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: 13T8/4F/830/BYP/RC

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ220600371

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

Review by: April Zou

Engineer: April Zou

Jun.30, 2022

Approved by: Jim Zhang

Manager: Jim Zhang

Jun. 30, 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: **13T8/4F/830/BYP/RC**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
128.9	1794.9	13.92	0.9772

CCT (K)	CRI	Stabilization Time (Light & Power)
3007	81.8	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	: Jun. 13, 2022
Date of Test	: Jun. 17, 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	: 13T8/4F/830/BYP/RC
Electrical Ratings	: 120-277V, 60Hz
Product Description	: 3000K

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)	0.119	0.055
Power Factor	0.9772	0.9271
Test Power (W)	13.92	14.01
THD A%	18.21	22.87
Luminous Efficacy (lm/W)	128.9	130.1
Total Luminous Flux (lm)	1794.9	1822.4
Color Rendering Index (CRI)	81.8	
R9	2.5	
Correlated Color Temperature (CCT)(K)	3007	
Chromaticity Chroma x	0.4368	
Chromaticity Chroma y	0.4048	
Chromaticity Chroma u	0.2501	
Chromaticity Chroma v	0.3478	
Duv	0.0003	
Chromaticity Chroma u ’	0.2501	
Chromaticity Chroma v’	0.5217	

Special Color Rendering Indices	
R1	79.7
R2	89.1
R3	96.8
R4	80.9
R5	80.2
R6	87
R7	82.8
R8	57.8
R9	2.5
R10	75.8
R11	81
R12	71.9
R13	81.7
R14	98.5

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)	0.119
Power Factor	0.9780
Power (W)	14.01
Luminous Efficacy (lm/W)	126.4
Total Luminous Flux (lm)	1770.4
Beam Angle (°)	116.0 (0^o-180^o) / 269.1 (90^o-270^o)
Center Beam Candle Power (cd)	249
Maximum Beam Candle Power (cd)	250.8 (At: C=50.0, Gamma=9.0)
Spacing Criteria	1.24 (0^o-180^o) / 1.48 (90^o-270^o)
Zonal Lumens in the 0°-60°Zone	38.00%
Zonal Lumens in the 60°-90°Zone	26.10%
Zonal Lumens in the 90°-120°Zone	19.40%
Zonal Lumens in the 120°-180°Zone	16.51%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

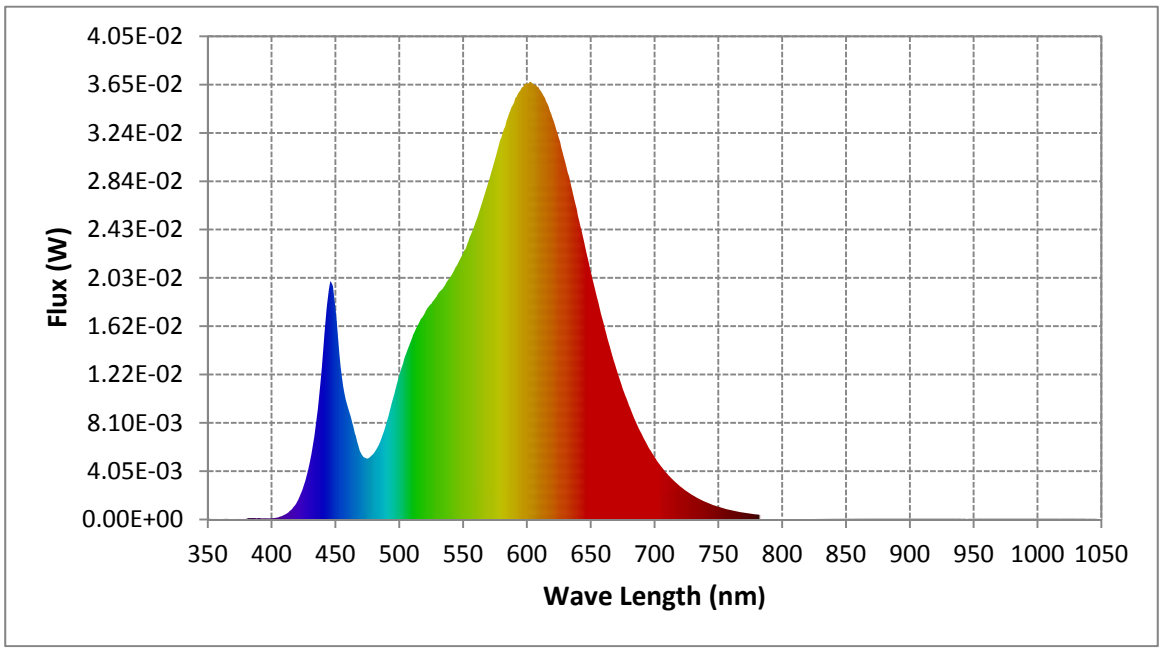
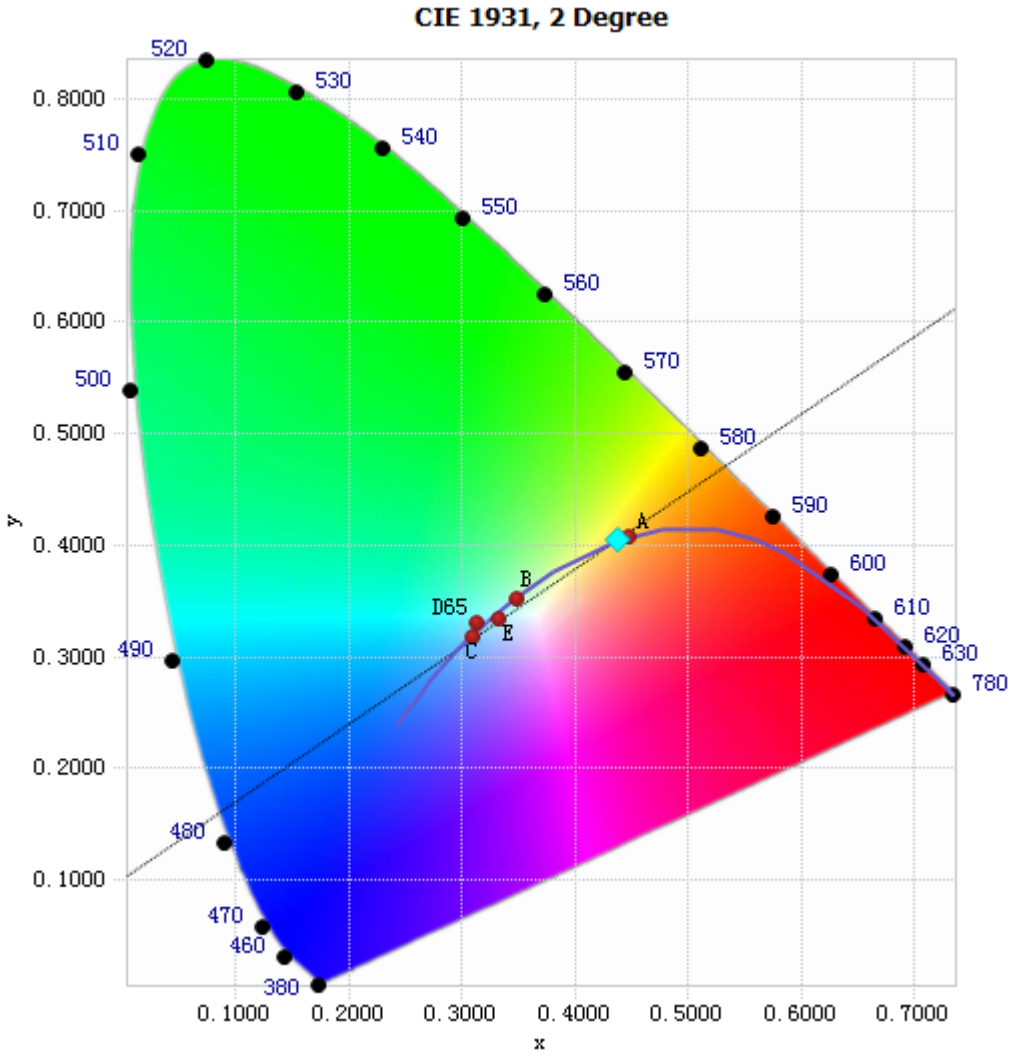


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.13E-04	485	6.52E-03	590	3.50E-02	695	6.08E-03
385	1.11E-04	490	8.11E-03	595	3.60E-02	700	5.23E-03
390	1.17E-04	495	1.01E-02	600	3.66E-02	705	4.46E-03
395	8.89E-05	500	1.20E-02	605	3.65E-02	710	3.81E-03
400	9.36E-05	505	1.38E-02	610	3.60E-02	715	3.25E-03
405	1.60E-04	510	1.52E-02	615	3.51E-02	720	2.76E-03
410	3.85E-04	515	1.64E-02	620	3.37E-02	725	2.37E-03
415	7.73E-04	520	1.73E-02	625	3.20E-02	730	2.01E-03
420	1.47E-03	525	1.81E-02	630	2.99E-02	735	1.70E-03
425	2.78E-03	530	1.88E-02	635	2.78E-02	740	1.45E-03
430	4.83E-03	535	1.95E-02	640	2.54E-02	745	1.23E-03
435	8.19E-03	540	2.03E-02	645	2.32E-02	750	1.05E-03
440	1.36E-02	545	2.13E-02	650	2.08E-02	755	8.99E-04
445	1.94E-02	550	2.23E-02	655	1.86E-02	760	7.64E-04
450	1.77E-02	555	2.36E-02	660	1.65E-02	765	6.47E-04
455	1.20E-02	560	2.49E-02	665	1.45E-02	770	5.58E-04
460	9.29E-03	565	2.66E-02	670	1.26E-02	775	4.70E-04
465	7.29E-03	570	2.83E-02	675	1.10E-02	780	4.03E-04
470	5.54E-03	575	3.01E-02	680	9.54E-03		
475	5.09E-03	580	3.20E-02	685	8.24E-03		
480	5.54E-03	585	3.37E-02	690	7.14E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4368, 0.4048)

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

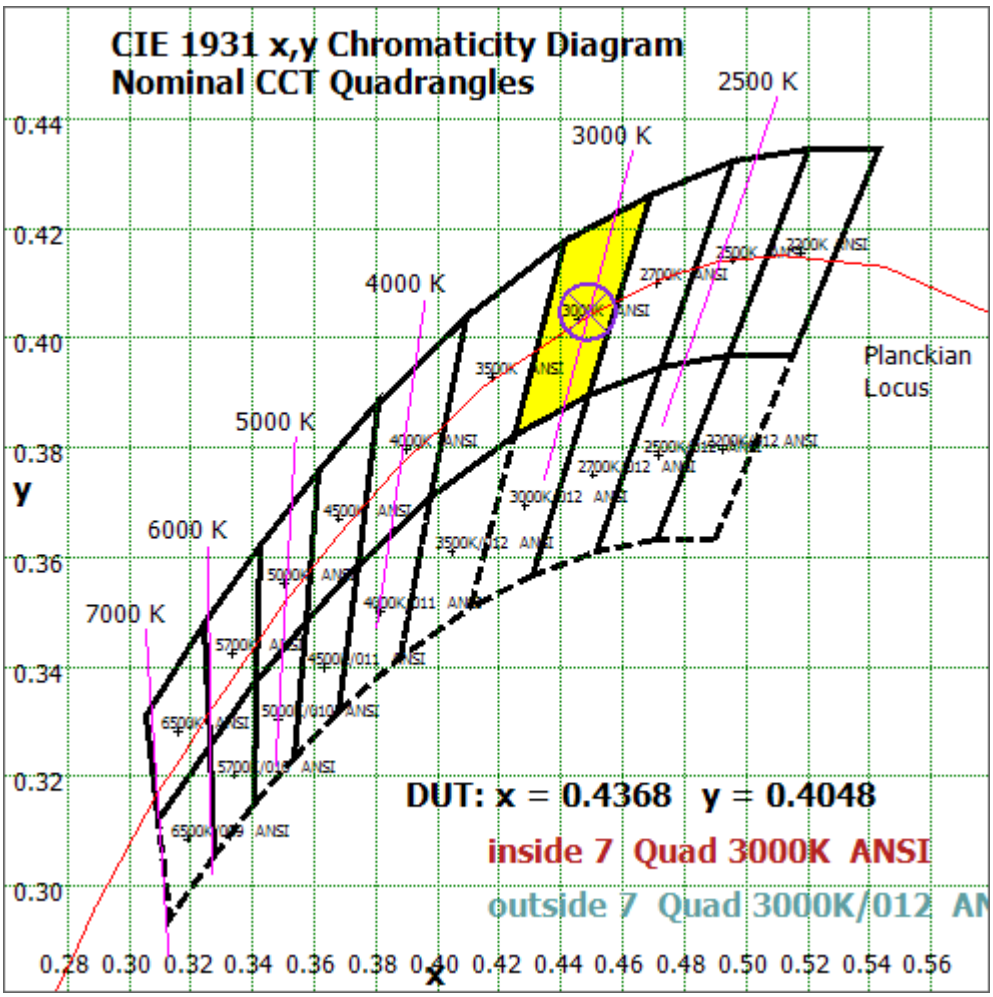


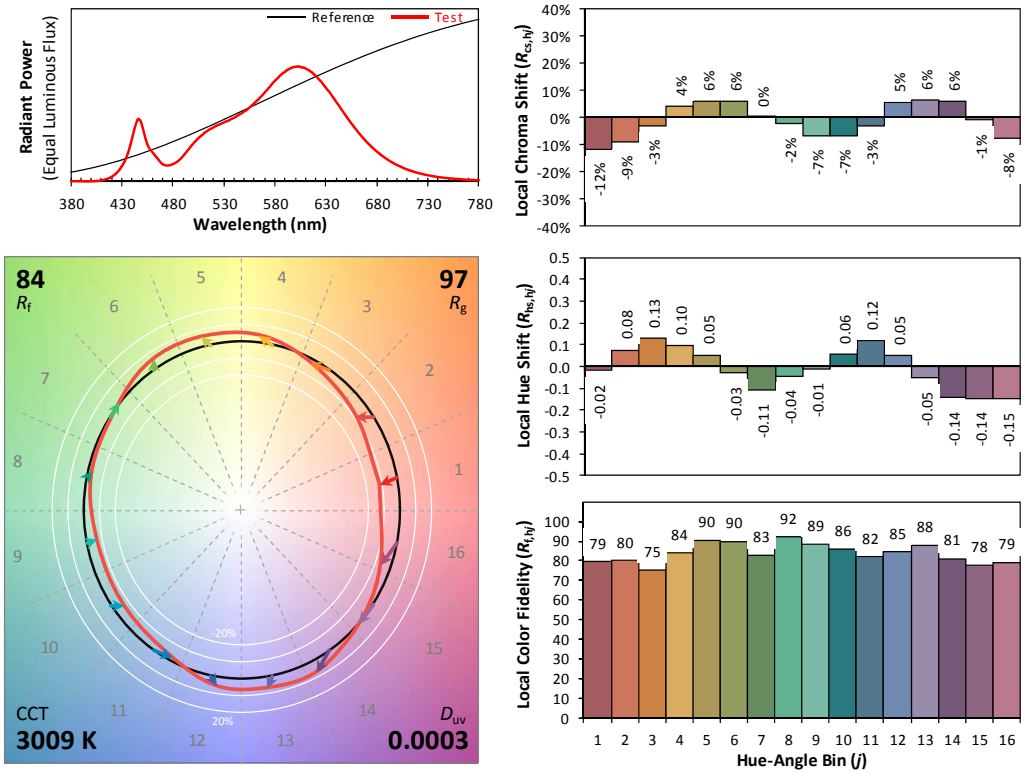
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** GREEN CREATIVE LTD

Date: 2022/06/17 **Model:** 13T8/4F/830/BYP/RC



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

x	0.4368
y	0.4048
u'	0.2501
v'	0.5217

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

γ(°)	Lumens	% Total
0- 10	23.713	1.34%
10- 20	69.263	3.91%
20- 30	109.253	6.17%
30- 40	140.511	7.94%
40- 50	160.811	9.08%
50- 60	169.238	9.56%
60- 70	166.383	9.40%
70- 80	155.097	8.76%
80- 90	140.525	7.94%
90-100	127.274	7.19%
100-110	114.523	6.47%
110-120	101.587	5.74%
120-130	88.189	4.98%
130-140	74.146	4.19%
140-150	58.8	3.32%
150-160	41.696	2.36%
160-170	22.745	1.28%
170-180	6.636	0.37%
Total	1770.4	100%

γ(°)	Lumens	% Total
0- 60	672.789	38.00%
60- 90	462.005	26.10%
0-90	1134.79	64.10%
90- 180	635.596	35.90%
0- 180	1770.4	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

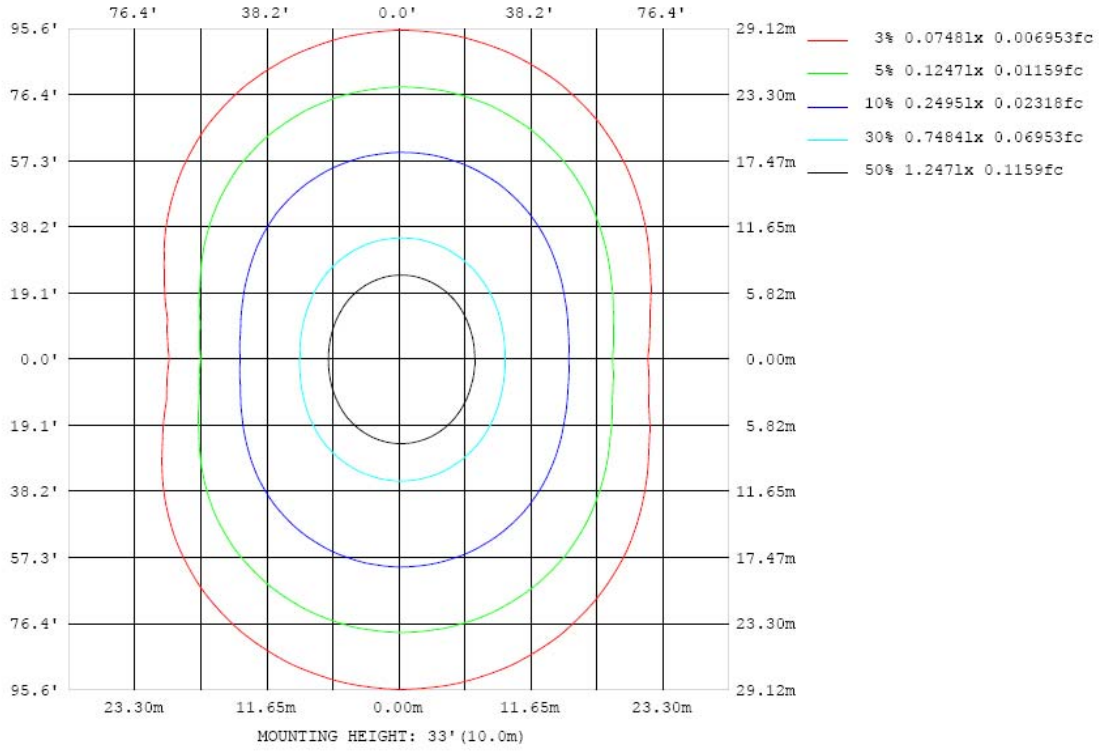


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

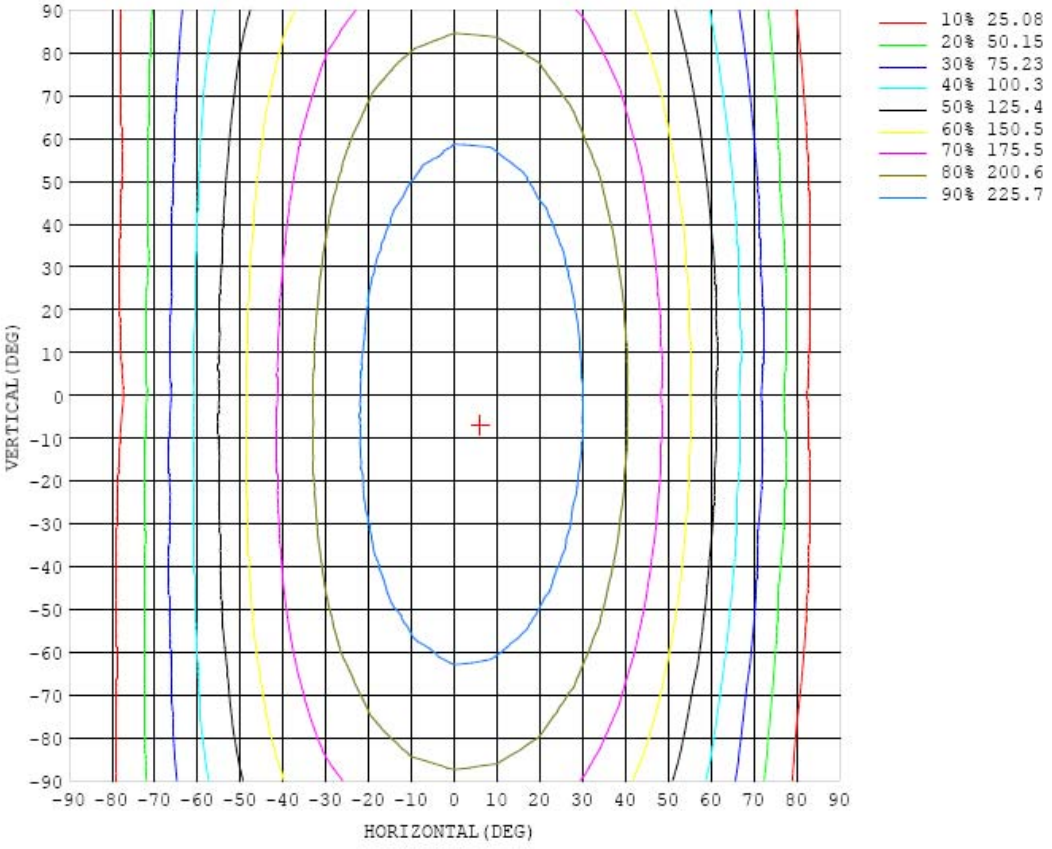


Chart 6: Isocandela Plot

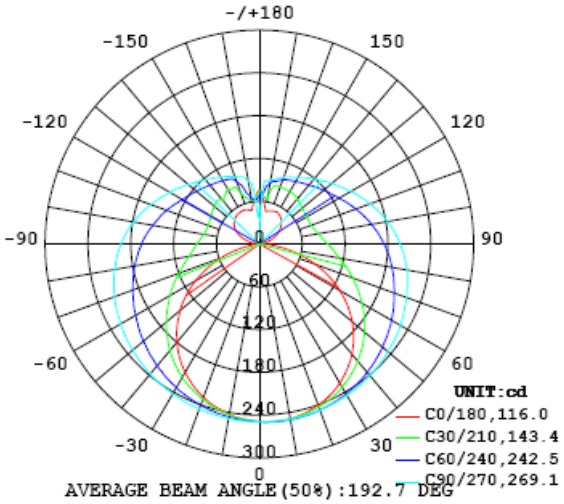


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249
5	250	250	250	250	250	250	250	250	249	250	249	249	249	248	247	248	247	247	247
10	249	249	249	249	250	250	250	250	250	249	249	248	247	246	245	245	244	243	242
15	246	246	247	247	248	249	249	250	249	249	248	247	245	243	241	240	239	237	237
20	240	242	243	243	246	247	248	248	248	248	247	245	242	239	237	234	232	230	229
25	234	235	237	239	241	244	246	246	247	247	245	243	238	234	230	227	223	221	219
30	225	226	229	232	236	240	243	245	245	245	243	240	235	229	224	218	213	210	208
35	214	216	219	224	230	235	239	242	243	243	241	236	230	224	216	208	202	197	195
40	202	204	208	214	222	229	235	239	241	241	238	233	226	217	207	198	189	182	180
45	187	190	195	204	214	223	230	236	237	238	235	229	221	210	198	186	175	166	163
50	170	173	181	192	205	216	225	232	235	235	232	226	215	203	189	174	159	149	145
55	151	155	166	180	195	208	220	227	231	232	228	221	210	196	179	161	143	130	125
60	130	135	149	166	185	201	213	223	227	228	224	217	204	189	170	148	127	110	103
65	108	114	131	153	174	193	208	217	222	224	220	212	198	181	160	136	110	89.3	80.4
70	83.6	92.2	114	139	164	185	201	212	218	219	215	207	193	174	151	125	94.7	68.8	57.0
75	59.6	70.1	96.3	126	154	177	195	207	213	215	211	202	188	168	143	113	81.0	50.7	34.4
80	36.1	49.9	80.8	114	145	169	189	201	208	210	206	197	182	162	136	105	69.0	35.1	14.9
85	15.2	32.5	67.3	104	137	163	182	195	202	204	200	191	176	156	130	97.8	61.8	25.1	2.33
90	2.32	21.3	59.3	96.0	129	155	175	188	195	197	194	185	170	150	124	92.3	57.1	21.5	1.33
95	1.45	17.5	53.3	89.1	122	148	167	180	188	190	187	178	163	143	118	87.9	54.4	22.4	5.20
100	5.52	18.9	50.2	83.7	115	140	160	173	180	182	179	170	156	137	113	84.2	53.8	26.2	11.2
105	10.6	23.0	49.8	79.8	109	133	152	165	172	174	171	163	149	131	108	81.8	55.5	31.5	18.2
110	16.8	29.5	51.5	77.4	104	126	144	156	163	165	162	155	142	125	104	81.0	58.5	38.6	25.4
115	23.1	36.8	54.3	76.5	99.4	120	136	148	154	156	154	147	135	120	101	81.3	62.2	45.5	32.2
120	29.1	43.2	57.8	76.7	96.6	114	129	140	146	148	146	139	128	115	99.2	82.2	66.0	52.9	38.3
125	35.1	48.8	62.4	77.4	94.5	110	123	132	137	140	137	132	123	111	98.0	83.6	69.9	59.4	42.9
130	39.9	54.6	67.3	78.5	93.0	106	117	125	130	132	131	126	118	109	97.1	85.2	73.9	64.3	46.4
135	43.7	60.2	71.6	80.5	92.1	103	113	119	124	126	124	120	114	106	96.6	86.8	78.0	69.2	48.9
140	47.2	64.6	74.3	82.9	91.6	101	108	114	118	119	118	115	110	103	95.8	88.0	79.3	73.4	50.8
145	49.5	69.5	76.7	84.9	91.7	98.6	105	109	112	113	113	110	106	101	95.0	88.9	81.7	76.4	51.9
150	51.3	74.5	79.3	84.9	91.8	96.9	102	105	107	108	108	106	103	98.8	94.5	86.2	83.0	79.2	52.3
155	50.4	71.0	81.1	84.8	90.9	95.7	98.9	101	103	104	104	103	100	97.4	93.1	84.8	79.5	74.3	52.6
160	49.4	61.8	82.4	85.8	89.1	92.9	95.6	97.8	99.0	100.0	99.9	99.1	97.2	94.0	79.4	78.7	71.4	65.4	51.0
165	48.0	54.7	67.9	85.1	88.0	89.5	91.4	93.2	94.4	95.3	95.3	94.8	88.3	76.2	72.4	66.8	62.7	55.9	49.4
170	49.0	53.0	55.3	66.5	80.6	83.6	86.6	89.8	90.4	90.9	90.9	80.9	68.7	63.8	67.2	65.9	64.8	56.6	54.5
175	64.2	66.7	67.1	67.0	71.0	69.9	72.6	76.7	87.2	89.4	60.4	52.5	60.5	67.4	66.9	70.2	67.9	67.9	66.6
180	75.6	75.3	74.6	72.6	69.4	64.2	61.6	60.4	55.3	9.25	53.5	61.2	62.5	66.2	69.7	73.8	76.5	78.2	75.4

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249	249		
5	247	247	247	248	248	248	249	248	249	249	250	249	250	250	250	250	250		
10	243	243	244	244	246	246	247	248	249	249	249	249	249	249	249	249	249		
15	237	238	239	240	243	244	245	246	247	248	248	248	248	247	247	246	246		
20	230	230	233	235	238	240	243	245	246	247	247	246	246	244	243	242	241		
25	220	222	224	229	233	237	240	243	245	245	245	244	242	240	238	236	234		
30	210	212	216	222	228	233	237	241	243	243	243	241	238	235	232	228	226		
35	196	200	206	214	221	228	233	237	240	241	240	237	233	228	224	219	216		
40	182	187	195	205	215	223	230	234	238	239	237	232	227	221	214	208	204		
45	166	173	183	195	207	218	226	232	235	235	233	228	221	213	204	195	189		
50	148	157	170	185	200	212	221	228	232	232	229	223	214	204	192	181	173		
55	130	142	157	175	192	206	217	224	228	228	225	217	207	194	180	166	155		
60	109	125	145	165	184	200	212	220	225	224	220	211	200	184	167	149	137		
65	88.2	108	132	156	177	195	207	216	221	220	215	206	192	174	153	133	116		
70	67.0	91.5	120	147	170	189	202	211	216	215	211	200	184	164	141	116	94.1		
75	47.4	76.9	109	139	163	183	197	207	211	210	205	193	177	155	128	99.1	72.4		
80	31.3	65.2	100	132	157	177	192	201	205	205	199	187	170	146	117	84.0	52.1		
85	21.2	56.9	93.1	125	151	171	186	195	200	199	193	181	162	138	107	71.8	35.3		
90	17.7	52.2	87.8	119	145	165	180	189	194	193	186	173	155	131	99.1	63.0	24.8		
95	18.7	49.3	82.8	114	139	159	173	182	187	186	179	167	148	124	92.6	57.3	20.9		
100	23.0	48.7	79.3	108	133	152	166	175	179	178	172	159	142	117	87.0	53.8	21.4		
105	29.5	50.7	76.9	104	127	145	158	167	171	169	163	151	135	111	82.6	52.5	25.5		
110	36.7	54.0	76.3	99.6	121	138	150	158	162	161	155	144	127	105	79.6	53.6	32.1		
115	43.5	58.4	76.9	96.8	115	131	143	150	153	152	146	136	121	100	78.2	56.4	39.1		
120	50.3	63.1	78.4	95.4	111	125	136	143	145	144	139	129	115	96.9	78.1	60.2	45.5		
125	56.8	67.0	80.3	94.4	108	120	129	134	137	136	131	122	110	94.7	78.9	64.7	52.5		
130	63.3	70.7	82.5	94.1	105	115	123	128	130	129	125	117	107	93.5	80.4	69.4	58.4		
135	68.8	75.5	84.8	93.9	103	111	118	122	124	123	119	112	104	92.6	82.5	73.2	64.0		
140	73.9	79.7	81.7	94.0	101	108	113	117	118	117	114	108	101	92.6	84.5	77.0	68.4		
145	78.0	83.1	84.5	94.4	100.0	105	109	112	113	112	110	105	99.9	92.5	86.1	80.4	72.5		
150	79.9	85.6	88.0	87.3	98.8	103	106	107	108	108	106	103	98.4	92.5	87.5	83.4	75.8		
155	74.3	81.0	86.5	85.9	94.0	100	102	104	104	104	103	100	97.0	92.4	89.1	85.9	73.4		
160	61.1	72.0	76.2	80.0	87.1	93.4	99.1	100	101	101	99.7	97.8	95.9	93.0	90.6	87.6	66.7		
165	53.3	61.1	66.7	67.4	74.5	77.2	87.2	95.4	97.4	97.5	97.3	96.2	95.2	92.9	90.5	86.3	57.2		
170	54.9	55.8	62.5	65.9	66.4	63.5	68.7	80.2	90.5	92.0	94.7	94.1	90.8	87.3	83.1	66.0	48.8		
175	66.6	65.1	63.4	65.3	63.5	63.5	57.9	47.2	56.9	86.3	84.1	74.2	71.4	66.3	65.2	60.9	60.1		
180	75.5	75.1	74.2	72.7	69.5	66.1	65.0	59.0	54.1	8.13	52.9	60.3	63.9	66.3	70.3	73.4	76.1		

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 8: 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 expended 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 expended 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 ***