1.39E-02	570	2.66E-02	675	1.05E-02	780	4.06E-04
470	1.23E-02	575	2.82E-02	680	9.19E-03		
475	1.01E-02	580	2.99E-02	685	7.95E-03		
480	8.39E-03	585	3.15E-02	690	6.89E-03		

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



## Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4300, 0.3996)

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

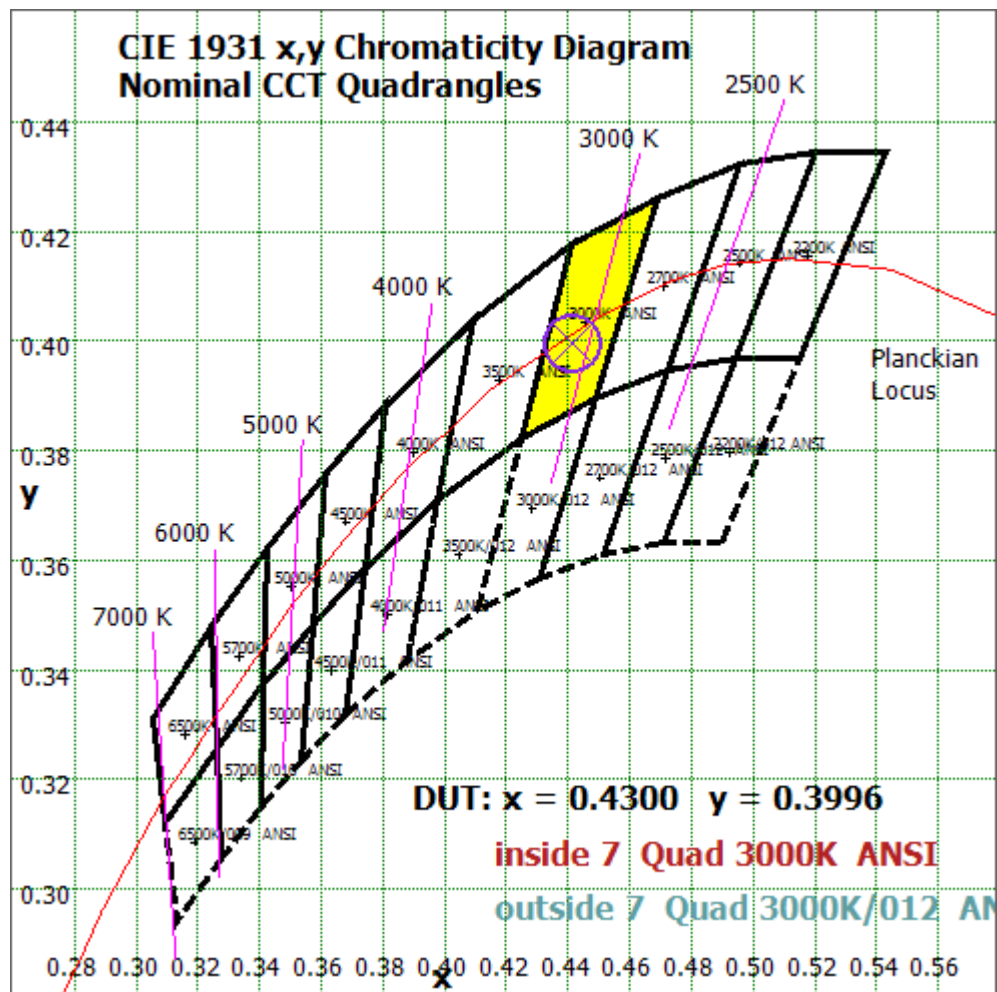


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

## Color Rendition Report – Sphere Spectroradiometer Method

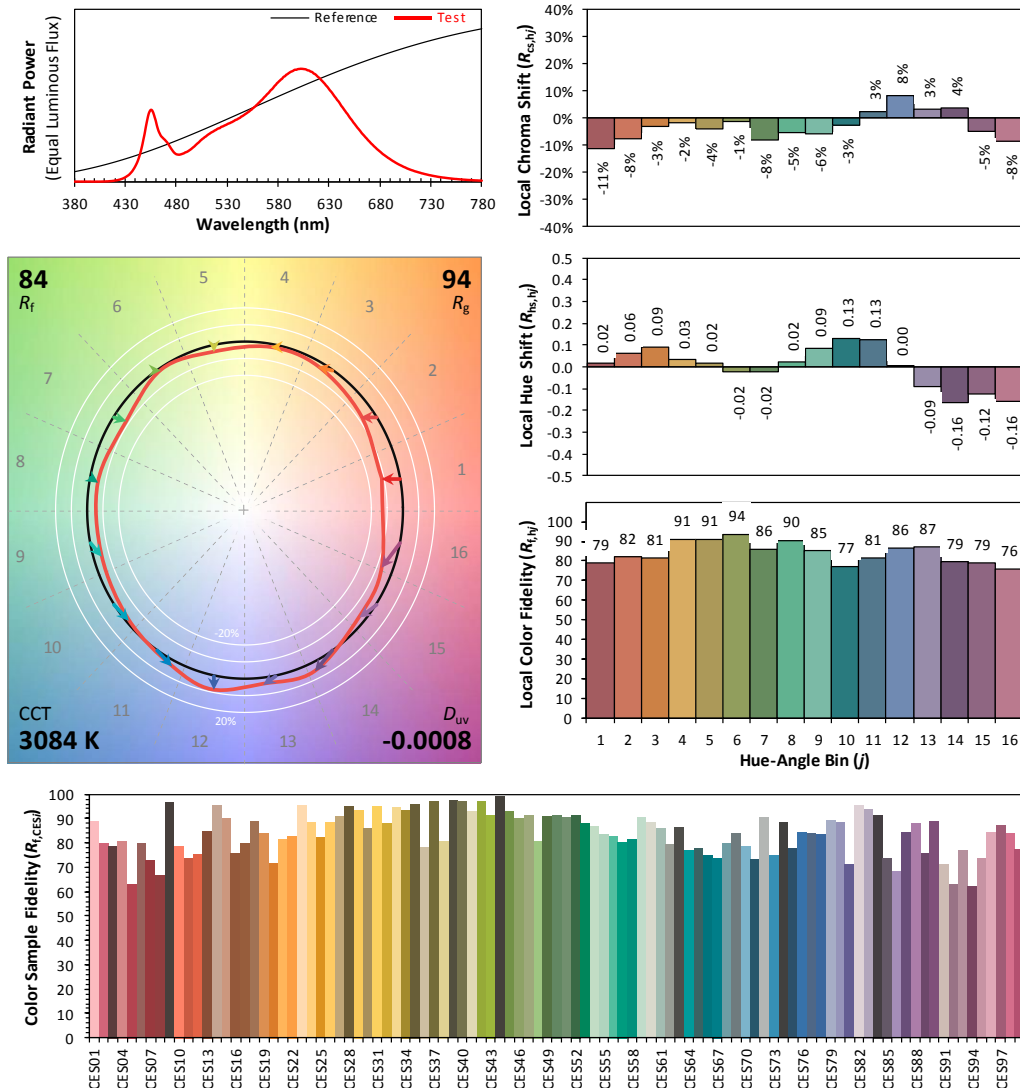
### ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/10/14

Model: 12T8/4F/830/HYB/R



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

$x$  0.4300  
 $y$  0.3996  
 $u'$  0.2480  
 $v'$  0.5186

CIE 13.3-1995  
(CRI)  
 $R_a$  83  
 $R_9$  10

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	28.912	1.71%
10- 20	83.528	4.94%
20- 30	129.203	7.65%
30- 40	161.738	9.57%
40- 50	178.958	10.59%
50- 60	181.006	10.71%
60- 70	170.284	10.08%
70- 80	150.924	8.93%
80- 90	129.094	7.64%
90-100	110.741	6.55%
100-110	94.989	5.62%
110-120	80.446	4.76%
120-130	66.209	3.92%
130-140	52.372	3.10%
140-150	37.802	2.24%
150-160	23.485	1.39%
160-170	9.488	0.56%
170-180	0.845	0.05%
Total	1690.0	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	763.345	45.17%
60- 90	450.302	26.64%
0-90	1213.65	71.81%
90- 180	476.377	28.19%
0- 180	1690.0	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

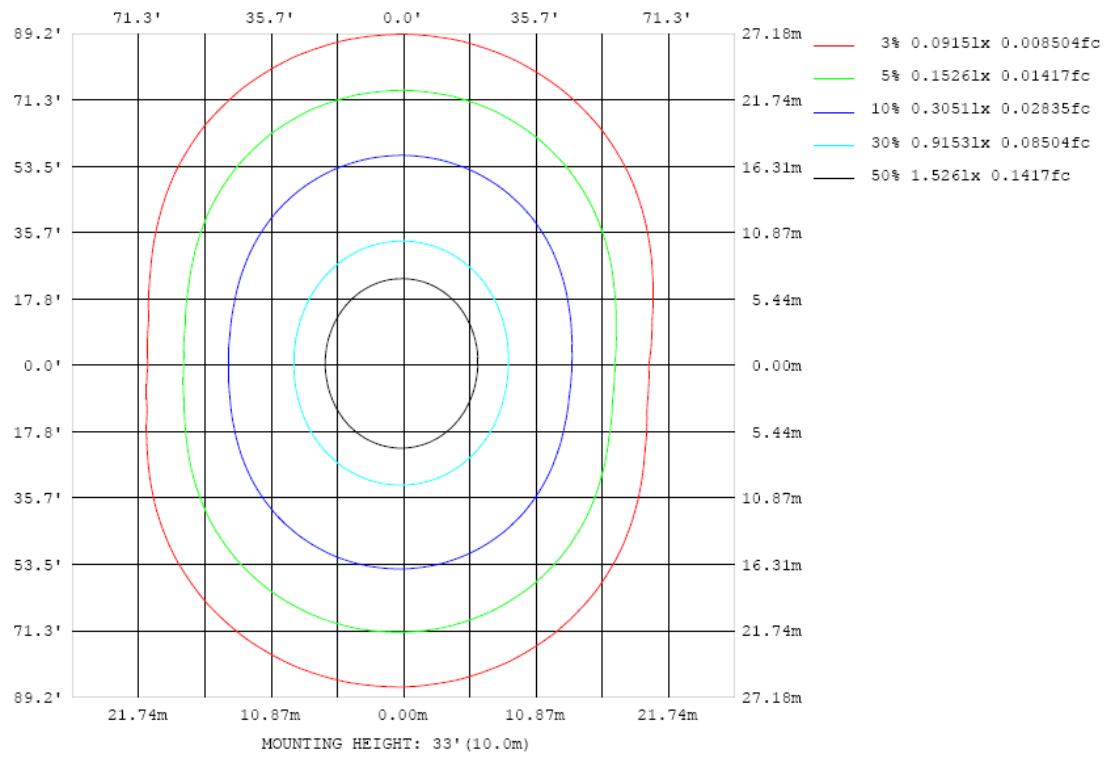


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

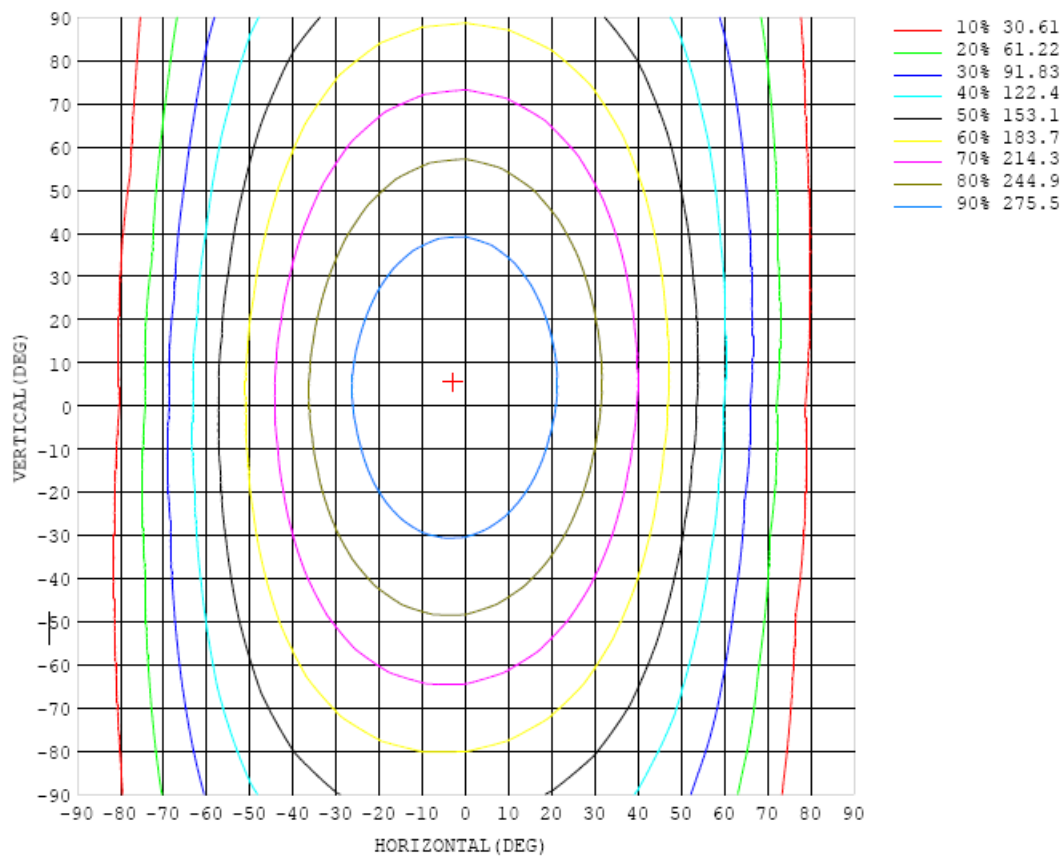


Chart 6: Isocandela Plot

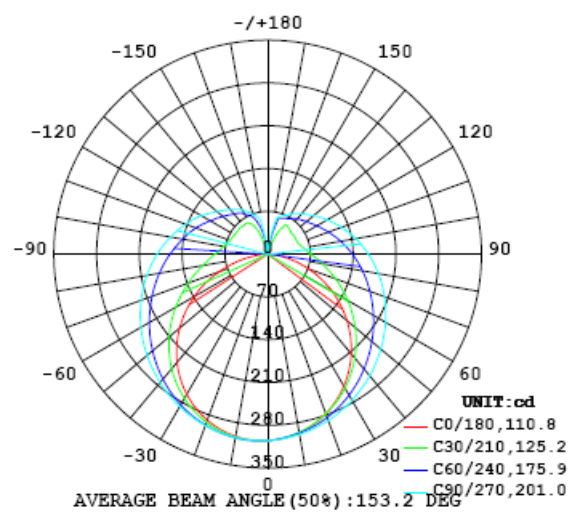


Chart 7: Polar Candela Distribution

## 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	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305
5	302	302	302	302	302	302	302	302	302	303	303	303	303	304	304	304	305	305	305
10	297	296	296	296	296	297	297	298	299	299	300	300	300	301	301	301	301	302	303
15	289	288	288	288	289	290	292	293	294	295	296	296	296	296	296	296	296	296	297
20	278	277	277	278	280	282	284	286	288	290	290	291	290	290	289	288	288	288	289
25	265	264	264	266	269	273	276	279	281	283	284	284	284	282	281	279	278	277	278
30	249	248	250	253	257	262	266	271	274	276	277	277	275	273	271	268	265	264	265
35	232	231	233	238	244	250	256	262	266	268	269	269	267	263	259	255	251	249	249
40	213	212	216	222	230	238	245	252	257	260	261	260	257	252	247	240	235	231	231
45	192	192	196	205	215	225	234	242	248	251	252	250	247	241	233	225	217	212	211
50	170	170	176	187	199	212	223	232	238	242	243	241	236	229	219	208	198	190	188
55	146	147	156	169	184	199	211	221	228	232	233	231	225	216	205	192	178	168	164
60	122	123	135	151	169	186	200	211	219	223	224	221	214	204	191	175	158	144	139
65	96.5	99.5	114	134	155	173	189	201	209	213	214	211	204	192	177	158	138	120	112
70	71.4	75.9	94.4	118	141	162	178	191	199	203	204	201	193	181	164	142	118	95.8	84.7
75	47.5	54.0	76.4	104	129	150	168	181	189	194	194	190	182	169	151	128	100	72.9	57.3
80	25.3	34.1	61.1	90.8	118	140	158	171	179	184	184	180	172	159	140	115	84.8	53.5	31.8
85	8.11	19.3	49.6	79.8	107	130	148	161	170	174	175	171	162	148	129	103	72.2	38.1	11.6
90	1.00	11.3	40.5	70.5	97.9	121	139	152	160	165	165	161	152	138	119	93.7	62.6	28.9	1.76
95	0.31	9.43	35.6	64.1	90.5	113	130	143	151	155	156	152	143	129	110	85.7	56.4	24.5	0.96
100	1.02	11.0	32.9	59.5	83.7	105	122	134	142	146	146	142	134	121	102	79.0	52.0	23.5	0.87
105	2.76	13.9	32.3	55.6	77.7	97.4	113	125	133	137	137	134	125	113	95.4	73.8	49.4	24.9	0.90
110	4.21	17.6	33.6	53.1	72.9	91.0	106	117	125	129	129	125	117	105	89.4	69.8	48.5	27.9	1.29
115	4.67	21.3	35.7	52.2	69.1	85.5	99.0	110	117	120	120	117	110	98.7	84.2	67.0	48.7	31.6	1.79
120	4.68	18.1	38.6	52.2	66.5	80.7	92.9	102	109	112	112	109	103	92.8	79.9	65.0	49.8	35.4	2.44
125	4.01	12.0	40.9	52.8	64.8	76.9	87.4	96.0	102	105	105	102	96.3	87.6	76.5	64.1	51.5	38.5	3.79
130	4.08	11.3	43.4	52.0	63.9	73.9	82.9	90.1	95.3	98.0	98.1	95.6	90.6	83.1	73.8	63.9	53.5	41.2	4.83
135	3.66	13.7	45.8	53.4	62.9	71.3	78.9	85.2	89.6	91.9	92.0	89.9	85.6	79.3	71.6	62.5	54.3	31.4	2.74
140	3.60	10.3	37.4	54.6	60.5	69.0	75.4	80.6	84.3	86.3	86.3	84.6	81.1	76.1	68.3	61.7	55.3	25.5	1.26
145	3.49	4.64	26.9	56.2	60.3	65.0	71.5	76.6	79.6	81.2	81.3	80.0	77.1	71.3	65.4	61.1	56.5	18.3	0.00
150	8.41	6.97	17.7	52.5	60.3	63.6	67.2	70.4	73.3	75.5	75.4	73.5	70.7	67.6	64.3	61.0	43.5	14.2	0.91
155	8.38	11.4	15.4	38.8	60.7	62.5	64.8	67.3	68.9	70.1	70.1	69.1	68.1	65.6	62.7	58.4	32.2	10.8	3.70
160	6.89	7.57	5.57	17.7	45.9	61.6	62.6	64.3	65.2	66.0	66.1	65.7	65.0	62.8	57.6	38.9	14.1	2.84	2.29
165	7.97	7.58	11.3	8.66	16.3	33.8	48.3	59.6	59.8	62.0	61.8	59.9	58.5	44.8	28.2	14.2	6.12	6.41	0.88
170	11.0	8.47	4.02	8.70	8.97	6.55	12.2	20.6	26.1	29.1	29.2	25.7	19.0	11.0	5.18	5.75	7.92	2.57	3.16
175	9.24	7.84	9.48	8.70	7.06	6.62	8.32	10.8	13.0	14.2	12.7	9.71	7.37	6.81	5.01	3.09	4.33	6.29	5.15
180	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36

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	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305	305		
5	305	306	306	306	306	306	306	306	306	305	305	305	304	304	303	303	303		
10	303	304	304	305	305	305	305	305	305	304	303	302	301	300	299	298	297		
15	298	299	300	301	302	302	303	303	302	301	300	298	296	295	293	291	289		
20	290	292	293	295	296	298	299	299	298	297	295	293	290	287	284	281	279		
25	280	282	284	287	289	292	294	294	294	292	290	286	282	277	273	270	267		
30	267	269	273	277	281	285	287	288	288	286	283	278	272	266	261	256	252		
35	251	255	260	265	271	276	280	282	282	279	275	269	262	254	247	240	235		
40	233	238	245	253	260	267	272	274	274	272	267	260	251	241	231	223	217		
45	213	219	228	239	248	257	263	266	266	263	258	250	239	227	215	204	196		
50	191	199	211	224	236	246	253	257	258	255	248	239	227	213	198	185	175		
55	168	178	192	208	223	235	243	248	249	246	239	228	215	199	181	165	153		
60	143	155	174	193	210	224	233	239	240	236	229	218	203	185	165	145	131		
65	117	134	155	178	197	213	223	229	230	227	219	207	191	171	148	126	107		
70	90.6	112	138	163	185	201	213	219	221	217	209	196	179	158	134	108	84.6		
75	64.8	91.2	122	150	173	191	203	209	211	207	199	186	168	146	120	90.8	63.2		
80	41.5	73.3	108	138	162	180	192	199	201	198	189	176	158	136	108	76.2	44.7		
85	23.6	59.3	95.9	127	151	170	182	189	191	188	180	166	148	126	97.4	64.6	30.9		
90	14.3	49.9	86.3	118	141	160	172	179	181	178	170	157	139	117	88.6	56.3	23.1		
95	12.5	44.5	78.9	109	133	150	163	169	171	168	161	148	131	109	81.2	50.0	18.4		
100	14.3	41.9	73.3	102	125	141	153	160	162	159	151	139	123	101	75.0	45.4	17.1		
105	16.6	40.9	69.0	95.3	117	134	144	150	152	149	142	132	116	94.9	70.0	43.0	19.1		
110	20.1	42.2	65.5	89.2	110	125	136	141	143	140	135	124	108	89.0	66.2	42.8	21.7		
115	24.7	43.9	64.1	84.1	102	117	127	133	135	132	126	116	101	83.9	63.9	43.8	24.6		
120	28.7	45.7	62.9	80.6	95.9	109	118	124	126	123	117	108	95.3	80.2	62.6	45.3	28.1		
125	31.5	47.6	62.4	77.4	91.0	102	110	115	117	115	109	101	90.6	77.1	62.0	46.7	29.8		
130	32.7	51.2	62.5	74.8	86.4	96.1	103	107	109	107	103	95.6	86.1	74.6	61.5	46.1	30.3		
135	29.1	52.1	62.4	72.8	82.5	90.6	96.6	100	101	100	96.5	90.4	82.3	72.6	61.5	48.1	28.5		
140	21.6	48.5	61.1	71.1	79.3	85.9	90.9	93.9	95.0	94.1	90.9	85.7	79.0	70.2	59.3	47.7	24.6		
145	14.8	45.7	61.8	65.6	75.3	82.0	86.0	88.5	89.4	88.5	85.8	81.5	75.3	66.7	60.0	41.6	11.6		
150	5.87	39.2	58.3	65.0	68.9	75.2	80.8	83.2	83.9	83.1	80.7	75.7	70.4	65.2	58.9	38.8	6.31		
155	2.06	23.2	49.1	58.1	64.8	69.6	73.0	75.1	76.0	75.4	73.7	71.0	66.8	62.0	55.4	28.4	2.38		
160	3.40	11.2	28.9	47.4	53.8	61.1	66.8	68.0	67.7	67.4	67.2	65.5	62.9	58.2	41.9	14.6	1.02		
165	4.24	6.81	7.73	22.3	36.1	45.4	53.1	61.5	62.9	62.9	62.6	59.8	53.9	41.7	23.6	9.00	4.04		
170	3.39	4.63	7.16	6.60	9.18	18.7	25.1	28.7	37.5	38.1	33.5	25.9	19.5	11.3	6.47	11.6	7.29		
175	4.57	4.25	3.79	7.11	8.81	8.40	7.29	5.78	2.16	9.10	10.5	10.1	9.35	9.01	7.85	5.31	6.78		
180	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36		

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 8: 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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