



# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

### GREEN CREATIVE LTD

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

**Test Model: 8T8/2F/835/BYP/FF**

<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>	PKS180910085-10-3
<b>Test Date:</b>	2018-09-11
<b>Report Date:</b>	2018-09-18
<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 2018-09-10 and used for testing.

Model Tested: 8T8/2F/835/BYP/FF  
 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 50/60Hz  
 Rated Power: 8W  
 Nominal CCT: 3500K  
 Nominal Lumen Output: 1000lm

## 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  $R_f$ ,  $R_g$  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**

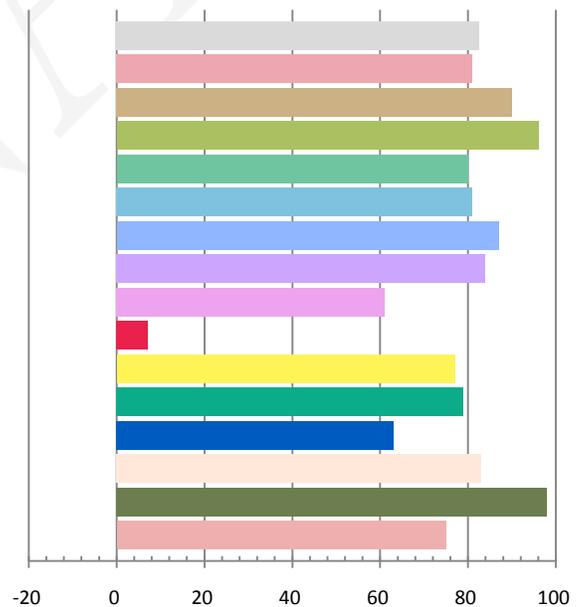
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0663	7.79	0.9789	1058	135.81

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
3.152	3445	0.00010	0.4085	0.3926	0.2371	0.5125

### Color Rendering Index

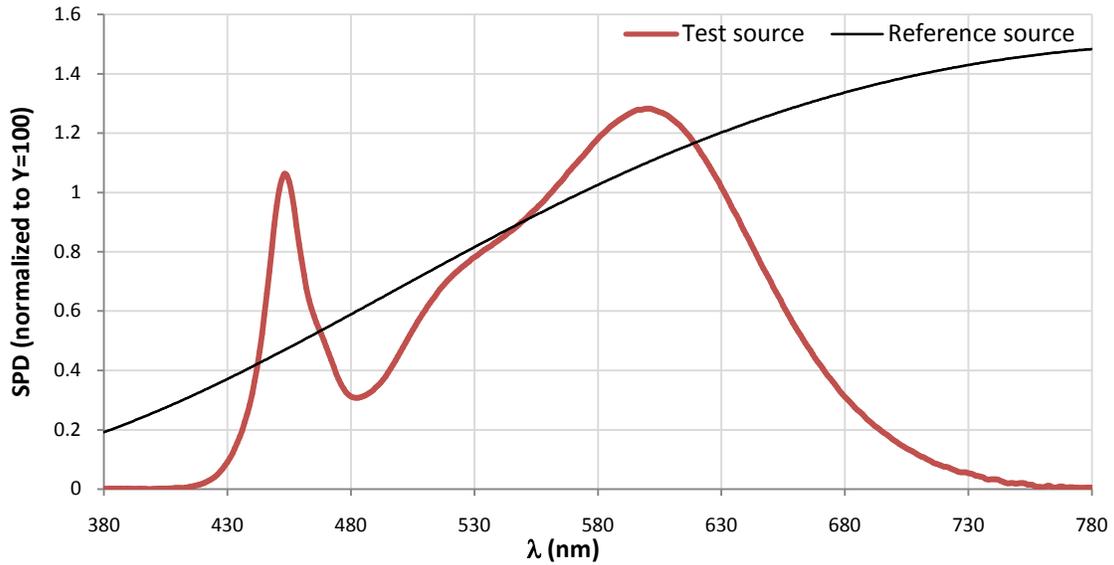
Ra			
<b>82.6</b>			
R1	R2	R3	R4
81	90	96	80
R5	R6	R7	R8
81	87	84	61
R9	R10	R11	R12
7	77	79	63
R13	R14	R15	
83	98	75	



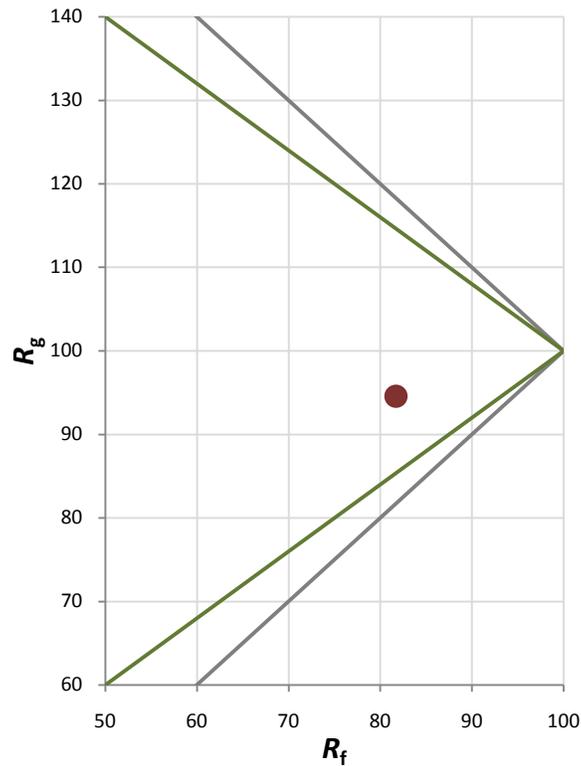
Fidelity Index and Gamut Index

Fidelity Index $R_f$	82
Gamut Index $R_g$	95

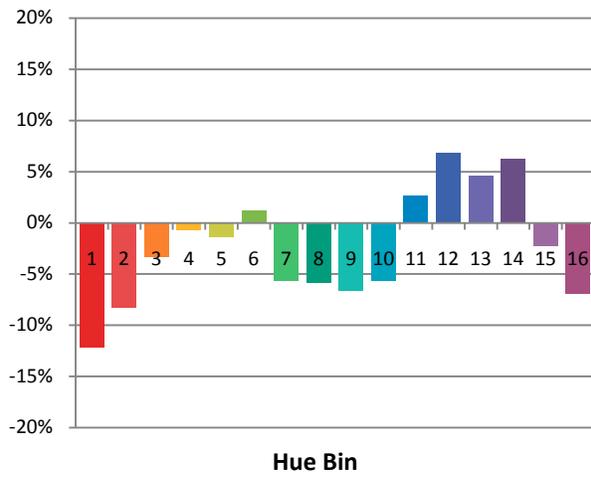
Spectral Power Distribution Comparison



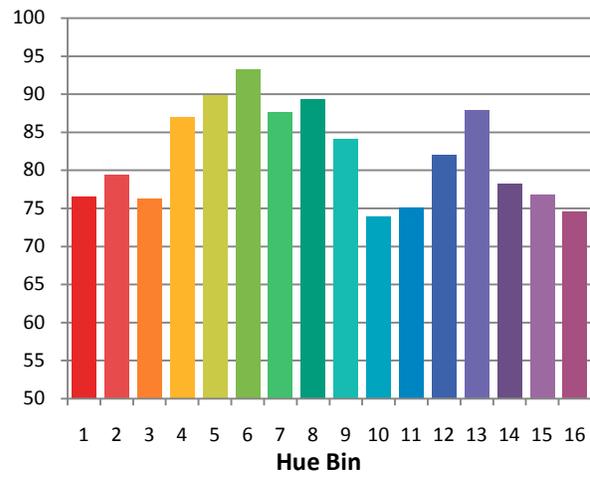
Plot of  $R_g$  versus  $R_f$



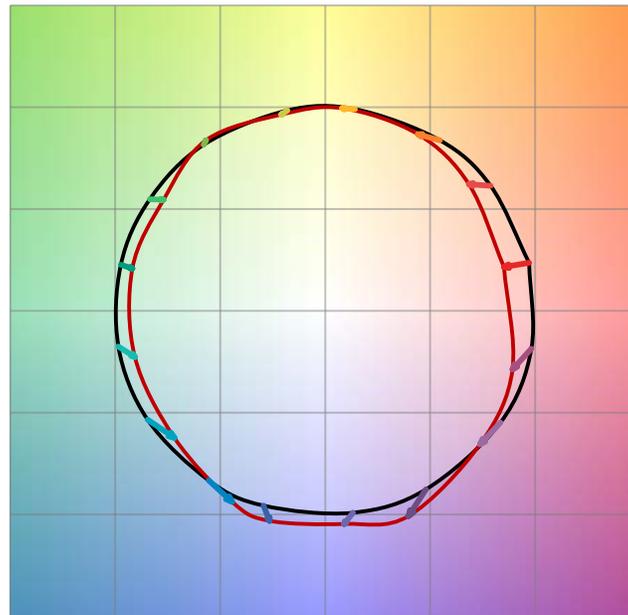
Chroma Shift by Hue



$R_T$  by Hue

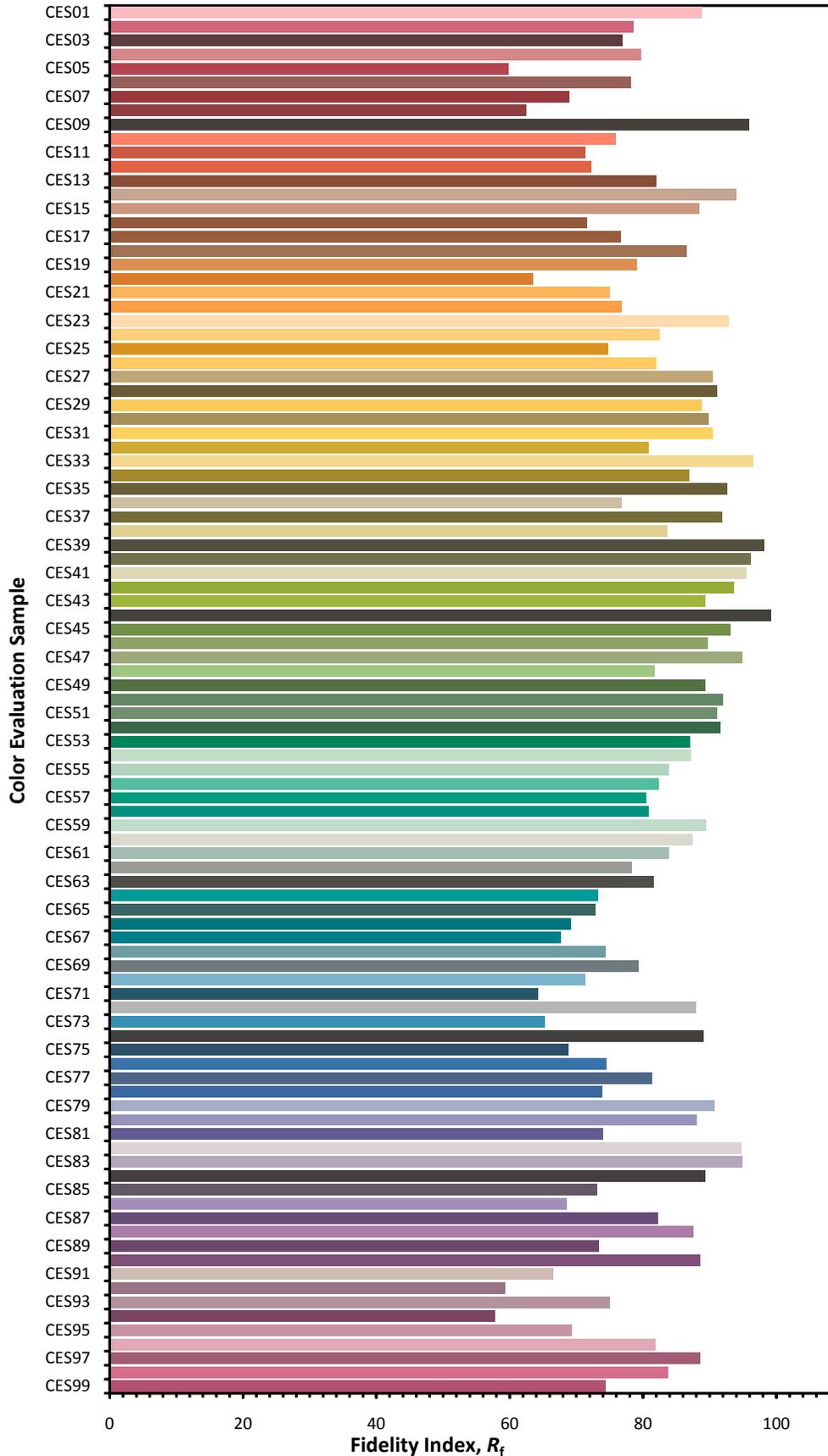


Color Vector Graphic

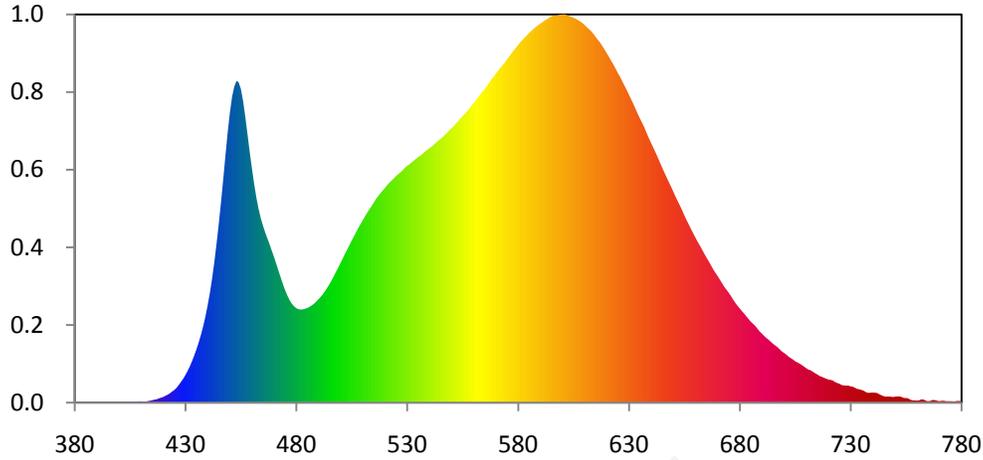


— Reference Illuminat    — Test Source

**Color Fidelity by CES Sample**



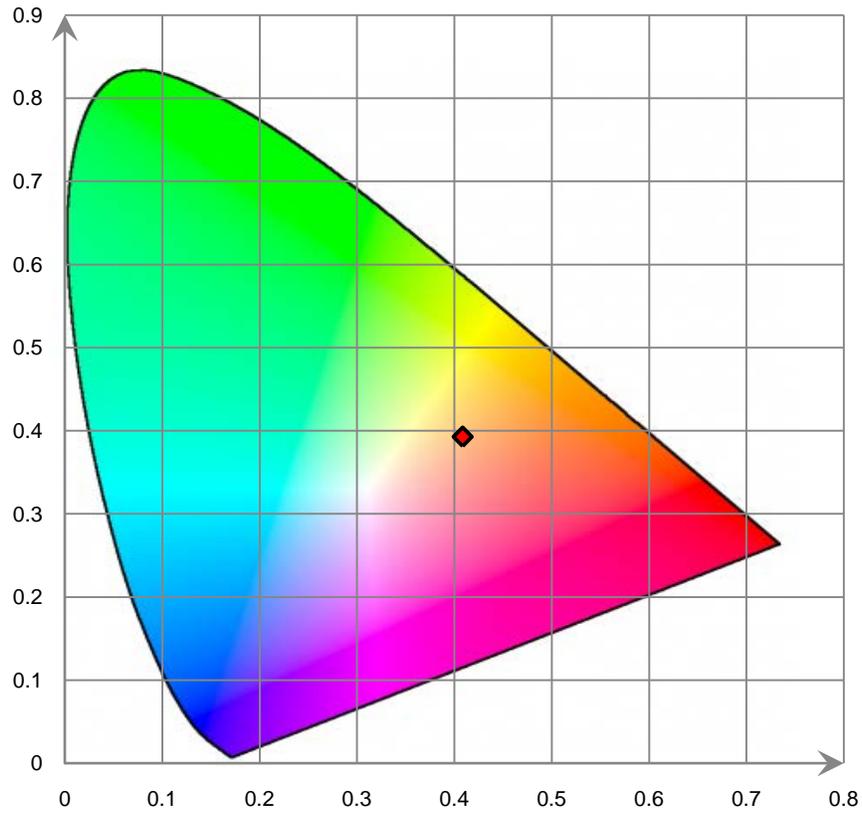
### Relative Spectral Power Distribution



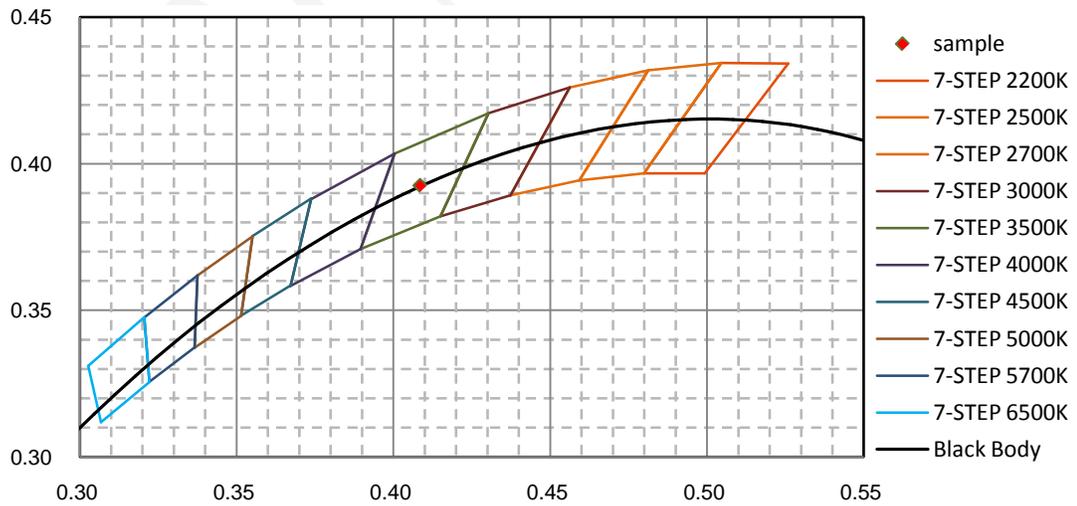
nm	mW								
380	2.780E-02	421	3.550E-01	462	1.048E+01	503	7.844E+00	544	1.340E+01
381	2.200E-02	422	4.063E-01	463	9.902E+00	504	8.075E+00	545	1.349E+01
382	2.970E-02	423	4.806E-01	464	9.426E+00	505	8.296E+00	546	1.359E+01
383	3.610E-02	424	5.703E-01	465	9.040E+00	506	8.512E+00	547	1.370E+01
384	3.680E-02	425	6.505E-01	466	8.697E+00	507	8.729E+00	548	1.380E+01
385	2.330E-02	426	7.633E-01	467	8.390E+00	508	8.942E+00	549	1.393E+01
386	2.390E-02	427	9.082E-01	468	8.087E+00	509	9.145E+00	550	1.404E+01
387	2.670E-02	428	1.064E+00	469	7.755E+00	510	9.337E+00	551	1.414E+01
388	2.240E-02	429	1.224E+00	470	7.437E+00	511	9.534E+00	552	1.428E+01
389	2.900E-02	430	1.417E+00	471	7.083E+00	512	9.719E+00	553	1.441E+01
390	2.780E-02	431	1.629E+00	472	6.734E+00	513	9.904E+00	554	1.453E+01
391	1.340E-02	432	1.863E+00	473	6.392E+00	514	1.006E+01	555	1.465E+01
392	9.600E-03	433	2.132E+00	474	6.051E+00	515	1.025E+01	556	1.478E+01
393	1.810E-02	434	2.429E+00	475	5.742E+00	516	1.043E+01	557	1.489E+01
394	2.330E-02	435	2.744E+00	476	5.469E+00	517	1.058E+01	558	1.503E+01
395	2.210E-02	436	3.091E+00	477	5.241E+00	518	1.072E+01	559	1.519E+01
396	1.530E-02	437	3.479E+00	478	5.060E+00	519	1.086E+01	560	1.533E+01
397	8.000E-03	438	3.913E+00	479	4.930E+00	520	1.099E+01	561	1.547E+01
398	4.300E-03	439	4.404E+00	480	4.833E+00	521	1.113E+01	562	1.562E+01
399	2.300E-03	440	4.978E+00	481	4.781E+00	522	1.125E+01	563	1.578E+01
400	1.700E-02	441	5.605E+00	482	4.763E+00	523	1.136E+01	564	1.591E+01
401	2.290E-02	442	6.334E+00	483	4.772E+00	524	1.147E+01	565	1.604E+01
402	2.610E-02	443	7.171E+00	484	4.806E+00	525	1.159E+01	566	1.620E+01
403	2.780E-02	444	8.106E+00	485	4.843E+00	526	1.169E+01	567	1.637E+01
404	2.830E-02	445	9.122E+00	486	4.906E+00	527	1.178E+01	568	1.653E+01
405	3.730E-02	446	1.021E+01	487	4.976E+00	528	1.189E+01	569	1.667E+01
406	3.570E-02	447	1.137E+01	488	5.065E+00	529	1.202E+01	570	1.683E+01
407	4.050E-02	448	1.260E+01	489	5.168E+00	530	1.211E+01	571	1.698E+01
408	4.340E-02	449	1.377E+01	490	5.290E+00	531	1.219E+01	572	1.712E+01
409	6.140E-02	450	1.480E+01	491	5.416E+00	532	1.228E+01	573	1.726E+01
410	6.810E-02	451	1.563E+01	492	5.553E+00	533	1.239E+01	574	1.739E+01
411	5.770E-02	452	1.616E+01	493	5.714E+00	534	1.248E+01	575	1.755E+01
412	5.450E-02	453	1.646E+01	494	5.886E+00	535	1.257E+01	576	1.770E+01
413	7.660E-02	454	1.639E+01	495	6.073E+00	536	1.264E+01	577	1.786E+01
414	9.760E-02	455	1.604E+01	496	6.272E+00	537	1.273E+01	578	1.802E+01
415	1.237E-01	456	1.543E+01	497	6.494E+00	538	1.284E+01	579	1.815E+01
416	1.549E-01	457	1.462E+01	498	6.715E+00	539	1.293E+01	580	1.829E+01
417	1.734E-01	458	1.371E+01	499	6.931E+00	540	1.301E+01	581	1.843E+01
418	2.194E-01	459	1.280E+01	500	7.162E+00	541	1.310E+01	582	1.856E+01
419	2.539E-01	460	1.197E+01	501	7.391E+00	542	1.319E+01	583	1.867E+01
420	2.933E-01	461	1.118E+01	502	7.625E+00	543	1.330E+01	584	1.879E+01

nm	mW								
585	1.891E+01	626	1.667E+01	667	7.037E+00	708	1.926E+00	749	2.898E-01
586	1.902E+01	627	1.644E+01	668	6.829E+00	709	1.848E+00	750	3.034E-01
587	1.912E+01	628	1.622E+01	669	6.648E+00	710	1.763E+00	751	3.168E-01
588	1.922E+01	629	1.600E+01	670	6.482E+00	711	1.690E+00	752	3.177E-01
589	1.930E+01	630	1.576E+01	671	6.302E+00	712	1.654E+00	753	2.911E-01
590	1.938E+01	631	1.552E+01	672	6.117E+00	713	1.579E+00	754	2.393E-01
591	1.946E+01	632	1.528E+01	673	5.931E+00	714	1.506E+00	755	2.364E-01
592	1.954E+01	633	1.503E+01	674	5.779E+00	715	1.441E+00	756	2.194E-01
593	1.962E+01	634	1.477E+01	675	5.630E+00	716	1.367E+00	757	1.489E-01
594	1.968E+01	635	1.454E+01	676	5.462E+00	717	1.323E+00	758	1.196E-01
595	1.975E+01	636	1.431E+01	677	5.280E+00	718	1.275E+00	759	1.132E-01
596	1.980E+01	637	1.407E+01	678	5.104E+00	719	1.224E+00	760	1.045E-01
597	1.980E+01	638	1.380E+01	679	4.957E+00	720	1.183E+00	761	1.195E-01
598	1.982E+01	639	1.354E+01	680	4.820E+00	721	1.164E+00	762	1.701E-01
599	1.985E+01	640	1.329E+01	681	4.685E+00	722	1.134E+00	763	1.576E-01
600	1.986E+01	641	1.305E+01	682	4.554E+00	723	1.055E+00	764	9.510E-02
601	1.986E+01	642	1.281E+01	683	4.416E+00	724	1.006E+00	765	7.490E-02
602	1.983E+01	643	1.255E+01	684	4.274E+00	725	9.668E-01	766	9.180E-02
603	1.978E+01	644	1.229E+01	685	4.136E+00	726	9.026E-01	767	1.343E-01
604	1.974E+01	645	1.203E+01	686	4.037E+00	727	8.789E-01	768	1.311E-01
605	1.969E+01	646	1.178E+01	687	3.925E+00	728	8.746E-01	769	9.860E-02
606	1.964E+01	647	1.153E+01	688	3.785E+00	729	8.721E-01	770	7.550E-02
607	1.957E+01	648	1.129E+01	689	3.642E+00	730	8.341E-01	771	9.310E-02
608	1.951E+01	649	1.106E+01	690	3.536E+00	731	8.142E-01	772	9.640E-02
609	1.942E+01	650	1.081E+01	691	3.416E+00	732	7.584E-01	773	7.500E-02
610	1.932E+01	651	1.055E+01	692	3.310E+00	733	7.011E-01	774	7.560E-02
611	1.921E+01	652	1.031E+01	693	3.222E+00	734	6.831E-01	775	7.290E-02
612	1.911E+01	653	1.009E+01	694	3.115E+00	735	6.483E-01	776	6.900E-02
613	1.900E+01	654	9.849E+00	695	3.011E+00	736	6.056E-01	777	6.580E-02
614	1.887E+01	655	9.586E+00	696	2.927E+00	737	5.346E-01	778	8.580E-02
615	1.871E+01	656	9.344E+00	697	2.841E+00	738	4.978E-01	779	8.810E-02
616	1.856E+01	657	9.121E+00	698	2.733E+00	739	5.108E-01	780	8.170E-02
617	1.842E+01	658	8.892E+00	699	2.620E+00	740	5.144E-01		
618	1.825E+01	659	8.669E+00	700	2.544E+00	741	5.112E-01		
619	1.807E+01	660	8.448E+00	701	2.458E+00	742	4.930E-01		
620	1.788E+01	661	8.235E+00	702	2.357E+00	743	4.315E-01		
621	1.769E+01	662	8.044E+00	703	2.282E+00	744	3.740E-01		
622	1.749E+01	663	7.837E+00	704	2.209E+00	745	3.290E-01		
623	1.730E+01	664	7.625E+00	705	2.119E+00	746	3.058E-01		
624	1.709E+01	665	7.423E+00	706	2.060E+00	747	3.115E-01		
625	1.687E+01	666	7.235E+00	707	1.997E+00	748	3.086E-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**

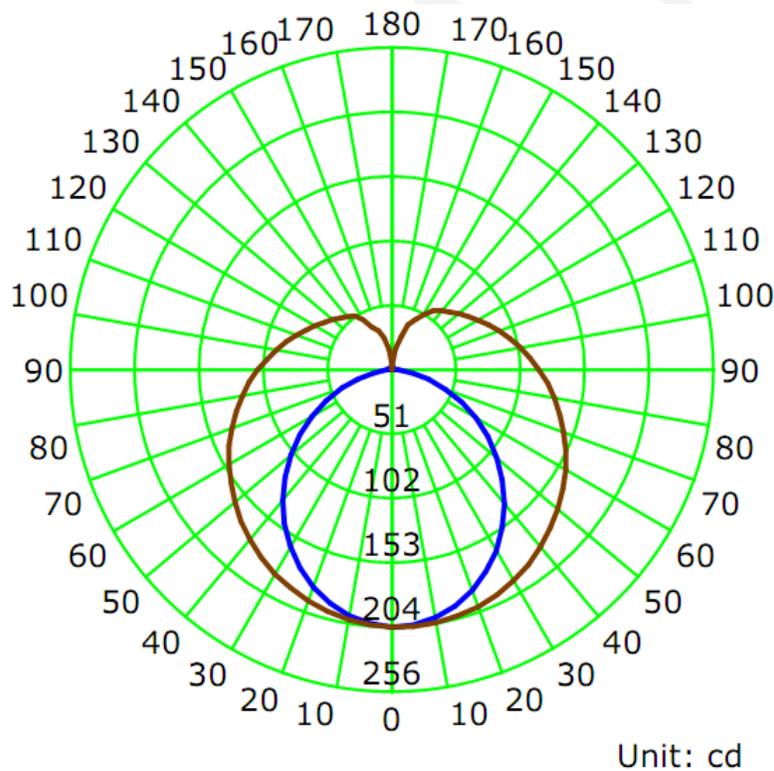
**Electrical Measurement**

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	0	0.0660	7.8	0.9820

**Photometric Measurement**

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
1060.3	135.98	204.8	1.20	1.40

**Luminous Intensity Distribution**



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	103.4	135.7	194.7	145.5	144.8
Field Angle (10% I <sub>max</sub> ):	156.3	327.3	336.3	324.1	286.0

Luminous Intensity (cd) Distribution Data

C Y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	204	204	204	204	204	204	204	204
5.0°	203	204	204	205	205	205	204	203
10.0°	200	201	202	204	204	203	202	201
15.0°	194	196	199	202	202	201	199	195
20.0°	187	189	194	198	200	198	194	189
25.0°	177	180	187	194	197	194	188	180
30.0°	166	170	179	188	193	189	180	170
35.0°	153	158	170	182	189	184	173	159
40.0°	140	145	161	175	184	178	164	147
45.0°	125	132	151	169	178	171	154	134
50.0°	110	118	141	161	172	164	145	121
55.0°	93	104	130	153	166	157	136	108
60.0°	77	90	120	145	160	149	126	96
65.0°	61	77	111	137	153	142	117	83
70.0°	45	64	101	130	146	135	108	72
75.0°	30	52	93	122	139	128	100	62
80.0°	16	42	85	115	132	121	93	52
85.0°	6	35	79	109	124	114	86	46
90.0°	1	30	72	102	117	107	81	41
95.0°	1	27	67	96	110	101	75	37
100.0°	2	26	63	90	104	95	71	35
105.0°	2	26	60	84	97	89	66	33
110.0°	2	26	57	79	91	83	63	33
115.0°	2	28	54	75	85	78	60	33
120.0°	1	28	52	70	80	73	57	33
125.0°	1	27	50	66	74	69	54	34
130.0°	0	27	49	63	70	65	52	31
135.0°	1	27	48	60	66	61	50	30
140.0°	1	26	46	57	62	58	48	29
145.0°	1	25	42	55	58	55	41	25
150.0°	1	23	40	48	52	47	37	21
155.0°	1	20	37	43	44	41	29	17
160.0°	3	17	32	37	38	33	18	11
165.0°	3	14	23	27	28	21	9	6
170.0°	2	10	14	16	16	8	3	2
175.0°	1	3	5	6	3	2	1	1
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°	204	204	204	204	204	204	204	204
5.0°	203	203	203	203	204	203	203	203
10.0°	199	199	200	201	202	202	201	200
15.0°	192	193	195	198	199	199	197	195
20.0°	184	185	189	193	196	195	192	188
25.0°	174	176	182	188	192	190	185	179
30.0°	162	165	173	182	187	185	177	169
35.0°	150	153	164	175	182	178	169	158
40.0°	136	140	154	168	176	172	160	145
45.0°	121	127	144	161	170	165	151	133
50.0°	106	113	134	153	164	157	141	120
55.0°	90	99	124	145	157	150	132	107
60.0°	74	85	114	137	150	143	123	94
65.0°	58	72	105	129	143	135	114	82
70.0°	43	60	95	121	136	127	105	71
75.0°	28	49	87	114	129	119	97	60
80.0°	15	39	79	106	121	112	89	52
85.0°	5	32	72	100	114	106	81	44
90.0°	1	27	66	93	108	99	76	39
95.0°	2	24	60	86	100	93	70	35
100.0°	2	23	56	81	94	87	66	33
105.0°	3	22	53	75	87	81	62	32
110.0°	3	23	50	71	81	76	58	31
115.0°	3	24	47	66	76	71	55	31
120.0°	3	24	46	62	71	67	52	32
125.0°	2	22	44	59	66	63	50	33
130.0°	1	21	43	56	62	59	49	29
135.0°	1	21	43	53	59	56	47	28
140.0°	1	20	38	51	55	54	46	27
145.0°	1	17	33	49	53	51	39	26
150.0°	1	14	30	40	47	44	34	23
155.0°	1	11	28	35	38	37	31	19
160.0°	1	7	22	30	33	32	27	15
165.0°	1	3	12	23	27	26	21	10
170.0°	1	1	6	12	17	16	12	4
175.0°	1	1	1	2	4	5	3	1
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	4.9	0.46	0-5	4.9	0.46
5-10	14.5	1.37	0-10	19.4	1.83
10-15	23.6	2.23	0-15	43.0	4.06
15-20	32.1	3.02	0-20	75.1	7.08
20-25	39.5	3.73	0-25	114.6	10.81
25-30	45.9	4.33	0-30	160.5	15.14
30-35	50.9	4.80	0-35	211.4	19.94
35-40	54.7	5.16	0-40	266.1	25.10
40-45	57.0	5.38	0-45	323.1	30.48
45-50	58.1	5.48	0-50	381.3	35.96
50-55	58.0	5.47	0-55	439.3	41.43
55-60	56.8	5.36	0-60	496.1	46.79
60-65	54.7	5.16	0-65	550.8	51.95
65-70	51.8	4.89	0-70	602.7	56.84
70-75	48.4	4.57	0-75	651.1	61.41
75-80	44.8	4.22	0-80	695.9	65.63
80-85	41.1	3.88	0-85	737.0	69.51
85-90	37.8	3.57	0-90	774.8	73.08
90-95	35.0	3.30	0-95	809.8	76.38
95-100	32.5	3.06	0-100	842.3	79.44
100-105	30.1	2.84	0-105	872.3	82.27
105-110	27.8	2.62	0-110	900.1	84.89
110-115	25.5	2.41	0-115	925.7	87.30
115-120	23.4	2.20	0-120	949.0	89.51
120-125	21.2	2.00	0-125	970.2	91.50
125-130	18.9	1.79	0-130	989.1	93.29
130-135	16.8	1.58	0-135	1005.9	94.87
135-140	14.6	1.38	0-140	1020.5	96.25
140-145	12.3	1.16	0-145	1032.9	97.42
145-150	9.8	0.93	0-150	1042.7	98.34
150-155	7.4	0.69	0-155	1050.1	99.04
155-160	5.2	0.49	0-160	1055.2	99.52
160-165	3.1	0.30	0-165	1058.4	99.82
165-170	1.5	0.14	0-170	1059.8	99.96
170-175	0.4	0.04	0-175	1060.2	100.00
175-180	0.0	0.00	0-180	1060.3	100.00

6. Product Photo



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