



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 17T8U6/850/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:	PKS180910084-10-4
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: 17T8U6/850/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: 5000K
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**

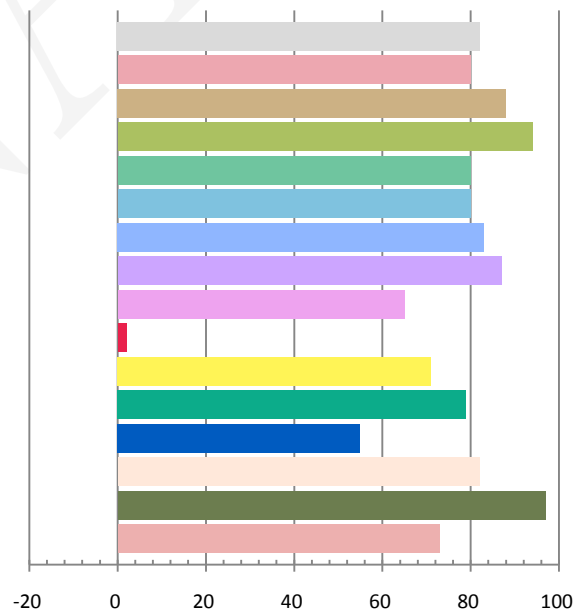
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1457	16.93	0.9682	2327	137.45

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
7.045	4968	0.00447	0.3470	0.3621	0.2086	0.4900

Color Rendering Index

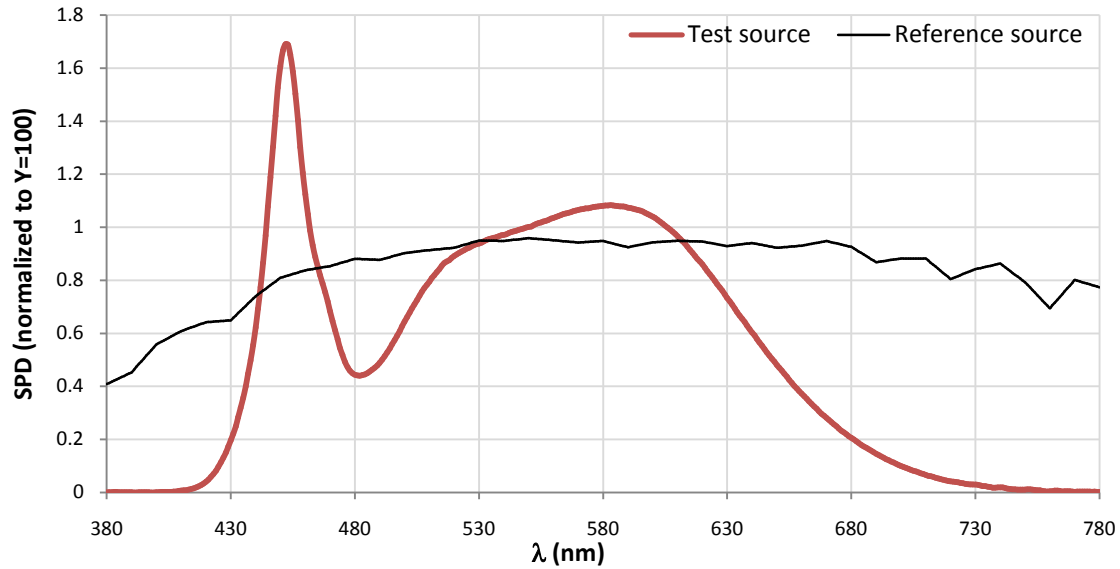
Ra 82.1			
R1 80	R2 88	R3 94	R4 80
R5 80	R6 83	R7 87	R8 65
R9 2	R10 71	R11 79	R12 55
R13 82	R14 97	R15 73	



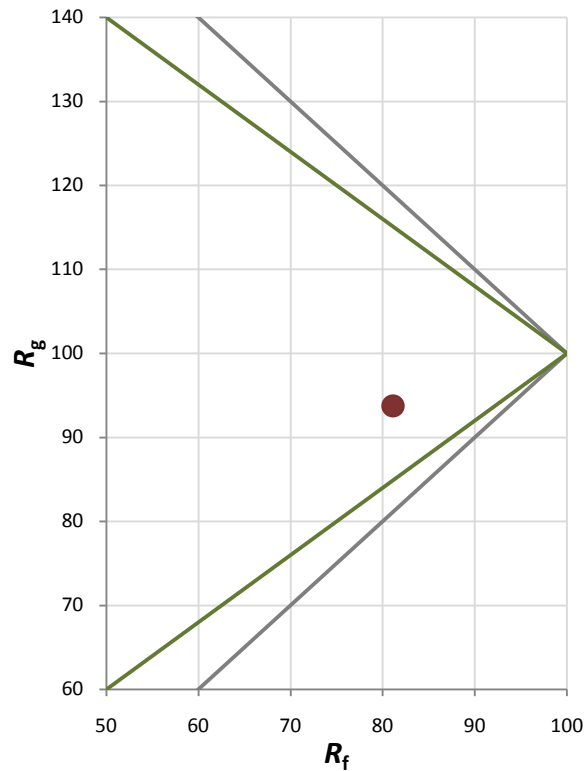
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	94

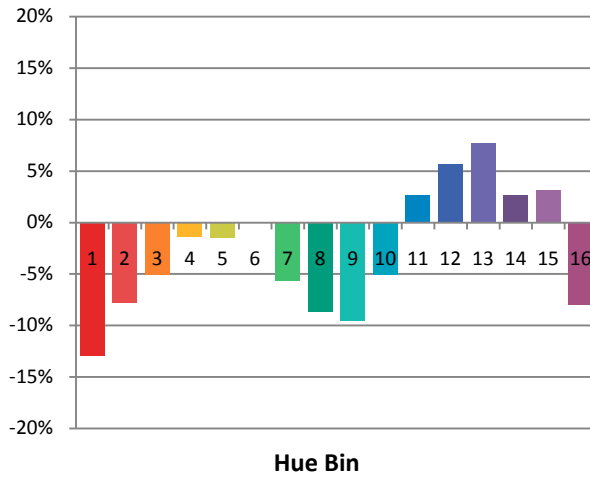
Spectral Power Distribution Comparison



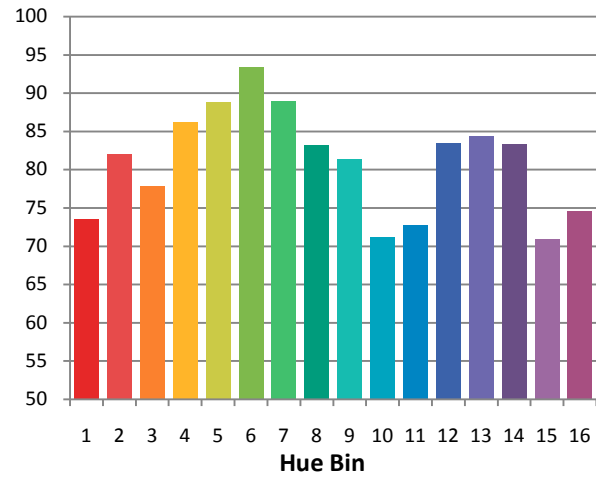
Plot of R_g versus R_f



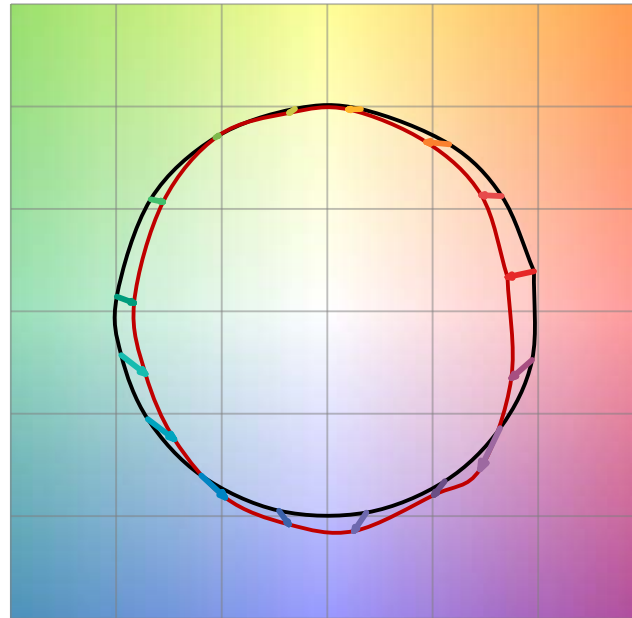
Chroma Shift by Hue



R_t by Hue

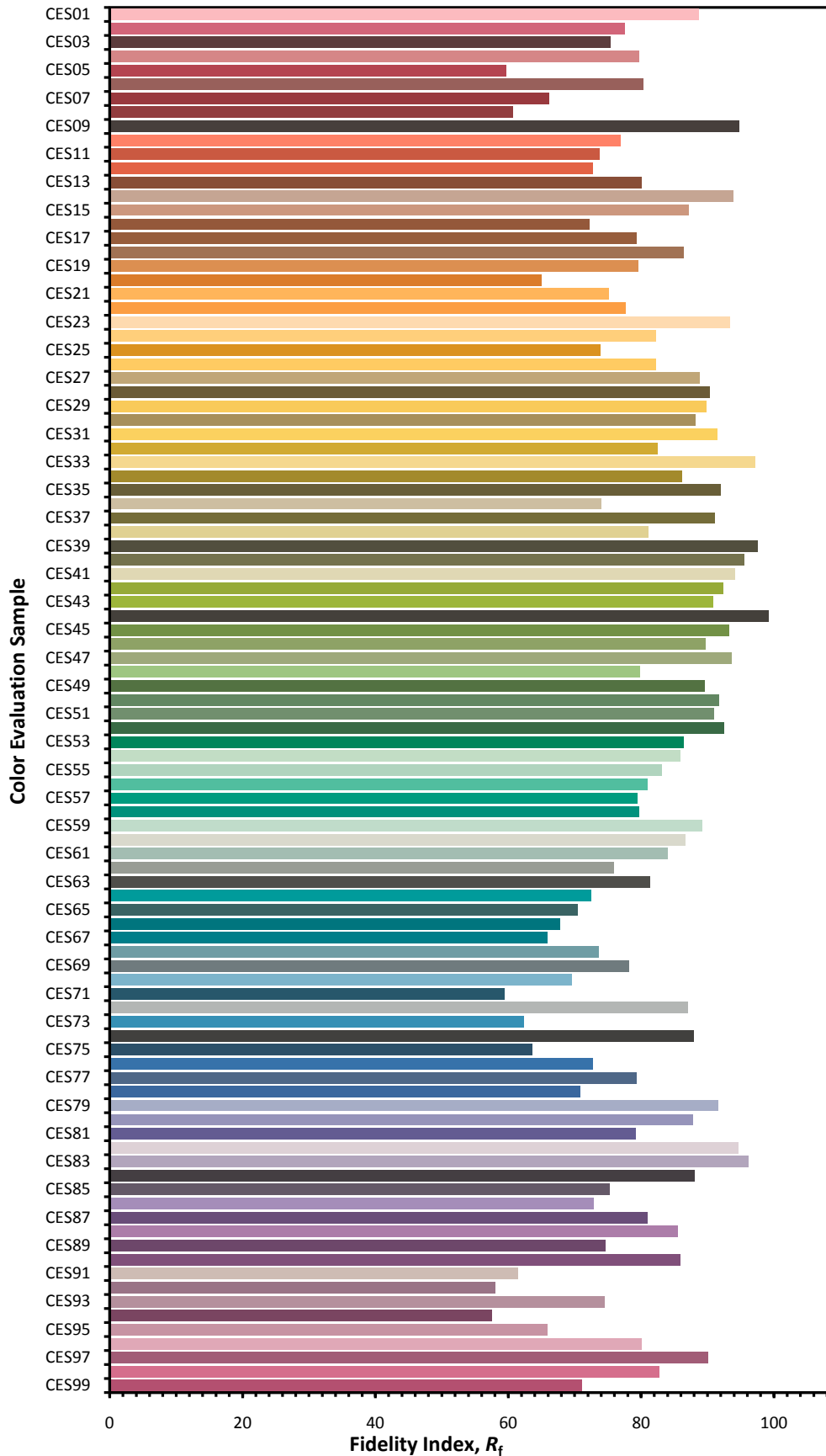


Color Vector Graphic

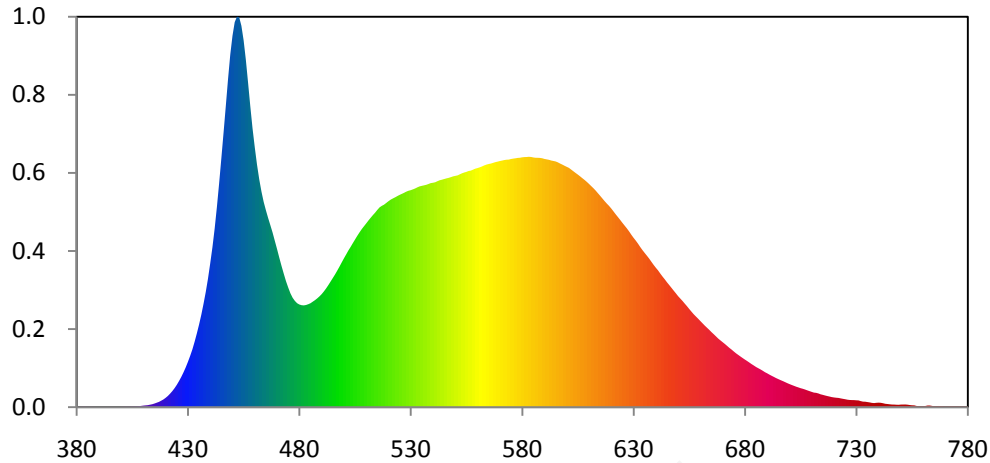


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



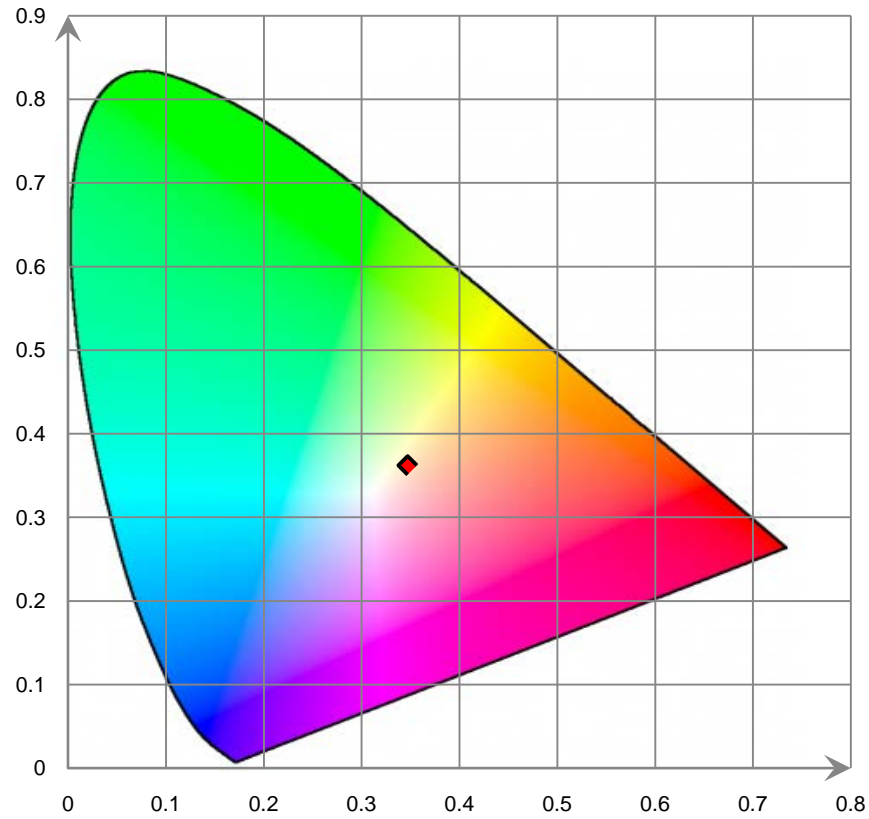
Relative Spectral Power Distribution



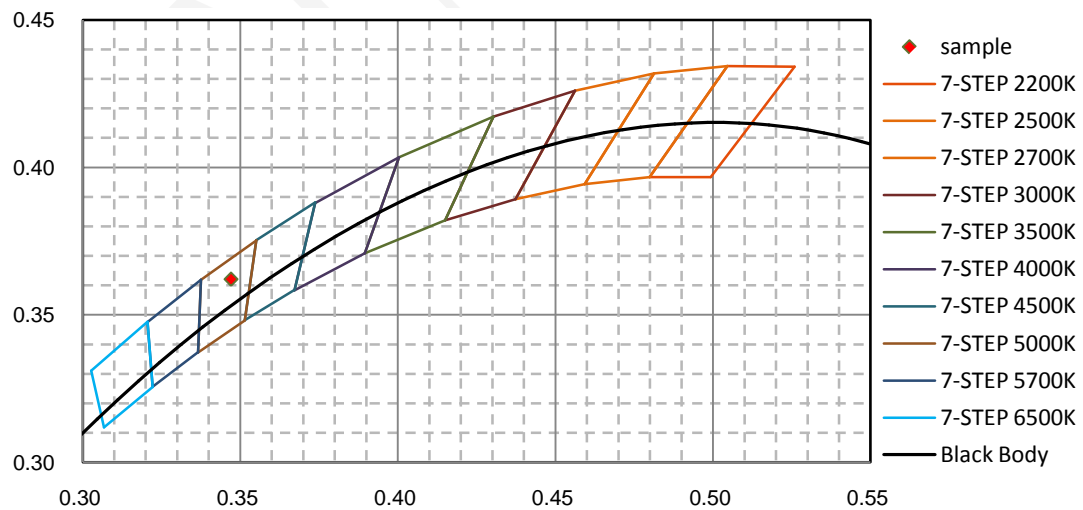
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.960E-02	421	1.659E+00	462	3.360E+01	503	2.362E+01	544	3.353E+01
381	3.620E-02	422	1.996E+00	463	3.179E+01	504	2.417E+01	545	3.363E+01
382	4.230E-02	423	2.373E+00	464	3.026E+01	505	2.471E+01	546	3.372E+01
383	6.180E-02	424	2.804E+00	465	2.903E+01	506	2.525E+01	547	3.380E+01
384	6.430E-02	425	3.292E+00	466	2.788E+01	507	2.576E+01	548	3.391E+01
385	4.770E-02	426	3.848E+00	467	2.682E+01	508	2.624E+01	549	3.402E+01
386	4.440E-02	427	4.457E+00	468	2.574E+01	509	2.667E+01	550	3.409E+01
387	4.040E-02	428	5.130E+00	469	2.452E+01	510	2.708E+01	551	3.416E+01
388	3.170E-02	429	5.867E+00	470	2.331E+01	511	2.751E+01	552	3.432E+01
389	3.100E-02	430	6.681E+00	471	2.204E+01	512	2.792E+01	553	3.448E+01
390	2.470E-02	431	7.563E+00	472	2.083E+01	513	2.831E+01	554	3.459E+01
391	1.460E-02	432	8.516E+00	473	1.969E+01	514	2.867E+01	555	3.469E+01
392	1.110E-02	433	9.646E+00	474	1.859E+01	515	2.908E+01	556	3.482E+01
393	2.500E-02	434	1.087E+01	475	1.765E+01	516	2.945E+01	557	3.487E+01
394	3.220E-02	435	1.218E+01	476	1.678E+01	517	2.968E+01	558	3.502E+01
395	3.580E-02	436	1.362E+01	477	1.612E+01	518	2.985E+01	559	3.516E+01
396	3.140E-02	437	1.524E+01	478	1.567E+01	519	3.010E+01	560	3.525E+01
397	2.030E-02	438	1.698E+01	479	1.532E+01	520	3.036E+01	561	3.536E+01
398	1.700E-02	439	1.894E+01	480	1.514E+01	521	3.059E+01	562	3.549E+01
399	1.160E-02	440	2.119E+01	481	1.504E+01	522	3.077E+01	563	3.564E+01
400	2.770E-02	441	2.358E+01	482	1.501E+01	523	3.093E+01	564	3.576E+01
401	4.910E-02	442	2.634E+01	483	1.506E+01	524	3.112E+01	565	3.584E+01
402	6.140E-02	443	2.950E+01	484	1.518E+01	525	3.129E+01	566	3.592E+01
403	6.380E-02	444	3.299E+01	485	1.532E+01	526	3.145E+01	567	3.602E+01
404	6.930E-02	445	3.669E+01	486	1.554E+01	527	3.160E+01	568	3.612E+01
405	9.010E-02	446	4.050E+01	487	1.577E+01	528	3.177E+01	569	3.620E+01
406	9.390E-02	447	4.439E+01	488	1.603E+01	529	3.190E+01	570	3.628E+01
407	1.094E-01	448	4.835E+01	489	1.632E+01	530	3.199E+01	571	3.635E+01
408	1.358E-01	449	5.197E+01	490	1.665E+01	531	3.211E+01	572	3.643E+01
409	1.895E-01	450	5.475E+01	491	1.706E+01	532	3.224E+01	573	3.648E+01
410	2.366E-01	451	5.676E+01	492	1.750E+01	533	3.241E+01	574	3.650E+01
411	2.678E-01	452	5.755E+01	493	1.798E+01	534	3.255E+01	575	3.658E+01
412	2.984E-01	453	5.749E+01	494	1.851E+01	535	3.263E+01	576	3.664E+01
413	3.656E-01	454	5.622E+01	495	1.903E+01	536	3.270E+01	577	3.669E+01
414	4.397E-01	455	5.407E+01	496	1.955E+01	537	3.278E+01	578	3.674E+01
415	5.388E-01	456	5.120E+01	497	2.012E+01	538	3.290E+01	579	3.677E+01
416	6.639E-01	457	4.782E+01	498	2.071E+01	539	3.303E+01	580	3.683E+01
417	7.819E-01	458	4.434E+01	499	2.132E+01	540	3.308E+01	581	3.686E+01
418	9.530E-01	459	4.110E+01	500	2.193E+01	541	3.316E+01	582	3.688E+01
419	1.142E+00	460	3.832E+01	501	2.251E+01	542	3.331E+01	583	3.691E+01
420	1.379E+00	461	3.576E+01	502	2.309E+01	543	3.345E+01	584	3.688E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.681E+01	626	2.677E+01	667	1.044E+01	708	2.479E+00	749	3.529E-01
586	3.676E+01	627	2.636E+01	668	1.012E+01	709	2.365E+00	750	3.860E-01
587	3.676E+01	628	2.591E+01	669	9.847E+00	710	2.253E+00	751	3.934E-01
588	3.674E+01	629	2.543E+01	670	9.583E+00	711	2.149E+00	752	3.943E-01
589	3.669E+01	630	2.497E+01	671	9.316E+00	712	2.111E+00	753	3.671E-01
590	3.659E+01	631	2.456E+01	672	9.036E+00	713	2.019E+00	754	3.161E-01
591	3.653E+01	632	2.411E+01	673	8.751E+00	714	1.896E+00	755	2.821E-01
592	3.647E+01	633	2.361E+01	674	8.494E+00	715	1.814E+00	756	2.699E-01
593	3.637E+01	634	2.316E+01	675	8.211E+00	716	1.718E+00	757	1.867E-01
594	3.629E+01	635	2.274E+01	676	7.944E+00	717	1.640E+00	758	1.430E-01
595	3.622E+01	636	2.233E+01	677	7.705E+00	718	1.565E+00	759	1.354E-01
596	3.609E+01	637	2.191E+01	678	7.469E+00	719	1.486E+00	760	1.458E-01
597	3.592E+01	638	2.145E+01	679	7.240E+00	720	1.433E+00	761	1.756E-01
598	3.577E+01	639	2.099E+01	680	7.017E+00	721	1.392E+00	762	2.490E-01
599	3.559E+01	640	2.056E+01	681	6.803E+00	722	1.367E+00	763	2.451E-01
600	3.543E+01	641	2.017E+01	682	6.578E+00	723	1.294E+00	764	1.872E-01
601	3.527E+01	642	1.971E+01	683	6.349E+00	724	1.229E+00	765	1.342E-01
602	3.503E+01	643	1.927E+01	684	6.139E+00	725	1.175E+00	766	1.528E-01
603	3.478E+01	644	1.886E+01	685	5.923E+00	726	1.104E+00	767	1.800E-01
604	3.453E+01	645	1.842E+01	686	5.742E+00	727	1.066E+00	768	1.480E-01
605	3.428E+01	646	1.802E+01	687	5.564E+00	728	1.045E+00	769	1.213E-01
606	3.403E+01	647	1.761E+01	688	5.367E+00	729	1.042E+00	770	9.730E-02
607	3.376E+01	648	1.719E+01	689	5.159E+00	730	1.014E+00	771	1.143E-01
608	3.351E+01	649	1.679E+01	690	4.988E+00	731	9.978E-01	772	1.345E-01
609	3.322E+01	650	1.637E+01	691	4.798E+00	732	8.940E-01	773	1.249E-01
610	3.292E+01	651	1.601E+01	692	4.628E+00	733	8.168E-01	774	1.169E-01
611	3.259E+01	652	1.565E+01	693	4.460E+00	734	8.051E-01	775	1.222E-01
612	3.227E+01	653	1.526E+01	694	4.288E+00	735	7.545E-01	776	1.191E-01
613	3.193E+01	654	1.488E+01	695	4.140E+00	736	6.999E-01	777	9.800E-02
614	3.155E+01	655	1.447E+01	696	3.991E+00	737	6.311E-01	778	1.037E-01
615	3.117E+01	656	1.408E+01	697	3.851E+00	738	6.055E-01	779	8.990E-02
616	3.078E+01	657	1.370E+01	698	3.698E+00	739	6.461E-01	780	8.820E-02
617	3.038E+01	658	1.337E+01	699	3.545E+00	740	6.650E-01		
618	3.002E+01	659	1.304E+01	700	3.409E+00	741	6.420E-01		
619	2.967E+01	660	1.270E+01	701	3.277E+00	742	5.842E-01		
620	2.929E+01	661	1.236E+01	702	3.149E+00	743	5.034E-01		
621	2.886E+01	662	1.202E+01	703	3.022E+00	744	4.685E-01		
622	2.843E+01	663	1.171E+01	704	2.911E+00	745	4.235E-01		
623	2.802E+01	664	1.140E+01	705	2.798E+00	746	3.932E-01		
624	2.761E+01	665	1.106E+01	706	2.710E+00	747	3.851E-01		
625	2.718E+01	666	1.076E+01	707	2.602E+00	748	3.654E-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**

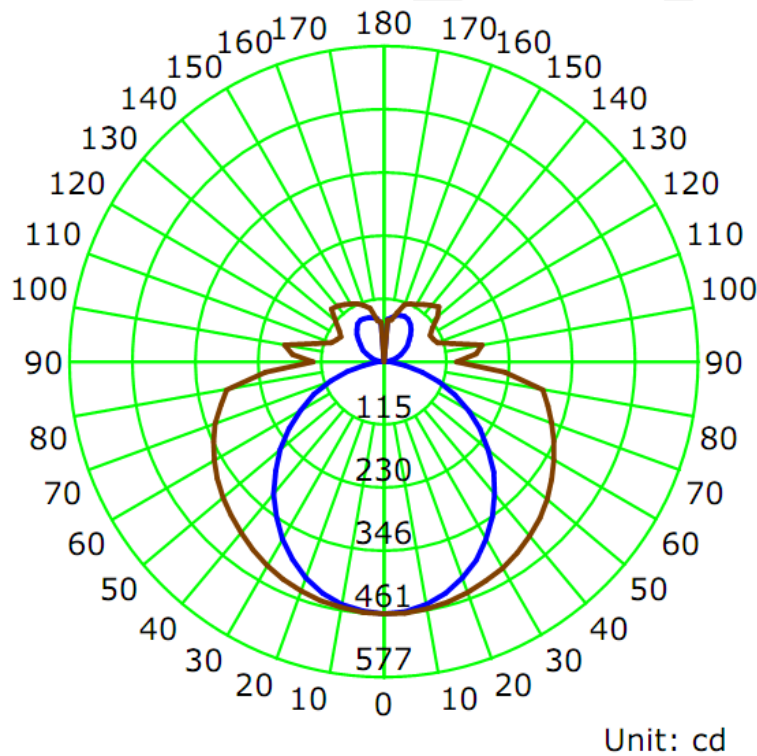
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1460	16.93	0.9700

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2334.8	137.96	462.0	1.21	1.41

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	105.5	143.2	168.7	151.3	142.2
Field Angle (10% I_{max}):	353.8	353.2	353.9	353.6	353.6

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	461	461	461	461	461	461	461	461
5.0°	459	459	459	460	461	462	459	459
10.0°	450	451	455	457	459	459	455	453
15.0°	439	440	446	451	456	455	448	442
20.0°	421	424	435	445	450	448	437	428
25.0°	400	405	419	435	443	440	425	410
30.0°	375	383	403	424	436	430	409	388
35.0°	347	358	385	412	427	419	393	364
40.0°	317	330	364	399	416	407	373	338
45.0°	285	301	344	384	405	393	354	310
50.0°	251	272	322	370	391	380	334	283
55.0°	215	241	300	355	376	364	314	253
60.0°	180	211	279	338	360	349	294	224
65.0°	144	181	257	323	345	332	274	197
70.0°	108	154	237	305	328	314	254	170
75.0°	73	127	218	288	312	294	233	145
80.0°	41	104	198	271	297	275	210	122
85.0°	13	81	165	212	224	214	173	95
90.0°	0	35	84	120	134	125	94	50
95.0°	1	37	111	154	170	160	121	53
100.0°	8	31	87	158	184	165	101	38
105.0°	17	41	70	104	130	113	77	39
110.0°	26	56	68	96	106	99	73	54
115.0°	35	58	76	91	101	94	75	64
120.0°	44	62	94	95	99	96	90	67
125.0°	53	66	107	110	109	109	111	69
130.0°	61	71	102	131	128	130	112	73
135.0°	70	75	102	130	144	138	109	78
140.0°	78	80	104	125	136	130	105	81
145.0°	85	86	106	122	129	122	103	85
150.0°	91	89	107	118	122	115	100	88
155.0°	92	88	107	116	117	111	93	89
160.0°	91	88	106	112	112	98	88	89
165.0°	88	88	99	108	94	87	82	76
170.0°	83	85	90	88	78	81	67	66
175.0°	79	81	71	73	77	69	70	71
180.0°	0	0	0	0	0	0	0	0

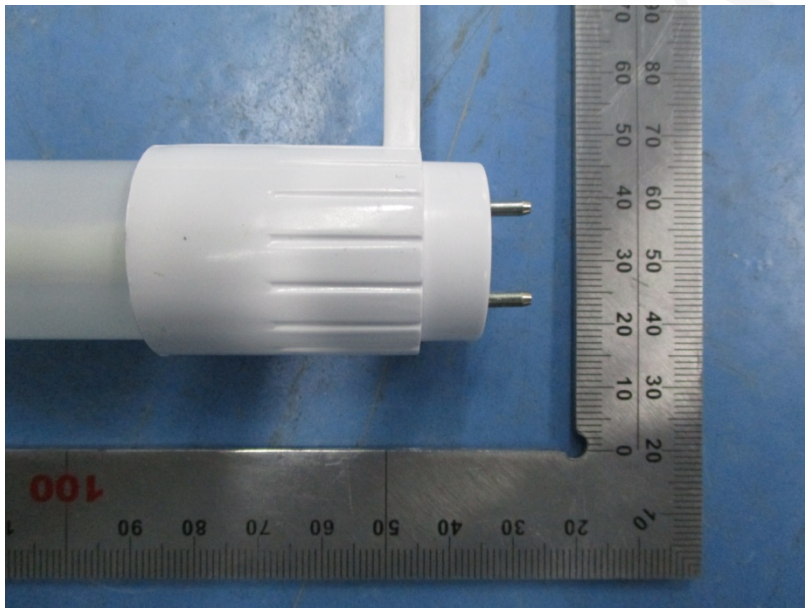
Luminous Intensity (cd) Distribution Data (cont.)

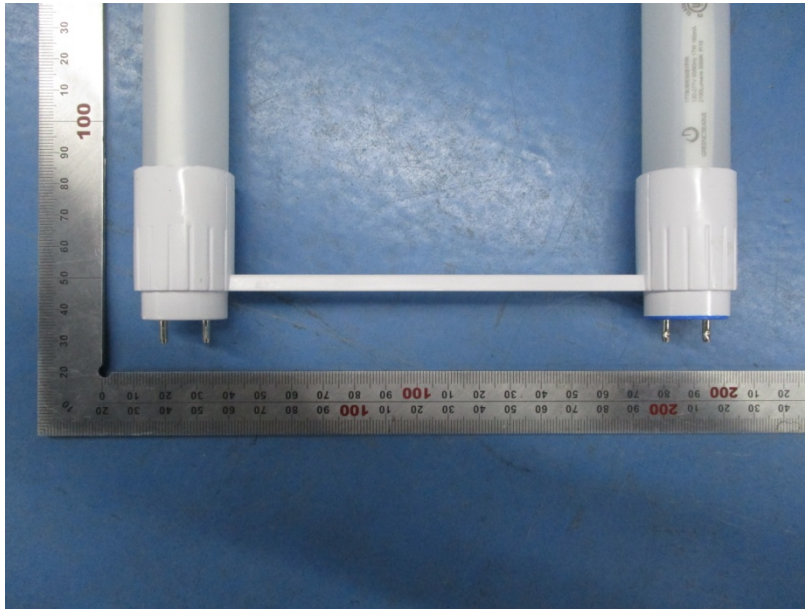
$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	461	461	461	461	461	461	461	461
5.0°	458	458	459	460	460	461	458	457
10.0°	451	452	454	456	456	457	453	451
15.0°	438	439	444	450	453	452	444	439
20.0°	421	424	433	442	446	444	433	424
25.0°	399	404	418	433	439	436	419	405
30.0°	375	382	401	421	430	426	404	383
35.0°	346	356	383	410	420	414	386	358
40.0°	316	329	362	396	409	402	367	332
45.0°	283	300	342	383	398	388	348	305
50.0°	249	270	321	368	387	374	328	276
55.0°	214	239	300	353	374	360	308	248
60.0°	177	209	277	338	361	346	288	219
65.0°	142	179	257	322	347	331	269	193
70.0°	106	152	237	305	330	316	251	166
75.0°	71	126	217	284	311	298	234	143
80.0°	39	103	193	264	294	282	213	121
85.0°	13	76	156	203	219	213	171	96
90.0°	0	41	84	119	131	122	89	44
95.0°	3	35	112	154	169	161	123	53
100.0°	10	30	85	156	186	172	104	38
105.0°	18	38	68	106	132	115	75	39
110.0°	27	50	66	94	104	97	71	52
115.0°	36	54	71	88	97	91	71	68
120.0°	45	59	86	89	93	89	83	69
125.0°	54	63	101	101	100	100	102	73
130.0°	63	68	103	120	117	119	113	76
135.0°	71	71	103	128	137	136	110	78
140.0°	79	75	102	124	134	130	109	83
145.0°	86	79	101	121	128	125	107	86
150.0°	88	81	100	116	123	120	106	88
155.0°	88	84	92	111	117	115	104	86
160.0°	86	85	83	103	110	111	99	87
165.0°	84	75	80	80	102	99	93	87
170.0°	81	67	76	79	77	89	88	82
175.0°	71	63	65	74	74	76	73	77
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	11.0	0.47	0-5	11.0	0.47
5-10	32.7	1.40	0-10	43.7	1.87
10-15	53.4	2.29	0-15	97.1	4.16
15-20	72.6	3.11	0-20	169.7	7.27
20-25	89.7	3.84	0-25	259.4	11.11
25-30	104.4	4.47	0-30	363.7	15.58
30-35	116.4	4.98	0-35	480.1	20.56
35-40	125.5	5.38	0-40	605.6	25.94
40-45	131.7	5.64	0-45	737.3	31.58
45-50	135.1	5.79	0-50	872.4	37.37
50-55	135.7	5.81	0-55	1008.1	43.18
55-60	133.8	5.73	0-60	1142.0	48.91
60-65	129.8	5.56	0-65	1271.8	54.47
65-70	123.9	5.30	0-70	1395.7	59.78
70-75	116.1	4.97	0-75	1511.7	64.75
75-80	107.0	4.58	0-80	1618.7	69.33
80-85	90.8	3.89	0-85	1709.5	73.22
85-90	61.5	2.63	0-90	1771.0	75.85
90-95	49.5	2.12	0-95	1820.5	77.97
95-100	53.9	2.31	0-100	1874.4	80.28
100-105	45.8	1.96	0-105	1920.2	82.24
105-110	37.9	1.62	0-110	1958.1	83.87
110-115	36.5	1.56	0-115	1994.6	85.43
115-120	36.9	1.58	0-120	2031.5	87.01
120-125	38.8	1.66	0-125	2070.3	88.67
125-130	40.9	1.75	0-130	2111.2	90.43
130-135	41.2	1.76	0-135	2152.4	92.19
135-140	38.8	1.66	0-140	2191.2	93.85
140-145	34.9	1.49	0-145	2226.1	95.34
145-150	30.6	1.31	0-150	2256.7	96.65
150-155	25.8	1.11	0-155	2282.5	97.76
155-160	20.7	0.89	0-160	2303.2	98.65
160-165	15.3	0.65	0-165	2318.5	99.30
165-170	10.0	0.43	0-170	2328.5	99.73
170-175	5.5	0.23	0-175	2333.9	99.96
175-180	0.9	0.04	0-180	2334.8	100.00

6. Product Photo





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