

LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

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

LED Tube

Model: 12T8/3F/830/GL/BYP

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19070032e

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

Review by:



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Jul. 25, 2019

Approved by:



Manager: Jim Zhang

Jul. 25, 2019

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: 12T8/3F/830/GL/BYP

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
135.3	1574.8	11.64	0.9830
CCT (K)	CRI	Stabilization Time (Light & Power)	
3072	82.7	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	: Jul. 22, 2019
Date of Test	: Jul. 24, 2019
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

LM-79-08 TEST REPORT	1
TEST SUMMARY	2
SAMPLE PHOTO	4
TEST RESULTS	5
Sphere-Spectroradiometer Method.....	5
Goniophotometer Method	6
Spectral Power Distribution - Sphere Spectroradiometer Method	7
Chromaticity Diagram - Sphere Spectroradiometer Method.....	8
Nominal CCT Quadrangles – Sphere Spectroradiometer Method	9
Color Rendition Report – Sphere Spectroradiometer Method	10
Zonal Lumen Tabulation- Goniophotometer Method	11
Illuminance Plots- Goniophotometer Method	12
Luminous Intensity Distribution Plots- Goniophotometer Method.....	13
Luminous Intensity Data- Goniophotometer Method	14
EQUIPMENT LIST	16
TEST METHODS	16
Seasoning of SSL Product.....	16
Sphere-Spectroradiometer Method- Photometric and Electrical Measurements.....	16
Goniophotometer Method	17
Photometric and Electrical Measurements	17
Color Characteristics Measurements.....	17
Color Spatial Uniformity	17

SAMPLE PHOTO



Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 12T8/3F/830/GL/BYP
Electrical Ratings	: 120-277V, 50/60Hz, 12W
Product Description	: 3000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

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)	0.099	0.047
Power Factor	0.9830	0.9144
Test Power (W)	11.64	11.81
THD A%	16.25	13.60
Luminous Efficacy (lm/W)	135.3	134.1
Total Luminous Flux (lm)	1574.8	1583.2
Color Rendering Index (CRI)	82.7	
R9	7.1	
Correlated Color Temperature (CCT)(K)	3072	
Chromaticity Chroma x	0.4294	
Chromaticity Chroma y	0.3973	
Chromaticity Chroma u	0.2486	
Chromaticity Chroma v	0.3450	
Duv	-0.0017	
Chromaticity Chroma u'	0.2486	
Chromaticity Chroma v'	0.5176	

Special Color Rendering Indices	
R1	81.6
R2	92
R3	95.2
R4	80.2
R5	81.9
R6	90.1
R7	81.8
R8	58.6
R9	7.1
R10	81.7
R11	79.7
R12	71.6
R13	84.3
R14	98.2

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 25.1 °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)	0.099
Power Factor	0.9827
Power (W)	11.68
Luminous Efficacy (lm/W)	132.8
Total Luminous Flux (lm)	1550.7
Beam Angle (°)	112.7 (0°-180°) / 237.9 (90°-270°)
Center Beam Candle Power (cd)	243
Maximum Beam Candle Power (cd)	243.2 (At: C=330.0, Gamma=1.0)
Spacing Criteria	1.25 (0°-180°) / 1.45 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	40.87%
Zonal Lumens in the 60 °-90 °Zone	26.53%
Zonal Lumens in the 90 °-120 °Zone	18.28%
Zonal Lumens in the 120 °-180 °Zone	14.31%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

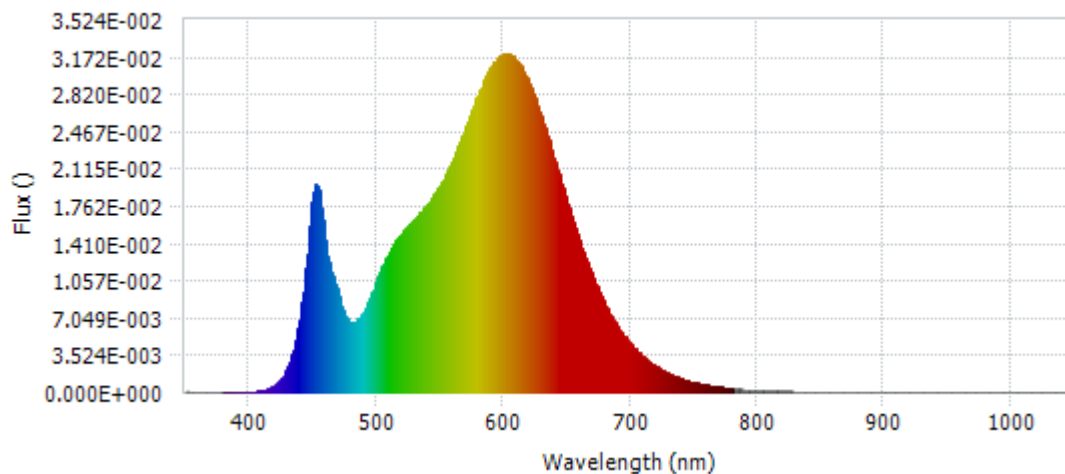
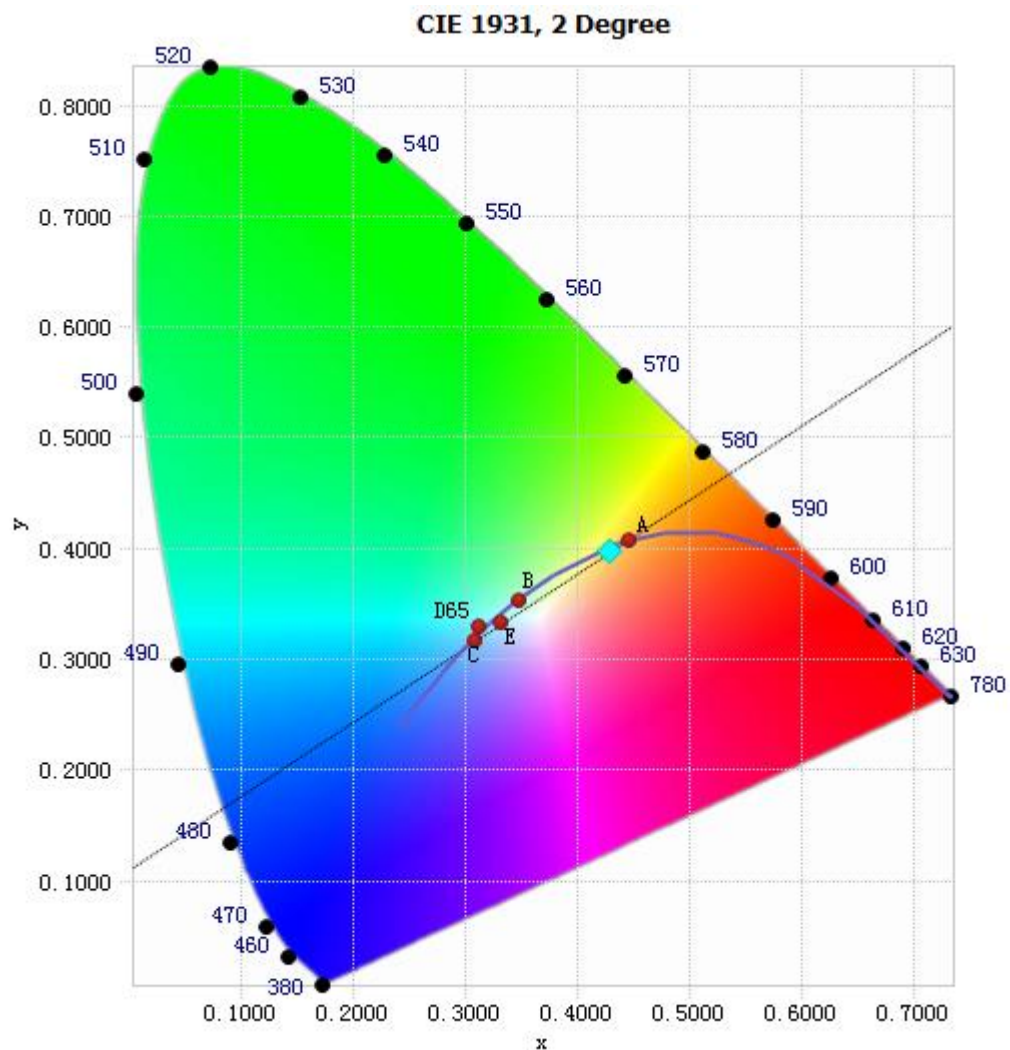


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	8.23E-05	485	6.84E-03	590	3.07E-02	695	5.38E-03
385	8.21E-05	490	7.62E-03	595	3.15E-02	700	4.61E-03
390	8.23E-05	495	8.83E-03	600	3.20E-02	705	3.96E-03
395	6.62E-05	500	1.04E-02	605	3.20E-02	710	3.38E-03
400	5.88E-05	505	1.18E-02	610	3.15E-02	715	2.89E-03
405	6.76E-05	510	1.31E-02	615	3.06E-02	720	2.47E-03
410	1.52E-04	515	1.42E-02	620	2.94E-02	725	2.11E-03
415	3.24E-04	520	1.50E-02	625	2.79E-02	730	1.80E-03
420	6.36E-04	525	1.57E-02	630	2.61E-02	735	1.53E-03
425	1.24E-03	530	1.64E-02	635	2.42E-02	740	1.30E-03
430	2.26E-03	535	1.70E-02	640	2.22E-02	745	1.11E-03
435	3.98E-03	540	1.77E-02	645	2.01E-02	750	9.50E-04
440	6.84E-03	545	1.85E-02	650	1.81E-02	755	8.11E-04
445	1.18E-02	550	1.95E-02	655	1.62E-02	760	6.87E-04
450	1.81E-02	555	2.06E-02	660	1.44E-02	765	5.93E-04
455	1.91E-02	560	2.18E-02	665	1.26E-02	770	5.05E-04
460	1.44E-02	565	2.33E-02	670	1.11E-02	775	4.28E-04
465	1.14E-02	570	2.49E-02	675	9.67E-03	780	3.68E-04
470	9.46E-03	575	2.64E-02	680	8.40E-03		
475	7.44E-03	580	2.80E-02	685	7.26E-03		
480	6.58E-03	585	2.95E-02	690	6.27E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4294, 0.3973)

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

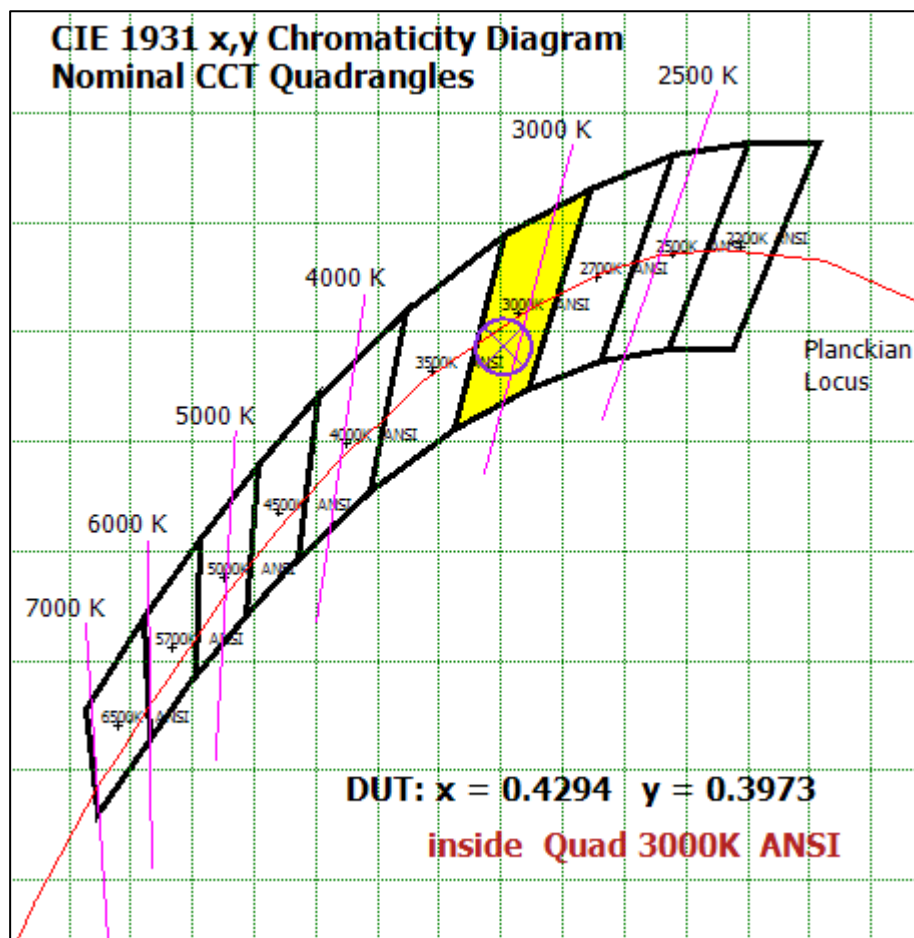


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

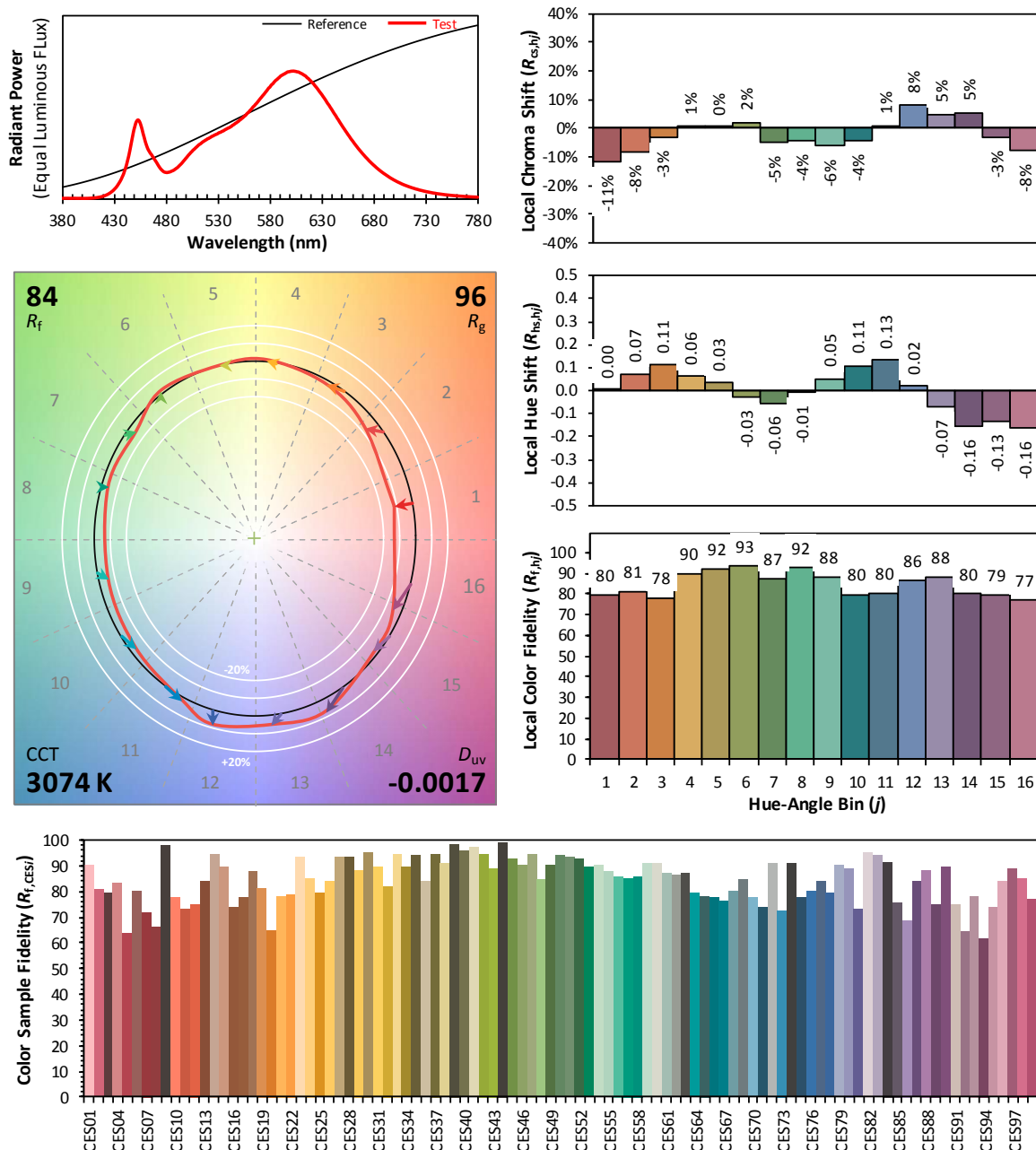


Chart 4: Full Report Created with the IES TM-30 Calculator

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

$\gamma(^{\circ})$	Lumens	% Total
0- 10	23.069	1.49%
10- 20	67.03	4.32%
20- 30	104.764	6.76%
30- 40	133.099	8.58%
40- 50	150.171	9.68%
50- 60	155.658	10.04%
60- 70	150.658	9.72%
70- 80	138.132	8.91%
80- 90	122.658	7.91%
90-100	108.47	6.99%
100-110	94.357	6.08%
110-120	80.673	5.20%
120-130	68.01	4.39%
130-140	56.126	3.62%
140-150	44.005	2.84%
150-160	31.485	2.03%
160-170	17.631	1.14%
170-180	4.725	0.30%
Total	1550.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	633.791	40.87%
60- 90	411.448	26.53%
0-90	1045.239	67.40%
90- 180	505.482	32.60%
0- 180	1550.7	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

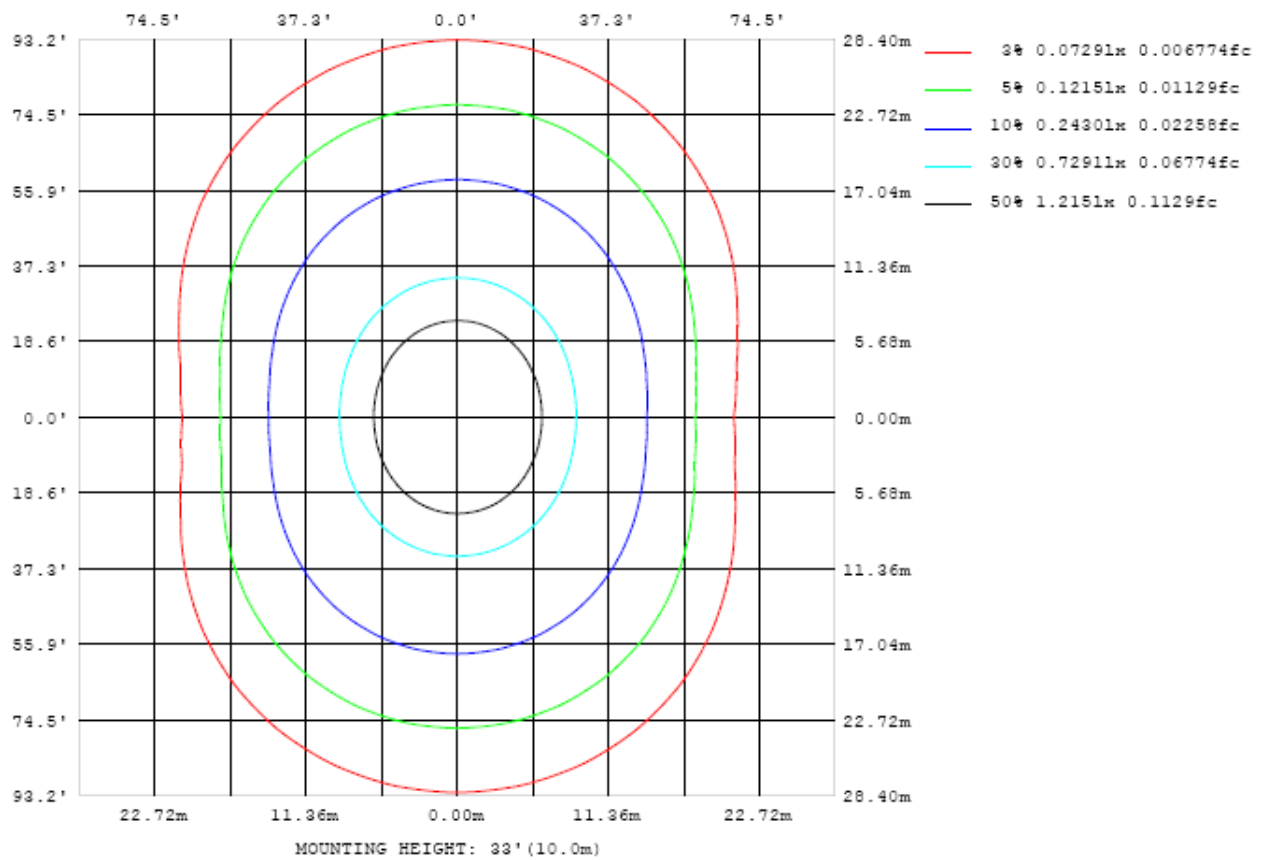


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

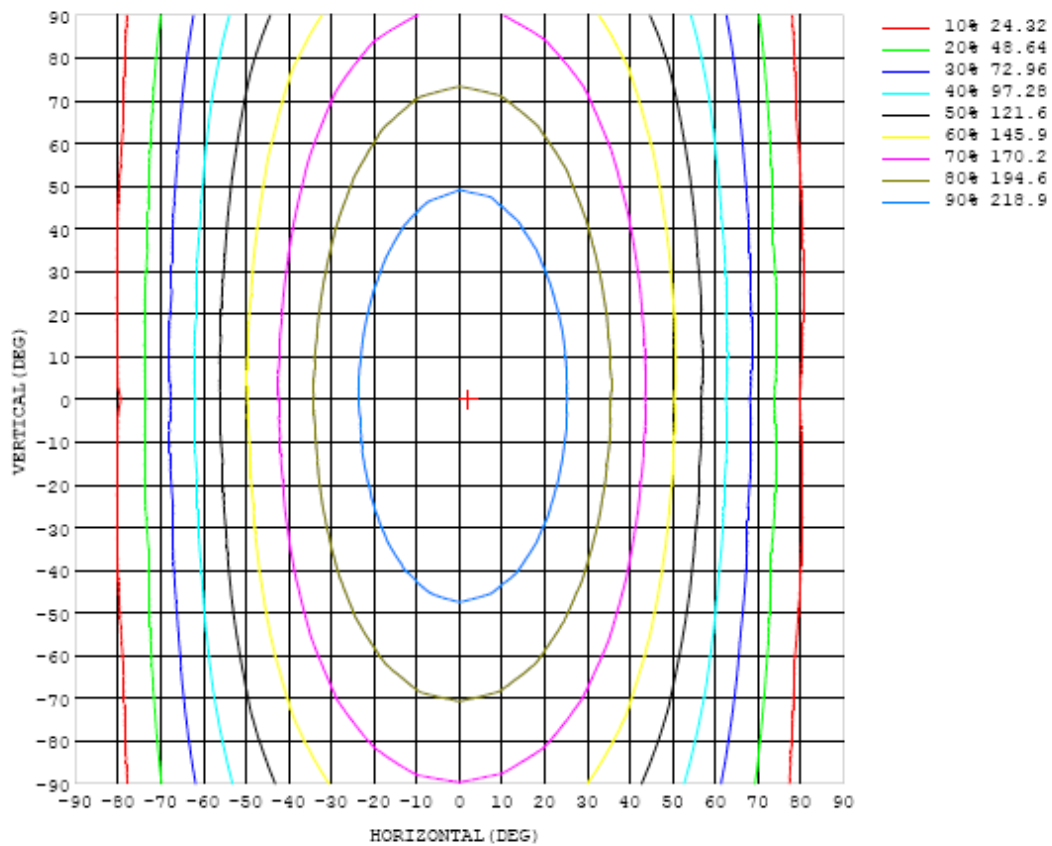


Chart 6: Isocandela Plot

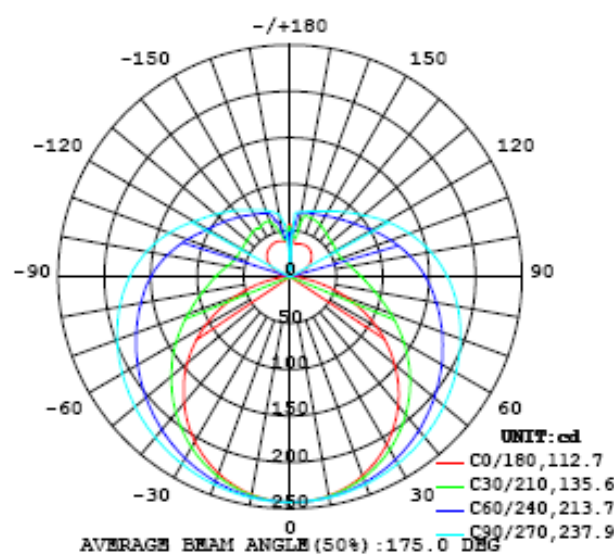


Chart 7: Polar Candela Distribution

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	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243
5	242	243	242	243	242	242	243	243	243	243	243	242	242	242	242	242	242	242	242
10	240	240	240	240	240	241	241	242	242	242	242	241	241	240	239	239	238	238	238
15	235	235	236	236	237	238	239	240	240	240	240	239	238	237	235	235	233	233	233
20	228	229	229	231	233	234	236	237	238	238	238	236	235	233	230	229	226	225	225
25	219	220	221	224	227	230	232	234	235	236	235	233	231	228	224	221	218	216	216
30	209	209	211	215	219	224	227	230	232	233	232	229	226	221	217	212	208	206	205
35	196	197	200	205	211	217	222	226	228	229	228	225	221	215	208	202	196	193	192
40	181	183	187	194	202	209	216	221	224	225	224	220	214	207	199	191	184	179	178
45	165	167	173	182	192	201	210	216	220	221	219	215	208	200	189	179	170	163	162
50	147	150	158	169	181	193	203	210	215	217	215	210	202	191	179	166	155	146	145
55	128	132	142	155	170	184	196	205	210	212	210	204	195	183	169	153	139	128	126
60	108	112	125	142	159	176	189	199	205	206	205	198	188	174	158	140	123	109	106
65	86.4	92.3	108	128	149	167	181	193	199	201	199	192	181	166	148	127	106	89.8	84.5
70	64.6	72.2	91.8	115	138	158	174	186	193	195	193	186	174	158	138	115	90.8	70.4	63.1
75	43.4	53.4	76.7	103	129	150	167	180	187	190	187	180	167	150	129	104	76.3	52.4	41.9
80	23.3	36.2	63.9	93.0	120	143	160	173	181	183	181	173	161	143	120	93.8	64.4	36.1	23.7
85	7.59	23.2	53.6	84.1	112	135	153	166	174	177	174	167	154	136	113	85.4	54.8	24.1	7.67
90	0.45	16.2	46.4	77.0	105	128	146	159	167	170	167	160	147	129	106	78.7	48.2	18.0	0.91
95	1.86	13.8	41.6	70.9	97.9	121	139	152	159	162	160	152	140	122	99.7	73.0	43.8	16.0	2.55
100	4.82	14.8	38.5	66.2	91.4	113	131	144	151	154	152	144	132	115	93.5	68.4	41.1	17.2	5.81
105	8.83	17.9	37.3	62.1	85.6	106	123	136	143	146	144	136	125	108	87.9	64.8	40.1	20.4	10.1
110	13.4	21.6	38.1	59.1	80.4	99.9	116	127	134	137	135	128	117	102	82.9	62.0	41.2	24.3	15.0
115	18.0	26.6	40.0	57.6	76.0	93.7	108	119	126	128	126	120	110	95.7	78.6	60.6	43.2	29.1	19.7
120	22.6	31.8	42.3	57.4	72.7	88.1	101	111	117	120	118	112	103	90.1	75.4	60.4	45.7	34.1	24.5
125	26.8	36.9	44.5	57.9	70.8	83.6	94.7	104	109	111	110	105	96.3	85.6	73.4	60.8	48.0	39.0	29.1
130	30.1	41.8	48.1	58.5	69.5	80.4	89.6	96.8	102	103	102	97.9	91.2	82.3	71.9	61.5	51.0	43.5	32.6
135	32.7	46.3	51.9	59.1	69.0	77.7	85.4	91.4	95.4	96.9	96.0	92.5	86.9	79.4	70.8	62.0	54.0	48.1	35.2
140	35.1	50.5	55.6	61.0	68.1	75.4	81.7	86.8	89.9	91.3	90.4	87.6	83.1	76.9	69.9	63.0	57.1	51.8	37.1
145	36.7	54.5	58.8	62.9	68.0	73.4	78.7	82.6	85.1	86.3	85.7	83.3	79.8	74.8	69.1	64.5	59.7	54.9	38.6
150	37.6	57.8	61.7	65.0	68.6	72.2	76.1	79.1	81.1	81.9	81.5	79.7	77.0	73.0	69.3	65.9	60.7	58.1	39.7
155	37.8	60.2	63.8	66.3	69.0	71.3	74.0	76.3	77.6	78.2	77.9	76.7	74.8	72.3	69.4	67.0	63.2	61.4	40.4
160	37.6	64.2	65.3	67.5	69.2	70.7	72.6	74.0	74.8	75.2	75.0	74.2	73.1	71.5	69.1	62.6	62.2	58.1	40.5
165	37.2	65.8	64.7	68.0	69.2	70.4	71.4	72.2	72.7	72.9	72.9	72.4	71.7	69.4	63.8	57.2	54.1	49.7	39.8
170	36.0	68.0	65.9	71.7	65.8	69.3	70.1	70.7	70.9	71.1	71.2	70.9	63.3	53.6	49.3	47.0	44.4	42.4	39.0
175	44.6	44.3	42.8	42.7	47.4	47.1	50.9	59.4	67.7	69.7	55.4	39.2	37.9	44.0	43.2	46.5	44.0	45.1	45.1
180	8.63	8.61	8.53	8.41	8.25	8.05	7.83	7.58	7.33	7.08	7.11	7.15	7.20	7.24	7.29	7.33	7.35	7.37	7.38

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	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243		
5	242	242	242	242	242	242	243	243	243	243	243	243	243	243	243	242	242		
10	238	238	239	240	240	241	241	242	242	242	242	242	241	241	241	240	240		
15	233	234	235	236	237	238	239	240	240	240	240	240	239	237	237	236	235		
20	226	227	229	231	233	235	237	238	238	238	238	237	235	233	231	230	229		
25	217	218	221	224	228	231	233	235	236	236	235	233	230	227	224	222	220		
30	206	208	212	217	222	226	230	232	233	233	231	228	224	220	216	212	210		
35	194	197	202	209	215	221	226	228	230	229	227	223	218	212	206	201	197		
40	179	184	191	200	208	215	221	225	226	226	222	217	210	203	195	188	183		
45	164	170	179	190	200	209	216	220	222	221	217	211	203	193	183	174	168		
50	148	156	167	180	192	203	211	216	218	217	212	205	195	183	171	160	152		
55	130	141	155	170	184	196	206	211	213	212	207	198	186	172	158	144	133		
60	111	124	142	160	176	190	200	206	209	207	201	192	178	162	145	128	114		
65	91.4	108	129	150	168	183	194	201	204	202	195	185	170	152	132	111	94.4		
70	71.8	92.2	117	140	160	177	189	196	198	196	189	178	162	143	119	94.9	74.4		
75	53.2	77.9	106	131	153	170	182	190	193	191	183	171	155	133	108	79.9	55.3		
80	36.8	65.4	95.8	123	146	163	176	184	186	184	177	164	147	124	97.4	66.9	38.2		
85	24.6	55.7	87.4	115	139	157	169	177	180	178	170	158	140	117	88.5	56.7	25.2		
90	18.1	48.9	80.5	108	132	150	162	170	173	171	163	151	132	109	81.1	49.4	18.1		
95	15.3	43.8	74.2	102	125	143	156	163	165	163	156	143	125	102	74.5	43.9	14.8		
100	16.4	40.3	68.4	94.6	117	134	147	155	157	155	147	135	117	94.6	68.4	39.8	15.3		
105	19.0	39.8	63.8	88.1	109	126	138	146	148	146	138	126	109	87.8	63.4	38.6	17.9		
110	23.0	40.7	61.6	82.3	102	118	129	136	138	136	129	118	102	82.0	60.4	39.0	21.0		
115	27.6	42.6	60.6	78.7	95.3	110	120	127	129	127	120	109	94.8	77.6	58.9	40.5	25.6		
120	32.7	44.5	60.2	76.1	90.7	103	112	118	120	118	112	102	89.7	74.7	58.5	42.3	30.0		
125	37.7	47.0	60.5	74.1	86.8	97.3	105	110	112	110	105	96.8	85.7	72.7	58.8	45.5	34.0		
130	42.5	50.1	61.0	72.7	83.5	92.6	99.3	104	105	103	98.8	91.9	82.5	71.4	58.8	48.8	38.0		
135	46.8	53.3	61.8	71.6	80.7	88.3	94.0	97.6	98.7	97.5	93.6	87.7	79.8	70.0	60.3	51.6	41.9		
140	50.3	56.2	62.9	70.5	78.2	84.5	89.2	92.3	93.2	92.1	88.9	84.0	77.0	69.0	62.0	54.0	45.4		
145	52.1	58.0	63.5	69.9	75.6	80.8	84.9	87.4	88.2	87.3	84.4	80.0	74.6	69.2	63.2	55.9	47.4		
150	53.5	59.7	63.4	69.5	74.0	77.7	80.6	82.4	82.9	82.3	80.2	77.3	73.5	69.3	64.1	57.3	48.6		
155	54.0	61.3	64.6	65.8	72.4	75.2	77.6	78.9	79.3	79.0	77.5	75.3	72.5	69.1	64.4	59.6	48.4		
160	45.5	58.3	63.4	64.9	67.9	72.8	74.6	75.7	76.1	75.8	74.8	73.3	71.0	68.1	64.3	61.5	45.6		
165	39.5	47.4	54.1	57.1	61.4	62.1	71.5	72.0	72.4	72.4	71.7	70.7	69.0	66.8	64.7	58.9	37.8		
170	38.8	39.9	42.4	45.9	47.6	50.7	57.5	63.4	67.6	68.3	67.9	67.3	66.4	65.5	57.6	37.5	31.4		
175	45.0	44.4	42.9	45.4	42.3	43.4	37.9	38.3	47.2	60.8	58.2	52.0	43.0	40.7	41.8	38.0	41.3		
180	7.37	7.35	7.33	7.29	7.24	7.20	7.15	7.11	7.08	7.33	7.58	7.83	8.05	8.25	8.41	8.53	8.61		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 14, 2018	Aug. 13, 2019
Digital Power Meter	PF2010A	HZTE028-01	Sep. 12, 2018	Sep. 11, 2019
AC Power Supply	DPS1060	HZTE001-06	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	WY12010	HZTE004-03	Aug. 09, 2018	Aug. 08, 2019
Temperature recorder	JM624U	HZTE018-08	Aug. 09, 2018	Aug. 08, 2019
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 09, 2018	Aug. 08, 2019
Standard source	D908	HZTE012-01	Aug. 14, 2018	Aug. 13, 2019
Integrate Sphere system	3M	HZTE015-04	Aug. 16, 2018	Aug. 15, 2019
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2018	Aug. 01, 2019
AC Power Supply	PCR 500L	HZTE001-07	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	IT6154	HZTE004-04	Aug. 09, 2018	Aug. 08, 2019
Standard source	SCL-1400	HZTE012-02	Aug. 16, 2018	Aug. 15, 2019
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 09, 2018	Aug. 08, 2019
Temperature Meter	TES1310	HZTE017-01	Aug. 09, 2018	Aug. 08, 2019

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

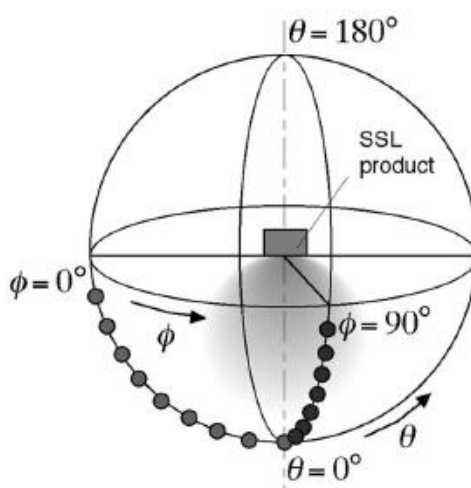
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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