



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/830/BYP

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180820081-10
Test Date:	2018-08-21 to 2018-08-23
Report Date:	2018-08-27
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 2018-08-20 and used for testing.

Model Tested: 9.5T5HE/2F/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: 9.5W
Nominal CCT: 3000K
Nominal Lumen Output: 1100lm

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_t , 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**

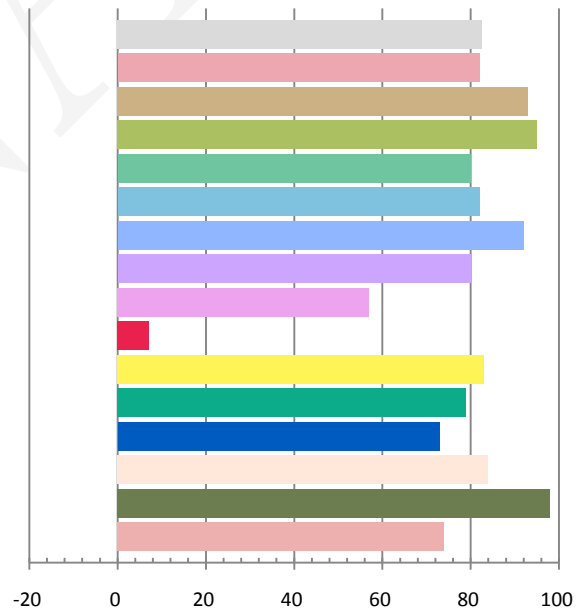
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0757	8.94	0.9841	1174.4	131.38

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
3.557	2921	0.00008	0.4428	0.4062	0.2534	0.5231

Color Rendering Index

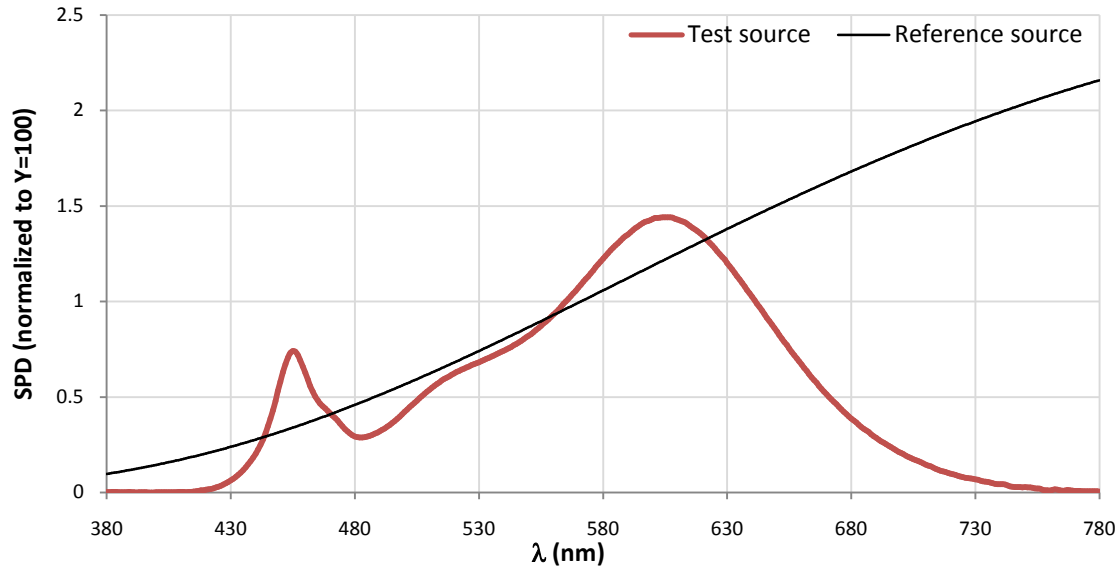
Ra 82.6			
R1 82	R2 93	R3 95	R4 80
R5 82	R6 92	R7 80	R8 57
R9 7	R10 83	R11 79	R12 73
R13 84	R14 98	R15 74	



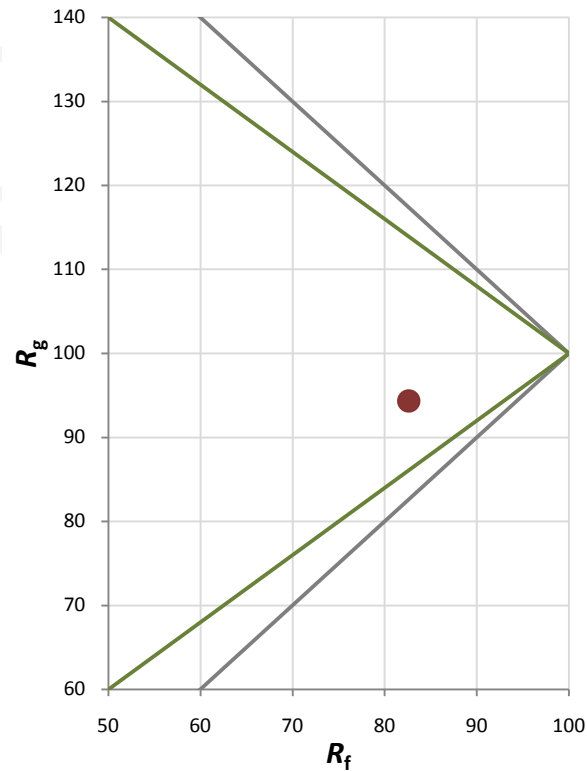
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	94

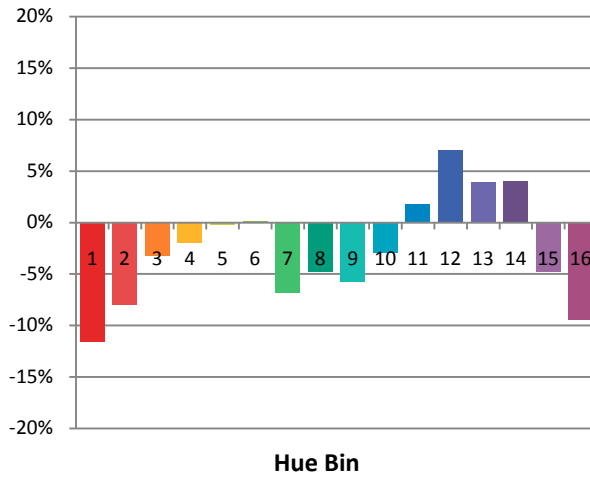
Spectral Power Distribution Comparison



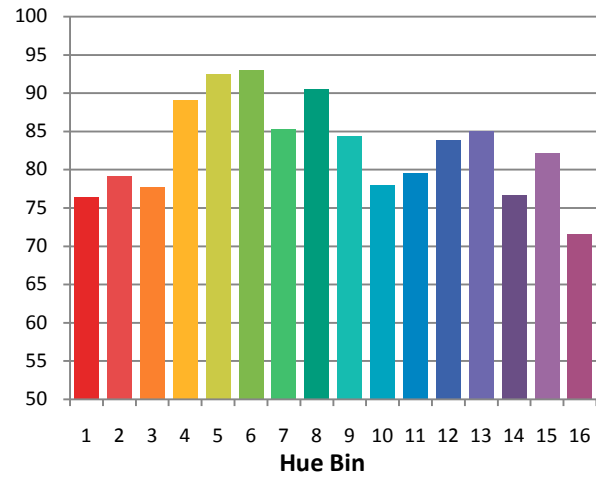
Plot of R_g versus R_f



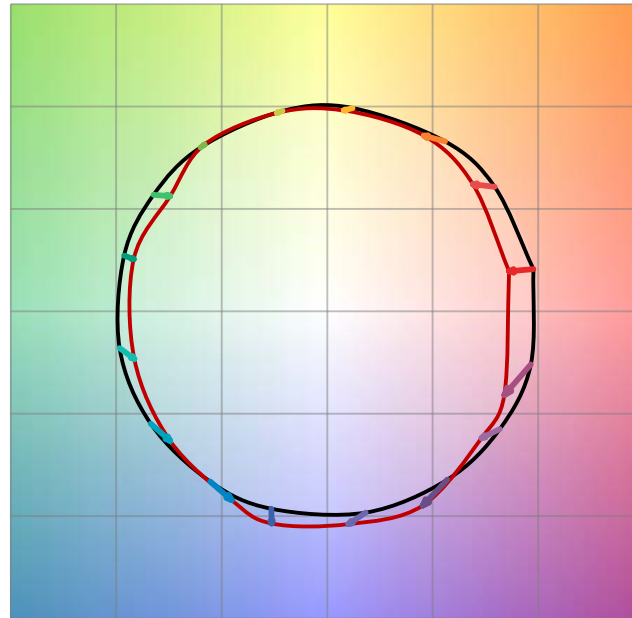
Chroma Shift by Hue



R_t by Hue

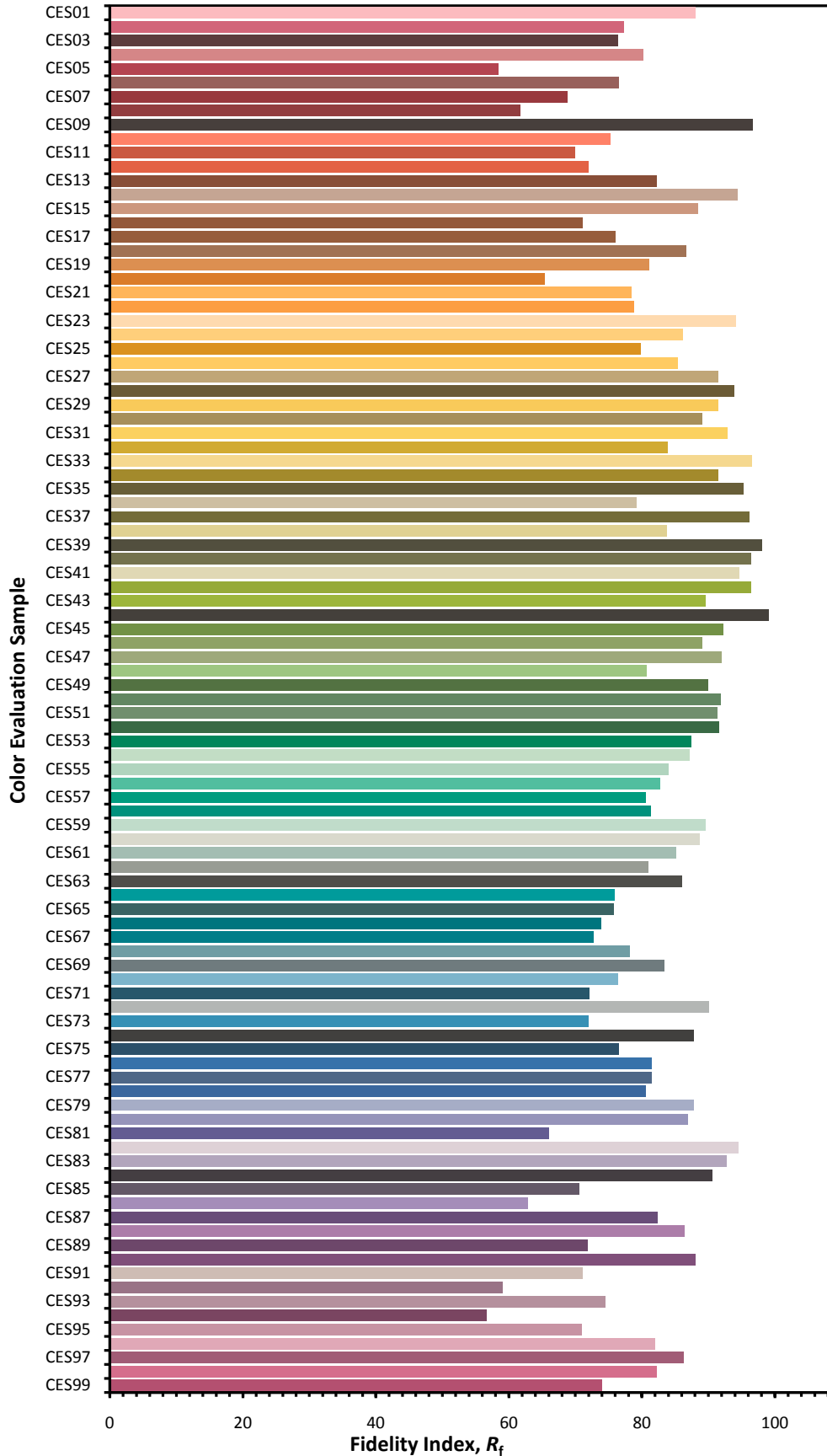


Color Vector Graphic

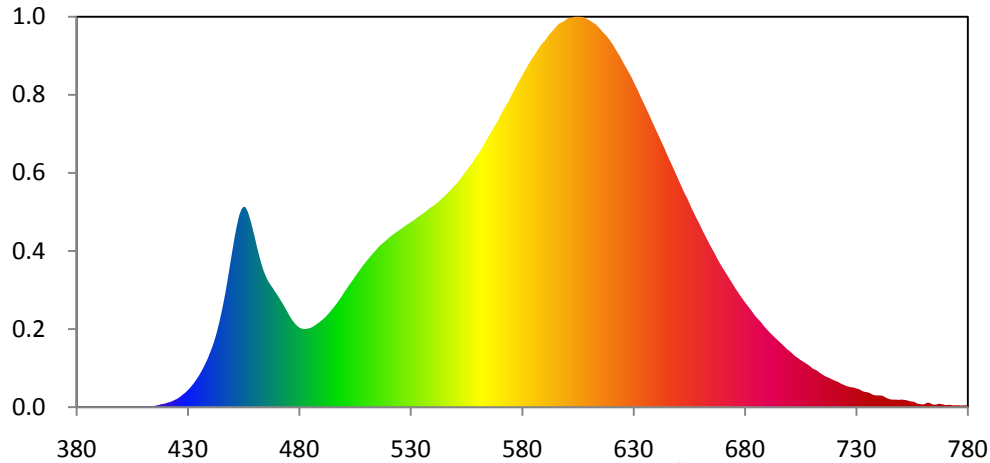


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



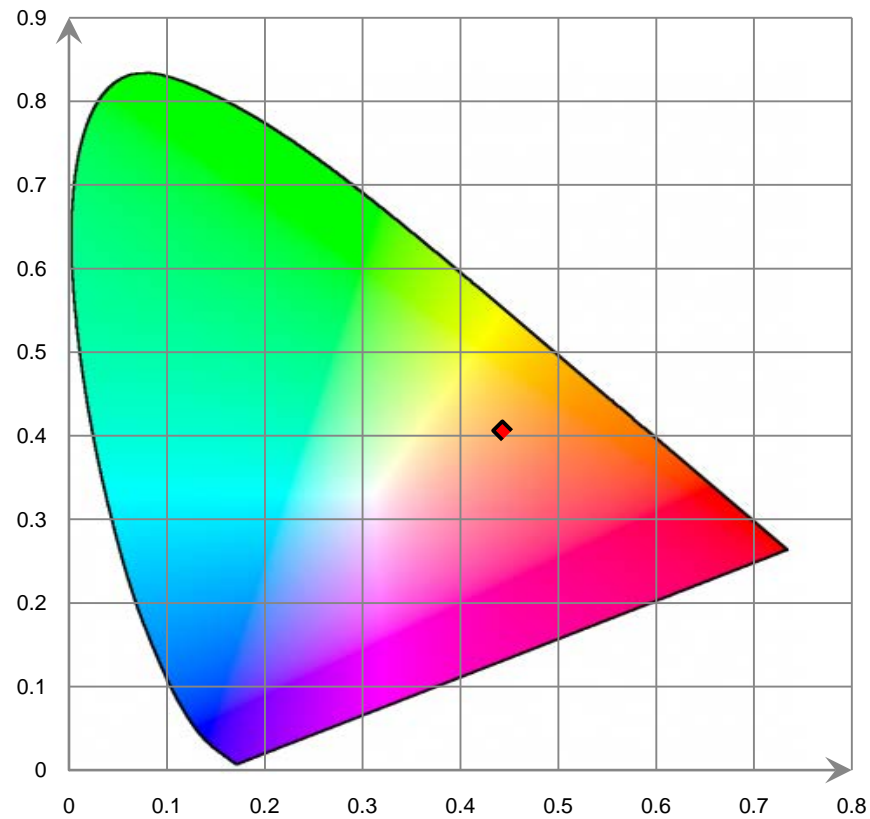
Relative Spectral Power Distribution



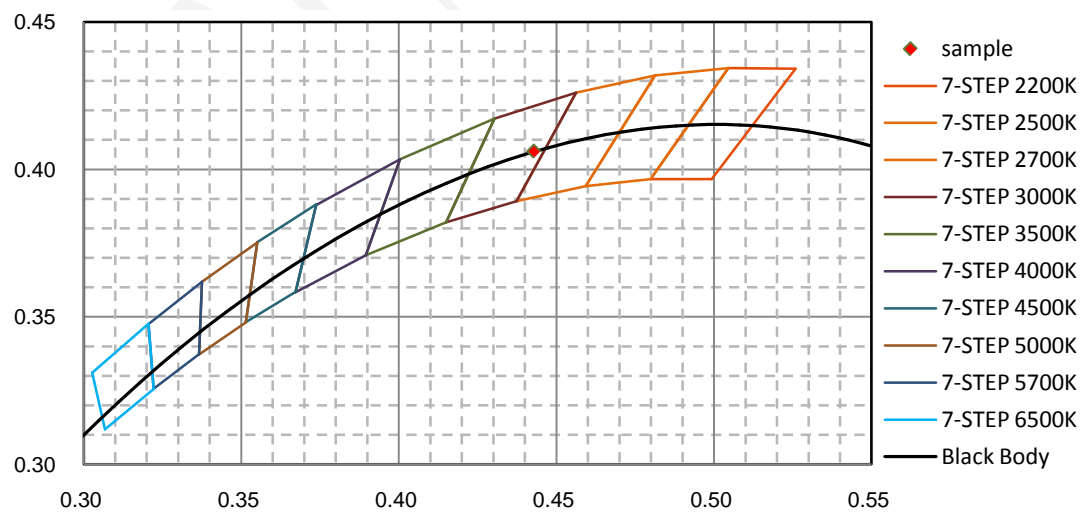
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.280E-02	421	2.953E-01	462	9.594E+00	503	7.871E+00	544	1.325E+01
381	3.880E-02	422	3.285E-01	463	9.094E+00	504	8.073E+00	545	1.337E+01
382	4.220E-02	423	3.846E-01	464	8.644E+00	505	8.279E+00	546	1.351E+01
383	4.650E-02	424	4.591E-01	465	8.297E+00	506	8.489E+00	547	1.365E+01
384	4.970E-02	425	5.189E-01	466	8.007E+00	507	8.681E+00	548	1.379E+01
385	3.570E-02	426	6.091E-01	467	7.778E+00	508	8.875E+00	549	1.396E+01
386	3.610E-02	427	7.187E-01	468	7.575E+00	509	9.066E+00	550	1.411E+01
387	3.410E-02	428	8.358E-01	469	7.352E+00	510	9.246E+00	551	1.425E+01
388	3.680E-02	429	9.454E-01	470	7.153E+00	511	9.414E+00	552	1.443E+01
389	4.400E-02	430	1.086E+00	471	6.924E+00	512	9.585E+00	553	1.463E+01
390	3.740E-02	431	1.235E+00	472	6.699E+00	513	9.761E+00	554	1.482E+01
391	1.680E-02	432	1.407E+00	473	6.466E+00	514	9.909E+00	555	1.500E+01
392	1.040E-02	433	1.594E+00	474	6.211E+00	515	1.007E+01	556	1.521E+01
393	1.450E-02	434	1.796E+00	475	5.957E+00	516	1.023E+01	557	1.538E+01
394	1.880E-02	435	2.020E+00	476	5.709E+00	517	1.035E+01	558	1.558E+01
395	2.210E-02	436	2.265E+00	477	5.494E+00	518	1.046E+01	559	1.581E+01
396	1.950E-02	437	2.525E+00	478	5.313E+00	519	1.059E+01	560	1.602E+01
397	1.100E-02	438	2.814E+00	479	5.164E+00	520	1.073E+01	561	1.622E+01
398	6.900E-03	439	3.128E+00	480	5.051E+00	521	1.085E+01	562	1.645E+01
399	3.400E-03	440	3.484E+00	481	4.991E+00	522	1.095E+01	563	1.671E+01
400	1.600E-02	441	3.853E+00	482	4.963E+00	523	1.105E+01	564	1.696E+01
401	1.910E-02	442	4.279E+00	483	4.962E+00	524	1.115E+01	565	1.719E+01
402	1.690E-02	443	4.776E+00	484	4.994E+00	525	1.126E+01	566	1.742E+01
403	1.810E-02	444	5.347E+00	485	5.030E+00	526	1.134E+01	567	1.769E+01
404	1.760E-02	445	5.970E+00	486	5.102E+00	527	1.145E+01	568	1.792E+01
405	3.010E-02	446	6.650E+00	487	5.190E+00	528	1.155E+01	569	1.815E+01
406	3.160E-02	447	7.406E+00	488	5.292E+00	529	1.165E+01	570	1.844E+01
407	3.760E-02	448	8.243E+00	489	5.393E+00	530	1.174E+01	571	1.870E+01
408	3.990E-02	449	9.118E+00	490	5.508E+00	531	1.182E+01	572	1.897E+01
409	6.040E-02	450	9.980E+00	491	5.632E+00	532	1.194E+01	573	1.922E+01
410	6.600E-02	451	1.083E+01	492	5.767E+00	533	1.204E+01	574	1.943E+01
411	5.030E-02	452	1.154E+01	493	5.920E+00	534	1.214E+01	575	1.973E+01
412	3.930E-02	453	1.217E+01	494	6.085E+00	535	1.224E+01	576	2.000E+01
413	4.870E-02	454	1.255E+01	495	6.256E+00	536	1.234E+01	577	2.027E+01
414	5.800E-02	455	1.273E+01	496	6.432E+00	537	1.245E+01	578	2.054E+01
415	7.970E-02	456	1.267E+01	497	6.627E+00	538	1.257E+01	579	2.079E+01
416	1.176E-01	457	1.235E+01	498	6.817E+00	539	1.268E+01	580	2.105E+01
417	1.400E-01	458	1.190E+01	499	7.026E+00	540	1.276E+01	581	2.129E+01
418	1.875E-01	459	1.135E+01	500	7.255E+00	541	1.287E+01	582	2.153E+01
419	2.097E-01	460	1.078E+01	501	7.468E+00	542	1.298E+01	583	2.179E+01
420	2.433E-01	461	1.016E+01	502	7.680E+00	543	1.311E+01	584	2.203E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.223E+01	626	2.171E+01	667	9.591E+00	708	2.725E+00	749	4.634E-01
586	2.244E+01	627	2.147E+01	668	9.324E+00	709	2.624E+00	750	4.796E-01
587	2.267E+01	628	2.121E+01	669	9.071E+00	710	2.499E+00	751	4.727E-01
588	2.290E+01	629	2.096E+01	670	8.842E+00	711	2.405E+00	752	4.554E-01
589	2.308E+01	630	2.067E+01	671	8.617E+00	712	2.353E+00	753	4.230E-01
590	2.321E+01	631	2.036E+01	672	8.395E+00	713	2.246E+00	754	3.791E-01
591	2.341E+01	632	2.008E+01	673	8.162E+00	714	2.142E+00	755	3.579E-01
592	2.362E+01	633	1.976E+01	674	7.939E+00	715	2.055E+00	756	3.405E-01
593	2.378E+01	634	1.946E+01	675	7.712E+00	716	1.968E+00	757	2.494E-01
594	2.393E+01	635	1.917E+01	676	7.478E+00	717	1.906E+00	758	2.105E-01
595	2.410E+01	636	1.886E+01	677	7.268E+00	718	1.848E+00	759	1.895E-01
596	2.426E+01	637	1.856E+01	678	7.062E+00	719	1.768E+00	760	1.764E-01
597	2.437E+01	638	1.824E+01	679	6.857E+00	720	1.705E+00	761	2.194E-01
598	2.444E+01	639	1.793E+01	680	6.666E+00	721	1.648E+00	762	2.901E-01
599	2.451E+01	640	1.761E+01	681	6.480E+00	722	1.592E+00	763	2.671E-01
600	2.463E+01	641	1.731E+01	682	6.299E+00	723	1.501E+00	764	1.867E-01
601	2.470E+01	642	1.700E+01	683	6.112E+00	724	1.440E+00	765	1.574E-01
602	2.472E+01	643	1.670E+01	684	5.907E+00	725	1.381E+00	766	1.689E-01
603	2.475E+01	644	1.639E+01	685	5.722E+00	726	1.319E+00	767	2.176E-01
604	2.478E+01	645	1.605E+01	686	5.580E+00	727	1.283E+00	768	2.036E-01
605	2.478E+01	646	1.574E+01	687	5.429E+00	728	1.260E+00	769	1.683E-01
606	2.477E+01	647	1.543E+01	688	5.251E+00	729	1.244E+00	770	1.347E-01
607	2.477E+01	648	1.513E+01	689	5.064E+00	730	1.188E+00	771	1.462E-01
608	2.473E+01	649	1.481E+01	690	4.917E+00	731	1.152E+00	772	1.458E-01
609	2.464E+01	650	1.448E+01	691	4.763E+00	732	1.078E+00	773	1.265E-01
610	2.457E+01	651	1.418E+01	692	4.617E+00	733	1.001E+00	774	1.168E-01
611	2.448E+01	652	1.385E+01	693	4.481E+00	734	9.655E-01	775	1.197E-01
612	2.439E+01	653	1.355E+01	694	4.347E+00	735	9.432E-01	776	1.208E-01
613	2.430E+01	654	1.328E+01	695	4.211E+00	736	9.020E-01	777	1.018E-01
614	2.416E+01	655	1.297E+01	696	4.081E+00	737	8.200E-01	778	1.141E-01
615	2.400E+01	656	1.265E+01	697	3.951E+00	738	7.661E-01	779	1.217E-01
616	2.383E+01	657	1.236E+01	698	3.809E+00	739	7.470E-01	780	9.790E-02
617	2.368E+01	658	1.206E+01	699	3.671E+00	740	7.480E-01		
618	2.353E+01	659	1.180E+01	700	3.568E+00	741	7.353E-01		
619	2.335E+01	660	1.151E+01	701	3.445E+00	742	7.157E-01		
620	2.316E+01	661	1.121E+01	702	3.302E+00	743	6.229E-01		
621	2.295E+01	662	1.094E+01	703	3.192E+00	744	5.565E-01		
622	2.270E+01	663	1.065E+01	704	3.100E+00	745	5.051E-01		
623	2.247E+01	664	1.038E+01	705	2.989E+00	746	4.817E-01		
624	2.225E+01	665	1.011E+01	706	2.904E+00	747	4.800E-01		
625	2.197E+01	666	9.865E+00	707	2.811E+00	748	4.746E-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**

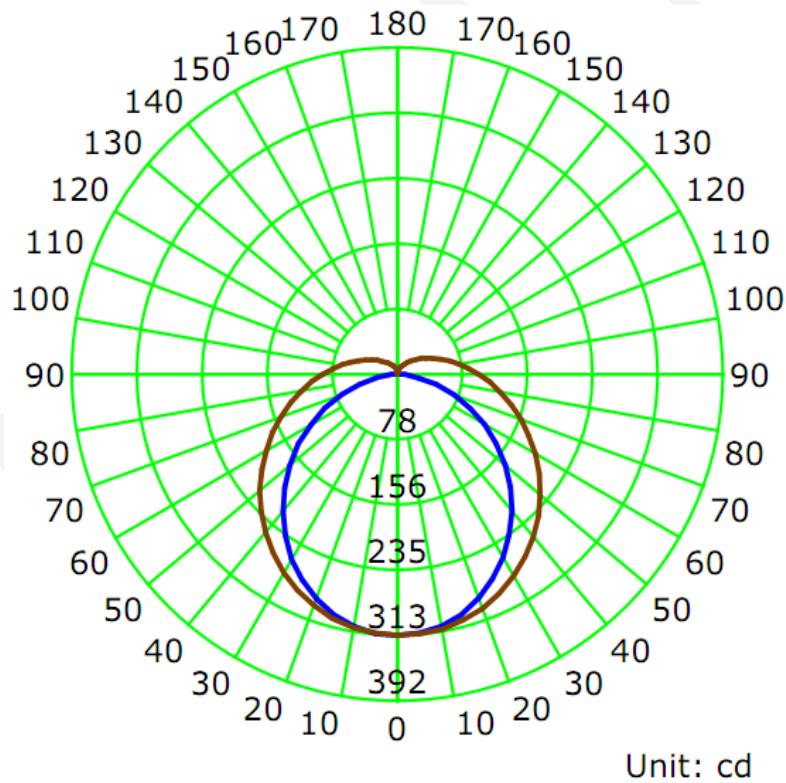
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0750	8.94	0.9880

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1178.6	131.88	314.0	1.21	1.32

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	105.3	118.0	138.3	121.9	120.9
Field Angle (10% I _{max}):	157.6	209.3	251.3	220.9	209.8

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	314	314	314	314	314	314	314	314
5.0°	312	312	313	313	313	313	313	313
10.0°	307	307	308	310	311	310	310	309
15.0°	299	299	302	305	306	306	303	301
20.0°	287	288	292	298	299	298	295	291
25.0°	272	274	280	287	291	289	284	278
30.0°	255	257	266	276	280	278	271	262
35.0°	235	239	250	262	268	265	256	245
40.0°	215	219	233	247	255	250	239	225
45.0°	193	198	214	230	241	235	221	205
50.0°	169	176	195	213	225	219	203	183
55.0°	146	154	175	196	209	201	184	162
60.0°	122	131	156	179	192	184	165	140
65.0°	97	109	137	162	175	166	146	118
70.0°	73	87	118	145	159	150	128	97
75.0°	49	66	101	129	142	134	111	77
80.0°	27	48	85	114	127	119	95	60
85.0°	10	33	71	99	112	104	81	45
90.0°	1	23	59	86	99	91	68	33
95.0°	0	15	48	74	86	79	58	25
100.0°	0	11	40	63	75	68	48	19
105.0°	0	8	33	54	64	59	40	14
110.0°	1	7	27	46	55	50	33	12
115.0°	1	6	23	39	47	42	28	10
120.0°	1	6	19	33	40	36	23	8
125.0°	0	5	16	28	34	30	19	8
130.0°	1	5	14	23	28	25	16	7
135.0°	1	5	12	20	23	21	14	6
140.0°	1	5	11	17	20	17	12	6
145.0°	1	5	10	14	16	14	10	6
150.0°	1	5	9	13	14	12	8	5
155.0°	1	5	8	10	11	9	7	4
160.0°	2	5	7	8	9	7	5	2
165.0°	2	3	6	7	7	6	2	2
170.0°	2	2	3	4	4	2	2	2
175.0°	2	2	2	2	2	2	2	2
180.0°	0	0	0	0	0	0	0	0

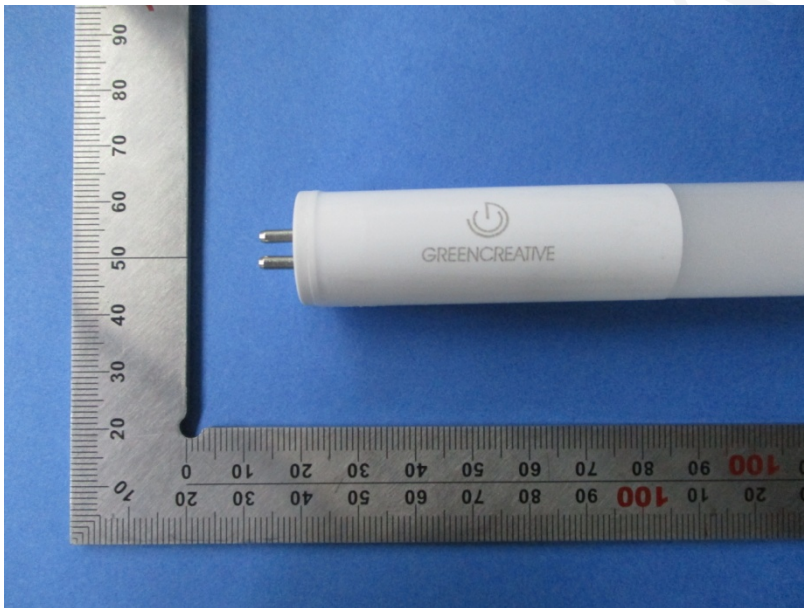
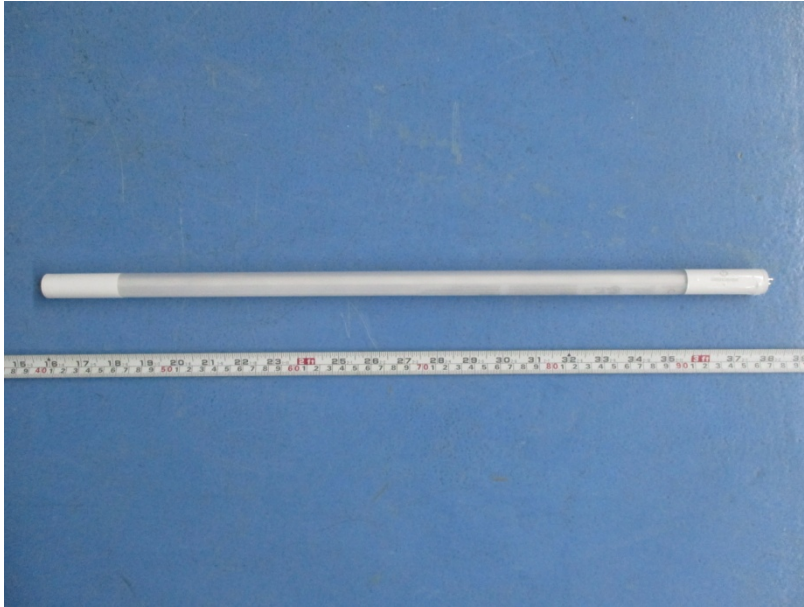
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	314	314	314	314	314	314	314	314
5.0°	313	312	312	312	312	312	312	311
10.0°	307	307	308	309	309	309	307	307
15.0°	299	299	300	303	304	302	300	298
20.0°	287	287	290	294	296	294	290	287
25.0°	273	273	277	284	286	284	278	273
30.0°	256	257	263	271	276	272	264	256
35.0°	237	237	246	257	262	258	248	238
40.0°	216	217	228	241	248	243	231	218
45.0°	193	196	209	225	233	227	212	197
50.0°	170	173	189	207	217	210	194	175
55.0°	146	150	170	189	200	193	175	153
60.0°	121	127	150	172	183	176	156	132
65.0°	97	104	131	154	166	158	138	110
70.0°	72	82	112	136	150	141	120	90
75.0°	48	62	95	120	134	125	103	72
80.0°	26	44	79	105	118	110	87	55
85.0°	9	29	65	91	104	97	74	41
90.0°	1	19	53	78	91	85	62	30
95.0°	0	13	43	67	79	73	53	23
100.0°	0	9	35	57	68	63	44	17
105.0°	1	7	29	49	59	54	37	14
110.0°	1	6	24	41	50	46	31	11
115.0°	0	5	20	35	43	39	26	9
120.0°	0	5	17	29	36	33	22	8
125.0°	0	5	14	25	31	28	18	8
130.0°	0	5	12	21	26	23	16	7
135.0°	1	4	11	18	22	20	14	7
140.0°	1	4	10	15	18	17	12	6
145.0°	1	4	9	13	15	14	11	6
150.0°	1	4	8	11	13	12	9	6
155.0°	1	4	7	9	11	10	8	5
160.0°	2	3	6	8	9	9	7	5
165.0°	2	2	4	6	7	7	5	4
170.0°	2	2	3	5	5	5	5	3
175.0°	2	2	2	2	2	3	2	2
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	7.5	0.64	0-5	7.5	0.64
5-10	22.2	1.88	0-10	29.7	2.52
10-15	36.2	3.07	0-15	65.9	5.59
15-20	48.9	4.15	0-20	114.8	9.74
20-25	60.0	5.09	0-25	174.8	14.83
25-30	69.1	5.86	0-30	243.9	20.69
30-35	76.0	6.45	0-35	319.9	27.15
35-40	80.6	6.84	0-40	400.6	33.99
40-45	82.8	7.03	0-45	483.4	41.01
45-50	82.7	7.02	0-50	566.1	48.03
50-55	80.5	6.83	0-55	646.6	54.86
55-60	76.4	6.48	0-60	723.0	61.34
60-65	70.7	6.00	0-65	793.6	67.34
65-70	63.7	5.40	0-70	857.3	72.74
70-75	55.9	4.74	0-75	913.3	77.49
75-80	47.9	4.06	0-80	961.1	81.55
80-85	40.1	3.41	0-85	1001.3	84.95
85-90	33.3	2.82	0-90	1034.5	87.78
90-95	27.6	2.34	0-95	1062.2	90.12
95-100	23.0	1.95	0-100	1085.2	92.07
100-105	19.0	1.62	0-105	1104.2	93.69
105-110	15.7	1.33	0-110	1119.9	95.02
110-115	12.8	1.09	0-115	1132.7	96.11
115-120	10.4	0.88	0-120	1143.2	96.99
120-125	8.4	0.72	0-125	1151.6	97.71
125-130	6.8	0.57	0-130	1158.4	98.28
130-135	5.4	0.46	0-135	1163.7	98.74
135-140	4.3	0.36	0-140	1168.0	99.10
140-145	3.3	0.28	0-145	1171.3	99.38
145-150	2.6	0.22	0-150	1173.9	99.60
150-155	1.9	0.16	0-155	1175.8	99.76
155-160	1.3	0.11	0-160	1177.2	99.88
160-165	0.8	0.07	0-165	1178.0	99.95
165-170	0.4	0.04	0-170	1178.4	99.98
170-175	0.2	0.01	0-175	1178.6	100.00
175-180	0.0	0.00	0-180	1178.6	100.00

6. Product Photo



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