



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 17T8U6/840/BYP/R

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180910084-10-3
Test Date:	2018-09-10 to 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: 17T8U6/840/BYP/R
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: 17W
Nominal CCT: 4000K
Nominal Lumen Output: 2100lm

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**

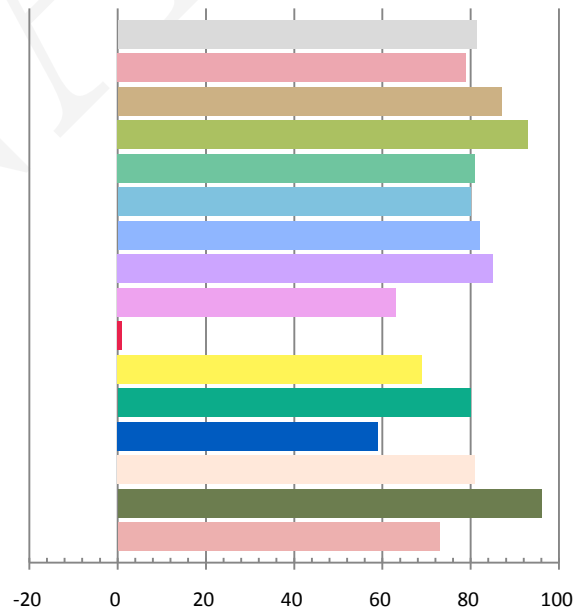
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1458	16.91	0.9666	2369.6	140.13

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
7.041	4074	0.00148	0.3782	0.3785	0.2229	0.5020

Color Rendering Index

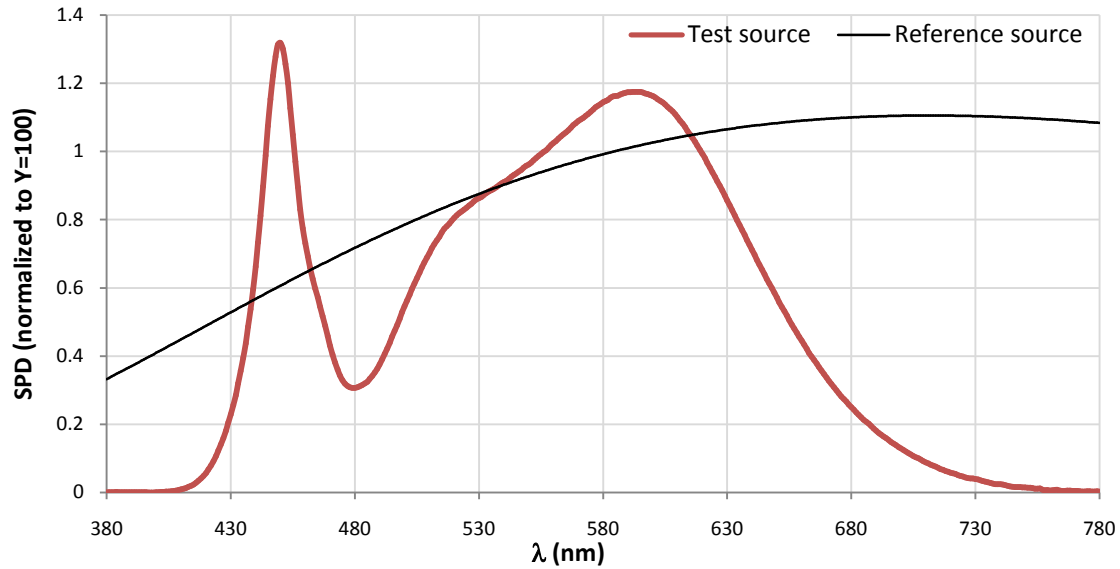
Ra 81.3			
R1 79	R2 87	R3 93	R4 81
R5 80	R6 82	R7 85	R8 63
R9 1	R10 69	R11 80	R12 59
R13 81	R14 96	R15 73	



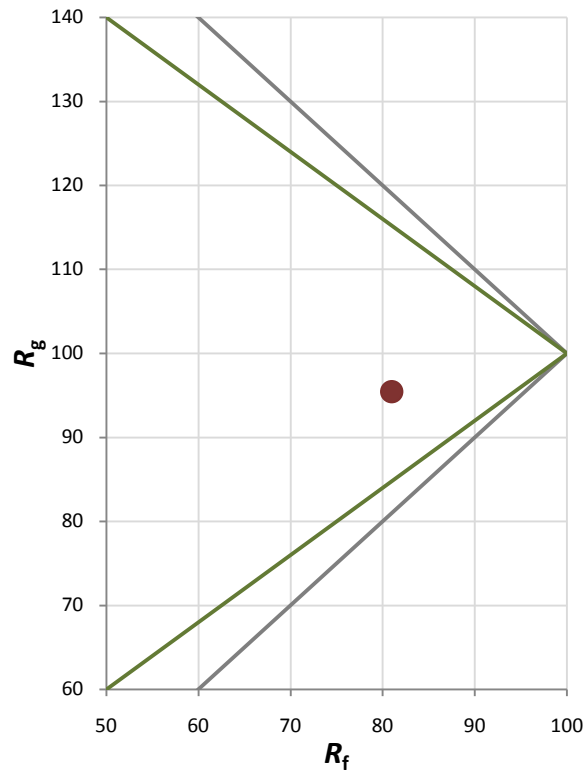
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	95

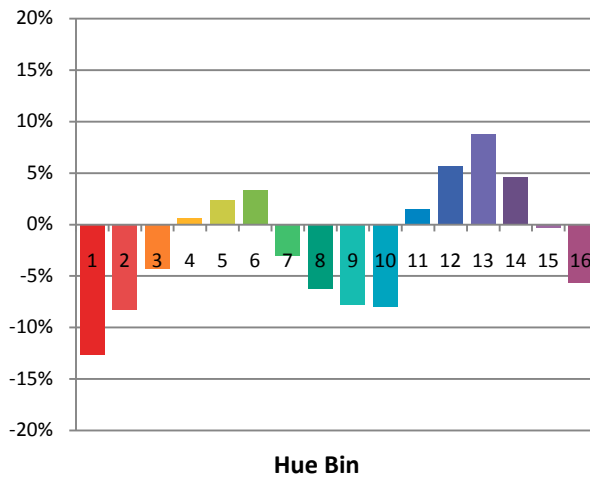
Spectral Power Distribution Comparison



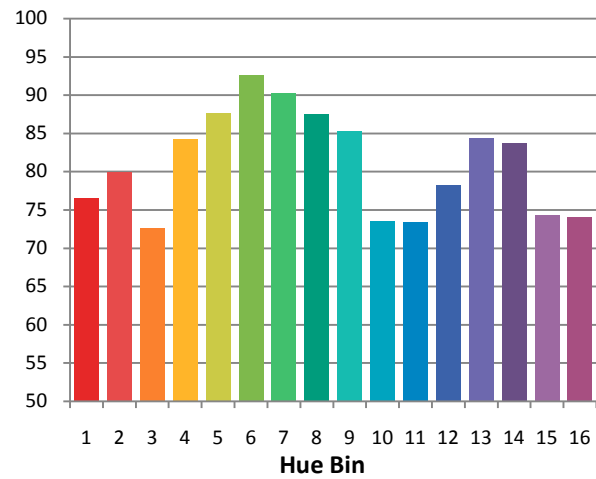
Plot of R_g versus R_f



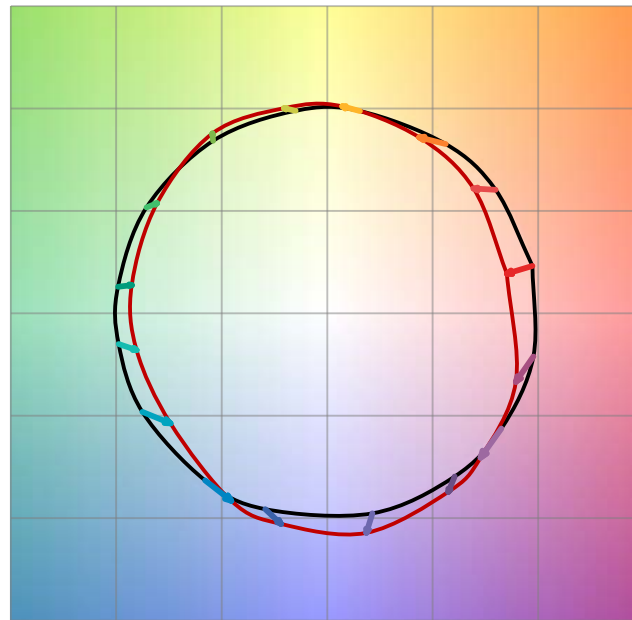
Chroma Shift by Hue



R_t by Hue

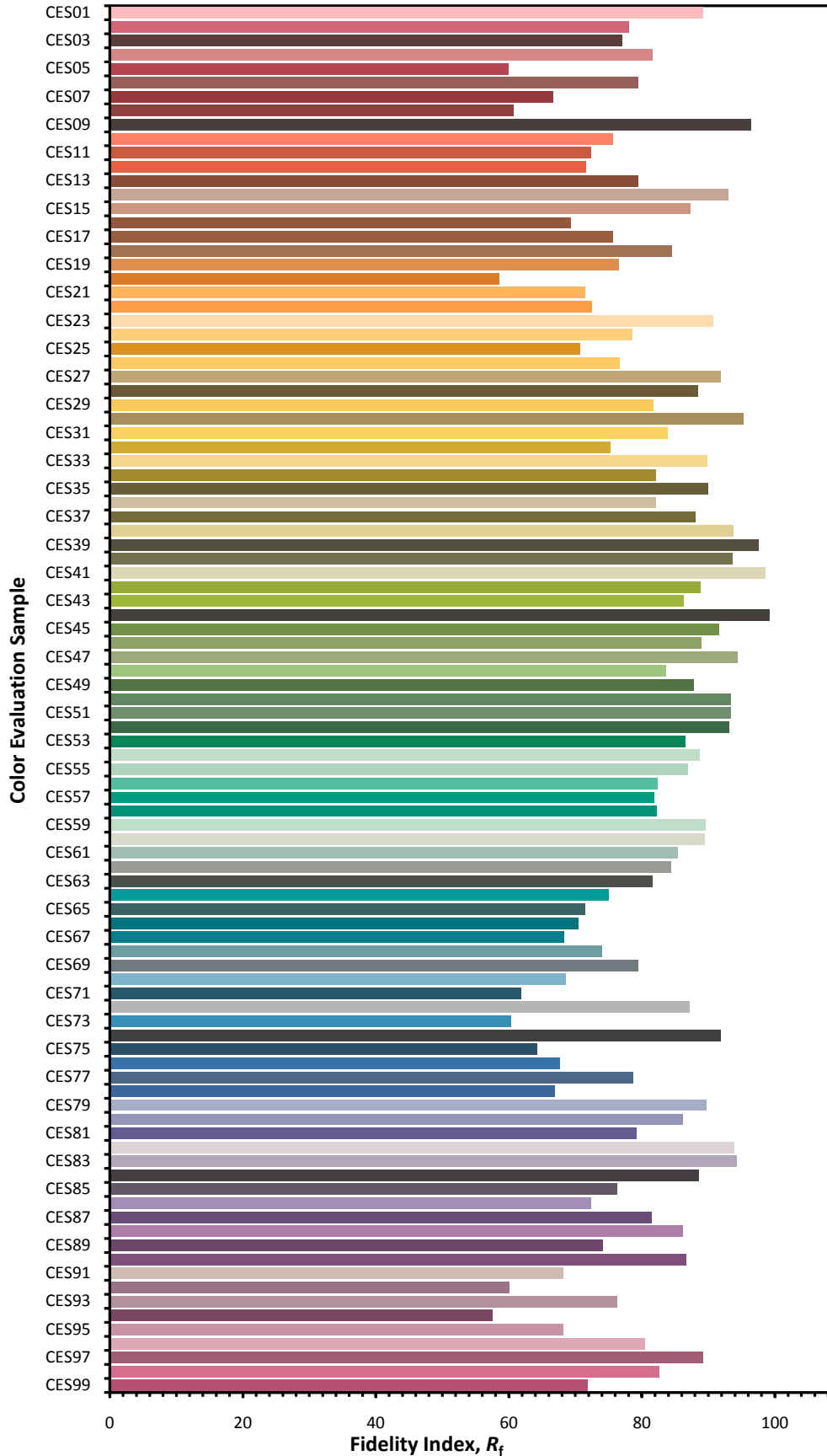


Color Vector Graphic

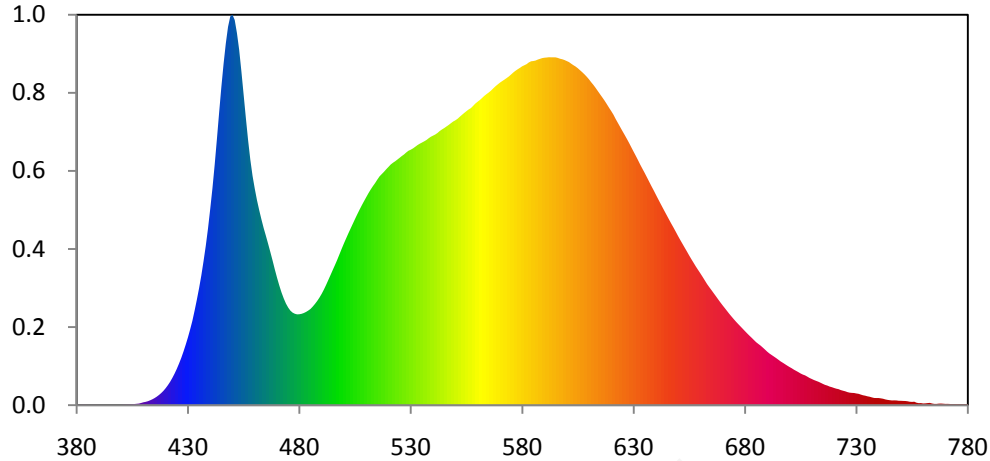


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



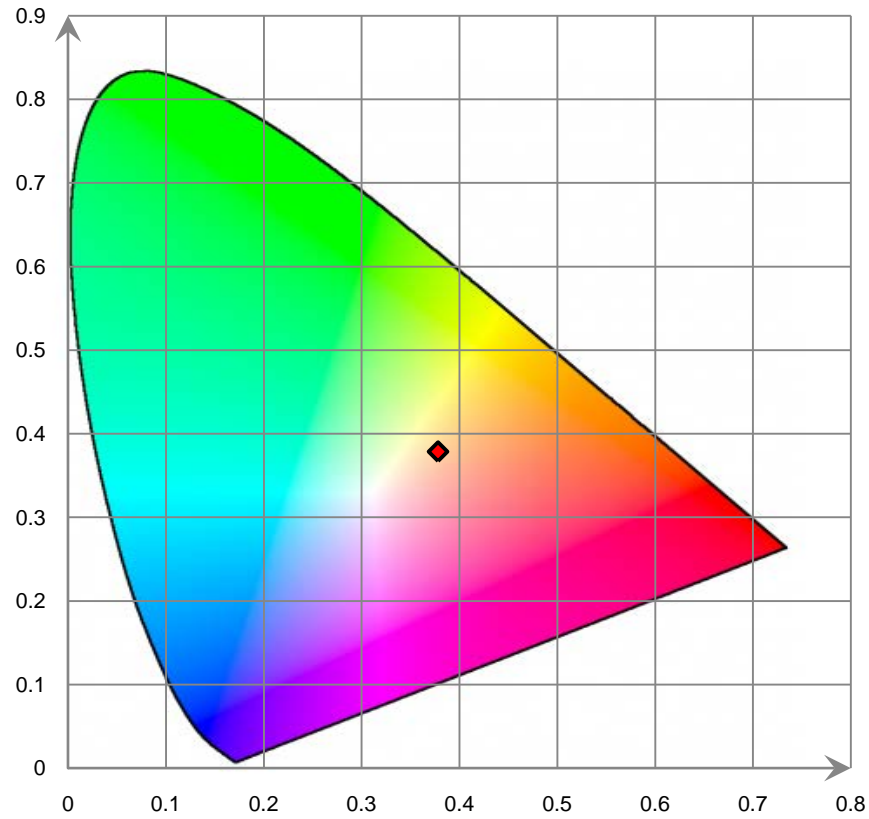
Relative Spectral Power Distribution



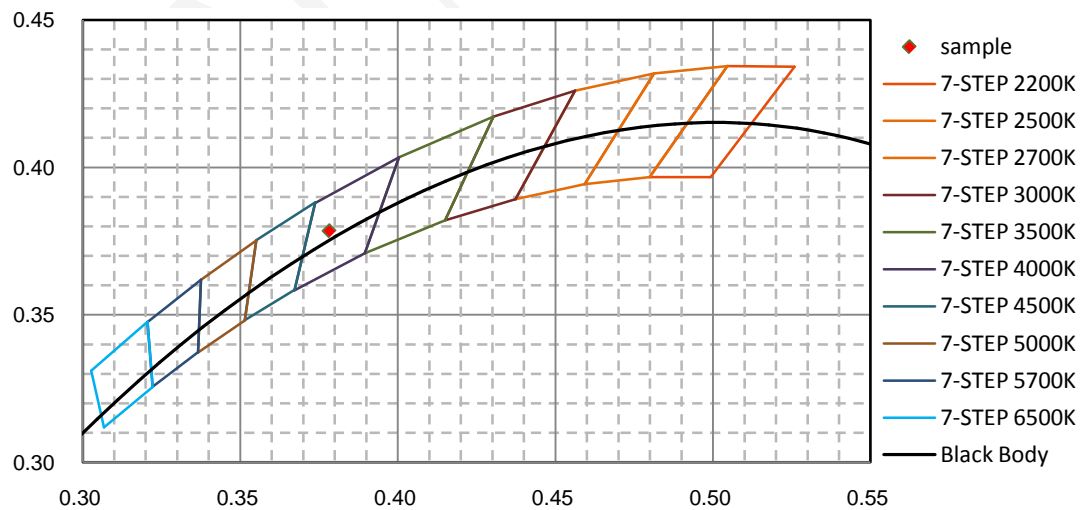
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.080E-02	421	2.340E+00	462	2.284E+01	503	2.069E+01	544	3.230E+01
381	3.080E-02	422	2.736E+00	463	2.176E+01	504	2.125E+01	545	3.246E+01
382	3.030E-02	423	3.194E+00	464	2.074E+01	505	2.181E+01	546	3.264E+01
383	4.420E-02	424	3.697E+00	465	1.984E+01	506	2.236E+01	547	3.282E+01
384	4.760E-02	425	4.254E+00	466	1.890E+01	507	2.289E+01	548	3.302E+01
385	2.970E-02	426	4.869E+00	467	1.793E+01	508	2.340E+01	549	3.322E+01
386	2.510E-02	427	5.536E+00	468	1.694E+01	509	2.388E+01	550	3.337E+01
387	2.760E-02	428	6.278E+00	469	1.590E+01	510	2.435E+01	551	3.355E+01
388	2.640E-02	429	7.083E+00	470	1.493E+01	511	2.482E+01	552	3.378E+01
389	3.430E-02	430	7.942E+00	471	1.403E+01	512	2.525E+01	553	3.401E+01
390	2.710E-02	431	8.883E+00	472	1.321E+01	513	2.565E+01	554	3.423E+01
391	1.930E-02	432	9.889E+00	473	1.250E+01	514	2.602E+01	555	3.444E+01
392	1.900E-02	433	1.108E+01	474	1.190E+01	515	2.642E+01	556	3.464E+01
393	1.690E-02	434	1.236E+01	475	1.144E+01	516	2.680E+01	557	3.480E+01
394	1.740E-02	435	1.370E+01	476	1.107E+01	517	2.707E+01	558	3.506E+01
395	1.970E-02	436	1.518E+01	477	1.084E+01	518	2.734E+01	559	3.534E+01
396	1.640E-02	437	1.686E+01	478	1.071E+01	519	2.763E+01	560	3.554E+01
397	1.090E-02	438	1.865E+01	479	1.064E+01	520	2.791E+01	561	3.574E+01
398	9.700E-03	439	2.067E+01	480	1.065E+01	521	2.819E+01	562	3.598E+01
399	8.600E-03	440	2.297E+01	481	1.070E+01	522	2.840E+01	563	3.623E+01
400	2.940E-02	441	2.540E+01	482	1.079E+01	523	2.857E+01	564	3.643E+01
401	4.480E-02	442	2.815E+01	483	1.092E+01	524	2.877E+01	565	3.663E+01
402	5.870E-02	443	3.115E+01	484	1.108E+01	525	2.898E+01	566	3.684E+01
403	6.690E-02	444	3.427E+01	485	1.127E+01	526	2.918E+01	567	3.710E+01
404	8.950E-02	445	3.726E+01	486	1.154E+01	527	2.937E+01	568	3.735E+01
405	1.111E-01	446	3.999E+01	487	1.185E+01	528	2.961E+01	569	3.757E+01
406	1.369E-01	447	4.237E+01	488	1.220E+01	529	2.981E+01	570	3.777E+01
407	1.669E-01	448	4.432E+01	489	1.259E+01	530	2.993E+01	571	3.796E+01
408	1.937E-01	449	4.554E+01	490	1.303E+01	531	3.008E+01	572	3.813E+01
409	2.596E-01	450	4.574E+01	491	1.353E+01	532	3.026E+01	573	3.831E+01
410	3.393E-01	451	4.512E+01	492	1.408E+01	533	3.046E+01	574	3.850E+01
411	3.910E-01	452	4.359E+01	493	1.466E+01	534	3.062E+01	575	3.873E+01
412	4.634E-01	453	4.163E+01	494	1.525E+01	535	3.076E+01	576	3.897E+01
413	5.692E-01	454	3.910E+01	495	1.584E+01	536	3.090E+01	577	3.917E+01
414	6.870E-01	455	3.638E+01	496	1.642E+01	537	3.105E+01	578	3.935E+01
415	8.270E-01	456	3.366E+01	497	1.703E+01	538	3.126E+01	579	3.951E+01
416	9.953E-01	457	3.106E+01	498	1.767E+01	539	3.144E+01	580	3.970E+01
417	1.192E+00	458	2.877E+01	499	1.832E+01	540	3.157E+01	581	3.982E+01
418	1.419E+00	459	2.687E+01	500	1.894E+01	541	3.171E+01	582	3.995E+01
419	1.680E+00	460	2.536E+01	501	1.953E+01	542	3.189E+01	583	4.015E+01
420	1.992E+00	461	2.400E+01	502	2.012E+01	543	3.211E+01	584	4.028E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.032E+01	626	3.167E+01	667	1.276E+01	708	3.345E+00	749	5.165E-01
586	4.037E+01	627	3.120E+01	668	1.239E+01	709	3.189E+00	750	5.112E-01
587	4.048E+01	628	3.072E+01	669	1.203E+01	710	3.067E+00	751	5.003E-01
588	4.057E+01	629	3.021E+01	670	1.169E+01	711	2.944E+00	752	4.905E-01
589	4.066E+01	630	2.971E+01	671	1.136E+01	712	2.845E+00	753	4.574E-01
590	4.070E+01	631	2.922E+01	672	1.103E+01	713	2.744E+00	754	4.022E-01
591	4.073E+01	632	2.871E+01	673	1.069E+01	714	2.623E+00	755	3.841E-01
592	4.076E+01	633	2.818E+01	674	1.038E+01	715	2.495E+00	756	4.070E-01
593	4.075E+01	634	2.770E+01	675	1.007E+01	716	2.373E+00	757	2.907E-01
594	4.075E+01	635	2.721E+01	676	9.779E+00	717	2.296E+00	758	2.390E-01
595	4.074E+01	636	2.670E+01	677	9.502E+00	718	2.183E+00	759	2.465E-01
596	4.068E+01	637	2.619E+01	678	9.232E+00	719	2.107E+00	760	2.011E-01
597	4.059E+01	638	2.568E+01	679	8.955E+00	720	2.018E+00	761	2.130E-01
598	4.052E+01	639	2.519E+01	680	8.681E+00	721	1.936E+00	762	2.467E-01
599	4.043E+01	640	2.468E+01	681	8.412E+00	722	1.879E+00	763	2.687E-01
600	4.032E+01	641	2.417E+01	682	8.150E+00	723	1.770E+00	764	1.953E-01
601	4.019E+01	642	2.367E+01	683	7.906E+00	724	1.698E+00	765	1.499E-01
602	4.001E+01	643	2.318E+01	684	7.645E+00	725	1.631E+00	766	1.496E-01
603	3.983E+01	644	2.269E+01	685	7.385E+00	726	1.534E+00	767	1.819E-01
604	3.967E+01	645	2.220E+01	686	7.182E+00	727	1.470E+00	768	1.908E-01
605	3.947E+01	646	2.172E+01	687	6.987E+00	728	1.440E+00	769	1.741E-01
606	3.923E+01	647	2.124E+01	688	6.756E+00	729	1.426E+00	770	1.512E-01
607	3.900E+01	648	2.078E+01	689	6.517E+00	730	1.372E+00	771	1.557E-01
608	3.875E+01	649	2.030E+01	690	6.273E+00	731	1.331E+00	772	1.410E-01
609	3.848E+01	650	1.981E+01	691	6.056E+00	732	1.245E+00	773	1.108E-01
610	3.818E+01	651	1.934E+01	692	5.876E+00	733	1.164E+00	774	1.068E-01
611	3.783E+01	652	1.889E+01	693	5.699E+00	734	1.111E+00	775	1.325E-01
612	3.751E+01	653	1.844E+01	694	5.520E+00	735	1.038E+00	776	1.183E-01
613	3.716E+01	654	1.799E+01	695	5.330E+00	736	9.860E-01	777	1.099E-01
614	3.679E+01	655	1.753E+01	696	5.130E+00	737	9.113E-01	778	1.021E-01
615	3.642E+01	656	1.709E+01	697	4.971E+00	738	8.470E-01	779	1.159E-01
616	3.605E+01	657	1.666E+01	698	4.801E+00	739	8.366E-01	780	1.108E-01
617	3.568E+01	658	1.624E+01	699	4.633E+00	740	8.354E-01		
618	3.527E+01	659	1.584E+01	700	4.475E+00	741	8.009E-01		
619	3.485E+01	660	1.544E+01	701	4.327E+00	742	7.568E-01		
620	3.445E+01	661	1.504E+01	702	4.160E+00	743	6.769E-01		
621	3.402E+01	662	1.462E+01	703	4.016E+00	744	6.240E-01		
622	3.352E+01	663	1.419E+01	704	3.871E+00	745	5.875E-01		
623	3.306E+01	664	1.383E+01	705	3.713E+00	746	5.557E-01		
624	3.259E+01	665	1.347E+01	706	3.588E+00	747	5.629E-01		
625	3.212E+01	666	1.311E+01	707	3.489E+00	748	5.538E-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**

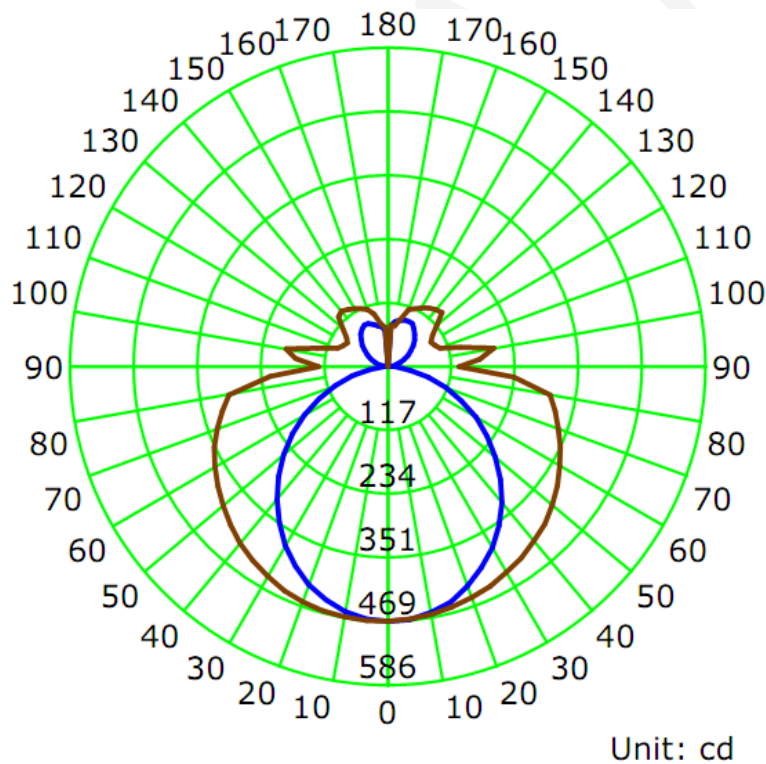
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1460	16.92	0.9680

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2373.9	140.35	469.3	1.22	1.42

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	106.1	149.9	168.9	146.4	142.8
Field Angle (10% I_{max}):	353.6	353.1	353.8	353.6	353.5

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	469	469	469	469	469	469	469	469
5.0°	467	467	467	466	466	467	466	466
10.0°	460	459	461	462	463	462	460	458
15.0°	448	449	453	456	458	456	452	447
20.0°	430	434	441	450	452	449	439	430
25.0°	409	415	428	441	446	440	425	412
30.0°	386	392	413	431	438	429	408	388
35.0°	357	368	395	421	430	418	391	363
40.0°	327	343	376	408	420	405	372	337
45.0°	294	314	356	396	409	392	351	307
50.0°	260	285	336	382	396	379	330	279
55.0°	225	255	315	368	383	364	309	247
60.0°	188	227	295	352	367	348	288	217
65.0°	150	198	275	337	351	333	267	188
70.0°	114	170	255	320	335	315	247	160
75.0°	77	144	236	301	320	297	228	133
80.0°	42	121	216	284	303	280	209	110
85.0°	14	97	181	225	234	219	175	91
90.0°	0	43	91	122	131	121	92	47
95.0°	1	52	119	159	171	158	119	41
100.0°	8	35	108	180	199	168	96	31
105.0°	16	38	72	121	140	114	70	36
110.0°	25	54	68	94	102	93	66	54
115.0°	34	65	71	89	95	88	70	60
120.0°	43	67	85	89	92	89	85	63
125.0°	53	70	108	101	100	101	108	67
130.0°	61	75	109	122	119	123	109	73
135.0°	70	79	108	135	141	134	107	77
140.0°	78	84	110	129	138	130	105	81
145.0°	85	89	111	128	133	124	103	85
150.0°	91	94	111	123	125	116	101	87
155.0°	93	92	110	119	119	112	92	88
160.0°	92	90	107	115	112	94	88	84
165.0°	89	91	100	109	89	85	78	73
170.0°	85	87	90	87	77	78	66	64
175.0°	78	81	69	73	78	67	71	72
180.0°	0	0	0	0	0	0	0	0

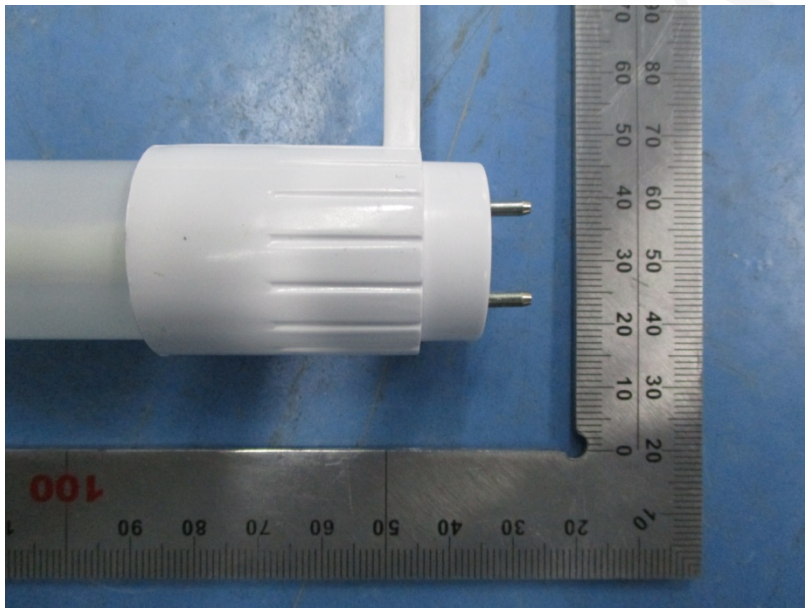
Luminous Intensity (cd) Distribution Data (cont.)

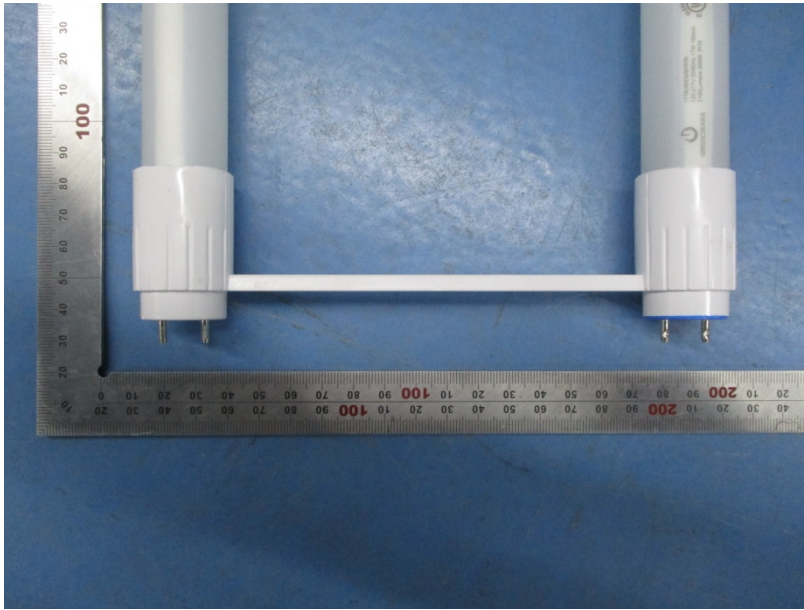
$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	469	469	469	469	469	469	469	469
5.0°	466	467	468	469	469	469	469	467
10.0°	457	460	465	468	468	467	464	461
15.0°	445	449	456	464	465	464	457	450
20.0°	427	434	447	457	461	458	447	435
25.0°	405	414	433	449	455	450	433	415
30.0°	380	393	418	439	446	440	417	393
35.0°	351	367	400	428	436	427	398	368
40.0°	320	341	380	414	425	415	378	341
45.0°	287	311	359	400	412	399	356	312
50.0°	252	282	338	384	397	383	335	281
55.0°	216	251	316	368	384	365	312	250
60.0°	179	221	293	352	370	349	290	219
65.0°	141	192	272	335	354	333	267	190
70.0°	105	164	252	317	336	315	247	161
75.0°	68	139	233	299	317	296	227	135
80.0°	36	118	213	279	299	278	205	111
85.0°	9	98	169	205	218	210	168	85
90.0°	0	51	93	120	129	117	83	37
95.0°	3	47	125	163	172	160	118	44
100.0°	10	34	99	168	192	171	99	32
105.0°	19	36	71	115	136	115	68	36
110.0°	27	48	67	93	100	91	64	52
115.0°	36	60	68	86	93	85	67	60
120.0°	46	65	79	85	87	83	79	63
125.0°	55	69	98	94	94	93	100	67
130.0°	63	73	107	112	109	112	107	71
135.0°	71	76	106	131	130	131	107	75
140.0°	79	79	107	128	135	128	107	78
145.0°	85	81	106	123	129	123	106	83
150.0°	90	84	105	119	124	119	105	88
155.0°	88	84	97	115	119	115	102	88
160.0°	84	86	86	107	113	110	93	89
165.0°	78	77	82	81	101	99	92	89
170.0°	76	69	78	78	81	90	89	83
175.0°	68	64	66	75	74	74	76	77
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	11.2	0.47	0-5	11.2	0.47
5-10	33.2	1.40	0-10	44.4	1.87
10-15	54.4	2.29	0-15	98.8	4.16
15-20	74.0	3.12	0-20	172.8	7.28
20-25	91.5	3.85	0-25	264.2	11.13
25-30	106.6	4.49	0-30	370.9	15.62
30-35	119.0	5.01	0-35	489.9	20.64
35-40	128.5	5.41	0-40	618.3	26.05
40-45	134.9	5.68	0-45	753.3	31.73
45-50	138.3	5.83	0-50	891.6	37.56
50-55	138.9	5.85	0-55	1030.6	43.41
55-60	136.9	5.77	0-60	1167.5	49.18
60-65	132.7	5.59	0-65	1300.2	54.77
65-70	126.5	5.33	0-70	1426.7	60.10
70-75	118.6	5.00	0-75	1545.3	65.09
75-80	109.5	4.61	0-80	1654.8	69.71
80-85	93.4	3.94	0-85	1748.2	73.64
85-90	62.9	2.65	0-90	1811.1	76.29
90-95	50.1	2.11	0-95	1861.2	78.40
95-100	55.7	2.35	0-100	1916.9	80.75
100-105	47.3	1.99	0-105	1964.2	82.74
105-110	37.6	1.58	0-110	2001.8	84.32
110-115	35.2	1.48	0-115	2037.0	85.81
115-120	35.3	1.49	0-120	2072.3	87.29
120-125	37.2	1.57	0-125	2109.5	88.86
125-130	39.7	1.67	0-130	2149.2	90.53
130-135	40.7	1.71	0-135	2189.9	92.25
135-140	39.0	1.64	0-140	2228.9	93.89
140-145	35.3	1.49	0-145	2264.2	95.38
145-150	31.1	1.31	0-150	2295.3	96.69
150-155	26.2	1.10	0-155	2321.5	97.79
155-160	20.9	0.88	0-160	2342.4	98.67
160-165	15.3	0.64	0-165	2357.6	99.31
165-170	10.0	0.42	0-170	2367.6	99.73
170-175	5.5	0.23	0-175	2373.1	99.96
175-180	0.9	0.04	0-180	2373.9	100.00

6. Product Photo





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