

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: 10T8/4F/840/UEB/SB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ23090016a

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

Review by:

Wei Fei

Approve by:



April Zou

Engineer: Wei Fei

Sep. 20, 2023

Manager: April Zou

Sep. 20, 2023

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: **10T8/4F/840/UEB/SB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
163.1	1646.1	10.09	0.9823
CCT (K)	CRI	Stabilization Time (Light & Power)	
4045	83.0	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	: Sep. 15, 2023
Date of Test	: Sep. 18, 2023
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	: 10T8/4F/840/UEB/SB
Electrical Ratings	: 120-277V, 50/60Hz, 10W
Product Description	: 4000K
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)	0.086	0.041
Power Factor	0.9823	0.9068
Test Power (W)	10.09	10.21
THD A%	16.87	20.87
Luminous Efficacy (lm/W)	163.1	162.5
Total Luminous Flux (lm)	1646.1	1659.1
Color Rendering Index (CRI)	83.0	
R9	8.7	
Correlated Color Temperature (CCT)(K)	4045	
Chromaticity Chroma x	0.3787	
Chromaticity Chroma y	0.3769	
Chromaticity Chroma u	0.2239	
Chromaticity Chroma v	0.3343	
Duv	0.0006	
Chromaticity Chroma u'	0.2239	
Chromaticity Chroma v'	0.5014	

Special Color Rendering Indices	
R1	81.2
R2	88.4
R3	94.2
R4	82.8
R5	81.6
R6	84.3
R7	86.3
R8	65.2
R9	8.7
R10	73.1
R11	82.3
R12	63
R13	82.9
R14	96.9

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)	0.086
Power Factor	0.9813
Power (W)	10.13
Luminous Efficacy (lm/W)	163.7
Total Luminous Flux (lm)	1657.9
Beam Angle (°)	111.9 (0°-180°) / 205.3 (90°-270°)
Center Beam Candle Power (cd)	290
Maximum Beam Candle Power (cd)	295.9 (At: C=300.0, Gamma=12.0)
Spacing Criteria	1.20 (0°-180°) / 1.45 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.35%
Zonal Lumens in the 60 °-90 °Zone	26.58%
Zonal Lumens in the 90 °-120 °Zone	17.20%
Zonal Lumens in the 120 °-180 °Zone	11.87%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

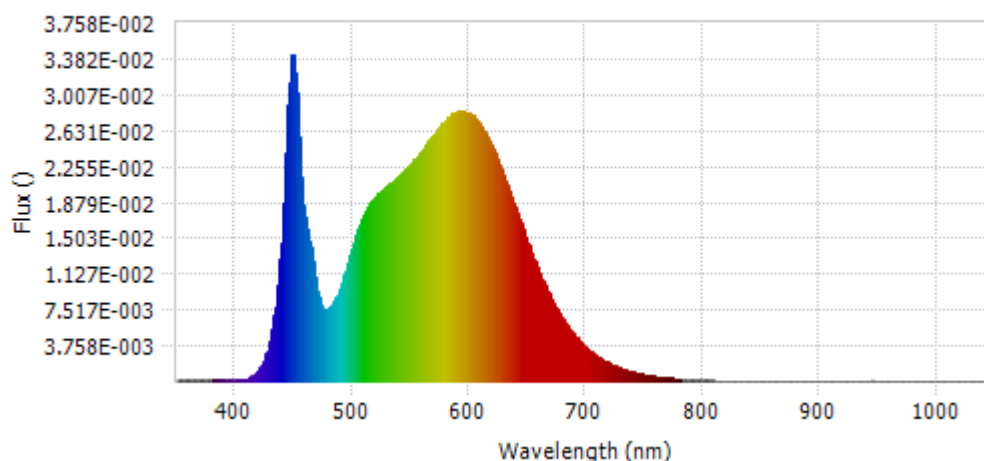
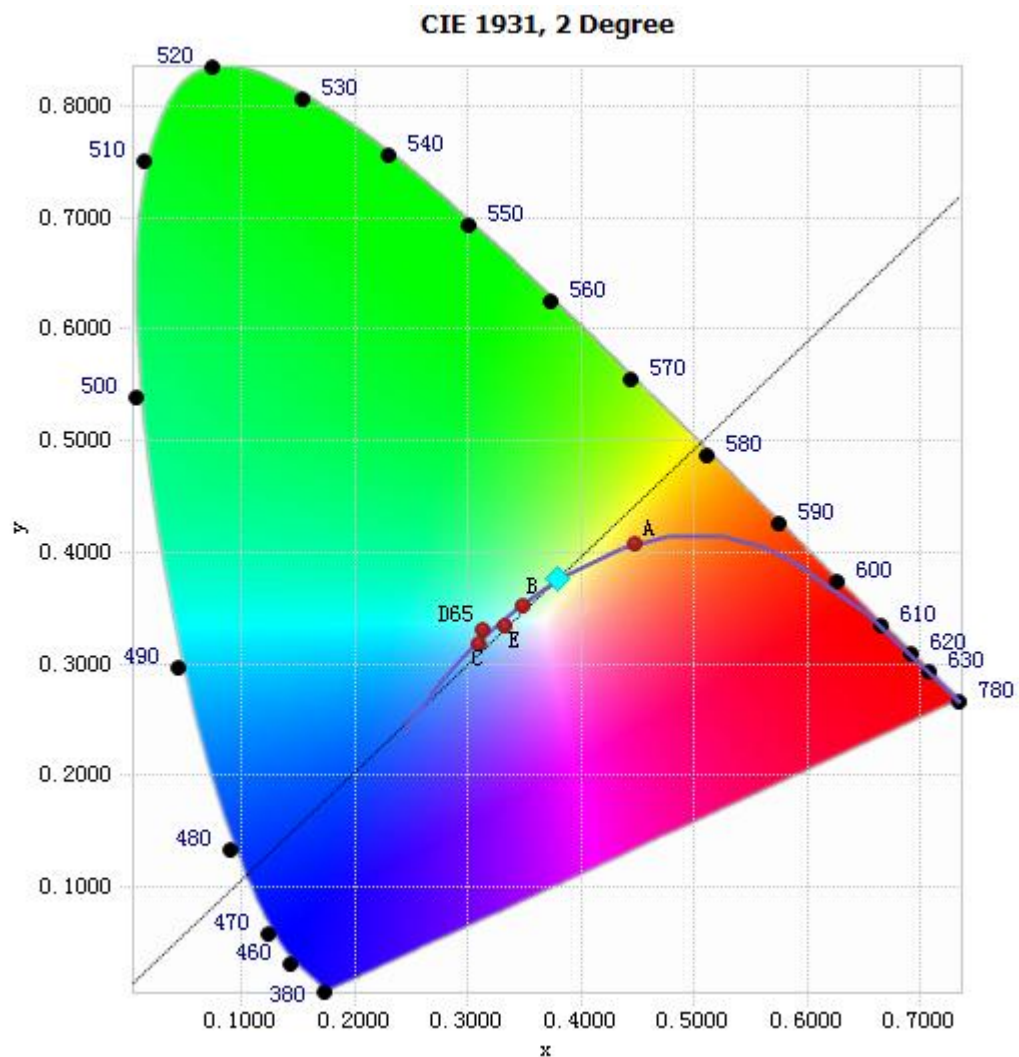


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.56E-04	485	8.49E-03	590	2.83E-02	695	4.16E-03
385	1.33E-04	490	9.96E-03	595	2.83E-02	700	3.57E-03
390	1.33E-04	495	1.21E-02	600	2.81E-02	705	3.04E-03
395	1.11E-04	500	1.42E-02	605	2.75E-02	710	2.57E-03
400	1.11E-04	505	1.60E-02	610	2.67E-02	715	2.21E-03
405	1.71E-04	510	1.75E-02	615	2.57E-02	720	1.87E-03
410	2.99E-04	515	1.87E-02	620	2.44E-02	725	1.60E-03
415	6.50E-04	520	1.93E-02	625	2.29E-02	730	1.36E-03
420	1.27E-03	525	2.00E-02	630	2.14E-02	735	1.16E-03
425	2.51E-03	530	2.05E-02	635	1.97E-02	740	9.80E-04
430	4.88E-03	535	2.10E-02	640	1.80E-02	745	8.34E-04
435	8.94E-03	540	2.15E-02	645	1.62E-02	750	7.14E-04
440	1.66E-02	545	2.22E-02	650	1.45E-02	755	6.03E-04
445	2.90E-02	550	2.28E-02	655	1.29E-02	760	5.11E-04
450	3.35E-02	555	2.35E-02	660	1.14E-02	765	4.44E-04
455	2.32E-02	560	2.43E-02	665	1.00E-02	770	3.80E-04
460	1.66E-02	565	2.51E-02	670	8.68E-03	775	3.21E-04
465	1.33E-02	570	2.59E-02	675	7.54E-03	780	2.78E-04
470	9.48E-03	575	2.68E-02	680	6.52E-03		
475	7.63E-03	580	2.74E-02	685	5.64E-03		
480	7.74E-03	585	2.81E-02	690	4.85E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3787, 0.3769)

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

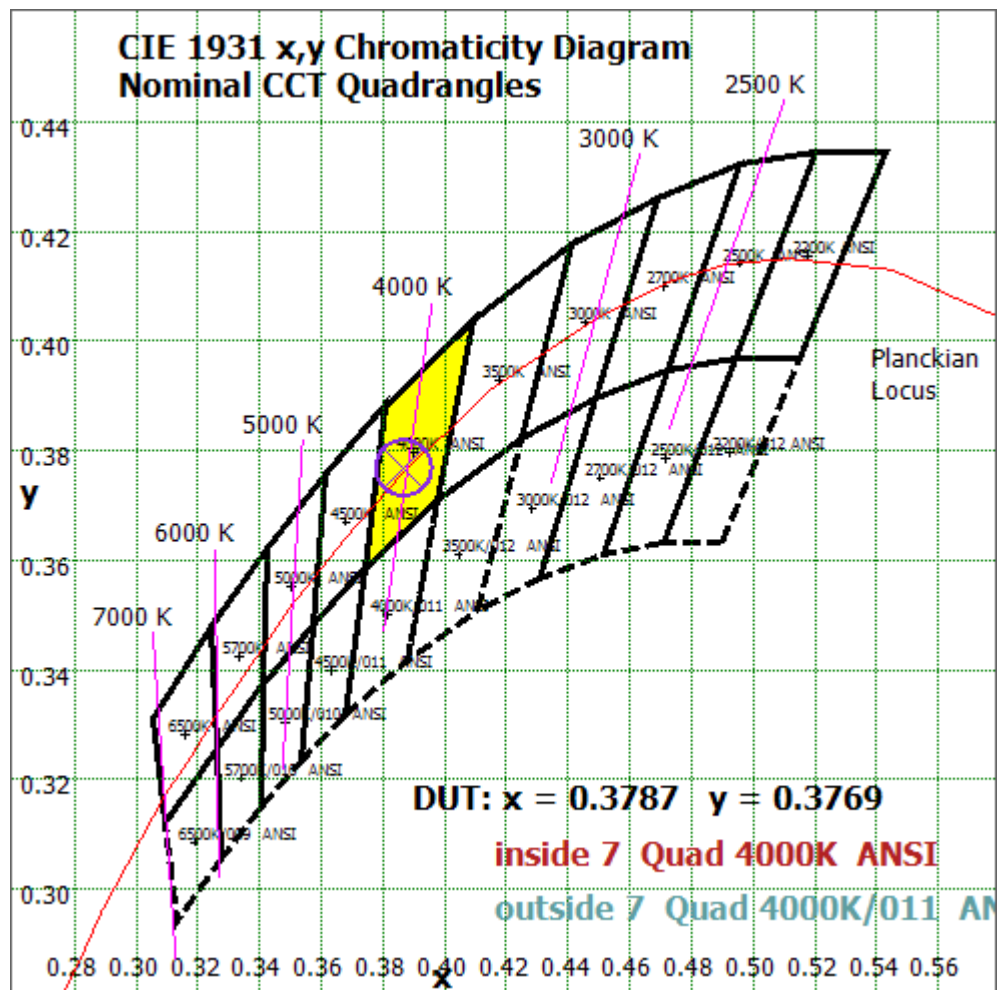


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

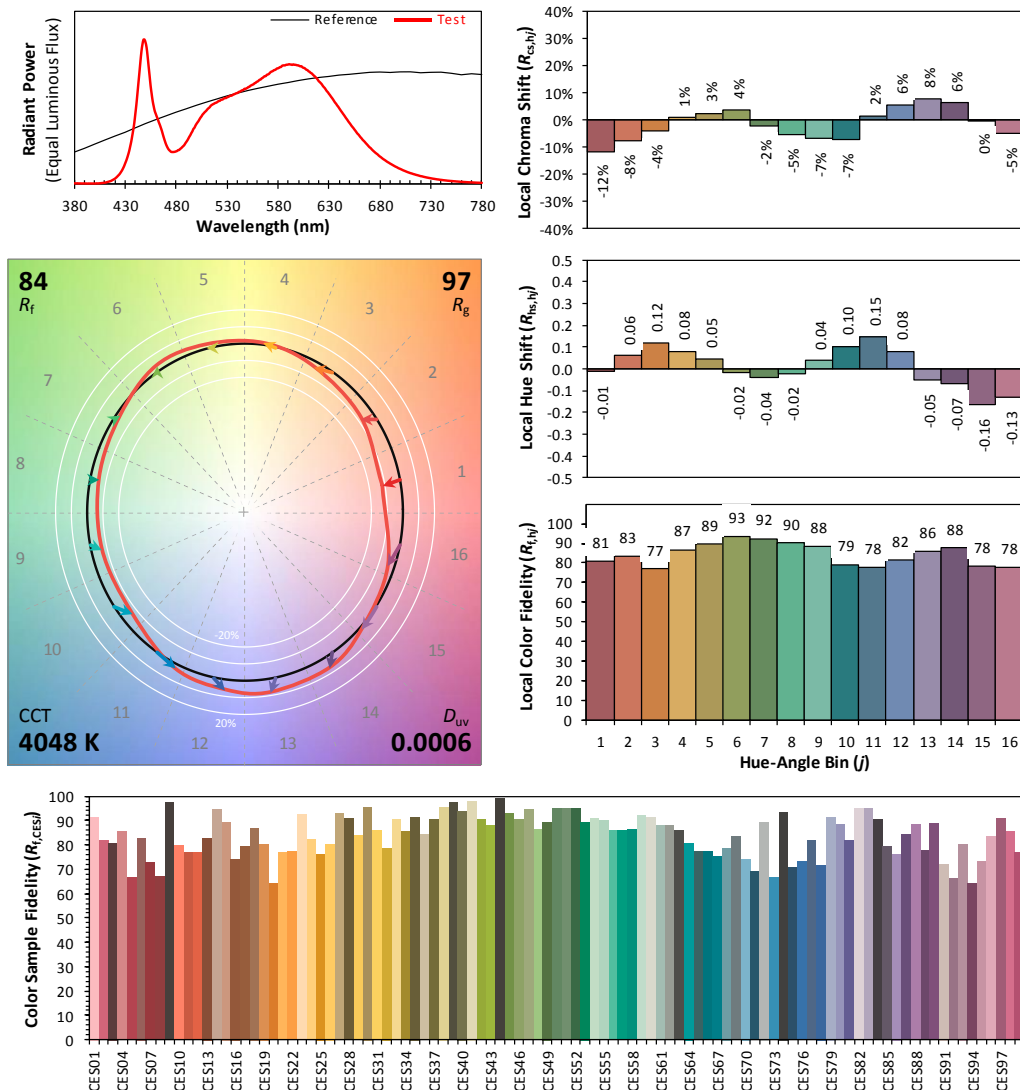
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/09/18

Model: 10T8/4F/840/UEB/SB



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

x 0.3787
 y 0.3769
 u' 0.2239
 v' 0.5014

CIE 13.3-1995
 (CRI)
 R_a 83
 R_9 9

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	27.598	1.66%
10- 20	79.887	4.82%
20- 30	123.831	7.47%
30- 40	155.519	9.38%
40- 50	172.806	10.42%
50- 60	175.643	10.59%
60- 70	165.995	10.01%
70- 80	147.726	8.91%
80- 90	126.942	7.66%
90-100	109.42	6.60%
100-110	94.565	5.70%
110-120	81.255	4.90%
120-130	67.949	4.10%
130-140	53.641	3.24%
140-150	39.47	2.38%
150-160	24.516	1.48%
160-170	9.678	0.58%
170-180	1.479	0.09%
Total	1657.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	735.284	44.35%
60- 90	440.663	26.58%
0-90	1175.95	70.93%
90- 180	481.973	29.07%
0- 180	1657.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

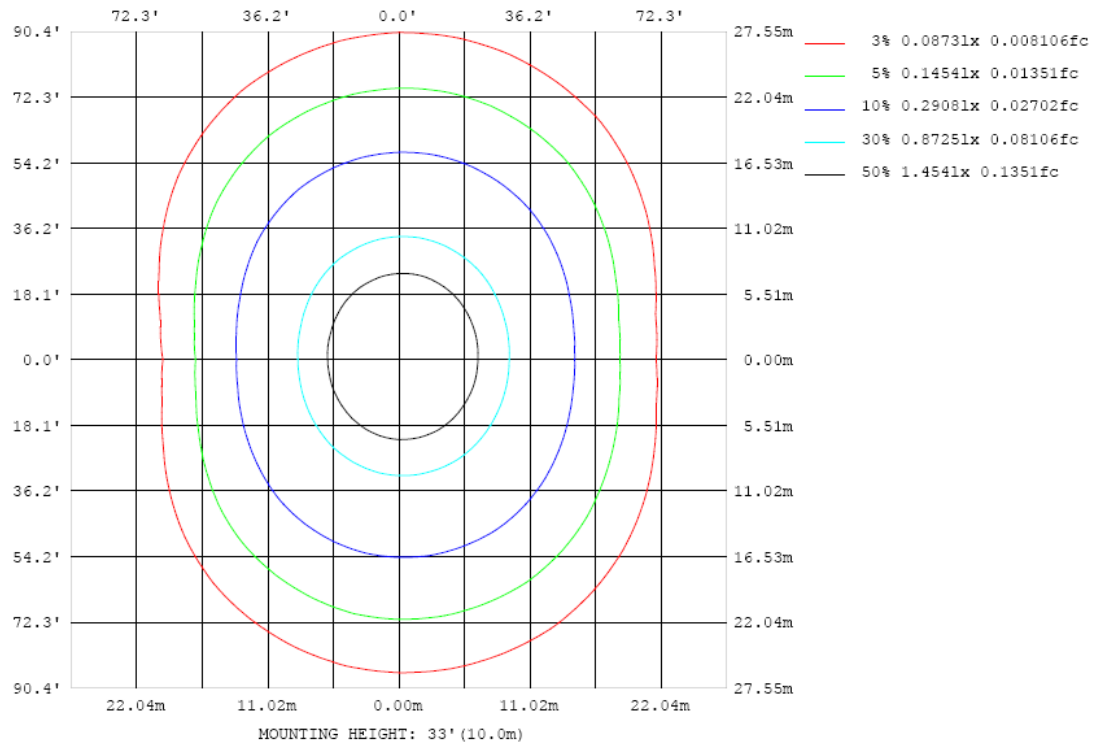


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

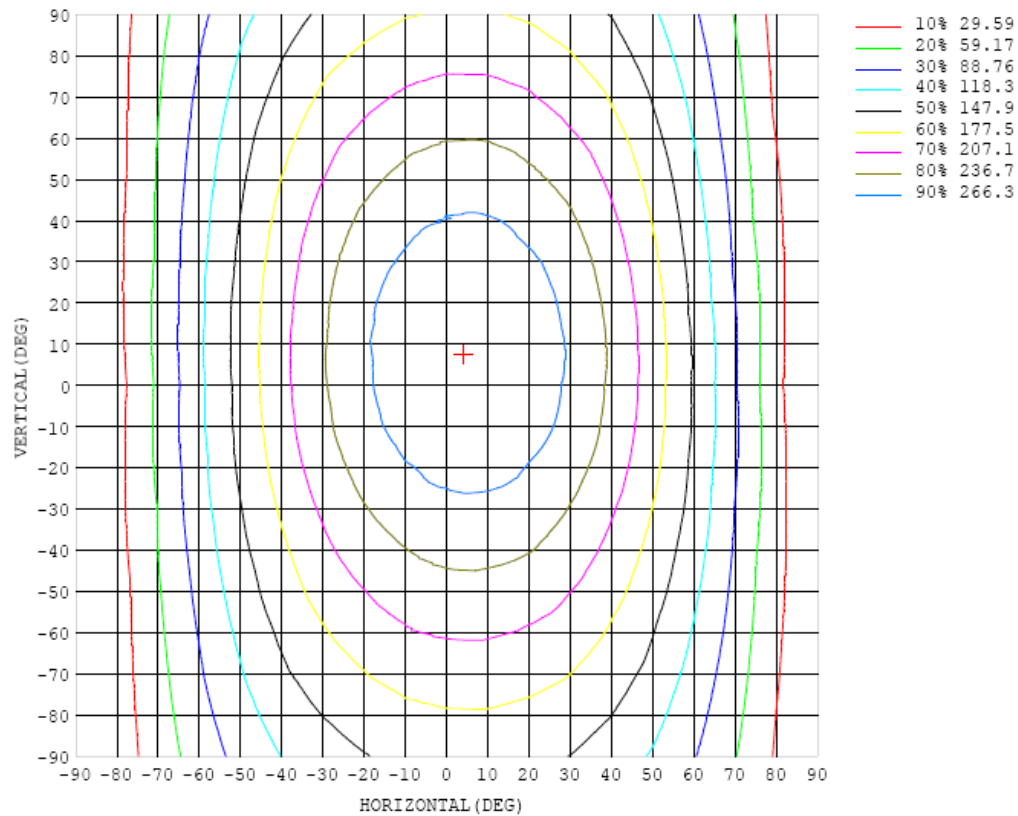


Chart 6: Isocandela Plot

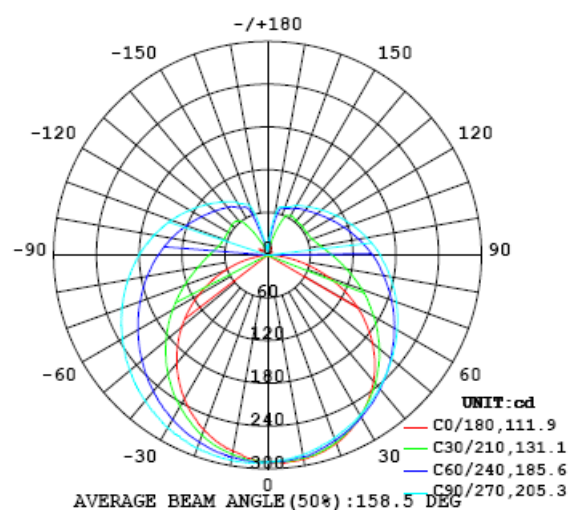


Chart 7: Polar Candela Distribution

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	290	290	290	290	290	290	290	290	290	290	290	290	290	290	290	290	290	290	290
5	292	292	291	290	290	291	290	289	288	288	287	288	287	286	286	284	286	287	286
10	291	291	290	289	289	288	287	286	285	285	284	284	282	280	281	280	281	280	279
15	287	286	286	286	285	283	283	283	281	278	278	276	276	274	273	272	271	272	272
20	281	280	280	280	278	279	277	276	274	274	272	268	268	264	264	262	261	260	262
25	273	272	272	271	270	271	271	270	269	266	265	262	258	256	253	250	249	247	247
30	261	261	261	261	260	262	263	262	261	260	257	252	249	245	240	237	234	231	233
35	247	247	248	249	250	253	255	254	254	252	249	244	239	234	228	222	219	216	217
40	231	231	233	235	239	242	245	246	246	244	241	235	229	223	214	208	202	198	198
45	213	213	216	220	226	231	236	237	237	236	231	226	219	211	201	192	184	179	179
50	192	193	198	204	213	220	226	227	229	227	225	216	208	199	187	176	165	159	157
55	169	171	179	189	199	208	215	218	220	219	214	208	198	187	173	160	148	138	135
60	145	149	159	172	185	196	206	209	211	210	207	198	188	176	160	144	128	116	111
65	119	125	140	156	172	185	195	199	202	201	198	189	178	165	148	129	109	93.7	87.4
70	91.2	101	120	141	159	174	185	190	193	192	188	180	169	156	136	114	91.2	71.8	63.9
75	64.1	76.9	102	126	148	163	175	181	184	183	180	171	159	146	125	101	74.8	51.0	40.8
80	37.9	55.2	84.7	112	136	154	165	172	174	175	170	163	152	136	115	89.9	60.9	33.2	19.7
85	15.8	37.8	71.1	101	126	143	157	162	166	166	162	155	143	127	106	80.4	50.5	20.6	4.86
90	2.15	26.6	60.7	90.4	116	134	148	155	158	158	155	147	134	119	97.9	72.4	43.4	14.4	0.49
95	0.48	20.6	53.0	82.4	107	125	138	146	150	150	146	138	126	111	90.6	66.5	39.1	13.5	0.53
100	0.57	17.8	47.7	75.5	98.9	117	130	137	141	141	138	130	119	105	84.8	61.9	37.3	15.6	0.88
105	1.09	19.9	44.4	70.2	92.3	109	122	129	133	133	130	123	112	98.2	79.9	59.1	37.4	19.7	1.78
110	2.25	23.4	44.1	67.0	86.7	102	114	121	125	125	122	116	106	92.5	76.1	57.5	38.9	24.7	3.92
115	4.33	27.4	45.3	64.2	82.0	96.3	107	114	118	118	115	109	99.7	88.3	73.3	56.9	41.3	30.0	7.36
120	7.28	31.2	47.3	63.4	78.4	90.9	101	107	111	111	108	103	94.4	84.2	71.0	57.3	44.3	35.4	11.9
125	7.57	30.2	50.2	63.1	75.8	86.6	95.3	101	104	105	103	97.5	90.3	80.8	69.7	58.0	47.6	38.2	14.8
130	4.18	24.5	52.9	63.2	73.7	82.8	90.6	95.3	98.3	98.5	96.7	92.4	85.9	78.1	68.7	58.6	49.5	34.6	12.8
135	3.23	26.3	54.2	62.7	72.6	79.8	86.1	90.2	92.9	93.7	92.1	88.2	82.4	75.9	68.6	59.1	53.4	33.2	9.51
140	4.68	28.9	55.2	63.1	71.1	77.5	82.7	85.8	87.9	88.5	87.1	84.2	79.4	74.7	67.0	59.7	56.1	35.0	7.15
145	6.34	22.1	51.8	64.0	69.0	75.2	79.4	82.0	84.1	84.4	83.7	81.0	77.3	71.5	65.9	61.6	55.7	33.0	6.39
150	10.9	14.9	46.3	64.2	68.2	71.3	75.3	78.5	80.3	80.6	79.4	77.3	72.9	69.4	66.3	63.2	53.7	24.8	6.94
155	11.5	12.3	33.1	61.4	67.9	70.3	72.0	73.5	74.4	74.9	74.5	73.1	71.2	69.1	67.4	63.6	48.4	19.3	8.03
160	13.2	9.01	15.5	40.1	64.4	69.0	70.1	71.1	71.9	72.1	71.8	71.0	69.5	68.5	66.8	57.4	36.4	16.6	8.67
165	11.6	9.21	9.53	15.6	32.9	57.6	66.7	69.2	69.7	70.0	69.8	69.5	68.3	63.8	56.4	42.2	26.1	15.4	9.89
170	12.9	10.9	9.85	10.5	10.9	17.4	33.9	46.1	52.3	54.4	54.6	52.6	47.9	41.0	32.2	23.3	18.3	13.2	11.2
175	13.3	11.1	10.8	9.51	8.20	8.55	10.7	13.8	16.6	18.8	19.7	19.7	19.1	18.0	16.5	14.2	12.3	12.7	13.2
180	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59

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	290	290	290	290	290	290	290	290	290	290	290	290	290	290	290	290	290		
5	287	288	289	289	289	290	291	292	293	293	293	294	295	293	292	293	295		
10	281	283	284	286	288	289	290	292	292	293	295	294	294	294	295	293	292		
15	272	275	278	280	284	284	287	289	291	294	294	293	292	293	292	290	290		
20	263	265	269	273	277	280	282	286	288	289	290	290	289	291	287	285	283		
25	250	253	258	262	270	274	277	282	285	288	288	285	284	283	280	278	275		
30	236	240	246	253	260	266	271	277	280	283	282	280	278	275	270	267	265		
35	220	225	232	241	250	258	264	270	273	276	276	273	270	265	259	255	250		
40	202	208	218	229	240	249	256	264	268	271	269	265	261	254	246	240	235		
45	183	191	202	216	227	240	248	256	259	262	261	255	250	242	231	223	216		
50	163	172	186	202	216	230	240	248	252	254	252	245	238	228	216	204	196		
55	141	154	170	188	205	220	230	239	243	246	242	236	227	213	198	184	173		
60	119	134	155	175	193	210	221	230	236	236	233	225	214	199	181	163	150		
65	96.1	115	138	162	182	200	212	221	226	228	223	214	202	184	163	142	124		
70	74.0	97.6	124	150	171	190	202	212	218	217	213	203	191	170	146	120	98.1		
75	54.3	81.2	110	138	162	181	194	203	208	209	203	193	178	156	130	99.8	72.7		
80	36.7	68.4	99.7	128	152	172	184	194	199	199	193	182	167	144	115	81.5	50.0		
85	24.4	57.8	89.9	119	143	163	175	184	190	189	183	172	157	133	103	67.9	31.4		
90	17.9	50.6	82.0	111	134	153	166	176	180	180	174	162	147	123	93.1	57.5	20.1		
95	15.0	45.5	75.6	103	126	145	157	166	172	170	164	153	137	114	85.1	51.2	17.1		
100	15.7	42.6	70.4	96.7	118	137	149	158	161	161	155	144	129	107	79.3	48.3	18.2		
105	17.6	42.2	67.0	90.9	111	129	140	149	153	152	146	136	121	100	74.9	47.6	20.3		
110	20.3	43.1	65.3	86.3	105	121	132	140	143	142	137	127	114	94.3	72.0	48.6	22.6		
115	22.9	44.8	64.8	82.7	99.6	114	124	131	135	134	129	120	107	89.8	70.0	50.3	26.0		
120	25.2	46.6	64.2	80.0	94.5	108	117	123	126	125	121	112	101	85.8	68.4	51.6	28.7		
125	21.9	46.2	64.9	78.0	90.4	102	110	116	118	118	113	106	96.1	82.9	67.5	53.0	29.7		
130	9.68	39.0	65.5	76.0	86.6	96.5	103	109	111	110	107	100	91.5	79.6	66.1	53.9	29.1		
135	3.67	33.9	65.7	74.1	83.6	91.6	97.7	102	104	104	100	94.6	87.1	76.4	66.9	53.8	25.0		
140	4.86	29.4	62.8	71.5	80.4	87.7	92.4	96.2	97.7	97.3	94.3	89.4	82.6	74.0	67.7	47.6	18.3		
145	6.56	18.9	50.7	71.4	75.3	82.8	87.6	90.4	91.5	91.4	88.8	84.2	77.9	72.5	66.4	36.1	12.0		
150	8.56	9.78	31.0	67.7	73.6	76.8	80.4	83.6	85.3	84.3	81.6	78.6	75.1	66.9	55.8	23.8	9.58		
155	9.10	7.00	18.7	41.8	68.5	74.5	76.6	78.1	79.1	79.1	77.6	75.2	64.8	58.3	34.7	12.7	9.24		
160	8.57	7.71	10.9	17.6	34.3	55.5	66.9	72.7	74.3	74.2	69.4	57.2	49.2	32.6	14.8	8.66	11.3		
165	8.26	10.00	9.00	9.18	16.5	21.0	26.0	33.8	40.1	39.8	34.1	27.7	20.6	12.3	8.43	9.00	9.67		
170	10.4	9.86	10.8	11.6	11.3	8.99	8.26	10.2	13.3	8.58	8.63	8.75	11.4	10.7	11.7	10.6	12.4		
175	13.2	12.6	11.9	11.9	12.4	12.2	11.9	12.3	11.2	14.0	14.3	14.3	13.6	12.0	11.8	14.2	15.2		
180	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59	8.59		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jun. 05, 2023	-
Digital Power Meter	PF2010A	HZTE028-01	Aug. 01, 2023	Jul. 31, 2024
AC Power Supply	DPS1060	HZTE001-06	Aug. 01, 2023	Jul. 31, 2024
DC Power Supply	WY12010	HZTE004-03	Aug. 01, 2023	Jul. 31, 2024
Temperature recorder	JM624U	HZTE018-08	Aug. 04, 2023	Aug. 03, 2024
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 04, 2023	Aug. 03, 2024
Standard source	D908	HZTE012-01	Aug. 14, 2018	-
Integrate Sphere system	3M	HZTE015-04	Jul. 24, 2023	-
Digital Power Meter	WT210	HZTE008-01	Aug. 01, 2023	Jul. 31, 2024
AC Power Supply	PCR 500L	HZTE001-07	Aug. 01, 2023	Jul.31, 2024
DC Power Supply	IT6154	HZTE004-04	Aug. 01, 2023	Jul. 31, 2024
Standard source	SCL-1400	HZTE012-06	Nov. 04, 2021	-
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 04, 2023	Aug. 03, 2024
Temperature Meter	TES1310	HZTE017-01	Aug. 04, 2023	Aug. 03, 2024

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 Tubes) 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 Tubes) 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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