LM-79-08 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 Track Light

Model: ORB/M/927/SP/DIM120V/xx/yy

Where xx mean different type of Adaptor, could be J, H, L, CM, GES, TEK.

Where yy mean different color of product, could be WH, SV, BL.

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.: HZ20120037s

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

Review by: April Zou

Engineer: April Zou

Feb. 03, 2021

Approved by:

Manager: Jim Zhang

Feb. 03, 2021

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: **ORB/M/927/SP/DIM120V/H/BL**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
87.1	1791.5	20.57	0.9821

CCT (K)	CRI	Stabilization Time (Light & Power)
2703	92.9	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 : Dec. 23, 2020

Date of Test : Jan. 08, 2021

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
ANSI/IES TM-30-18 IES Method for Evaluating Light Source Color Rendition

TABLE OF CONTENT

SAMPLE PHOTO

Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Track Light
Model	: ORB/M/927/SP/DIM120V/H/BL
Electrical Ratings	: 120V, 60Hz, 20W
Product Description	: 2700K
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 ℃.

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 65 minutes.

Sphere-Spectroradiometer Method

Parameter	Result
Test Voltage (V)	120.0
Voltage frequency (Hz)	60
Test Current (A)	0.175
Power Factor	0.9821
Test Power (W)	20.57
THD A%	11.25
Luminous Efficacy (lm/W)	87.1
Total Luminous Flux (lm)	1791.5
Color Rendering Index (CRI)	92.9
R9	62.3
Correlated Color Temperature (CCT)(K)	2703
Chromaticity Chroma x	0.4616
Chromaticity Chroma y	0.4143
Chromaticity Chroma u	0.2620
Chromaticity Chroma v	0.3527
Duv	0.0012
Chromaticity Chroma u ’	0.2620
Chromaticity Chroma v’	0.5290

Special Color Rendering Indices	
R1	93
R2	95.7
R3	97.2
R4	93.5
R5	92.4
R6	95.1
R7	93.2
R8	83.2
R9	62.3
R10	89.1
R11	94.5
R12	81.6
R13	93.6
R14	97.6

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 25.1 ℃.

The photometric distance is 2.47 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)	0.176
Power Factor	0.9830
Power (W)	20.77
Luminous Efficacy (lm/W)	92.4
Total Luminous Flux (lm)	1919.1
Beam Angle (°)	14.9 (0^o-180^o) / 14.6 (90^o-270^o)
Center Beam Candle Power (cd)	22030
Maximum Beam Candle Power (cd)	22035 (At: C=270.0, Gamma=0.5)
Spacing Criteria	0.26 (0^o-180^o) / 0.26 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	99.02%
Zonal Lumens in the 60 °-90 °Zone	0.91%
Zonal Lumens in the 90 °-120 °Zone	0.00%
Zonal Lumens in the 120 °-180 °Zone	0.07%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

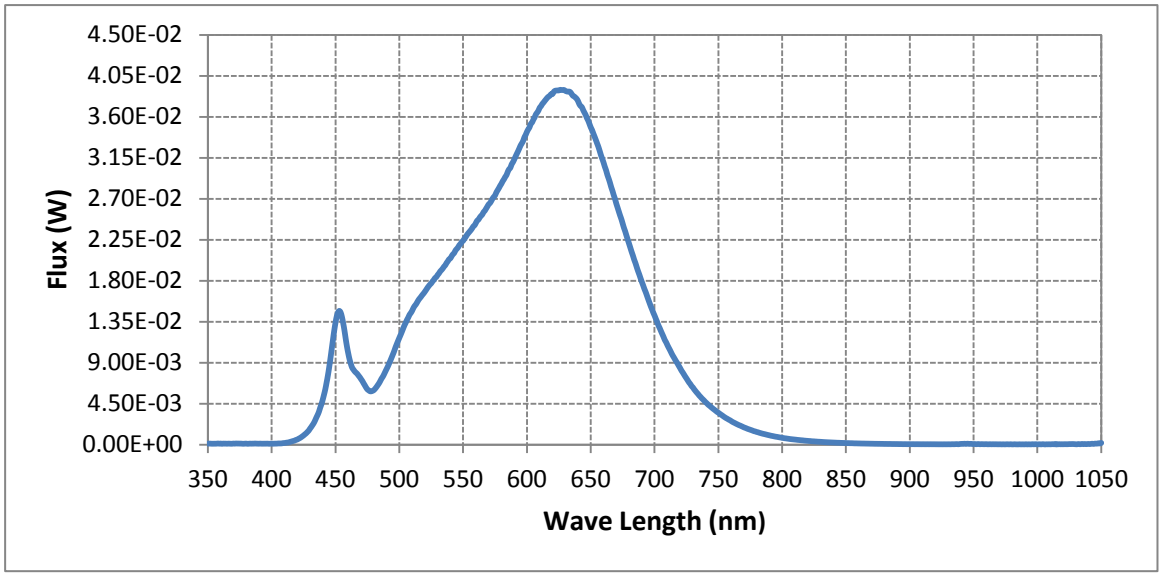
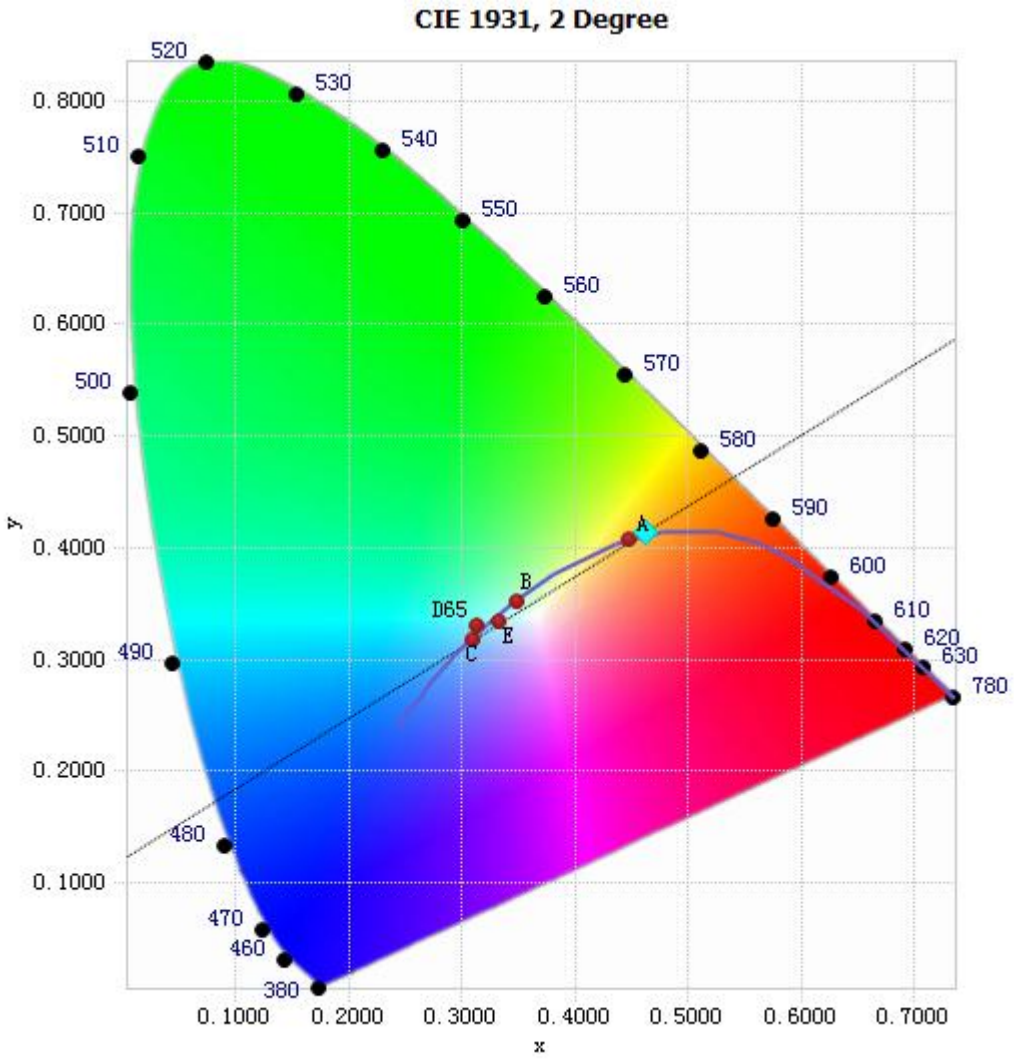


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.04E-04	485	6.95E-03	590	3.13E-02	695	1.60E-02
385	9.95E-05	490	8.29E-03	595	3.28E-02	700	1.42E-02
390	9.36E-05	495	9.91E-03	600	3.43E-02	705	1.25E-02
395	9.40E-05	500	1.17E-02	605	3.57E-02	710	1.09E-02
400	9.61E-05	505	1.34E-02	610	3.70E-02	715	9.59E-03
405	1.17E-04	510	1.47E-02	615	3.79E-02	720	8.40E-03
410	1.67E-04	515	1.59E-02	620	3.85E-02	725	7.26E-03
415	3.14E-04	520	1.68E-02	625	3.89E-02	730	6.27E-03
420	5.53E-04	525	1.77E-02	630	3.88E-02	735	5.38E-03
425	1.00E-03	530	1.86E-02	635	3.85E-02	740	4.65E-03
430	1.75E-03	535	1.95E-02	640	3.77E-02	745	4.03E-03
435	2.97E-03	540	2.04E-02	645	3.65E-02	750	3.49E-03
440	4.93E-03	545	2.15E-02	650	3.48E-02	755	2.99E-03
445	8.44E-03	550	2.24E-02	655	3.31E-02	760	2.58E-03
450	1.34E-02	555	2.34E-02	660	3.10E-02	765	2.21E-03
455	1.40E-02	560	2.43E-02	665	2.88E-02	770	1.89E-03
460	1.00E-02	565	2.53E-02	670	2.65E-02	775	1.62E-03
465	8.04E-03	570	2.64E-02	675	2.43E-02	780	1.38E-03
470	7.19E-03	575	2.74E-02	680	2.21E-02		
475	6.06E-03	580	2.86E-02	685	1.99E-02		
480	5.97E-03	585	3.00E-02	690	1.79E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4616, 0.4143)

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

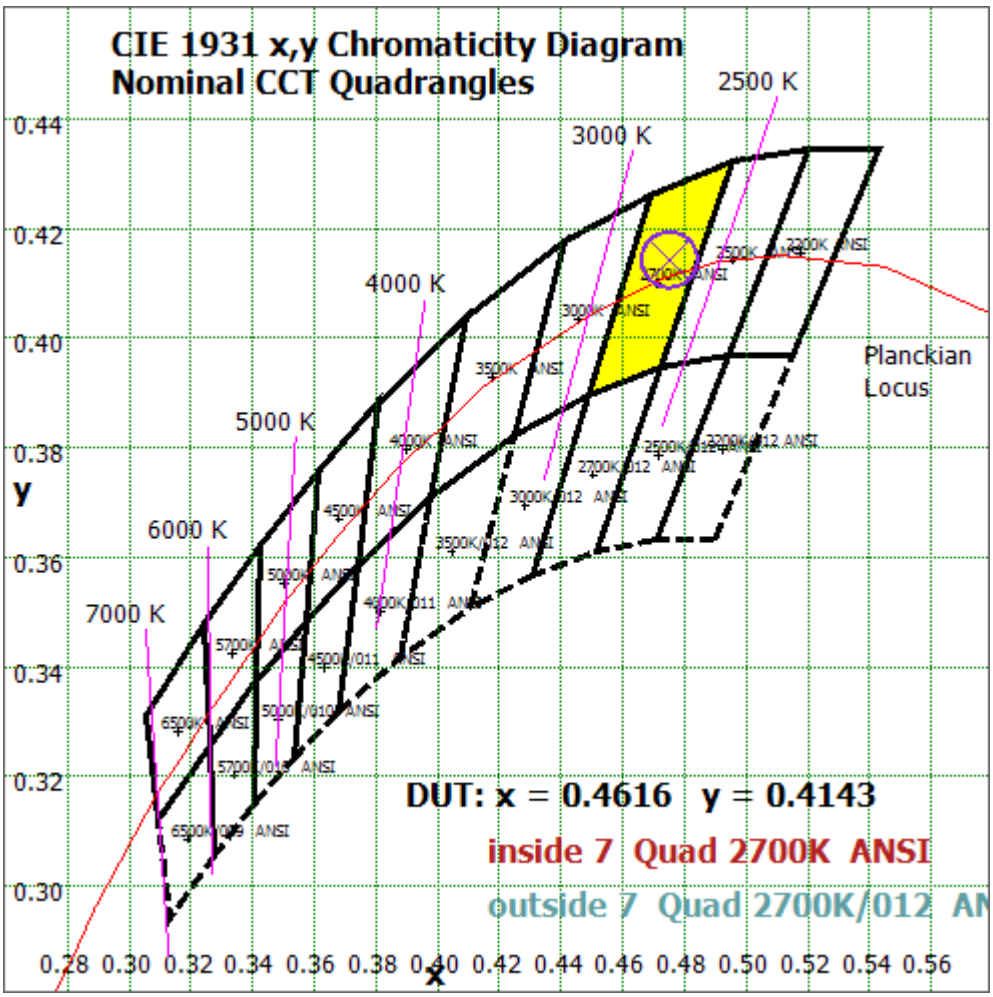


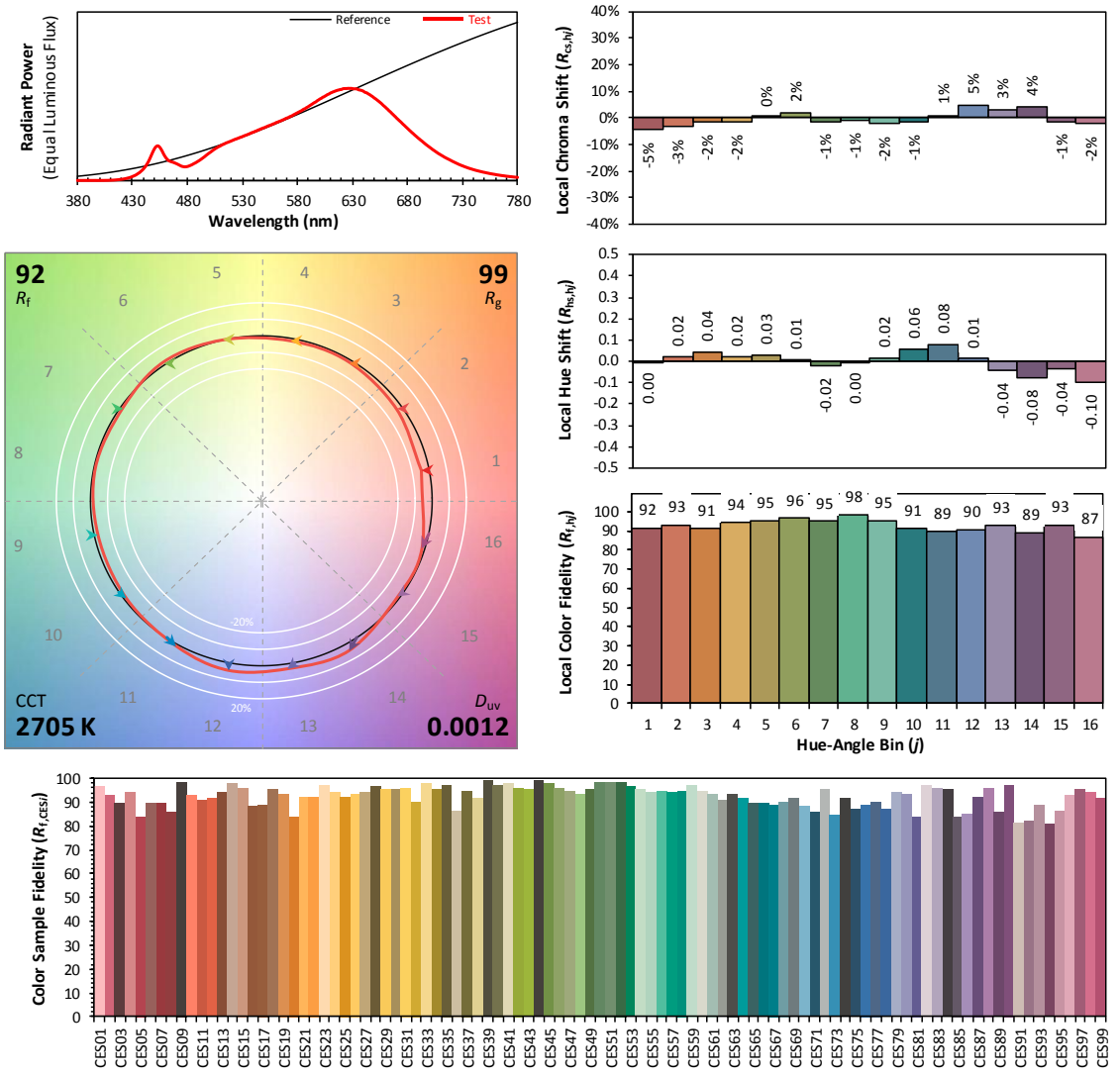
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** GREEN CREATIVE LTD

Date: 2021/01/08 **Model:** ORB/M/927/SP/DIM120V/H/BL



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

x	0.4616
y	0.4143
u'	0.2620
v'	0.5290

CIE 13.3-1995 (CRI)

R_a	93
R_9	63

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

γ(°)	Lumens	% Total
0- 10	1191.867	62.10%
10- 20	529.424	27.59%
20- 30	100.017	5.21%
30- 40	34.313	1.79%
40- 50	23.929	1.25%
50- 60	20.74	1.08%
60- 70	13.69	0.71%
70- 80	3.65	0.19%
80- 90	0.214	0.01%
90-100	0	0.00%
100-110	0	0.00%
110-120	0	0.00%
120-130	0.001	0.00%
130-140	0.047	0.00%
140-150	0.257	0.01%
150-160	0.463	0.02%
160-170	0.388	0.02%
170-180	0.131	0.01%
Total	1919.1	100%

γ(°)	Lumens	% Total
0- 60	1900.29	99.02%
60- 90	17.554	0.91%
0-90	1917.844	99.93%
90- 180	1.287	0.07%
0- 180	1919.1	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

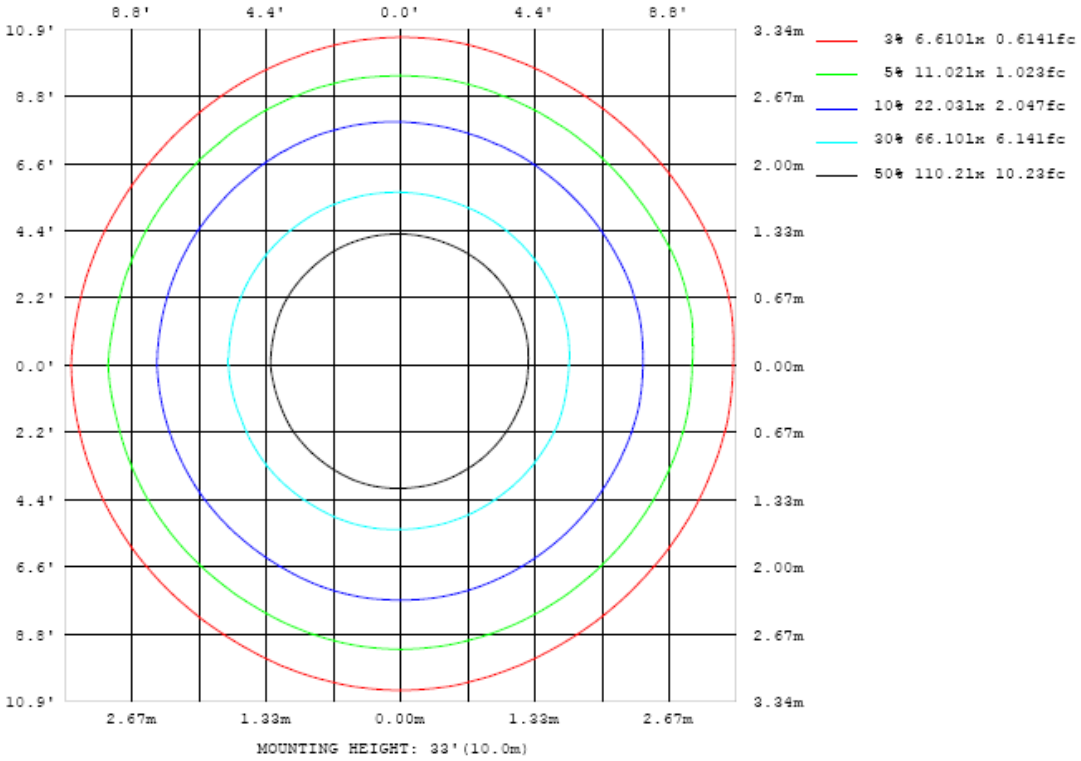


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

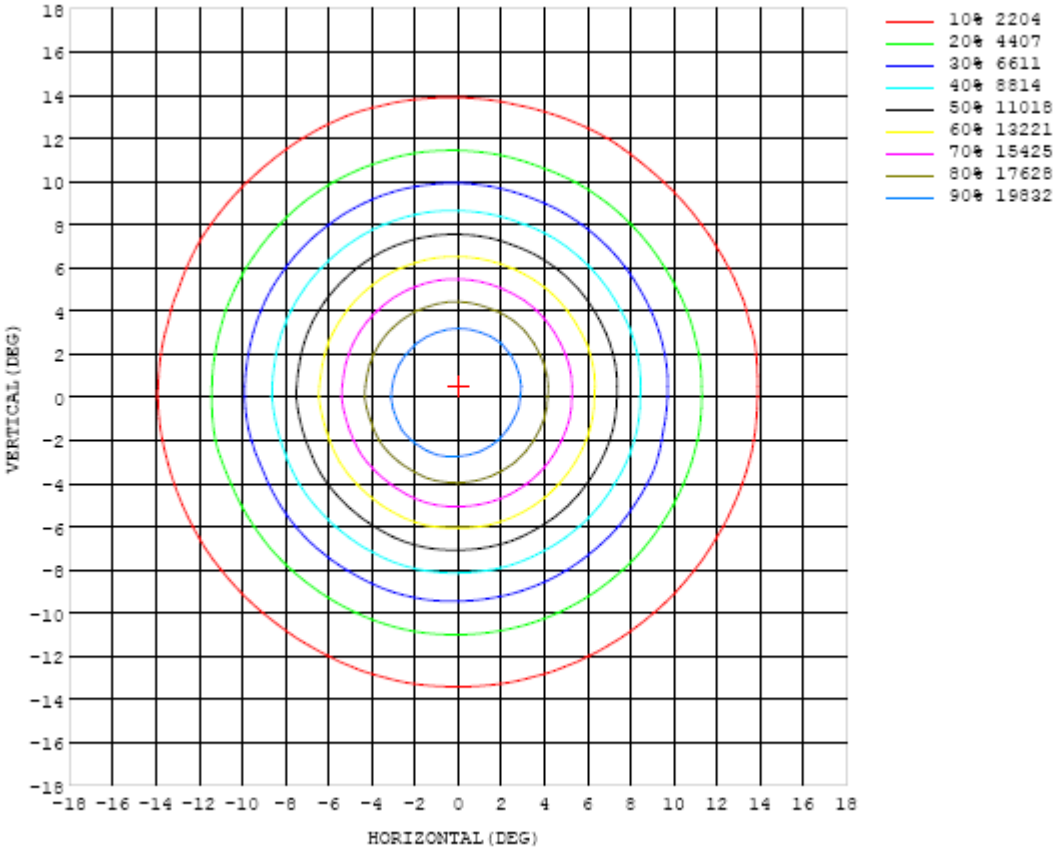


Chart 6: Isocandela Plot

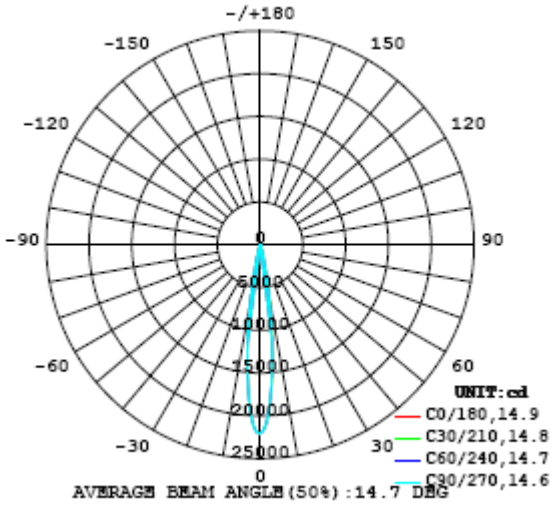


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: ×10cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203
5	1597	1597	1584	1579	1573	1568	1564	1563	1557	1558	1564	1568	1563	1565	1575	1591	1595	1607	1628
10	619	609	614	599	592	585	583	581	581	583	589	592	591	597	607	610	614	636	645
15	165	163	158	153	150	147	146	147	147	148	147	146	145	146	149	154	157	161	175
20	56.6	55.7	52.4	51.0	49.7	48.8	47.0	50.0	51.2	51.7	51.0	49.8	48.8	48.9	49.4	50.2	51.0	51.5	51.5
25	22.2	22.0	21.4	21.0	20.7	20.4	20.1	20.2	20.2	20.0	19.5	18.9	18.4	18.2	18.2	18.4	18.7	18.9	19.8
30	9.51	9.48	9.35	9.27	9.21	9.16	9.01	8.96	8.88	8.73	8.58	8.42	8.20	8.01	8.01	8.08	8.10	8.08	8.25
35	5.78	5.77	5.70	5.67	5.65	5.64	5.60	5.57	5.56	5.47	5.37	5.29	5.20	5.09	5.06	5.08	5.05	5.04	5.04
40	4.15	4.08	4.01	3.98	4.00	3.95	3.93	3.97	4.05	4.06	3.98	3.85	3.77	3.69	3.67	3.69	3.69	3.71	3.72
45	3.32	3.26	3.18	3.16	3.19	3.09	3.09	3.14	3.23	3.25	3.15	3.04	2.99	2.96	2.91	2.93	2.97	3.00	3.02
50	2.93	2.83	2.71	2.71	2.74	2.67	2.64	2.66	2.65	2.78	2.71	2.63	2.60	2.60	2.59	2.60	2.64	2.59	2.68
55	2.49	2.43	2.34	2.31	2.41	2.27	2.23	2.24	2.22	2.33	2.31	2.26	2.24	2.27	2.28	2.29	2.34	2.29	2.39
60	2.00	1.97	1.92	1.90	2.55	1.95	1.82	1.81	1.79	1.86	1.81	1.77	1.76	1.80	1.85	1.84	1.88	1.87	1.96
65	1.52	1.50	1.47	1.44	1.65	1.49	1.42	1.40	1.26	1.43	1.41	1.39	1.37	1.38	1.40	1.42	1.44	1.32	1.51
70	0.70	0.69	0.66	0.66	0.72	0.69	0.67	0.66	0.63	0.70	0.70	0.69	0.69	0.70	0.72	0.73	0.75	0.69	0.80
75	0.33	0.33	0.32	0.32	0.34	0.33	0.33	0.32	0.32	0.33	0.33	0.32	0.31	0.32	0.32	0.33	0.33	0.35	0.37
80	0.10	0.11	0.10	0.11	0.11	0.11	0.10	0.11	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.13	0.14
85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
135	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
140	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
145	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
150	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.08
155	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.11
160	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.13
165	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
170	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.14
175	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13
180	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07

Table 6: Luminous Intensity Data

Table--2 UNIT: ×10cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203	2203		
5	1628	1637	1642	1646	1645	1649	1646	1648	1643	1639	1631	1633	1632	1624	1615	1615	1608		
10	648	657	661	660	660	661	660	654	648	642	634	634	631	630	625	627	622		
15	169	168	170	168	168	170	172	170	169	166	166	167	164	166	169	176	177		
20	50.1	48.9	47.4	46.6	46.6	47.3	48.0	49.3	50.2	50.2	49.6	49.8	50.8	52.3	53.6	55.8	56.4		
25	19.3	19.0	18.7	18.6	18.5	18.6	18.8	19.2	19.6	19.6	19.6	19.9	20.7	20.9	21.6	22.5	22.9		
30	8.11	8.03	7.95	7.89	7.90	7.98	8.08	8.16	8.30	8.43	8.51	8.65	8.82	9.03	9.22	9.51	9.73		
35	4.97	4.88	4.81	4.75	4.75	4.81	4.87	4.96	5.04	5.13	5.18	5.29	5.38	5.49	5.59	5.71	5.80		
40	3.64	3.57	3.49	3.44	3.43	3.46	3.53	3.64	3.71	3.71	3.71	3.76	3.83	3.88	3.94	4.07	4.16		
45	2.96	2.90	2.86	2.84	2.81	2.83	2.89	2.97	3.02	3.00	2.97	2.99	3.03	3.06	3.13	3.24	3.32		
50	2.61	2.57	2.56	2.56	2.53	2.52	2.58	2.57	2.69	2.67	2.62	2.62	2.68	2.71	2.76	2.85	2.79		
55	2.35	2.30	2.33	2.34	2.29	2.27	2.31	2.28	2.40	2.38	2.34	2.32	2.37	2.39	2.40	2.47	2.41		
60	1.92	1.89	1.88	1.87	1.83	1.84	1.89	1.87	1.97	1.95	1.91	1.88	1.91	1.95	1.90	1.95	1.95		
65	1.48	1.46	1.44	1.43	1.40	1.41	1.44	1.32	1.50	1.50	1.47	1.45	1.45	1.45	1.46	1.48	1.32		
70	0.78	0.77	0.76	0.76	0.75	0.74	0.74	0.68	0.76	0.73	0.70	0.68	0.68	0.68	0.66	0.67	0.64		
75	0.37	0.36	0.36	0.37	0.36	0.36	0.35	0.35	0.36	0.34	0.32	0.31	0.31	0.31	0.31	0.31	0.32		
80	0.14	0.13	0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.12	0.11	0.11	0.11	0.10	0.10	0.10	0.10		
85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
115	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
120	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
135	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
140	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
145	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		
150	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08		
155	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11		
160	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13		
165	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14		
170	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.15	0.15		
175	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.13	0.14	0.15	0.14	0.15	0.15		
180	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07		

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, 2020	Aug. 04, 2021
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2020	Aug. 04, 2021
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2020	Aug. 04, 2021
Standard source	D908	HZTE012-01	Aug. 05, 2020	Aug. 04, 2021
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2020	Aug. 04, 2021
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2020	Aug. 04, 2021
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2020	Aug. 04, 2021
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2020	Aug. 04, 2021

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.

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86 571 86376106 www.ledtestlab.com

The uncertainty of integrating sphere system reported in this document is expended 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 expended 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.

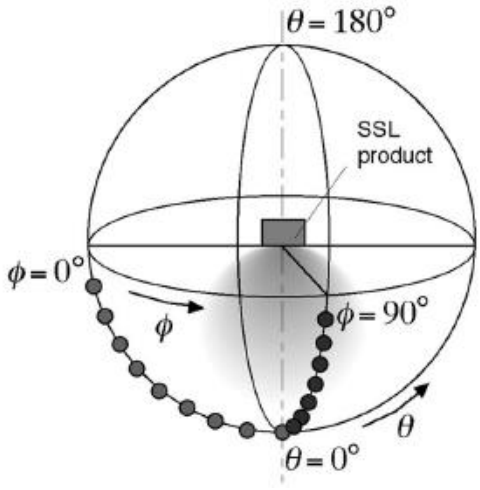
Color Spatial Uniformity

The characteristics of SSL products may be spatially non-uniform, the chromaticity coordinate shall be measured at two vertical planes (C=0 °/180 ° and C=90 °/270 °) 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

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, YuhangDist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86 571 86376106 www.ledtestlab.com

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, Δu'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 ***