

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 Tube

Model: 12T8/4F/850/DEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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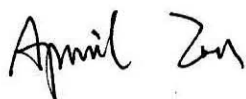
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Report No.: HZ20070023o

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

Review by:



Engineer: April Zou

Aug. 03, 2020

Approved by:



Manager: Jim Zhang

Aug. 03, 2020

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: 12T8/4F/850/DEB

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
158.2	1974.5	12.48	0.9794
CCT (K)	CRI	Stabilization Time (Light & Power)	
5150	83.4	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, 2020
Date of Test	: Jul. 22, 2020
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

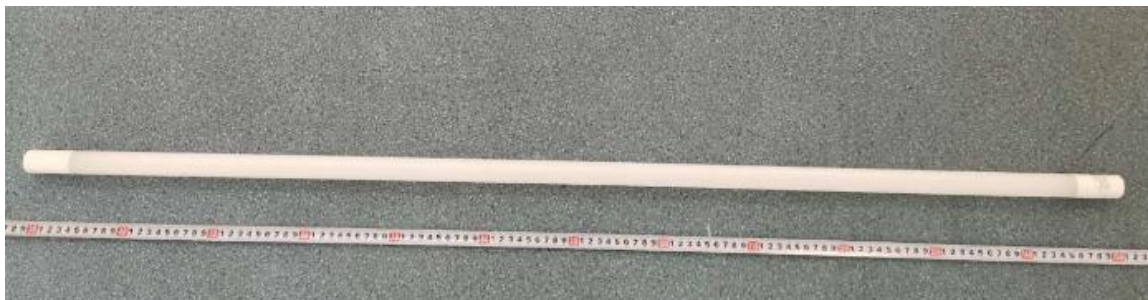


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 12T8/4F/850/DEB
Electrical Ratings	: 120-277V, 50/60Hz, 12W
Product Description	: 5000K
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 24.8 °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)	0.106	0.049
Power Factor	0.9794	0.9197
Test Power (W)	12.48	12.51
THD A%	18.60	18.96
Luminous Efficacy (lm/W)	158.2	156.7
Total Luminous Flux (lm)	1974.5	1960.1
Color Rendering Index (CRI)	83.4	
R9	6.7	
Correlated Color Temperature (CCT)(K)	5150	
Chromaticity Chroma x	0.3413	
Chromaticity Chroma y	0.3538	
Chromaticity Chroma u	0.2080	
Chromaticity Chroma v	0.3235	
Duv	0.0027	
Chromaticity Chroma u'	0.2080	
Chromaticity Chroma v'	0.4852	

Special Color Rendering Indices	
R1	81.8
R2	90.8
R3	94.6
R4	80.8
R5	81.9
R6	85.7
R7	85.9
R8	65.8
R9	6.7
R10	77.2
R11	79.9
R12	59.9
R13	84.7
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 25.2 °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)	0.106
Power Factor	0.9795
Power (W)	12.49
Luminous Efficacy (lm/W)	155.9
Total Luminous Flux (lm)	1946.9
Beam Angle (°)	110.5 (0°-180°) / 201.8 (90°-270°)
Center Beam Candle Power (cd)	347
Maximum Beam Candle Power (cd)	347.1 (At: C=280.0, Gamma=2.5)
Spacing Criteria	1.25 (0°-180°) / 1.41 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.78%
Zonal Lumens in the 60 °-90 °Zone	26.51%
Zonal Lumens in the 90 °-120 °Zone	16.67%
Zonal Lumens in the 120 °-180 °Zone	12.04%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

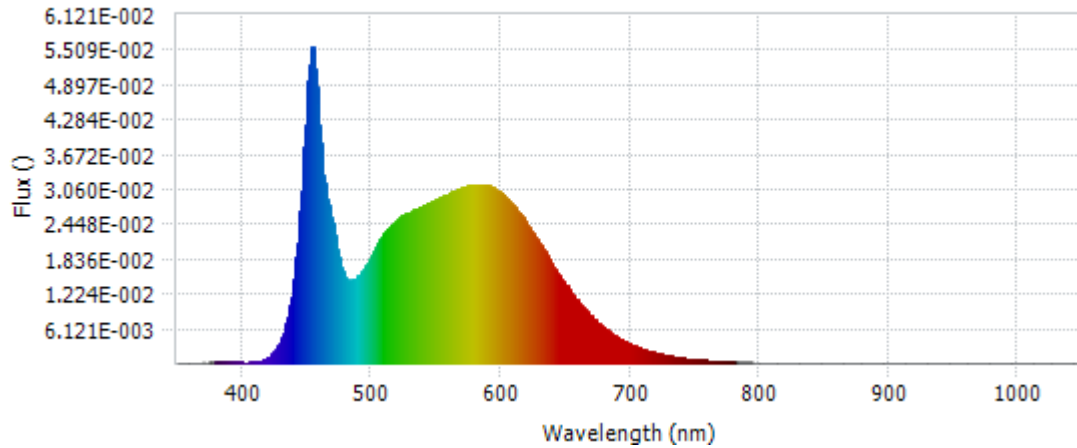


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.11E-04	485	1.46E-02	590	3.12E-02	695	3.99E-03
385	2.06E-04	490	1.54E-02	595	3.07E-02	700	3.41E-03
390	2.04E-04	495	1.69E-02	600	2.99E-02	705	2.92E-03
395	1.95E-04	500	1.89E-02	605	2.90E-02	710	2.49E-03
400	1.90E-04	505	2.11E-02	610	2.77E-02	715	2.13E-03
405	1.73E-04	510	2.28E-02	615	2.63E-02	720	1.83E-03
410	2.68E-04	515	2.42E-02	620	2.46E-02	725	1.57E-03
415	5.01E-04	520	2.53E-02	625	2.29E-02	730	1.33E-03
420	1.03E-03	525	2.60E-02	630	2.10E-02	735	1.14E-03
425	2.11E-03	530	2.66E-02	635	1.92E-02	740	9.72E-04
430	4.18E-03	535	2.71E-02	640	1.74E-02	745	8.30E-04
435	8.01E-03	540	2.77E-02	645	1.56E-02	750	7.07E-04
440	1.48E-02	545	2.82E-02	650	1.39E-02	755	6.08E-04
445	2.67E-02	550	2.87E-02	655	1.23E-02	760	5.18E-04
450	4.58E-02	555	2.93E-02	660	1.08E-02	765	4.50E-04
455	5.56E-02	560	2.98E-02	665	9.49E-03	770	3.83E-04
460	4.19E-02	565	3.03E-02	670	8.29E-03	775	3.31E-04
465	3.00E-02	570	3.08E-02	675	7.19E-03	780	2.84E-04
470	2.47E-02	575	3.12E-02	680	6.21E-03		
475	1.88E-02	580	3.14E-02	685	5.38E-03		
480	1.50E-02	585	3.15E-02	690	4.63E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method

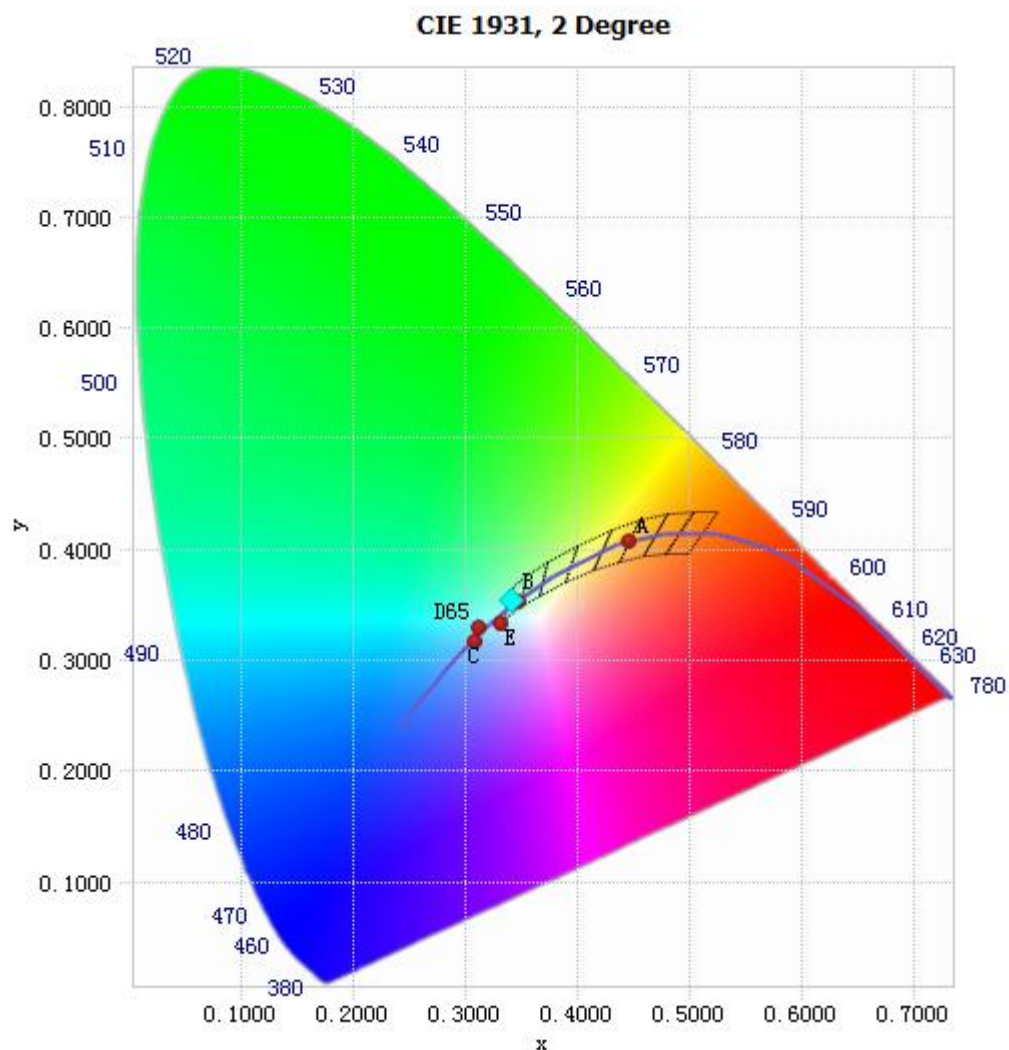


Chart 2: Chromaticity Diagram per Sphere - Spectroradiometer Method

Note: The location on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Nominal CCT Quadrangles – Sphere Spectroradiometer Method

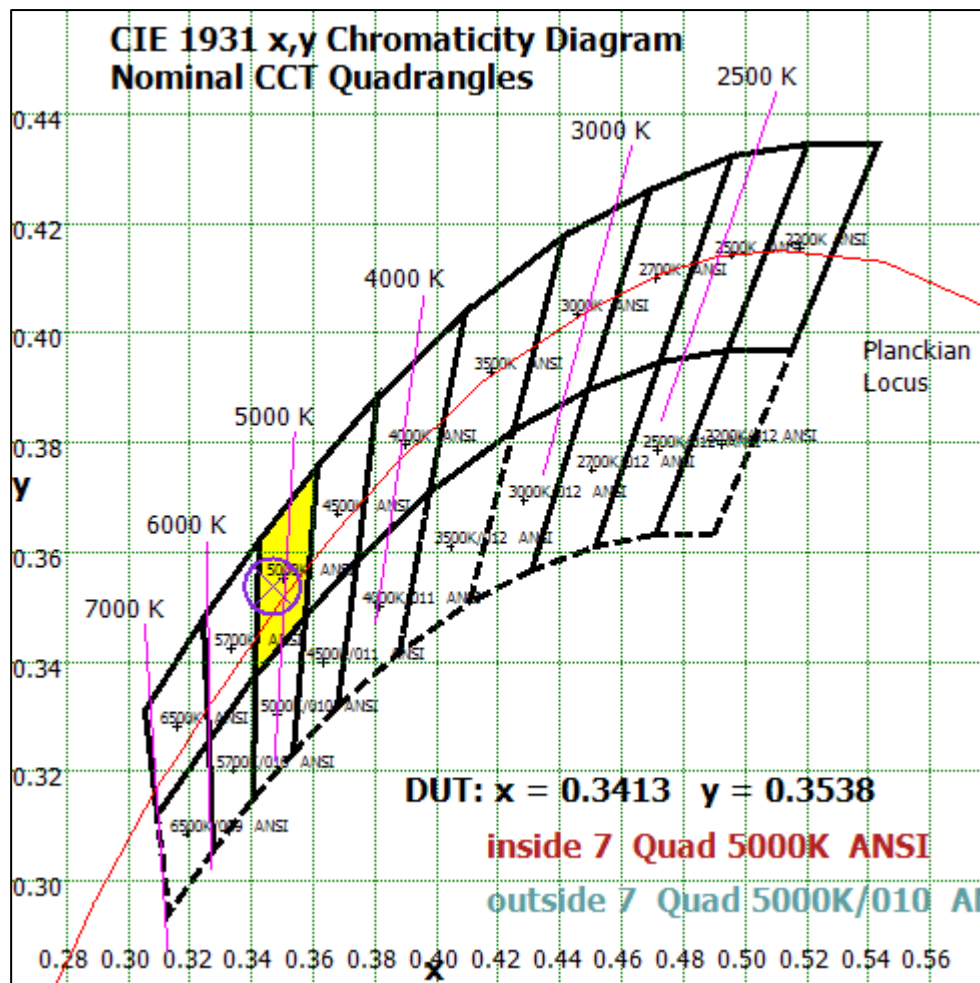
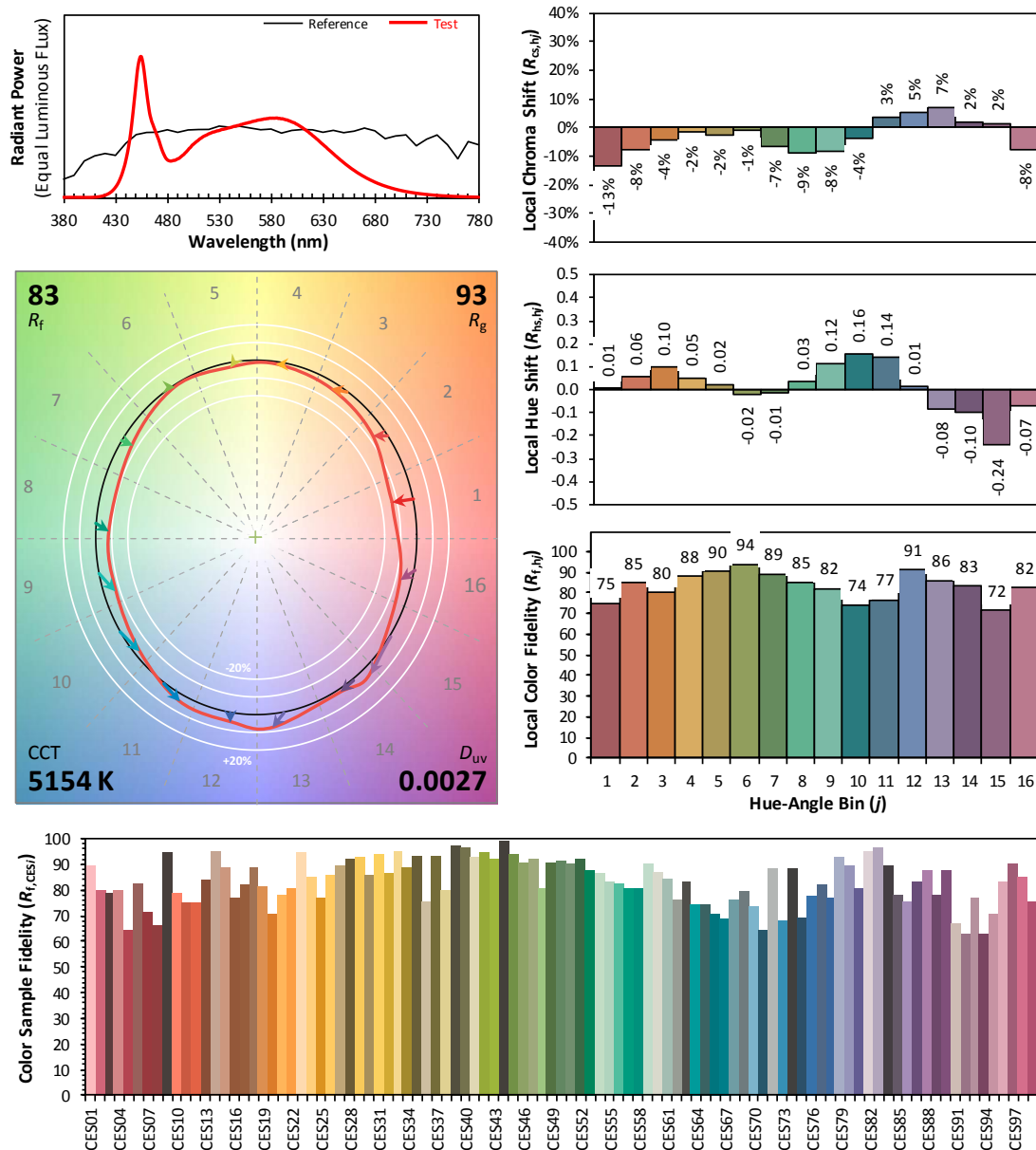


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x 0.3413

y 0.3538

u' 0.2080

v' 0.4852

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	32.888	1.69%
10- 20	95.149	4.89%
20- 30	147.398	7.57%
30- 40	184.722	9.49%
40- 50	204.587	10.51%
50- 60	207.134	10.64%
60- 70	195.03	10.02%
70- 80	172.996	8.89%
80- 90	148.042	7.60%
90-100	126.667	6.51%
100-110	107.684	5.53%
110-120	90.231	4.63%
120-130	74.377	3.82%
130-140	59.85	3.07%
140-150	45.913	2.36%
150-160	31.897	1.64%
160-170	17.317	0.89%
170-180	4.995	0.26%
Total	1946.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	871.878	44.78%
60- 90	516.068	26.51%
0-90	1387.946	71.29%
90- 180	558.931	28.71%
0- 180	1946.9	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

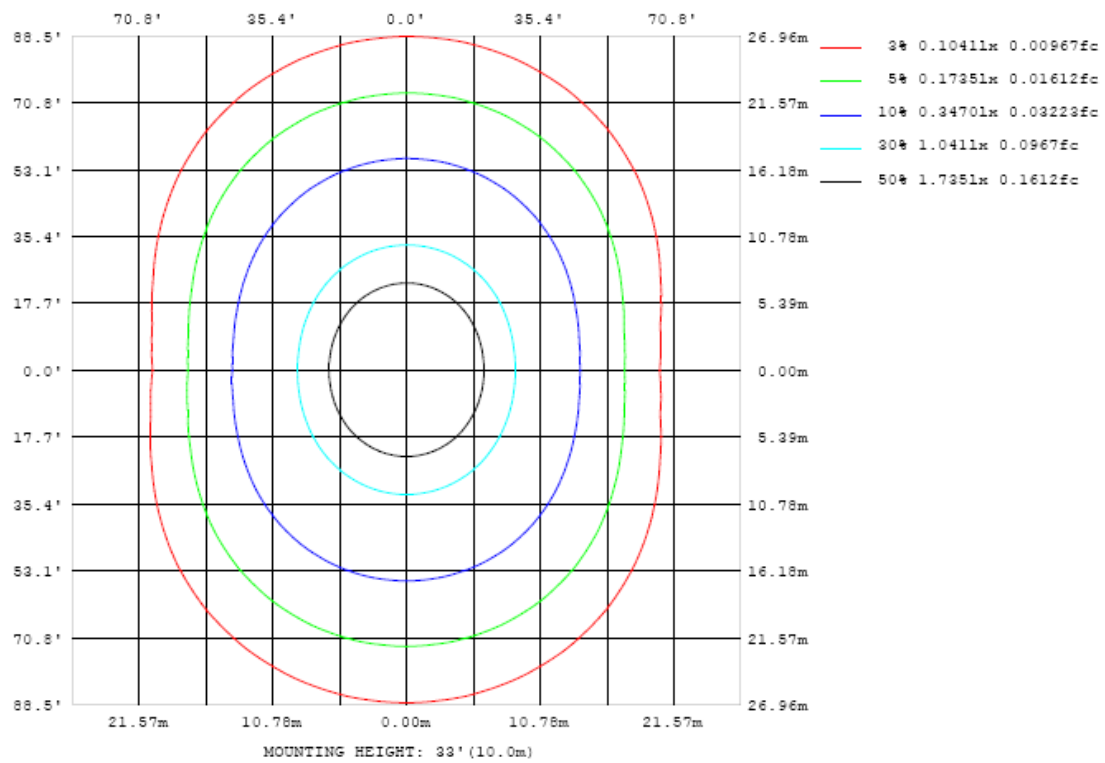


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

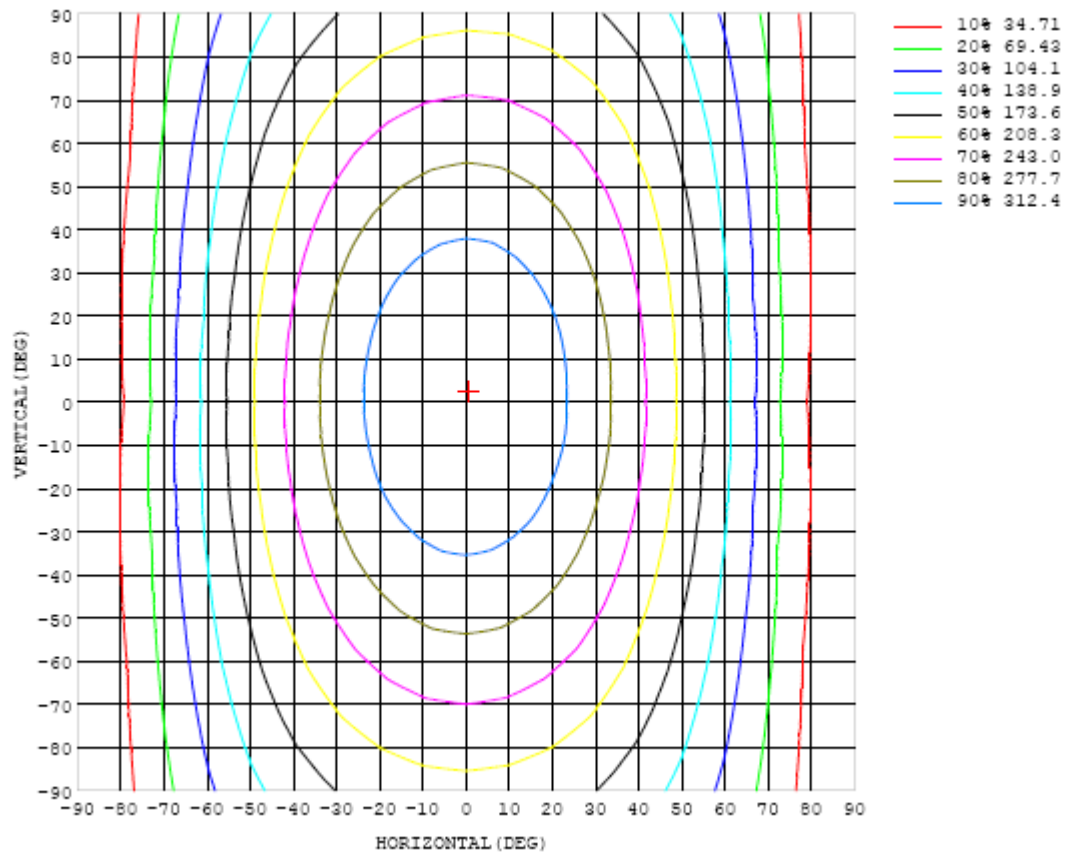


Chart 6: Isocandela Plot

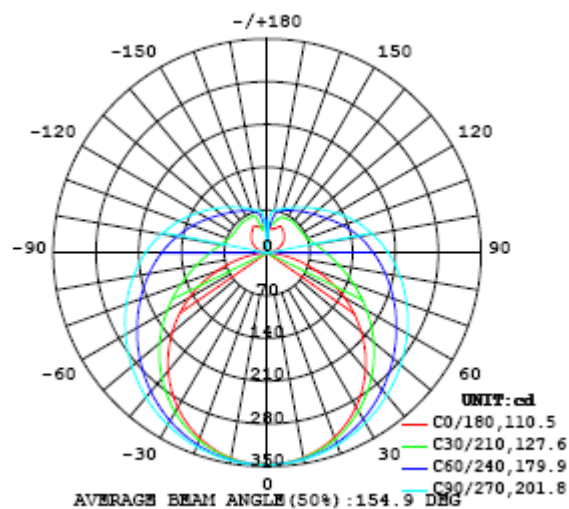


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347
5	345	345	345	345	346	346	345	346	345	346	345	346	345	345	345	346	346	345	345
10	340	340	341	341	341	342	343	343	343	343	343	343	343	342	341	341	341	341	341
15	332	333	333	334	335	336	338	339	339	340	339	339	338	337	336	334	333	333	333
20	321	322	323	325	327	329	331	333	334	335	334	333	331	330	327	325	323	323	323
25	308	308	310	313	316	320	323	326	328	328	328	326	323	321	317	314	311	309	309
30	291	292	295	299	304	309	314	318	320	321	321	318	314	310	305	300	296	293	292
35	272	273	277	283	290	297	304	309	312	313	312	309	304	298	292	284	279	275	274
40	250	252	258	266	275	284	293	299	303	304	303	299	293	285	277	268	260	254	252
45	227	229	237	247	259	271	281	289	293	295	294	289	281	272	261	249	239	231	229
50	201	204	214	227	242	257	269	278	283	285	284	278	269	258	245	230	216	207	203
55	174	178	191	207	226	243	257	267	273	275	273	267	257	244	228	210	194	181	176
60	146	152	167	188	209	228	244	255	262	265	263	256	245	230	211	191	170	155	147
65	116	124	144	168	193	215	232	244	251	254	252	244	232	216	195	171	148	127	118
70	85.9	96.3	122	151	178	201	220	233	240	243	241	233	220	203	180	154	125	100	87.5
75	56.6	70.1	101	134	164	189	208	221	229	232	229	222	208	190	166	137	104	74.0	58.7
80	29.8	47.2	82.9	119	152	177	196	210	218	221	218	210	197	178	153	122	86.0	51.0	32.4
85	8.88	30.2	68.9	107	140	165	185	198	206	209	207	199	185	166	141	109	71.7	33.3	10.3
90	0.36	21.1	59.0	96.4	129	155	174	187	195	198	196	188	174	156	130	98.5	61.2	23.2	0.51
95	2.22	17.6	52.2	87.8	119	145	164	176	184	187	184	177	164	146	121	89.6	54.0	19.0	1.90
100	6.05	18.6	47.5	80.2	110	134	153	165	173	175	173	165	153	135	111	81.6	48.6	18.9	5.39
105	11.0	21.9	45.6	74.0	101	124	142	155	162	164	162	155	142	125	102	74.9	45.8	21.8	10.1
110	16.8	26.5	45.9	69.8	93.8	115	132	143	150	153	151	144	132	115	94.3	70.0	45.2	26.2	15.0
115	22.5	31.6	47.4	67.4	87.9	106	122	133	139	141	139	133	122	106	87.8	66.8	46.0	30.3	20.4
120	27.9	36.2	49.3	66.2	83.5	99.4	113	122	128	130	128	122	112	99.1	83.0	65.0	48.2	35.4	25.9
125	32.3	40.0	51.8	65.6	80.3	93.8	105	113	118	120	118	113	105	93.2	79.4	64.2	50.8	39.5	30.2
130	36.4	45.0	54.1	65.4	77.7	89.2	98.7	106	110	111	110	105	98.1	88.3	76.6	64.4	52.7	44.4	33.9
135	39.4	48.2	56.0	65.6	75.5	85.1	93.1	99.0	103	104	103	98.7	92.5	84.3	74.7	65.0	55.1	48.0	37.0
140	42.2	51.3	57.5	66.2	73.8	81.6	88.2	93.1	96.1	97.1	96.1	92.8	87.5	80.9	73.3	65.3	57.2	51.5	40.0
145	44.9	54.5	58.2	65.8	72.7	78.5	83.8	87.8	90.2	91.0	90.1	87.5	83.3	78.0	72.0	65.7	58.7	54.4	43.3
150	47.4	58.2	60.2	64.7	71.7	76.1	80.0	83.0	84.9	85.5	84.9	82.8	79.7	75.6	70.8	65.8	61.6	58.3	47.2
155	47.9	58.4	60.7	62.1	68.2	74.0	76.7	78.9	80.3	80.8	80.4	78.9	76.5	73.4	69.9	66.0	63.3	60.2	48.7
160	42.9	52.4	58.6	60.6	65.5	70.8	73.8	75.3	76.2	76.6	76.4	75.3	73.7	71.5	69.1	67.1	65.8	60.4	45.9
165	41.6	46.5	50.7	54.3	58.3	64.7	70.4	73.0	73.4	73.7	73.7	72.6	71.3	70.0	68.8	68.1	66.6	62.6	43.6
170	38.5	40.6	45.7	48.0	47.6	51.9	60.6	66.9	69.9	71.3	71.3	71.1	70.5	69.4	67.9	65.8	63.6	56.6	43.5
175	45.5	45.7	46.8	48.3	46.9	43.1	42.3	48.9	57.2	63.7	65.7	67.0	68.5	66.7	63.9	61.2	57.1	51.4	48.5
180	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2

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	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347	347		
5	345	346	346	346	346	346	346	347	347	347	347	346	346	346	346	346	345		
10	341	341	342	343	344	344	344	345	345	345	344	344	343	342	342	341	340		
15	334	334	335	337	339	340	341	342	342	342	341	340	338	337	335	334	333		
20	323	324	326	329	332	334	336	337	338	337	336	334	331	329	326	324	322		
25	310	312	315	319	323	327	329	331	332	331	329	326	323	319	315	311	308		
30	294	297	301	307	313	318	321	324	325	325	322	318	313	307	301	296	292		
35	275	279	286	293	301	307	313	316	317	317	313	308	301	294	286	279	273		
40	254	260	268	278	288	296	303	307	309	308	303	297	289	279	268	259	253		
45	232	239	250	262	274	284	292	297	299	298	293	285	275	263	250	238	229		
50	207	216	230	245	260	272	281	287	289	288	282	273	261	246	231	216	205		
55	180	193	210	228	245	259	269	276	279	277	271	261	247	230	211	192	179		
60	153	169	189	211	230	246	258	265	268	266	260	248	233	213	191	169	151		
65	125	145	169	194	216	233	246	254	257	255	248	236	219	197	172	145	124		
70	97.0	121	150	178	202	221	234	242	246	244	236	224	206	182	154	123	96.5		
75	70.6	100.0	133	163	189	208	222	231	234	232	225	212	193	168	137	103	71.2		
80	47.2	81.5	118	150	176	196	210	219	223	221	213	200	180	154	122	85.2	49.1		
85	29.3	67.4	105	137	164	184	199	207	211	209	201	188	169	143	110	71.7	32.5		
90	19.5	57.0	93.9	126	153	173	187	196	199	198	190	177	158	132	99.4	62.2	23.6		
95	16.2	49.7	84.8	116	142	162	176	184	188	186	178	166	147	122	90.5	55.3	20.4		
100	17.0	45.3	77.3	107	132	151	164	172	176	174	167	155	136	113	83.3	51.0	21.2		
105	20.0	43.4	71.5	98.7	122	140	153	161	164	163	156	144	127	104	77.4	49.0	24.1		
110	24.5	43.5	67.9	91.7	113	130	142	150	153	151	145	134	118	97.1	73.1	49.1	28.1		
115	29.1	44.7	65.2	85.9	105	121	132	139	142	140	134	124	110	91.1	70.7	50.1	32.7		
120	34.2	46.9	63.9	81.5	98.0	112	122	129	131	130	124	115	102	86.5	69.2	51.8	37.1		
125	37.5	49.4	63.4	78.1	92.3	104	113	119	122	120	115	107	96.3	82.8	68.3	53.9	40.8		
130	39.0	51.3	63.5	75.6	87.5	97.8	106	111	113	112	108	101	91.2	79.8	67.9	55.8	43.4		
135	42.3	54.2	64.2	73.7	83.6	92.1	98.7	103	105	104	100	94.7	86.8	77.5	67.9	57.5	45.3		
140	46.1	56.8	64.4	72.4	80.4	87.3	92.7	96.3	97.9	97.1	94.2	89.4	83.0	75.5	67.8	59.1	46.8		
145	48.5	58.2	64.6	71.4	77.6	83.1	87.4	90.3	91.5	90.9	88.6	84.8	79.8	74.1	66.9	59.2	48.8		
150	49.2	59.4	64.2	70.7	75.1	79.4	82.8	85.0	86.0	85.5	83.7	80.9	76.8	72.4	66.6	60.7	48.9		
155	43.8	57.6	64.2	68.8	73.1	75.9	78.3	80.1	80.9	80.6	79.1	77.0	74.4	69.7	63.0	58.8	46.9		
160	37.1	50.0	65.2	66.8	70.2	73.0	74.8	76.0	76.5	76.3	75.5	73.7	68.7	60.8	55.6	53.3	43.8		
165	35.2	38.7	48.1	64.6	66.5	68.4	70.5	72.1	72.8	73.0	71.0	62.9	54.6	51.6	47.7	45.6	40.4		
170	36.0	36.9	37.9	43.1	53.1	61.4	64.3	67.9	69.5	64.5	47.5	47.7	49.3	47.6	44.8	40.8	39.7		
175	47.1	47.5	50.0	51.4	51.0	50.0	52.7	49.3	36.3	43.5	50.9	53.3	52.7	52.6	51.4	50.2	48.1		
180	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	PF2010A	HZTE028-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	DPS1060	HZTE001-06	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	WY12010	HZTE004-03	Aug. 02, 2019	Aug. 01, 2020
Temperature recorder	JM624U	HZTE018-08	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 02, 2019	Aug. 01, 2020
Standard source	D908	HZTE012-01	Aug. 02, 2019	Aug. 01, 2020
Integrate Sphere system	3M	HZTE015-04	Aug. 02, 2019	Aug. 01, 2020
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2019	Aug. 01, 2020
AC Power Supply	PCR 500L	HZTE001-07	Aug. 02, 2019	Aug. 01, 2020
DC Power Supply	IT6154	HZTE004-04	Aug. 02, 2019	Aug. 01, 2020
Standard source	SCL-1400	HZTE012-02	Aug. 02, 2019	Aug. 01, 2020
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 02, 2019	Aug. 01, 2020
Temperature Meter	TES1310	HZTE017-01	Aug. 02, 2019	Aug. 01, 2020

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

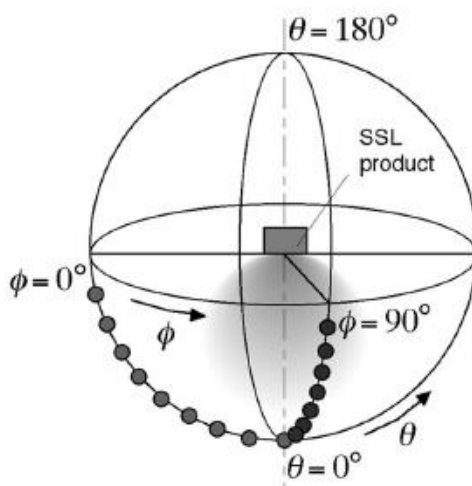
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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