

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: 11.5T5HO/2F/835/BYP/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ22070025x

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

Review by:



Engineer: April Zou
Oct. 21, 2022

Approved by:



Manager: Jim Zhang
Oct. 21, 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: 11.5T5HO/2F/835/BYP/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
135.3	1706.7	12.61	0.9800
CCT (K)	CRI	Stabilization Time (Light & Power)	
3509	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	: Oct. 19, 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	: 11.5T5HO/2F/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)	0.107	0.050
Power Factor	0.9800	0.9144
Test Power (W)	12.61	12.63
THD A%	15.36	18.43
Luminous Efficacy (lm/W)	135.3	136.8
Total Luminous Flux (lm)	1706.7	1727.6
Color Rendering Index (CRI)	82.0	
R9	1.6	
Correlated Color Temperature (CCT)(K)	3509	
Chromaticity Chroma x	0.4059	
Chromaticity Chroma y	0.3936	
Chromaticity Chroma u	0.2349	
Chromaticity Chroma v	0.3417	
Duv	0.0011	
Chromaticity Chroma u'	0.2349	
Chromaticity Chroma v'	0.5126	

Special Color Rendering Indices	
R1	79.8
R2	88.9
R3	96.2
R4	81
R5	80.3
R6	85.9
R7	84.2
R8	60
R9	1.6
R10	74.8
R11	80.3
R12	67.6
R13	81.9
R14	98.2

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)	0.108
Power Factor	0.9800
Power (W)	12.64
Luminous Efficacy (lm/W)	135.3
Total Luminous Flux (lm)	1710.7
Beam Angle (°)	111.6 (0°-180°) / 225.8 (90°-270°)
Center Beam Candle Power (cd)	280
Maximum Beam Candle Power (cd)	280.7 (At: C=110.0, Gamma=3.0)
Spacing Criteria	1.26 (0°-180°) / 1.47 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	42.74%
Zonal Lumens in the 60 °-90 °Zone	27.56%
Zonal Lumens in the 90 °-120 °Zone	17.48%
Zonal Lumens in the 120 °-180 °Zone	12.22%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

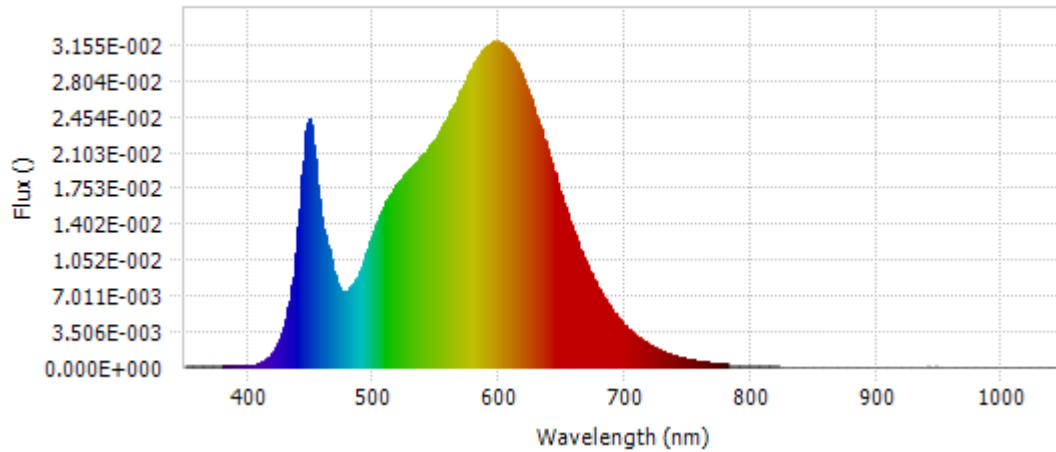
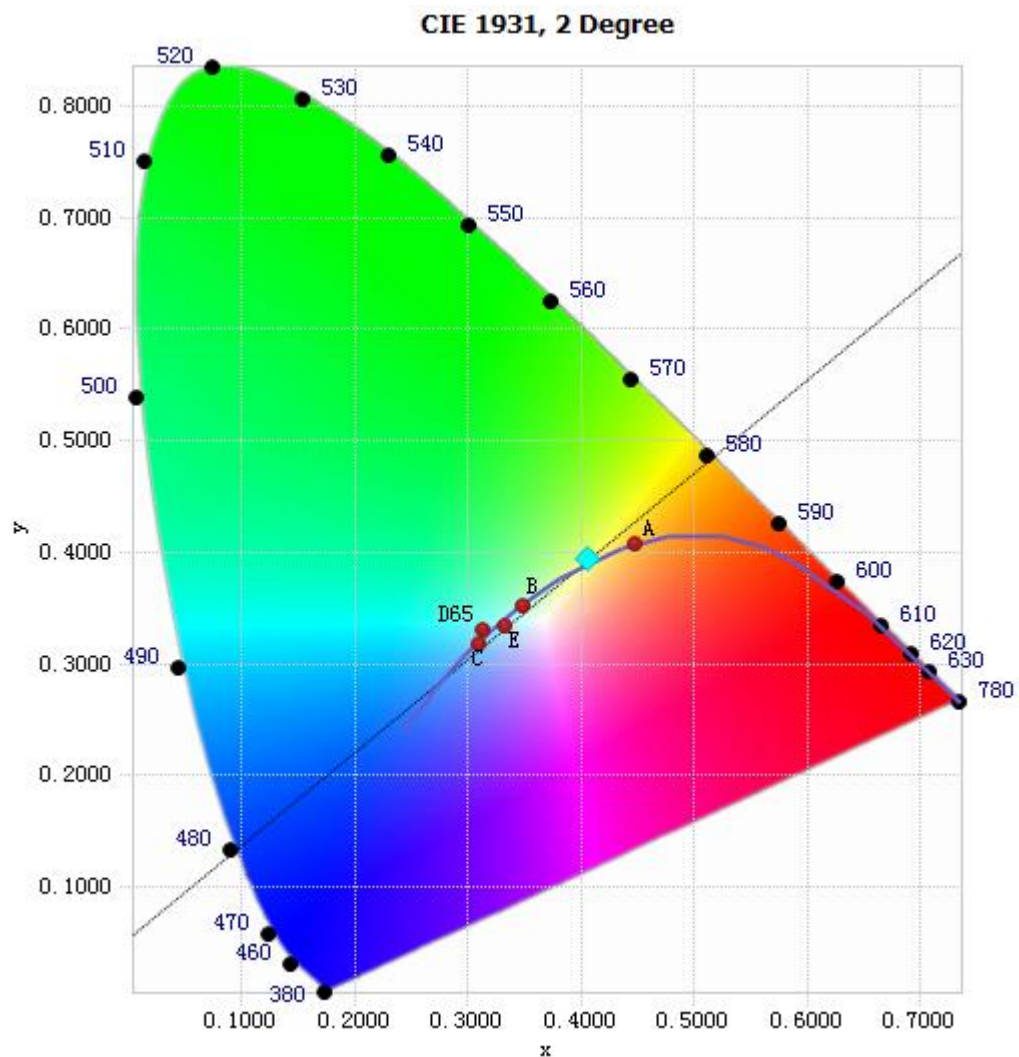


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.35E-04	485	8.41E-03	590	3.14E-02	695	4.73E-03
385	1.19E-04	490	9.81E-03	595	3.18E-02	700	4.04E-03
390	1.22E-04	495	1.16E-02	600	3.18E-02	705	3.43E-03
395	9.34E-05	500	1.33E-02	605	3.14E-02	710	2.94E-03
400	1.36E-04	505	1.49E-02	610	3.06E-02	715	2.50E-03
405	2.25E-04	510	1.62E-02	615	2.94E-02	720	2.16E-03
410	4.44E-04	515	1.73E-02	620	2.80E-02	725	1.83E-03
415	8.26E-04	520	1.82E-02	625	2.62E-02	730	1.55E-03
420	1.49E-03	525	1.88E-02	630	2.44E-02	735	1.32E-03
425	2.71E-03	530	1.96E-02	635	2.24E-02	740	1.11E-03
430	4.73E-03	535	2.02E-02	640	2.05E-02	745	9.50E-04
435	7.99E-03	540	2.09E-02	645	1.84E-02	750	8.14E-04
440	1.38E-02	545	2.17E-02	650	1.65E-02	755	6.90E-04
445	2.18E-02	550	2.26E-02	655	1.46E-02	760	5.91E-04
450	2.37E-02	555	2.36E-02	660	1.29E-02	765	5.01E-04
455	1.77E-02	560	2.46E-02	665	1.13E-02	770	4.28E-04
460	1.35E-02	565	2.59E-02	670	9.93E-03	775	3.67E-04
465	1.10E-02	570	2.73E-02	675	8.61E-03	780	3.15E-04
470	8.53E-03	575	2.85E-02	680	7.43E-03		
475	7.39E-03	580	2.97E-02	685	6.42E-03		
480	7.63E-03	585	3.08E-02	690	5.52E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4059, 0.3936)

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

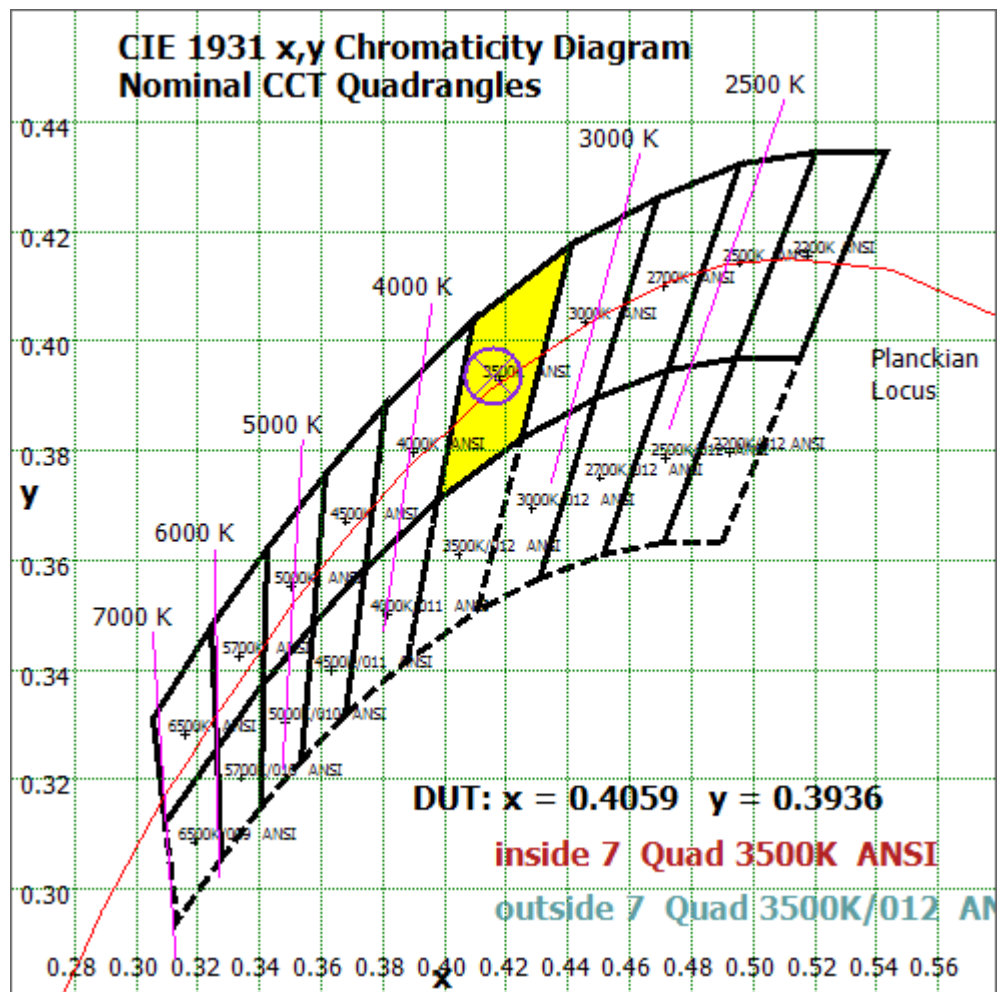


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

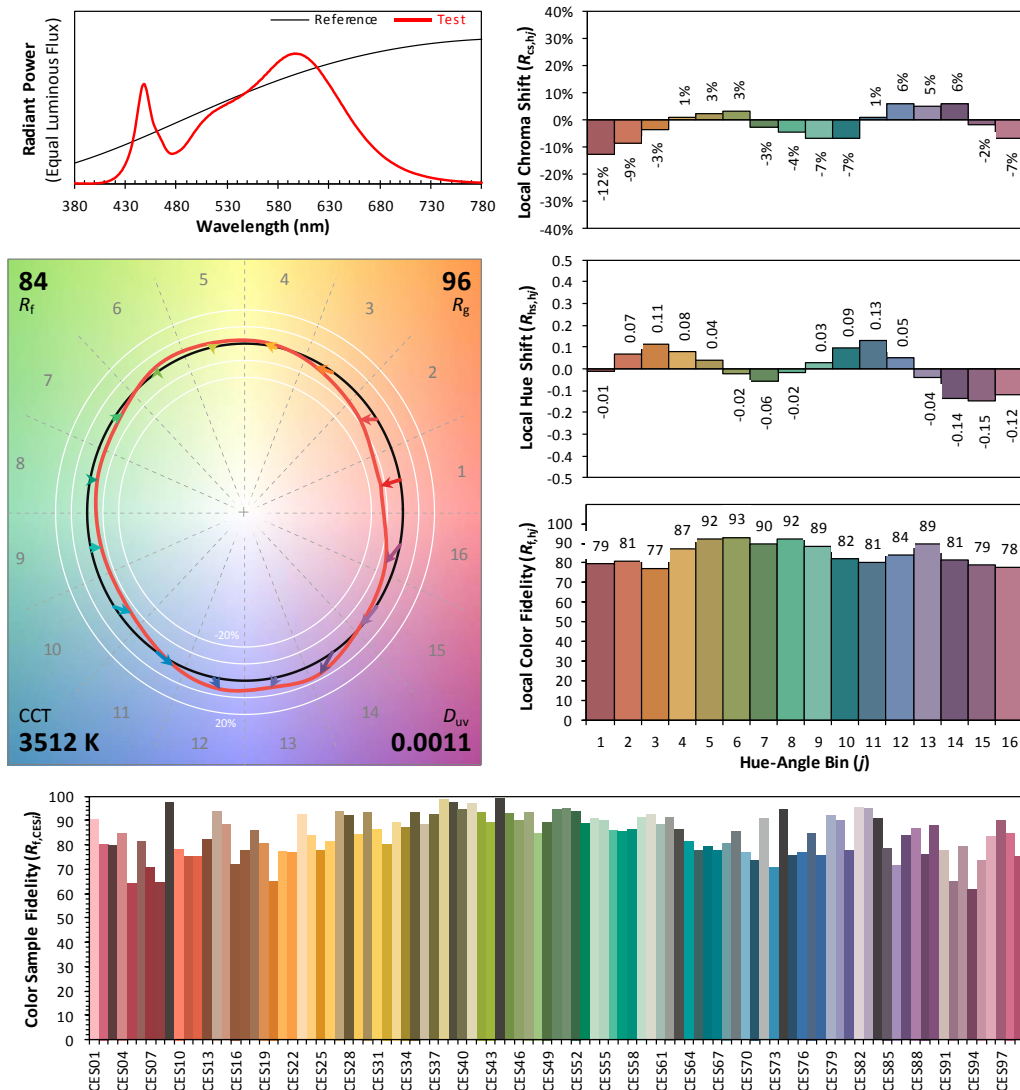
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/10/19

Model: 11.5T5HO/2F/835/BYP/R



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

x 0.4059
 y 0.3936
 u' 0.2349
 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	26.598	1.55%
10- 20	77.31	4.52%
20- 30	120.86	7.07%
30- 40	153.614	8.98%
40- 50	173.295	10.13%
50- 60	179.518	10.49%
60- 70	173.521	10.14%
70- 80	158.504	9.27%
80- 90	139.398	8.15%
90-100	120.327	7.03%
100-110	99.147	5.80%
110-120	79.598	4.65%
120-130	65.33	3.82%
130-140	53.017	3.10%
140-150	41.068	2.40%
150-160	29.024	1.70%
160-170	16.565	0.97%
170-180	3.968	0.23%
Total	1710.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	731.195	42.74%
60- 90	471.423	27.56%
0-90	1202.62	70.30%
90- 180	508.044	29.70%
0- 180	1710.7	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

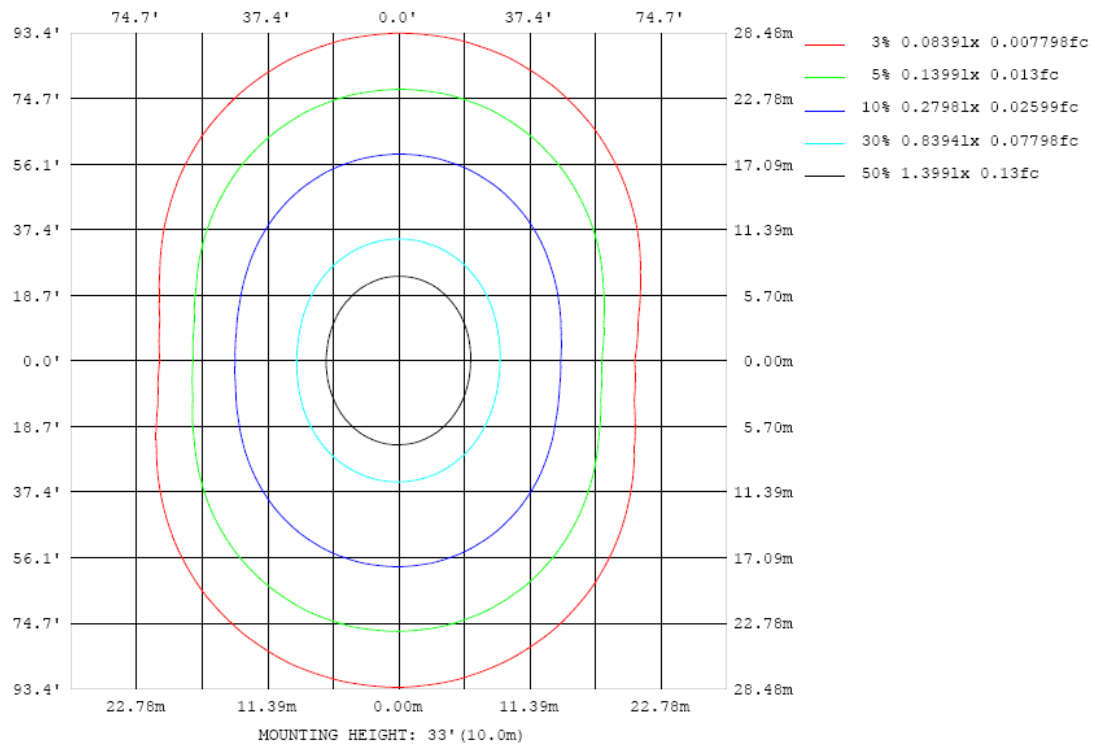


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

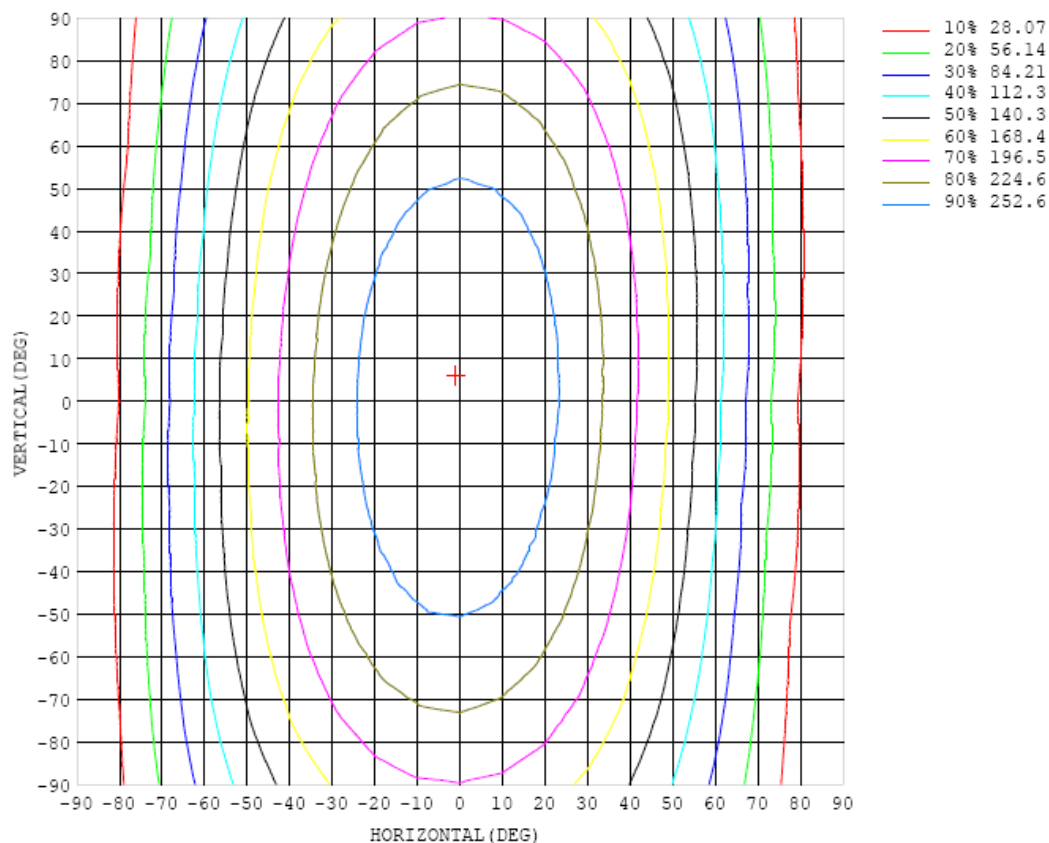


Chart 6: Isocandela Plot

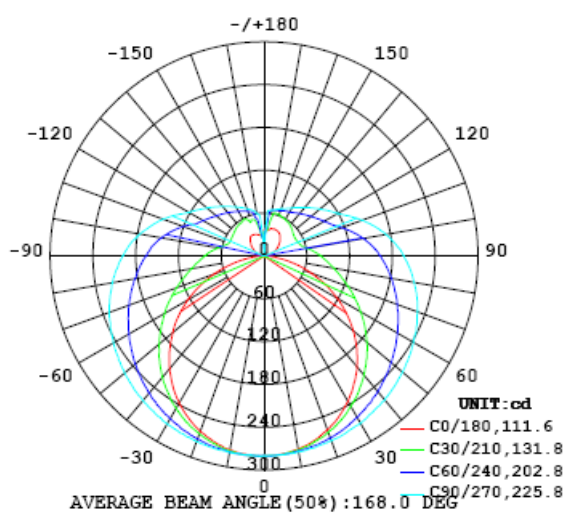


Chart 7: Polar Candela Distribution

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	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280
5	279	279	279	279	279	279	280	279	279	280	279	280	279	279	279	279	280	279	280
10	275	274	275	276	276	277	278	278	279	279	278	279	278	278	277	276	276	276	276
15	268	268	269	270	271	273	275	276	277	278	277	277	275	275	273	272	271	270	270
20	259	260	262	263	265	268	271	273	275	276	275	275	272	270	268	266	263	262	262
25	248	249	250	254	258	262	267	270	272	273	273	272	268	265	261	257	254	251	251
30	235	235	239	243	249	255	261	266	269	271	269	268	263	258	253	247	243	239	238
35	219	221	225	231	239	247	255	260	265	266	266	264	257	252	244	236	229	225	223
40	203	204	210	218	228	238	248	255	260	263	261	258	251	243	234	224	215	208	206
45	184	186	192	204	216	228	240	250	255	258	257	253	245	235	223	210	199	190	187
50	163	166	175	188	203	218	233	243	250	253	252	247	237	225	211	196	182	171	167
55	141	144	156	173	190	208	225	237	244	248	246	241	229	216	199	181	164	151	146
60	118	122	136	156	177	198	216	229	238	242	240	234	222	206	187	166	146	129	124
65	94.7	99.3	117	141	165	187	207	222	232	236	233	227	213	196	175	151	128	108	99.3
70	70.3	76.6	98.3	126	153	178	199	214	225	229	227	220	205	186	163	137	110	86.1	74.9
75	47.2	55.3	80.8	112	141	168	190	206	217	222	219	211	196	177	152	123	93.5	66.0	50.9
80	25.5	35.9	66.2	99.1	130	158	181	198	209	214	211	203	187	167	142	112	78.8	47.8	28.6
85	9.23	21.3	54.1	88.6	121	149	172	189	200	205	202	194	179	158	132	101	67.5	33.5	10.8
90	2.09	13.6	45.6	79.6	112	140	163	181	191	196	193	185	169	149	122	91.5	58.5	24.6	1.91
95	2.87	9.73	37.3	70.5	102	130	153	170	181	186	183	175	159	139	113	82.6	50.3	17.9	1.89
100	5.62	10.4	31.5	61.6	91.3	118	141	158	169	174	171	163	148	128	102	73.0	42.5	17.0	4.02
105	8.87	14.0	30.7	55.0	81.1	107	129	145	156	160	158	150	135	116	91.9	65.0	39.9	18.1	7.34
110	12.8	18.9	31.1	52.2	73.5	95.7	116	132	142	147	144	137	123	105	82.3	61.2	39.6	21.8	10.8
115	17.3	23.6	33.0	50.7	70.0	88.0	104	118	128	132	130	123	110	95.1	77.5	58.8	40.7	26.2	13.8
120	21.4	27.8	36.5	50.3	67.2	82.9	97.4	109	116	119	118	113	102	89.2	73.4	57.5	42.4	30.2	16.7
125	24.5	31.7	40.5	50.8	65.1	78.5	91.2	101	107	110	109	104	95.2	83.8	70.7	57.3	44.5	33.8	20.3
130	28.1	35.1	44.5	52.5	63.9	75.3	86.1	94.4	100.0	102	101	96.9	89.1	79.8	69.2	57.4	46.7	37.7	23.8
135	31.7	38.4	47.5	54.7	63.3	72.5	81.7	88.4	93.1	94.8	93.8	90.4	83.6	76.1	67.5	57.9	48.8	41.2	26.9
140	35.0	41.8	50.1	56.6	63.4	70.9	77.7	83.0	86.8	88.6	87.5	84.7	79.2	72.9	66.2	58.2	50.9	44.4	30.3
145	37.8	45.1	52.5	58.1	63.6	69.4	74.0	78.4	81.3	82.8	81.9	79.7	75.1	70.5	65.1	58.9	53.3	47.7	33.3
150	39.5	47.8	54.3	59.3	63.5	67.6	71.2	74.5	76.6	77.6	77.0	75.3	71.9	68.8	64.3	59.7	55.4	51.2	33.6
155	40.1	48.2	56.5	60.2	63.5	66.3	69.5	71.0	72.5	73.1	72.7	71.6	69.7	67.0	63.6	60.6	57.7	54.0	33.1
160	40.2	49.6	58.5	61.2	63.4	65.4	67.4	68.8	69.9	70.4	70.0	69.0	67.4	65.7	63.5	61.4	59.4	55.6	31.8
165	39.7	49.0	59.5	62.2	63.3	64.7	66.0	66.8	67.2	67.5	67.1	66.8	65.7	64.7	63.3	60.4	57.8	51.6	30.8
170	37.0	39.9	42.6	50.0	57.2	64.0	64.8	65.2	65.2	65.4	65.0	64.9	64.3	60.0	53.1	48.1	43.6	37.9	29.3
175	35.5	35.6	35.5	35.5	35.2	35.2	38.7	49.7	58.7	63.8	54.2	34.0	30.8	29.9	29.9	30.0	30.1	30.1	28.6
180	36.5	36.6	35.7	31.8	20.1	15.1	10.0	8.09	0.00	2.18	0.00	0.00	7.58	16.0	30.0	30.7	30.8	32.0	36.5

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	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280		
5	279	280	280	279	280	280	280	280	280	280	280	279	279	279	279	279	279		
10	276	276	277	277	277	279	279	279	279	279	279	278	277	277	276	276	274		
15	270	271	272	273	275	276	278	278	278	278	277	275	274	273	271	269	268		
20	262	263	265	268	270	273	275	276	277	275	275	272	270	267	264	262	260		
25	251	254	257	261	264	269	272	273	274	273	272	267	264	259	256	251	249		
30	239	242	246	252	258	264	268	270	272	270	269	263	257	252	246	241	236		
35	224	229	235	242	250	258	263	267	268	267	264	257	251	242	234	227	222		
40	207	213	222	231	241	251	258	262	265	262	259	251	243	232	221	212	205		
45	189	197	207	219	232	244	252	257	260	258	254	245	234	221	208	196	187		
50	170	179	192	207	222	236	245	252	255	253	247	238	225	210	194	180	168		
55	150	160	176	194	211	228	239	247	249	248	241	229	215	197	179	162	149		
60	128	142	161	181	201	219	232	240	244	242	235	222	206	185	164	144	127		
65	105	122	146	169	191	210	225	234	238	235	228	214	196	174	151	126	105		
70	81.9	103	131	158	181	201	217	227	231	228	221	206	187	163	137	109	83.6		
75	59.6	85.4	116	146	171	193	210	219	224	221	213	197	177	153	123	92.3	63.3		
80	39.8	69.8	103	135	161	184	201	211	216	213	205	189	168	143	112	77.9	45.2		
85	24.3	57.1	92.3	125	153	175	192	203	207	205	196	180	160	133	102	66.4	31.5		
90	15.5	48.1	83.0	115	144	165	183	194	198	195	187	171	151	124	92.6	57.7	23.4		
95	10.4	40.6	74.9	107	134	158	173	184	189	186	178	162	142	115	84.1	50.1	17.1		
100	10.5	33.9	65.6	96.6	124	146	162	173	177	174	166	152	131	105	74.2	42.0	15.6		
105	13.7	31.7	57.6	86.1	112	134	150	160	164	161	155	140	119	93.9	65.1	37.4	17.4		
110	18.0	32.3	52.7	74.3	99.1	121	136	146	151	149	141	126	106	81.1	58.6	37.5	22.3		
115	21.1	35.0	52.0	71.0	89.5	106	121	132	136	134	126	111	95.2	76.9	57.5	38.4	26.9		
120	25.2	38.0	52.2	68.3	84.5	99.1	110	118	122	121	115	104	90.4	74.3	56.5	41.0	31.2		
125	30.1	40.8	52.8	66.5	80.4	92.9	103	110	113	111	106	97.2	85.5	71.2	56.0	44.2	34.9		
130	31.7	43.6	53.9	65.2	77.1	87.6	96.3	102	104	103	99.0	91.1	81.0	69.0	56.8	47.5	38.4		
135	33.5	45.4	55.2	64.5	74.3	83.2	90.4	95.3	97.1	95.9	92.5	85.9	77.6	67.6	58.1	50.5	40.2		
140	35.1	48.6	56.3	64.1	72.0	79.3	85.0	89.0	90.6	89.4	86.7	81.2	74.6	66.8	59.4	52.3	42.3		
145	39.1	49.4	56.7	63.8	69.8	75.6	80.2	83.3	84.6	83.7	81.5	77.3	72.0	66.1	60.3	53.9	45.0		
150	43.8	47.3	58.2	63.2	68.0	72.3	75.7	78.3	79.3	78.7	77.1	73.7	69.9	65.5	60.7	54.6	47.2		
155	44.7	49.1	56.6	62.5	65.9	69.2	72.0	73.8	74.7	74.2	73.1	70.9	68.4	65.3	60.6	52.8	50.0		
160	40.5	50.0	53.3	58.5	64.3	66.5	68.2	69.7	70.5	70.5	70.2	68.8	66.6	63.3	57.1	54.1	51.7		
165	33.8	50.2	52.5	56.3	56.2	63.8	65.3	65.7	66.3	66.2	65.9	64.3	62.5	57.7	55.3	55.2	50.2		
170	28.9	31.5	37.7	39.7	43.2	48.6	52.7	60.9	60.5	59.9	59.4	59.2	58.3	56.8	52.8	43.5	38.9		
175	28.6	27.6	26.2	25.9	25.5	24.9	24.6	26.6	38.0	56.8	55.1	48.0	40.5	35.4	35.4	35.4	35.4		
180	36.5	36.2	34.6	31.2	25.7	17.8	12.1	7.31	5.76	2.08	3.27	6.58	9.97	17.1	24.4	31.0	34.8		

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 ***

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