



LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED PLL

Model: 17PLL/840/DIR

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

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Report No.: HZ15100038c/R1

This report is replaced the old report No. HZ15100038c dated Oct. 28, 2015

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

Review by:

Engineer: April Zou
Oct. 29, 2015

Approved by:



Manager: Jim Zhang
Oct. 29, 2015

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: 17PLL/840/DIR

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
102.9	2226.0	21.64	0.9948
CCT (K)	CRI	Stabilization Time (Light & Power)	
4114	86.6	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	: Oct. 26, 2015
Date of Test	: Oct. 26, 2015 to Oct. 27, 2015
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

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Sample Photos



Figure 1- Overview of the sample

Equipment Under Test (EUT)

Name	: LED PLL
Model	: 17PLL/840/DIR
Electrical Ratings	: 120-270Vac, 50/60Hz, 17W
Product Description	: 2G11 base, 4000K, Frosted lens LED PLL supplied by a high frequency fluorescent lamp ballast: SYLVANIA QTP 2x26/32/42 CF/UNV DM
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 24.9°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)	0.181	0.090
Power Factor	0.9948	0.8924
Test Power (W)	21.64	22.26
THD A%	8.96	22.86
Luminous Efficacy (lm/W)	102.9	
Total Luminous Flux (lm)	2226.0	
Color Rendering Index (CRI)	86.6	
R9	22.7	
Correlated Color Temperature (CCT) (K)	4114	
Chromaticity Chroma x	0.3758	
Chromaticity Chroma y	0.3751	
Chromaticity Chroma u	0.2227	
Chromaticity Chroma v	0.3334	
Duv	0.0001	
Chromaticity Chroma u'	0.2227	
Chromaticity Chroma v'	0.5002	

Special Color Rendering Indices	
R1	85.8
R2	94.3
R3	96
R4	84.1
R5	85.9
R6	91.4
R7	86.4
R8	68.6
R9	22.6
R10	86.1
R11	84
R12	70.5
R13	88.4
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 24.9°C.

The photometric distance is 30m.

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)	0.182
Power Factor	0.9945
Test Power (W)	21.67
Luminous Efficacy (lm/W)	104.3
Total Luminous Flux (lm)	2260.2
Beam Angle (°)	117.9
Center Beam Candle Power (cd)	629
Spacing Criteria	1.23 (0°-180°)/ 1.29(90°-270°)
Zonal Lumens in the 0°-60°Zone	63.44%
Zonal Lumens in the 60°-90°Zone	25.30%
Zonal Lumens in the 90°-120°Zone	7.38%
Zonal Lumens in the 120°-180°Zone	3.88%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

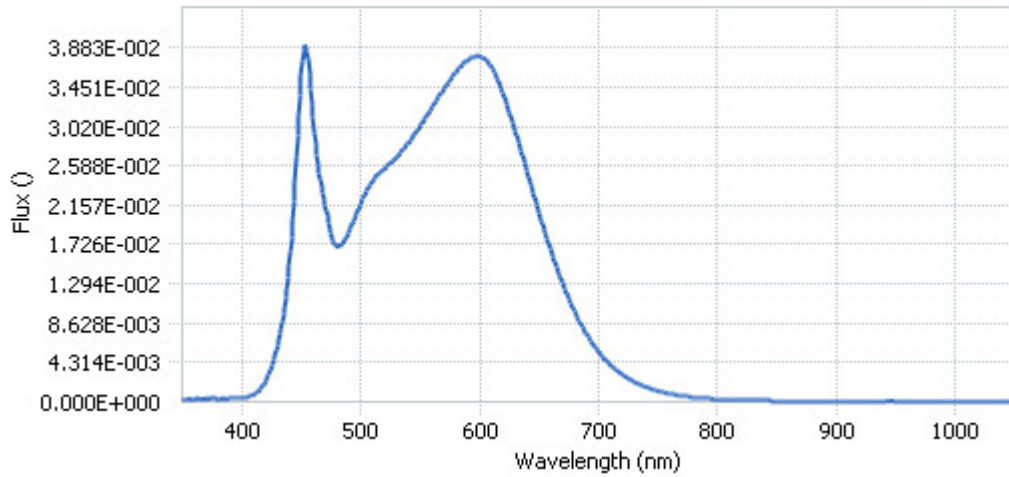
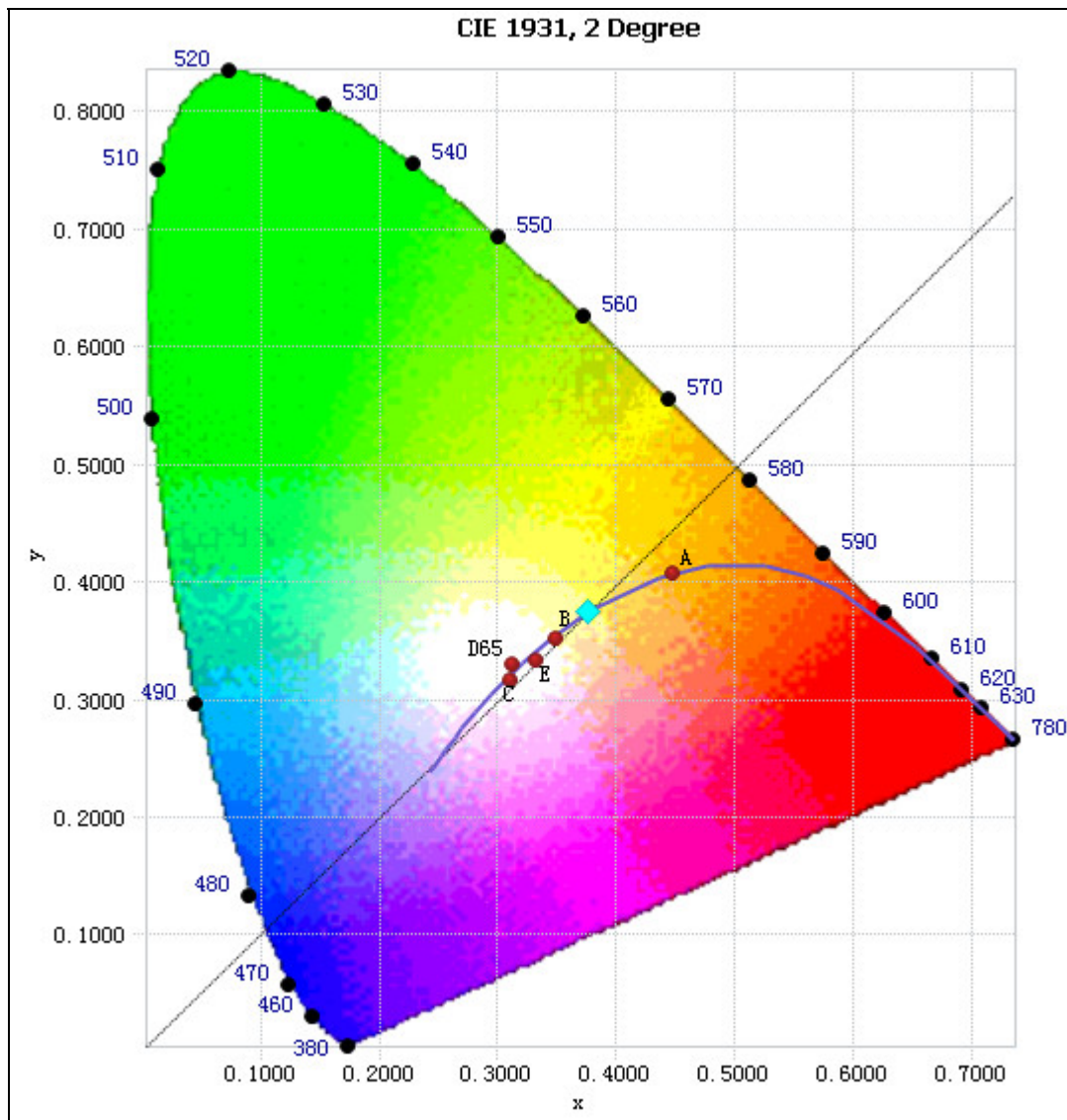


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	2.85E-04	485	1.74E-02	590	3.74E-02	695	6.34E-03
385	3.22E-04	490	1.87E-02	595	3.79E-02	700	5.46E-03
390	3.30E-04	495	2.03E-02	600	3.79E-02	705	4.68E-03
395	3.56E-04	500	2.18E-02	605	3.76E-02	710	4.00E-03
400	4.02E-04	505	2.32E-02	610	3.67E-02	715	3.44E-03
405	5.18E-04	510	2.42E-02	615	3.55E-02	720	2.95E-03
410	7.66E-04	515	2.50E-02	620	3.38E-02	725	2.53E-03
415	1.31E-03	520	2.56E-02	625	3.18E-02	730	2.19E-03
420	2.27E-03	525	2.61E-02	630	2.97E-02	735	1.85E-03
425	3.83E-03	530	2.68E-02	635	2.74E-02	740	1.57E-03
430	6.16E-03	535	2.76E-02	640	2.52E-02	745	1.35E-03
435	9.61E-03	540	2.84E-02	645	2.29E-02	750	1.17E-03
440	1.50E-02	545	2.94E-02	650	2.07E-02	755	9.98E-04
445	2.41E-02	550	3.03E-02	655	1.86E-02	760	8.58E-04
450	3.58E-02	555	3.13E-02	660	1.66E-02	765	7.34E-04
455	3.86E-02	560	3.23E-02	665	1.47E-02	770	6.38E-04
460	3.12E-02	565	3.34E-02	670	1.29E-02	775	5.45E-04
465	2.51E-02	570	3.44E-02	675	1.13E-02	780	4.71E-04
470	2.16E-02	575	3.52E-02	680	9.84E-03		
475	1.85E-02	580	3.61E-02	685	8.58E-03		
480	1.71E-02	585	3.70E-02	690	7.35E-03		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y): (0.3758, 0.3751)

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

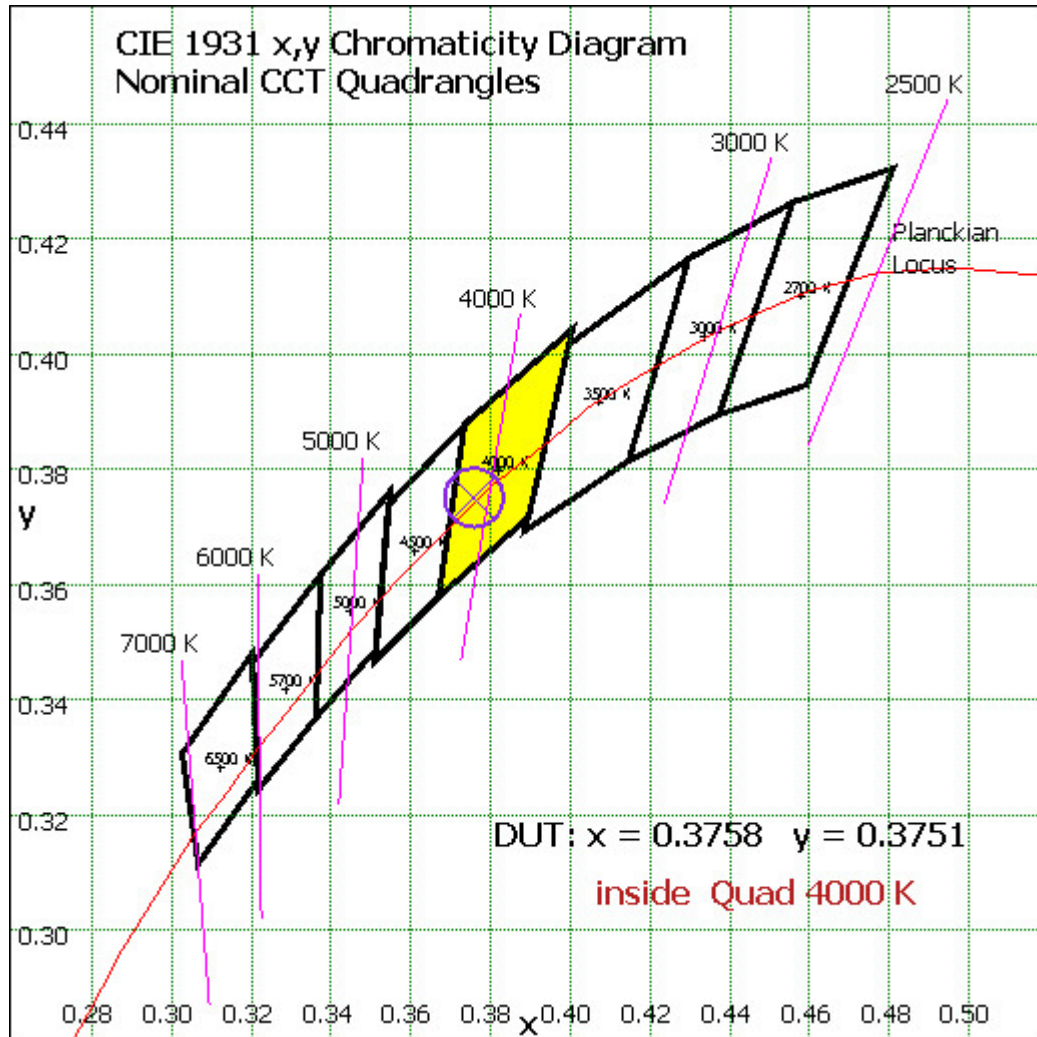


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

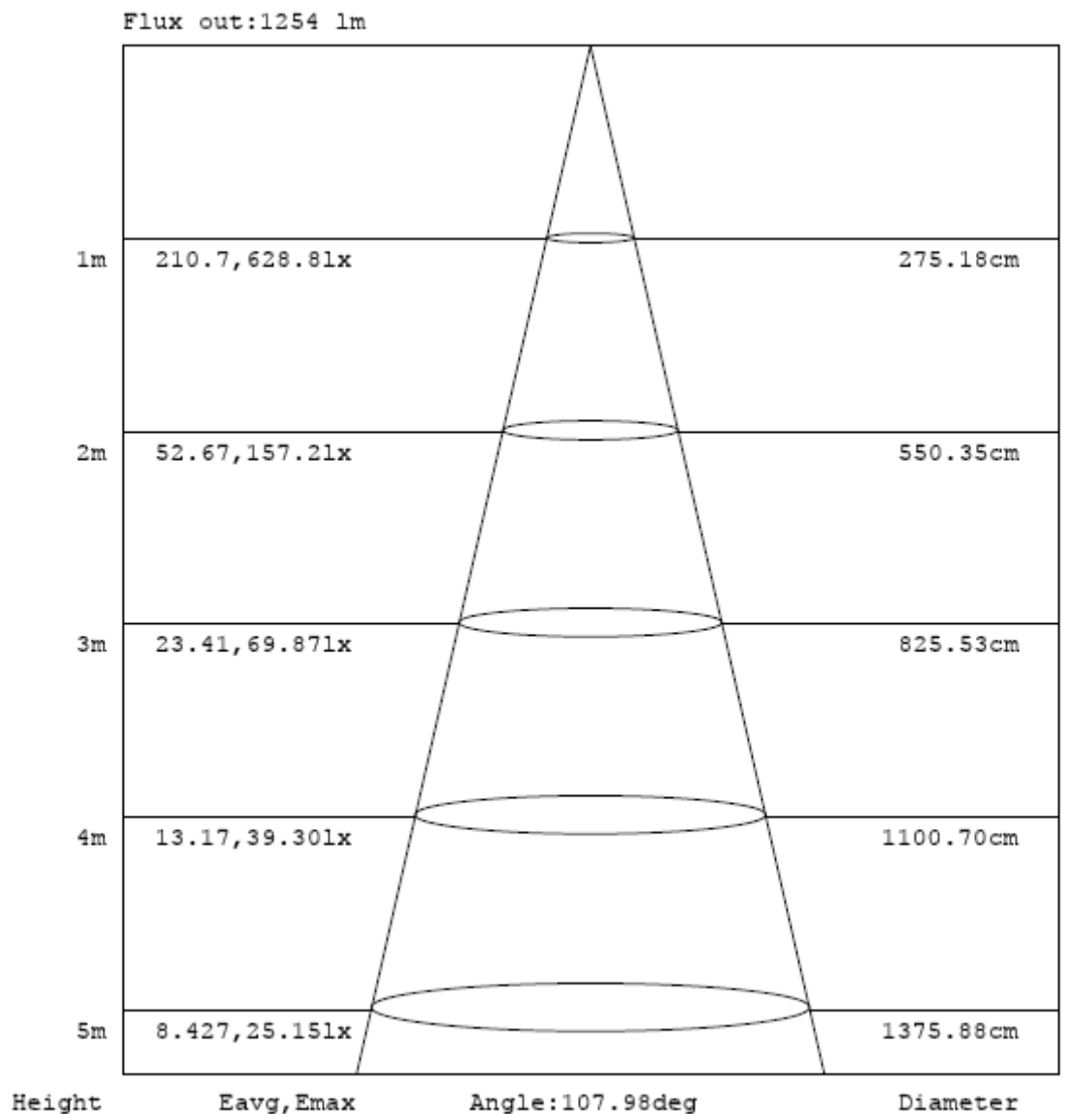
Zonal Lumen Tabulation- Goniophotometer Method

$\gamma(^{\circ})$	Lumens	% Total
0- 10	59.467	2.63%
10- 20	170.14	7.53%
20- 30	257.652	11.40%
30- 40	311.637	13.79%
40- 50	327.697	14.50%
50- 60	307.306	13.60%
60- 70	257.408	11.39%
70- 80	190.171	8.41%
80- 90	124.276	5.50%
90-100	79.312	3.51%
100-110	52.177	2.31%
110-120	35.325	1.56%
120-130	26.162	1.16%
130-140	21.212	0.94%
140-150	17.364	0.77%
150-160	13.201	0.58%
160-170	7.647	0.34%
170-180	2.05	0.09%
Total	2260.2	100%

$\gamma(^{\circ})$	Lumens	% Total
0- 60	1433.899	63.44%
60- 90	571.855	25.30%
0-90	2005.754	88.74%
90- 180	254.45	11.26%
0- 180	2260.2	100%

Table 5: Zonal Lumen Data

Illuminance Plots- Goniophotometer Method



Note:The Curves indicate the illuminated area and the average illumination when the luminaire is at different distance.

Chart 4: Beam Angle

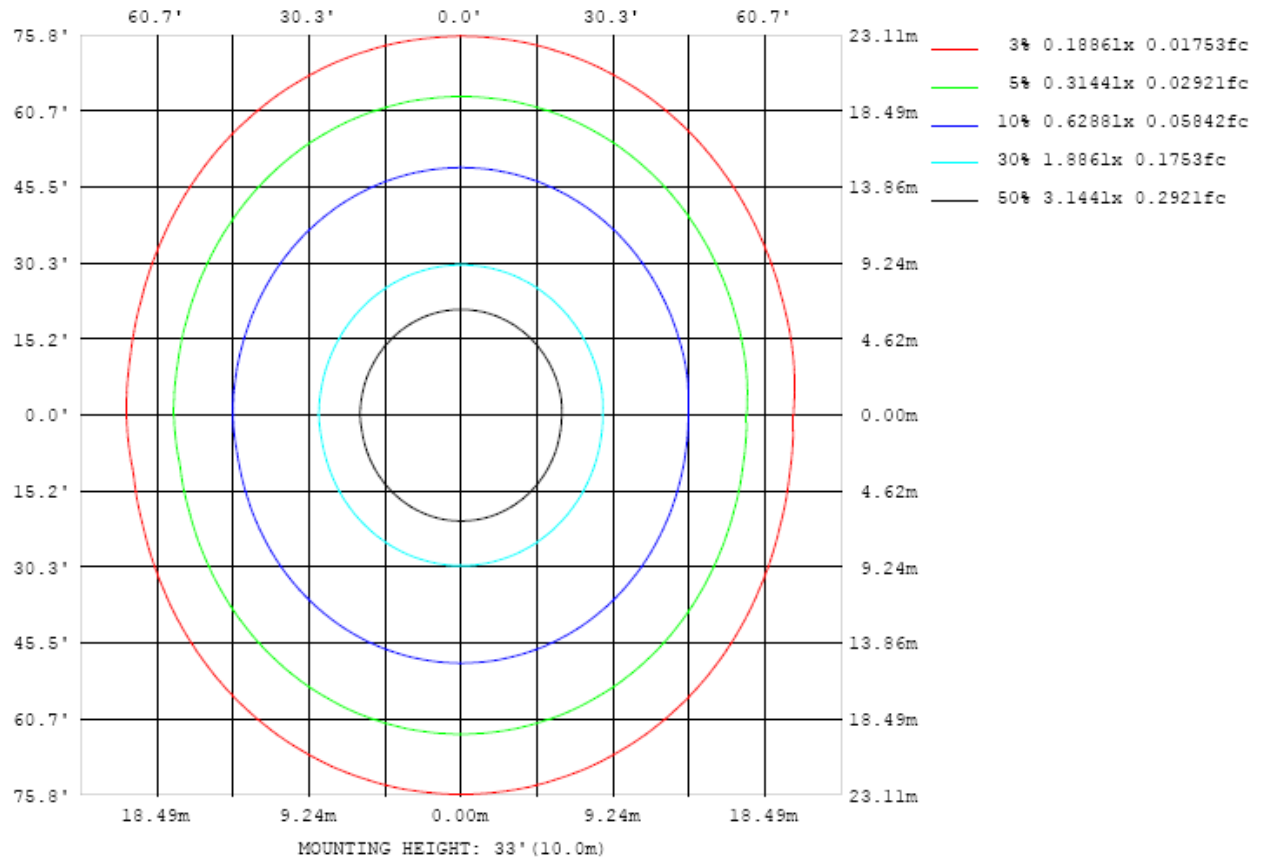


Chart 5: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

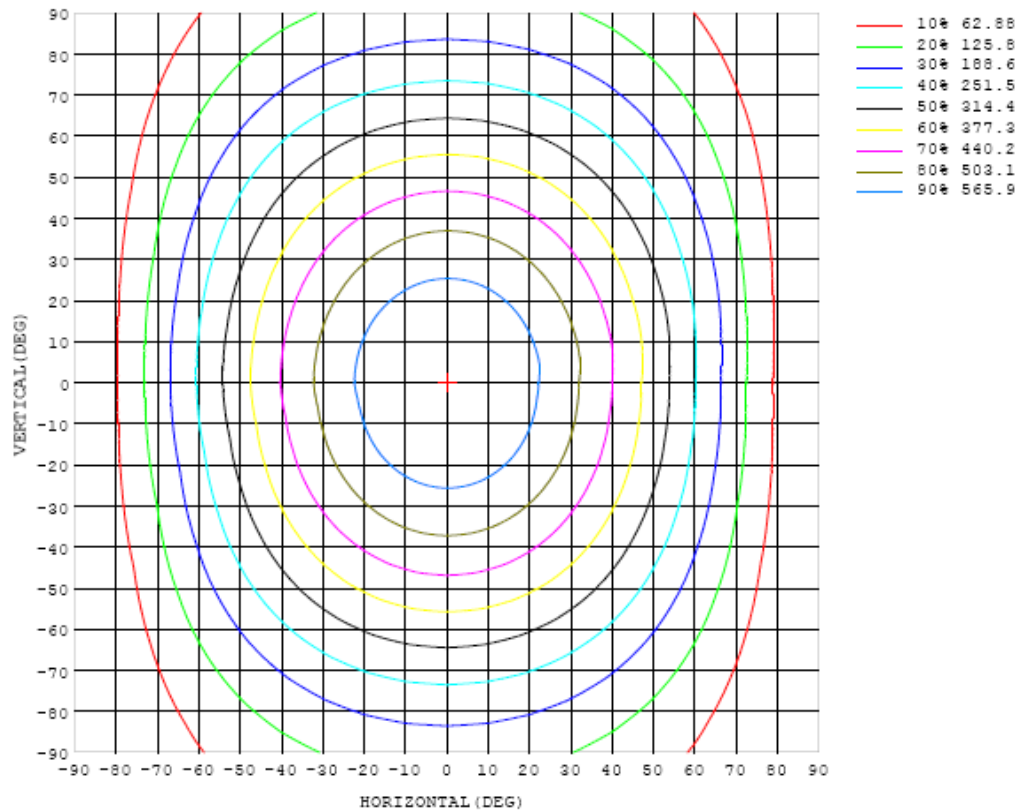


Chart 6: Isocandela Plot

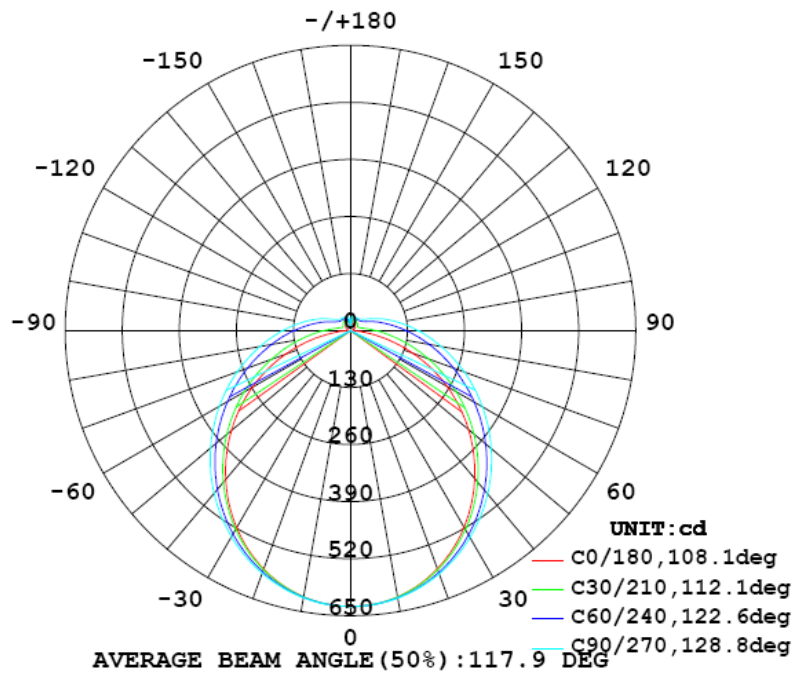


Chart 7: Polar Candela Distribution

Luminous Intensity Data- Goniophotometer Method

Table--1

UNIT: cd

C (DEG) γ (DEG)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629
5	626	625	625	626	626	626	626	626	626	626	626	626	626	626	625	625	625	626	626
10	616	615	616	616	617	618	618	619	619	619	619	618	618	617	616	616	615	615	616
15	600	599	600	601	603	604	605	606	607	607	606	606	604	603	601	600	598	599	600
20	578	577	579	580	583	585	587	589	590	590	589	588	586	584	581	579	576	576	578
25	550	550	552	554	558	561	564	567	569	569	568	566	563	560	556	552	549	548	551
30	517	517	520	524	528	533	538	541	544	544	543	540	536	532	526	521	517	515	519
35	481	481	484	489	495	501	507	512	516	517	515	511	506	500	493	487	481	479	483
40	440	441	445	451	458	467	474	481	485	486	484	480	473	465	456	448	442	438	443
45	397	398	403	410	419	430	439	447	452	453	451	446	438	428	417	408	400	395	400
50	351	352	358	367	378	391	402	411	417	419	416	410	400	389	377	365	355	350	355
55	303	305	312	323	336	351	364	374	381	383	380	373	362	349	335	321	309	302	307
60	254	256	265	278	294	310	325	337	344	347	344	336	324	309	292	276	262	253	258
65	203	206	217	233	251	270	287	300	308	311	308	299	286	269	250	231	215	203	208
70	151	156	170	189	211	232	250	264	273	276	273	264	249	231	210	188	168	154	158
75	100	107	125	148	172	195	214	229	239	242	239	229	214	195	172	147	124	105	107
80	53.8	62.9	84.6	111	138	162	182	197	207	210	207	197	182	162	138	111	84.7	62.7	59.8
85	16.6	28.2	53.2	80.6	108	132	153	168	177	181	178	168	153	133	108	81.5	54.5	29.3	21.5
90	0.25	10.3	32.3	58.5	83.9	107	127	142	151	154	151	142	127	108	84.7	59.8	33.9	11.7	1.03
95	1.02	4.70	20.6	42.6	65.8	86.9	105	119	128	131	128	120	106	87.7	66.9	44.0	22.1	5.71	1.07
100	2.82	4.27	14.3	31.9	51.7	70.6	86.9	99.7	108	110	108	100	87.5	71.7	52.9	33.2	15.6	5.35	2.70
105	4.83	6.27	12.0	24.5	41.1	57.8	71.6	83.3	90.4	93.0	90.7	83.7	72.6	58.7	42.3	25.8	13.1	6.77	5.10
110	6.71	7.28	11.7	20.7	32.9	46.9	59.8	69.4	75.6	77.9	76.0	70.1	60.5	47.9	34.1	21.8	13.1	8.63	7.69
115	8.66	8.85	13.5	19.2	28.4	38.7	48.9	57.6	63.3	65.3	63.5	58.2	49.7	39.7	29.3	20.2	14.3	10.5	9.67
120	10.9	11.2	15.0	18.8	25.9	33.7	41.6	48.1	52.5	54.1	52.8	48.6	42.3	34.5	26.6	20.3	16.0	12.5	11.4
125	13.0	14.3	16.2	20.3	24.6	30.7	36.5	41.6	45.0	46.3	45.3	42.1	37.1	31.3	25.7	21.2	17.9	14.4	13.5
130	14.4	16.6	17.7	21.5	24.7	28.9	33.5	37.2	39.7	40.7	39.9	37.6	34.0	29.8	25.7	22.5	19.9	16.3	14.9
135	15.3	17.9	19.4	22.2	25.6	28.2	31.4	34.4	36.4	37.1	36.6	34.8	32.2	29.2	26.4	23.9	21.1	18.1	16.1
140	16.3	19.8	21.3	23.1	26.0	28.6	30.7	32.5	34.0	34.7	34.4	33.3	31.4	29.4	27.3	25.2	22.9	20.5	17.0
145	16.7	20.5	24.0	24.1	26.6	28.8	30.8	32.0	32.7	33.2	33.1	32.4	31.3	29.7	28.0	26.1	24.3	22.4	17.8
150	18.0	22.4	25.6	25.8	27.0	29.0	30.5	31.7	32.5	32.8	32.7	32.3	31.4	30.1	28.7	27.1	25.3	22.8	19.3
155	18.4	23.9	27.2	28.5	28.4	29.1	30.4	31.3	31.9	32.3	32.4	32.2	31.5	30.7	29.5	28.5	26.8	24.0	20.3
160	17.5	21.7	25.7	30.1	30.4	30.1	30.7	31.1	31.6	32.0	32.2	32.1	31.8	31.1	31.0	28.4	26.5	23.4	20.4
165	16.8	19.3	22.4	28.0	30.9	31.2	32.2	31.9	31.7	31.9	32.1	32.1	32.2	31.6	27.7	25.5	22.7	20.8	19.8
170	16.5	17.4	17.8	21.0	27.1	31.1	31.7	32.1	32.3	32.3	32.0	31.0	27.9	24.3	21.8	20.3	19.9	19.2	18.8
175	18.2	18.2	17.3	19.3	19.7	20.7	24.5	28.5	29.7	26.7	23.3	19.2	17.8	18.2	18.5	19.1	20.3	19.7	20.7
180	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23

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	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629	629		
5	626	626	626	626	626	626	626	626	626	626	626	626	626	626	626	626	626		
10	616	616	616	617	617	617	618	618	618	618	618	618	618	617	617	617	617		
15	600	600	601	602	603	604	605	605	606	606	605	605	604	603	602	602	602		
20	578	579	580	582	584	585	587	588	589	589	588	587	585	583	582	581	580		
25	551	552	554	557	560	562	565	567	567	567	566	564	561	559	556	554	554		
30	519	520	523	527	531	536	539	542	543	542	540	537	534	530	526	523	522		
35	483	485	489	494	500	505	510	513	515	514	511	507	502	497	492	488	486		
40	443	446	451	458	465	472	478	482	484	483	480	474	468	461	454	449	447		
45	400	404	411	419	428	437	444	449	451	450	446	439	431	422	414	408	404		
50	355	360	368	379	390	400	408	414	416	415	410	402	392	382	372	364	359		
55	309	315	325	337	350	362	372	378	381	379	373	364	353	340	328	318	312		
60	260	268	280	295	310	324	335	342	345	343	337	326	313	298	283	271	264		
65	211	221	236	253	271	286	299	307	310	307	300	288	273	256	239	224	214		
70	162	174	193	213	233	250	263	272	275	272	265	252	235	216	196	178	165		
75	114	131	153	175	197	215	229	238	241	239	230	217	199	178	155	133	116		
80	69.1	90.5	116	141	164	183	197	206	210	207	198	184	166	143	118	92.4	70.9		
85	33.4	57.9	85.1	111	135	154	168	177	181	178	169	156	137	113	86.7	58.9	34.1		
90	13.1	35.5	61.4	86.9	110	129	143	152	155	152	144	130	111	88.1	62.5	36.0	13.1		
95	5.67	22.3	44.4	67.5	88.8	107	120	129	132	129	121	108	89.8	68.4	45.1	22.6	5.70		
100	4.98	15.2	32.9	52.7	71.6	87.9	100	108	111	109	101	88.7	72.4	53.3	33.3	15.3	4.94		
105	6.47	12.5	25.0	41.5	58.0	72.5	83.7	90.7	93.2	90.9	84.0	73.0	58.5	41.8	25.1	12.4	6.40		
110	8.63	12.6	20.9	33.0	46.7	59.3	69.3	75.6	77.8	75.7	69.6	59.7	47.0	33.1	20.9	12.6	8.61		
115	10.7	14.0	19.6	28.1	38.3	48.3	56.6	62.2	64.1	62.2	56.8	48.4	38.4	28.2	19.6	13.9	10.6		
120	12.6	16.0	19.9	25.9	33.3	40.8	47.2	51.4	52.9	51.4	47.2	40.8	33.3	25.9	19.8	15.8	12.8		
125	14.7	18.2	21.0	25.2	30.6	36.1	40.8	44.0	45.1	44.0	40.8	36.1	30.5	25.2	20.9	18.0	13.9		
130	15.7	20.0	22.7	25.6	29.4	33.4	36.9	39.2	40.1	39.2	36.9	33.4	29.3	25.5	22.5	19.6	14.8		
135	16.4	21.2	24.4	26.6	29.2	32.0	34.5	36.3	36.8	36.2	34.6	32.0	29.2	26.5	24.3	20.9	15.4		
140	17.3	21.3	25.3	27.8	29.8	31.7	33.4	34.6	35.0	34.6	33.6	31.7	29.7	27.8	25.9	21.6	14.6		
145	18.2	21.7	26.5	28.2	29.7	31.9	33.1	33.9	34.1	33.9	33.3	32.1	30.6	29.2	26.7	21.7	14.9		
150	19.5	22.5	26.9	29.8	27.7	31.0	33.3	33.9	34.0	33.9	33.6	32.8	31.6	30.0	27.2	21.6	17.7		
155	21.0	23.0	26.3	29.3	31.3	28.8	31.4	33.8	33.9	33.9	33.9	33.5	32.0	30.4	27.7	22.6	18.8		
160	19.0	21.2	24.9	28.5	30.9	31.6	28.5	33.0	34.0	34.2	34.4	33.6	32.5	30.8	26.7	20.8	17.8		
165	18.9	19.2	20.7	22.5	25.6	30.4	31.9	31.4	31.9	32.6	32.7	32.8	32.4	30.1	24.4	18.2	16.1		
170	18.9	18.9	18.8	18.9	19.4	20.3	23.6	29.8	31.2	30.4	31.4	30.8	28.4	24.1	18.3	16.0	15.6		
175	19.9	19.9	19.9	19.4	20.4	19.4	18.5	17.2	16.4	22.7	22.4	18.7	17.8	17.5	14.3	14.6	17.9		
180	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23	5.23		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Jul. 17, 2015	Jul. 16, 2016
Digital Power Meter	PF2010A	HZTE028-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-08	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	WY12010	HZTE004-03	Jul. 17, 2015	Jul. 16, 2016
Temperature Meter	TES1310	HZTE017-01	Jul. 17, 2015	Jul. 16, 2016
Standard source	D908	HZTE012-01	Jul. 23, 2015	Jul. 22, 2016
Integrate Sphere system	2M	HZTE015-01	Jul. 16, 2015	Jul. 15, 2016
Digital Power Meter	WT210	HZTE008-01	Jul. 17, 2015	Jul. 16, 2016
AC Power Supply	PCR 500L	HZTE001-07	Jul. 17, 2015	Jul. 16, 2016
DC Power Supply	6154	HZTE004-04	Jul. 17, 2015	Jul. 16, 2016
Temperature and humidity recorder	JR900	HZTE018-01	Jul. 21, 2015	Jul. 20, 2016
Standard source	SCL-1400	HZTE012-02	Oct. 21, 2015	Oct. 20, 2016

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 1.06% 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 1.94% with a coverage factor $k=2$.

Color Characteristics Measurements

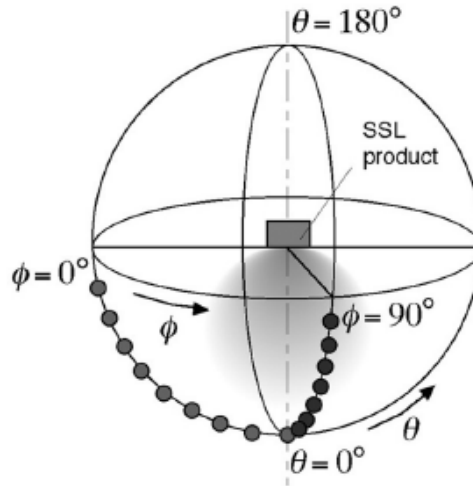
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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