

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: 10T8/4F/850/UEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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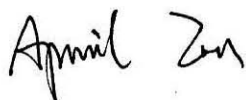
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Report No.: HZ23030039h

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: **10T8/4F/850/UEB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
164.1	1678.4	10.23	0.9822
CCT (K)	CRI	Stabilization Time (Light & Power)	
5109	84.0	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	: Mar. 28, 2023
Date of Test	: Mar. 30, 2023
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

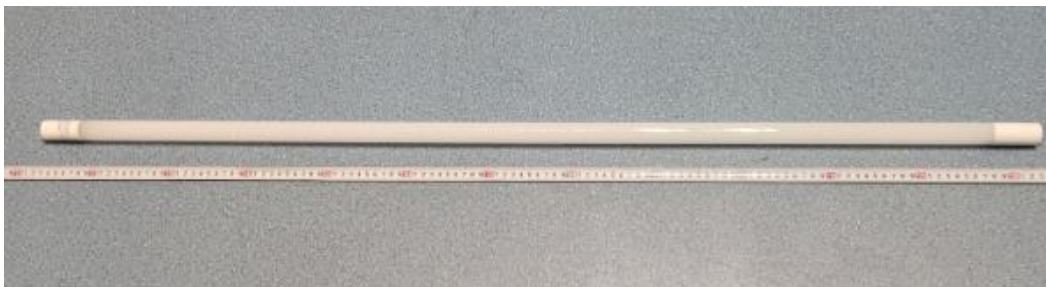


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 10T8/4F/850/UEB
Electrical Ratings	: 120-277V, 50/60Hz, 10W
Product Description	: 5000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 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)	0.086	0.041
Power Factor	0.9822	0.9302
Test Power (W)	10.23	10.51
THD A%	15.74	16.16
Luminous Efficacy (lm/W)	164.1	162.5
Total Luminous Flux (lm)	1678.4	1708.3
Color Rendering Index (CRI)	84.0	
R9	12	
Correlated Color Temperature (CCT)(K)	5109	
Chromaticity Chroma x	0.3423	
Chromaticity Chroma y	0.3531	
Chromaticity Chroma u	0.2090	
Chromaticity Chroma v	0.3233	
Duv	0.0019	
Chromaticity Chroma u'	0.2090	
Chromaticity Chroma v'	0.4850	

Special Color Rendering Indices	
R1	82.5
R2	89.3
R3	93.2
R4	83.6
R5	83
R6	84.3
R7	87.3
R8	68.6
R9	12
R10	74.1
R11	83.1
R12	61.4
R13	84.4
R14	96.6

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)	0.087
Power Factor	0.9824
Power (W)	10.25
Luminous Efficacy (lm/W)	164.6
Total Luminous Flux (lm)	1686.8
Beam Angle (°)	113.1 (0°-180°) / 220.5 (90°-270°)
Center Beam Candle Power (cd)	286
Maximum Beam Candle Power (cd)	286.4 (At: C=40.0, Gamma=1.0)
Spacing Criteria	1.26 (0°-180°) / 1.43 (90°-270°)
Zonal Lumens in the 0°-60° Zone	43.40%
Zonal Lumens in the 60°-90° Zone	26.84%
Zonal Lumens in the 90°-120° Zone	17.76%
Zonal Lumens in the 120°-180° Zone	12.00%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

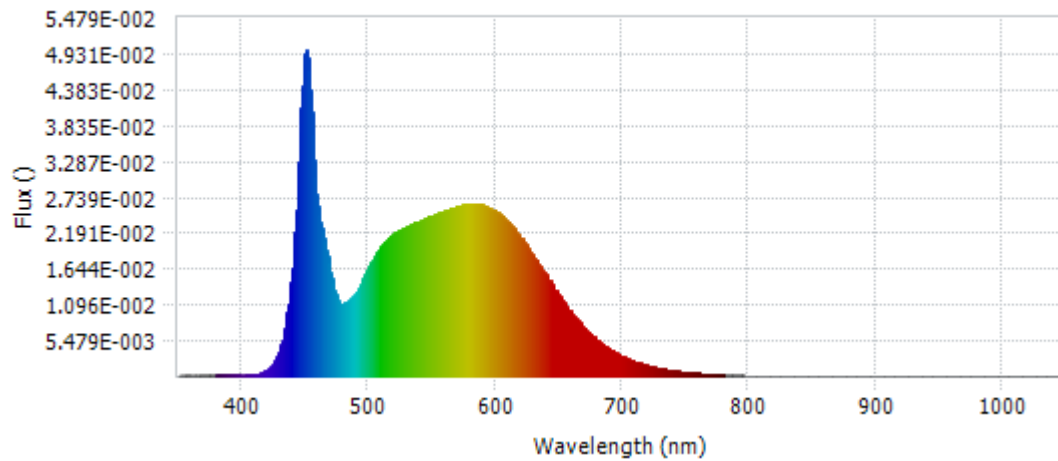
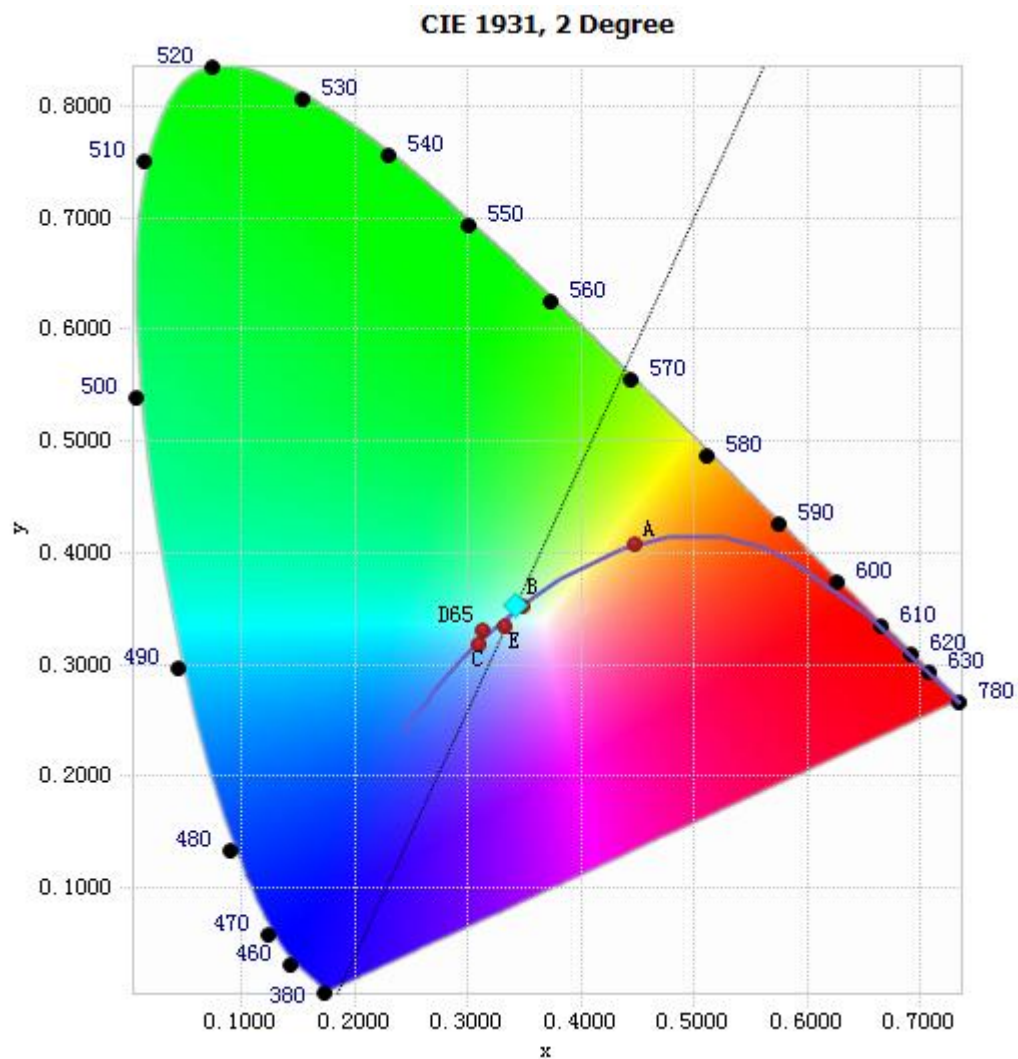


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.98E-04	485	1.17E-02	590	2.63E-02	695	3.63E-03
385	1.71E-04	490	1.27E-02	595	2.59E-02	700	3.11E-03
390	2.15E-04	495	1.46E-02	600	2.53E-02	705	2.66E-03
395	1.97E-04	500	1.67E-02	605	2.46E-02	710	2.28E-03
400	1.58E-04	505	1.85E-02	610	2.37E-02	715	1.95E-03
405	1.72E-04	510	1.98E-02	615	2.26E-02	720	1.66E-03
410	2.67E-04	515	2.11E-02	620	2.13E-02	725	1.43E-03
415	5.15E-04	520	2.18E-02	625	1.99E-02	730	1.22E-03
420	1.02E-03	525	2.24E-02	630	1.85E-02	735	1.05E-03
425	2.06E-03	530	2.29E-02	635	1.70E-02	740	8.93E-04
430	4.22E-03	535	2.33E-02	640	1.55E-02	745	7.63E-04
435	8.50E-03	540	2.37E-02	645	1.39E-02	750	6.58E-04
440	1.67E-02	545	2.42E-02	650	1.24E-02	755	5.66E-04
445	3.28E-02	550	2.45E-02	655	1.11E-02	760	4.83E-04
450	4.92E-02	555	2.49E-02	660	9.78E-03	765	4.17E-04
455	4.03E-02	560	2.53E-02	665	8.60E-03	770	3.58E-04
460	2.60E-02	565	2.57E-02	670	7.46E-03	775	3.07E-04
465	2.12E-02	570	2.59E-02	675	6.53E-03	780	2.67E-04
470	1.60E-02	575	2.62E-02	680	5.67E-03		
475	1.18E-02	580	2.63E-02	685	4.88E-03		
480	1.12E-02	585	2.64E-02	690	4.22E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3423, 0.3531)

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

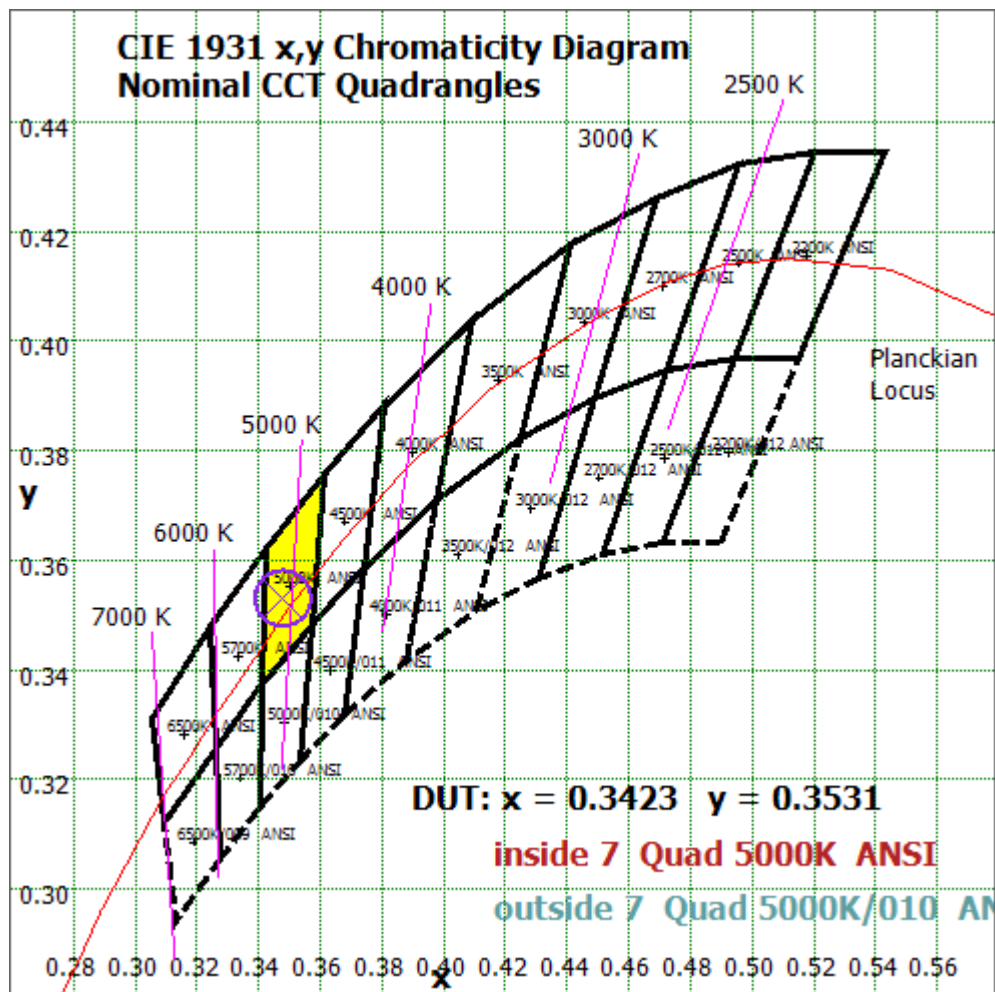


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

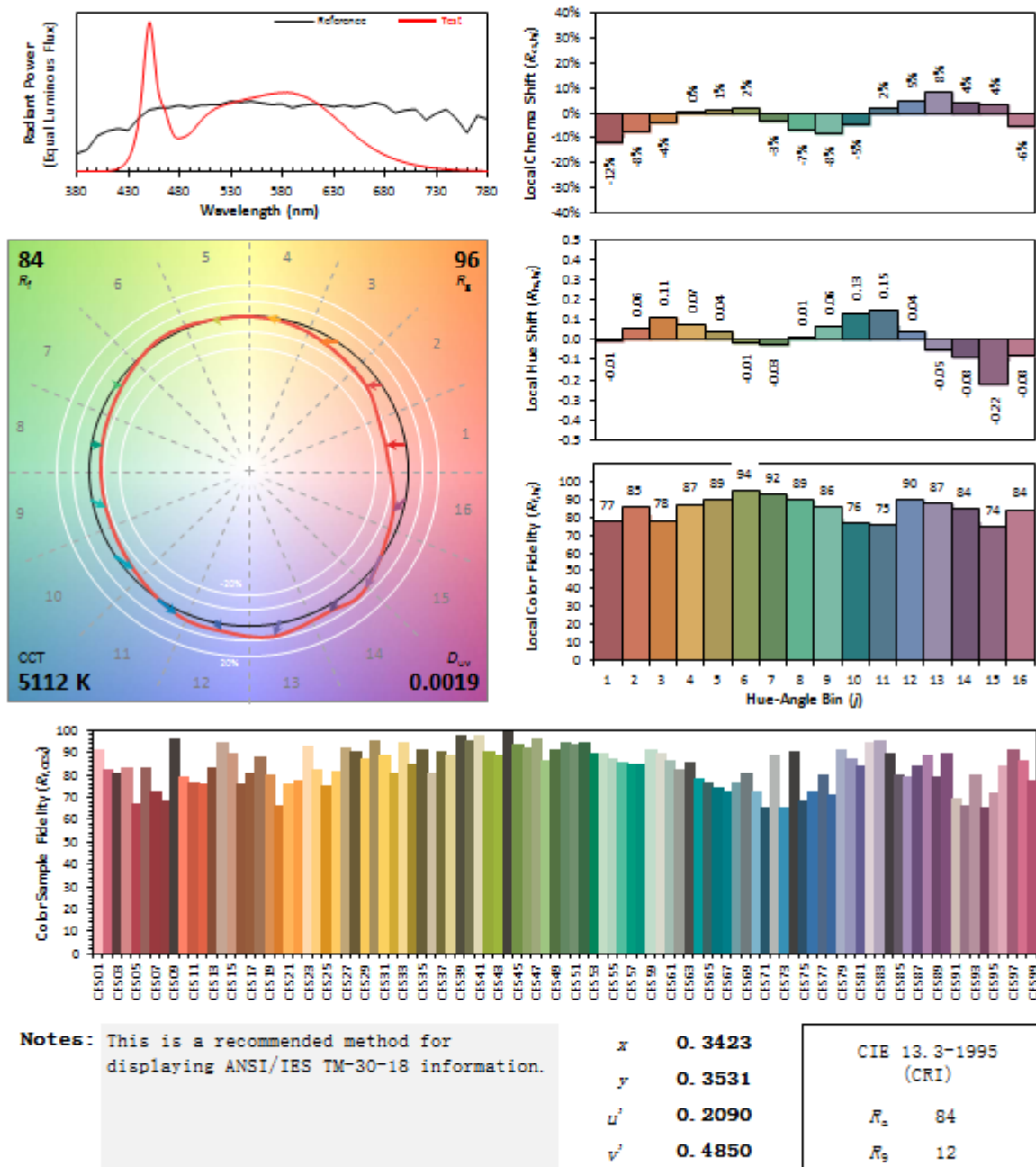
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/03/30

Model: 10T8/4F/850/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	27.156	1.61%
10- 20	78.727	4.67%
20- 30	122.427	7.26%
30- 40	154.43	9.16%
40- 50	172.576	10.23%
50- 60	176.726	10.48%
60- 70	168.659	10.00%
70- 80	151.941	9.01%
80- 90	132.131	7.83%
90-100	114.577	6.79%
100-110	99.596	5.90%
110-120	85.449	5.07%
120-130	70.949	4.21%
130-140	55.376	3.28%
140-150	40.505	2.40%
150-160	24.556	1.46%
160-170	9.618	0.57%
170-180	1.429	0.08%
Total	1686.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	732.042	43.40%
60- 90	452.731	26.84%
0-90	1184.773	70.24%
90- 180	502.055	29.76%
0- 180	1686.8	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

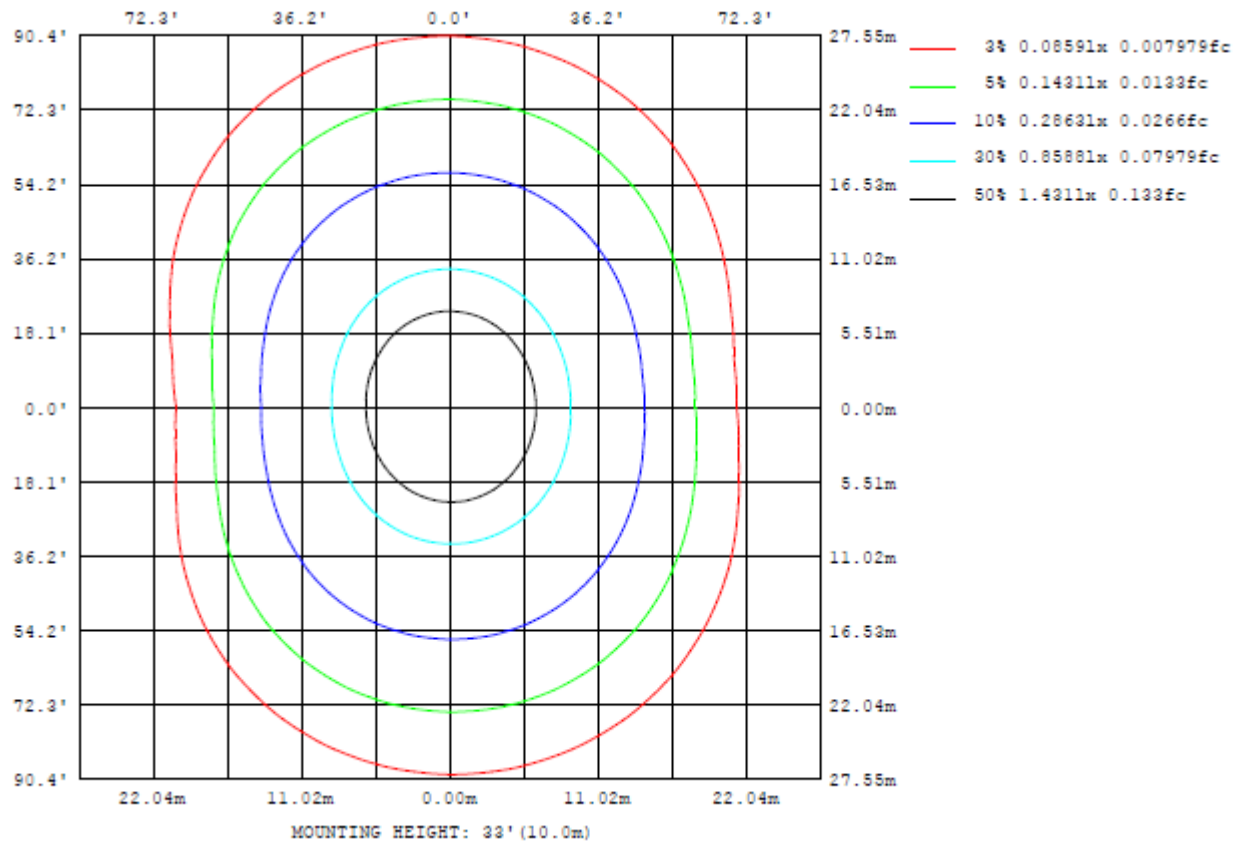


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

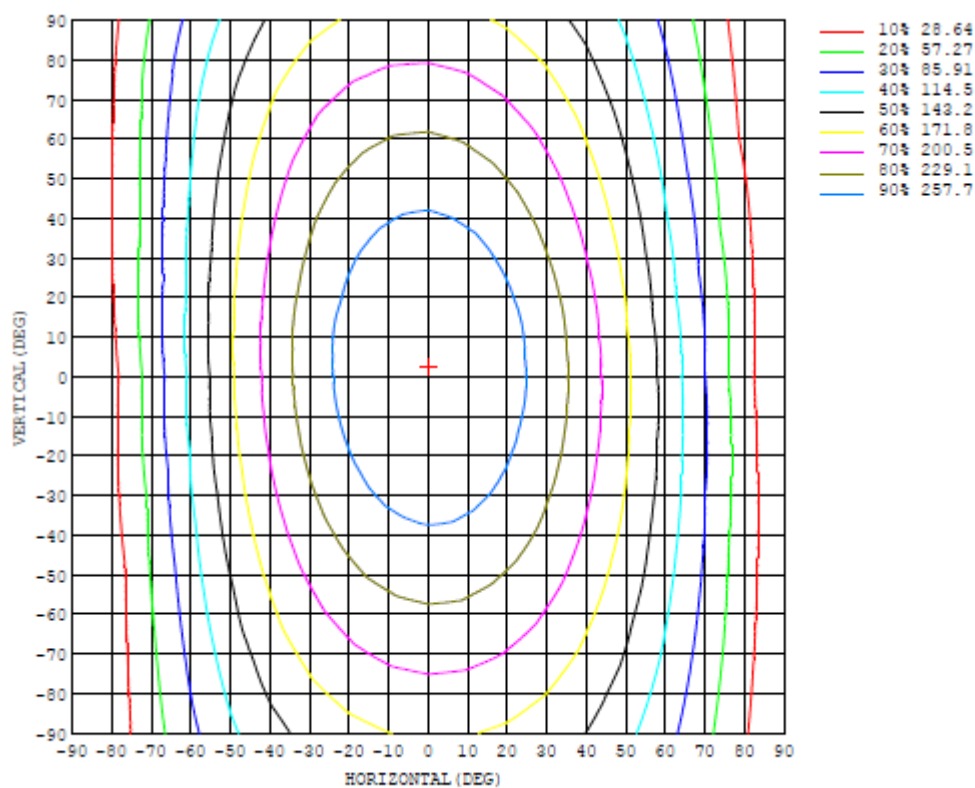


Chart 6: Isocandela Plot

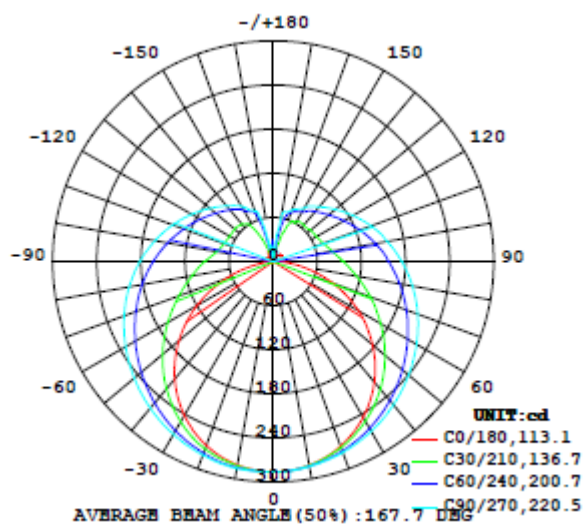


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	286	286	286	286	286	286	286	286	286	286	286	286	286	286	286	286	286	286	286
5	285	285	285	285	285	285	285	285	285	286	285	285	285	285	285	285	285	285	285
10	281	282	282	282	282	282	283	283	283	283	283	282	282	282	282	282	282	281	281
15	276	276	276	276	277	278	279	279	280	280	280	279	278	277	276	276	275	275	275
20	267	268	268	269	271	273	274	275	276	276	276	275	273	271	270	268	267	266	266
25	257	258	259	261	263	266	269	270	272	272	271	269	267	264	261	258	257	255	255
30	245	245	247	251	254	259	262	265	266	267	265	263	260	256	251	247	244	242	242
35	230	232	235	239	244	250	255	258	260	261	259	256	252	246	240	234	229	227	226
40	214	216	220	227	233	241	247	251	254	254	253	249	243	236	228	220	213	209	209
45	196	198	204	213	222	231	238	244	247	248	245	241	234	225	215	205	196	190	189
50	176	180	188	198	210	221	229	236	240	240	238	233	224	214	201	188	177	169	168
55	156	160	170	184	197	210	220	228	232	233	230	224	215	202	187	171	157	148	144
60	134	140	153	169	185	200	211	219	224	225	222	216	205	191	174	155	138	124	120
65	110	119	135	154	172	189	202	211	216	217	214	207	196	180	161	139	117	99.9	94.3
70	86.0	97.2	118	141	161	179	193	202	208	209	206	198	186	170	149	124	97.1	75.5	68.2
75	61.7	76.2	101	127	151	169	184	194	199	201	197	190	177	160	138	110	79.0	52.3	43.9
80	38.6	57.2	86.2	115	140	159	175	185	191	192	189	181	168	151	127	97.6	63.9	32.2	21.1
85	18.5	41.5	73.8	105	130	152	166	176	182	184	180	173	160	142	118	87.6	52.6	18.3	5.22
90	5.10	30.8	64.2	95.3	122	143	157	167	173	175	172	164	152	134	110	79.6	45.4	12.6	0.35
95	2.60	25.5	57.4	87.7	114	134	150	159	165	166	163	155	144	126	102	73.6	41.6	12.9	0.25
100	5.19	24.2	53.0	81.5	106	126	141	152	156	158	155	148	136	118	96.0	69.1	40.3	15.9	0.43
105	9.21	25.4	50.5	76.5	99.7	119	133	143	149	150	147	140	128	112	90.7	66.1	40.8	19.4	0.70
110	13.2	28.2	49.5	72.7	93.8	112	125	135	140	142	139	132	121	105	86.2	64.4	42.8	22.2	1.32
115	12.5	32.3	49.7	69.9	88.9	105	118	127	132	133	131	124	114	99.9	82.6	63.6	45.0	29.8	4.23
120	13.4	37.0	50.8	68.0	84.7	99.6	111	119	124	125	123	117	108	95.0	79.8	63.7	47.8	33.2	10.6
125	15.3	41.4	51.3	67.1	81.3	94.2	104	112	116	117	115	110	102	90.8	77.8	63.9	49.8	30.6	9.71
130	13.0	44.7	53.4	66.5	78.5	89.7	98.7	105	109	110	108	104	96.5	87.1	76.2	64.0	49.7	22.8	5.29
135	13.6	47.6	55.1	64.4	76.6	85.8	93.5	99.0	103	104	102	98.0	91.9	84.2	73.0	62.9	53.4	20.4	4.07
140	11.1	38.7	56.6	64.7	72.7	82.6	88.8	93.5	96.5	97.3	96.0	92.8	87.9	79.6	71.1	61.1	57.1	14.4	3.58
145	7.59	34.3	59.2	65.1	70.9	77.3	84.4	88.5	91.0	91.7	90.7	88.0	81.7	75.2	70.1	61.1	49.2	18.6	9.37
150	3.10	26.0	58.7	61.9	70.3	74.2	78.2	81.2	83.3	83.8	83.0	80.6	77.2	74.0	66.4	64.7	44.5	20.2	14.4
155	2.78	15.8	43.5	60.3	67.6	72.2	74.9	76.8	78.3	78.7	78.1	77.1	74.9	69.7	65.6	64.1	33.0	11.2	15.9
160	8.88	10.6	21.5	43.2	58.7	66.9	71.0	73.0	74.4	74.7	73.9	72.2	69.7	67.8	67.7	52.3	23.7	7.40	14.4
165	5.52	9.38	12.1	22.9	40.2	54.1	61.6	68.6	69.2	69.4	69.2	69.6	69.3	68.1	54.5	32.0	12.5	4.46	10.9
170	11.3	9.22	14.3	8.23	16.0	24.6	28.7	35.3	48.1	56.1	54.5	48.1	42.9	38.1	26.7	13.4	7.13	13.6	7.42
175	5.47	8.85	11.7	13.0	11.7	8.19	8.30	5.11	4.45	7.96	5.81	7.49	10.8	8.86	10.4	11.1	10.5	9.58	7.77
180	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) Y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	286	286	286	286	286	286	286	286	286	286	286	286	286	286	286	286	286		
5	285	285	285	285	286	286	286	286	286	286	286	286	286	286	285	285	285		
10	281	282	282	283	284	285	285	286	286	286	285	284	284	283	282	282	282		
15	275	276	278	279	281	282	283	284	284	283	283	282	281	279	278	276	276		
20	267	269	271	273	276	277	279	280	280	280	279	277	276	273	271	269	268		
25	257	259	263	265	269	272	274	276	276	275	274	271	268	265	262	260	257		
30	244	248	252	256	262	266	269	271	272	270	268	264	260	256	252	248	245		
35	229	234	239	246	253	259	263	266	266	265	262	257	251	245	240	235	231		
40	212	218	226	235	244	251	256	260	260	258	254	248	241	233	226	220	215		
45	193	201	212	223	234	243	249	253	254	251	247	239	230	220	211	203	197		
50	173	183	197	211	224	234	242	246	247	244	238	230	219	207	195	185	177		
55	151	164	181	198	213	226	234	239	240	236	230	220	208	193	178	165	157		
60	128	145	166	186	203	217	226	231	232	228	221	211	196	179	162	146	135		
65	105	126	151	173	193	208	218	223	224	220	212	201	185	166	145	126	112		
70	82.3	108	136	162	183	199	209	215	216	212	204	191	174	153	129	106	89.1		
75	61.7	91.9	124	151	173	190	201	207	208	204	195	181	163	140	114	87.1	66.4		
80	43.7	78.3	112	141	164	181	192	198	199	195	186	172	153	129	101	70.3	44.9		
85	31.2	69.0	103	132	155	172	183	189	190	186	177	163	144	119	89.4	57.3	26.5		
90	22.2	58.9	93.2	123	146	163	174	180	181	177	168	154	135	110	80.1	47.2	14.9		
95	17.3	50.7	84.8	114	138	155	166	172	173	168	159	145	126	102	72.7	40.8	10.1		
100	18.5	47.2	77.9	106	129	146	157	163	163	159	151	137	118	94.7	67.6	36.1	8.39		
105	21.0	46.6	74.0	99.8	122	138	148	154	154	150	142	129	111	88.5	62.8	33.9	10.4		
110	23.5	47.2	71.3	94.7	115	130	139	145	146	142	134	121	104	83.3	59.6	34.2	13.7		
115	26.7	48.6	69.6	90.3	108	122	131	136	137	133	126	114	98.1	79.1	58.1	36.0	17.2		
120	30.3	50.5	68.7	86.8	103	115	123	128	128	125	118	107	93.0	76.1	57.8	38.4	20.0		
125	29.8	51.5	68.3	83.7	97.6	108	116	120	120	117	111	101	88.6	73.9	58.2	38.0	14.3		
130	20.2	51.3	68.6	81.4	93.1	102	109	112	113	110	104	95.8	84.8	72.3	58.8	36.8	1.84		
135	1.76	48.0	68.0	79.2	89.1	96.9	102	105	106	103	98.1	90.9	81.8	71.0	58.7	38.5	0.00		
140	0.00	46.9	66.8	76.5	85.5	91.8	96.2	98.7	99.0	96.9	92.7	86.8	79.0	68.7	57.1	41.0	7.34		
145	13.8	37.5	62.8	72.8	80.7	87.0	90.8	92.8	93.0	91.3	87.8	82.5	75.0	66.0	54.2	27.6	5.36		
150	11.1	4.74	49.7	71.4	74.7	80.5	84.4	86.6	86.7	85.2	82.0	76.3	69.8	65.0	43.5	3.75	4.50		
155	8.57	1.91	27.8	61.2	72.7	74.8	76.4	77.4	77.8	76.5	74.3	71.3	65.9	51.4	21.3	1.10	2.77		
160	17.7	18.3	14.3	23.1	50.1	69.0	72.7	72.9	72.9	72.1	69.8	58.8	41.9	20.4	11.7	13.7	8.44		
165	22.3	11.5	9.07	18.9	10.6	14.1	31.7	45.9	48.9	46.2	32.2	13.8	3.64	12.1	7.48	19.8	17.2		
170	20.1	6.56	20.8	5.73	8.10	17.6	22.2	17.6	14.0	11.4	8.52	11.7	10.4	6.37	17.2	15.0	18.2		
175	8.20	19.9	24.4	13.8	8.37	14.8	20.0	9.34	5.70	7.37	20.3	26.7	21.0	10.8	15.3	27.9	20.3		
180	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98	7.98		

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 4π . 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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