

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: 12T8/4F/840/HYB/R

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ22120037b

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

Review by:



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Jan. 05, 2023

Approved by:



Manager: Jim Zhang
Jan. 05, 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: 12T8/4F/840/HYB/R

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)/2	Power Factor
125.5	1868.0	14.89	0.9942
CCT (K)	CRI	Stabilization Time (Light & Power)	
4046	82.7	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	: Dec. 27, 2022
Date of Test	: Dec. 28, 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

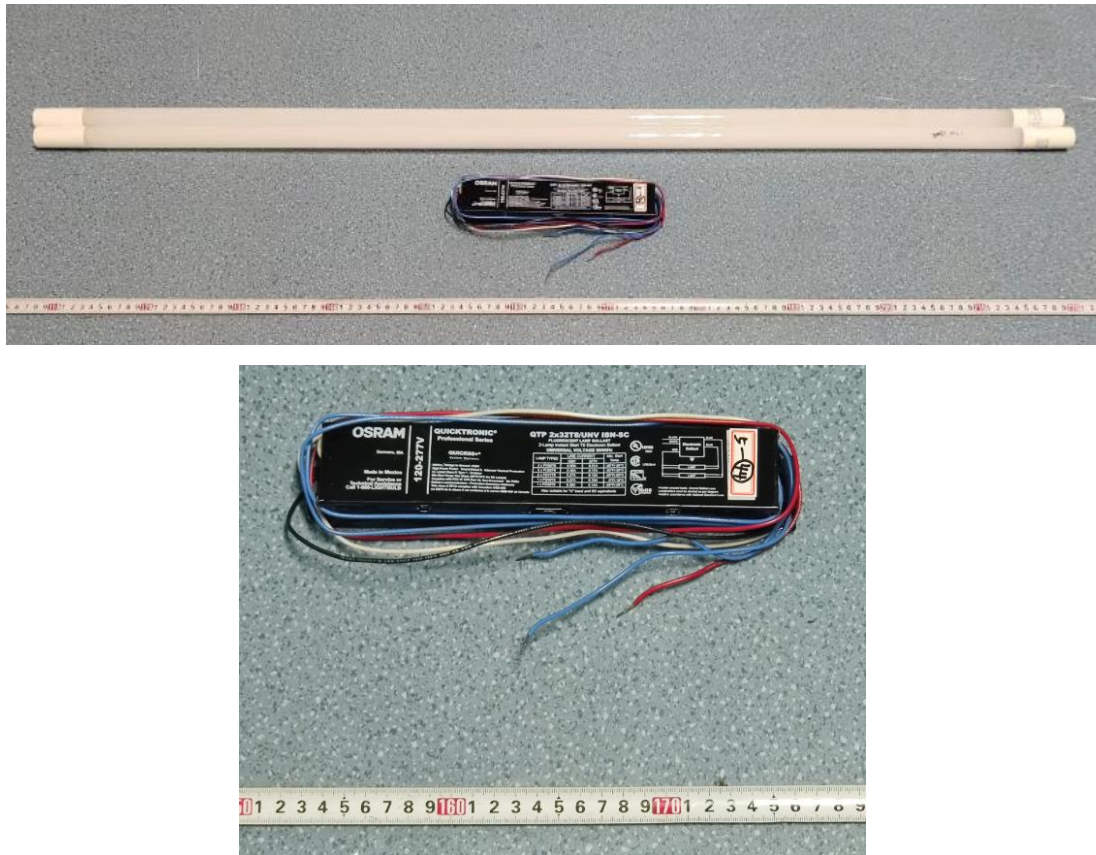


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 12T8/4F/840/HYB/R
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: 4000K LED Tubes supplied by a high frequency fluorescent lamp ballast: QTP 2x32T8/UNV ISN-SC
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)	0.250	0.112
Power Factor	0.9942	0.9587
Test Power (W)/2	14.89	14.88
THD A%	8.67	13.32
Luminous Efficacy (lm/W)	125.5	125.5
Total Luminous Flux (lm)	1868.0	1867.5
Color Rendering Index (CRI)	82.7	
R9	6.6	
Correlated Color Temperature (CCT)(K)	4046	
Chromaticity Chroma x	0.3795	
Chromaticity Chroma y	0.3800	
Chromaticity Chroma u	0.2232	
Chromaticity Chroma v	0.3352	
Duv	0.0018	
Chromaticity Chroma u'	0.2232	
Chromaticity Chroma v'	0.5029	

Special Color Rendering Indices	
R1	80.7
R2	87.7
R3	94
R4	83.1
R5	81.3
R6	83.8
R7	86.3
R8	64.8
R9	6.6
R10	71.7
R11	82.8
R12	65.1
R13	82.2
R14	96.7

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)	0.249
Power Factor	0.9945
Power (W)/2	14.88
Luminous Efficacy (lm/W)	126.4
Total Luminous Flux (lm)	1880.2
Beam Angle (°)	111.0 (0°-180°) / 206.8 (90°-270°)
Center Beam Candle Power (cd)	333
Maximum Beam Candle Power (cd)	333.9 (At: C=100.0, Gamma=3.0)
Spacing Criteria	1.25 (0°-180°) / 1.40 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.61%
Zonal Lumens in the 60 °-90 °Zone	26.65%
Zonal Lumens in the 90 °-120 °Zone	17.23%
Zonal Lumens in the 120 °-180 °Zone	11.51%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

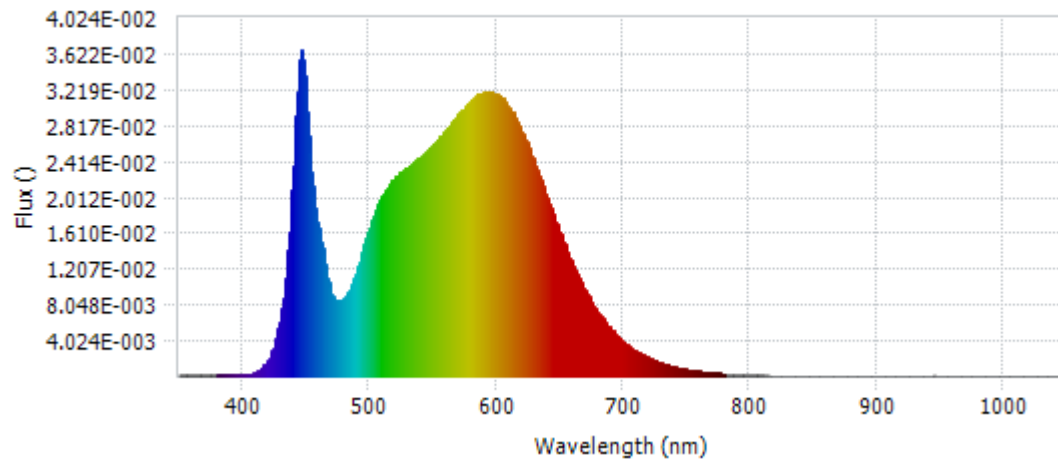
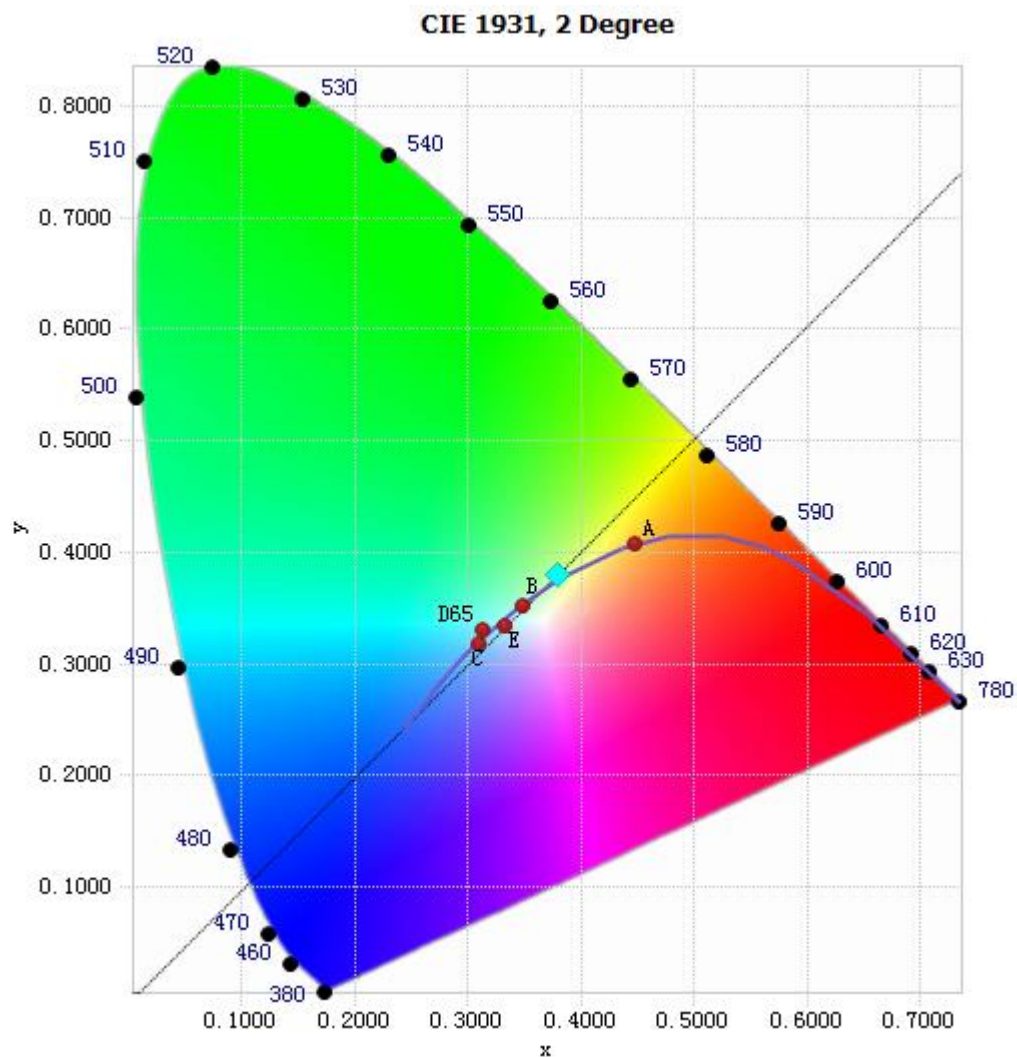


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.22E-04	485	9.94E-03	590	3.19E-02	695	4.61E-03
385	1.59E-04	490	1.19E-02	595	3.20E-02	700	3.94E-03
390	1.34E-04	495	1.44E-02	600	3.18E-02	705	3.36E-03
395	1.34E-04	500	1.67E-02	605	3.11E-02	710	2.85E-03
400	1.49E-04	505	1.86E-02	610	3.02E-02	715	2.44E-03
405	2.07E-04	510	2.02E-02	615	2.90E-02	720	2.09E-03
410	4.41E-04	515	2.14E-02	620	2.75E-02	725	1.78E-03
415	9.43E-04	520	2.23E-02	625	2.58E-02	730	1.50E-03
420	1.85E-03	525	2.29E-02	630	2.41E-02	735	1.28E-03
425	3.66E-03	530	2.34E-02	635	2.21E-02	740	1.08E-03
430	6.88E-03	535	2.40E-02	640	2.01E-02	745	9.24E-04
435	1.27E-02	540	2.46E-02	645	1.82E-02	750	7.85E-04
440	2.37E-02	545	2.53E-02	650	1.62E-02	755	6.69E-04
445	3.56E-02	550	2.60E-02	655	1.44E-02	760	5.71E-04
450	3.19E-02	555	2.68E-02	660	1.27E-02	765	4.82E-04
455	2.13E-02	560	2.76E-02	665	1.11E-02	770	4.20E-04
460	1.66E-02	565	2.85E-02	670	9.72E-03	775	3.54E-04
465	1.27E-02	570	2.94E-02	675	8.42E-03	780	3.11E-04
470	9.32E-03	575	3.01E-02	680	7.28E-03		
475	8.45E-03	580	3.10E-02	685	6.26E-03		
480	8.76E-03	585	3.16E-02	690	5.40E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3795, 0.3800)

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

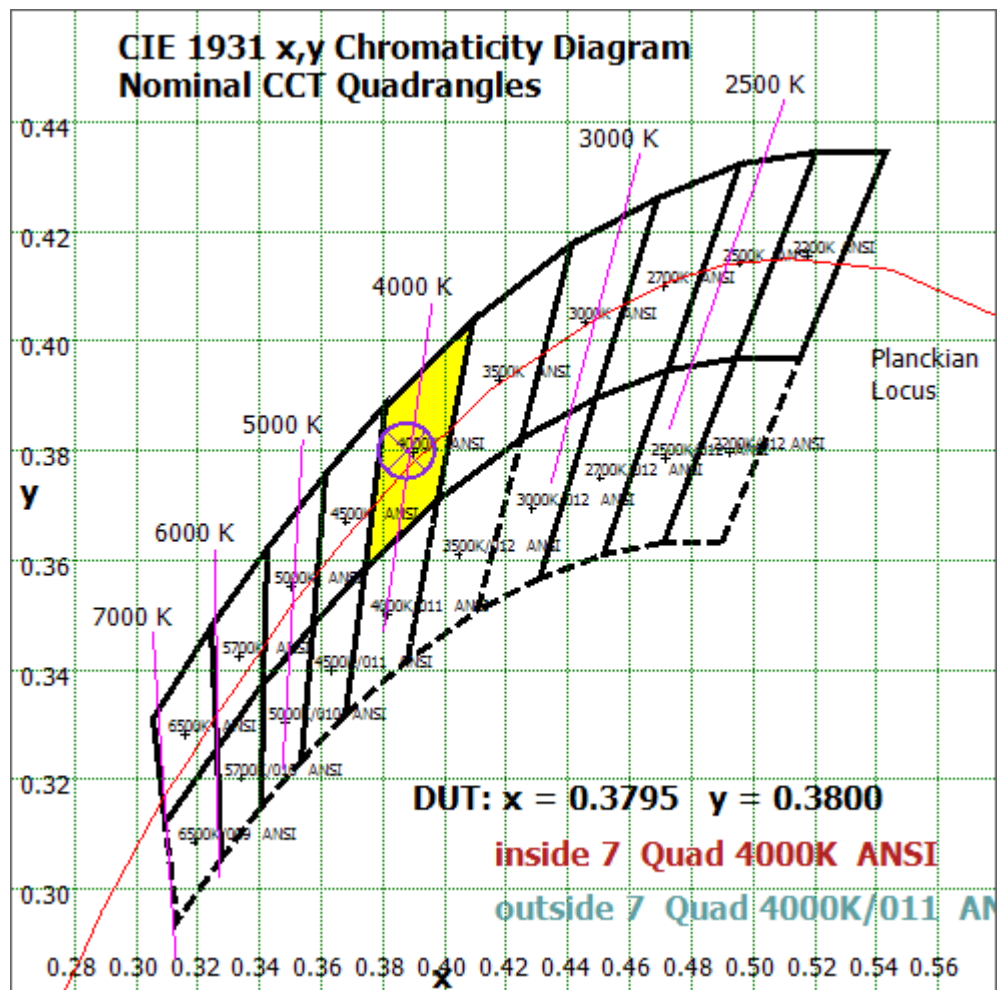


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

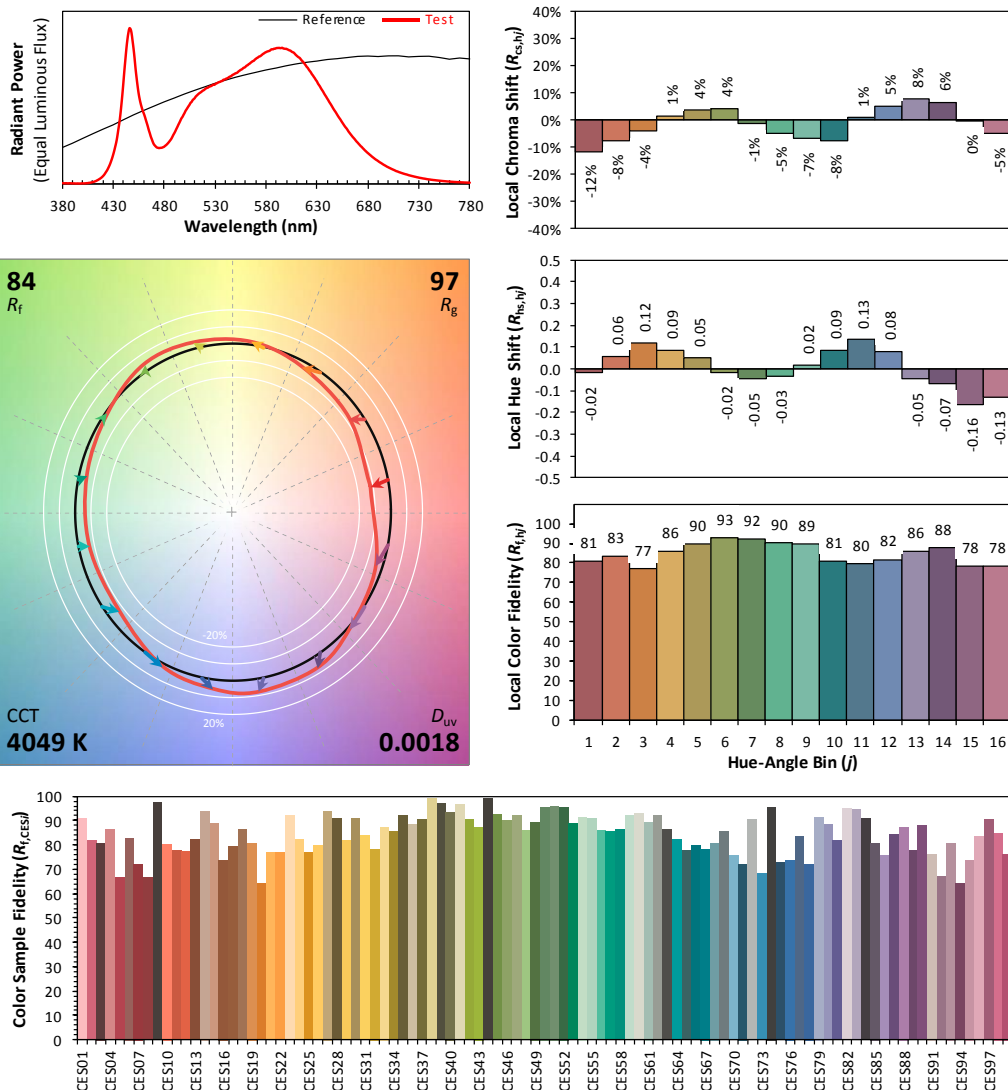
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: GREEN CREATIVE LTD

Date: 2022/12/28

Model: 12T8/4F/840/HYB/R



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

x 0.3795
 y 0.3800
 u' 0.2232
 v' 0.5029

CIE 13.3-1995
(CRI)
 R_a 83
 R_9 7

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	31.588	1.68%
10- 20	91.369	4.86%
20- 30	141.518	7.53%
30- 40	177.507	9.44%
40- 50	196.909	10.47%
50- 60	199.828	10.63%
60- 70	188.742	10.04%
70- 80	167.998	8.94%
80- 90	144.407	7.68%
90-100	124.627	6.63%
100-110	107.653	5.73%
110-120	91.624	4.87%
120-130	75.365	4.01%
130-140	59.191	3.15%
140-150	42.782	2.28%
150-160	26.415	1.40%
160-170	10.713	0.57%
170-180	1.916	0.10%
Total	1880.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	838.719	44.61%
60- 90	501.147	26.65%
0-90	1339.87	71.26%
90- 180	540.286	28.74%
0- 180	1880.2	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

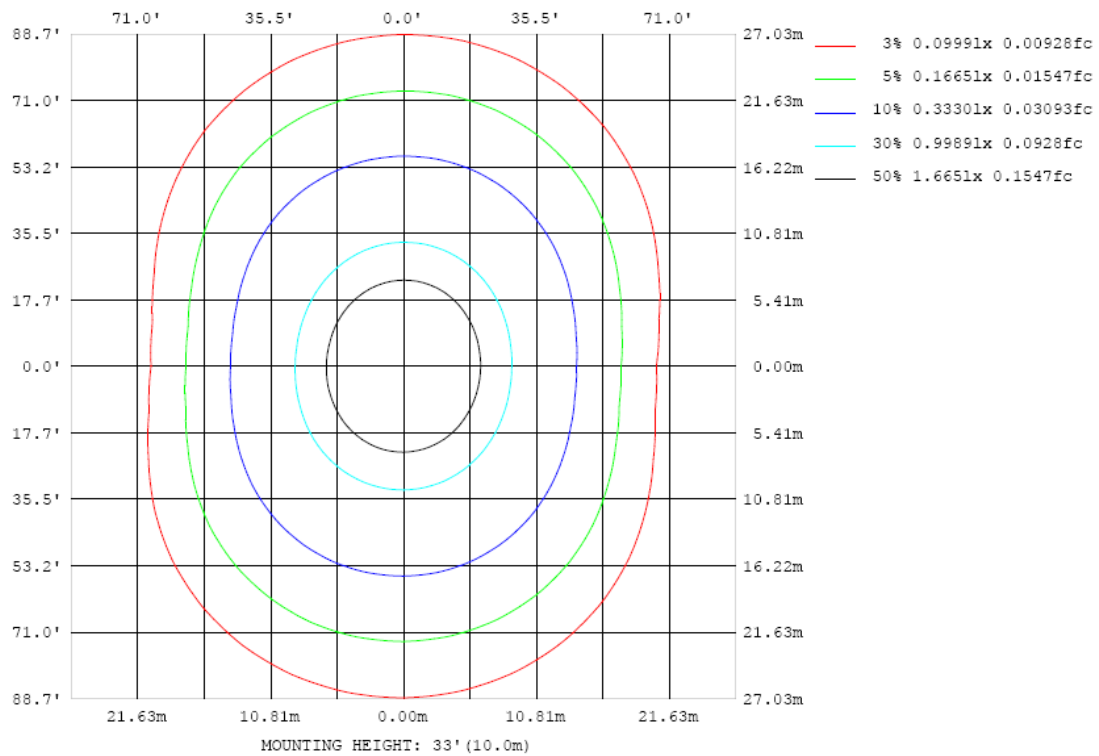


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

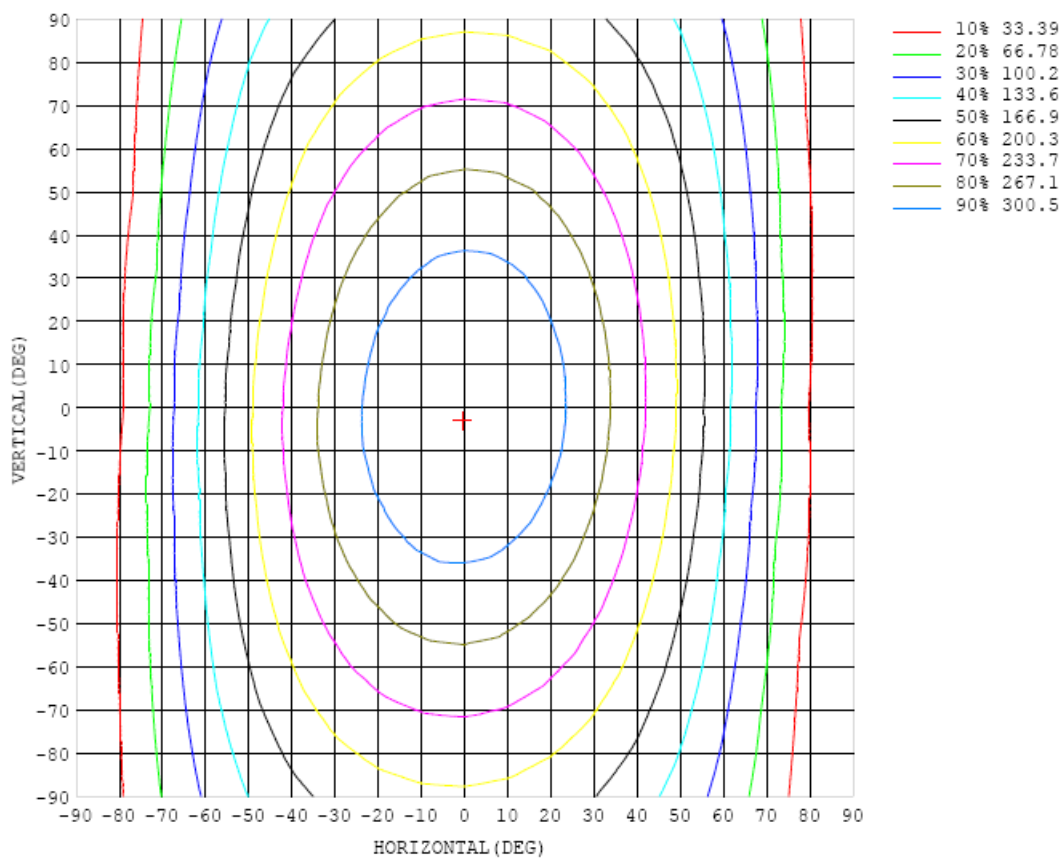


Chart 6: Isocandela Plot

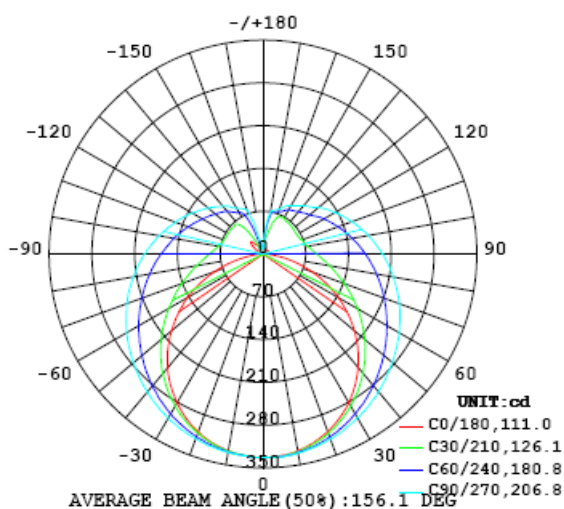


Chart 7: Polar Candela Distribution

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	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333
5	331	332	332	333	333	333	333	333	333	334	333	333	333	333	332	332	332	332	332
10	327	327	328	329	329	329	329	331	330	331	331	331	331	330	329	329	328	327	327
15	320	320	321	322	323	324	326	326	327	327	327	327	326	325	324	323	322	321	320
20	309	310	311	312	314	317	319	320	322	322	322	321	320	318	316	314	313	311	310
25	296	296	298	301	303	307	311	313	316	317	317	315	313	310	306	303	301	298	297
30	280	281	284	287	291	297	302	305	308	309	310	308	304	300	295	290	286	283	281
35	262	263	266	272	278	285	292	297	301	302	302	300	295	289	283	276	270	266	263
40	242	243	248	255	263	273	281	287	292	294	294	291	285	277	269	260	251	246	243
45	219	221	227	236	248	259	269	277	283	286	285	281	274	265	255	243	232	224	220
50	195	197	205	217	232	246	258	267	274	276	276	271	263	252	239	225	211	200	196
55	169	172	183	198	215	232	246	257	264	267	266	261	252	239	224	207	189	176	169
60	142	145	159	179	199	219	234	246	254	257	256	251	241	227	209	188	167	150	143
65	114	118	136	159	184	205	222	235	244	248	246	240	229	214	194	171	145	124	113
70	85.4	91.6	114	142	169	192	211	225	233	237	236	230	219	202	180	154	124	97.7	83.9
75	57.9	66.0	93.0	125	155	180	200	214	223	227	226	219	208	190	167	139	106	73.2	54.9
80	31.9	43.6	75.1	110	142	169	189	204	213	217	215	209	197	179	155	125	89.6	53.3	28.5
85	10.8	25.6	61.5	98.1	131	158	178	193	203	206	205	198	186	168	144	114	77.0	38.1	8.21
90	0.79	15.7	52.0	88.2	121	147	168	183	192	196	194	188	176	158	134	104	67.8	30.1	1.00
95	0.78	12.6	45.9	80.5	112	138	158	172	182	185	184	178	166	149	125	96.2	62.6	27.3	1.76
100	2.07	13.3	42.9	74.5	104	129	148	162	172	175	174	168	157	140	117	90.0	58.9	28.1	3.22
105	4.86	16.4	41.1	70.2	97.6	121	139	153	161	165	164	158	147	131	110	84.9	57.1	31.0	4.97
110	7.53	20.7	42.2	67.7	92.0	114	131	143	152	155	154	148	138	123	104	80.9	56.7	35.2	6.34
115	9.70	25.8	44.0	64.9	87.2	107	123	134	142	145	145	139	130	116	98.5	78.2	57.3	40.3	7.82
120	9.89	27.8	47.2	63.8	82.0	101	115	126	133	136	135	131	122	110	94.0	76.2	58.8	45.6	12.1
125	4.59	25.0	51.0	63.8	78.9	93.6	107	118	125	128	127	122	115	104	90.2	75.1	60.6	50.1	17.9
130	1.82	26.5	55.3	64.4	76.8	89.4	100.0	109	115	118	118	114	108	98.3	87.0	74.5	61.3	51.9	24.6
135	2.50	31.8	57.4	65.3	75.3	85.7	94.9	102	107	110	110	107	101	93.6	84.3	74.1	63.8	54.5	28.3
140	4.05	32.1	56.7	65.8	74.6	82.8	90.3	96.5	101	103	103	100	96.0	89.6	82.1	72.8	64.4	52.6	22.8
145	4.48	23.6	55.6	65.5	72.7	80.9	86.6	91.6	95.0	96.7	96.6	94.8	91.2	86.3	79.6	71.7	67.1	54.8	18.5
150	6.79	14.6	58.1	68.1	70.7	77.5	83.6	87.2	90.0	91.2	91.1	89.7	87.0	82.7	76.0	70.9	66.8	54.2	13.2
155	10.1	16.2	47.8	66.7	70.7	73.2	77.5	82.2	84.8	86.2	86.0	84.7	81.3	77.1	73.9	69.6	64.9	41.2	13.3
160	9.73	13.5	33.7	60.8	69.0	72.0	74.1	76.0	77.3	78.1	78.1	77.7	76.7	74.6	71.6	66.5	56.4	33.4	12.9
165	5.63	13.5	22.7	44.2	62.7	69.9	71.3	72.7	73.9	74.5	74.5	74.0	72.9	71.7	68.6	57.8	41.0	22.2	9.35
170	7.54	12.6	14.4	23.1	38.0	52.1	60.3	66.0	69.3	70.4	70.6	69.7	66.5	59.5	49.8	34.6	23.2	15.1	8.00
175	8.67	10.8	13.6	13.7	14.4	17.9	23.3	27.9	30.4	31.6	31.8	30.6	28.0	24.1	19.5	15.0	10.8	7.89	7.83
180	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5

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	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333	333		
5	331	331	331	331	331	331	332	332	332	332	332	332	332	332	332	332	331		
10	327	327	328	328	328	329	329	329	329	329	329	330	329	328	328	327	327		
15	320	321	321	322	323	324	325	326	326	327	326	325	324	323	321	320	320		
20	310	310	312	314	316	318	320	321	322	322	321	320	317	315	313	311	310		
25	297	298	301	304	308	311	313	316	317	316	315	313	309	305	303	299	297		
30	282	283	287	292	297	302	306	309	310	310	308	305	300	294	289	285	281		
35	264	266	272	279	286	292	298	301	303	302	300	295	289	282	275	269	264		
40	243	247	255	264	274	282	289	293	295	294	291	285	277	268	259	251	244		
45	221	227	237	248	260	271	279	284	286	285	282	275	265	253	242	231	223		
50	197	205	217	233	247	259	268	275	277	276	272	263	252	238	224	210	200		
55	171	182	198	216	233	247	258	265	267	267	261	252	239	222	205	188	175		
60	145	159	178	200	219	235	247	255	258	256	251	240	225	207	187	166	151		
65	118	135	159	184	206	223	236	244	247	246	240	228	212	192	169	145	125		
70	89.5	113	141	169	193	211	225	234	237	236	229	217	199	177	152	124	99.0		
75	62.6	91.4	125	155	180	200	214	223	227	225	218	205	187	164	136	104	74.1		
80	39.1	73.2	110	143	168	189	203	212	215	214	207	194	175	152	122	87.0	52.3		
85	22.0	59.5	97.6	131	157	178	192	201	204	203	196	183	164	141	109	73.1	35.5		
90	13.7	50.2	87.8	121	148	167	181	190	194	192	185	172	154	130	98.9	62.8	25.6		
95	11.2	44.6	80.3	112	138	157	171	180	183	181	174	162	145	120	90.3	55.8	21.7		
100	12.7	42.2	74.7	104	129	148	161	169	173	171	164	152	135	112	83.4	51.6	21.5		
105	15.1	42.1	70.6	97.7	121	139	152	159	162	160	154	144	126	104	78.1	49.7	23.2		
110	17.1	43.4	68.2	92.4	113	130	143	151	153	151	146	134	118	98.0	74.1	49.4	25.7		
115	18.9	45.8	66.8	87.9	107	122	134	141	144	142	136	126	111	92.4	71.2	50.6	28.2		
120	18.6	47.1	66.6	84.4	101	115	125	132	134	133	127	118	104	87.9	69.6	52.6	30.5		
125	12.6	42.1	66.8	81.8	96.1	108	117	123	125	124	119	110	98.4	84.3	68.8	55.2	31.7		
130	4.68	34.4	66.2	78.2	92.1	102	110	115	117	116	111	104	93.6	81.2	67.5	56.4	31.0		
135	2.68	29.8	66.1	74.9	87.4	96.9	103	108	109	108	104	97.9	89.2	77.1	66.2	54.6	26.1		
140	6.37	25.2	63.2	72.9	81.1	91.0	97.5	101	102	101	98.3	92.4	83.2	74.6	67.8	44.6	16.4		
145	9.03	16.5	50.1	71.6	77.3	84.1	88.8	93.1	94.8	93.8	89.9	84.6	79.1	73.8	67.1	30.8	8.48		
150	10.6	10.3	21.9	61.8	71.8	78.8	83.3	85.9	87.0	86.6	84.3	81.2	77.3	72.8	58.1	14.9	6.34		
155	10.4	8.20	8.38	28.6	55.0	69.8	77.7	80.6	81.9	81.7	80.6	78.2	75.5	62.3	30.6	6.96	7.69		
160	11.1	11.4	12.5	8.54	15.4	34.5	51.7	67.9	75.9	77.5	76.2	69.1	56.5	33.2	13.9	5.67	8.42		
165	9.88	10.4	10.9	8.16	9.11	14.3	9.64	15.2	33.7	34.4	32.0	25.8	18.4	12.7	10.6	7.01	7.91		
170	11.4	10.7	8.89	10.0	11.7	12.8	10.3	8.04	9.56	12.7	12.7	12.8	12.5	10.6	12.7	11.5	9.62		
175	10.1	11.9	13.6	12.0	9.36	9.66	11.6	13.2	4.04	15.9	16.1	12.7	9.39	8.78	11.6	11.9	8.97		
180	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5		

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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