



# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

### GREEN CREATIVE LTD

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

**Test Model: 9.5T5HE/2F/835/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>	PKS180820081-10-3
<b>Test Date:</b>	2018-08-21 to 2018-08-23
<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: 9.5T5HE/2F/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: 9.5W  
Nominal CCT: 3500K  
Nominal Lumen Output: 1150lm

## 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**

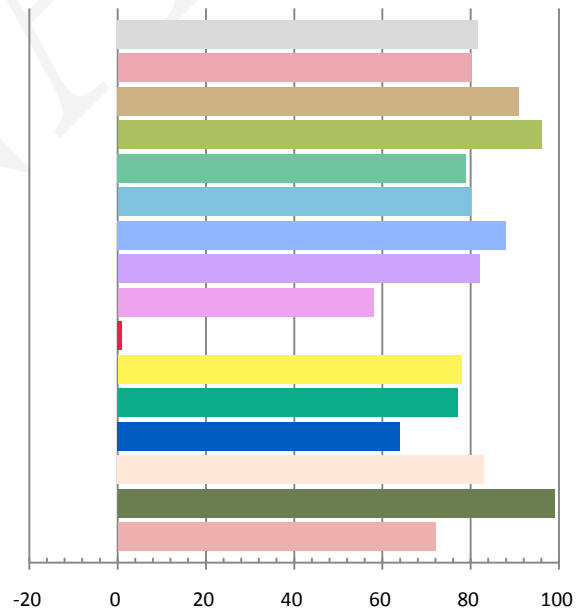
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0742	8.77	0.9845	1214.5	138.5

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
3.576	3321	0.00149	0.4176	0.4000	0.2398	0.5169

### Color Rendering Index

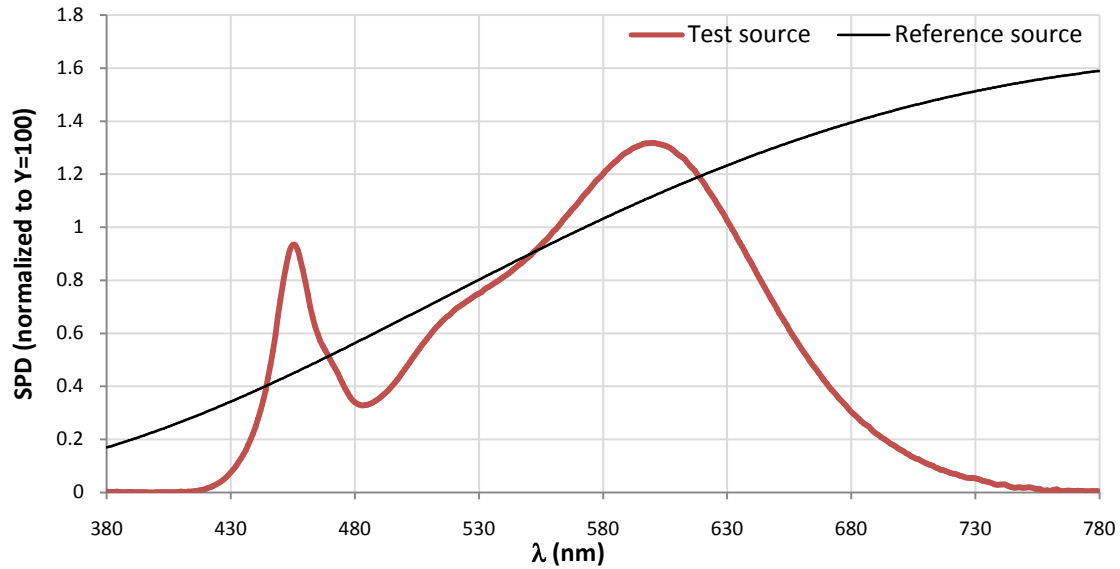
<b>Ra</b> <b>81.7</b>			
<b>R1</b> 80	<b>R2</b> 91	<b>R3</b> 96	<b>R4</b> 79
<b>R5</b> 80	<b>R6</b> 88	<b>R7</b> 82	<b>R8</b> 58
<b>R9</b> 1	<b>R10</b> 78	<b>R11</b> 77	<b>R12</b> 64
<b>R13</b> 83	<b>R14</b> 99	<b>R15</b> 72	



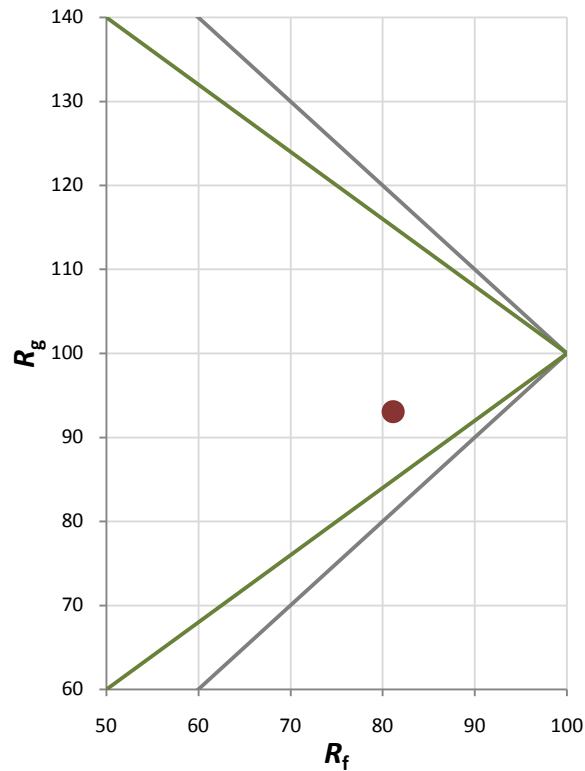
### Fidelity Index and Gamut Index

Fidelity Index $R_f$	81
Gamut Index $R_g$	93

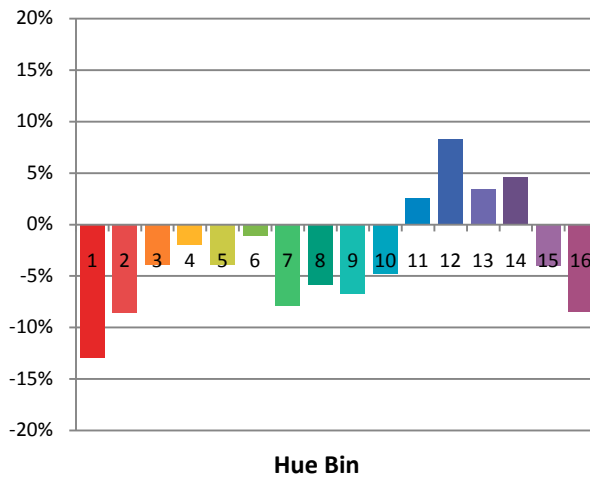
### Spectral Power Distribution Comparison



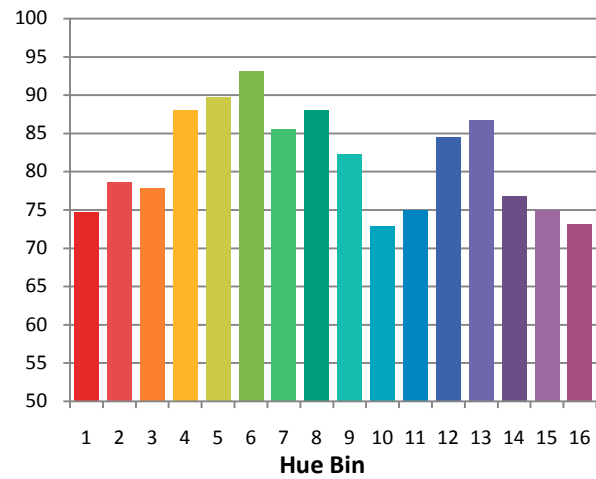
### Plot of $R_g$ versus $R_f$



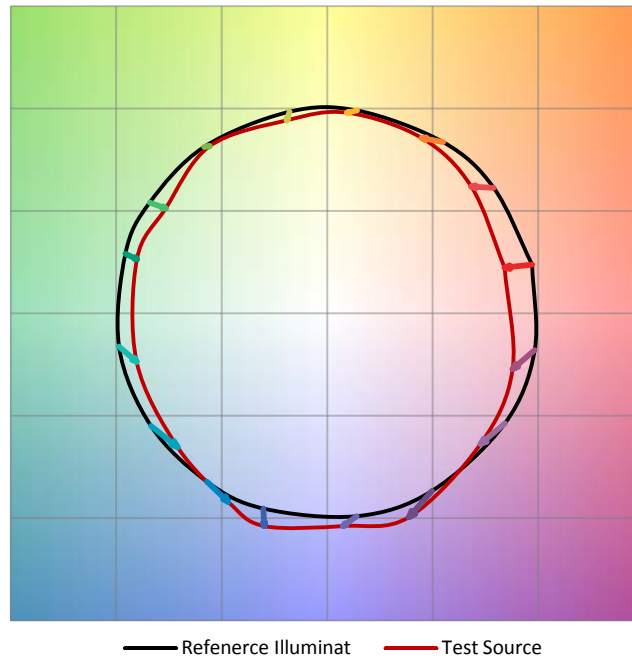
Chroma Shift by Hue



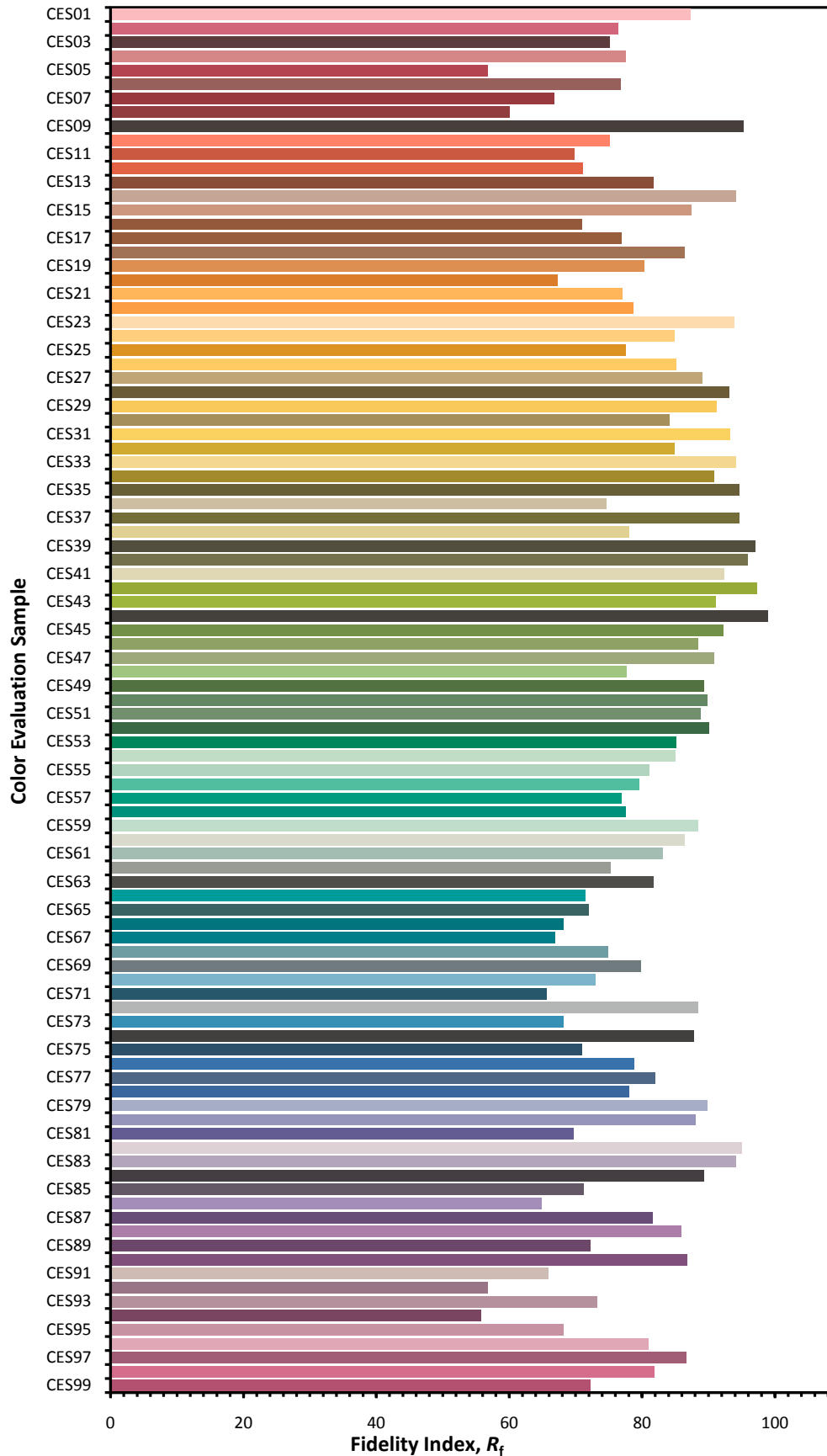
$R_t$  by Hue



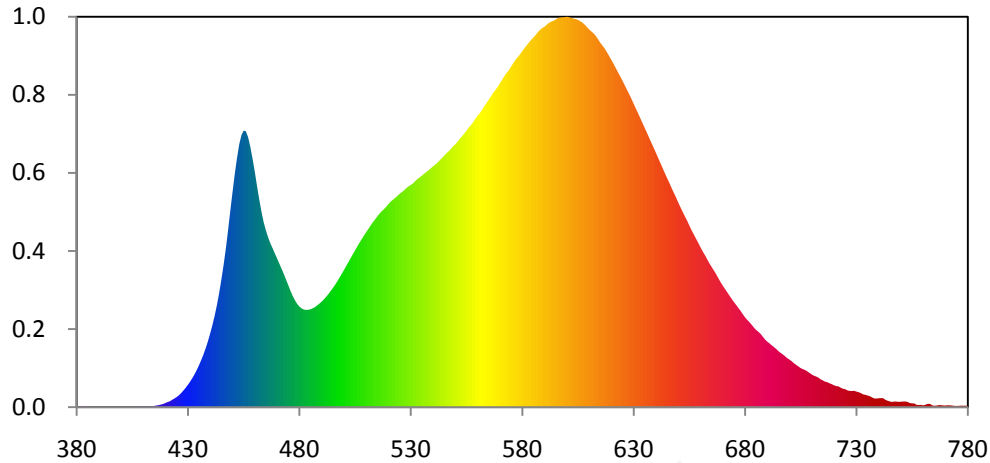
Color Vector Graphic



### Color Fidelity by CES Sample



### Relative Spectral Power Distribution

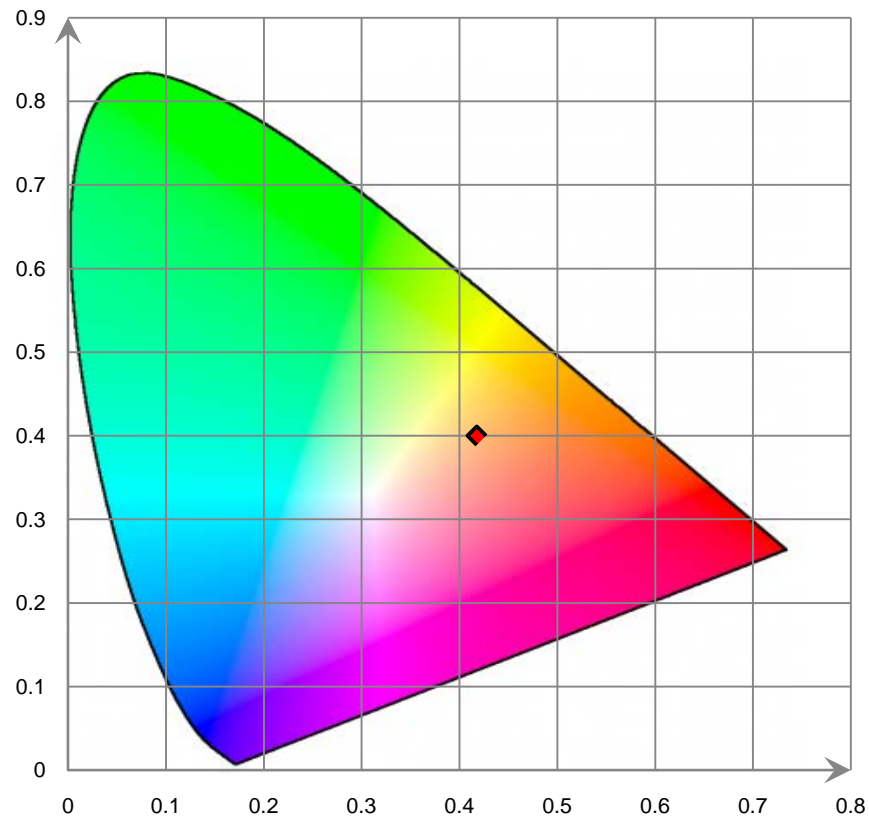


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.300E-02	421	3.116E-01	462	1.249E+01	503	8.940E+00	544	1.496E+01
381	4.660E-02	422	3.607E-01	463	1.175E+01	504	9.180E+00	545	1.510E+01
382	3.210E-02	423	4.500E-01	464	1.110E+01	505	9.407E+00	546	1.524E+01
383	5.040E-02	424	5.281E-01	465	1.061E+01	506	9.647E+00	547	1.536E+01
384	5.530E-02	425	6.133E-01	466	1.019E+01	507	9.872E+00	548	1.550E+01
385	3.650E-02	426	7.200E-01	467	9.843E+00	508	1.009E+01	549	1.566E+01
386	3.020E-02	427	8.548E-01	468	9.541E+00	509	1.030E+01	550	1.578E+01
387	2.670E-02	428	1.005E+00	469	9.235E+00	510	1.051E+01	551	1.594E+01
388	2.110E-02	429	1.166E+00	470	8.939E+00	511	1.071E+01	552	1.611E+01
389	3.440E-02	430	1.346E+00	471	8.628E+00	512	1.091E+01	553	1.626E+01
390	3.360E-02	431	1.538E+00	472	8.321E+00	513	1.110E+01	554	1.642E+01
391	1.750E-02	432	1.749E+00	473	8.010E+00	514	1.128E+01	555	1.659E+01
392	1.310E-02	433	1.983E+00	474	7.672E+00	515	1.145E+01	556	1.678E+01
393	1.510E-02	434	2.242E+00	475	7.339E+00	516	1.163E+01	557	1.693E+01
394	1.830E-02	435	2.530E+00	476	6.999E+00	517	1.177E+01	558	1.710E+01
395	2.070E-02	436	2.840E+00	477	6.688E+00	518	1.189E+01	559	1.731E+01
396	1.390E-02	437	3.177E+00	478	6.429E+00	519	1.204E+01	560	1.749E+01
397	8.200E-03	438	3.551E+00	479	6.205E+00	520	1.220E+01	561	1.766E+01
398	4.500E-03	439	3.968E+00	480	6.047E+00	521	1.234E+01	562	1.785E+01
399	2.400E-03	440	4.435E+00	481	5.933E+00	522	1.245E+01	563	1.806E+01
400	1.630E-02	441	4.933E+00	482	5.866E+00	523	1.256E+01	564	1.826E+01
401	2.320E-02	442	5.493E+00	483	5.839E+00	524	1.268E+01	565	1.846E+01
402	2.380E-02	443	6.124E+00	484	5.846E+00	525	1.281E+01	566	1.866E+01
403	1.980E-02	444	6.846E+00	485	5.879E+00	526	1.291E+01	567	1.887E+01
404	2.000E-02	445	7.656E+00	486	5.935E+00	527	1.302E+01	568	1.904E+01
405	2.190E-02	446	8.530E+00	487	6.009E+00	528	1.315E+01	569	1.922E+01
406	2.600E-02	447	9.502E+00	488	6.110E+00	529	1.326E+01	570	1.944E+01
407	2.790E-02	448	1.060E+01	489	6.219E+00	530	1.334E+01	571	1.966E+01
408	2.450E-02	449	1.177E+01	490	6.334E+00	531	1.344E+01	572	1.987E+01
409	4.390E-02	450	1.289E+01	491	6.474E+00	532	1.357E+01	573	2.005E+01
410	5.470E-02	451	1.398E+01	492	6.622E+00	533	1.370E+01	574	2.023E+01
411	4.310E-02	452	1.493E+01	493	6.785E+00	534	1.379E+01	575	2.044E+01
412	4.430E-02	453	1.577E+01	494	6.965E+00	535	1.390E+01	576	2.065E+01
413	5.400E-02	454	1.633E+01	495	7.145E+00	536	1.402E+01	577	2.085E+01
414	6.120E-02	455	1.660E+01	496	7.335E+00	537	1.412E+01	578	2.102E+01
415	7.930E-02	456	1.657E+01	497	7.547E+00	538	1.423E+01	579	2.118E+01
416	1.029E-01	457	1.621E+01	498	7.773E+00	539	1.435E+01	580	2.136E+01
417	1.262E-01	458	1.564E+01	499	8.000E+00	540	1.445E+01	581	2.155E+01
418	1.634E-01	459	1.492E+01	500	8.229E+00	541	1.457E+01	582	2.172E+01
419	1.995E-01	460	1.414E+01	501	8.468E+00	542	1.469E+01	583	2.189E+01
420	2.601E-01	461	1.328E+01	502	8.705E+00	543	1.482E+01	584	2.205E+01

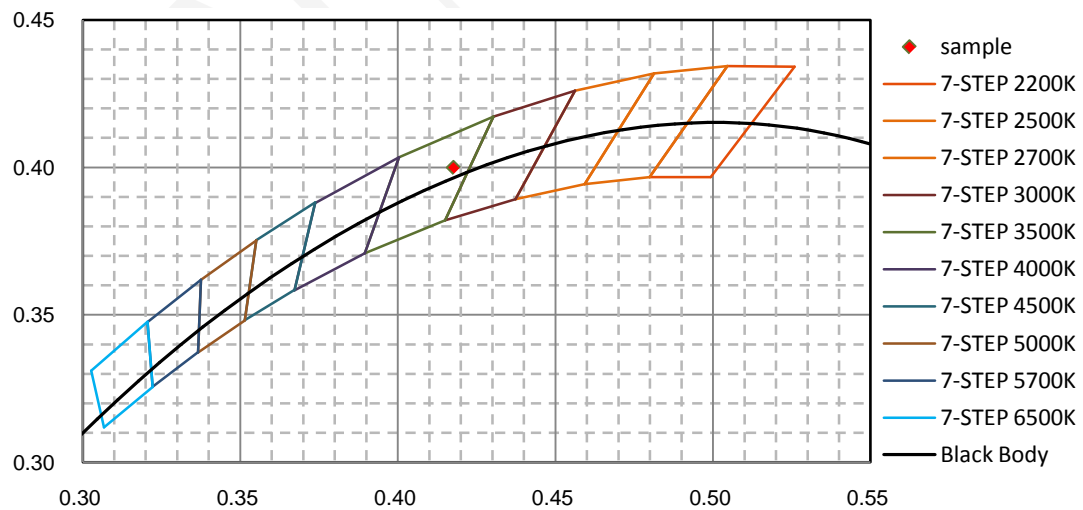


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.219E+01	626	1.934E+01	667	8.003E+00	708	2.153E+00	749	3.195E-01
586	2.234E+01	627	1.907E+01	668	7.761E+00	709	2.056E+00	750	3.305E-01
587	2.250E+01	628	1.881E+01	669	7.525E+00	710	1.962E+00	751	3.365E-01
588	2.265E+01	629	1.853E+01	670	7.311E+00	711	1.887E+00	752	3.431E-01
589	2.276E+01	630	1.823E+01	671	7.107E+00	712	1.840E+00	753	3.170E-01
590	2.284E+01	631	1.794E+01	672	6.910E+00	713	1.772E+00	754	2.487E-01
591	2.296E+01	632	1.766E+01	673	6.711E+00	714	1.673E+00	755	2.299E-01
592	2.307E+01	633	1.736E+01	674	6.511E+00	715	1.605E+00	756	2.250E-01
593	2.314E+01	634	1.707E+01	675	6.326E+00	716	1.531E+00	757	1.453E-01
594	2.320E+01	635	1.677E+01	676	6.151E+00	717	1.500E+00	758	1.260E-01
595	2.327E+01	636	1.648E+01	677	5.968E+00	718	1.435E+00	759	1.427E-01
596	2.336E+01	637	1.618E+01	678	5.792E+00	719	1.381E+00	760	1.074E-01
597	2.339E+01	638	1.588E+01	679	5.590E+00	720	1.316E+00	761	1.453E-01
598	2.340E+01	639	1.559E+01	680	5.404E+00	721	1.263E+00	762	1.951E-01
599	2.342E+01	640	1.528E+01	681	5.248E+00	722	1.250E+00	763	2.047E-01
600	2.344E+01	641	1.498E+01	682	5.105E+00	723	1.168E+00	764	1.152E-01
601	2.342E+01	642	1.468E+01	683	4.952E+00	724	1.110E+00	765	8.400E-02
602	2.337E+01	643	1.438E+01	684	4.784E+00	725	1.080E+00	766	9.760E-02
603	2.334E+01	644	1.407E+01	685	4.640E+00	726	1.010E+00	767	1.252E-01
604	2.330E+01	645	1.377E+01	686	4.531E+00	727	9.775E-01	768	1.208E-01
605	2.326E+01	646	1.349E+01	687	4.408E+00	728	9.694E-01	769	1.047E-01
606	2.318E+01	647	1.319E+01	688	4.239E+00	729	9.848E-01	770	1.004E-01
607	2.309E+01	648	1.289E+01	689	4.071E+00	730	9.382E-01	771	1.152E-01
608	2.298E+01	649	1.262E+01	690	3.940E+00	731	9.019E-01	772	1.106E-01
609	2.283E+01	650	1.231E+01	691	3.832E+00	732	8.482E-01	773	1.010E-01
610	2.269E+01	651	1.202E+01	692	3.718E+00	733	7.719E-01	774	7.910E-02
611	2.257E+01	652	1.175E+01	693	3.613E+00	734	7.457E-01	775	7.640E-02
612	2.245E+01	653	1.147E+01	694	3.499E+00	735	7.034E-01	776	7.870E-02
613	2.230E+01	654	1.121E+01	695	3.372E+00	736	6.623E-01	777	9.380E-02
614	2.210E+01	655	1.092E+01	696	3.263E+00	737	5.933E-01	778	8.770E-02
615	2.190E+01	656	1.064E+01	697	3.170E+00	738	5.263E-01	779	9.480E-02
616	2.172E+01	657	1.039E+01	698	3.059E+00	739	5.170E-01	780	7.340E-02
617	2.155E+01	658	1.013E+01	699	2.944E+00	740	5.357E-01		
618	2.133E+01	659	9.878E+00	700	2.856E+00	741	5.447E-01		
619	2.109E+01	660	9.617E+00	701	2.760E+00	742	5.426E-01		
620	2.086E+01	661	9.365E+00	702	2.638E+00	743	4.478E-01		
621	2.062E+01	662	9.141E+00	703	2.542E+00	744	3.861E-01		
622	2.036E+01	663	8.897E+00	704	2.446E+00	745	3.460E-01		
623	2.011E+01	664	8.646E+00	705	2.350E+00	746	3.139E-01		
624	1.987E+01	665	8.434E+00	706	2.283E+00	747	3.389E-01		
625	1.961E+01	666	8.222E+00	707	2.230E+00	748	3.359E-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**

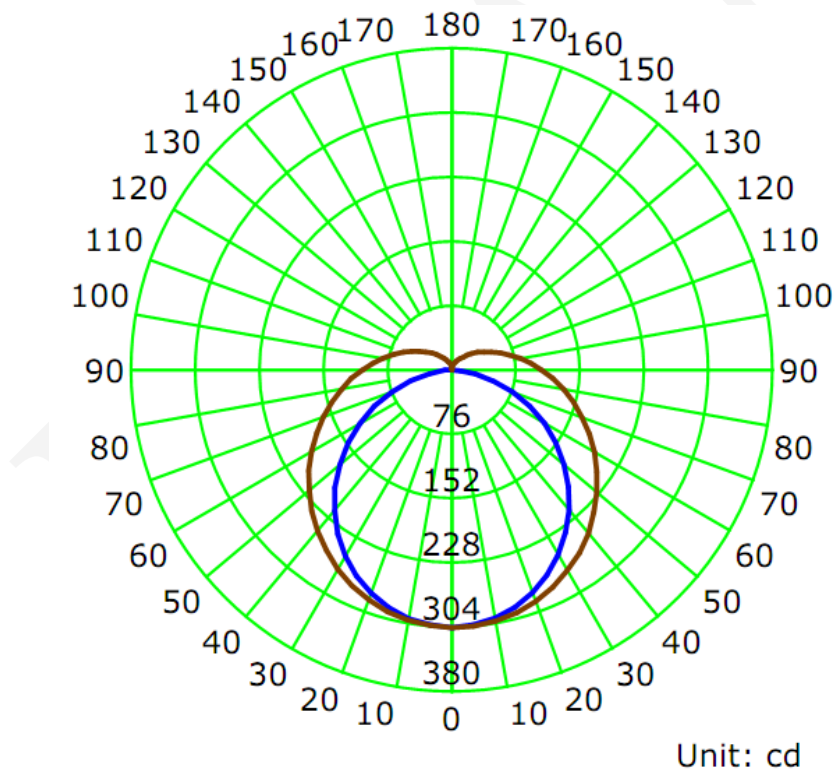
#### Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0740	8.76	0.9870

#### Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
1217.4	139.03	304.2	1.24	1.34

#### Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	109.5	123.6	147.7	127.9	127.2
Field Angle (10% I <sub>max</sub> ):	159.0	218.1	261.6	230.6	217.3

**Luminous Intensity (cd) Distribution Data**

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	304	304	304	304	304	304	304	304
5.0°	302	303	303	304	304	304	303	304
10.0°	298	298	299	300	301	300	301	300
15.0°	290	291	293	295	297	296	295	293
20.0°	280	282	284	288	291	290	288	284
25.0°	268	269	274	279	283	281	277	273
30.0°	253	255	261	268	274	271	266	259
35.0°	235	238	247	256	264	259	252	243
40.0°	217	219	231	242	252	247	238	226
45.0°	196	200	214	228	239	233	221	206
50.0°	174	179	196	212	225	218	204	187
55.0°	151	157	178	196	210	203	187	166
60.0°	127	135	159	181	195	187	169	144
65.0°	102	113	140	165	180	171	150	123
70.0°	77	90	122	149	164	156	132	101
75.0°	52	70	106	133	149	140	117	81
80.0°	29	51	90	119	135	126	101	63
85.0°	10	36	76	105	120	112	86	48
90.0°	1	24	63	91	107	98	73	36
95.0°	0	16	52	80	94	86	62	27
100.0°	0	11	43	68	82	75	52	20
105.0°	0	9	35	58	71	65	43	15
110.0°	1	7	29	50	61	55	36	12
115.0°	0	6	24	42	52	46	30	10
120.0°	0	6	20	35	44	39	25	9
125.0°	0	5	17	30	37	33	21	8
130.0°	1	5	14	25	31	27	17	7
135.0°	1	5	12	21	25	22	14	6
140.0°	1	5	11	17	21	18	12	6
145.0°	1	5	10	15	17	15	10	5
150.0°	1	5	9	12	14	12	8	5
155.0°	1	5	8	10	11	9	6	5
160.0°	1	5	7	8	9	7	5	4
165.0°	2	4	6	7	7	6	3	1
170.0°	2	2	4	5	5	3	2	2
175.0°	2	2	2	2	2	2	2	2
180.0°	0	0	0	0	0	0	0	0

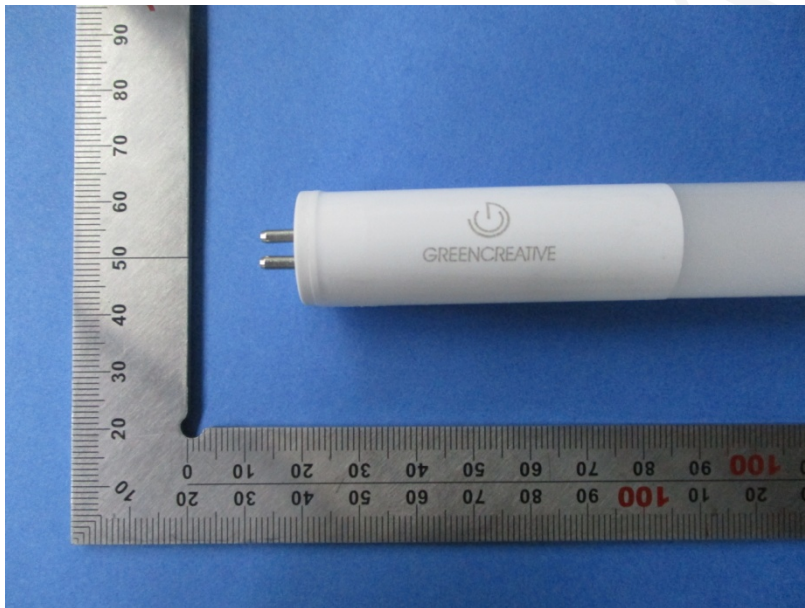
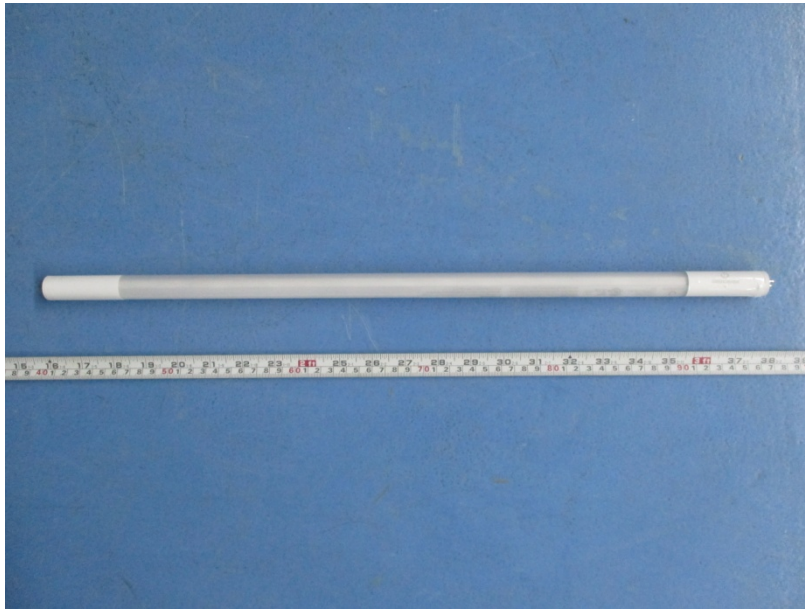
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	304	304	304	304	304	304	304	304
5.0°	303	303	303	303	303	302	302	302
10.0°	298	299	299	300	301	299	299	298
15.0°	291	292	293	295	296	294	292	291
20.0°	281	282	284	288	289	287	284	281
25.0°	268	270	274	279	281	278	274	269
30.0°	254	255	261	268	272	268	261	254
35.0°	237	239	246	255	260	255	247	238
40.0°	217	220	230	242	249	242	232	220
45.0°	197	201	213	227	235	228	215	201
50.0°	174	179	195	212	222	214	198	181
55.0°	151	157	177	196	207	199	181	160
60.0°	127	134	159	180	193	183	164	139
65.0°	102	112	140	164	177	167	147	118
70.0°	76	89	122	148	163	151	129	97
75.0°	51	69	105	132	148	137	113	78
80.0°	28	50	89	118	133	123	98	61
85.0°	9	34	75	105	120	110	84	47
90.0°	1	23	62	91	107	98	72	35
95.0°	0	16	51	79	94	87	62	27
100.0°	0	12	43	69	83	76	52	21
105.0°	1	9	36	59	72	65	44	17
110.0°	1	7	30	51	62	56	38	14
115.0°	1	7	25	43	53	48	32	11
120.0°	0	6	21	36	45	41	27	10
125.0°	0	5	17	31	38	34	22	9
130.0°	0	5	15	26	32	29	19	8
135.0°	1	5	13	21	26	24	16	7
140.0°	1	5	11	18	22	20	14	7
145.0°	1	4	9	15	18	17	12	7
150.0°	1	4	8	13	15	14	10	6
155.0°	1	4	7	10	12	11	9	5
160.0°	1	2	6	8	10	9	8	5
165.0°	2	2	4	6	8	7	5	4
170.0°	2	2	2	4	5	5	4	2
175.0°	2	2	2	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	7.3	0.60	0-5	7.3	0.60
5-10	21.5	1.77	0-10	28.8	2.37
10-15	35.2	2.89	0-15	64.0	5.25
15-20	47.7	3.92	0-20	111.6	9.17
20-25	58.7	4.82	0-25	170.4	13.99
25-30	68.0	5.58	0-30	238.3	19.57
30-35	75.2	6.18	0-35	313.5	25.75
35-40	80.2	6.59	0-40	393.7	32.34
40-45	83.0	6.82	0-45	476.8	39.16
45-50	83.6	6.87	0-50	560.4	46.03
50-55	82.2	6.75	0-55	642.6	52.78
55-60	78.7	6.47	0-60	721.3	59.25
60-65	73.6	6.05	0-65	794.9	65.29
65-70	67.0	5.51	0-70	861.9	70.80
70-75	59.6	4.89	0-75	921.5	75.69
75-80	51.7	4.25	0-80	973.2	79.94
80-85	43.9	3.61	0-85	1017.1	83.55
85-90	36.9	3.03	0-90	1054.0	86.58
90-95	31.1	2.55	0-95	1085.1	89.13
95-100	26.2	2.15	0-100	1111.3	91.28
100-105	21.8	1.79	0-105	1133.1	93.07
105-110	18.1	1.49	0-110	1151.2	94.56
110-115	14.8	1.22	0-115	1166.0	95.78
115-120	12.0	0.99	0-120	1178.1	96.77
120-125	9.7	0.80	0-125	1187.8	97.56
125-130	7.7	0.63	0-130	1195.5	98.20
130-135	6.1	0.50	0-135	1201.5	98.69
135-140	4.7	0.39	0-140	1206.3	99.08
140-145	3.6	0.30	0-145	1209.9	99.38
145-150	2.7	0.22	0-150	1212.6	99.60
150-155	2.0	0.16	0-155	1214.6	99.77
155-160	1.4	0.11	0-160	1216.0	99.88
160-165	0.9	0.07	0-165	1216.8	99.95
165-170	0.4	0.04	0-170	1217.3	99.99
170-175	0.2	0.01	0-175	1217.4	100.00
175-180	0.0	0.00	0-180	1217.4	100.00

## 6. Product Photo



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