

LM-79-08 TEST REPORT

for

IDEAL INDUSTRIES LIGHTING LLC, DBA CREE LIGHTING

4401 SILICON DRIVE, DURHAM, NC 27703, USA

LED Tube

Model: C-T824-A-17W-35K-B1

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

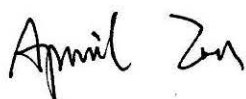
Tel: +86571 86376106

www.ledtestlab.com

Report No.: HZ22030014g

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

Review by:



Engineer: April Zou

Mar. 04, 2022

Approved by:



Manager: Jim Zhang

Mar. 04, 2022

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: **C-T824-A-17W-35K-B1**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
131.7	1190.4	9.04	0.9766
CCT (K)	CRI	Stabilization Time (Light & Power)	
3492	81.7	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 : Nov. 30, 2021

Date of Test : Dec. 01, 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 Tube
Model	: C-T824-A-17W-35K-B1
Electrical Ratings	: 120-277V, 50/60Hz, 9W
Product Description	: 3500K Manufacturer of light source: Bridgelux Inc. Model of LED light source: BXVN-35E-11L-3DV-000-00-00-0

TEST RESULTS

Test ambient temperature was 26.0°C.

Base orientation was horizontal. 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	277.0
Voltage frequency (Hz)	60	60
Test Current (A)	0.077	0.037
Power Factor	0.9766	0.9215
Test Power (W)	9.04	9.45
THD A%	20.63	21.10
Luminous Efficacy (lm/W)	131.7	128.3
Total Luminous Flux (lm)	1190.4	1212.3
Color Rendering Index (CRI)	81.7	
R9	0.9	
Correlated Color Temperature (CCT)(K)	3492	
Chromaticity Chroma x	0.4063	
Chromaticity Chroma y	0.3927	
Chromaticity Chroma u	0.2355	
Chromaticity Chroma v	0.3415	
Duv	0.0006	
Chromaticity Chroma u'	0.2355	
Chromaticity Chroma v'	0.5122	

Special Color Rendering Indices	
R1	79.6
R2	89.8
R3	96.1
R4	79.3
R5	79.8
R6	86.4
R7	83.4
R8	59
R9	0.9
R10	76.2
R11	78.1
R12	64.9
R13	82.1
R14	98.3

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 24.9°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)	0.078
Power Factor	0.9723
Power (W)	9.11
Luminous Efficacy (lm/W)	126.9
Total Luminous Flux (lm)	1155.6
Beam Angle (°)	110.5 (0°-180°) / 228.9 (90°-270°)
Center Beam Candle Power (cd)	188
Maximum Beam Candle Power (cd)	188.2 (At: C=90.0, Gamma=8.0)
Spacing Criteria	1.25 (0°-180°) / 1.41 (90°-270°)
Zonal Lumens in the 0°-60°Zone	41.76%
Zonal Lumens in the 60°-90°Zone	26.50%
Zonal Lumens in the 90°-120°Zone	17.80%
Zonal Lumens in the 120°-180°Zone	13.94%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

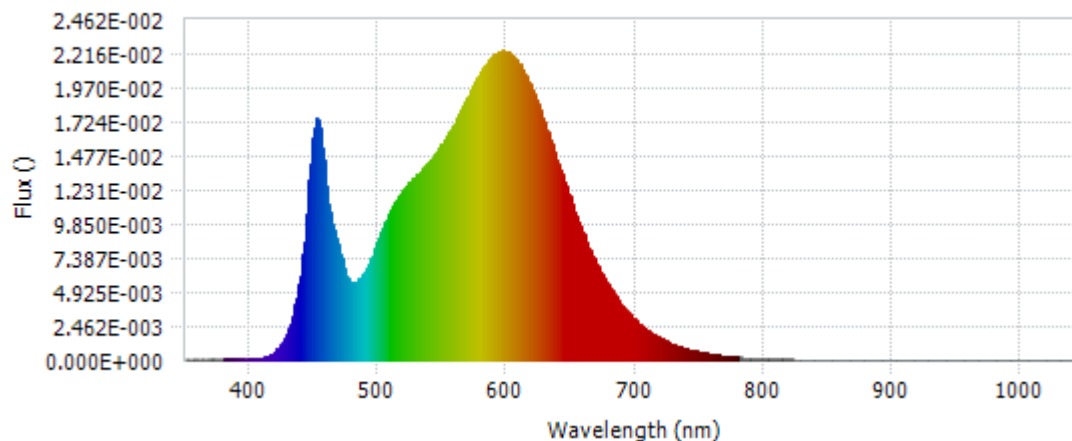
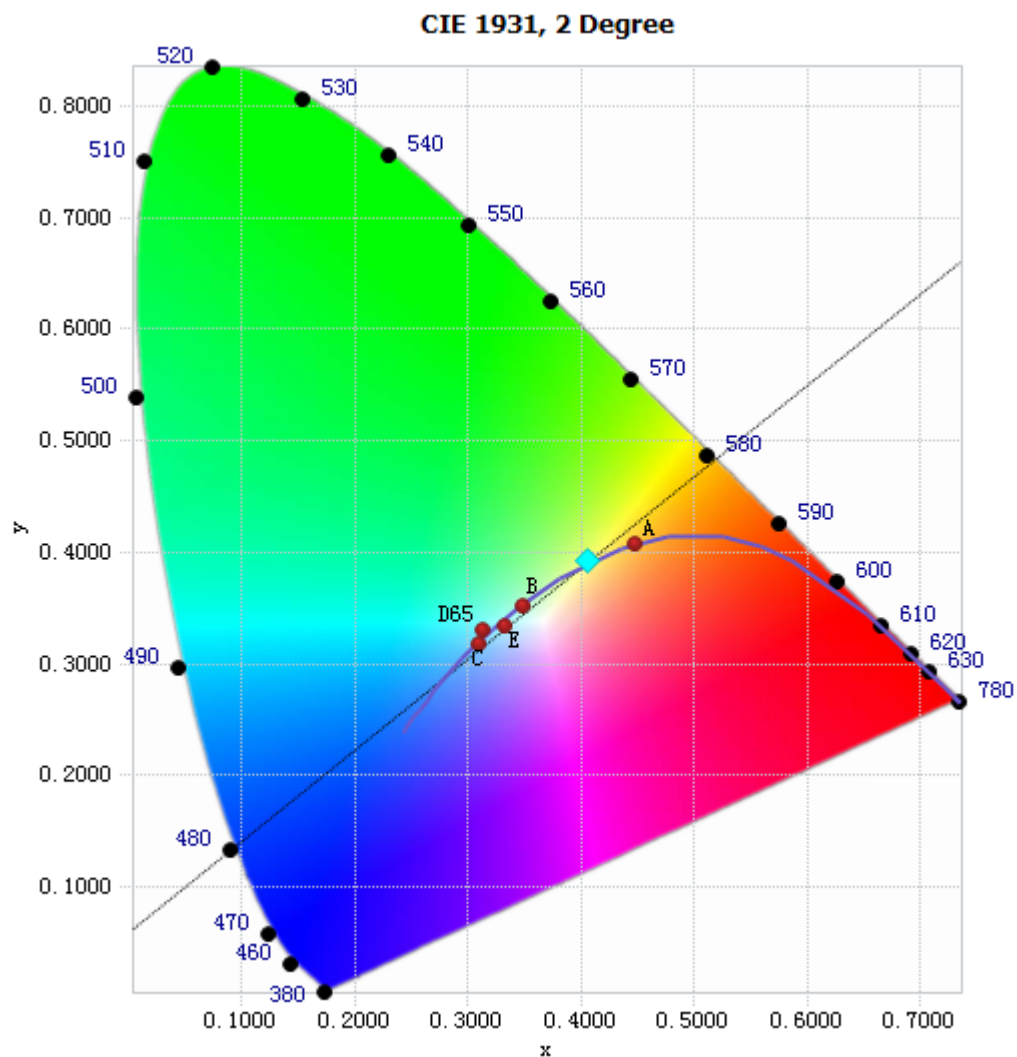


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	8.55E-05	485	5.89E-03	590	2.21E-02	695	3.41E-03
385	7.37E-05	490	6.53E-03	595	2.23E-02	700	2.94E-03
390	8.35E-05	495	7.60E-03	600	2.23E-02	705	2.51E-03
395	6.42E-05	500	8.80E-03	605	2.20E-02	710	2.14E-03
400	7.80E-05	505	9.96E-03	610	2.14E-02	715	1.83E-03
405	1.17E-04	510	1.09E-02	615	2.06E-02	720	1.59E-03
410	1.92E-04	515	1.18E-02	620	1.95E-02	725	1.35E-03
415	3.91E-04	520	1.24E-02	625	1.83E-02	730	1.15E-03
420	7.08E-04	525	1.29E-02	630	1.70E-02	735	9.74E-04
425	1.29E-03	530	1.34E-02	635	1.57E-02	740	8.34E-04
430	2.29E-03	535	1.39E-02	640	1.43E-02	745	7.16E-04
435	3.99E-03	540	1.44E-02	645	1.28E-02	750	6.10E-04
440	6.84E-03	545	1.51E-02	650	1.15E-02	755	5.22E-04
445	1.17E-02	550	1.57E-02	655	1.03E-02	760	4.37E-04
450	1.68E-02	555	1.64E-02	660	9.07E-03	765	3.84E-04
455	1.62E-02	560	1.73E-02	665	7.97E-03	770	3.29E-04
460	1.19E-02	565	1.82E-02	670	6.97E-03	775	2.86E-04
465	9.45E-03	570	1.92E-02	675	6.10E-03	780	2.44E-04
470	7.69E-03	575	2.01E-02	680	5.31E-03		
475	6.12E-03	580	2.09E-02	685	4.59E-03		
480	5.61E-03	585	2.17E-02	690	3.95E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4063, 0.3927)

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

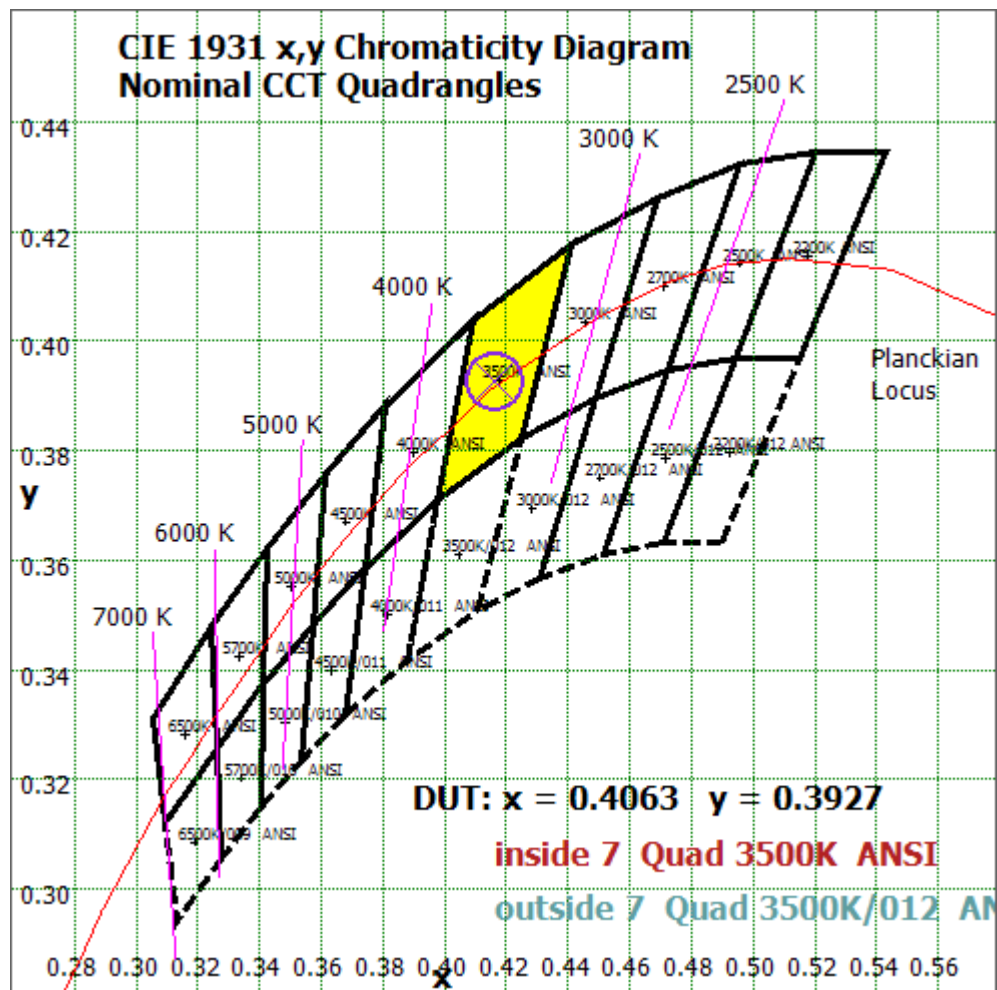


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

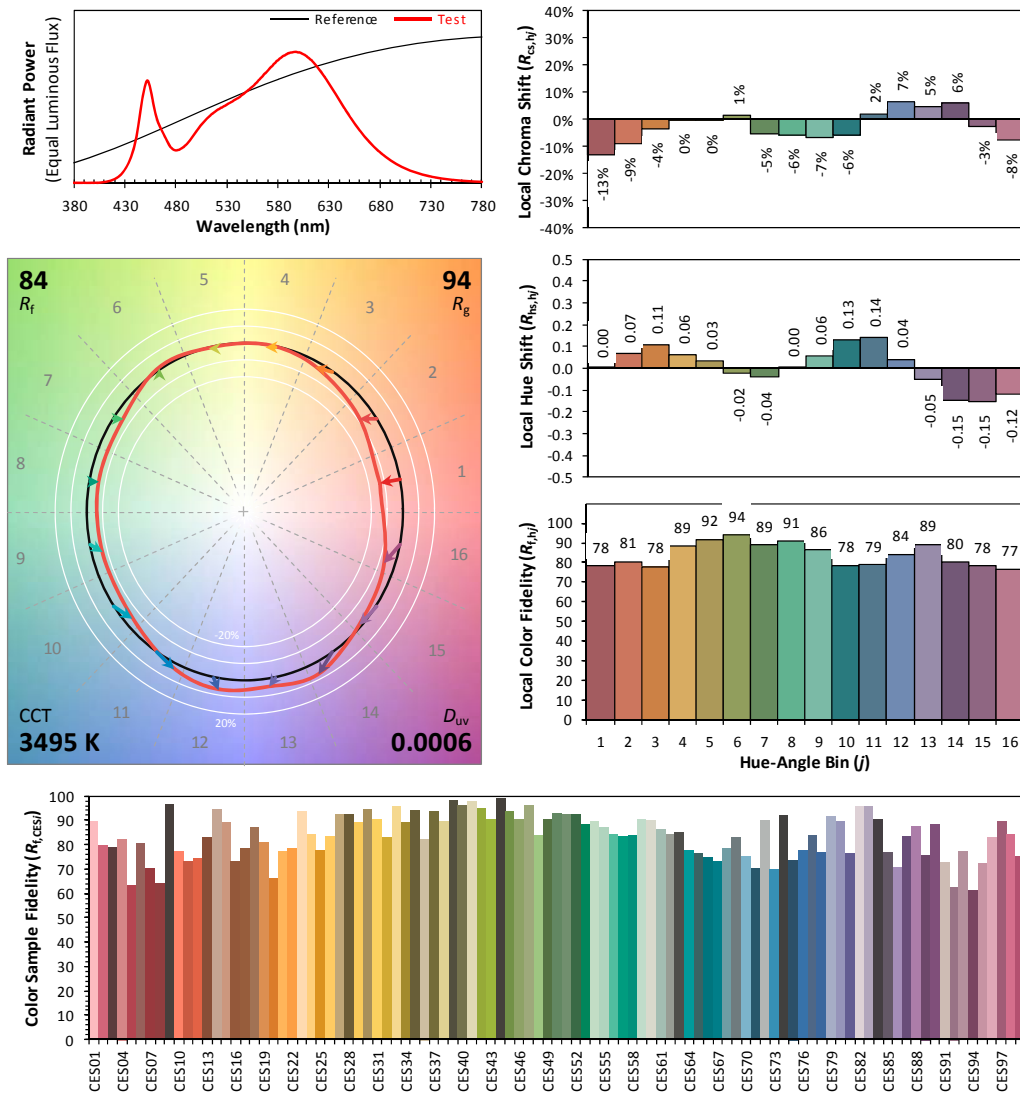
ANSI/IES TM-30-18 Color Rendition Report

Source: LED

Manufacturer: IDEAL INDUSTRIES LIGHTING LLC,
DBA CREE LIGHTING

Date: 2021/12/01

Model: C-T824-A-17W-35K-B1



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

x 0.4063
 y 0.3927
 u' 0.2355
 v' 0.5122

CIE 13.3-1995
(CRI)

R_a 82
 R_g 1

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.

Prepared by: Leading Testing Laboratories
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

Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	17.793	1.54%
10- 20	51.592	4.46%
20- 30	80.301	6.95%
30- 40	101.585	8.79%
40- 50	113.981	9.86%
50- 60	117.378	10.16%
60- 70	112.813	9.76%
70- 80	102.813	8.90%
80- 90	90.594	7.84%
90-100	79.395	6.87%
100-110	68.399	5.92%
110-120	57.905	5.01%
120-130	48.605	4.21%
130-140	40.295	3.49%
140-150	31.948	2.76%
150-160	23.297	2.02%
160-170	13.603	1.18%
170-180	3.317	0.29%
Total	1155.6	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	482.63	41.76%
60- 90	306.22	26.50%
0-90	788.85	68.26%
90- 180	366.764	31.74%
0- 180	1155.6	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

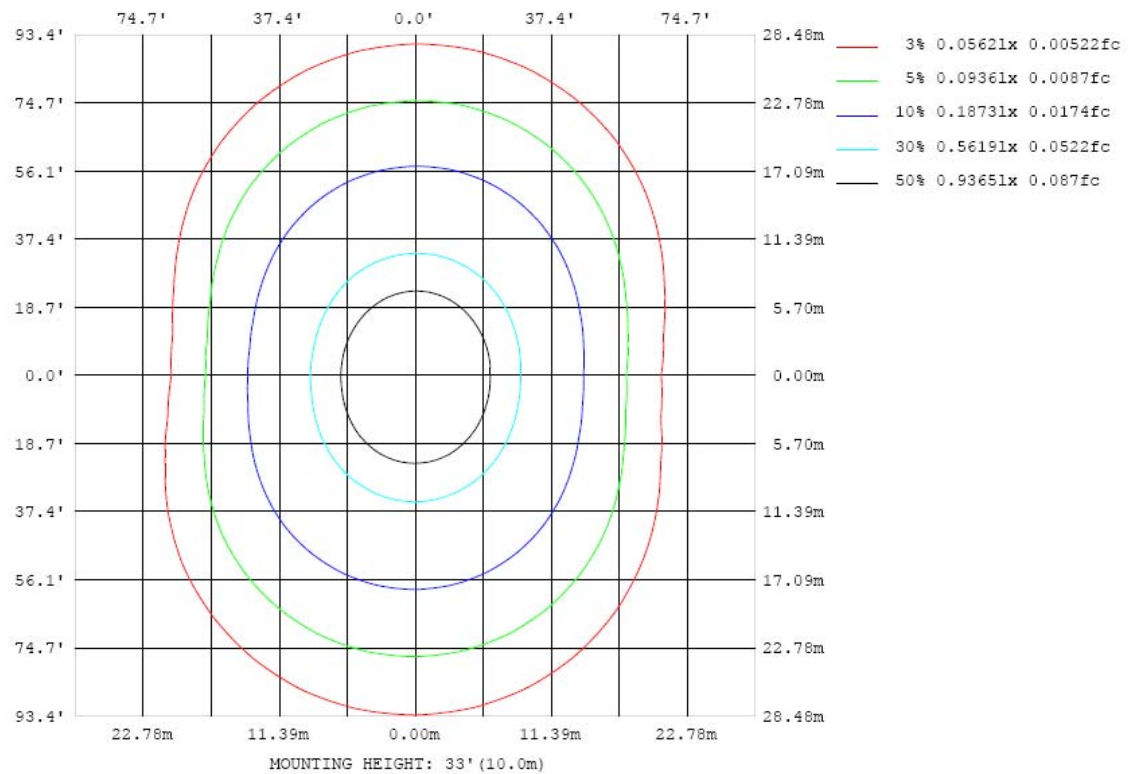


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

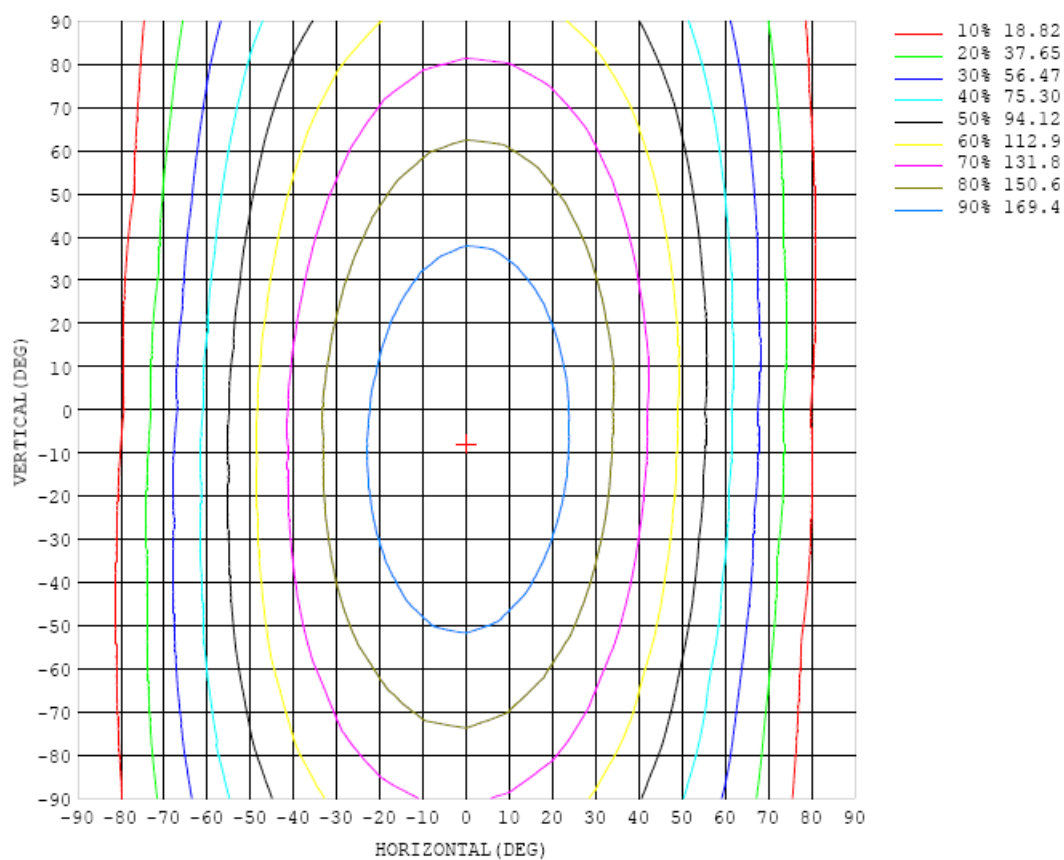


Chart 6: Isocandela Plot

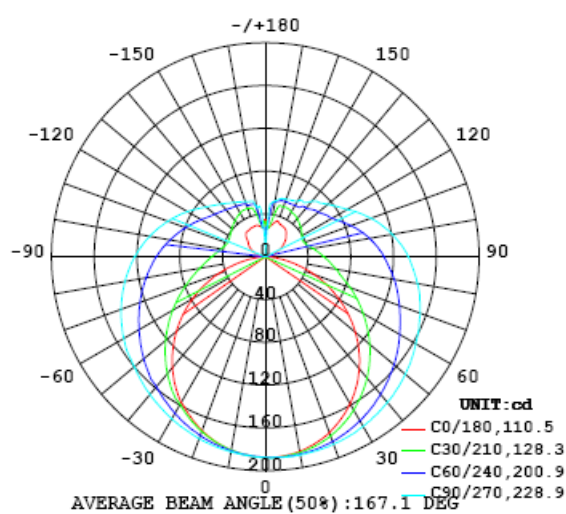


Chart 7: Polar Candela Distribution

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	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188
5	187	187	187	188	187	188	188	188	188	188	188	188	188	188	187	187	187	187	186
10	185	185	185	186	186	187	187	188	188	188	188	187	187	186	186	185	185	184	184
15	181	181	182	183	184	185	186	187	187	188	187	186	186	184	183	182	181	180	179
20	175	175	176	178	180	182	184	185	186	186	186	185	184	182	179	177	175	174	173
25	167	168	170	172	175	178	181	183	185	185	184	183	181	178	175	171	169	166	165
30	159	160	162	165	169	173	177	180	182	183	182	180	177	173	169	165	161	158	157
35	148	150	152	157	162	168	173	177	179	180	180	177	173	168	162	157	152	148	147
40	137	138	142	148	155	162	168	173	176	177	177	174	169	163	156	148	142	137	135
45	124	126	131	138	146	155	163	169	173	175	173	170	164	157	148	139	131	124	122
50	110	112	118	128	138	148	157	164	169	171	170	166	159	151	140	130	119	112	108
55	95.4	97.8	106	117	129	141	151	159	164	167	166	161	154	144	132	120	107	97.8	94.0
60	79.8	82.9	92.3	106	120	134	145	154	160	163	161	156	148	138	125	110	95.6	83.8	78.5
65	64.8	68.0	79.1	95.2	111	126	139	149	156	158	157	152	143	131	117	101	83.8	70.1	62.7
70	48.6	52.9	67.2	84.6	102	119	133	144	151	154	153	147	138	125	110	91.9	72.6	56.4	46.7
75	32.8	38.0	55.3	74.5	94.8	113	128	139	146	150	148	143	133	119	102	83.5	63.3	43.3	31.1
80	18.3	24.8	44.0	67.3	88.2	107	123	134	141	145	143	137	128	114	96.4	75.8	54.5	31.9	17.0
85	7.08	14.6	36.2	60.7	81.8	101	116	128	136	139	138	132	122	108	90.3	70.4	47.1	23.4	6.15
90	1.71	9.08	31.1	54.8	76.1	95.3	111	123	130	134	132	127	117	103	85.2	64.9	41.4	18.3	1.54
95	2.00	7.04	26.5	49.8	70.8	89.8	105	117	124	128	126	121	111	97.4	79.9	60.0	37.3	15.1	2.02
100	3.82	8.44	23.6	45.4	66.5	83.8	99.0	110	117	121	119	114	104	91.0	74.2	55.4	34.2	15.0	4.17
105	6.87	12.0	23.1	41.2	60.9	78.0	92.4	103	110	113	112	106	97.4	84.7	69.7	51.4	33.1	16.3	7.06
110	10.9	15.6	25.2	38.9	55.8	71.2	85.1	95.5	102	105	104	98.9	90.4	78.4	64.5	48.8	33.5	20.5	10.5
115	13.9	19.0	28.1	38.1	52.4	66.5	78.0	87.7	94.0	96.8	95.9	91.0	83.2	72.6	60.9	47.4	31.0	23.7	13.9
120	17.8	22.4	31.1	39.6	50.2	62.5	72.2	80.4	85.9	88.6	87.7	83.6	77.1	69.0	58.2	46.8	33.8	27.1	16.3
125	21.4	25.3	34.1	41.6	49.9	59.3	68.5	74.9	79.6	82.0	81.2	77.9	72.4	65.6	56.7	44.7	35.3	29.7	19.1
130	24.7	27.7	36.5	43.3	49.6	57.8	64.9	70.7	74.2	76.3	75.8	73.0	69.2	63.1	55.1	45.8	37.7	32.5	21.1
135	27.7	30.5	38.9	44.8	50.5	55.7	62.4	67.6	70.8	71.5	71.5	69.9	65.5	58.4	54.1	44.8	40.3	34.5	24.9
140	30.3	32.5	41.6	46.5	49.5	55.1	59.3	63.0	66.1	67.6	66.7	63.3	58.0	58.1	54.0	46.5	42.9	36.8	28.4
145	32.3	33.6	43.6	47.9	49.8	53.1	56.6	61.2	62.4	62.3	61.6	60.8	61.7	58.9	53.4	48.0	44.1	38.8	29.1
150	32.8	34.0	44.4	48.5	50.9	53.1	55.6	57.2	58.8	59.8	59.7	59.5	60.2	57.7	53.5	49.7	45.2	40.8	29.6
155	33.3	34.0	44.7	49.8	51.7	53.6	54.7	56.3	57.3	58.2	58.4	59.2	58.6	56.6	54.2	49.8	46.5	40.7	30.0
160	35.1	30.5	44.7	49.6	52.1	53.7	54.9	56.0	56.9	57.2	57.2	57.9	57.2	55.6	53.7	50.5	47.6	38.5	30.4
165	32.9	28.1	38.9	49.1	50.9	52.8	54.2	55.1	55.8	56.2	56.1	56.2	55.5	54.0	52.9	51.6	42.1	30.4	30.4
170	29.5	27.4	28.1	33.0	43.0	51.9	52.0	52.1	52.5	52.7	52.4	52.7	53.3	47.0	41.1	35.7	30.3	25.7	28.9
175	26.4	26.7	26.8	26.8	26.8	27.2	32.0	38.4	44.1	47.7	40.4	26.3	25.2	25.5	21.4	21.5	24.6	27.0	27.7
180	35.0	34.6	33.3	31.1	27.3	20.8	16.2	8.45	14.6	2.33	11.0	11.0	11.9	16.2	23.6	29.0	31.6	33.2	34.7

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	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188	188		
5	186	186	186	186	186	186	186	186	187	187	186	187	187	187	187	187	187		
10	183	183	183	184	184	184	185	185	185	185	185	185	185	185	184	184	184		
15	179	179	179	180	181	181	182	183	183	183	183	183	182	181	181	181	180		
20	173	173	174	175	176	178	179	180	181	180	180	179	178	177	176	175	175		
25	165	166	167	169	171	174	175	177	178	178	177	176	174	172	170	168	168		
30	157	158	159	163	166	169	172	174	175	175	173	172	169	166	163	161	159		
35	147	149	152	156	160	164	168	170	171	171	169	167	163	159	156	153	150		
40	135	138	143	148	154	159	163	166	168	168	165	162	158	153	147	142	139		
45	123	126	132	140	147	154	159	162	164	164	161	158	152	145	138	131	127		
50	109	114	122	131	140	149	155	158	160	160	157	152	145	137	128	120	113		
55	94.8	101	111	122	133	142	150	155	157	157	153	147	139	128	117	107	99.7		
60	80.0	88.1	100	113	126	136	145	150	153	152	148	141	132	120	107	94.9	85.2		
65	64.8	75.0	89.5	105	119	131	140	146	148	147	143	136	125	112	97.4	82.7	70.6		
70	49.6	62.5	79.5	96.6	112	125	134	141	144	143	138	130	118	104	88.1	71.0	56.1		
75	35.2	51.0	70.3	89.0	106	119	129	136	139	138	132	124	112	97.1	79.3	60.3	42.6		
80	22.5	41.0	62.3	82.1	99.4	113	124	130	133	132	127	118	106	90.2	71.5	50.9	30.6		
85	12.9	33.4	55.6	75.9	93.4	108	118	125	128	127	121	113	100.0	83.9	64.8	43.2	21.4		
90	8.09	28.2	50.1	70.4	87.8	102	113	119	122	121	116	107	94.2	78.2	59.0	37.6	16.0		
95	6.52	24.8	45.7	65.4	82.6	96.4	107	113	116	115	110	101	88.6	72.8	54.1	33.5	13.3		
100	7.91	22.8	42.1	60.7	77.2	90.6	101	107	110	109	104	95.0	82.9	67.6	49.7	30.4	12.6		
105	10.7	22.6	39.5	56.7	72.2	84.9	94.6	101	104	102	97.5	89.2	77.5	63.0	46.2	28.6	14.1		
110	14.7	24.1	37.8	53.3	67.6	79.5	88.6	94.7	97.1	96.0	91.2	83.5	72.5	58.9	43.6	28.4	16.6		
115	18.8	26.5	37.7	50.5	63.4	74.4	82.8	88.2	90.6	89.6	85.1	77.9	67.8	55.3	41.9	29.4	20.2		
120	22.5	29.2	38.3	49.0	59.6	69.4	77.1	82.2	84.3	83.3	79.3	72.6	63.4	52.6	41.3	31.1	24.0		
125	26.1	32.2	39.4	48.2	57.0	65.0	71.8	76.2	78.1	77.3	73.7	67.7	59.8	51.0	41.7	33.2	27.4		
130	29.8	35.1	40.9	48.0	55.2	61.9	67.2	70.9	72.4	71.7	68.7	64.0	57.5	50.1	42.5	35.8	30.6		
135	32.9	37.9	42.5	48.1	54.0	59.4	63.8	66.8	68.0	67.4	64.8	61.0	55.8	49.8	43.5	38.6	33.6		
140	35.5	40.4	44.2	48.5	53.1	57.4	60.9	63.3	64.4	63.8	61.8	58.7	54.5	49.7	45.0	41.1	36.9		
145	36.1	42.7	45.7	49.0	52.5	55.8	58.5	60.4	61.2	60.9	59.1	56.7	53.6	50.0	46.6	43.0	39.0		
150	36.8	44.7	47.2	49.7	52.2	54.6	56.6	58.0	58.6	58.3	57.1	55.4	53.1	50.5	48.0	44.7	41.3		
155	39.7	45.6	48.2	49.9	52.0	53.7	55.1	56.1	56.5	56.4	55.6	54.5	52.9	51.2	48.7	46.5	43.6		
160	39.8	44.6	48.0	49.5	50.4	51.8	53.9	54.6	55.0	55.0	54.5	53.8	52.7	51.1	49.5	48.1	45.0		
165	33.3	42.4	46.9	49.6	50.4	50.7	50.3	52.6	53.7	53.6	53.2	52.6	52.0	51.5	50.8	49.1	44.3		
170	29.5	32.9	35.6	37.5	40.7	45.3	50.0	49.4	47.9	52.1	52.1	52.3	52.0	51.2	48.6	36.9	30.2		
175	27.7	27.6	27.5	27.4	27.2	27.3	27.3	28.4	39.5	45.1	41.0	38.7	33.1	27.8	24.7	25.1	25.2		
180	34.7	34.5	33.3	31.1	27.3	22.5	16.6	10.5	10.4	10.5	8.90	11.1	13.1	17.3	24.2	29.0	31.6		

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, 2021	Aug. 04, 2022
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2021	Aug. 04, 2022
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2021	Aug. 04, 2022
Standard source	D908	HZTE012-01	Aug. 05, 2021	Aug. 04, 2022
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2021	Aug. 04, 2022
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2021	Aug. 04, 2022
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2021	Aug. 04, 2022
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2021	Aug. 04, 2022
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2021	Aug. 04, 2022
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2021	Aug. 04, 2022
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2021	Aug. 04, 2022

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

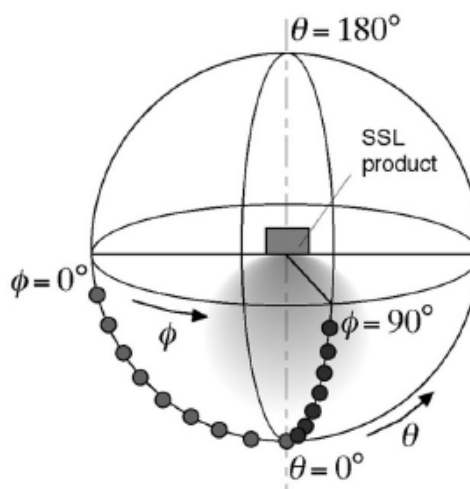
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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

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