



# 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/830/BYP**

<b>Report Type:</b>	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
<b>Test Engineer:</b>	George Yang <i>George Yang</i>
<b>Report Number:</b>	PKS180820080-10
<b>Test Date:</b>	2018-08-20 to 2018-08-21
<b>Report Date:</b>	2018-08-27
<b>Reviewed By:</b>	Ray Gao/EE Engineer <i>Ray Gao</i>
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Kunshan). No.248 Chenghu Road, Kunshan, Jiangsu province, China. Tel: +86-0512-86175000 Fax: +86-0512-88934268
<b>Test Facility:</b>	Test facility was located at No.248 Chenghu Road, Kunshan, Jiangsu province, China.
<b>Accreditation:</b>	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/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: 12W  
 Nominal CCT: 3000K  
 Nominal Lumen Output: 1350lm

## 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.

$4\pi$  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 ( $\gamma$ ) 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**

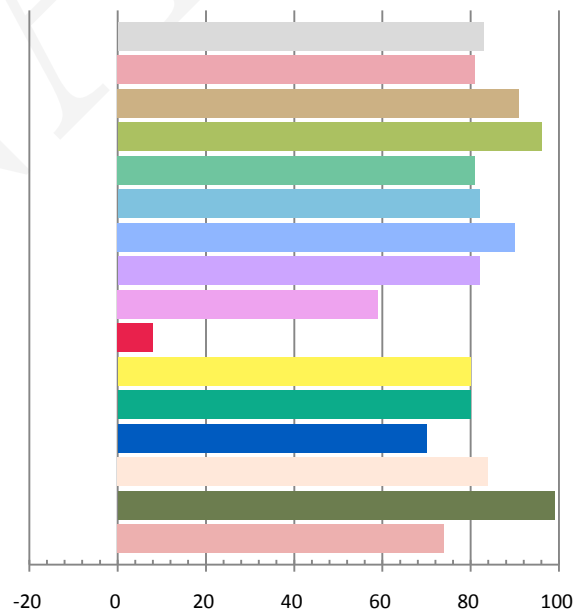
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.0974	11.47	0.9814	1431.9	124.8

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
4.313	3070	0.00042	0.4326	0.4036	0.2480	0.5205

### Color Rendering Index

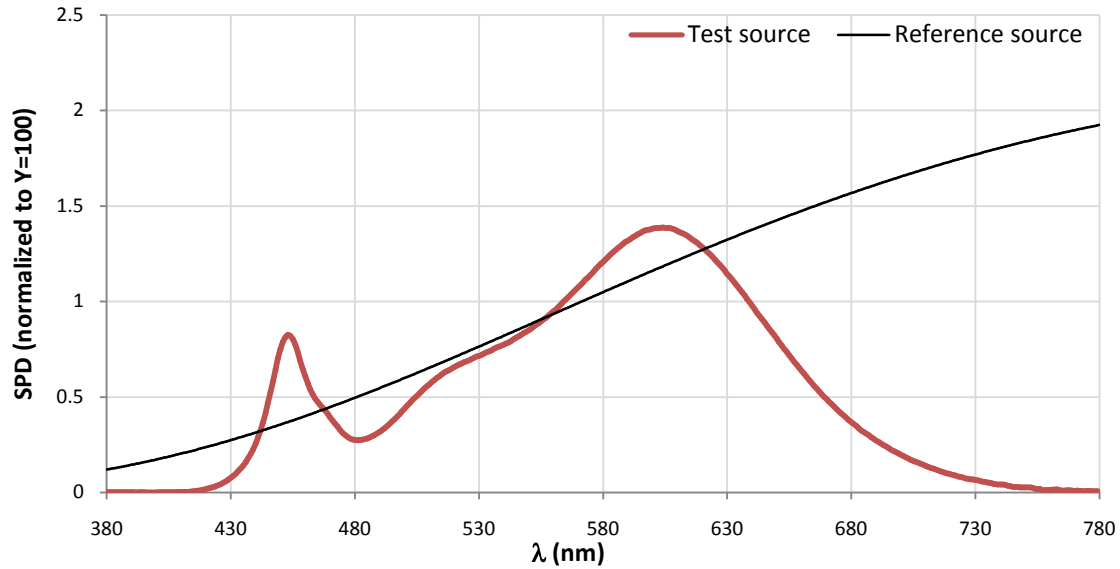
<b>Ra</b> <b>82.9</b>			
<b>R1</b> 81	<b>R2</b> 91	<b>R3</b> 96	<b>R4</b> 81
<b>R5</b> 82	<b>R6</b> 90	<b>R7</b> 82	<b>R8</b> 59
<b>R9</b> 8	<b>R10</b> 80	<b>R11</b> 80	<b>R12</b> 70
<b>R13</b> 84	<b>R14</b> 99	<b>R15</b> 74	



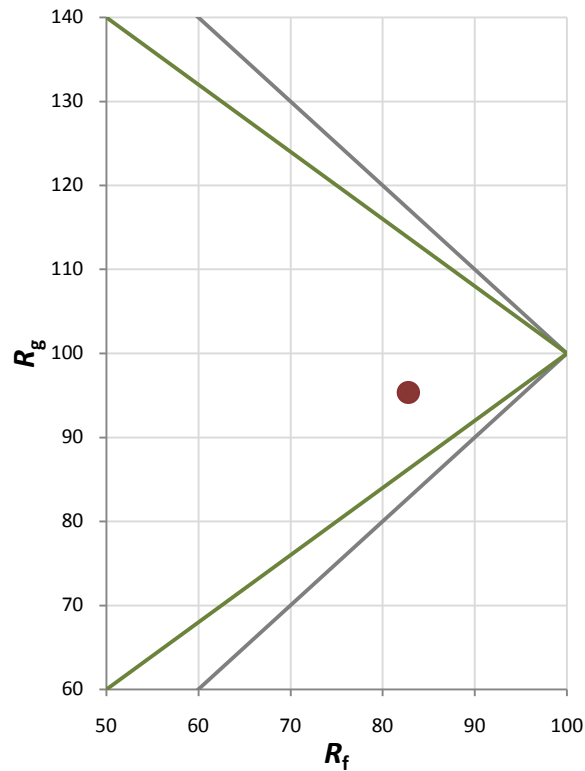
### Fidelity Index and Gamut Index

Fidelity Index $R_f$	83
Gamut Index $R_g$	95

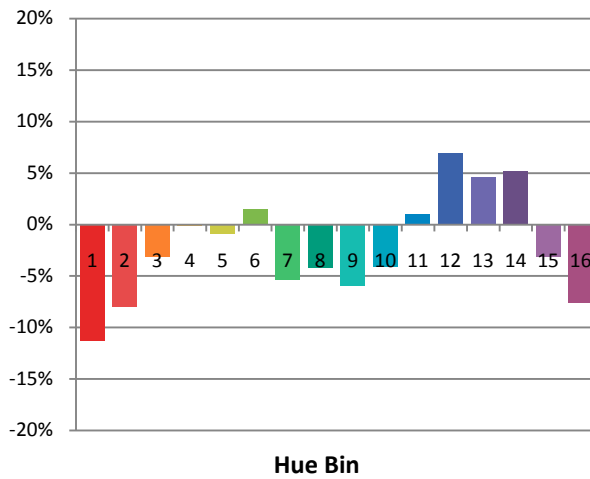
### Spectral Power Distribution Comparison



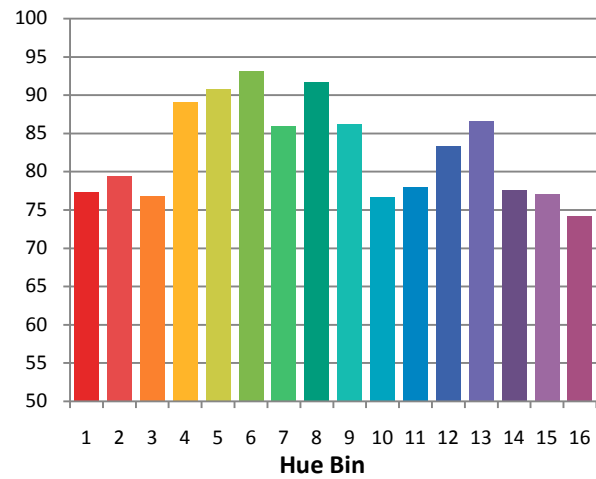
### Plot of $R_g$ versus $R_f$



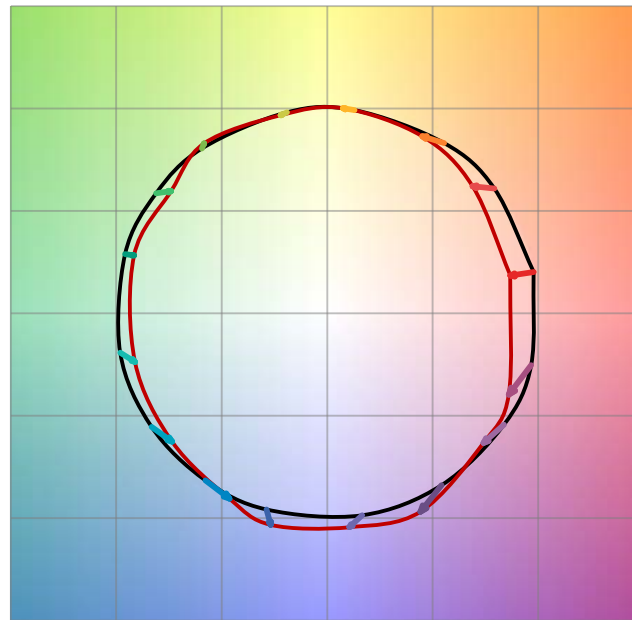
Chroma Shift by Hue



$R_t$  by Hue

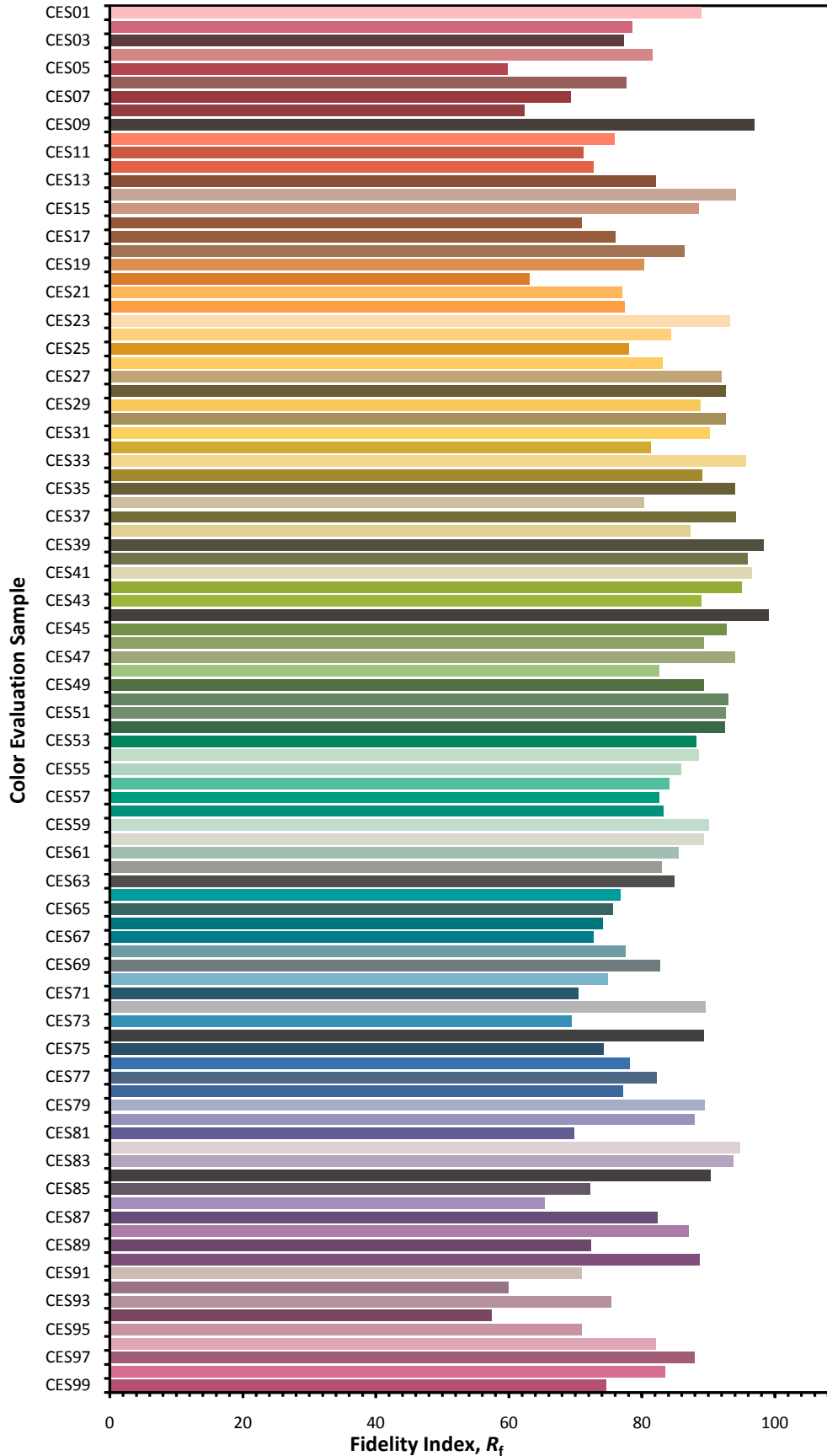


Color Vector Graphic

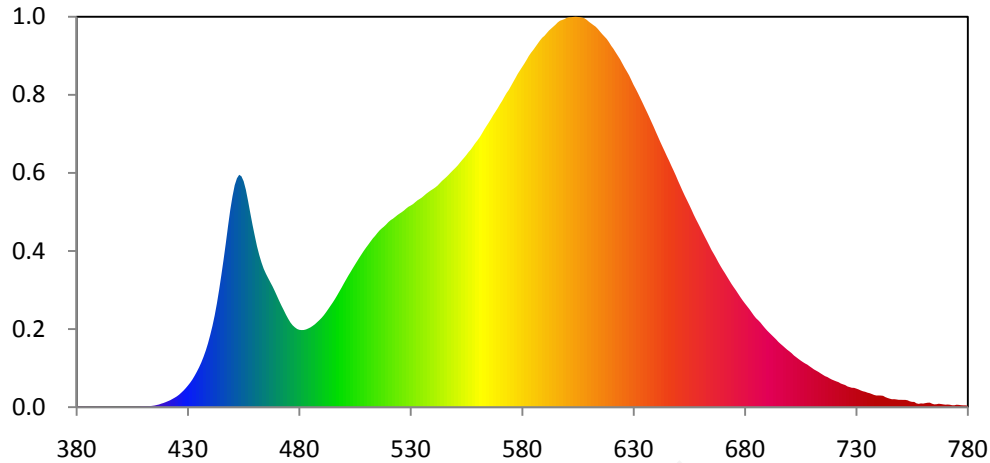


— Reference Illuminat — Test Source

### Color Fidelity by CES Sample



### Relative Spectral Power Distribution

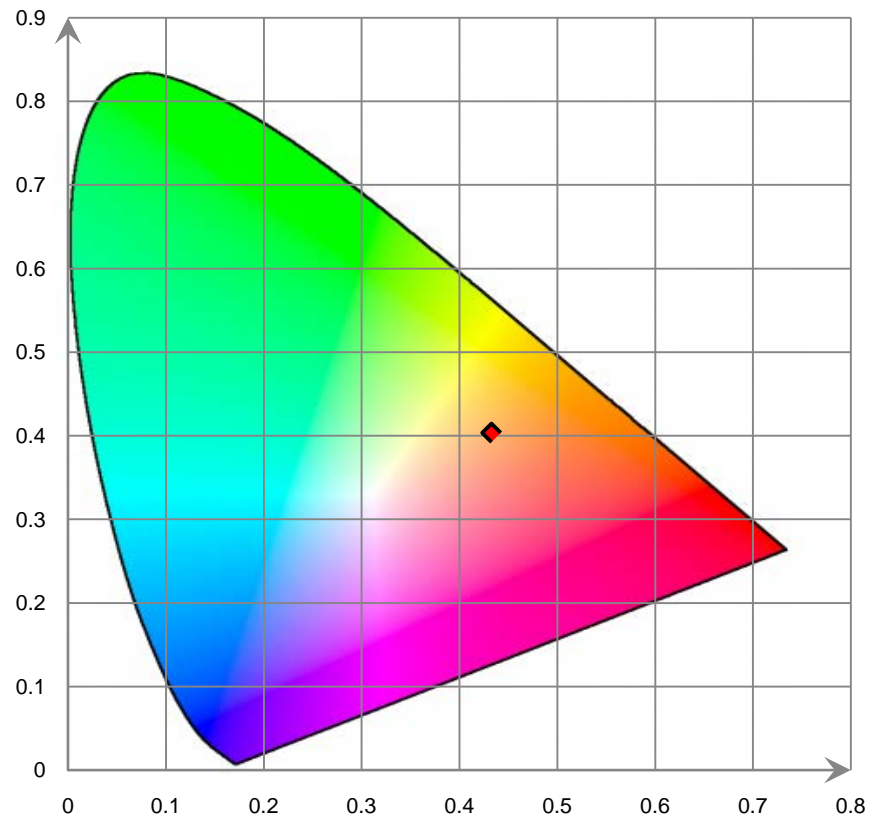


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.060E-02	421	4.444E-01	462	1.134E+01	503	1.006E+01	544	1.684E+01
381	4.520E-02	422	5.147E-01	463	1.078E+01	504	1.034E+01	545	1.698E+01
382	3.120E-02	423	6.084E-01	464	1.031E+01	505	1.061E+01	546	1.713E+01
383	3.860E-02	424	7.012E-01	465	9.938E+00	506	1.088E+01	547	1.730E+01
384	4.710E-02	425	8.035E-01	466	9.612E+00	507	1.114E+01	548	1.747E+01
385	3.290E-02	426	9.237E-01	467	9.294E+00	508	1.140E+01	549	1.764E+01
386	2.910E-02	427	1.074E+00	468	8.983E+00	509	1.165E+01	550	1.780E+01
387	3.020E-02	428	1.233E+00	469	8.636E+00	510	1.189E+01	551	1.798E+01
388	2.850E-02	429	1.412E+00	470	8.268E+00	511	1.211E+01	552	1.818E+01
389	4.340E-02	430	1.611E+00	471	7.898E+00	512	1.234E+01	553	1.839E+01
390	3.840E-02	431	1.818E+00	472	7.551E+00	513	1.256E+01	554	1.858E+01
391	1.940E-02	432	2.058E+00	473	7.224E+00	514	1.275E+01	555	1.878E+01
392	1.480E-02	433	2.336E+00	474	6.884E+00	515	1.296E+01	556	1.900E+01
393	2.120E-02	434	2.639E+00	475	6.581E+00	516	1.315E+01	557	1.918E+01
394	2.610E-02	435	2.966E+00	476	6.304E+00	517	1.331E+01	558	1.942E+01
395	2.460E-02	436	3.329E+00	477	6.094E+00	518	1.344E+01	559	1.966E+01
396	1.520E-02	437	3.746E+00	478	5.943E+00	519	1.361E+01	560	1.987E+01
397	7.700E-03	438	4.211E+00	479	5.822E+00	520	1.378E+01	561	2.010E+01
398	4.600E-03	439	4.750E+00	480	5.758E+00	521	1.392E+01	562	2.038E+01
399	2.700E-03	440	5.368E+00	481	5.741E+00	522	1.403E+01	563	2.066E+01
400	1.350E-02	441	6.046E+00	482	5.746E+00	523	1.416E+01	564	2.093E+01
401	1.670E-02	442	6.823E+00	483	5.788E+00	524	1.430E+01	565	2.118E+01
402	1.860E-02	443	7.723E+00	484	5.859E+00	525	1.441E+01	566	2.145E+01
403	2.260E-02	444	8.733E+00	485	5.941E+00	526	1.452E+01	567	2.173E+01
404	2.930E-02	445	9.836E+00	486	6.050E+00	527	1.465E+01	568	2.199E+01
405	3.200E-02	446	1.099E+01	487	6.172E+00	528	1.479E+01	569	2.225E+01
406	3.110E-02	447	1.220E+01	488	6.328E+00	529	1.492E+01	570	2.253E+01
407	3.100E-02	448	1.348E+01	489	6.482E+00	530	1.501E+01	571	2.280E+01
408	3.010E-02	449	1.469E+01	490	6.649E+00	531	1.511E+01	572	2.310E+01
409	5.650E-02	450	1.569E+01	491	6.844E+00	532	1.525E+01	573	2.338E+01
410	7.280E-02	451	1.653E+01	492	7.069E+00	533	1.540E+01	574	2.361E+01
411	6.270E-02	452	1.704E+01	493	7.305E+00	534	1.550E+01	575	2.391E+01
412	5.880E-02	453	1.730E+01	494	7.550E+00	535	1.561E+01	576	2.421E+01
413	7.790E-02	454	1.719E+01	495	7.793E+00	536	1.575E+01	577	2.450E+01
414	1.026E-01	455	1.682E+01	496	8.050E+00	537	1.589E+01	578	2.481E+01
415	1.252E-01	456	1.619E+01	497	8.329E+00	538	1.602E+01	579	2.506E+01
416	1.613E-01	457	1.535E+01	498	8.620E+00	539	1.614E+01	580	2.532E+01
417	2.018E-01	458	1.444E+01	499	8.909E+00	540	1.624E+01	581	2.558E+01
418	2.607E-01	459	1.357E+01	500	9.214E+00	541	1.635E+01	582	2.585E+01
419	3.119E-01	460	1.276E+01	501	9.504E+00	542	1.649E+01	583	2.614E+01
420	3.742E-01	461	1.198E+01	502	9.795E+00	543	1.666E+01	584	2.639E+01

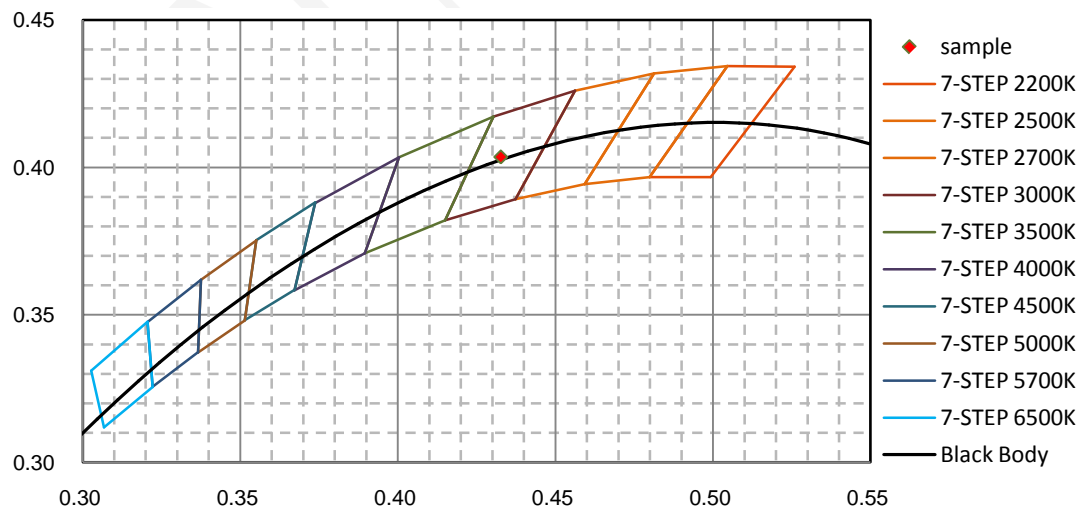


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.659E+01	626	2.527E+01	667	1.112E+01	708	3.167E+00	749	5.490E-01
586	2.683E+01	627	2.499E+01	668	1.081E+01	709	3.046E+00	750	5.486E-01
587	2.706E+01	628	2.470E+01	669	1.052E+01	710	2.928E+00	751	5.439E-01
588	2.729E+01	629	2.436E+01	670	1.024E+01	711	2.811E+00	752	5.447E-01
589	2.750E+01	630	2.400E+01	671	9.983E+00	712	2.718E+00	753	5.121E-01
590	2.764E+01	631	2.369E+01	672	9.709E+00	713	2.626E+00	754	4.345E-01
591	2.783E+01	632	2.336E+01	673	9.436E+00	714	2.513E+00	755	3.938E-01
592	2.803E+01	633	2.302E+01	674	9.166E+00	715	2.410E+00	756	3.917E-01
593	2.818E+01	634	2.268E+01	675	8.922E+00	716	2.307E+00	757	2.846E-01
594	2.833E+01	635	2.232E+01	676	8.687E+00	717	2.245E+00	758	2.474E-01
595	2.847E+01	636	2.198E+01	677	8.434E+00	718	2.145E+00	759	2.813E-01
596	2.865E+01	637	2.162E+01	678	8.180E+00	719	2.057E+00	760	2.666E-01
597	2.877E+01	638	2.125E+01	679	7.944E+00	720	1.989E+00	761	3.034E-01
598	2.883E+01	639	2.089E+01	680	7.724E+00	721	1.922E+00	762	3.312E-01
599	2.889E+01	640	2.050E+01	681	7.510E+00	722	1.862E+00	763	3.381E-01
600	2.898E+01	641	2.013E+01	682	7.297E+00	723	1.766E+00	764	2.591E-01
601	2.902E+01	642	1.975E+01	683	7.063E+00	724	1.703E+00	765	2.081E-01
602	2.903E+01	643	1.939E+01	684	6.828E+00	725	1.648E+00	766	2.219E-01
603	2.905E+01	644	1.904E+01	685	6.620E+00	726	1.548E+00	767	2.561E-01
604	2.906E+01	645	1.867E+01	686	6.466E+00	727	1.495E+00	768	2.344E-01
605	2.905E+01	646	1.833E+01	687	6.293E+00	728	1.445E+00	769	2.092E-01
606	2.903E+01	647	1.796E+01	688	6.083E+00	729	1.438E+00	770	1.867E-01
607	2.900E+01	648	1.761E+01	689	5.885E+00	730	1.383E+00	771	1.963E-01
608	2.895E+01	649	1.724E+01	690	5.700E+00	731	1.322E+00	772	1.822E-01
609	2.883E+01	650	1.685E+01	691	5.533E+00	732	1.245E+00	773	1.457E-01
610	2.869E+01	651	1.648E+01	692	5.370E+00	733	1.182E+00	774	1.436E-01
611	2.856E+01	652	1.610E+01	693	5.209E+00	734	1.145E+00	775	1.825E-01
612	2.844E+01	653	1.574E+01	694	5.047E+00	735	1.083E+00	776	1.721E-01
613	2.832E+01	654	1.541E+01	695	4.864E+00	736	1.042E+00	777	1.485E-01
614	2.815E+01	655	1.507E+01	696	4.710E+00	737	9.758E-01	778	1.376E-01
615	2.795E+01	656	1.471E+01	697	4.568E+00	738	9.084E-01	779	1.359E-01
616	2.776E+01	657	1.434E+01	698	4.421E+00	739	8.701E-01	780	1.105E-01
617	2.758E+01	658	1.400E+01	699	4.276E+00	740	8.727E-01		
618	2.740E+01	659	1.368E+01	700	4.151E+00	741	8.662E-01		
619	2.717E+01	660	1.335E+01	701	4.015E+00	742	8.443E-01		
620	2.690E+01	661	1.301E+01	702	3.849E+00	743	7.527E-01		
621	2.667E+01	662	1.269E+01	703	3.722E+00	744	6.860E-01		
622	2.641E+01	663	1.236E+01	704	3.595E+00	745	6.335E-01		
623	2.615E+01	664	1.203E+01	705	3.473E+00	746	5.903E-01		
624	2.589E+01	665	1.170E+01	706	3.359E+00	747	5.948E-01		
625	2.558E+01	666	1.142E+01	707	3.256E+00	748	5.753E-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**

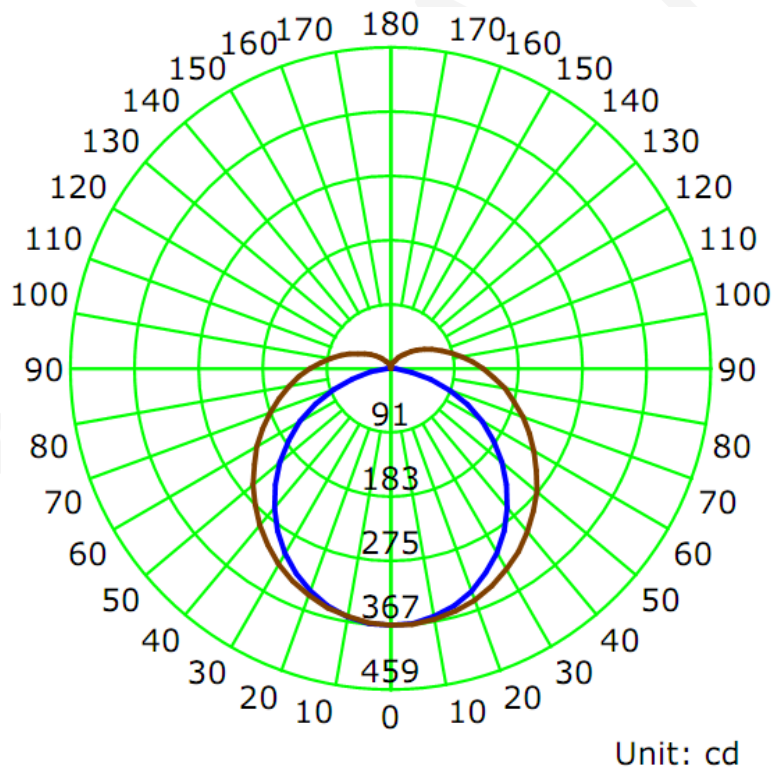
### Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0970	11.47	0.9840

### Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
1435.3	125.18	367.8	1.23	1.33

### Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	108.8	123.1	145.3	126.2	125.9
Field Angle (10% I <sub>max</sub> ):	157.8	214.3	255.6	223.9	212.9

### Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	368	368	368	368	368	368	368	368
5.0°	367	366	366	367	368	368	367	367
10.0°	360	362	362	365	364	365	363	363
15.0°	352	353	355	358	359	360	358	355
20.0°	340	342	345	351	353	353	348	344
25.0°	323	328	332	341	344	343	337	329
30.0°	305	310	318	328	332	330	322	313
35.0°	284	291	301	313	320	317	307	294
40.0°	260	268	283	298	306	301	288	272
45.0°	236	244	261	280	290	284	269	248
50.0°	209	219	239	261	274	267	248	223
55.0°	181	193	218	243	255	248	227	199
60.0°	152	166	197	223	238	229	205	172
65.0°	122	138	174	203	220	210	182	146
70.0°	91	112	152	183	202	190	162	120
75.0°	60	86	131	165	184	172	141	96
80.0°	31	63	111	148	166	154	121	74
85.0°	8	43	94	130	149	137	104	55
90.0°	0	30	79	114	133	121	88	41
95.0°	0	20	65	100	118	106	74	30
100.0°	0	14	54	86	103	93	62	22
105.0°	0	10	45	74	90	80	52	17
110.0°	0	7	36	64	78	68	44	13
115.0°	0	7	30	53	66	57	36	10
120.0°	0	5	25	45	56	48	30	9
125.0°	0	5	20	38	47	41	24	8
130.0°	0	4	18	31	39	33	20	7
135.0°	0	4	14	26	31	27	17	6
140.0°	0	4	13	22	25	23	13	5
145.0°	0	4	11	17	20	17	10	5
150.0°	0	4	10	15	16	13	9	4
155.0°	0	4	8	11	13	10	6	2
160.0°	0	3	7	9	9	8	3	2
165.0°	0	2	5	7	7	4	2	0
170.0°	0	0	3	4	4	1	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

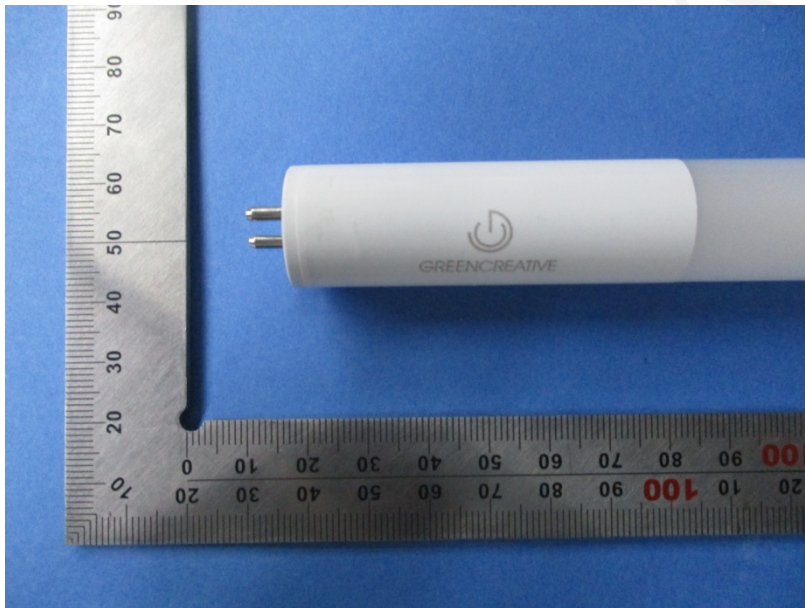
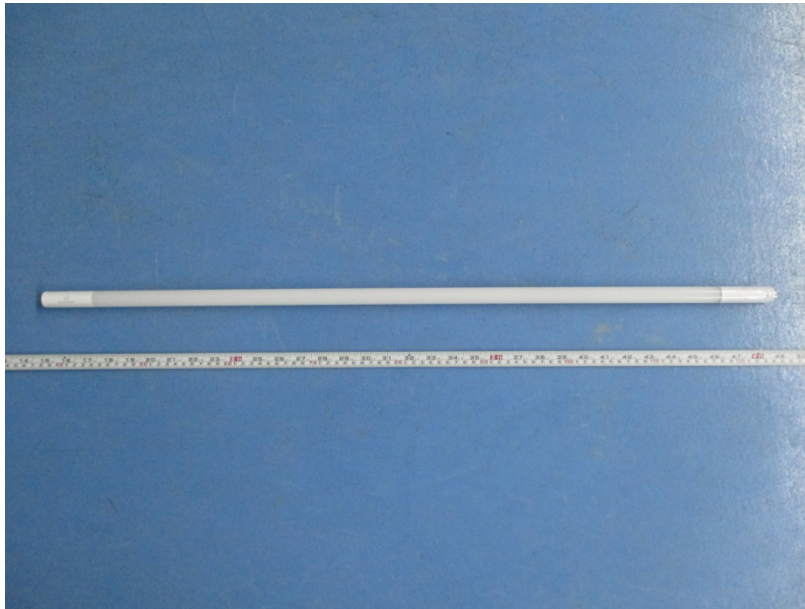
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	368	368	368	368	368	368	368	368
5.0°	366	366	365	366	365	366	365	366
10.0°	361	361	360	361	360	361	360	360
15.0°	352	352	352	355	355	354	352	350
20.0°	339	340	341	345	345	345	341	339
25.0°	324	324	327	333	335	333	328	323
30.0°	305	307	311	319	323	319	313	305
35.0°	283	286	293	304	309	303	295	286
40.0°	261	263	273	286	293	287	276	263
45.0°	235	239	252	268	276	269	255	240
50.0°	208	213	230	248	259	251	234	215
55.0°	180	187	207	229	240	231	212	189
60.0°	151	159	185	209	222	212	190	163
65.0°	120	132	163	189	204	192	169	138
70.0°	88	104	141	168	185	173	148	111
75.0°	58	79	119	149	167	154	126	88
80.0°	30	56	100	132	149	136	108	67
85.0°	7	38	82	115	132	120	91	49
90.0°	0	24	67	100	117	105	77	34
95.0°	0	15	55	85	101	91	63	25
100.0°	0	10	44	73	88	77	53	18
105.0°	0	6	36	62	75	65	44	13
110.0°	0	4	29	52	63	55	35	10
115.0°	0	4	24	43	53	46	29	7
120.0°	0	3	18	35	44	38	23	6
125.0°	0	2	15	28	36	31	19	5
130.0°	0	2	12	23	29	25	15	4
135.0°	0	1	9	18	23	20	12	4
140.0°	0	2	8	14	18	16	10	4
145.0°	0	1	6	12	14	13	9	2
150.0°	0	0	5	9	11	10	7	2
155.0°	0	0	4	7	9	8	5	2
160.0°	0	0	2	5	6	5	4	2
165.0°	0	0	1	3	4	4	3	0
170.0°	0	0	0	1	3	2	1	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	8.8	0.61	0-5	8.8	0.61
5-10	26.0	1.81	0-10	34.8	2.43
10-15	42.5	2.96	0-15	77.3	5.39
15-20	57.6	4.01	0-20	134.9	9.40
20-25	70.9	4.94	0-25	205.7	14.33
25-30	81.9	5.71	0-30	287.7	20.04
30-35	90.6	6.31	0-35	378.3	26.35
35-40	96.6	6.73	0-40	474.9	33.08
40-45	99.8	6.95	0-45	574.7	40.04
45-50	100.3	6.99	0-50	675.0	47.03
50-55	98.3	6.85	0-55	773.3	53.88
55-60	94.0	6.55	0-60	867.4	60.43
60-65	87.7	6.11	0-65	955.1	66.54
65-70	79.6	5.55	0-70	1034.7	72.09
70-75	70.3	4.90	0-75	1105.0	76.99
75-80	60.5	4.21	0-80	1165.5	81.20
80-85	50.9	3.55	0-85	1216.4	84.75
85-90	42.5	2.96	0-90	1258.9	87.71
90-95	35.5	2.48	0-95	1294.4	90.19
95-100	29.6	2.06	0-100	1324.1	92.25
100-105	24.5	1.71	0-105	1348.6	93.96
105-110	20.0	1.39	0-110	1368.6	95.35
110-115	16.2	1.13	0-115	1384.7	96.48
115-120	12.9	0.90	0-120	1397.6	97.38
120-125	10.1	0.71	0-125	1407.8	98.08
125-130	7.9	0.55	0-130	1415.7	98.63
130-135	6.0	0.42	0-135	1421.6	99.05
135-140	4.5	0.32	0-140	1426.2	99.36
140-145	3.3	0.23	0-145	1429.5	99.60
145-150	2.4	0.17	0-150	1431.9	99.76
150-155	1.6	0.11	0-155	1433.5	99.87
155-160	1.0	0.07	0-160	1434.5	99.94
160-165	0.5	0.04	0-165	1435.0	99.98
165-170	0.2	0.01	0-170	1435.3	100.00
170-175	0.0	0.00	0-175	1435.3	100.00
175-180	0.0	0.00	0-180	1435.3	100.00

## 6. Product Photo



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