

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/830/BYP/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100

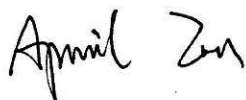
Tel: +86571 86376106

www.ledtestlab.com

Report No.: HZ22070025ab

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

Review by:



Engineer: April Zou
Nov. 08, 2022

Approved by:



Manager: Jim Zhang
Nov. 08, 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/830/BYP/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
130.5	1635.6	12.53	0.9797
CCT (K)	CRI	Stabilization Time (Light & Power)	
3154	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	: Nov. 07, 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	: 12T5HE/3F/830/BYP/R
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: 3000K
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)	0.107	0.050
Power Factor	0.9797	0.9097
Test Power (W)	12.53	12.68
THD A%	15.32	18.37
Luminous Efficacy (lm/W)	130.5	130.2
Total Luminous Flux (lm)	1635.6	1651.4
Color Rendering Index (CRI)	82.1	
R9	4	
Correlated Color Temperature (CCT)(K)	3154	
Chromaticity Chroma x	0.4273	
Chromaticity Chroma y	0.4025	
Chromaticity Chroma u	0.2450	
Chromaticity Chroma v	0.3462	
Duv	0.0008	
Chromaticity Chroma u'	0.2450	
Chromaticity Chroma v'	0.5193	

Special Color Rendering Indices	
R1	80
R2	89.5
R3	96.7
R4	80.7
R5	80.4
R6	87.1
R7	83.5
R8	59
R9	4
R10	76.5
R11	80.2
R12	69.7
R13	82.1
R14	98.6

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 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)	0.107
Power Factor	0.9797
Power (W)	12.58
Luminous Efficacy (lm/W)	130.5
Total Luminous Flux (lm)	1641.2
Beam Angle (°)	113.7 (0°-180°) / 238.0 (90°-270°)
Center Beam Candle Power (cd)	256
Maximum Beam Candle Power (cd)	255.9 (At: C=110.0, Gamma=1.5)
Spacing Criteria	1.27 (0°-180°) / 1.47 (90°-270°)
Zonal Lumens in the 0°-60°Zone	41.14%
Zonal Lumens in the 60°-90°Zone	27.11%
Zonal Lumens in the 90°-120°Zone	18.21%
Zonal Lumens in the 120°-180°Zone	13.54%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

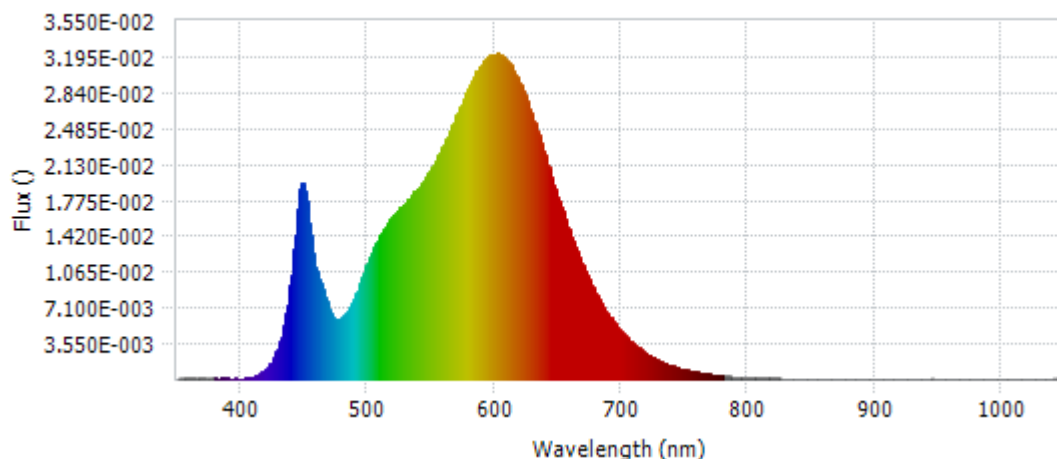
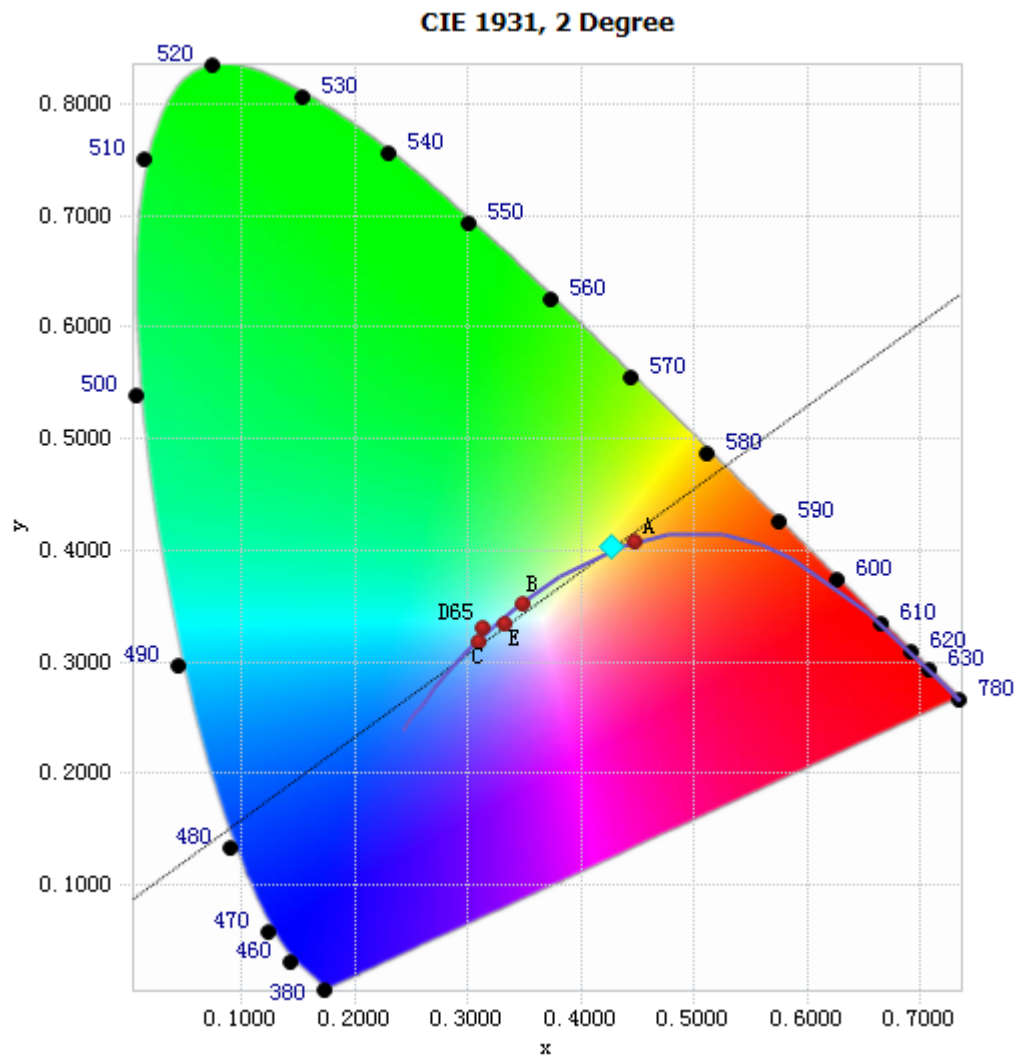


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.20E-04	485	6.92E-03	590	3.12E-02	695	5.54E-03
385	1.24E-04	490	8.22E-03	595	3.19E-02	700	4.76E-03
390	1.10E-04	495	9.83E-03	600	3.22E-02	705	4.11E-03
395	8.31E-05	500	1.15E-02	605	3.21E-02	710	3.48E-03
400	9.70E-05	505	1.30E-02	610	3.16E-02	715	2.98E-03
405	1.26E-04	510	1.43E-02	615	3.06E-02	720	2.57E-03
410	2.62E-04	515	1.54E-02	620	2.94E-02	725	2.18E-03
415	5.33E-04	520	1.62E-02	625	2.78E-02	730	1.84E-03
420	1.02E-03	525	1.69E-02	630	2.60E-02	735	1.58E-03
425	1.91E-03	530	1.75E-02	635	2.42E-02	740	1.34E-03
430	3.39E-03	535	1.82E-02	640	2.22E-02	745	1.13E-03
435	5.93E-03	540	1.89E-02	645	2.01E-02	750	9.63E-04
440	1.04E-02	545	1.99E-02	650	1.81E-02	755	8.27E-04
445	1.69E-02	550	2.09E-02	655	1.63E-02	760	7.07E-04
450	1.91E-02	555	2.19E-02	660	1.44E-02	765	5.95E-04
455	1.43E-02	560	2.32E-02	665	1.28E-02	770	5.08E-04
460	1.07E-02	565	2.46E-02	670	1.12E-02	775	4.27E-04
465	8.89E-03	570	2.61E-02	675	9.85E-03	780	3.68E-04
470	6.87E-03	575	2.75E-02	680	8.58E-03		
475	5.95E-03	580	2.90E-02	685	7.44E-03		
480	6.15E-03	585	3.02E-02	690	6.42E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4273, 0.4025)

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

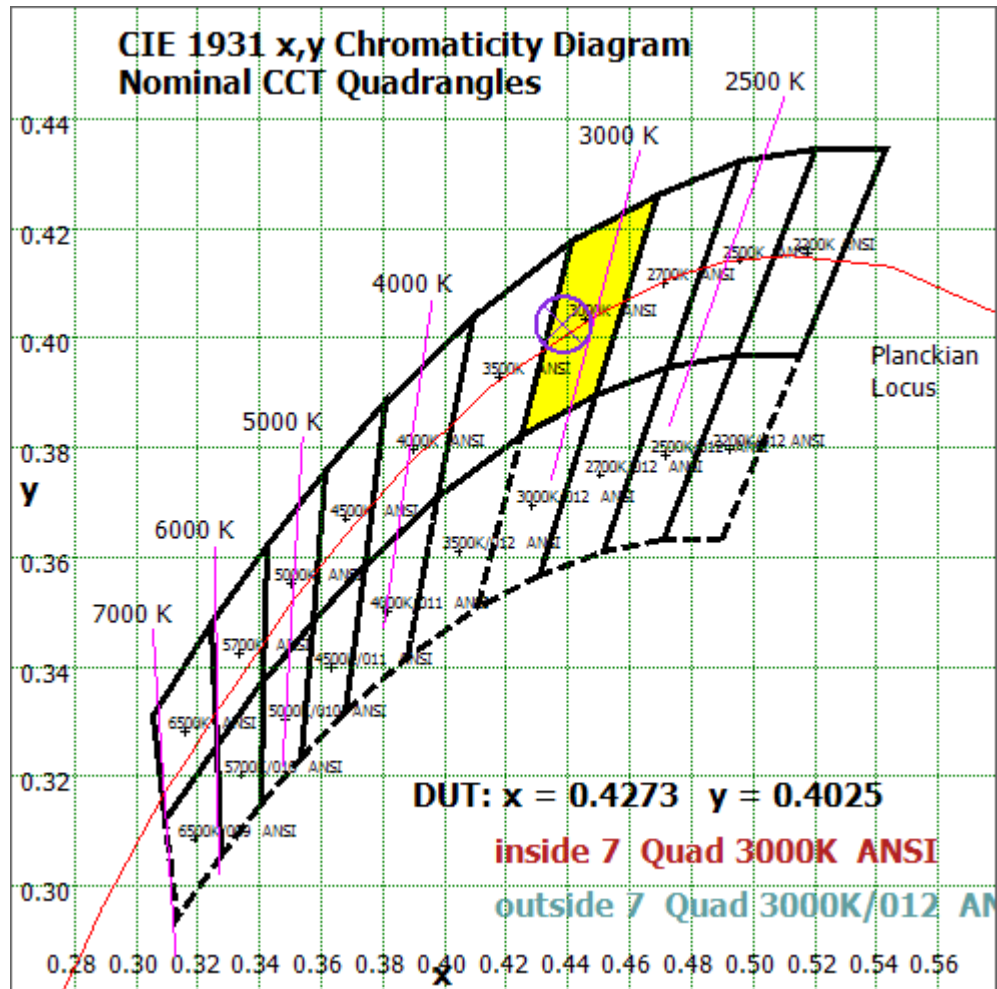


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

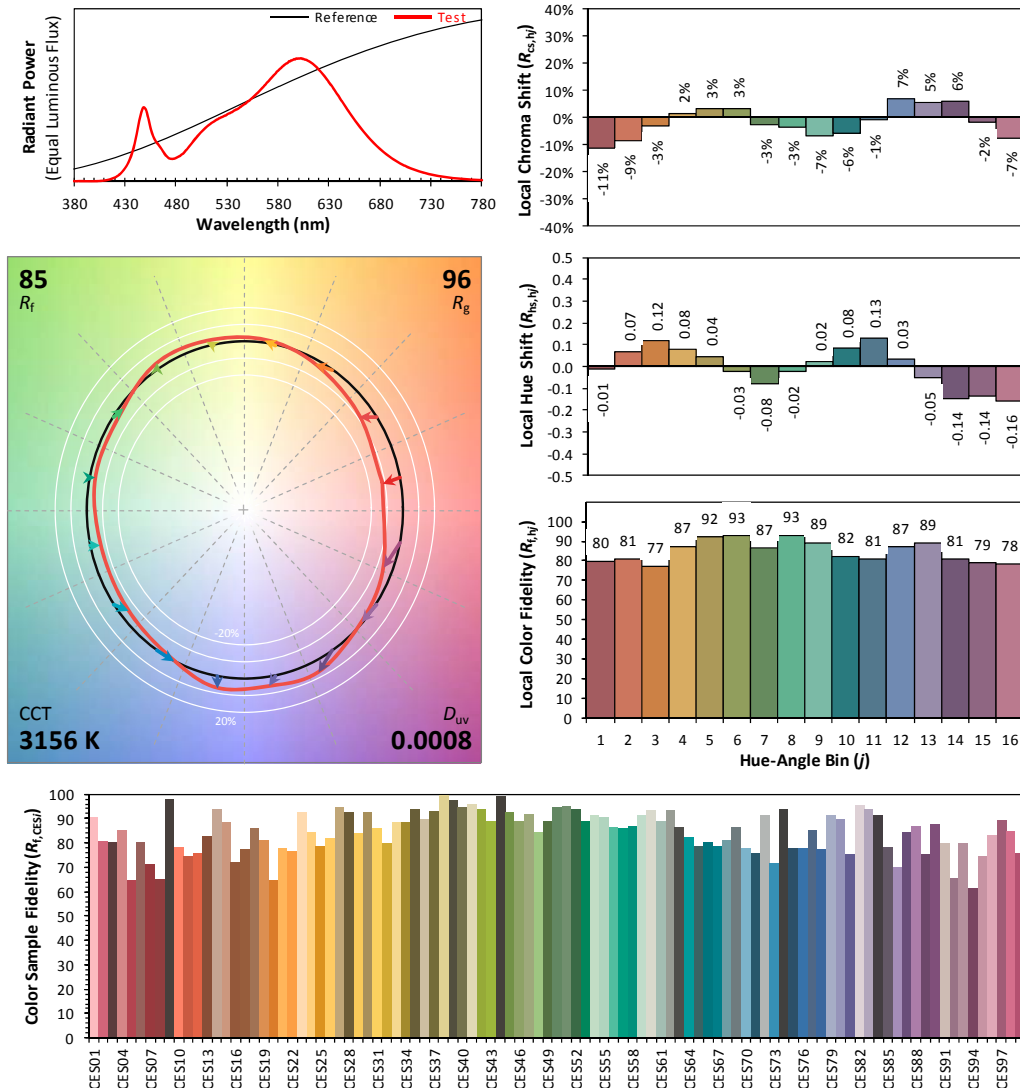
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/11/07

Model: 12T5HE/3F/830/BYP/R



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

x 0.4273
 y 0.4025
 u' 0.2450
 v' 0.5193

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	24.264	1.48%
10- 20	70.649	4.30%
20- 30	110.832	6.75%
30- 40	141.529	8.62%
40- 50	160.554	9.78%
50- 60	167.345	10.20%
60- 70	162.746	9.92%
70- 80	149.589	9.11%
80- 90	132.627	8.08%
90-100	115.932	7.06%
100-110	99.396	6.06%
110-120	83.579	5.09%
120-130	69.285	4.22%
130-140	56.626	3.45%
140-150	43.965	2.68%
150-160	30.952	1.89%
160-170	16.914	1.03%
170-180	4.441	0.27%
Total	1641.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	675.173	41.14%
60- 90	444.962	27.11%
0-90	1120.14	68.25%
90- 180	521.09	31.75%
0- 180	1641.2	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

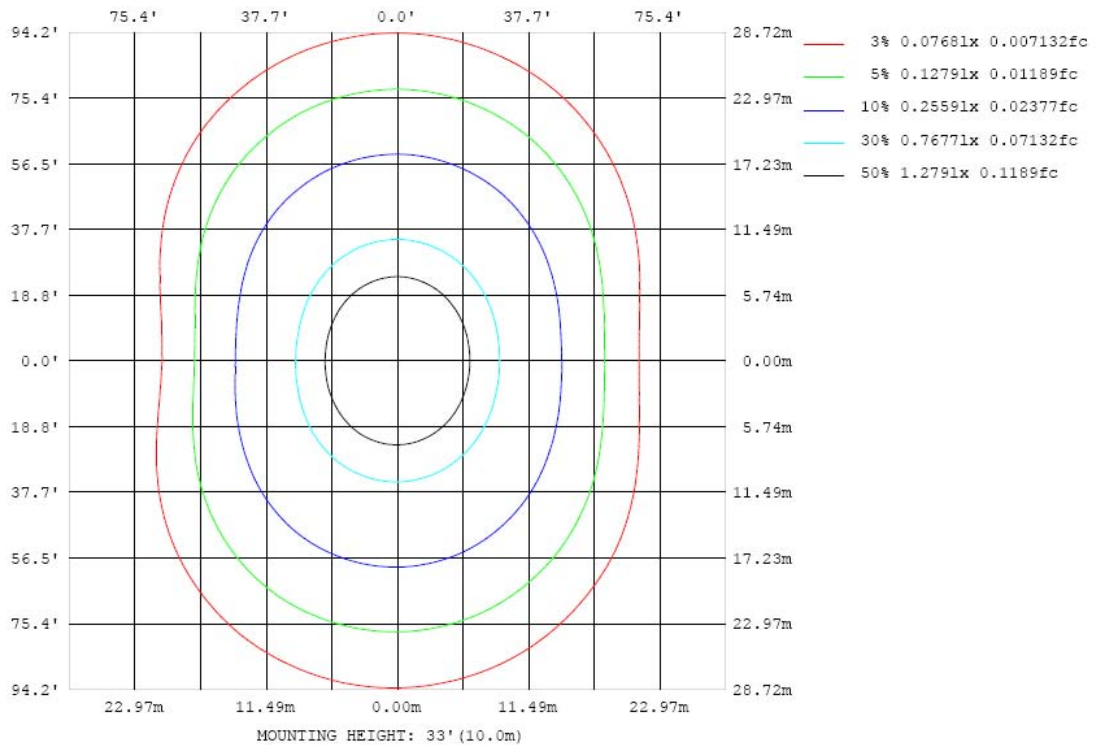


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

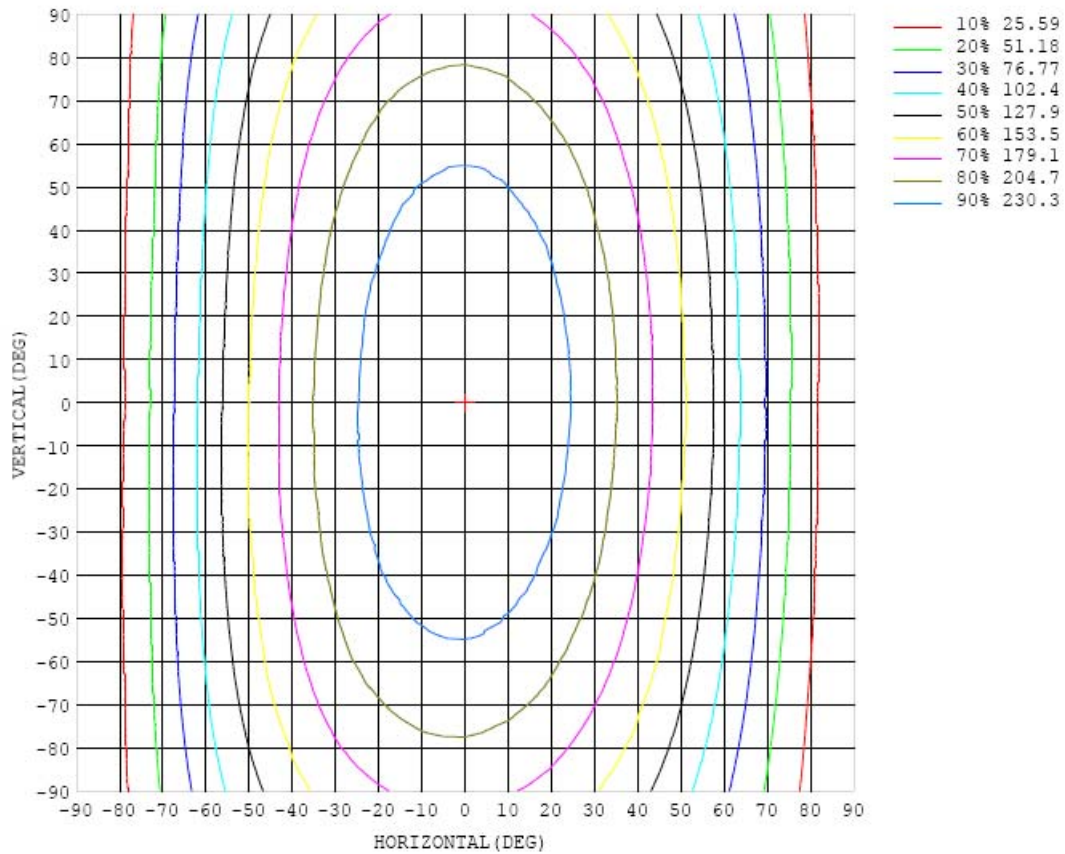


Chart 6: Isocandela Plot

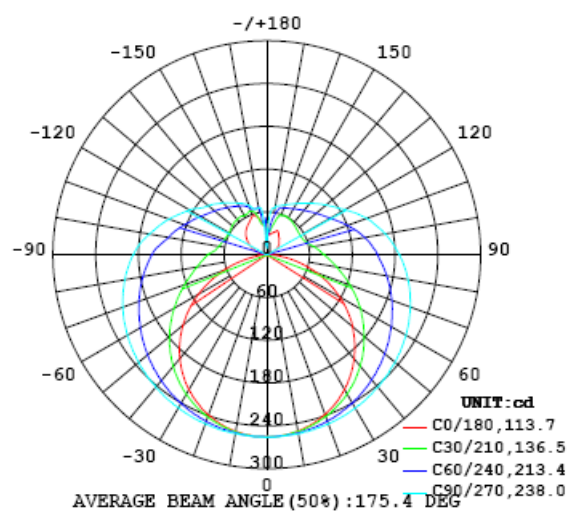


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256
5	254	254	255	254	255	254	255	255	255	255	255	256	255	255	255	255	255	254	254
10	251	251	251	252	253	253	254	254	254	255	254	254	254	254	253	253	252	252	251
15	246	246	246	247	249	250	251	253	253	254	254	253	252	251	250	249	247	247	247
20	238	239	240	241	244	246	248	250	252	252	252	251	250	247	245	243	241	240	239
25	229	230	231	234	238	242	245	248	249	251	250	248	247	243	239	236	233	231	230
30	218	219	221	225	230	236	240	244	247	248	247	246	243	238	232	227	223	220	218
35	205	206	210	215	222	229	235	240	244	245	245	242	238	231	225	217	211	207	205
40	190	192	197	204	212	221	229	236	240	242	242	238	233	225	215	206	198	192	190
45	174	176	182	191	203	213	223	231	236	239	237	233	227	217	206	194	184	176	172
50	157	159	167	178	192	205	216	225	231	235	234	229	221	209	196	181	168	158	153
55	138	142	152	165	180	196	209	220	227	230	229	223	215	201	185	168	152	139	133
60	118	122	135	152	169	187	202	214	222	225	224	218	208	193	174	154	135	119	111
65	96.5	102	117	138	158	178	194	208	216	220	219	212	201	184	164	141	117	97.1	87.7
70	74.7	81.7	100	124	148	169	187	201	210	215	213	206	194	176	154	128	99.9	75.7	64.2
75	52.9	61.8	84.4	111	138	160	179	194	203	208	207	199	187	168	145	116	84.3	55.5	41.4
80	31.9	43.6	69.9	99.4	128	152	171	186	196	201	200	192	179	160	136	105	71.1	38.1	20.3
85	13.9	28.4	58.0	89.2	118	144	163	179	189	194	193	185	172	153	127	95.7	60.7	25.7	5.43
90	2.47	18.5	48.8	80.5	110	135	155	171	181	186	185	177	164	145	119	88.0	53.4	19.5	1.13
95	1.09	13.9	42.7	73.5	102	128	148	163	173	178	177	169	157	137	112	81.3	48.0	16.9	3.36
100	2.76	12.7	37.4	66.9	94.8	119	140	155	164	169	168	160	148	129	104	74.7	43.9	17.9	7.32
105	5.46	14.5	34.7	60.7	87.1	111	130	145	155	159	158	151	139	120	96.6	69.3	42.7	21.9	12.1
110	8.61	18.7	34.9	56.5	80.0	102	121	135	145	149	148	141	129	111	89.4	65.9	43.0	26.8	17.5
115	11.7	23.4	36.4	54.8	74.9	94.1	111	125	134	138	137	130	119	103	84.4	64.2	44.8	32.0	22.9
120	15.3	28.0	38.7	54.3	71.4	88.2	102	114	123	127	125	120	110	96.8	80.9	63.2	47.7	37.0	28.0
125	19.0	32.9	41.6	54.4	69.2	83.6	96.1	106	113	117	116	112	103	91.9	78.2	63.3	50.9	42.1	33.1
130	22.5	37.1	44.6	55.1	67.4	79.6	90.3	99.4	106	109	108	104	97.4	87.6	76.0	64.0	54.1	46.8	37.7
135	24.7	38.9	47.7	56.3	66.2	76.6	85.5	93.2	98.4	101	101	97.6	91.9	83.8	74.4	64.9	57.0	51.2	41.9
140	27.0	42.3	50.8	57.6	65.5	73.8	81.3	87.7	92.1	94.4	94.0	91.4	87.0	80.5	73.2	65.9	59.6	55.1	45.1
145	29.9	47.6	53.6	58.8	65.3	71.6	77.5	82.8	86.4	88.3	88.2	86.2	82.6	77.7	72.2	66.6	62.0	58.5	48.2
150	33.2	50.8	53.8	59.4	65.3	70.0	74.6	78.5	81.3	83.0	83.0	81.5	79.0	75.3	71.4	67.4	63.9	61.1	51.0
155	36.7	53.7	55.3	60.7	64.7	68.6	71.9	75.0	77.1	78.5	78.5	77.5	76.0	73.6	70.8	68.2	65.3	63.5	54.3
160	34.3	48.3	55.4	59.1	63.3	67.6	69.7	71.8	73.4	74.4	74.6	74.2	73.2	71.8	70.3	68.0	66.2	65.7	58.1
165	31.5	40.7	46.1	51.0	57.2	61.8	67.2	69.6	70.3	71.1	71.6	71.5	71.3	70.7	69.1	67.5	67.1	63.9	55.5
170	29.3	30.8	35.7	38.4	40.9	46.8	53.1	60.0	67.1	67.8	68.0	67.7	67.4	67.5	67.4	67.1	65.7	54.5	48.5
175	34.4	31.4	33.3	34.2	34.0	31.1	31.5	38.0	48.5	58.6	63.6	65.2	65.3	66.2	64.6	57.9	47.9	42.9	41.5
180	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8

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	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256	256		
5	254	255	255	255	254	255	255	255	255	256	255	255	255	255	255	255	254		
10	252	251	252	253	253	253	254	255	254	255	254	254	253	252	252	251	252		
15	246	247	248	249	250	252	253	253	254	253	252	252	250	249	248	246	246		
20	239	240	242	244	247	249	251	252	252	252	250	249	246	244	242	240	239		
25	230	232	235	239	242	245	248	249	250	250	247	246	242	238	234	232	230		
30	219	222	226	231	236	241	245	247	248	247	244	241	236	231	226	222	219		
35	206	210	216	223	230	236	241	244	246	244	240	236	230	223	216	210	206		
40	191	196	204	214	223	230	237	241	243	240	236	231	222	214	205	198	192		
45	174	182	192	203	215	225	232	237	239	237	231	225	215	204	193	183	177		
50	156	165	178	193	207	219	228	233	235	232	226	218	206	193	180	168	159		
55	136	148	164	182	198	212	223	228	230	227	221	212	198	183	166	152	141		
60	116	130	150	171	190	205	217	223	226	223	215	204	189	172	153	136	122		
65	94.0	113	136	160	181	198	211	218	221	217	209	197	180	161	139	119	102		
70	72.3	95.1	123	150	173	191	205	213	215	211	203	190	172	150	126	102	82.3		
75	52.4	79.4	110	139	164	184	198	206	209	205	196	182	163	140	114	86.9	63.6		
80	34.6	66.5	99.4	130	156	176	191	199	202	198	189	175	155	131	102	72.9	45.9		
85	22.1	56.2	90.4	122	149	169	184	192	195	191	182	167	146	122	92.5	61.9	31.2		
90	15.9	48.9	82.8	114	141	161	177	185	188	184	174	159	138	113	84.0	53.1	21.6		
95	14.0	42.0	72.6	103	130	151	167	176	179	175	165	151	130	105	75.9	44.8	15.7		
100	16.1	40.2	68.2	96.5	121	140	155	164	167	164	155	141	120	95.9	68.5	40.2	14.6		
105	20.7	39.7	65.5	90.2	113	132	146	154	157	153	145	131	112	88.7	63.4	37.5	16.3		
110	25.9	40.8	63.1	85.4	106	123	136	143	146	143	134	121	103	82.0	59.2	36.7	20.2		
115	30.4	43.4	61.8	81.6	100	115	126	133	135	132	124	112	95.9	75.1	55.8	39.1	24.2		
120	34.6	46.6	61.4	78.1	94.5	107	118	124	126	123	115	103	87.0	71.3	56.7	41.5	27.3		
125	39.3	50.2	62.2	75.8	90.0	101	109	113	114	111	104	94.9	83.5	70.5	57.3	43.6	27.7		
130	42.9	53.0	63.4	74.3	86.2	95.5	103	107	107	104	98.9	91.2	80.8	69.3	58.0	46.0	29.5		
135	45.5	54.0	64.4	73.3	82.7	90.9	96.9	100	101	98.6	93.7	87.0	78.0	68.3	58.8	48.5	35.1		
140	50.4	55.2	64.6	72.6	79.9	86.4	91.6	94.1	94.9	92.8	88.7	83.1	75.5	67.4	58.9	48.6	39.4		
145	52.0	58.3	65.1	71.6	77.4	82.4	86.3	88.5	89.1	87.4	84.0	79.4	73.3	67.5	58.8	50.0	41.8		
150	54.9	61.1	63.7	69.6	75.2	78.8	81.7	83.5	83.8	82.3	79.8	76.1	71.5	65.5	57.9	53.9	41.3		
155	55.0	61.5	64.1	66.9	72.1	75.7	77.9	79.1	79.2	77.9	75.8	72.8	67.6	61.6	58.6	56.9	40.6		
160	50.9	60.0	65.4	66.3	68.0	69.6	72.8	74.0	73.8	72.4	70.0	66.3	62.8	60.4	57.0	50.9	35.2		
165	46.6	52.7	59.6	66.6	66.4	66.8	66.6	66.2	66.0	65.4	64.2	62.7	55.9	48.3	44.8	37.6	30.0		
170	44.0	44.7	44.2	47.1	59.8	67.4	67.6	66.7	66.5	65.8	64.0	60.1	55.8	53.7	53.1	49.5	28.5		
175	40.9	42.2	43.7	44.2	43.3	46.9	46.7	47.6	38.0	21.7	37.4	41.3	44.4	41.9	41.3	39.8	37.8		
180	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8	13.8		

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 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 ***

This report is considered invalidated without the Special Seal for Inspection of the LTL. This report shall not be altered, increased or deleted. The results shown in this test report refer only to the sample(s) tested. Without written approval of LTL, this test report shall not be copied except in full and published as advertisement.