



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 3.5PLS/840/HYB/G23

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS181030083-10-1-M1
Test Date:	2018-11-02 to 2018-11-06
Report Date:	2018-11-22
Reviewed By:	Ray Gao/EE Engineer <i>Ray Gao</i>
Revised Note:	The previous report PKS181030083-10-1 is replaced by this report on 2018-11-22
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan). No.248 Chenghu Road, Kunshan, Jiangsu province, China. Tel: +86-0512-86175000 Fax: +86-0512-88934268
Test Facility:	Test facility was located at No.248 Chenghu Road, Kunshan, Jiangsu province, China.
Accreditation:	The IAS Accreditation Number TL-749.

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Kunshan). This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

1. Product Description

General Information:

one sample was received on 2018-10-30 and used for testing.

Model Tested: 3.5PLS/840/HYB/G23
Manufacturer: GREEN CREATIVE LTD
Brand Name: GREEN CREATIVE
Product Designation: LED Lamp
Aging Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277VAC 60Hz
Rated Power: 3.5W
Nominal CCT: 4000K
Nominal Lumen Output: 320lm

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-10-2014: Harmonic Emission Limits – Related Power Quality Requirements for Lighting Equipment
- IES TM-30-15: IES Method for Evaluating Light Source Color Rendition

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Integrating Sphere	INVENTFINE	Dia 1.5m	JWWCV090112	2018-01-24	2019-01-24
Power Meter	INVENTFINE	WT500	GSJWQ20009	2018-04-08	2019-04-08
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2018-01-24	2019-01-24
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2018-04-08	2019-04-08
Standard Light Source	INVENTFINE	N/A	JWWCR020106	2018-01-24	2019-01-24
Thermal Meter	KEJIAN	TA298	N/A	2017-11-14	2018-11-14
DC Power Supply	INVENTFINE	WL3005	JWWCP020069	2018-04-08	2019-04-08
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	2018-04-08	2019-04-08
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	2018-04-08	2019-04-08
Power Meter	INVENTFINE	WT500	GSDSQ200007	2018-04-08	2019-04-08
Goniophotometer	INVENTFINE	GPM-1900	YWGCF120001	2018-01-24	2019-01-24
Wireless Weather Station	ZHONGXING	KG218	N/A	2017-11-14	2018-11-14
Standard Light Source	INVENTFINE	N/A	JWBYR040007	2018-01-24	2019-01-24

Statement of Traceability: Bay Area Compliance Laboratories Corp.(Kunshan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ during measurement. And relative humidity is less than 65%.

Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is $U=2.6\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=24\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.5(K=2)$, at the 95% confidence level.

The uncertainty of power meter AC current $U=0.16\%$ of rdg, AC Voltage $U=0.18\%$ of rdg, Power $U=0.14\%$ ($K=2$), at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. The vertical angle (γ) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

The uncertainty of the luminous flux is $U=2.6\%$ ($K=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_i , R_g was calculated according to IES TM-30-15 by using calculation tools. The calculation was based on the measured SPD from 380nm to 780nm with 1nm intervals. All the colors in this report is for reference only.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Downward**

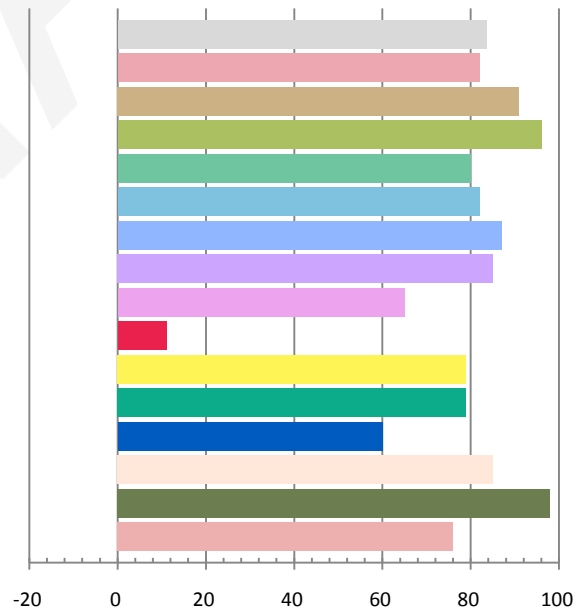
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0279	3.29	0.9826	342.63	104.12

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
1.036	4157	0.00086	0.3743	0.3747	0.2219	0.4997

Color Rendering Index

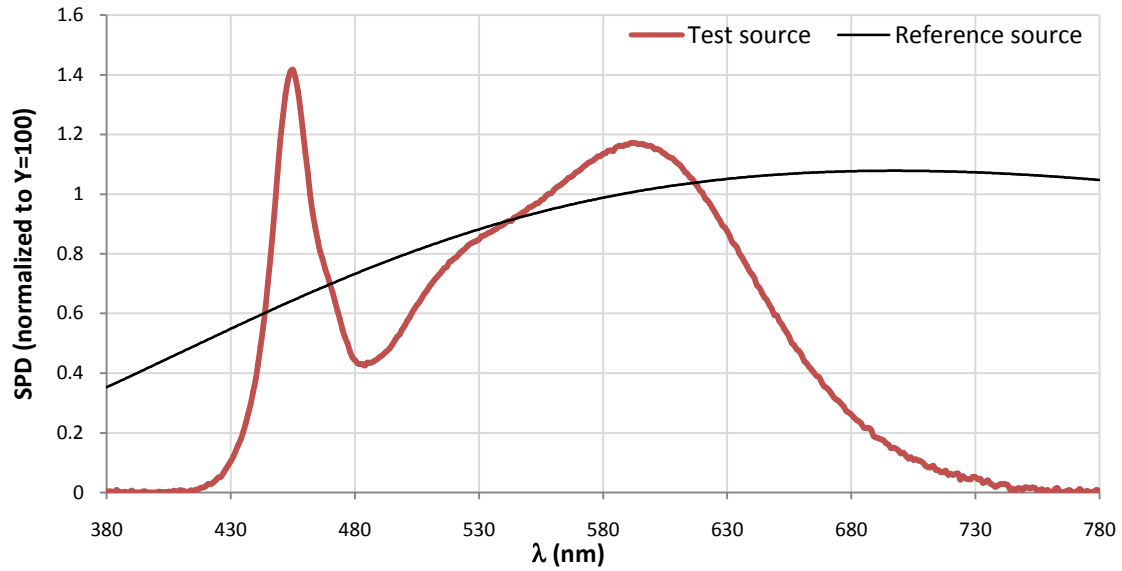
Ra 83.6			
R1 82	R2 91	R3 96	R4 80
R5 82	R6 87	R7 85	R8 65
R9 11	R10 79	R11 79	R12 60
R13 85	R14 98	R15 76	



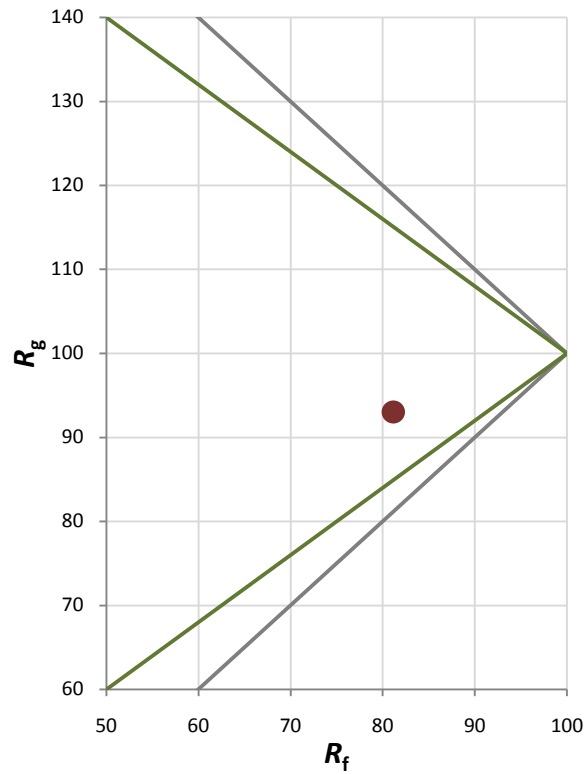
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	93

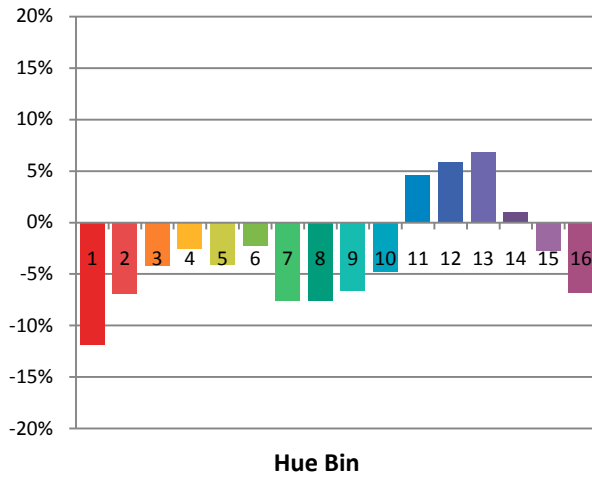
Spectral Power Distribution Comparison



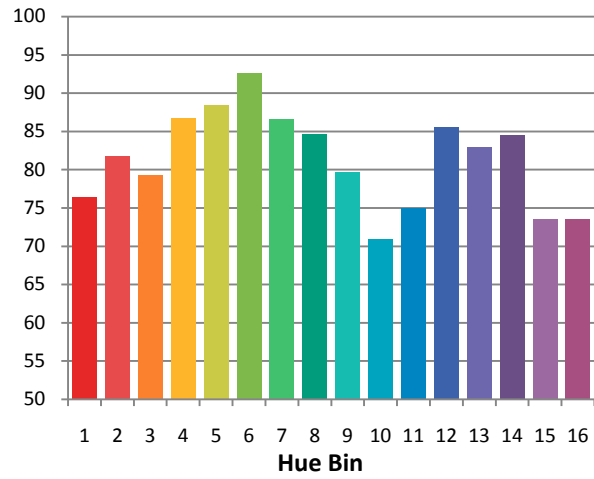
Plot of R_g versus R_f



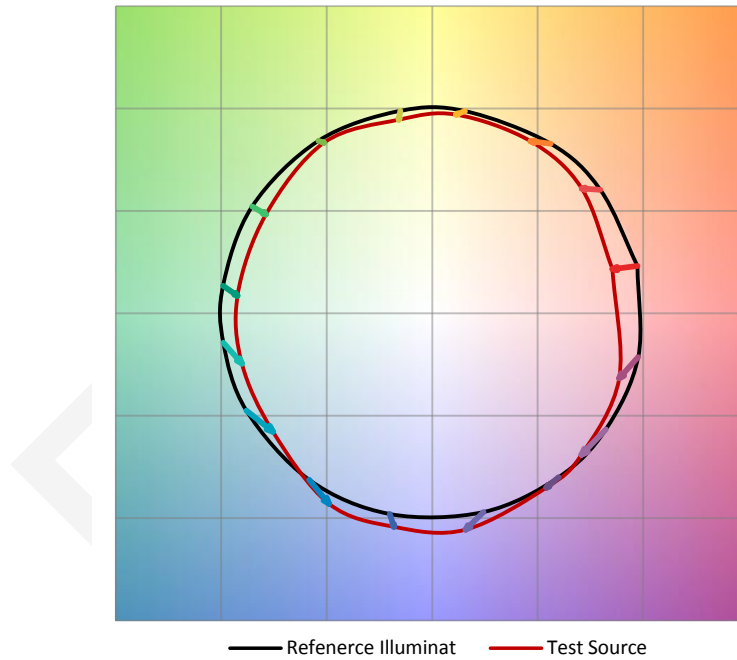
Chroma Shift by Hue



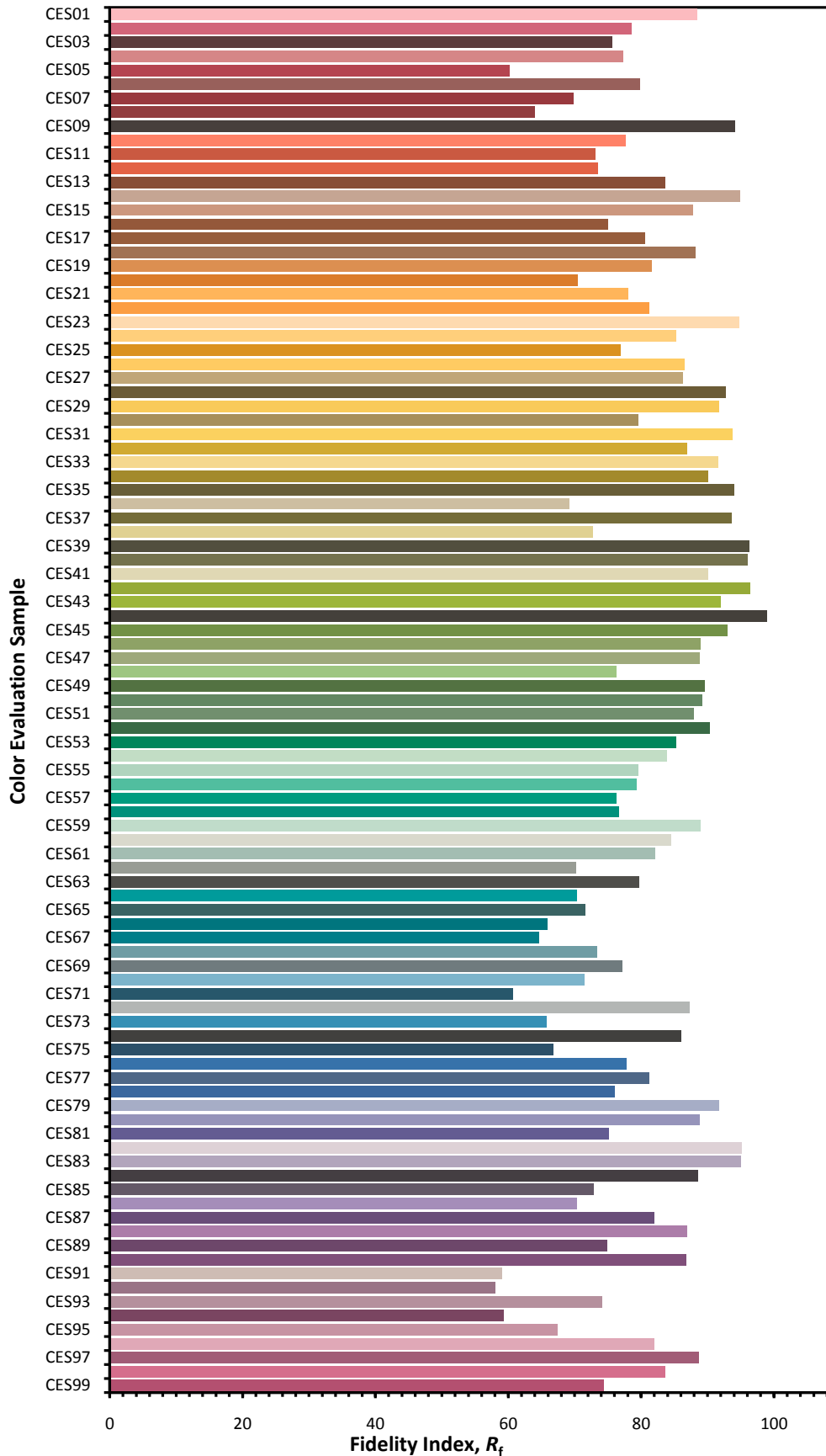
R_f by Hue



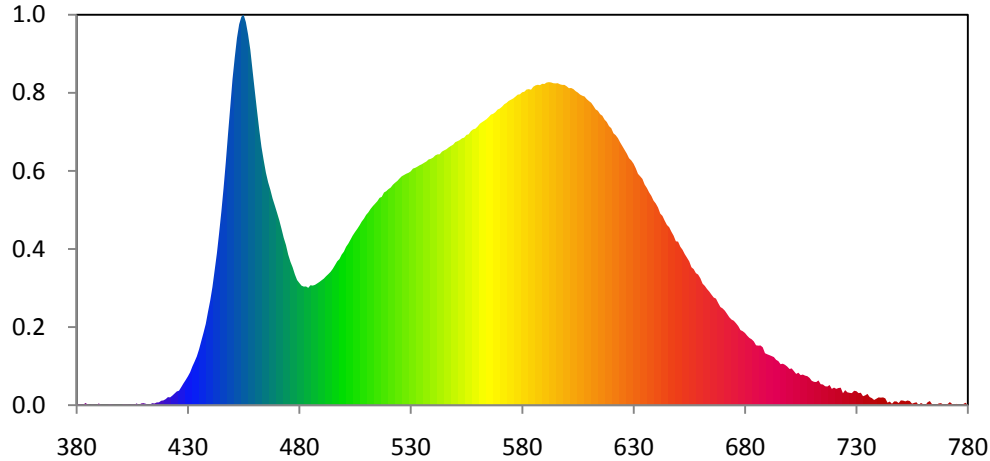
Color Vector Graphic



Color Fidelity by CES Sample



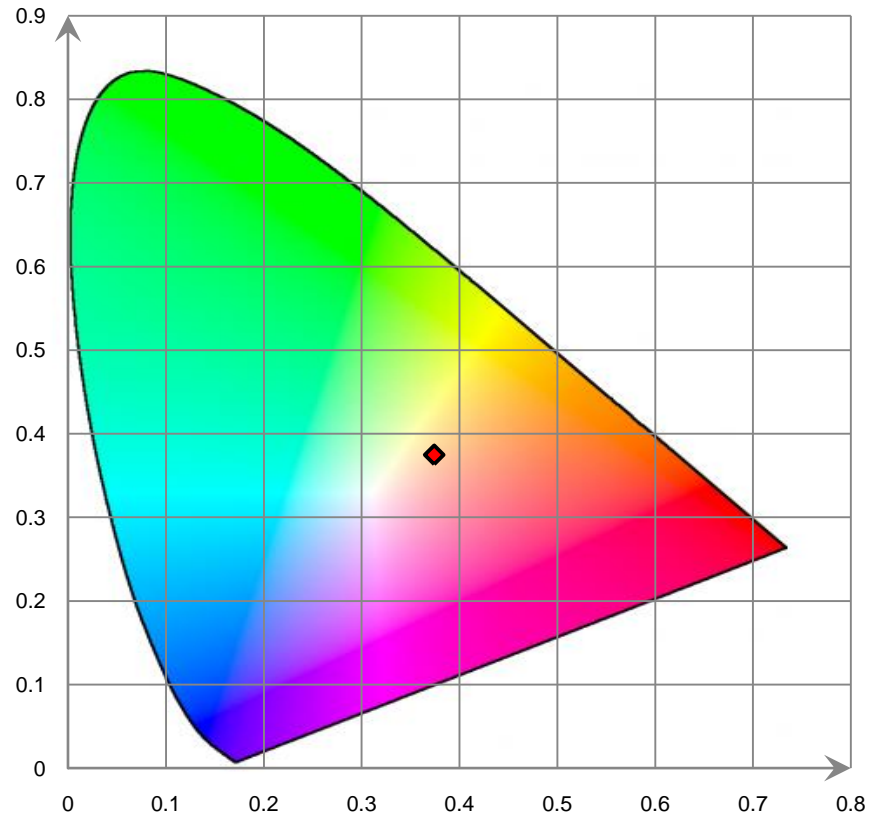
Relative Spectral Power Distribution



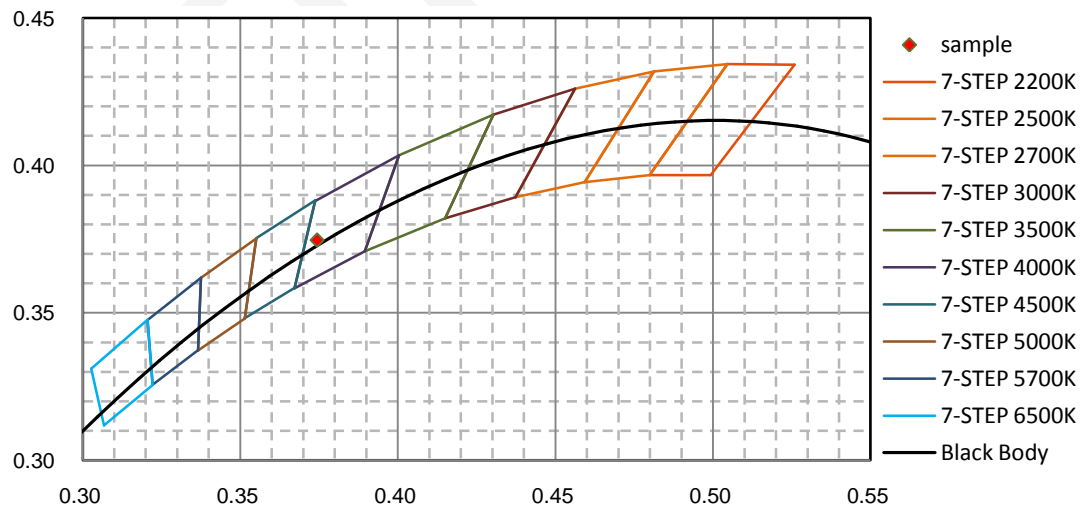
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.040E-02	421	1.461E-01	462	5.015E+00	503	3.015E+00	544	4.613E+00
381	1.840E-02	422	1.420E-01	463	4.700E+00	504	3.089E+00	545	4.637E+00
382	1.690E-02	423	1.737E-01	464	4.458E+00	505	3.152E+00	546	4.657E+00
383	4.900E-03	424	2.119E-01	465	4.230E+00	506	3.208E+00	547	4.690E+00
384	4.140E-02	425	2.502E-01	466	4.057E+00	507	3.271E+00	548	4.717E+00
385	1.300E-02	426	2.633E-01	467	3.919E+00	508	3.341E+00	549	4.740E+00
386	5.000E-04	427	3.286E-01	468	3.761E+00	509	3.395E+00	550	4.786E+00
387	1.290E-02	428	3.965E-01	469	3.633E+00	510	3.463E+00	551	4.804E+00
388	7.000E-03	429	4.590E-01	470	3.501E+00	511	3.511E+00	552	4.824E+00
389	1.700E-03	430	5.251E-01	471	3.365E+00	512	3.572E+00	553	4.856E+00
390	3.310E-02	431	6.005E-01	472	3.208E+00	513	3.622E+00	554	4.869E+00
391	4.500E-03	432	7.053E-01	473	3.045E+00	514	3.667E+00	555	4.918E+00
392	9.000E-04	433	7.938E-01	474	2.914E+00	515	3.711E+00	556	4.930E+00
393	2.000E-04	434	8.897E-01	475	2.741E+00	516	3.772E+00	557	4.986E+00
394	5.000E-03	435	1.017E+00	476	2.611E+00	517	3.791E+00	558	5.020E+00
395	1.920E-02	436	1.169E+00	477	2.508E+00	518	3.870E+00	559	5.031E+00
396	1.000E-02	437	1.318E+00	478	2.379E+00	519	3.893E+00	560	5.070E+00
397	2.200E-03	438	1.478E+00	479	2.277E+00	520	3.932E+00	561	5.120E+00
398	1.400E-03	439	1.696E+00	480	2.224E+00	521	3.960E+00	562	5.149E+00
399	0.000E+00	440	1.903E+00	481	2.175E+00	522	4.011E+00	563	5.176E+00
400	0.000E+00	441	2.149E+00	482	2.158E+00	523	4.049E+00	564	5.205E+00
401	1.590E-02	442	2.456E+00	483	2.160E+00	524	4.081E+00	565	5.243E+00
402	1.170E-02	443	2.766E+00	484	2.135E+00	525	4.127E+00	566	5.287E+00
403	1.180E-02	444	3.132E+00	485	2.183E+00	526	4.166E+00	567	5.303E+00
404	7.300E-03	445	3.523E+00	486	2.177E+00	527	4.189E+00	568	5.332E+00
405	1.720E-02	446	3.950E+00	487	2.189E+00	528	4.212E+00	569	5.379E+00
406	7.000E-03	447	4.425E+00	488	2.214E+00	529	4.228E+00	570	5.398E+00
407	3.370E-02	448	4.935E+00	489	2.242E+00	530	4.255E+00	571	5.432E+00
408	1.600E-03	449	5.428E+00	490	2.273E+00	531	4.306E+00	572	5.476E+00
409	3.140E-02	450	5.925E+00	491	2.304E+00	532	4.318E+00	573	5.501E+00
410	3.780E-02	451	6.323E+00	492	2.346E+00	533	4.341E+00	574	5.538E+00
411	2.660E-02	452	6.681E+00	493	2.385E+00	534	4.366E+00	575	5.559E+00
412	1.020E-02	453	6.933E+00	494	2.426E+00	535	4.385E+00	576	5.582E+00
413	1.430E-02	454	7.069E+00	495	2.480E+00	536	4.411E+00	577	5.615E+00
414	3.720E-02	455	7.105E+00	496	2.548E+00	537	4.433E+00	578	5.651E+00
415	3.100E-02	456	6.971E+00	497	2.618E+00	538	4.472E+00	579	5.657E+00
416	4.990E-02	457	6.746E+00	498	2.658E+00	539	4.483E+00	580	5.694E+00
417	5.170E-02	458	6.469E+00	499	2.739E+00	540	4.505E+00	581	5.704E+00
418	8.020E-02	459	6.096E+00	500	2.794E+00	541	4.544E+00	582	5.744E+00
419	8.720E-02	460	5.724E+00	501	2.883E+00	542	4.564E+00	583	5.751E+00
420	1.101E-01	461	5.366E+00	502	2.942E+00	543	4.566E+00	584	5.741E+00

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	5.794E+00	626	4.644E+00	667	1.939E+00	708	5.281E-01	749	3.920E-02
586	5.819E+00	627	4.576E+00	668	1.859E+00	709	4.969E-01	750	8.740E-02
587	5.830E+00	628	4.493E+00	669	1.786E+00	710	4.443E-01	751	8.280E-02
588	5.823E+00	629	4.454E+00	670	1.761E+00	711	4.249E-01	752	6.980E-02
589	5.848E+00	630	4.395E+00	671	1.719E+00	712	4.213E-01	753	8.510E-02
590	5.845E+00	631	4.311E+00	672	1.660E+00	713	4.497E-01	754	7.460E-02
591	5.871E+00	632	4.210E+00	673	1.599E+00	714	3.821E-01	755	2.690E-02
592	5.878E+00	633	4.164E+00	674	1.558E+00	715	3.769E-01	756	4.200E-02
593	5.873E+00	634	4.117E+00	675	1.536E+00	716	3.444E-01	757	5.270E-02
594	5.859E+00	635	4.014E+00	676	1.491E+00	717	3.399E-01	758	1.200E-03
595	5.855E+00	636	3.951E+00	677	1.439E+00	718	3.664E-01	759	4.080E-02
596	5.859E+00	637	3.871E+00	678	1.366E+00	719	2.973E-01	760	1.790E-02
597	5.838E+00	638	3.807E+00	679	1.346E+00	720	3.196E-01	761	4.000E-04
598	5.828E+00	639	3.722E+00	680	1.314E+00	721	2.970E-01	762	5.430E-02
599	5.828E+00	640	3.669E+00	681	1.265E+00	722	3.127E-01	763	7.500E-02
600	5.803E+00	641	3.596E+00	682	1.223E+00	723	3.185E-01	764	1.630E-02
601	5.768E+00	642	3.485E+00	683	1.200E+00	724	2.166E-01	765	7.000E-04
602	5.772E+00	643	3.444E+00	684	1.160E+00	725	2.738E-01	766	9.300E-03
603	5.752E+00	644	3.357E+00	685	1.090E+00	726	2.337E-01	767	3.090E-02
604	5.715E+00	645	3.280E+00	686	1.084E+00	727	2.246E-01	768	3.690E-02
605	5.688E+00	646	3.239E+00	687	1.086E+00	728	2.193E-01	769	1.190E-02
606	5.653E+00	647	3.156E+00	688	1.053E+00	729	2.625E-01	770	7.000E-03
607	5.632E+00	648	3.084E+00	689	9.459E-01	730	2.555E-01	771	2.200E-02
608	5.617E+00	649	2.982E+00	690	9.265E-01	731	2.195E-01	772	5.690E-02
609	5.569E+00	650	2.977E+00	691	9.108E-01	732	2.268E-01	773	2.130E-02
610	5.534E+00	651	2.884E+00	692	8.939E-01	733	1.632E-01	774	3.400E-03
611	5.503E+00	652	2.828E+00	693	8.753E-01	734	1.789E-01	775	2.450E-02
612	5.446E+00	653	2.748E+00	694	8.257E-01	735	2.056E-01	776	6.100E-03
613	5.382E+00	654	2.684E+00	695	8.017E-01	736	1.478E-01	777	4.300E-03
614	5.357E+00	655	2.618E+00	696	7.464E-01	737	1.277E-01	778	2.080E-02
615	5.296E+00	656	2.510E+00	697	7.548E-01	738	9.530E-02	779	4.430E-02
616	5.266E+00	657	2.475E+00	698	7.346E-01	739	1.182E-01	780	7.300E-03
617	5.197E+00	658	2.403E+00	699	7.016E-01	740	1.414E-01		
618	5.153E+00	659	2.376E+00	700	6.585E-01	741	1.374E-01		
619	5.078E+00	660	2.309E+00	701	6.683E-01	742	1.413E-01		
620	5.040E+00	661	2.211E+00	702	6.191E-01	743	1.240E-01		
621	4.947E+00	662	2.170E+00	703	5.693E-01	744	4.590E-02		
622	4.912E+00	663	2.114E+00	704	5.907E-01	745	6.600E-02		
623	4.859E+00	664	2.067E+00	705	5.472E-01	746	2.570E-02		
624	4.781E+00	665	2.012E+00	706	5.568E-01	747	6.900E-02		
625	4.713E+00	666	1.959E+00	707	5.376E-01	748	6.900E-02		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hours**

Test orientation: **Downward**

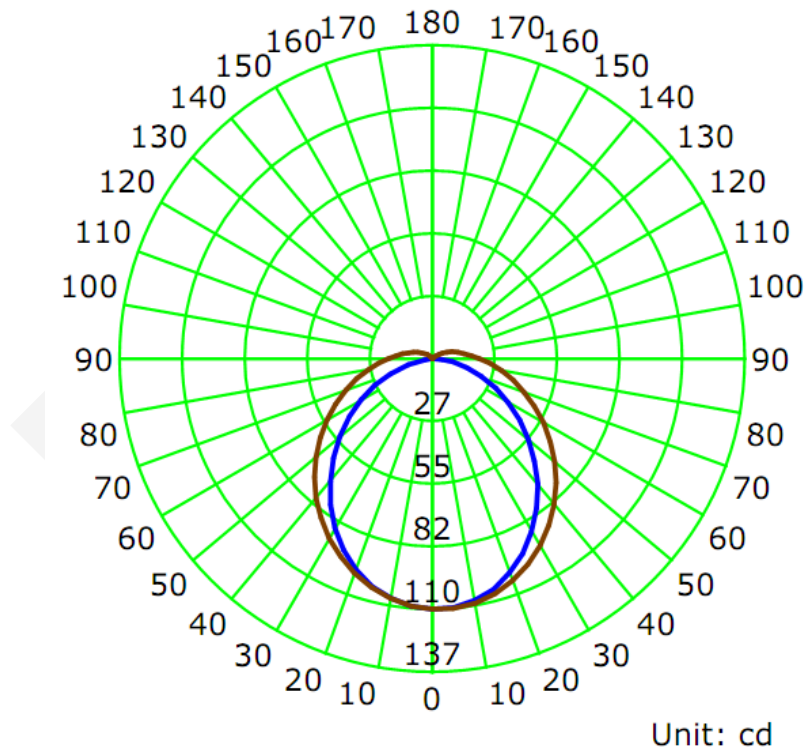
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0280	3.3	0.9850

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
344.8	104.53	110.1	1.18	1.26

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	99.2	108.9	120.2	109.2	109.4
Field Angle (10% I_{max}):	153.7	186.4	211.5	187.2	184.7

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	110	110	110	110	110	110	110	110
5.0°	110	110	110	110	110	110	110	109
10.0°	108	108	109	109	109	109	108	107
15.0°	105	105	106	107	107	106	105	104
20.0°	100	101	103	104	104	103	102	100
25.0°	95	96	98	99	100	99	97	95
30.0°	88	89	92	94	95	93	91	88
35.0°	80	82	86	89	89	88	85	81
40.0°	72	74	79	82	84	82	78	73
45.0°	64	66	71	76	77	75	70	65
50.0°	56	58	64	69	71	68	63	57
55.0°	47	50	56	62	64	61	55	49
60.0°	39	42	49	55	57	54	48	41
65.0°	31	34	42	48	50	47	41	33
70.0°	23	27	35	41	43	40	34	26
75.0°	16	20	29	35	37	34	28	19
80.0°	9	14	23	29	31	28	22	12
85.0°	4	10	18	24	26	23	17	8
90.0°	1	6	14	20	21	19	13	5
95.0°	0	4	11	16	18	16	10	3
100.0°	0	2	8	13	14	13	8	2
105.0°	0	1	6	10	12	10	6	1
110.0°	0	1	5	8	9	8	4	0
115.0°	0	1	3	6	7	6	3	0
120.0°	0	0	2	4	6	4	2	0
125.0°	0	1	1	3	4	3	1	0
130.0°	0	0	1	2	2	2	1	1
135.0°	0	1	1	1	1	1	1	1
140.0°	0	0	1	1	1	1	1	0
145.0°	0	1	1	1	1	1	1	1
150.0°	0	1	1	1	1	1	1	0
155.0°	0	1	1	1	1	1	1	0
160.0°	0	1	1	1	1	1	0	0
165.0°	0	0	0	1	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

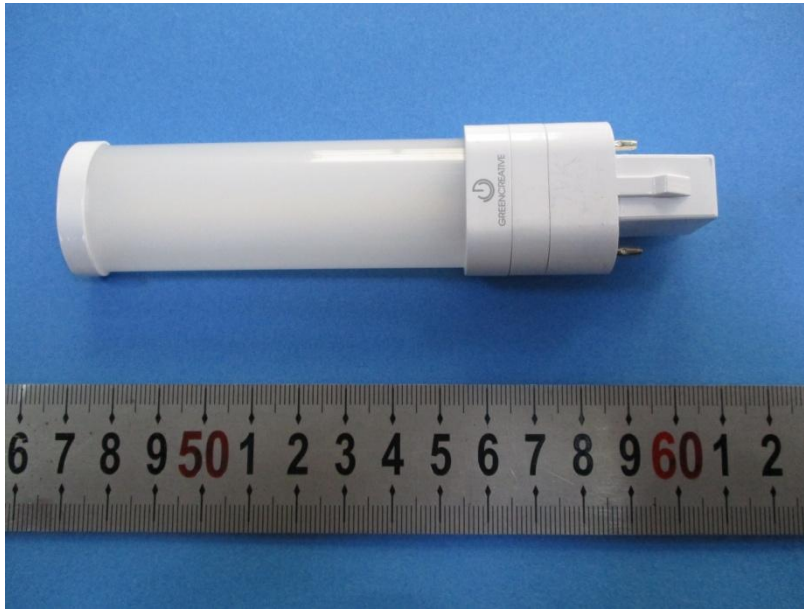
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	110	110	110	110	110	110	110	110
5.0°	109	109	109	109	109	109	109	109
10.0°	107	107	107	106	107	107	107	108
15.0°	103	103	103	104	104	104	104	104
20.0°	99	98	99	100	100	100	100	100
25.0°	93	93	94	95	96	96	95	94
30.0°	86	86	88	90	91	91	89	87
35.0°	78	78	81	84	86	85	82	80
40.0°	70	71	74	78	80	79	76	72
45.0°	62	63	67	71	74	73	68	64
50.0°	53	54	60	65	67	66	61	56
55.0°	45	46	52	58	61	59	54	48
60.0°	36	39	45	51	54	52	47	41
65.0°	28	31	38	45	47	46	40	33
70.0°	20	24	32	38	41	39	33	26
75.0°	11	15	26	32	35	33	27	20
80.0°	4	10	20	26	29	27	22	14
85.0°	1	7	16	22	24	22	17	9
90.0°	0	5	12	18	20	18	13	6
95.0°	0	3	9	14	16	15	10	4
100.0°	0	2	7	12	14	12	8	3
105.0°	0	1	6	10	11	10	6	2
110.0°	0	1	4	8	9	8	5	1
115.0°	0	0	3	6	7	6	4	1
120.0°	0	0	2	5	6	5	3	1
125.0°	0	0	1	4	4	4	2	1
130.0°	0	0	1	2	3	3	1	1
135.0°	0	0	1	1	2	1	1	1
140.0°	0	0	1	1	1	1	1	0
145.0°	0	0	0	1	1	1	1	0
150.0°	0	0	0	1	1	1	1	0
155.0°	0	0	0	0	1	1	1	0
160.0°	0	0	0	1	1	1	0	0
165.0°	0	0	0	0	1	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	2.6	0.76	0-5	2.6	0.76
5-10	7.8	2.25	0-10	10.4	3.01
10-15	12.6	3.65	0-15	23.0	6.66
15-20	16.9	4.91	0-20	39.9	11.57
20-25	20.6	5.97	0-25	60.5	17.54
25-30	23.5	6.81	0-30	83.9	24.35
30-35	25.5	7.40	0-35	109.4	31.74
35-40	26.7	7.73	0-40	136.1	39.47
40-45	26.9	7.81	0-45	163.0	47.29
45-50	26.4	7.66	0-50	189.4	54.95
50-55	25.2	7.30	0-55	214.6	62.25
55-60	23.3	6.76	0-60	237.9	69.01
60-65	21.0	6.08	0-65	258.9	75.09
65-70	18.3	5.30	0-70	277.2	80.39
70-75	15.3	4.44	0-75	292.5	84.83
75-80	12.3	3.57	0-80	304.8	88.40
80-85	9.7	2.80	0-85	314.4	91.20
85-90	7.5	2.17	0-90	321.9	93.36
90-95	5.8	1.68	0-95	327.7	95.05
95-100	4.5	1.31	0-100	332.2	96.36
100-105	3.5	1.01	0-105	335.7	97.37
105-110	2.6	0.77	0-110	338.4	98.14
110-115	2.0	0.57	0-115	340.3	98.71
115-120	1.4	0.41	0-120	341.7	99.12
120-125	1.0	0.28	0-125	342.7	99.40
125-130	0.6	0.19	0-130	343.4	99.59
130-135	0.4	0.12	0-135	343.8	99.71
135-140	0.3	0.08	0-140	344.1	99.79
140-145	0.2	0.06	0-145	344.3	99.85
145-150	0.2	0.05	0-150	344.4	99.90
150-155	0.1	0.04	0-155	344.6	99.94
155-160	0.1	0.03	0-160	344.7	99.97
160-165	0.1	0.02	0-165	344.7	99.99
165-170	0.0	0.01	0-170	344.8	100.00
170-175	0.0	0.00	0-175	344.8	100.00
175-180	0.0	0.00	0-180	344.8	100.00

6. Product Photo



*****END OF REPORT*****