

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: 12T5HE/3F/840/BYP/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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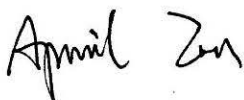
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www.ledtestlab.com

Report No.: HZ22070025n

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

Review by:



Engineer: April Zou
Aug. 16, 2022

Approved by:



Manager: Jim Zhang
Aug. 16, 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: 12T5HE/3F/840/BYP/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
131.2	1618.2	12.33	0.9788
CCT (K)	CRI	Stabilization Time (Light & Power)	
4094	82.1	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	: Aug. 15, 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	: 12T5HE/3F/840/BYP/R
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)	0.105	0.050
Power Factor	0.9788	0.9064
Test Power (W)	12.33	12.60
THD A%	15.41	18.67
Luminous Efficacy (lm/W)	131.2	130.8
Total Luminous Flux (lm)	1618.2	1648.4
Color Rendering Index (CRI)	82.1	
R9	2.8	
Correlated Color Temperature (CCT)(K)	4094	
Chromaticity Chroma x	0.3772	
Chromaticity Chroma y	0.3776	
Chromaticity Chroma u	0.2226	
Chromaticity Chroma v	0.3343	
Duv	0.0014	
Chromaticity Chroma u'	0.2226	
Chromaticity Chroma v'	0.5015	

Special Color Rendering Indices	
R1	79.9
R2	87.8
R3	94.3
R4	81.6
R5	80.4
R6	83.6
R7	85.8
R8	63.2
R9	2.8
R10	71.6
R11	80.8
R12	63.2
R13	81.7
R14	97

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)	0.106
Power Factor	0.9794
Power (W)	12.40
Luminous Efficacy (lm/W)	131.0
Total Luminous Flux (lm)	1624.3
Beam Angle (°)	112.4 (0°-180°) / 238.8 (90°-270°)
Center Beam Candle Power (cd)	255
Maximum Beam Candle Power (cd)	256.2 (At: C=240.0, Gamma=6.0)
Spacing Criteria	1.31 (0°-180°) / 1.49 (90°-270°)
Zonal Lumens in the 0°-60°Zone	41.34%
Zonal Lumens in the 60°-90°Zone	26.91%
Zonal Lumens in the 90°-120°Zone	18.07%
Zonal Lumens in the 120°-180°Zone	13.68%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

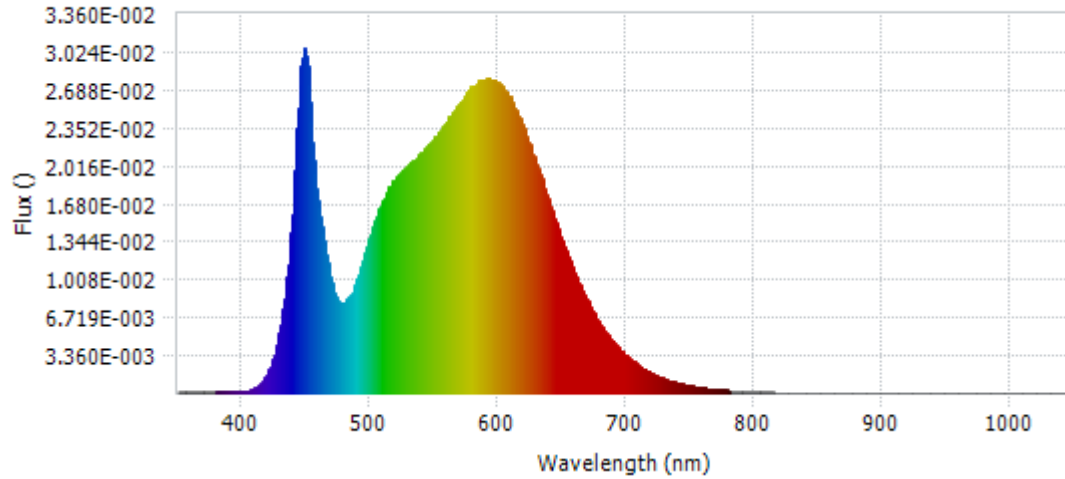
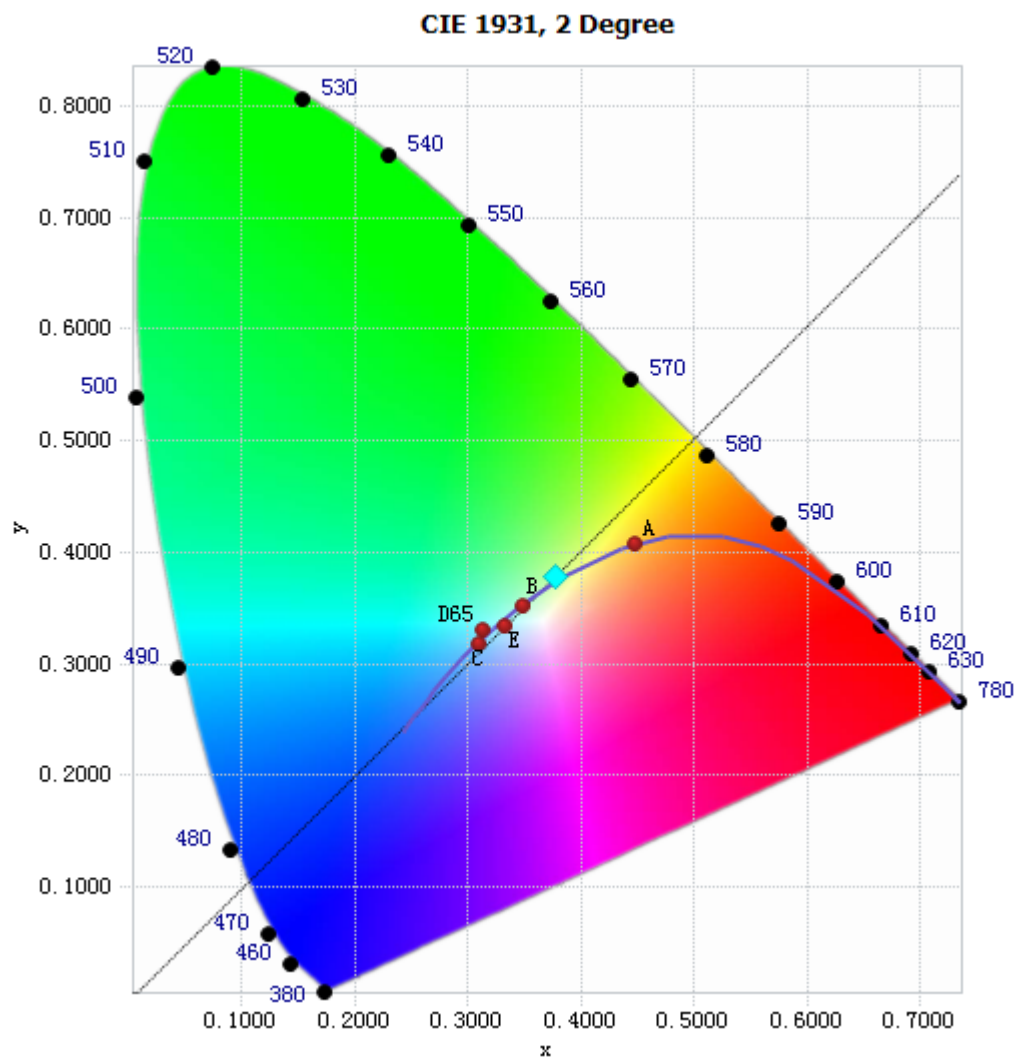


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.59E-04	485	8.79E-03	590	2.77E-02	695	3.91E-03
385	1.31E-04	490	1.02E-02	595	2.78E-02	700	3.32E-03
390	1.14E-04	495	1.21E-02	600	2.75E-02	705	2.85E-03
395	1.22E-04	500	1.40E-02	605	2.69E-02	710	2.41E-03
400	1.16E-04	505	1.57E-02	610	2.60E-02	715	2.06E-03
405	2.29E-04	510	1.71E-02	615	2.49E-02	720	1.77E-03
410	4.84E-04	515	1.83E-02	620	2.34E-02	725	1.51E-03
415	9.56E-04	520	1.91E-02	625	2.20E-02	730	1.27E-03
420	1.85E-03	525	1.97E-02	630	2.02E-02	735	1.09E-03
425	3.43E-03	530	2.02E-02	635	1.86E-02	740	9.24E-04
430	6.03E-03	535	2.07E-02	640	1.69E-02	745	7.78E-04
435	1.03E-02	540	2.13E-02	645	1.52E-02	750	6.68E-04
440	1.75E-02	545	2.20E-02	650	1.36E-02	755	5.73E-04
445	2.72E-02	550	2.26E-02	655	1.20E-02	760	4.90E-04
450	2.98E-02	555	2.33E-02	660	1.06E-02	765	4.18E-04
455	2.22E-02	560	2.41E-02	665	9.30E-03	770	3.51E-04
460	1.63E-02	565	2.49E-02	670	8.10E-03	775	3.04E-04
465	1.29E-02	570	2.57E-02	675	7.05E-03	780	2.61E-04
470	9.78E-03	575	2.65E-02	680	6.10E-03		
475	8.13E-03	580	2.71E-02	685	5.27E-03		
480	8.05E-03	585	2.77E-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): (0.3772, 0.3776)

Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

CIE 1931 x,y Chromaticity Diagram
Nominal CCT Quadrangles

The diagram shows the Planckian Locus and various color temperature quadrangles (2500K, 3000K, 3500K, 4000K, 4500K, 5000K, 5500K, 6000K, 6500K, 7000K). A yellow shaded region indicates the 4000K ANSI quad, and a purple circle marks the DUT point at $x = 0.3772$ and $y = 0.3776$.

DUT: $x = 0.3772$ $y = 0.3776$
inside 7 Quad 4000K ANSI
outside 7 Quad 4000K/011 ANSI

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

Color Rendition Report – Sphere Spectroradiometer Method

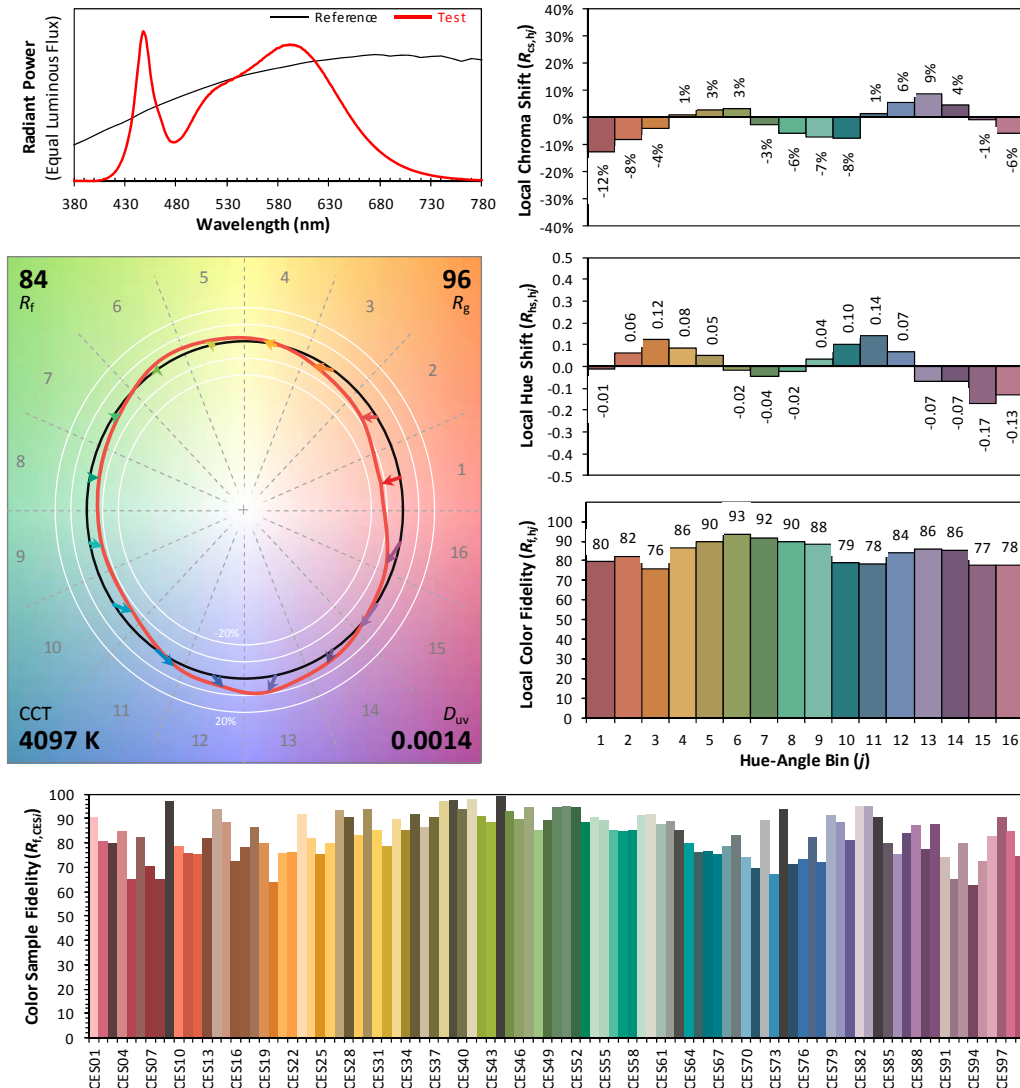
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/08/15

Model: 12T5HE/3F/840/BYP/R



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

x 0.3771
 y 0.3776
 u' 0.2226
 v' 0.5015

CIE 13.3-1995
(CRI)
 R_a 82
 R_9 3

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	24.225	1.49%
10- 20	70.529	4.34%
20- 30	110.559	6.81%
30- 40	140.987	8.68%
40- 50	159.544	9.82%
50- 60	165.648	10.20%
60- 70	160.435	9.88%
70- 80	146.942	9.05%
80- 90	129.688	7.98%
90-100	112.602	6.93%
100-110	97.505	6.00%
110-120	83.491	5.14%
120-130	69.664	4.29%
130-140	56.452	3.48%
140-150	43.752	2.69%
150-160	30.386	1.87%
160-170	16.284	1.00%
170-180	5.639	0.35%
Total	1624.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	671.492	41.34%
60- 90	437.065	26.91%
0-90	1108.56	68.25%
90- 180	515.775	31.75%
0- 180	1624.3	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

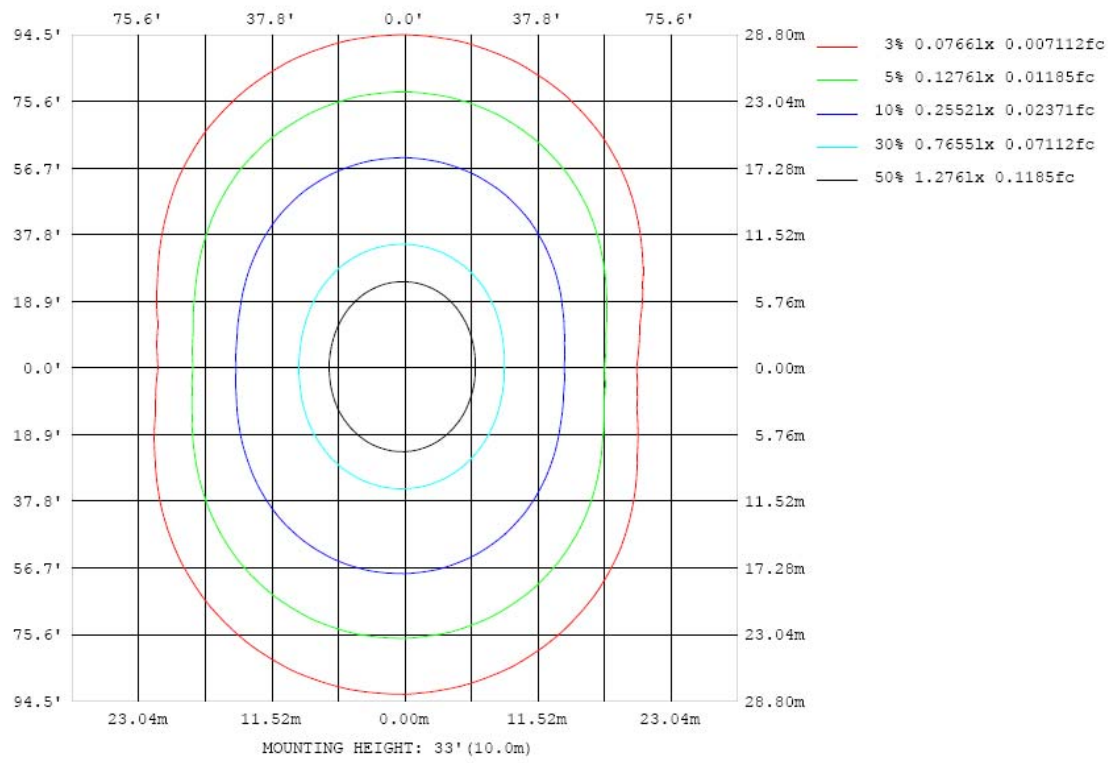


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

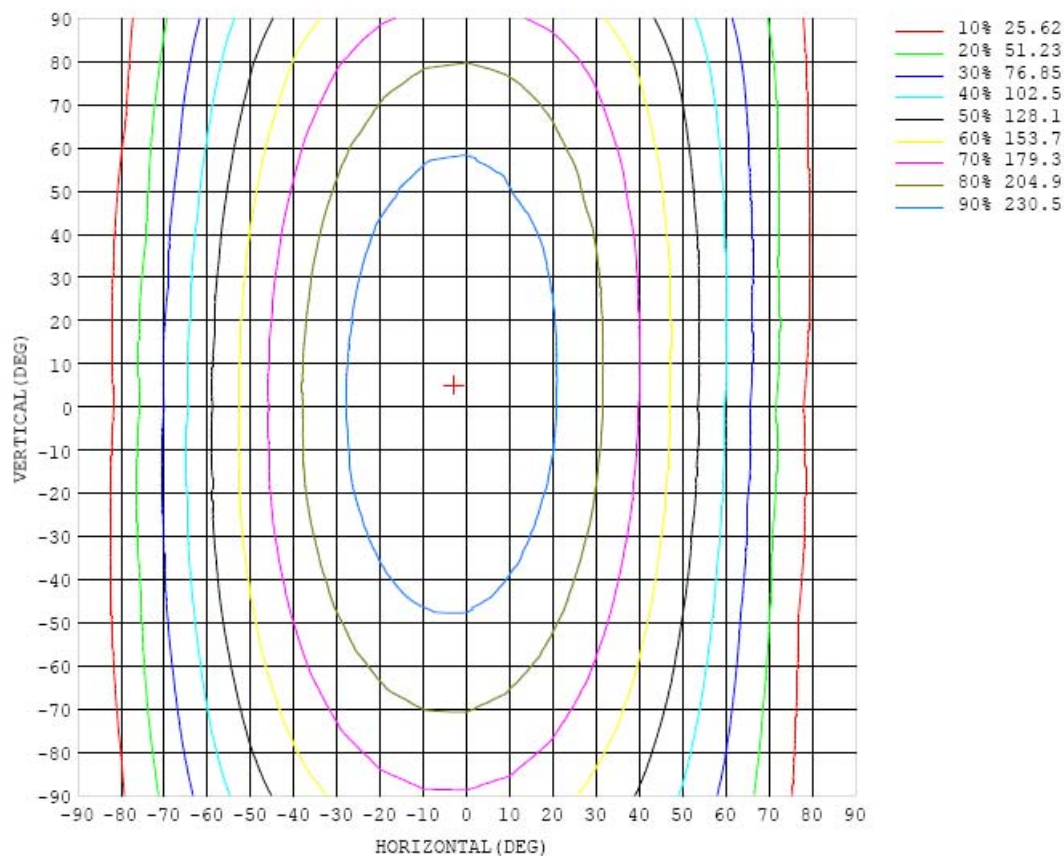


Chart 6: Isocandela Plot

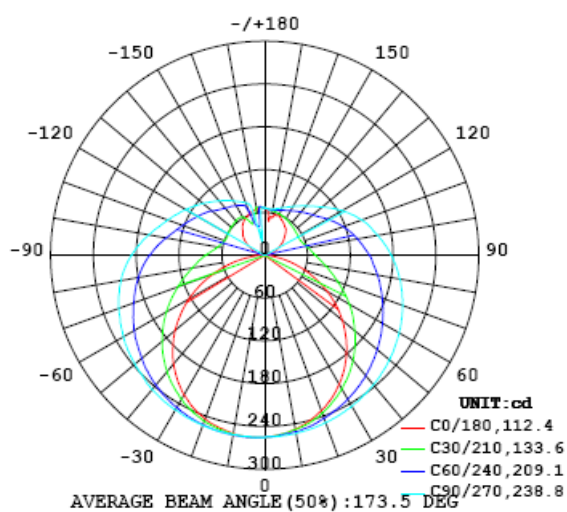


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255
5	253	252	252	252	253	253	253	254	254	255	255	255	255	255	255	256	255	256	255
10	248	248	248	248	249	250	251	252	253	253	254	254	255	255	254	254	254	254	254
15	240	240	242	243	244	246	248	249	251	252	252	253	253	253	252	251	251	250	250
20	232	232	234	235	238	241	243	246	248	249	251	251	250	249	248	246	245	245	244
25	221	222	224	226	231	235	238	242	246	247	248	248	247	245	243	241	238	237	236
30	209	210	212	216	222	227	233	238	242	244	245	245	243	240	236	233	229	226	226
35	194	195	199	205	212	219	227	233	238	241	242	241	238	233	228	223	218	214	213
40	179	180	184	193	202	211	220	228	234	237	238	236	232	226	219	212	206	200	199
45	161	163	169	179	190	202	213	222	229	233	234	231	226	219	209	200	192	185	182
50	142	145	153	165	179	193	206	216	224	228	229	226	220	210	199	187	176	167	164
55	122	126	136	151	167	183	198	210	219	223	224	220	213	201	188	174	160	149	144
60	101	106	118	137	156	174	191	204	213	217	218	214	205	193	177	159	144	129	123
65	79.5	84.8	101	123	145	165	183	197	207	212	212	207	198	183	165	146	126	109	100
70	57.9	64.4	84.2	109	135	157	175	190	200	206	206	200	190	174	155	132	109	88.0	77.0
75	37.2	45.3	69.0	97.2	125	149	168	183	194	199	199	193	182	165	145	119	92.0	67.5	54.4
80	18.8	29.2	56.6	87.0	116	141	161	177	187	192	192	186	174	157	135	107	77.1	48.8	32.5
85	5.09	17.8	46.9	78.2	107	133	153	169	180	185	185	178	166	149	125	96.8	65.1	33.5	13.7
90	1.15	12.7	40.6	71.2	100	126	147	162	172	178	177	170	158	140	117	87.6	55.5	23.2	2.57
95	3.07	11.3	37.1	65.9	93.6	119	139	154	164	169	169	162	151	132	109	80.4	49.2	18.8	2.27
100	6.10	13.3	34.6	61.8	88.4	112	132	147	156	161	160	154	142	125	102	74.5	45.1	17.5	5.23
105	9.84	16.4	34.1	58.0	83.0	106	125	140	149	153	152	146	134	117	95.2	69.5	42.0	19.0	9.29
110	14.1	20.7	35.2	55.1	77.9	99.3	117	131	140	145	144	138	126	110	88.8	64.8	40.9	22.6	14.4
115	18.9	25.2	37.3	54.0	73.1	92.7	109	123	131	135	134	128	117	102	82.7	61.4	41.5	26.9	20.5
120	24.1	29.8	39.8	54.0	69.8	86.3	102	114	122	125	124	119	109	94.4	77.3	59.6	43.0	31.4	26.5
125	29.9	34.5	42.5	54.5	67.9	81.3	93.9	105	112	115	114	109	100	87.6	73.6	58.8	45.1	36.2	32.8
130	35.1	38.9	45.2	55.1	66.6	77.9	88.2	96.5	102	105	104	100	92.6	82.6	71.1	58.7	47.6	40.8	38.9
135	40.4	42.8	47.9	55.9	65.3	74.8	83.3	90.3	94.9	97.1	96.5	93.0	86.9	78.7	69.1	59.1	50.3	45.2	43.5
140	46.5	46.8	50.8	56.7	64.5	72.1	79.2	84.9	88.7	90.3	89.8	87.1	82.0	75.4	67.8	59.8	53.2	49.5	48.5
145	49.3	49.8	53.3	58.0	63.7	69.8	75.4	80.0	83.1	84.4	84.0	81.7	77.8	72.5	66.6	60.6	55.9	53.3	53.5
150	52.5	53.2	55.7	59.2	63.4	67.9	72.2	75.7	78.1	79.1	78.7	77.0	74.1	70.2	65.8	61.6	58.2	56.6	57.0
155	55.3	54.0	57.3	60.5	63.3	66.4	69.4	71.9	73.7	74.6	74.3	72.9	71.0	68.1	65.3	62.5	60.4	59.4	59.2
160	58.9	56.4	60.0	61.3	63.3	65.2	67.1	68.8	70.1	70.7	70.5	69.7	68.5	66.7	65.0	63.4	62.0	61.9	62.5
165	58.1	58.9	60.4	62.8	63.3	64.5	65.6	66.7	67.4	67.6	67.6	67.3	66.7	65.9	64.9	64.1	63.6	63.7	64.1
170	54.5	55.0	59.0	63.5	63.8	64.0	64.5	65.1	65.4	65.6	65.7	65.6	65.4	65.1	64.8	64.6	64.7	65.1	65.7
175	57.2	60.2	63.5	64.8	64.9	64.8	64.7	64.7	64.8	64.9	65.0	65.0	65.0	65.1	65.2	65.5	65.7	66.0	66.2
180	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4

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	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255		
5	256	256	256	256	256	256	256	255	255	255	255	254	254	253	253	253	253		
10	254	254	255	255	256	255	256	256	255	254	253	252	251	250	249	248	248		
15	250	251	252	253	254	255	255	255	255	253	251	250	248	246	244	243	241		
20	244	245	248	249	251	253	254	254	254	252	250	247	244	241	237	235	233		
25	237	238	241	244	247	250	252	253	252	251	248	243	239	234	229	225	222		
30	227	229	233	238	243	246	250	251	250	248	244	239	233	226	220	214	210		
35	215	218	224	230	237	242	247	249	249	246	241	235	226	218	209	202	196		
40	201	206	213	222	230	237	243	245	245	243	237	229	219	208	198	188	181		
45	185	191	201	212	223	232	238	242	241	238	232	223	212	199	185	173	165		
50	167	176	188	201	214	225	233	237	237	234	226	216	203	189	172	158	147		
55	148	159	174	190	205	218	228	233	234	230	222	210	194	177	159	141	128		
60	127	141	159	178	197	211	222	228	229	225	216	203	187	166	145	125	108		
65	106	123	144	167	187	203	215	222	223	219	210	196	178	157	132	109	88.5		
70	83.8	104	130	155	178	196	209	216	218	214	204	190	170	146	120	93.1	69.8		
75	62.6	86.4	116	144	169	188	202	210	212	208	198	183	162	137	109	78.5	51.5		
80	42.6	71.1	103	133	160	180	194	202	204	201	191	175	155	129	99.1	67.4	36.7		
85	26.7	58.9	92.6	124	151	171	186	195	197	193	183	167	146	120	90.4	58.6	25.9		
90	16.8	49.0	82.8	114	141	161	176	185	187	183	173	158	137	111	81.6	50.3	19.3		
95	12.3	41.1	73.6	104	131	151	166	174	176	173	163	147	127	102	73.9	44.8	17.9		
100	13.1	38.0	67.0	95.2	120	140	155	163	165	162	152	138	118	94.9	69.3	43.4	18.8		
105	17.6	37.6	62.8	88.8	112	131	144	152	154	150	142	129	111	89.9	66.7	43.0	20.7		
110	22.2	38.9	60.4	83.7	105	123	135	143	145	142	134	122	106	86.0	65.1	44.5	23.3		
115	25.4	40.1	58.4	79.7	99.3	116	127	134	136	133	126	115	101	83.3	62.5	45.1	26.5		
120	28.6	43.3	59.1	76.2	94.2	109	120	126	128	126	119	109	96.3	79.6	61.7	46.9	28.3		
125	31.4	46.3	60.4	73.6	89.4	103	113	119	121	118	113	104	91.5	75.1	61.8	49.6	29.5		
130	34.0	48.6	61.7	72.4	84.5	96.6	106	111	113	111	106	97.7	84.8	72.3	63.5	51.8	29.8		
135	37.5	51.0	62.1	72.3	81.7	90.3	98.5	105	106	105	100	92.4	82.1	73.2	64.0	51.7	31.7		
140	43.0	51.6	63.0	71.7	79.7	86.2	92.3	97.8	99.4	98.3	94.4	88.8	81.1	72.7	64.6	48.7	35.8		
145	50.3	49.6	63.6	71.6	77.8	83.4	87.6	91.8	93.4	92.6	89.3	84.7	77.2	70.1	64.5	42.9	40.9		
150	56.1	45.8	61.7	71.8	75.8	80.2	83.7	86.3	87.8	87.0	84.3	79.1	73.0	69.0	63.2	35.6	49.8		
155	60.6	53.7	54.5	65.7	73.1	77.2	79.9	81.7	82.7	82.4	76.1	70.2	65.4	61.6	47.2	42.0	57.5		
160	63.4	61.2	48.7	50.4	55.1	66.1	75.9	77.9	78.4	74.6	53.3	49.7	47.5	40.5	35.9	47.5	56.6		
165	64.9	66.0	55.8	45.0	43.2	42.7	42.6	50.7	59.3	39.5	42.6	37.0	35.0	35.4	39.6	48.0	52.7		
170	66.5	67.5	68.2	62.5	45.6	42.5	46.5	49.6	18.5	52.3	46.7	39.5	35.8	36.6	40.3	44.6	50.2		
175	66.6	67.1	67.4	67.9	68.1	68.4	68.7	68.3	62.7	41.9	38.3	39.9	40.4	41.5	44.0	47.5	53.7		
180	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4	66.4		

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 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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