



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 12T5HE/3F/840/BYP

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180820080-10-4
Test Date:	2018-08-20 to 2018-08-22
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: 12T5HE/3F/840/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: 12W
 Nominal CCT: 4000K
 Nominal Lumen Output: 1500lm

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**

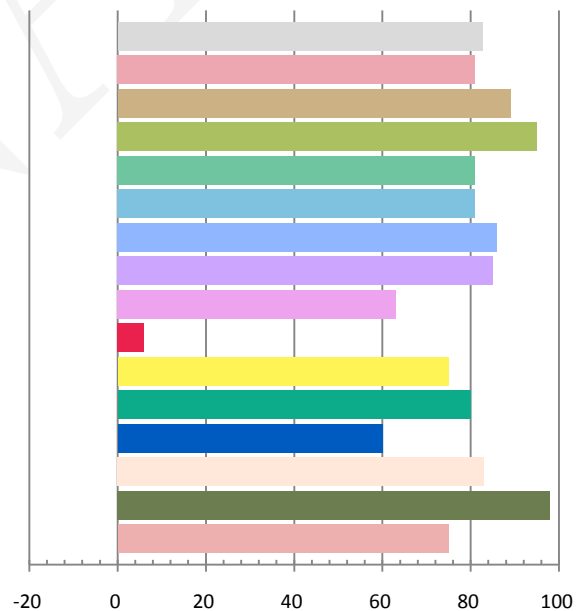
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.0971	11.43	0.9808	1512.6	132.34

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
4.511	3959	0.00152	0.3834	0.3819	0.2250	0.5043

Color Rendering Index

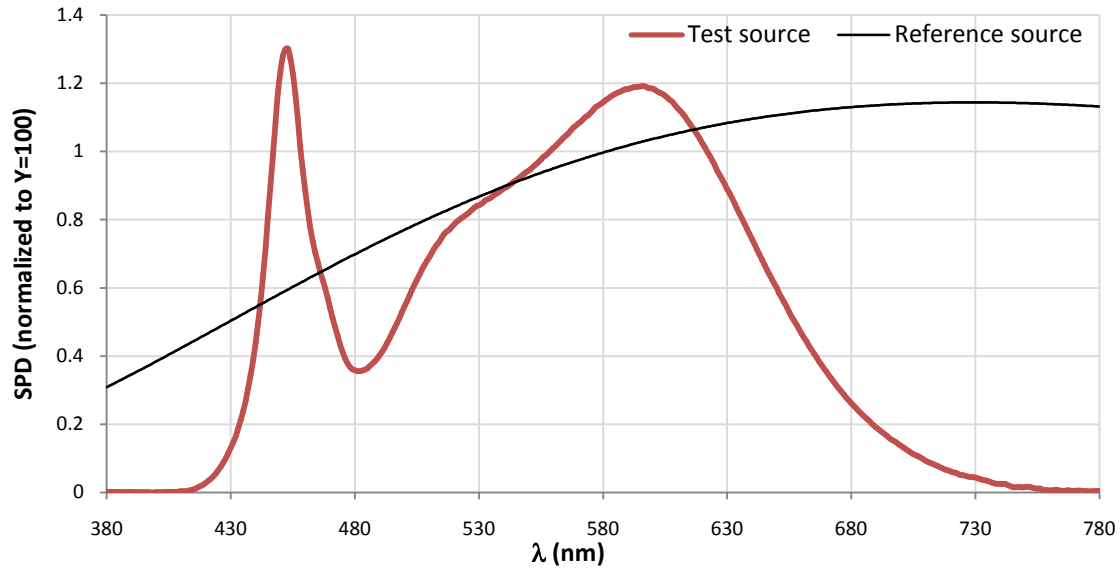
Ra 82.7			
R1 81	R2 89	R3 95	R4 81
R5 81	R6 86	R7 85	R8 63
R9 6	R10 75	R11 80	R12 60
R13 83	R14 98	R15 75	



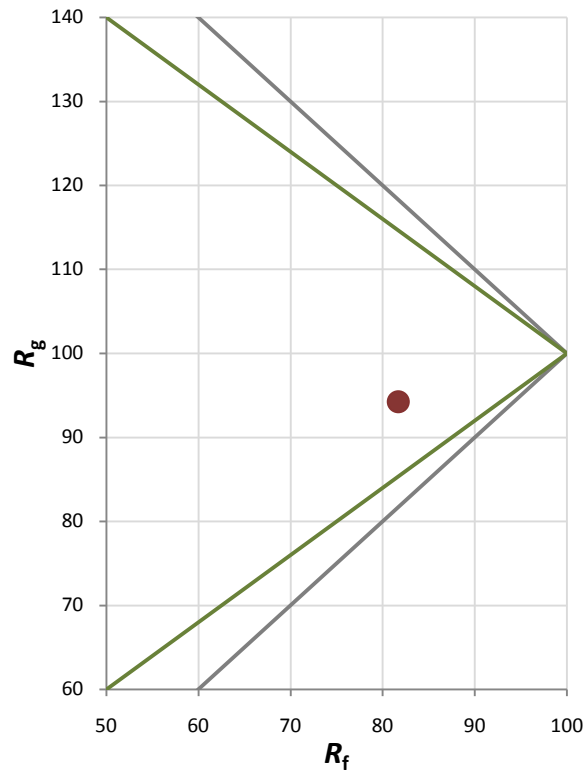
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	94

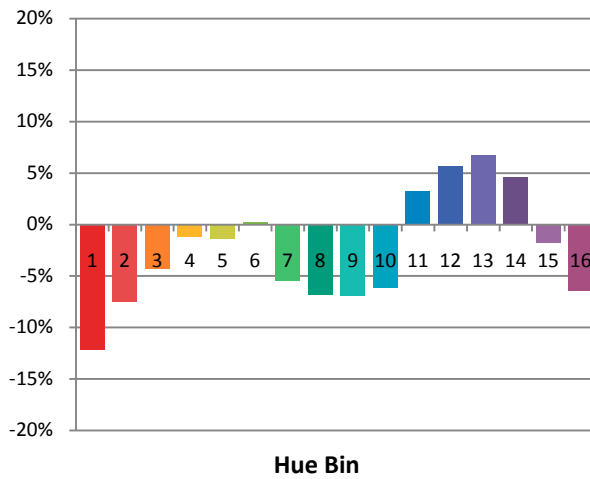
Spectral Power Distribution Comparison



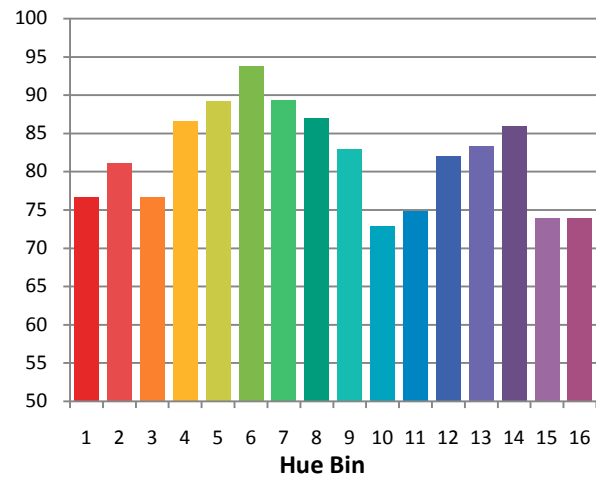
Plot of R_g versus R_f



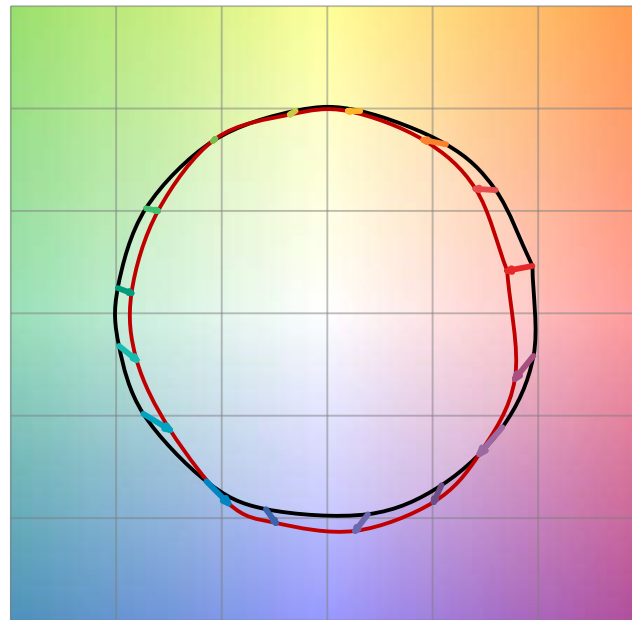
Chroma Shift by Hue



R_t by Hue

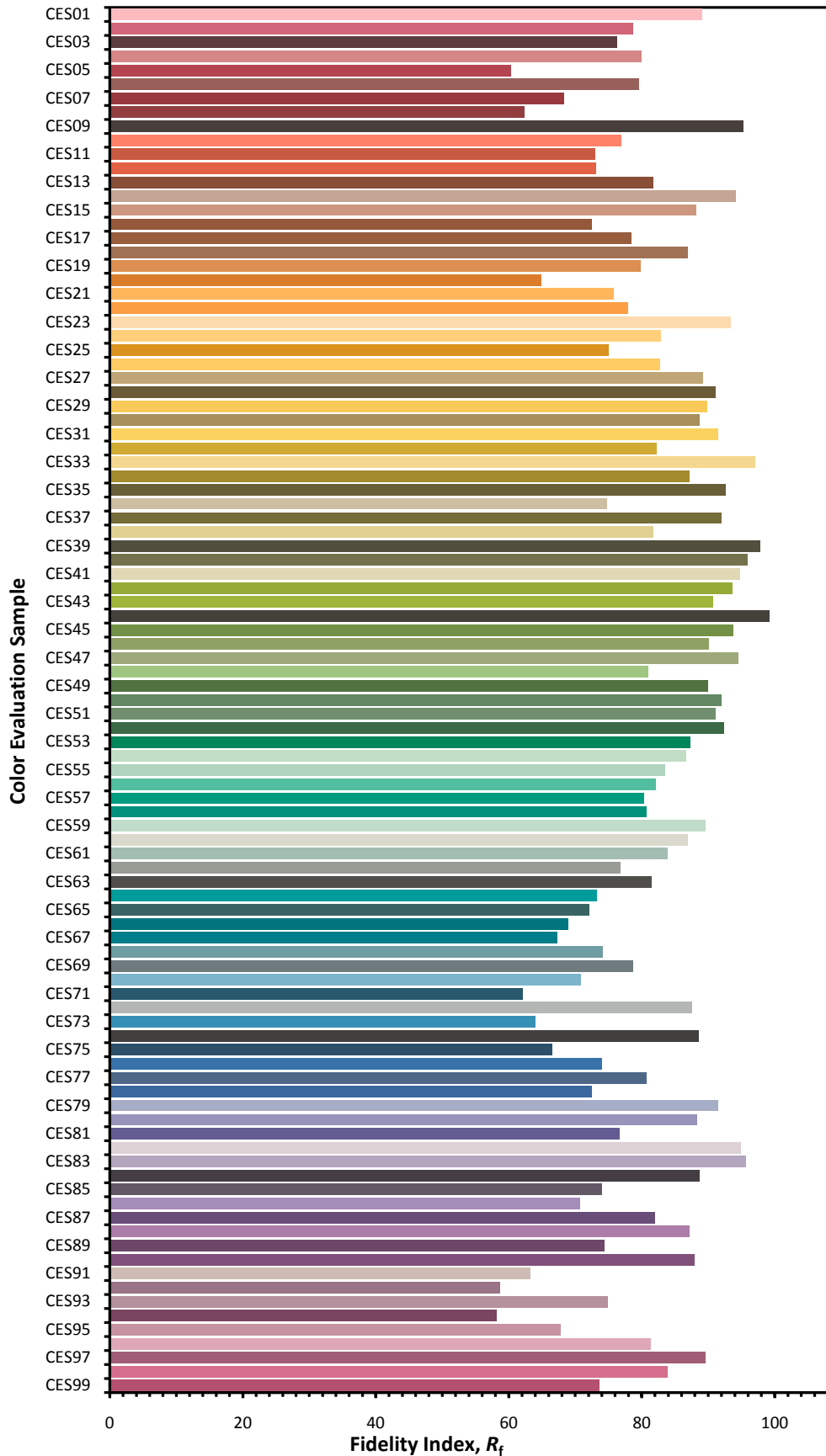


Color Vector Graphic

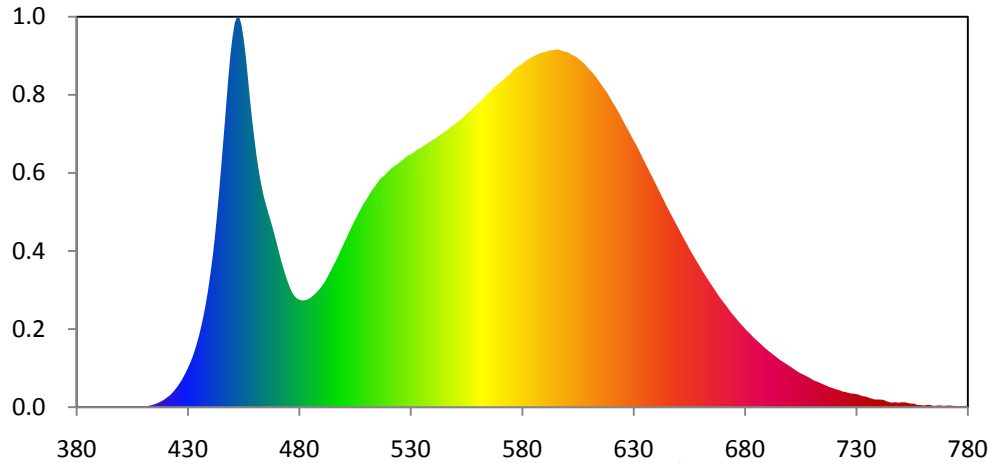


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



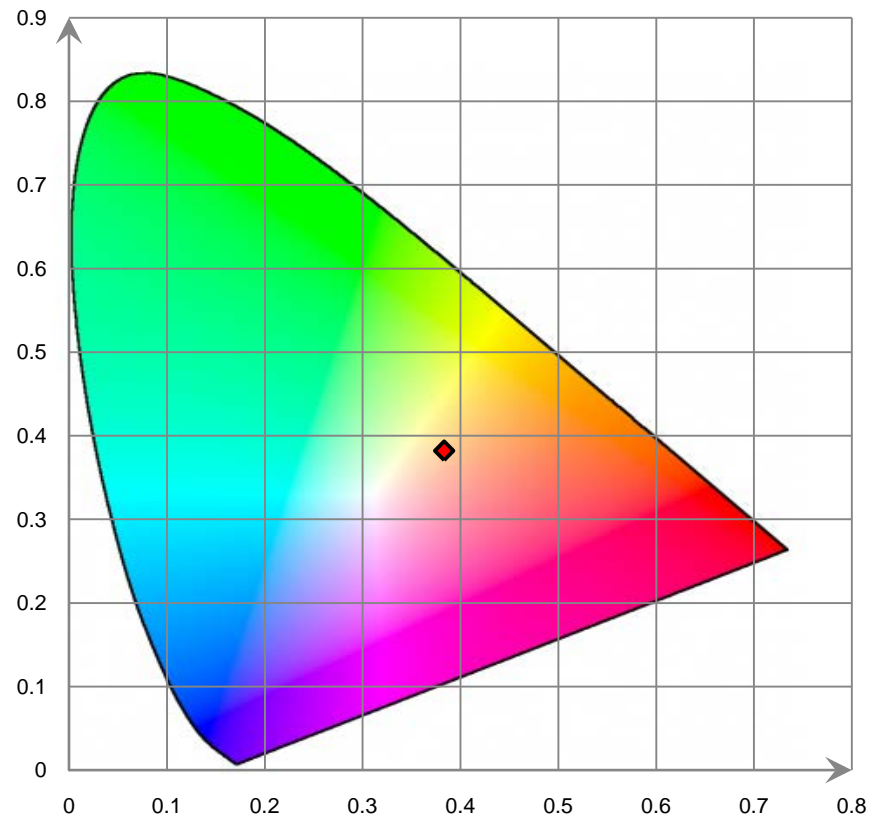
Relative Spectral Power Distribution



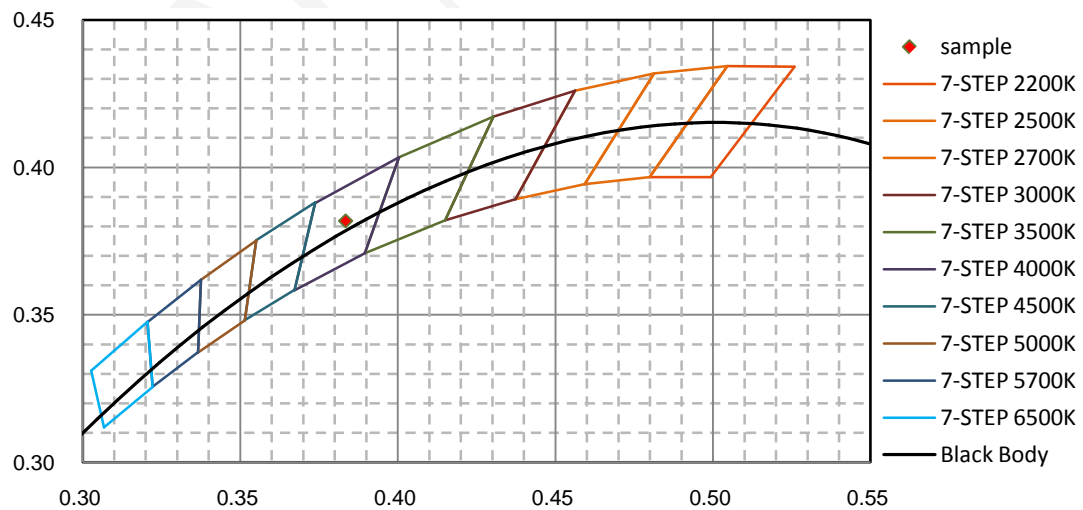
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.490E-02	421	7.601E-01	462	1.724E+01	503	1.314E+01	544	2.017E+01
381	3.910E-02	422	8.932E-01	463	1.635E+01	504	1.349E+01	545	2.028E+01
382	3.280E-02	423	1.061E+00	464	1.557E+01	505	1.382E+01	546	2.041E+01
383	3.250E-02	424	1.246E+00	465	1.496E+01	506	1.414E+01	547	2.054E+01
384	3.230E-02	425	1.454E+00	466	1.438E+01	507	1.445E+01	548	2.067E+01
385	1.860E-02	426	1.688E+00	467	1.382E+01	508	1.475E+01	549	2.079E+01
386	2.330E-02	427	1.945E+00	468	1.326E+01	509	1.504E+01	550	2.090E+01
387	2.920E-02	428	2.236E+00	469	1.263E+01	510	1.530E+01	551	2.103E+01
388	2.850E-02	429	2.553E+00	470	1.200E+01	511	1.557E+01	552	2.118E+01
389	4.060E-02	430	2.897E+00	471	1.135E+01	512	1.584E+01	553	2.131E+01
390	3.940E-02	431	3.266E+00	472	1.073E+01	513	1.609E+01	554	2.146E+01
391	1.820E-02	432	3.671E+00	473	1.017E+01	514	1.630E+01	555	2.162E+01
392	1.210E-02	433	4.151E+00	474	9.632E+00	515	1.654E+01	556	2.179E+01
393	1.880E-02	434	4.698E+00	475	9.158E+00	516	1.678E+01	557	2.190E+01
394	2.380E-02	435	5.300E+00	476	8.733E+00	517	1.694E+01	558	2.206E+01
395	2.790E-02	436	5.976E+00	477	8.397E+00	518	1.706E+01	559	2.223E+01
396	2.200E-02	437	6.753E+00	478	8.171E+00	519	1.723E+01	560	2.237E+01
397	1.680E-02	438	7.615E+00	479	8.008E+00	520	1.741E+01	561	2.253E+01
398	9.000E-03	439	8.594E+00	480	7.927E+00	521	1.757E+01	562	2.268E+01
399	4.900E-03	440	9.734E+00	481	7.880E+00	522	1.771E+01	563	2.286E+01
400	1.640E-02	441	1.096E+01	482	7.878E+00	523	1.782E+01	564	2.303E+01
401	2.140E-02	442	1.240E+01	483	7.911E+00	524	1.793E+01	565	2.317E+01
402	2.090E-02	443	1.409E+01	484	7.972E+00	525	1.805E+01	566	2.332E+01
403	2.260E-02	444	1.592E+01	485	8.066E+00	526	1.818E+01	567	2.351E+01
404	3.290E-02	445	1.788E+01	486	8.201E+00	527	1.832E+01	568	2.368E+01
405	3.570E-02	446	1.989E+01	487	8.351E+00	528	1.847E+01	569	2.382E+01
406	4.030E-02	447	2.195E+01	488	8.520E+00	529	1.860E+01	570	2.395E+01
407	3.780E-02	448	2.404E+01	489	8.702E+00	530	1.866E+01	571	2.408E+01
408	3.750E-02	449	2.590E+01	490	8.912E+00	531	1.874E+01	572	2.425E+01
409	6.230E-02	450	2.730E+01	491	9.140E+00	532	1.889E+01	573	2.440E+01
410	7.800E-02	451	2.835E+01	492	9.407E+00	533	1.901E+01	574	2.450E+01
411	7.620E-02	452	2.878E+01	493	9.721E+00	534	1.907E+01	575	2.467E+01
412	8.980E-02	453	2.881E+01	494	1.004E+01	535	1.917E+01	576	2.486E+01
413	1.241E-01	454	2.822E+01	495	1.035E+01	536	1.930E+01	577	2.502E+01
414	1.673E-01	455	2.721E+01	496	1.067E+01	537	1.940E+01	578	2.513E+01
415	2.145E-01	456	2.584E+01	497	1.100E+01	538	1.951E+01	579	2.521E+01
416	2.752E-01	457	2.417E+01	498	1.136E+01	539	1.963E+01	580	2.534E+01
417	3.434E-01	458	2.248E+01	499	1.172E+01	540	1.973E+01	581	2.546E+01
418	4.328E-01	459	2.094E+01	500	1.208E+01	541	1.983E+01	582	2.558E+01
419	5.235E-01	460	1.957E+01	501	1.243E+01	542	1.993E+01	583	2.571E+01
420	6.392E-01	461	1.829E+01	502	1.280E+01	543	2.006E+01	584	2.580E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.588E+01	626	2.091E+01	667	8.527E+00	708	2.258E+00	749	3.266E-01
586	2.596E+01	627	2.061E+01	668	8.281E+00	709	2.166E+00	750	3.524E-01
587	2.604E+01	628	2.033E+01	669	8.035E+00	710	2.065E+00	751	3.635E-01
588	2.611E+01	629	2.000E+01	670	7.821E+00	711	1.966E+00	752	3.508E-01
589	2.617E+01	630	1.970E+01	671	7.609E+00	712	1.910E+00	753	3.183E-01
590	2.619E+01	631	1.942E+01	672	7.393E+00	713	1.845E+00	754	2.741E-01
591	2.625E+01	632	1.910E+01	673	7.163E+00	714	1.768E+00	755	2.583E-01
592	2.631E+01	633	1.876E+01	674	6.942E+00	715	1.699E+00	756	2.609E-01
593	2.633E+01	634	1.842E+01	675	6.754E+00	716	1.621E+00	757	1.856E-01
594	2.635E+01	635	1.810E+01	676	6.560E+00	717	1.560E+00	758	1.590E-01
595	2.637E+01	636	1.777E+01	677	6.350E+00	718	1.481E+00	759	1.558E-01
596	2.639E+01	637	1.744E+01	678	6.159E+00	719	1.429E+00	760	1.262E-01
597	2.636E+01	638	1.712E+01	679	5.988E+00	720	1.371E+00	761	1.446E-01
598	2.628E+01	639	1.679E+01	680	5.800E+00	721	1.312E+00	762	1.672E-01
599	2.623E+01	640	1.646E+01	681	5.621E+00	722	1.279E+00	763	1.751E-01
600	2.621E+01	641	1.613E+01	682	5.469E+00	723	1.204E+00	764	1.190E-01
601	2.614E+01	642	1.579E+01	683	5.305E+00	724	1.148E+00	765	9.640E-02
602	2.602E+01	643	1.546E+01	684	5.123E+00	725	1.127E+00	766	1.088E-01
603	2.595E+01	644	1.513E+01	685	4.964E+00	726	1.079E+00	767	1.343E-01
604	2.587E+01	645	1.479E+01	686	4.828E+00	727	1.039E+00	768	1.181E-01
605	2.575E+01	646	1.448E+01	687	4.681E+00	728	1.001E+00	769	1.045E-01
606	2.561E+01	647	1.417E+01	688	4.513E+00	729	9.995E-01	770	1.019E-01
607	2.547E+01	648	1.385E+01	689	4.364E+00	730	9.659E-01	771	1.217E-01
608	2.534E+01	649	1.355E+01	690	4.226E+00	731	9.207E-01	772	1.254E-01
609	2.514E+01	650	1.325E+01	691	4.099E+00	732	8.615E-01	773	1.023E-01
610	2.496E+01	651	1.293E+01	692	3.967E+00	733	8.106E-01	774	9.250E-02
611	2.479E+01	652	1.262E+01	693	3.841E+00	734	7.888E-01	775	9.030E-02
612	2.460E+01	653	1.232E+01	694	3.711E+00	735	7.412E-01	776	7.170E-02
613	2.439E+01	654	1.202E+01	695	3.577E+00	736	6.773E-01	777	8.610E-02
614	2.417E+01	655	1.171E+01	696	3.451E+00	737	6.249E-01	778	8.050E-02
615	2.393E+01	656	1.141E+01	697	3.356E+00	738	5.754E-01	779	1.003E-01
616	2.369E+01	657	1.114E+01	698	3.251E+00	739	5.616E-01	780	9.690E-02
617	2.347E+01	658	1.086E+01	699	3.134E+00	740	5.688E-01		
618	2.324E+01	659	1.060E+01	700	3.033E+00	741	5.560E-01		
619	2.296E+01	660	1.031E+01	701	2.931E+00	742	5.513E-01		
620	2.267E+01	661	1.003E+01	702	2.808E+00	743	4.781E-01		
621	2.240E+01	662	9.781E+00	703	2.692E+00	744	4.092E-01		
622	2.213E+01	663	9.519E+00	704	2.594E+00	745	3.619E-01		
623	2.185E+01	664	9.260E+00	705	2.495E+00	746	3.378E-01		
624	2.155E+01	665	9.017E+00	706	2.417E+00	747	3.622E-01		
625	2.123E+01	666	8.776E+00	707	2.337E+00	748	3.543E-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**

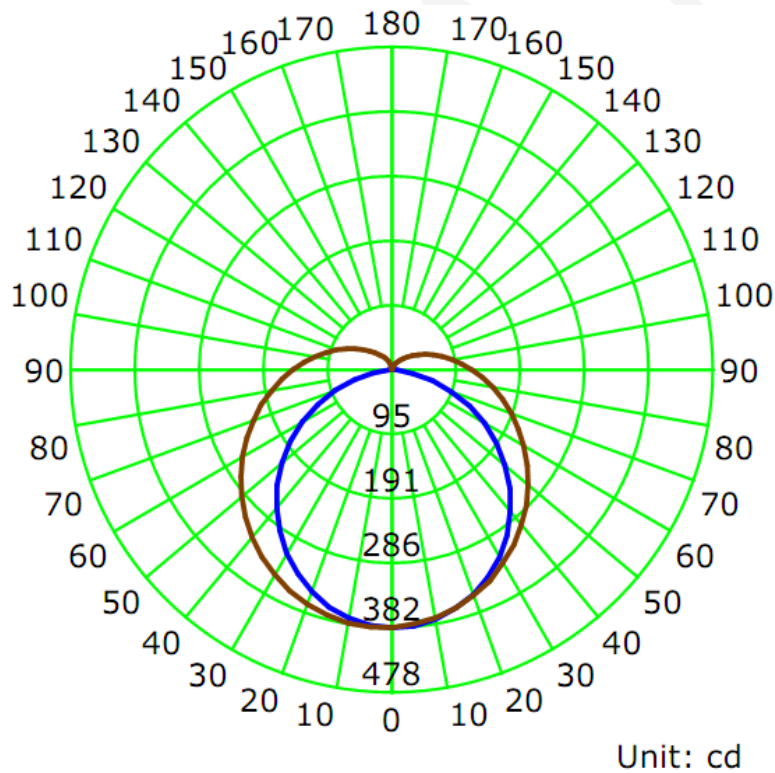
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0970	11.44	0.9840

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1515.6	132.53	382.6	1.24	1.33

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	109.0	126.6	147.6	125.1	127.1
Field Angle (10% I _{max}):	157.5	224.4	258.8	221.6	215.6

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	382	382	382	382	382	382	382	382
5.0°	382	380	379	378	378	378	379	378
10.0°	376	375	373	374	374	373	372	372
15.0°	366	366	365	366	366	365	364	363
20.0°	355	354	354	356	356	354	353	350
25.0°	339	337	341	343	345	342	338	334
30.0°	320	319	323	329	331	327	321	316
35.0°	299	299	305	312	317	312	302	294
40.0°	274	276	285	296	300	293	282	271
45.0°	249	251	263	276	284	275	260	246
50.0°	220	224	242	257	265	255	237	219
55.0°	191	198	219	238	247	235	214	192
60.0°	160	169	197	218	227	214	191	164
65.0°	129	142	174	198	208	195	169	137
70.0°	95	115	151	178	190	174	146	110
75.0°	63	90	131	160	171	156	125	84
80.0°	33	67	111	142	153	138	106	62
85.0°	8	48	94	124	136	122	89	43
90.0°	0	33	78	109	120	105	73	30
95.0°	0	23	65	95	104	90	60	20
100.0°	0	16	53	81	90	78	49	13
105.0°	0	11	43	68	77	65	40	9
110.0°	0	8	35	58	66	55	32	7
115.0°	0	6	28	48	55	45	26	5
120.0°	0	5	23	40	45	38	21	4
125.0°	0	5	19	32	38	31	17	4
130.0°	0	4	16	26	30	25	14	3
135.0°	0	4	13	22	25	20	11	2
140.0°	0	3	11	18	20	16	9	2
145.0°	0	3	9	14	16	12	7	2
150.0°	0	3	8	12	12	10	5	2
155.0°	0	3	6	8	9	7	4	1
160.0°	0	3	5	6	7	5	2	0
165.0°	0	2	3	5	4	2	0	0
170.0°	0	0	2	3	2	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

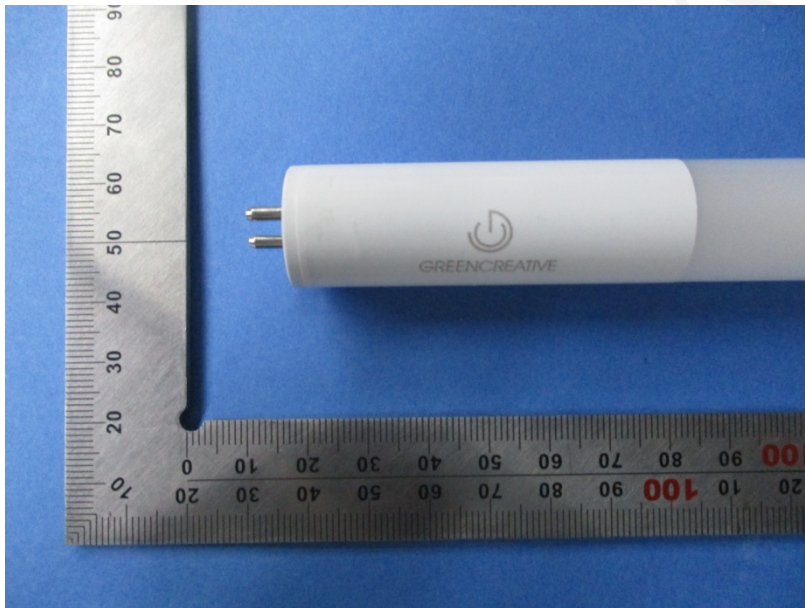
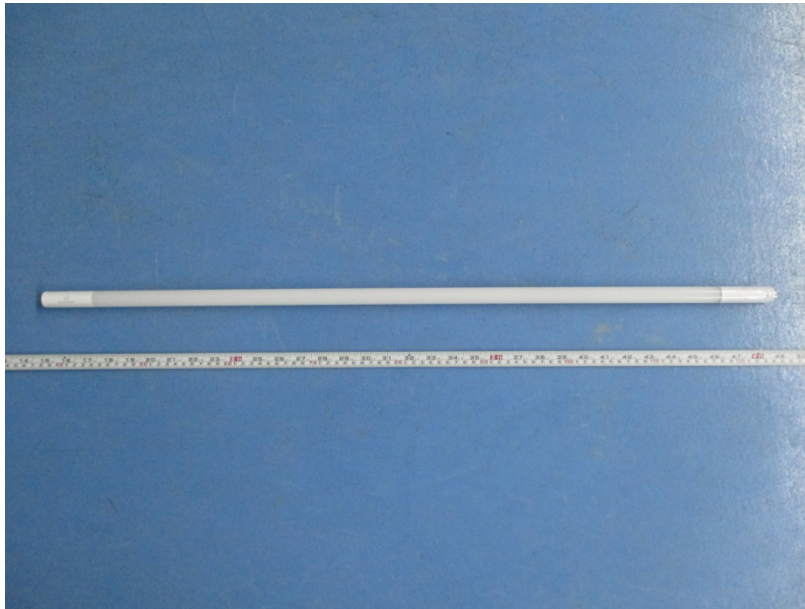
Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	382	382	382	382	382	382	382	382
5.0°	380	381	381	382	382	383	382	380
10.0°	374	375	378	380	381	380	378	376
15.0°	364	368	371	374	376	375	373	368
20.0°	349	355	361	367	370	368	363	357
25.0°	333	341	349	357	361	358	351	342
30.0°	314	323	335	346	350	346	337	325
35.0°	292	302	317	332	339	333	320	305
40.0°	268	280	300	316	324	318	303	283
45.0°	243	257	279	298	309	301	282	258
50.0°	214	231	259	281	292	282	260	233
55.0°	185	204	236	262	276	263	237	206
60.0°	154	177	214	242	257	243	215	178
65.0°	123	149	192	224	239	224	192	151
70.0°	90	122	170	204	220	205	170	123
75.0°	58	97	148	184	202	184	148	97
80.0°	29	74	128	166	183	166	128	74
85.0°	6	54	110	150	165	148	109	54
90.0°	0	39	94	133	148	132	93	38
95.0°	0	28	80	117	132	116	79	28
100.0°	0	21	67	102	116	101	66	21
105.0°	0	16	56	89	102	87	56	16
110.0°	0	13	47	77	88	75	47	12
115.0°	0	10	40	66	75	64	39	10
120.0°	0	9	33	56	64	54	33	9
125.0°	0	8	28	47	54	46	27	7
130.0°	0	7	23	39	45	38	23	6
135.0°	0	6	19	32	37	31	19	6
140.0°	0	5	17	26	30	26	16	6
145.0°	0	4	14	21	25	21	14	5
150.0°	0	3	11	17	20	17	11	5
155.0°	0	2	10	14	15	14	9	4
160.0°	0	1	7	11	11	10	7	3
165.0°	0	0	4	8	9	8	5	0
170.0°	0	0	1	4	5	5	3	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	9.1	0.60	0-5	9.1	0.60
5-10	27.0	1.78	0-10	36.1	2.38
10-15	44.1	2.91	0-15	80.3	5.30
15-20	59.8	3.95	0-20	140.1	9.24
20-25	73.6	4.86	0-25	213.7	14.10
25-30	85.2	5.62	0-30	298.9	19.72
30-35	94.2	6.22	0-35	393.1	25.94
35-40	100.6	6.64	0-40	493.7	32.58
40-45	104.1	6.87	0-45	597.8	39.45
45-50	104.8	6.92	0-50	702.7	46.36
50-55	102.9	6.79	0-55	805.6	53.15
55-60	98.6	6.51	0-60	904.2	59.66
60-65	92.1	6.08	0-65	996.3	65.74
65-70	84.0	5.54	0-70	1080.3	71.28
70-75	74.5	4.91	0-75	1154.8	76.19
75-80	64.4	4.25	0-80	1219.2	80.44
80-85	54.6	3.60	0-85	1273.8	84.05
85-90	45.9	3.03	0-90	1319.7	87.08
90-95	38.7	2.55	0-95	1358.4	89.63
95-100	32.4	2.14	0-100	1390.8	91.77
100-105	26.9	1.78	0-105	1417.7	93.54
105-110	22.1	1.46	0-110	1439.9	95.01
110-115	18.0	1.19	0-115	1457.9	96.19
115-120	14.5	0.95	0-120	1472.4	97.15
120-125	11.5	0.76	0-125	1483.8	97.90
125-130	8.9	0.59	0-130	1492.8	98.49
130-135	6.9	0.45	0-135	1499.6	98.95
135-140	5.2	0.34	0-140	1504.9	99.29
140-145	3.9	0.25	0-145	1508.7	99.55
145-150	2.8	0.18	0-150	1511.5	99.73
150-155	1.9	0.13	0-155	1513.4	99.86
155-160	1.2	0.08	0-160	1514.6	99.94
160-165	0.7	0.04	0-165	1515.3	99.98
165-170	0.3	0.02	0-170	1515.5	100.00
170-175	0.1	0.00	0-175	1515.6	100.00
175-180	0.0	0.00	0-180	1515.6	100.00

6. Product Photo



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