LM-79-08 Test Report

for

GREEN CREATIVE LTD

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

LED HID

Model: 54HID/840/277V/EX39

Laboratory: Leading Testing Laboratories

NVLAP CODE: 200960-0

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist, Hangzhou, Zhejiang Province, China 311100

Tel: +86 571 86376106

www.ledtestlab.com

Report No.: HZ18030035b

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

Review by: April Zou

Engineer: April Zou

May 22, 2018

Approved by:

Manager: Jim Zhang

May 22, 2018

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: **54HID/840/277V/EX39**

Luminous Efficacy (Lumens /Watt)	Total Luminous Flux (Lumens)	Power (Watts)	Power Factor
145.1	7551.0	52.04	0.9928

CCT (K)	CRI	Stabilization Time (Light & Power)
4013	83.2	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	: Mar. 20, 2018
Date of Test	: Mar. 21, 2018
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

TABLE OF CONTENT

Sample Photos

Equipment Under Test (EUT)	
Name	: LED HID
Model	: 54HID/840/277V/EX39
Electrical Ratings	: 120-277V, 50/60HZ
Product Description	: 4000K
Manufacturer	: GREEN CREATIVE LTD
Address	: 756 North Zhongshan Rd., Unit B301 Zhabei District, Shanghai

TEST RESULTS

Test ambient temperature was 24.9℃.

Test orientation was light down. 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)	0.436	0.202
Power Factor	0.9928	0.9205
Test Power (W)	52.04	51.53
THD A%	9.66	14.98
Luminous Efficacy (lm/W)	145.1	146..0
Total Luminous Flux (lm)	7551.0	7560.0
Color Rendering Index (CRI)	83.2	
R9	10.6	
Correlated Color Temperature (CCT)(K)	4013	
Chromaticity Chroma x	0.3789	
Chromaticity Chroma y	0.3731	
Chromaticity Chroma u	0.2256	
Chromaticity Chroma v	0.3331	
Duv	0.0020	
Chromaticity Chroma u ’	0.2256	
Chromaticity Chroma v’	0.4997	

Special Color Rendering Indices	
R1	81.7
R2	89.3
R3	94.5
R4	82.2
R5	81.9
R6	84.9
R7	85.9
R8	65.3
R9	10.6
R10	74.4
R11	81.2
R12	64.6
R13	83.5
R14	97.1
Rf	82
Rg	96

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 24.7℃.

The photometric distance is 2.47m.

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)	0.436
Power Factor	0.9924
Test Power (W)	51.94
Luminous Efficacy (lm/W)	145.2
Total Luminous Flux (lm)	7542.6
Beam Angle (°)	292.0
Center Beam Candle Power (cd)	550
Spacing Criteria	2.06 (0°-180°)/ 2.02 (90°-270°)
Zonal Lumens in the 0°-60°Zone	30.82%
Zonal Lumens in the 60°-90°Zone	29.14%
Zonal Lumens in the 90°-120°Zone	26.06%
Zonal Lumens in the 120°-180°Zone	13.98%

Table 3: Test data per Goniophotometer Method

Spectral Power Distribution - Sphere Spectroradiometer Method

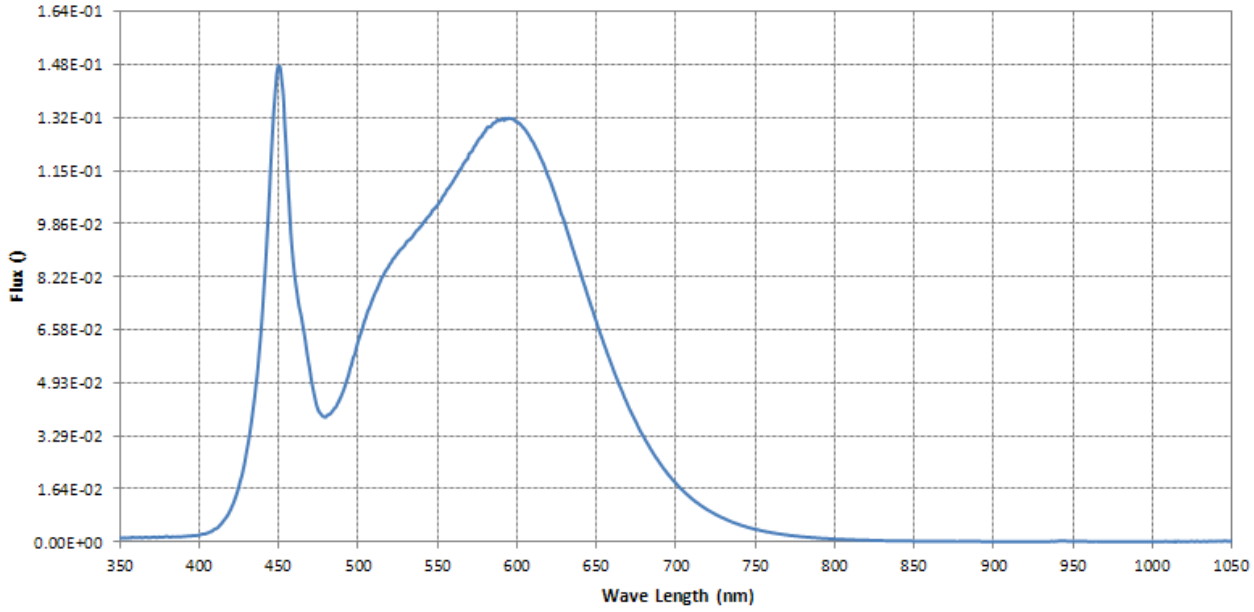
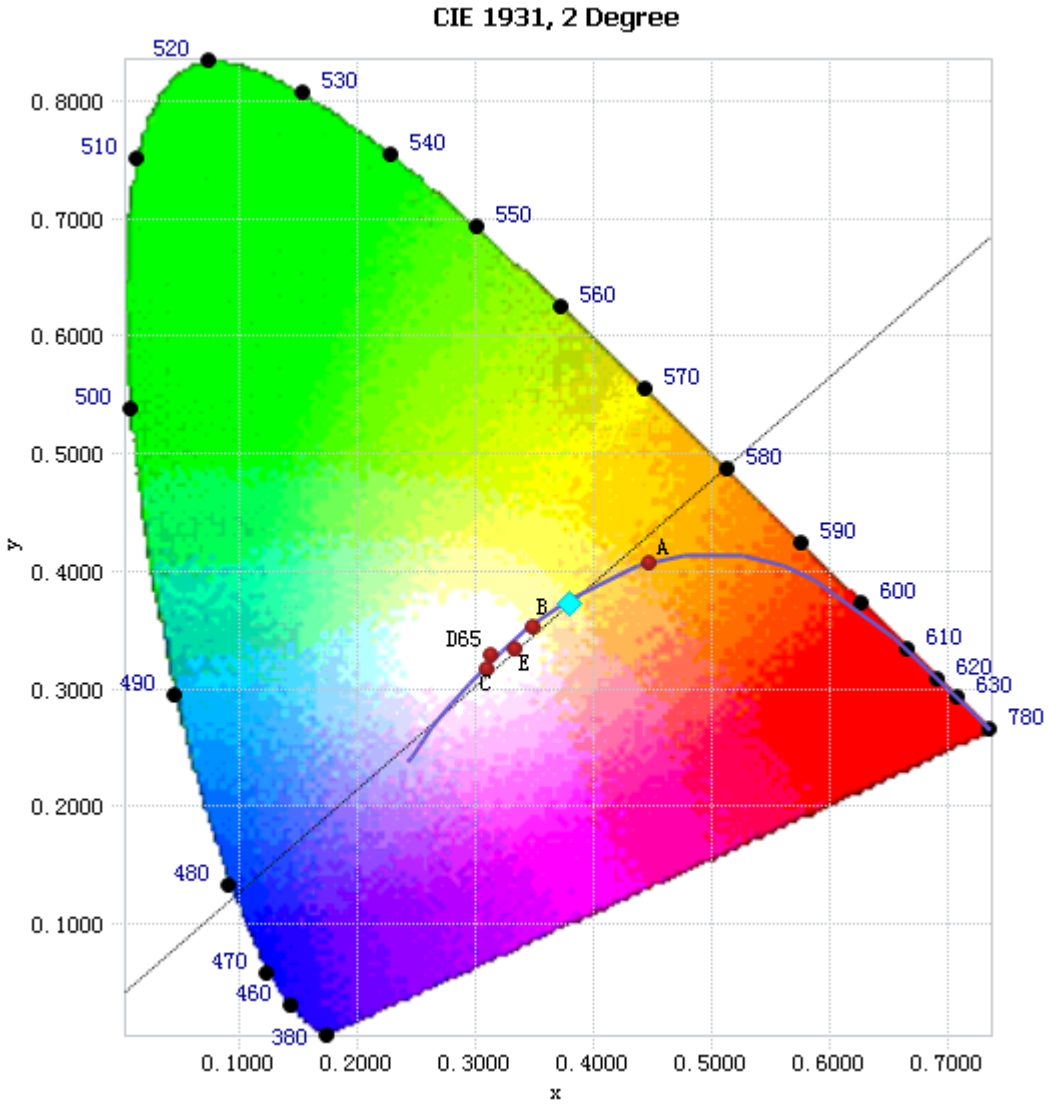


Chart 1: Spectral Power Distribution

Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	1.68E-03	485	4.13E-02	590	1.31E-01	695	2.11E-02
385	1.52E-03	490	4.59E-02	595	1.31E-01	700	1.83E-02
390	1.67E-03	495	5.36E-02	600	1.30E-01	705	1.57E-02
395	1.82E-03	500	6.19E-02	605	1.28E-01	710	1.35E-02
400	2.10E-03	505	6.95E-02	610	1.24E-01	715	1.16E-02
405	2.74E-03	510	7.62E-02	615	1.19E-01	720	9.96E-03
410	4.06E-03	515	8.19E-02	620	1.13E-01	725	8.58E-03
415	6.30E-03	520	8.60E-02	625	1.06E-01	730	7.39E-03
420	1.02E-02	525	8.94E-02	630	9.91E-02	735	6.29E-03
425	1.70E-02	530	9.24E-02	635	9.11E-02	740	5.39E-03
430	2.82E-02	535	9.51E-02	640	8.35E-02	745	4.60E-03
435	4.49E-02	540	9.80E-02	645	7.58E-02	750	3.96E-03
440	7.23E-02	545	1.01E-01	650	6.84E-02	755	3.41E-03
445	1.15E-01	550	1.04E-01	655	6.11E-02	760	2.94E-03
450	1.48E-01	555	1.08E-01	660	5.45E-02	765	2.53E-03
455	1.21E-01	560	1.12E-01	665	4.81E-02	770	2.17E-03
460	8.32E-02	565	1.16E-01	670	4.23E-02	775	1.86E-03
465	6.79E-02	570	1.20E-01	675	3.71E-02	780	1.60E-03
470	5.25E-02	575	1.24E-01	680	3.24E-02		
475	4.09E-02	580	1.27E-01	685	2.82E-02		
480	3.87E-02	585	1.30E-01	690	2.45E-02		

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

Chromaticity Diagram - Sphere Spectroradiometer Method



Tristimulus values(x, y) : (0.3789, 0.3731)

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

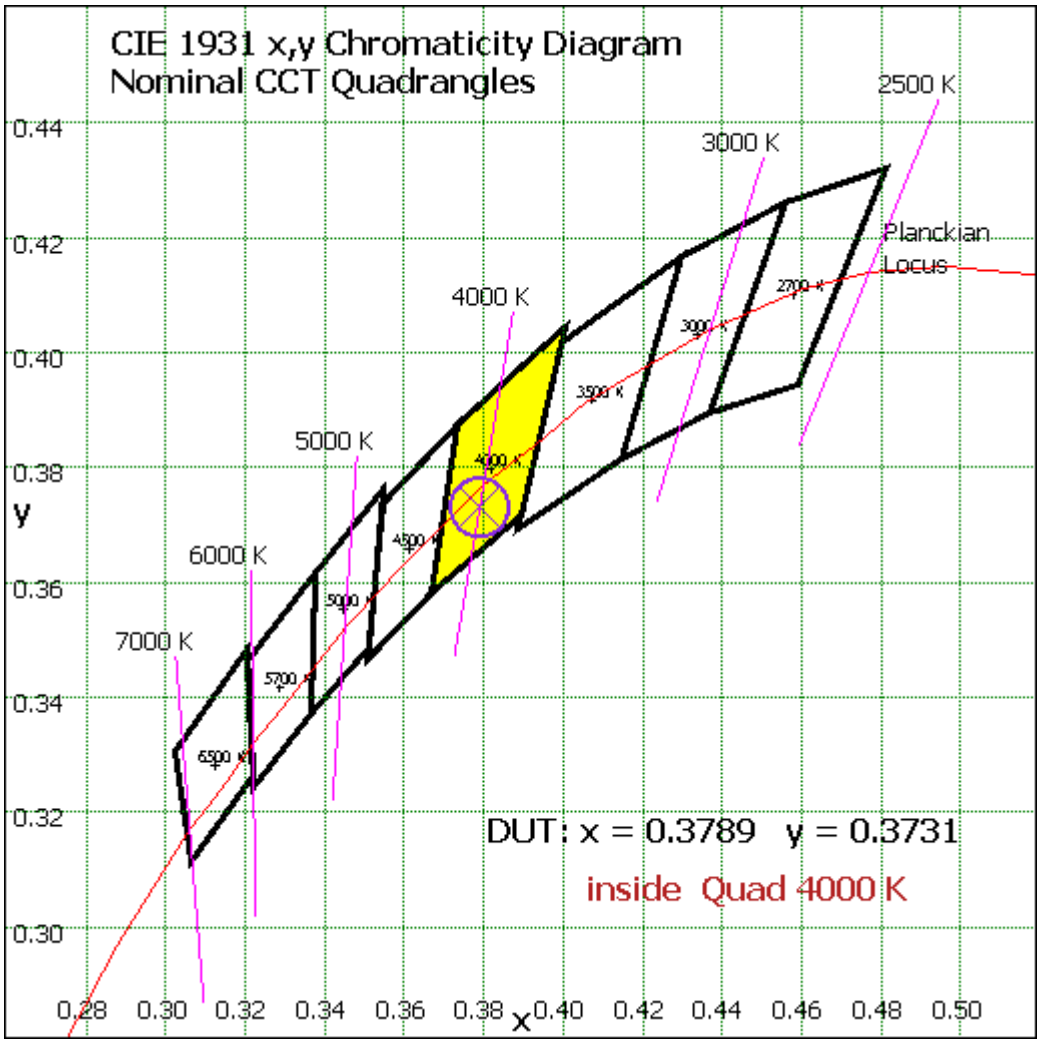


Chart 3: Plot of Lamp x/y coordinates on CIE 1931 Chromaticity Diagram

3rd Floor, Bld. 2, NO. 96 Longchuanwu Rd Qianjiang Economy Dev. Zone, Yuhang Dist,
Hangzhou, Zhejiang Province, China 311100
Tel: +86 571 86376106 www.ledtestlab.com

Zonal Lumen Tabulation- Goniophotometer Method

γ(°)	Lumens	% Total
0- 10	53.233	0.71%
10- 20	169.412	2.25%
20- 30	311.286	4.13%
30- 40	473.136	6.27%
40- 50	613.694	8.14%
50- 60	703.619	9.33%
60- 70	744.826	9.87%
70- 80	730.423	9.68%
80- 90	722.82	9.58%
90-100	714.291	9.47%
100-110	669.087	8.87%
110-120	582.493	7.72%
120-130	457.351	6.06%
130-140	311.273	4.13%
140-150	182.784	2.42%
150-160	81.788	1.08%
160-170	19.729	0.26%
170-180	1.335	0.02%
Total	7542.6	100%

γ(°)	Lumens	% Total
0- 60	2324.38	30.82%
60- 90	2198.069	29.14%
0-90	4522.449	59.96%
90- 180	3020.131	40.04%
0- 180	7542.6	100%

Table 4: Zonal Lumen Data

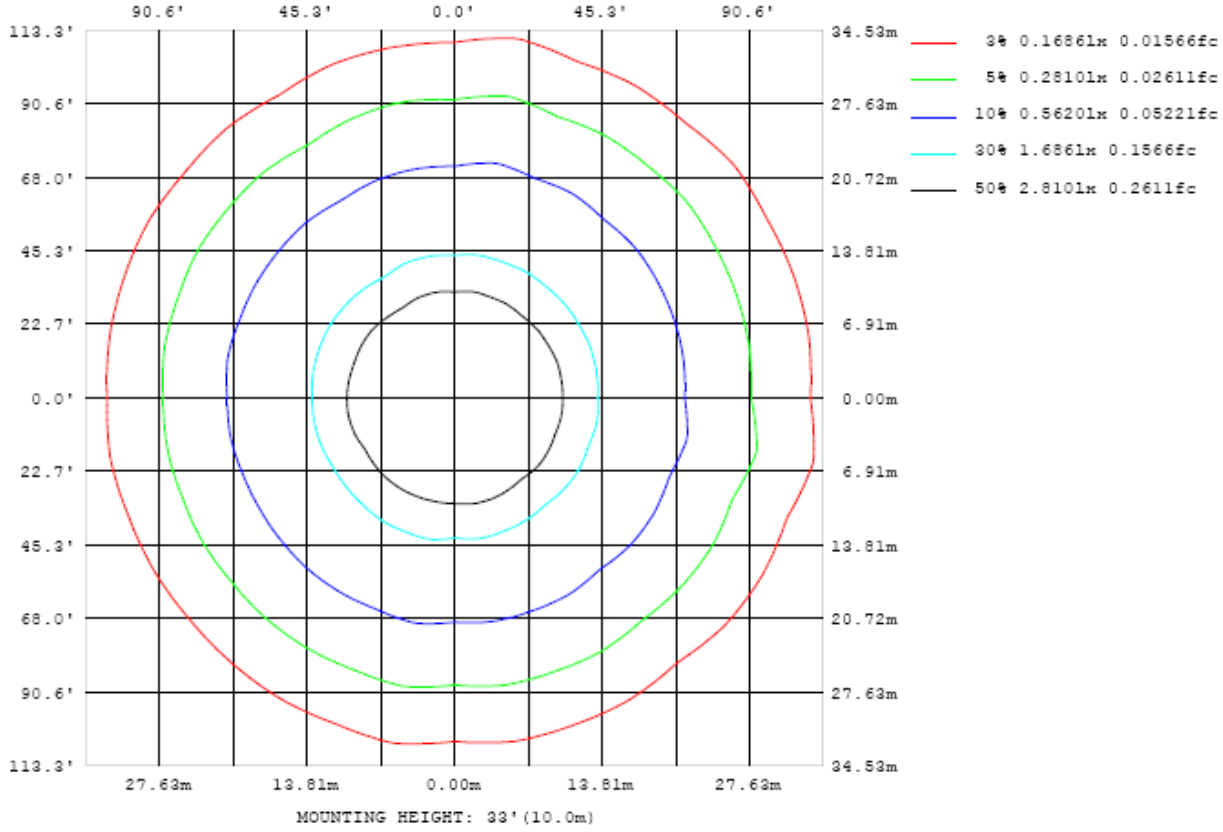


Chart 4: Illuminance Plot (Footcandles)

Luminous Intensity Distribution Plots- Goniophotometer Method

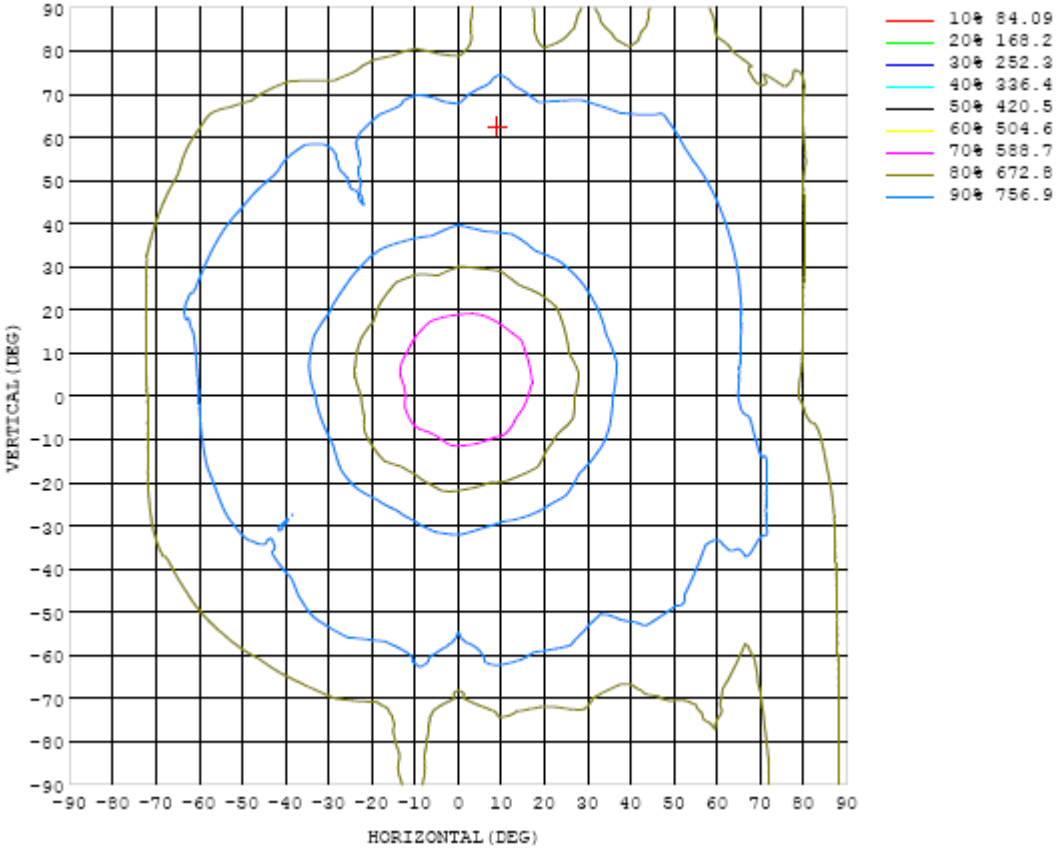


Chart 5: Isocandela Plot

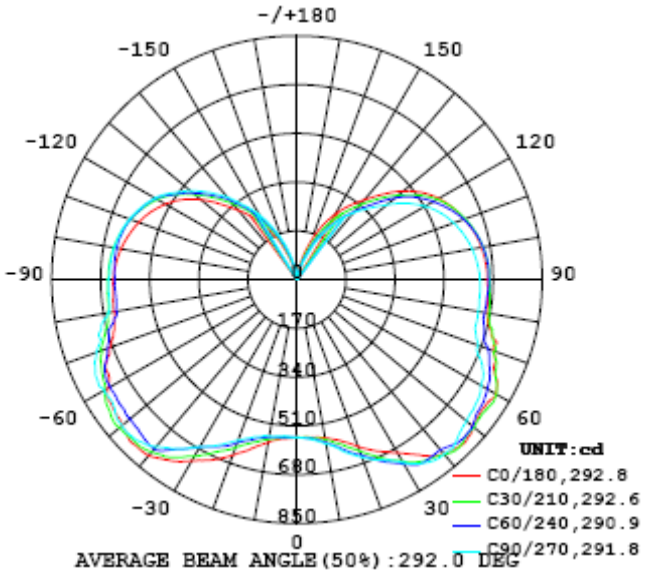


Chart 6: Polar Candela Distribution

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	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550
5	552	553	553	552	554	556	556	557	558	558	558	558	559	559	557	556	555	555	557
10	560	563	565	566	570	574	577	578	581	581	581	583	586	584	578	577	576	574	576
15	581	587	594	594	595	605	612	618	616	619	617	621	622	622	613	611	607	608	609
20	619	620	633	636	638	647	651	662	658	658	656	662	667	665	653	648	647	653	651
25	659	658	677	685	678	687	698	709	706	693	697	712	713	705	692	692	693	696	693
30	697	699	719	731	725	731	742	752	747	735	739	753	758	756	743	737	747	740	729
35	747	750	760	770	767	773	774	777	785	778	774	780	785	789	774	767	781	774	769
40	791	801	787	795	799	780	774	794	805	793	795	787	791	788	771	762	781	797	800
45	812	812	797	808	811	782	797	808	810	786	785	784	786	782	774	757	790	804	807
50	796	801	783	801	794	762	794	794	798	767	795	781	787	773	771	756	783	798	790
55	786	811	783	796	782	759	777	782	786	756	793	778	782	767	756	755	769	776	779
60	796	834	784	798	780	743	762	759	768	737	767	742	755	749	740	732	745	755	758
65	755	806	743	758	751	713	737	730	732	710	752	719	719	718	712	708	712	733	732
70	725	795	717	728	716	689	705	694	697	669	707	686	686	684	675	682	680	693	689
75	698	754	690	701	684	659	672	663	671	640	688	662	665	656	655	658	654	662	655
80	670	741	664	676	666	648	661	655	667	638	685	660	660	651	653	655	648	655	644
85	664	736	662	671	662	647	662	652	665	636	683	656	657	649	651	653	645	652	639
90	660	733	658	668	662	651	665	650	664	634	681	654	655	647	650	650	643	651	636
95	657	730	655	665	658	650	664	642	658	628	671	646	647	639	644	642	638	645	630
100	650	718	645	655	650	642	655	630	646	617	657	634	634	626	630	627	627	634	620
105	637	700	629	641	636	629	639	613	629	600	636	615	617	608	610	606	612	618	604
110	618	674	610	621	617	610	615	590	607	579	609	591	593	585	582	579	590	596	584
115	595	638	588	595	593	584	583	562	579	550	572	559	563	554	545	546	563	569	559
120	566	592	558	561	560	548	545	525	541	513	536	518	522	514	503	505	526	534	527
125	530	539	518	514	514	505	502	480	489	464	493	468	469	463	454	459	477	485	487
130	481	485	470	458	459	451	444	425	429	407	432	411	412	407	393	402	419	426	434
135	422	417	412	399	402	391	373	367	371	352	371	355	357	351	332	344	362	367	372
140	364	352	355	340	346	335	311	314	318	304	314	304	304	300	281	295	311	316	315
145	314	298	306	287	294	282	256	256	263	252	256	246	250	246	227	241	260	265	264
150	263	243	249	231	236	223	202	200	203	194	188	184	188	187	175	186	201	207	208
155	206	188	189	170	170	165	147	143	139	130	121	119	127	123	118	127	141	146	156
160	144	127	120	111	107	104	89.3	81.9	79.4	74.5	69.7	66.9	72.0	68.7	67.0	72.8	82.6	84.2	91.6
165	86.9	75.0	69.6	63.2	55.9	54.1	45.9	38.1	36.4	31.9	29.3	28.4	29.3	27.9	30.1	32.4	39.7	39.6	48.8
170	40.0	36.8	30.4	26.3	22.7	19.0	15.7	13.7	11.5	9.22	8.32	8.38	7.98	8.38	9.14	10.0	12.0	13.8	18.6
175	12.4	11.3	8.37	6.95	6.73	6.37	5.22	4.30	3.47	2.40	1.36	0.91	0.88	0.88	1.02	1.99	2.96	3.70	2.37
180	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83

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	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550		
5	557	555	553	553	552	552	550	549	547	545	545	545	545	545	547	548	549		
10	575	569	565	564	559	558	556	555	554	553	553	553	554	553	553	555	557		
15	602	592	587	585	582	575	569	569	567	566	565	564	566	566	570	572	576		
20	642	628	623	623	613	604	599	598	596	591	591	594	593	591	599	607	607		
25	679	670	662	664	648	642	637	642	635	633	629	634	632	631	641	650	647		
30	716	708	711	705	690	674	677	686	672	673	669	683	673	670	684	696	689		
35	755	750	756	749	739	723	726	730	720	719	712	730	727	716	726	739	731		
40	782	774	784	782	775	770	777	773	760	773	764	777	770	779	781	782	780		
45	797	787	797	797	776	763	796	801	789	807	797	801	786	801	800	813	811		
50	791	796	802	794	776	756	796	807	791	824	805	813	796	809	810	818	820		
55	803	799	794	782	777	753	789	802	774	807	790	809	798	802	798	805	795		
60	783	776	771	771	776	747	780	792	772	825	779	796	785	801	792	805	815		
65	759	742	746	747	754	735	766	776	771	837	787	805	776	796	787	782	774		
70	711	708	722	717	720	698	736	758	740	804	749	772	763	778	760	750	742		
75	673	671	689	675	693	676	703	705	708	755	721	717	718	751	729	721	713		
80	653	654	664	651	657	635	665	677	664	723	675	698	684	710	692	688	686		
85	641	648	658	643	648	631	653	661	654	716	659	682	667	694	674	673	674		
90	637	644	655	638	649	632	652	660	653	712	658	675	661	688	670	667	670		
95	631	639	653	635	652	635	652	658	650	712	655	673	659	685	668	665	669		
100	620	632	645	626	653	635	647	653	643	706	650	670	655	678	662	660	664		
105	609	620	632	613	645	628	638	644	633	693	640	660	646	666	650	649	654		
110	592	603	614	595	629	615	624	628	618	676	625	646	631	648	631	633	639		
115	567	581	590	572	603	593	604	607	596	651	604	626	612	623	605	611	617		
120	532	550	559	542	565	566	577	580	569	617	578	600	587	590	570	583	589		
125	496	508	517	501	516	520	530	534	528	572	543	566	553	549	527	548	555		
130	448	457	462	450	470	471	475	477	482	521	496	519	507	503	481	500	505		
135	384	400	404	400	413	417	424	424	431	470	446	462	452	447	424	441	443		
140	326	345	347	346	349	364	376	374	375	407	390	402	393	384	363	383	383		
145	273	293	292	290	284	306	311	312	315	340	336	346	337	329	312	333	331		
150	217	237	232	233	232	249	260	257	260	279	278	291	285	273	261	279	277		
155	162	175	173	179	176	191	197	200	201	216	217	230	228	216	213	214	219		
160	99.0	112	112	119	121	128	131	135	140	154	157	168	167	160	156	151	155		
165	52.3	60.1	60.9	63.1	66.6	70.7	76.5	78.9	83.5	88.2	94.1	99.6	104	98.7	95.8	91.9	89.8		
170	19.4	21.7	23.8	24.7	27.5	30.0	31.9	34.7	39.7	43.1	48.7	50.3	53.2	52.4	50.7	45.4	43.4		
175	2.39	3.11	4.44	6.05	7.51	8.58	9.71	11.5	13.6	15.2	16.2	17.1	17.3	17.3	16.9	16.6	15.1		
180	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83		

Table 7: Luminous Intensity Data

EQUIPMENT LIST

Test Equipment	Model	Equipment No.	Calibration Date	Calibration Due date
Goniophotometer system	GO-R5000	HZTE011-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	PF2010A	HZTE028-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	DPS1060	HZTE001-06	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	WY12010	HZTE004-03	Aug. 10, 2017	Aug. 09, 2018
Temperature recorder	JM624U	HZTE018-08	Aug. 17, 2017	Aug. 16, 2018
Temperature and humidity recorder	JR900	HZTE018-01	Aug. 16, 2017	Aug. 15, 2018
Standard source	D908	HZTE012-01	Aug. 20, 2017	Aug. 19, 2018
Integrate Sphere system	2M	HZTE015-01	Aug. 23, 2017	Aug. 22, 2018
Digital Power Meter	WT210	HZTE008-01	Aug. 10, 2017	Aug. 09, 2018
AC Power Supply	PCR 500L	HZTE001-07	Aug. 10, 2017	Aug. 09, 2018
DC Power Supply	IT6154	HZTE004-04	Aug. 10, 2017	Aug. 09, 2018
Standard source	SCL-1400	HZTE012-02	Aug. 20, 2017	Aug. 19, 2018
Temperature and humidity recorder	JR900	HZTE018-02	Aug. 16, 2017	Aug. 15, 2018
Temperature Meter	TES1310	HZTE017-01	Aug. 17, 2017	Aug. 16, 2018

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 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 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 expended uncertainty is 2.3% with a coverage factor k=2.

Color Characteristics Measurements

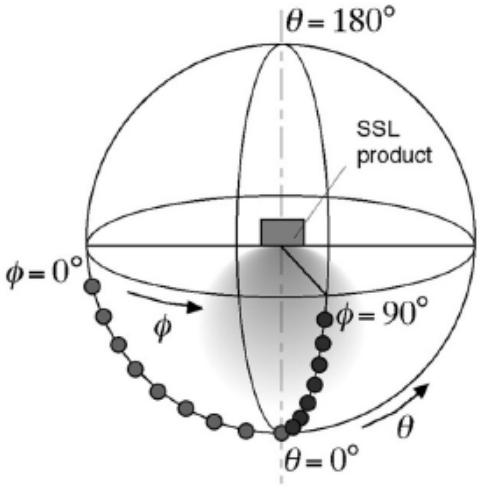
The color characteristics of SSL products include chromaticity coordinates, correlated color temperature, and color rendering index. These characteristics of SSL products may be spatially non-uniform, and thus, in order that they can be specified accurately, the color quantities shall be measured as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