

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: 16T8/4F/830/BYP/RC

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

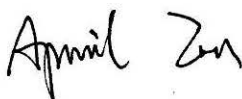
Tel: +86571 86376106

www.ledtestlab.com

Report No.: HZ22060037n

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

Review by:



Engineer: April Zou

Jun. 30, 2022

Approved by:



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: 16T8/4F/830/BYP/RC

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
129.5	2083.5	16.09	0.9683
CCT (K)	CRI	Stabilization Time (Light & Power)	
3001	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

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	: 16T8/4F/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)	0.138	0.062
Power Factor	0.9683	0.9403
Test Power (W)	16.09	16.18
THD A%	22.67	20.41
Luminous Efficacy (lm/W)	129.5	131.6
Total Luminous Flux (lm)	2083.5	2129.7
Color Rendering Index (CRI)	81.8	
R9	2.5	
Correlated Color Temperature (CCT)(K)	3001	
Chromaticity Chroma x	0.4368	
Chromaticity Chroma y	0.4043	
Chromaticity Chroma u	0.2504	
Chromaticity Chroma v	0.3476	
Duv	0.0001	
Chromaticity Chroma u'	0.2504	
Chromaticity Chroma v'	0.5215	

Special Color Rendering Indices	
R1	79.8
R2	89.2
R3	96.7
R4	80.8
R5	80.2
R6	87.2
R7	82.6
R8	57.7
R9	2.5
R10	76
R11	80.9
R12	72
R13	81.8
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)	0.139
Power Factor	0.9695
Power (W)	16.15
Luminous Efficacy (lm/W)	128.0
Total Luminous Flux (lm)	2066.6
Beam Angle (°)	116.2 (0°-180°) / 268.5 (90°-270°)
Center Beam Candle Power (cd)	292
Maximum Beam Candle Power (cd)	293.3 (At: C=320.0, Gamma=3.5)
Spacing Criteria	1.25 (0°-180°) / 1.48 (90°-270°)
Zonal Lumens in the 0°-60°Zone	38.10%
Zonal Lumens in the 60°-90°Zone	26.05%
Zonal Lumens in the 90°-120°Zone	19.36%
Zonal Lumens in the 120°-180°Zone	16.49%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

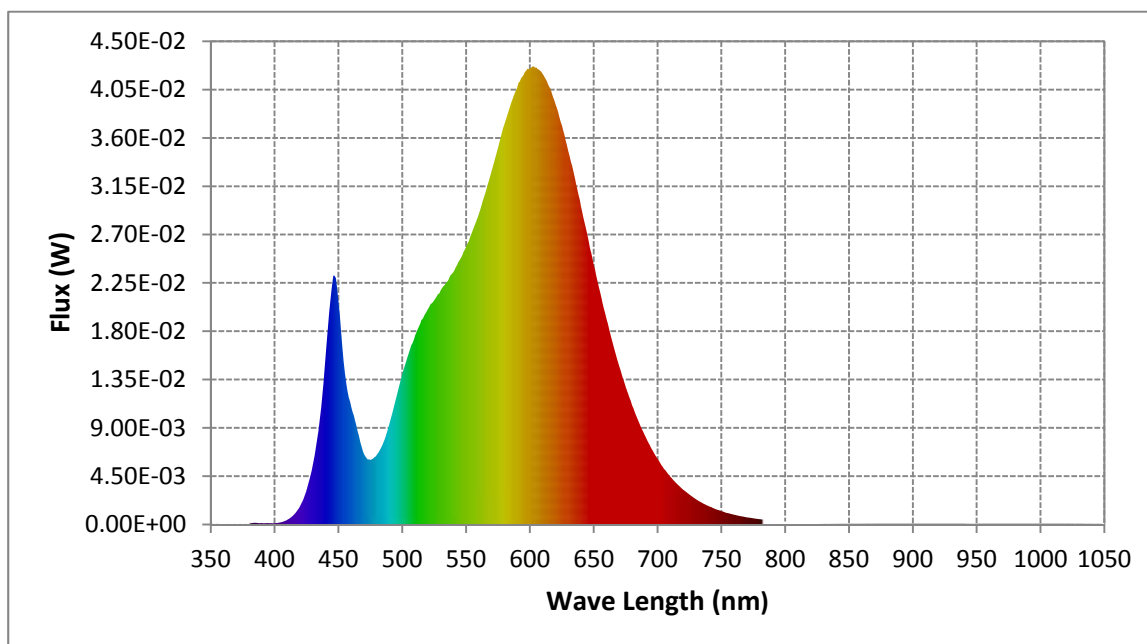
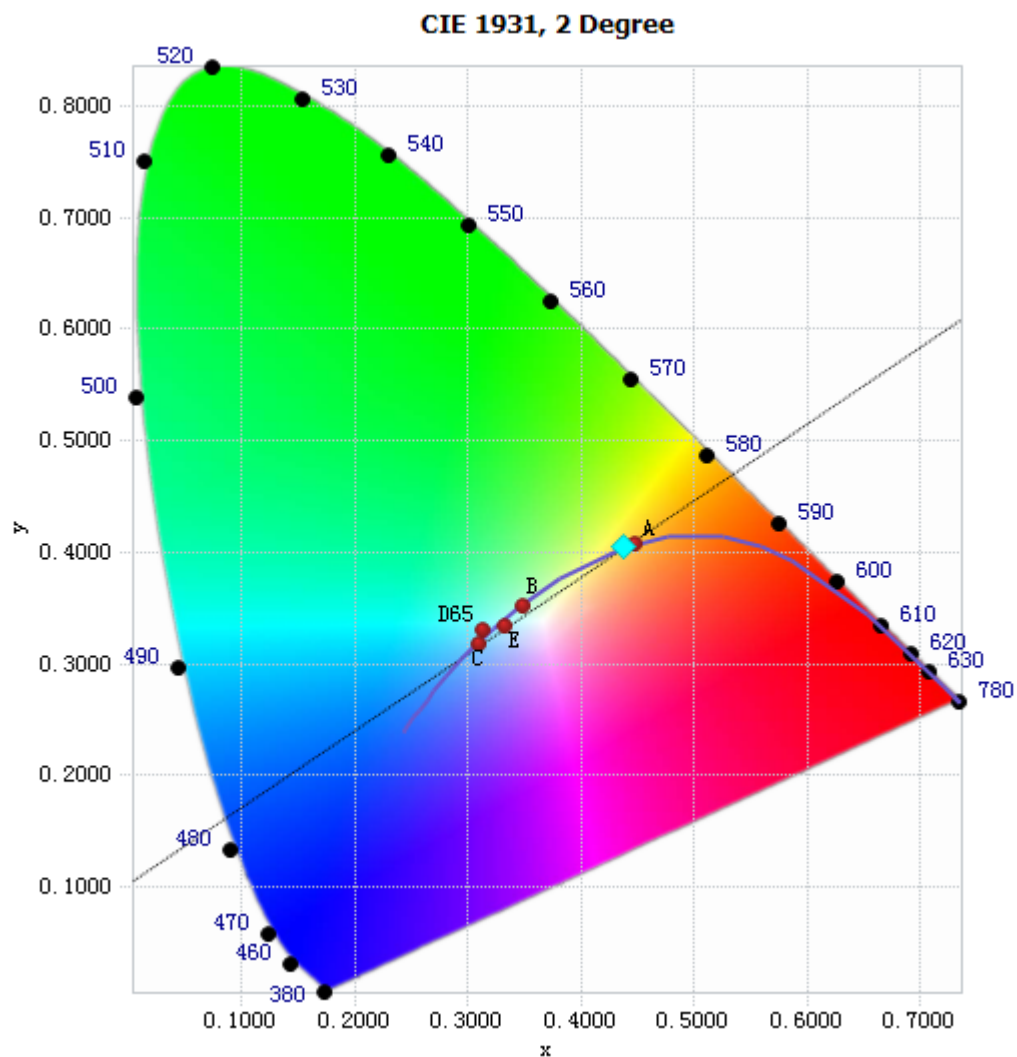


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.44E-04	485	7.57E-03	590	4.07E-02	695	7.11E-03
385	1.65E-04	490	9.41E-03	595	4.19E-02	700	6.11E-03
390	1.26E-04	495	1.17E-02	600	4.25E-02	705	5.16E-03
395	1.25E-04	500	1.40E-02	605	4.26E-02	710	4.44E-03
400	1.08E-04	505	1.60E-02	610	4.19E-02	715	3.79E-03
405	1.83E-04	510	1.75E-02	615	4.08E-02	720	3.23E-03
410	4.26E-04	515	1.91E-02	620	3.91E-02	725	2.76E-03
415	8.76E-04	520	2.00E-02	625	3.72E-02	730	2.33E-03
420	1.70E-03	525	2.09E-02	630	3.48E-02	735	2.00E-03
425	3.18E-03	530	2.18E-02	635	3.24E-02	740	1.70E-03
430	5.61E-03	535	2.26E-02	640	2.96E-02	745	1.44E-03
435	9.37E-03	540	2.35E-02	645	2.70E-02	750	1.23E-03
440	1.56E-02	545	2.46E-02	650	2.42E-02	755	1.06E-03
445	2.24E-02	550	2.59E-02	655	2.16E-02	760	8.99E-04
450	2.07E-02	555	2.74E-02	660	1.91E-02	765	7.62E-04
455	1.41E-02	560	2.90E-02	665	1.68E-02	770	6.46E-04
460	1.10E-02	565	3.09E-02	670	1.47E-02	775	5.61E-04
465	8.67E-03	570	3.29E-02	675	1.28E-02	780	4.83E-04
470	6.55E-03	575	3.50E-02	680	1.11E-02		
475	6.00E-03	580	3.72E-02	685	9.62E-03		
480	6.46E-03	585	3.92E-02	690	8.30E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4368, 0.4043)

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

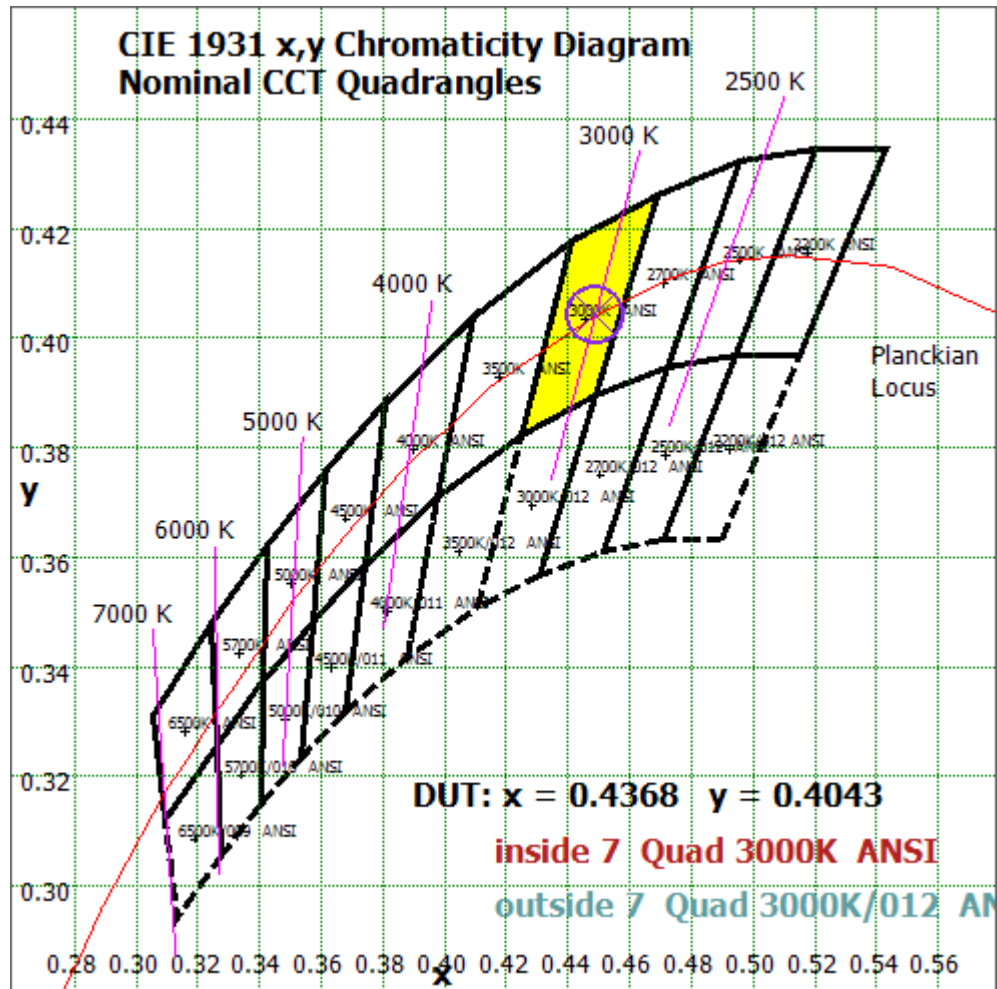


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

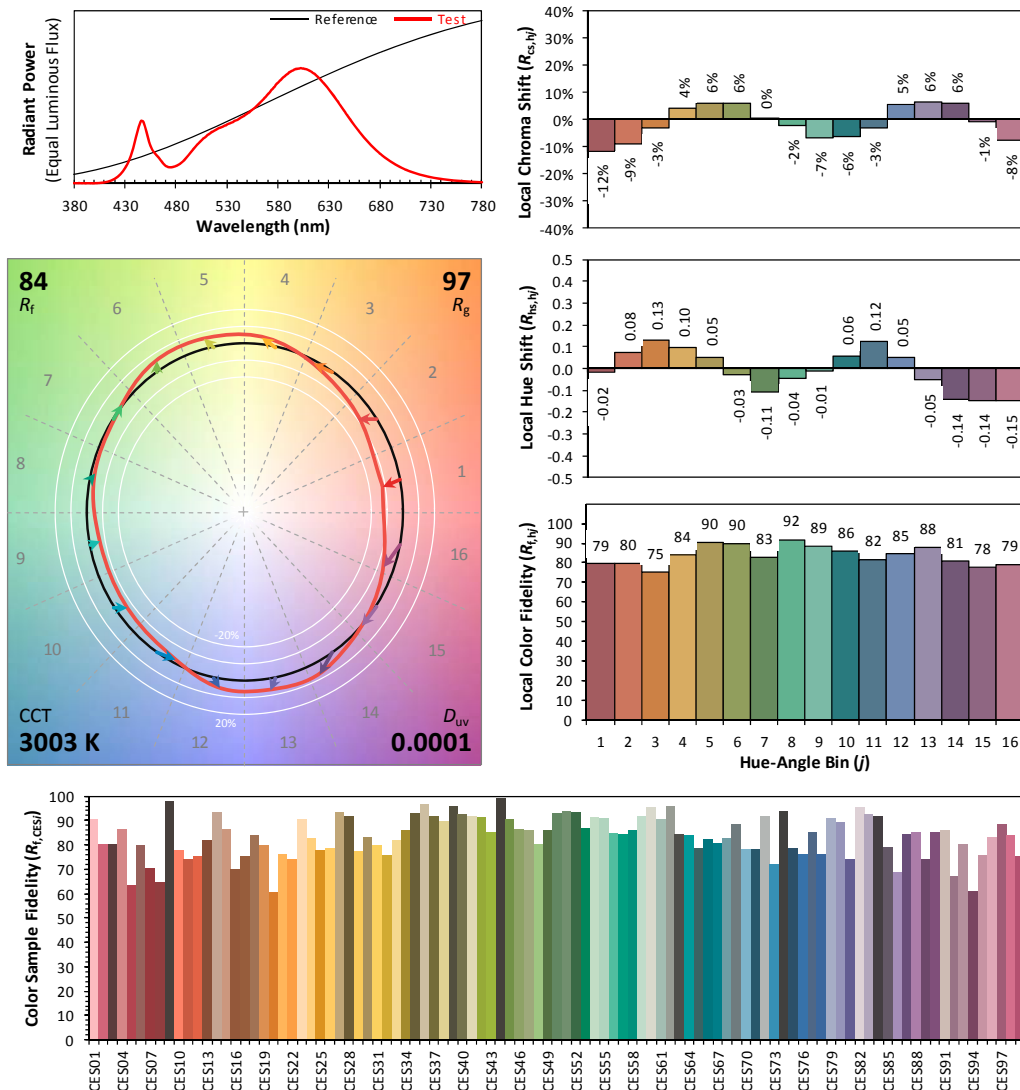
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/06/17

Model: 16T8/4F/830/BYP/RC



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

x 0.4368
 y 0.4043
 u' 0.2504
 v' 0.5215

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	27.787	1.34%
10- 20	81.151	3.93%
20- 30	127.999	6.19%
30- 40	164.552	7.96%
40- 50	188.171	9.11%
50- 60	197.789	9.57%
60- 70	194.078	9.39%
70- 80	180.585	8.74%
80- 90	163.618	7.92%
90-100	148.347	7.18%
100-110	133.508	6.46%
110-120	118.34	5.73%
120-130	102.834	4.98%
130-140	86.536	4.19%
140-150	68.687	3.32%
150-160	48.343	2.34%
160-170	26.242	1.27%
170-180	8.047	0.39%
Total	2066.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	787.449	38.10%
60- 90	538.281	26.05%
0-90	1325.73	64.15%
90- 180	740.884	35.85%
0- 180	2066.6	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

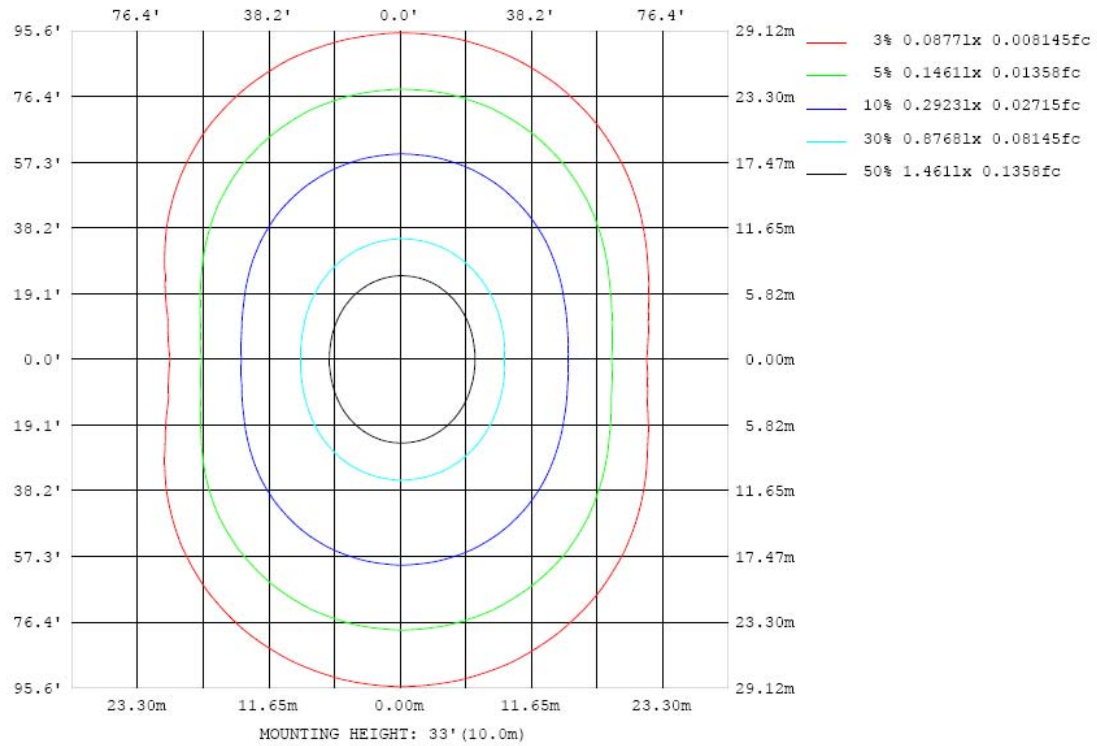


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

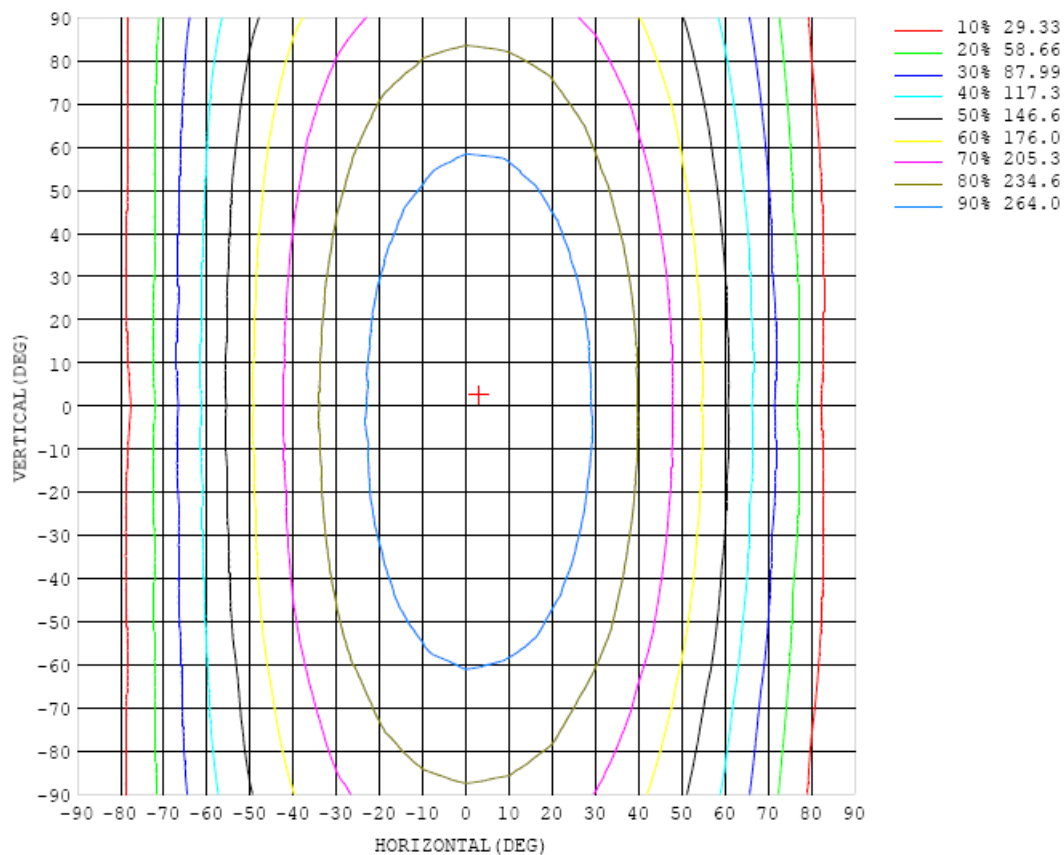


Chart 6: Isocandela Plot

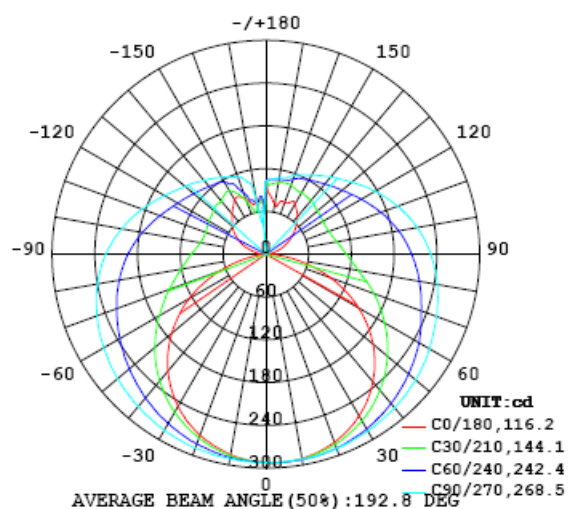


Chart 7: Polar Candela Distribution

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	292	292	292	292	292	292	292	292	292	292	292	292	292	292	292	292	292	292	292
5	293	293	293	293	293	293	292	293	292	292	292	292	291	290	291	290	290	289	290
10	291	290	291	292	292	292	292	292	293	292	292	291	290	289	287	287	286	285	285
15	287	287	288	288	289	291	292	291	292	291	291	289	287	286	284	281	280	280	279
20	281	281	282	284	286	288	289	290	290	290	289	287	284	281	278	275	272	271	270
25	272	273	275	277	281	284	286	288	288	288	287	284	280	276	271	267	262	261	260
30	262	263	266	270	274	279	283	285	287	286	285	281	275	270	263	257	251	248	247
35	249	251	254	260	267	273	278	282	284	284	282	277	270	263	254	245	238	233	231
40	233	236	241	249	258	266	273	278	280	281	278	273	264	255	244	232	222	216	214
45	216	219	226	237	248	259	267	274	277	278	274	268	259	247	233	219	206	197	194
50	196	200	209	223	237	251	261	269	273	274	270	263	252	238	222	204	188	176	172
55	174	179	191	208	225	242	255	264	269	270	266	258	246	229	210	189	169	154	149
60	150	156	171	192	214	233	248	258	263	265	261	253	239	221	199	174	149	130	124
65	124	132	151	177	202	224	240	252	258	260	256	246	231	211	187	159	129	105	96.9
70	96.2	106	131	161	190	214	232	246	253	255	251	241	225	203	176	144	110	80.9	69.1
75	67.8	80.6	111	146	178	205	225	240	248	250	246	235	219	195	166	131	93.3	58.4	42.1
80	40.9	57.4	93.0	132	168	197	219	234	242	244	240	230	212	188	158	121	78.9	40.0	18.7
85	17.0	38.2	78.1	121	159	189	212	228	236	238	234	224	206	182	151	113	70.2	27.6	3.39
90	2.33	25.4	69.0	113	151	182	204	221	229	232	227	217	200	175	145	107	65.3	24.1	1.56
95	2.14	22.1	64.3	107	144	175	197	213	221	224	220	210	192	169	139	103	63.1	25.2	6.33
100	7.23	23.9	61.3	101	137	167	189	205	213	216	212	202	185	162	133	98.9	62.6	30.3	13.5
105	13.7	29.0	60.8	96.9	131	159	180	196	204	207	203	193	177	155	128	96.3	64.7	37.1	22.0
110	21.6	36.4	62.7	94.0	125	151	172	186	194	197	193	184	169	148	123	95.3	68.3	45.6	30.9
115	29.0	43.5	65.9	92.7	120	144	163	177	184	187	184	175	161	142	120	95.6	72.9	53.9	39.5
120	36.8	50.9	70.1	92.6	116	138	155	167	174	177	174	166	153	136	117	96.9	77.6	62.4	47.5
125	45.5	60.0	74.8	93.4	113	132	146	158	165	167	164	157	146	132	116	98.7	82.6	70.6	54.8
130	53.4	67.5	79.4	94.7	112	127	140	150	155	157	155	150	141	128	115	101	87.2	77.5	61.0
135	61.2	73.3	82.5	96.4	110	123	134	142	147	149	147	143	135	125	114	103	91.4	83.4	67.3
140	68.6	80.1	87.3	98.4	109	120	129	136	140	142	140	136	130	122	114	105	95.2	88.9	74.0
145	75.4	86.7	90.2	99.0	109	117	124	130	133	135	134	131	126	120	113	105	97.4	93.5	80.5
150	81.7	90.7	93.7	99.7	108	115	120	124	127	128	128	125	122	117	112	106	99.7	96.6	88.3
155	80.3	94.5	97.7	100	106	113	117	120	122	123	122	121	118	115	110	104	96.6	95.6	88.7
160	77.3	99.3	99.8	103	105	108	112	115	117	118	118	117	114	111	108	105	95.9	88.7	81.6
165	76.2	97.9	103	104	106	107	108	109	110	111	111	111	110	109	106	95.1	84.6	78.3	73.3
170	73.8	93.1	100	102	104	106	107	108	108	109	109	109	109	103	91.0	79.9	75.8	77.2	76.1
175	81.2	90.3	96.2	98.8	102	105	106	105	106	106	107	106	99.8	90.3	80.1	71.3	70.8	74.0	75.8
180	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102

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	292	292	292	292	292	292	292	292	292	292	292	292	292	292	292	292	292		
5	290	290	290	291	291	291	291	291	292	292	292	293	293	293	293	293	293		
10	285	286	287	287	288	289	290	290	291	291	292	292	292	292	291	291	291		
15	279	280	281	283	284	287	288	289	290	291	291	291	290	289	289	288	287		
20	271	272	274	277	280	283	286	287	289	290	290	289	287	285	284	282	281		
25	260	263	266	270	275	279	283	285	287	288	287	286	283	280	277	275	273		
30	247	251	256	263	269	274	279	282	285	285	284	281	278	273	269	265	263		
35	233	237	245	253	261	269	275	279	282	282	281	277	272	266	260	254	250		
40	216	223	232	243	254	263	271	276	279	279	277	272	264	257	249	241	235		
45	197	206	218	232	245	257	266	272	275	275	272	266	257	247	236	226	219		
50	176	188	203	220	237	250	261	268	271	271	267	260	249	236	222	209	200		
55	154	169	188	209	228	244	256	264	267	267	262	253	240	224	207	191	179		
60	131	150	173	197	219	236	250	259	263	262	256	246	230	213	192	171	156		
65	106	130	158	186	210	230	245	253	258	256	250	239	222	201	176	152	133		
70	81.6	111	145	175	202	223	239	248	252	251	244	231	213	189	161	132	107		
75	58.3	93.5	132	165	194	216	232	242	246	245	237	224	204	178	146	112	81.9		
80	39.1	79.5	121	156	186	209	226	235	240	238	230	216	194	167	133	94.9	58.2		
85	26.9	69.5	112	148	178	202	219	228	233	231	223	208	186	157	121	80.3	38.8		
90	22.2	63.0	105	140	171	194	210	221	225	222	215	199	177	148	112	69.8	26.7		
95	23.0	58.9	98.3	133	162	185	202	211	215	213	205	190	168	139	103	62.5	22.0		
100	27.6	58.1	93.6	126	154	176	192	201	206	204	195	180	158	130	95.9	57.9	22.7		
105	34.7	60.3	90.8	120	146	167	183	192	196	193	185	170	149	123	90.5	56.8	27.4		
110	42.3	64.1	90.2	115	139	158	173	181	185	182	175	161	141	116	87.4	58.7	34.7		
115	49.4	69.0	90.8	112	133	150	163	172	174	172	165	152	133	111	86.0	61.8	41.9		
120	55.9	74.2	92.5	111	128	143	155	162	164	162	155	144	127	108	86.5	66.6	48.5		
125	61.7	78.5	93.5	110	125	137	147	153	156	154	148	138	123	106	88.0	72.0	55.2		
130	66.5	83.8	96.1	109	122	132	141	147	148	147	142	132	119	105	90.3	77.5	60.3		
135	69.2	89.1	98.2	108	119	128	135	140	142	140	135	127	116	105	92.6	82.1	64.3		
140	70.3	94.2	96.5	105	117	124	130	134	135	134	130	123	114	105	95.2	86.4	66.1		
145	69.5	97.5	102	106	113	121	125	129	130	129	126	120	113	105	97.2	90.1	65.6		
150	66.7	97.3	103	105	108	117	121	124	125	124	121	117	111	105	99.5	92.4	61.9		
155	65.1	85.0	93.5	103	100	109	115	119	120	119	118	114	110	106	101	84.0	56.6		
160	66.3	67.2	78.4	83.5	88.8	91.4	100.0	112	115	115	115	112	110	107	94.8	67.5	55.2		
165	64.8	59.5	63.3	69.3	77.6	78.7	77.7	90.1	107	111	112	106	104	95.7	68.7	52.2	54.9		
170	71.6	65.8	66.5	69.0	70.5	73.6	74.3	67.4	71.2	102	91.0	84.7	76.0	62.9	58.5	57.1	57.6		
175	74.7	75.1	78.3	78.8	79.7	81.9	83.6	85.7	66.3	85.0	84.2	81.8	78.5	74.4	72.1	73.4	75.2		
180	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102		

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 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.