

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/C

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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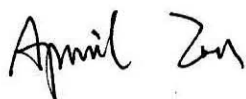
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www.ledtestlab.com

Report No.: HZ20070023c

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/C

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
176.4	1838.3	10.42	0.9788
CCT (K)	CRI	Stabilization Time (Light & Power)	
3987	82.8	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. 24, 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	: 10T8/4F/840/DEB/C
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 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)	0.089	0.042
Power Factor	0.9788	0.9096
Test Power (W)	10.42	10.53
THD A%	18.26	20.82
Luminous Efficacy (lm/W)	176.4	174.1
Total Luminous Flux (lm)	1838.3	1832.8
Color Rendering Index (CRI)	82.8	
R9	6.9	
Correlated Color Temperature (CCT)(K)	3987	
Chromaticity Chroma x	0.3814	
Chromaticity Chroma y	0.3790	
Chromaticity Chroma u	0.2249	
Chromaticity Chroma v	0.3351	
Duv	0.0008	
Chromaticity Chroma u'	0.2249	
Chromaticity Chroma v'	0.5027	

Special Color Rendering Indices	
R1	80.9
R2	89.1
R3	95
R4	81.6
R5	81
R6	84.7
R7	85.8
R8	63.9
R9	6.9
R10	74.1
R11	80.6
R12	60.6
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 25.0 °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)	0.089
Power Factor	0.9791
Power (W)	10.45
Luminous Efficacy (lm/W)	173.6
Total Luminous Flux (lm)	1814.5
Beam Angle (°)	107.6 (0°-180°) / 182.1 (90°-270°)
Center Beam Candle Power (cd)	350
Maximum Beam Candle Power (cd)	351.9 (At: C=270.0, Gamma=6.0)
Spacing Criteria	1.23 (0°-180°) / 1.40 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	46.97%
Zonal Lumens in the 60 °-90 °Zone	26.44%
Zonal Lumens in the 90 °-120 °Zone	15.65%
Zonal Lumens in the 120 °-180 °Zone	10.94%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

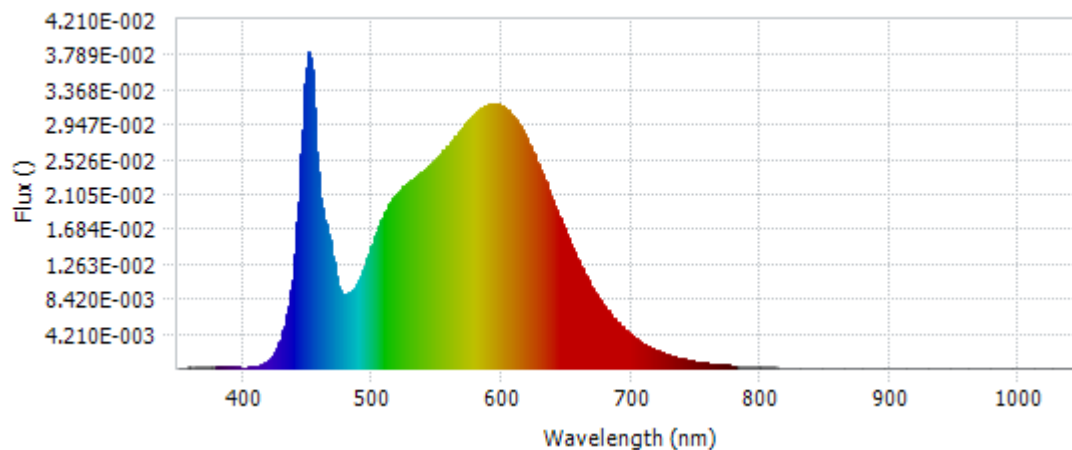
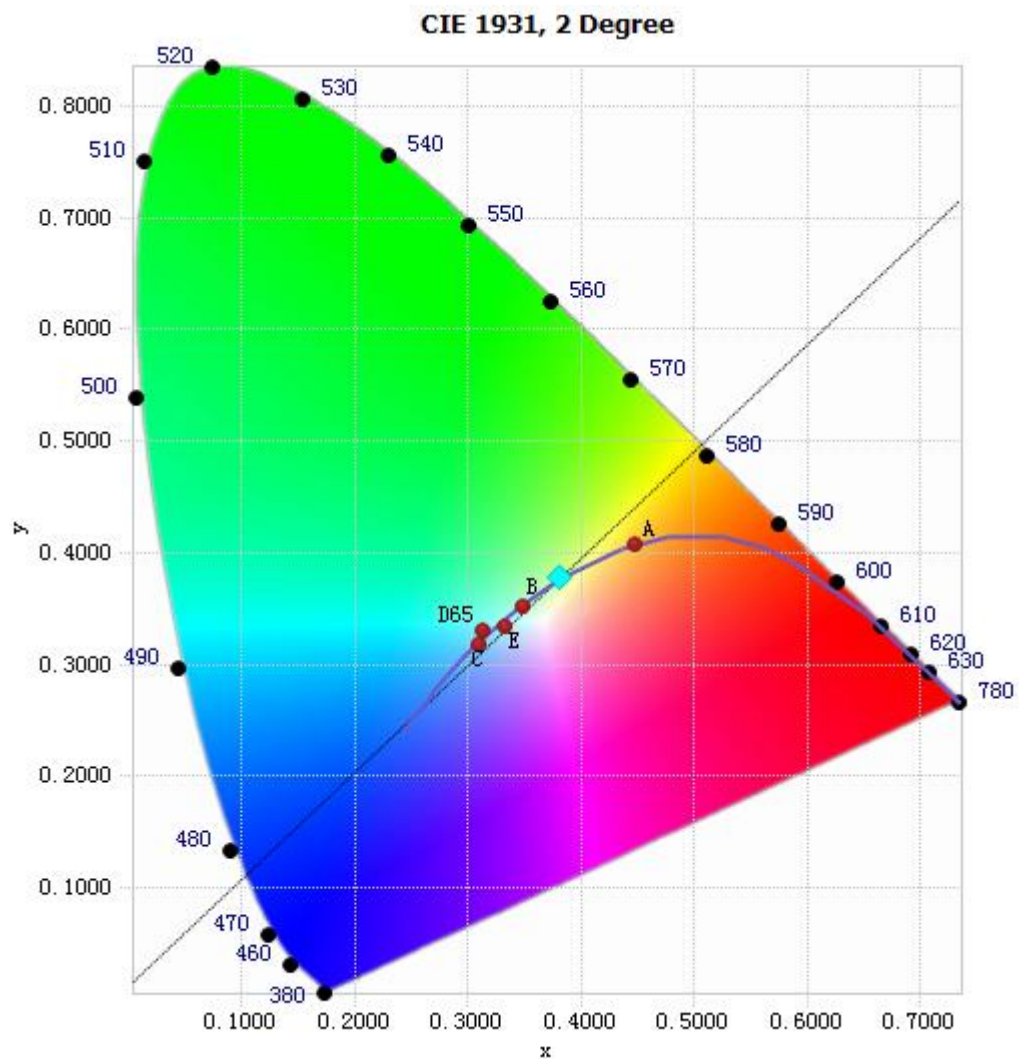


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.61E-04	485	9.54E-03	590	3.19E-02	695	4.69E-03
385	1.48E-04	490	1.07E-02	595	3.20E-02	700	4.02E-03
390	1.58E-04	495	1.28E-02	600	3.17E-02	705	3.44E-03
395	1.27E-04	500	1.51E-02	605	3.12E-02	710	2.92E-03
400	1.19E-04	505	1.72E-02	610	3.02E-02	715	2.51E-03
405	1.37E-04	510	1.89E-02	615	2.90E-02	720	2.14E-03
410	2.43E-04	515	2.03E-02	620	2.74E-02	725	1.83E-03
415	4.87E-04	520	2.13E-02	625	2.58E-02	730	1.56E-03
420	1.02E-03	525	2.20E-02	630	2.39E-02	735	1.33E-03
425	2.04E-03	530	2.26E-02	635	2.20E-02	740	1.13E-03
430	4.01E-03	535	2.33E-02	640	2.01E-02	745	9.66E-04
435	7.48E-03	540	2.39E-02	645	1.81E-02	750	8.27E-04
440	1.38E-02	545	2.47E-02	650	1.62E-02	755	7.07E-04
445	2.58E-02	550	2.54E-02	655	1.44E-02	760	6.02E-04
450	3.76E-02	555	2.63E-02	660	1.27E-02	765	5.20E-04
455	3.14E-02	560	2.71E-02	665	1.12E-02	770	4.44E-04
460	2.05E-02	565	2.81E-02	670	9.75E-03	775	3.79E-04
465	1.68E-02	570	2.91E-02	675	8.49E-03	780	3.29E-04
470	1.27E-02	575	3.00E-02	680	7.34E-03		
475	9.44E-03	580	3.09E-02	685	6.35E-03		
480	8.91E-03	585	3.15E-02	690	5.46E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3814, 0.3790)

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

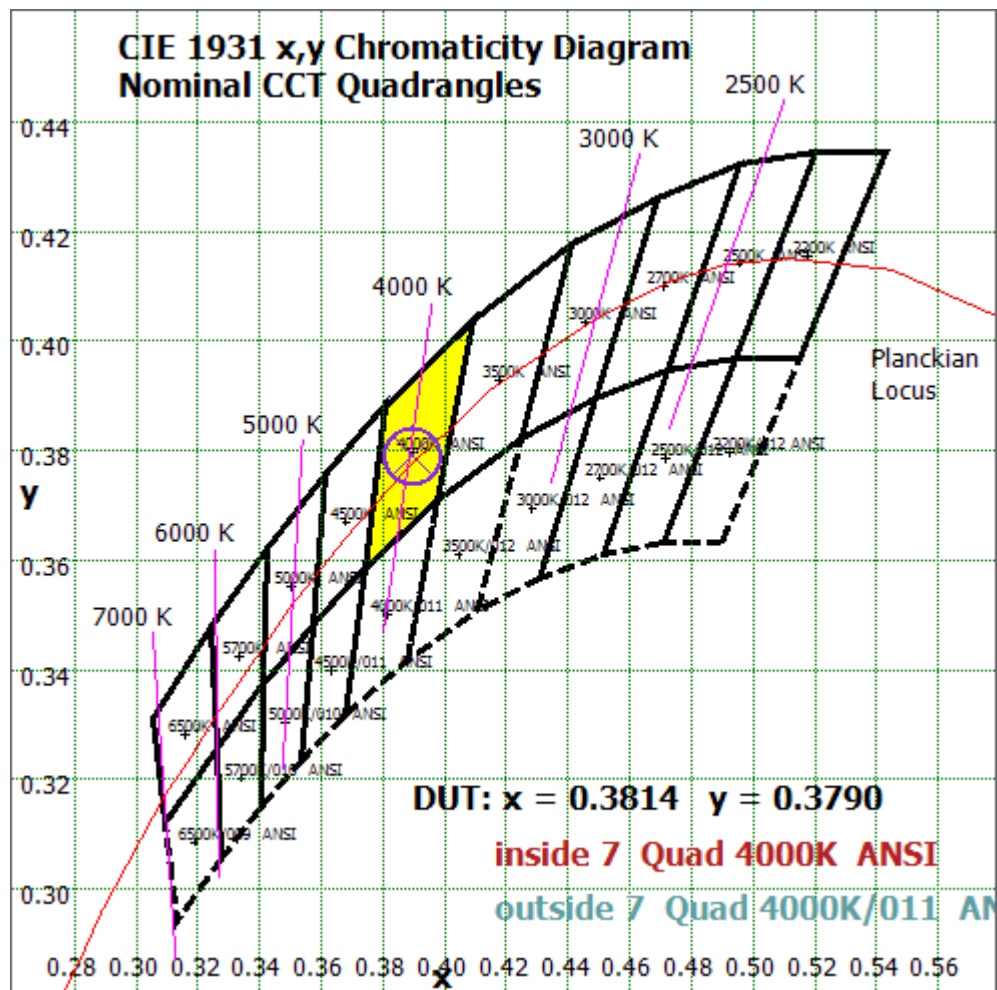
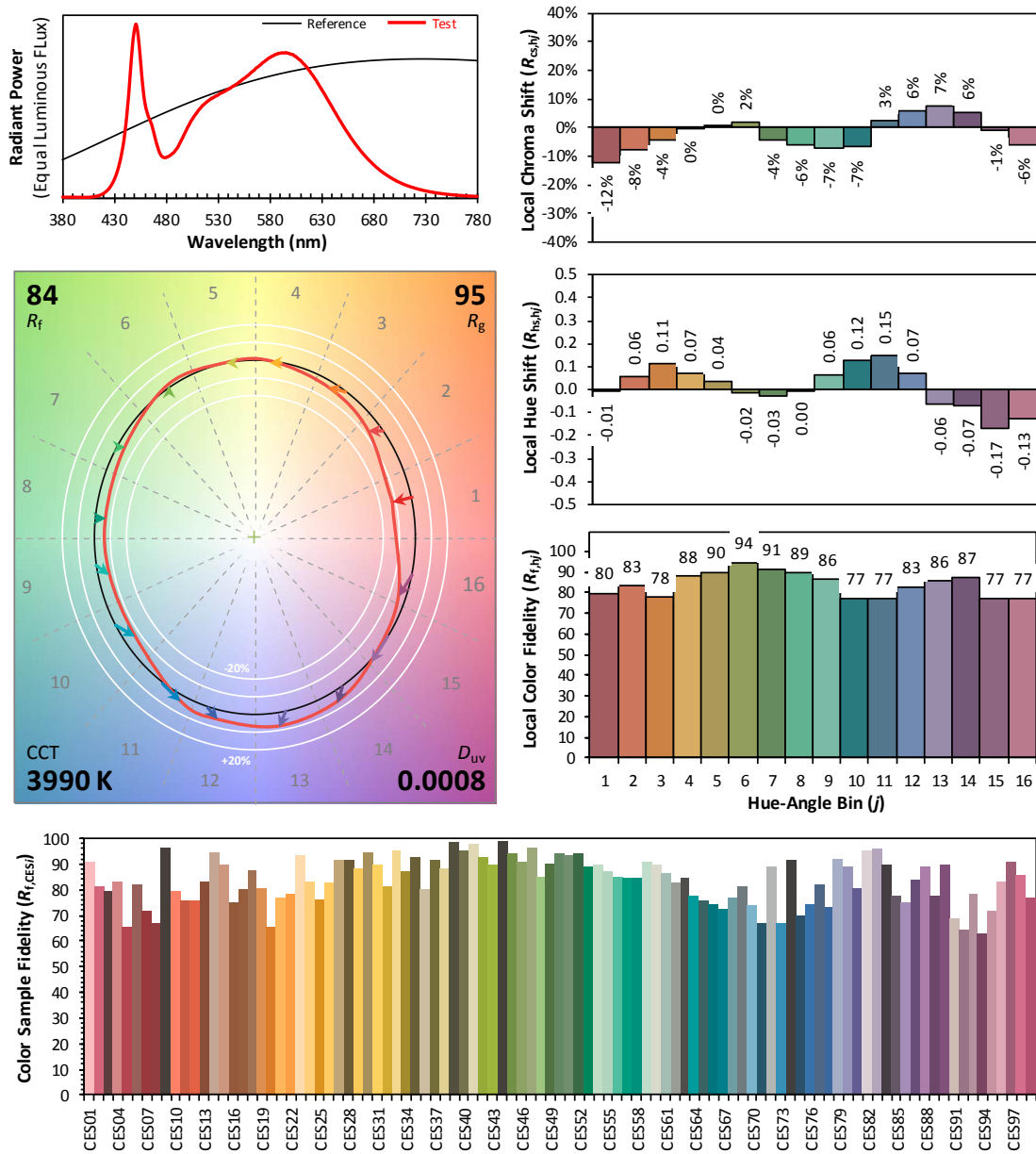


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x 0.3814
 y 0.3790
 u' 0.2249
 v' 0.5027

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	33.149	1.83%
10- 20	95.37	5.26%
20- 30	146.348	8.07%
30- 40	181.223	9.99%
40- 50	198.125	10.92%
50- 60	198.02	10.91%
60- 70	184.041	10.14%
70- 80	160.872	8.87%
80- 90	134.812	7.43%
90-100	112.461	6.20%
100-110	93.931	5.18%
110-120	77.632	4.28%
120-130	63.428	3.50%
130-140	50.678	2.79%
140-150	38.73	2.13%
150-160	26.716	1.47%
160-170	14.37	0.79%
170-180	4.603	0.25%
Total	1814.5	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	852.235	46.97%
60- 90	479.725	26.44%
0-90	1331.96	73.41%
90- 180	482.549	26.59%
0- 180	1814.5	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

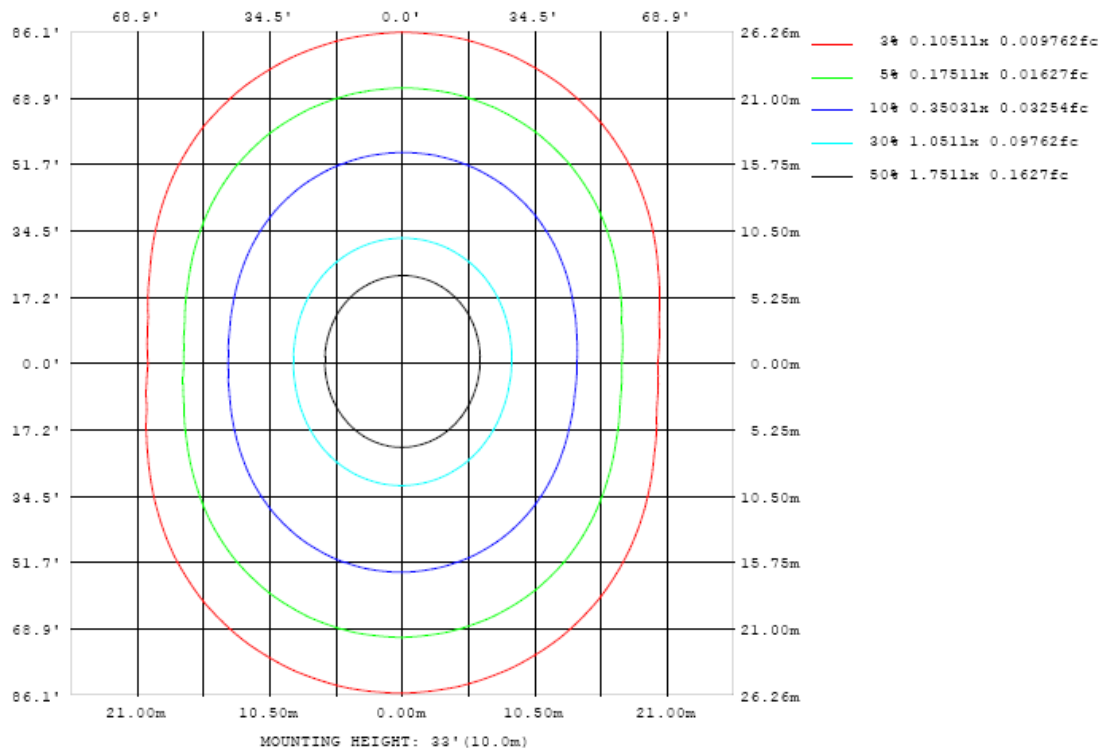


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

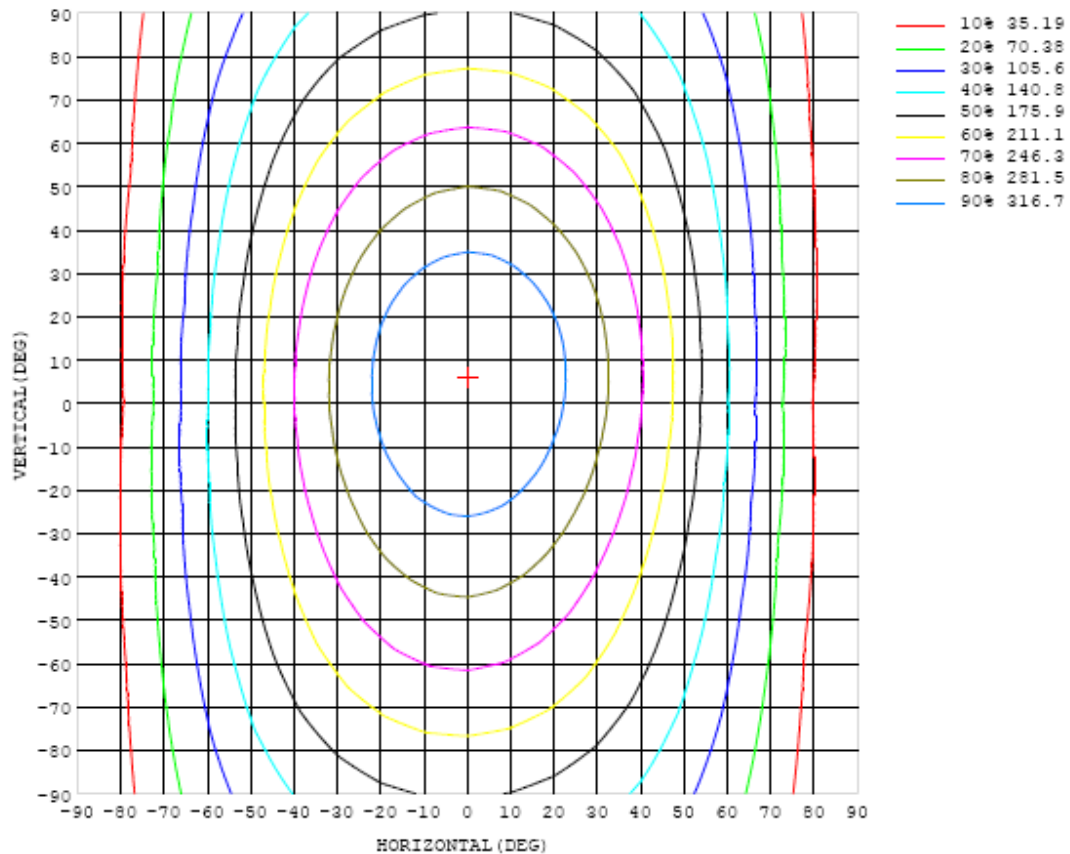


Chart 6: Isocandela Plot

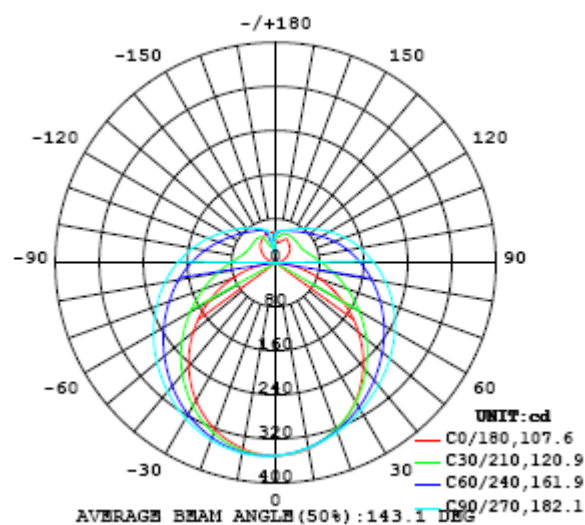


Chart 7: Polar Candela Distribution

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	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
5	348	348	348	347	347	347	347	346	346	347	346	347	347	347	347	347	348	348	349
10	343	342	341	341	341	341	341	341	341	341	341	341	341	341	341	341	341	342	343
15	334	333	333	332	333	333	333	334	334	335	334	335	334	333	333	332	333	333	334
20	323	322	321	321	322	323	324	326	326	327	327	326	325	323	322	322	321	321	322
25	308	306	306	307	309	311	314	316	318	318	318	317	315	313	310	308	306	306	307
30	290	289	289	292	295	299	303	306	308	310	309	307	305	301	296	293	290	288	289
35	270	269	270	274	279	285	291	295	298	300	300	297	293	288	281	276	271	268	268
40	247	246	249	255	262	271	278	284	289	291	290	287	281	274	266	258	251	246	246
45	223	222	227	235	245	256	266	273	278	281	280	276	269	260	249	238	229	223	221
50	197	197	204	215	228	241	253	262	268	271	270	265	257	246	233	219	207	198	195
55	169	171	181	195	211	226	240	250	257	261	259	254	244	232	216	199	184	172	168
60	142	145	158	175	194	212	227	239	246	250	249	242	232	218	200	180	161	147	140
65	114	119	135	156	178	198	215	227	235	239	237	231	219	204	184	161	139	121	112
70	85.5	92.5	113	138	162	184	202	215	224	227	226	219	207	190	169	144	118	95.3	83.7
75	58.5	68.0	93.0	122	149	171	189	203	212	215	214	207	195	177	155	128	98.4	71.6	57.1
80	33.5	46.4	75.7	107	135	159	177	191	200	203	202	195	182	165	142	113	81.5	50.8	32.3
85	12.0	29.6	62.0	94.4	123	147	165	179	187	191	190	182	170	153	130	101	67.9	34.6	11.1
90	0.34	19.7	52.0	83.9	112	136	155	167	175	179	177	171	159	142	119	90.1	57.9	24.8	0.59
95	2.44	16.0	45.4	75.5	103	126	144	156	164	167	165	159	148	131	109	81.3	50.9	20.5	2.53
100	5.94	16.2	40.9	68.7	94.4	116	133	145	153	156	155	149	137	121	99.9	74.2	46.0	19.6	6.07
105	10.2	18.5	38.4	63.1	86.7	107	123	135	142	145	144	138	127	112	91.8	68.1	42.8	21.4	10.0
110	15.0	22.3	38.0	58.7	79.9	98.6	114	124	131	134	133	127	117	103	84.5	63.1	41.6	24.7	14.2
115	19.7	26.5	38.9	55.9	74.2	90.9	105	115	121	123	122	117	108	94.6	78.2	59.6	41.6	28.5	19.0
120	24.5	30.7	40.5	54.3	69.5	84.1	96.3	105	111	113	112	107	98.9	87.3	72.9	57.4	42.5	32.4	24.4
125	29.0	34.7	42.5	53.7	66.2	78.3	88.9	96.8	102	104	103	98.5	91.0	80.9	69.0	56.1	44.1	36.3	29.4
130	33.3	38.5	44.7	53.6	63.9	73.8	82.5	89.1	93.6	95.3	94.4	90.5	84.2	75.9	66.1	55.5	46.0	40.1	34.1
135	37.0	42.0	46.8	53.9	62.1	70.2	77.4	82.9	86.4	87.8	87.0	83.9	78.7	71.9	63.9	55.4	48.1	43.5	39.0
140	39.8	44.3	48.8	54.4	60.9	67.3	73.0	77.5	80.4	81.5	80.9	78.3	74.1	68.6	62.2	55.7	50.1	46.5	43.6
145	42.0	47.6	50.8	54.9	59.9	64.9	69.3	72.9	75.2	76.1	75.6	73.6	70.2	65.9	61.0	56.1	51.9	49.2	46.5
150	45.6	49.9	50.6	55.5	59.2	62.9	66.3	68.9	70.7	71.4	71.0	69.5	66.9	63.7	60.1	56.6	53.6	51.8	49.4
155	48.1	51.4	52.6	56.2	58.7	61.3	63.7	65.6	66.9	67.4	67.1	66.0	64.2	62.0	59.5	57.1	55.1	54.1	51.4
160	44.8	50.9	52.8	55.4	58.4	60.0	61.5	62.8	63.7	64.0	63.9	63.2	62.0	60.6	59.1	57.6	56.5	55.7	54.8
165	40.9	46.1	50.4	54.2	57.7	59.0	59.9	60.6	61.1	61.4	61.4	61.0	60.4	59.6	58.8	58.1	57.5	57.1	56.6
170	38.1	41.0	45.3	50.9	55.3	58.0	58.8	59.1	59.4	59.5	59.6	59.5	59.2	58.9	58.6	58.3	58.1	57.5	56.2
175	35.8	37.6	41.8	46.5	51.2	54.1	55.6	57.1	58.0	58.5	58.6	58.6	58.5	58.4	58.3	58.2	57.9	57.4	56.3
180	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4

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	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350		
5	349	349	350	350	351	351	351	352	352	352	352	351	351	350	350	349	349		
10	344	345	346	347	348	349	350	351	351	351	350	350	349	348	347	346	344		
15	335	337	339	341	343	345	346	347	348	348	347	345	344	342	340	338	336		
20	323	326	329	332	335	338	340	342	343	342	341	339	337	334	331	328	325		
25	309	312	316	321	325	329	332	334	336	335	333	330	327	323	319	314	311		
30	291	295	301	307	313	318	322	325	327	326	324	320	315	310	304	298	293		
35	271	276	283	291	299	306	311	315	317	316	313	308	302	295	287	279	274		
40	249	255	264	274	284	292	299	303	305	304	301	295	287	278	268	259	252		
45	225	232	243	256	268	278	286	291	294	292	288	281	271	260	248	237	228		
50	199	209	222	237	252	264	273	279	282	280	275	266	255	242	227	213	202		
55	172	184	201	218	235	249	259	266	269	267	262	252	239	223	206	189	176		
60	145	160	179	200	219	234	246	253	256	254	248	238	223	205	185	165	149		
65	118	136	159	182	203	220	232	240	243	241	234	223	208	188	165	142	123		
70	91.6	113	140	166	188	206	218	227	230	228	221	209	193	172	147	120	96.8		
75	67.0	92.9	123	150	173	192	205	214	217	215	208	196	178	156	129	100	73.0		
80	45.3	75.2	107	136	160	179	192	201	204	202	195	183	165	142	114	83.1	52.3		
85	28.6	61.3	93.3	122	147	166	179	188	191	189	182	170	152	129	101	69.4	36.4		
90	18.7	50.6	82.3	111	135	153	167	175	178	176	170	157	140	118	89.9	59.0	26.1		
95	15.3	43.5	73.1	100	124	142	154	162	166	164	157	146	129	107	80.7	51.4	21.4		
100	15.8	39.2	66.0	91.5	113	130	143	150	153	152	145	134	118	97.8	73.1	46.4	20.8		
105	18.4	37.7	61.1	83.9	104	120	131	139	141	140	134	124	109	89.6	67.2	44.0	22.2		
110	21.7	37.8	57.6	77.5	95.6	110	121	128	130	129	123	114	100	82.9	63.5	43.4	24.9		
115	25.1	39.1	55.3	72.7	88.6	102	111	118	120	119	113	105	92.7	77.6	60.9	43.9	27.6		
120	28.1	41.1	54.2	68.9	82.8	94.5	103	108	111	109	105	97.2	86.5	73.5	59.1	45.1	30.4		
125	29.8	43.3	54.0	66.0	77.9	88.2	95.6	100	102	101	97.3	90.6	81.3	70.2	58.1	46.5	32.5		
130	30.2	45.2	54.3	64.1	74.0	82.7	89.2	93.4	95.1	94.1	90.7	84.8	76.9	67.6	57.5	48.1	33.6		
135	30.5	46.6	54.9	62.9	71.0	77.9	83.4	87.0	88.4	87.6	84.7	79.8	73.1	65.5	57.3	49.6	33.7		
140	30.5	46.9	55.3	61.9	68.3	73.8	78.3	81.3	82.5	81.9	79.4	75.3	70.3	64.0	57.2	50.9	32.9		
145	33.1	46.2	55.4	61.0	66.1	70.2	73.8	76.3	77.2	76.7	74.7	71.5	67.6	62.6	57.3	49.5	33.4		
150	38.3	42.8	54.1	60.2	64.2	67.7	70.0	71.7	72.5	72.1	70.6	68.6	65.2	60.5	56.8	44.1	35.4		
155	41.2	33.8	47.6	58.8	62.3	65.0	67.0	68.3	68.5	68.5	67.6	64.9	58.1	54.6	50.6	36.6	37.0		
160	44.5	31.9	34.7	45.2	59.0	61.3	63.6	64.7	65.2	65.3	58.9	50.6	47.1	45.0	39.9	32.7	37.9		
165	52.8	37.4	29.6	32.5	35.6	46.5	55.3	58.4	61.1	46.2	41.7	41.6	40.1	34.6	31.9	33.2	35.5		
170	54.1	48.5	39.2	35.5	37.1	39.8	41.8	44.9	29.7	42.9	45.0	42.1	38.0	35.4	33.1	33.6	35.2		
175	54.5	53.1	51.5	47.8	44.6	41.9	41.1	38.0	24.4	36.8	39.9	39.8	37.6	36.6	37.8	38.4	37.0		
180	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4	52.4		

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

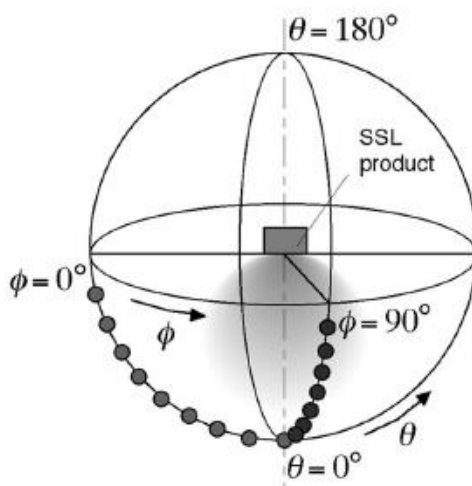
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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