

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/830/DEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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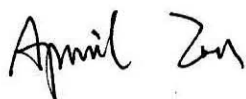
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Report No.: HZ200700231

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/830/DEB**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
145.1	1801.9	12.42	0.9794
CCT (K)	CRI	Stabilization Time (Light & Power)	
3079	82.3	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	: 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

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	: 12T8/4F/830/DEB
Electrical Ratings	: 120-277V, 50/60Hz, 12W
Product Description	: 3000K
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	0.9199
Test Power (W)	12.42	12.43
THD A%	18.66	18.48
Luminous Efficacy (lm/W)	145.1	143.7
Total Luminous Flux (lm)	1801.9	1785.6
Color Rendering Index (CRI)	82.3	
R9	6	
Correlated Color Temperature (CCT)(K)	3079	
Chromaticity Chroma x	0.4313	
Chromaticity Chroma y	0.4021	
Chromaticity Chroma u	0.2478	
Chromaticity Chroma v	0.3465	
Duv	0.0002	
Chromaticity Chroma u'	0.2478	
Chromaticity Chroma v'	0.5198	

Special Color Rendering Indices	
R1	80.6
R2	91
R3	96.1
R4	79.7
R5	80.7
R6	88.6
R7	82.6
R8	58.7
R9	6
R10	79.2
R11	78.7
R12	68.5
R13	83.1
R14	98.5

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)	12.42
Luminous Efficacy (lm/W)	142.9
Total Luminous Flux (lm)	1774.7
Beam Angle (°)	111.0 (0°-180°) / 201.5 (90°-270°)
Center Beam Candle Power (cd)	316
Maximum Beam Candle Power (cd)	316.4 (At: C=330.0, Gamma=1.0)
Spacing Criteria	1.25 (0°-180°) / 1.41 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.89%
Zonal Lumens in the 60 °-90 °Zone	26.59%
Zonal Lumens in the 90 °-120 °Zone	16.60%
Zonal Lumens in the 120 °-180 °Zone	11.92%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

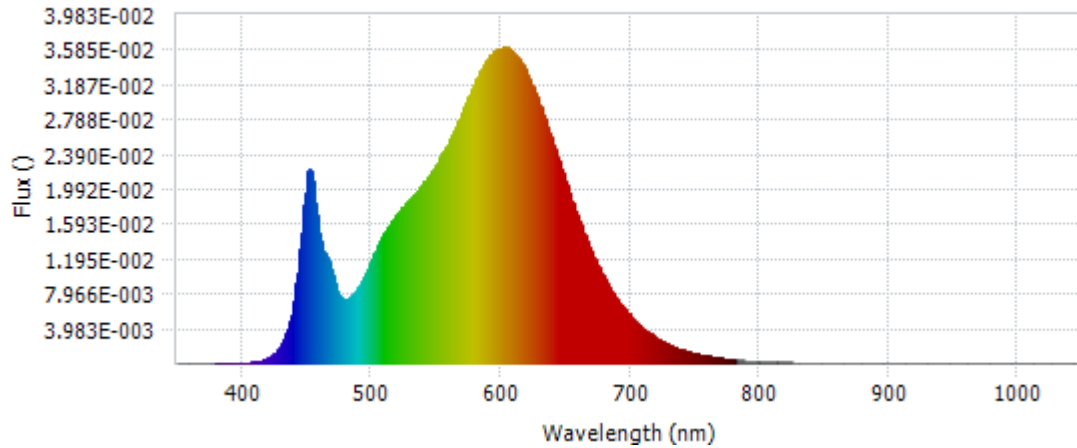
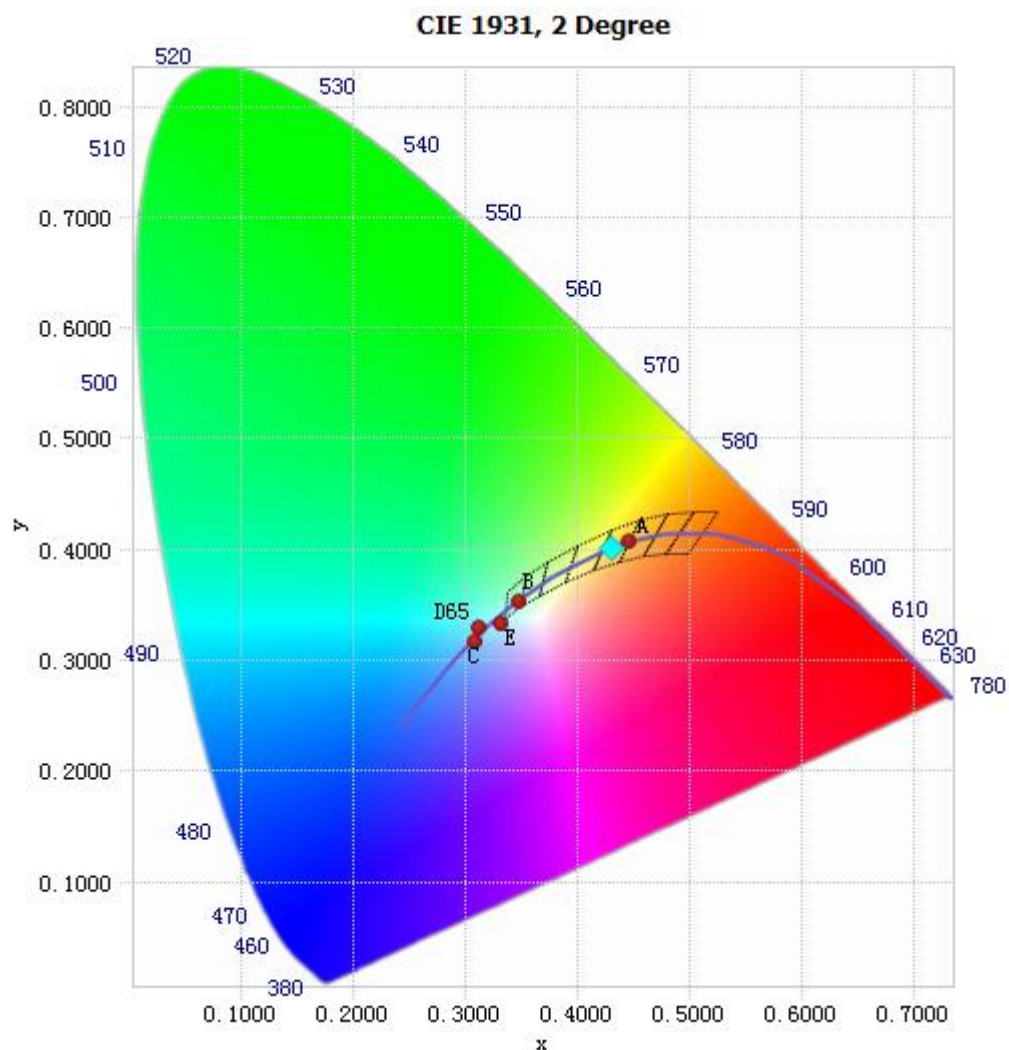


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.11E-04	485	7.72E-03	590	3.48E-02	695	6.35E-03
385	9.39E-05	490	8.64E-03	595	3.57E-02	700	5.45E-03
390	1.02E-04	495	1.01E-02	600	3.61E-02	705	4.67E-03
395	1.00E-04	500	1.18E-02	605	3.61E-02	710	4.00E-03
400	9.02E-05	505	1.35E-02	610	3.55E-02	715	3.43E-03
405	1.07E-04	510	1.49E-02	615	3.46E-02	720	2.95E-03
410	1.69E-04	515	1.62E-02	620	3.32E-02	725	2.52E-03
415	3.16E-04	520	1.71E-02	625	3.16E-02	730	2.15E-03
420	5.85E-04	525	1.80E-02	630	2.96E-02	735	1.83E-03
425	1.13E-03	530	1.88E-02	635	2.75E-02	740	1.56E-03
430	2.08E-03	535	1.97E-02	640	2.54E-02	745	1.34E-03
435	3.87E-03	540	2.05E-02	645	2.31E-02	750	1.14E-03
440	7.08E-03	545	2.16E-02	650	2.08E-02	755	9.80E-04
445	1.32E-02	550	2.27E-02	655	1.86E-02	760	8.29E-04
450	2.08E-02	555	2.40E-02	660	1.66E-02	765	7.15E-04
455	2.08E-02	560	2.54E-02	665	1.47E-02	770	6.16E-04
460	1.48E-02	565	2.69E-02	670	1.28E-02	775	5.28E-04
465	1.23E-02	570	2.87E-02	675	1.12E-02	780	4.52E-04
470	1.02E-02	575	3.04E-02	680	9.80E-03		
475	7.89E-03	580	3.21E-02	685	8.51E-03		
480	7.27E-03	585	3.36E-02	690	7.35E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4313, 0.4021)

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

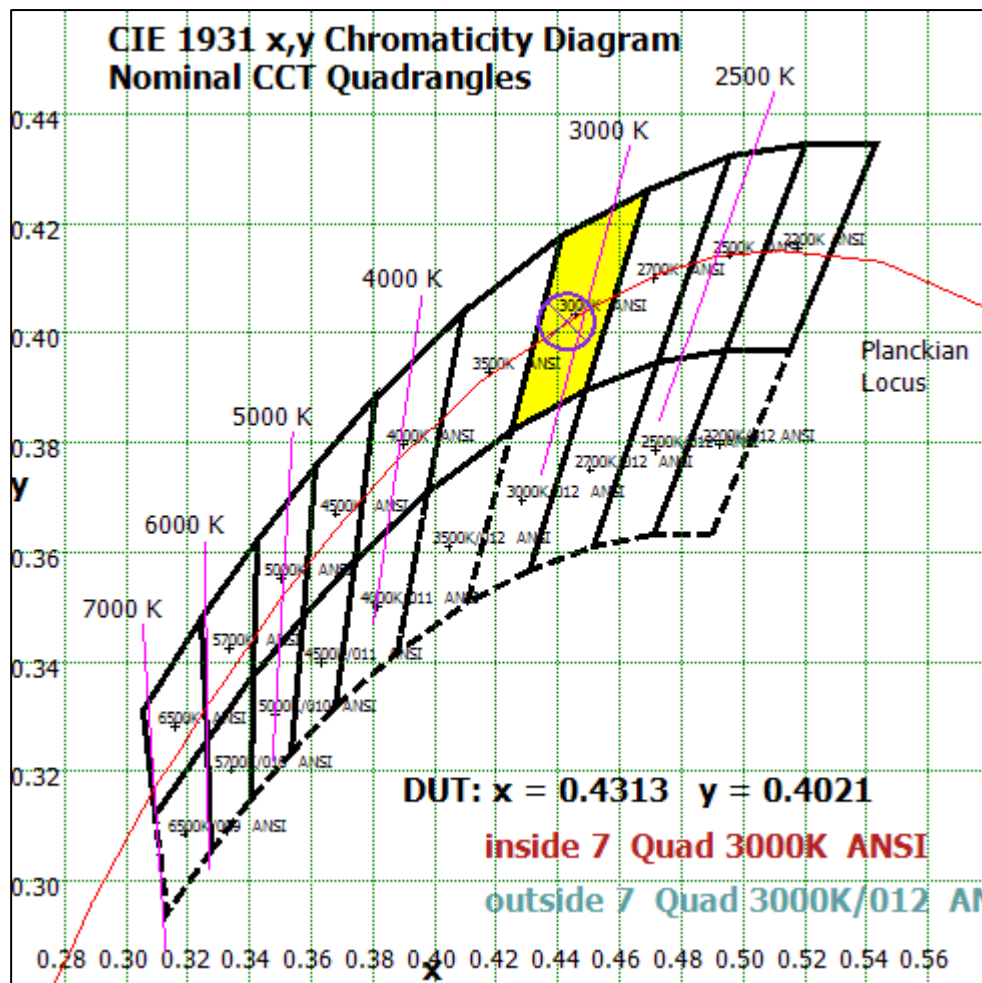
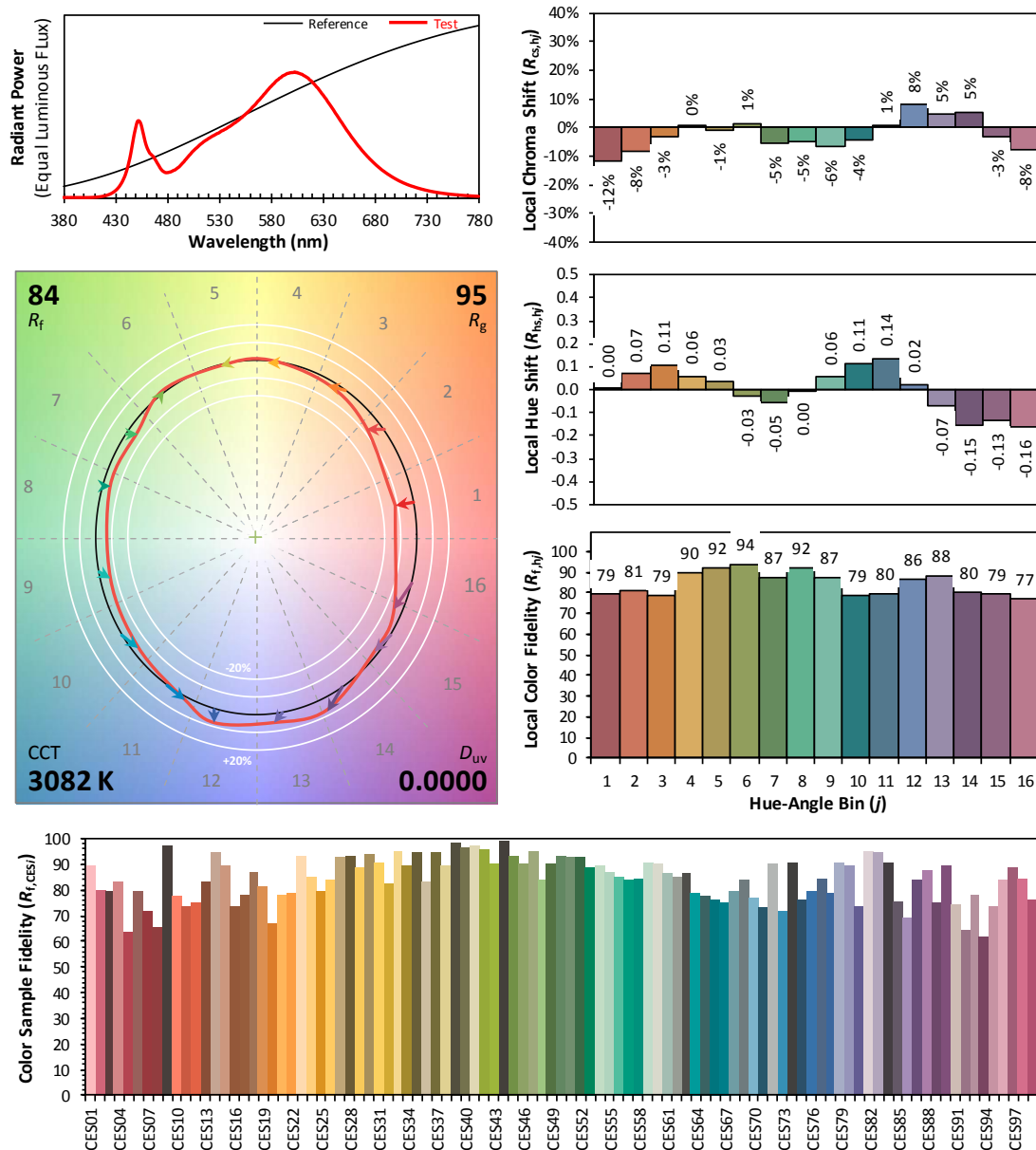


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x 0.4313
 y 0.4021
 u' 0.2478
 v' 0.5198

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	30.004	1.69%
10- 20	86.833	4.89%
20- 30	134.572	7.58%
30- 40	168.73	9.51%
40- 50	187.006	10.54%
50- 60	189.493	10.68%
60- 70	178.482	10.06%
70- 80	158.248	8.92%
80- 90	135.211	7.62%
90-100	115.24	6.49%
100-110	97.651	5.50%
110-120	81.733	4.61%
120-130	67.355	3.80%
130-140	53.99	3.04%
140-150	41.292	2.33%
150-160	28.693	1.62%
160-170	15.583	0.88%
170-180	4.618	0.26%
Total	1774.7	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	796.638	44.89%
60- 90	471.941	26.59%
0-90	1268.579	71.48%
90- 180	506.155	28.52%
0- 180	1774.7	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

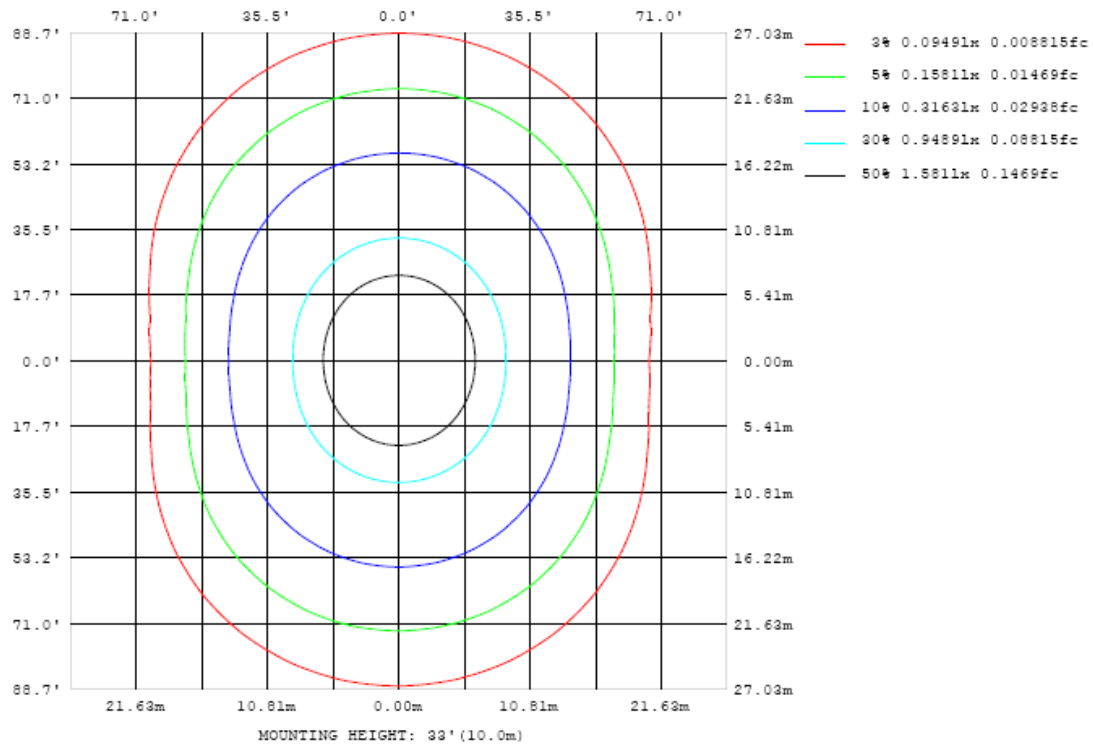


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

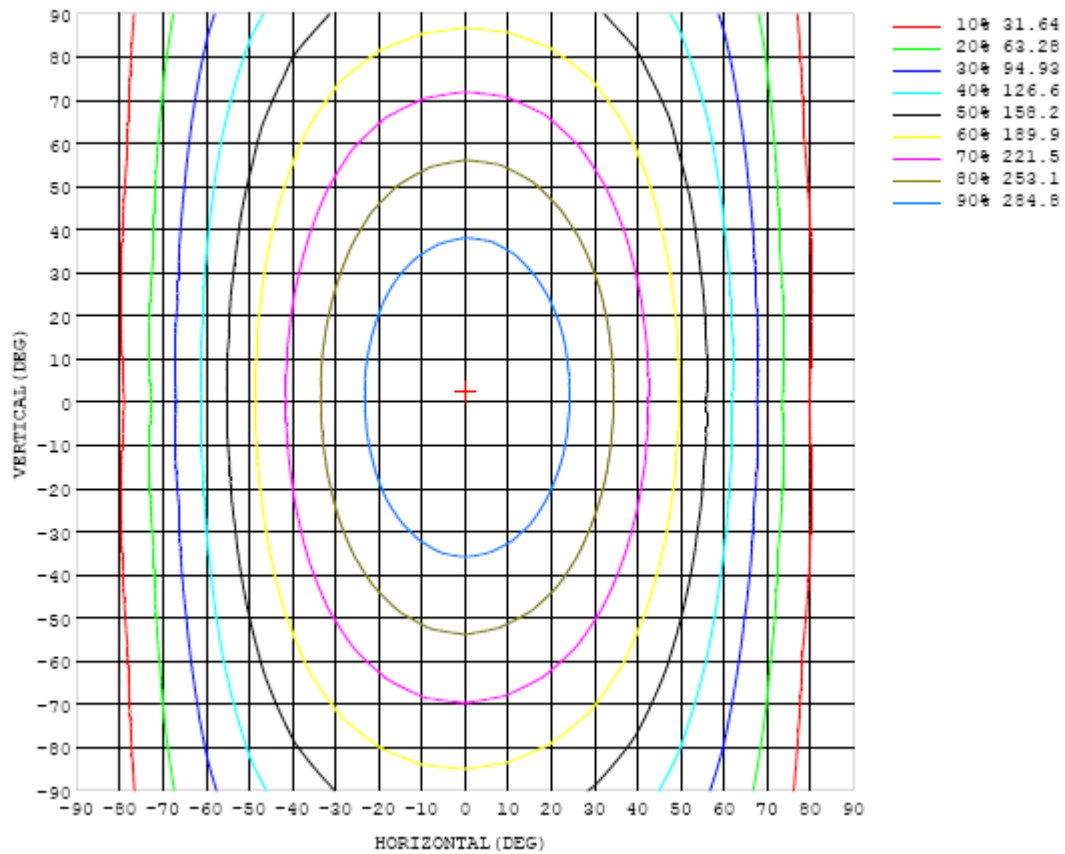


Chart 6: Isocandela Plot

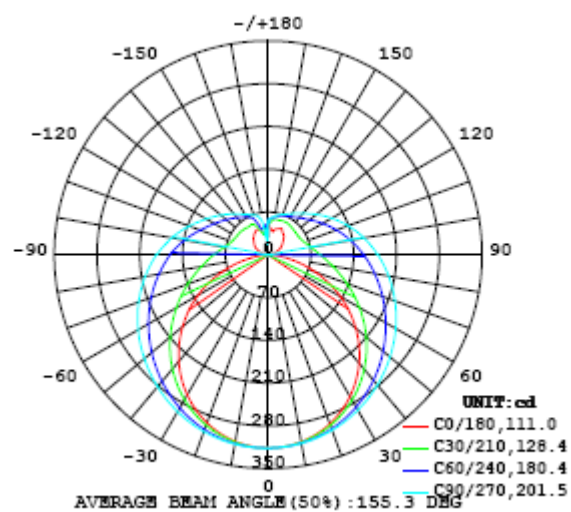


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) y (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316
5	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	314
10	311	311	311	312	312	312	313	313	313	313	313	313	313	312	311	311	310	310	310
15	304	304	305	306	307	308	309	310	310	310	310	309	308	307	305	304	303	303	303
20	295	295	296	297	299	301	303	304	305	305	305	304	302	300	298	296	294	293	293
25	282	283	284	287	290	293	296	298	300	300	299	298	295	292	288	285	282	281	280
30	268	268	271	274	279	283	288	291	293	293	290	287	282	277	272	268	266	265	265
35	251	252	255	260	266	273	278	282	285	286	285	282	277	272	265	258	252	249	247
40	232	233	238	245	252	261	268	273	277	278	277	273	267	260	251	242	234	229	228
45	210	212	218	227	238	248	257	264	268	269	268	264	257	248	237	225	215	208	206
50	187	190	198	209	222	235	246	254	258	260	259	254	246	235	222	208	195	186	183
55	163	166	176	191	207	222	234	243	248	251	249	244	234	222	206	189	174	162	159
60	137	141	154	173	191	208	222	232	238	241	239	233	223	209	191	171	152	137	133
65	109	115	133	154	176	195	211	222	228	231	229	223	212	196	177	154	131	112	106
70	81.7	89.9	111	137	161	183	199	211	218	221	219	212	201	184	163	137	110	87.3	78.3
75	55.1	65.9	91.7	121	148	170	188	200	208	210	209	202	190	172	150	122	91.6	64.3	51.5
80	30.1	44.4	74.9	107	136	159	177	190	197	200	198	191	179	161	138	109	75.6	43.6	27.1
85	10.3	27.9	62.0	95.3	124	148	166	179	187	190	188	181	169	151	127	97.3	63.5	28.3	8.16
90	0.36	18.6	52.4	85.4	114	138	156	169	176	179	178	171	159	141	117	88.0	54.6	20.2	0.49
95	1.91	15.4	46.1	77.4	106	129	146	159	166	169	168	161	149	132	109	80.4	48.7	17.6	2.08
100	5.04	15.9	42.2	71.5	97.6	120	137	149	156	159	158	151	139	123	101	74.3	45.1	18.3	5.29
105	9.12	18.7	40.2	66.4	90.5	111	128	139	146	149	147	141	130	114	93.8	69.7	43.3	21.2	9.69
110	14.1	22.6	40.0	62.4	84.2	104	119	130	137	139	138	132	121	106	87.5	65.8	43.2	25.2	14.5
115	19.2	27.4	41.1	59.8	78.8	96.4	111	121	127	130	128	122	113	99.1	82.0	63.0	44.3	29.9	19.5
120	23.7	31.4	43.0	58.4	74.8	89.9	103	112	118	120	119	114	105	92.5	77.3	61.4	46.1	33.6	24.2
125	27.5	34.7	45.4	57.9	71.5	84.2	95.5	104	109	111	110	105	97.4	86.6	74.3	60.8	48.4	36.5	27.5
130	31.3	38.6	48.2	58.0	69.1	79.6	89.0	96.3	101	103	102	97.6	90.7	81.7	71.7	60.7	50.8	40.1	30.3
135	35.5	43.3	50.6	58.5	67.4	75.9	83.6	89.5	93.5	95.0	94.1	90.7	85.1	77.8	69.6	60.9	52.8	44.5	33.7
140	39.7	47.0	52.5	59.3	66.3	73.3	79.1	84.0	87.2	88.5	87.7	85.0	80.4	75.1	68.3	61.4	54.2	47.6	37.1
145	42.5	48.9	54.0	60.2	65.5	70.8	75.2	79.1	81.7	82.7	82.1	79.9	76.4	72.2	67.1	62.0	54.5	48.7	40.4
150	45.9	51.2	55.4	60.9	65.1	69.1	72.5	74.9	76.9	77.7	77.3	75.6	73.3	70.1	66.3	62.2	55.6	49.9	42.7
155	47.6	54.1	56.4	60.7	64.6	67.6	70.1	72.0	73.0	73.4	73.2	72.4	70.7	68.3	65.6	61.5	55.5	52.2	44.7
160	45.5	55.3	56.9	60.0	63.5	66.1	67.9	69.3	70.1	70.5	70.4	69.6	68.4	66.9	64.5	59.8	52.8	49.6	44.9
165	43.2	54.5	58.9	59.4	61.4	63.5	65.2	66.5	67.3	67.7	67.6	67.1	66.3	65.2	62.2	54.2	48.5	42.8	39.8
170	39.8	49.8	56.7	59.0	59.7	60.8	62.0	63.1	63.8	64.3	64.5	64.3	63.4	60.4	53.4	47.4	43.1	41.2	39.1
175	43.5	46.9	51.5	54.6	56.9	59.4	60.6	60.9	61.2	61.4	61.9	60.9	56.5	49.9	43.1	38.7	39.2	41.2	41.6
180	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8

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	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316	316		
5	315	315	315	316	316	316	316	316	316	316	316	316	316	316	315	315	315		
10	311	311	311	312	313	314	314	314	315	315	314	314	313	313	312	312	311		
15	303	304	305	307	309	310	311	311	312	312	311	310	309	308	307	305	304		
20	294	295	297	299	302	304	306	307	308	308	307	305	303	301	299	297	295		
25	281	283	286	290	294	298	300	302	303	302	301	298	295	292	289	286	283		
30	266	270	274	279	285	289	293	295	297	296	294	291	286	282	277	272	269		
35	249	254	260	267	274	280	285	288	289	289	286	282	276	269	263	257	252		
40	230	236	244	253	262	270	276	280	282	281	278	272	264	256	247	239	234		
45	209	217	227	238	250	260	267	272	273	272	268	261	252	242	231	220	213		
50	187	196	209	224	237	248	257	262	265	263	258	250	240	227	213	200	191		
55	163	175	191	208	224	238	247	253	255	254	248	239	227	212	195	179	168		
60	139	154	173	193	211	226	237	243	246	244	238	228	214	197	177	158	144		
65	114	133	156	179	199	215	226	233	236	234	228	216	201	182	160	137	118		
70	88.6	112	140	165	186	204	216	223	226	224	217	205	189	168	143	116	92.5		
75	64.9	93.5	125	153	175	193	205	212	215	213	206	194	177	155	127	96.4	68.1		
80	44.2	77.4	111	140	164	182	194	202	204	202	195	183	165	143	113	79.6	46.5		
85	28.8	64.5	99.3	129	153	171	183	191	194	192	184	172	155	131	101	66.2	30.2		
90	20.4	55.1	89.3	119	143	161	173	180	183	181	174	162	144	121	91.0	56.3	20.9		
95	16.8	47.9	80.3	109	132	150	162	169	171	169	163	151	134	111	81.7	48.7	16.8		
100	17.3	43.4	72.7	99.5	122	139	151	158	160	159	152	140	123	101	73.7	43.6	16.7		
105	20.3	41.9	67.1	91.2	112	128	140	147	149	147	140	129	113	92.4	67.6	41.3	19.1		
110	24.0	42.1	63.7	84.8	103	118	129	135	138	136	130	119	104	85.3	63.2	40.3	22.9		
115	27.4	43.2	61.5	79.8	96.2	110	119	125	127	125	119	110	96.5	79.6	59.9	41.1	27.1		
120	30.0	44.5	60.2	75.8	90.2	102	111	116	117	116	111	102	90.0	74.8	58.0	43.0	31.0		
125	33.4	46.5	59.5	72.6	85.0	95.4	103	107	109	108	103	95.0	84.2	71.1	57.4	45.4	34.9		
130	36.2	48.3	59.1	70.1	80.5	89.4	95.9	99.7	101	99.8	95.5	88.6	79.4	68.5	57.4	47.8	38.0		
135	37.7	47.8	57.8	68.2	76.6	84.1	89.6	92.8	93.9	92.7	89.0	83.1	75.4	66.6	57.0	48.5	40.4		
140	38.8	49.9	57.4	66.2	73.4	79.3	83.9	86.6	87.4	86.4	83.3	78.3	72.0	65.3	57.8	50.9	41.9		
145	39.0	52.5	56.1	62.8	70.7	75.2	78.8	80.9	81.5	80.7	78.2	74.3	69.6	63.6	57.8	52.9	42.3		
150	38.6	54.0	56.8	59.3	65.6	72.0	74.5	75.9	76.4	75.9	74.1	71.5	67.2	62.6	59.1	54.5	41.5		
155	36.0	48.6	54.2	58.0	60.8	66.3	71.0	72.1	72.6	72.3	70.7	67.9	64.9	62.8	60.0	51.4	38.0		
160	35.2	39.7	46.7	49.6	52.9	57.7	65.8	68.3	68.9	68.8	67.2	65.6	64.6	62.9	58.9	44.1	36.1		
165	36.3	34.7	37.1	39.5	43.7	43.6	49.8	59.0	65.1	66.4	65.7	63.9	62.0	58.4	46.9	36.0	35.4		
170	36.4	35.4	36.5	39.4	42.0	43.5	43.3	36.2	52.7	60.5	56.9	53.4	47.1	42.2	36.9	35.8	35.6		
175	41.6	42.8	44.1	46.0	47.4	48.7	50.8	48.8	27.1	44.6	48.5	49.6	49.2	47.4	44.9	42.9	43.0		
180	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8	52.8		

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

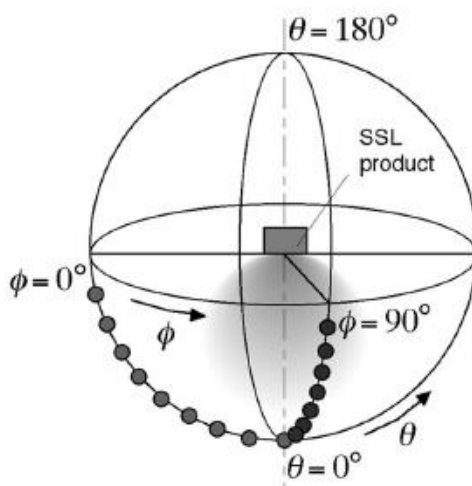
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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