

LM-79-08 TEST REPORT

for

GREEN CREATIVE LTD

756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

LED Tube

Model: 8.5PLL/835/GL/BYP

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ19050037b

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

Review by:



Engineer: April Zou
May 31, 2019

Approved by:



Manager: Jim Zhang
May 31, 2019

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: 8.5PLL/835/GL/BYP

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
128.9	1106.0	8.58	0.9784
CCT (K)	CRI	Stabilization Time (Light & Power)	
3500	81.8	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	: May 23, 2019
Date of Test	: May 29, 2019
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

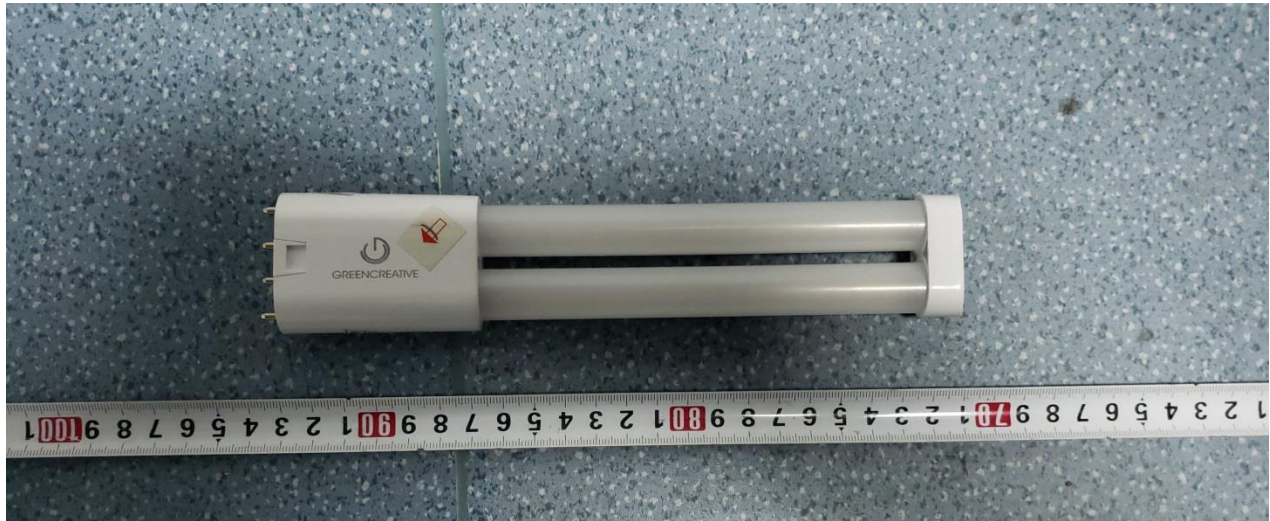


Figure 1- Overview of the sample

Equipment Under Test(EUT)

Name	: LED Tube
Model	: 8.5PLL/835/GL/BYP
Electrical Ratings	: 120-277V, 60Hz, 8.5W
Product Description	: 3500K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 24.8 °C.

Base orientation was base up. 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)	0.073	0.036
Power Factor	0.9784	0.8974
Test Power (W)	8.58	8.90
THD A%	18.32	24.11
Luminous Efficacy (lm/W)	128.9	124.8
Total Luminous Flux (lm)	1106.0	1111.0
Color Rendering Index (CRI)	81.8	
R9	1.4	
Correlated Color Temperature (CCT)(K)	3500	
Chromaticity Chroma x	0.4059	
Chromaticity Chroma y	0.3926	
Chromaticity Chroma u	0.2353	
Chromaticity Chroma v	0.3414	
Duv	0.0005	
Chromaticity Chroma u'	0.2353	
Chromaticity Chroma v'	0.5121	

Special Color Rendering Indices	
R1	79.8
R2	89.8
R3	96.2
R4	79.6
R5	80
R6	86.6
R7	83.5
R8	59.3
R9	1.4
R10	76.3
R11	78.4
R12	65.6
R13	82.2
R14	98.3

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 25.1 °C.

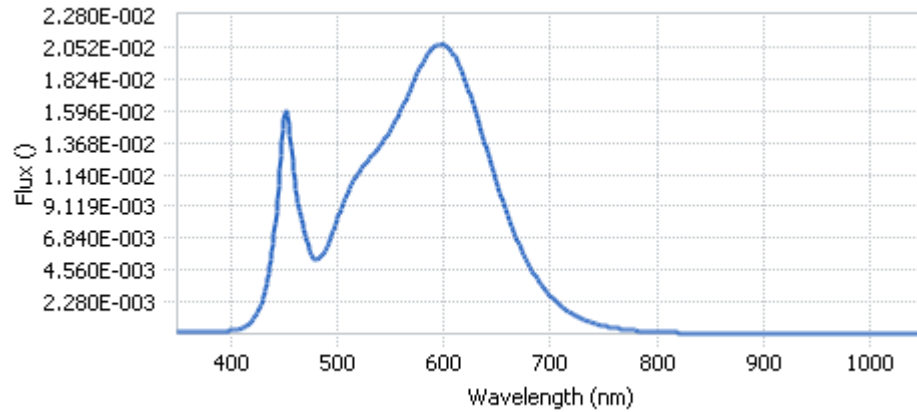
The photometric distance is 2.47 m.

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)	0.073
Power Factor	0.9786
Power (W)	8.62
Luminous Efficacy (lm/W)	125.9
Total Luminous Flux (lm)	1085.2
Beam Angle (°)	98.1 (0°-180°) / 113.6 (90°-270°)
Center Beam Candle Power (cd)	338
Maximum Beam Candle Power (cd)	339.1 (At: C=300.0, Gamma=3.0)
Spacing Criteria	1.17 (0°-180°) / 1.33 (90°-270°)
Zonal Lumens in the 0 °-60 °Zone	67.74%
Zonal Lumens in the 60 °-90 °Zone	22.11%
Zonal Lumens in the 90 °-120 °Zone	6.67%
Zonal Lumens in the 120 °-180 °Zone	3.48%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method



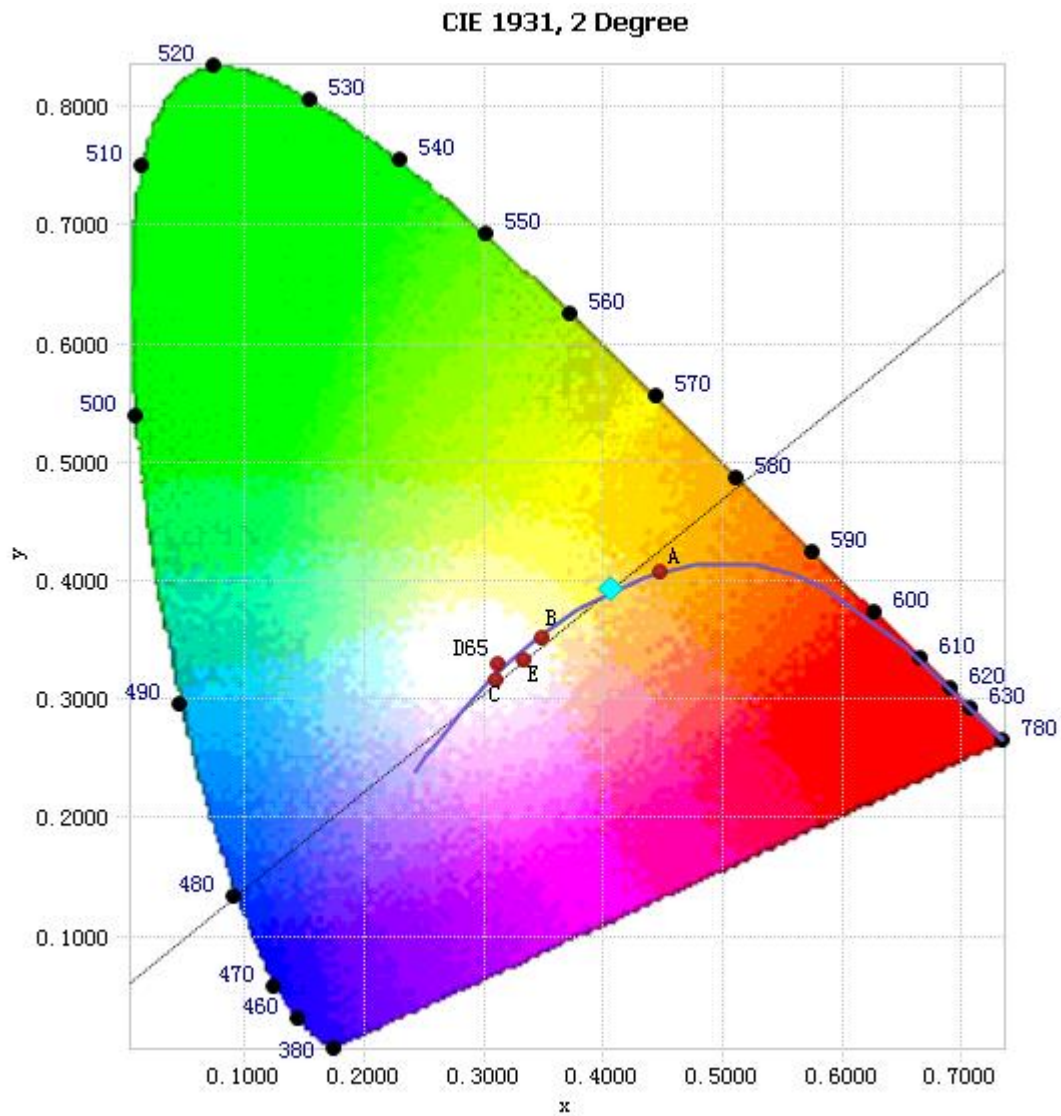
s19050037b-01 8.5PLL 830 GL BYP

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	1.70E-04	485	5.56E-03	590	2.05E-02	695	3.15E-03
385	1.75E-04	490	6.18E-03	595	2.07E-02	700	2.70E-03
390	1.78E-04	495	7.11E-03	600	2.07E-02	705	2.32E-03
395	2.00E-04	500	8.20E-03	605	2.04E-02	710	1.99E-03
400	2.32E-04	505	9.28E-03	610	1.99E-02	715	1.70E-03
405	2.81E-04	510	1.01E-02	615	1.91E-02	720	1.45E-03
410	3.98E-04	515	1.10E-02	620	1.81E-02	725	1.25E-03
415	5.98E-04	520	1.15E-02	625	1.70E-02	730	1.07E-03
420	9.15E-04	525	1.20E-02	630	1.58E-02	735	9.12E-04
425	1.48E-03	530	1.25E-02	635	1.45E-02	740	7.87E-04
430	2.44E-03	535	1.30E-02	640	1.33E-02	745	6.69E-04
435	3.97E-03	540	1.35E-02	645	1.19E-02	750	5.74E-04
440	6.40E-03	545	1.40E-02	650	1.07E-02	755	4.96E-04
445	1.06E-02	550	1.46E-02	655	9.52E-03	760	4.24E-04
450	1.54E-02	555	1.53E-02	660	8.45E-03	765	3.65E-04
455	1.50E-02	560	1.60E-02	665	7.40E-03	770	3.14E-04
460	1.09E-02	565	1.69E-02	670	6.46E-03	775	2.72E-04
465	8.74E-03	570	1.77E-02	675	5.64E-03	780	2.35E-04
470	7.20E-03	575	1.86E-02	680	4.90E-03		
475	5.72E-03	580	1.94E-02	685	4.24E-03		
480	5.26E-03	585	2.01E-02	690	3.67E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.4059, 0.3926)

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

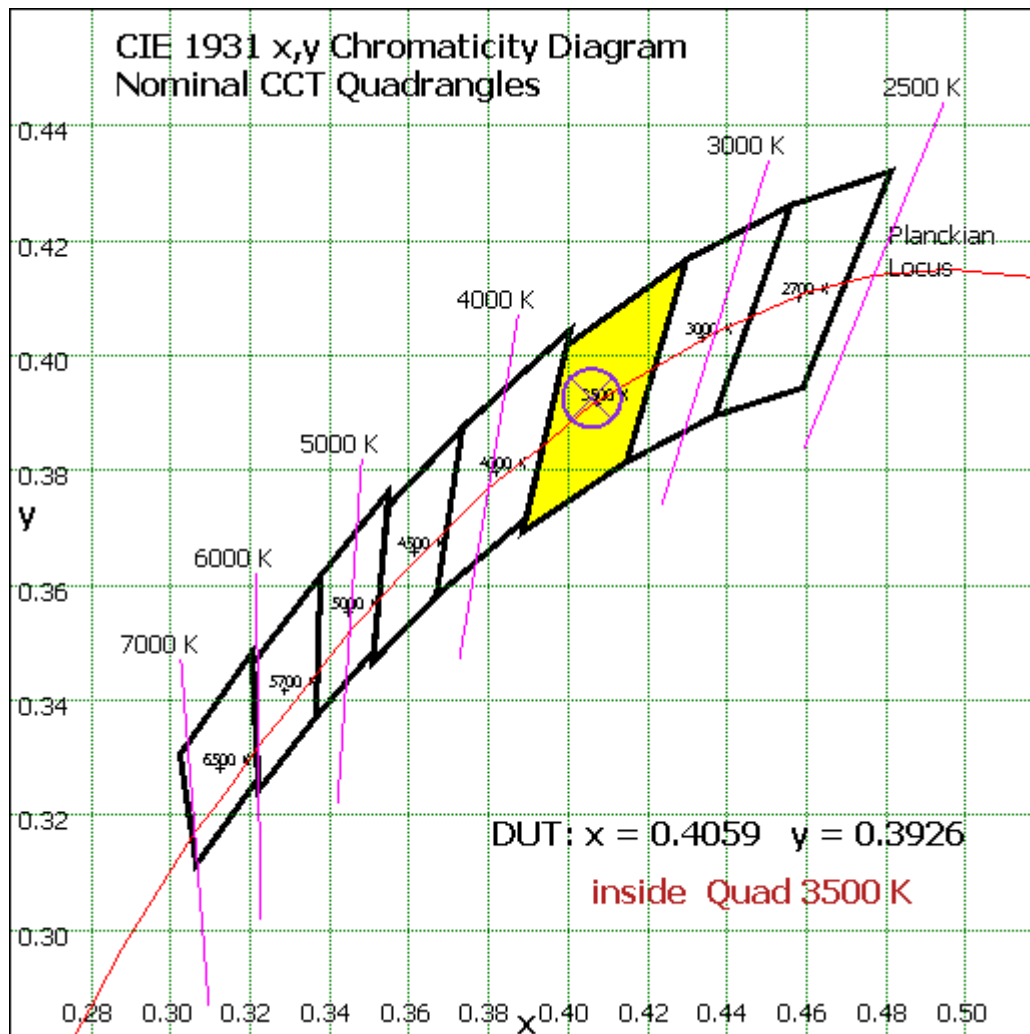
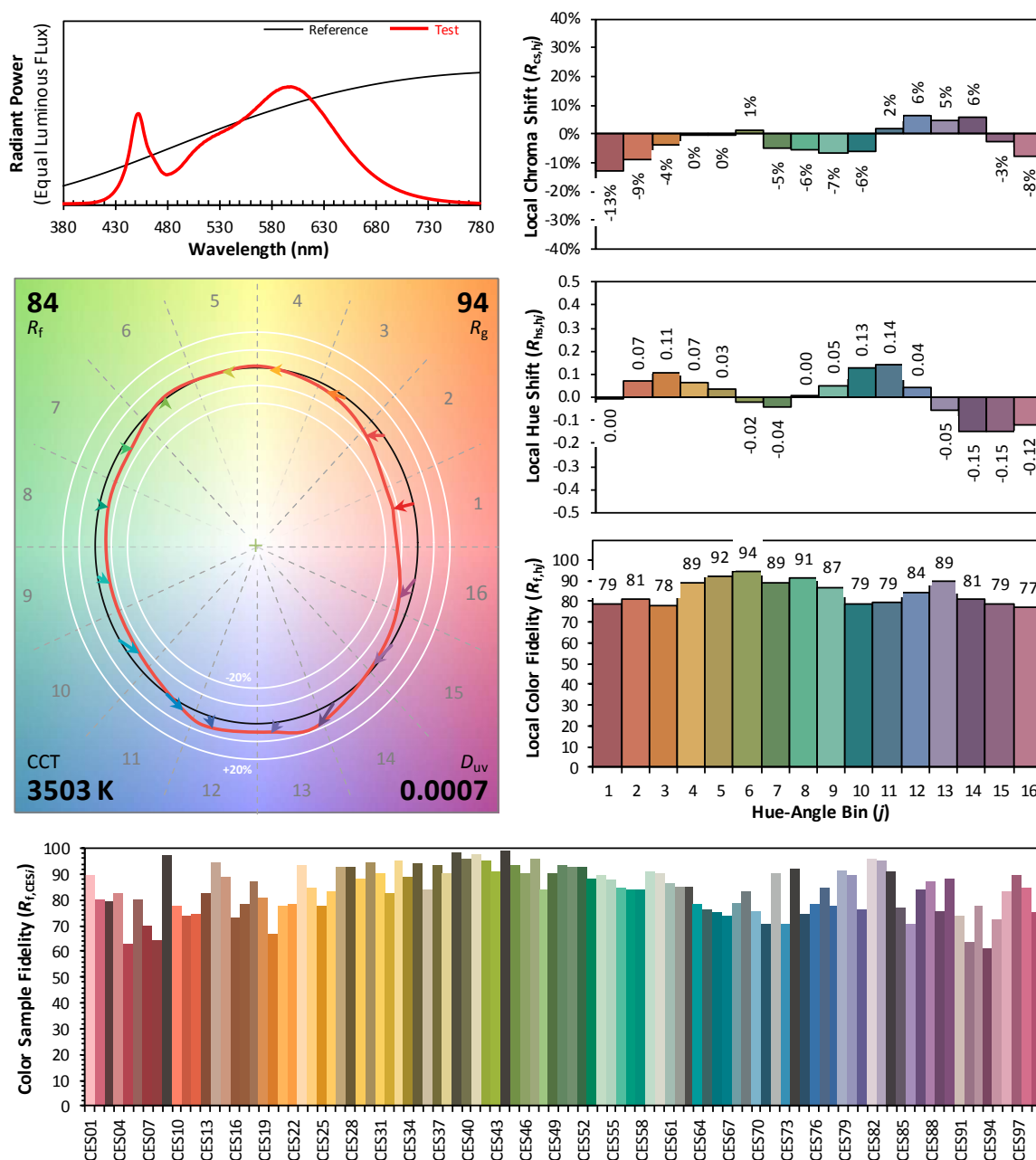


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

Color Rendition Report – Sphere Spectroradiometer Method



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

x 0.4059

y 0.3926

u' 0.2353

v' 0.5121

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	31.915	2.94%
10- 20	90.814	8.37%
20- 30	136.322	12.56%
30- 40	162.883	15.01%
40- 50	166.708	15.36%
50- 60	146.519	13.50%
60- 70	112.067	10.33%
70- 80	78.094	7.20%
80- 90	49.734	4.58%
90-100	33.339	3.07%
100-110	23.057	2.12%
110-120	16.032	1.48%
120-130	12.499	1.15%
130-140	10.088	0.93%
140-150	7.357	0.68%
150-160	4.678	0.43%
160-170	2.486	0.23%
170-180	0.625	0.06%
Total	1085.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	735.161	67.74%
60- 90	239.895	22.11%
0-90	975.056	89.85%
90- 180	110.161	10.15%
0- 180	1085.2	100%

Table 5: Zonal Lumen

Illuminance Plots- Goniophotometer Method

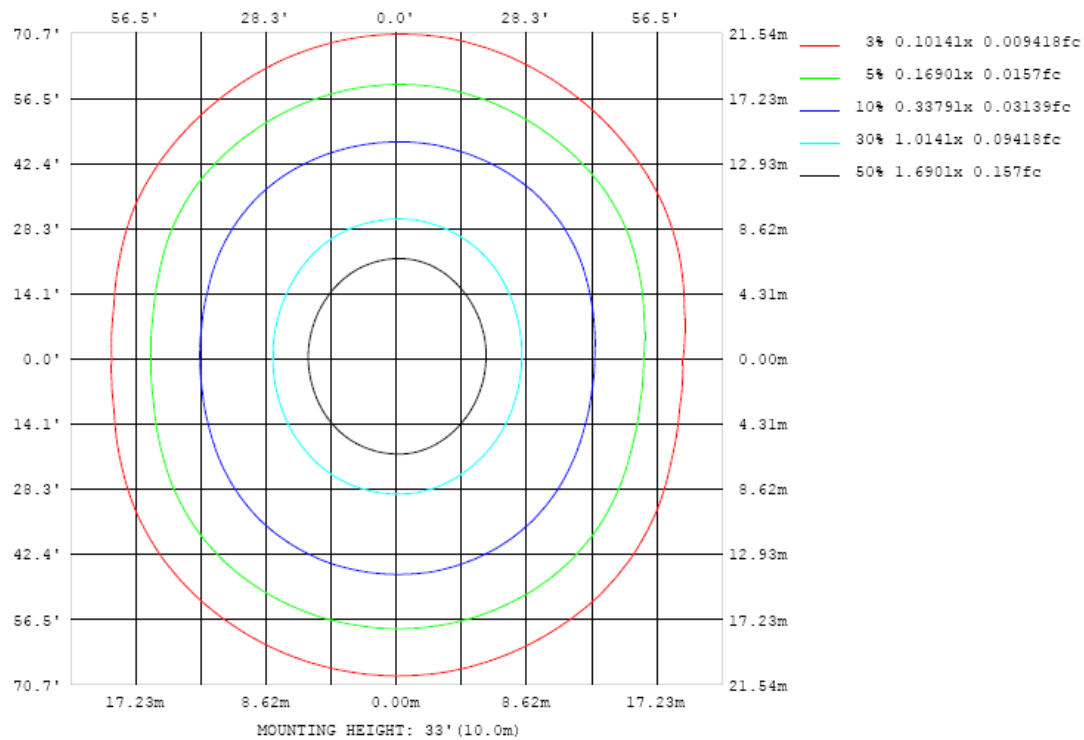


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

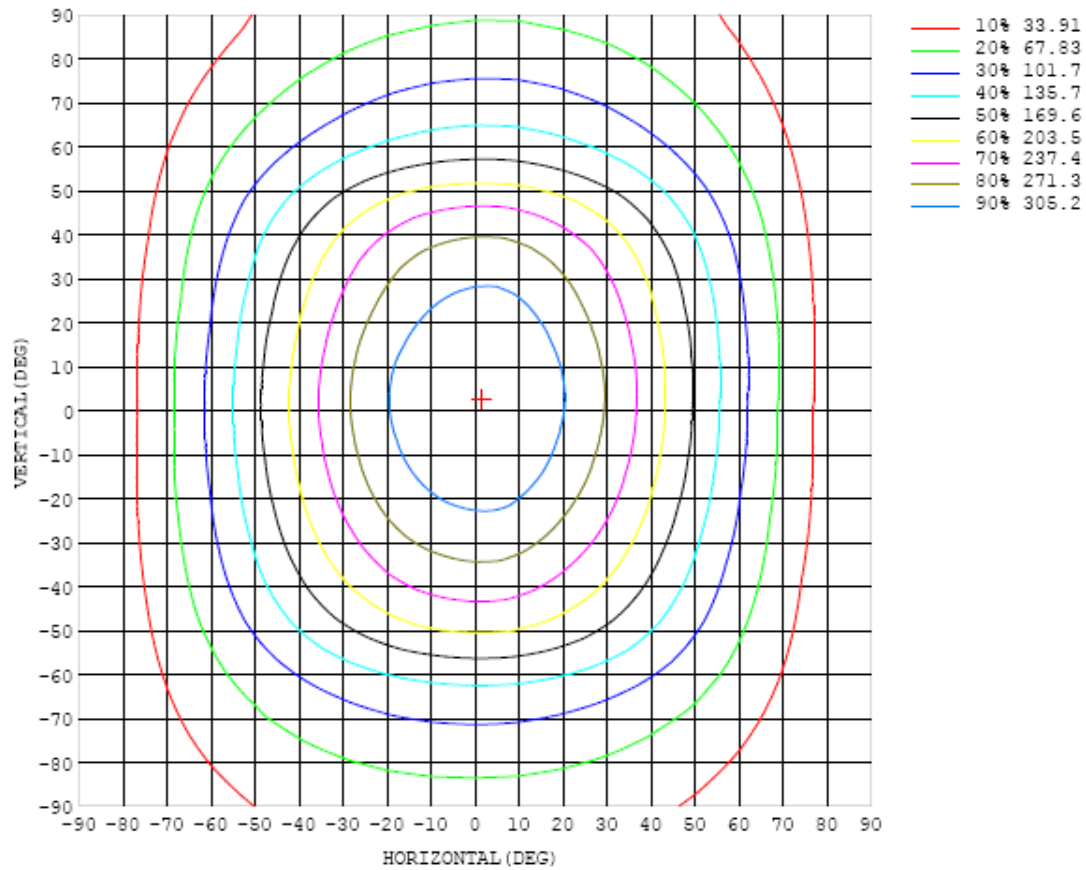


Chart 6: Isocandela Plot

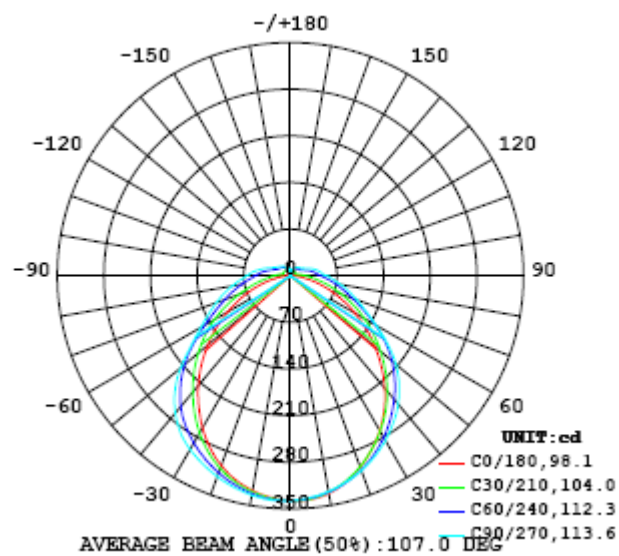


Chart 7: Polar Candela Distribution

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	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338
5	337	337	337	337	336	336	335	335	335	334	334	334	334	333	334	334	334	335	334
10	332	331	331	330	331	330	330	330	329	328	328	328	327	326	326	326	327	327	328
15	321	320	320	320	321	321	322	322	322	321	320	319	318	318	317	316	316	317	318
20	306	305	304	305	307	308	311	312	313	312	310	309	308	306	304	303	302	302	303
25	288	287	287	288	291	294	297	300	300	300	298	296	295	292	290	287	285	285	285
30	269	267	267	270	272	276	280	284	286	286	284	282	279	276	272	268	264	263	264
35	246	245	246	249	253	257	262	267	270	269	268	266	262	257	251	246	242	240	240
40	220	219	221	226	231	237	242	248	252	252	250	248	243	237	230	224	218	215	215
45	193	193	196	202	209	216	222	227	231	231	229	227	222	215	208	200	194	189	189
50	166	166	170	177	185	193	199	204	207	207	205	203	198	193	185	176	168	163	162
55	139	139	144	152	161	169	174	177	179	178	177	176	173	168	161	153	143	137	136
60	112	112	118	128	137	143	147	148	149	148	148	147	145	142	137	129	119	111	109
65	85.9	87.2	94.6	105	112	118	121	123	125	125	124	122	120	116	112	106	96.5	87.2	83.9
70	62.6	64.3	72.9	82.3	89.3	95.0	99.5	103	106	106	106	103	99.6	95.1	89.6	83.3	75.3	66.4	60.9
75	41.3	43.8	53.3	62.2	70.7	76.7	82.4	87.0	90.1	90.8	90.0	87.6	83.4	77.8	71.1	64.1	56.1	47.0	40.4
80	23.1	26.5	35.5	45.0	53.9	61.9	68.3	72.7	75.7	76.5	75.8	73.5	69.5	63.8	56.4	48.1	39.1	30.1	23.1
85	9.15	12.5	21.4	31.4	40.8	49.1	55.9	60.8	63.8	64.7	64.1	61.8	57.5	51.5	43.9	35.1	25.7	16.3	9.58
90	0.79	3.85	12.4	21.9	30.9	39.1	45.7	50.5	53.3	54.1	53.6	51.5	47.4	41.6	34.1	25.6	16.6	7.83	0.86
95	0.66	2.17	8.63	17.1	25.6	33.2	39.3	43.8	46.5	47.4	47.0	45.0	41.3	35.9	29.0	21.0	12.4	4.96	0.98
100	0.66	1.43	5.58	12.9	21.1	28.6	34.7	39.2	41.9	42.8	42.4	40.4	36.7	31.5	24.7	17.0	8.98	3.82	1.19
105	1.08	1.57	4.24	9.29	16.5	23.6	29.4	33.8	36.6	37.6	37.2	35.3	31.7	26.7	20.3	13.4	7.21	3.65	1.65
110	1.70	2.13	4.41	8.06	12.8	19.0	24.3	28.4	31.0	32.1	31.8	30.1	26.7	22.1	16.5	11.5	7.14	4.00	2.47
115	2.51	3.10	4.98	7.88	11.2	15.7	19.9	23.5	25.9	26.9	26.6	25.1	22.2	18.4	14.6	11.1	7.88	4.82	3.41
120	3.05	3.65	5.18	7.84	10.4	14.4	17.4	19.8	21.7	22.6	22.3	21.1	19.1	16.8	14.0	11.1	8.49	5.76	4.24
125	3.33	4.10	5.61	8.22	10.3	13.6	16.4	18.3	19.6	20.2	20.0	19.2	17.9	15.9	13.6	11.2	8.81	6.30	4.88
130	3.85	4.95	6.35	8.71	10.7	13.1	15.6	17.2	18.3	18.9	18.7	18.0	16.8	15.3	13.3	11.3	8.95	6.46	5.30
135	4.60	5.73	7.03	8.89	11.2	13.0	14.9	16.2	17.2	17.6	17.4	16.8	15.8	14.6	12.9	10.9	8.70	6.26	5.42
140	5.30	6.20	7.45	9.05	10.9	12.8	14.2	15.3	16.0	16.4	16.2	15.7	14.9	13.9	12.3	10.5	8.57	6.43	5.77
145	5.01	4.68	5.48	7.46	10.4	12.1	13.4	14.4	15.0	15.3	15.2	14.8	14.0	12.9	11.6	10.2	8.60	6.87	6.19
150	4.99	4.75	5.09	5.89	8.46	11.4	12.4	13.2	13.8	14.0	13.9	13.4	12.8	12.0	11.0	9.86	8.72	7.45	6.62
155	5.41	6.14	7.00	7.16	8.33	10.3	11.7	12.1	12.5	12.7	12.5	12.1	11.3	10.8	10.3	9.66	8.86	7.88	6.93
160	6.23	6.55	7.25	8.16	9.03	10.3	11.0	11.3	11.5	11.5	10.9	9.82	8.38	7.61	7.61	7.83	7.83	7.13	6.54
165	6.02	6.42	7.34	8.17	9.30	10.1	10.4	10.6	10.7	10.7	9.99	8.78	7.43	6.80	6.37	6.28	6.28	5.96	6.09
170	5.40	6.59	6.67	8.24	9.11	9.81	10.1	10.1	10.1	10.1	9.86	9.32	8.55	7.79	7.18	6.64	6.43	6.26	5.93
175	4.39	3.96	4.32	5.43	6.82	8.23	9.35	9.53	9.49	9.52	9.46	9.37	9.22	8.92	8.24	6.82	5.64	5.37	5.39
180	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39

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	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338		
5	335	335	335	336	336	337	337	338	338	338	339	339	339	339	339	338	338		
10	328	329	330	330	331	332	333	334	335	335	336	336	335	335	334	333	332		
15	318	320	321	322	323	325	326	328	329	330	330	329	328	326	324	323	322		
20	305	306	308	310	312	315	317	320	321	322	322	320	317	314	312	309	308		
25	287	289	292	295	299	303	307	310	312	313	312	308	304	299	295	292	290		
30	265	268	273	278	284	290	295	299	301	302	300	295	289	283	278	274	271		
35	242	245	251	258	266	275	281	285	288	289	286	280	272	265	258	252	249		
40	217	222	228	237	247	256	263	267	269	270	267	261	254	246	237	229	224		
45	191	196	205	215	225	234	240	243	245	246	243	239	233	224	214	204	198		
50	164	170	181	192	201	207	212	214	215	216	215	212	208	200	190	179	171		
55	138	145	157	166	173	178	180	181	182	183	182	181	179	174	165	154	145		
60	112	120	132	140	145	148	152	154	156	156	155	152	150	147	139	129	118		
65	87.0	96.8	106	113	118	124	129	133	135	135	132	128	124	119	113	104	93.3		
70	64.3	74.2	82.4	89.6	97.0	105	112	116	118	118	115	110	103	95.4	88.2	80.3	70.3		
75	44.2	53.5	61.8	70.6	79.9	88.6	95.9	101	103	103	99.4	93.5	85.7	76.6	67.4	58.6	49.5		
80	27.1	35.6	45.3	55.2	65.2	74.3	81.8	86.7	89.0	88.7	85.1	79.1	70.9	61.2	50.8	40.5	31.2		
85	12.9	21.9	32.3	42.8	53.0	61.9	69.0	73.7	75.8	75.6	72.3	66.5	58.5	48.6	37.9	26.9	16.8		
90	4.71	13.8	24.3	34.7	44.5	53.0	59.7	64.0	65.8	65.6	62.4	56.9	49.3	39.8	29.3	18.5	8.23		
95	3.29	9.71	19.3	29.1	38.4	46.3	52.5	56.5	58.2	57.9	55.1	50.0	42.9	34.1	24.0	13.6	5.17		
100	2.75	6.87	14.6	23.5	31.9	39.1	44.6	48.2	49.7	49.4	46.9	42.3	35.8	27.6	18.4	9.17	3.15		
105	2.81	6.16	11.4	18.8	26.1	32.4	37.3	40.4	41.7	41.4	39.1	35.0	29.3	21.9	13.6	6.90	2.91		
110	3.31	6.54	11.0	16.0	21.5	26.9	31.0	33.7	34.9	34.5	32.5	28.9	23.8	17.5	11.2	6.83	3.34		
115	4.23	7.32	11.0	15.2	19.2	22.7	26.0	28.3	29.2	28.9	27.1	24.0	20.1	14.9	10.3	7.12	3.80		
120	5.31	7.92	11.3	14.6	18.1	20.9	23.1	24.5	25.3	25.0	23.7	21.5	18.3	13.8	10.2	6.97	4.04		
125	5.93	8.38	11.4	14.3	17.2	19.6	21.5	22.7	23.2	22.9	21.8	20.0	17.2	13.8	10.8	7.21	4.48		
130	6.29	8.65	11.2	14.0	16.6	18.6	20.1	21.1	21.6	21.3	20.3	18.8	16.7	14.0	10.9	7.97	5.32		
135	6.41	8.56	11.0	13.3	15.9	17.7	18.9	19.7	20.2	19.9	19.1	17.9	16.2	13.5	10.7	8.52	6.15		
140	6.56	8.33	10.6	12.6	14.5	16.4	17.8	18.5	18.9	18.7	18.0	16.9	15.0	12.8	10.7	8.88	7.04		
145	6.98	8.31	9.98	11.8	13.4	14.8	16.1	16.9	17.3	17.1	16.4	15.3	13.9	12.3	10.7	9.15	7.18		
150	7.12	7.82	9.27	10.9	12.1	13.4	14.3	14.9	15.2	15.2	14.7	13.9	12.9	11.8	10.4	8.57	6.48		
155	6.99	8.13	9.02	9.34	10.7	12.2	12.9	13.3	13.6	13.6	13.3	12.5	11.4	10.3	9.19	7.44	6.11		
160	6.84	7.86	8.96	9.83	9.94	10.4	11.6	12.1	12.3	12.4	12.3	11.8	10.6	9.40	8.07	7.60	6.84		
165	6.64	7.35	9.05	9.79	9.52	9.11	10.2	11.1	11.2	11.4	11.2	11.0	10.7	8.41	7.75	6.32	7.10		
170	6.57	6.66	7.55	8.44	7.39	6.92	7.85	8.21	8.72	9.74	9.75	9.59	9.20	7.68	5.55	5.48	6.05		
175	5.41	5.45	5.45	5.47	5.49	5.49	5.45	4.66	2.39	1.65	1.50	2.71	3.25	3.92	4.28	4.38	4.49		
180	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 14, 2018	Aug. 13, 2019
Digital Power Meter	PF2010A	HZTE028-01	Sep. 12, 2018	Sep. 11, 2019
AC Power Supply	DPS1060	HZTE001-06	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	WY12010	HZTE004-03	Aug. 09, 2018	Aug. 08, 2019
Temperature recorder	JM624U	HZTE018-08	Aug. 09, 2018	Aug. 08, 2019
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 09, 2018	Aug. 08, 2019
Standard source	D908	HZTE012-01	Aug. 14, 2018	Aug. 13, 2019
Integrate Sphere system	3M	HZTE015-04	Aug. 16, 2018	Aug. 15, 2019
Digital Power Meter	WT210	HZTE008-01	Aug. 02, 2018	Aug. 01, 2019
AC Power Supply	PCR 500L	HZTE001-07	Aug. 09, 2018	Aug. 08, 2019
DC Power Supply	IT6154	HZTE004-04	Aug. 09, 2018	Aug. 08, 2019
Standard source	SCL-1400	HZTE012-02	Aug. 16, 2018	Aug. 15, 2019
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 09, 2018	Aug. 08, 2019
Temperature Meter	TES1310	HZTE017-01	Aug. 09, 2018	Aug. 08, 2019

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

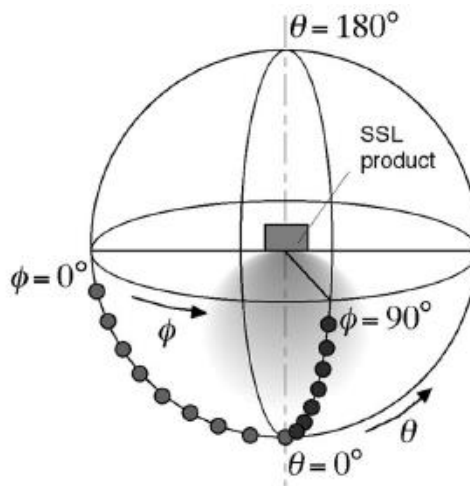
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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