

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/835/BYP/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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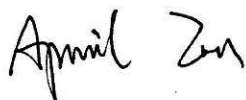
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www.ledtestlab.com

Report No.: HZ22070025m

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/835/BYP/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
129.5	1602.1	12.37	0.9787
CCT (K)	CRI	Stabilization Time (Light & Power)	
3511	82.0	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/835/BYP/R
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: 3500K
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	0.9787	0.9103
Test Power (W)	12.37	12.51
THD A%	15.14	18.36
Luminous Efficacy (lm/W)	129.5	129.7
Total Luminous Flux (lm)	1602.1	1622.7
Color Rendering Index (CRI)	82.0	
R9	1.3	
Correlated Color Temperature (CCT)(K)	3511	
Chromaticity Chroma x	0.4058	
Chromaticity Chroma y	0.3938	
Chromaticity Chroma u	0.2348	
Chromaticity Chroma v	0.3417	
Duv	0.0012	
Chromaticity Chroma u'	0.2348	
Chromaticity Chroma v'	0.5126	

Special Color Rendering Indices	
R1	79.8
R2	89.3
R3	96.4
R4	80.6
R5	80.3
R6	86.3
R7	84
R8	59.7
R9	1.3
R10	75.6
R11	79.8
R12	66.8
R13	82.1
R14	98.3

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	0.9793
Power (W)	12.40
Luminous Efficacy (lm/W)	130.2
Total Luminous Flux (lm)	1614.4
Beam Angle (°)	112.2 (0°-180°) / 234.4 (90°-270°)
Center Beam Candle Power (cd)	255
Maximum Beam Candle Power (cd)	256.0 (At: C=80.0, Gamma=8.0)
Spacing Criteria	1.25 (0°-180°) / 1.44 (90°-270°)
Zonal Lumens in the 0°-60°Zone	41.46%
Zonal Lumens in the 60°-90°Zone	26.92%
Zonal Lumens in the 90°-120°Zone	18.08%
Zonal Lumens in the 120°-180°Zone	13.54%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

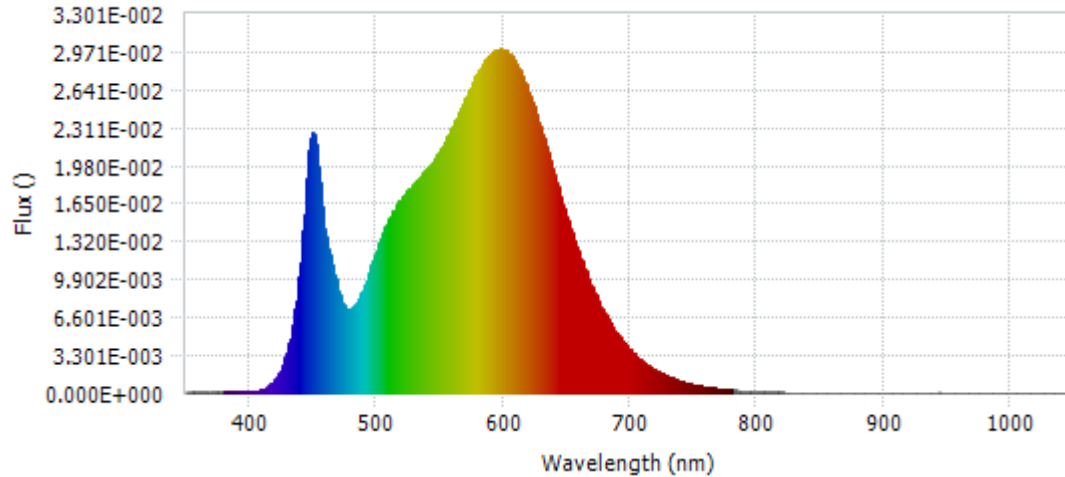


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.26E-04	485	8.00E-03	590	2.95E-02	695	4.44E-03
385	1.13E-04	490	9.15E-03	595	2.99E-02	700	3.78E-03
390	1.15E-04	495	1.08E-02	600	2.98E-02	705	3.22E-03
395	1.23E-04	500	1.25E-02	605	2.94E-02	710	2.75E-03
400	1.14E-04	505	1.39E-02	610	2.87E-02	715	2.34E-03
405	1.54E-04	510	1.53E-02	615	2.76E-02	720	2.00E-03
410	3.30E-04	515	1.63E-02	620	2.62E-02	725	1.71E-03
415	6.63E-04	520	1.70E-02	625	2.47E-02	730	1.45E-03
420	1.19E-03	525	1.77E-02	630	2.28E-02	735	1.23E-03
425	2.23E-03	530	1.83E-02	635	2.10E-02	740	1.04E-03
430	3.84E-03	535	1.88E-02	640	1.91E-02	745	8.85E-04
435	6.63E-03	540	1.95E-02	645	1.72E-02	750	7.56E-04
440	1.13E-02	545	2.03E-02	650	1.54E-02	755	6.39E-04
445	1.86E-02	550	2.12E-02	655	1.37E-02	760	5.45E-04
450	2.28E-02	555	2.21E-02	660	1.21E-02	765	4.68E-04
455	1.83E-02	560	2.31E-02	665	1.06E-02	770	4.01E-04
460	1.36E-02	565	2.44E-02	670	9.25E-03	775	3.42E-04
465	1.12E-02	570	2.56E-02	675	8.04E-03	780	2.88E-04
470	8.88E-03	575	2.68E-02	680	6.98E-03		
475	7.40E-03	580	2.79E-02	685	6.03E-03		
480	7.33E-03	585	2.90E-02	690	5.17E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method

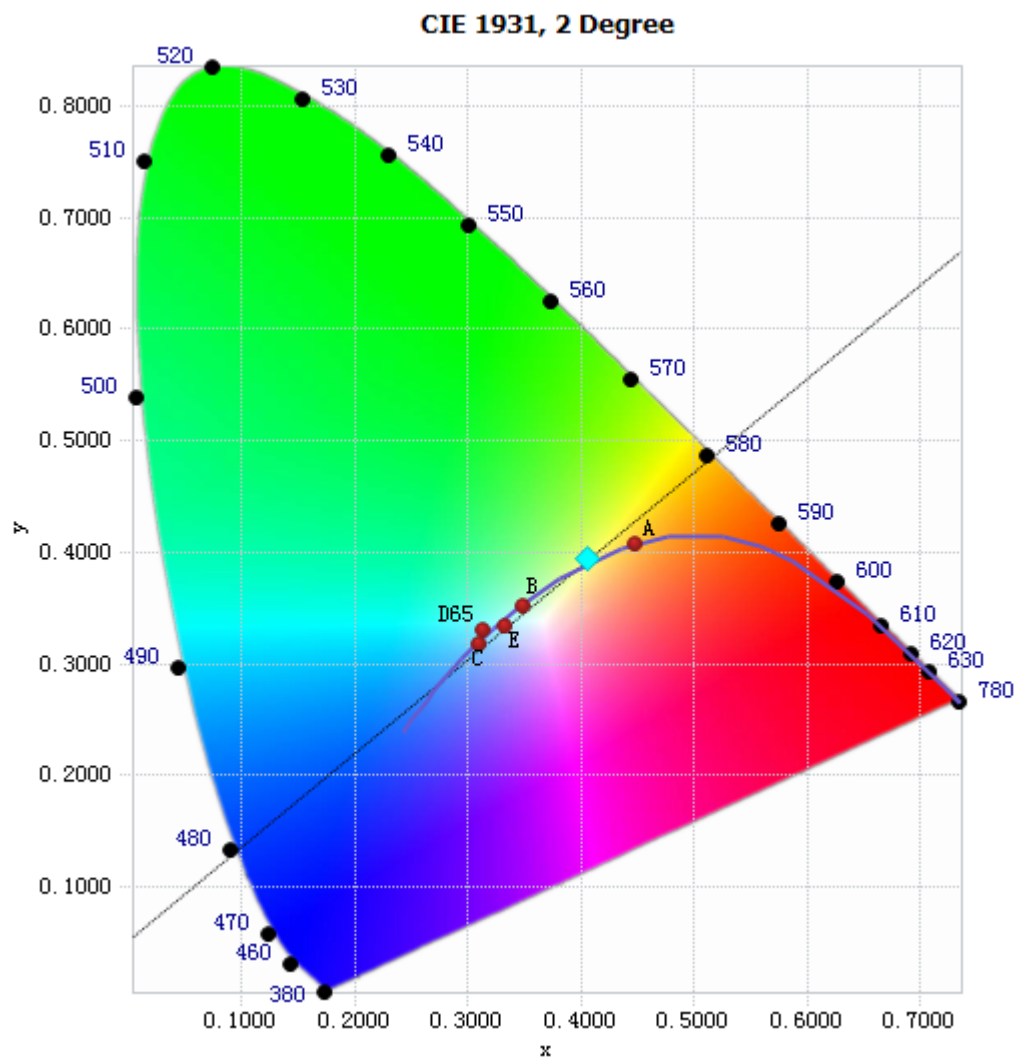


Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

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

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

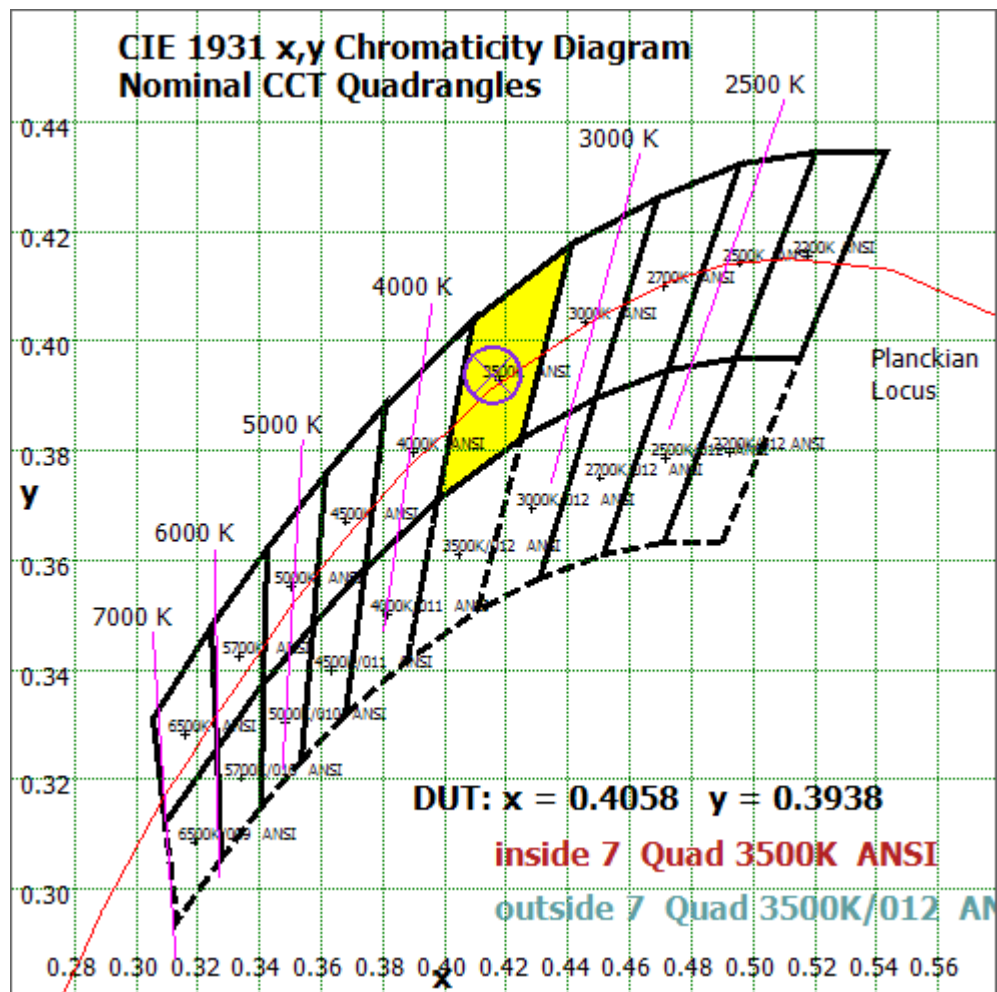


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

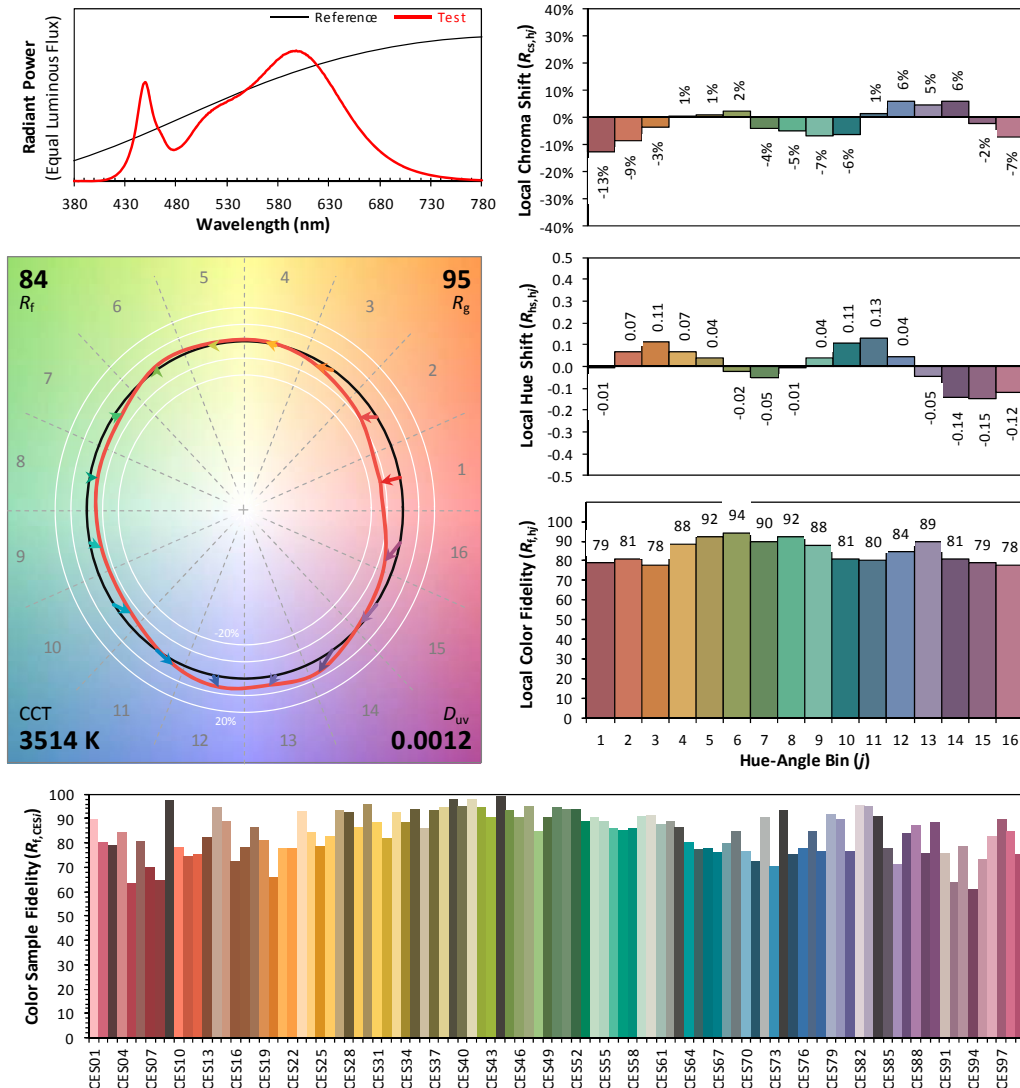
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/08/15

Model: 12T5HE/3F/835/BYP/R



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

x 0.4058
 y 0.3938
 u' 0.2348
 v' 0.5126

CIE 13.3-1995
(CRI)
 R_a 82
 R_9 2

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	24.215	1.50%
10- 20	70.459	4.36%
20- 30	110.357	6.84%
30- 40	140.556	8.71%
40- 50	158.896	9.84%
50- 60	164.892	10.21%
60- 70	159.592	9.89%
70- 80	145.949	9.04%
80- 90	129.009	7.99%
90-100	113.22	7.01%
100-110	97.133	6.02%
110-120	81.582	5.05%
120-130	68.05	4.22%
130-140	55.557	3.44%
140-150	43.117	2.67%
150-160	30.403	1.88%
160-170	16.954	1.05%
170-180	4.444	0.28%
Total	1614.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	669.375	41.46%
60- 90	434.55	26.92%
0-90	1103.93	68.38%
90- 180	510.46	31.62%
0- 180	1614.4	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

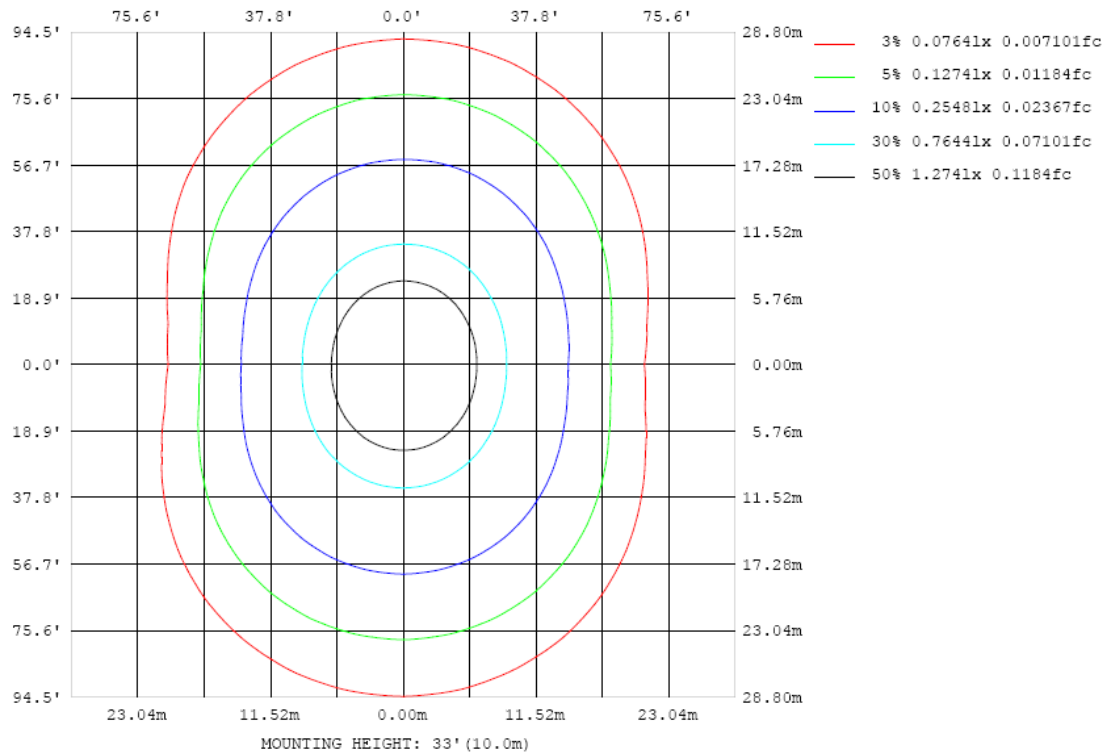


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

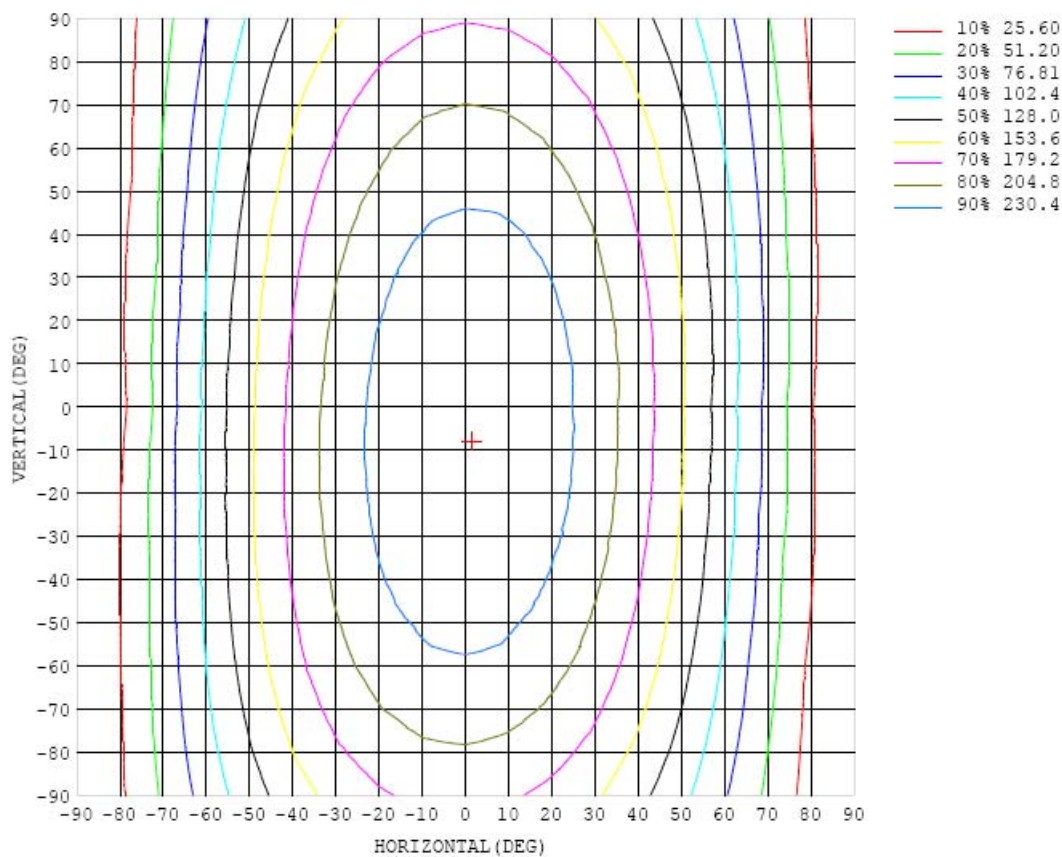


Chart 6: Isocandela Plot

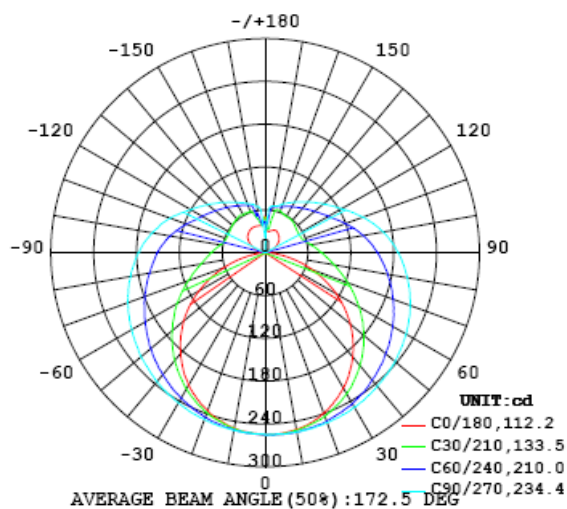


Chart 7: Polar Candela Distribution

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	254	254	255	255	255	255	256	255	256	255	256	254	254	255	255	254	254	253	253
10	251	251	252	253	253	254	255	255	256	255	255	254	254	253	253	251	250	250	249
15	247	247	248	249	250	252	254	254	255	255	255	253	252	251	249	247	245	244	244
20	239	240	242	244	246	249	251	253	254	253	253	251	249	247	244	240	238	236	235
25	230	231	234	236	240	244	248	250	252	252	252	249	246	243	238	234	230	227	226
30	219	220	223	228	233	239	244	247	250	250	250	246	242	237	231	225	220	215	214
35	205	207	212	218	225	232	239	244	248	247	247	243	237	231	223	215	208	202	200
40	191	193	198	206	216	225	233	240	244	244	244	239	232	224	214	204	194	187	184
45	174	176	184	194	205	216	227	235	240	241	240	235	226	217	204	192	180	171	167
50	156	159	168	181	194	209	220	229	235	237	235	230	221	209	194	179	164	153	149
55	136	139	151	166	183	199	214	224	231	233	232	225	214	201	184	165	148	134	129
60	115	120	133	152	172	190	206	218	226	228	226	218	208	192	173	152	131	114	107
65	92.8	98.6	115	137	160	181	198	212	220	222	220	212	201	184	163	139	115	93.7	84.3
70	70.0	77.4	97.7	123	149	172	191	204	213	216	215	207	193	175	152	126	98.4	73.5	61.6
75	48.7	57.5	81.1	110	138	162	183	197	206	209	208	199	186	167	143	114	83.7	55.6	39.6
80	27.8	39.0	66.8	98.0	127	153	174	189	199	202	200	192	178	158	133	104	71.0	39.6	19.7
85	10.6	24.1	55.4	87.8	118	144	166	181	191	195	193	184	170	150	125	94.5	61.5	27.8	5.38
90	1.45	15.4	46.6	79.0	109	136	157	173	183	186	185	176	162	142	117	86.8	54.4	21.6	0.83
95	1.43	11.4	40.4	71.8	101	128	149	164	174	177	176	167	153	134	109	79.7	48.4	17.9	2.66
100	3.76	12.0	35.4	65.3	93.4	119	139	155	165	168	166	158	144	125	101	72.8	43.7	18.7	6.06
105	6.49	15.0	33.4	59.6	85.4	110	130	145	153	157	156	147	134	116	93.2	67.2	42.2	22.0	10.4
110	9.52	19.7	34.2	55.8	78.6	101	119	134	143	146	144	137	124	107	86.4	64.8	42.7	26.4	14.9
115	13.1	24.2	36.2	54.5	73.7	93.1	110	123	131	134	133	126	114	99.7	82.2	62.5	45.3	30.6	19.3
120	17.0	27.1	39.3	54.1	70.6	87.5	102	113	121	123	122	116	107	94.2	78.0	62.2	47.7	33.9	23.8
125	21.0	31.3	42.6	54.4	68.3	83.0	95.7	106	112	115	114	108	101	89.0	75.2	62.9	50.2	37.2	28.1
130	25.2	35.6	45.6	55.6	67.2	79.1	90.3	98.5	104	107	106	102	94.4	84.5	74.0	63.4	52.3	40.9	32.1
135	27.7	39.7	47.9	57.3	66.7	76.2	85.8	92.4	97.4	99.5	98.7	95.3	88.7	81.4	72.8	63.8	54.3	44.7	34.5
140	30.1	43.0	49.9	58.6	66.3	73.8	81.1	87.1	91.3	92.7	92.5	89.4	84.8	78.7	71.3	64.3	55.5	49.1	36.3
145	32.0	46.1	52.3	59.0	66.3	71.8	77.9	82.3	85.6	86.9	86.7	84.4	80.6	75.7	70.1	64.7	58.1	53.0	38.0
150	33.6	48.1	55.1	58.9	65.2	70.1	74.7	78.1	80.6	81.8	81.6	80.0	77.0	73.4	69.1	65.0	58.6	55.0	38.9
155	34.7	48.0	57.1	60.0	63.5	67.8	71.6	74.6	76.5	77.0	77.3	76.1	74.1	71.3	68.1	63.0	60.4	55.4	39.5
160	33.5	43.0	58.4	62.3	64.0	66.4	68.1	70.6	72.0	72.9	72.9	72.4	71.1	69.5	64.0	63.7	61.5	54.2	39.4
165	32.1	36.4	44.9	62.8	64.5	65.8	67.0	68.0	67.8	68.1	68.8	69.0	69.0	63.8	63.2	57.5	53.1	44.9	39.0
170	30.1	31.2	32.9	40.8	59.3	64.7	65.5	66.3	66.7	66.8	66.9	66.7	57.2	51.8	48.2	44.4	42.2	41.1	38.5
175	37.1	37.0	35.6	34.4	40.2	39.9	43.1	54.6	60.2	62.4	54.3	35.5	34.1	36.0	36.4	40.3	39.2	40.5	41.7
180	50.1	49.8	48.7	46.5	43.5	37.8	35.1	28.2	33.8	0.00	22.6	31.7	32.3	38.8	41.7	46.2	48.7	50.5	50.1

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	253	253	253	253	253	254	254	254	254	255	255	254	255	254	255	255	254		
10	249	249	250	250	251	252	253	253	253	253	253	253	253	252	252	252	251		
15	243	245	245	246	248	249	250	251	251	252	251	250	250	249	248	247	246		
20	235	237	239	240	243	245	247	249	249	250	248	247	246	244	242	241	239		
25	226	227	230	233	236	241	244	245	246	247	245	243	241	238	235	233	230		
30	214	217	220	225	230	235	239	242	243	244	241	239	235	231	226	223	220		
35	200	205	209	216	223	230	235	239	240	240	238	233	229	222	216	211	207		
40	185	190	197	206	214	223	230	234	236	236	232	227	221	213	205	198	193		
45	169	175	184	195	206	216	224	229	231	231	228	221	213	203	192	183	176		
50	151	159	170	183	197	209	218	224	227	226	221	214	205	192	179	168	159		
55	131	142	156	172	188	202	212	219	221	221	216	206	195	181	165	152	142		
60	111	124	142	161	179	194	206	213	216	215	209	199	186	170	152	135	122		
65	89.6	106	128	150	170	187	199	208	210	210	203	192	177	159	138	118	101		
70	68.5	88.9	115	140	161	179	193	202	205	203	196	184	168	149	125	101	80.6		
75	48.7	73.4	102	130	153	172	186	195	198	197	189	176	160	139	113	85.3	61.1		
80	31.7	60.3	91.4	120	146	164	179	188	191	190	182	169	152	129	101	71.7	43.5		
85	19.6	50.2	82.5	112	138	158	172	181	185	183	175	161	144	120	91.4	60.5	29.8		
90	14.1	43.8	75.6	105	131	151	165	174	177	175	167	154	136	112	83.4	52.3	21.3		
95	12.3	38.7	69.3	98.2	123	144	157	166	170	167	159	147	129	105	76.6	46.3	17.2		
100	14.1	36.0	63.8	91.0	116	135	150	157	161	159	152	139	121	97.1	70.0	41.4	16.3		
105	18.5	36.3	59.6	84.4	107	126	140	149	152	150	142	130	112	89.6	64.2	38.8	18.0		
110	23.4	38.1	58.1	79.2	99.6	117	130	139	142	140	133	120	104	82.8	60.5	38.6	22.0		
115	28.3	40.9	57.7	76.1	93.7	109	121	128	131	129	122	111	96.1	78.1	58.4	39.4	26.5		
120	33.3	43.9	58.1	73.8	88.9	102	112	119	120	119	113	103	90.2	74.4	57.2	41.9	30.9		
125	37.3	46.9	58.8	72.0	85.3	96.4	105	111	113	111	106	96.9	85.4	71.6	56.9	44.9	34.7		
130	41.4	50.1	59.8	71.0	81.7	91.5	98.9	104	105	104	98.7	91.4	81.4	69.6	57.7	48.0	38.2		
135	44.5	53.0	61.1	69.8	79.0	86.9	93.2	97.0	97.9	96.9	92.9	86.4	78.3	68.4	59.0	50.7	38.5		
140	46.8	55.7	62.2	69.2	76.5	82.9	87.8	91.1	92.1	91.2	87.7	82.2	75.8	67.6	60.1	52.8	43.1		
145	50.2	55.9	63.1	68.6	74.2	79.3	83.4	85.9	86.4	85.6	82.6	78.4	73.4	67.2	61.1	55.1	46.8		
150	53.2	57.4	61.2	68.2	72.4	76.2	79.2	81.1	81.5	80.8	78.7	75.3	71.5	66.9	61.7	54.4	50.6		
155	54.8	58.2	61.8	66.1	70.9	73.5	75.7	76.9	77.1	76.7	75.1	72.9	70.2	66.5	62.4	55.7	53.9		
160	51.0	59.2	61.9	63.0	69.1	71.1	72.5	73.5	73.5	73.5	72.2	70.6	68.5	66.0	60.5	59.7	51.6		
165	44.2	50.0	53.1	57.8	60.9	64.9	69.9	70.6	70.6	70.5	69.6	68.6	66.8	63.2	62.8	61.6	41.9		
170	38.7	41.9	43.5	45.6	48.2	52.2	50.5	64.8	65.5	65.4	65.1	65.0	65.6	65.7	61.4	41.6	31.4		
175	41.5	41.3	40.0	42.6	39.4	40.5	37.0	38.1	45.7	62.7	63.1	56.6	44.3	39.9	39.6	34.5	34.3		
180	49.9	49.7	48.6	46.8	43.8	39.2	35.1	30.0	26.4	5.70	23.2	30.6	34.3	38.2	42.5	46.0	48.0		

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, 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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