



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 12T5HE/3F/835/BYP

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180820080-10-3
Test Date:	2018-08-20 to 2018-08-21
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: 12T5HE/3F/835/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: 12W
 Nominal CCT: 3500K
 Nominal Lumen Output: 1400lm

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**

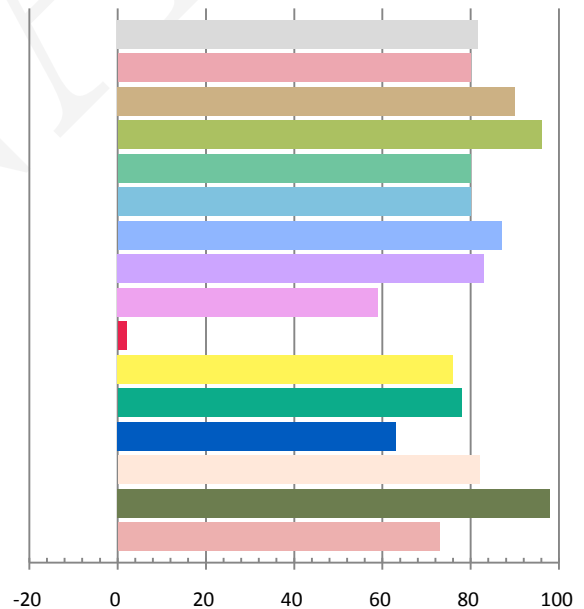
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1002	11.77	0.9788	1525.1	129.58

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
4.501	3409	0.00083	0.4114	0.3956	0.2377	0.5142

Color Rendering Index

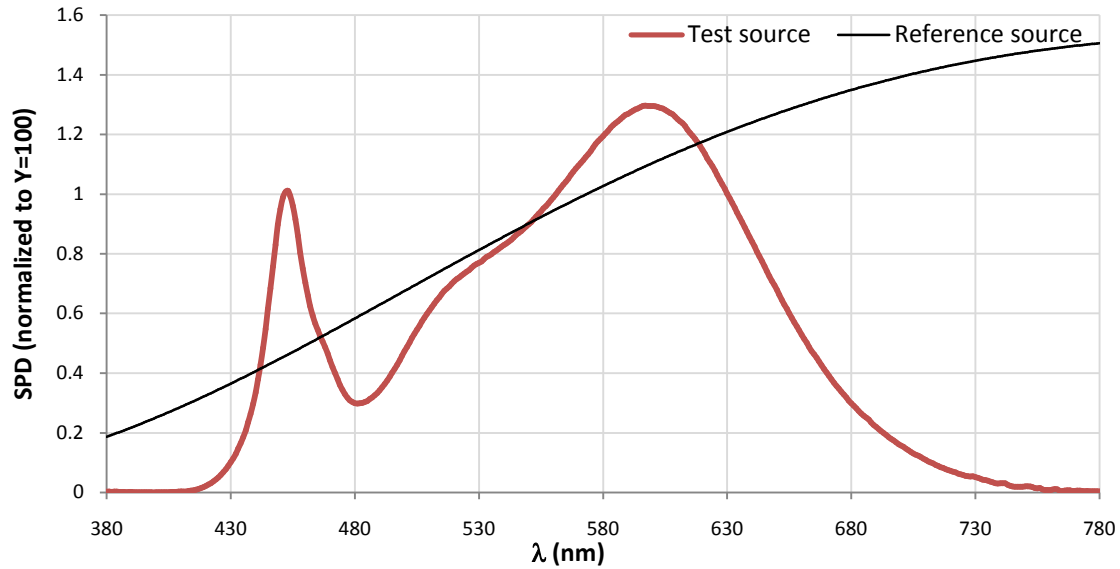
Ra 81.7			
R1 80	R2 90	R3 96	R4 80
R5 80	R6 87	R7 83	R8 59
R9 2	R10 76	R11 78	R12 63
R13 82	R14 98	R15 73	



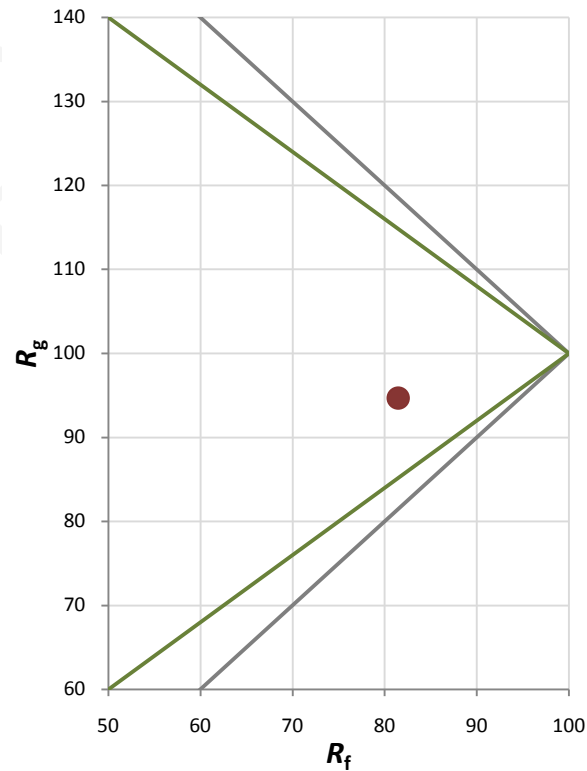
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	95

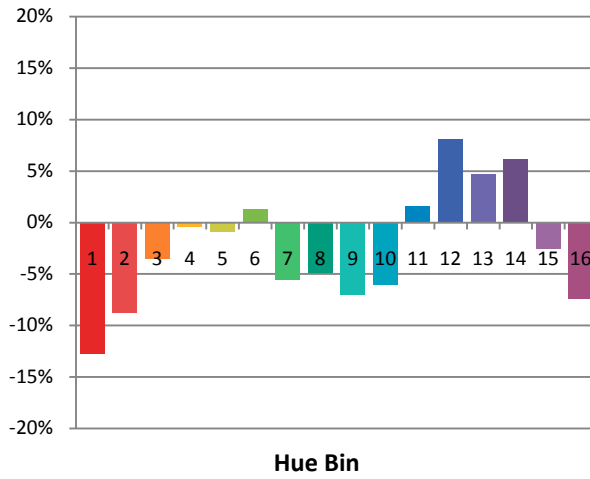
Spectral Power Distribution Comparison



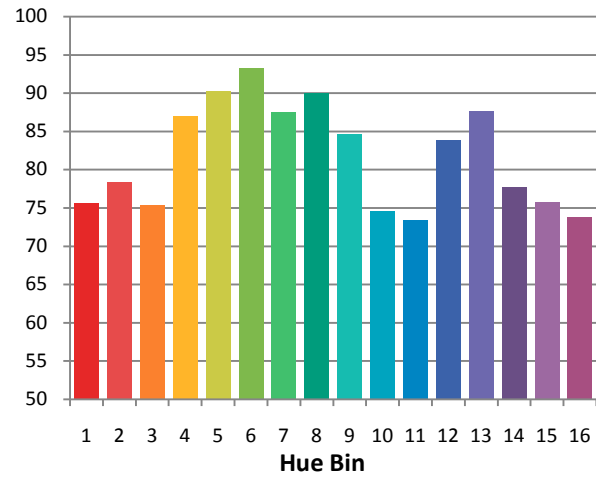
Plot of R_g versus R_f



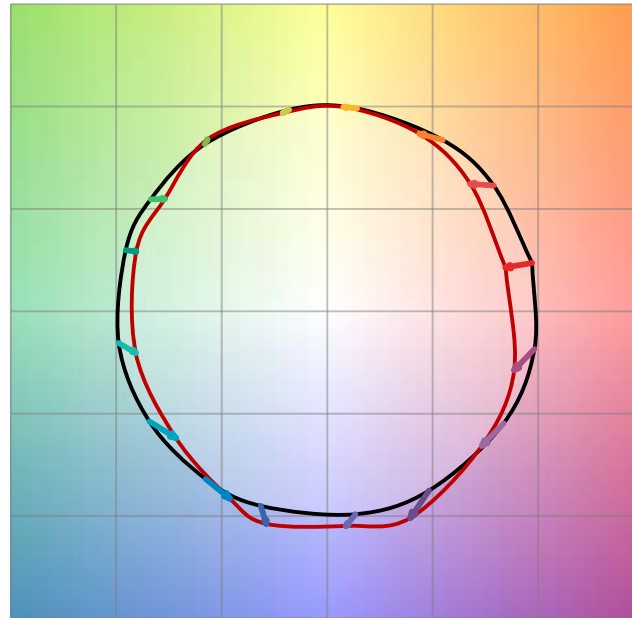
Chroma Shift by Hue



R_t by Hue

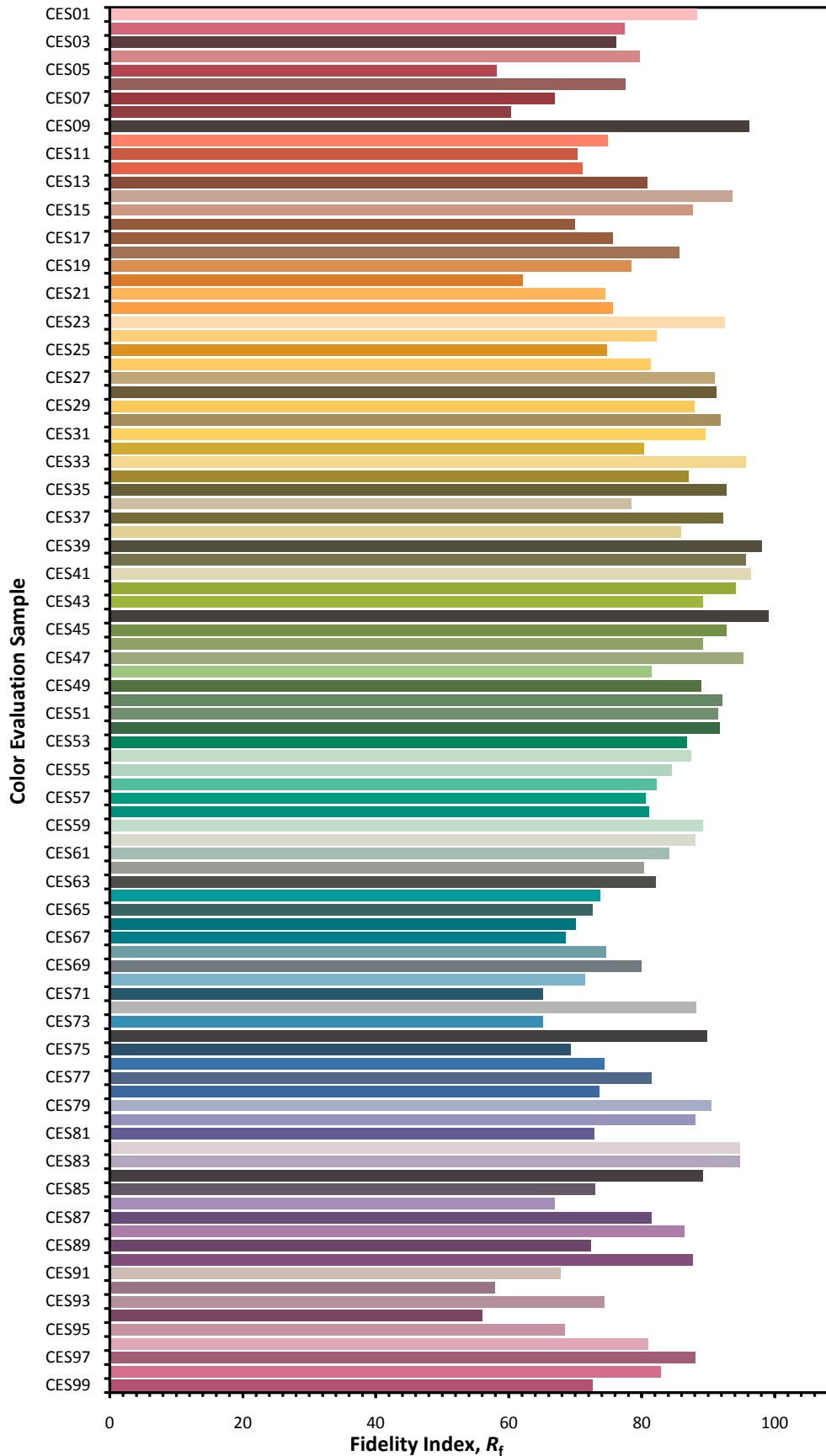


Color Vector Graphic

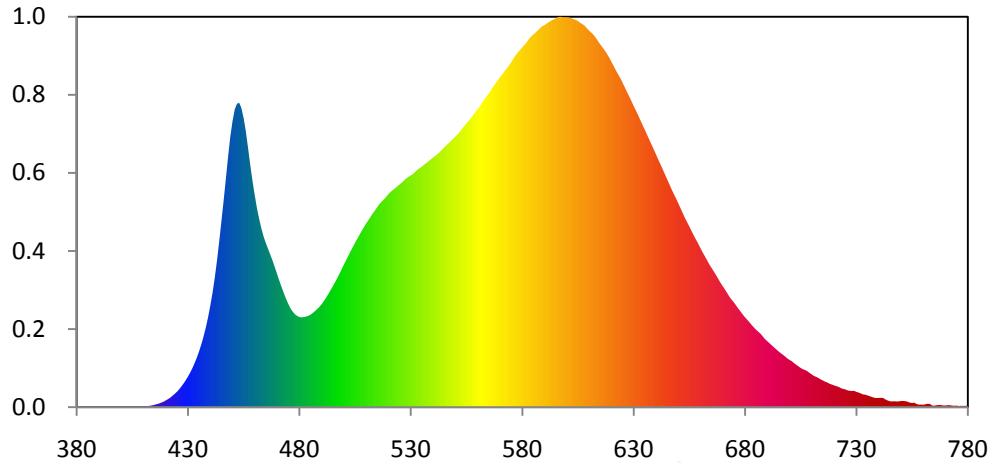


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



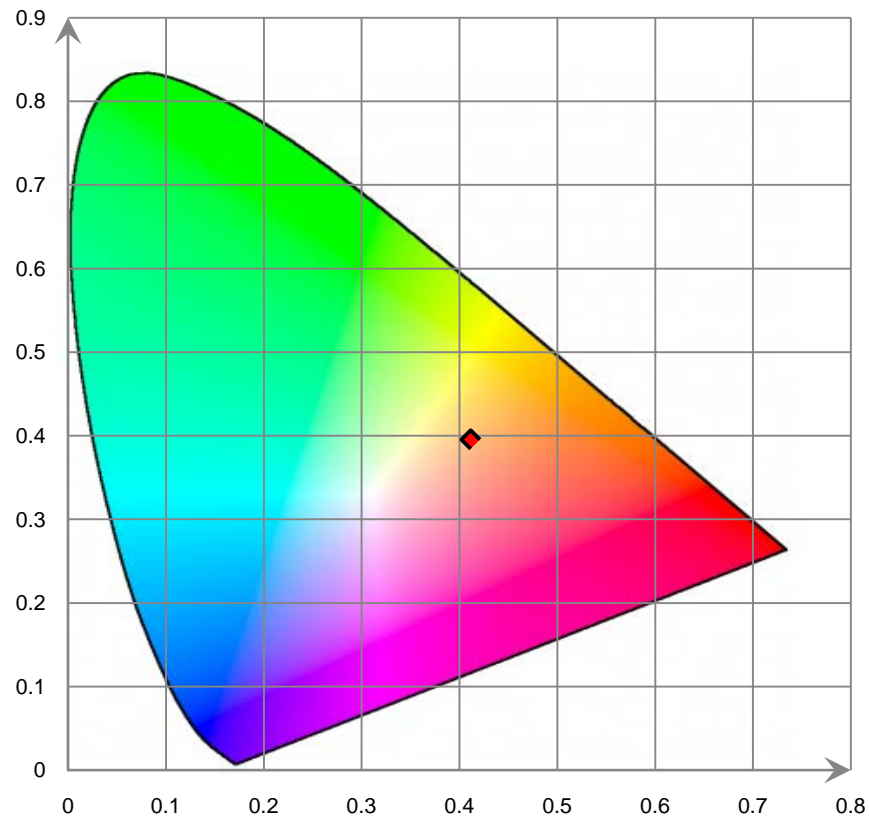
Relative Spectral Power Distribution



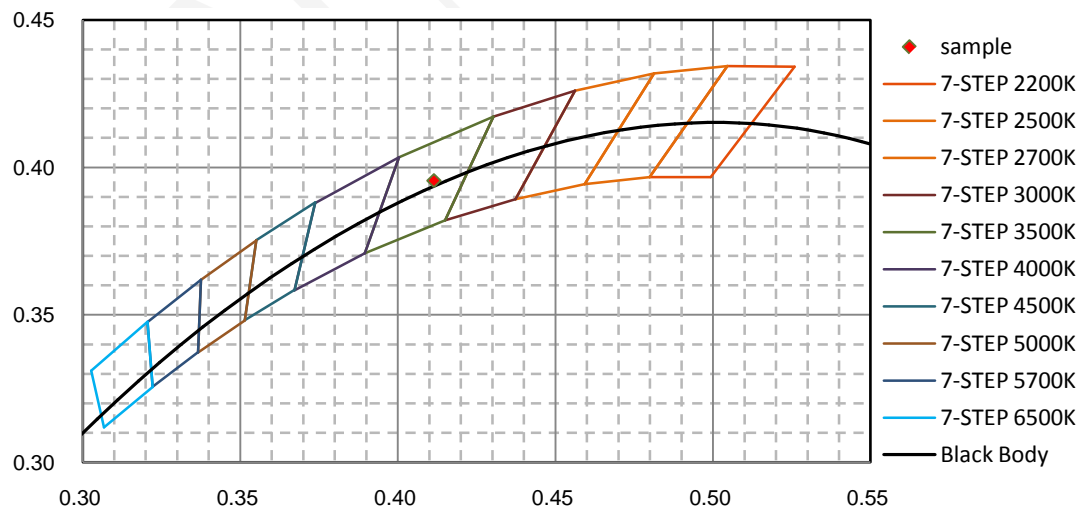
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	6.720E-02	421	5.921E-01	462	1.394E+01	503	1.155E+01	544	1.908E+01
381	5.940E-02	422	6.974E-01	463	1.324E+01	504	1.187E+01	545	1.926E+01
382	4.390E-02	423	8.353E-01	464	1.263E+01	505	1.218E+01	546	1.942E+01
383	6.550E-02	424	9.800E-01	465	1.216E+01	506	1.248E+01	547	1.957E+01
384	7.730E-02	425	1.132E+00	466	1.172E+01	507	1.278E+01	548	1.973E+01
385	5.380E-02	426	1.310E+00	467	1.130E+01	508	1.307E+01	549	1.990E+01
386	4.880E-02	427	1.522E+00	468	1.086E+01	509	1.335E+01	550	2.006E+01
387	4.560E-02	428	1.748E+00	469	1.038E+01	510	1.363E+01	551	2.022E+01
388	3.320E-02	429	1.995E+00	470	9.885E+00	511	1.387E+01	552	2.042E+01
389	4.600E-02	430	2.268E+00	471	9.387E+00	512	1.412E+01	553	2.064E+01
390	4.200E-02	431	2.565E+00	472	8.920E+00	513	1.438E+01	554	2.084E+01
391	1.990E-02	432	2.895E+00	473	8.476E+00	514	1.460E+01	555	2.104E+01
392	1.360E-02	433	3.269E+00	474	8.049E+00	515	1.484E+01	556	2.125E+01
393	2.250E-02	434	3.677E+00	475	7.673E+00	516	1.507E+01	557	2.142E+01
394	2.830E-02	435	4.137E+00	476	7.339E+00	517	1.525E+01	558	2.164E+01
395	3.270E-02	436	4.654E+00	477	7.084E+00	518	1.541E+01	559	2.189E+01
396	2.670E-02	437	5.238E+00	478	6.899E+00	519	1.560E+01	560	2.208E+01
397	1.670E-02	438	5.887E+00	479	6.767E+00	520	1.580E+01	561	2.231E+01
398	1.140E-02	439	6.634E+00	480	6.688E+00	521	1.597E+01	562	2.257E+01
399	5.500E-03	440	7.491E+00	481	6.659E+00	522	1.610E+01	563	2.281E+01
400	2.120E-02	441	8.438E+00	482	6.679E+00	523	1.624E+01	564	2.304E+01
401	2.510E-02	442	9.542E+00	483	6.712E+00	524	1.638E+01	565	2.325E+01
402	2.170E-02	443	1.081E+01	484	6.771E+00	525	1.652E+01	566	2.349E+01
403	2.370E-02	444	1.223E+01	485	6.854E+00	526	1.665E+01	567	2.376E+01
404	2.830E-02	445	1.374E+01	486	6.980E+00	527	1.680E+01	568	2.399E+01
405	3.420E-02	446	1.528E+01	487	7.120E+00	528	1.696E+01	569	2.422E+01
406	4.670E-02	447	1.689E+01	488	7.269E+00	529	1.708E+01	570	2.445E+01
407	5.180E-02	448	1.854E+01	489	7.437E+00	530	1.718E+01	571	2.465E+01
408	4.030E-02	449	2.004E+01	490	7.634E+00	531	1.728E+01	572	2.488E+01
409	6.810E-02	450	2.119E+01	491	7.864E+00	532	1.744E+01	573	2.510E+01
410	8.220E-02	451	2.207E+01	492	8.120E+00	533	1.762E+01	574	2.530E+01
411	7.500E-02	452	2.249E+01	493	8.385E+00	534	1.772E+01	575	2.555E+01
412	8.180E-02	453	2.258E+01	494	8.675E+00	535	1.784E+01	576	2.582E+01
413	1.072E-01	454	2.217E+01	495	8.960E+00	536	1.798E+01	577	2.608E+01
414	1.356E-01	455	2.144E+01	496	9.250E+00	537	1.810E+01	578	2.629E+01
415	1.771E-01	456	2.044E+01	497	9.559E+00	538	1.823E+01	579	2.647E+01
416	2.246E-01	457	1.921E+01	498	9.890E+00	539	1.839E+01	580	2.667E+01
417	2.685E-01	458	1.794E+01	499	1.023E+01	540	1.850E+01	581	2.685E+01
418	3.363E-01	459	1.676E+01	500	1.057E+01	541	1.863E+01	582	2.704E+01
419	4.030E-01	460	1.571E+01	501	1.090E+01	542	1.877E+01	583	2.729E+01
420	4.975E-01	461	1.474E+01	502	1.123E+01	543	1.892E+01	584	2.748E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.762E+01	626	2.374E+01	667	9.805E+00	708	2.666E+00	749	4.297E-01
586	2.777E+01	627	2.340E+01	668	9.520E+00	709	2.545E+00	750	4.594E-01
587	2.793E+01	628	2.306E+01	669	9.234E+00	710	2.429E+00	751	4.633E-01
588	2.810E+01	629	2.272E+01	670	8.980E+00	711	2.313E+00	752	4.464E-01
589	2.824E+01	630	2.236E+01	671	8.739E+00	712	2.248E+00	753	4.079E-01
590	2.833E+01	631	2.202E+01	672	8.475E+00	713	2.167E+00	754	3.411E-01
591	2.844E+01	632	2.168E+01	673	8.204E+00	714	2.059E+00	755	3.135E-01
592	2.856E+01	633	2.131E+01	674	7.982E+00	715	1.981E+00	756	3.348E-01
593	2.865E+01	634	2.094E+01	675	7.783E+00	716	1.889E+00	757	2.414E-01
594	2.874E+01	635	2.059E+01	676	7.550E+00	717	1.831E+00	758	1.869E-01
595	2.882E+01	636	2.023E+01	677	7.316E+00	718	1.738E+00	759	1.959E-01
596	2.891E+01	637	1.986E+01	678	7.103E+00	719	1.680E+00	760	1.808E-01
597	2.895E+01	638	1.950E+01	679	6.877E+00	720	1.618E+00	761	2.163E-01
598	2.893E+01	639	1.914E+01	680	6.672E+00	721	1.558E+00	762	2.520E-01
599	2.891E+01	640	1.877E+01	681	6.491E+00	722	1.511E+00	763	2.420E-01
600	2.891E+01	641	1.840E+01	682	6.299E+00	723	1.420E+00	764	1.268E-01
601	2.889E+01	642	1.804E+01	683	6.102E+00	724	1.358E+00	765	1.089E-01
602	2.885E+01	643	1.768E+01	684	5.916E+00	725	1.322E+00	766	1.447E-01
603	2.878E+01	644	1.730E+01	685	5.745E+00	726	1.253E+00	767	1.640E-01
604	2.872E+01	645	1.693E+01	686	5.598E+00	727	1.212E+00	768	1.543E-01
605	2.863E+01	646	1.656E+01	687	5.448E+00	728	1.203E+00	769	1.264E-01
606	2.851E+01	647	1.618E+01	688	5.249E+00	729	1.212E+00	770	1.240E-01
607	2.840E+01	648	1.583E+01	689	5.050E+00	730	1.137E+00	771	1.479E-01
608	2.829E+01	649	1.551E+01	690	4.897E+00	731	1.088E+00	772	1.471E-01
609	2.811E+01	650	1.515E+01	691	4.748E+00	732	1.023E+00	773	1.182E-01
610	2.793E+01	651	1.479E+01	692	4.595E+00	733	9.469E-01	774	1.041E-01
611	2.778E+01	652	1.442E+01	693	4.444E+00	734	9.304E-01	775	1.174E-01
612	2.762E+01	653	1.406E+01	694	4.299E+00	735	8.783E-01	776	8.710E-02
613	2.741E+01	654	1.373E+01	695	4.147E+00	736	8.150E-01	777	9.750E-02
614	2.715E+01	655	1.341E+01	696	4.015E+00	737	7.548E-01	778	9.430E-02
615	2.691E+01	656	1.308E+01	697	3.897E+00	738	7.003E-01	779	1.029E-01
616	2.670E+01	657	1.275E+01	698	3.764E+00	739	6.790E-01	780	9.290E-02
617	2.647E+01	658	1.243E+01	699	3.618E+00	740	6.853E-01		
618	2.622E+01	659	1.213E+01	700	3.508E+00	741	6.934E-01		
619	2.594E+01	660	1.181E+01	701	3.417E+00	742	6.832E-01		
620	2.563E+01	661	1.149E+01	702	3.270E+00	743	5.819E-01		
621	2.532E+01	662	1.120E+01	703	3.148E+00	744	5.015E-01		
622	2.500E+01	663	1.090E+01	704	3.032E+00	745	4.421E-01		
623	2.470E+01	664	1.059E+01	705	2.910E+00	746	4.262E-01		
624	2.442E+01	665	1.033E+01	706	2.817E+00	747	4.390E-01		
625	2.409E+01	666	1.008E+01	707	2.752E+00	748	4.265E-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**

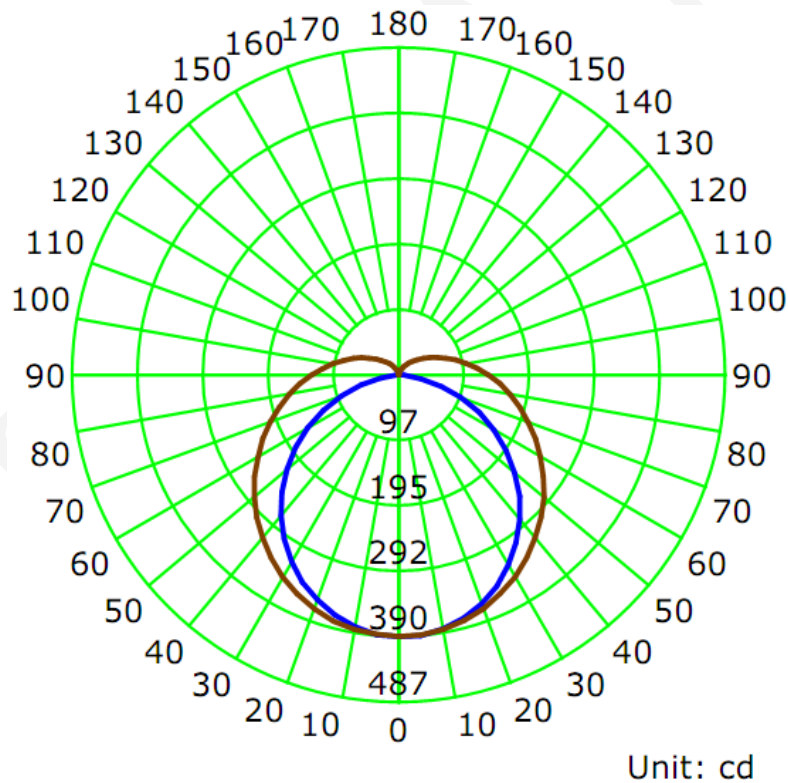
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1000	11.77	0.9810

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1529	129.96	390.4	1.24	1.33

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	109.1	124.9	145.5	125.0	126.1
Field Angle (10% I _{max}):	157.5	219.8	256.0	219.9	213.3

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	390	390	390	390	390	390	390	390
5.0°	390	389	390	389	389	389	389	388
10.0°	384	384	385	385	385	385	384	382
15.0°	375	377	376	379	379	378	376	373
20.0°	363	365	367	370	371	369	365	360
25.0°	347	350	353	358	360	357	351	344
30.0°	327	331	337	344	348	343	335	326
35.0°	306	311	319	328	334	328	317	305
40.0°	281	288	299	311	318	311	297	282
45.0°	255	263	279	293	301	292	275	257
50.0°	227	236	256	274	283	273	253	230
55.0°	197	208	233	254	264	252	230	203
60.0°	165	180	210	234	245	232	207	175
65.0°	133	151	187	212	226	212	183	147
70.0°	99	123	163	192	206	191	160	118
75.0°	66	96	141	174	188	171	138	93
80.0°	34	72	120	154	169	153	118	69
85.0°	9	52	102	136	152	136	100	49
90.0°	0	37	86	120	134	118	84	34
95.0°	0	25	71	105	118	102	70	24
100.0°	0	18	59	91	103	89	58	17
105.0°	0	14	49	77	89	76	48	13
110.0°	0	10	41	65	76	64	39	9
115.0°	0	8	33	55	64	55	33	8
120.0°	0	7	27	47	54	45	26	6
125.0°	0	6	22	39	45	38	22	5
130.0°	0	6	19	32	37	31	18	5
135.0°	0	5	15	26	30	25	15	5
140.0°	0	5	14	21	24	20	13	4
145.0°	0	5	12	18	19	16	10	4
150.0°	0	5	10	14	15	13	7	3
155.0°	0	5	8	11	11	9	5	2
160.0°	0	4	6	9	9	7	3	0
165.0°	0	3	5	6	6	3	0	0
170.0°	0	0	3	4	3	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

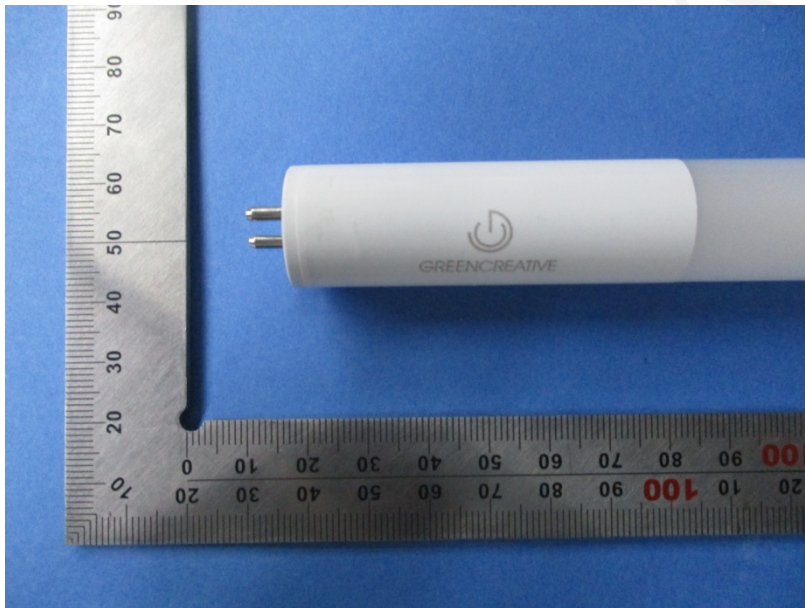
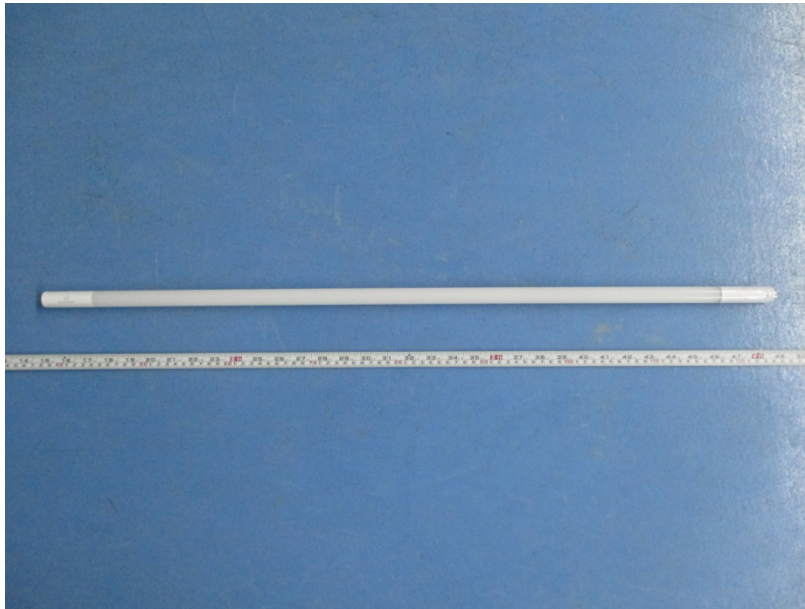
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	390	390	390	390	390	390	390	390
5.0°	389	389	388	389	388	390	389	388
10.0°	381	382	384	385	385	385	385	382
15.0°	371	373	374	377	380	380	377	374
20.0°	357	361	364	368	371	370	366	362
25.0°	341	345	349	357	360	358	353	346
30.0°	322	326	333	343	348	344	337	329
35.0°	299	304	315	328	334	329	319	308
40.0°	274	281	294	309	318	312	300	285
45.0°	247	255	272	290	301	293	277	259
50.0°	218	229	251	271	283	274	254	232
55.0°	188	201	227	251	264	253	231	204
60.0°	158	173	204	229	244	233	208	176
65.0°	125	144	181	209	225	212	184	148
70.0°	92	116	158	188	205	192	161	119
75.0°	59	90	136	168	186	171	138	93
80.0°	29	67	115	149	167	151	118	70
85.0°	5	47	96	133	149	133	98	50
90.0°	0	33	80	116	132	117	83	34
95.0°	0	23	67	100	115	102	69	24
100.0°	0	16	56	86	100	87	57	17
105.0°	0	12	45	74	86	74	48	12
110.0°	0	9	37	63	73	63	38	10
115.0°	0	7	30	53	62	53	32	8
120.0°	0	6	25	44	52	44	26	6
125.0°	0	5	20	36	43	36	21	5
130.0°	0	4	17	29	35	29	18	5
135.0°	0	4	14	24	29	24	15	5
140.0°	0	3	12	19	23	20	12	4
145.0°	0	3	10	16	18	16	10	4
150.0°	0	2	8	12	14	13	8	3
155.0°	0	1	6	10	11	10	7	3
160.0°	0	0	4	7	8	8	5	3
165.0°	0	0	2	5	6	5	3	0
170.0°	0	0	1	2	3	3	2	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	9.3	0.61	0-5	9.3	0.61
5-10	27.6	1.81	0-10	37.0	2.42
10-15	45.1	2.95	0-15	82.1	5.37
15-20	61.1	4.00	0-20	143.2	9.36
20-25	75.2	4.92	0-25	218.4	14.28
25-30	87.0	5.69	0-30	305.4	19.97
30-35	96.2	6.29	0-35	401.6	26.27
35-40	102.6	6.71	0-40	504.2	32.98
40-45	106.1	6.94	0-45	610.3	39.92
45-50	106.8	6.98	0-50	717.1	46.90
50-55	104.7	6.85	0-55	821.8	53.75
55-60	100.1	6.55	0-60	922.0	60.30
60-65	93.4	6.11	0-65	1015.3	66.40
65-70	84.8	5.55	0-70	1100.1	71.95
70-75	75.0	4.90	0-75	1175.1	76.85
75-80	64.6	4.22	0-80	1239.7	81.07
80-85	54.4	3.56	0-85	1294.0	84.63
85-90	45.4	2.97	0-90	1339.4	87.60
90-95	38.0	2.49	0-95	1377.4	90.08
95-100	31.7	2.08	0-100	1409.2	92.16
100-105	26.2	1.71	0-105	1435.4	93.87
105-110	21.4	1.40	0-110	1456.8	95.28
110-115	17.3	1.13	0-115	1474.1	96.41
115-120	13.9	0.91	0-120	1488.0	97.32
120-125	10.9	0.72	0-125	1498.9	98.03
125-130	8.5	0.56	0-130	1507.5	98.59
130-135	6.5	0.43	0-135	1514.0	99.02
135-140	4.9	0.32	0-140	1518.9	99.34
140-145	3.7	0.24	0-145	1522.6	99.58
145-150	2.6	0.17	0-150	1525.2	99.75
150-155	1.8	0.12	0-155	1527.0	99.87
155-160	1.1	0.07	0-160	1528.1	99.94
160-165	0.6	0.04	0-165	1528.7	99.98
165-170	0.2	0.02	0-170	1529.0	100.00
170-175	0.0	0.00	0-175	1529.0	100.00
175-180	0.0	0.00	0-180	1529.0	100.00

6. Product Photo



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