



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 25T5HO/4F/840/BYP

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180820083-10-4
Test Date:	2018-08-21 to 2018-08-23
Report Date:	2018-08-27
Reviewed By:	Ray Gao/EE Engineer <i>Ray Gao</i>
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 2018-08-20 and used for testing.

Model Tested: 25T5HO/4F/840/BYP
Manufacturer: GREEN CREATIVE LTD
Brand Name: GREEN CREATIVE
Product Designation: LED Tube
Aging Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277VAC 60Hz
Rated Power: 25W
Nominal CCT: 4000K
Nominal Lumen Output: 3200lm

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**

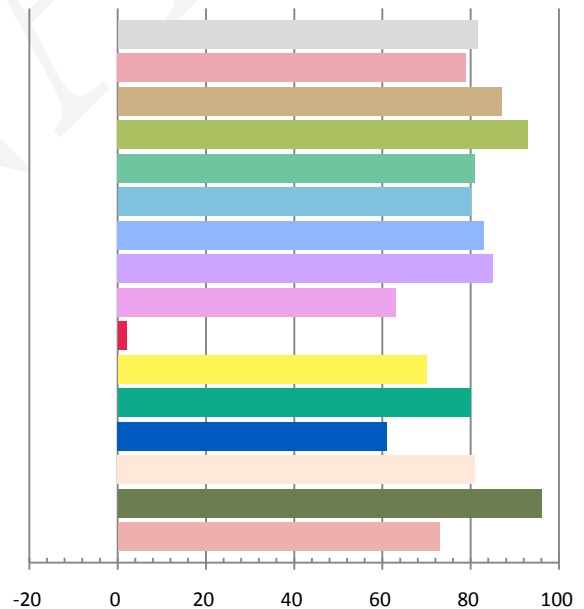
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.211	24.76	0.9776	3290.9	132.91

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
9.810	3987	0.00106	0.3818	0.3799	0.2248	0.5032

Color Rendering Index

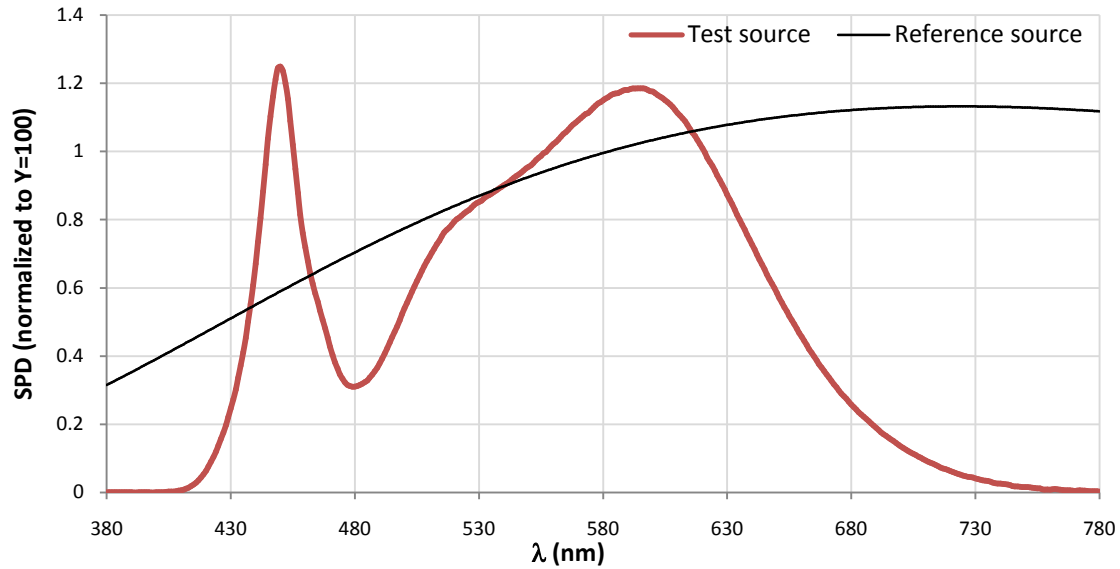
Ra 81.5			
R1 79	R2 87	R3 93	R4 81
R5 80	R6 83	R7 85	R8 63
R9 2	R10 70	R11 80	R12 61
R13 81	R14 96	R15 73	



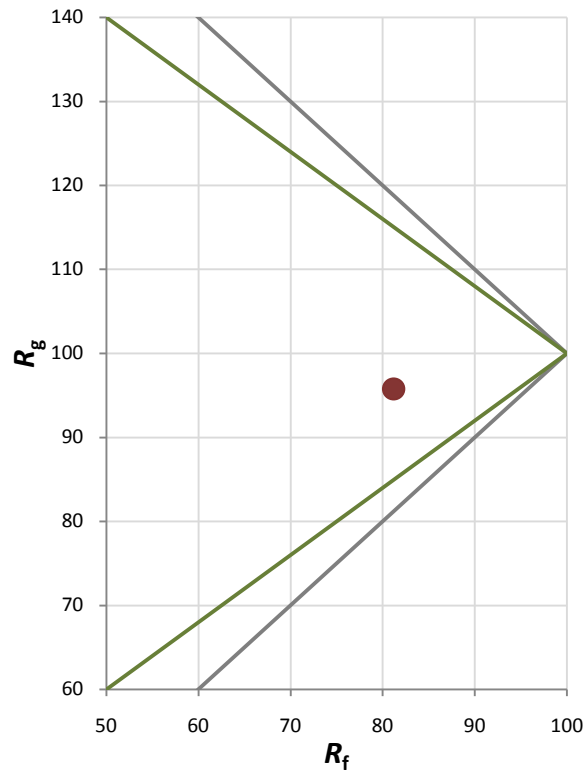
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	96

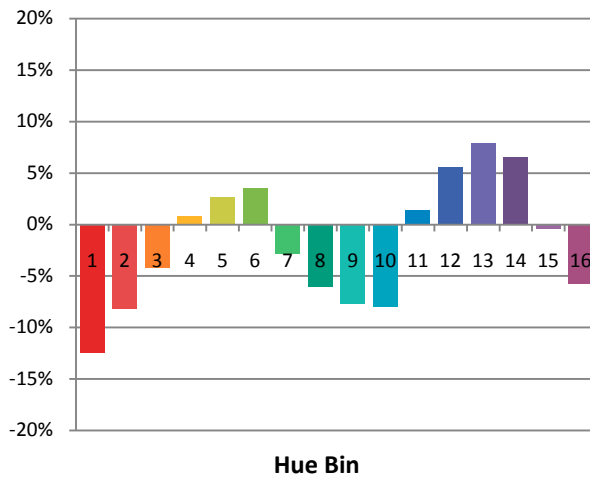
Spectral Power Distribution Comparison



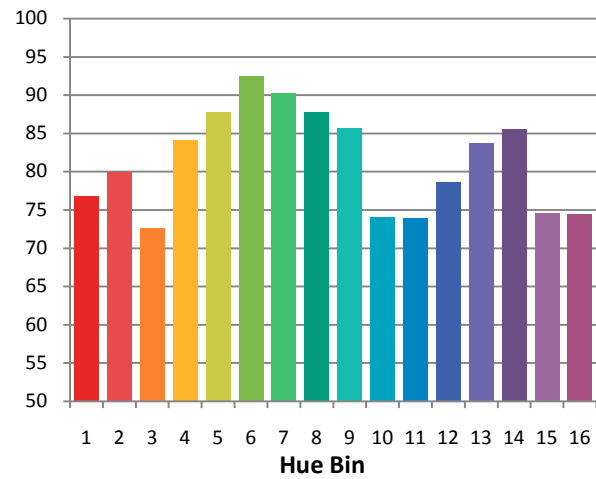
Plot of R_g versus R_f



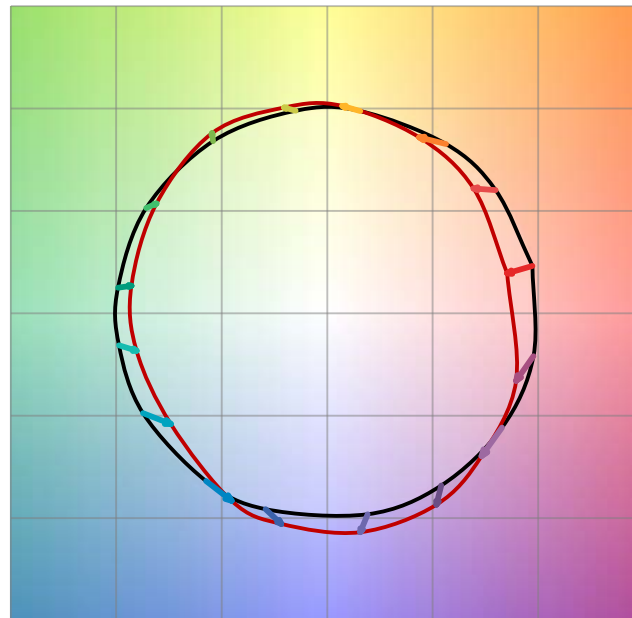
Chroma Shift by Hue



R_t by Hue

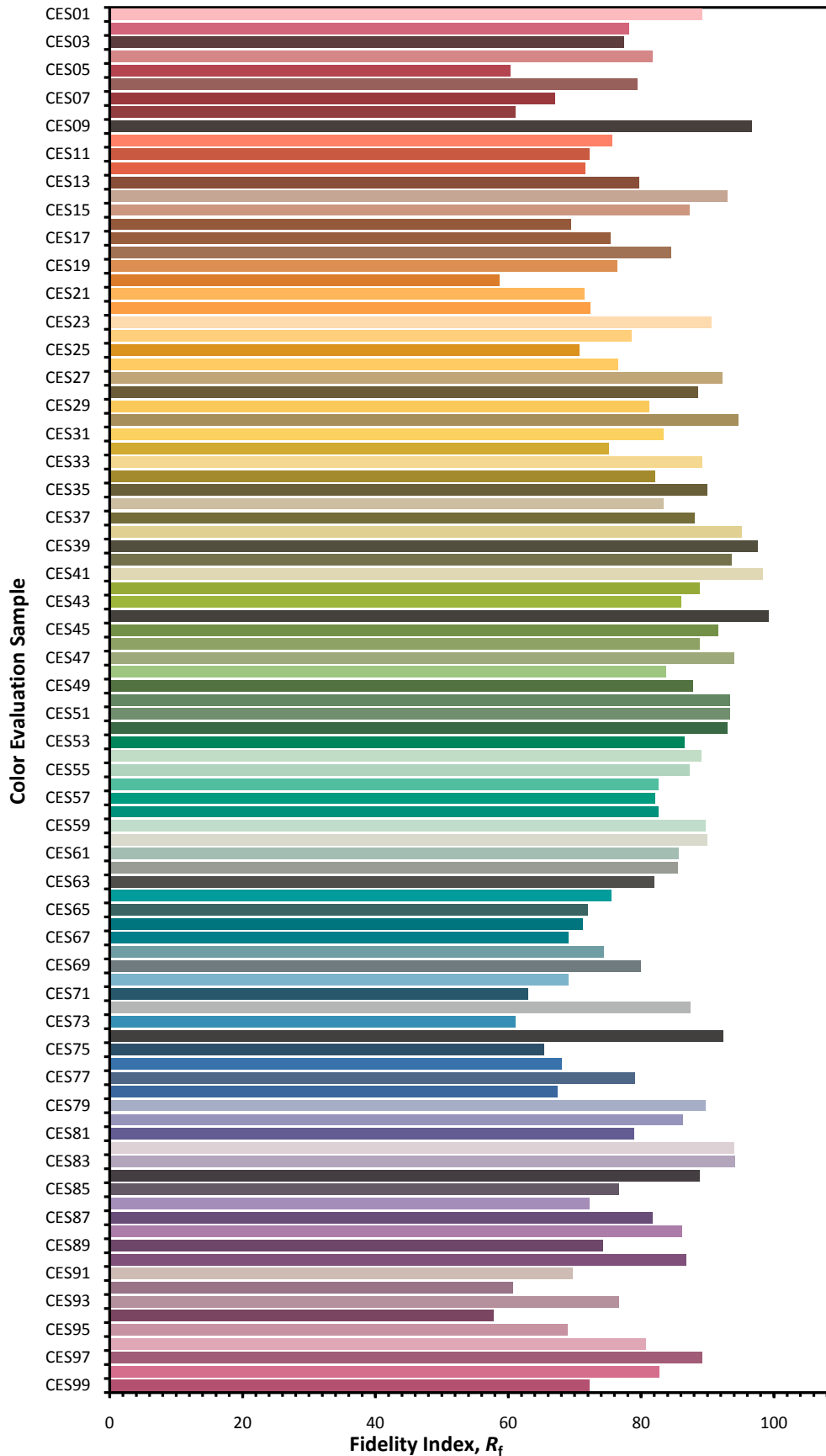


Color Vector Graphic

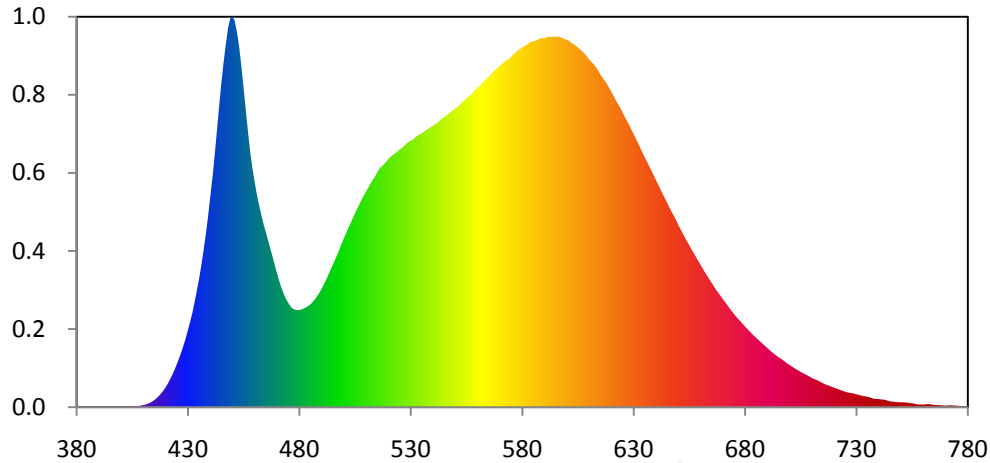


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



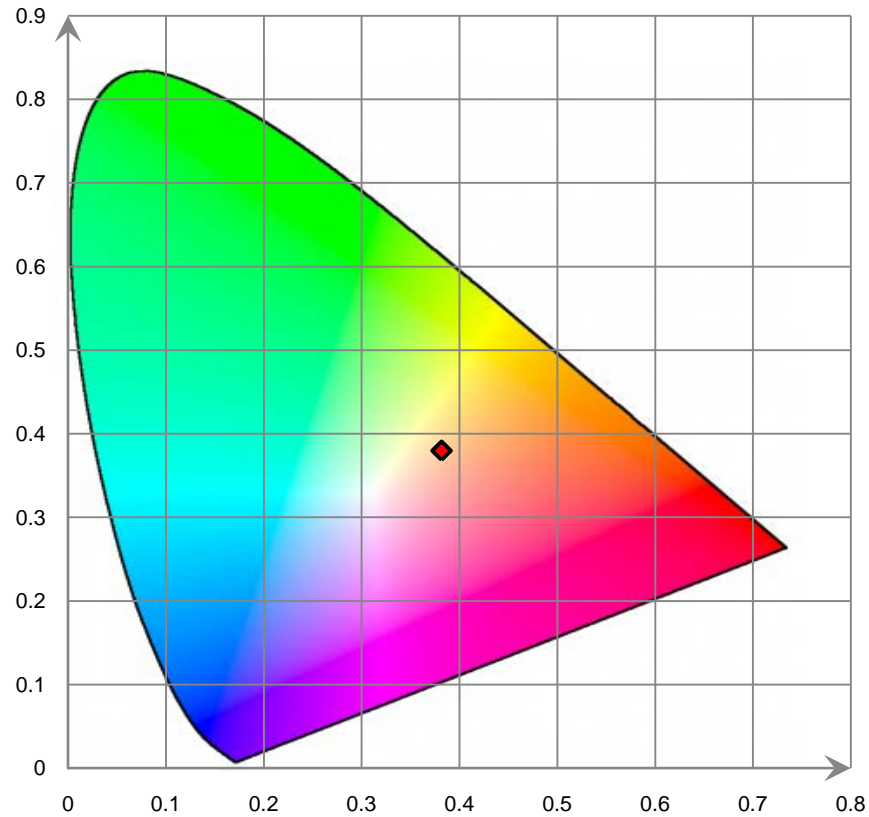
Relative Spectral Power Distribution



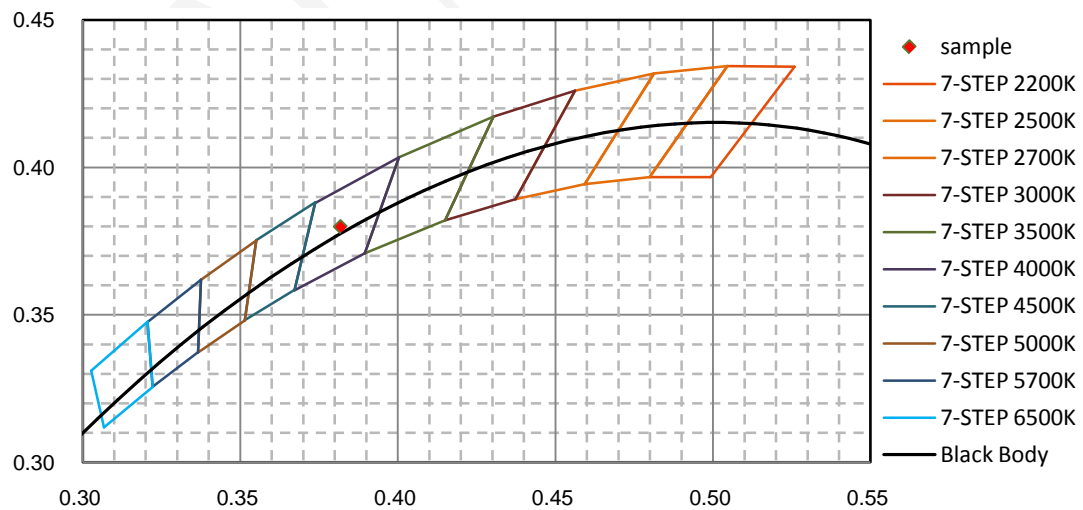
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.470E-02	421	3.643E+00	462	3.103E+01	503	2.834E+01	544	4.445E+01
381	3.430E-02	422	4.315E+00	463	2.953E+01	504	2.912E+01	545	4.470E+01
382	3.190E-02	423	5.003E+00	464	2.813E+01	505	2.986E+01	546	4.494E+01
383	4.680E-02	424	5.773E+00	465	2.692E+01	506	3.059E+01	547	4.519E+01
384	5.270E-02	425	6.607E+00	466	2.568E+01	507	3.129E+01	548	4.549E+01
385	4.590E-02	426	7.526E+00	467	2.443E+01	508	3.199E+01	549	4.579E+01
386	3.810E-02	427	8.471E+00	468	2.319E+01	509	3.266E+01	550	4.600E+01
387	3.350E-02	428	9.486E+00	469	2.186E+01	510	3.328E+01	551	4.623E+01
388	3.290E-02	429	1.061E+01	470	2.062E+01	511	3.386E+01	552	4.658E+01
389	4.150E-02	430	1.187E+01	471	1.942E+01	512	3.447E+01	553	4.695E+01
390	3.940E-02	431	1.317E+01	472	1.837E+01	513	3.507E+01	554	4.726E+01
391	1.680E-02	432	1.454E+01	473	1.748E+01	514	3.558E+01	555	4.755E+01
392	1.190E-02	433	1.619E+01	474	1.670E+01	515	3.617E+01	556	4.790E+01
393	2.280E-02	434	1.794E+01	475	1.609E+01	516	3.673E+01	557	4.811E+01
394	3.110E-02	435	1.978E+01	476	1.556E+01	517	3.712E+01	558	4.849E+01
395	3.310E-02	436	2.181E+01	477	1.520E+01	518	3.741E+01	559	4.893E+01
396	3.090E-02	437	2.413E+01	478	1.503E+01	519	3.781E+01	560	4.922E+01
397	2.350E-02	438	2.657E+01	479	1.495E+01	520	3.823E+01	561	4.949E+01
398	1.440E-02	439	2.928E+01	480	1.497E+01	521	3.860E+01	562	4.986E+01
399	7.100E-03	440	3.234E+01	481	1.506E+01	522	3.885E+01	563	5.027E+01
400	2.510E-02	441	3.538E+01	482	1.521E+01	523	3.912E+01	564	5.061E+01
401	3.330E-02	442	3.880E+01	483	1.538E+01	524	3.940E+01	565	5.090E+01
402	4.590E-02	443	4.254E+01	484	1.560E+01	525	3.968E+01	566	5.125E+01
403	6.380E-02	444	4.634E+01	485	1.584E+01	526	3.993E+01	567	5.169E+01
404	8.600E-02	445	4.994E+01	486	1.622E+01	527	4.023E+01	568	5.199E+01
405	1.128E-01	446	5.310E+01	487	1.663E+01	528	4.058E+01	569	5.226E+01
406	1.243E-01	447	5.590E+01	488	1.711E+01	529	4.085E+01	570	5.259E+01
407	1.547E-01	448	5.836E+01	489	1.763E+01	530	4.102E+01	571	5.287E+01
408	1.843E-01	449	5.992E+01	490	1.823E+01	531	4.123E+01	572	5.321E+01
409	2.581E-01	450	6.015E+01	491	1.889E+01	532	4.153E+01	573	5.347E+01
410	3.334E-01	451	5.952E+01	492	1.960E+01	533	4.183E+01	574	5.359E+01
411	4.084E-01	452	5.779E+01	493	2.037E+01	534	4.201E+01	575	5.397E+01
412	5.185E-01	453	5.554E+01	494	2.118E+01	535	4.221E+01	576	5.435E+01
413	6.865E-01	454	5.246E+01	495	2.193E+01	536	4.247E+01	577	5.467E+01
414	8.794E-01	455	4.914E+01	496	2.268E+01	537	4.268E+01	578	5.495E+01
415	1.119E+00	456	4.570E+01	497	2.348E+01	538	4.292E+01	579	5.516E+01
416	1.413E+00	457	4.229E+01	498	2.432E+01	539	4.318E+01	580	5.540E+01
417	1.736E+00	458	3.922E+01	499	2.518E+01	540	4.338E+01	581	5.562E+01
418	2.134E+00	459	3.667E+01	500	2.602E+01	541	4.360E+01	582	5.582E+01
419	2.582E+00	460	3.461E+01	501	2.681E+01	542	4.385E+01	583	5.610E+01
420	3.071E+00	461	3.266E+01	502	2.760E+01	543	4.416E+01	584	5.630E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	5.635E+01	626	4.478E+01	667	1.812E+01	708	4.904E+00	749	7.668E-01
586	5.643E+01	627	4.414E+01	668	1.766E+01	709	4.713E+00	750	7.543E-01
587	5.661E+01	628	4.349E+01	669	1.718E+01	710	4.516E+00	751	7.430E-01
588	5.678E+01	629	4.281E+01	670	1.670E+01	711	4.343E+00	752	7.360E-01
589	5.687E+01	630	4.208E+01	671	1.625E+01	712	4.217E+00	753	6.943E-01
590	5.686E+01	631	4.138E+01	672	1.579E+01	713	4.056E+00	754	6.312E-01
591	5.699E+01	632	4.072E+01	673	1.529E+01	714	3.875E+00	755	6.010E-01
592	5.708E+01	633	3.997E+01	674	1.485E+01	715	3.693E+00	756	5.663E-01
593	5.707E+01	634	3.925E+01	675	1.441E+01	716	3.527E+00	757	4.421E-01
594	5.709E+01	635	3.855E+01	676	1.397E+01	717	3.392E+00	758	4.144E-01
595	5.709E+01	636	3.784E+01	677	1.359E+01	718	3.280E+00	759	4.259E-01
596	5.710E+01	637	3.716E+01	678	1.322E+01	719	3.141E+00	760	4.085E-01
597	5.703E+01	638	3.645E+01	679	1.284E+01	720	3.004E+00	761	4.283E-01
598	5.685E+01	639	3.575E+01	680	1.245E+01	721	2.881E+00	762	4.836E-01
599	5.670E+01	640	3.504E+01	681	1.209E+01	722	2.755E+00	763	4.595E-01
600	5.663E+01	641	3.434E+01	682	1.172E+01	723	2.620E+00	764	3.931E-01
601	5.643E+01	642	3.363E+01	683	1.137E+01	724	2.511E+00	765	3.472E-01
602	5.615E+01	643	3.291E+01	684	1.102E+01	725	2.392E+00	766	3.263E-01
603	5.593E+01	644	3.224E+01	685	1.069E+01	726	2.282E+00	767	3.249E-01
604	5.570E+01	645	3.154E+01	686	1.039E+01	727	2.219E+00	768	2.988E-01
605	5.542E+01	646	3.083E+01	687	1.007E+01	728	2.155E+00	769	2.696E-01
606	5.515E+01	647	3.016E+01	688	9.763E+00	729	2.100E+00	770	2.344E-01
607	5.482E+01	648	2.954E+01	689	9.429E+00	730	1.993E+00	771	2.516E-01
608	5.447E+01	649	2.888E+01	690	9.122E+00	731	1.902E+00	772	2.989E-01
609	5.404E+01	650	2.816E+01	691	8.809E+00	732	1.808E+00	773	2.788E-01
610	5.360E+01	651	2.750E+01	692	8.514E+00	733	1.724E+00	774	2.558E-01
611	5.323E+01	652	2.684E+01	693	8.240E+00	734	1.672E+00	775	2.293E-01
612	5.286E+01	653	2.618E+01	694	7.977E+00	735	1.605E+00	776	1.959E-01
613	5.244E+01	654	2.557E+01	695	7.727E+00	736	1.514E+00	777	1.771E-01
614	5.192E+01	655	2.497E+01	696	7.499E+00	737	1.389E+00	778	1.739E-01
615	5.134E+01	656	2.434E+01	697	7.260E+00	738	1.286E+00	779	1.619E-01
616	5.082E+01	657	2.375E+01	698	7.001E+00	739	1.257E+00	780	1.397E-01
617	5.035E+01	658	2.316E+01	699	6.732E+00	740	1.255E+00		
618	4.982E+01	659	2.255E+01	700	6.500E+00	741	1.204E+00		
619	4.924E+01	660	2.200E+01	701	6.287E+00	742	1.171E+00		
620	4.862E+01	661	2.142E+01	702	6.064E+00	743	1.119E+00		
621	4.800E+01	662	2.082E+01	703	5.844E+00	744	1.018E+00		
622	4.730E+01	663	2.026E+01	704	5.645E+00	745	8.980E-01		
623	4.671E+01	664	1.973E+01	705	5.449E+00	746	8.621E-01		
624	4.615E+01	665	1.919E+01	706	5.265E+00	747	8.345E-01		
625	4.546E+01	666	1.866E+01	707	5.075E+00	748	8.009E-01		

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**

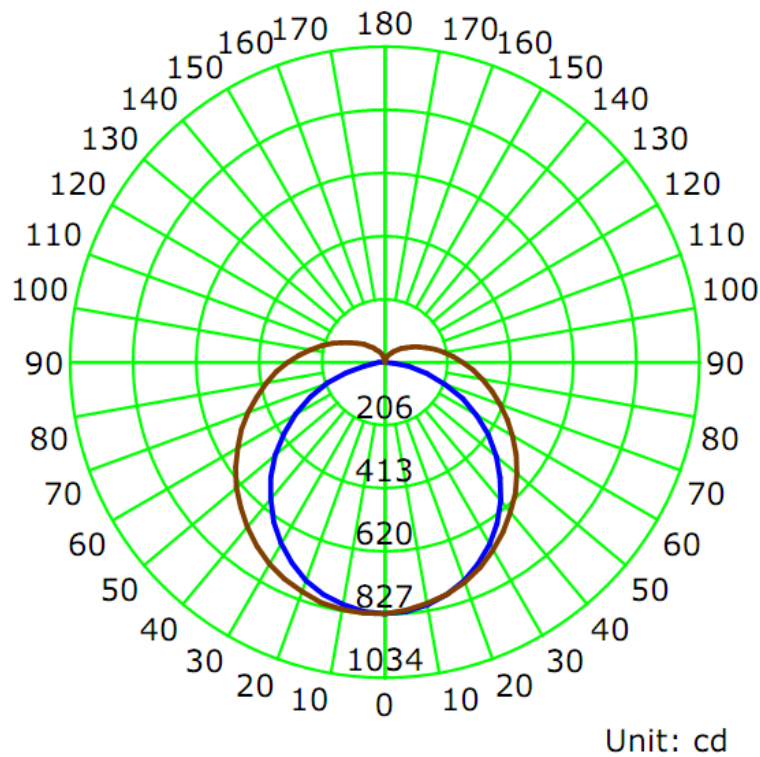
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2100	24.76	0.9830

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
3293.8	133.08	827.8	1.24	1.33

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	109.9	123.5	147.1	128.7	127.3
Field Angle (10% I_{max}):	158.9	216.9	259.7	229.8	216.3

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	823	823	823	823	823	823	823	823
5.0°	821	819	815	815	816	818	817	818
10.0°	807	805	802	803	803	806	803	806
15.0°	789	785	782	783	788	789	786	786
20.0°	762	756	755	761	767	765	760	759
25.0°	729	722	724	733	741	740	730	727
30.0°	688	684	687	702	712	709	697	686
35.0°	644	638	648	664	679	674	657	643
40.0°	593	588	602	625	643	637	616	595
45.0°	537	534	553	584	606	596	570	540
50.0°	480	479	503	540	567	554	524	484
55.0°	415	418	453	499	526	512	475	428
60.0°	350	356	403	454	485	471	428	369
65.0°	282	294	354	412	445	428	380	312
70.0°	213	234	306	370	404	387	333	255
75.0°	144	177	260	329	364	347	288	203
80.0°	80	127	219	293	326	308	248	156
85.0°	28	86	182	256	291	273	211	116
90.0°	2	57	150	223	257	237	177	85
95.0°	0	37	123	195	227	207	149	62
100.0°	0	25	101	167	197	179	124	46
105.0°	0	19	83	142	170	154	103	35
110.0°	0	15	67	120	145	130	84	27
115.0°	0	12	55	101	124	110	70	22
120.0°	0	11	46	84	104	92	58	19
125.0°	0	10	39	70	86	77	48	17
130.0°	0	10	33	58	72	63	40	15
135.0°	0	10	28	48	59	51	34	14
140.0°	0	10	25	40	47	42	28	13
145.0°	0	10	23	34	39	34	23	11
150.0°	0	11	20	29	31	27	17	9
155.0°	1	11	18	23	24	21	12	8
160.0°	1	10	15	19	19	14	10	6
165.0°	2	8	13	14	15	10	5	1
170.0°	2	1	9	10	9	5	2	1
175.0°	2	1	2	1	1	1	2	2
180.0°	0	0	0	0	0	0	0	0

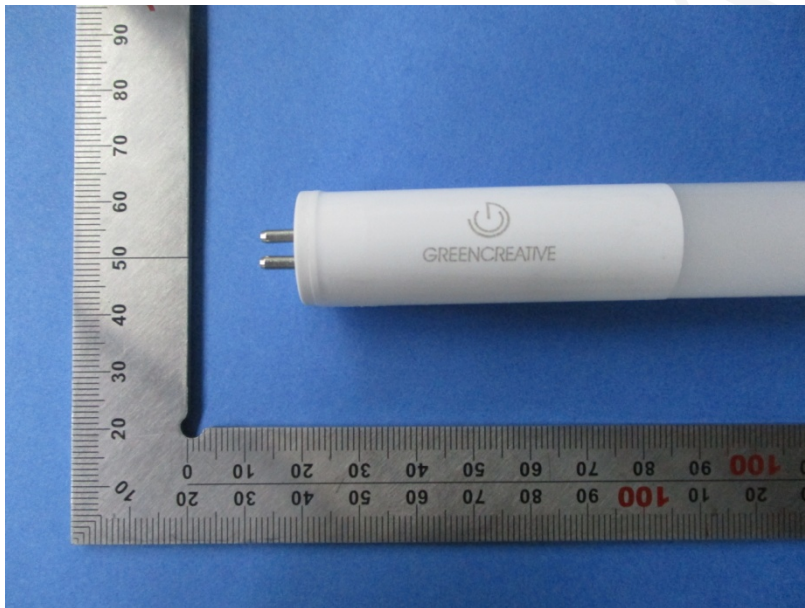
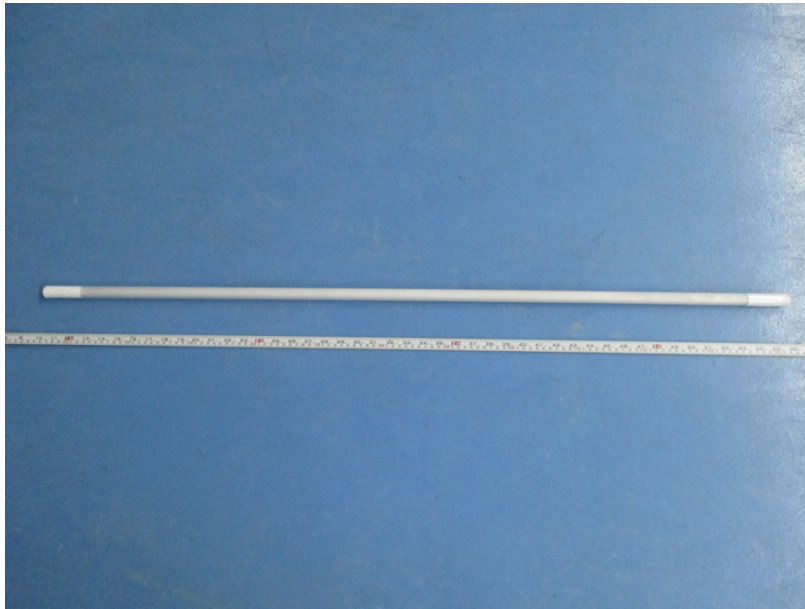
Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	823	823	823	823	823	823	823	823
5.0°	819	823	822	826	826	828	822	821
10.0°	806	813	817	823	822	823	816	812
15.0°	788	795	803	812	816	814	803	794
20.0°	761	772	785	797	801	799	785	771
25.0°	726	740	758	777	784	779	760	740
30.0°	686	702	727	751	763	754	731	703
35.0°	639	658	690	721	736	725	696	660
40.0°	587	612	647	687	706	693	658	615
45.0°	531	559	602	650	673	658	616	564
50.0°	472	503	555	609	639	620	573	510
55.0°	408	442	506	568	601	581	526	455
60.0°	341	382	455	523	561	540	480	397
65.0°	272	319	405	479	522	496	432	341
70.0°	203	256	354	436	481	451	383	284
75.0°	134	196	306	393	438	408	337	232
80.0°	70	145	260	350	398	367	295	182
85.0°	23	99	218	312	358	329	252	141
90.0°	0	67	183	275	321	294	219	106
95.0°	0	45	153	240	283	259	185	82
100.0°	0	33	128	208	249	225	158	63
105.0°	0	25	106	181	216	195	134	50
110.0°	0	20	88	155	186	168	112	40
115.0°	0	17	73	131	159	144	95	33
120.0°	0	16	60	110	135	121	80	28
125.0°	0	15	51	92	113	102	66	25
130.0°	0	13	43	77	94	85	56	23
135.0°	0	13	36	64	77	71	47	21
140.0°	0	12	31	52	64	58	40	19
145.0°	0	9	27	43	52	48	34	17
150.0°	0	7	22	35	42	39	29	16
155.0°	0	7	17	29	33	31	24	14
160.0°	1	5	14	22	26	25	20	12
165.0°	1	2	9	15	19	19	15	10
170.0°	1	2	5	9	13	13	11	2
175.0°	2	2	1	2	2	2	2	2
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	19.7	0.60	0-5	19.7	0.60
5-10	58.3	1.77	0-10	78.0	2.37
10-15	95.2	2.89	0-15	173.2	5.26
15-20	129.1	3.92	0-20	302.3	9.18
20-25	159.0	4.83	0-25	461.4	14.01
25-30	184.2	5.59	0-30	645.6	19.60
30-35	203.9	6.19	0-35	849.5	25.79
35-40	217.7	6.61	0-40	1067.1	32.40
40-45	225.4	6.84	0-45	1292.5	39.24
45-50	227.1	6.90	0-50	1519.7	46.14
50-55	223.2	6.78	0-55	1742.8	52.91
55-60	213.9	6.49	0-60	1956.7	59.41
60-65	200.0	6.07	0-65	2156.8	65.48
65-70	182.3	5.53	0-70	2339.1	71.01
70-75	161.8	4.91	0-75	2500.9	75.93
75-80	140.2	4.26	0-80	2641.0	80.18
80-85	118.9	3.61	0-85	2759.9	83.79
85-90	99.7	3.03	0-90	2859.6	86.82
90-95	83.8	2.54	0-95	2943.4	89.36
95-100	70.4	2.14	0-100	3013.9	91.50
100-105	58.7	1.78	0-105	3072.6	93.29
105-110	48.5	1.47	0-110	3121.1	94.76
110-115	39.6	1.20	0-115	3160.7	95.96
115-120	32.0	0.97	0-120	3192.8	96.93
120-125	25.6	0.78	0-125	3218.4	97.71
125-130	20.3	0.62	0-130	3238.7	98.33
130-135	15.8	0.48	0-135	3254.5	98.81
135-140	12.2	0.37	0-140	3266.7	99.18
140-145	9.2	0.28	0-145	3275.9	99.46
145-150	6.8	0.21	0-150	3282.6	99.66
150-155	4.8	0.14	0-155	3287.4	99.81
155-160	3.2	0.10	0-160	3290.6	99.90
160-165	1.9	0.06	0-165	3292.6	99.96
165-170	0.9	0.03	0-170	3293.5	99.99
170-175	0.3	0.01	0-175	3293.8	100.00
175-180	0.0	0.00	0-180	3293.8	100.00

6. Product Photo



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