



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/840/BYP/FF

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180910085-10-4
Test Date:	2018-09-11
Report Date:	2018-09-18
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 2018-09-10 and used for testing.

Model Tested: 8T8/2F/840/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: 4000K
 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.

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**

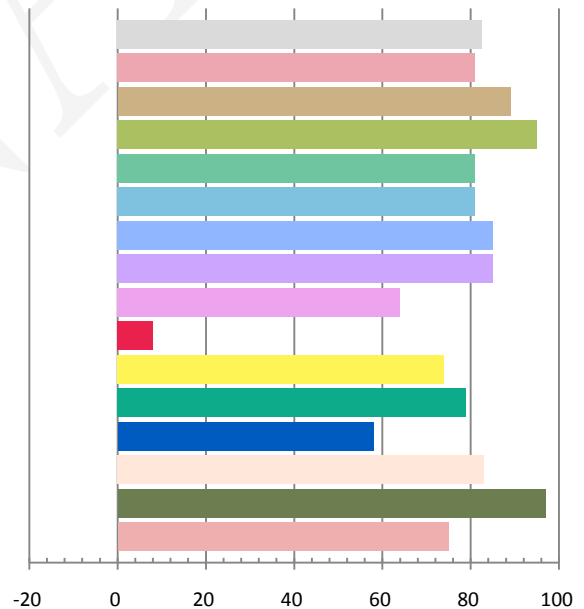
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0665	7.81	0.9786	1084.2	138.89

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
3.247	3935	0.00043	0.3837	0.3797	0.2261	0.5033

Color Rendering Index

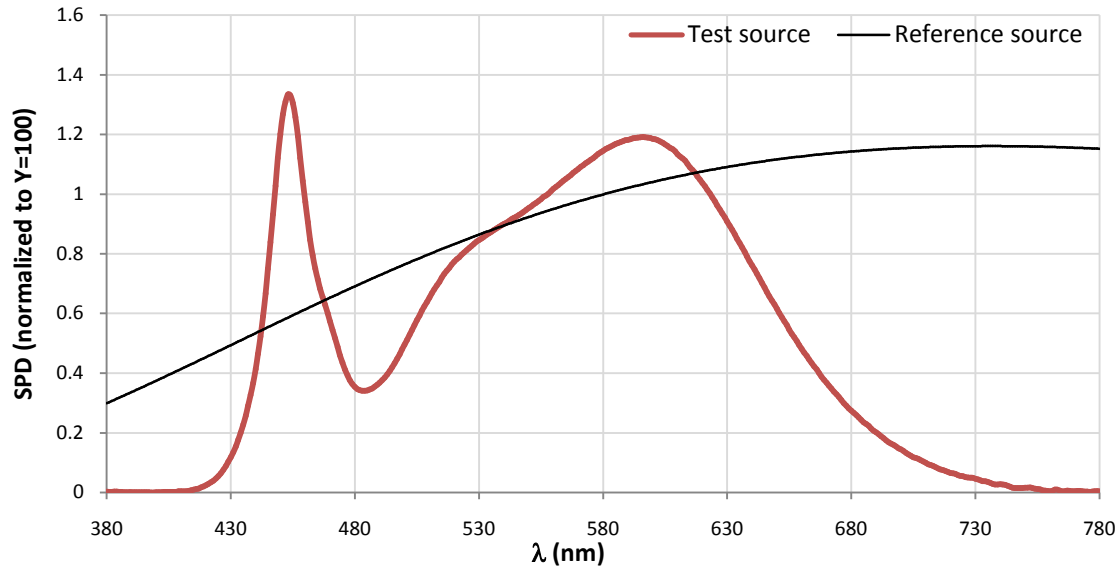
Ra 82.6			
R1 81	R2 89	R3 95	R4 81
R5 81	R6 85	R7 85	R8 64
R9 8	R10 74	R11 79	R12 58
R13 83	R14 97	R15 75	



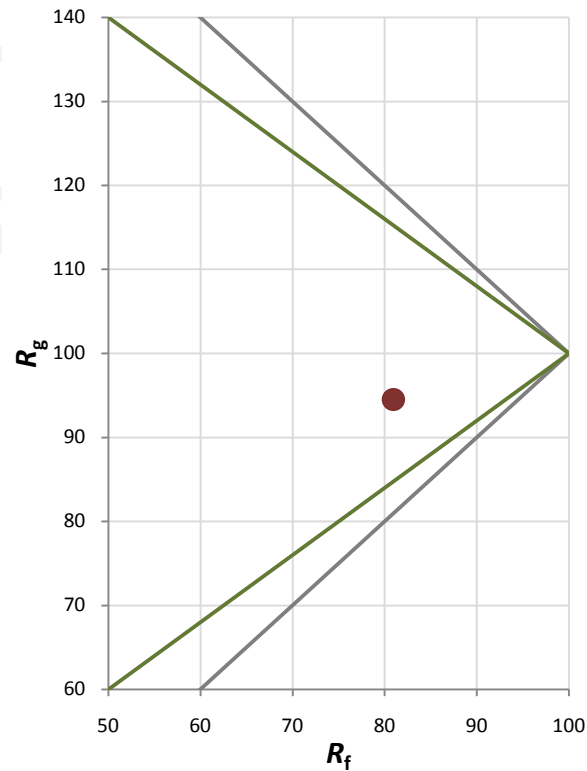
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	95

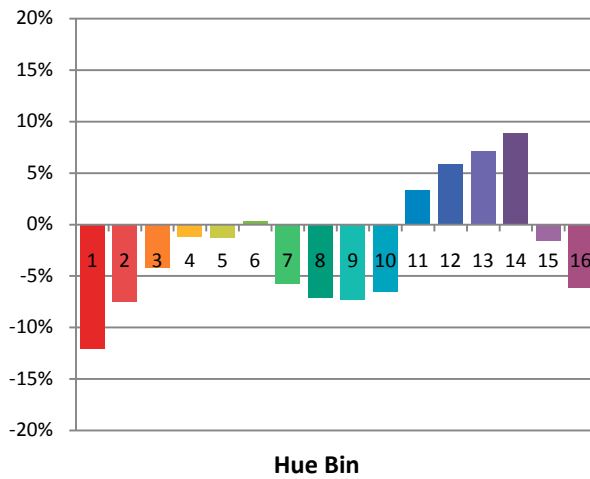
Spectral Power Distribution Comparison



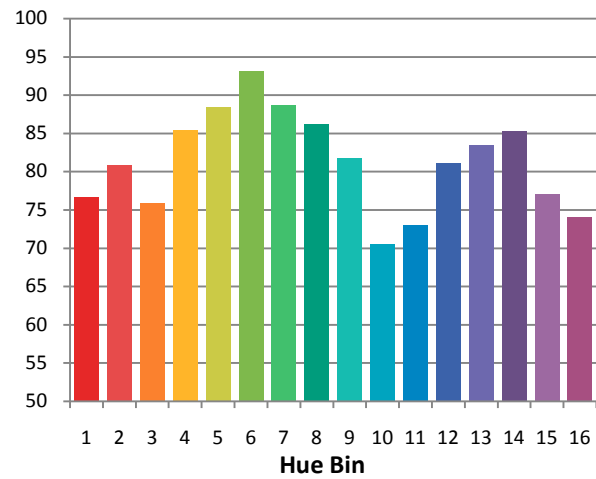
Plot of R_g versus R_f



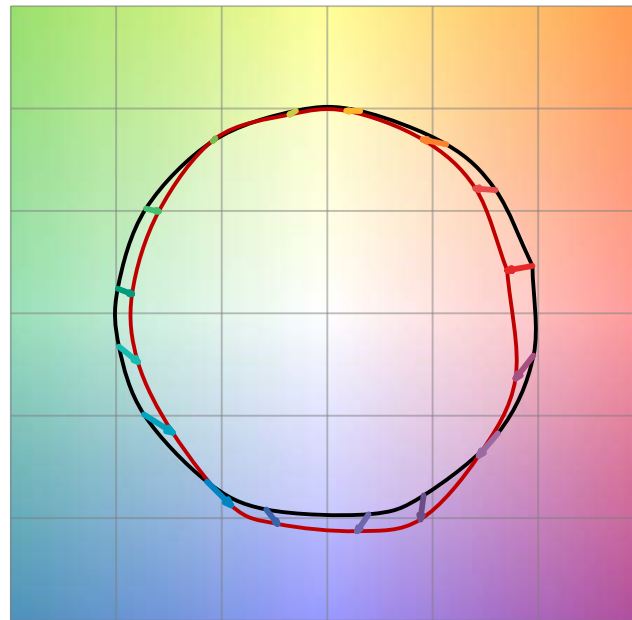
Chroma Shift by Hue



R_t by Hue

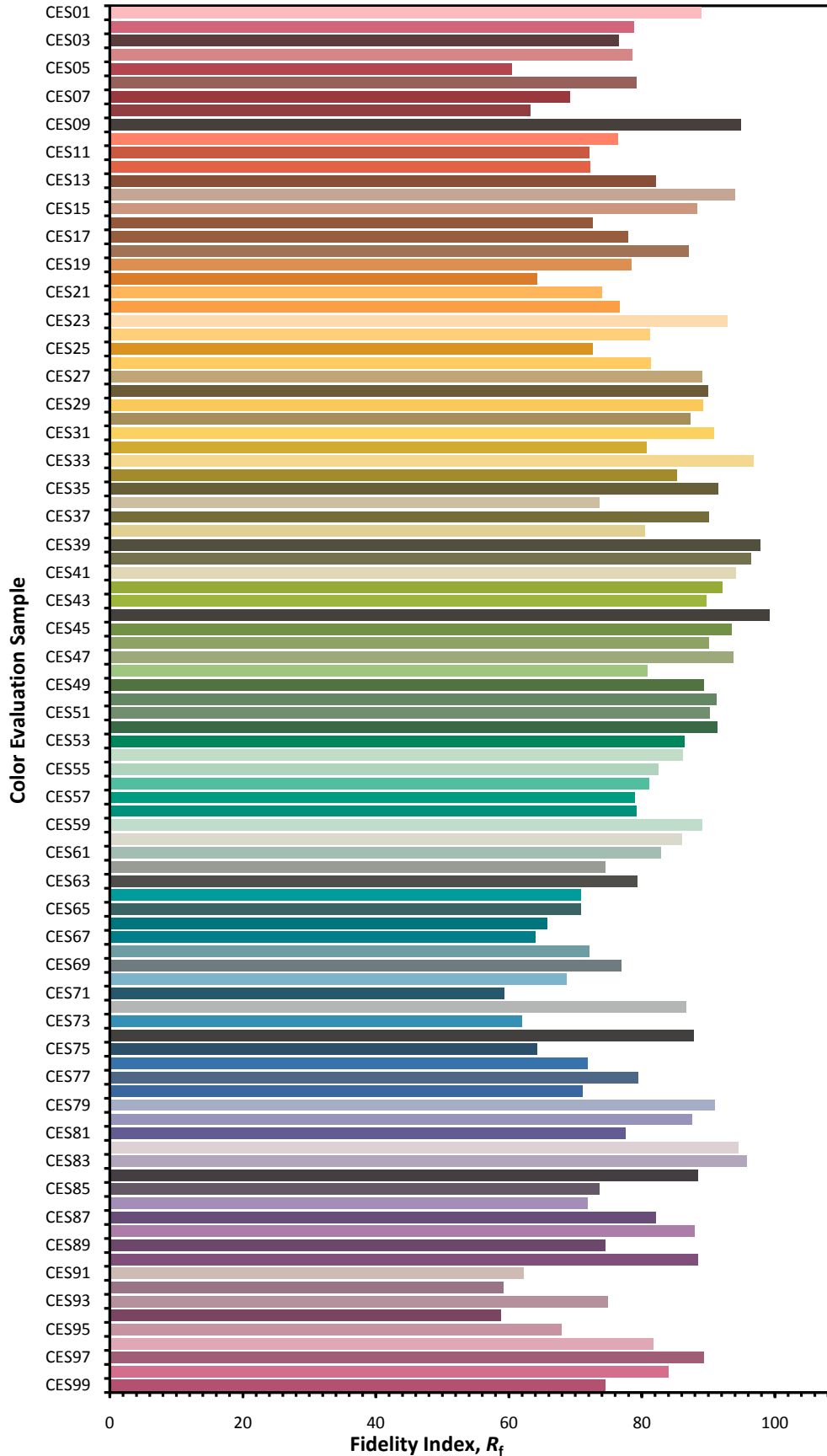


Color Vector Graphic

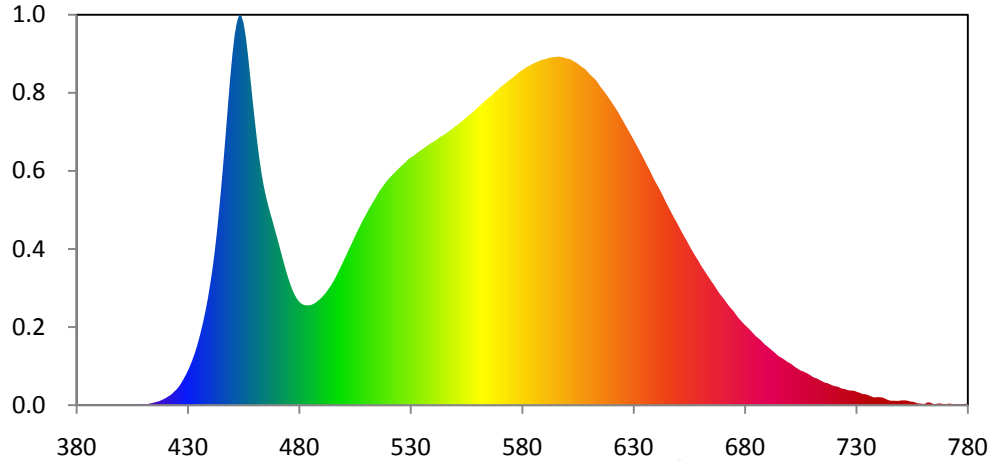


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



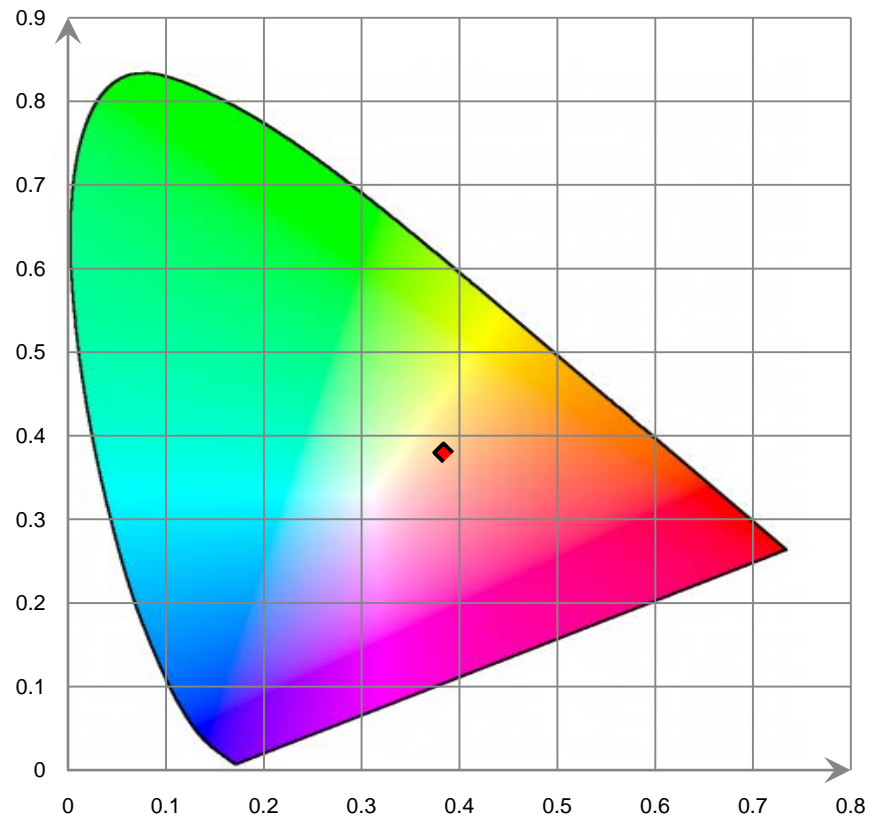
Relative Spectral Power Distribution



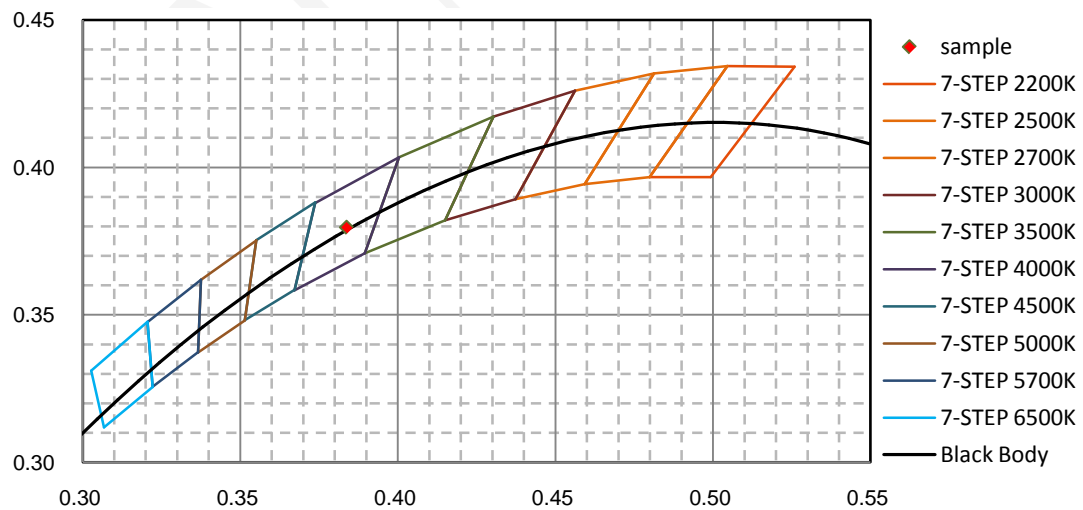
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.320E-02	421	4.634E-01	462	1.343E+01	503	8.635E+00	544	1.460E+01
381	3.340E-02	422	5.357E-01	463	1.261E+01	504	8.900E+00	545	1.468E+01
382	3.770E-02	423	6.325E-01	464	1.191E+01	505	9.165E+00	546	1.476E+01
383	4.820E-02	424	7.543E-01	465	1.134E+01	506	9.415E+00	547	1.485E+01
384	5.000E-02	425	8.691E-01	466	1.085E+01	507	9.662E+00	548	1.493E+01
385	3.810E-02	426	1.018E+00	467	1.040E+01	508	9.910E+00	549	1.504E+01
386	2.650E-02	427	1.203E+00	468	9.980E+00	509	1.013E+01	550	1.513E+01
387	2.030E-02	428	1.410E+00	469	9.529E+00	510	1.036E+01	551	1.521E+01
388	1.820E-02	429	1.628E+00	470	9.104E+00	511	1.059E+01	552	1.531E+01
389	2.390E-02	430	1.875E+00	471	8.654E+00	512	1.080E+01	553	1.541E+01
390	2.370E-02	431	2.148E+00	472	8.197E+00	513	1.101E+01	554	1.551E+01
391	1.310E-02	432	2.451E+00	473	7.741E+00	514	1.120E+01	555	1.561E+01
392	1.030E-02	433	2.792E+00	474	7.306E+00	515	1.141E+01	556	1.572E+01
393	1.410E-02	434	3.180E+00	475	6.906E+00	516	1.162E+01	557	1.580E+01
394	1.810E-02	435	3.610E+00	476	6.541E+00	517	1.179E+01	558	1.590E+01
395	2.390E-02	436	4.079E+00	477	6.228E+00	518	1.195E+01	559	1.603E+01
396	1.920E-02	437	4.606E+00	478	5.970E+00	519	1.212E+01	560	1.615E+01
397	1.160E-02	438	5.186E+00	479	5.763E+00	520	1.227E+01	561	1.625E+01
398	6.100E-03	439	5.826E+00	480	5.607E+00	521	1.240E+01	562	1.636E+01
399	3.200E-03	440	6.566E+00	481	5.500E+00	522	1.252E+01	563	1.647E+01
400	1.470E-02	441	7.373E+00	482	5.442E+00	523	1.264E+01	564	1.658E+01
401	1.840E-02	442	8.311E+00	483	5.417E+00	524	1.276E+01	565	1.668E+01
402	2.000E-02	443	9.377E+00	484	5.414E+00	525	1.289E+01	566	1.678E+01
403	2.580E-02	444	1.059E+01	485	5.430E+00	526	1.300E+01	567	1.689E+01
404	2.860E-02	445	1.190E+01	486	5.473E+00	527	1.311E+01	568	1.700E+01
405	3.780E-02	446	1.330E+01	487	5.535E+00	528	1.322E+01	569	1.710E+01
406	3.270E-02	447	1.479E+01	488	5.628E+00	529	1.335E+01	570	1.721E+01
407	3.580E-02	448	1.631E+01	489	5.728E+00	530	1.344E+01	571	1.732E+01
408	3.920E-02	449	1.779E+01	490	5.841E+00	531	1.350E+01	572	1.741E+01
409	6.020E-02	450	1.906E+01	491	5.968E+00	532	1.359E+01	573	1.751E+01
410	6.890E-02	451	2.011E+01	492	6.114E+00	533	1.370E+01	574	1.761E+01
411	5.950E-02	452	2.079E+01	493	6.283E+00	534	1.378E+01	575	1.770E+01
412	6.230E-02	453	2.118E+01	494	6.459E+00	535	1.387E+01	576	1.779E+01
413	9.070E-02	454	2.111E+01	495	6.660E+00	536	1.395E+01	577	1.789E+01
414	1.187E-01	455	2.072E+01	496	6.870E+00	537	1.403E+01	578	1.800E+01
415	1.453E-01	456	1.997E+01	497	7.109E+00	538	1.413E+01	579	1.809E+01
416	1.840E-01	457	1.894E+01	498	7.354E+00	539	1.421E+01	580	1.818E+01
417	2.089E-01	458	1.778E+01	499	7.606E+00	540	1.428E+01	581	1.826E+01
418	2.685E-01	459	1.658E+01	500	7.866E+00	541	1.435E+01	582	1.833E+01
419	3.210E-01	460	1.546E+01	501	8.119E+00	542	1.443E+01	583	1.840E+01
420	3.824E-01	461	1.438E+01	502	8.384E+00	543	1.453E+01	584	1.846E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.853E+01	626	1.527E+01	667	6.359E+00	708	1.723E+00	749	2.338E-01
586	1.858E+01	627	1.505E+01	668	6.162E+00	709	1.656E+00	750	2.554E-01
587	1.864E+01	628	1.484E+01	669	5.997E+00	710	1.573E+00	751	2.606E-01
588	1.869E+01	629	1.463E+01	670	5.845E+00	711	1.497E+00	752	2.629E-01
589	1.873E+01	630	1.441E+01	671	5.686E+00	712	1.466E+00	753	2.419E-01
590	1.876E+01	631	1.419E+01	672	5.522E+00	713	1.405E+00	754	2.046E-01
591	1.879E+01	632	1.397E+01	673	5.359E+00	714	1.339E+00	755	1.884E-01
592	1.884E+01	633	1.373E+01	674	5.225E+00	715	1.274E+00	756	1.714E-01
593	1.887E+01	634	1.350E+01	675	5.081E+00	716	1.219E+00	757	1.172E-01
594	1.888E+01	635	1.327E+01	676	4.912E+00	717	1.194E+00	758	9.630E-02
595	1.889E+01	636	1.303E+01	677	4.749E+00	718	1.145E+00	759	8.450E-02
596	1.891E+01	637	1.280E+01	678	4.612E+00	719	1.086E+00	760	6.670E-02
597	1.890E+01	638	1.255E+01	679	4.480E+00	720	1.043E+00	761	8.440E-02
598	1.888E+01	639	1.230E+01	680	4.351E+00	721	1.019E+00	762	1.521E-01
599	1.885E+01	640	1.208E+01	681	4.238E+00	722	9.915E-01	763	1.504E-01
600	1.881E+01	641	1.186E+01	682	4.122E+00	723	9.204E-01	764	9.360E-02
601	1.879E+01	642	1.164E+01	683	3.993E+00	724	8.886E-01	765	5.960E-02
602	1.874E+01	643	1.140E+01	684	3.856E+00	725	8.707E-01	766	7.350E-02
603	1.867E+01	644	1.115E+01	685	3.729E+00	726	8.172E-01	767	9.430E-02
604	1.860E+01	645	1.091E+01	686	3.635E+00	727	7.983E-01	768	8.660E-02
605	1.852E+01	646	1.067E+01	687	3.532E+00	728	7.891E-01	769	6.750E-02
606	1.842E+01	647	1.044E+01	688	3.408E+00	729	7.844E-01	770	6.200E-02
607	1.833E+01	648	1.021E+01	689	3.286E+00	730	7.332E-01	771	7.590E-02
608	1.825E+01	649	1.000E+01	690	3.194E+00	731	6.957E-01	772	8.520E-02
609	1.814E+01	650	9.776E+00	691	3.092E+00	732	6.457E-01	773	6.560E-02
610	1.800E+01	651	9.544E+00	692	2.990E+00	733	6.028E-01	774	5.620E-02
611	1.788E+01	652	9.322E+00	693	2.890E+00	734	5.973E-01	775	4.610E-02
612	1.777E+01	653	9.102E+00	694	2.780E+00	735	5.616E-01	776	3.820E-02
613	1.765E+01	654	8.901E+00	695	2.670E+00	736	5.142E-01	777	4.170E-02
614	1.748E+01	655	8.667E+00	696	2.597E+00	737	4.569E-01	778	6.110E-02
615	1.730E+01	656	8.447E+00	697	2.528E+00	738	4.224E-01	779	7.430E-02
616	1.715E+01	657	8.248E+00	698	2.443E+00	739	4.292E-01	780	7.090E-02
617	1.700E+01	658	8.042E+00	699	2.353E+00	740	4.398E-01		
618	1.682E+01	659	7.850E+00	700	2.291E+00	741	4.261E-01		
619	1.664E+01	660	7.642E+00	701	2.220E+00	742	4.085E-01		
620	1.646E+01	661	7.444E+00	702	2.117E+00	743	3.497E-01		
621	1.628E+01	662	7.265E+00	703	2.029E+00	744	2.972E-01		
622	1.610E+01	663	7.076E+00	704	1.958E+00	745	2.500E-01		
623	1.591E+01	664	6.897E+00	705	1.879E+00	746	2.385E-01		
624	1.570E+01	665	6.709E+00	706	1.840E+00	747	2.406E-01		
625	1.548E+01	666	6.547E+00	707	1.783E+00	748	2.322E-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**

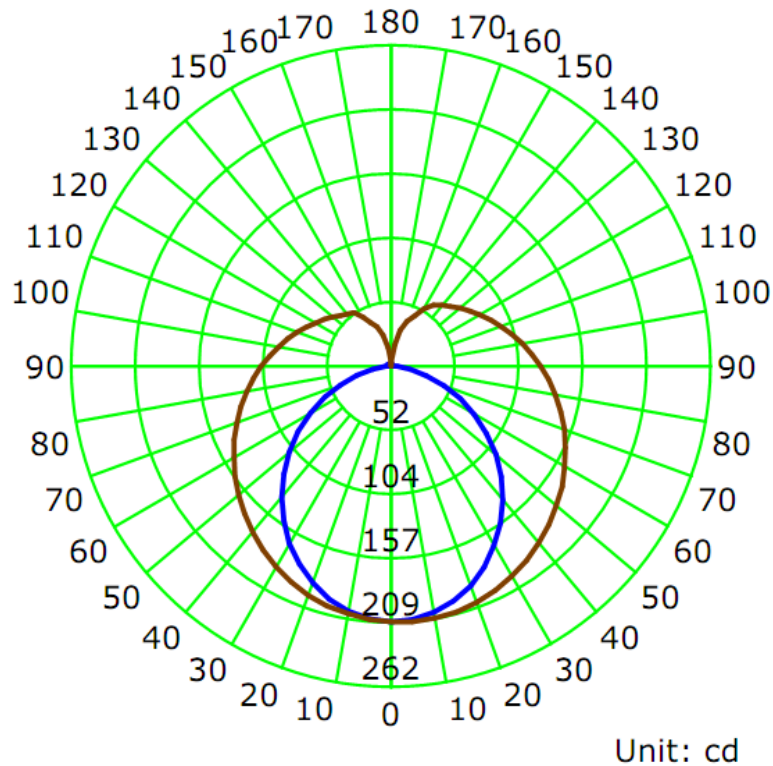
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0660	7.79	0.9820

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1087.7	139.68	209.7	1.20	1.39

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	103.9	135.8	195.1	145.8	145.2
Field Angle (10% I _{max}):	156.5	327.7	336.6	324.2	286.3

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	209	209	209	209	209	209	209	209
5.0°	207	209	208	209	209	210	209	208
10.0°	204	206	206	208	209	208	207	205
15.0°	199	201	203	206	208	206	204	200
20.0°	191	194	198	203	205	204	199	193
25.0°	181	185	191	198	202	199	193	185
30.0°	169	174	183	193	198	194	186	175
35.0°	157	162	174	187	194	189	178	164
40.0°	143	150	165	180	189	183	169	152
45.0°	128	136	155	173	183	176	160	139
50.0°	112	122	144	165	177	169	150	126
55.0°	96	108	134	157	171	162	141	113
60.0°	79	94	125	150	165	155	132	100
65.0°	63	80	115	142	158	148	123	88
70.0°	46	67	106	135	151	140	114	76
75.0°	31	55	97	127	144	134	106	65
80.0°	16	45	90	121	137	127	99	56
85.0°	6	37	83	114	130	120	92	49
90.0°	1	32	77	107	123	113	86	44
95.0°	1	29	72	101	116	107	81	40
100.0°	2	28	67	95	109	100	75	37
105.0°	3	28	64	89	103	94	71	36
110.0°	2	29	60	84	96	88	67	36
115.0°	2	30	58	79	90	83	64	36
120.0°	1	31	56	75	84	78	61	36
125.0°	1	29	54	71	79	73	58	36
130.0°	1	28	52	67	74	69	56	33
135.0°	1	28	51	64	70	65	54	32
140.0°	1	28	48	60	65	62	51	30
145.0°	1	27	44	58	61	58	43	28
150.0°	1	26	41	50	55	49	38	24
155.0°	1	23	38	44	45	42	32	19
160.0°	2	20	34	38	39	35	21	12
165.0°	3	15	25	30	30	24	10	7
170.0°	2	11	16	18	18	9	4	3
175.0°	1	2	6	7	4	3	1	1
180.0°	0	0	0	0	0	0	0	0

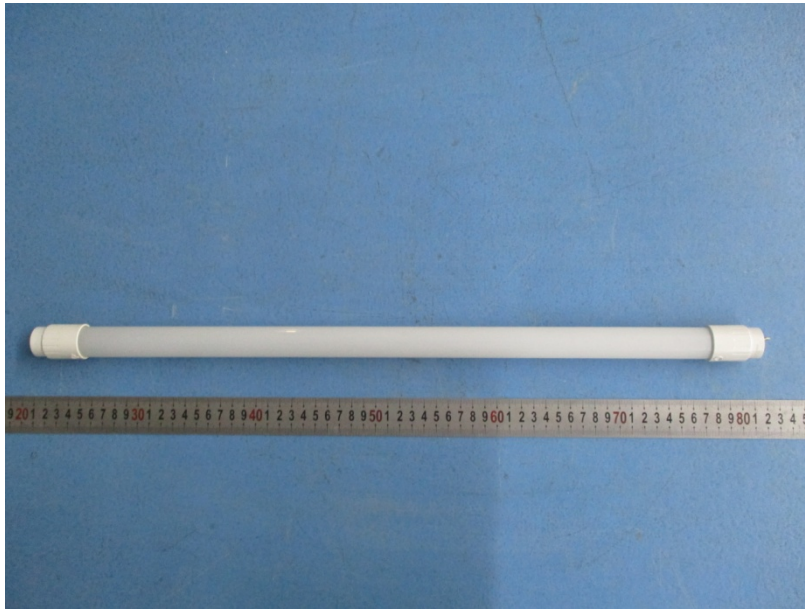
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	209	209	209	209	209	209	209	209
5.0°	207	207	207	207	208	208	208	208
10.0°	203	204	204	205	205	206	205	205
15.0°	197	198	199	201	203	202	201	199
20.0°	189	190	192	197	199	198	195	192
25.0°	179	180	185	191	195	193	188	182
30.0°	167	169	176	185	189	186	180	173
35.0°	154	157	166	177	183	180	171	161
40.0°	140	144	156	170	177	173	162	148
45.0°	125	130	145	161	170	165	152	135
50.0°	109	116	135	153	164	158	142	122
55.0°	93	101	124	145	156	150	132	108
60.0°	77	87	114	137	149	142	123	95
65.0°	61	74	105	128	142	134	114	83
70.0°	45	61	95	120	135	126	105	71
75.0°	29	49	87	113	128	118	96	61
80.0°	16	40	78	105	120	111	88	52
85.0°	6	32	71	99	114	105	81	44
90.0°	2	27	66	92	107	99	76	39
95.0°	2	24	60	86	100	93	71	36
100.0°	2	23	56	80	94	87	66	33
105.0°	3	22	53	76	88	81	62	32
110.0°	4	23	50	71	82	76	59	31
115.0°	4	24	48	67	77	72	56	31
120.0°	3	24	46	63	72	67	53	32
125.0°	3	22	45	59	67	63	51	33
130.0°	2	22	44	56	63	60	49	30
135.0°	2	22	43	54	59	57	48	29
140.0°	1	19	38	52	56	54	47	28
145.0°	1	17	34	49	54	52	39	27
150.0°	1	14	32	41	47	44	36	23
155.0°	1	10	28	36	40	38	33	19
160.0°	1	6	22	32	35	34	27	15
165.0°	1	3	11	22	27	25	20	10
170.0°	1	1	5	12	16	15	12	4
175.0°	1	1	1	2	4	4	3	1
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	5.0	0.46	0-5	5.0	0.46
5-10	14.8	1.36	0-10	19.8	1.82
10-15	24.2	2.22	0-15	43.9	4.04
15-20	32.8	3.01	0-20	76.7	7.05
20-25	40.4	3.72	0-25	117.1	10.77
25-30	46.9	4.31	0-30	164.0	15.08
30-35	52.0	4.78	0-35	216.0	19.86
35-40	55.8	5.13	0-40	271.8	24.99
40-45	58.2	5.35	0-45	330.0	30.34
45-50	59.3	5.45	0-50	389.3	35.79
50-55	59.2	5.44	0-55	448.5	41.24
55-60	58.0	5.33	0-60	506.5	46.57
60-65	55.9	5.13	0-65	562.4	51.70
65-70	53.0	4.87	0-70	615.3	56.57
70-75	49.5	4.55	0-75	664.9	61.12
75-80	45.8	4.21	0-80	710.7	65.34
80-85	42.2	3.88	0-85	752.8	69.21
85-90	38.9	3.57	0-90	791.7	72.79
90-95	36.1	3.31	0-95	827.8	76.10
95-100	33.5	3.08	0-100	861.3	79.18
100-105	31.1	2.86	0-105	892.4	82.04
105-110	28.8	2.65	0-110	921.2	84.69
110-115	26.5	2.44	0-115	947.7	87.13
115-120	24.3	2.23	0-120	972.0	89.36
120-125	22.0	2.03	0-125	994.0	91.39
125-130	19.7	1.81	0-130	1013.7	93.20
130-135	17.4	1.60	0-135	1031.2	94.80
135-140	15.2	1.40	0-140	1046.4	96.20
140-145	12.8	1.18	0-145	1059.2	97.38
145-150	10.2	0.94	0-150	1069.5	98.32
150-155	7.6	0.70	0-155	1077.1	99.02
155-160	5.4	0.49	0-160	1082.5	99.52
160-165	3.3	0.30	0-165	1085.7	99.82
165-170	1.5	0.14	0-170	1087.3	99.96
170-175	0.4	0.04	0-175	1087.7	100.00
175-180	0.0	0.00	0-180	1087.7	100.00

6. Product Photo



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