



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/830/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
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/830/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: 3000K
 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**

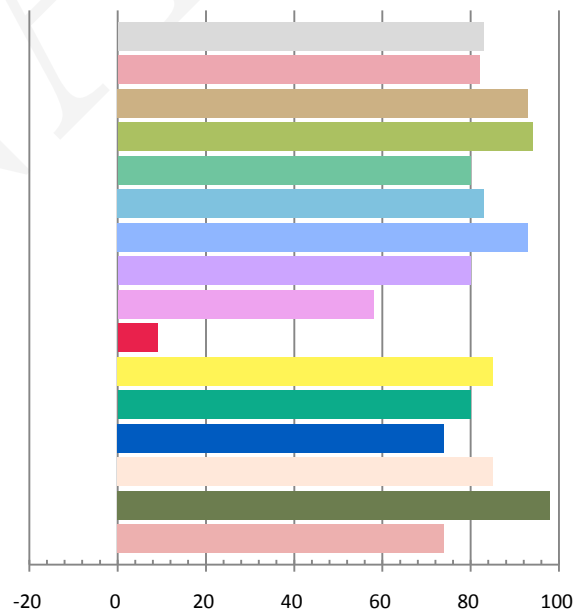
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.2097	24.64	0.9789	3352.4	136.04

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
10.219	2913	-0.00027	0.4429	0.4053	0.2539	0.5228

Color Rendering Index

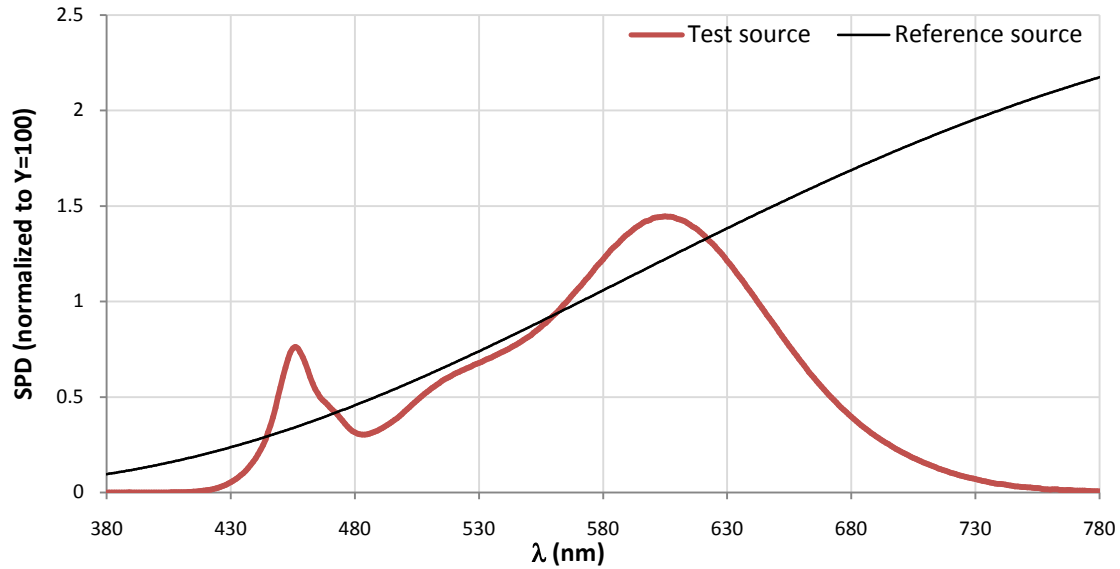
Ra 82.9			
R1 82	R2 93	R3 94	R4 80
R5 83	R6 93	R7 80	R8 58
R9 9	R10 85	R11 80	R12 74
R13 85	R14 98	R15 74	



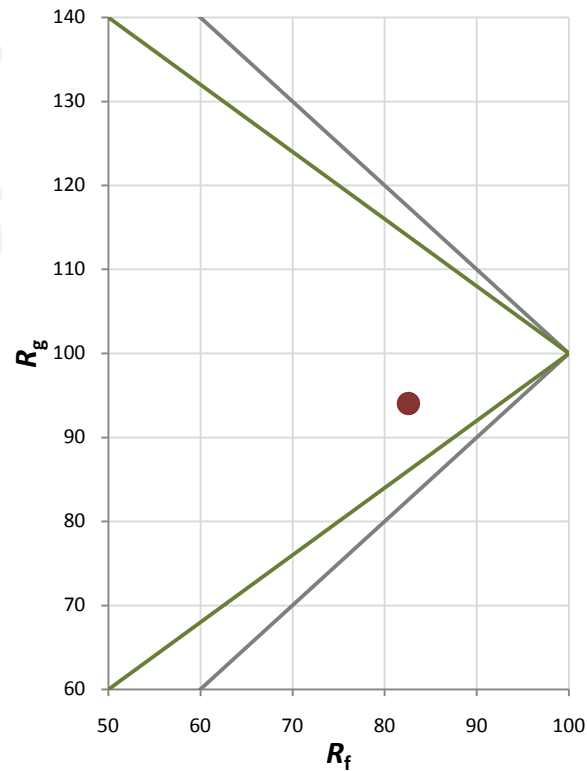
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	94

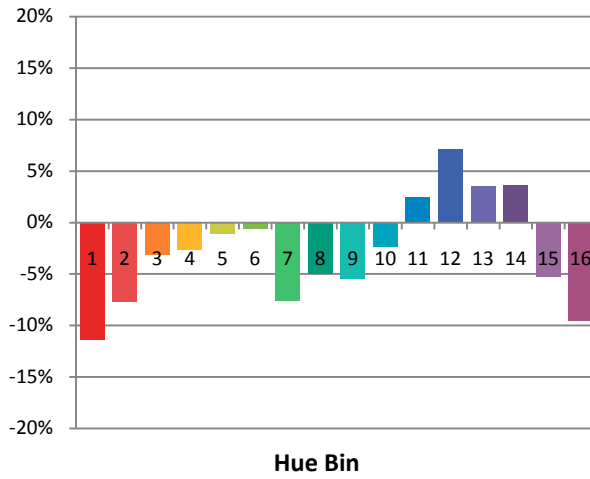
Spectral Power Distribution Comparison



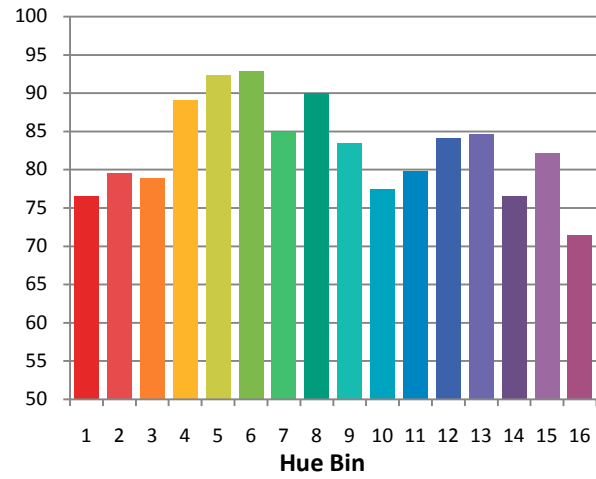
Plot of R_g versus R_f



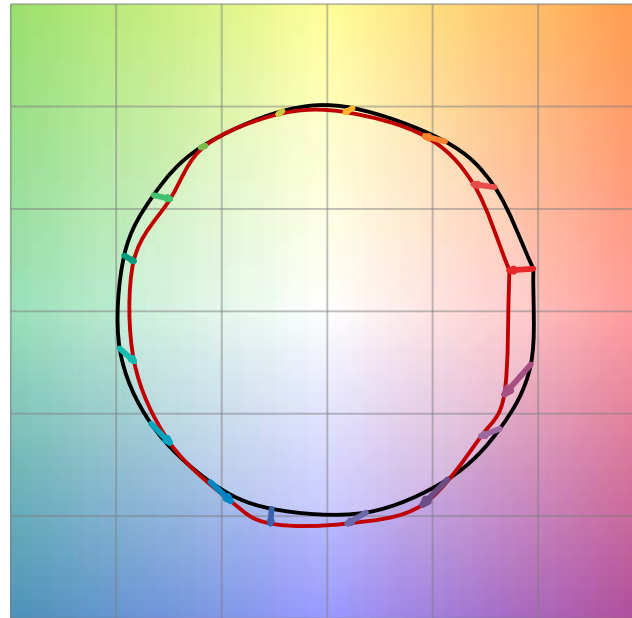
Chroma Shift by Hue



R_t by Hue

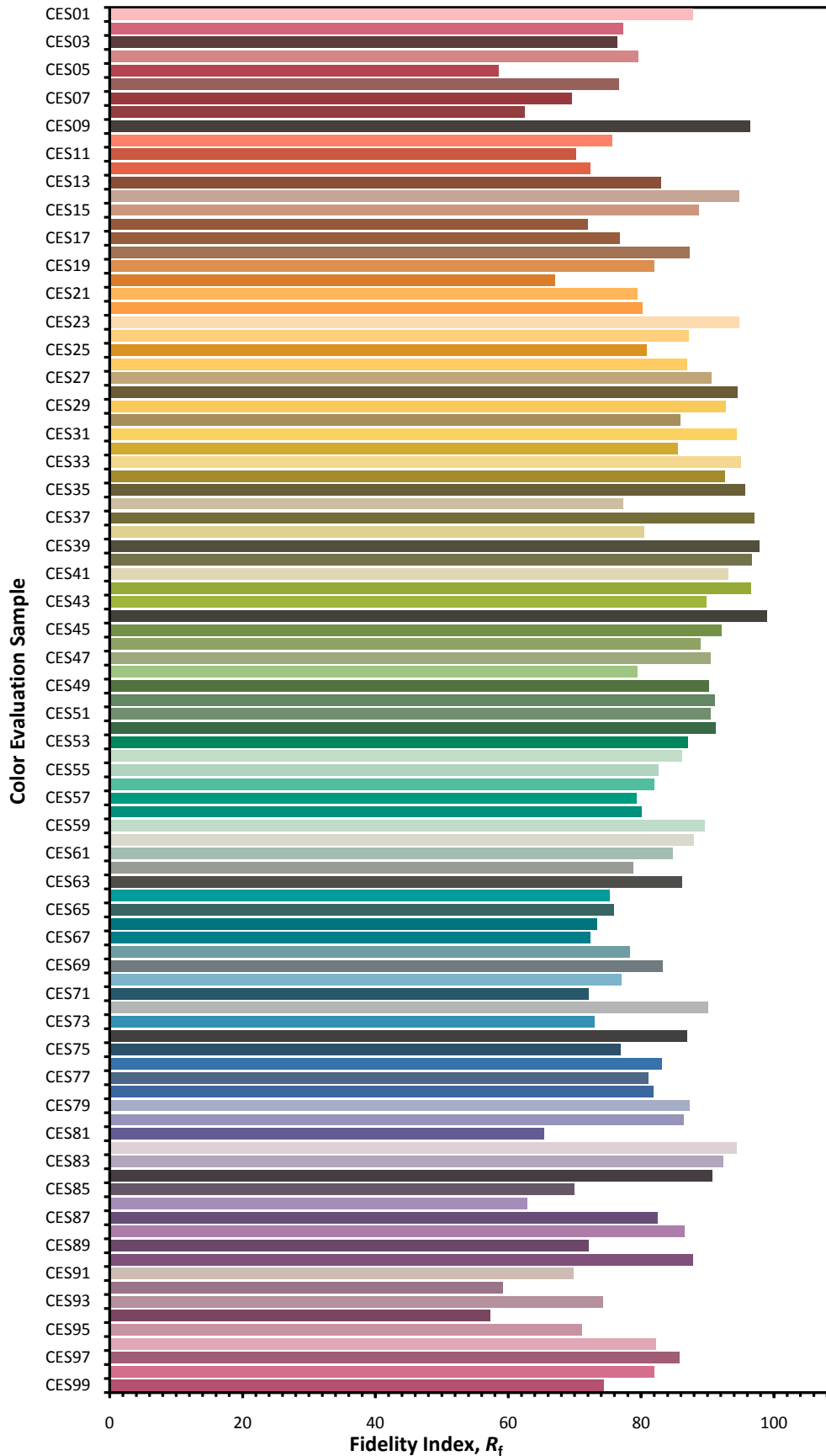


Color Vector Graphic

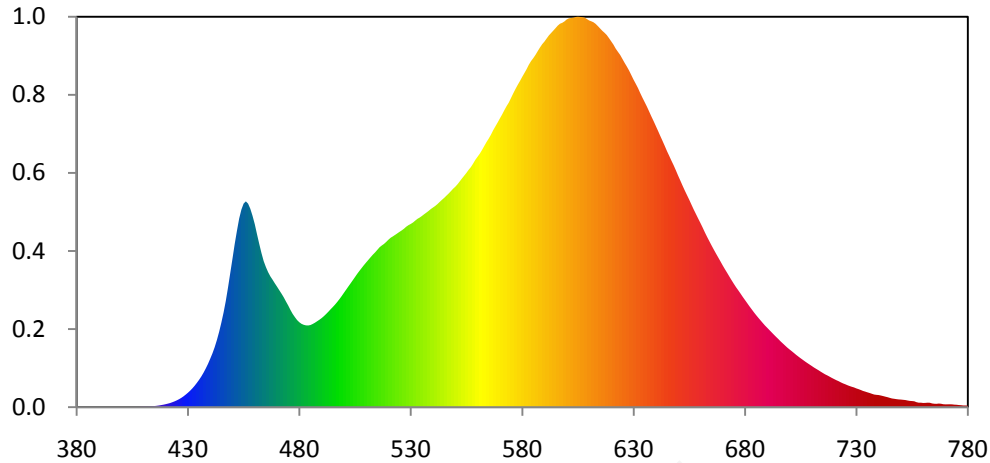


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



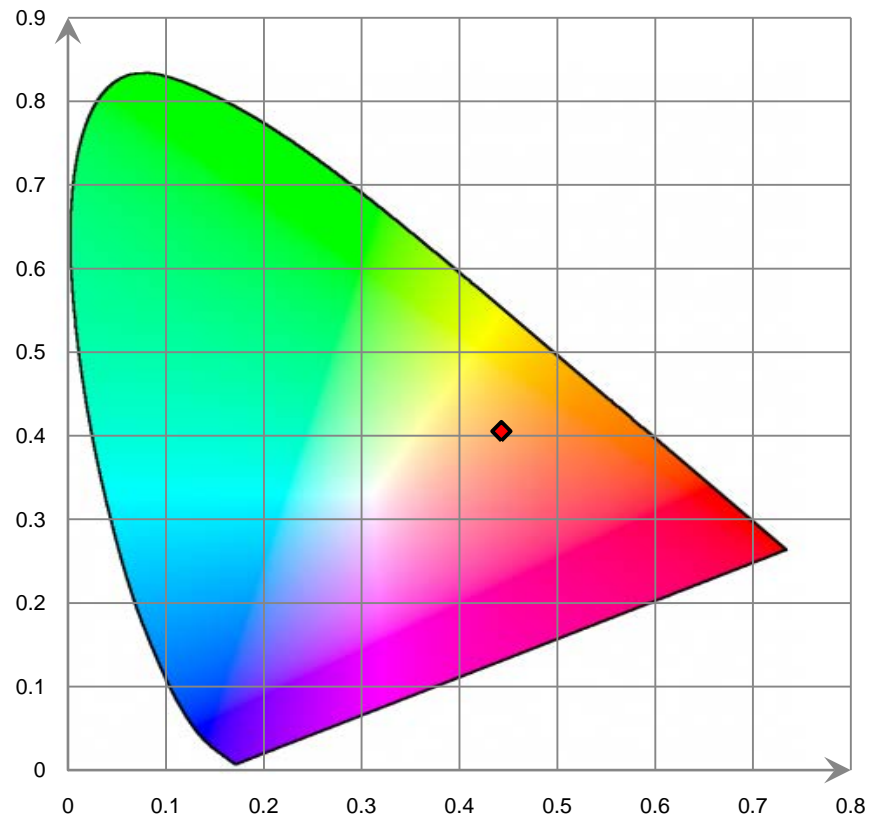
Relative Spectral Power Distribution



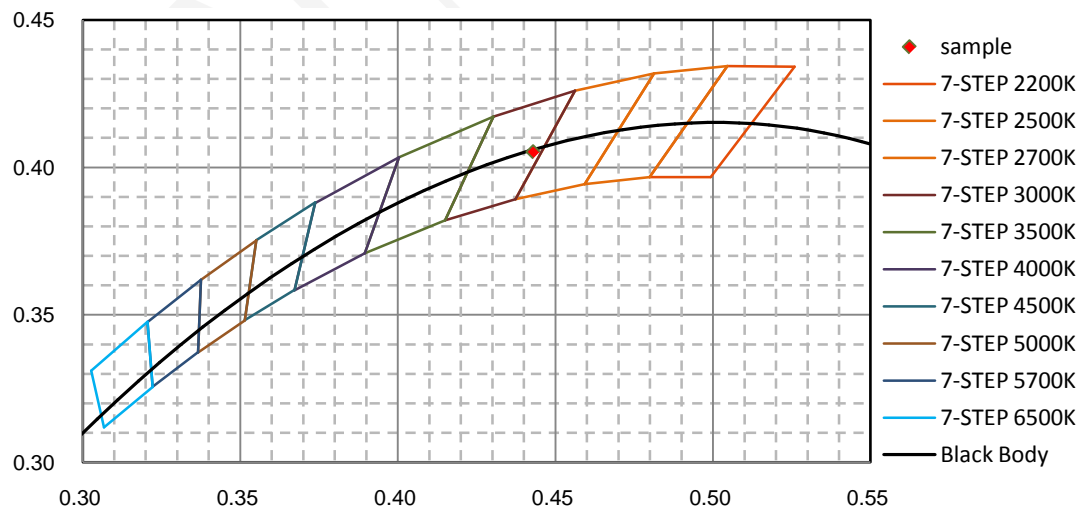
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.310E-02	421	6.483E-01	462	2.968E+01	503	2.249E+01	544	3.766E+01
381	2.470E-02	422	7.524E-01	463	2.801E+01	504	2.307E+01	545	3.801E+01
382	1.590E-02	423	8.977E-01	464	2.654E+01	505	2.365E+01	546	3.841E+01
383	2.540E-02	424	1.058E+00	465	2.545E+01	506	2.424E+01	547	3.880E+01
384	3.150E-02	425	1.238E+00	466	2.452E+01	507	2.477E+01	548	3.923E+01
385	1.920E-02	426	1.448E+00	467	2.376E+01	508	2.529E+01	549	3.967E+01
386	2.420E-02	427	1.691E+00	468	2.315E+01	509	2.581E+01	550	4.005E+01
387	2.210E-02	428	1.964E+00	469	2.250E+01	510	2.629E+01	551	4.049E+01
388	2.490E-02	429	2.281E+00	470	2.189E+01	511	2.677E+01	552	4.102E+01
389	3.580E-02	430	2.624E+00	471	2.125E+01	512	2.724E+01	553	4.155E+01
390	3.500E-02	431	3.001E+00	472	2.063E+01	513	2.771E+01	554	4.205E+01
391	1.540E-02	432	3.417E+00	473	1.996E+01	514	2.812E+01	555	4.256E+01
392	9.800E-03	433	3.889E+00	474	1.920E+01	515	2.858E+01	556	4.313E+01
393	8.500E-03	434	4.410E+00	475	1.848E+01	516	2.904E+01	557	4.361E+01
394	1.280E-02	435	4.964E+00	476	1.767E+01	517	2.937E+01	558	4.425E+01
395	1.500E-02	436	5.575E+00	477	1.695E+01	518	2.966E+01	559	4.493E+01
396	1.130E-02	437	6.264E+00	478	1.636E+01	519	3.003E+01	560	4.549E+01
397	7.700E-03	438	7.028E+00	479	1.582E+01	520	3.043E+01	561	4.605E+01
398	4.500E-03	439	7.861E+00	480	1.543E+01	521	3.078E+01	562	4.672E+01
399	2.300E-03	440	8.795E+00	481	1.514E+01	522	3.103E+01	563	4.745E+01
400	1.430E-02	441	9.774E+00	482	1.496E+01	523	3.130E+01	564	4.815E+01
401	1.760E-02	442	1.089E+01	483	1.486E+01	524	3.157E+01	565	4.880E+01
402	1.710E-02	443	1.220E+01	484	1.485E+01	525	3.186E+01	566	4.949E+01
403	1.910E-02	444	1.369E+01	485	1.492E+01	526	3.212E+01	567	5.031E+01
404	2.670E-02	445	1.536E+01	486	1.511E+01	527	3.242E+01	568	5.101E+01
405	2.980E-02	446	1.720E+01	487	1.534E+01	528	3.279E+01	569	5.170E+01
406	3.820E-02	447	1.931E+01	488	1.561E+01	529	3.307E+01	570	5.244E+01
407	4.160E-02	448	2.176E+01	489	1.588E+01	530	3.328E+01	571	5.315E+01
408	4.240E-02	449	2.438E+01	490	1.618E+01	531	3.354E+01	572	5.393E+01
409	7.460E-02	450	2.699E+01	491	1.653E+01	532	3.389E+01	573	5.467E+01
410	9.730E-02	451	2.966E+01	492	1.691E+01	533	3.421E+01	574	5.532E+01
411	9.580E-02	452	3.205E+01	493	1.732E+01	534	3.444E+01	575	5.615E+01
412	9.990E-02	453	3.427E+01	494	1.777E+01	535	3.472E+01	576	5.700E+01
413	1.297E-01	454	3.590E+01	495	1.819E+01	536	3.505E+01	577	5.779E+01
414	1.625E-01	455	3.699E+01	496	1.862E+01	537	3.533E+01	578	5.854E+01
415	2.038E-01	456	3.739E+01	497	1.911E+01	538	3.565E+01	579	5.923E+01
416	2.539E-01	457	3.697E+01	498	1.963E+01	539	3.599E+01	580	5.998E+01
417	3.108E-01	458	3.605E+01	499	2.018E+01	540	3.628E+01	581	6.068E+01
418	3.841E-01	459	3.476E+01	500	2.077E+01	541	3.656E+01	582	6.140E+01
419	4.548E-01	460	3.325E+01	501	2.134E+01	542	3.690E+01	583	6.220E+01
420	5.478E-01	461	3.143E+01	502	2.192E+01	543	3.729E+01	584	6.287E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	6.340E+01	626	6.255E+01	667	2.792E+01	708	8.020E+00	749	1.410E+00
586	6.400E+01	627	6.188E+01	668	2.721E+01	709	7.751E+00	750	1.384E+00
587	6.468E+01	628	6.115E+01	669	2.650E+01	710	7.483E+00	751	1.342E+00
588	6.534E+01	629	6.033E+01	670	2.577E+01	711	7.210E+00	752	1.297E+00
589	6.594E+01	630	5.950E+01	671	2.508E+01	712	6.957E+00	753	1.214E+00
590	6.641E+01	631	5.875E+01	672	2.442E+01	713	6.718E+00	754	1.144E+00
591	6.697E+01	632	5.797E+01	673	2.374E+01	714	6.454E+00	755	1.113E+00
592	6.753E+01	633	5.707E+01	674	2.307E+01	715	6.203E+00	756	1.074E+00
593	6.797E+01	634	5.622E+01	675	2.243E+01	716	5.968E+00	757	9.060E-01
594	6.841E+01	635	5.541E+01	676	2.181E+01	717	5.768E+00	758	8.166E-01
595	6.886E+01	636	5.461E+01	677	2.123E+01	718	5.546E+00	759	8.177E-01
596	6.932E+01	637	5.372E+01	678	2.065E+01	719	5.322E+00	760	7.628E-01
597	6.966E+01	638	5.283E+01	679	2.005E+01	720	5.111E+00	761	7.831E-01
598	6.982E+01	639	5.198E+01	680	1.948E+01	721	4.909E+00	762	8.156E-01
599	7.007E+01	640	5.108E+01	681	1.891E+01	722	4.729E+00	763	7.982E-01
600	7.043E+01	641	5.020E+01	682	1.834E+01	723	4.515E+00	764	6.813E-01
601	7.064E+01	642	4.928E+01	683	1.780E+01	724	4.329E+00	765	6.213E-01
602	7.069E+01	643	4.838E+01	684	1.726E+01	725	4.174E+00	766	6.092E-01
603	7.076E+01	644	4.747E+01	685	1.674E+01	726	3.992E+00	767	6.565E-01
604	7.088E+01	645	4.653E+01	686	1.625E+01	727	3.836E+00	768	6.262E-01
605	7.093E+01	646	4.567E+01	687	1.578E+01	728	3.699E+00	769	5.356E-01
606	7.090E+01	647	4.479E+01	688	1.530E+01	729	3.582E+00	770	5.092E-01
607	7.086E+01	648	4.394E+01	689	1.484E+01	730	3.414E+00	771	5.166E-01
608	7.078E+01	649	4.303E+01	690	1.443E+01	731	3.274E+00	772	5.247E-01
609	7.053E+01	650	4.207E+01	691	1.401E+01	732	3.117E+00	773	5.098E-01
610	7.026E+01	651	4.117E+01	692	1.359E+01	733	2.950E+00	774	4.640E-01
611	7.011E+01	652	4.025E+01	693	1.317E+01	734	2.833E+00	775	4.431E-01
612	6.993E+01	653	3.937E+01	694	1.277E+01	735	2.699E+00	776	3.871E-01
613	6.963E+01	654	3.852E+01	695	1.237E+01	736	2.576E+00	777	3.614E-01
614	6.922E+01	655	3.769E+01	696	1.196E+01	737	2.431E+00	778	3.122E-01
615	6.880E+01	656	3.680E+01	697	1.159E+01	738	2.297E+00	779	3.113E-01
616	6.837E+01	657	3.592E+01	698	1.121E+01	739	2.243E+00	780	2.893E-01
617	6.800E+01	658	3.510E+01	699	1.083E+01	740	2.207E+00		
618	6.759E+01	659	3.428E+01	700	1.049E+01	741	2.124E+00		
619	6.704E+01	660	3.348E+01	701	1.018E+01	742	2.023E+00		
620	6.644E+01	661	3.265E+01	702	9.842E+00	743	1.912E+00		
621	6.585E+01	662	3.178E+01	703	9.505E+00	744	1.817E+00		
622	6.513E+01	663	3.095E+01	704	9.189E+00	745	1.694E+00		
623	6.455E+01	664	3.017E+01	705	8.887E+00	746	1.585E+00		
624	6.399E+01	665	2.940E+01	706	8.594E+00	747	1.527E+00		
625	6.328E+01	666	2.865E+01	707	8.298E+00	748	1.459E+00		

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**

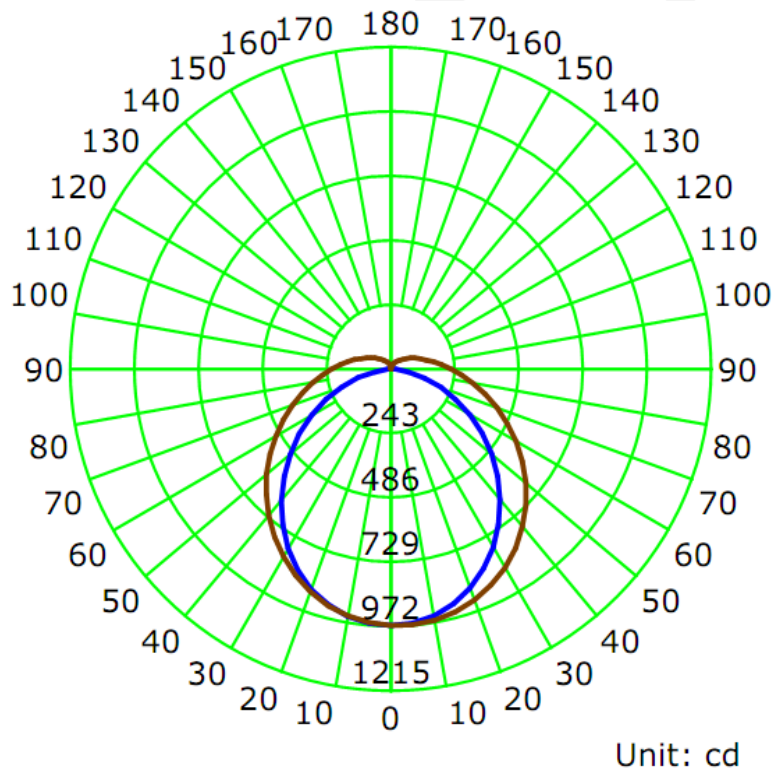
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2090	24.64	0.9820

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
3355.3	136.22	972.2	1.20	1.29

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	102.0	113.9	127.2	114.7	114.5
Field Angle (10% I_{max}):	155.4	202.9	233.7	203.8	199.0

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	969	969	969	969	969	969	969	969
5.0°	964	966	964	967	969	972	969	966
10.0°	945	950	955	960	964	965	958	955
15.0°	919	925	935	943	949	949	942	931
20.0°	879	890	905	920	927	929	912	898
25.0°	831	846	869	887	898	898	879	857
30.0°	777	795	823	850	866	862	835	804
35.0°	714	735	770	805	825	818	785	747
40.0°	645	672	712	755	776	769	730	683
45.0°	572	603	653	702	726	718	669	614
50.0°	498	534	590	643	670	657	606	541
55.0°	422	462	525	584	611	597	540	469
60.0°	348	390	462	523	550	533	476	397
65.0°	274	320	399	462	489	471	412	327
70.0°	202	256	337	400	429	411	351	263
75.0°	132	197	282	347	371	353	293	201
80.0°	71	146	233	295	318	300	243	148
85.0°	20	103	192	249	271	254	197	104
90.0°	0	71	155	209	229	212	159	72
95.0°	0	49	126	178	195	178	130	49
100.0°	0	35	103	149	165	150	105	35
105.0°	0	27	84	125	140	126	85	26
110.0°	0	21	69	105	119	106	69	20
115.0°	0	18	57	89	101	89	57	17
120.0°	0	16	48	75	85	75	48	16
125.0°	0	15	41	64	72	64	41	15
130.0°	0	14	35	54	61	53	35	12
135.0°	0	13	31	46	52	46	30	12
140.0°	0	13	28	40	44	39	26	11
145.0°	0	13	26	35	37	32	22	10
150.0°	1	13	22	30	32	28	17	8
155.0°	1	13	19	24	25	20	12	7
160.0°	2	12	17	20	20	14	9	4
165.0°	2	10	14	15	16	10	4	2
170.0°	2	3	9	11	8	4	2	2
175.0°	2	2	3	2	3	2	3	2
180.0°	0	0	0	0	0	0	0	0

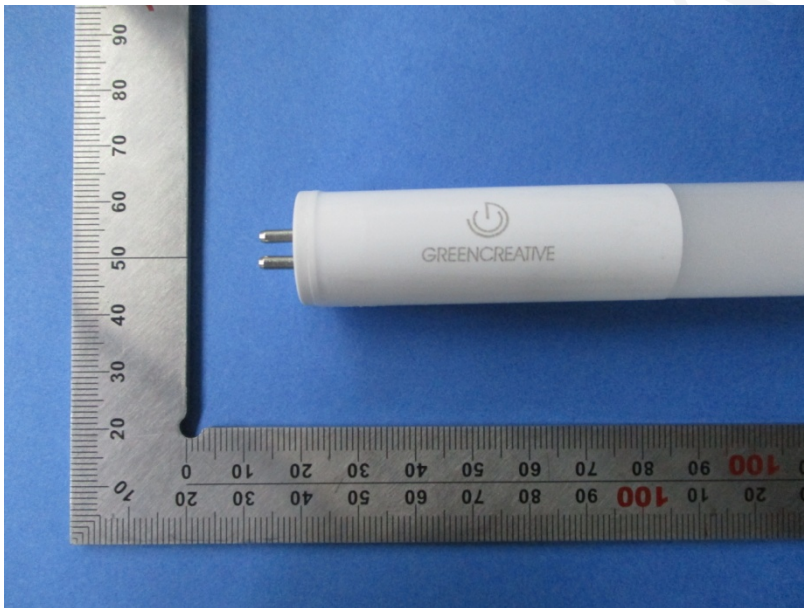
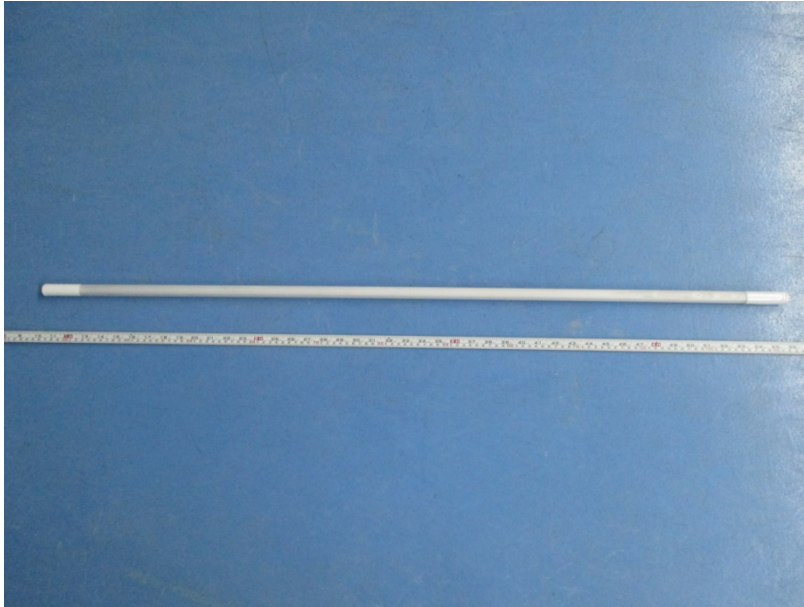
Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	969	969	969	969	969	969	969	969
5.0°	964	963	960	961	961	963	958	959
10.0°	947	946	944	944	944	946	942	943
15.0°	922	919	917	920	925	923	914	910
20.0°	885	880	885	888	894	890	879	873
25.0°	837	834	840	852	859	853	834	825
30.0°	783	780	792	806	816	810	787	770
35.0°	717	719	737	757	773	759	732	708
40.0°	649	656	678	706	722	708	673	644
45.0°	575	585	615	652	670	650	611	575
50.0°	502	515	554	593	617	593	551	504
55.0°	424	443	493	536	560	536	488	435
60.0°	348	373	430	478	504	481	428	365
65.0°	272	306	372	424	450	426	372	300
70.0°	200	241	316	373	399	373	316	239
75.0°	129	184	265	323	350	323	267	183
80.0°	65	136	220	278	304	277	223	135
85.0°	17	95	182	240	263	240	183	97
90.0°	0	65	150	205	228	207	152	68
95.0°	0	46	123	174	196	176	124	49
100.0°	0	34	102	148	168	149	103	36
105.0°	0	26	84	127	144	127	86	28
110.0°	0	21	70	109	123	109	72	23
115.0°	0	18	58	91	105	93	60	20
120.0°	0	16	49	78	89	79	51	18
125.0°	0	15	42	66	76	67	43	17
130.0°	0	14	36	56	65	57	38	16
135.0°	0	13	31	48	55	49	33	15
140.0°	0	13	28	41	47	42	29	14
145.0°	0	11	25	36	40	36	27	13
150.0°	0	8	21	31	34	31	23	12
155.0°	1	8	16	26	28	26	20	11
160.0°	1	6	14	21	22	22	17	9
165.0°	2	2	10	15	18	17	13	5
170.0°	2	2	6	9	13	12	8	2
175.0°	2	2	3	2	2	3	2	2
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	23.1	0.69	0-5	23.1	0.69
5-10	68.5	2.04	0-10	91.6	2.73
10-15	111.4	3.32	0-15	203.0	6.05
15-20	150.3	4.48	0-20	353.2	10.53
20-25	183.7	5.48	0-25	537.0	16.00
25-30	210.8	6.28	0-30	747.8	22.29
30-35	230.6	6.87	0-35	978.4	29.16
35-40	242.8	7.24	0-40	1221.2	36.40
40-45	247.3	7.37	0-45	1468.4	43.76
45-50	244.5	7.29	0-50	1712.9	51.05
50-55	235.0	7.00	0-55	1947.9	58.05
55-60	219.7	6.55	0-60	2167.6	64.60
60-65	199.9	5.96	0-65	2367.6	70.56
65-70	176.9	5.27	0-70	2544.5	75.83
70-75	152.0	4.53	0-75	2696.4	80.36
75-80	126.9	3.78	0-80	2823.4	84.15
80-85	103.6	3.09	0-85	2926.9	87.23
85-90	83.6	2.49	0-90	3010.6	89.73
90-95	68.0	2.03	0-95	3078.6	91.75
95-100	55.6	1.66	0-100	3134.2	93.41
100-105	45.4	1.35	0-105	3179.6	94.76
105-110	37.1	1.10	0-110	3216.6	95.87
110-115	30.2	0.90	0-115	3246.8	96.77
115-120	24.5	0.73	0-120	3271.3	97.50
120-125	19.9	0.59	0-125	3291.2	98.09
125-130	16.1	0.48	0-130	3307.3	98.57
130-135	12.9	0.38	0-135	3320.1	98.95
135-140	10.3	0.31	0-140	3330.4	99.26
140-145	8.1	0.24	0-145	3338.5	99.50
145-150	6.2	0.18	0-150	3344.7	99.68
150-155	4.5	0.13	0-155	3349.2	99.82
155-160	3.0	0.09	0-160	3352.2	99.91
160-165	1.9	0.06	0-165	3354.1	99.96
165-170	0.9	0.03	0-170	3355.0	99.99
170-175	0.3	0.01	0-175	3355.3	100.00
175-180	0.0	0.00	0-180	3355.3	100.00

6. Product Photo



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