

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/C

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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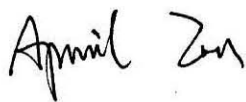
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Report No.: HZ23030039j

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

Review by:



Engineer: April Zou
Apr. 04, 2023

Approved by:



Manager: Jim Zhang
Apr. 04, 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/C

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
171.6	1743.6	10.16	0.9846
CCT (K)	CRI	Stabilization Time (Light & Power)	
4055	82.4	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	: Mar. 28, 2023
Date of Test	: Mar. 30, 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/C
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	0.9846	0.9216
Test Power (W)	10.16	10.47
THD A%	15.04	16.67
Luminous Efficacy (lm/W)	171.6	170.1
Total Luminous Flux (lm)	1743.6	1780.7
Color Rendering Index (CRI)	82.4	
R9	5.4	
Correlated Color Temperature (CCT)(K)	4055	
Chromaticity Chroma x	0.3788	
Chromaticity Chroma y	0.3785	
Chromaticity Chroma u	0.2233	
Chromaticity Chroma v	0.3347	
Duv	0.0013	
Chromaticity Chroma u'	0.2233	
Chromaticity Chroma v'	0.5021	

Special Color Rendering Indices	
R1	80.4
R2	88.6
R3	94.7
R4	81.1
R5	80.4
R6	84
R7	85.9
R8	63.7
R9	5.4
R10	73
R11	80.1
R12	58.7
R13	82.4
R14	97.3

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)	0.086
Power Factor	0.9845
Power (W)	10.19
Luminous Efficacy (lm/W)	172.4
Total Luminous Flux (lm)	1756.8
Beam Angle (°)	106.3 (0°-180°) / 174.4 (90°-270°)
Center Beam Candle Power (cd)	356
Maximum Beam Candle Power (cd)	356.8 (At: C=80.0, Gamma=3.0)
Spacing Criteria	1.23 (0°-180°) / 1.32 (90°-270°)
Zonal Lumens in the 0°-60° Zone	48.19%
Zonal Lumens in the 60°-90° Zone	26.39%
Zonal Lumens in the 90°-120° Zone	15.59%
Zonal Lumens in the 120°-180° Zone	9.83%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

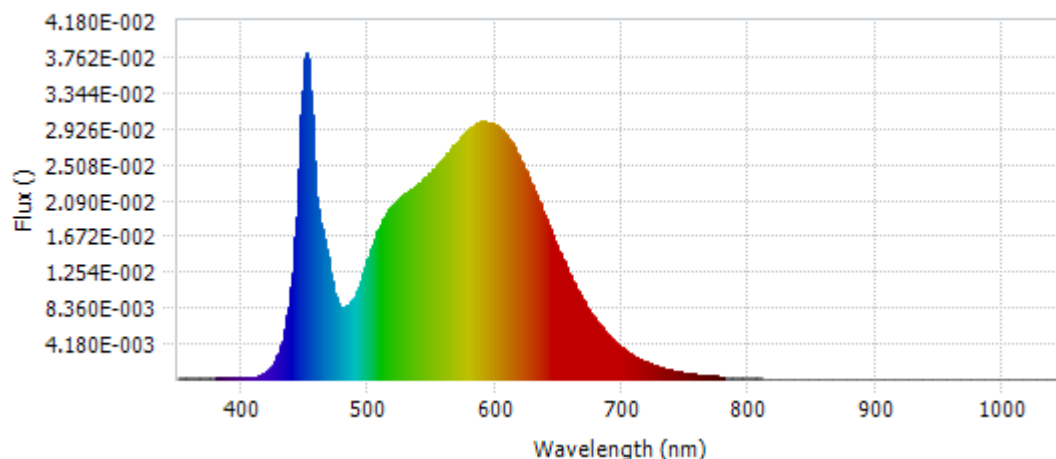
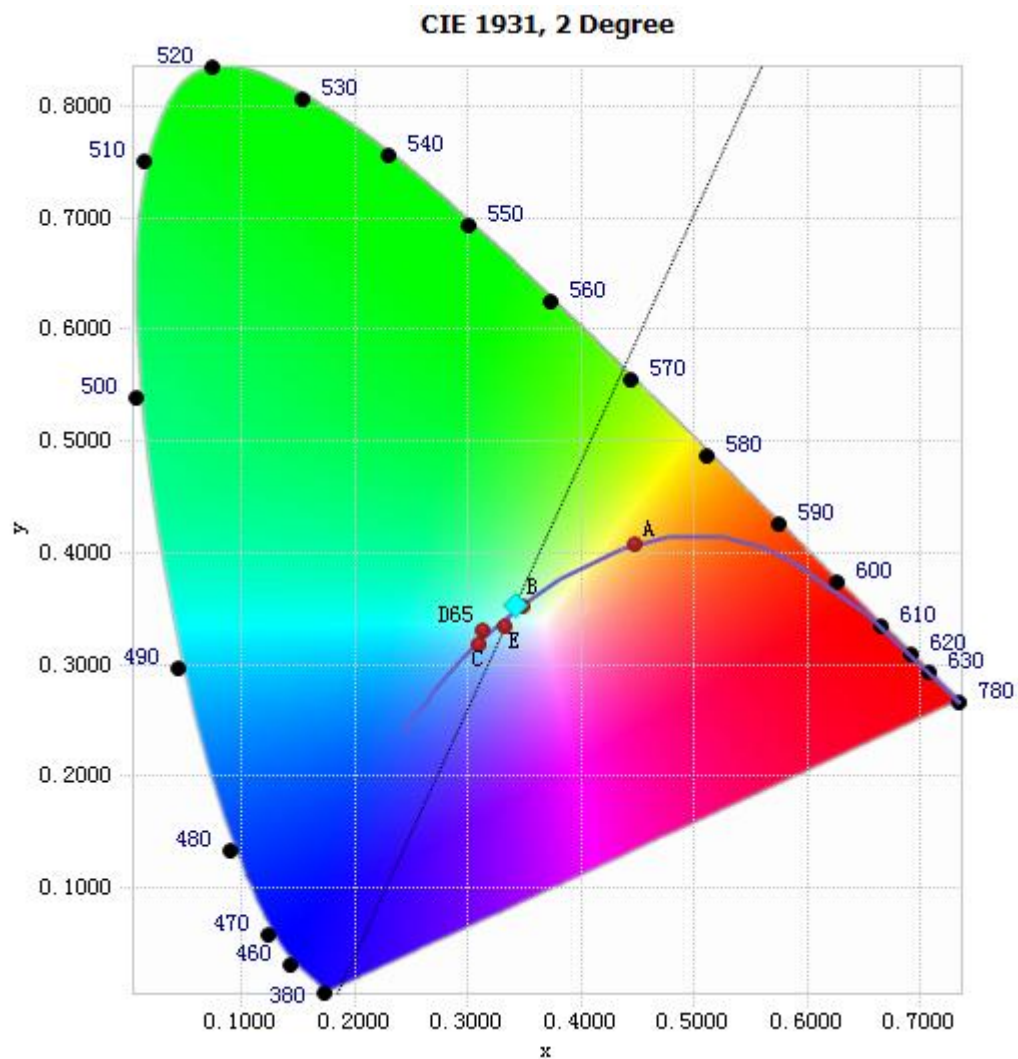


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.76E-04	485	8.87E-03	590	3.01E-02	695	4.30E-03
385	1.58E-04	490	9.91E-03	595	3.00E-02	700	3.67E-03
390	1.72E-04	495	1.20E-02	600	2.97E-02	705	3.13E-03
395	1.45E-04	500	1.43E-02	605	2.91E-02	710	2.68E-03
400	1.11E-04	505	1.64E-02	610	2.81E-02	715	2.29E-03
405	1.54E-04	510	1.81E-02	615	2.70E-02	720	1.93E-03
410	2.51E-04	515	1.96E-02	620	2.55E-02	725	1.65E-03
415	4.79E-04	520	2.04E-02	625	2.40E-02	730	1.41E-03
420	9.37E-04	525	2.11E-02	630	2.22E-02	735	1.21E-03
425	1.85E-03	530	2.17E-02	635	2.05E-02	740	1.02E-03
430	3.50E-03	535	2.23E-02	640	1.87E-02	745	8.67E-04
435	6.62E-03	540	2.28E-02	645	1.68E-02	750	7.40E-04
440	1.25E-02	545	2.36E-02	650	1.50E-02	755	6.36E-04
445	2.46E-02	550	2.42E-02	655	1.34E-02	760	5.40E-04
450	3.75E-02	555	2.50E-02	660	1.18E-02	765	4.69E-04
455	3.07E-02	560	2.59E-02	665	1.04E-02	770	3.92E-04
460	1.99E-02	565	2.68E-02	670	9.00E-03	775	3.41E-04
465	1.64E-02	570	2.77E-02	675	7.82E-03	780	2.87E-04
470	1.24E-02	575	2.85E-02	680	6.78E-03		
475	8.95E-03	580	2.92E-02	685	5.86E-03		
480	8.39E-03	585	2.99E-02	690	5.03E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3788, 0.3785)

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

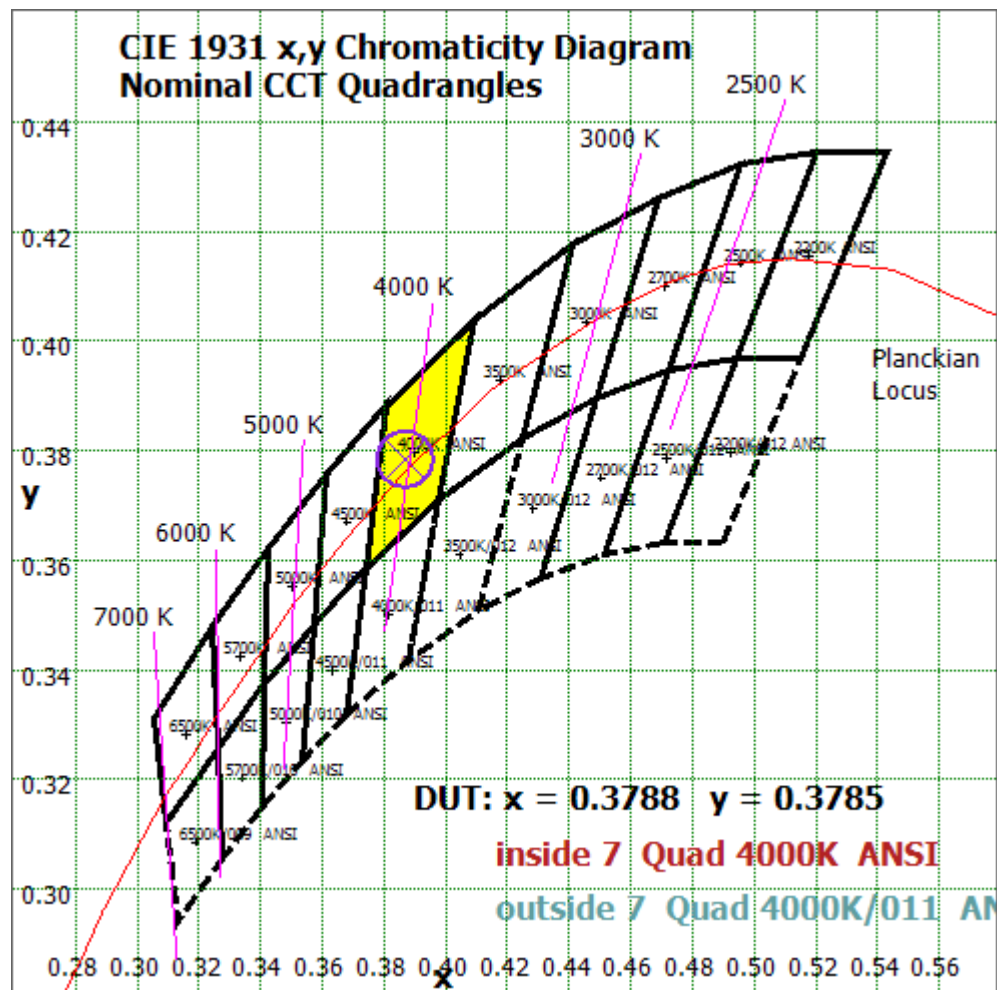


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

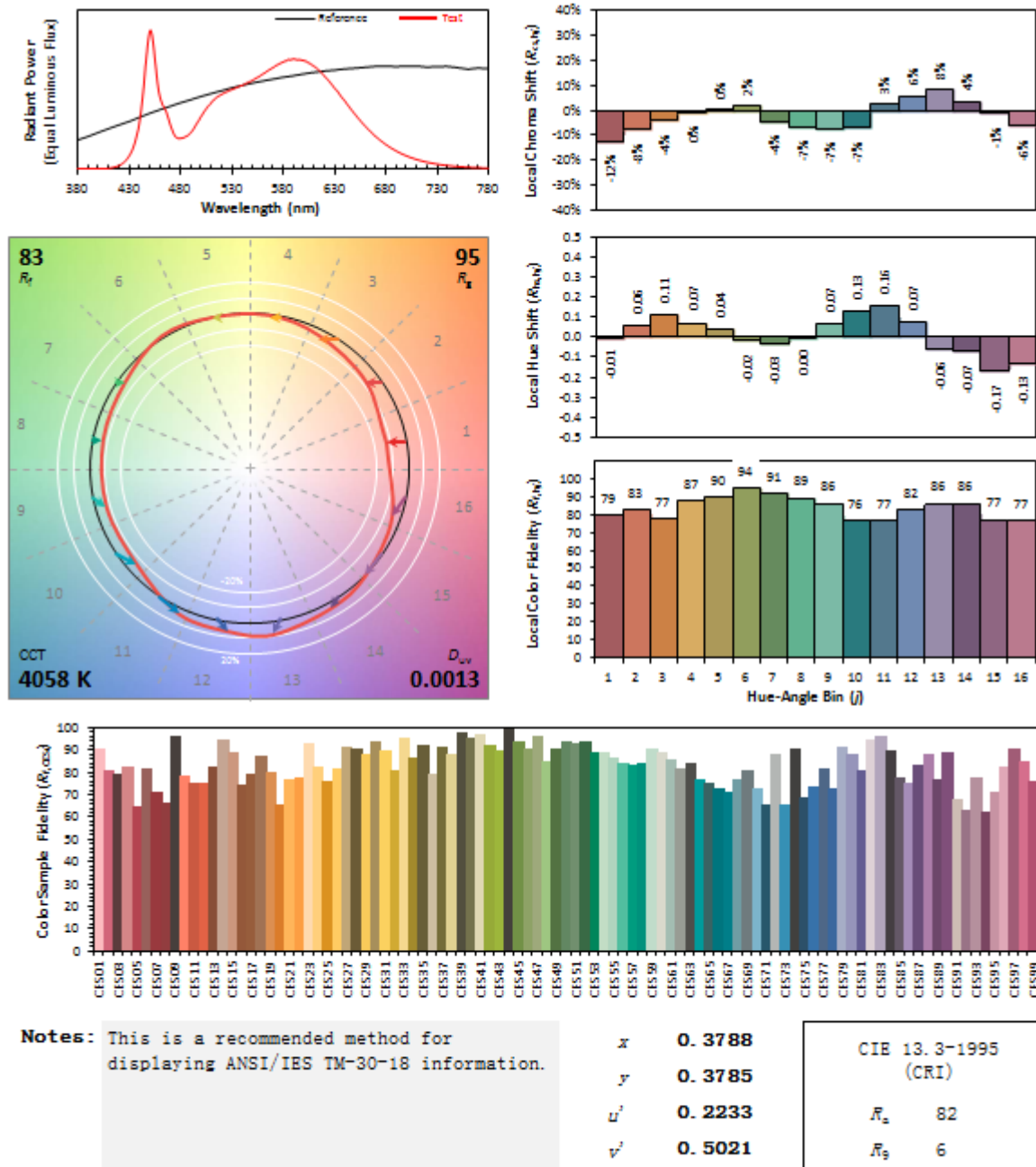
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2023/03/30

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



Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	33.732	1.92%
10- 20	96.652	5.50%
20- 30	147.098	8.37%
30- 40	180.345	10.27%
40- 50	195.279	11.12%
50- 60	193.5	11.01%
60- 70	178.591	10.17%
70- 80	155.265	8.84%
80- 90	129.771	7.39%
90-100	108.21	6.16%
100-110	90.442	5.15%
110-120	75.248	4.28%
120-130	61.388	3.49%
130-140	47.577	2.71%
140-150	34.183	1.95%
150-160	20.685	1.18%
160-170	7.701	0.44%
170-180	1.176	0.07%
Total	1756.8	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	846.606	48.19%
60- 90	463.627	26.39%
0-90	1310.233	74.58%
90- 180	446.61	25.42%
0- 180	1756.8	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

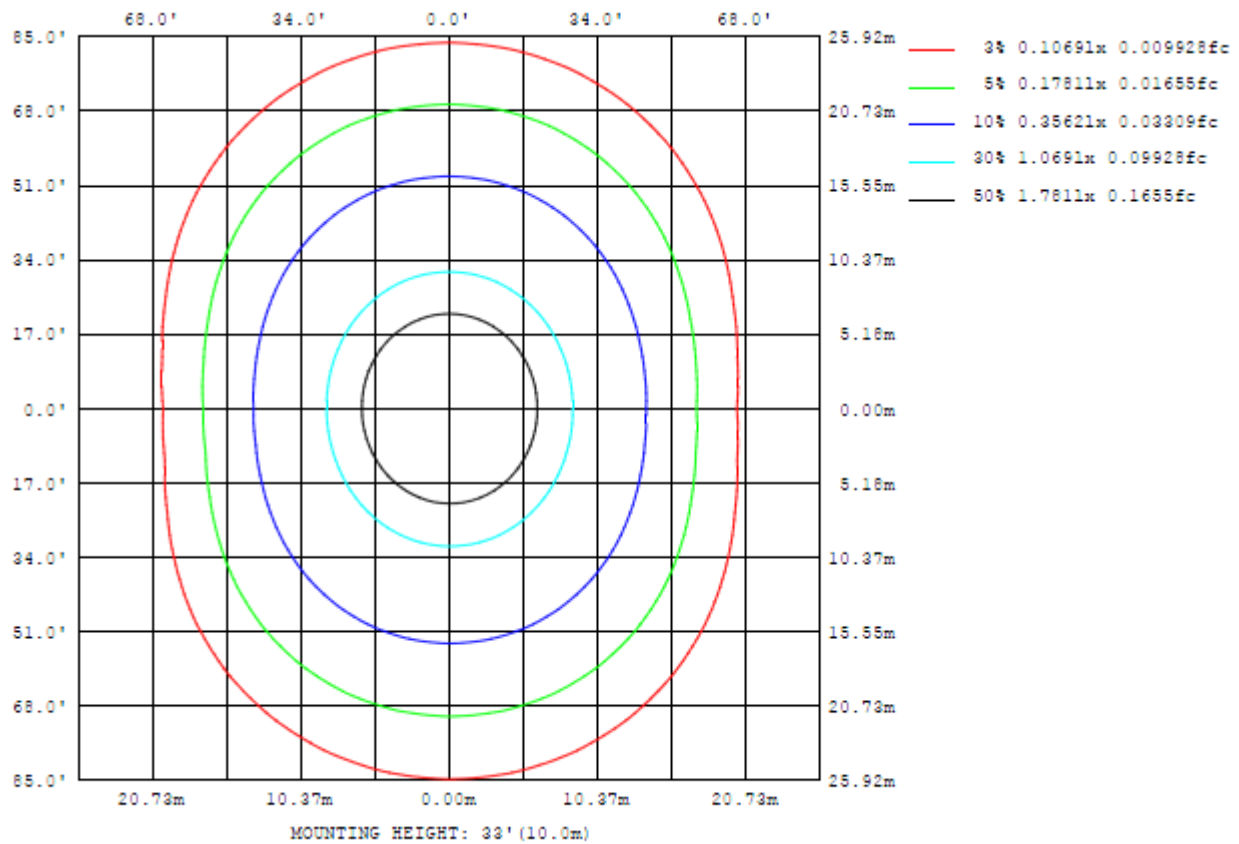


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

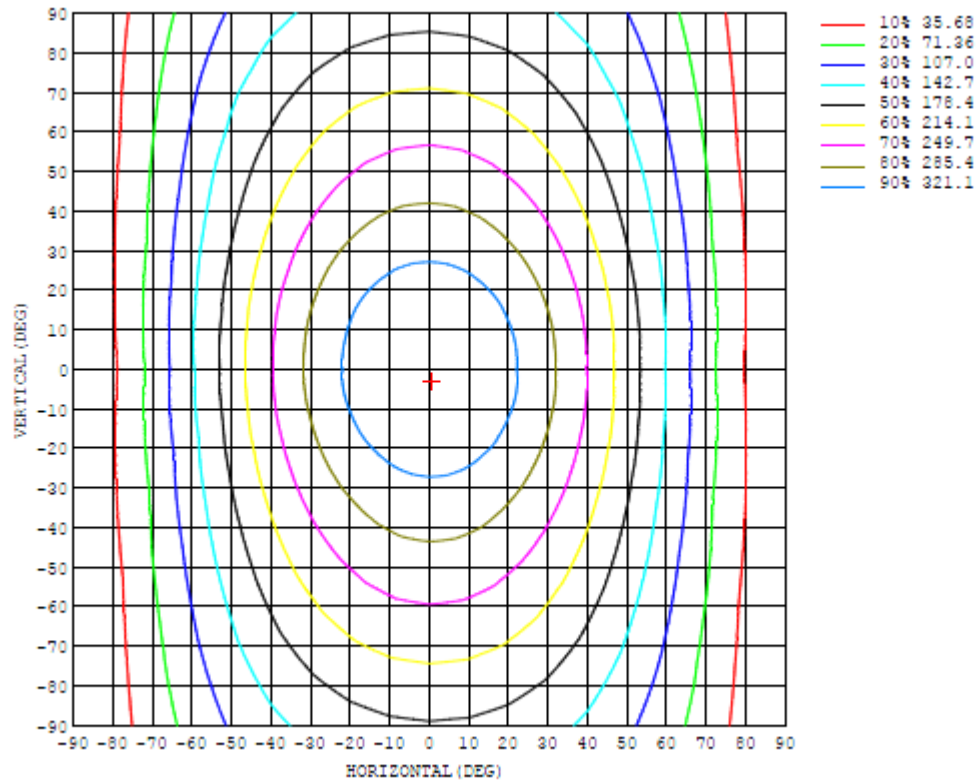


Chart 6: Isocandela Plot

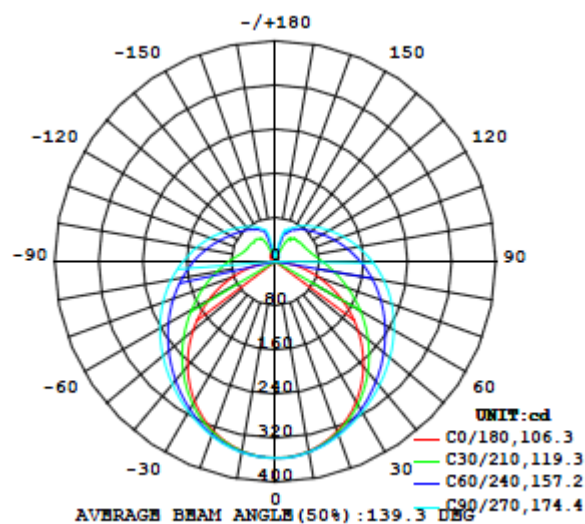


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	356	356	356	356	356	356	356	356	356	356	356	356	356	356	356	356	356	356	356
5	355	355	355	355	355	355	355	356	356	356	356	355	355	355	355	355	355	355	355
10	349	350	350	350	351	350	351	351	352	351	351	350	350	350	350	350	350	349	349
15	340	341	341	342	342	343	344	344	345	344	344	343	343	342	341	341	341	340	340
20	328	329	329	330	332	332	334	335	336	335	335	334	333	332	330	329	328	328	327
25	312	313	314	316	318	321	323	325	326	326	325	323	321	319	316	314	313	312	312
30	294	295	297	299	303	307	311	313	315	315	314	312	308	305	301	297	295	293	293
35	272	274	277	281	287	292	298	302	304	304	303	300	295	290	284	278	274	272	271
40	249	251	255	262	270	277	284	289	293	293	292	287	282	274	266	258	252	248	247
45	223	226	232	241	252	261	271	278	282	282	280	275	268	258	248	237	228	223	222
50	197	200	208	220	233	246	257	265	271	271	269	263	254	242	229	216	204	197	194
55	169	173	184	199	215	230	243	253	259	260	257	250	240	227	211	194	180	169	167
60	140	146	160	178	198	215	230	241	247	249	246	238	227	212	193	174	155	142	139
65	112	120	137	159	181	200	217	228	235	237	234	226	214	197	177	154	132	115	110
70	84.3	93.6	115	140	165	186	204	216	223	225	222	214	201	183	161	136	110	88.6	82.1
75	58.3	69.6	95.0	124	150	173	191	203	211	213	210	201	188	170	146	119	90.1	64.4	55.1
80	33.6	49.1	77.9	109	137	160	178	191	199	200	197	189	176	157	133	105	73.5	44.1	30.3
85	12.0	32.6	64.6	96.4	125	148	166	179	186	188	185	177	164	145	121	92.8	61.3	28.4	9.32
90	0.30	22.4	55.0	86.0	114	137	154	167	174	176	173	165	152	134	111	83.0	52.1	20.0	0.42
95	0.26	16.4	47.6	77.5	104	126	143	155	162	164	161	154	141	124	102	75.2	46.2	17.6	0.25
100	0.23	15.1	42.6	70.7	95.9	117	133	144	151	153	150	143	131	115	93.9	69.1	42.9	18.6	0.19
105	0.22	16.7	40.4	65.9	88.7	108	123	134	140	142	139	133	122	107	87.2	65.4	41.6	21.2	0.20
110	0.29	19.2	39.8	62.5	82.5	100	114	124	130	132	129	123	113	99.0	81.5	62.2	41.7	21.2	0.56
115	1.53	20.4	40.5	60.0	77.5	93.1	106	115	120	122	120	114	105	92.3	76.8	60.1	42.7	27.5	2.41
120	3.63	20.4	41.9	58.4	73.3	87.1	98.4	107	112	113	111	106	97.8	86.7	73.1	58.9	43.5	31.6	5.25
125	5.20	14.1	43.4	57.5	70.0	81.9	91.8	99.1	104	105	103	98.6	91.5	81.7	70.1	58.3	42.5	34.8	8.39
130	6.45	7.60	42.3	55.5	67.5	77.5	85.9	92.3	96.3	97.4	96.1	92.1	85.8	77.6	67.9	55.4	43.3	32.8	10.5
135	7.73	7.17	38.3	55.1	65.9	73.8	80.9	86.3	89.7	90.8	89.6	86.3	81.1	74.2	66.0	54.2	46.6	23.4	12.2
140	8.92	7.36	36.4	53.0	61.9	70.0	76.5	81.0	83.9	84.8	83.8	81.1	76.8	70.4	62.0	52.1	46.6	16.5	13.5
145	9.87	6.31	21.8	47.6	60.8	65.8	70.5	76.0	78.6	79.3	78.6	76.1	70.6	66.3	57.8	53.2	44.5	11.0	14.6
150	10.7	10.4	13.0	45.4	53.8	62.4	66.9	69.5	71.2	71.6	71.2	69.5	66.3	60.6	56.4	50.9	32.7	8.06	15.1
155	11.3	12.0	13.2	26.4	51.9	54.5	63.1	63.8	65.3	65.7	65.2	63.3	62.4	57.2	55.0	42.3	18.6	7.72	15.4
160	11.7	13.2	8.74	16.2	30.1	50.0	58.3	56.7	57.5	58.6	58.3	58.1	60.1	52.2	40.0	24.3	9.46	8.87	15.3
165	11.8	15.8	12.2	10.7	15.6	20.5	33.4	44.6	49.9	51.9	51.6	49.2	41.6	30.6	19.5	10.8	8.13	7.86	15.0
170	15.5	14.7	14.5	13.8	8.60	11.4	14.6	17.3	18.9	19.4	19.4	16.0	12.7	9.78	7.77	8.23	12.7	9.15	15.0
175	19.3	18.8	15.2	14.8	15.2	15.6	15.4	13.5	13.7	12.3	7.17	9.22	13.0	14.9	12.9	9.93	10.2	17.4	15.6
180	18.6	18.4	18.3	18.9	22.5	22.2	22.6	23.6	15.4	7.74	9.60	21.0	23.1	25.2	25.0	23.4	24.1	22.7	18.4

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (D ₅₀ G) y (D ₅₀ G)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	356	356	356	356	356	356	356	356	356	356	356	356	356	356	356	356	356		
5	355	354	354	355	354	355	355	356	355	355	355	355	355	355	355	355	355		
10	349	349	349	350	350	351	351	352	351	351	351	351	350	350	350	349	349		
15	340	340	341	342	343	344	345	346	345	345	344	344	343	342	342	341	341		
20	328	329	330	332	333	334	336	337	336	336	335	334	333	332	330	329	328		
25	312	313	316	318	320	323	325	326	326	325	324	322	320	319	316	314	313		
30	294	296	299	303	306	310	312	315	314	314	312	309	306	303	299	296	294		
35	273	276	280	286	291	295	300	302	303	302	299	295	290	285	280	276	273		
40	250	254	260	268	275	281	286	290	290	289	286	280	274	267	260	254	251		
45	224	231	239	249	258	267	273	277	278	277	272	266	257	248	239	231	226		
50	198	206	217	230	242	252	260	265	266	264	259	251	241	229	217	206	200		
55	172	182	196	211	226	238	247	253	254	251	246	236	224	210	195	182	173		
60	146	158	175	194	210	224	234	240	242	239	233	222	208	192	174	157	147		
65	118	135	156	177	195	210	221	228	229	226	220	208	193	175	154	135	120		
70	92.4	114	138	161	181	197	208	215	217	214	206	195	178	158	136	112	93.4		
75	68.4	94.1	122	148	167	184	195	202	204	201	194	181	165	145	119	92.0	68.7		
80	47.8	77.6	108	134	154	171	183	190	192	189	181	169	152	131	104	74.7	47.0		
85	32.6	64.5	95.3	122	144	159	171	178	179	176	169	157	141	118	91.3	60.8	30.1		
90	23.2	54.5	84.7	111	132	149	159	166	167	164	157	146	129	107	80.8	50.7	20.0		
95	16.2	46.1	75.2	101	122	138	149	154	156	153	147	135	119	97.9	72.4	43.9	16.4		
100	15.3	40.1	67.5	92.0	112	127	138	144	146	143	137	125	110	89.8	66.0	40.1	16.7		
105	16.9	37.9	61.5	84.3	103	118	128	134	135	133	127	116	101	82.9	61.2	38.4	19.1		
110	18.9	37.7	58.2	78.1	95.5	109	118	124	125	123	117	108	94.1	77.3	57.9	38.3	22.6		
115	21.8	38.5	56.2	73.8	89.1	101	110	115	116	114	109	100.0	87.8	72.8	55.9	39.4	26.4		
120	24.9	38.2	55.1	70.3	83.8	94.6	102	107	108	106	101	93.3	82.5	69.3	54.9	39.5	30.1		
125	21.6	40.5	54.7	67.7	79.3	88.9	95.6	99.6	101	98.9	94.4	87.5	78.0	66.7	54.4	42.4	32.0		
130	9.90	40.9	52.9	65.8	75.6	83.8	89.6	93.1	93.9	92.4	88.5	82.4	74.3	64.8	53.1	45.0	28.8		
135	5.30	41.8	53.6	64.0	72.5	79.4	84.4	87.4	88.0	86.7	83.3	78.0	71.2	62.9	54.2	46.0	19.6		
140	6.68	41.7	52.8	61.6	69.5	75.6	79.6	82.2	82.7	81.4	78.5	74.2	68.3	61.2	53.0	46.4	13.1		
145	7.98	31.2	50.0	60.6	66.1	70.9	75.2	77.2	77.7	76.7	74.4	70.4	65.4	59.4	53.1	41.2	8.77		
150	6.11	12.1	47.0	57.7	63.4	67.6	70.3	72.0	72.4	71.6	69.8	67.0	62.3	57.1	52.3	28.6	7.08		
155	9.09	7.45	26.4	46.6	60.0	62.4	65.4	67.6	68.1	67.3	65.1	62.1	59.0	56.3	42.4	16.4	7.05		
160	12.6	7.67	6.88	23.6	39.2	58.8	61.0	62.1	62.1	61.7	60.6	59.6	55.6	44.9	25.7	12.6	7.11		
165	15.6	11.0	8.35	8.23	10.5	21.1	39.8	51.0	52.7	52.3	50.5	44.6	34.1	22.5	13.0	6.96	7.51		
170	15.6	14.2	11.5	7.81	9.65	9.30	5.77	8.28	18.4	20.0	17.8	13.1	11.8	11.1	7.76	9.78	8.46		
175	15.6	15.1	15.1	15.9	14.6	11.3	7.37	7.01	6.27	8.05	7.25	9.38	12.3	15.5	13.4	8.59	12.4		
180	18.4	18.3	18.2	18.0	17.6	17.3	16.9	15.1	13.4	3.98	12.2	16.4	17.8	19.7	20.4	21.1	21.4		

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 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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