

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: 10T8/4F/840/DEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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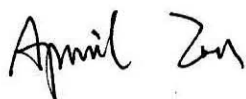
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Report No.: HZ20070023g

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: 10T8/4F/840/DEB

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
178.5	1853.2	10.38	0.9791
CCT (K)	CRI	Stabilization Time (Light & Power)	
3999	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, 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	: 10T8/4F/840/DEB
Electrical Ratings	: 120-277V, 50/60Hz, 10W
Product Description	: 4000K
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 25.2 °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)	0.088	0.042
Power Factor	0.9791	0.9102
Test Power (W)	10.38	10.50
THD A%	18.29	20.31
Luminous Efficacy (lm/W)	178.5	176.0
Total Luminous Flux (lm)	1853.2	1848.5
Color Rendering Index (CRI)	82.7	
R9	6.8	
Correlated Color Temperature (CCT)(K)	3999	
Chromaticity Chroma x	0.3808	
Chromaticity Chroma y	0.3784	
Chromaticity Chroma u	0.2247	
Chromaticity Chroma v	0.3349	
Duv	0.0007	
Chromaticity Chroma u'	0.2247	
Chromaticity Chroma v'	0.5024	

Special Color Rendering Indices	
R1	80.9
R2	89.1
R3	94.9
R4	81.5
R5	81
R6	84.7
R7	85.8
R8	63.9
R9	6.8
R10	74.2
R11	80.6
R12	60.4
R13	83
R14	97.4

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 24.8 °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)	0.088
Power Factor	0.9793
Power (W)	10.38
Luminous Efficacy (lm/W)	175.4
Total Luminous Flux (lm)	1820.4
Beam Angle (°)	110.6 (0°-180°) / 198.7 (90°-270°)
Center Beam Candle Power (cd)	326
Maximum Beam Candle Power (cd)	326.3 (At: C=10.0, Gamma=3.0)
Spacing Criteria	1.24 (0°-180°) / 1.41 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.90%
Zonal Lumens in the 60 °-90 °Zone	26.43%
Zonal Lumens in the 90 °-120 °Zone	16.54%
Zonal Lumens in the 120 °-180 °Zone	12.13%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

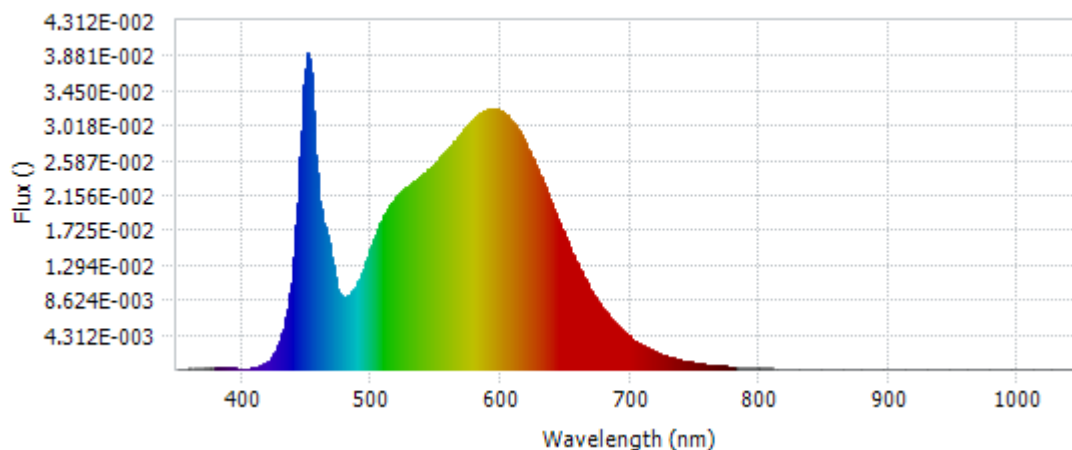
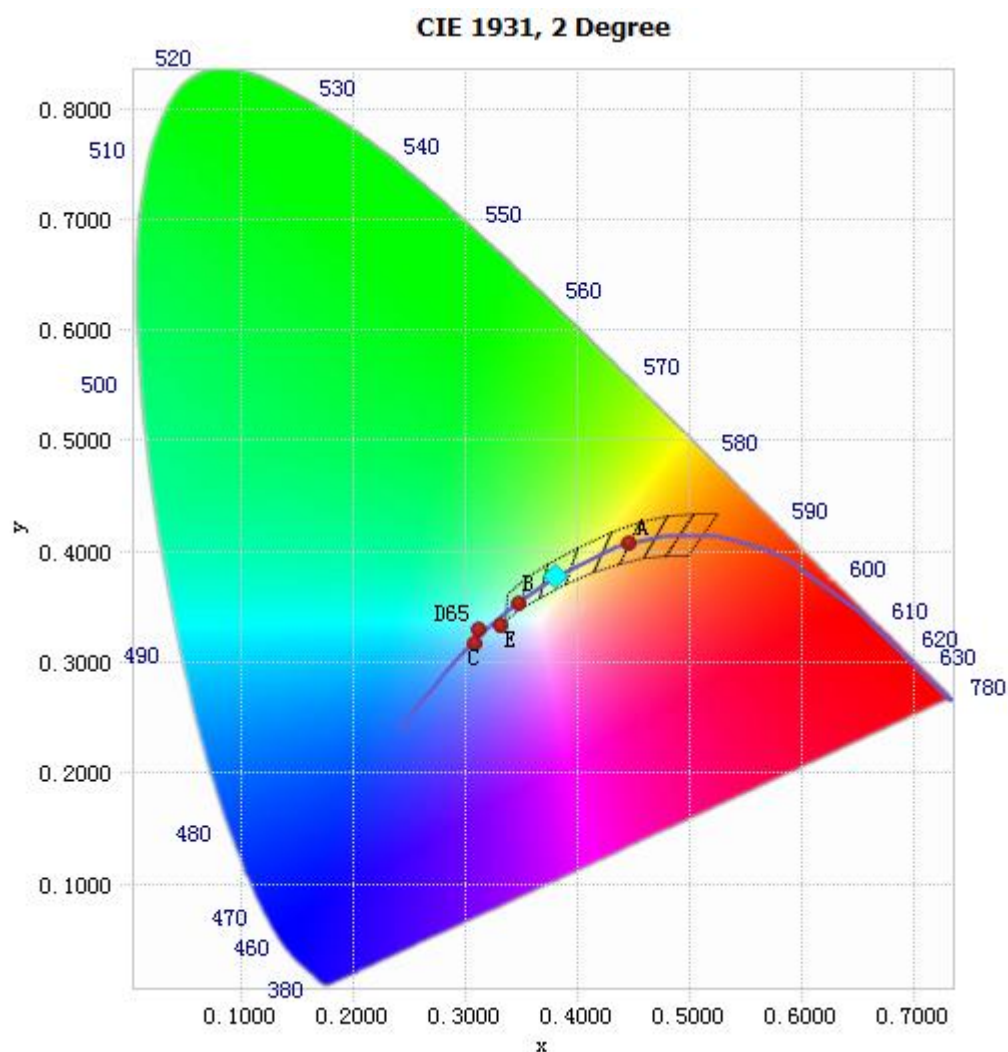


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.66E-04	485	9.61E-03	590	3.21E-02	695	4.65E-03
385	1.50E-04	490	1.08E-02	595	3.22E-02	700	3.97E-03
390	1.37E-04	495	1.29E-02	600	3.19E-02	705	3.40E-03
395	1.33E-04	500	1.53E-02	605	3.14E-02	710	2.88E-03
400	1.10E-04	505	1.74E-02	610	3.04E-02	715	2.46E-03
405	1.14E-04	510	1.90E-02	615	2.92E-02	720	2.11E-03
410	2.10E-04	515	2.05E-02	620	2.76E-02	725	1.80E-03
415	4.55E-04	520	2.15E-02	625	2.60E-02	730	1.53E-03
420	9.70E-04	525	2.22E-02	630	2.41E-02	735	1.30E-03
425	1.98E-03	530	2.28E-02	635	2.21E-02	740	1.11E-03
430	3.94E-03	535	2.35E-02	640	2.02E-02	745	9.39E-04
435	7.41E-03	540	2.41E-02	645	1.82E-02	750	8.10E-04
440	1.38E-02	545	2.49E-02	650	1.62E-02	755	6.93E-04
445	2.62E-02	550	2.56E-02	655	1.44E-02	760	5.89E-04
450	3.85E-02	555	2.65E-02	660	1.27E-02	765	5.06E-04
455	3.21E-02	560	2.74E-02	665	1.12E-02	770	4.31E-04
460	2.09E-02	565	2.83E-02	670	9.72E-03	775	3.68E-04
465	1.71E-02	570	2.94E-02	675	8.44E-03	780	3.18E-04
470	1.29E-02	575	3.03E-02	680	7.30E-03		
475	9.55E-03	580	3.11E-02	685	6.29E-03		
480	8.96E-03	585	3.18E-02	690	5.42E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3808, 0.3784)

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

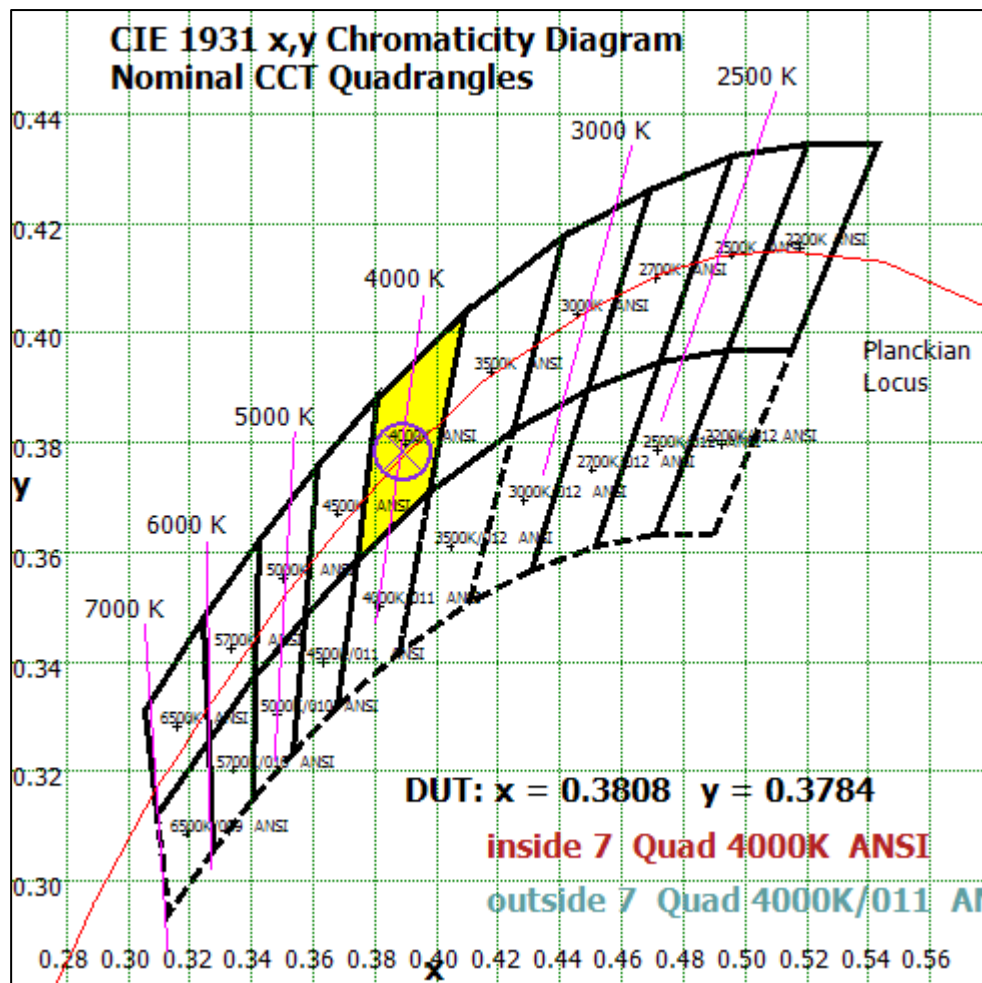


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

(a) Radiant Power Spectrum

Y-axis: Radiant Power (Equal Luminous F Lux)
X-axis: Wavelength (nm)
Legend: Reference (black line), Test (red line)

(b) CIE 1931 Color Diagram

Y-axis: R_f (84 to 95)
X-axis: R_g (1 to 16)
CCT: 4002 K
 D_{uv} : 0.0006

(c) Local Chroma Shift ($R_{cs,h}$)

Y-axis: Local Chroma Shift ($R_{cs,h}$)
X-axis: Hue-Angle Bin (j)

(d) Local Hue Shift ($R_{hs,h}$)

Y-axis: Local Hue Shift ($R_{hs,h}$)
X-axis: Hue-Angle Bin (j)

(e) Local Color Fidelity ($R_{f,h}$)

Y-axis: Local Color Fidelity ($R_{f,h}$)
X-axis: Hue-Angle Bin (j)

(f) Color Sample Fidelity ($R_{f,CES}$)

Y-axis: Color Sample Fidelity ($R_{f,CES}$)
X-axis: Color Sample Index (CES01 to CES97)

x	0.3808
y	0.3784
u'	0.2247
v'	0.5024

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	30.94	1.70%
10- 20	89.448	4.91%
20- 30	138.412	7.60%
30- 40	173.224	9.52%
40- 50	191.578	10.52%
50- 60	193.738	10.64%
60- 70	182.225	10.01%
70- 80	161.356	8.86%
80- 90	137.565	7.56%
90-100	117.06	6.43%
100-110	99.802	5.48%
110-120	84.178	4.62%
120-130	69.884	3.84%
130-140	56.279	3.09%
140-150	43.303	2.38%
150-160	29.61	1.63%
160-170	16.082	0.88%
170-180	5.669	0.31%
Total	1820.4	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	817.34	44.90%
60- 90	481.146	26.43%
0-90	1298.486	71.33%
90- 180	521.867	28.67%
0- 180	1820.4	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

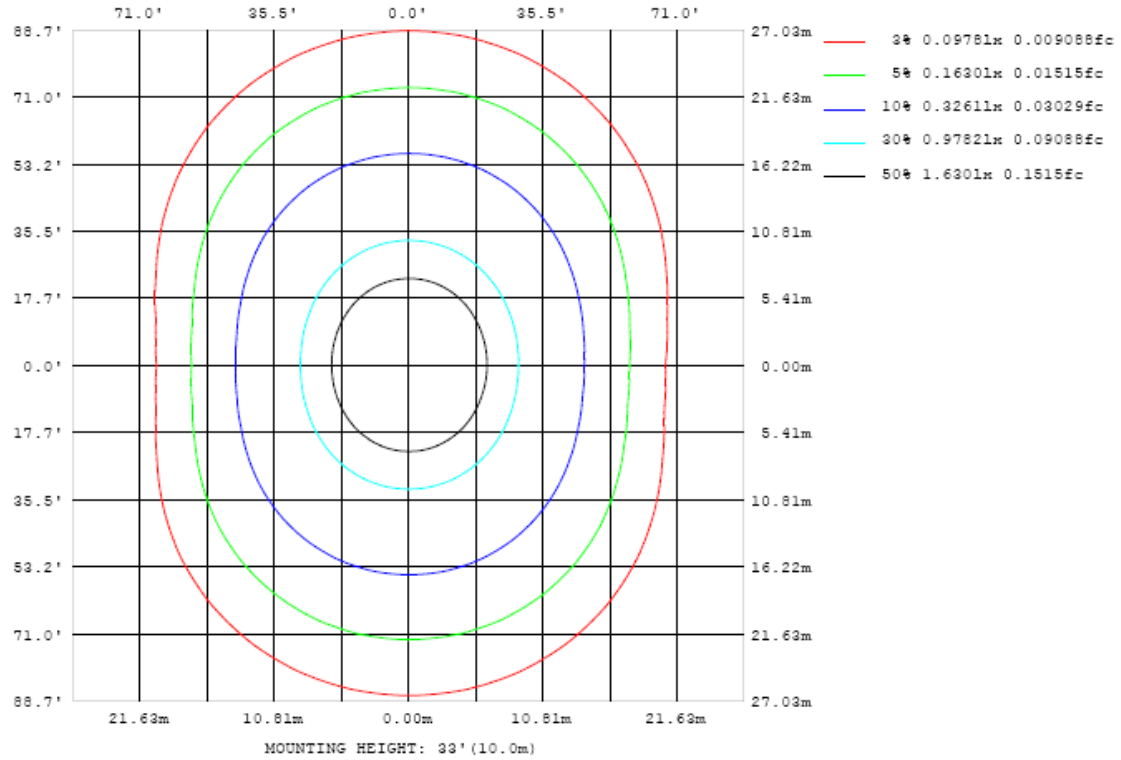


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

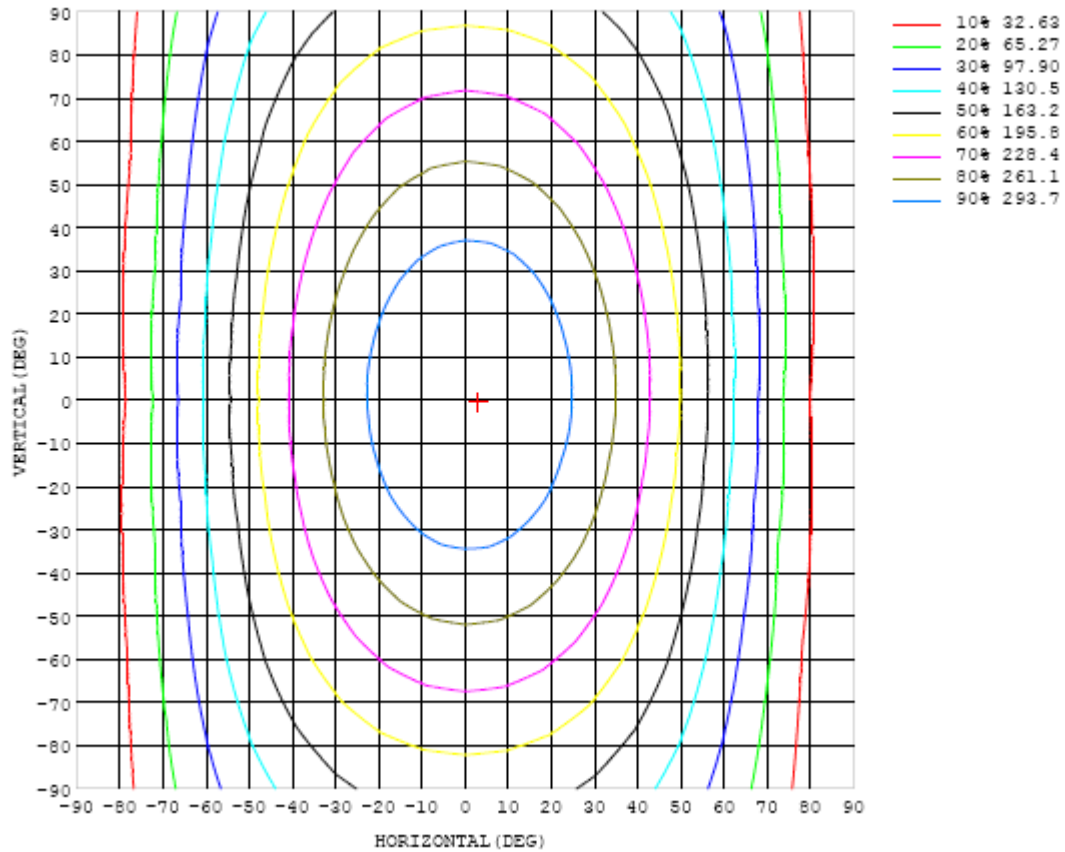


Chart 6: Isocandela Plot

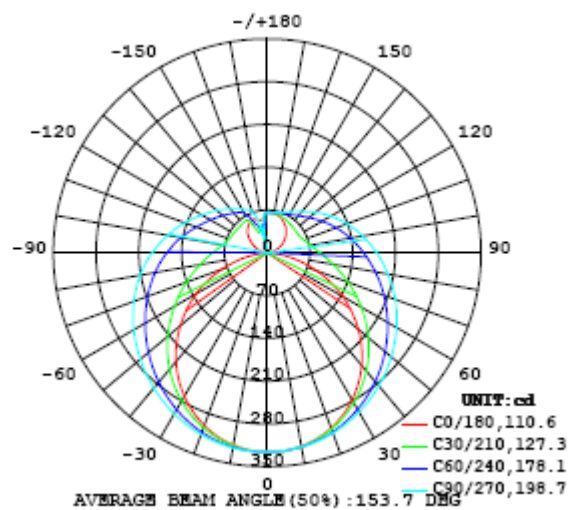


Chart 7: Polar Candela Distribution

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	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326
5	326	326	325	326	325	326	326	325	325	325	325	325	325	325	325	324	324	324	324
10	321	321	322	322	322	323	323	323	323	323	322	322	322	321	321	320	320	319	319
15	315	315	315	316	316	317	318	319	319	319	319	318	317	315	314	313	312	312	312
20	305	305	306	307	309	310	312	313	314	314	314	312	310	308	305	304	302	301	301
25	293	293	294	296	299	302	305	307	308	308	307	305	302	299	295	292	289	287	287
30	278	278	280	283	288	292	296	299	301	301	300	297	293	289	284	278	275	272	271
35	260	261	264	269	275	281	286	290	293	293	292	289	283	277	270	263	258	254	253
40	241	241	245	252	261	268	275	281	284	284	283	279	273	265	256	247	239	234	232
45	219	219	225	235	245	255	264	270	274	275	273	269	261	252	241	229	219	212	210
50	195	196	204	216	229	242	252	260	264	265	263	258	249	238	225	211	197	189	186
55	169	171	182	197	213	228	240	248	254	255	253	247	237	224	209	192	176	164	160
60	143	145	159	178	197	214	227	237	243	244	242	236	225	211	193	174	154	139	134
65	114	119	136	159	181	200	215	226	232	234	231	225	213	198	178	156	132	114	106
70	85.7	92.5	114	141	166	187	203	215	221	223	221	214	201	185	164	139	111	88.4	78.6
75	58.0	67.4	94.0	124	152	174	191	203	210	212	209	202	190	173	151	124	93.0	64.9	51.4
80	32.1	45.4	76.4	110	139	162	180	192	199	201	198	191	178	161	138	110	77.3	44.9	26.8
85	11.2	28.0	62.5	96.9	127	151	169	181	188	190	187	180	168	150	127	98.0	64.2	30.0	7.86
90	0.58	18.0	52.6	86.7	116	140	158	170	177	179	177	170	157	140	117	88.4	55.8	21.9	0.33
95	2.30	14.8	46.2	78.4	107	130	148	160	167	169	166	160	147	130	108	80.6	49.9	19.2	2.21
100	6.00	15.6	42.4	72.2	99.1	121	138	150	157	159	156	150	138	121	100	74.4	46.1	19.6	5.79
105	10.8	18.6	40.5	67.4	92.0	113	129	140	147	149	147	140	129	113	93.1	69.7	44.0	22.2	10.6
110	16.5	23.0	40.4	63.4	85.6	105	120	131	137	139	137	131	120	105	86.8	65.6	43.6	26.1	15.8
115	22.3	27.9	41.6	60.6	80.1	97.6	112	122	128	130	128	122	112	98.2	81.3	62.6	44.5	30.6	21.6
120	28.4	32.9	43.6	59.2	75.5	91.0	104	113	118	120	118	113	104	91.6	76.6	60.9	46.2	35.2	27.6
125	33.9	37.7	46.2	58.7	72.1	85.0	96.3	105	109	111	110	105	96.6	85.7	73.3	60.5	48.4	39.8	33.3
130	39.0	42.5	48.9	58.8	69.6	80.1	89.6	96.8	101	103	101	97.0	89.9	80.7	70.7	60.4	50.7	44.0	39.4
135	43.8	47.0	51.7	59.3	67.8	76.3	84.0	89.8	93.5	94.8	93.7	90.0	84.3	76.9	68.8	60.7	53.2	47.7	45.4
140	48.5	51.1	54.4	60.1	67.0	73.4	79.4	84.1	87.1	88.1	87.2	84.4	79.7	73.8	67.4	61.2	55.5	51.3	50.0
145	52.7	54.6	57.0	61.1	66.3	71.0	75.6	79.3	81.5	82.3	81.7	79.5	75.9	71.5	66.9	61.9	57.6	54.7	54.1
150	55.7	57.8	59.4	62.1	65.8	69.1	72.5	75.2	77.0	77.6	77.1	75.4	72.7	69.4	66.1	62.6	59.6	57.6	57.1
155	59.4	60.3	61.3	63.2	65.6	68.1	70.1	71.9	73.1	73.6	73.2	72.0	70.3	68.3	65.8	63.4	61.3	60.0	59.2
160	62.5	62.3	63.0	64.1	65.6	67.2	68.7	69.5	70.1	70.4	70.1	69.5	68.7	67.3	65.6	64.1	62.9	61.4	59.1
165	63.9	63.9	64.3	64.9	65.7	66.5	67.3	67.9	68.3	68.5	68.4	68.0	67.3	66.5	65.6	64.8	63.7	59.6	55.1
170	64.7	65.0	65.3	65.5	65.8	66.1	66.4	66.6	66.8	66.9	66.8	66.7	66.4	66.1	65.7	65.3	64.0	59.0	53.4
175	65.5	65.7	65.8	65.8	65.9	65.9	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	66.0	65.9	65.3	63.6	60.0
180	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7

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	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326	326		
5	325	325	325	325	325	325	326	326	326	326	326	326	326	326	326	326	326		
10	319	320	321	321	322	323	324	324	324	324	324	324	324	323	323	322	321		
15	312	313	314	315	317	319	320	320	321	321	321	320	319	318	317	316	315		
20	302	303	305	307	310	313	315	316	317	317	316	315	313	311	308	307	306		
25	288	291	293	297	301	305	308	310	311	311	310	308	305	301	298	295	294		
30	273	276	280	286	291	296	301	303	304	304	303	300	295	290	286	282	279		
35	255	259	265	273	280	287	292	296	297	297	294	290	284	278	271	266	262		
40	235	240	249	258	268	276	283	287	289	288	285	280	272	264	255	248	243		
45	213	220	231	243	255	265	273	278	280	279	276	269	260	249	238	229	222		
50	189	199	213	227	242	254	263	269	271	270	266	258	247	234	220	208	198		
55	165	177	194	212	228	242	253	259	262	260	255	246	233	218	202	186	174		
60	140	155	175	196	215	231	242	250	252	251	245	234	220	203	183	164	149		
65	114	133	158	181	202	219	232	240	242	240	234	223	207	188	166	142	124		
70	87.9	112	141	167	190	208	221	229	232	230	223	212	194	173	148	121	97.5		
75	63.5	92.7	125	155	178	197	211	219	222	220	213	200	182	160	132	101	72.6		
80	42.2	76.2	112	143	167	187	200	208	211	209	202	189	171	148	118	84.2	50.4		
85	26.8	63.4	99.9	131	157	175	189	197	200	198	191	178	159	136	106	70.4	33.6		
90	18.6	54.0	89.7	121	146	164	178	186	188	186	179	166	149	125	94.8	59.7	23.7		
95	16.2	47.4	81.0	111	135	154	167	174	177	174	167	156	138	114	85.2	51.7	19.3		
100	17.2	44.0	74.2	102	125	143	156	163	165	163	157	145	127	105	77.3	46.8	19.4		
105	20.2	43.3	69.5	94.6	116	133	145	152	155	153	146	134	118	96.4	71.4	44.9	21.9		
110	23.8	44.2	66.5	88.8	108	123	135	141	144	142	135	124	109	89.7	67.3	44.8	25.6		
115	27.3	45.8	64.6	84.0	101	115	125	131	133	131	125	116	102	84.3	64.8	46.0	29.4		
120	30.2	47.9	63.6	80.3	95.4	108	117	122	124	122	117	108	95.5	80.2	63.5	48.0	33.1		
125	32.0	50.1	63.1	77.2	90.3	101	109	114	116	114	109	101	90.2	77.0	63.1	50.3	35.5		
130	32.8	52.1	62.8	74.8	85.8	95.1	102	106	108	106	102	95.1	85.7	74.7	63.2	52.4	36.2		
135	33.5	51.3	62.3	72.7	81.9	89.7	95.7	99.4	101	99.4	95.8	89.7	81.9	72.8	63.4	53.8	37.8		
140	37.1	48.6	62.9	69.4	78.5	85.0	89.9	93.0	94.0	93.1	90.1	85.1	78.6	71.4	64.1	53.9	42.2		
145	43.1	43.4	63.1	67.7	74.3	80.6	84.6	87.2	88.1	87.4	85.1	81.1	76.0	70.3	64.6	51.7	46.6		
150	51.7	37.5	60.3	64.0	68.6	73.9	79.9	81.9	82.8	82.5	80.8	77.8	73.9	69.8	62.5	44.4	49.7		
155	55.5	39.4	41.9	50.7	56.7	60.1	67.4	76.8	78.1	78.1	77.0	75.0	72.4	65.9	50.9	41.5	51.7		
160	53.2	45.8	35.9	36.7	42.6	48.7	49.2	54.8	71.7	73.9	72.3	70.7	67.2	47.0	38.2	40.6	58.9		
165	50.3	46.3	40.4	35.1	35.4	38.0	42.1	47.2	40.7	56.7	61.3	46.9	39.0	35.7	34.6	46.0	61.3		
170	48.4	46.5	45.7	43.1	44.3	46.2	50.7	54.4	7.88	54.3	51.2	45.0	40.4	41.5	50.3	60.6	63.7		
175	56.1	52.8	49.3	45.5	43.1	42.3	46.1	56.4	64.8	64.9	60.8	60.8	61.8	62.5	63.1	64.1	64.9		
180	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7	65.7		

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

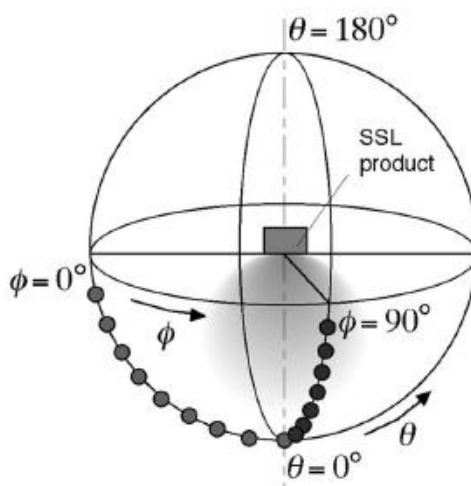
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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