

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/850/HYB/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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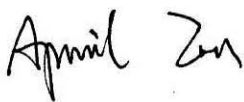
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www.ledtestlab.com

Report No.: HZ22120037c

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/850/HYB/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)/2	Power Factor
122.9	1827.8	14.87	0.9942
CCT (K)	CRI	Stabilization Time (Light & Power)	
5019	83.6	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	: Dec. 27, 2022
Date of Test	: Dec. 28, 2022
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

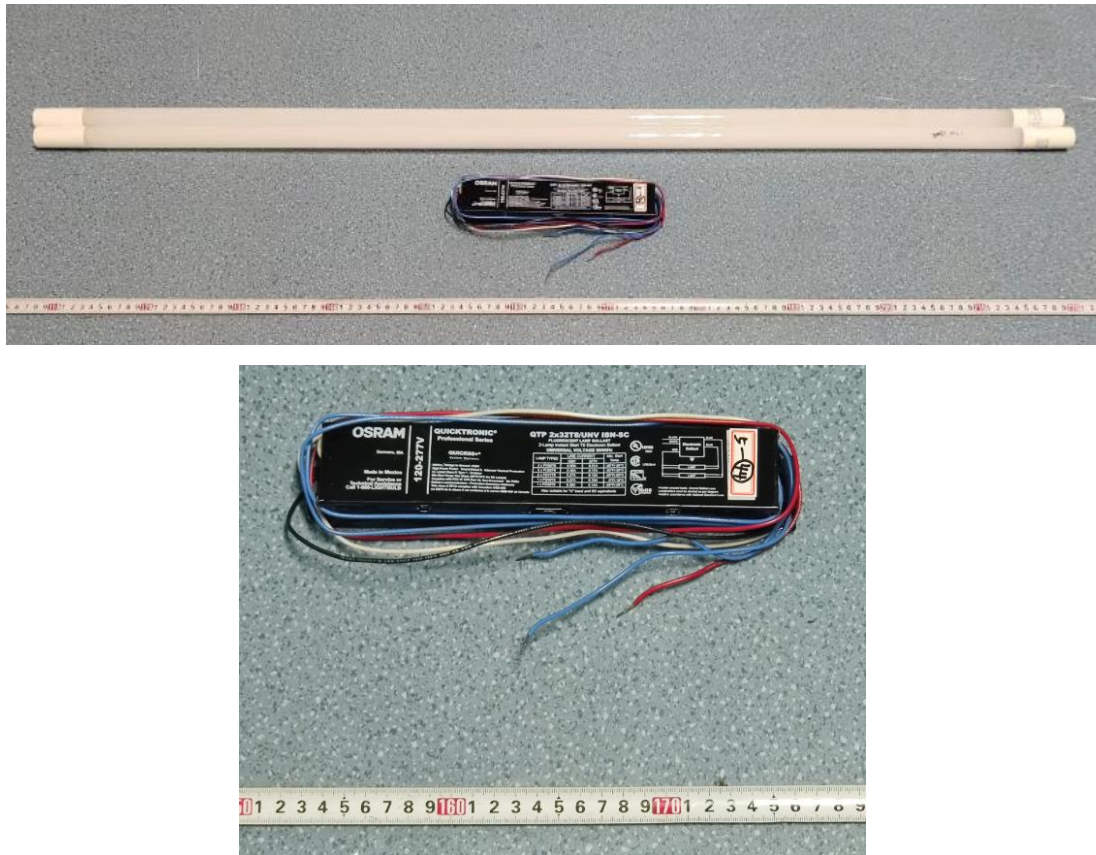


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 12T8/4F/850/HYB/R
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: 5000K LED Tubes supplied by a high frequency fluorescent lamp ballast: QTP 2x32T8/UNV ISN-SC
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)	0.249	0.112
Power Factor	0.9942	0.9588
Test Power (W)/2	14.87	14.87
THD A%	8.84	13.31
Luminous Efficacy (lm/W)	122.9	122.9
Total Luminous Flux (lm)	1827.8	1827.4
Color Rendering Index (CRI)	83.6	
R9	8.9	
Correlated Color Temperature (CCT)(K)	5019	
Chromaticity Chroma x	0.3449	
Chromaticity Chroma y	0.3566	
Chromaticity Chroma u	0.2094	
Chromaticity Chroma v	0.3247	
Duv	0.0025	
Chromaticity Chroma u'	0.2094	
Chromaticity Chroma v'	0.4870	

Special Color Rendering Indices	
R1	82
R2	89.6
R3	94
R4	82.5
R5	82.4
R6	84.8
R7	86.8
R8	67
R9	8.9
R10	74.9
R11	81.9
R12	60.7
R13	84.2
R14	97.1

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)	0.250
Power Factor	0.9943
Power (W)/2	14.89
Luminous Efficacy (lm/W)	123.7
Total Luminous Flux (lm)	1841.6
Beam Angle (°)	110.8 (0°-180°) / 207.8 (90°-270°)
Center Beam Candle Power (cd)	325
Maximum Beam Candle Power (cd)	325.9 (At: C=220.0, Gamma=1.5)
Spacing Criteria	1.28(0°-180°) / 1.43 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.52%
Zonal Lumens in the 60 °-90 °Zone	26.68%
Zonal Lumens in the 90 °-120 °Zone	17.25%
Zonal Lumens in the 120 °-180 °Zone	11.56%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

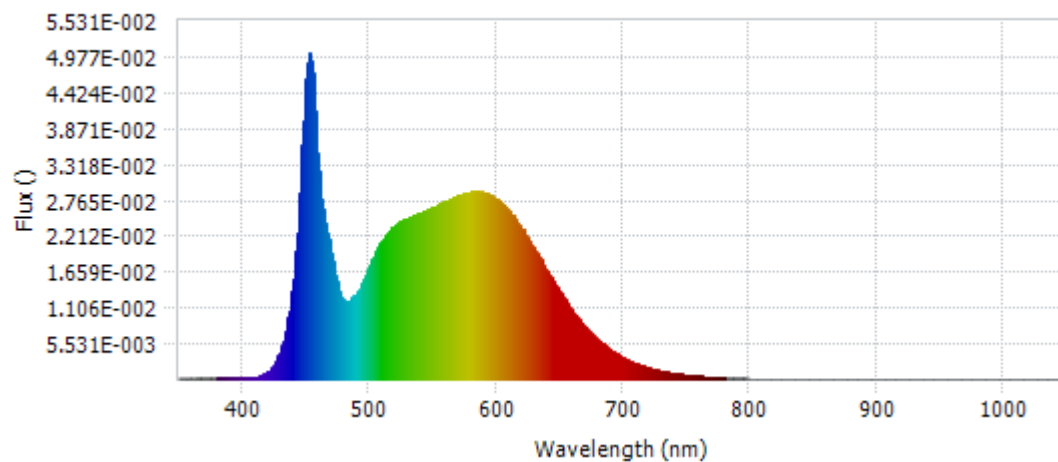
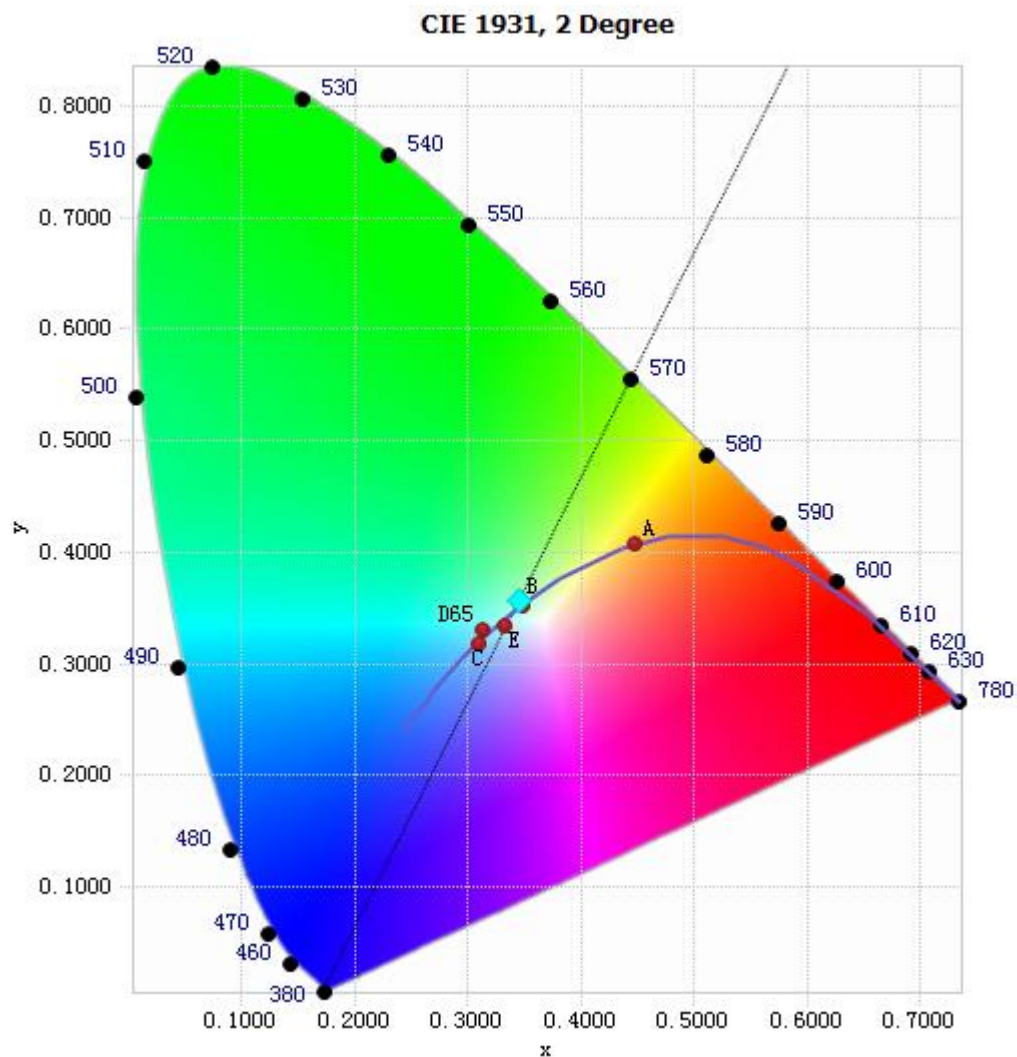


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.32E-04	485	1.24E-02	590	2.88E-02	695	3.89E-03
385	2.13E-04	490	1.33E-02	595	2.84E-02	700	3.33E-03
390	2.06E-04	495	1.51E-02	600	2.78E-02	705	2.86E-03
395	1.90E-04	500	1.75E-02	605	2.70E-02	710	2.44E-03
400	1.83E-04	505	1.97E-02	610	2.60E-02	715	2.08E-03
405	2.22E-04	510	2.14E-02	615	2.47E-02	720	1.81E-03
410	3.22E-04	515	2.28E-02	620	2.33E-02	725	1.53E-03
415	6.41E-04	520	2.37E-02	625	2.17E-02	730	1.29E-03
420	1.29E-03	525	2.44E-02	630	2.01E-02	735	1.10E-03
425	2.39E-03	530	2.48E-02	635	1.84E-02	740	9.40E-04
430	4.58E-03	535	2.52E-02	640	1.67E-02	745	7.99E-04
435	8.45E-03	540	2.57E-02	645	1.51E-02	750	6.89E-04
440	1.54E-02	545	2.61E-02	650	1.35E-02	755	5.90E-04
445	2.88E-02	550	2.66E-02	655	1.20E-02	760	4.98E-04
450	4.64E-02	555	2.70E-02	660	1.06E-02	765	4.27E-04
455	4.72E-02	560	2.75E-02	665	9.27E-03	770	3.72E-04
460	3.23E-02	565	2.80E-02	670	8.08E-03	775	3.16E-04
465	2.43E-02	570	2.84E-02	675	7.04E-03	780	2.76E-04
470	1.94E-02	575	2.86E-02	680	6.08E-03		
475	1.43E-02	580	2.89E-02	685	5.27E-03		
480	1.21E-02	585	2.90E-02	690	4.54E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3449, 0.3566)

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

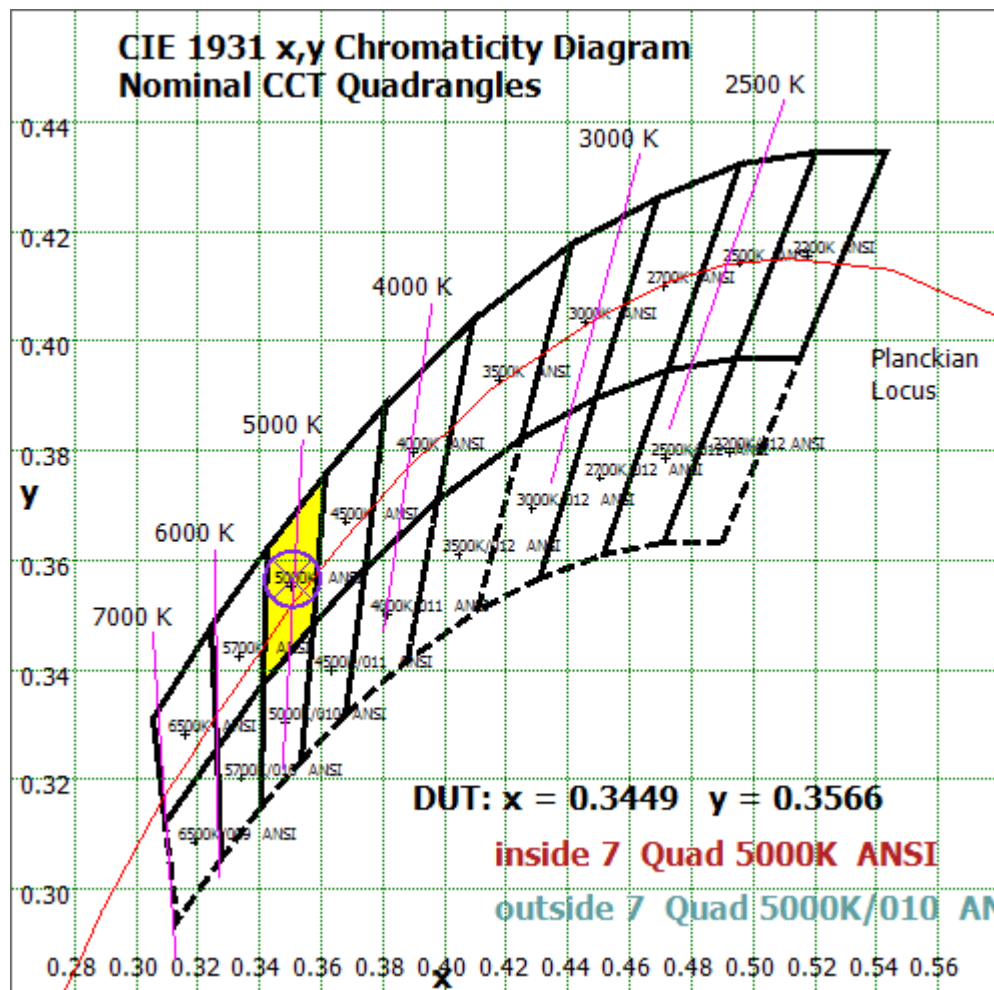


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

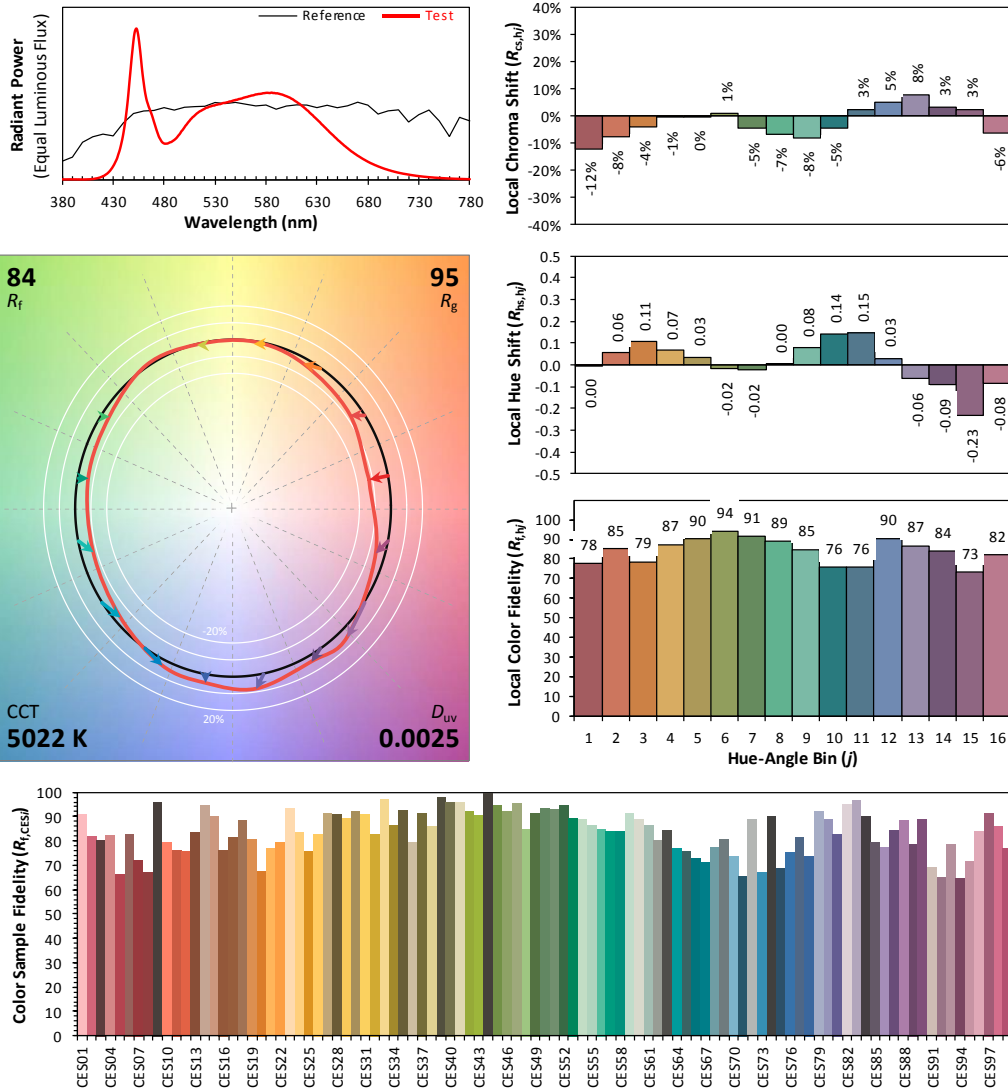
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/12/28

Model: 12T8/4F/850/HYB/R



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

x 0.3449
 y 0.3566
 u' 0.2094
 v' 0.4870

CIE 13.3-1995
(CRI)
 R_a 84
 R_g 9

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	30.81	1.67%
10- 20	89.098	4.84%
20- 30	138.157	7.50%
30- 40	173.49	9.42%
40- 50	192.633	10.46%
50- 60	195.622	10.62%
60- 70	184.886	10.04%
70- 80	164.691	8.94%
80- 90	141.666	7.69%
90-100	122.289	6.64%
100-110	105.6	5.73%
110-120	89.782	4.88%
120-130	73.846	4.01%
130-140	58.34	3.17%
140-150	42.407	2.30%
150-160	26.342	1.43%
160-170	10.705	0.58%
170-180	1.186	0.06%
Total	1841.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	819.81	44.52%
60- 90	491.243	26.68%
0-90	1311.05	71.19%
90- 180	530.497	28.81%
0- 180	1841.6	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

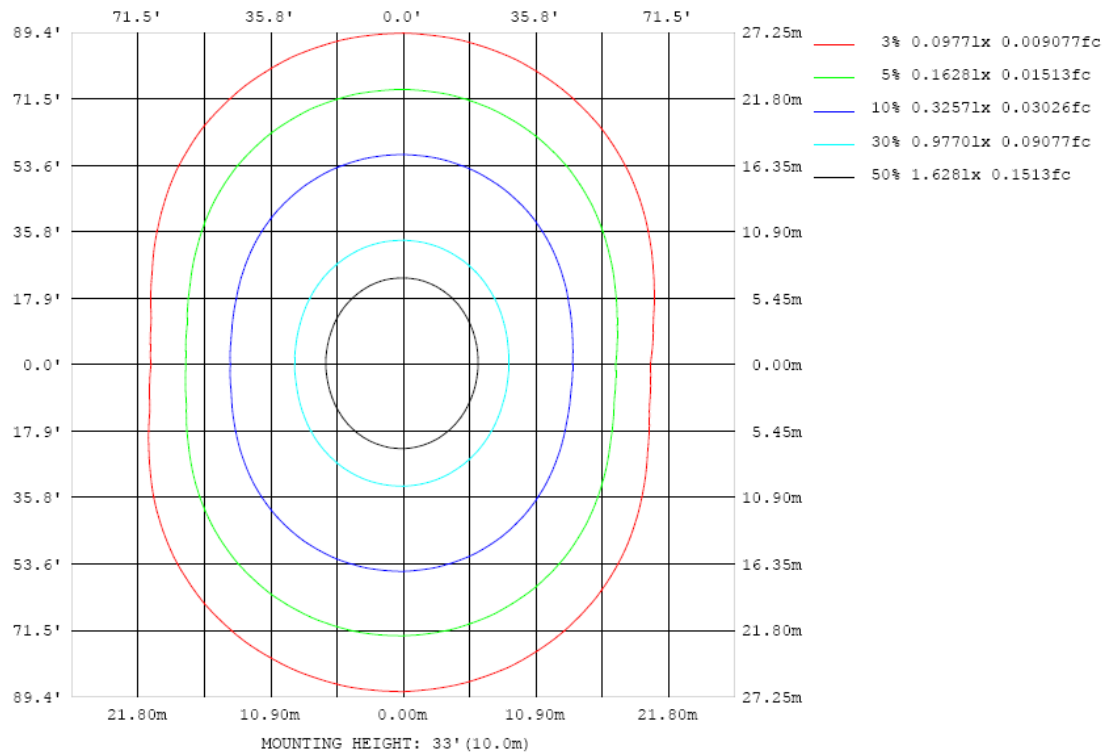


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

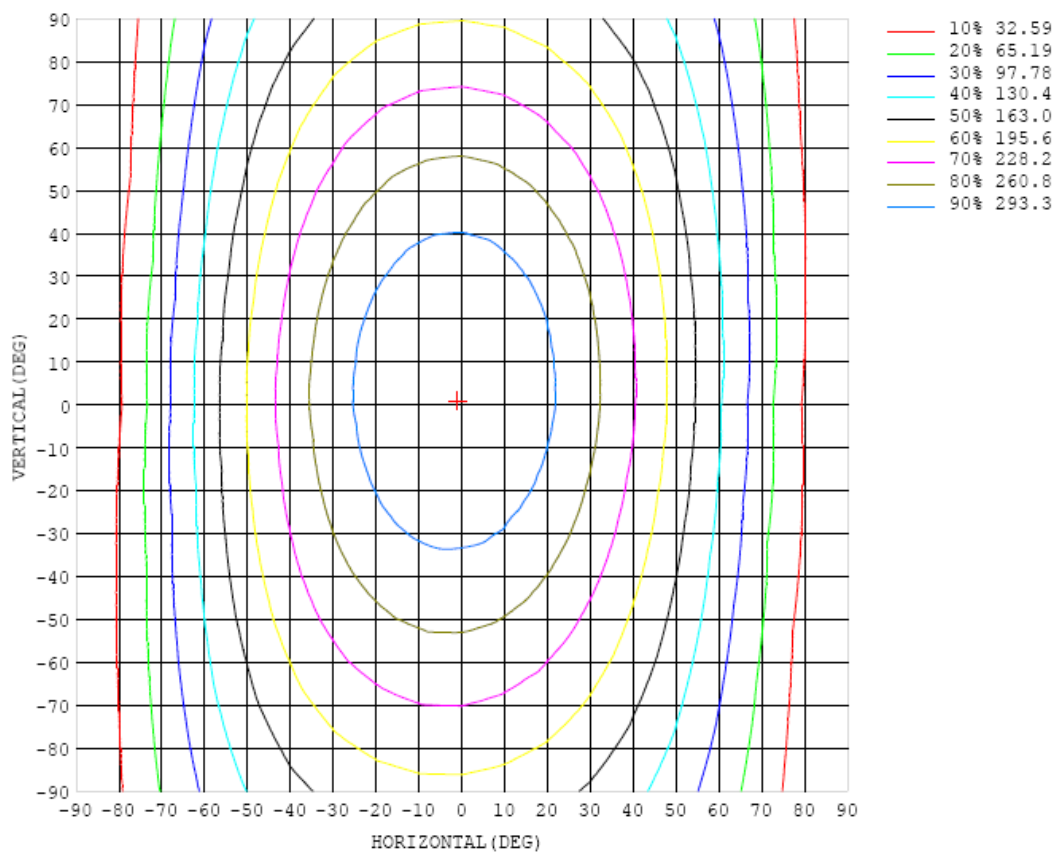


Chart 6: Isocandela Plot

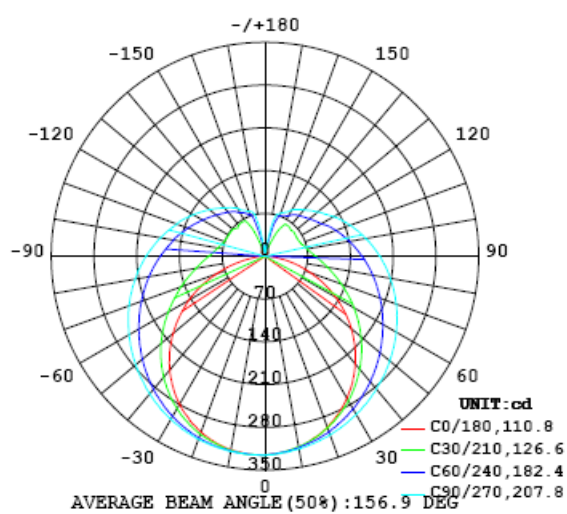


Chart 7: Polar Candela Distribution

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	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325
5	323	323	322	322	322	323	322	322	323	323	323	323	324	324	324	324	325	325	325
10	317	317	316	317	318	318	318	318	319	320	320	320	321	321	320	320	321	321	321
15	308	309	308	309	310	312	312	314	314	316	316	316	317	316	315	314	315	315	315
20	298	298	298	298	302	303	306	308	309	311	311	311	311	310	308	306	306	306	306
25	284	284	285	287	291	294	297	301	304	305	305	305	304	302	299	296	295	294	294
30	268	269	270	273	278	284	288	293	297	299	299	298	296	293	288	285	281	279	280
35	250	250	253	258	265	272	279	285	289	292	292	290	287	283	276	271	266	263	262
40	230	231	234	241	250	260	268	275	281	284	283	281	278	272	264	256	248	244	243
45	208	209	214	224	235	247	257	266	272	276	275	273	268	260	249	239	229	222	221
50	184	186	193	205	219	234	246	256	263	267	267	263	257	248	235	222	209	199	196
55	159	162	172	187	204	220	234	246	253	258	257	253	246	235	220	204	188	175	170
60	133	137	149	168	189	207	223	235	244	248	248	243	235	222	205	186	166	150	144
65	106	111	128	150	173	194	211	224	234	239	238	233	225	210	191	169	145	123	115
70	79.5	85.7	107	133	159	182	201	214	223	229	228	223	214	198	178	152	124	97.7	85.1
75	53.9	61.9	87.2	117	146	170	190	204	214	219	218	212	203	186	164	137	105	73.6	55.8
80	29.3	40.6	70.4	104	134	159	179	194	203	208	207	202	192	175	152	123	89.3	53.6	28.9
85	9.80	24.0	58.1	92.3	123	149	169	184	193	198	197	191	181	165	141	112	76.5	38.2	8.27
90	0.74	15.1	48.9	82.8	114	139	159	174	183	188	187	182	171	154	131	102	66.9	29.6	0.91
95	0.63	11.7	43.3	75.5	105	130	149	164	173	178	177	172	161	145	122	94.1	61.3	26.4	1.20
100	1.57	12.4	40.5	69.9	97.9	121	141	154	163	168	167	162	152	136	114	87.5	57.5	26.8	2.12
105	3.43	15.2	38.8	66.5	91.5	114	132	145	154	158	157	152	142	127	107	82.1	55.4	29.2	3.02
110	4.49	19.0	39.6	62.6	85.8	107	124	136	144	149	148	143	134	120	101	78.4	54.9	32.8	2.67
115	4.72	23.1	41.5	60.9	80.1	99.3	116	128	135	139	138	134	125	112	95.3	75.5	55.6	37.1	1.30
120	5.19	22.0	44.3	60.3	77.0	93.1	106	118	126	130	129	125	117	106	90.6	73.6	57.0	41.7	1.61
125	5.16	11.9	47.3	60.8	74.5	88.7	100	110	116	120	120	117	110	100	87.1	72.5	57.6	45.8	3.45
130	5.38	8.11	50.3	61.7	72.9	84.8	95.1	104	110	113	112	110	104	95.1	84.1	72.0	58.1	47.2	5.58
135	6.03	8.35	51.3	60.3	72.4	82.0	90.8	98.0	103	106	105	103	97.8	90.7	81.5	69.9	61.0	45.9	6.51
140	6.37	7.45	45.0	62.0	69.1	79.9	86.9	92.7	96.8	99.1	98.8	96.6	92.8	86.7	78.8	68.7	61.9	34.4	7.84
145	6.29	6.62	27.0	62.4	68.0	74.9	83.0	88.1	91.4	93.3	93.2	91.3	88.2	82.5	74.4	68.6	63.0	23.4	8.68
150	6.40	7.06	13.5	56.6	67.2	72.2	76.2	81.7	85.9	87.4	87.4	85.2	80.9	76.9	72.3	67.4	56.1	14.5	9.55
155	6.55	9.73	13.4	36.4	65.1	69.8	73.7	76.0	78.3	79.6	79.6	78.7	76.9	73.9	68.7	61.0	33.5	10.6	10.4
160	6.65	8.88	8.96	15.3	44.0	62.6	70.2	72.2	73.8	75.0	75.0	74.0	72.7	69.4	58.6	41.6	17.4	9.47	10.7
165	6.74	7.54	6.33	12.3	14.9	29.8	50.3	59.9	65.8	67.6	67.7	66.7	58.8	47.8	30.1	18.3	9.77	11.7	10.7
170	8.79	9.90	9.74	8.65	8.07	13.9	15.4	17.0	22.3	25.4	25.5	23.0	19.1	15.0	10.3	9.05	12.8	7.93	10.6
175	10.8	14.7	11.3	8.03	11.0	13.1	11.7	8.84	8.50	8.91	8.07	8.98	10.8	13.0	14.5	12.0	8.89	11.5	10.9
180	11.7	11.6	11.7	11.0	24.4	11.1	11.1	10.9	9.71	4.29	10.4	13.9	15.7	15.9	16.4	16.3	15.8	16.0	11.9

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	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325		
5	326	325	325	325	325	325	325	325	325	324	324	324	324	324	323	323	323		
10	321	322	323	323	324	323	324	324	324	323	323	322	321	320	319	318	318		
15	316	317	317	319	320	321	322	322	322	321	320	318	317	314	312	311	310		
20	307	308	310	312	315	316	318	318	319	317	315	313	310	307	303	301	299		
25	295	297	300	304	308	310	313	314	314	312	309	306	303	297	292	289	286		
30	281	284	288	294	299	303	306	308	308	306	303	299	292	286	280	275	271		
35	265	268	274	282	289	294	299	301	301	299	295	289	282	274	265	258	253		
40	245	250	258	268	277	284	290	293	294	291	287	279	270	260	249	240	233		
45	223	230	241	253	264	273	281	285	285	282	277	269	257	245	232	221	212		
50	200	209	222	237	251	262	270	275	276	273	267	257	244	230	214	200	190		
55	174	186	203	221	238	251	260	266	267	264	257	246	232	214	196	179	166		
60	149	163	183	205	224	239	250	256	257	254	246	234	218	199	178	158	143		
65	121	140	164	189	211	227	239	246	247	243	235	222	206	184	161	138	118		
70	92.7	117	147	174	197	215	228	235	237	233	225	211	193	170	145	117	93.2		
75	65.7	95.4	130	160	185	204	217	225	226	223	214	200	181	157	130	98.6	69.8		
80	41.7	77.0	115	148	173	193	207	214	216	212	203	189	170	146	116	82.2	49.1		
85	24.0	62.8	102	136	162	182	196	203	205	201	193	179	159	135	104	69.2	33.4		
90	15.5	53.5	92.3	126	153	171	185	193	195	191	183	169	150	125	94.5	59.6	24.1		
95	12.6	47.8	84.4	117	143	161	175	182	184	181	172	159	141	116	86.5	53.4	20.8		
100	14.2	44.9	78.5	109	134	152	165	172	174	170	162	151	132	108	80.2	49.6	21.0		
105	17.6	44.6	74.2	102	126	144	155	162	164	160	153	141	124	101	75.3	47.9	23.4		
110	21.6	45.9	71.2	96.5	118	135	146	153	154	152	144	133	116	95.3	71.8	47.7	27.0		
115	26.6	48.0	69.6	91.7	111	126	137	143	145	142	135	124	109	90.3	69.4	48.6	31.5		
120	29.5	50.6	69.0	87.8	105	118	128	134	136	133	127	117	103	86.1	67.9	50.4	36.3		
125	23.7	52.9	68.9	84.8	99.4	111	120	125	127	124	119	110	97.4	82.7	67.2	52.6	40.9		
130	13.8	54.2	68.8	82.4	94.6	105	112	117	118	116	111	103	92.7	80.1	67.2	54.3	44.4		
135	9.16	56.8	64.9	80.6	90.6	99.1	106	110	111	109	104	97.4	88.5	78.1	65.2	56.0	43.4		
140	11.6	57.4	66.7	76.4	87.4	94.1	99.3	103	103	102	97.9	92.4	85.1	75.7	65.2	58.1	33.4		
145	11.0	47.1	67.5	72.4	81.4	89.3	93.7	96.3	97.0	95.6	92.5	88.1	80.7	71.5	66.3	59.3	22.6		
150	9.94	27.4	66.9	71.6	77.6	82.2	86.4	90.0	90.9	89.5	86.0	81.3	76.2	71.8	67.0	56.9	16.5		
155	7.92	11.1	51.0	67.1	73.5	78.0	80.9	82.4	82.9	82.0	80.4	77.6	74.8	71.4	66.2	39.7	11.7		
160	11.0	12.7	17.0	48.1	66.2	73.2	76.0	78.2	78.5	77.9	77.0	75.4	73.5	70.1	56.4	25.0	9.45		
165	11.5	6.57	13.4	10.1	30.7	47.9	65.6	69.3	73.2	74.7	74.2	71.2	62.6	51.6	28.3	17.5	9.42		
170	10.7	11.8	7.57	12.7	13.5	8.42	17.3	28.1	36.3	36.1	33.7	29.5	23.7	19.1	15.5	9.27	12.7		
175	10.9	12.5	13.4	12.5	8.64	7.08	9.27	9.95	10.4	13.5	12.4	10.9	10.5	10.8	13.2	13.3	8.78		
180	11.9	11.8	11.6	11.5	10.9	10.7	10.2	9.44	8.20	6.90	8.62	11.4	13.1	14.2	14.7	15.8	15.8		

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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