



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 10.5/T8/4F/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:	PKS181012082-10
Test Date:	2018-10-16
Report Date:	2018-10-18
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 2018-10-16 and used for testing.

Model Tested: 10.5/T8/4F/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 50/60Hz
Rated Power: 10.5W
Nominal CCT: 3000K
Nominal Lumen Output: 1650lm

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**

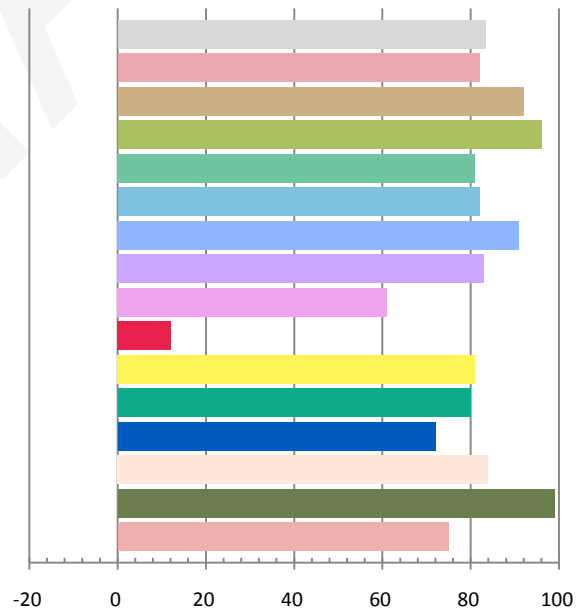
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.0947	11.12	0.9781	1675	150.63

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
5.110	2994	0.00065	0.4383	0.4062	0.2505	0.5224

Color Rendering Index

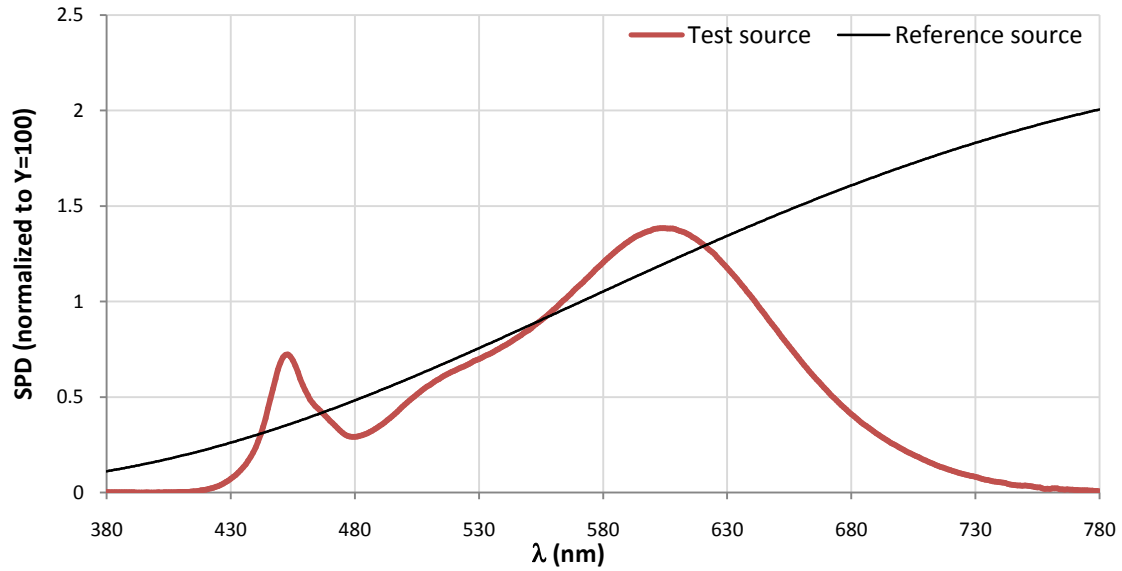
Ra 83.4			
R1 82	R2 92	R3 96	R4 81
R5 82	R6 91	R7 83	R8 61
R9 12	R10 81	R11 80	R12 72
R13 84	R14 99	R15 75	



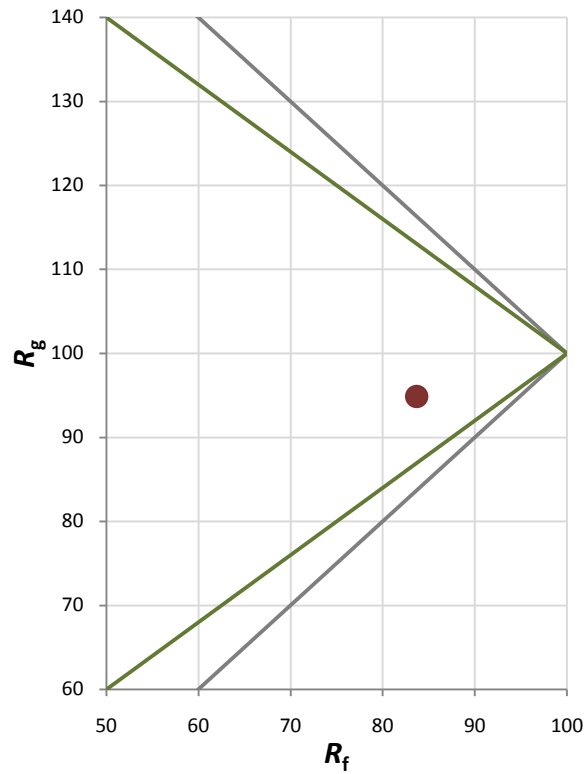
Fidelity Index and Gamut Index

Fidelity Index R_f	84
Gamut Index R_g	95

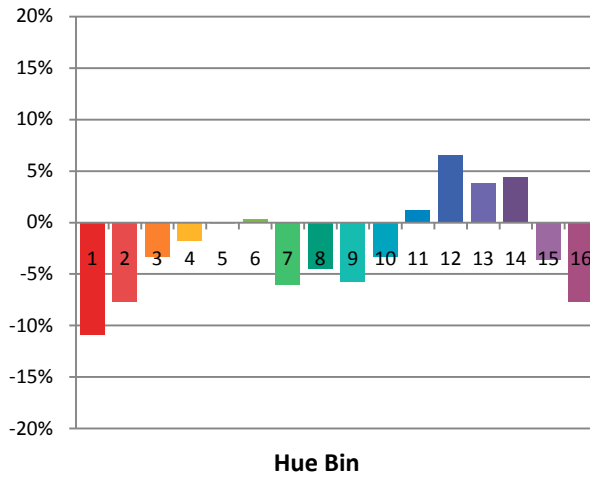
Spectral Power Distribution Comparison



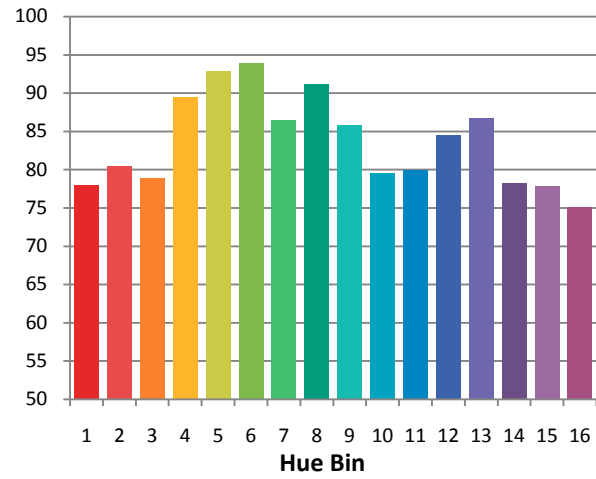
Plot of R_g versus R_f



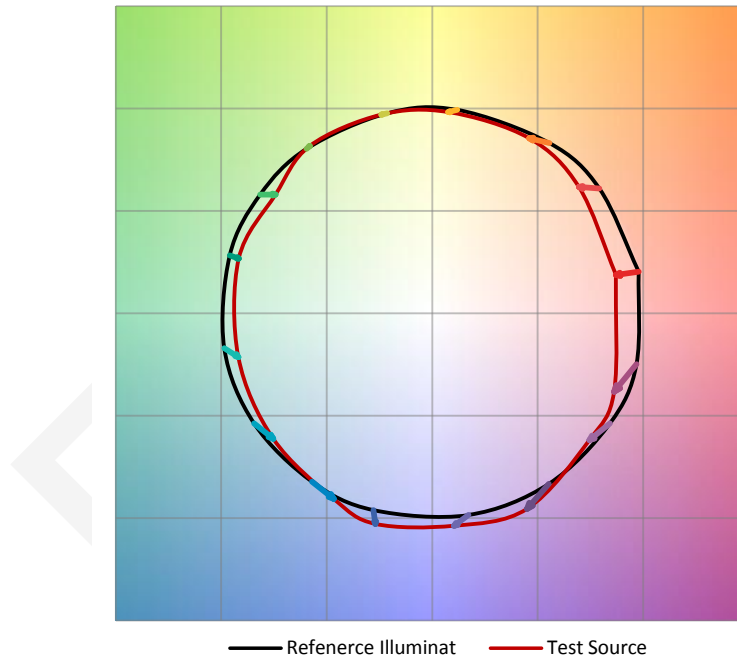
Chroma Shift by Hue



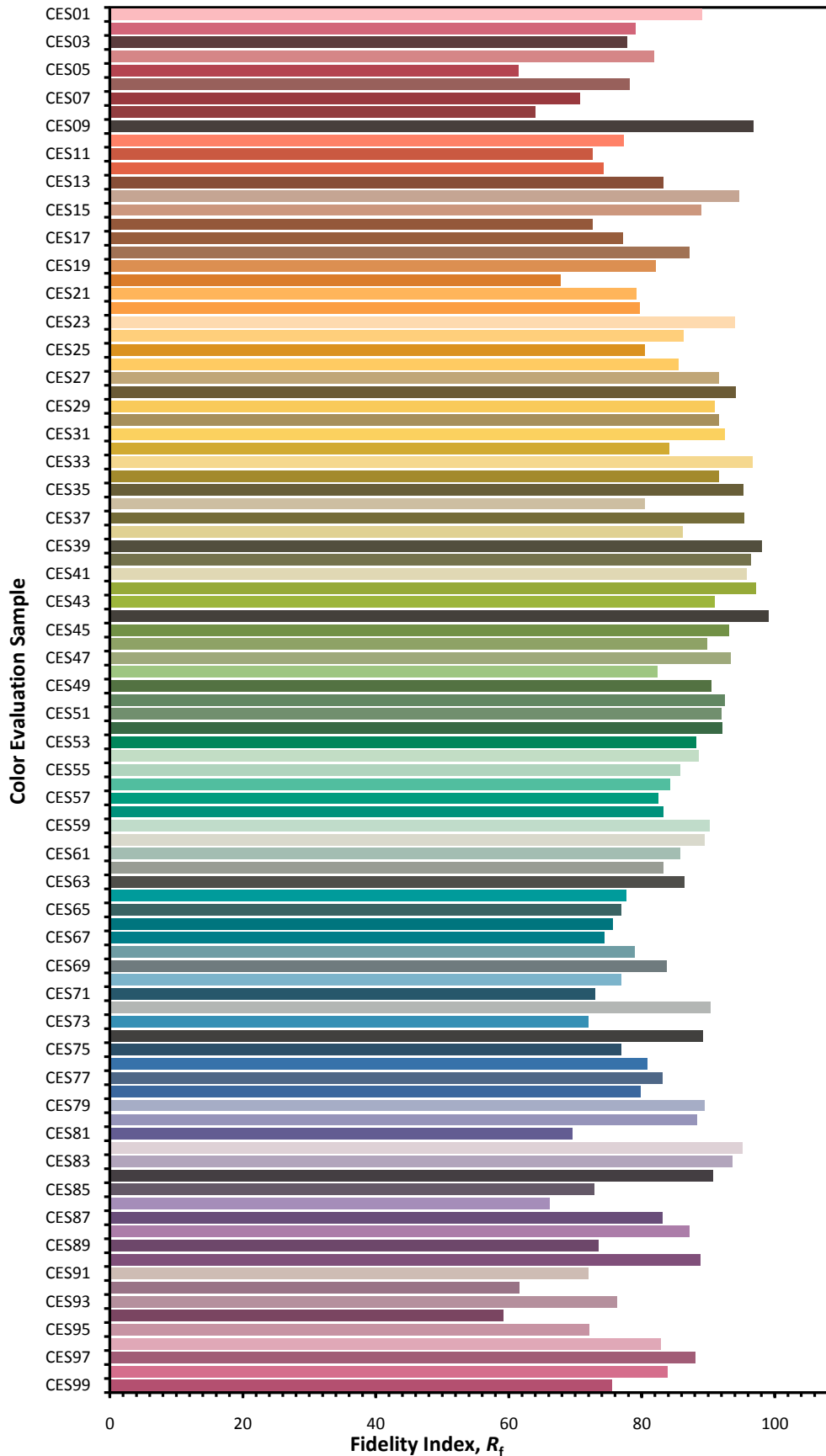
R_f by Hue



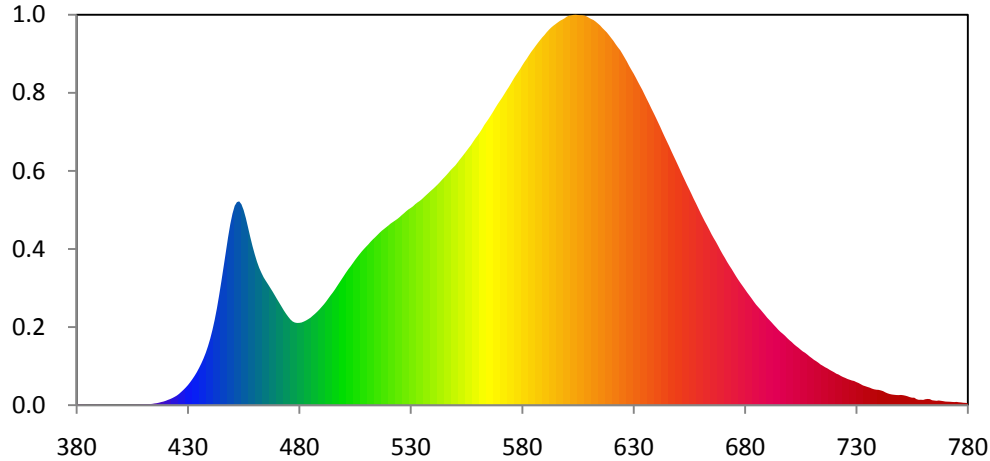
Color Vector Graphic



Color Fidelity by CES Sample



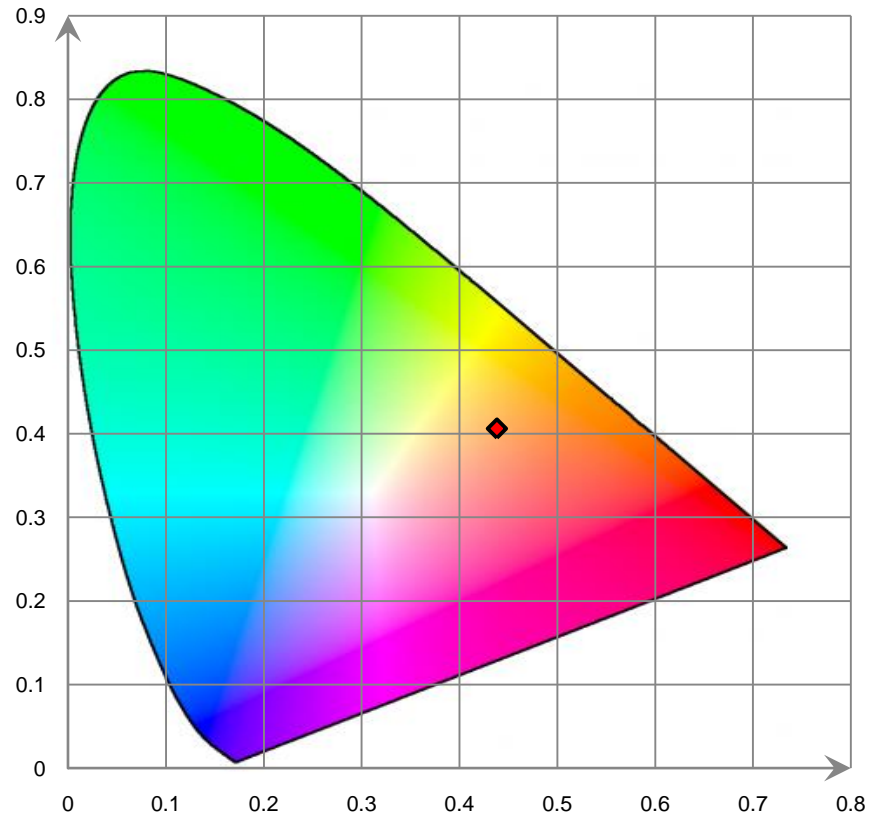
Relative Spectral Power Distribution



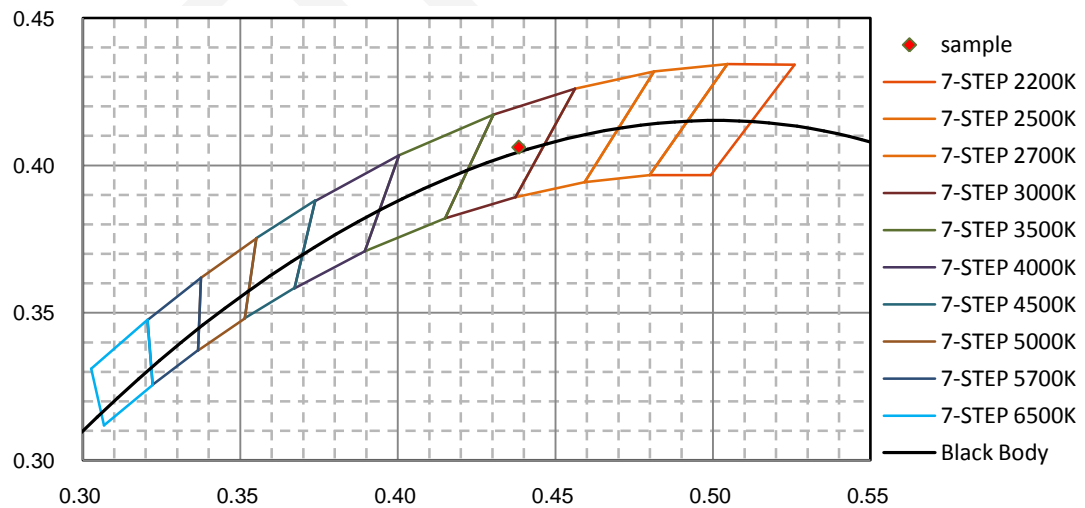
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	6.970E-02	421	4.578E-01	462	1.193E+01	503	1.207E+01	544	1.959E+01
381	5.830E-02	422	5.288E-01	463	1.150E+01	504	1.234E+01	545	1.979E+01
382	5.380E-02	423	6.186E-01	464	1.111E+01	505	1.262E+01	546	2.000E+01
383	5.230E-02	424	7.195E-01	465	1.080E+01	506	1.287E+01	547	2.022E+01
384	3.900E-02	425	8.349E-01	466	1.050E+01	507	1.312E+01	548	2.045E+01
385	2.330E-02	426	9.784E-01	467	1.019E+01	508	1.336E+01	549	2.065E+01
386	3.210E-02	427	1.153E+00	468	9.876E+00	509	1.358E+01	550	2.084E+01
387	3.730E-02	428	1.335E+00	469	9.549E+00	510	1.378E+01	551	2.109E+01
388	3.530E-02	429	1.532E+00	470	9.219E+00	511	1.399E+01	552	2.135E+01
389	4.820E-02	430	1.745E+00	471	8.898E+00	512	1.421E+01	553	2.159E+01
390	4.270E-02	431	1.991E+00	472	8.573E+00	513	1.441E+01	554	2.184E+01
391	2.020E-02	432	2.265E+00	473	8.252E+00	514	1.459E+01	555	2.209E+01
392	1.310E-02	433	2.553E+00	474	7.955E+00	515	1.478E+01	556	2.236E+01
393	1.380E-02	434	2.874E+00	475	7.693E+00	516	1.498E+01	557	2.260E+01
394	1.510E-02	435	3.234E+00	476	7.450E+00	517	1.516E+01	558	2.290E+01
395	1.570E-02	436	3.629E+00	477	7.277E+00	518	1.532E+01	559	2.318E+01
396	1.780E-02	437	4.061E+00	478	7.183E+00	519	1.547E+01	560	2.344E+01
397	1.660E-02	438	4.553E+00	479	7.147E+00	520	1.562E+01	561	2.371E+01
398	1.010E-02	439	5.123E+00	480	7.154E+00	521	1.579E+01	562	2.402E+01
399	5.100E-03	440	5.776E+00	481	7.189E+00	522	1.592E+01	563	2.435E+01
400	1.740E-02	441	6.533E+00	482	7.266E+00	523	1.606E+01	564	2.463E+01
401	1.970E-02	442	7.410E+00	483	7.363E+00	524	1.619E+01	565	2.491E+01
402	1.680E-02	443	8.419E+00	484	7.478E+00	525	1.635E+01	566	2.521E+01
403	1.890E-02	444	9.545E+00	485	7.605E+00	526	1.653E+01	567	2.552E+01
404	2.950E-02	445	1.076E+01	486	7.774E+00	527	1.669E+01	568	2.585E+01
405	3.700E-02	446	1.202E+01	487	7.939E+00	528	1.687E+01	569	2.616E+01
406	4.400E-02	447	1.329E+01	488	8.120E+00	529	1.702E+01	570	2.645E+01
407	4.450E-02	448	1.458E+01	489	8.318E+00	530	1.714E+01	571	2.673E+01
408	4.060E-02	449	1.573E+01	490	8.536E+00	531	1.729E+01	572	2.704E+01
409	6.770E-02	450	1.664E+01	491	8.757E+00	532	1.747E+01	573	2.736E+01
410	8.670E-02	451	1.734E+01	492	9.002E+00	533	1.762E+01	574	2.765E+01
411	7.820E-02	452	1.766E+01	493	9.272E+00	534	1.775E+01	575	2.798E+01
412	7.950E-02	453	1.772E+01	494	9.543E+00	535	1.791E+01	576	2.831E+01
413	9.360E-02	454	1.747E+01	495	9.791E+00	536	1.809E+01	577	2.862E+01
414	1.163E-01	455	1.696E+01	496	1.006E+01	537	1.827E+01	578	2.890E+01
415	1.478E-01	456	1.626E+01	497	1.036E+01	538	1.845E+01	579	2.920E+01
416	1.763E-01	457	1.544E+01	498	1.066E+01	539	1.863E+01	580	2.952E+01
417	2.162E-01	458	1.460E+01	499	1.095E+01	540	1.880E+01	581	2.982E+01
418	2.726E-01	459	1.382E+01	500	1.124E+01	541	1.898E+01	582	3.010E+01
419	3.144E-01	460	1.311E+01	501	1.154E+01	542	1.917E+01	583	3.040E+01
420	3.775E-01	461	1.247E+01	502	1.182E+01	543	1.937E+01	584	3.069E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.095E+01	626	3.021E+01	667	1.420E+01	708	4.403E+00	749	8.759E-01
586	3.121E+01	627	2.988E+01	668	1.384E+01	709	4.238E+00	750	8.892E-01
587	3.148E+01	628	2.951E+01	669	1.347E+01	710	4.094E+00	751	8.671E-01
588	3.172E+01	629	2.916E+01	670	1.312E+01	711	3.939E+00	752	8.291E-01
589	3.196E+01	630	2.884E+01	671	1.280E+01	712	3.822E+00	753	7.689E-01
590	3.218E+01	631	2.848E+01	672	1.246E+01	713	3.685E+00	754	6.996E-01
591	3.241E+01	632	2.811E+01	673	1.215E+01	714	3.532E+00	755	6.506E-01
592	3.263E+01	633	2.775E+01	674	1.185E+01	715	3.418E+00	756	6.517E-01
593	3.282E+01	634	2.739E+01	675	1.153E+01	716	3.299E+00	757	5.268E-01
594	3.298E+01	635	2.699E+01	676	1.121E+01	717	3.202E+00	758	4.668E-01
595	3.313E+01	636	2.659E+01	677	1.091E+01	718	3.077E+00	759	4.734E-01
596	3.327E+01	637	2.620E+01	678	1.062E+01	719	2.972E+00	760	4.577E-01
597	3.341E+01	638	2.579E+01	679	1.035E+01	720	2.865E+00	761	5.147E-01
598	3.352E+01	639	2.541E+01	680	1.008E+01	721	2.740E+00	762	5.421E-01
599	3.362E+01	640	2.500E+01	681	9.798E+00	722	2.665E+00	763	5.262E-01
600	3.377E+01	641	2.460E+01	682	9.537E+00	723	2.548E+00	764	4.285E-01
601	3.386E+01	642	2.419E+01	683	9.279E+00	724	2.451E+00	765	4.048E-01
602	3.389E+01	643	2.375E+01	684	9.001E+00	725	2.374E+00	766	3.787E-01
603	3.393E+01	644	2.332E+01	685	8.745E+00	726	2.280E+00	767	4.057E-01
604	3.394E+01	645	2.292E+01	686	8.524E+00	727	2.213E+00	768	3.792E-01
605	3.392E+01	646	2.251E+01	687	8.305E+00	728	2.146E+00	769	3.481E-01
606	3.390E+01	647	2.208E+01	688	8.074E+00	729	2.101E+00	770	3.167E-01
607	3.390E+01	648	2.166E+01	689	7.843E+00	730	2.005E+00	771	3.056E-01
608	3.387E+01	649	2.125E+01	690	7.603E+00	731	1.927E+00	772	2.975E-01
609	3.379E+01	650	2.084E+01	691	7.401E+00	732	1.821E+00	773	2.812E-01
610	3.368E+01	651	2.041E+01	692	7.193E+00	733	1.714E+00	774	2.705E-01
611	3.357E+01	652	1.998E+01	693	6.973E+00	734	1.654E+00	775	2.866E-01
612	3.349E+01	653	1.957E+01	694	6.770E+00	735	1.586E+00	776	2.549E-01
613	3.334E+01	654	1.916E+01	695	6.553E+00	736	1.523E+00	777	2.370E-01
614	3.318E+01	655	1.877E+01	696	6.364E+00	737	1.440E+00	778	2.105E-01
615	3.301E+01	656	1.836E+01	697	6.205E+00	738	1.377E+00	779	1.987E-01
616	3.279E+01	657	1.794E+01	698	6.032E+00	739	1.345E+00	780	1.662E-01
617	3.260E+01	658	1.755E+01	699	5.831E+00	740	1.332E+00		
618	3.241E+01	659	1.715E+01	700	5.649E+00	741	1.282E+00		
619	3.217E+01	660	1.674E+01	701	5.488E+00	742	1.222E+00		
620	3.191E+01	661	1.636E+01	702	5.298E+00	743	1.115E+00		
621	3.167E+01	662	1.597E+01	703	5.138E+00	744	1.030E+00		
622	3.137E+01	663	1.562E+01	704	4.993E+00	745	9.670E-01		
623	3.111E+01	664	1.525E+01	705	4.826E+00	746	9.268E-01		
624	3.086E+01	665	1.487E+01	706	4.671E+00	747	9.027E-01		
625	3.055E+01	666	1.452E+01	707	4.554E+00	748	8.813E-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**

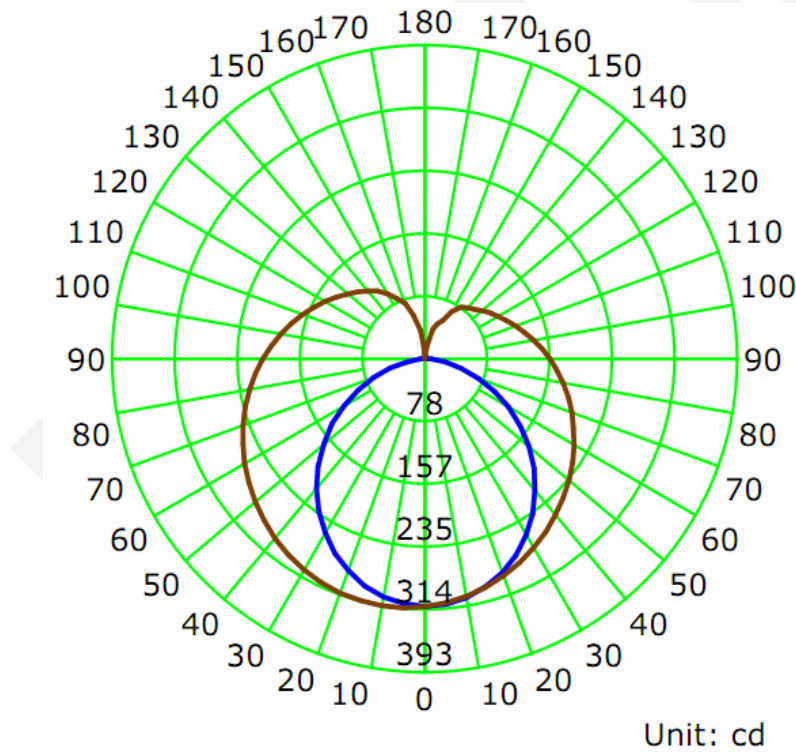
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0950	11.13	0.9800

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1678.1	150.82	314.5	1.22	1.40

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	105.8	142.1	203.6	148.7	150.1
Field Angle (10% I_{max}):	157.0	330.7	338.2	324.7	287.7

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	310	310	310	310	310	310	310	310
5.0°	309	308	307	307	307	307	307	308
10.0°	304	302	302	302	302	302	302	302
15.0°	296	294	294	295	296	296	294	294
20.0°	285	283	285	288	289	288	285	283
25.0°	271	269	273	279	282	280	274	270
30.0°	255	254	260	269	274	271	261	254
35.0°	237	236	246	258	265	261	249	237
40.0°	216	218	232	247	255	250	235	219
45.0°	194	199	216	236	246	239	220	200
50.0°	172	179	202	225	236	228	206	180
55.0°	147	159	187	213	227	217	192	160
60.0°	122	138	172	202	217	206	178	141
65.0°	97	118	159	192	207	196	165	122
70.0°	73	99	145	181	197	185	152	104
75.0°	48	82	133	170	187	174	140	88
80.0°	26	68	121	160	177	163	128	74
85.0°	9	55	112	149	167	153	118	62
90.0°	1	47	102	140	157	143	108	53
95.0°	1	41	95	132	148	134	100	47
100.0°	2	38	88	124	139	126	93	44
105.0°	1	37	83	117	130	118	87	41
110.0°	1	37	78	109	122	111	82	41
115.0°	1	38	74	103	114	104	78	42
120.0°	1	41	71	97	107	98	74	43
125.0°	1	35	69	91	100	92	72	40
130.0°	1	34	67	87	94	87	70	36
135.0°	1	34	67	83	89	83	68	35
140.0°	1	34	62	79	84	79	62	34
145.0°	1	34	52	77	80	75	49	31
150.0°	2	34	48	63	69	57	41	27
155.0°	2	34	45	53	54	48	34	22
160.0°	4	31	42	46	47	37	26	15
165.0°	4	25	36	40	40	27	14	9
170.0°	2	14	24	27	21	13	5	3
175.0°	2	3	6	8	5	3	2	2
180.0°	0	0	0	0	0	0	0	0

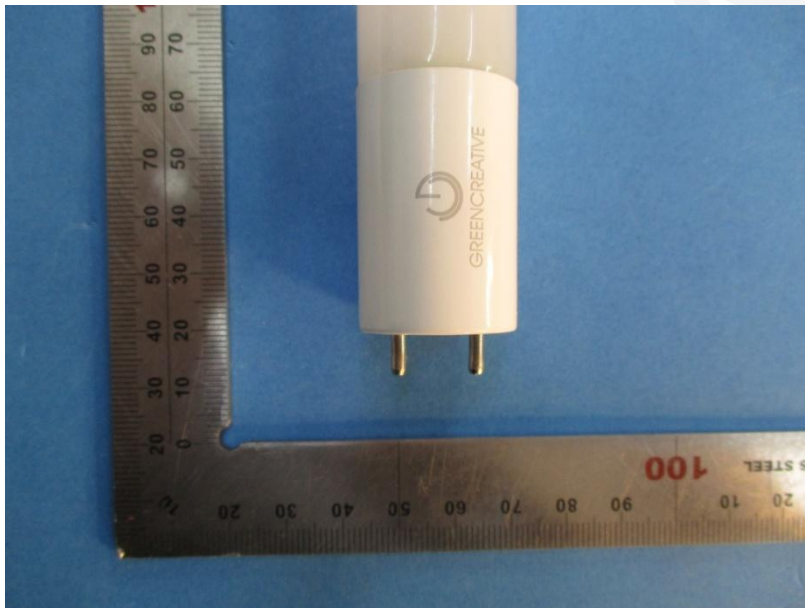
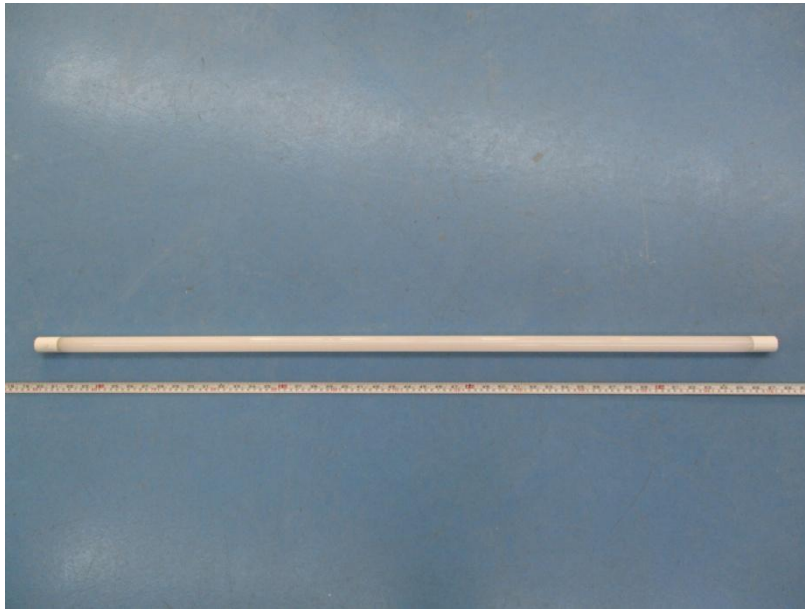
Luminous Intensity (cd) Distribution Data (cont.)

C γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	310	310	310	310	310	310	310	310
5.0°	308	310	312	313	313	313	312	310
10.0°	303	306	310	313	314	313	310	307
15.0°	294	300	306	312	314	312	307	300
20.0°	283	290	300	308	312	309	301	291
25.0°	269	278	292	304	309	305	292	280
30.0°	252	263	281	297	305	299	282	266
35.0°	233	246	269	290	300	292	271	249
40.0°	212	228	255	281	294	283	259	232
45.0°	190	209	241	272	287	274	246	213
50.0°	167	189	227	262	279	265	232	193
55.0°	143	168	213	252	271	256	218	173
60.0°	118	147	198	241	262	246	205	153
65.0°	93	127	184	230	253	235	192	134
70.0°	68	107	171	220	244	224	179	116
75.0°	45	90	158	209	234	213	167	100
80.0°	23	76	147	198	224	201	156	86
85.0°	7	64	136	189	214	192	145	74
90.0°	1	56	128	180	204	184	137	66
95.0°	1	52	121	169	194	174	129	63
100.0°	2	51	116	161	184	165	123	60
105.0°	1	50	110	154	174	157	117	59
110.0°	1	51	105	146	164	149	112	59
115.0°	1	53	101	138	154	141	107	59
120.0°	1	54	96	131	145	133	103	60
125.0°	1	54	93	123	136	126	99	60
130.0°	1	53	90	116	127	119	95	60
135.0°	1	53	87	110	119	112	92	59
140.0°	1	49	81	104	112	106	88	57
145.0°	1	38	76	98	105	100	81	53
150.0°	1	27	67	88	94	89	76	45
155.0°	2	24	54	79	85	81	69	37
160.0°	2	18	43	67	74	72	57	30
165.0°	2	10	27	42	57	54	41	21
170.0°	2	5	17	24	36	35	25	9
175.0°	2	2	4	7	12	11	8	2
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	7.4	0.44	0-5	7.4	0.44
5-10	22.0	1.31	0-10	29.4	1.75
10-15	36.0	2.14	0-15	65.4	3.90
15-20	48.9	2.91	0-20	114.2	6.81
20-25	60.3	3.60	0-25	174.6	10.40
25-30	70.1	4.18	0-30	244.7	14.58
30-35	78.0	4.65	0-35	322.7	19.23
35-40	84.0	5.00	0-40	406.7	24.24
40-45	87.9	5.24	0-45	494.6	29.48
45-50	90.0	5.36	0-50	584.6	34.84
50-55	90.2	5.37	0-55	674.8	40.21
55-60	88.7	5.29	0-60	763.5	45.50
60-65	85.8	5.11	0-65	849.3	50.61
65-70	81.7	4.87	0-70	931.0	55.48
70-75	76.8	4.57	0-75	1007.8	60.06
75-80	71.3	4.25	0-80	1079.1	64.30
80-85	65.8	3.92	0-85	1144.8	68.22
85-90	60.7	3.62	0-90	1205.6	71.84
90-95	56.6	3.37	0-95	1262.1	75.21
95-100	52.9	3.15	0-100	1315.1	78.37
100-105	49.4	2.94	0-105	1364.4	81.31
105-110	45.8	2.73	0-110	1410.2	84.04
110-115	42.3	2.52	0-115	1452.6	86.56
115-120	38.9	2.32	0-120	1491.5	88.88
120-125	35.3	2.10	0-125	1526.8	90.98
125-130	31.6	1.89	0-130	1558.4	92.87
130-135	28.1	1.68	0-135	1586.5	94.54
135-140	24.6	1.46	0-140	1611.1	96.01
140-145	20.7	1.23	0-145	1631.8	97.24
145-150	16.4	0.98	0-150	1648.2	98.22
150-155	12.3	0.73	0-155	1660.5	98.95
155-160	8.7	0.52	0-160	1669.2	99.47
160-165	5.4	0.32	0-165	1674.7	99.79
165-170	2.6	0.16	0-170	1677.3	99.95
170-175	0.8	0.05	0-175	1678.1	100.00
175-180	0.1	0.00	0-180	1678.1	100.00

6. Product Photo



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