



LM-79-08 Test Report

for

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

LED Tube System

Model: 22T5HO/4F/850/EXT/A4

(LED tube model: 22T5HO/4F/850/EXT 4pcs and LED driver model: 24T5HODRIVER/4CH 1pcs)

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist,
Hangzhou, Zhejiang Province, China 311100

Tel: +86 571 86376106

www.ledtestlab.com

Report No.: HZ18070047d/R1

This report is replaced the old report No. HZ18070047d dated Aug. 09, 2018

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

Review by:

Engineer: April Zou
Aug. 28, 2018

Approved by:



Manager: Jim Zhang
Aug. 28, 2018

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: 22T5HO/4F/850/EXT/A4

Luminous Efficacy (Lumens /Watt)	Luminous Flux per lamp (Lumens)	Power (Watts)/4	Power Factor
129.8	3420.0	26.73	0.9973
CCT (K)	CRI	Stabilization Time (Light & Power)	
4925	81.8	60	

Table 1: Executive Data Summary

Note: The above results are recorded/ derived from measurements made using an Integrating Sphere.

Test specifications:

Date of Receipt : Jul. 30, 2018

Date of Test : Aug. 01, 2018

Test item : Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters

Reference Standard : IESNA LM-79-2008 Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

TABLE OF CONTENT

LM-79-08 Test Report.....	1
Test Summary.....	2
Sample Photos.....	4
TEST RESULTS	5
Goniophotometer Method	6
Spectral Power Distribution - Sphere Spectroradiometer Method	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	9
Zonal Lumen Tabulation- Goniophotometer Method	10
Luminous Intensity Distribution Plots- Goniophotometer Method.....	12
Luminous Intensity Data- Goniophotometer Method.....	13
EQUIPMENT LIST	15
TEST METHODS	15
Seasoning of SSL Product.....	15
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	15
Goniophotometer Method	16
Photometric and Electrical Measurements.....	16
Color Characteristics Measurements.....	16
Color Spatial Uniformity	16

Sample Photos

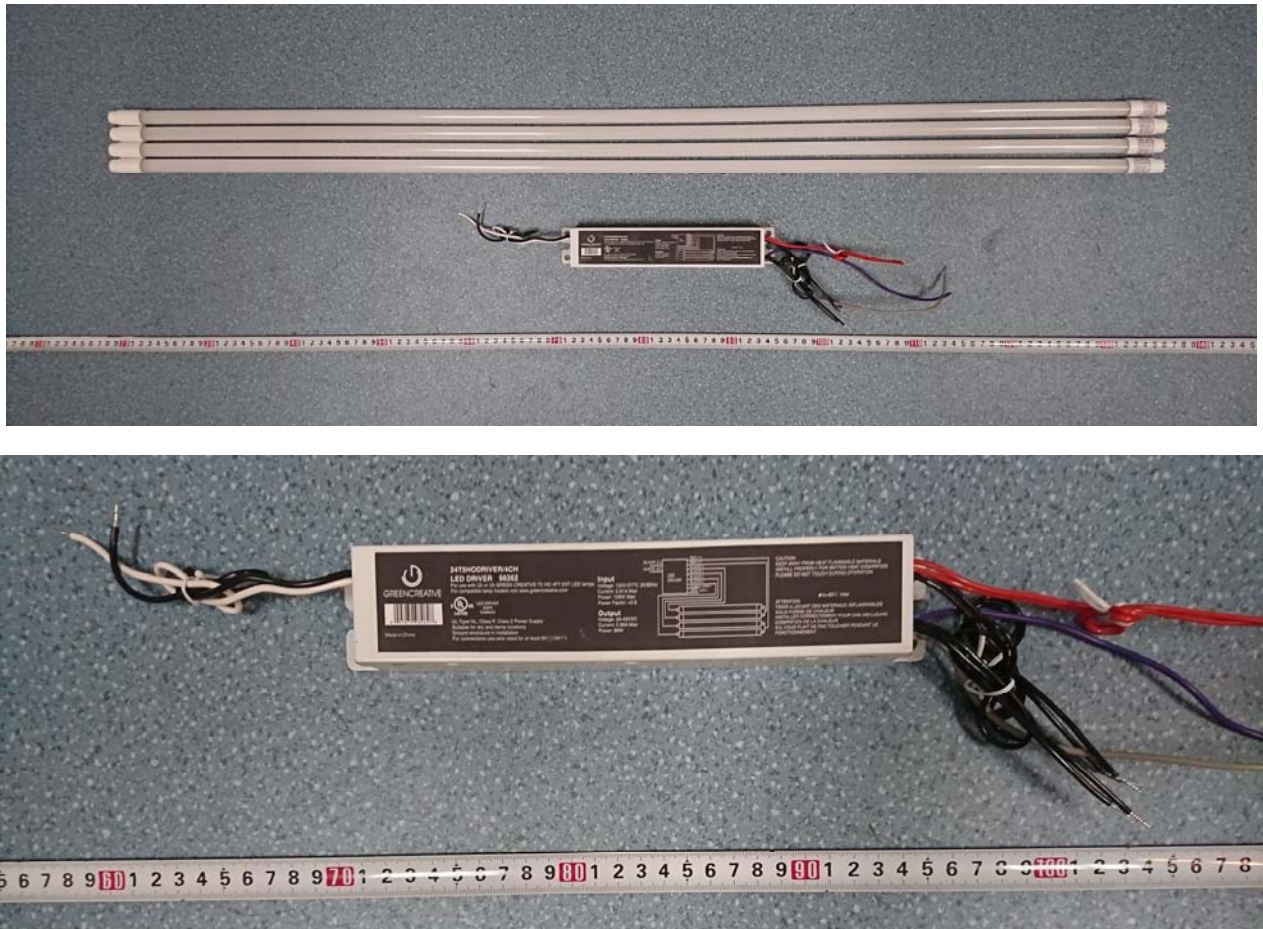


Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED Tube System
Model	: 22T5HO/4F/850/EXT/A4
Electrical Ratings	: 120-277V, 50/60Hz
Product Description	: 5000K LED tube model: 22T5HO/4F/850/EXT 4 LED tubes supplied by a LED driver: 24T5HODRIVER/4CH
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 25.0°C.

Base orientation was light down. Test was conducted without a dimmer in the circuit.

The stabilization time of the sample was 60 minutes, and the total operating time including stabilization was 70 minutes.

Sphere-Spectroradiometer Method

Parameter	Result	
Test Voltage (V)	120.0	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.894	0.397
Power Factor	0.9973	0.9633
Test Power (W)/4	26.73	26.45
THD A%	2.80	5.42
Luminous Efficacy (lm/W)	129.8	131.2
Luminous Flux per lamp (lm)	3420.0	3470.0
Color Rendering Index (CRI)	81.8	
R9	1.6	
Correlated Color Temperature (CCT)(K)	4925	
Chromaticity Chroma x	0.3481	
Chromaticity Chroma y	0.3620	
Chromaticity Chroma u	0.2095	
Chromaticity Chroma v	0.3267	
Duv	0.0039	
Chromaticity Chroma u'	0.2095	
Chromaticity Chroma v'	0.4901	

Special Color Rendering Indices	
R1	78.7
R2	86.8
R3	93.1
R4	81.2
R5	80.6
R6	83.5
R7	85.9
R8	64.3
R9	1.6
R10	69.3
R11	82.7
R12	50.5
R13	80.3
R14	96.3
Rf	81
Rg	94

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 25.0°C.

The photometric distance is 30m.

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)	0.896
Power Factor	0.9961
Test Power (W)/4	26.75
Luminous Efficacy (lm/W)	127.8
Luminous Flux per lamp (lm)	3417.5
Beam Angle (°)	129.5
Center Beam Candle Power (cd)	843
Spacing Criteria	1.28(0°-180°)/ 1.33 (90°-270°)
Zonal Lumens in the 0°-60°Zone	59.46%
Zonal Lumens in the 60°-90°Zone	27.80%
Zonal Lumens in the 90°-120°Zone	9.87%
Zonal Lumens in the 120°-180°Zone	2.87%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

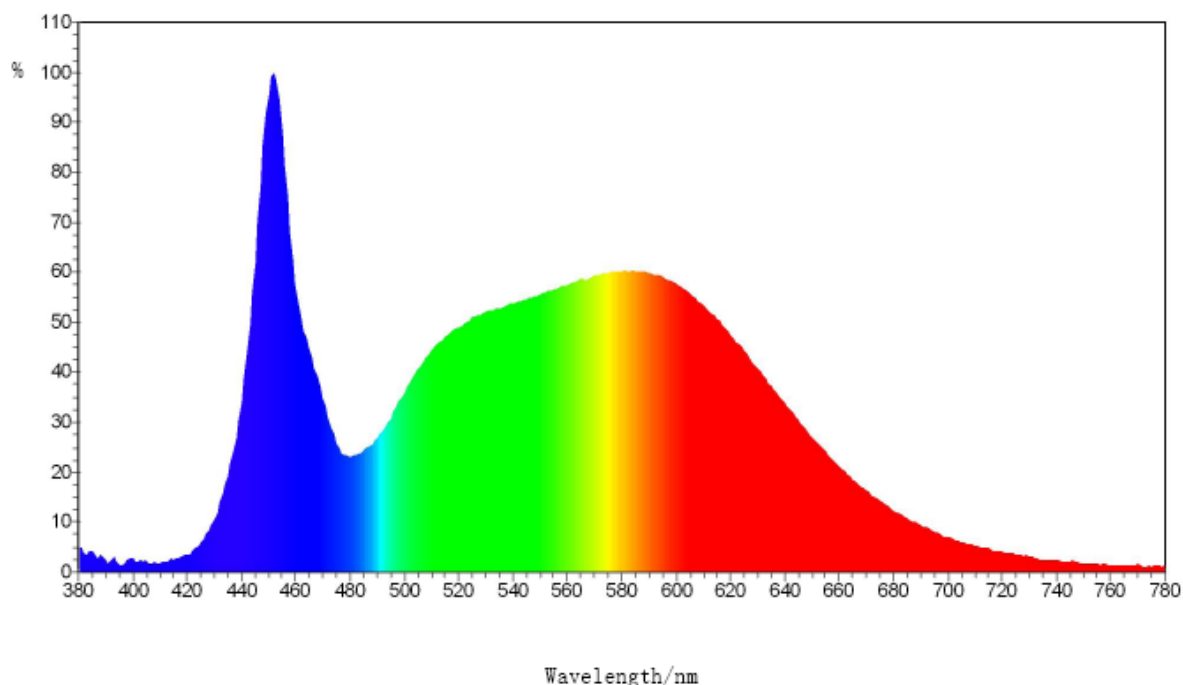
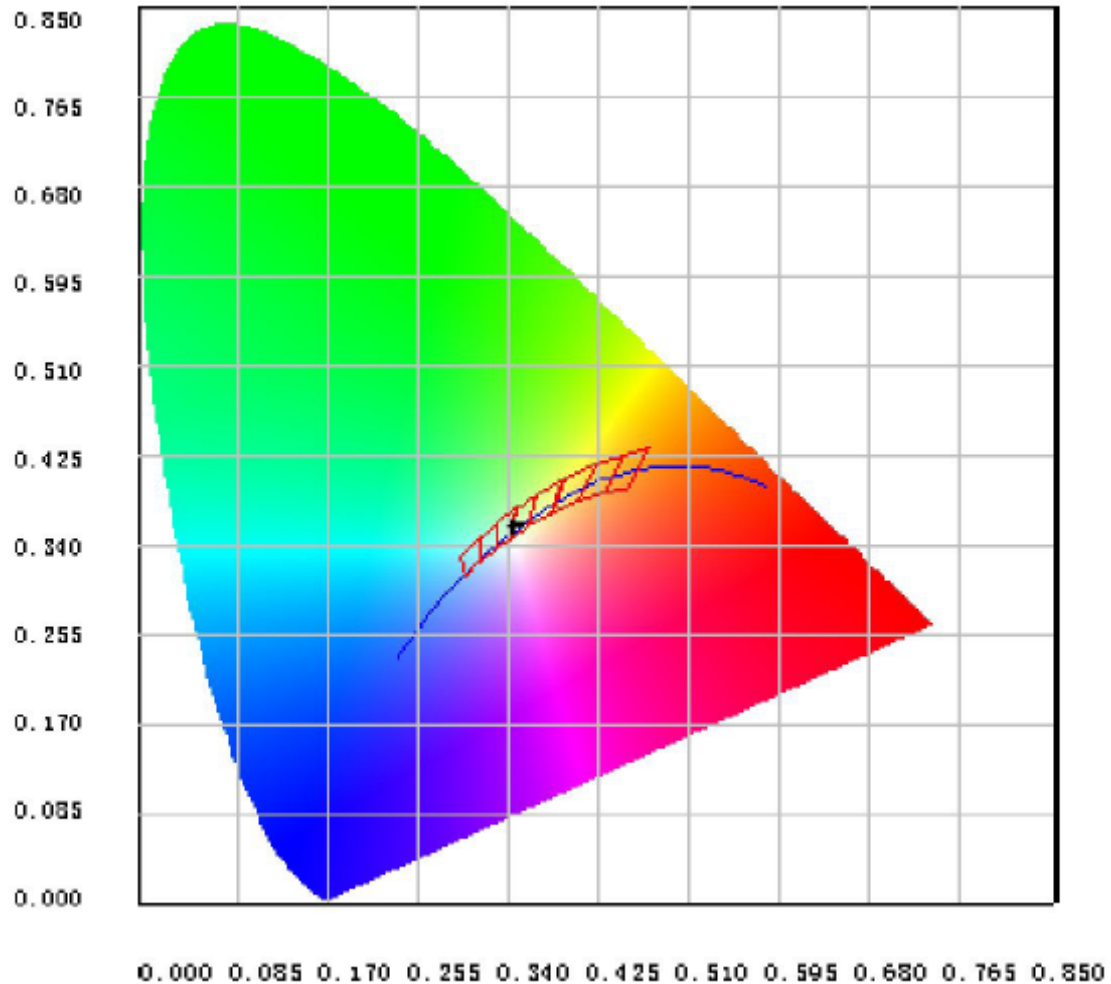


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	4.53E-03	485	2.19E-02	590	5.40E-02	695	7.34E-03
385	3.77E-03	490	2.43E-02	595	5.32E-02	700	6.38E-03
390	2.05E-03	495	2.79E-02	600	5.19E-02	705	5.49E-03
395	1.35E-03	500	3.24E-02	605	5.04E-02	710	4.68E-03
400	2.45E-03	505	3.67E-02	610	4.82E-02	715	4.29E-03
405	2.13E-03	510	4.00E-02	615	4.58E-02	720	3.81E-03
410	1.57E-03	515	4.26E-02	620	4.30E-02	725	3.22E-03
415	2.10E-03	520	4.42E-02	625	4.01E-02	730	2.89E-03
420	3.07E-03	525	4.59E-02	630	3.70E-02	735	2.33E-03
425	5.22E-03	530	4.69E-02	635	3.36E-02	740	2.06E-03
430	9.40E-03	535	4.76E-02	640	3.05E-02	745	1.98E-03
435	1.75E-02	540	4.86E-02	645	2.74E-02	750	1.61E-03
440	3.07E-02	545	4.93E-02	650	2.44E-02	755	1.58E-03
445	5.59E-02	550	5.02E-02	655	2.18E-02	760	1.39E-03
450	8.65E-02	555	5.11E-02	660	1.92E-02	765	1.38E-03
455	7.93E-02	560	5.19E-02	665	1.69E-02	770	1.49E-03
460	5.21E-02	565	5.29E-02	670	1.47E-02	775	1.09E-03
465	4.07E-02	570	5.36E-02	675	1.30E-02	780	1.30E-03
470	3.17E-02	575	5.41E-02	680	1.12E-02		
475	2.33E-02	580	5.43E-02	685	9.68E-03		
480	2.09E-02	585	5.44E-02	690	8.52E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3481, 0.3620)

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

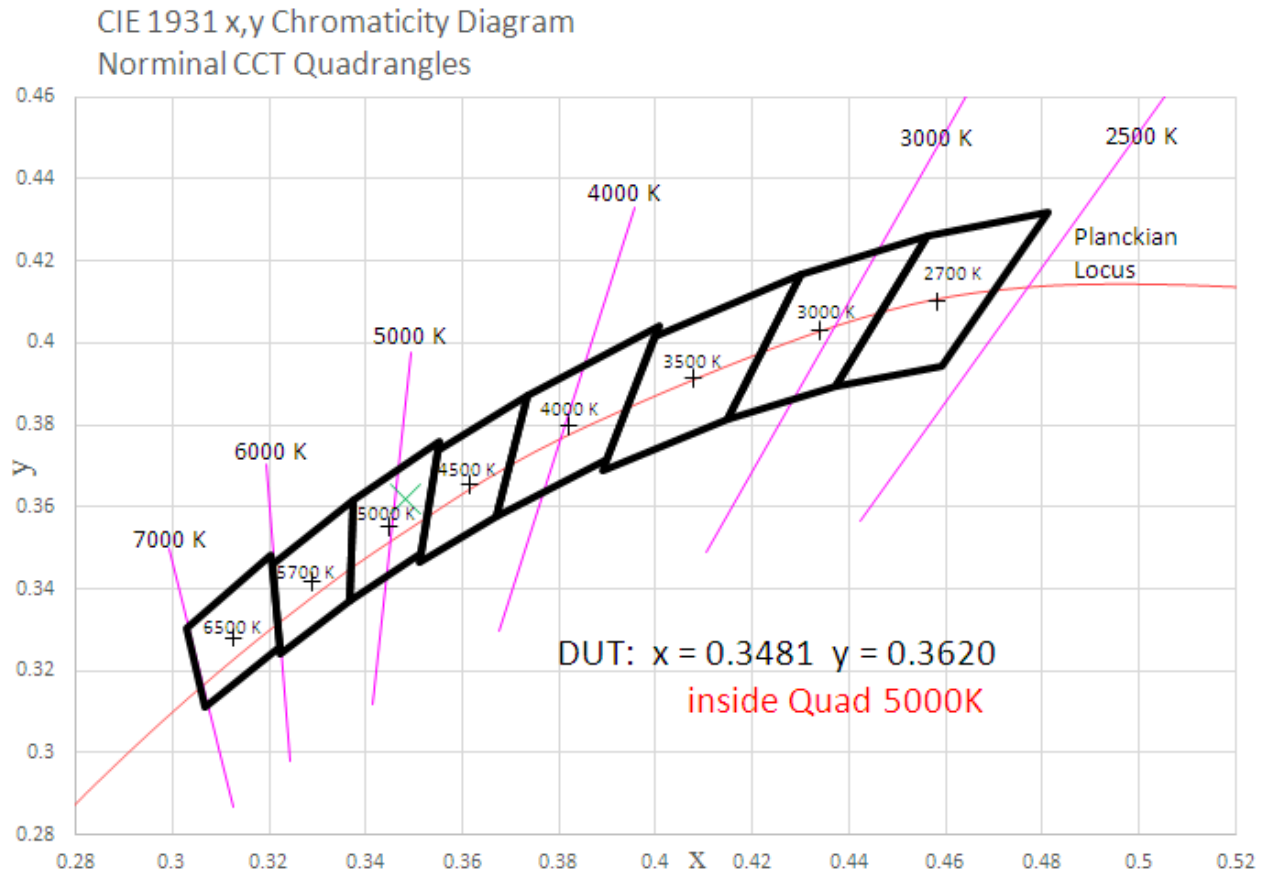


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	79.848	2.34%
10- 20	230.182	6.74%
20- 30	353.812	10.35%
30- 40	437.138	12.79%
40- 50	472.349	13.82%
50- 60	458.576	13.42%
60- 70	402.429	11.78%
70- 80	318.35	9.32%
80- 90	229.292	6.71%
90-100	159.491	4.67%
100-110	108.125	3.16%
110-120	69.624	2.04%
120-130	43.739	1.28%
130-140	26.208	0.77%
140-150	15.193	0.44%
150-160	8.379	0.25%
160-170	3.755	0.11%
170-180	0.973	0.03%
Total	3417.5	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	2031.905	59.46%
60- 90	950.071	27.80%
0-90	2981.976	87.26%
90- 180	435.487	12.74%
0- 180	3417.5	100%

Table 5: Zonal Lumen Data

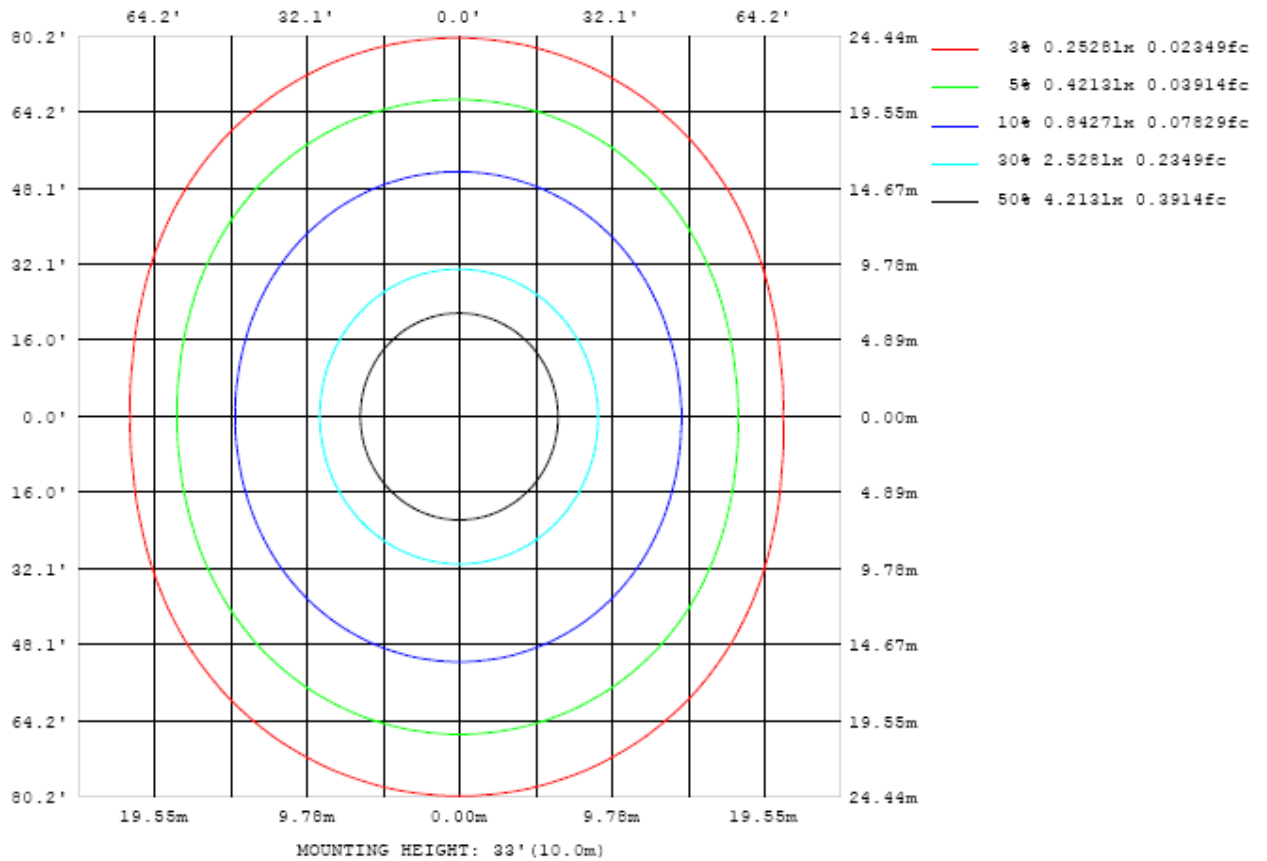


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

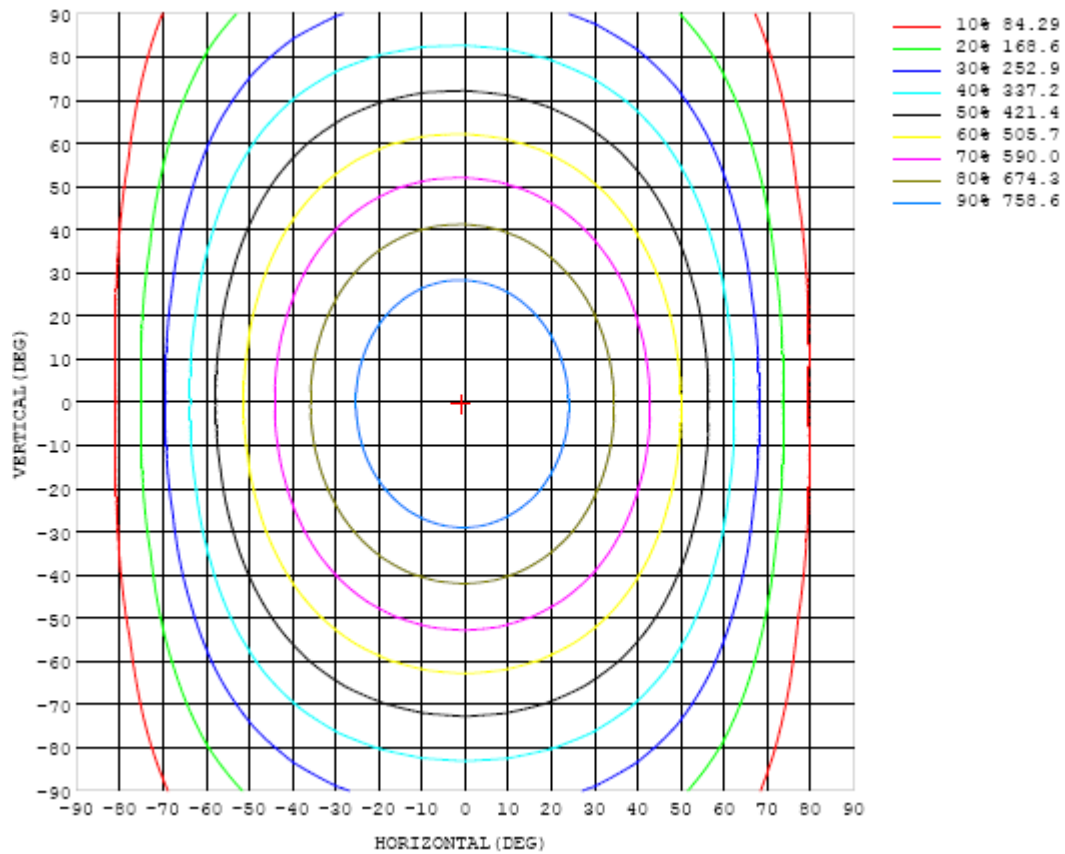


Chart 5: Isocandela Plot

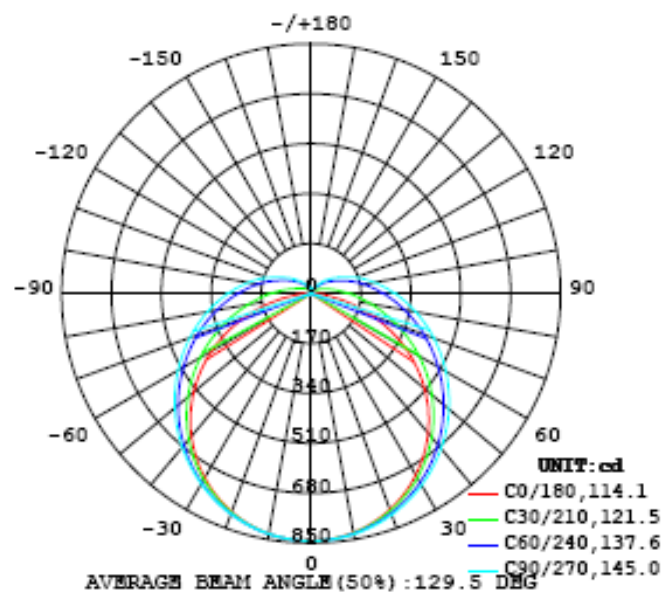


Chart 6: Polar Candela Distribution

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	843	843	843	843	843	843	843	843	843	843	843	843	843	843	843	843	843	843	843
5	838	838	839	838	839	839	839	840	840	840	841	841	841	841	840	841	840	840	840
10	827	827	828	828	829	830	831	832	832	833	833	833	833	832	832	832	831	831	831
15	808	809	810	811	813	815	816	818	819	820	820	820	819	818	817	816	815	814	814
20	783	784	786	788	791	794	797	799	801	802	802	802	800	798	796	794	792	791	791
25	752	753	756	759	764	768	772	776	779	780	780	778	776	772	769	766	763	761	761
30	714	716	719	725	730	737	743	748	752	753	753	751	747	742	737	732	728	726	725
35	669	672	677	684	693	701	710	716	721	723	722	719	713	707	699	693	687	684	682
40	620	623	630	639	650	662	672	681	687	689	688	683	677	667	657	648	641	636	634
45	565	569	578	590	605	620	632	643	649	652	651	645	636	624	611	600	589	583	581
50	505	510	521	537	555	574	590	602	610	613	611	604	593	579	563	547	533	524	522
55	439	446	461	482	504	526	545	559	569	572	570	561	548	531	511	491	474	462	459
60	370	379	398	424	452	478	500	516	526	530	527	517	502	482	458	433	411	396	391
65	297	309	334	367	400	430	454	472	483	487	484	473	456	433	405	375	347	326	319
70	222	237	271	310	348	382	409	429	441	445	441	429	411	385	353	317	282	254	244
75	147	167	210	256	299	336	365	386	399	403	399	386	366	338	303	263	220	183	170
80	77.3	104	155	207	254	293	323	345	358	362	358	345	323	294	256	212	163	118	97.5
85	23.3	55.3	110	164	213	253	283	305	319	323	318	305	283	253	214	167	115	64.4	36.4
90	1.51	26.1	76.2	128	176	216	247	268	282	286	281	268	246	215	176	130	78.8	29.6	3.19
95	0.37	13.0	52.7	99.8	145	183	213	234	247	251	247	233	212	182	144	100	53.6	13.7	0.67
100	0.51	7.17	36.3	76.4	118	154	182	202	215	219	214	202	181	152	117	76.2	35.7	8.12	0.87
105	1.42	6.75	26.9	58.7	94.2	127	154	173	185	189	185	172	153	126	92.8	57.4	26.1	5.90	1.49
110	2.43	6.25	18.6	46.4	74.9	103	127	145	157	160	156	145	126	101	73.4	45.2	20.2	5.79	2.10
115	3.28	6.77	16.3	36.2	61.1	83.8	104	119	129	132	128	118	103	82.8	59.7	36.0	16.1	5.91	2.77
120	4.05	6.99	14.5	25.9	49.7	69.4	85.9	98.8	107	110	107	98.1	84.8	68.0	48.3	28.5	14.5	6.16	3.43
125	4.70	7.26	13.9	23.3	37.4	56.5	70.8	81.4	88.3	90.6	87.9	80.8	69.8	55.5	38.6	22.8	13.3	6.55	4.06
130	5.28	7.38	13.3	20.8	26.2	43.0	56.1	66.8	72.2	74.0	71.9	66.2	56.7	43.9	30.4	21.1	12.5	6.52	4.57
135	5.78	7.47	12.7	19.3	26.4	29.6	42.8	52.4	58.0	59.7	57.5	52.3	43.7	33.5	26.6	18.5	11.6	6.57	5.09
140	6.28	7.85	12.2	17.3	23.7	29.9	32.1	36.1	42.6	44.7	43.0	38.4	32.8	29.7	23.1	16.6	11.0	6.80	5.64
145	6.76	8.38	11.2	15.8	20.6	25.5	30.0	33.8	35.0	35.1	34.7	33.5	29.9	25.0	20.0	14.9	10.7	7.54	6.16
150	7.13	8.94	10.7	14.4	17.7	21.7	25.0	27.6	29.5	30.3	29.6	27.7	24.8	21.2	17.4	13.2	10.5	8.14	6.50
155	7.31	8.86	10.7	12.8	15.7	18.2	20.7	22.6	23.9	24.5	24.0	22.6	20.5	18.1	15.4	11.7	10.1	8.28	6.62
160	7.33	8.35	11.0	11.9	13.9	16.0	17.5	18.6	19.4	19.7	19.4	18.4	17.4	15.6	12.4	10.6	9.02	7.98	6.56
165	7.45	7.94	9.44	11.7	12.4	13.6	14.5	15.3	16.1	16.4	16.1	15.5	14.2	11.2	10.0	8.74	7.91	6.84	6.62
170	7.85	7.86	8.21	9.92	11.6	12.0	12.7	13.1	13.3	13.5	13.5	12.1	9.23	8.26	8.57	8.45	7.95	6.62	7.10
175	9.56	9.53	9.44	9.53	10.1	10.2	10.6	11.2	12.5	12.3	9.02	7.15	8.08	9.14	8.87	8.75	8.51	8.75	9.13
180	0.19	0.18	0.17	0.16	0.14	0.11	0.08	0.05	0.02	0.00	0.04	0.07	0.11	0.14	0.17	0.19	0.21	0.22	0.23

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) y (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	843	843	843	843	843	843	843	843	843	843	843	843	843	843	843	843	843		
5	840	840	840	840	840	840	840	840	840	839	839	839	839	838	838	838	838		
10	831	831	831	831	831	831	832	832	831	831	830	829	828	828	827	827	827		
15	814	815	815	816	817	818	818	818	818	817	816	814	812	811	810	809	808		
20	791	792	794	795	797	799	799	800	799	798	796	793	791	788	786	784	783		
25	761	763	766	768	771	774	776	777	776	774	772	768	764	759	756	753	752		
30	726	728	732	736	741	745	748	750	749	746	743	738	731	726	720	716	714		
35	684	687	693	699	706	712	716	718	718	715	710	703	695	687	679	673	670		
40	636	641	649	658	666	674	681	684	683	680	673	664	654	643	633	625	621		
45	583	590	600	612	624	634	642	646	646	642	634	623	610	596	583	572	566		
50	525	534	548	563	579	592	602	607	607	602	593	580	564	546	529	515	507		
55	463	475	493	513	532	548	559	566	566	561	550	535	516	494	473	455	443		
60	397	413	436	461	484	503	516	523	524	518	507	489	467	442	415	391	375		
65	328	350	379	409	435	457	473	481	482	476	463	444	418	389	357	327	305		
70	257	286	322	357	388	412	429	438	439	433	420	399	371	338	300	262	233		
75	187	225	268	308	342	368	387	397	398	392	378	355	325	289	247	202	164		
80	122	170	218	262	298	326	346	356	358	352	337	314	283	244	198	148	100		
85	69.0	122	174	220	257	286	307	317	320	313	298	275	243	203	156	103	51.6		
90	34.1	85.2	137	182	220	249	270	281	283	277	262	239	207	167	121	69.8	23.2		
95	16.9	58.8	107	151	187	215	236	247	249	243	229	206	175	138	93.1	47.0	10.7		
100	10.4	40.6	81.4	123	158	185	204	215	217	212	198	176	147	111	70.3	32.4	7.16		
105	8.55	30.3	62.6	97.2	130	156	174	185	187	182	169	149	120	87.9	54.1	24.5	6.39		
110	8.19	24.4	49.9	78.6	106	128	145	155	158	153	140	122	98.2	71.0	43.3	19.9	6.57		
115	8.27	20.8	40.9	64.4	87.4	107	121	130	132	127	117	101	81.1	58.2	35.5	17.4	6.92		
120	8.62	18.6	34.4	53.4	72.4	89.0	101	109	110	107	98.0	84.5	67.3	48.3	29.9	16.0	7.40		
125	9.08	17.1	29.5	44.6	60.1	73.9	84.3	90.6	92.2	89.2	81.7	70.3	56.1	40.5	26.1	15.1	7.89		
130	9.52	16.0	25.7	37.6	50.0	61.2	69.9	75.1	76.5	74.0	67.8	58.4	46.9	34.5	23.3	14.4	8.56		
135	10.0	15.1	22.9	32.2	41.9	50.8	57.7	62.0	63.1	61.1	56.1	48.6	39.4	29.9	21.1	14.0	9.32		
140	10.5	14.6	20.7	27.8	35.2	42.1	47.5	50.9	51.7	50.1	46.2	40.3	33.3	26.0	19.2	13.8	10.1		
145	11.0	14.1	18.4	24.2	29.7	34.9	39.0	41.5	42.2	41.0	38.0	33.6	28.4	22.9	17.7	13.5	10.8		
150	11.4	13.7	16.9	21.2	25.2	28.9	31.9	33.7	34.3	33.4	31.3	28.1	24.3	20.4	16.6	13.5	11.3		
155	11.0	13.0	15.3	17.7	21.4	23.9	26.0	27.4	27.8	27.3	25.8	23.7	21.1	18.4	15.6	13.5	11.1		
160	8.82	11.4	13.1	15.0	17.5	19.9	21.3	22.2	22.5	22.3	21.5	20.2	18.5	16.7	15.1	13.6	10.2		
165	7.49	9.45	10.6	11.7	13.4	15.1	17.6	18.1	18.4	18.4	18.0	17.3	16.4	15.5	14.6	13.2	8.91		
170	7.17	7.89	9.41	10.0	10.3	10.4	11.8	14.5	15.5	15.5	15.4	14.9	14.3	13.8	12.8	10.3	8.01		
175	9.12	9.28	9.39	9.85	9.71	9.97	8.95	8.03	9.84	13.6	13.1	11.5	10.8	10.4	10.2	9.65	9.43		
180	0.22	0.21	0.19	0.16	0.14	0.10	0.07	0.03	0.00	0.03	0.06	0.09	0.12	0.14	0.16	0.18	0.19		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	PF2010A	HZTE028-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	DPS1060	HZTE001-06	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	WY12010	HZTE004-03	Aug. 10, 2017	Aug. 09, 2018
Temperature recorder	JM624U	HZTE018-08	Aug. 17, 2017	Aug. 16, 2018
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 16, 2017	Aug. 15, 2018
Standard source	D908	HZTE012-01	Aug. 20, 2017	Aug. 19, 2018
Integrate Sphere system	2M	HZTE015-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	WT210	HZTE008-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	PCR 500L	HZTE001-07	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	IT6154	HZTE004-04	Aug. 10, 2017	Aug. 09, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 16, 2017	Aug. 15, 2018
Temperature Meter	TES1310	HZTE017-01	Aug. 17, 2017	Aug. 16, 2018

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 Two 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 30 min, taken 15 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 30 min, taken 15 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

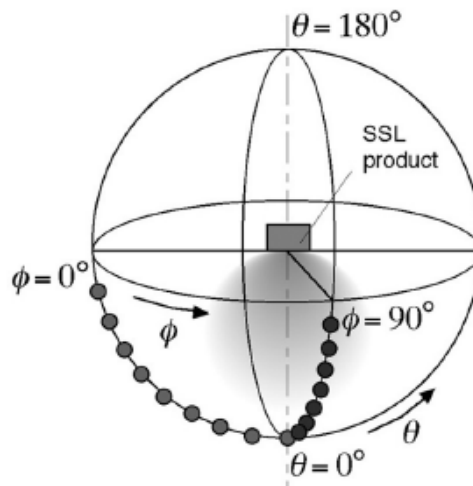
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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.

Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes ($C=0^\circ/180^\circ$ and $C=90^\circ/270^\circ$) and at 10° or less intervals for vertical angle until the light output dropped to below 10% of the peak intensity. The averaged weighted chromaticity coordinate

was calculated from these points. The data was then analyzed to check for delta color differences of the u' , v' chromaticity coordinates. The spatial non-uniformity of chromaticity, $\Delta u'v'$, is determined as the maximum deviation (distance on the CIE (u' , v') diagram) among all measured points from the spatially averaged chromaticity coordinate.

The geometry for the chromaticity measurement using gonio-spectroradiometer is shown as following.



*** 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.