

LM-79-08 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: 8T5HE/2F/850/DIR

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Hangzhou, Zhejiang Province, China 311100

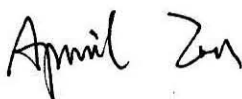
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www.ledtestlab.com

Report No.: HZ20100014c

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

Review by:



Engineer: April Zou

Oct. 23, 2020

Approved by:



Manager: Jim Zhang

Oct. 23, 2020

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: **8T5HE/2F/850/DIR**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
109.7	1291.9	11.78	0.9854
CCT (K)	CRI	Stabilization Time (Light & Power)	
5052	83.5	60	

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:

Date of Receipt	: Oct. 20, 2020
Date of Test	: Oct. 22, 2020
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
Reference Standard	: IESNA LM-79-2008 Approved Method for the 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

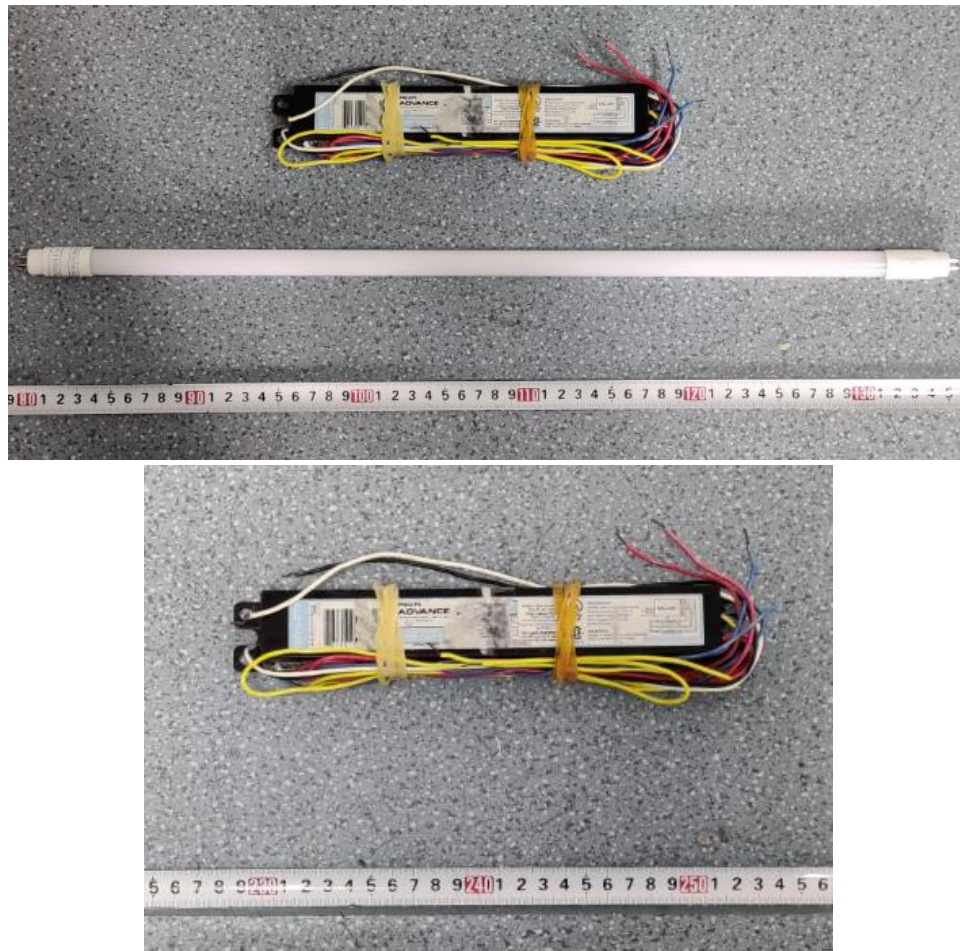


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 8T5HE/2F/850/DIR
Electrical Ratings	: 120-277V, 50/60Hz, 8W
Product Description	: 5000K LED Tubes supplied by a high frequency fluorescent lamp ballast: ICN-2S28-N
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 horizontal. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 65 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.100	0.058
Power Factor	0.9854	0.7671
Test Power (W)	11.78	12.34
THD A%	8.07	29.87
Luminous Efficacy (lm/W)	109.7	104.9
Total Luminous Flux (lm)	1291.9	1294.7
Color Rendering Index (CRI)	83.5	
R9	7.1	
Correlated Color Temperature (CCT)(K)	5052	
Chromaticity Chroma x	0.3443	
Chromaticity Chroma y	0.3591	
Chromaticity Chroma u	0.2080	
Chromaticity Chroma v	0.3254	
Duv	0.0041	
Chromaticity Chroma u'	0.2080	
Chromaticity Chroma v'	0.4882	

Special Color Rendering Indices	
R1	81.4
R2	88.1
R3	93.3
R4	83.8
R5	82.6
R6	84
R7	87.2
R8	67.4
R9	7.1
R10	72.3
R11	83.8
R12	64.9
R13	83
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 25.0 °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)	0.100
Power Factor	0.9848
Power (W)	11.79
Luminous Efficacy (lm/W)	107.7
Total Luminous Flux (lm)	1270.3
Beam Angle (°)	109.7 (0°-180°) / 146.4 (90°-270°)
Center Beam Candle Power (cd)	321
Maximum Beam Candle Power (cd)	321.5 (At: C=10.0, Gamma=0.5)
Spacing Criteria	1.24 (0°-180°) / 1.33 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	59.96%
Zonal Lumens in the 60 °-90 °Zone	27.71%
Zonal Lumens in the 90 °-120 °Zone	9.70%
Zonal Lumens in the 120 °-180 °Zone	2.63%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

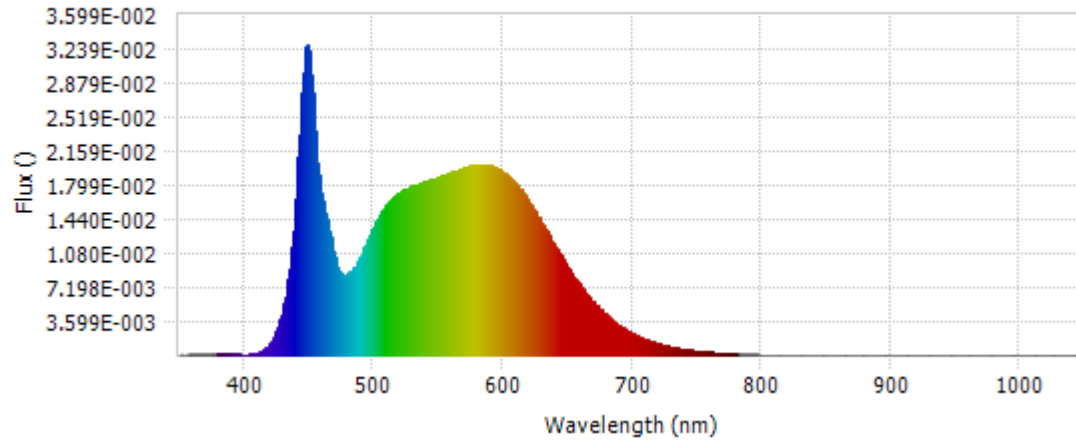
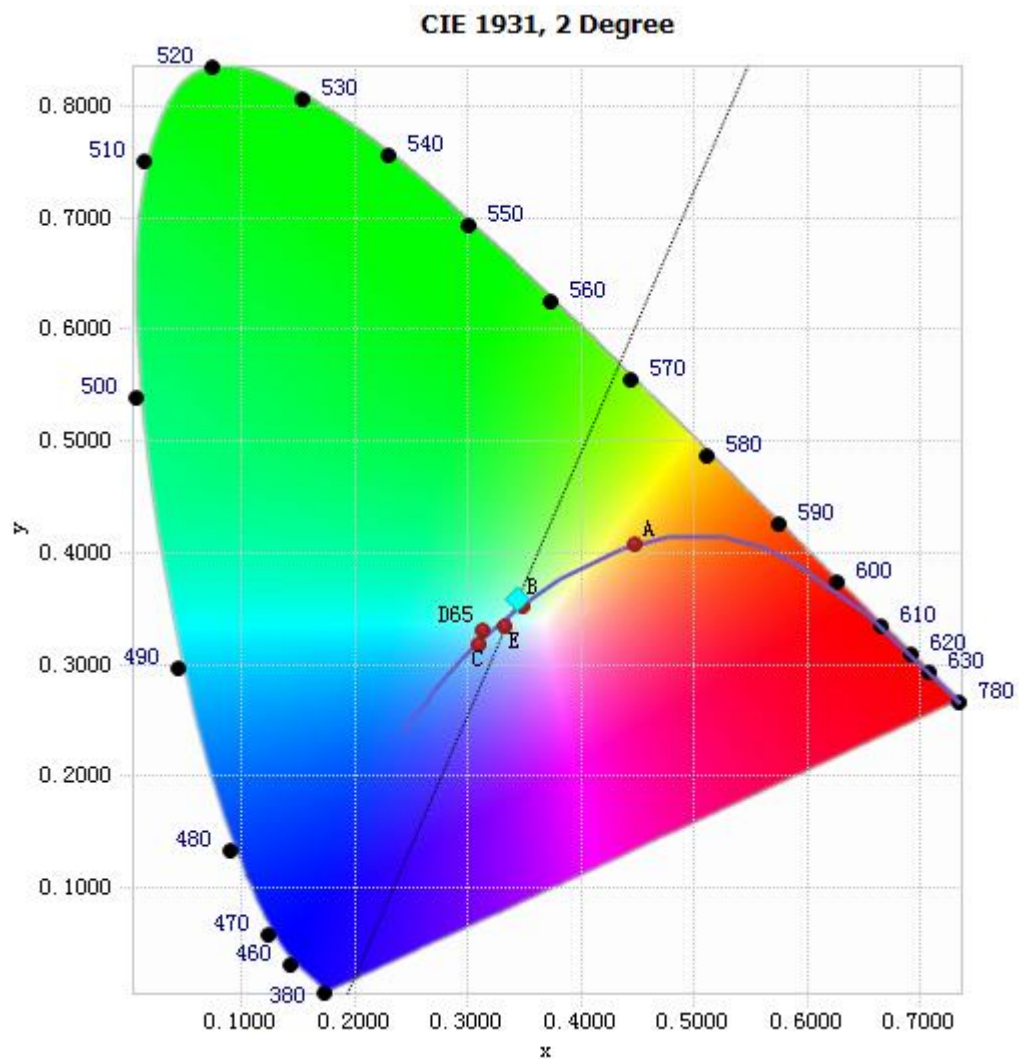


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.46E-04	485	9.25E-03	590	2.00E-02	695	2.71E-03
385	1.44E-04	490	1.04E-02	595	1.98E-02	700	2.32E-03
390	1.34E-04	495	1.20E-02	600	1.94E-02	705	2.00E-03
395	1.17E-04	500	1.36E-02	605	1.88E-02	710	1.69E-03
400	1.02E-04	505	1.49E-02	610	1.81E-02	715	1.45E-03
405	1.20E-04	510	1.59E-02	615	1.73E-02	720	1.25E-03
410	2.40E-04	515	1.67E-02	620	1.63E-02	725	1.06E-03
415	5.76E-04	520	1.72E-02	625	1.52E-02	730	9.07E-04
420	1.24E-03	525	1.76E-02	630	1.40E-02	735	7.72E-04
425	2.50E-03	530	1.79E-02	635	1.29E-02	740	6.55E-04
430	4.88E-03	535	1.80E-02	640	1.17E-02	745	5.61E-04
435	9.05E-03	540	1.83E-02	645	1.05E-02	750	4.77E-04
440	1.66E-02	545	1.86E-02	650	9.41E-03	755	4.08E-04
445	2.78E-02	550	1.88E-02	655	8.35E-03	760	3.52E-04
450	3.22E-02	555	1.91E-02	660	7.37E-03	765	2.99E-04
455	2.38E-02	560	1.93E-02	665	6.46E-03	770	2.57E-04
460	1.72E-02	565	1.96E-02	670	5.65E-03	775	2.20E-04
465	1.38E-02	570	1.98E-02	675	4.91E-03	780	1.90E-04
470	1.04E-02	575	2.00E-02	680	4.25E-03		
475	8.61E-03	580	2.01E-02	685	3.68E-03		
480	8.59E-03	585	2.02E-02	690	3.17E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3443, 0.3591)

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

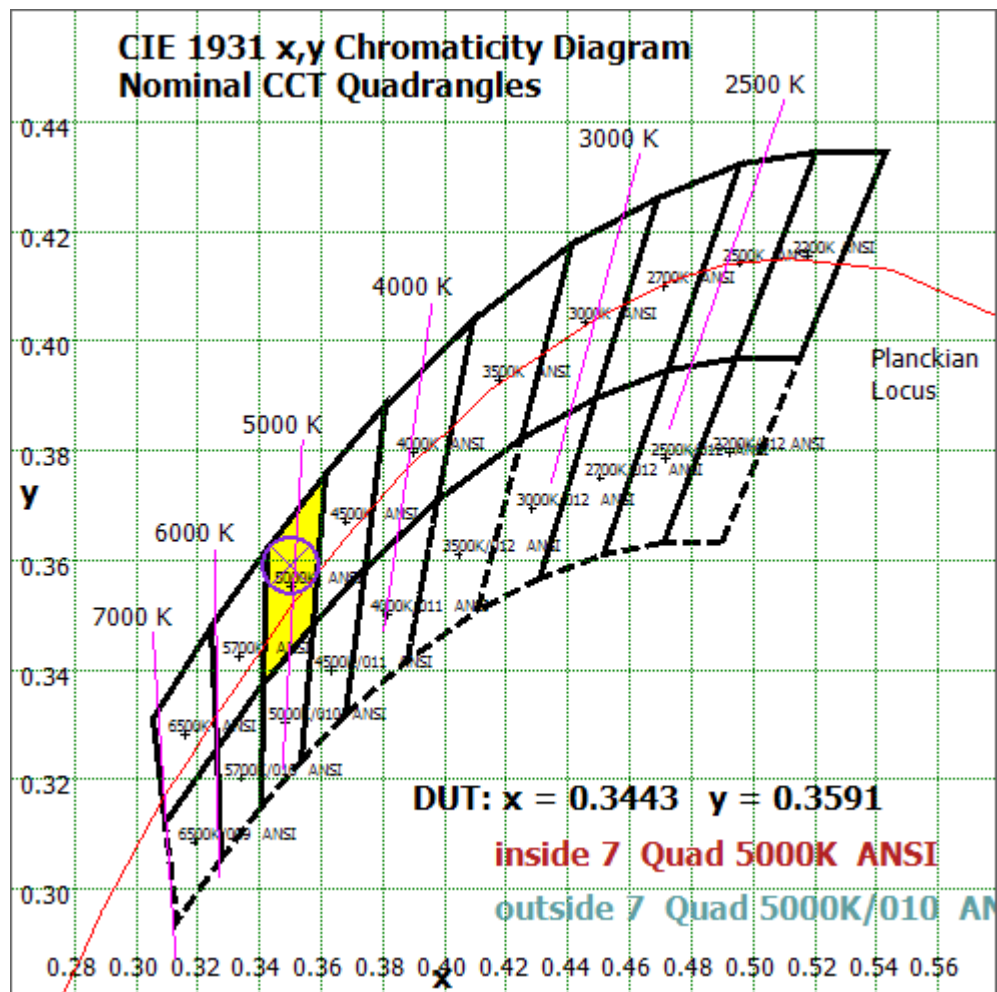


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

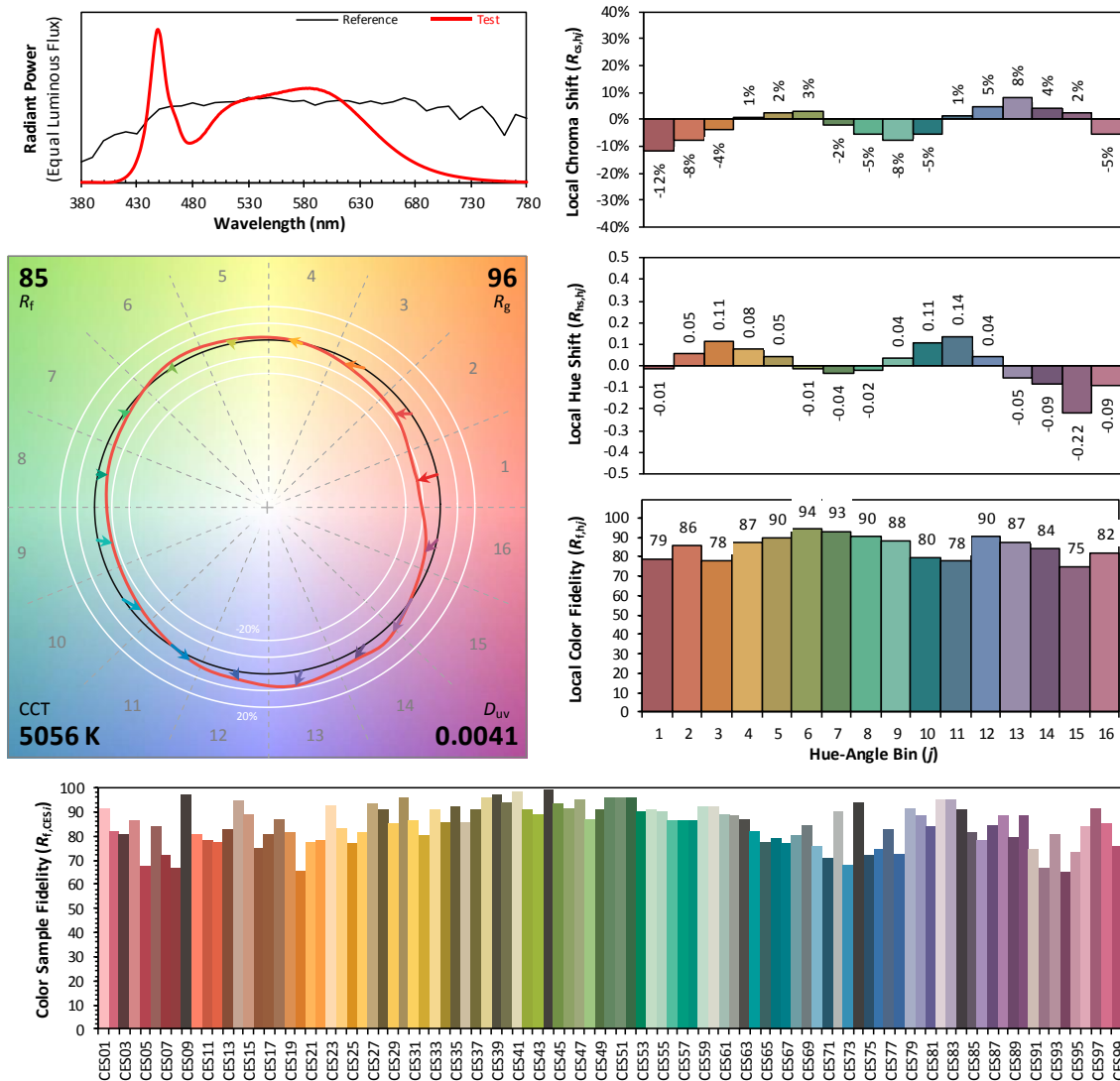
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2020/10/22

Model: 8T5HE/2F/850/DIR



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

x 0.3443
 y 0.3591
 u' 0.2080
 v' 0.4882

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	30.439	2.40%
10- 20	87.495	6.89%
20- 30	133.751	10.53%
30- 40	164.095	12.92%
40- 50	176.02	13.86%
50- 60	169.905	13.38%
60- 70	148.704	11.71%
70- 80	117.862	9.28%
80- 90	85.401	6.72%
90-100	59.495	4.68%
100-110	39.47	3.11%
110-120	24.233	1.91%
120-130	14.992	1.18%
130-140	8.995	0.71%
140-150	5.164	0.41%
150-160	2.758	0.22%
160-170	1.232	0.10%
170-180	0.274	0.02%
Total	1270.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	761.705	59.96%
60- 90	351.967	27.71%
0-90	1113.672	87.67%
90- 180	156.613	12.33%
0- 180	1270.3	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

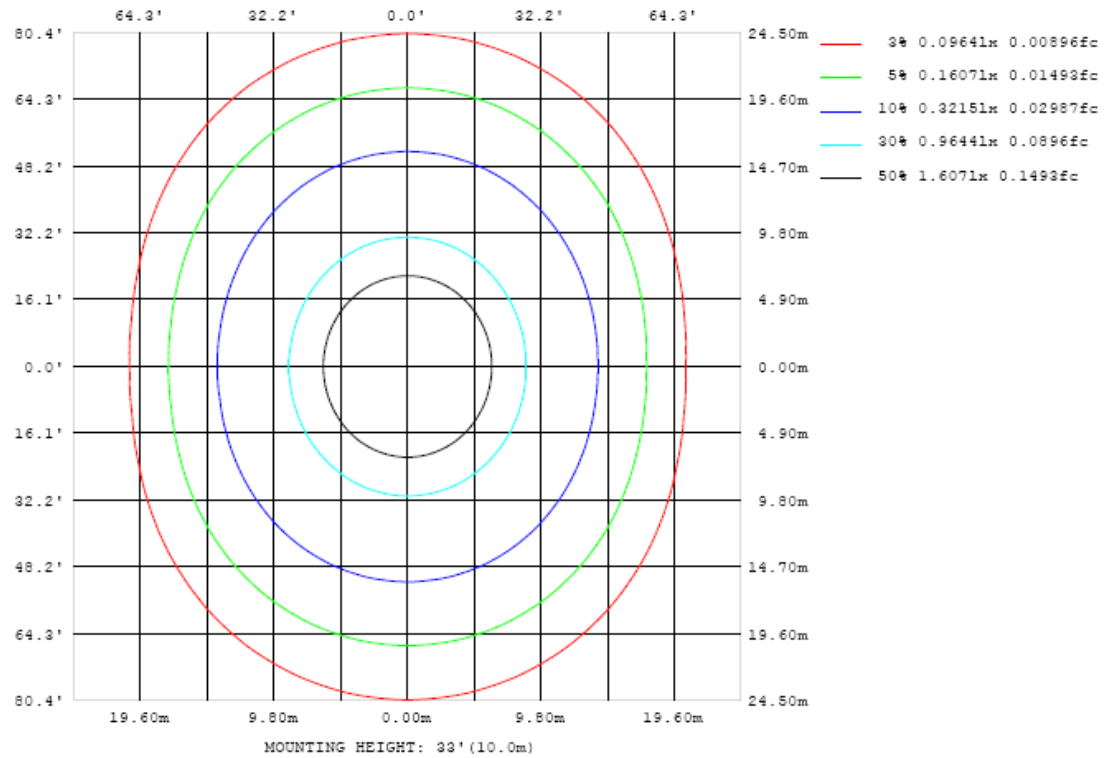


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

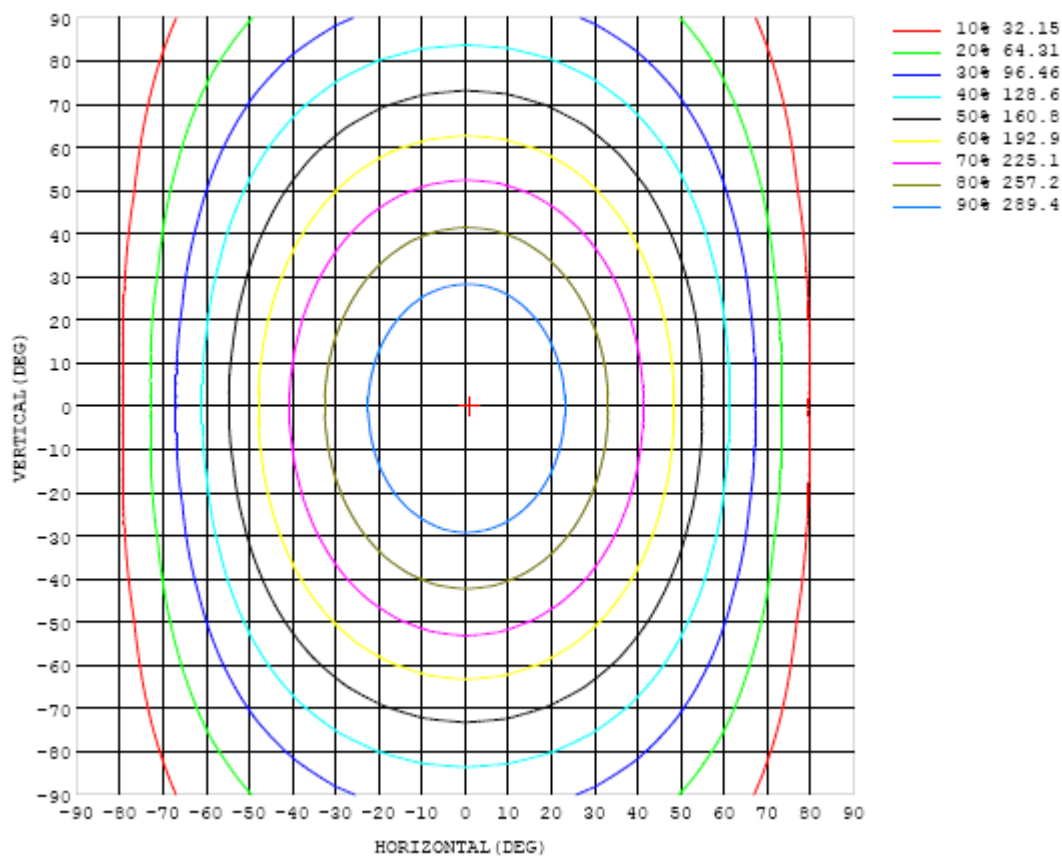


Chart 6: Isocandela Plot

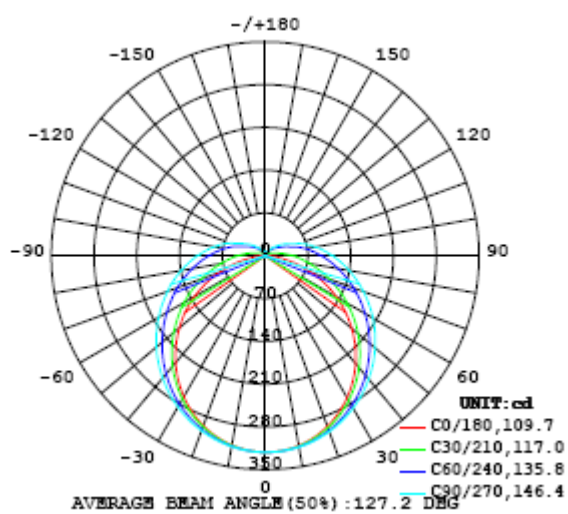


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321
5	320	320	320	320	320	321	321	321	321	321	321	321	320	320	320	320	320	320	320
10	315	316	316	316	317	317	317	318	318	318	318	317	317	317	316	316	315	315	315
15	308	308	309	309	310	311	312	313	313	313	313	312	311	310	309	308	307	307	307
20	297	298	299	300	301	303	304	305	306	306	306	305	304	302	300	298	297	296	296
25	284	284	286	288	290	292	295	296	298	298	297	296	294	291	289	286	284	283	282
30	268	269	271	273	277	280	283	286	287	288	287	285	282	279	275	272	269	267	266
35	250	251	253	257	261	266	270	273	276	276	275	273	269	264	259	255	251	249	248
40	230	231	234	239	244	250	256	260	263	263	262	259	254	249	243	237	232	229	228
45	208	210	213	219	226	233	240	245	249	250	248	244	239	232	224	217	211	208	207
50	185	187	192	198	207	215	223	230	234	235	233	229	222	214	205	197	189	185	183
55	160	163	168	177	187	197	206	213	218	219	217	213	205	196	185	175	166	160	160
60	135	137	145	155	167	178	189	197	202	203	201	196	188	177	165	153	143	135	134
65	108	111	121	133	147	160	171	180	186	187	185	179	170	159	146	132	119	110	107
70	80.9	85.5	97.2	112	127	142	154	163	169	171	169	163	153	141	126	111	95.9	84.0	80.1
75	54.8	61.0	75.7	92.1	109	125	137	147	153	155	153	147	137	124	108	91.4	73.9	59.9	53.6
80	30.1	38.0	55.6	74.4	92.0	108	121	131	138	140	137	131	121	108	91.5	73.8	55.1	37.6	29.0
85	10.6	20.1	39.0	58.6	76.8	92.9	106	116	122	125	122	116	106	92.5	76.3	58.5	38.9	20.2	9.59
90	1.00	9.09	26.3	45.3	63.5	79.0	92.2	102	108	110	108	102	92.1	78.9	63.5	45.4	26.6	9.46	0.35
95	0.13	3.76	16.9	34.3	51.6	67.0	79.2	88.7	94.7	96.7	94.6	88.7	79.4	67.1	51.7	34.7	17.4	3.86	0.26
100	0.20	2.31	10.9	24.9	40.5	55.3	67.5	75.7	81.9	83.8	82.0	76.5	67.9	55.7	41.0	25.1	11.2	2.68	0.31
105	0.36	1.75	7.66	18.1	30.8	43.9	55.4	64.2	69.7	71.7	70.0	64.7	55.9	44.1	30.7	18.8	8.34	2.00	0.55
110	0.60	1.72	5.83	14.0	24.1	34.4	43.6	51.3	56.6	58.5	56.8	51.7	43.9	34.7	24.8	14.7	6.56	1.96	0.79
115	0.83	1.83	4.77	11.2	19.2	27.8	35.6	41.7	45.6	47.0	45.7	41.9	36.1	28.4	19.9	11.8	5.52	2.06	1.02
120	1.05	1.92	4.24	8.98	15.5	22.5	29.0	34.2	37.5	38.7	37.6	34.5	29.4	23.1	16.1	9.73	4.88	2.16	1.27
125	1.28	2.01	3.96	7.42	12.7	18.3	23.5	27.8	30.6	31.6	30.7	28.1	24.0	18.8	13.3	8.24	4.48	2.29	1.51
130	1.54	2.24	3.81	6.45	10.4	14.8	19.0	22.5	24.8	25.6	24.9	22.7	19.4	15.3	11.0	7.10	4.22	2.41	1.68
135	1.79	2.41	3.76	5.75	8.67	12.1	15.4	18.1	19.9	20.5	20.0	18.3	15.7	12.5	9.12	6.13	3.99	2.50	1.84
140	2.04	2.36	3.67	5.24	7.34	9.91	12.4	14.4	15.8	16.3	15.9	14.6	12.6	10.2	7.75	5.51	3.91	2.64	2.06
145	2.22	2.62	3.51	4.82	6.37	8.21	9.97	11.5	12.5	12.9	12.6	11.6	10.2	8.45	6.61	5.03	3.90	2.73	2.22
150	2.39	2.70	3.56	4.52	5.58	6.79	8.07	9.12	9.83	10.1	9.91	9.28	8.26	6.99	5.77	4.68	3.82	2.66	2.31
155	2.57	2.51	3.27	3.97	4.95	5.80	6.57	7.23	7.76	7.96	7.81	7.36	6.72	5.94	5.11	4.25	3.53	2.48	2.47
160	2.72	2.37	2.42	3.38	4.17	4.90	5.51	5.91	6.19	6.29	6.21	5.98	5.63	5.08	4.33	3.72	3.11	2.16	2.52
165	2.86	2.20	2.40	2.63	3.49	4.19	4.42	4.63	5.01	5.10	5.06	4.84	4.45	4.18	3.80	3.09	2.52	2.04	2.17
170	2.32	2.22	2.24	2.13	2.19	2.76	3.47	3.88	4.16	4.28	4.31	4.03	3.31	2.67	2.43	2.32	2.27	1.95	2.00
175	2.18	2.17	2.19	2.18	2.15	2.11	2.21	2.19	2.58	1.82	1.92	2.17	2.24	2.28	2.28	2.23	1.96	1.98	2.01
180	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57

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	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321	321		
5	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320	320		
10	315	315	315	316	316	316	317	317	317	317	317	317	316	316	316	316	316		
15	307	307	308	309	309	310	311	312	312	312	312	311	310	310	309	308	308		
20	296	297	298	299	301	302	304	304	305	305	304	303	302	301	299	298	298		
25	283	284	285	288	290	292	294	295	296	296	295	293	291	289	287	285	284		
30	267	268	271	274	277	280	283	285	286	285	284	282	279	276	273	270	269		
35	249	251	254	258	263	267	271	273	274	274	272	268	264	260	256	253	251		
40	229	232	236	241	247	252	257	260	261	261	258	254	249	243	238	234	231		
45	208	211	216	223	230	237	242	246	247	246	243	238	232	225	218	213	210		
50	185	189	195	204	212	220	227	231	233	232	228	222	214	206	198	191	187		
55	161	166	174	184	194	203	211	215	217	216	212	205	196	186	176	168	163		
60	136	143	153	165	176	186	194	200	201	200	195	188	177	167	156	145	138		
65	110	119	132	145	158	169	178	184	186	184	179	171	160	147	134	121	112		
70	84.4	96.1	111	126	141	153	163	168	170	168	163	154	142	128	113	98.0	86.4		
75	59.6	74.2	91.4	108	124	137	147	153	155	153	147	138	125	110	93.0	75.9	61.5		
80	37.4	54.8	73.6	91.5	108	121	131	137	140	138	132	122	109	92.8	74.9	56.1	38.9		
85	20.2	38.7	58.1	76.4	92.7	106	116	123	125	123	117	107	93.7	77.5	59.2	39.6	21.1		
90	9.42	26.5	45.2	63.1	79.1	92.4	103	109	111	109	103	93.2	79.9	64.0	46.0	27.0	9.79		
95	4.20	17.8	34.9	51.8	67.0	79.9	89.6	95.5	97.6	95.8	90.0	80.5	67.7	52.4	35.4	18.1	4.21		
100	2.68	11.6	25.9	41.8	56.2	68.3	77.5	83.2	85.2	83.4	77.9	68.9	56.8	42.3	26.3	11.5	2.57		
105	2.41	8.59	19.1	31.8	45.4	57.1	65.9	71.4	73.2	71.6	66.3	57.7	45.9	32.2	19.1	8.28	2.03		
110	2.44	6.98	15.0	25.2	35.6	45.1	53.4	58.8	60.6	58.9	53.7	45.3	35.5	25.0	14.8	6.45	2.14		
115	2.51	6.13	12.4	20.5	29.0	36.8	43.0	46.9	48.2	46.8	42.9	36.6	28.8	20.2	11.9	5.49	2.24		
120	2.66	5.61	10.5	17.0	23.9	30.4	35.4	38.6	39.6	38.5	35.3	30.1	23.7	16.7	9.80	5.07	2.39		
125	2.85	5.25	9.15	14.2	19.9	25.1	29.2	31.9	32.7	31.8	29.1	24.9	19.6	13.7	8.47	4.86	2.58		
130	2.96	4.94	8.05	12.0	16.5	20.6	24.0	26.2	26.9	26.2	24.0	20.5	16.3	11.5	7.57	4.68	2.80		
135	3.09	4.70	7.16	10.3	13.7	17.1	19.8	21.5	22.1	21.4	19.7	16.9	13.5	9.94	6.92	4.55	3.02		
140	3.29	4.59	6.53	8.91	11.5	14.0	16.2	17.5	18.0	17.5	16.1	13.8	11.3	8.70	6.33	4.47	3.25		
145	3.48	4.51	6.01	7.80	9.74	11.6	13.1	14.1	14.4	14.0	13.0	11.5	9.57	7.63	5.84	4.42	3.47		
150	3.54	4.46	5.55	6.87	8.27	9.59	10.7	11.4	11.6	11.3	10.6	9.50	8.15	6.75	5.45	4.40	3.68		
155	3.57	4.22	5.00	6.00	7.04	7.95	8.70	9.19	9.36	9.18	8.70	7.94	7.03	6.06	5.15	4.40	3.83		
160	3.27	3.95	4.68	5.06	5.70	6.64	7.09	7.42	7.55	7.47	7.17	6.71	6.13	5.52	4.92	4.43	3.87		
165	3.11	3.68	4.22	4.69	4.96	5.30	5.79	6.06	6.15	6.13	5.99	5.74	5.42	5.08	4.73	4.33	3.81		
170	2.47	2.83	3.06	3.72	4.36	4.61	4.42	4.32	4.95	5.12	5.08	4.97	4.82	4.61	4.36	3.86	2.88		
175	2.09	1.93	2.08	2.32	2.46	2.74	3.31	3.86	4.07	3.95	3.80	3.68	3.57	3.37	2.93	2.38	2.14		
180	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57		

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, 2020	Aug. 04, 2021
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2020	Aug. 04, 2021
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2020	Aug. 04, 2021
Standard source	D908	HZTE012-01	Aug. 05, 2020	Aug. 04, 2021
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2020	Aug. 04, 2021
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2020	Aug. 04, 2021
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2020	Aug. 04, 2021
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2020	Aug. 04, 2021

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 Two 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 30 min, taken 15 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 30 min, taken 15 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.

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ($C=0^\circ/180^\circ$ and $C=90^\circ/270^\circ$) and at 10° or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate

was calculated from these points. The data was then analyzed to check for delta color differences of the u' , v' chromaticity coordinates. The spatial non-uniformity of chromaticity, $\Delta u'v'$, is determined as the maximum deviation (distance on the CIE (u' , v') diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



*** End of Report ***

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