



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/850/BYP

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180820083-10-5
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/850/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: 5000K
 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**

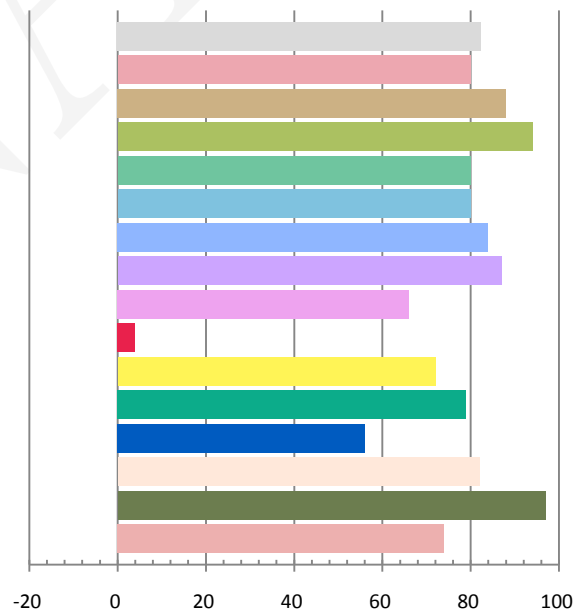
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.2114	24.81	0.9777	3316	133.66

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
10.098	4886	0.00365	0.3493	0.3623	0.2101	0.4904

Color Rendering Index

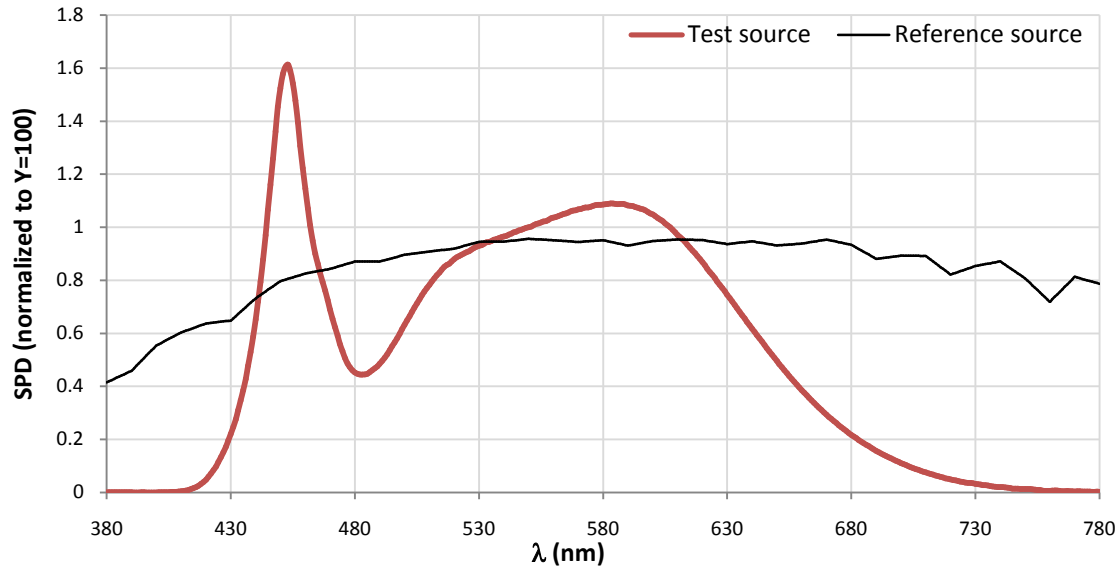
Ra 82.4			
R1 80	R2 88	R3 94	R4 80
R5 80	R6 84	R7 87	R8 66
R9 4	R10 72	R11 79	R12 56
R13 82	R14 97	R15 74	



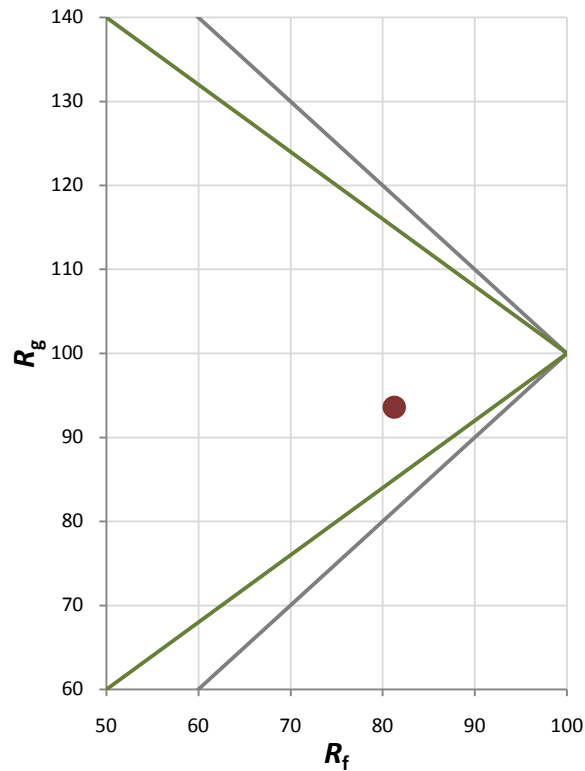
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	94

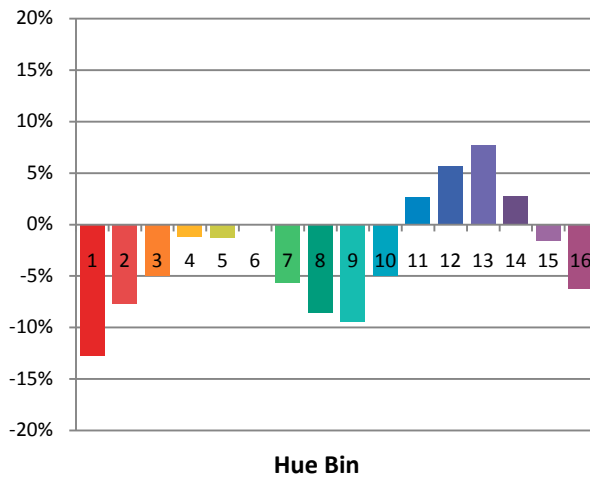
Spectral Power Distribution Comparison



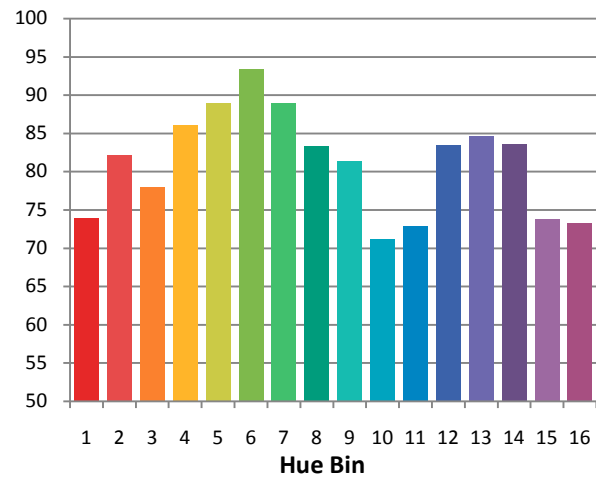
Plot of R_g versus R_f



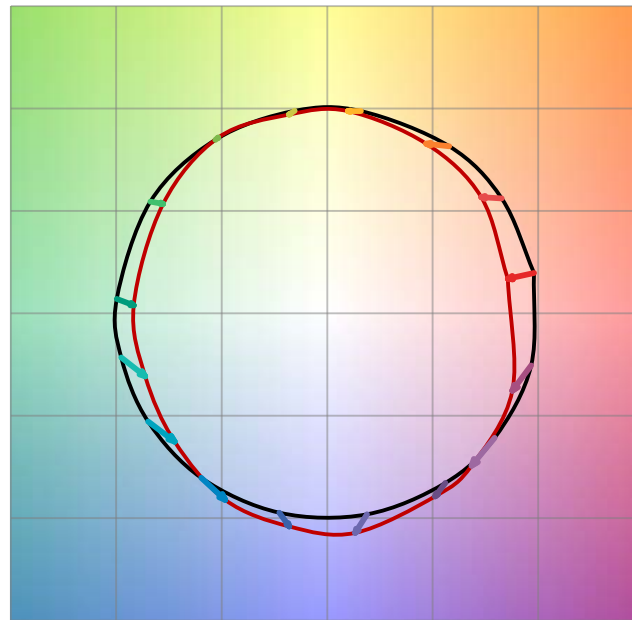
Chroma Shift by Hue



R_t by Hue

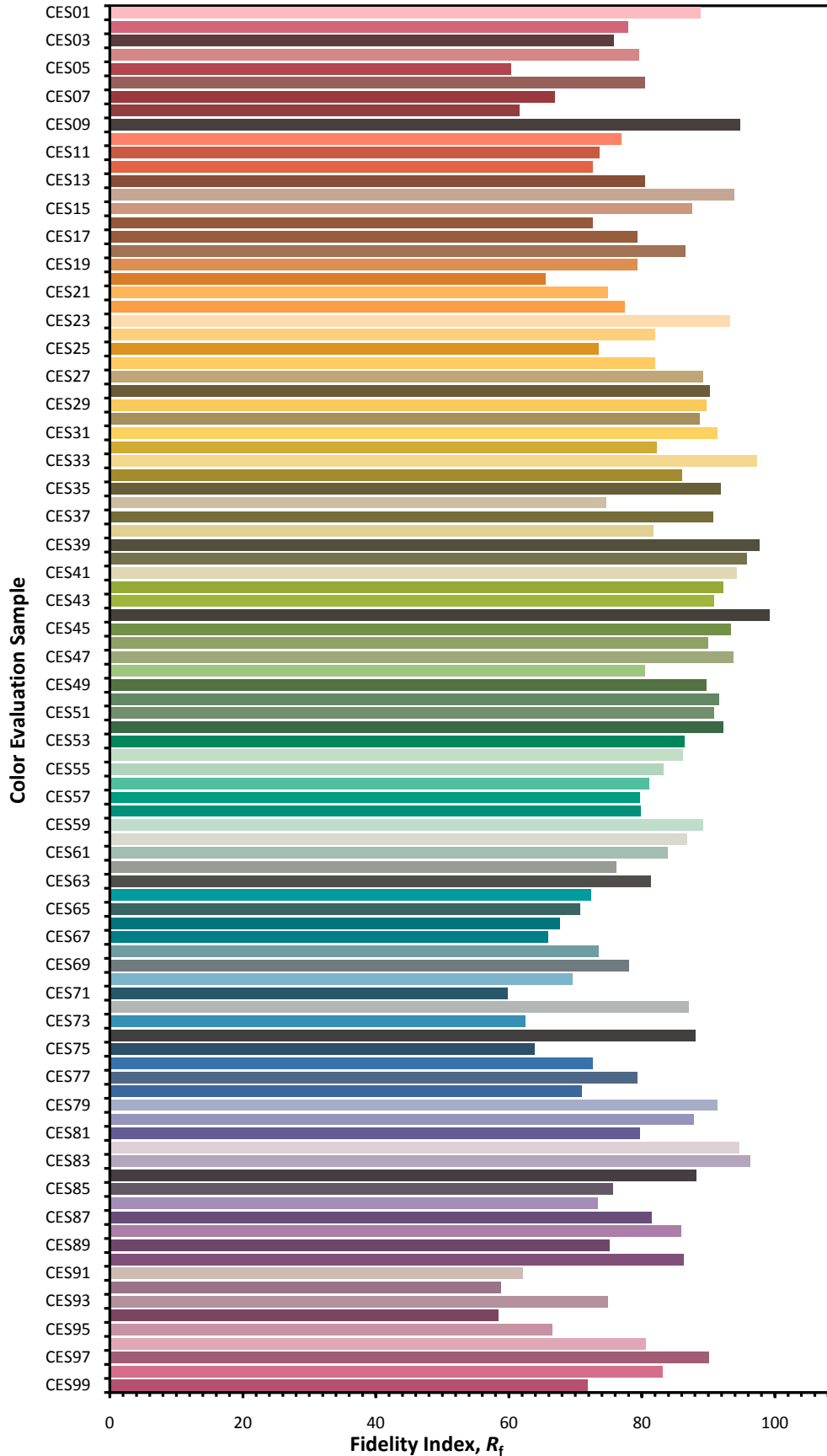


Color Vector Graphic

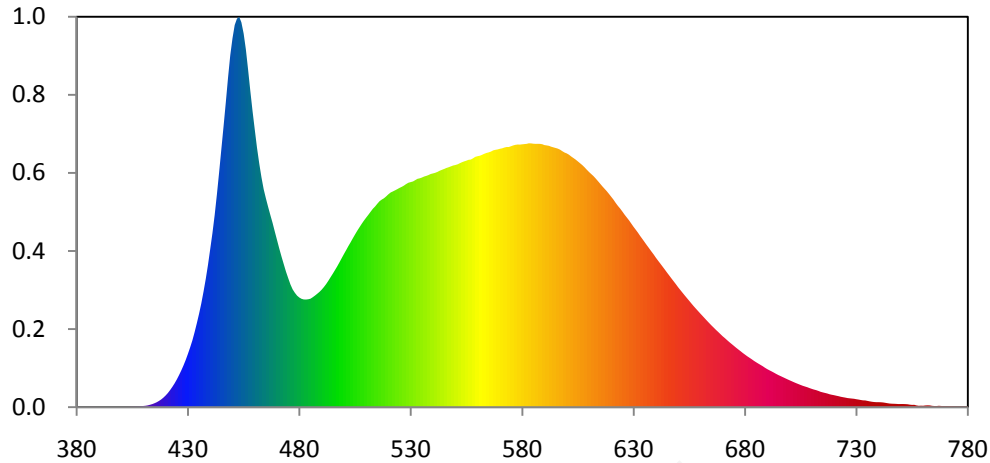


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



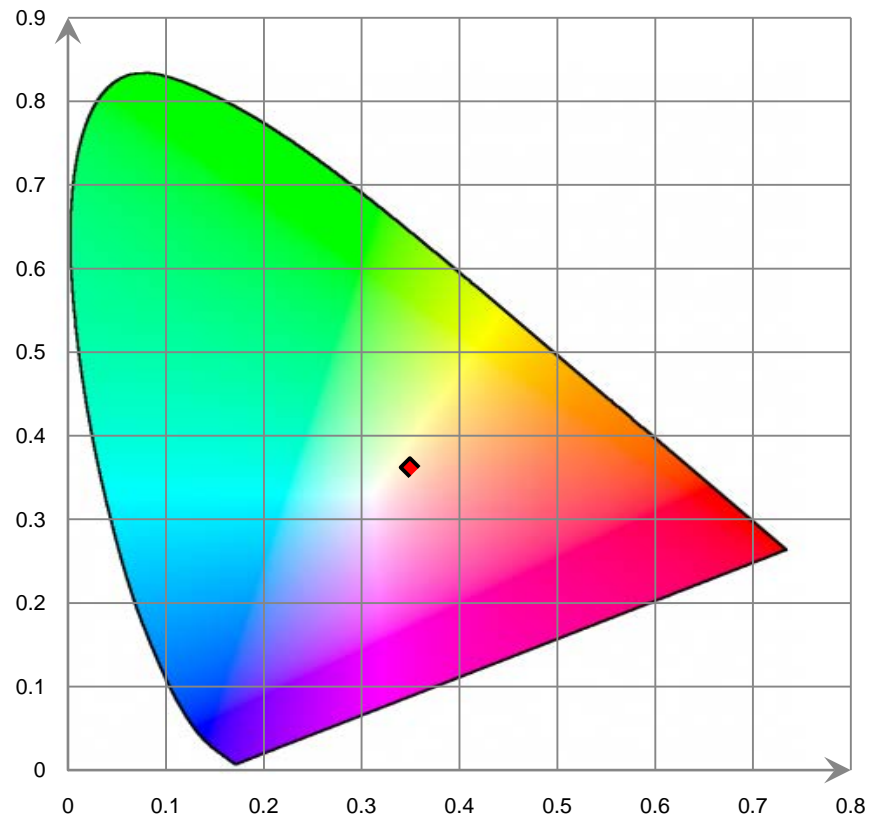
Relative Spectral Power Distribution



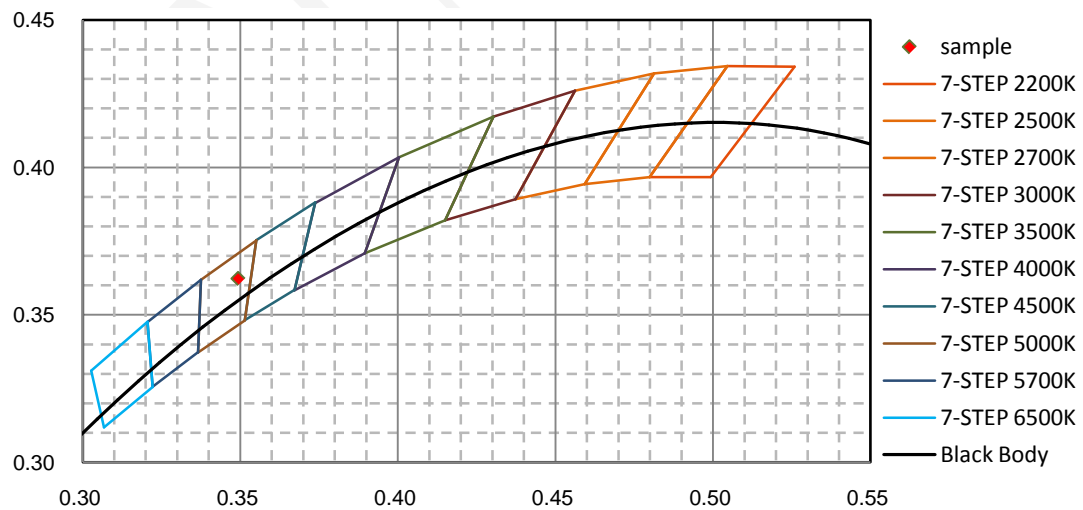
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	6.720E-02	421	2.841E+00	462	4.889E+01	503	3.305E+01	544	4.758E+01
381	5.730E-02	422	3.429E+00	463	4.610E+01	504	3.385E+01	545	4.775E+01
382	3.950E-02	423	4.067E+00	464	4.370E+01	505	3.462E+01	546	4.795E+01
383	3.660E-02	424	4.763E+00	465	4.186E+01	506	3.537E+01	547	4.810E+01
384	3.580E-02	425	5.553E+00	466	4.014E+01	507	3.607E+01	548	4.827E+01
385	2.900E-02	426	6.422E+00	467	3.851E+01	508	3.676E+01	549	4.844E+01
386	4.170E-02	427	7.348E+00	468	3.693E+01	509	3.740E+01	550	4.854E+01
387	5.140E-02	428	8.358E+00	469	3.519E+01	510	3.801E+01	551	4.868E+01
388	4.080E-02	429	9.462E+00	470	3.350E+01	511	3.858E+01	552	4.890E+01
389	3.940E-02	430	1.070E+01	471	3.180E+01	512	3.918E+01	553	4.911E+01
390	3.380E-02	431	1.199E+01	472	3.020E+01	513	3.977E+01	554	4.927E+01
391	2.040E-02	432	1.339E+01	473	2.869E+01	514	4.023E+01	555	4.943E+01
392	1.700E-02	433	1.504E+01	474	2.719E+01	515	4.078E+01	556	4.960E+01
393	2.480E-02	434	1.684E+01	475	2.587E+01	516	4.129E+01	557	4.964E+01
394	3.270E-02	435	1.873E+01	476	2.462E+01	517	4.162E+01	558	4.990E+01
395	3.280E-02	436	2.081E+01	477	2.362E+01	518	4.188E+01	559	5.019E+01
396	2.350E-02	437	2.317E+01	478	2.293E+01	519	4.227E+01	560	5.031E+01
397	1.330E-02	438	2.571E+01	479	2.235E+01	520	4.269E+01	561	5.041E+01
398	9.500E-03	439	2.853E+01	480	2.198E+01	521	4.304E+01	562	5.059E+01
399	7.000E-03	440	3.169E+01	481	2.172E+01	522	4.325E+01	563	5.080E+01
400	2.100E-02	441	3.489E+01	482	2.160E+01	523	4.348E+01	564	5.097E+01
401	3.010E-02	442	3.851E+01	483	2.158E+01	524	4.372E+01	565	5.109E+01
402	3.980E-02	443	4.264E+01	484	2.163E+01	525	4.396E+01	566	5.124E+01
403	5.440E-02	444	4.708E+01	485	2.174E+01	526	4.418E+01	567	5.148E+01
404	6.730E-02	445	5.173E+01	486	2.204E+01	527	4.444E+01	568	5.159E+01
405	7.960E-02	446	5.634E+01	487	2.236E+01	528	4.475E+01	569	5.167E+01
406	9.740E-02	447	6.109E+01	488	2.272E+01	529	4.500E+01	570	5.180E+01
407	1.035E-01	448	6.606E+01	489	2.310E+01	530	4.513E+01	571	5.189E+01
408	1.189E-01	449	7.055E+01	490	2.355E+01	531	4.525E+01	572	5.204E+01
409	1.811E-01	450	7.395E+01	491	2.407E+01	532	4.551E+01	573	5.215E+01
410	2.411E-01	451	7.662E+01	492	2.466E+01	533	4.578E+01	574	5.215E+01
411	2.900E-01	452	7.787E+01	493	2.532E+01	534	4.587E+01	575	5.231E+01
412	3.686E-01	453	7.827E+01	494	2.604E+01	535	4.603E+01	576	5.248E+01
413	4.823E-01	454	7.714E+01	495	2.675E+01	536	4.624E+01	577	5.259E+01
414	6.204E-01	455	7.492E+01	496	2.748E+01	537	4.637E+01	578	5.266E+01
415	7.883E-01	456	7.175E+01	497	2.823E+01	538	4.655E+01	579	5.264E+01
416	9.922E-01	457	6.769E+01	498	2.904E+01	539	4.675E+01	580	5.269E+01
417	1.249E+00	458	6.342E+01	499	2.986E+01	540	4.686E+01	581	5.274E+01
418	1.551E+00	459	5.937E+01	500	3.069E+01	541	4.699E+01	582	5.279E+01
419	1.918E+00	460	5.565E+01	501	3.148E+01	542	4.717E+01	583	5.290E+01
420	2.345E+00	461	5.202E+01	502	3.229E+01	543	4.740E+01	584	5.288E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	5.282E+01	626	3.859E+01	667	1.550E+01	708	3.996E+00	749	6.287E-01
586	5.279E+01	627	3.802E+01	668	1.508E+01	709	3.826E+00	750	6.373E-01
587	5.280E+01	628	3.745E+01	669	1.465E+01	710	3.669E+00	751	6.339E-01
588	5.279E+01	629	3.680E+01	670	1.422E+01	711	3.527E+00	752	6.146E-01
589	5.272E+01	630	3.616E+01	671	1.384E+01	712	3.414E+00	753	5.837E-01
590	5.254E+01	631	3.558E+01	672	1.344E+01	713	3.258E+00	754	5.126E-01
591	5.247E+01	632	3.498E+01	673	1.305E+01	714	3.077E+00	755	4.646E-01
592	5.240E+01	633	3.432E+01	674	1.268E+01	715	2.961E+00	756	4.746E-01
593	5.222E+01	634	3.371E+01	675	1.231E+01	716	2.849E+00	757	3.519E-01
594	5.210E+01	635	3.308E+01	676	1.193E+01	717	2.739E+00	758	2.852E-01
595	5.197E+01	636	3.245E+01	677	1.158E+01	718	2.588E+00	759	3.035E-01
596	5.183E+01	637	3.185E+01	678	1.124E+01	719	2.489E+00	760	2.896E-01
597	5.163E+01	638	3.123E+01	679	1.088E+01	720	2.405E+00	761	3.550E-01
598	5.133E+01	639	3.064E+01	680	1.055E+01	721	2.305E+00	762	3.730E-01
599	5.106E+01	640	2.999E+01	681	1.023E+01	722	2.207E+00	763	3.633E-01
600	5.088E+01	641	2.939E+01	682	9.926E+00	723	2.089E+00	764	2.727E-01
601	5.062E+01	642	2.880E+01	683	9.628E+00	724	2.006E+00	765	2.310E-01
602	5.027E+01	643	2.821E+01	684	9.310E+00	725	1.927E+00	766	2.250E-01
603	4.996E+01	644	2.761E+01	685	9.021E+00	726	1.833E+00	767	2.806E-01
604	4.964E+01	645	2.700E+01	686	8.745E+00	727	1.778E+00	768	2.531E-01
605	4.928E+01	646	2.642E+01	687	8.475E+00	728	1.730E+00	769	2.047E-01
606	4.891E+01	647	2.582E+01	688	8.208E+00	729	1.685E+00	770	1.933E-01
607	4.853E+01	648	2.525E+01	689	7.909E+00	730	1.597E+00	771	2.097E-01
608	4.810E+01	649	2.466E+01	690	7.633E+00	731	1.530E+00	772	2.172E-01
609	4.761E+01	650	2.405E+01	691	7.396E+00	732	1.440E+00	773	1.899E-01
610	4.716E+01	651	2.349E+01	692	7.170E+00	733	1.368E+00	774	1.566E-01
611	4.675E+01	652	2.294E+01	693	6.926E+00	734	1.352E+00	775	1.664E-01
612	4.634E+01	653	2.239E+01	694	6.676E+00	735	1.262E+00	776	1.446E-01
613	4.585E+01	654	2.186E+01	695	6.441E+00	736	1.167E+00	777	1.416E-01
614	4.534E+01	655	2.132E+01	696	6.235E+00	737	1.089E+00	778	1.397E-01
615	4.481E+01	656	2.078E+01	697	6.028E+00	738	1.033E+00	779	1.430E-01
616	4.428E+01	657	2.025E+01	698	5.816E+00	739	1.006E+00	780	1.256E-01
617	4.379E+01	658	1.975E+01	699	5.604E+00	740	9.984E-01		
618	4.329E+01	659	1.926E+01	700	5.401E+00	741	9.837E-01		
619	4.274E+01	660	1.877E+01	701	5.207E+00	742	9.439E-01		
620	4.218E+01	661	1.828E+01	702	5.005E+00	743	8.776E-01		
621	4.160E+01	662	1.780E+01	703	4.815E+00	744	8.007E-01		
622	4.095E+01	663	1.731E+01	704	4.630E+00	745	7.260E-01		
623	4.035E+01	664	1.684E+01	705	4.451E+00	746	6.988E-01		
624	3.982E+01	665	1.638E+01	706	4.281E+00	747	6.806E-01		
625	3.922E+01	666	1.595E+01	707	4.143E+00	748	6.565E-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**

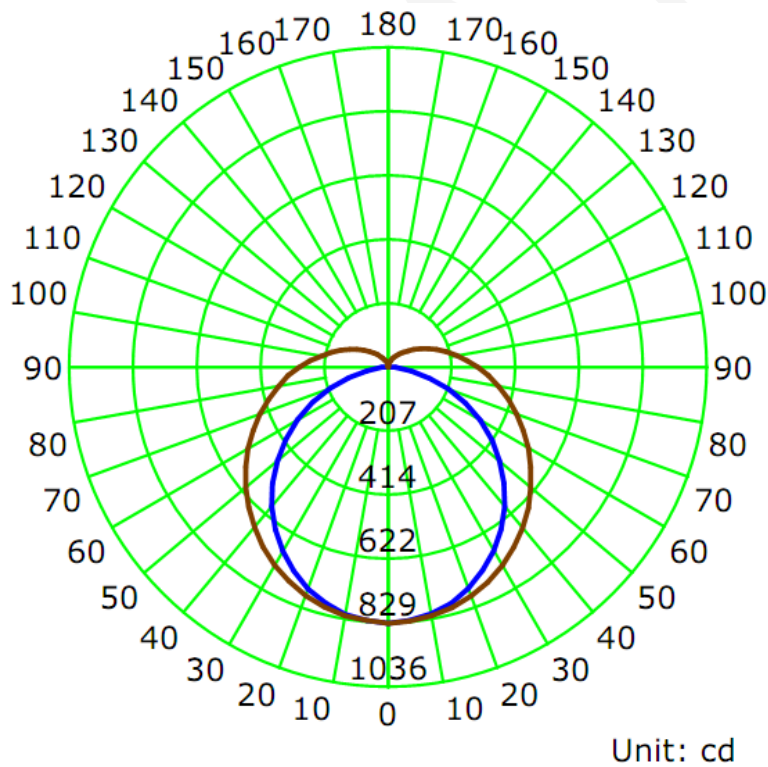
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2110	24.81	0.9800

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
3319.1	133.83	829.5	1.23	1.33

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	109.3	123.3	147.5	128.5	127.2
Field Angle (10% I _{max}):	158.7	218.9	260.4	230.8	217.2

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	830	830	830	830	830	830	830	830
5.0°	824	824	825	828	827	827	827	827
10.0°	813	813	814	818	819	821	817	817
15.0°	792	792	796	805	808	807	801	797
20.0°	764	766	773	784	790	789	780	774
25.0°	728	731	743	762	769	766	752	742
30.0°	689	694	710	731	743	738	722	704
35.0°	642	647	669	699	714	709	684	661
40.0°	590	598	625	661	681	673	645	611
45.0°	535	546	580	622	645	634	600	560
50.0°	475	488	529	580	607	592	555	504
55.0°	412	430	479	535	568	553	508	447
60.0°	347	367	429	493	528	510	459	388
65.0°	278	307	380	449	487	468	411	331
70.0°	209	246	332	407	446	426	364	274
75.0°	141	190	286	364	405	384	318	221
80.0°	78	139	243	327	366	343	275	172
85.0°	27	97	206	287	328	306	237	130
90.0°	1	65	170	252	292	267	200	98
95.0°	0	45	142	221	258	234	172	73
100.0°	0	31	119	191	226	204	143	56
105.0°	0	23	98	164	196	176	121	43
110.0°	0	18	82	139	169	150	101	34
115.0°	0	16	68	118	145	127	85	28
120.0°	0	14	56	99	123	108	71	23
125.0°	0	13	47	83	103	90	59	21
130.0°	0	13	40	68	85	75	49	19
135.0°	0	12	34	56	70	61	41	16
140.0°	0	12	30	47	57	50	33	15
145.0°	0	13	26	39	46	40	27	13
150.0°	0	12	23	33	36	32	21	11
155.0°	1	13	21	26	28	24	14	10
160.0°	1	12	18	20	22	17	11	6
165.0°	1	9	15	16	17	12	5	1
170.0°	1	1	9	10	9	4	1	1
175.0°	2	1	1	2	2	2	1	2
180.0°	0	0	0	0	0	0	0	0

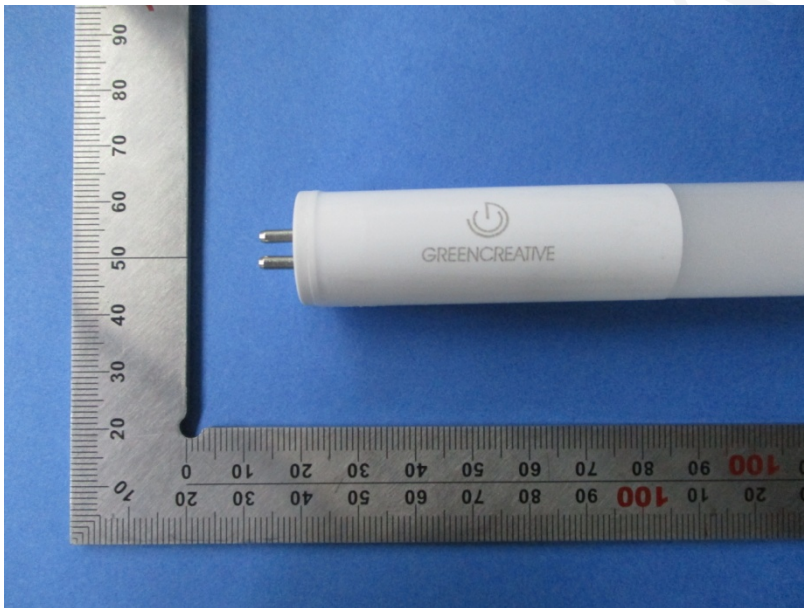
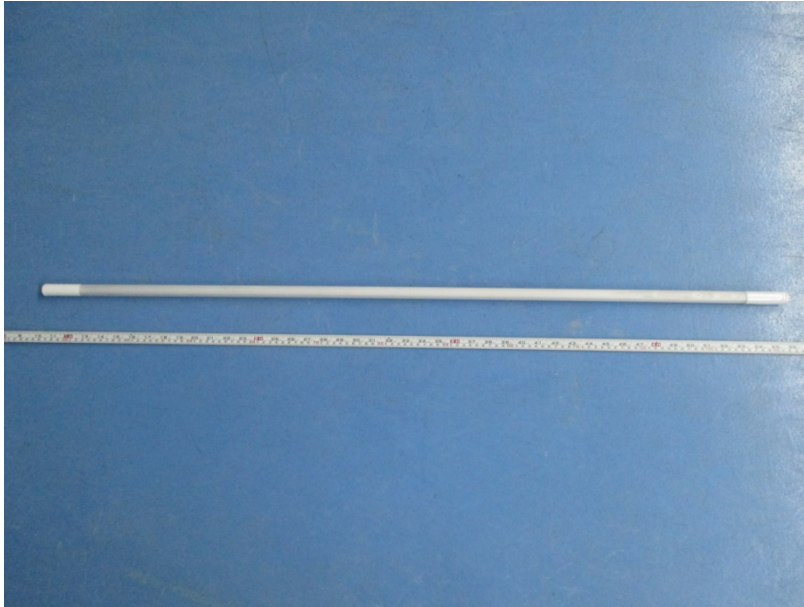
Luminous Intensity (cd) Distribution Data (cont.)

C γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	830	830	830	830	830	830	830	830
5.0°	824	826	827	829	824	826	824	826
10.0°	813	814	816	820	819	819	814	812
15.0°	792	795	803	805	806	803	798	793
20.0°	766	768	779	787	789	785	774	765
25.0°	730	737	750	762	766	762	747	734
30.0°	689	696	716	733	742	733	714	694
35.0°	643	652	675	700	712	700	678	651
40.0°	590	601	631	664	679	666	636	602
45.0°	533	549	582	624	642	630	593	549
50.0°	472	491	536	583	606	589	548	495
55.0°	409	431	485	538	567	550	500	438
60.0°	341	370	434	495	527	508	452	381
65.0°	273	307	382	450	487	466	405	324
70.0°	202	245	333	408	445	421	357	268
75.0°	134	187	286	365	404	380	313	216
80.0°	72	137	241	325	364	339	271	170
85.0°	23	94	202	289	327	304	231	129
90.0°	0	62	169	254	290	269	200	97
95.0°	0	43	141	221	254	237	168	74
100.0°	0	30	117	191	222	206	142	57
105.0°	0	23	97	165	193	178	119	44
110.0°	0	18	80	141	165	154	101	35
115.0°	0	16	66	119	140	130	84	29
120.0°	0	14	55	100	118	110	70	25
125.0°	0	13	46	84	98	92	58	21
130.0°	0	12	39	69	82	77	49	19
135.0°	0	11	33	57	66	63	41	18
140.0°	0	11	28	47	54	52	34	16
145.0°	0	9	24	39	44	43	29	15
150.0°	0	7	20	32	36	35	26	13
155.0°	0	7	15	26	29	29	21	12
160.0°	0	5	13	19	22	22	18	11
165.0°	1	1	8	13	18	17	13	9
170.0°	1	2	6	8	11	12	10	4
175.0°	2	1	2	2	4	4	2	1
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	19.8	0.60	0-5	19.8	0.60
5-10	58.7	1.77	0-10	78.5	2.37
10-15	95.8	2.89	0-15	174.4	5.25
15-20	129.9	3.91	0-20	304.3	9.17
20-25	160.0	4.82	0-25	464.3	13.99
25-30	185.3	5.58	0-30	649.7	19.57
30-35	205.1	6.18	0-35	854.7	25.75
35-40	218.8	6.59	0-40	1073.6	32.34
40-45	226.5	6.83	0-45	1300.1	39.17
45-50	228.3	6.88	0-50	1528.4	46.05
50-55	224.2	6.75	0-55	1752.6	52.80
55-60	214.9	6.48	0-60	1967.5	59.28
60-65	201.0	6.06	0-65	2168.5	65.33
65-70	183.4	5.52	0-70	2351.9	70.86
70-75	163.0	4.91	0-75	2514.9	75.77
75-80	141.4	4.26	0-80	2656.3	80.03
80-85	120.2	3.62	0-85	2776.5	83.65
85-90	101.0	3.04	0-90	2877.4	86.69
90-95	85.0	2.56	0-95	2962.5	89.25
95-100	71.6	2.16	0-100	3034.1	91.41
100-105	59.8	1.80	0-105	3093.8	93.21
105-110	49.5	1.49	0-110	3143.3	94.70
110-115	40.5	1.22	0-115	3183.8	95.92
115-120	32.8	0.99	0-120	3216.5	96.91
120-125	26.2	0.79	0-125	3242.7	97.70
125-130	20.7	0.62	0-130	3263.4	98.32
130-135	16.1	0.49	0-135	3279.5	98.81
135-140	12.3	0.37	0-140	3291.8	99.18
140-145	9.3	0.28	0-145	3301.1	99.46
145-150	6.8	0.21	0-150	3308.0	99.66
150-155	4.8	0.15	0-155	3312.8	99.81
155-160	3.2	0.10	0-160	3316.0	99.91
160-165	1.9	0.06	0-165	3317.9	99.96
165-170	0.9	0.03	0-170	3318.8	99.99
170-175	0.3	0.01	0-175	3319.1	100.00
175-180	0.0	0.00	0-180	3319.1	100.00

6. Product Photo



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