

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/840/DEB

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20070023n

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

Review by:



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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/840/DEB

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
157.6	1933.3	12.27	0.9795
CCT (K)	CRI	Stabilization Time (Light & Power)	
4050	82.6	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

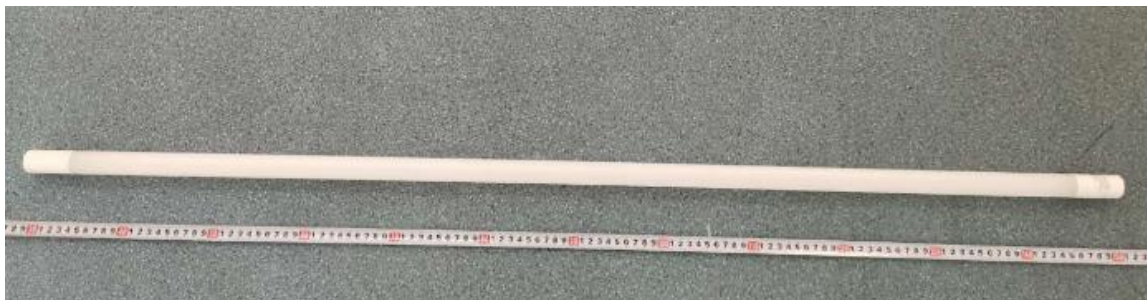


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 12T8/4F/840/DEB
Electrical Ratings	: 120-277V, 50/60Hz, 12W
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 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)	0.104	0.048
Power Factor	0.9795	0.9196
Test Power (W)	12.27	12.30
THD A%	18.62	19.21
Luminous Efficacy (lm/W)	157.6	155.7
Total Luminous Flux (lm)	1933.3	1915.5
Color Rendering Index (CRI)	82.6	
R9	7.6	
Correlated Color Temperature (CCT)(K)	4050	
Chromaticity Chroma x	0.3785	
Chromaticity Chroma y	0.3768	
Chromaticity Chroma u	0.2238	
Chromaticity Chroma v	0.3342	
Duv	0.0006	
Chromaticity Chroma u'	0.2238	
Chromaticity Chroma v'	0.5013	

Special Color Rendering Indices	
R1	80.8
R2	89.3
R3	94.9
R4	80.7
R5	80.7
R6	84.6
R7	85.8
R8	64.1
R9	7.6
R10	74.3
R11	79.3
R12	59.2
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 25.2 °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)	0.105
Power Factor	0.9795
Power (W)	12.28
Luminous Efficacy (lm/W)	154.6
Total Luminous Flux (lm)	1898.0
Beam Angle (°)	110.4 (0°-180°) / 200.8 (90°-270°)
Center Beam Candle Power (cd)	340
Maximum Beam Candle Power (cd)	340.1 (At: C=290.0, Gamma=2.0)
Spacing Criteria	1.25 (0°-180°) / 1.42 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	44.90%
Zonal Lumens in the 60 °-90 °Zone	26.54%
Zonal Lumens in the 90 °-120 °Zone	16.62%
Zonal Lumens in the 120 °-180 °Zone	11.93%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

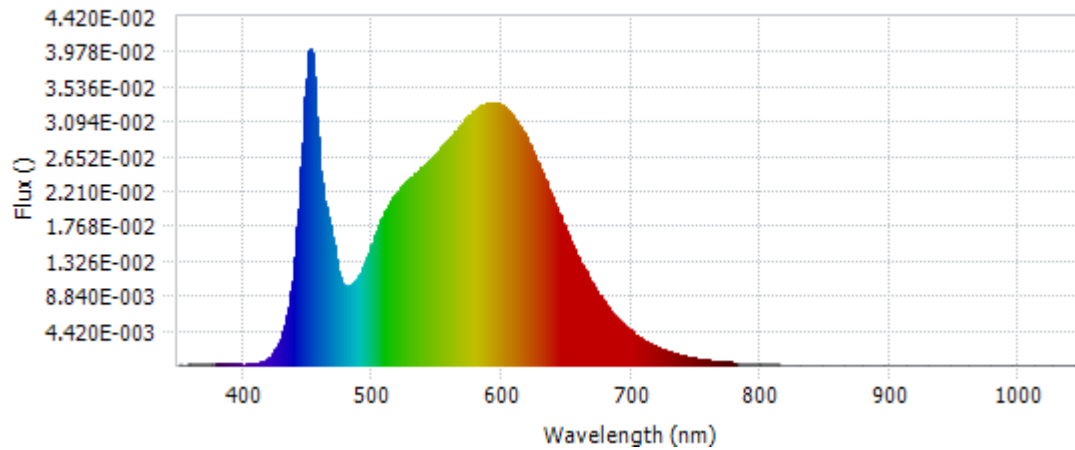
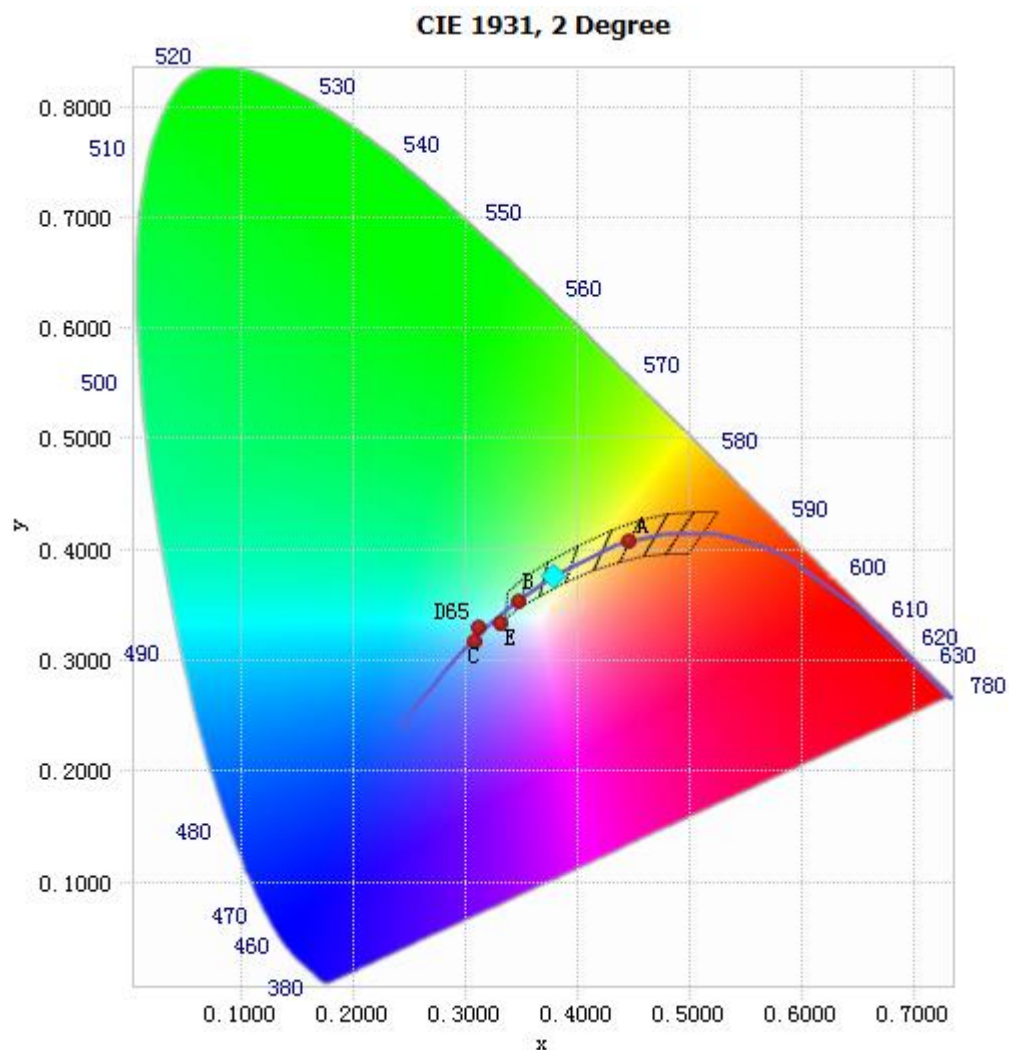


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.60E-04	485	1.04E-02	590	3.33E-02	695	5.04E-03
385	1.52E-04	490	1.14E-02	595	3.33E-02	700	4.34E-03
390	1.48E-04	495	1.33E-02	600	3.29E-02	705	3.72E-03
395	1.36E-04	500	1.56E-02	605	3.23E-02	710	3.18E-03
400	1.24E-04	505	1.78E-02	610	3.13E-02	715	2.73E-03
405	1.41E-04	510	1.95E-02	615	3.00E-02	720	2.33E-03
410	2.42E-04	515	2.11E-02	620	2.84E-02	725	2.00E-03
415	4.69E-04	520	2.22E-02	625	2.68E-02	730	1.70E-03
420	9.61E-04	525	2.30E-02	630	2.49E-02	735	1.45E-03
425	1.93E-03	530	2.38E-02	635	2.29E-02	740	1.24E-03
430	3.84E-03	535	2.46E-02	640	2.09E-02	745	1.06E-03
435	7.36E-03	540	2.54E-02	645	1.89E-02	750	9.05E-04
440	1.37E-02	545	2.62E-02	650	1.70E-02	755	7.68E-04
445	2.52E-02	550	2.70E-02	655	1.51E-02	760	6.61E-04
450	3.84E-02	555	2.80E-02	660	1.34E-02	765	5.61E-04
455	3.65E-02	560	2.89E-02	665	1.18E-02	770	4.80E-04
460	2.47E-02	565	2.98E-02	670	1.03E-02	775	4.09E-04
465	1.93E-02	570	3.08E-02	675	9.02E-03	780	3.55E-04
470	1.52E-02	575	3.17E-02	680	7.83E-03		
475	1.13E-02	580	3.24E-02	685	6.79E-03		
480	9.99E-03	585	3.30E-02	690	5.88E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3785, 0.3768)

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

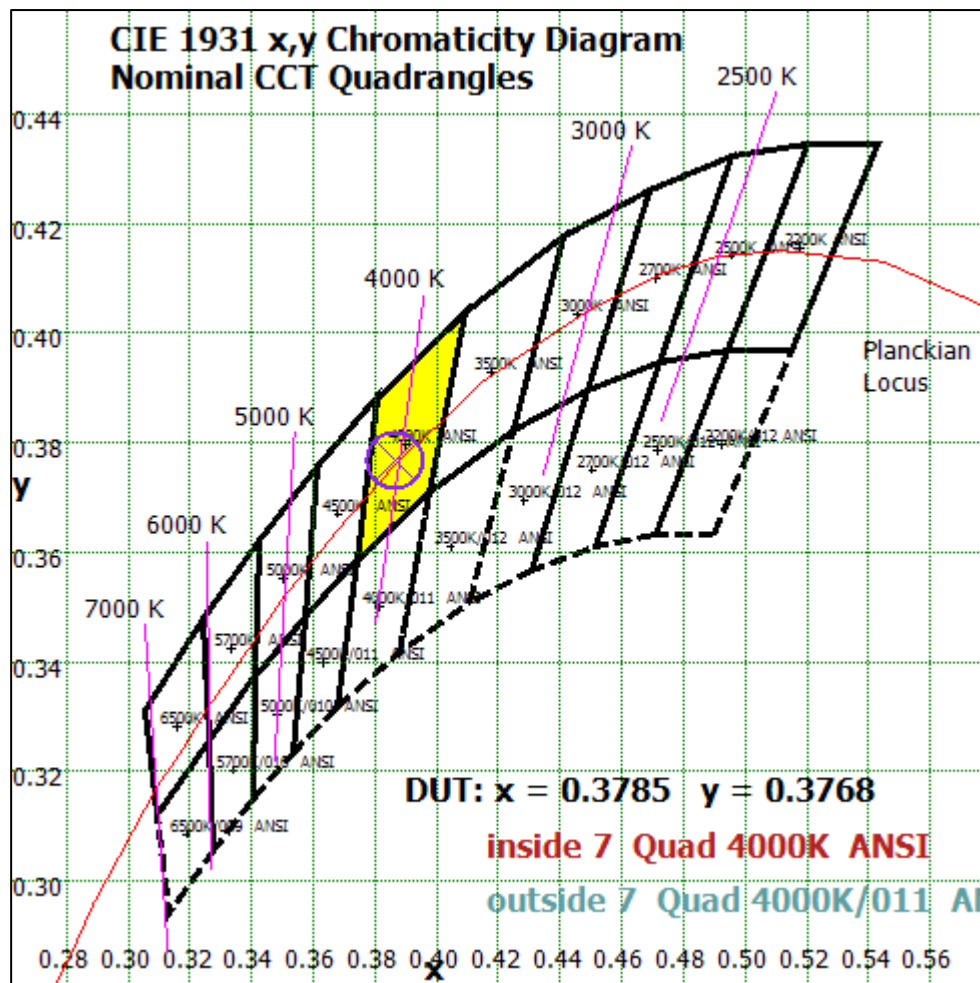
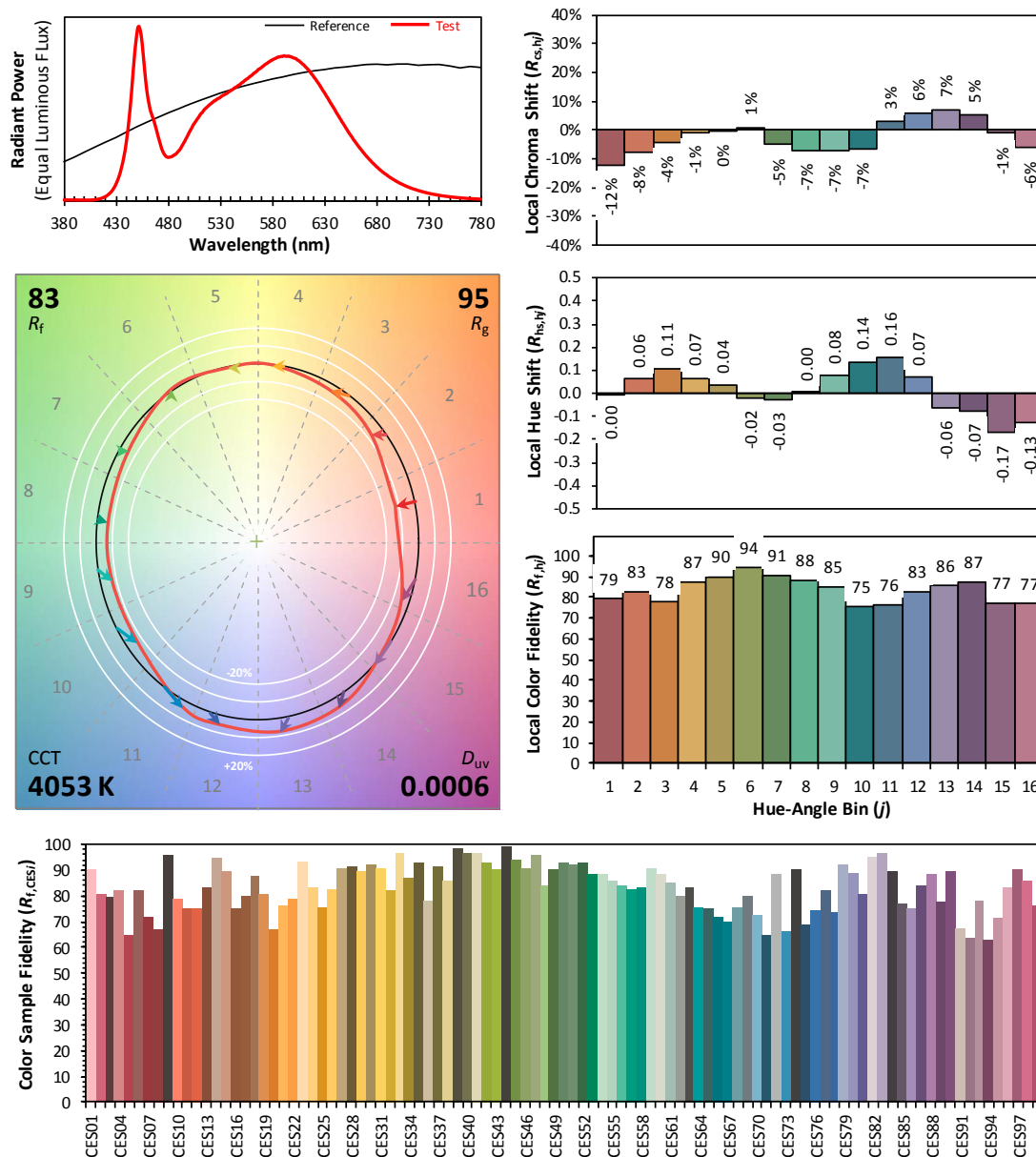


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x 0.3785

y 0.3768

u' 0.2238

v' 0.5013

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	32.198	1.70%
10- 20	93.105	4.91%
20- 30	144.156	7.60%
30- 40	180.571	9.51%
40- 50	199.902	10.53%
50- 60	202.316	10.66%
60- 70	190.428	10.03%
70- 80	168.838	8.90%
80- 90	144.38	7.61%
90-100	123.373	6.50%
100-110	104.67	5.52%
110-120	87.484	4.61%
120-130	71.988	3.79%
130-140	57.85	3.05%
140-150	44.314	2.33%
150-160	30.731	1.62%
160-170	16.623	0.88%
170-180	4.983	0.26%
Total	1897.9	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	852.248	44.90%
60- 90	503.646	26.54%
0-90	1355.894	71.44%
90- 180	542.016	28.56%
0- 180	1897.9	100%

Table 5: Zonal Lumen

Note: The Flux in this table might be a little different from the total flux in Table 2 due to rounding.

Illuminance Plots- Goniophotometer Method

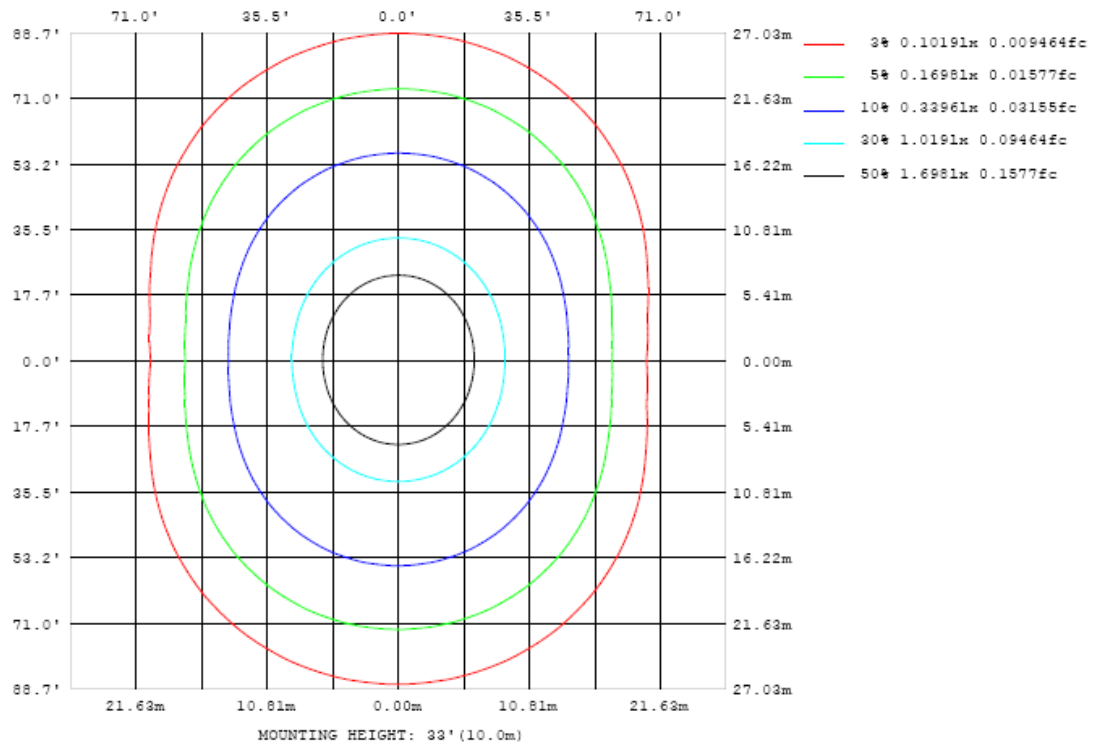


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

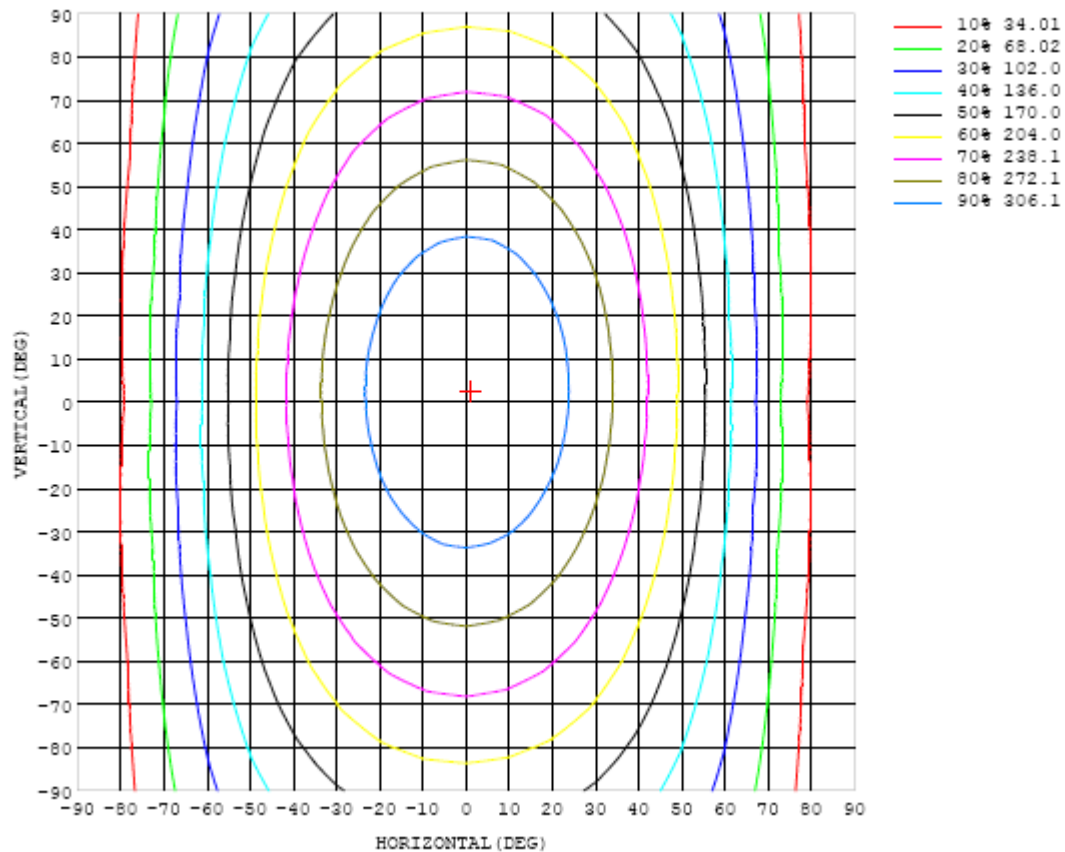


Chart 6: Isocandela Plot

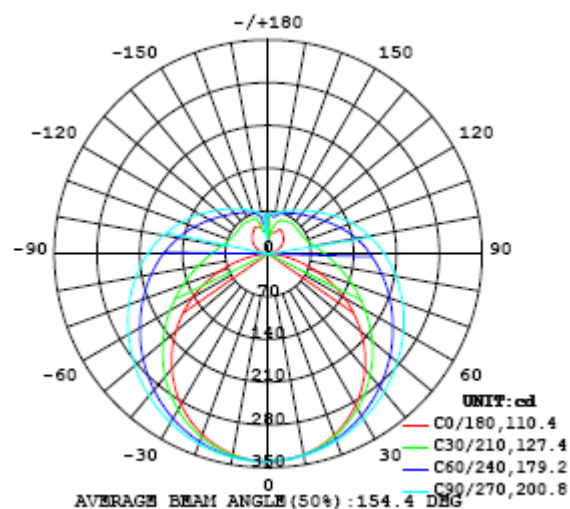


Chart 7: Polar Candela Distribution

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	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340
5	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338
10	333	333	333	334	334	334	335	335	335	335	335	335	335	334	334	333	333	333	333
15	326	326	326	327	328	329	330	331	331	331	331	331	330	329	328	327	326	325	325
20	316	316	316	318	319	321	323	325	325	326	326	324	323	321	319	317	315	315	315
25	302	302	304	306	309	312	315	317	319	319	319	317	315	312	309	305	303	301	301
30	286	286	289	292	297	301	306	309	311	312	311	309	305	301	297	292	288	286	285
35	268	268	271	277	283	289	295	300	303	304	303	300	295	290	283	276	271	267	266
40	247	248	252	260	268	276	284	290	294	295	294	291	285	277	268	260	252	247	245
45	223	225	232	241	252	263	272	280	284	286	284	280	273	264	253	242	231	225	222
50	198	201	210	222	236	249	260	269	274	276	274	269	261	250	237	223	210	201	197
55	172	175	187	202	219	235	248	258	264	266	264	259	249	236	221	203	187	175	171
60	144	149	164	183	203	221	236	247	253	255	254	247	237	222	205	184	165	150	143
65	115	122	141	164	187	207	224	235	242	245	243	236	225	209	189	166	143	123	114
70	84.8	94.4	119	147	172	194	212	224	231	234	232	225	213	196	174	149	121	96.5	84.9
75	55.7	68.7	98.0	130	159	182	200	213	220	223	221	214	201	184	161	132	100	71.3	57.0
80	29.3	46.3	80.5	116	146	170	188	202	209	212	210	203	190	172	148	118	83.0	49.0	30.7
85	9.11	29.6	66.8	103	134	159	177	190	198	201	199	192	179	161	136	105	69.1	32.0	9.94
90	0.39	20.6	56.9	92.8	124	148	166	180	187	190	188	181	168	150	126	94.8	58.9	22.2	0.49
95	1.85	17.0	50.1	84.3	114	138	157	169	176	179	177	170	158	140	116	86.1	51.8	18.1	1.87
100	4.96	17.8	45.3	76.7	105	128	146	159	166	168	166	160	148	130	107	78.2	46.4	18.0	5.33
105	9.14	21.1	43.4	70.5	96.6	119	136	148	155	157	155	149	137	120	98.0	71.6	43.7	20.8	10.0
110	14.2	25.6	43.5	66.4	89.2	109	126	137	144	146	144	138	126	110	90.1	66.7	43.1	25.1	14.9
115	19.4	30.1	45.2	64.1	83.5	101	116	126	133	135	133	127	116	102	83.8	63.7	43.9	29.3	20.1
120	24.4	34.3	47.3	62.9	79.3	94.5	107	117	122	124	123	117	107	94.5	79.1	61.9	46.1	33.4	25.2
125	28.6	37.9	49.7	62.6	76.2	89.1	100.0	108	113	114	113	108	99.8	88.9	75.6	61.2	48.7	37.7	29.9
130	32.5	42.9	51.8	62.7	73.9	84.7	93.8	101	105	106	105	101	93.6	84.2	73.1	61.5	51.0	42.7	33.7
135	35.6	46.0	53.3	63.1	72.1	81.0	88.6	94.3	97.8	99.0	97.8	94.1	88.2	80.4	71.3	62.2	52.5	46.2	37.0
140	38.3	48.7	54.6	63.5	70.7	77.8	84.0	88.7	91.6	92.5	91.6	88.5	83.6	77.3	70.1	62.9	54.5	49.4	40.0
145	41.0	51.6	55.2	62.9	69.7	75.2	80.1	83.8	86.1	86.8	86.0	83.6	79.7	74.7	69.2	62.9	56.1	52.2	43.0
150	43.4	55.0	57.0	61.5	68.7	72.9	76.6	79.5	81.2	81.8	81.2	79.3	76.3	72.6	68.0	62.6	58.8	56.0	46.6
155	43.7	55.1	57.5	58.9	65.1	70.7	73.5	75.7	76.9	77.4	77.1	75.7	73.5	70.4	66.7	62.9	60.6	58.0	48.3
160	39.0	49.4	55.7	57.5	62.4	67.3	70.4	72.1	73.0	73.4	73.2	72.2	70.5	68.1	65.7	64.0	63.0	58.7	46.7
165	36.9	42.9	48.1	51.7	55.7	61.9	67.1	69.4	69.8	70.1	70.1	69.2	68.0	66.7	65.7	65.1	63.8	61.6	45.3
170	35.7	35.9	40.4	42.7	44.9	52.6	61.9	66.9	67.8	67.9	67.9	67.9	67.1	65.9	65.8	65.3	64.4	64.1	53.9
175	28.3	33.0	29.6	27.9	36.8	51.2	63.4	65.8	66.1	65.8	65.9	66.2	66.6	65.5	64.6	65.4	65.3	64.7	64.0
180	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6

Table 6: Luminous Intensity Data

Table--2

UNIT: cd

C (DEG) γ (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340	340		
5	338	338	338	339	339	339	340	340	340	340	340	340	339	339	339	339	338		
10	334	334	335	336	336	337	338	338	338	338	338	337	336	336	335	335	334		
15	326	327	328	330	332	333	334	335	335	335	335	333	332	331	329	328	327		
20	316	317	319	322	325	327	329	331	331	331	330	328	325	323	321	318	316		
25	302	305	308	312	316	320	323	325	326	326	324	321	317	314	310	306	303		
30	287	290	295	300	306	311	315	318	319	319	316	312	308	302	296	292	288		
35	268	273	279	287	295	302	307	310	312	311	308	303	296	289	282	275	270		
40	248	254	262	272	282	291	297	302	303	302	299	292	284	275	265	256	250		
45	225	233	244	257	269	279	287	292	294	293	289	281	271	259	247	235	227		
50	201	211	225	240	255	267	276	282	285	283	278	269	257	243	228	213	203		
55	175	188	205	223	241	255	265	272	275	273	267	257	243	227	208	191	177		
60	149	165	185	207	226	242	254	261	264	262	256	244	229	210	189	167	150		
65	122	141	166	191	213	230	243	250	253	251	244	232	216	194	170	144	123		
70	94.5	119	148	175	199	218	231	239	242	240	233	220	202	179	151	122	95.8		
75	69.1	98.2	131	161	186	206	220	228	231	229	221	208	190	165	135	101	70.7		
80	46.3	80.3	116	148	174	194	208	217	220	218	210	197	177	152	120	84.0	48.4		
85	28.9	66.7	104	136	163	183	197	205	209	206	199	185	166	140	108	70.7	31.9		
90	19.4	56.5	93.1	125	151	172	186	194	197	195	187	174	155	129	97.6	61.1	23.0		
95	16.2	49.5	84.1	115	141	160	174	182	186	184	176	163	144	120	88.9	54.2	19.8		
100	17.0	45.2	76.8	106	131	150	163	171	174	172	165	152	134	111	81.7	49.9	20.6		
105	19.9	43.3	71.1	98.0	121	139	152	159	162	160	153	142	125	102	75.8	47.9	23.3		
110	24.1	43.2	67.4	91.0	112	129	141	148	151	149	143	132	116	95.3	71.5	47.9	27.1		
115	28.7	44.4	64.8	85.1	104	119	131	137	140	138	132	122	107	89.3	69.4	48.9	31.4		
120	33.6	46.3	63.3	80.7	97.0	111	121	127	130	128	123	113	100	84.6	67.6	50.6	35.6		
125	36.8	48.6	62.7	77.2	91.3	103	112	117	120	118	113	105	94.3	80.9	66.7	52.6	39.0		
130	38.3	50.5	62.7	74.6	86.5	96.6	104	109	111	110	106	98.7	89.2	78.0	66.3	54.3	41.1		
135	40.8	52.8	63.2	72.7	82.5	91.0	97.4	102	103	102	98.7	92.8	84.9	75.7	66.2	55.9	42.3		
140	44.3	55.2	63.4	71.2	79.1	86.0	91.3	94.8	96.2	95.4	92.5	87.6	81.2	73.7	66.1	57.1	43.2		
145	46.4	56.5	63.3	70.6	76.4	81.7	86.0	88.7	89.9	89.3	86.9	83.0	77.9	72.2	65.0	56.8	44.3		
150	46.7	57.0	62.4	69.2	73.8	78.0	81.3	83.4	84.3	83.9	82.0	79.0	75.2	70.9	64.3	58.6	44.6		
155	42.2	55.3	62.0	66.8	72.0	74.7	76.7	78.5	79.3	79.0	77.5	75.2	72.5	67.7	59.9	57.2	42.9		
160	36.8	48.1	62.4	64.4	68.1	71.9	73.4	74.1	74.7	74.5	73.7	72.5	66.9	58.3	52.6	51.6	39.1		
165	35.8	38.0	45.6	61.7	63.7	66.0	68.4	69.7	71.1	71.7	68.8	60.1	51.9	48.9	46.7	43.2	35.7		
170	34.8	36.7	37.2	40.6	50.0	57.6	61.4	64.9	66.4	60.7	44.2	46.7	48.1	46.4	42.6	37.3	38.4		
175	64.5	46.9	31.9	50.0	49.8	48.8	49.9	48.3	34.7	43.8	50.6	52.6	52.3	49.9	47.9	46.1	37.3		
180	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6	63.6		

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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