

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/840/UEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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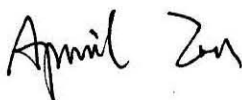
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Report No.: HZ23030039g

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/840/UEB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
171.8	1747.1	10.17	0.9842
CCT (K)	CRI	Stabilization Time (Light & Power)	
4044	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	: 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/840/UEB
Electrical Ratings	: 120-277V, 50/60Hz, 10W
Product Description	: 4000K
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	0.9842	0.9285
Test Power (W)	10.17	10.50
THD A%	14.87	16.26
Luminous Efficacy (lm/W)	171.8	170.0
Total Luminous Flux (lm)	1747.1	1785.1
Color Rendering Index (CRI)	82.3	
R9	5.2	
Correlated Color Temperature (CCT)(K)	4044	
Chromaticity Chroma x	0.3794	
Chromaticity Chroma y	0.3791	
Chromaticity Chroma u	0.2235	
Chromaticity Chroma v	0.3350	
Duv	0.0014	
Chromaticity Chroma u'	0.2235	
Chromaticity Chroma v'	0.5025	

Special Color Rendering Indices	
R1	80.3
R2	88.5
R3	94.7
R4	81.1
R5	80.3
R6	84
R7	85.9
R8	63.6
R9	5.2
R10	73
R11	80
R12	58.5
R13	82.3
R14	97.3

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)	0.086
Power Factor	0.9843
Power (W)	10.18
Luminous Efficacy (lm/W)	173.0
Total Luminous Flux (lm)	1761.2
Beam Angle (°)	113.1 (0°-180°) / 218.5 (90°-270°)
Center Beam Candle Power (cd)	301
Maximum Beam Candle Power (cd)	301.2 (At: C=260.0, Gamma=5.5)
Spacing Criteria	1.25 (0°-180°) / 1.43 (90°-270°)
Zonal Lumens in the 0°-60° Zone	43.52%
Zonal Lumens in the 60°-90° Zone	26.80%
Zonal Lumens in the 90°-120° Zone	17.71%
Zonal Lumens in the 120°-180° Zone	11.97%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

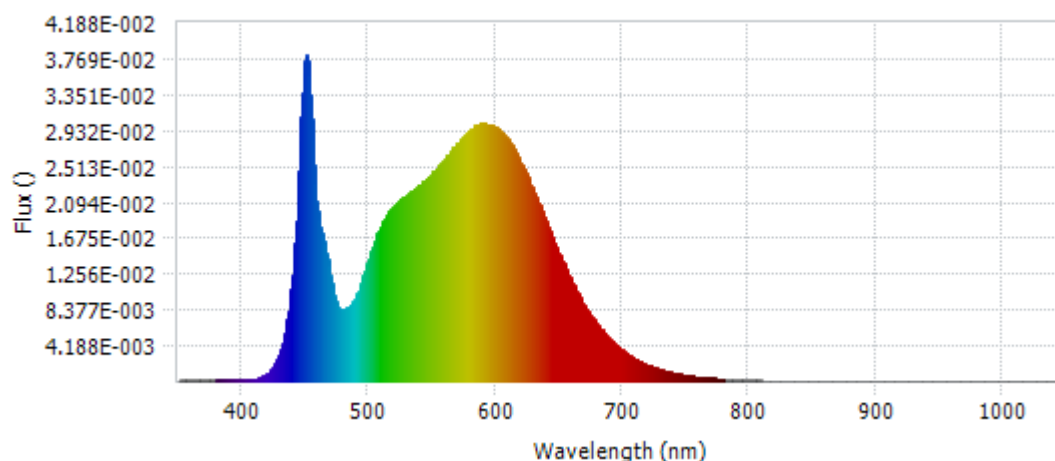
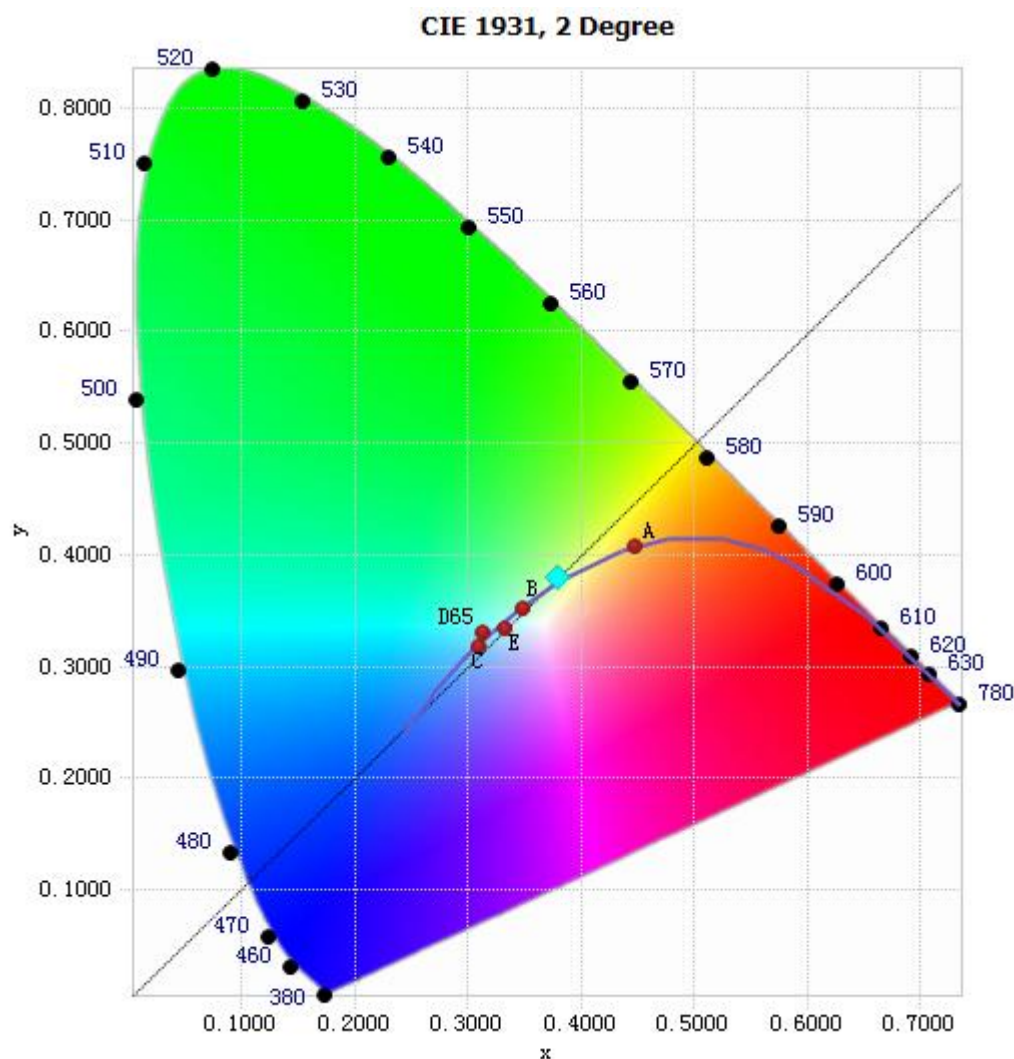


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.41E-04	485	8.83E-03	590	3.02E-02	695	4.30E-03
385	1.49E-04	490	9.94E-03	595	3.01E-02	700	3.67E-03
390	1.59E-04	495	1.19E-02	600	2.97E-02	705	3.13E-03
395	1.39E-04	500	1.43E-02	605	2.91E-02	710	2.66E-03
400	1.33E-04	505	1.64E-02	610	2.82E-02	715	2.25E-03
405	1.57E-04	510	1.81E-02	615	2.71E-02	720	1.94E-03
410	2.51E-04	515	1.96E-02	620	2.56E-02	725	1.65E-03
415	4.60E-04	520	2.04E-02	625	2.41E-02	730	1.41E-03
420	8.68E-04	525	2.12E-02	630	2.23E-02	735	1.20E-03
425	1.77E-03	530	2.18E-02	635	2.05E-02	740	1.02E-03
430	3.39E-03	535	2.23E-02	640	1.87E-02	745	8.75E-04
435	6.45E-03	540	2.29E-02	645	1.69E-02	750	7.42E-04
440	1.23E-02	545	2.36E-02	650	1.51E-02	755	6.30E-04
445	2.45E-02	550	2.42E-02	655	1.34E-02	760	5.38E-04
450	3.75E-02	555	2.51E-02	660	1.18E-02	765	4.62E-04
455	3.07E-02	560	2.60E-02	665	1.04E-02	770	3.97E-04
460	1.98E-02	565	2.69E-02	670	9.01E-03	775	3.41E-04
465	1.64E-02	570	2.77E-02	675	7.83E-03	780	2.89E-04
470	1.23E-02	575	2.86E-02	680	6.75E-03		
475	8.91E-03	580	2.93E-02	685	5.85E-03		
480	8.30E-03	585	3.00E-02	690	5.03E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3794, 0.3791)

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

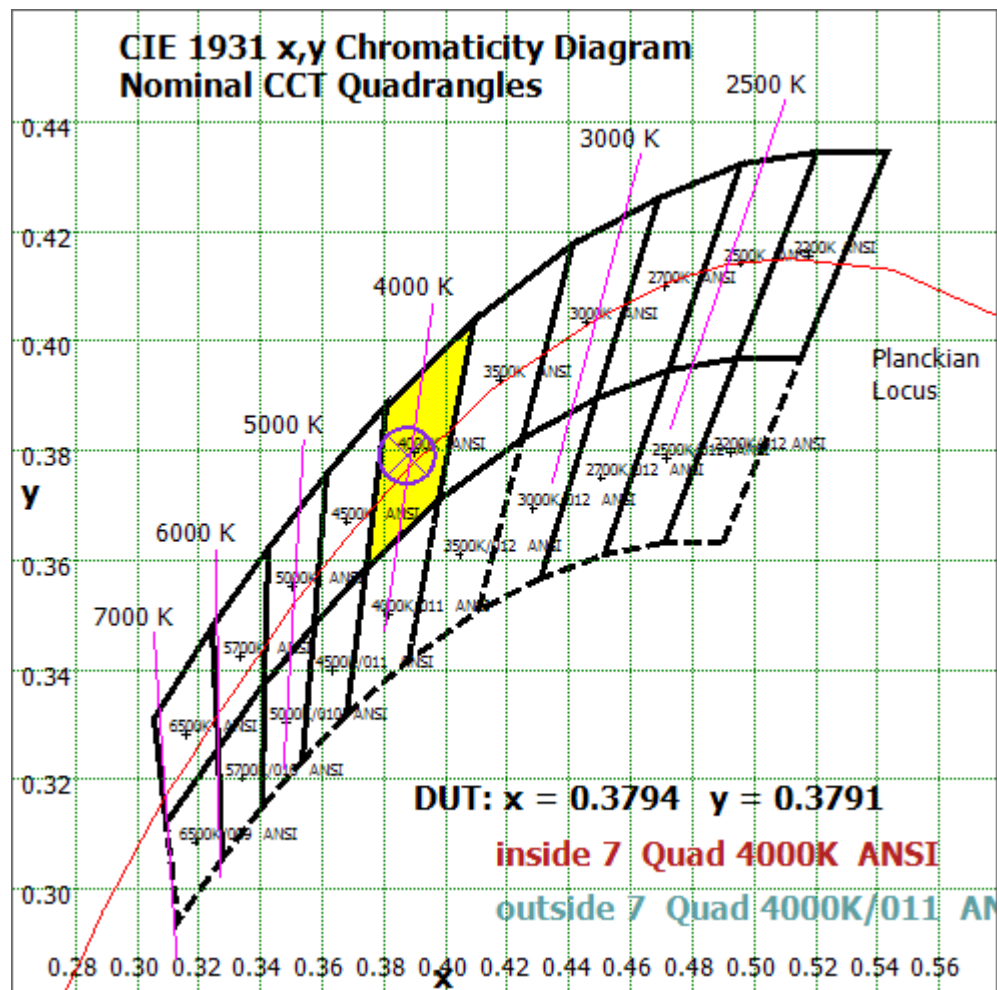


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

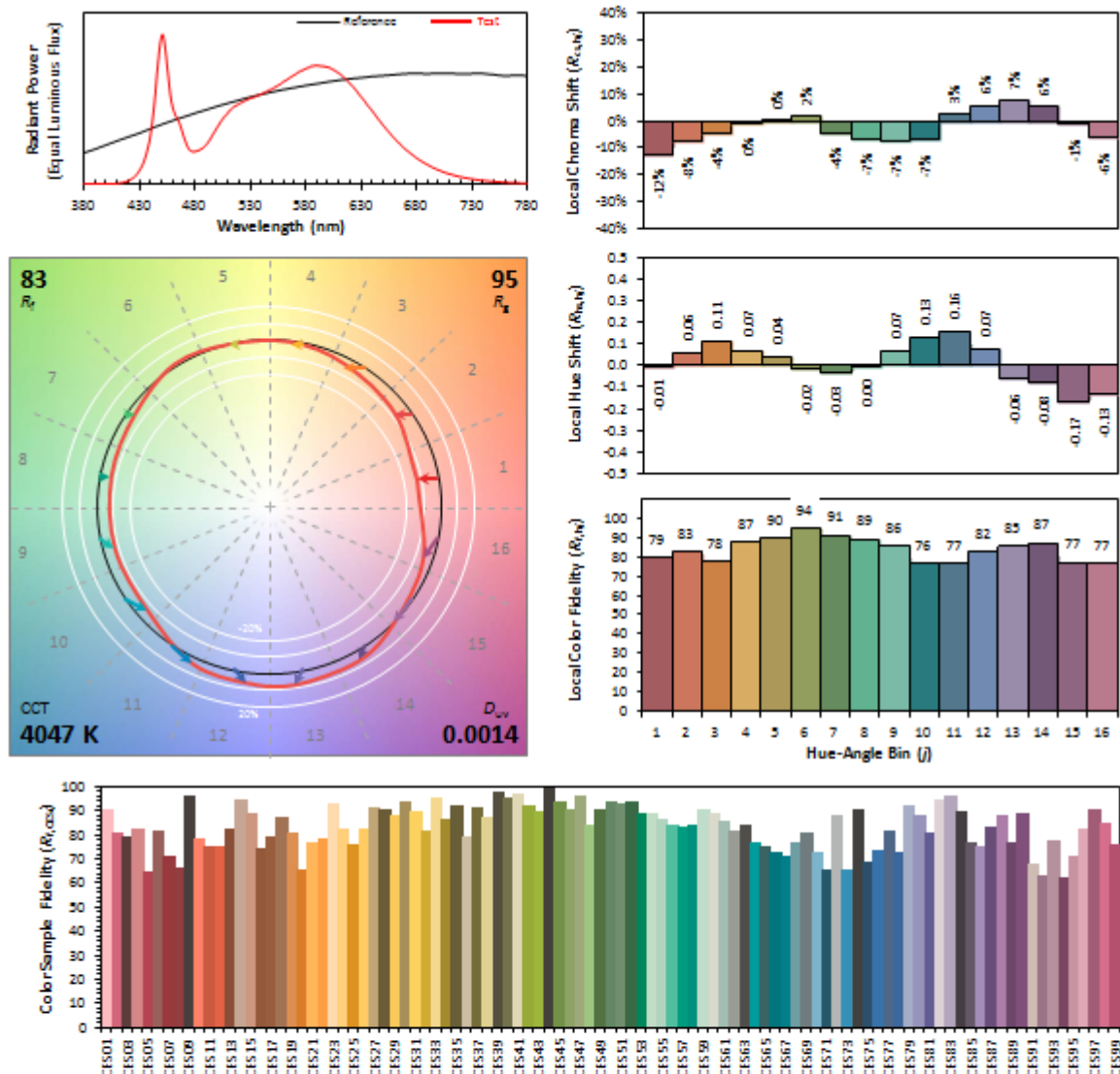
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/03/30

Model: 10T8/4F/840/UEB



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

x 0.3794
 y 0.3791
 u' 0.2235
 v' 0.5025

CIE 13.3-1995
(CRI)

R_a 82
 R_g 5

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	28.562	1.62%
10- 20	82.732	4.70%
20- 30	128.457	7.29%
30- 40	161.765	9.18%
40- 50	180.476	10.25%
50- 60	184.552	10.48%
60- 70	175.953	9.99%
70- 80	158.355	8.99%
80- 90	137.617	7.81%
90-100	119.345	6.78%
100-110	103.686	5.89%
110-120	88.895	5.05%
120-130	74.029	4.20%
130-140	57.909	3.29%
140-150	42.103	2.39%
150-160	25.608	1.45%
160-170	9.782	0.56%
170-180	1.372	0.08%
Total	1761.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	766.544	43.52%
60- 90	471.925	26.80%
0-90	1238.469	70.32%
90- 180	522.729	29.68%
0- 180	1761.2	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

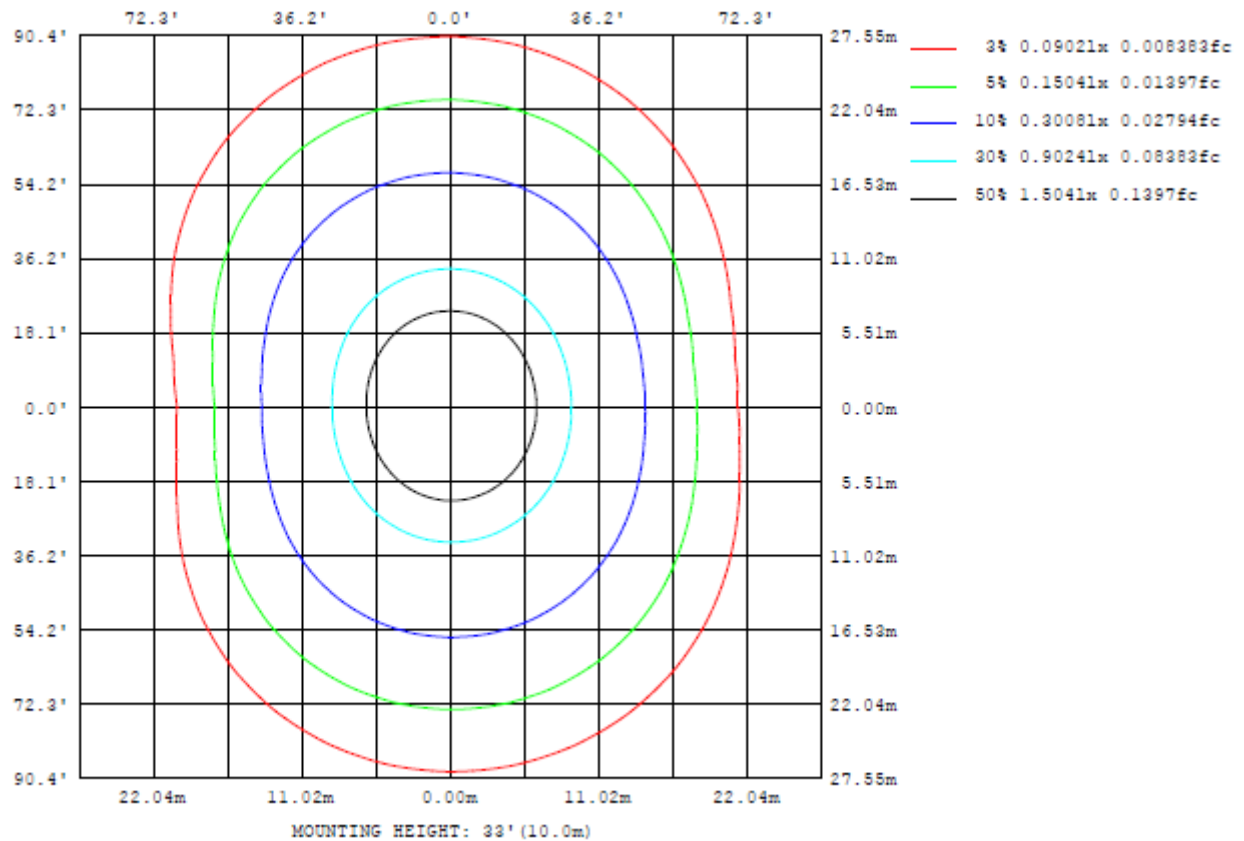


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

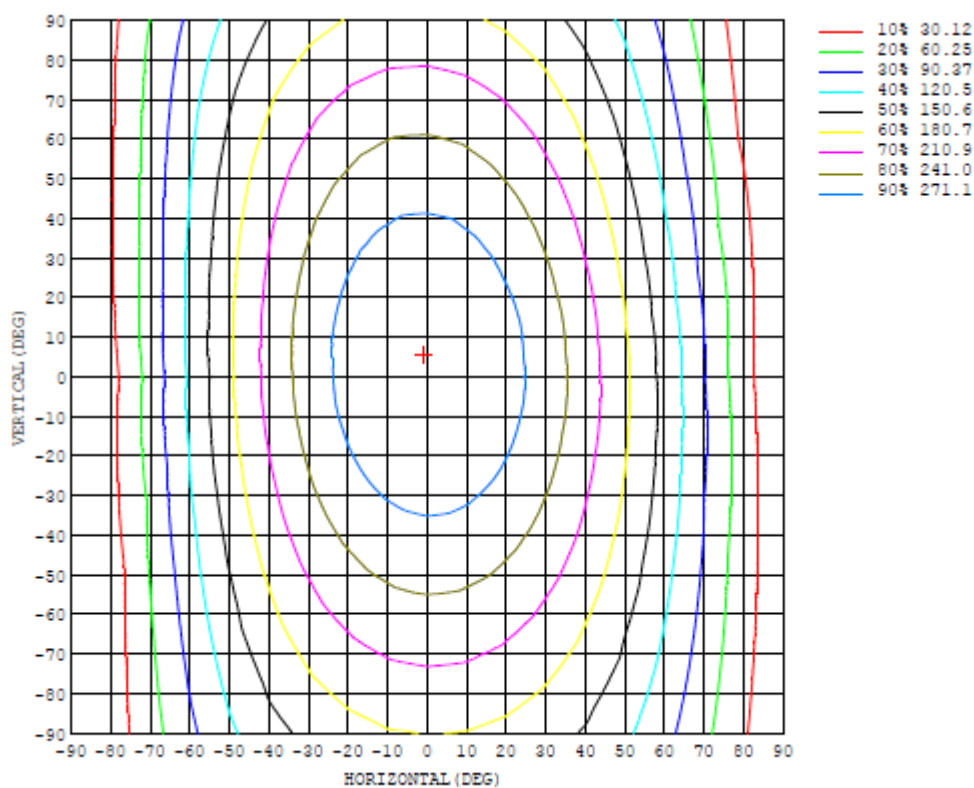


Chart 6: Isocandela Plot

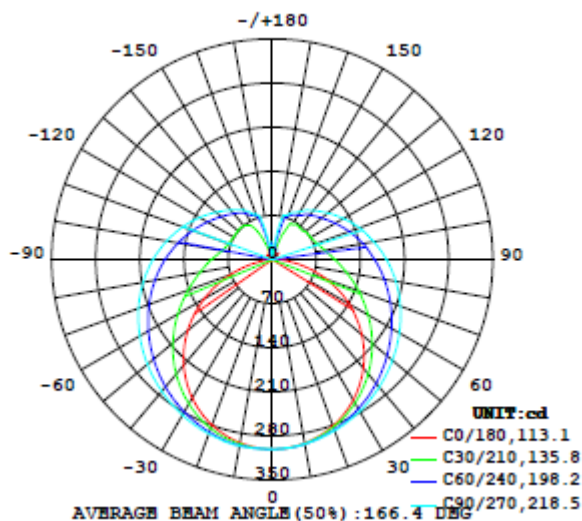


Chart 7: Polar Candela Distribution

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	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301
5	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	299	299	299
10	296	296	296	297	297	298	297	297	298	297	297	297	297	297	296	296	296	296	295
15	290	290	290	291	292	292	293	293	294	294	293	293	292	291	290	290	289	289	288
20	281	282	282	283	285	286	287	288	289	288	289	288	286	285	283	281	280	280	279
25	270	271	272	274	276	279	281	283	284	284	283	281	279	277	274	271	269	268	268
30	257	258	260	263	267	270	273	276	278	278	277	275	271	267	263	259	256	254	254
35	242	243	246	250	256	261	265	269	271	271	270	267	263	257	251	245	240	238	237
40	225	227	231	237	244	251	257	261	264	264	263	259	253	246	238	230	224	219	219
45	206	209	214	222	232	240	247	253	256	257	255	251	244	235	224	214	205	199	198
50	185	189	196	207	219	229	238	245	248	249	247	242	234	223	210	197	185	177	175
55	163	168	178	191	205	218	228	235	240	241	239	233	224	211	196	179	164	154	151
60	141	147	159	175	192	207	218	227	231	233	231	224	214	199	182	162	144	130	125
65	117	125	142	160	179	196	209	218	223	225	222	215	204	188	168	146	122	104	97.9
70	91.5	102	123	147	167	185	199	209	215	216	214	206	194	177	155	130	102	78.8	70.7
75	66.1	80.7	106	133	156	175	190	200	206	208	205	198	185	167	144	115	83.0	54.6	44.8
80	41.8	60.8	90.4	120	146	165	181	191	198	199	196	188	176	157	134	103	67.4	33.9	21.0
85	20.5	44.2	77.4	109	136	156	171	182	189	190	188	180	166	149	124	92.4	55.9	19.6	4.82
90	6.06	32.9	67.3	99.3	126	148	162	173	180	181	179	171	158	140	115	84.2	48.6	14.0	0.31
95	2.36	27.0	60.1	91.3	118	139	154	165	171	173	170	162	151	132	108	78.0	44.8	14.5	0.24
100	3.10	25.2	55.3	84.8	110	131	146	156	162	164	161	154	142	124	101	73.5	43.4	17.7	0.38
105	4.11	26.2	52.6	79.7	104	123	138	149	154	155	153	146	134	118	95.9	70.3	44.0	20.4	0.61
110	4.32	29.0	51.4	75.5	97.6	116	130	140	146	147	145	138	127	111	91.2	68.5	45.9	24.4	1.25
115	2.56	32.9	51.4	72.6	92.4	109	122	132	137	139	137	130	120	105	87.5	67.7	48.3	31.6	3.39
120	3.95	37.2	52.6	70.7	88.1	103	115	124	129	130	128	122	113	100	84.6	67.6	50.1	34.6	7.90
125	5.29	40.9	52.9	69.5	84.5	97.9	109	117	121	123	121	115	107	95.7	82.3	68.0	51.1	27.8	10.8
130	10.2	41.8	55.2	68.9	81.8	93.2	103	110	114	115	113	109	102	91.9	80.5	67.2	52.6	19.4	10.2
135	14.6	34.0	57.3	66.1	79.7	89.2	97.3	103	107	108	107	103	96.5	88.6	76.5	65.1	57.4	17.3	9.51
140	11.4	18.9	59.7	67.0	75.5	85.7	92.5	97.6	101	102	101	97.4	92.2	83.0	74.9	63.0	54.8	19.6	9.76
145	8.16	17.7	61.9	67.2	73.7	80.0	86.7	92.2	95.1	95.8	94.9	91.4	85.0	79.7	72.5	65.4	44.1	17.4	10.3
150	9.60	19.0	45.4	63.7	73.1	77.3	81.4	84.6	86.7	87.3	86.5	84.4	81.4	76.7	68.7	65.5	33.9	11.3	9.19
155	7.93	6.97	23.2	56.0	68.4	74.8	78.1	80.5	81.9	82.3	82.1	80.5	77.1	71.7	70.6	56.2	22.8	6.65	7.93
160	11.3	12.1	13.5	28.1	52.6	68.3	73.2	75.1	76.6	76.9	76.3	74.2	72.4	72.3	62.5	37.8	16.0	7.22	6.95
165	15.7	8.76	11.2	10.3	20.4	37.0	53.2	71.3	73.1	73.2	73.5	73.0	65.8	55.0	37.5	19.3	12.0	11.0	5.24
170	16.4	22.4	7.55	11.0	10.8	7.69	9.96	19.5	32.3	36.3	36.0	31.5	26.6	19.5	12.2	12.7	13.2	9.72	7.54
175	16.2	20.5	19.6	10.8	8.57	10.3	9.02	9.42	11.5	13.8	14.1	13.7	13.6	13.8	12.8	10.7	12.1	12.7	10.5
180	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91

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	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301	301		
5	300	300	300	300	300	301	301	301	300	301	301	301	301	300	300	300	300		
10	296	296	297	298	299	299	300	300	300	300	300	300	299	298	297	296	296		
15	289	291	293	294	296	296	297	298	298	298	297	296	295	294	292	291	290		
20	280	283	285	288	290	292	293	294	294	294	293	291	289	288	285	283	281		
25	269	272	276	279	283	286	288	290	290	289	288	285	282	279	276	273	270		
30	256	260	264	270	275	279	283	285	285	284	281	278	273	269	264	260	258		
35	240	245	252	259	266	272	276	279	279	278	274	269	263	257	251	246	243		
40	222	229	237	247	256	264	269	272	273	271	267	261	252	245	236	230	226		
45	202	211	222	234	246	255	261	266	266	264	258	251	242	231	221	213	207		
50	181	191	206	221	235	246	253	258	258	256	250	241	229	217	204	193	187		
55	158	172	189	208	224	236	245	250	251	248	241	231	217	202	187	173	165		
60	134	151	173	194	213	227	237	242	243	239	232	221	205	188	169	153	142		
65	109	131	157	181	202	218	228	234	234	231	222	210	193	173	152	132	119		
70	84.9	112	142	169	191	208	219	225	226	222	213	200	182	160	135	111	94.0		
75	63.1	95.0	128	158	181	198	210	216	217	213	204	190	170	147	119	91.3	69.5		
80	44.2	80.6	116	147	171	189	201	207	208	204	194	180	160	135	105	73.4	47.3		
85	31.2	69.4	106	137	161	180	191	198	199	195	185	170	150	124	92.8	59.4	28.0		
90	22.5	60.7	96.6	128	152	170	182	188	189	185	175	161	140	114	82.8	48.6	15.3		
95	17.7	52.8	88.1	119	143	161	173	179	180	176	166	151	131	106	75.0	41.9	10.8		
100	19.1	48.8	80.9	111	135	152	163	169	170	166	157	143	123	98.3	69.2	38.4	10.5		
105	21.8	48.2	76.6	104	126	143	154	160	161	157	148	134	115	92.1	65.6	37.2	12.7		
110	25.1	49.0	73.9	98.2	119	135	145	150	151	148	139	126	108	86.9	63.0	37.8	16.3		
115	28.1	50.5	72.3	93.7	112	126	136	141	142	139	130	118	102	82.8	61.5	39.9	20.3		
120	32.1	52.7	71.3	90.0	106	119	128	133	133	130	123	111	96.6	79.4	61.1	42.7	24.1		
125	33.4	54.5	71.0	86.9	101	112	120	124	125	122	115	105	91.9	76.9	61.4	45.0	25.4		
130	26.6	54.6	71.2	84.4	96.5	106	113	116	117	114	108	99.2	87.9	75.3	62.2	43.8	21.1		
135	8.88	51.3	71.4	82.4	92.4	100	106	109	109	107	102	94.2	84.6	74.1	63.1	44.0	12.1		
140	2.12	49.6	69.5	79.9	88.7	95.2	99.8	102	102	100	96.0	89.8	81.9	72.2	61.7	43.7	5.41		
145	5.92	42.2	66.5	76.4	84.7	90.5	94.2	96.2	96.3	94.6	91.1	85.9	78.5	69.1	61.3	39.6	5.99		
150	11.2	23.5	58.7	74.2	78.4	84.8	88.6	90.2	90.2	88.9	85.9	80.7	72.7	66.8	53.9	25.6	7.03		
155	10.7	8.65	38.1	68.7	75.9	77.5	80.0	81.8	81.8	80.5	77.6	73.9	68.7	60.1	36.3	12.2	11.1		
160	7.05	9.37	18.2	39.9	64.6	73.8	75.6	76.3	76.4	75.7	73.1	66.9	57.1	38.2	16.4	8.29	10.7		
165	13.4	15.7	12.9	13.3	19.3	39.6	52.2	58.0	60.3	58.9	51.9	39.9	23.3	12.3	10.8	7.75	11.5		
170	14.8	16.3	12.1	10.4	15.8	14.5	12.6	10.8	10.5	9.08	8.57	9.94	9.06	13.1	11.1	11.3	20.8		
175	20.4	25.5	16.1	11.2	14.9	18.1	16.6	13.8	8.73	10.2	13.8	15.6	16.8	14.5	18.3	30.0	25.1		
180	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91	6.91		

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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