



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/830/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
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/830/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: 3000K
 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**

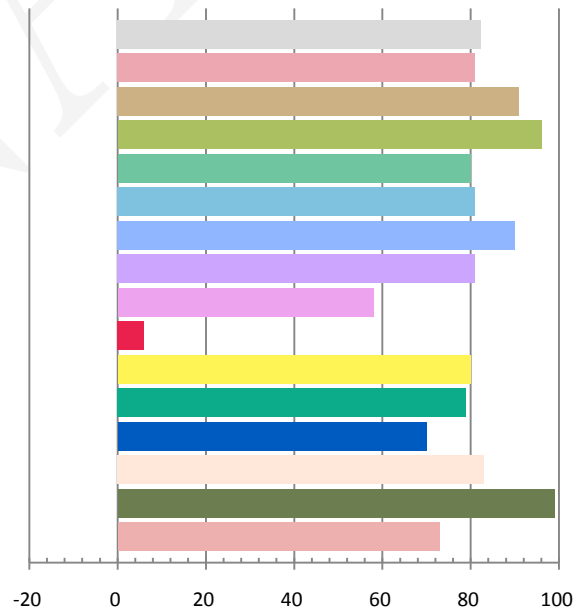
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0679	7.97	0.9781	1043.7	130.96

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
3.122	3013	-0.00026	0.4357	0.4030	0.2502	0.5208

Color Rendering Index

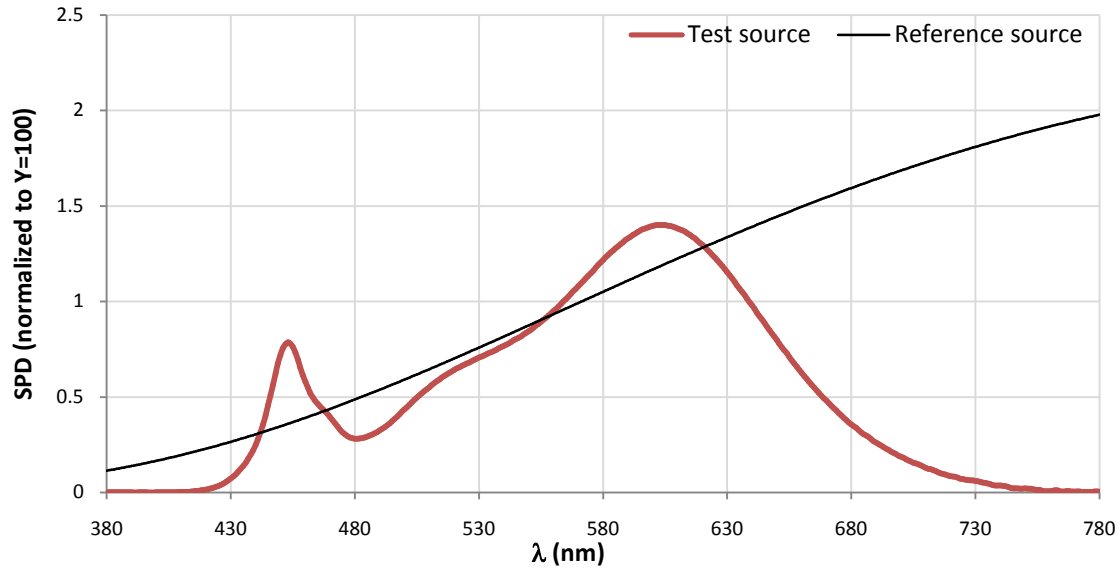
Ra 82.4			
R1 81	R2 91	R3 96	R4 80
R5 81	R6 90	R7 81	R8 58
R9 6	R10 80	R11 79	R12 70
R13 83	R14 99	R15 73	



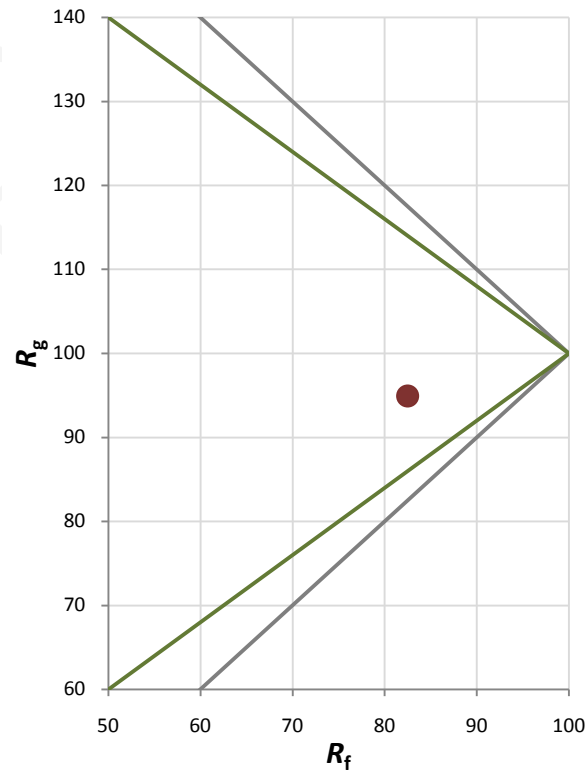
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	95

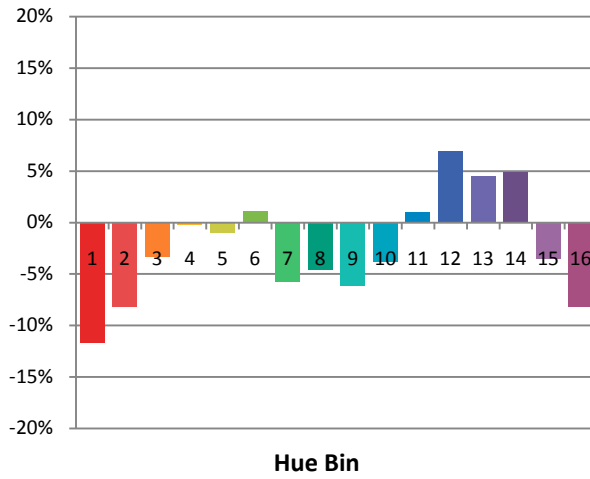
Spectral Power Distribution Comparison



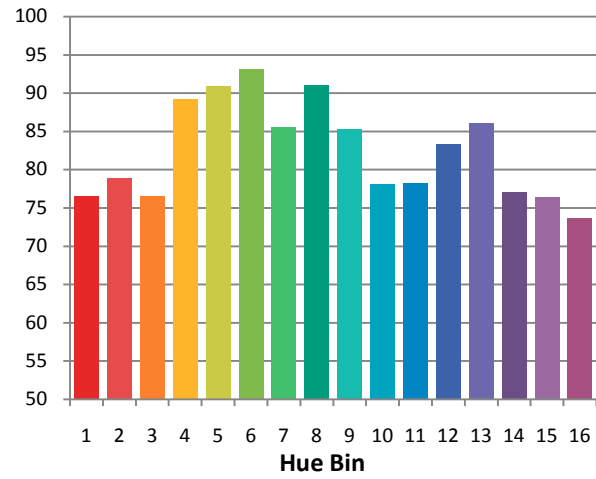
Plot of R_g versus R_f



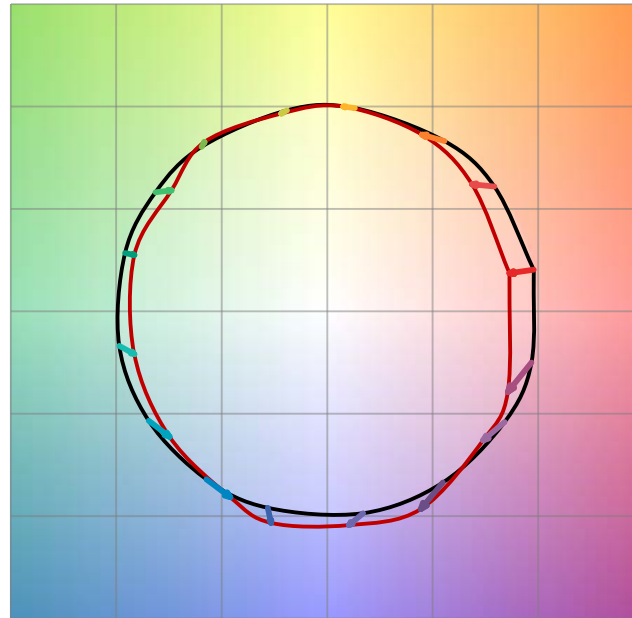
Chroma Shift by Hue



R_t by Hue

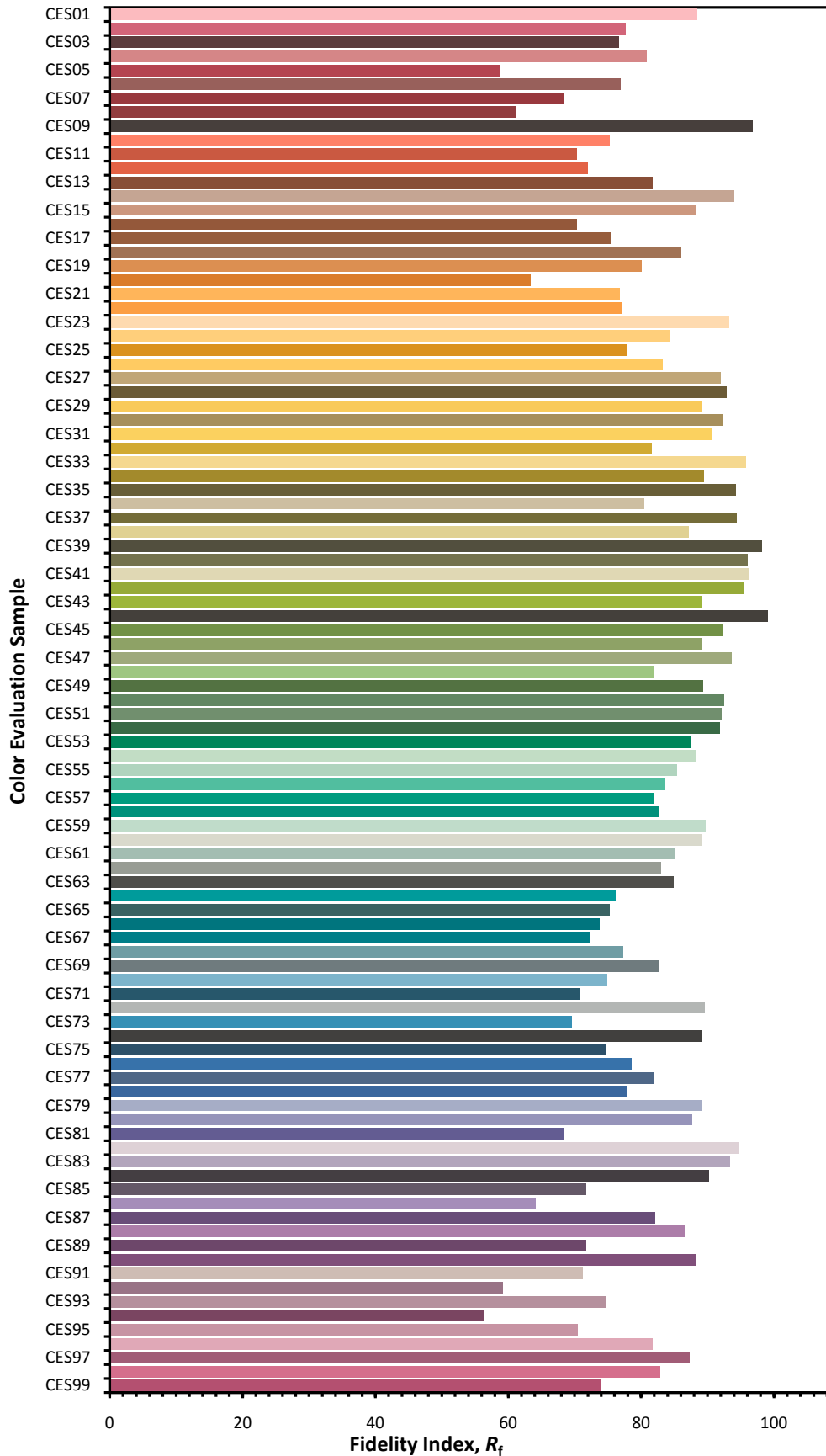


Color Vector Graphic

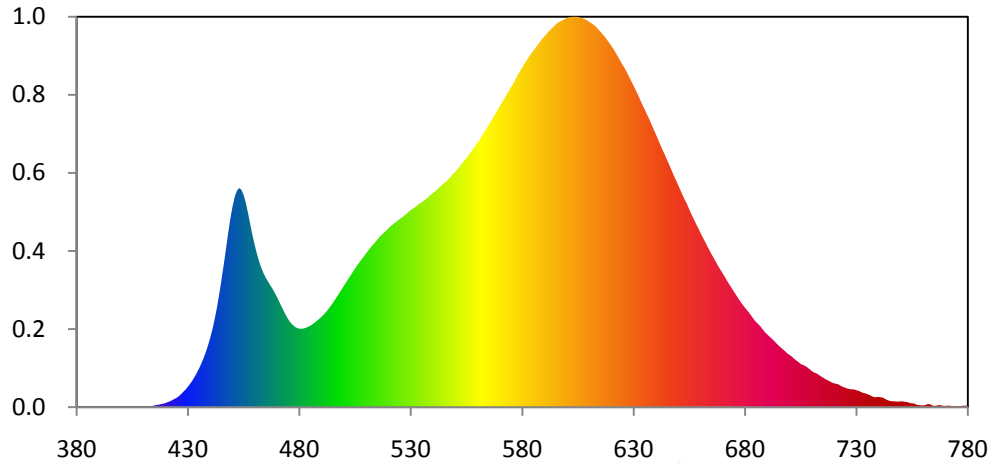


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



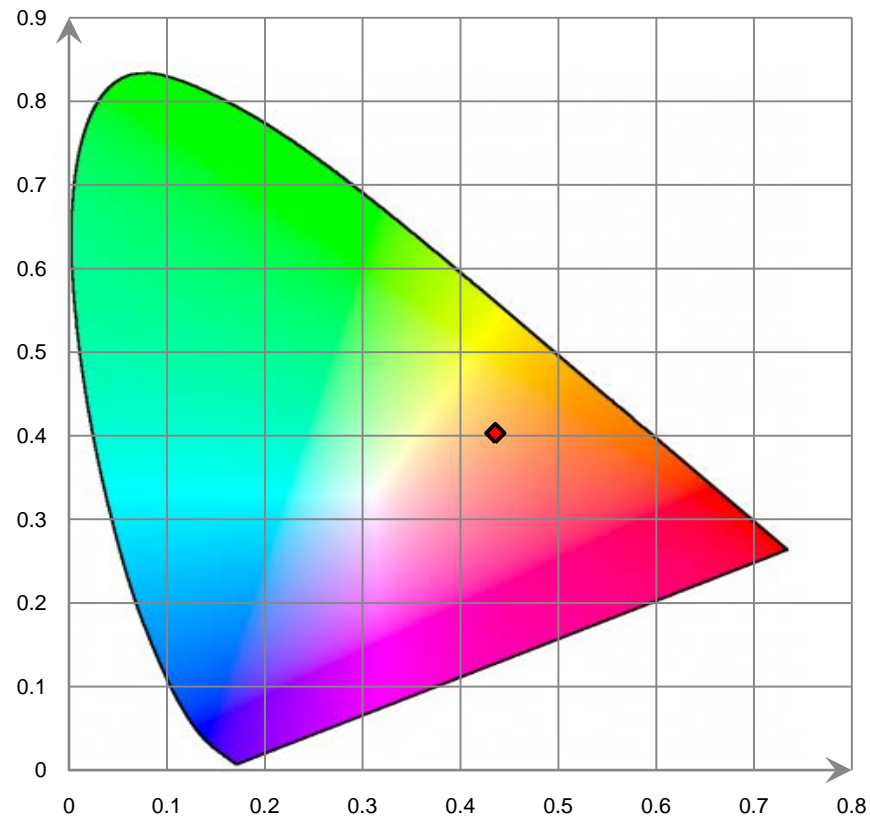
Relative Spectral Power Distribution



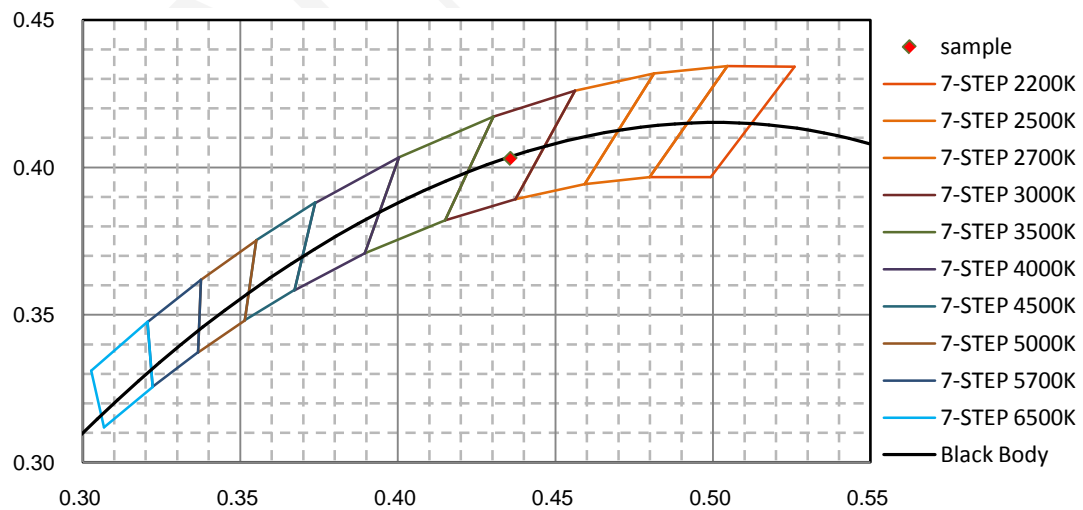
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.950E-02	421	2.852E-01	462	7.968E+00	503	7.218E+00	544	1.218E+01
381	2.090E-02	422	3.251E-01	463	7.617E+00	504	7.411E+00	545	1.228E+01
382	2.480E-02	423	3.868E-01	464	7.320E+00	505	7.593E+00	546	1.238E+01
383	2.850E-02	424	4.560E-01	465	7.086E+00	506	7.779E+00	547	1.250E+01
384	2.890E-02	425	5.174E-01	466	6.875E+00	507	7.947E+00	548	1.264E+01
385	1.930E-02	426	6.110E-01	467	6.673E+00	508	8.108E+00	549	1.278E+01
386	1.830E-02	427	7.261E-01	468	6.482E+00	509	8.265E+00	550	1.291E+01
387	1.580E-02	428	8.525E-01	469	6.260E+00	510	8.431E+00	551	1.304E+01
388	1.440E-02	429	9.723E-01	470	6.032E+00	511	8.596E+00	552	1.319E+01
389	1.920E-02	430	1.124E+00	471	5.774E+00	512	8.750E+00	553	1.335E+01
390	1.880E-02	431	1.284E+00	472	5.518E+00	513	8.899E+00	554	1.350E+01
391	8.800E-03	432	1.461E+00	473	5.274E+00	514	9.032E+00	555	1.366E+01
392	6.200E-03	433	1.662E+00	474	5.038E+00	515	9.182E+00	556	1.383E+01
393	1.530E-02	434	1.880E+00	475	4.820E+00	516	9.328E+00	557	1.398E+01
394	1.980E-02	435	2.121E+00	476	4.645E+00	517	9.452E+00	558	1.415E+01
395	2.200E-02	436	2.387E+00	477	4.514E+00	518	9.564E+00	559	1.433E+01
396	1.580E-02	437	2.680E+00	478	4.409E+00	519	9.686E+00	560	1.450E+01
397	6.900E-03	438	3.014E+00	479	4.338E+00	520	9.808E+00	561	1.468E+01
398	4.200E-03	439	3.378E+00	480	4.306E+00	521	9.927E+00	562	1.488E+01
399	2.200E-03	440	3.801E+00	481	4.298E+00	522	1.002E+01	563	1.508E+01
400	1.340E-02	441	4.271E+00	482	4.315E+00	523	1.011E+01	564	1.527E+01
401	1.580E-02	442	4.825E+00	483	4.356E+00	524	1.021E+01	565	1.547E+01
402	1.240E-02	443	5.449E+00	484	4.411E+00	525	1.031E+01	566	1.567E+01
403	1.320E-02	444	6.158E+00	485	4.474E+00	526	1.040E+01	567	1.589E+01
404	1.620E-02	445	6.940E+00	486	4.554E+00	527	1.049E+01	568	1.610E+01
405	2.950E-02	446	7.758E+00	487	4.642E+00	528	1.059E+01	569	1.629E+01
406	3.030E-02	447	8.613E+00	488	4.745E+00	529	1.070E+01	570	1.650E+01
407	3.580E-02	448	9.490E+00	489	4.847E+00	530	1.080E+01	571	1.671E+01
408	3.210E-02	449	1.031E+01	490	4.959E+00	531	1.089E+01	572	1.692E+01
409	5.050E-02	450	1.098E+01	491	5.083E+00	532	1.097E+01	573	1.712E+01
410	5.690E-02	451	1.153E+01	492	5.219E+00	533	1.106E+01	574	1.732E+01
411	4.490E-02	452	1.186E+01	493	5.369E+00	534	1.116E+01	575	1.754E+01
412	3.820E-02	453	1.201E+01	494	5.532E+00	535	1.124E+01	576	1.774E+01
413	5.320E-02	454	1.191E+01	495	5.705E+00	536	1.133E+01	577	1.797E+01
414	6.740E-02	455	1.164E+01	496	5.889E+00	537	1.143E+01	578	1.821E+01
415	9.710E-02	456	1.120E+01	497	6.078E+00	538	1.153E+01	579	1.840E+01
416	1.240E-01	457	1.063E+01	498	6.265E+00	539	1.164E+01	580	1.861E+01
417	1.373E-01	458	1.002E+01	499	6.464E+00	540	1.174E+01	581	1.881E+01
418	1.731E-01	459	9.402E+00	500	6.656E+00	541	1.183E+01	582	1.900E+01
419	1.940E-01	460	8.874E+00	501	6.840E+00	542	1.194E+01	583	1.919E+01
420	2.333E-01	461	8.393E+00	502	7.033E+00	543	1.206E+01	584	1.937E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.953E+01	626	1.859E+01	667	7.958E+00	708	2.181E+00	749	3.048E-01
586	1.969E+01	627	1.836E+01	668	7.732E+00	709	2.084E+00	750	3.263E-01
587	1.986E+01	628	1.811E+01	669	7.533E+00	710	1.982E+00	751	3.091E-01
588	2.003E+01	629	1.787E+01	670	7.341E+00	711	1.901E+00	752	2.938E-01
589	2.019E+01	630	1.763E+01	671	7.139E+00	712	1.864E+00	753	2.811E-01
590	2.032E+01	631	1.737E+01	672	6.928E+00	713	1.786E+00	754	2.271E-01
591	2.047E+01	632	1.712E+01	673	6.726E+00	714	1.702E+00	755	2.096E-01
592	2.060E+01	633	1.684E+01	674	6.541E+00	715	1.624E+00	756	1.991E-01
593	2.072E+01	634	1.657E+01	675	6.350E+00	716	1.545E+00	757	1.391E-01
594	2.084E+01	635	1.632E+01	676	6.156E+00	717	1.490E+00	758	1.132E-01
595	2.096E+01	636	1.606E+01	677	5.966E+00	718	1.421E+00	759	1.021E-01
596	2.107E+01	637	1.580E+01	678	5.783E+00	719	1.355E+00	760	9.650E-02
597	2.113E+01	638	1.552E+01	679	5.615E+00	720	1.308E+00	761	1.167E-01
598	2.120E+01	639	1.524E+01	680	5.458E+00	721	1.277E+00	762	1.721E-01
599	2.127E+01	640	1.497E+01	681	5.308E+00	722	1.251E+00	763	1.677E-01
600	2.132E+01	641	1.468E+01	682	5.161E+00	723	1.172E+00	764	1.049E-01
601	2.137E+01	642	1.439E+01	683	4.989E+00	724	1.112E+00	765	6.910E-02
602	2.139E+01	643	1.411E+01	684	4.816E+00	725	1.069E+00	766	8.250E-02
603	2.140E+01	644	1.385E+01	685	4.667E+00	726	1.019E+00	767	1.158E-01
604	2.140E+01	645	1.357E+01	686	4.554E+00	727	9.938E-01	768	1.004E-01
605	2.139E+01	646	1.330E+01	687	4.422E+00	728	9.779E-01	769	7.630E-02
606	2.136E+01	647	1.301E+01	688	4.261E+00	729	9.730E-01	770	6.680E-02
607	2.131E+01	648	1.272E+01	689	4.107E+00	730	9.285E-01	771	8.480E-02
608	2.128E+01	649	1.245E+01	690	3.994E+00	731	8.985E-01	772	8.340E-02
609	2.121E+01	650	1.218E+01	691	3.872E+00	732	8.406E-01	773	5.710E-02
610	2.113E+01	651	1.191E+01	692	3.762E+00	733	7.842E-01	774	5.180E-02
611	2.105E+01	652	1.163E+01	693	3.646E+00	734	7.574E-01	775	5.260E-02
612	2.097E+01	653	1.137E+01	694	3.515E+00	735	7.132E-01	776	5.750E-02
613	2.087E+01	654	1.114E+01	695	3.392E+00	736	6.648E-01	777	6.020E-02
614	2.073E+01	655	1.085E+01	696	3.279E+00	737	5.990E-01	778	8.370E-02
615	2.060E+01	656	1.057E+01	697	3.177E+00	738	5.507E-01	779	8.650E-02
616	2.046E+01	657	1.032E+01	698	3.069E+00	739	5.515E-01	780	6.790E-02
617	2.032E+01	658	1.007E+01	699	2.952E+00	740	5.641E-01		
618	2.016E+01	659	9.822E+00	700	2.868E+00	741	5.436E-01		
619	1.998E+01	660	9.573E+00	701	2.780E+00	742	5.174E-01		
620	1.981E+01	661	9.327E+00	702	2.662E+00	743	4.472E-01		
621	1.963E+01	662	9.095E+00	703	2.562E+00	744	3.846E-01		
622	1.942E+01	663	8.849E+00	704	2.477E+00	745	3.425E-01		
623	1.922E+01	664	8.620E+00	705	2.371E+00	746	3.245E-01		
624	1.899E+01	665	8.386E+00	706	2.318E+00	747	3.215E-01		
625	1.878E+01	666	8.176E+00	707	2.260E+00	748	3.053E-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**

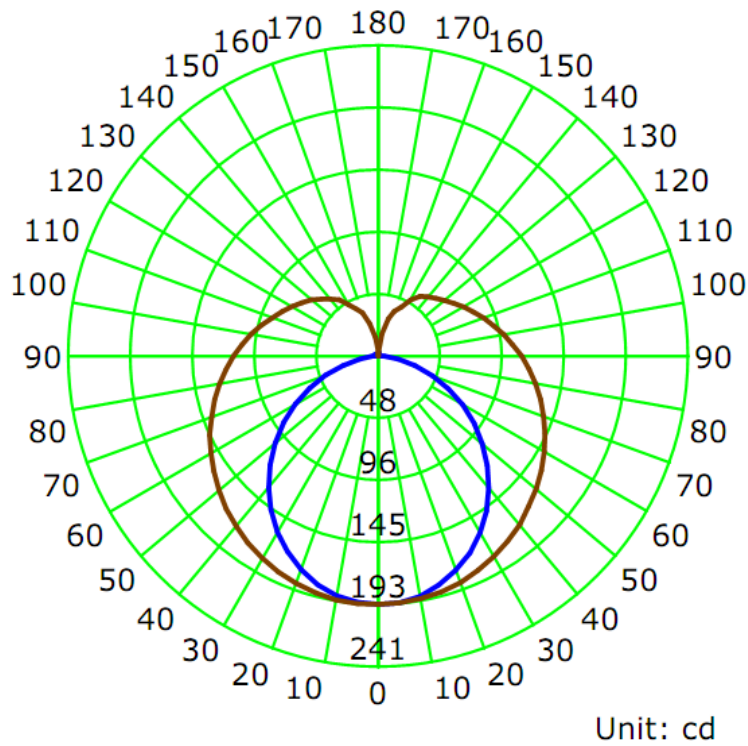
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0680	7.97	0.9800

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1046.9	131.40	193.6	1.22	1.41

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	106.1	141.3	205.6	152.2	151.3
Field Angle (10% I_{max}):	157.3	328.6	337.4	324.5	287.0

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	194	194	194	194	194	194	194	194
5.0°	193	193	193	193	193	193	193	193
10.0°	190	190	191	191	192	192	191	191
15.0°	184	185	187	189	190	189	188	186
20.0°	178	178	182	186	188	186	183	180
25.0°	169	170	175	181	184	182	178	172
30.0°	159	161	169	176	180	177	171	163
35.0°	147	150	160	170	176	172	164	154
40.0°	134	138	151	164	172	167	156	142
45.0°	121	126	142	158	166	161	148	131
50.0°	106	113	133	151	161	155	139	119
55.0°	92	100	124	143	156	148	131	107
60.0°	76	87	115	136	150	141	122	95
65.0°	60	75	106	130	143	135	114	83
70.0°	45	62	97	123	138	128	106	72
75.0°	30	51	89	116	131	122	98	62
80.0°	16	42	82	110	125	116	91	53
85.0°	6	34	76	104	119	109	85	46
90.0°	1	30	70	98	112	104	79	41
95.0°	1	26	65	92	106	97	74	37
100.0°	2	25	61	87	100	92	69	34
105.0°	2	25	58	81	94	86	65	33
110.0°	2	26	55	76	88	81	61	33
115.0°	2	27	52	72	82	76	58	33
120.0°	1	28	50	68	77	72	56	34
125.0°	0	26	49	64	73	67	54	34
130.0°	0	26	48	61	68	64	52	31
135.0°	1	26	47	58	64	61	50	30
140.0°	1	27	45	56	61	58	48	29
145.0°	1	26	40	54	57	55	40	28
150.0°	1	24	38	47	51	45	36	24
155.0°	2	22	36	41	43	40	32	18
160.0°	3	19	33	36	38	34	20	11
165.0°	3	16	25	30	31	23	9	6
170.0°	2	10	16	18	18	8	3	2
175.0°	1	3	6	7	3	2	1	1
180.0°	0	0	0	0	0	0	0	0

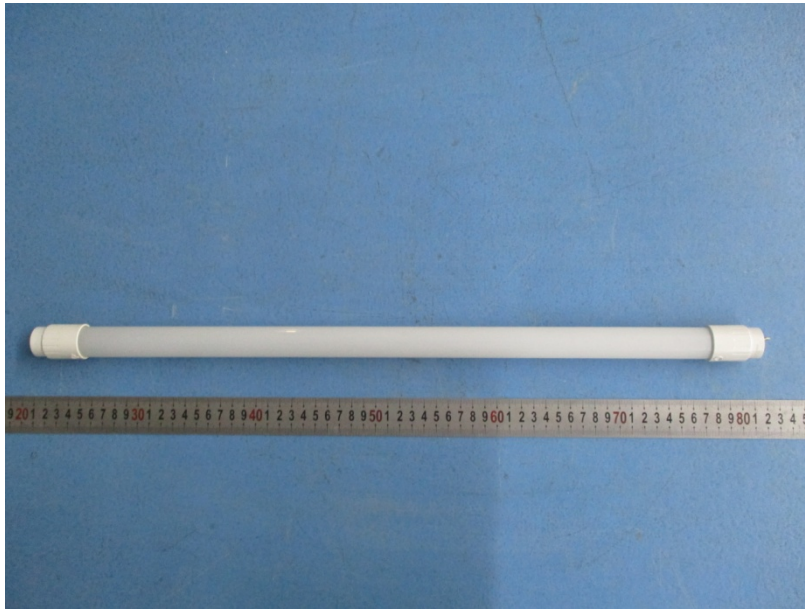
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	194	194	194	194	194	194	194	194
5.0°	192	193	193	193	194	193	193	193
10.0°	189	190	191	192	193	192	191	190
15.0°	184	185	187	190	191	190	188	185
20.0°	177	179	183	187	188	187	183	179
25.0°	168	171	176	182	185	183	178	171
30.0°	158	161	169	178	182	179	172	162
35.0°	146	150	161	172	178	174	164	153
40.0°	134	139	152	166	173	168	156	142
45.0°	120	126	143	160	168	162	148	130
50.0°	105	113	134	153	163	156	139	118
55.0°	90	100	125	146	157	150	131	106
60.0°	75	87	116	139	151	143	122	93
65.0°	59	74	107	132	145	136	114	82
70.0°	44	62	99	125	139	129	106	71
75.0°	29	51	90	118	132	123	99	61
80.0°	15	41	83	111	126	116	92	53
85.0°	5	34	76	105	120	110	85	46
90.0°	1	29	70	98	113	105	80	41
95.0°	2	26	65	92	107	99	75	38
100.0°	3	25	62	87	101	93	70	36
105.0°	3	25	58	82	95	87	67	35
110.0°	3	24	56	78	89	83	63	34
115.0°	3	24	53	73	83	77	60	33
120.0°	3	23	50	69	78	73	57	33
125.0°	2	23	48	65	73	69	55	33
130.0°	1	24	45	61	68	65	51	30
135.0°	1	23	43	57	63	60	48	29
140.0°	1	20	38	53	58	56	46	29
145.0°	1	15	36	49	54	52	40	27
150.0°	1	13	34	41	47	44	37	23
155.0°	1	11	30	38	41	39	34	18
160.0°	1	7	21	33	36	35	27	14
165.0°	1	3	10	21	26	25	18	10
170.0°	1	1	6	11	15	14	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	4.6	0.44	0-5	4.6	0.44
5-10	13.7	1.31	0-10	18.4	1.75
10-15	22.4	2.14	0-15	40.8	3.90
15-20	30.5	2.91	0-20	71.3	6.81
20-25	37.7	3.60	0-25	109.0	10.41
25-30	43.8	4.19	0-30	152.8	14.60
30-35	48.8	4.66	0-35	201.7	19.26
35-40	52.6	5.02	0-40	254.3	24.29
40-45	55.1	5.26	0-45	309.4	29.55
45-50	56.4	5.39	0-50	365.8	34.94
50-55	56.6	5.40	0-55	422.3	40.34
55-60	55.6	5.32	0-60	478.0	45.66
60-65	53.8	5.14	0-65	531.8	50.80
65-70	51.3	4.90	0-70	583.1	55.70
70-75	48.1	4.60	0-75	631.2	60.30
75-80	44.7	4.27	0-80	675.9	64.56
80-85	41.3	3.94	0-85	717.2	68.50
85-90	38.1	3.64	0-90	755.3	72.15
90-95	35.5	3.39	0-95	790.8	75.54
95-100	33.1	3.16	0-100	823.8	78.70
100-105	30.8	2.94	0-105	854.6	81.64
105-110	28.5	2.72	0-110	883.1	84.36
110-115	26.2	2.51	0-115	909.4	86.87
115-120	24.0	2.29	0-120	933.4	89.16
120-125	21.7	2.08	0-125	955.1	91.23
125-130	19.4	1.85	0-130	974.5	93.09
130-135	17.1	1.64	0-135	991.7	94.73
135-140	14.9	1.42	0-140	1006.5	96.15
140-145	12.5	1.19	0-145	1019.0	97.34
145-150	9.9	0.95	0-150	1028.9	98.29
150-155	7.5	0.72	0-155	1036.4	99.00
155-160	5.3	0.51	0-160	1041.7	99.51
160-165	3.2	0.31	0-165	1045.0	99.82
165-170	1.5	0.14	0-170	1046.4	99.96
170-175	0.4	0.04	0-175	1046.8	100.00
175-180	0.0	0.00	0-180	1046.9	100.00

6. Product Photo



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