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: 10.5T5HO/2F/850/DIR

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ20100014a

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

Review by: April Zou

Engineer: April Zou

Oct. 23, 2020

Approved by:

Manager: Jim Zhang

Oct. 23, 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: **10.5T5HO/2F/850/DIR**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
111.1	1696.1	15.27	0.9888

CCT (K)	CRI	Stabilization Time (Light & Power)
5086	83.8	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 : Oct. 20, 2020

Date of Test : Oct. 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

SAMPLE PHOTO

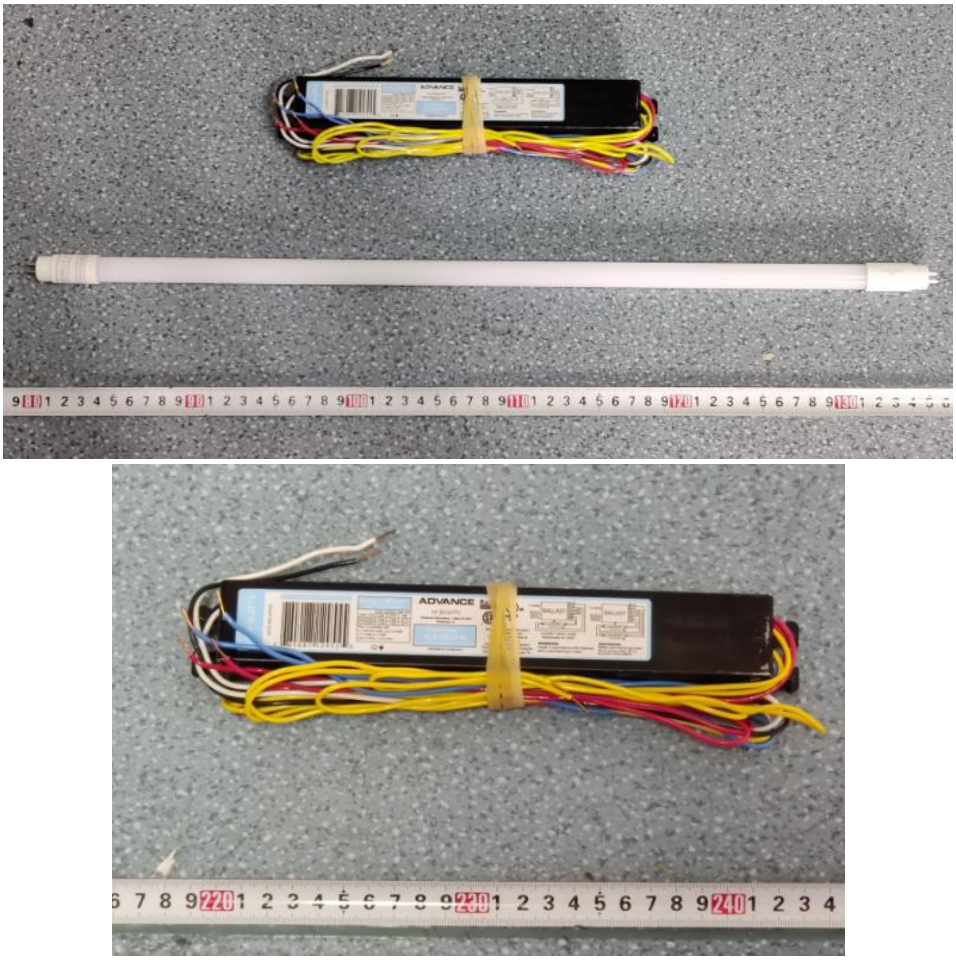


Figure 1- Overview of the sample

Equipment Under Test(EUT)	
Name	: LED Tube
Model	: 10.5T5HO/2F/850/DIR
Electrical Ratings	: 120-277V, 50/60Hz, 10.5W
Product Description	: 5000K LED Tubes supplied by a high frequency fluorescent lamp ballast: ICN-2S24-N
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 ℃.

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)	0.129	0.066
Power Factor	0.9888	0.8660
Test Power (W)	15.27	15.72
THD A%	11.87	41.56
Luminous Efficacy (lm/W)	111.1	108.1
Total Luminous Flux (lm)	1696.1	1699.1
Color Rendering Index (CRI)	83.8	
R9	8.3	
Correlated Color Temperature (CCT)(K)	5086	
Chromaticity Chroma x	0.3432	
Chromaticity Chroma y	0.3574	
Chromaticity Chroma u	0.2080	
Chromaticity Chroma v	0.3248	
Duv	0.0036	
Chromaticity Chroma u ’	0.2080	
Chromaticity Chroma v’	0.4872	

Special Color Rendering Indices	
R1	81.8
R2	88.6
R3	93.6
R4	83.9
R5	82.9
R6	84.4
R7	87.3
R8	67.7
R9	8.3
R10	73.3
R11	83.8
R12	64.8
R13	83.5
R14	96.7

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 ℃.

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)	0.129
Power Factor	0.9890
Power (W)	15.33
Luminous Efficacy (lm/W)	111.0
Total Luminous Flux (lm)	1701.4
Beam Angle (°)	109.7 (0^o-180^o) / 144.7 (90^o-270^o)
Center Beam Candle Power (cd)	435
Maximum Beam Candle Power (cd)	434.8 (At: C=0.0, Gamma=0.5)
Spacing Criteria	1.24 (0^o-180^o) / 1.33 (90^o-270^o)
Zonal Lumens in the 0 °-60 °Zone	60.45%
Zonal Lumens in the 60 °-90 °Zone	27.61%
Zonal Lumens in the 90 °-120 °Zone	9.44%
Zonal Lumens in the 120 °-180 °Zone	2.50%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

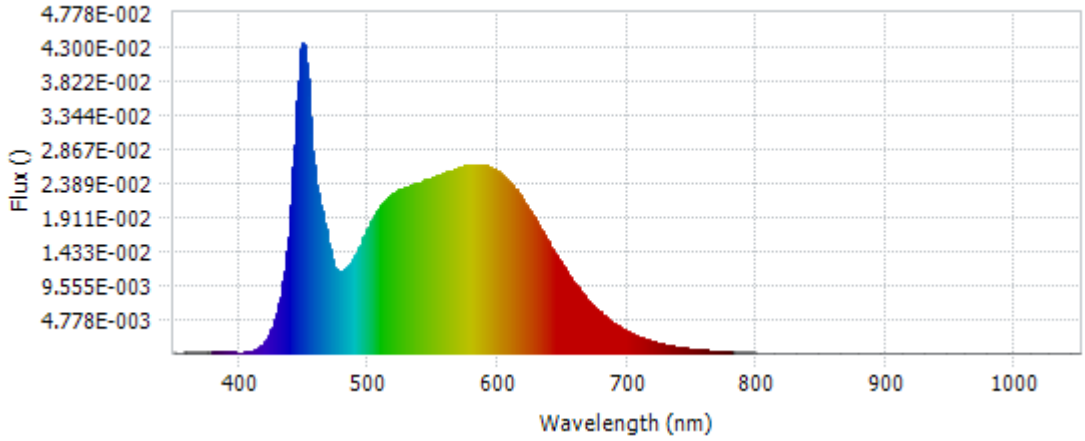
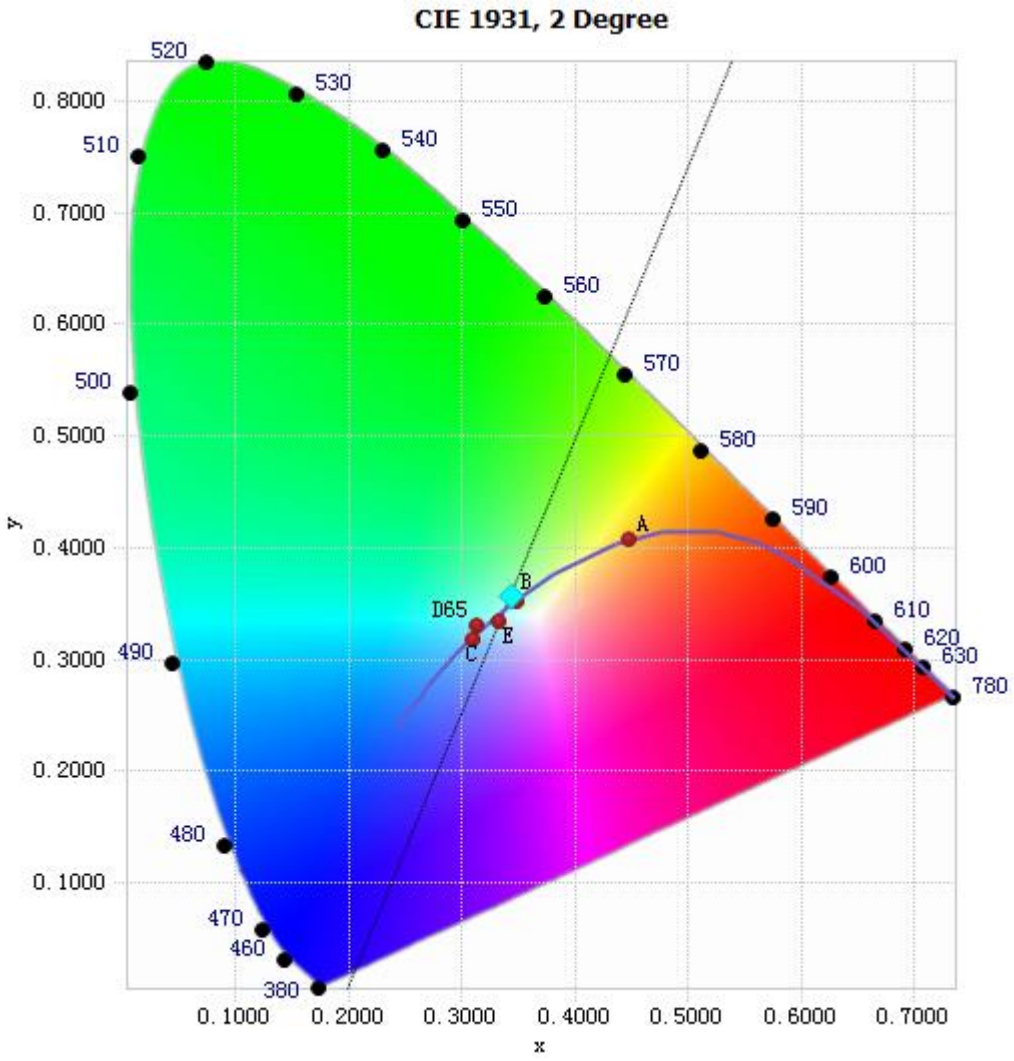


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.92E-04	485	1.24E-02	590	2.63E-02	695	3.59E-03
385	1.95E-04	490	1.38E-02	595	2.60E-02	700	3.08E-03
390	1.84E-04	495	1.58E-02	600	2.55E-02	705	2.63E-03
395	1.54E-04	500	1.77E-02	605	2.48E-02	710	2.25E-03
400	1.38E-04	505	1.95E-02	610	2.38E-02	715	1.93E-03
405	1.66E-04	510	2.07E-02	615	2.27E-02	720	1.65E-03
410	3.38E-04	515	2.18E-02	620	2.13E-02	725	1.42E-03
415	7.84E-04	520	2.25E-02	625	1.99E-02	730	1.21E-03
420	1.65E-03	525	2.30E-02	630	1.84E-02	735	1.03E-03
425	3.27E-03	530	2.35E-02	635	1.69E-02	740	8.73E-04
430	6.28E-03	535	2.36E-02	640	1.54E-02	745	7.48E-04
435	1.15E-02	540	2.40E-02	645	1.38E-02	750	6.36E-04
440	2.07E-02	545	2.43E-02	650	1.23E-02	755	5.49E-04
445	3.53E-02	550	2.47E-02	655	1.10E-02	760	4.64E-04
450	4.32E-02	555	2.50E-02	660	9.69E-03	765	4.00E-04
455	3.32E-02	560	2.54E-02	665	8.51E-03	770	3.46E-04
460	2.37E-02	565	2.57E-02	670	7.43E-03	775	2.96E-04
465	1.92E-02	570	2.61E-02	675	6.47E-03	780	2.53E-04
470	1.46E-02	575	2.63E-02	680	5.60E-03		
475	1.18E-02	580	2.65E-02	685	4.85E-03		
480	1.16E-02	585	2.66E-02	690	4.18E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3432, 0.3574)

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

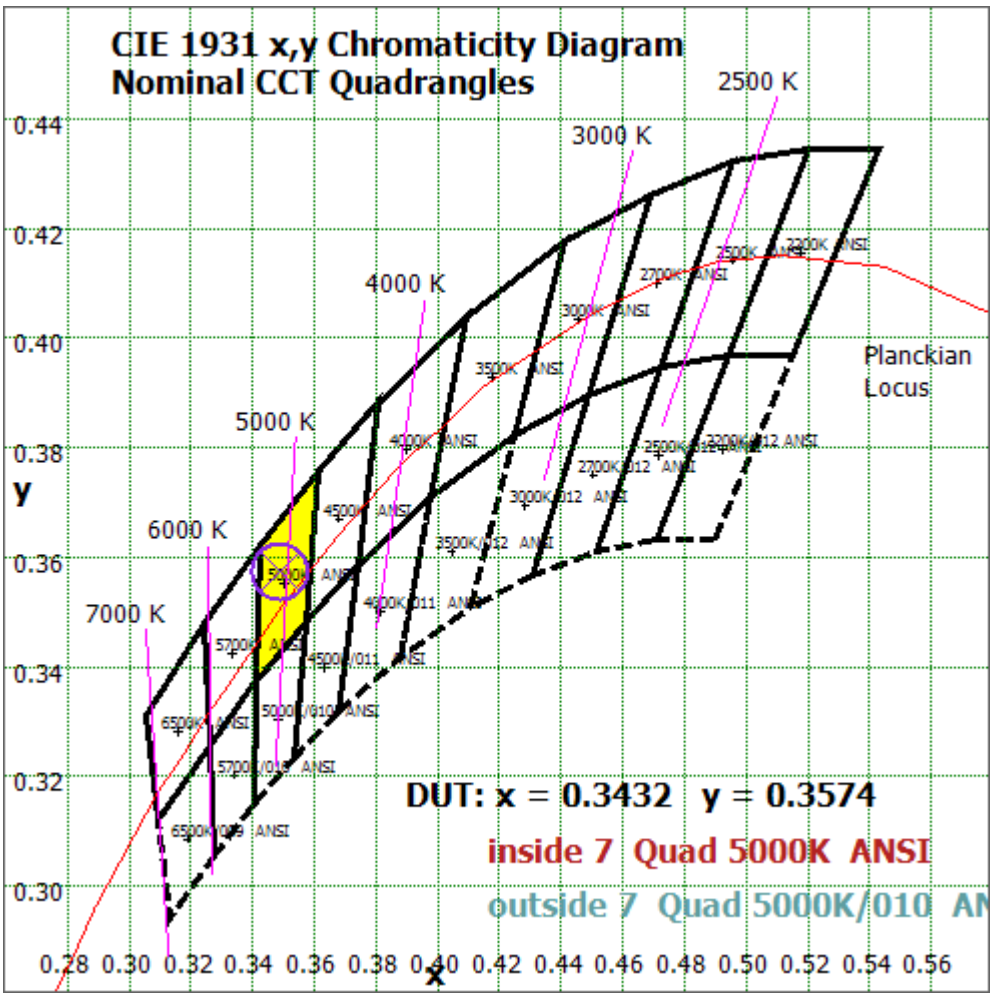


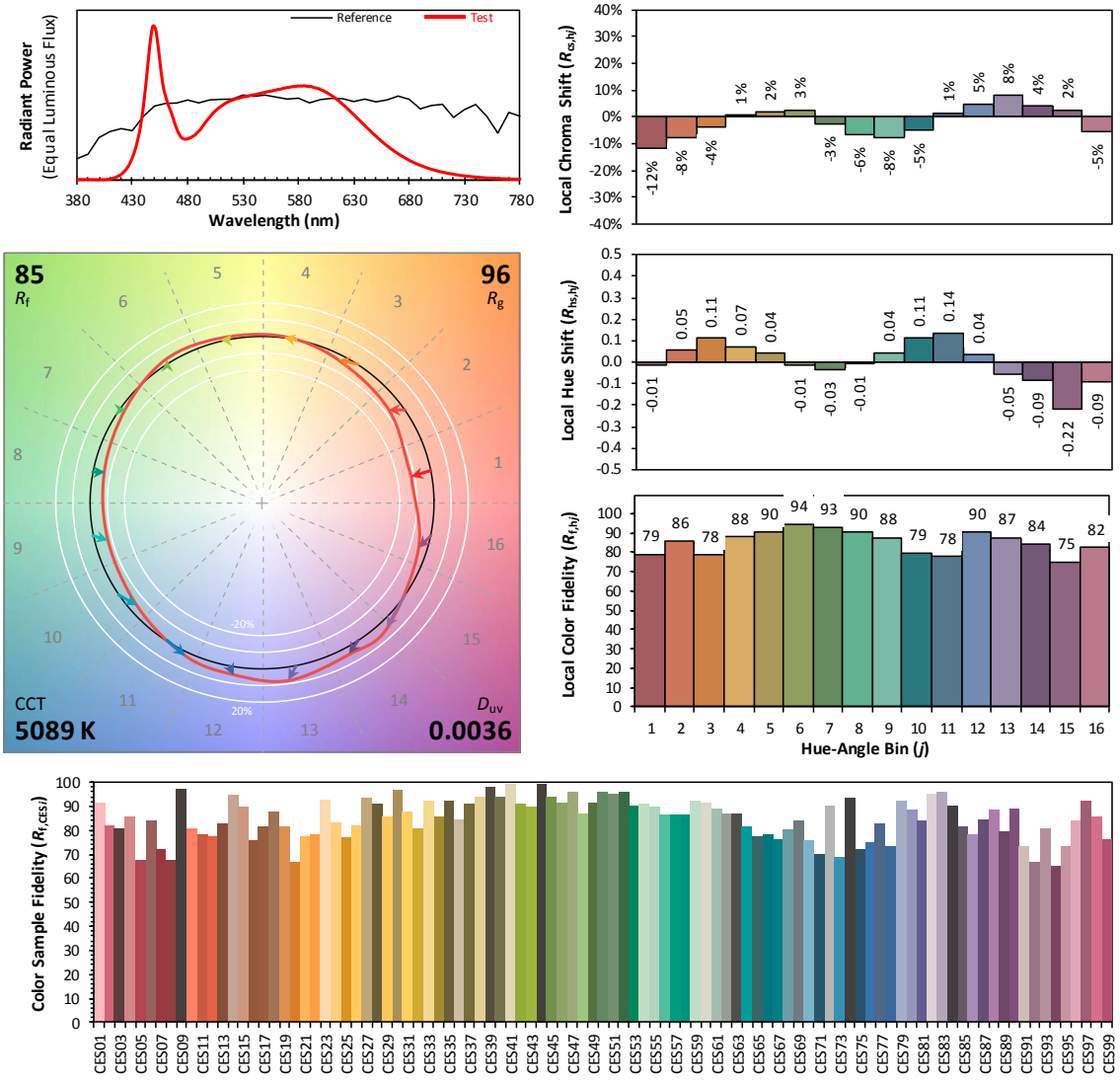
Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method

ANSI/IES TM-30-18 Color Rendition Report

Source: LED **Manufacturer:** GREEN CREATIVE LTD

Date: 2020/10/22 **Model:** 10.5T5HO/2F/850/DIR



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

x	0.3432
y	0.3574
u'	0.2080
v'	0.4872

CIE 13.3-1995 (CRI)

R_a	84
R_9	8

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.00.

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

γ(°)	Lumens	% Total
0- 10	41.166	2.42%
10- 20	118.326	6.95%
20- 30	180.852	10.63%
30- 40	221.763	13.03%
40- 50	237.616	13.97%
50- 60	228.785	13.45%
60- 70	199.451	11.72%
70- 80	157.153	9.24%
80- 90	113.119	6.65%
90-100	78.091	4.59%
100-110	51.205	3.01%
110-120	31.369	1.84%
120-130	19.16	1.13%
130-140	11.406	0.67%
140-150	6.524	0.38%
150-160	3.462	0.20%
160-170	1.548	0.09%
170-180	0.357	0.02%
Total	1701.4	100%

γ(°)	Lumens	% Total
0- 60	1028.508	60.45%
60- 90	469.723	27.61%
0-90	1498.231	88.06%
90- 180	203.122	11.94%
0- 180	1701.4	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

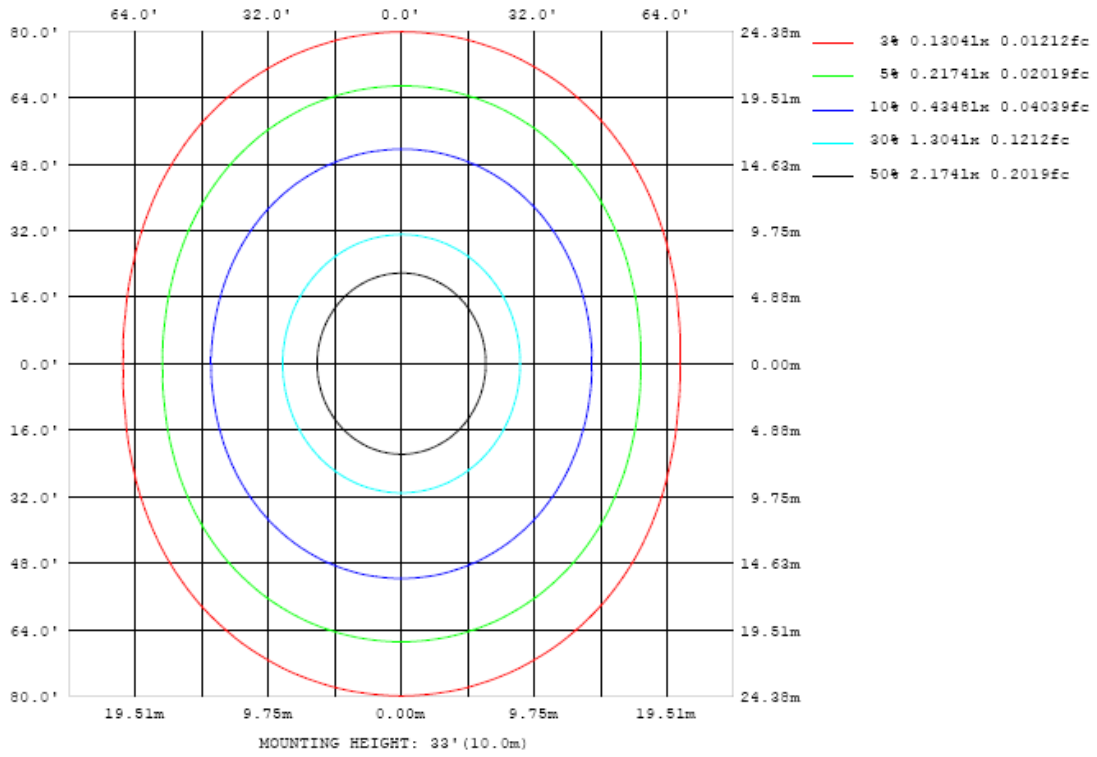


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

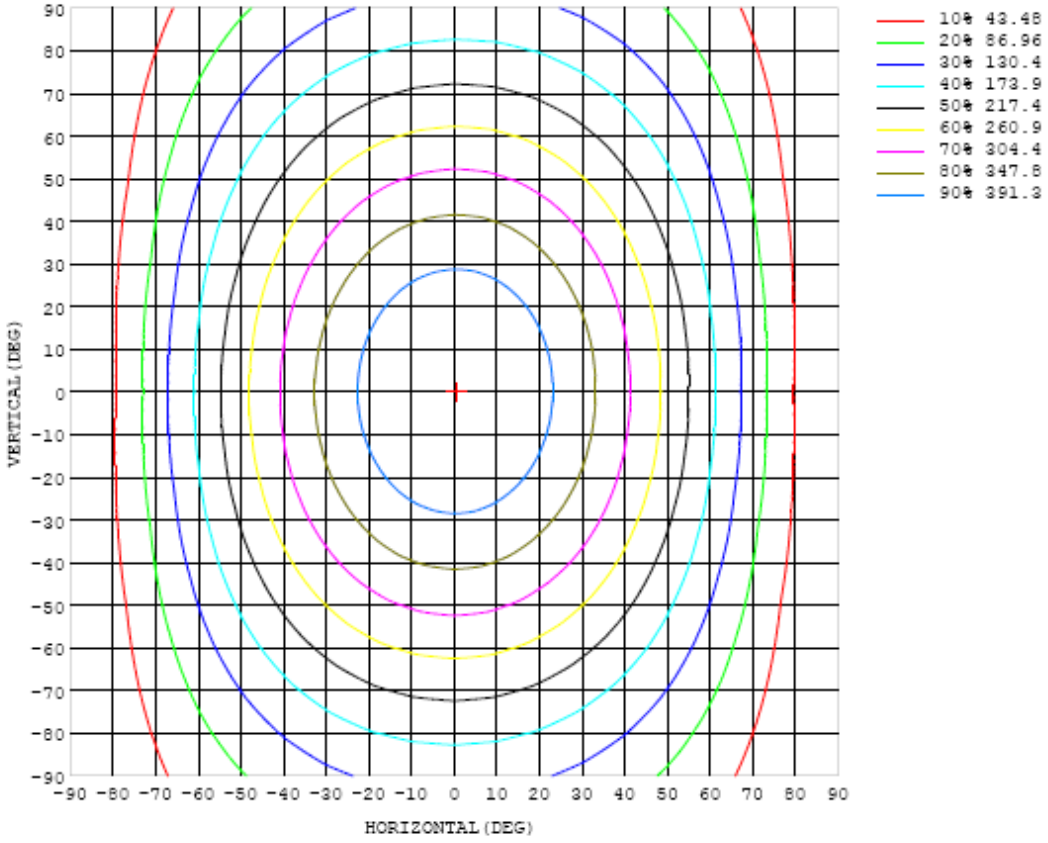


Chart 6: Isocandela Plot

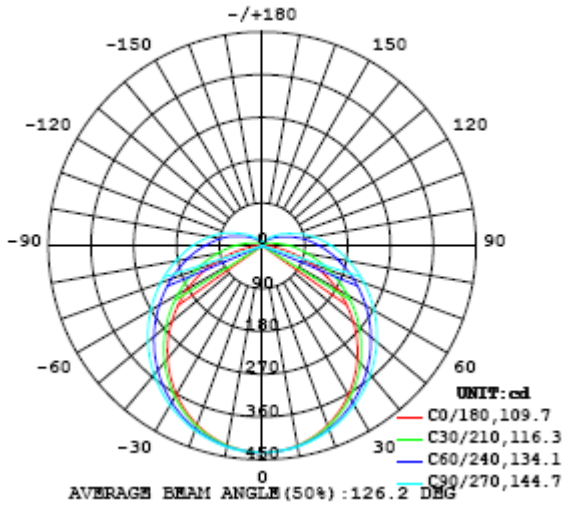


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1 UNIT: cd

γ (DEG) \ C (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435
5	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433	433	432	432	432
10	427	427	427	427	428	428	428	429	429	429	429	428	428	428	427	427	426	426	426
15	416	416	417	418	419	420	421	421	422	422	422	421	420	419	418	417	416	415	415
20	402	402	403	404	406	408	410	411	412	413	412	411	409	407	405	403	402	401	401
25	384	384	386	388	391	394	397	399	400	401	400	399	396	393	390	387	384	383	382
30	363	363	365	368	372	377	381	384	386	387	386	384	380	376	371	367	364	362	361
35	338	339	342	346	351	357	363	367	370	371	370	367	362	356	350	345	340	337	336
40	311	312	316	321	328	336	343	349	352	354	352	348	342	335	327	320	314	311	309
45	282	283	288	295	303	313	321	328	333	335	333	328	321	312	303	294	287	282	280
50	251	252	258	267	277	288	299	307	313	314	312	307	299	288	277	266	257	251	248
55	217	220	227	237	250	263	275	285	291	293	291	285	276	263	250	237	226	218	215
60	182	185	194	208	223	238	251	262	269	272	269	263	252	238	223	208	194	184	181
65	146	150	162	178	196	213	228	240	247	250	247	240	228	213	196	178	162	150	146
70	110	115	130	149	169	188	204	217	225	228	225	218	205	189	170	150	131	115	109
75	73.7	80.6	99.4	122	144	164	182	195	203	206	204	196	183	166	146	124	101	81.7	72.9
80	40.6	50.0	72.6	97.0	121	142	160	174	182	185	182	174	161	144	123	99.4	74.6	52.2	39.6
85	14.1	25.5	50.1	75.7	100	122	140	153	162	165	162	154	141	124	102	78.5	53.3	28.5	13.4
90	1.42	10.8	33.3	58.3	81.8	103	121	134	143	146	143	135	122	105	84.4	61.4	36.5	13.7	0.79
95	0.12	4.17	20.3	43.2	66.2	86.3	103	117	125	128	125	118	105	88.5	68.8	46.5	23.6	6.00	0.25
100	0.33	2.45	13.1	30.6	50.9	70.4	86.6	99.3	107	110	108	101	88.7	72.7	53.8	33.1	15.7	3.78	0.37
105	0.54	2.06	9.10	22.3	38.5	54.8	69.9	81.7	89.4	92.3	90.2	83.2	71.8	57.0	41.0	25.2	11.3	2.78	0.66
110	0.87	2.10	6.82	17.2	30.2	43.6	55.7	65.3	71.8	73.7	72.4	66.6	57.6	45.9	32.6	19.6	8.98	2.68	0.91
115	1.20	2.20	5.77	13.6	24.1	35.1	45.3	53.4	58.8	60.7	59.3	54.6	47.0	37.2	26.2	15.7	7.54	2.73	1.08
120	1.52	2.28	5.25	10.9	19.4	28.4	36.8	43.7	48.2	49.8	48.5	44.6	38.3	30.2	21.3	13.0	6.60	2.80	1.42
125	1.86	2.52	4.97	9.26	15.6	23.0	29.9	35.6	39.3	40.7	39.6	36.3	31.0	24.4	17.4	10.9	5.94	2.88	1.73
130	2.22	2.72	4.81	8.15	12.9	18.6	24.1	28.7	31.8	32.9	32.1	29.4	25.2	19.8	14.2	9.22	5.43	2.94	2.01
135	2.59	2.68	4.63	7.27	10.9	15.2	19.5	23.0	25.5	26.4	25.7	23.6	20.3	16.2	11.9	8.10	5.18	3.08	2.39
140	2.96	3.21	4.47	6.60	9.38	12.5	15.7	18.4	20.2	20.9	20.5	18.9	16.4	13.3	10.1	7.24	5.03	3.22	2.79
145	3.30	3.53	4.46	6.05	8.12	10.4	12.7	14.6	16.0	16.5	16.2	15.0	13.2	11.0	8.65	6.53	4.94	3.25	3.08
150	3.62	3.59	4.37	5.54	7.02	8.69	10.3	11.6	12.6	13.0	12.7	12.0	10.7	9.14	7.51	5.99	4.69	3.13	3.37
155	4.00	3.31	3.77	4.67	6.00	7.32	8.41	9.32	9.95	10.2	10.0	9.56	8.75	7.74	6.14	5.34	4.29	3.00	3.39
160	4.32	3.25	3.41	4.34	5.09	5.82	6.78	7.51	7.95	8.12	8.01	7.71	7.16	6.10	5.44	4.67	3.34	2.80	3.41
165	4.31	3.19	3.05	3.47	4.01	4.80	5.73	6.09	6.43	6.53	6.29	5.95	5.76	5.40	4.25	3.29	2.82	2.89	3.53
170	3.44	2.98	2.86	2.82	2.78	2.83	3.90	4.64	4.81	4.99	5.03	4.15	3.26	2.83	2.71	2.68	2.81	2.90	3.05
175	2.77	2.79	2.78	2.77	2.75	2.75	2.69	2.82	2.36	1.35	2.09	2.54	2.68	2.56	2.60	2.75	2.77	2.77	2.84
180	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75

Table 6: Luminous Intensity Data

Table--2 UNIT: cd

γ (DEG) \ C (DEG)	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350		
0	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435	435		
5	433	433	433	433	433	433	433	433	434	434	434	433	433	433	433	433	433		
10	426	426	427	427	428	429	429	429	430	430	429	429	429	428	428	427	427		
15	416	416	417	418	419	421	422	422	423	423	422	421	421	419	418	417	417		
20	401	402	404	406	408	410	412	413	414	414	413	411	409	407	405	404	402		
25	383	385	387	390	393	397	399	401	402	402	400	398	395	392	389	386	385		
30	362	364	367	371	376	380	384	387	388	387	385	382	378	374	369	366	364		
35	337	340	345	350	356	362	367	370	372	371	368	364	359	353	347	343	340		
40	311	314	320	327	334	342	348	352	354	353	350	344	337	330	323	317	313		
45	281	286	293	301	311	320	327	332	334	334	329	322	314	305	296	289	284		
50	250	256	264	275	287	297	306	312	314	313	308	300	290	279	268	259	253		
55	217	224	235	248	261	274	284	290	293	291	286	276	265	252	239	228	220		
60	183	192	205	221	236	250	261	268	271	269	263	253	240	225	209	196	186		
65	149	160	176	194	211	226	238	246	249	247	240	229	214	198	180	164	152		
70	114	129	148	168	187	203	216	224	227	225	218	206	190	172	152	133	117		
75	80.1	98.9	121	144	164	181	194	202	206	204	196	184	167	148	125	103	83.3		
80	49.5	72.1	96.9	121	142	160	173	182	185	183	175	163	146	125	101	75.8	52.9		
85	25.7	50.1	75.7	100	122	140	154	162	165	163	156	143	125	104	79.4	53.5	28.9		
90	11.3	33.5	58.1	81.9	103	121	135	143	147	144	137	124	106	85.3	61.5	36.5	13.8		
95	4.81	22.1	44.3	66.6	87.0	104	117	125	128	126	119	106	89.8	69.6	47.3	24.5	5.95		
100	3.04	14.2	32.8	53.4	72.4	88.7	101	109	112	110	103	90.8	75.0	56.1	35.5	15.9	3.57		
105	2.72	10.3	23.8	40.7	58.9	74.3	85.9	93.2	95.9	94.0	87.3	76.2	61.3	43.4	25.6	11.2	2.72		
110	2.80	8.34	18.6	31.8	45.5	59.2	70.5	77.6	80.3	78.4	71.9	61.0	47.3	33.1	19.6	8.68	2.73		
115	2.94	7.21	15.1	25.6	36.7	47.2	55.5	61.1	63.2	61.7	56.3	48.1	37.8	26.5	15.8	7.18	2.90		
120	3.15	6.58	12.7	21.0	30.0	38.5	45.3	49.8	51.4	50.1	45.8	39.1	30.8	21.6	12.9	6.44	3.06		
125	3.35	6.15	11.0	17.6	24.7	31.6	37.1	40.7	42.0	41.0	37.5	32.1	25.2	17.9	10.9	6.05	3.29		
130	3.50	5.78	9.59	14.6	20.3	25.8	30.3	33.2	34.3	33.5	30.6	26.3	20.8	14.8	9.57	5.87	3.56		
135	3.78	5.59	8.56	12.5	16.9	21.2	24.7	27.1	27.9	27.2	25.0	21.5	17.3	12.6	8.62	5.71	3.84		
140	4.07	5.52	7.82	10.8	14.1	17.4	20.1	21.9	22.5	22.0	20.3	17.6	14.2	10.9	7.92	5.61	4.12		
145	4.35	5.47	7.23	9.42	11.8	14.2	16.3	17.7	18.1	17.7	16.4	14.3	11.9	9.50	7.29	5.55	4.40		
150	4.57	5.43	6.73	8.31	10.0	11.7	13.1	14.0	14.4	14.1	13.2	11.8	10.1	8.38	6.80	5.52	4.66		
155	4.52	5.27	6.01	7.21	8.57	9.68	10.6	11.3	11.5	11.3	10.7	9.80	8.68	7.51	6.42	5.52	4.90		
160	4.60	5.20	5.73	6.19	7.05	8.12	8.68	9.11	9.26	9.16	8.81	8.26	7.57	6.84	6.13	5.54	5.08		
165	4.33	5.10	5.43	5.81	5.99	6.45	7.14	7.45	7.57	7.54	7.37	7.08	6.71	6.30	5.90	5.54	5.20		
170	3.44	4.03	4.51	5.08	5.55	5.67	5.34	5.33	6.17	6.34	6.29	6.16	6.00	5.82	5.64	5.48	4.48		
175	2.84	2.93	3.13	3.41	3.74	4.24	5.04	5.40	5.39	5.33	5.12	4.95	5.04	5.10	4.95	4.09	3.11		
180	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 05, 2020	Aug. 04, 2021
Digital Power Meter	PF2010A	HZTE028-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	DPS1060	HZTE001-06	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	WY12010	HZTE004-03	Aug. 05, 2020	Aug. 04, 2021
Temperature recorder	JM624U	HZTE018-08	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 05, 2020	Aug. 04, 2021
Standard source	D908	HZTE012-01	Aug. 05, 2020	Aug. 04, 2021
Integrate Sphere system	3M	HZTE015-04	Aug. 05, 2020	Aug. 04, 2021
Digital Power Meter	WT210	HZTE008-01	Aug. 05, 2020	Aug. 04, 2021
AC Power Supply	PCR 500L	HZTE001-07	Aug. 05, 2020	Aug. 04, 2021
DC Power Supply	IT6154	HZTE004-04	Aug. 05, 2020	Aug. 04, 2021
Standard source	SCL-1400	HZTE012-02	Aug. 05, 2020	Aug. 04, 2021
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 05, 2020	Aug. 04, 2021
Temperature Meter	TES1310	HZTE017-01	Aug. 05, 2020	Aug. 04, 2021

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 Tubes) 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.

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The uncertainty of integrating sphere system reported in this document is expended 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 Tubes) 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 expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

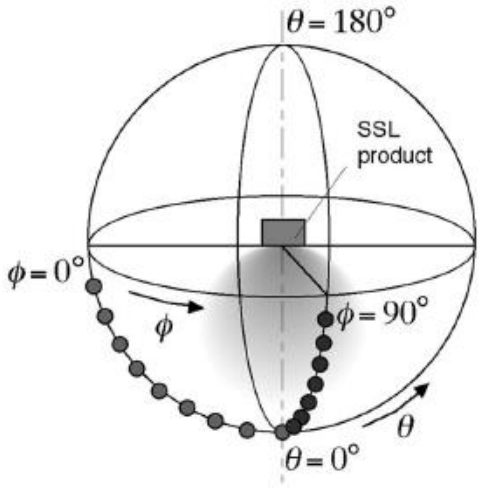
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as 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°/180° and C=90°/270°) 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, Δu'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 ***