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/L/927/NR/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

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Report No.: HZ20120037w

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/L/927/NR/DIM120V/H/BL**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
87.6	3448.6	39.35	0.9811

CCT (K)	CRI	Stabilization Time (Light & Power)
2730	92.3	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

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SAMPLE PHOTO

Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Track Light
Model	: ORB/L/927/NR/DIM120V/H/BL
Electrical Ratings	: 120V, 60Hz, 40W
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)	0.334
Power Factor	0.9811
Test Power (W)	39.35
THD A%	13.91
Luminous Efficacy (lm/W)	87.6
Total Luminous Flux (lm)	3448.6
Color Rendering Index (CRI)	92.3
R9	57.7
Correlated Color Temperature (CCT)(K)	2730
Chromaticity Chroma x	0.4558
Chromaticity Chroma y	0.4073
Chromaticity Chroma u	0.2614
Chromaticity Chroma v	0.3503
Duv	-0.0009
Chromaticity Chroma u ’	0.2614
Chromaticity Chroma v’	0.5255

Special Color Rendering Indices	
R1	92.6
R2	95.7
R3	97.3
R4	92.7
R5	92.3
R6	95.1
R7	91.4
R8	80.8
R9	57.7
R10	89.2
R11	93.9
R12	84.3
R13	93.4
R14	97.7

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 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)	0.338
Power Factor	0.9829
Power (W)	39.87
Luminous Efficacy (lm/W)	91.5
Total Luminous Flux (lm)	3631.3
Beam Angle (°)	21.1 (0^o-180^o) / 21.1 (90^o-270^o)
Center Beam Candle Power (cd)	20480
Maximum Beam Candle Power (cd)	20574 (At: C=290.0, Gamma=1.0)
Spacing Criteria	0.35 (0^o-180^o) / 0.39 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	99.22%
Zonal Lumens in the 60 °-90 °Zone	0.71%
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

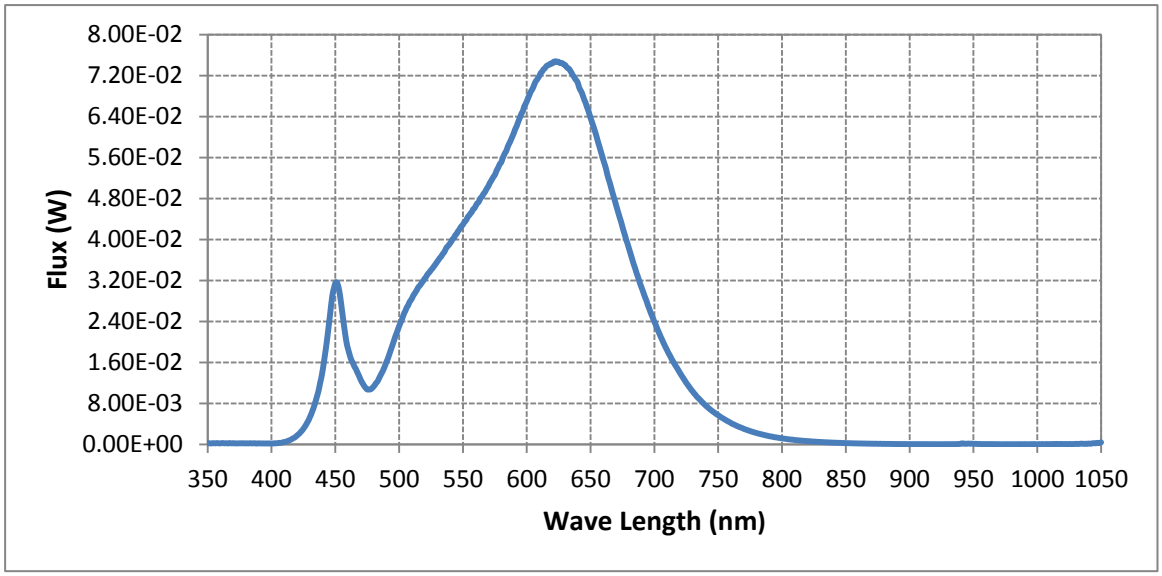
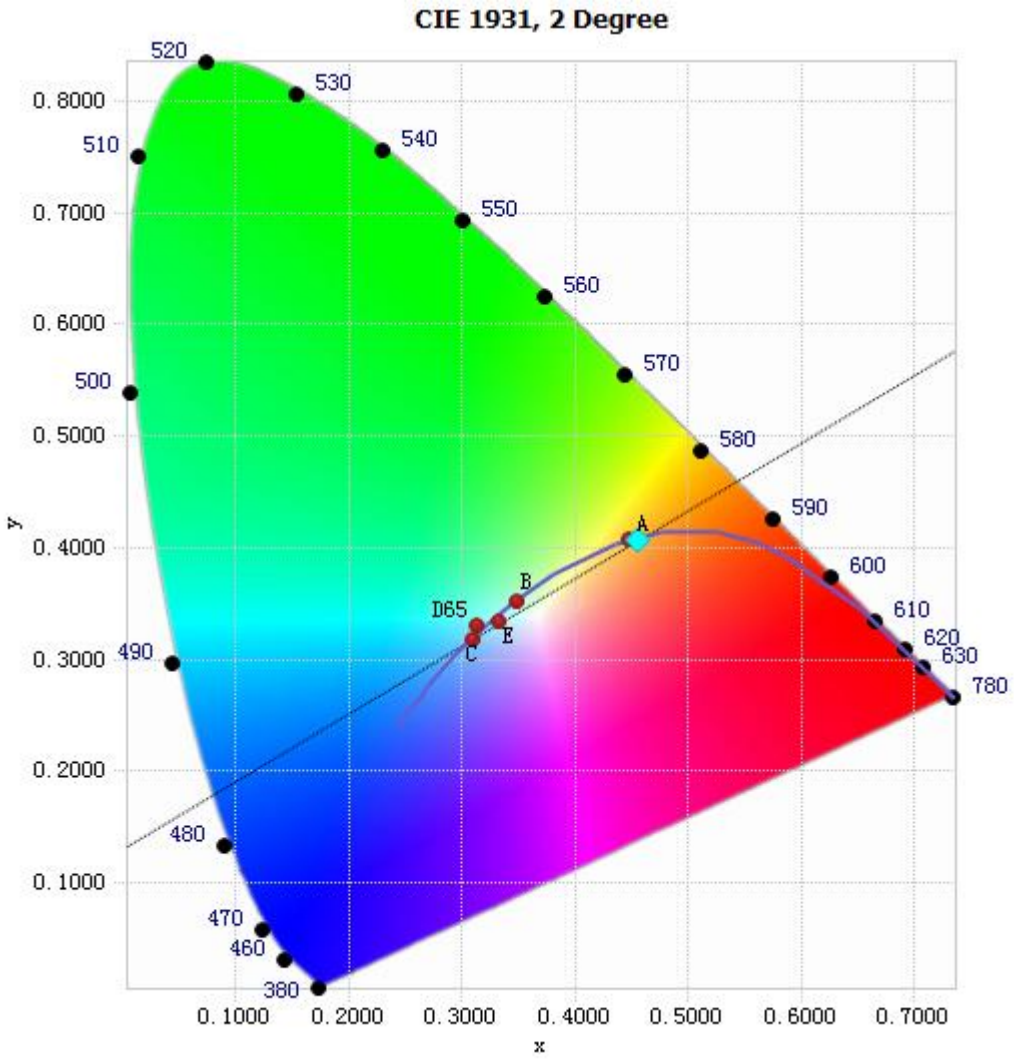


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.15E-04	485	1.33E-02	590	6.09E-02	695	2.71E-02
385	2.15E-04	490	1.61E-02	595	6.40E-02	700	2.40E-02
390	2.21E-04	495	1.96E-02	600	6.70E-02	705	2.10E-02
395	1.87E-04	500	2.31E-02	605	6.97E-02	710	1.84E-02
400	1.87E-04	505	2.61E-02	610	7.20E-02	715	1.61E-02
405	2.67E-04	510	2.85E-02	615	7.37E-02	720	1.40E-02
410	4.80E-04	515	3.07E-02	620	7.44E-02	725	1.20E-02
415	9.24E-04	520	3.24E-02	625	7.47E-02	730	1.04E-02
420	1.74E-03	525	3.41E-02	630	7.41E-02	735	8.91E-03
425	3.07E-03	530	3.58E-02	635	7.26E-02	740	7.64E-03
430	5.30E-03	535	3.74E-02	640	7.06E-02	745	6.59E-03
435	8.80E-03	540	3.93E-02	645	6.73E-02	750	5.71E-03
440	1.44E-02	545	4.11E-02	650	6.38E-02	755	4.89E-03
445	2.35E-02	550	4.29E-02	655	5.98E-02	760	4.19E-03
450	3.15E-02	555	4.48E-02	660	5.55E-02	765	3.59E-03
455	2.67E-02	560	4.66E-02	665	5.11E-02	770	3.07E-03
460	1.86E-02	565	4.84E-02	670	4.67E-02	775	2.62E-03
465	1.52E-02	570	5.05E-02	675	4.25E-02	780	2.24E-03
470	1.26E-02	575	5.26E-02	680	3.83E-02		
475	1.07E-02	580	5.51E-02	685	3.43E-02		
480	1.13E-02	585	5.80E-02	690	3.06E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4558, 0.4073)

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

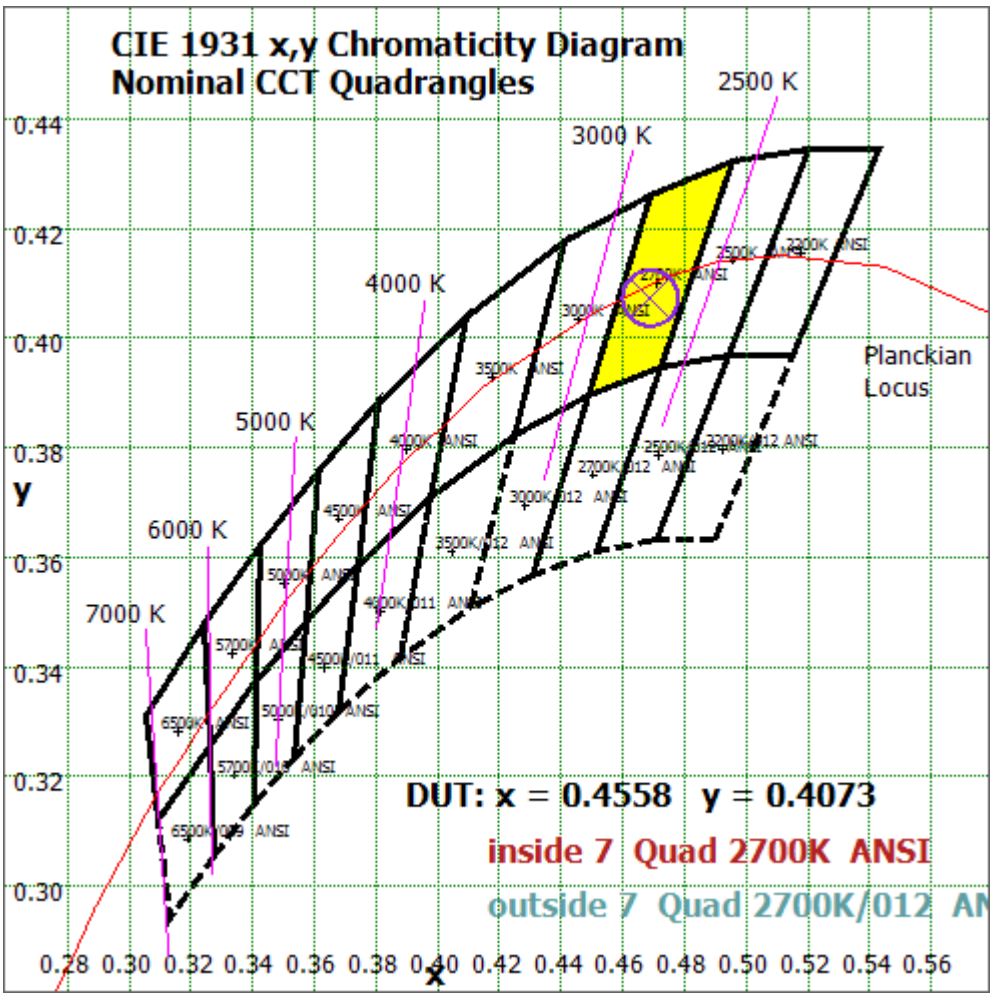


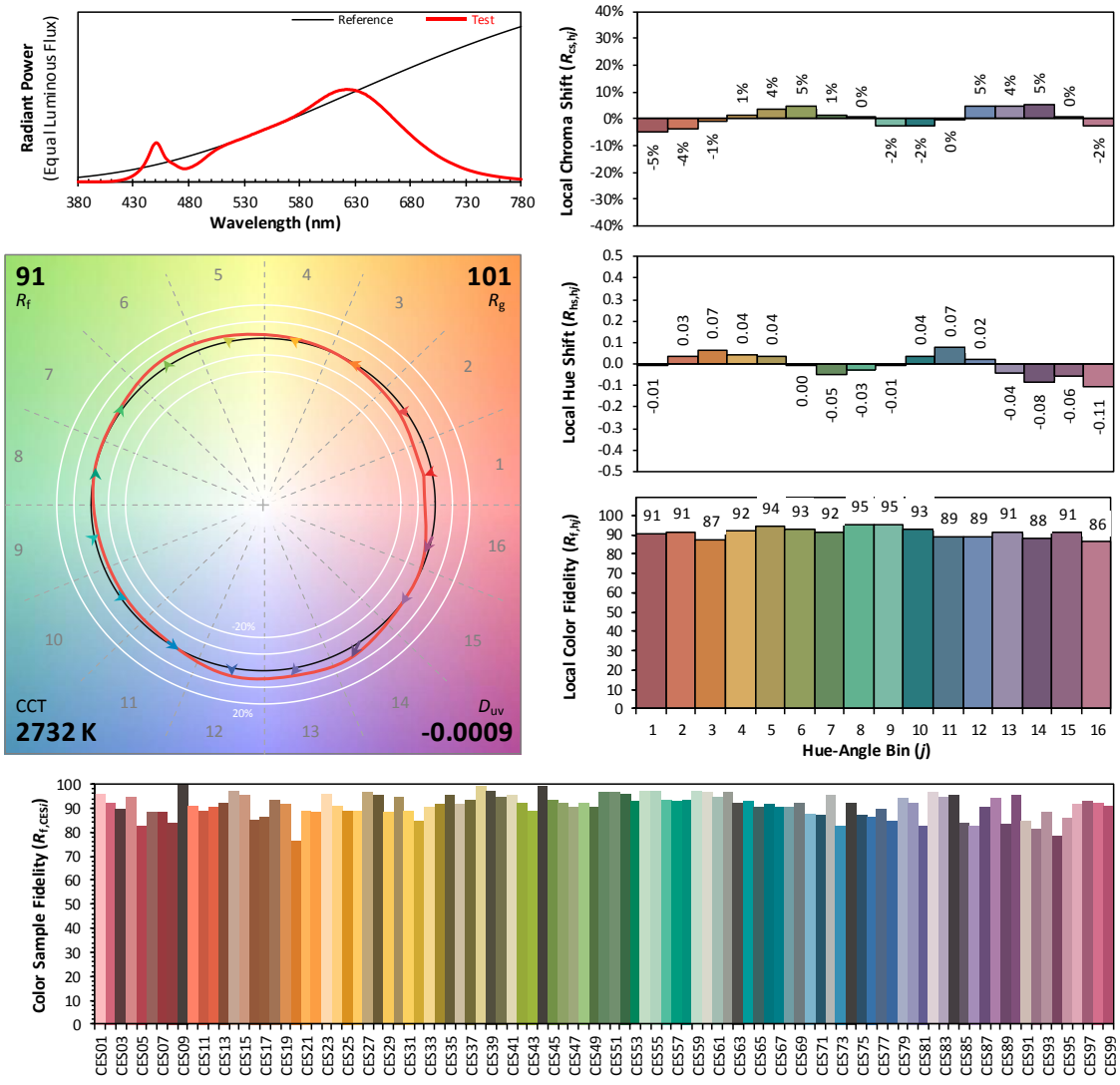
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

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/L/927/NR/DIM120V/H/BL



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

x	0.4558
y	0.4073
u'	0.2614
v'	0.5255

CIE 13.3-1995 (CRI)

R_a	92
R_9	58

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	1445.103	39.80%
10- 20	1508.671	41.55%
20- 30	459.336	12.65%
30- 40	90.585	2.49%
40- 50	57.43	1.58%
50- 60	41.796	1.15%
60- 70	21.107	0.58%
70- 80	4.691	0.13%
80- 90	0.037	0.00%
90-100	0	0.00%
100-110	0	0.00%
110-120	0.005	0.00%
120-130	0.033	0.00%
130-140	0.199	0.01%
140-150	0.558	0.02%
150-160	0.833	0.02%
160-170	0.709	0.02%
170-180	0.241	0.01%
Total	3631.3	100%

γ(°)	Lumens	% Total
0- 60	3602.921	99.22%
60- 90	25.835	0.71%
0-90	3628.756	99.93%
90- 180	2.578	0.07%
0- 180	3631.3	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

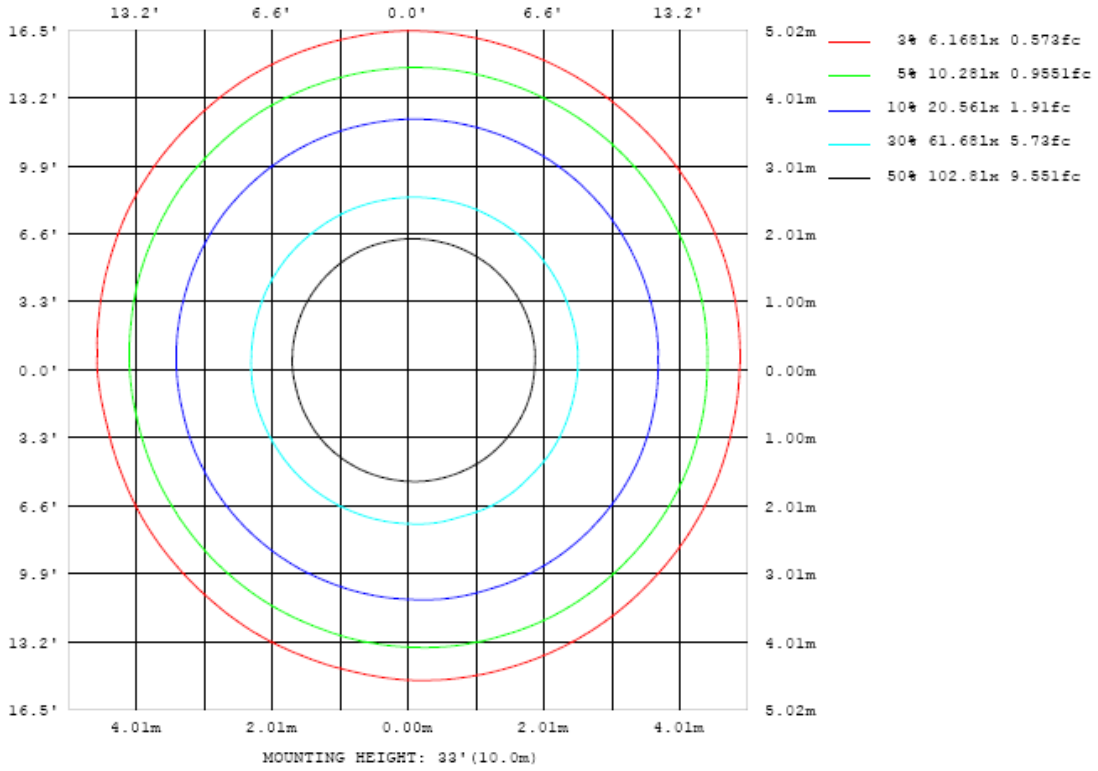


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

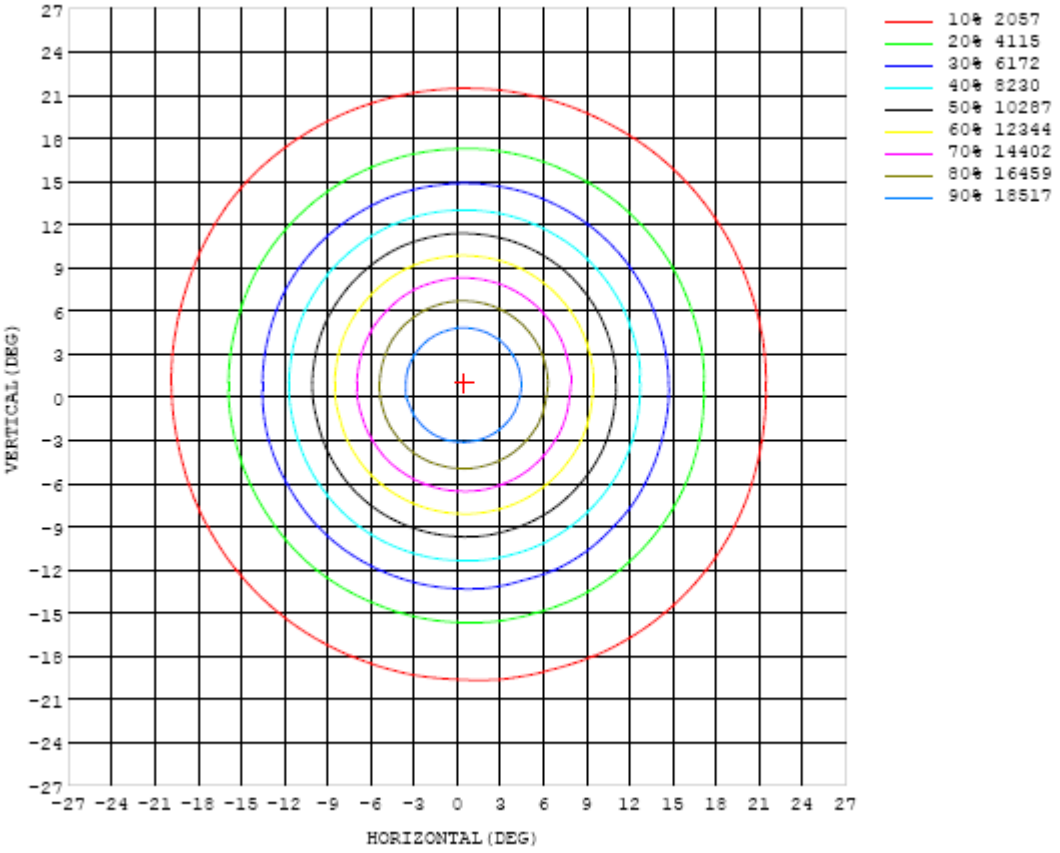


Chart 6: Isocandela Plot

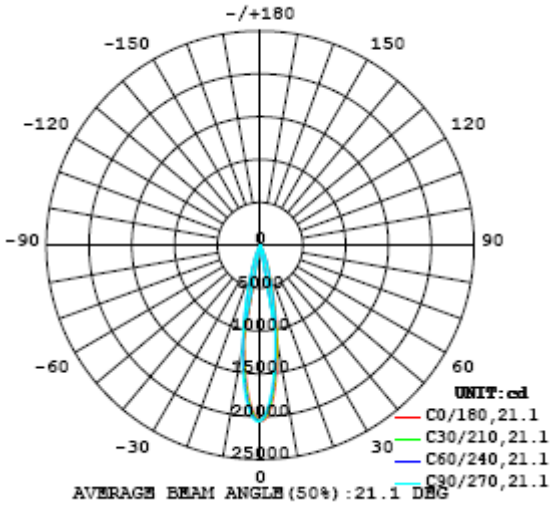


Chart 7: Polar Candela Distribution

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	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048
5	1784	1769	1751	1729	1711	1692	1675	1660	1650	1638	1634	1631	1633	1635	1643	1650	1662	1674	1693
10	1156	1138	1119	1094	1073	1053	1033	1015	1003	988	980	976	978	981	985	990	1000	1010	1035
15	590	575	567	550	530	515	499	482	472	459	452	445	443	444	445	449	458	468	482
20	261	257	252	244	235	226	216	206	200	192	189	185	183	183	184	185	190	193	200
25	108	104	102	97.2	92.5	89.1	85.3	81.4	78.3	75.3	71.0	70.5	69.3	68.2	68.1	68.7	70.7	71.1	77.0
30	31.3	30.7	29.4	28.0	26.3	24.7	23.6	22.8	21.8	20.9	20.9	20.8	20.8	21.1	20.9	20.3	20.7	21.6	22.8
35	11.5	11.4	11.1	10.6	10.3	10.2	9.95	9.93	9.91	9.84	9.77	10.1	10.7	11.1	11.4	11.8	12.2	12.6	13.1
40	7.90	7.73	7.43	7.26	7.11	7.00	7.16	7.28	7.34	7.34	7.30	7.30	7.65	8.12	8.58	8.95	9.53	9.93	10.4
45	6.83	6.65	6.44	6.00	5.77	5.74	5.82	5.94	6.12	6.18	5.99	5.93	5.89	6.35	6.88	7.56	8.09	8.44	8.71
50	5.98	5.70	5.48	5.04	4.78	4.86	5.03	5.14	5.40	5.44	5.14	4.96	4.80	4.85	5.43	6.06	6.61	7.00	7.24
55	5.12	4.87	4.54	4.14	3.89	3.87	3.97	4.09	4.28	4.28	4.02	3.84	3.70	3.58	3.79	4.14	4.48	4.78	4.92
60	4.05	3.70	3.49	3.27	2.99	3.03	3.11	3.16	3.27	3.25	3.08	2.98	2.87	2.73	2.91	3.20	3.42	3.79	3.96
65	2.57	2.29	2.12	2.03	1.77	1.83	1.83	1.82	1.85	1.83	1.74	1.70	1.68	1.57	1.74	1.89	2.01	2.31	2.44
70	1.41	1.22	1.08	1.06	0.88	0.87	0.84	0.84	0.87	0.87	0.80	0.77	0.77	0.76	0.84	0.90	0.95	1.19	1.29
75	0.58	0.48	0.43	0.40	0.37	0.36	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.31	0.32	0.34	0.37	0.39	0.42
80	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02
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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
135	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
140	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06
145	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10
150	0.12	0.12	0.12	0.12	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	0.15
155	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.20
160	0.21	0.21	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.24
165	0.24	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.26
170	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
175	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.24
180	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19

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	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048	2048		
5	1706	1724	1743	1761	1778	1795	1809	1822	1834	1841	1846	1845	1846	1839	1833	1818	1805		
10	1054	1073	1098	1119	1141	1165	1186	1200	1214	1222	1229	1230	1228	1221	1212	1197	1183		
15	491	506	524	539	553	567	582	593	603	610	616	618	620	618	614	605	597		
20	207	214	224	232	238	245	251	256	262	265	267	269	271	272	271	268	266		
25	80.9	86.3	92.2	96.4	101	105	109	111	114	114	114	115	115	115	115	112	111		
30	24.9	27.2	30.1	33.2	36.5	38.8	41.2	42.8	43.0	43.1	41.8	40.0	39.2	38.4	37.2	35.7	34.3		
35	13.3	13.5	13.7	13.9	14.4	15.5	16.0	16.3	16.8	16.8	16.3	15.9	15.5	14.2	13.4	12.6	11.9		
40	10.6	10.6	10.5	10.6	10.7	10.9	11.1	11.3	11.3	11.2	10.8	10.4	9.84	9.55	9.09	8.68	8.25		
45	8.60	8.48	8.33	8.25	8.49	8.68	8.83	9.12	9.25	8.99	8.74	8.36	7.98	7.45	7.30	6.99	6.92		
50	7.12	7.03	6.75	6.32	6.65	7.00	7.22	7.50	7.68	7.48	7.13	6.74	6.06	5.97	5.93	5.94	6.03		
55	4.85	4.70	4.52	4.41	4.49	4.78	5.09	5.40	5.62	5.49	5.27	5.06	4.77	4.83	4.95	5.21	5.31		
60	3.62	3.48	3.36	3.17	3.29	3.43	3.57	3.76	3.88	3.71	3.61	3.49	3.29	3.32	3.53	3.70	3.94		
65	2.24	2.09	2.09	1.88	2.05	2.13	2.19	2.29	2.36	2.31	2.27	2.23	2.02	2.14	2.22	2.28	2.61		
70	1.14	1.03	1.09	0.96	1.04	1.08	1.12	1.17	1.22	1.16	1.12	1.12	1.05	1.16	1.21	1.23	1.41		
75	0.43	0.42	0.40	0.41	0.41	0.43	0.46	0.48	0.48	0.48	0.46	0.45	0.45	0.46	0.48	0.51	0.55		
80	0.02	0.03	0.03	0.04	0.04	0.05	0.06	0.06	0.07	0.07	0.07	0.06	0.06	0.05	0.05	0.04	0.04		
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	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
135	0.03	0.03	0.03	0.03	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		
140	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05		
145	0.10	0.10	0.10	0.10	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		
150	0.15	0.15	0.15	0.15	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		
155	0.20	0.20	0.20	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19		
160	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23		
165	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26		
170	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27		
175	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.25	0.25	0.25	0.25	0.25		
180	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	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. 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.

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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

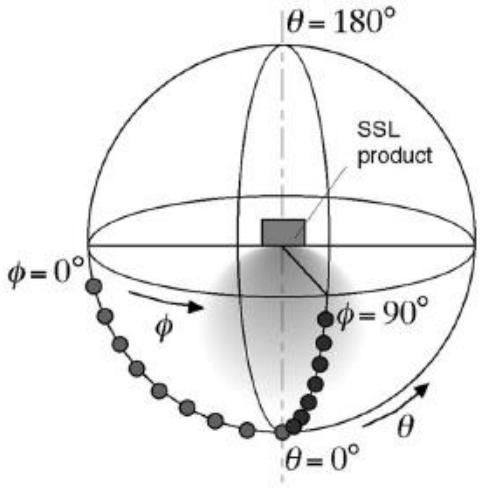
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

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 ***