

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: 24T5HO/4F/840/UEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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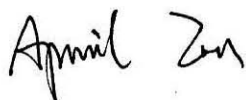
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Report No.: HZ22070025k

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

Review by:



Engineer: April Zou
Aug. 02, 2022

Approved by:



Manager: Jim Zhang
Aug. 02, 2022

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: **24T5HO/4F/840/UEB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
142.8	3536.9	24.76	0.9849
CCT (K)	CRI	Stabilization Time (Light & Power)	
4100	82.4	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 : Jul. 20, 2022

Date of Test : Jul. 29, 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

TABLE OF CONTENT

LM-79-19 TEST REPORT.....	1
TEST SUMMARY	2
SAMPLE PHOTO	4
TEST RESULTS	5
Sphere-Spectroradiometer Method.....	5
Goniophotometer Method	6
Spectral Power Distribution - Sphere Spectroradiometer Method	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	9
Color Rendition Report – Sphere Spectroradiometer Method	10
Zonal Lumen Tabulation- Goniophotometer Method	11
Illuminance Plots- Goniophotometer Method	12
Luminous Intensity Distribution Plots- Goniophotometer Method.....	13
Luminous Intensity Data- Goniophotometer Method	14
EQUIPMENT LIST	16
TEST METHODS	16
Seasoning of SSL Product.....	16
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	16
Goniophotometer Method	17
Photometric and Electrical Measurements	17
Color Characteristics Measurements.....	17

SAMPLE PHOTO



Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 24T5HO/4F/840/UEB
Electrical Ratings	: 120-277V, 50/60Hz
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)	0.210	0.096
Power Factor	0.9849	0.9141
Test Power (W)	24.76	24.31
THD A%	16.44	20.98
Luminous Efficacy (lm/W)	142.8	146.3
Total Luminous Flux (lm)	3536.9	3555.6
Color Rendering Index (CRI)	82.4	
R9	4	
Correlated Color Temperature (CCT)(K)	4100	
Chromaticity Chroma x	0.3766	
Chromaticity Chroma y	0.3760	
Chromaticity Chroma u	0.2228	
Chromaticity Chroma v	0.3338	
Duv	0.0008	
Chromaticity Chroma u'	0.2228	
Chromaticity Chroma v'	0.5007	

Special Color Rendering Indices	
R1	80.4
R2	88.3
R3	94.5
R4	81.8
R5	80.9
R6	84.1
R7	85.7
R8	63.5
R9	4
R10	72.6
R11	81
R12	63.1
R13	82.3
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)	0.211
Power Factor	0.9822
Power (W)	24.88
Luminous Efficacy (lm/W)	143.9
Total Luminous Flux (lm)	3580.9
Beam Angle (°)	114.6 (0°-180°) / 214.4 (90°-270°)
Center Beam Candle Power (cd)	610
Maximum Beam Candle Power (cd)	612.6 (At: C=90.0, Gamma=4.0)
Spacing Criteria	1.27 (0°-180°) / 1.42 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.60%
Zonal Lumens in the 60 °-90 °Zone	27.76%
Zonal Lumens in the 90 °-120 °Zone	16.91%
Zonal Lumens in the 120 °-180 °Zone	10.73%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

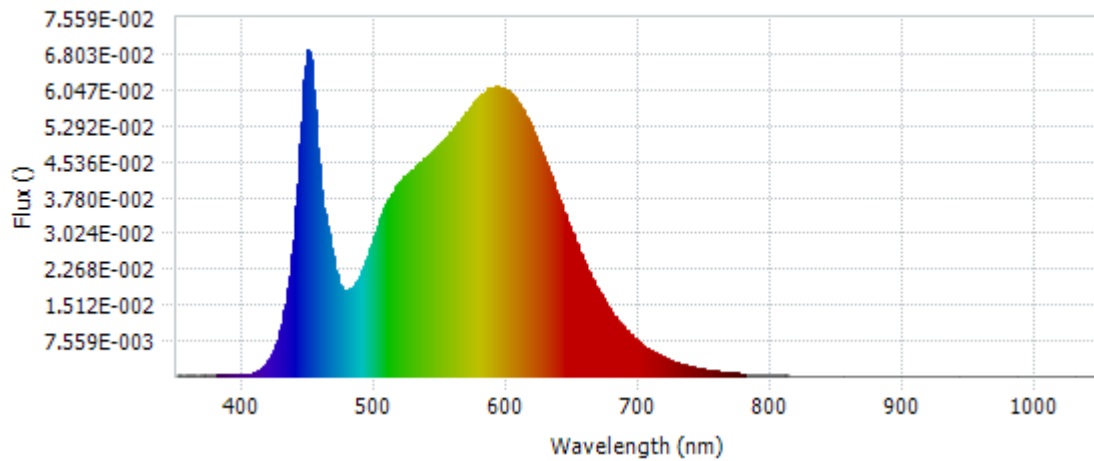
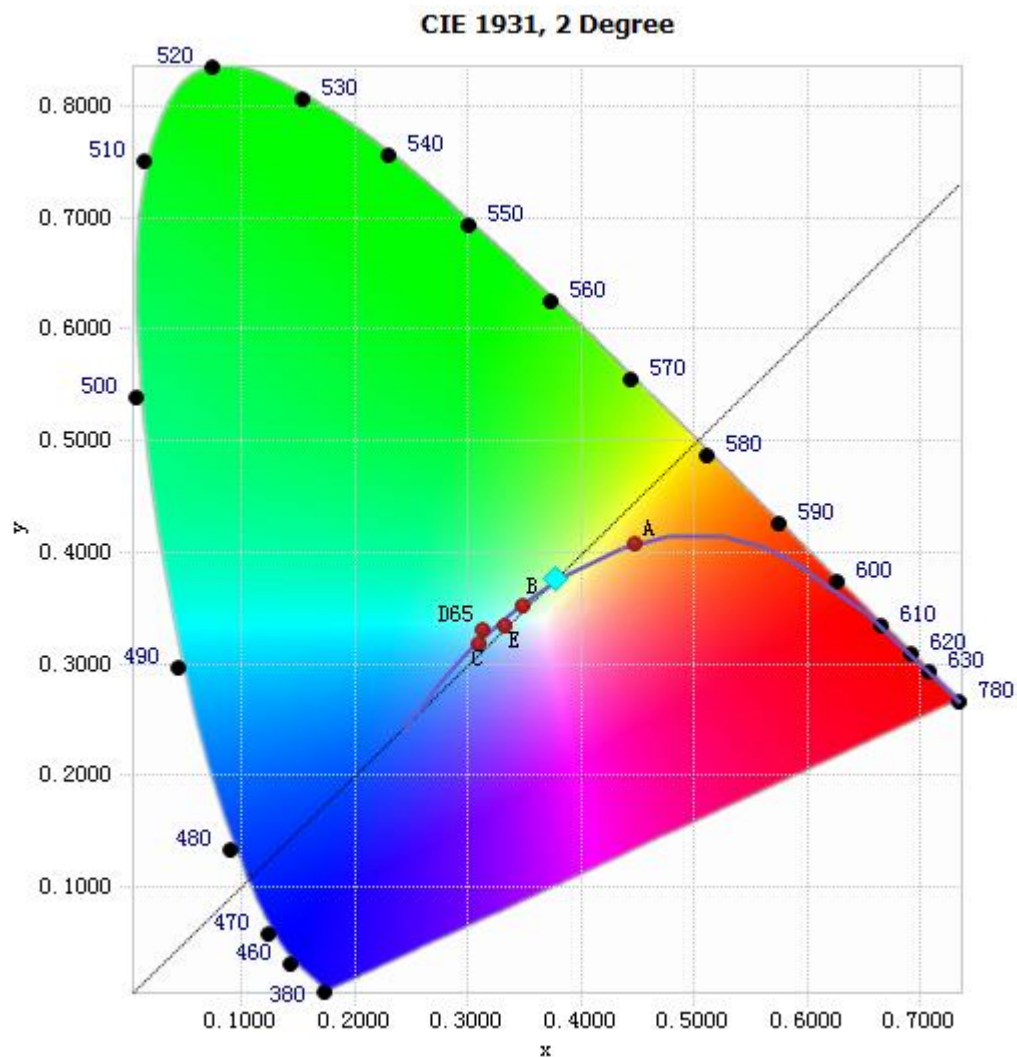


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.94E-04	485	1.97E-02	590	6.08E-02	695	8.44E-03
385	3.25E-04	490	2.23E-02	595	6.10E-02	700	7.21E-03
390	3.15E-04	495	2.63E-02	600	6.03E-02	705	6.13E-03
395	2.93E-04	500	3.04E-02	605	5.91E-02	710	5.24E-03
400	3.05E-04	505	3.41E-02	610	5.70E-02	715	4.46E-03
405	4.78E-04	510	3.72E-02	615	5.44E-02	720	3.82E-03
410	9.71E-04	515	3.98E-02	620	5.14E-02	725	3.27E-03
415	1.93E-03	520	4.16E-02	625	4.82E-02	730	2.77E-03
420	3.82E-03	525	4.28E-02	630	4.45E-02	735	2.35E-03
425	6.85E-03	530	4.41E-02	635	4.08E-02	740	1.99E-03
430	1.23E-02	535	4.52E-02	640	3.71E-02	745	1.69E-03
435	2.09E-02	540	4.66E-02	645	3.34E-02	750	1.45E-03
440	3.59E-02	545	4.79E-02	650	2.98E-02	755	1.21E-03
445	5.86E-02	550	4.93E-02	655	2.64E-02	760	1.04E-03
450	6.85E-02	555	5.07E-02	660	2.32E-02	765	8.96E-04
455	5.15E-02	560	5.24E-02	665	2.04E-02	770	7.63E-04
460	3.72E-02	565	5.41E-02	670	1.77E-02	775	6.42E-04
465	3.00E-02	570	5.60E-02	675	1.54E-02	780	5.59E-04
470	2.25E-02	575	5.78E-02	680	1.33E-02		
475	1.85E-02	580	5.94E-02	685	1.15E-02		
480	1.82E-02	585	6.07E-02	690	9.87E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3766, 0.3760)

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

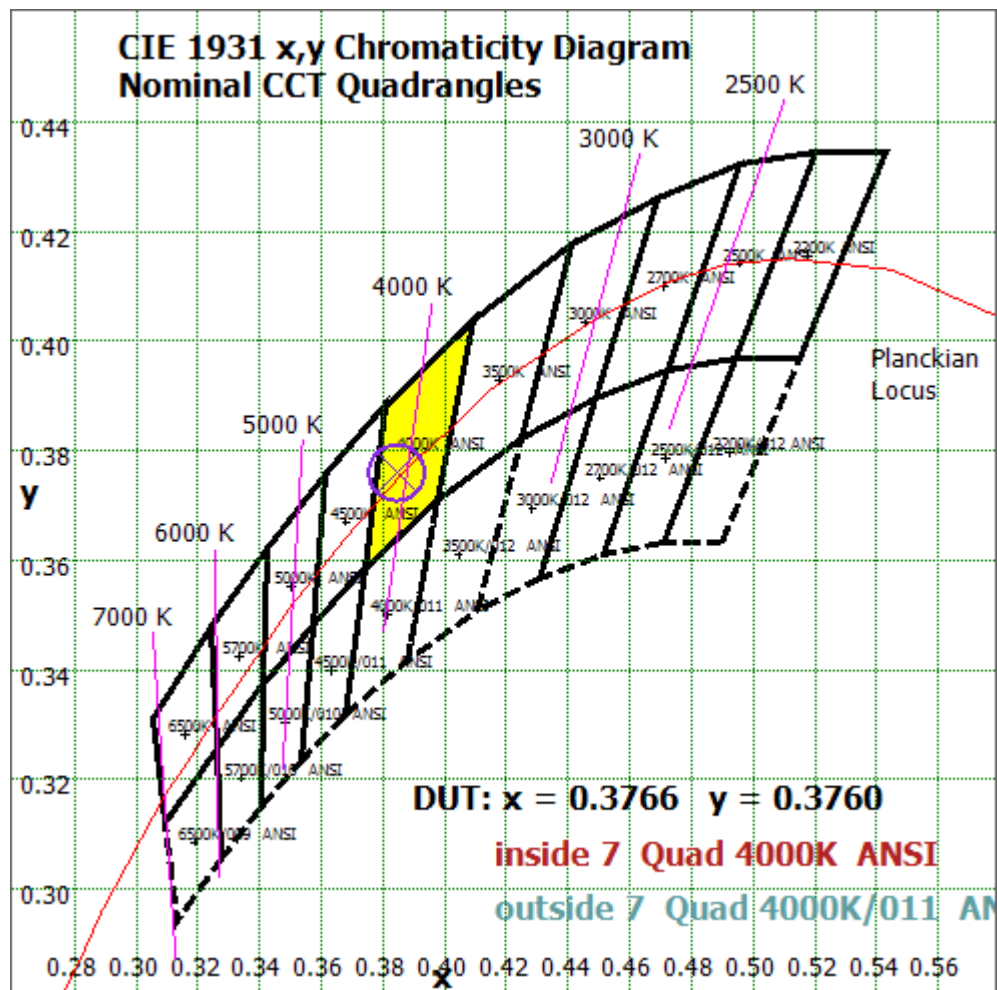


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

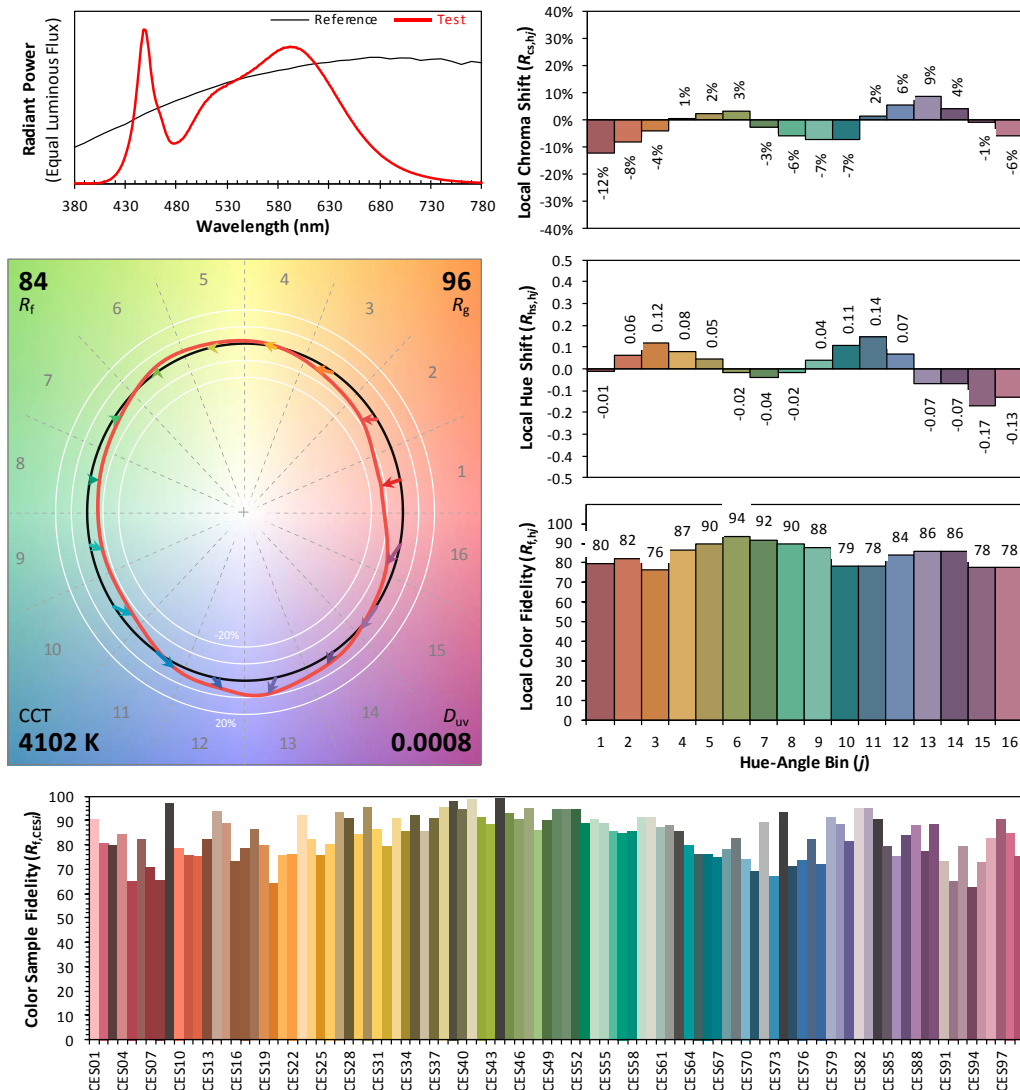
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/07/29

Model: 24T5HO/4F/840/UEB



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

x 0.3766
 y 0.3760
 u' 0.2228
 v' 0.5007

CIE 13.3-1995
(CRI)
 R_a 82
 R_9 4

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	57.987	1.62%
10- 20	168.727	4.71%
20- 30	264.261	7.38%
30- 40	336.258	9.39%
40- 50	379.1	10.59%
50- 60	390.787	10.91%
60- 70	373.474	10.43%
70- 80	334.247	9.33%
80- 90	286.208	7.99%
90-100	242.551	6.77%
100-110	200.996	5.61%
110-120	161.978	4.52%
120-130	128.444	3.59%
130-140	99.532	2.78%
140-150	73.361	2.05%
150-160	49.343	1.38%
160-170	26.298	0.73%
170-180	7.302	0.20%
Total	3580.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1597.12	44.60%
60- 90	993.929	27.76%
0-90	2591.05	72.36%
90- 180	989.805	27.64%
0- 180	3580.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

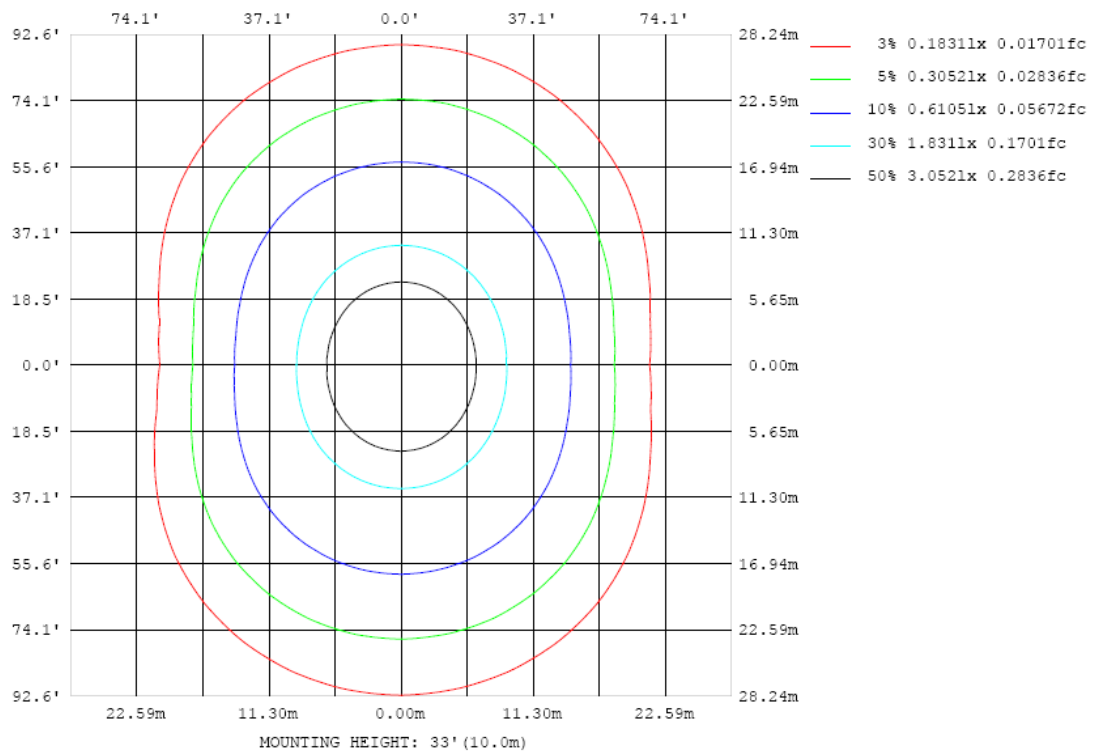


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

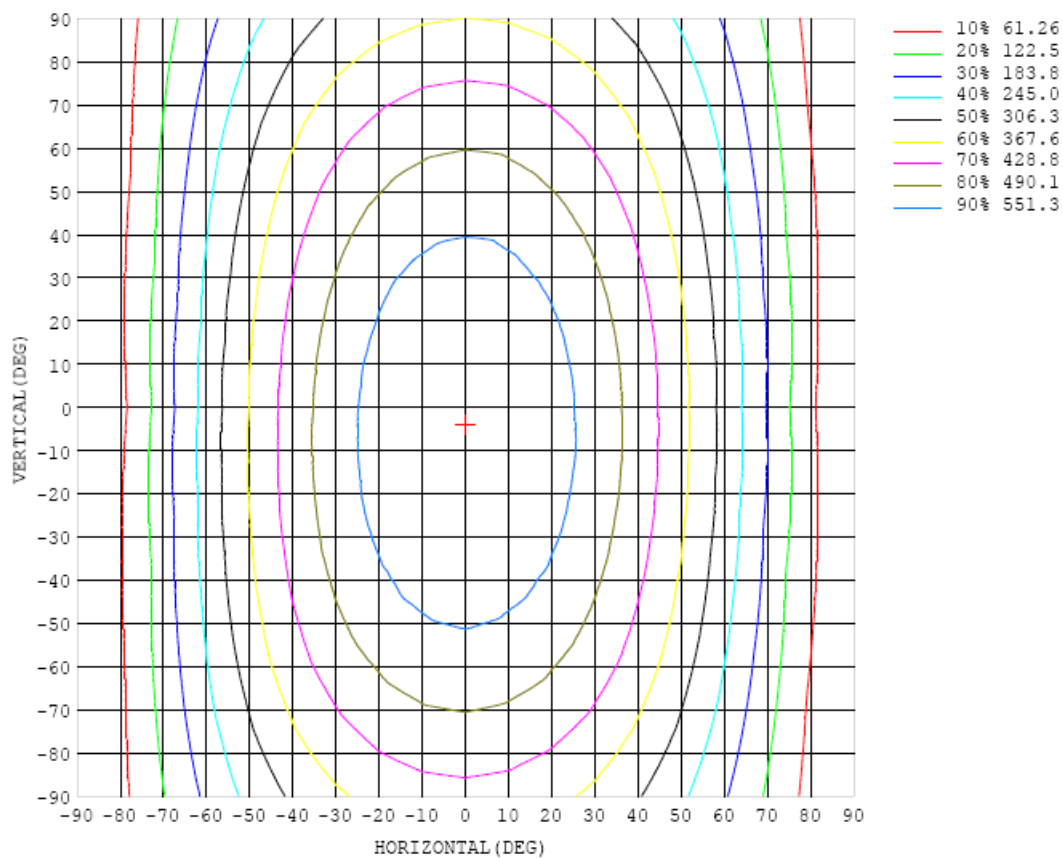


Chart 6: Isocandela Plot

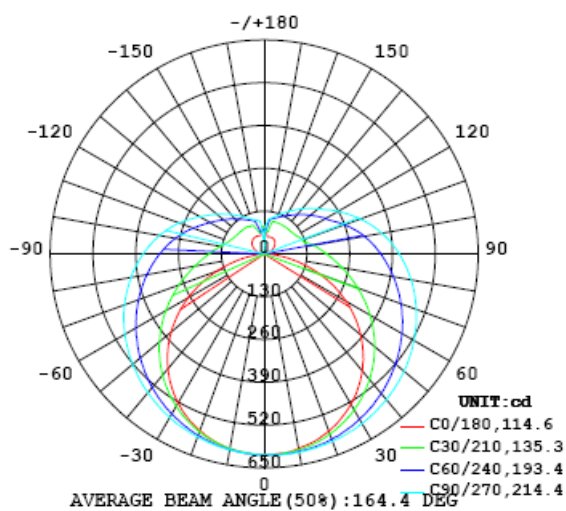


Chart 7: Polar Candela Distribution

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	610	610	610	610	610	610	610	610	610	610	610	610	610	610	610	610	610	610	610
5	607	609	609	609	610	611	611	612	611	612	612	612	612	611	610	610	608	608	608
10	600	602	604	604	607	608	609	611	610	612	611	610	610	608	607	604	602	602	601
15	589	591	593	596	599	602	605	608	608	610	609	608	606	602	600	595	592	590	589
20	573	575	579	583	589	594	599	604	604	606	605	602	599	594	588	583	578	573	572
25	552	555	562	567	575	583	590	597	599	601	600	596	591	583	575	566	558	553	550
30	527	531	538	547	558	570	579	588	593	595	594	589	581	570	558	546	535	527	522
35	497	503	512	524	539	554	568	579	583	586	585	579	568	554	539	522	507	497	491
40	464	469	482	498	517	536	553	567	573	577	576	567	555	537	517	496	476	462	455
45	425	432	448	469	493	516	537	553	562	566	564	555	539	518	493	466	442	422	414
50	383	392	411	438	468	495	521	540	549	554	551	541	522	497	468	435	403	380	369
55	336	347	372	405	442	474	503	524	535	541	537	525	504	476	441	401	363	333	320
60	287	299	331	371	413	452	483	507	520	526	523	508	486	453	413	367	321	284	267
65	234	250	288	337	386	428	463	489	504	510	505	491	466	430	385	333	279	232	211
70	180	199	246	303	357	405	442	470	485	492	487	472	445	407	359	301	237	181	154
75	124	149	206	270	330	380	421	449	466	473	468	452	424	384	332	270	199	132	97.2
80	71.9	102	169	240	304	357	399	428	446	453	448	432	402	360	307	242	166	90.4	46.0
85	28.3	65.2	139	213	279	334	376	407	424	432	427	410	380	338	284	216	140	61.4	9.79
90	3.63	41.6	115	190	256	311	355	385	403	410	405	388	359	316	262	195	120	45.3	1.42
95	2.35	30.0	98.2	170	235	290	332	362	381	388	382	365	337	294	241	177	104	36.9	4.68
100	6.64	28.2	83.0	152	214	267	309	339	356	363	359	341	313	272	220	159	89.0	37.7	10.3
105	11.7	31.9	76.8	133	194	244	285	314	331	338	333	316	289	250	201	141	85.9	42.9	16.7
110	17.8	38.1	75.4	125	172	221	260	288	305	311	306	291	264	227	181	131	86.1	48.2	24.1
115	24.1	43.3	74.9	118	163	198	234	262	278	285	280	266	242	208	167	126	87.0	53.9	31.5
120	30.8	49.8	76.8	112	152	187	216	237	252	259	256	243	220	189	157	123	88.5	60.3	38.2
125	37.3	56.8	79.9	109	142	173	199	218	230	234	231	219	201	177	149	119	89.3	66.9	43.9
130	42.5	63.4	82.1	106	134	161	183	200	210	214	211	202	186	166	142	116	90.3	72.8	48.5
135	46.5	70.1	85.6	105	127	150	169	184	193	196	194	186	173	156	135	113	92.5	78.4	52.2
140	50.9	76.0	88.8	104	122	140	156	169	176	180	177	171	160	145	129	110	94.5	82.3	55.0
145	52.8	78.0	91.9	104	118	132	145	155	161	164	162	157	148	137	122	108	94.7	86.6	57.0
150	54.8	78.6	94.6	104	114	125	134	142	147	150	149	145	137	128	117	106	96.7	89.4	58.2
155	54.9	77.8	96.6	103	111	118	126	131	135	137	136	133	128	121	113	101	96.8	87.0	58.8
160	54.4	69.5	95.0	103	108	113	118	122	124	126	125	123	120	114	99.9	97.4	86.9	79.4	58.4
165	53.4	61.5	71.4	102	106	109	112	114	116	117	117	115	112	91.5	86.4	79.8	74.1	67.8	57.8
170	53.2	52.6	57.5	69.3	91.1	100	105	108	109	109	110	103	79.6	71.9	72.8	70.9	69.0	59.6	57.7
175	71.0	67.6	67.9	69.5	74.6	72.1	73.4	78.6	93.5	96.7	73.3	60.8	64.3	71.4	70.7	74.8	72.3	73.3	73.9
180	83.5	83.5	82.2	80.9	76.7	70.1	64.2	61.4	59.7	12.4	49.7	65.3	61.8	73.4	73.3	78.2	79.9	81.7	83.6

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	610	610	610	610	610	610	610	610	610	610	610	610	610	610	610	610	610		
5	607	608	607	607	607	608	608	607	608	608	609	609	607	608	608	607	607		
10	601	601	600	602	602	604	603	603	604	605	605	604	602	602	601	600	601		
15	588	589	589	591	593	596	598	597	598	600	598	597	595	592	591	589	588		
20	572	573	575	579	582	587	590	590	592	592	590	587	584	581	577	574	573		
25	549	553	557	562	569	575	580	581	583	583	580	576	570	566	560	555	553		
30	523	528	535	543	552	561	569	572	574	573	569	563	555	547	539	532	528		
35	492	499	509	522	535	546	555	559	562	561	556	549	538	527	514	505	499		
40	457	466	480	497	514	529	541	547	550	549	543	533	518	503	488	475	465		
45	418	431	449	472	492	511	524	532	537	534	527	515	497	478	458	441	429		
50	374	391	415	444	469	492	508	517	522	519	510	495	475	452	427	404	388		
55	327	350	381	414	445	471	490	501	506	503	492	476	451	424	393	365	344		
60	276	306	345	385	421	450	471	483	488	486	474	455	428	396	359	324	297		
65	224	263	309	356	396	429	452	465	471	468	455	433	403	367	325	282	248		
70	172	220	275	328	371	406	431	445	451	448	434	412	378	339	291	240	198		
75	123	181	243	300	347	384	410	425	431	428	413	389	354	311	258	201	150		
80	79.6	147	214	274	323	362	389	405	411	406	391	366	330	284	228	165	105		
85	49.1	120	189	250	300	339	367	383	390	385	370	344	307	259	201	136	68.2		
90	33.6	100	168	228	279	318	345	361	368	363	348	322	284	236	178	112	44.4		
95	27.8	86.0	151	208	257	296	324	339	346	341	326	300	262	215	158	94.6	32.5		
100	28.6	76.2	135	189	237	274	301	317	323	318	304	278	241	195	141	81.2	28.8		
105	33.5	72.5	122	171	216	252	278	293	299	295	280	255	220	176	126	73.1	30.4		
110	39.7	71.7	114	157	196	230	255	269	275	271	257	233	199	159	114	69.4	35.3		
115	45.0	72.7	108	146	179	209	231	245	250	246	233	210	180	145	106	67.8	40.9		
120	51.6	74.9	104	136	165	191	210	222	226	223	211	191	165	134	101	69.1	46.5		
125	58.7	77.1	101	129	154	175	192	202	206	203	192	175	153	125	96.7	71.7	53.0		
130	65.4	80.0	99.9	122	144	162	176	184	187	185	175	161	142	117	94.8	74.9	59.3		
135	71.3	82.0	98.7	117	134	150	161	168	170	168	160	149	132	112	94.2	77.0	64.3		
140	73.8	85.3	98.3	112	126	139	149	155	156	154	148	137	124	108	93.9	80.3	69.7		
145	79.1	87.7	97.5	109	120	129	137	141	143	141	136	128	117	105	93.2	83.8	70.7		
150	80.5	90.5	95.9	106	114	121	127	130	131	130	126	120	112	102	93.6	86.9	77.0		
155	81.1	89.6	95.0	103	109	114	118	120	121	120	118	113	108	100	95.4	89.6	78.0		
160	68.0	79.8	86.9	89.7	104	109	111	112	113	113	111	108	105	100	97.1	91.0	70.3		
165	61.0	69.2	73.2	76.8	82.6	89.3	106	107	107	107	106	105	103	99.9	98.2	90.4	60.7		
170	58.4	57.7	65.2	68.9	68.5	69.8	83.5	99.0	103	104	103	102	98.1	92.1	87.7	67.9	51.7		
175	73.8	73.3	71.4	72.7	69.2	69.1	63.2	54.1	70.4	97.0	95.1	81.0	75.4	70.2	70.7	67.1	68.3		
180	83.8	83.6	82.2	80.1	75.7	71.3	63.6	63.5	55.8	6.66	52.3	63.8	68.4	70.5	75.0	78.3	81.0		

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, 2021	Aug. 04, 2022
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2021	Aug. 04, 2022
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2021	Aug. 04, 2022
Standard source	D908	HZTE012-01	Aug. 05, 2021	Aug. 04, 2022
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2021	Aug. 04, 2022
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2021	Aug. 04, 2022
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2021	Aug. 04, 2022
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2021	Aug. 04, 2022

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 lamps) 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 lamps) 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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