

## LM-79-08 TEST REPORT

for

**IDEAL INDUSTRIES LIGHTING LLC, DBA CREE LIGHTING**

4401 SILICON DRIVE, DURHAM, NC 27703, USA

**LED Tube**

**Model: C-T848-B-32W-50K-B1**

**Laboratory: Leading Testing Laboratories**

**NVLAP CODE: 200960-0**

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Hangzhou, Zhejiang Province, China 311100

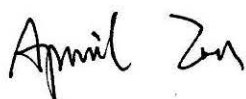
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www.ledtestlab.com

Report No.: HZ22030014c

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-T848-B-32W-50K-B1**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
156.4	1914.8	12.24	0.9833
CCT (K)	CRI	Stabilization Time (Light & Power)	
4974	81.3	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** : Nov. 30, 2021

**Date of Test** : Dec. 02, 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

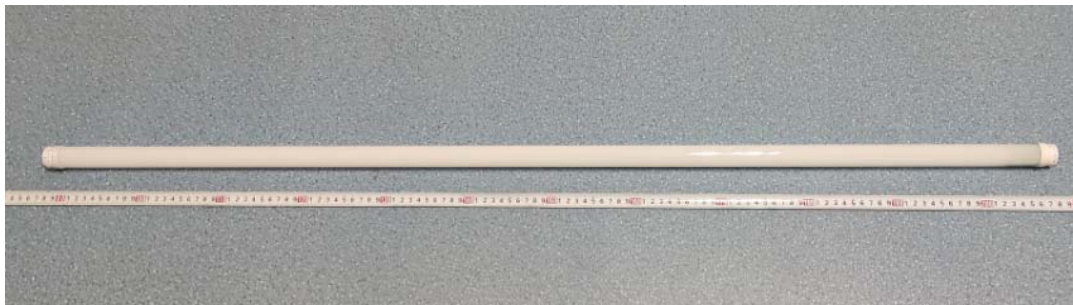


Figure 1- Overview of the sample

### Equipment Under Test(EUT)

<b>Name</b>	: LED Tube
<b>Model</b>	: C-T848-B-32W-50K-B1
<b>Electrical Ratings</b>	: 120-277V, 50/60Hz, 12W
<b>Product Description</b>	: 5000K
	: Manufacturer of light source: Bridgelux Inc.
	: Model of LED light source: BXVN-50E-11L-3EJ-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)	0.104	0.048
Power Factor	0.9833	0.9427
Test Power (W)	12.24	12.43
THD A%	17.47	18.52
Luminous Efficacy (lm/W)	156.4	155.5
Total Luminous Flux (lm)	1914.8	1933.1
Color Rendering Index (CRI)	81.3	
R9	5	
Correlated Color Temperature (CCT)(K)	4974	
Chromaticity Chroma x	0.3463	
Chromaticity Chroma y	0.3582	
Chromaticity Chroma u	0.2097	
Chromaticity Chroma v	0.3254	
Duv	0.0028	
Chromaticity Chroma u'	0.2097	
Chromaticity Chroma v'	0.4880	

Special Color Rendering Indices	
R1	79.4
R2	84.7
R3	89.3
R4	82.4
R5	80.2
R6	79.6
R7	86.7
R8	67.7
R9	5
R10	64.4
R11	82.1
R12	59.3
R13	80.3
R14	94.2

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 25.8°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)	0.105
Power Factor	0.9792
Power (W)	12.37
Luminous Efficacy (lm/W)	153.2
Total Luminous Flux (lm)	1895.3
Beam Angle (°)	116.5 (0°-180°) / 251.8 (90°-270°)
Center Beam Candle Power (cd)	281
Maximum Beam Candle Power (cd)	280.9 (At: C=270.0, Gamma=3.0)
Spacing Criteria	1.28 (0°-180°) / 1.46 (90°-270°)
Zonal Lumens in the 0°-60°Zone	39.39%
Zonal Lumens in the 60°-90°Zone	26.27%
Zonal Lumens in the 90°-120°Zone	18.83%
Zonal Lumens in the 120°-180°Zone	15.52%

Table 3: Test data per Goniophotometer Method

## Spectral Power Distribution - Sphere Spectroradiometer Method

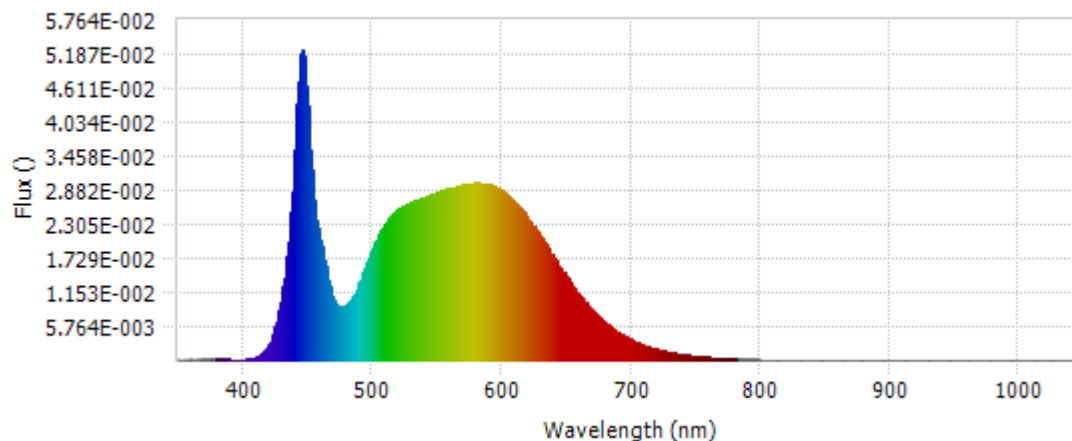
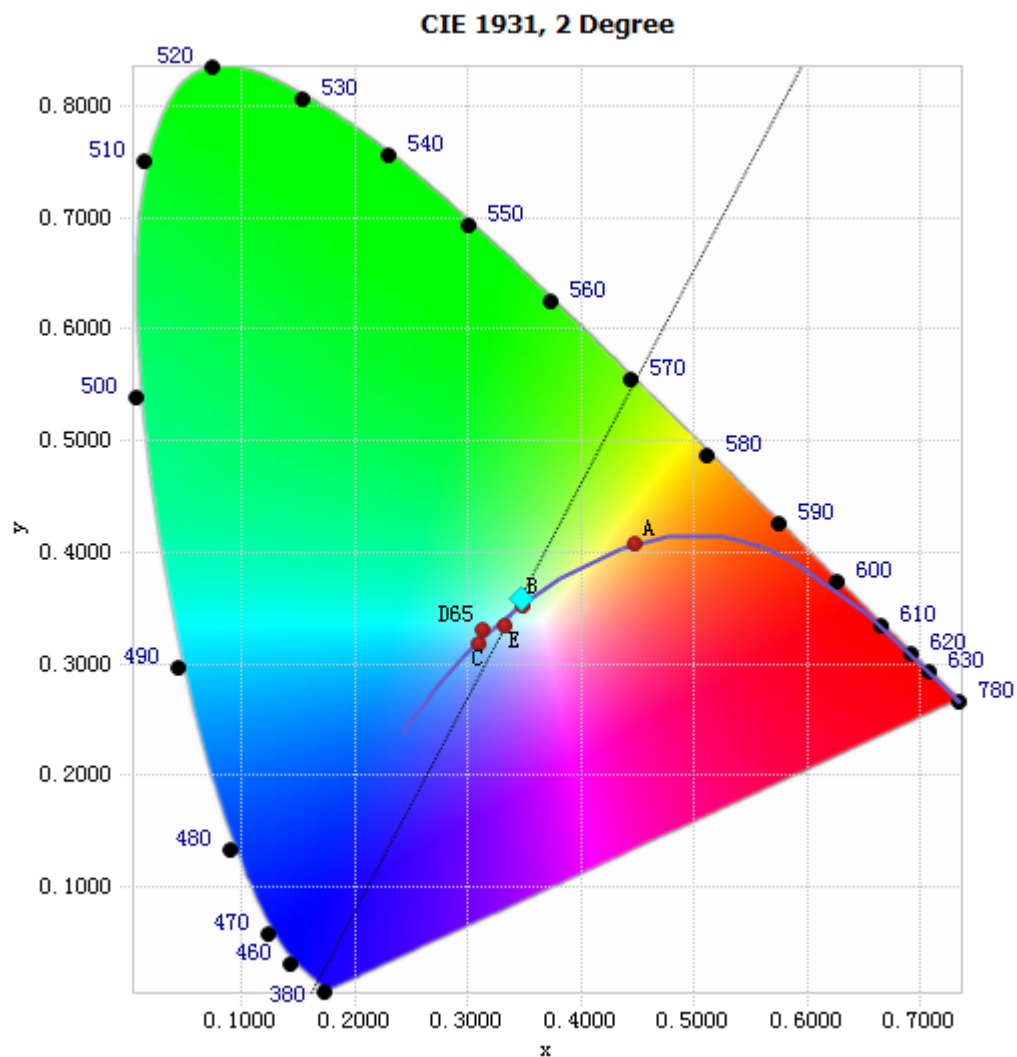


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.00E-04	485	1.07E-02	590	2.98E-02	695	4.10E-03
385	1.64E-04	490	1.31E-02	595	2.94E-02	700	3.51E-03
390	1.47E-04	495	1.61E-02	600	2.88E-02	705	3.00E-03
395	1.23E-04	500	1.89E-02	605	2.79E-02	710	2.54E-03
400	1.31E-04	505	2.13E-02	610	2.68E-02	715	2.18E-03
405	2.33E-04	510	2.32E-02	615	2.56E-02	720	1.88E-03
410	5.61E-04	515	2.47E-02	620	2.41E-02	725	1.60E-03
415	1.27E-03	520	2.56E-02	625	2.26E-02	730	1.36E-03
420	2.75E-03	525	2.62E-02	630	2.09E-02	735	1.17E-03
425	5.68E-03	530	2.67E-02	635	1.92E-02	740	9.90E-04
430	1.11E-02	535	2.71E-02	640	1.75E-02	745	8.46E-04
435	2.00E-02	540	2.75E-02	645	1.58E-02	750	7.25E-04
440	3.56E-02	545	2.80E-02	650	1.41E-02	755	6.17E-04
445	5.18E-02	550	2.84E-02	655	1.25E-02	760	5.31E-04
450	4.32E-02	555	2.88E-02	660	1.11E-02	765	4.56E-04
455	2.70E-02	560	2.90E-02	665	9.67E-03	770	3.90E-04
460	2.04E-02	565	2.94E-02	670	8.48E-03	775	3.35E-04
465	1.48E-02	570	2.97E-02	675	7.38E-03	780	2.88E-04
470	1.03E-02	575	2.99E-02	680	6.39E-03		
475	9.11E-03	580	3.00E-02	685	5.53E-03		
480	9.42E-03	585	3.00E-02	690	4.75E-03		

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

# Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3463, 0.3582)

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

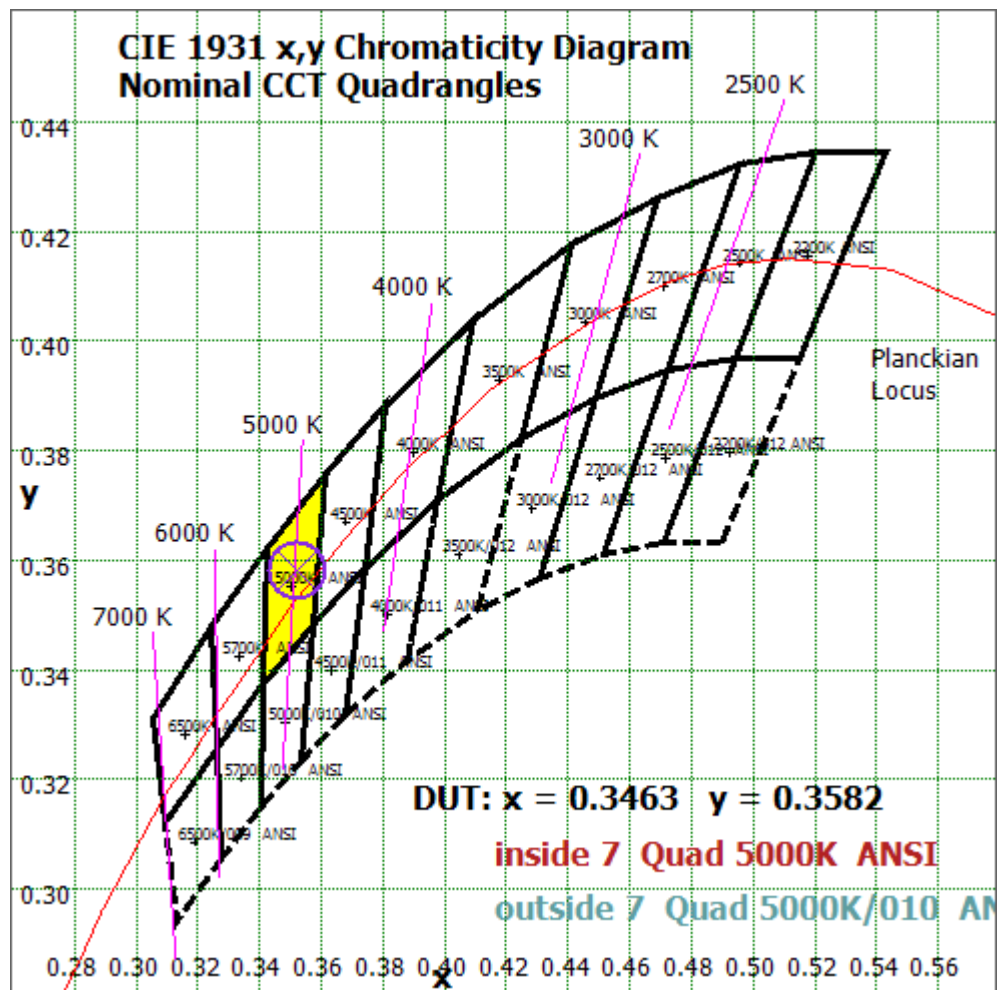


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

# Color Rendition Report – Sphere Spectroradiometer Method

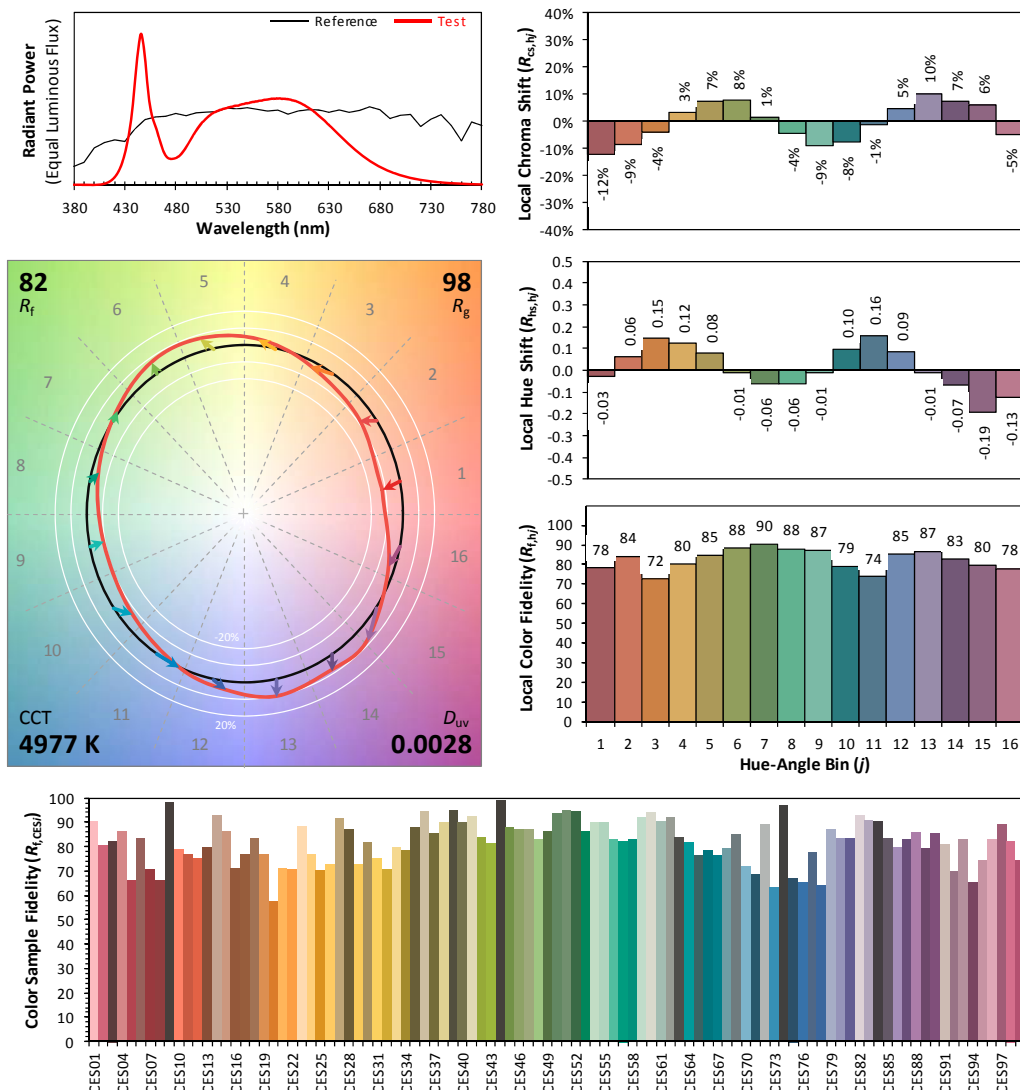
## ANSI/IES TM-30-18 Color Rendition Report

**Source:** LED

**Manufacturer:** IDEAL INDUSTRIES LIGHTING LLC,  
DBA CREE LIGHTING

**Date:** 2021/12/02

**Model:** C-T848-B-32W-50K-B1



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

$x$  0.3463  
 $y$  0.3582  
 $u'$  0.2097  
 $v'$  0.4880

CIE 13.3-1995  
(CRI)

$R_a$  81  
 $R_g$  5

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.

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### Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	26.652	1.41%
10- 20	77.675	4.10%
20- 30	122.113	6.44%
30- 40	156.329	8.25%
40- 50	177.855	9.38%
50- 60	185.872	9.81%
60- 70	181.267	9.56%
70- 80	167.181	8.82%
80- 90	149.408	7.88%
90-100	133.633	7.05%
100-110	118.891	6.27%
110-120	104.322	5.50%
120-130	89.733	4.73%
130-140	74.754	3.94%
140-150	58.86	3.11%
150-160	41.281	2.18%
160-170	22.403	1.18%
170-180	7.059	0.37%
Total	1895.3	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	746.496	39.39%
60- 90	497.856	26.27%
0-90	1244.35	65.66%
90- 180	650.936	34.34%
0- 180	1895.3	100%

Table 5: Zonal Lumen

## Illuminance Plots- Goniophotometer Method

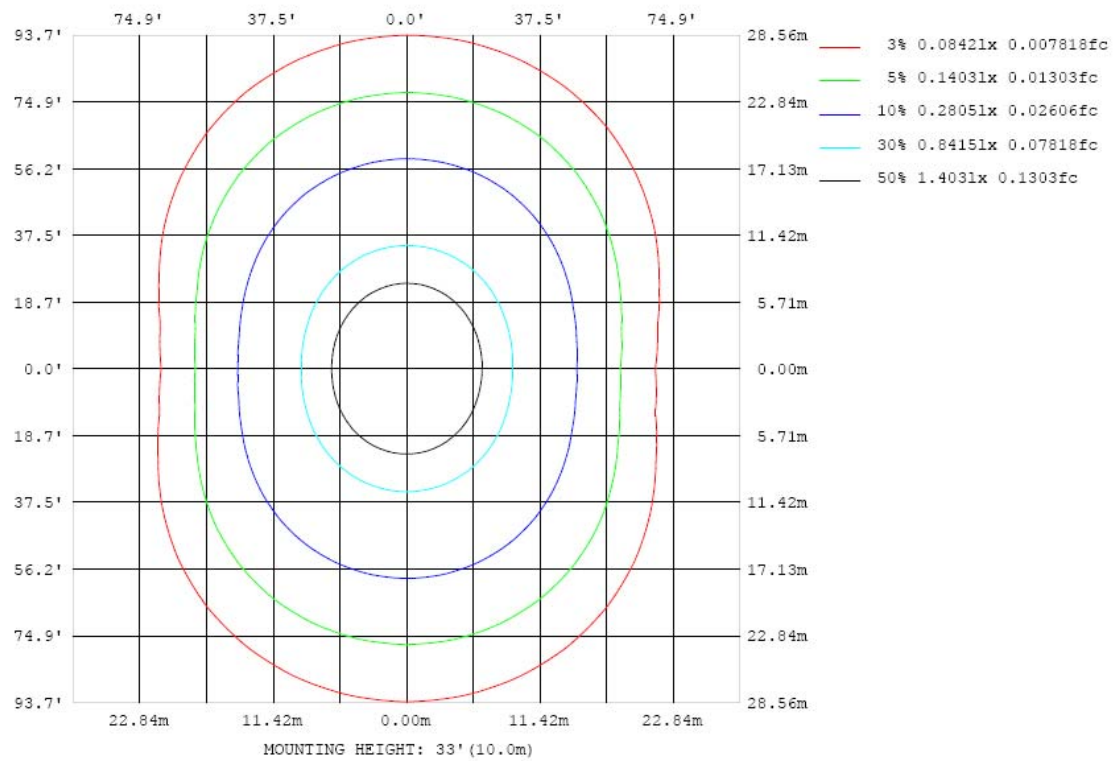


Chart 5: Illuminance Plot (Footcandles)

## Luminous Intensity Distribution Plots- Goniophotometer Method

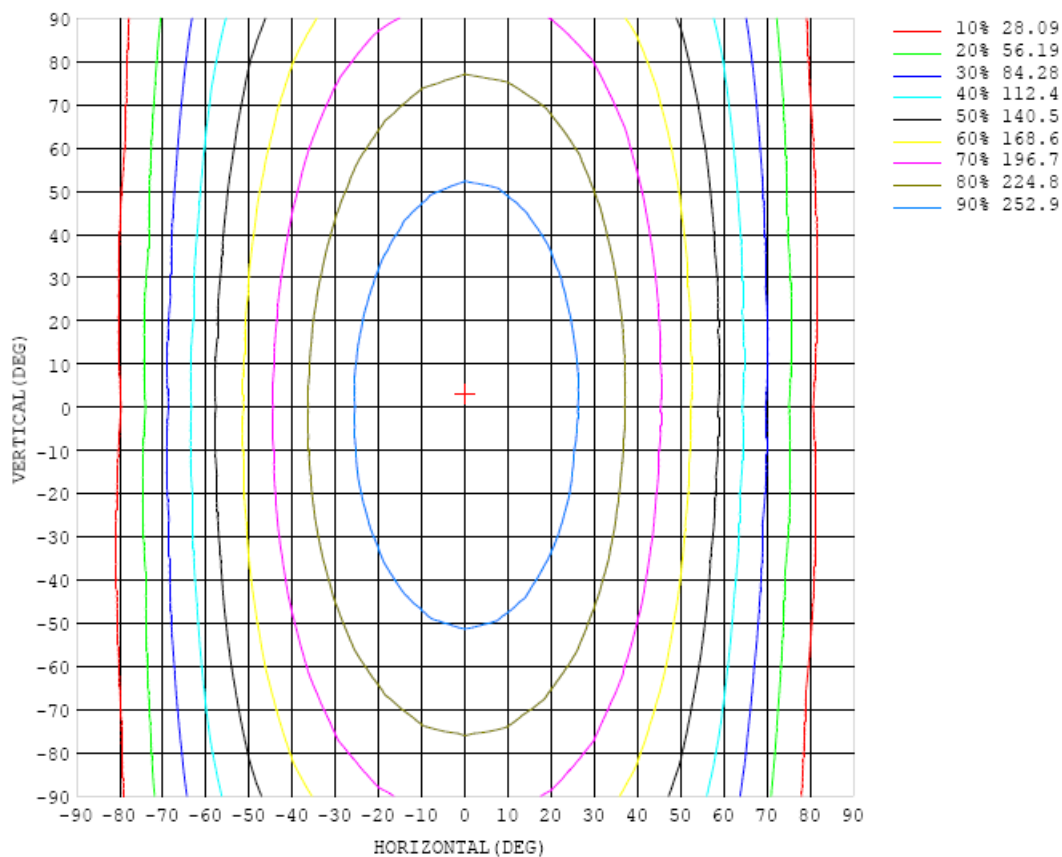


Chart 6: Isocandela Plot

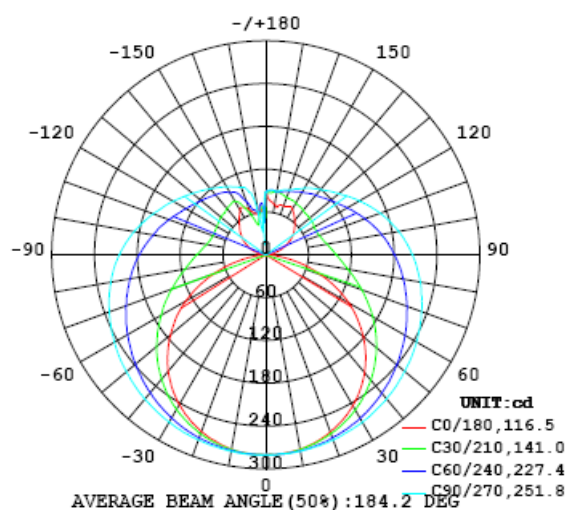


Chart 7: Polar Candela Distribution

## Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: 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	281	281	281	281	281	281	281	281	281	281	281	281	281	281	281	281	281	281	281
5	279	279	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280	280
10	277	277	277	277	277	278	279	279	279	279	279	279	279	278	277	277	276	276	277
15	272	272	272	273	274	276	276	277	278	278	277	278	276	276	274	273	272	271	271
20	264	264	265	267	269	272	273	275	275	276	276	275	273	271	269	267	265	264	264
25	255	256	257	260	263	267	269	271	273	273	273	271	269	266	263	260	257	255	254
30	244	245	247	251	256	260	264	267	269	271	270	267	264	260	256	251	246	244	242
35	231	232	235	241	248	254	259	264	266	267	266	263	259	253	247	240	235	230	229
40	215	217	222	229	238	246	253	258	262	263	262	258	253	245	237	228	220	215	213
45	198	200	206	216	227	238	247	253	257	259	257	253	246	237	226	215	205	197	195
50	178	181	190	203	217	229	240	248	253	254	252	247	239	228	215	201	188	178	174
55	157	161	172	188	205	220	233	242	247	250	247	241	232	219	203	187	170	158	153
60	134	138	153	173	193	211	226	236	242	244	242	235	225	210	192	172	151	135	129
65	109	115	133	158	181	202	218	229	236	239	236	229	217	201	180	157	132	112	104
70	82.5	91.0	114	143	170	193	211	223	230	232	230	222	209	192	169	142	114	88.4	77.2
75	56.7	66.9	96.2	130	159	184	203	216	224	226	223	215	202	183	159	129	96.4	65.9	51.1
80	31.4	46.5	80.2	117	150	176	196	210	217	220	217	208	195	175	149	118	81.8	46.7	26.6
85	10.8	29.4	67.8	107	141	168	188	202	210	213	210	201	187	167	141	108	70.5	32.0	7.81
90	0.85	20.2	60.0	99.0	133	160	181	195	203	206	202	194	180	159	133	101	63.6	24.7	0.61
95	2.80	17.9	55.0	92.6	126	153	173	187	195	198	194	186	172	152	126	94.4	58.9	22.7	3.03
100	8.46	20.1	52.0	87.1	119	145	165	179	186	189	186	178	164	145	119	89.1	56.1	24.2	7.99
105	15.7	25.2	51.3	82.8	112	137	157	170	177	180	177	169	156	137	113	85.0	55.2	29.5	13.8
110	23.5	31.3	52.8	79.8	107	130	148	161	168	171	168	160	147	130	108	82.1	56.2	35.4	20.7
115	30.6	37.0	56.7	78.4	102	123	140	152	159	161	158	151	139	123	103	80.6	60.0	41.8	27.2
120	38.5	43.7	58.7	78.3	98.4	117	132	143	149	151	149	142	132	117	99.5	80.1	62.5	47.9	33.7
125	45.8	50.5	62.6	79.8	95.7	112	125	134	140	142	140	134	125	112	97.0	81.6	65.9	55.0	40.1
130	51.9	57.4	66.1	79.9	94.8	107	119	127	132	134	132	127	119	108	95.5	82.0	68.8	61.0	45.8
135	57.6	62.7	69.4	80.6	93.5	104	113	120	125	126	125	120	114	105	94.5	82.6	72.2	66.9	51.8
140	63.4	67.8	73.3	81.7	91.6	102	109	114	118	120	118	115	109	102	92.4	82.7	75.5	71.6	57.9
145	69.1	73.3	76.8	82.9	89.9	97.8	105	110	113	114	113	110	105	98.1	90.6	83.9	78.8	75.9	64.8
150	74.4	79.2	78.9	84.3	89.6	95.9	102	105	107	108	107	104	99.8	95.3	90.0	85.3	81.2	79.8	72.5
155	74.6	83.0	81.4	85.2	90.3	94.2	97.8	101	102	102	101	99.2	96.5	93.1	90.1	86.0	79.3	81.4	73.6
160	72.9	87.0	85.7	85.6	89.1	92.8	95.2	96.9	97.5	96.8	96.4	95.4	94.0	92.2	89.6	86.0	81.2	75.8	67.4
165	71.9	86.7	88.7	88.2	88.5	90.3	91.9	93.2	94.0	94.1	93.7	92.8	91.5	90.3	88.9	79.7	72.8	66.8	60.4
170	72.4	85.2	88.5	89.8	90.5	90.2	90.0	90.4	90.6	90.6	90.5	90.4	90.1	87.9	80.5	70.5	65.9	64.0	63.6
175	76.2	81.9	84.9	87.3	89.8	91.1	91.3	91.2	91.1	91.0	91.5	91.2	87.7	81.3	72.5	63.7	59.2	59.6	62.2
180	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9

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	281	281	281	281	281	281	281	281	281	281	281	281	281	281	281	281	281		
5	280	280	279	280	280	280	280	280	281	281	280	280	280	280	280	280	279		
10	277	277	277	278	278	278	279	279	280	279	279	279	278	278	277	277	277		
15	272	273	273	274	276	276	277	278	278	278	277	276	276	274	273	272	272		
20	264	266	267	269	271	273	275	276	276	276	275	273	272	269	268	266	265		
25	255	257	259	262	266	269	272	273	274	273	272	270	267	264	261	258	256		
30	244	247	250	255	260	264	267	270	271	270	268	265	261	257	252	248	245		
35	230	234	239	246	252	258	263	266	267	267	264	260	255	249	242	237	232		
40	214	220	227	236	245	252	258	262	264	263	260	255	247	239	231	223	218		
45	197	204	214	225	236	245	253	257	260	259	254	248	240	229	218	208	201		
50	177	187	200	214	227	238	247	252	255	254	250	242	231	218	205	192	183		
55	157	168	185	202	218	231	241	247	250	249	244	235	223	208	191	175	163		
60	135	150	169	190	208	224	235	242	245	243	238	228	214	196	176	157	142		
65	111	131	155	178	199	216	228	236	239	238	232	221	205	185	163	139	118		
70	86.5	111	140	166	190	209	221	230	234	232	225	214	197	174	149	120	94.6		
75	63.1	93.4	127	157	181	201	215	223	227	225	219	206	188	164	135	102	71.2		
80	42.5	78.0	115	147	173	193	207	217	221	219	212	199	179	155	124	86.5	50.1		
85	27.3	66.0	105	138	165	186	200	209	213	212	204	191	171	146	113	74.1	33.8		
90	19.8	58.1	96.8	130	157	177	192	201	205	203	196	183	163	138	105	65.3	24.8		
95	18.2	52.9	90.0	123	149	169	183	193	197	195	187	174	156	130	97.1	59.0	21.8		
100	21.0	50.5	84.4	115	141	160	175	184	188	185	178	165	147	122	90.7	55.6	23.6		
105	26.0	51.3	80.7	109	134	153	165	174	178	176	169	157	139	115	86.0	54.9	28.3		
110	32.4	54.1	79.0	104	126	144	157	165	168	166	160	149	131	109	83.1	56.6	34.8		
115	38.5	58.0	78.8	100	120	137	149	156	159	157	151	140	124	104	82.0	59.5	41.5		
120	43.9	62.4	79.4	98.0	115	129	140	147	150	148	143	133	119	101	82.0	63.3	47.8		
125	48.2	67.0	80.7	96.3	111	124	133	139	142	140	135	126	114	99.0	82.8	67.7	53.7		
130	51.1	71.4	82.1	95.5	108	118	127	132	134	133	128	121	110	97.6	84.1	72.0	58.6		
135	52.4	75.1	82.4	93.4	105	114	121	125	127	126	122	116	107	96.8	85.4	75.9	62.4		
140	51.6	77.8	84.6	93.5	103	110	116	119	121	120	117	112	104	95.9	86.7	79.5	65.1		
145	49.5	78.7	86.4	90.6	98.4	107	111	114	115	114	112	108	102	95.0	88.2	82.1	66.1		
150	47.1	78.9	86.7	90.3	94.8	100	107	109	110	110	108	104	99.6	94.6	90.1	83.6	64.2		
155	50.2	63.9	75.1	86.5	87.6	95.9	99.7	104	105	105	104	101	98.0	95.1	90.7	76.7	63.4		
160	53.2	48.2	59.5	67.5	73.7	79.5	87.9	97.4	101	101	100	98.9	97.4	95.8	82.3	64.9	57.6		
165	52.8	45.3	44.3	50.6	63.0	65.8	64.7	76.8	91.2	98.3	97.9	93.6	91.0	83.3	61.4	55.7	56.0		
170	60.7	55.9	53.8	55.5	57.3	60.0	62.6	61.0	49.8	84.1	77.0	71.7	66.6	59.1	59.0	55.7	57.0		
175	64.0	64.6	67.4	69.9	71.1	72.5	73.9	74.0	14.0	75.6	77.3	75.3	72.0	69.2	69.2	70.7	72.1		
180	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9	87.9		

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  $4\pi$ . 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**

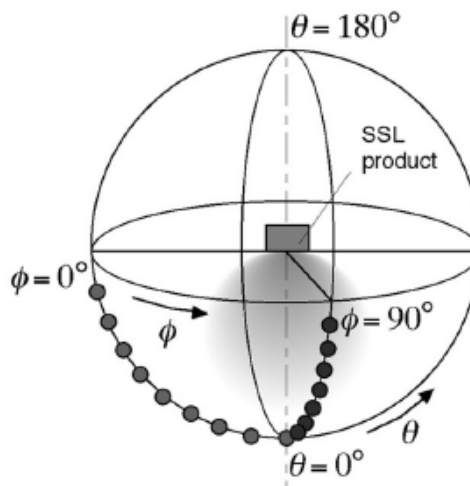
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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  $10^\circ$  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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