

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

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180428080-10-2
Test Date:	2018-04-28 to 2018-05-02
Report Date:	2018-05-07
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.

1. Product Description

General Information:

one sample was received on 2018-04-28 and used for testing.

Model Tested: 17T8U6/850/BYP
 Manufacturer: GREEN CREATIVE LTD
 Brand Name: GREEN CREATIVE
 Product Designation: LED Tube
 Lamp Shape: U tube
 Lamp base: G13
 Aging Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277VAC 60Hz
 Rated Power: 17W
 Nominal CCT: 5000K
 Nominal Lumen Output: 2300lm

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
- 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	2018-03-23	2019-03-22
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2018-01-24	2019-01-24
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2018-03-23	2019-03-22
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	2018-03-23	2019-03-22
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	2018-03-23	2019-03-22
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	2018-03-23	2019-03-22
Power Meter	INVENTFINE	WT500	GSDSQ200007	2018-03-23	2019-03-22
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**

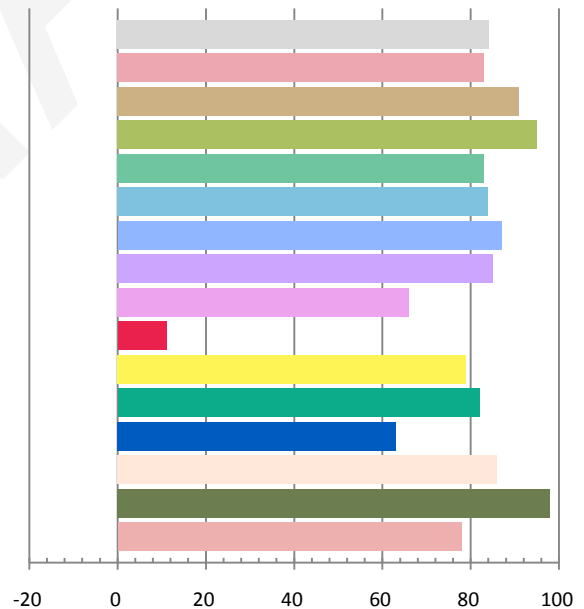
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1466	17.03	0.9678	2350.6	137.99

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
7.234	4957	0.00289	0.3470	0.3589	0.2099	0.4885

Color Rendering Index

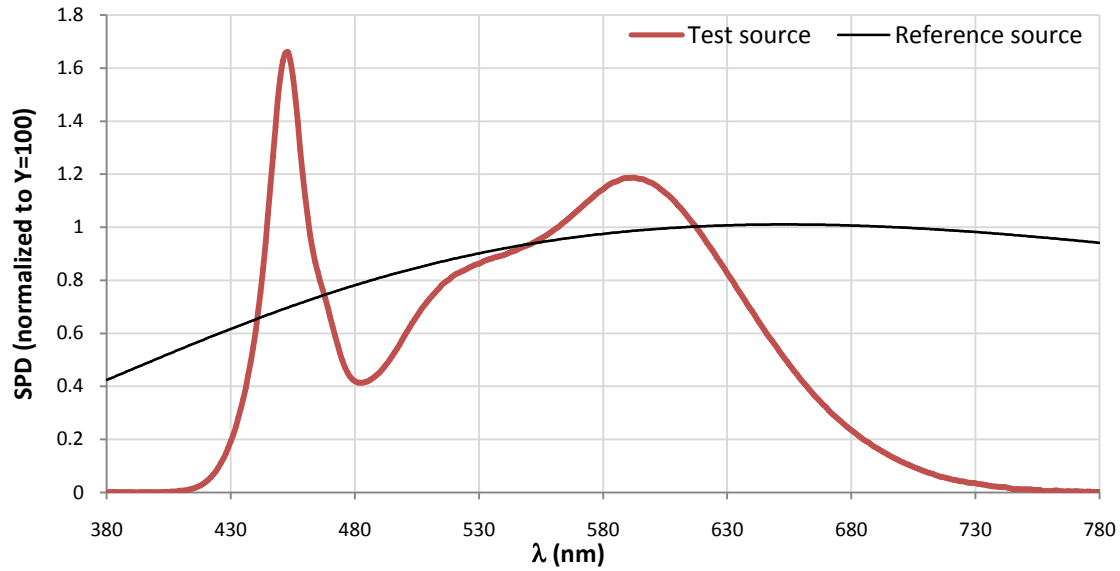
Ra 84.2			
R1 83	R2 91	R3 95	R4 83
R5 84	R6 87	R7 85	R8 66
R9 11	R10 79	R11 82	R12 63
R13 86	R14 98	R15 78	



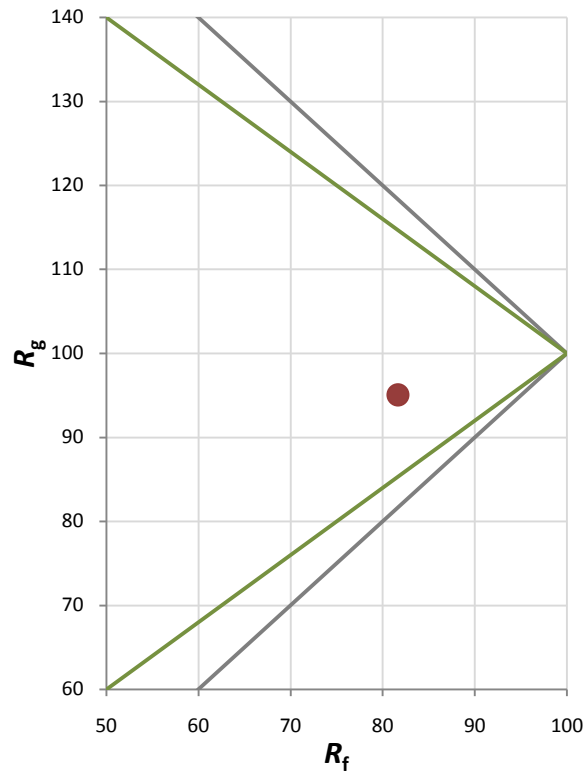
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	95

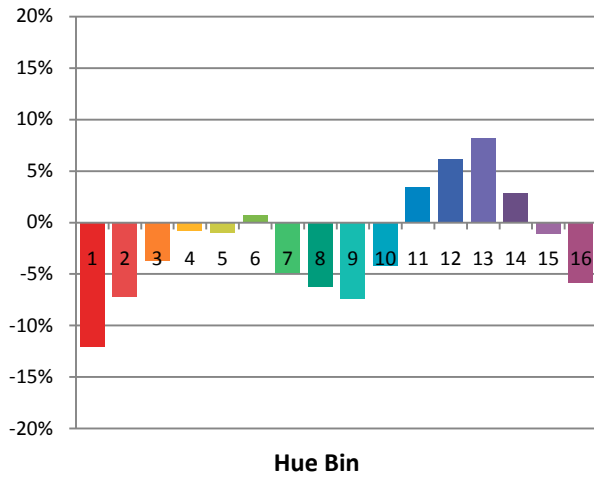
Spectral Power Distribution Comparison



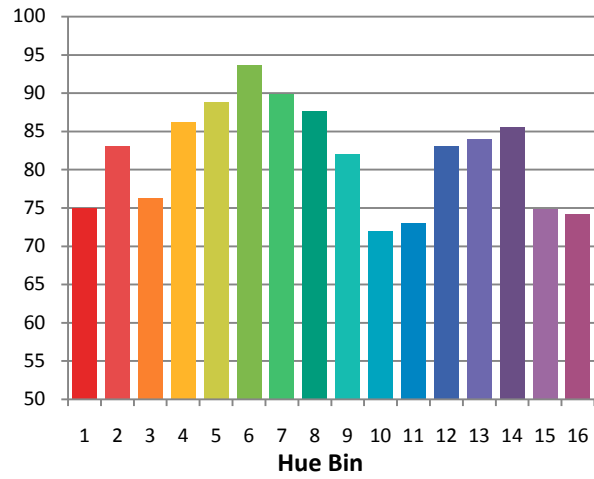
Plot of R_g versus R_f



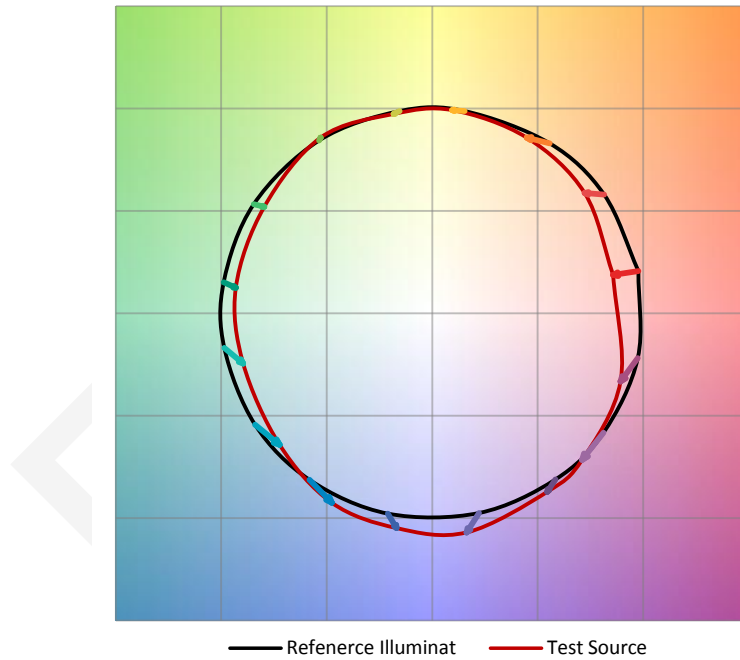
Chroma Shift by Hue



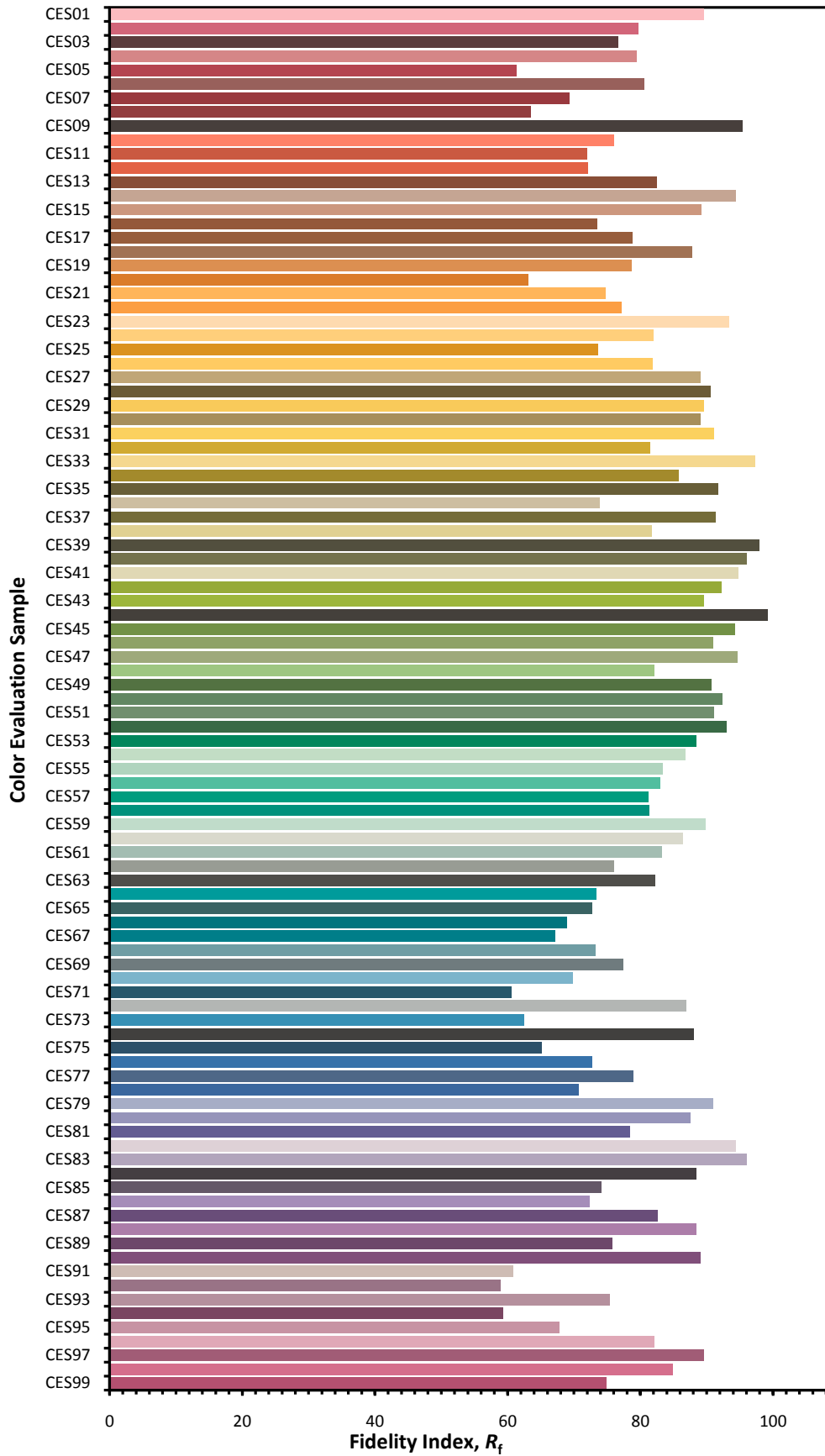
R_f by Hue



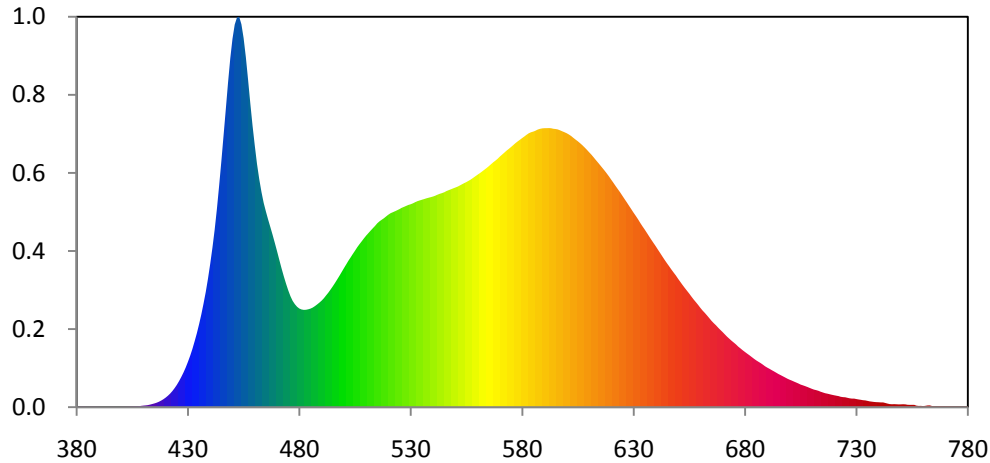
Color Vector Graphic



Color Fidelity by CES Sample



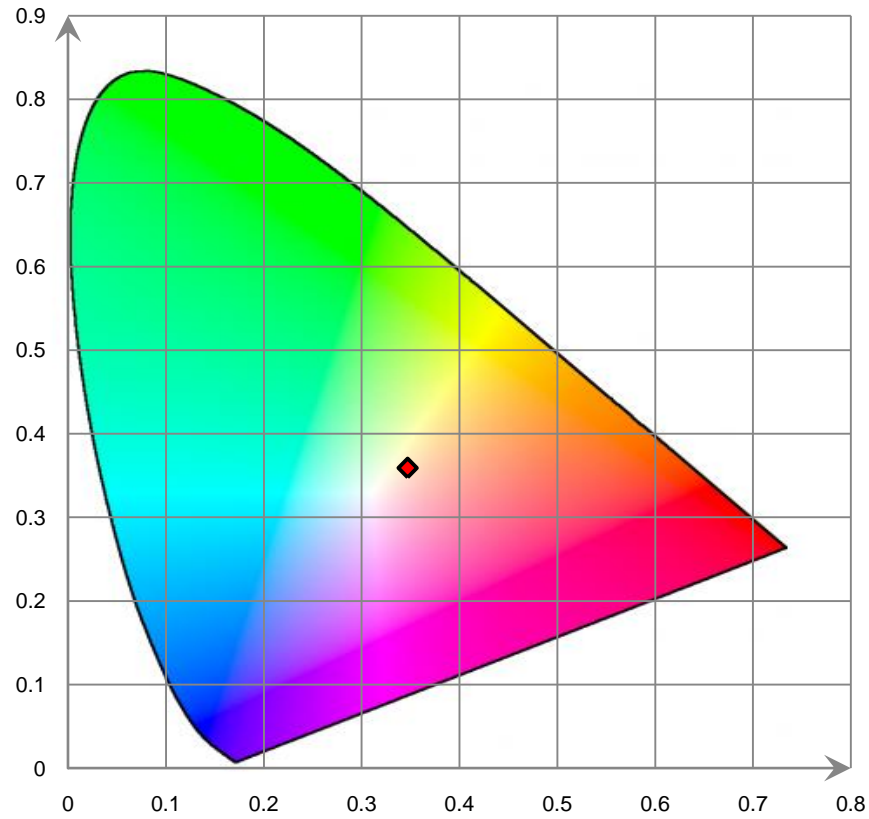
Relative Spectral Power Distribution



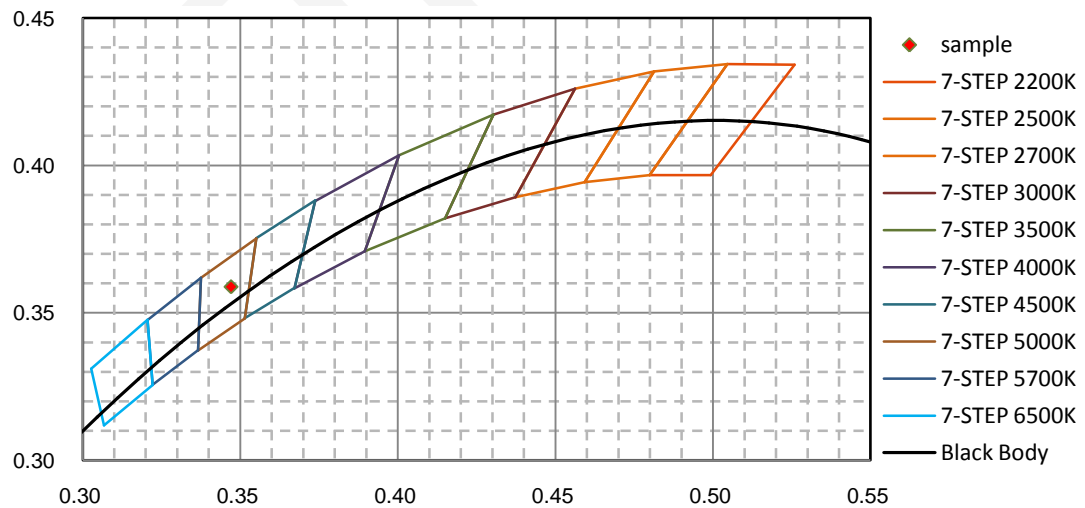
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.490E-02	421	1.671E+00	462	3.338E+01	503	2.191E+01	544	3.132E+01
381	5.710E-02	422	1.983E+00	463	3.149E+01	504	2.241E+01	545	3.144E+01
382	5.600E-02	423	2.354E+00	464	2.989E+01	505	2.290E+01	546	3.161E+01
383	6.580E-02	424	2.778E+00	465	2.862E+01	506	2.340E+01	547	3.174E+01
384	5.880E-02	425	3.254E+00	466	2.745E+01	507	2.385E+01	548	3.187E+01
385	4.140E-02	426	3.797E+00	467	2.634E+01	508	2.427E+01	549	3.201E+01
386	4.810E-02	427	4.411E+00	468	2.522E+01	509	2.470E+01	550	3.214E+01
387	5.550E-02	428	5.070E+00	469	2.403E+01	510	2.510E+01	551	3.226E+01
388	5.090E-02	429	5.803E+00	470	2.283E+01	511	2.547E+01	552	3.243E+01
389	5.700E-02	430	6.625E+00	471	2.156E+01	512	2.583E+01	553	3.261E+01
390	4.690E-02	431	7.520E+00	472	2.033E+01	513	2.618E+01	554	3.278E+01
391	2.300E-02	432	8.515E+00	473	1.919E+01	514	2.653E+01	555	3.294E+01
392	1.690E-02	433	9.631E+00	474	1.810E+01	515	2.690E+01	556	3.313E+01
393	2.190E-02	434	1.081E+01	475	1.712E+01	516	2.720E+01	557	3.332E+01
394	2.810E-02	435	1.213E+01	476	1.625E+01	517	2.742E+01	558	3.355E+01
395	3.630E-02	436	1.356E+01	477	1.556E+01	518	2.766E+01	559	3.379E+01
396	3.350E-02	437	1.514E+01	478	1.506E+01	519	2.792E+01	560	3.401E+01
397	2.600E-02	438	1.685E+01	479	1.468E+01	520	2.818E+01	561	3.424E+01
398	2.340E-02	439	1.879E+01	480	1.443E+01	521	2.839E+01	562	3.447E+01
399	1.940E-02	440	2.097E+01	481	1.429E+01	522	2.853E+01	563	3.473E+01
400	3.470E-02	441	2.332E+01	482	1.424E+01	523	2.867E+01	564	3.498E+01
401	4.410E-02	442	2.597E+01	483	1.425E+01	524	2.882E+01	565	3.524E+01
402	4.810E-02	443	2.901E+01	484	1.432E+01	525	2.899E+01	566	3.553E+01
403	6.140E-02	444	3.238E+01	485	1.442E+01	526	2.917E+01	567	3.582E+01
404	7.970E-02	445	3.600E+01	486	1.457E+01	527	2.931E+01	568	3.607E+01
405	8.490E-02	446	3.977E+01	487	1.478E+01	528	2.945E+01	569	3.635E+01
406	1.046E-01	447	4.360E+01	488	1.503E+01	529	2.959E+01	570	3.666E+01
407	1.169E-01	448	4.746E+01	489	1.530E+01	530	2.969E+01	571	3.695E+01
408	1.300E-01	449	5.102E+01	490	1.558E+01	531	2.983E+01	572	3.723E+01
409	1.959E-01	450	5.388E+01	491	1.593E+01	532	2.999E+01	573	3.753E+01
410	2.369E-01	451	5.598E+01	492	1.634E+01	533	3.014E+01	574	3.778E+01
411	2.618E-01	452	5.701E+01	493	1.675E+01	534	3.025E+01	575	3.806E+01
412	3.015E-01	453	5.713E+01	494	1.721E+01	535	3.034E+01	576	3.834E+01
413	3.744E-01	454	5.603E+01	495	1.767E+01	536	3.045E+01	577	3.863E+01
414	4.638E-01	455	5.399E+01	496	1.817E+01	537	3.055E+01	578	3.888E+01
415	5.550E-01	456	5.120E+01	497	1.869E+01	538	3.064E+01	579	3.913E+01
416	6.617E-01	457	4.791E+01	498	1.922E+01	539	3.073E+01	580	3.937E+01
417	8.011E-01	458	4.444E+01	499	1.977E+01	540	3.082E+01	581	3.961E+01
418	9.650E-01	459	4.122E+01	500	2.033E+01	541	3.094E+01	582	3.985E+01
419	1.164E+00	460	3.829E+01	501	2.086E+01	542	3.109E+01	583	4.007E+01
420	1.401E+00	461	3.561E+01	502	2.141E+01	543	3.121E+01	584	4.022E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.032E+01	626	3.044E+01	667	1.198E+01	708	2.956E+00	749	4.050E-01
586	4.045E+01	627	2.996E+01	668	1.163E+01	709	2.821E+00	750	4.092E-01
587	4.062E+01	628	2.946E+01	669	1.130E+01	710	2.690E+00	751	4.310E-01
588	4.072E+01	629	2.896E+01	670	1.099E+01	711	2.573E+00	752	4.124E-01
589	4.079E+01	630	2.847E+01	671	1.064E+01	712	2.488E+00	753	3.503E-01
590	4.081E+01	631	2.799E+01	672	1.031E+01	713	2.396E+00	754	3.358E-01
591	4.082E+01	632	2.750E+01	673	1.001E+01	714	2.257E+00	755	3.456E-01
592	4.083E+01	633	2.697E+01	674	9.725E+00	715	2.150E+00	756	3.432E-01
593	4.081E+01	634	2.647E+01	675	9.457E+00	716	2.043E+00	757	2.248E-01
594	4.074E+01	635	2.600E+01	676	9.178E+00	717	1.978E+00	758	1.803E-01
595	4.069E+01	636	2.550E+01	677	8.861E+00	718	1.897E+00	759	1.918E-01
596	4.063E+01	637	2.499E+01	678	8.597E+00	719	1.819E+00	760	1.563E-01
597	4.051E+01	638	2.449E+01	679	8.331E+00	720	1.746E+00	761	1.973E-01
598	4.036E+01	639	2.401E+01	680	8.076E+00	721	1.677E+00	762	2.594E-01
599	4.023E+01	640	2.353E+01	681	7.839E+00	722	1.624E+00	763	2.656E-01
600	4.008E+01	641	2.303E+01	682	7.602E+00	723	1.520E+00	764	1.710E-01
601	3.989E+01	642	2.253E+01	683	7.352E+00	724	1.469E+00	765	1.431E-01
602	3.967E+01	643	2.203E+01	684	7.103E+00	725	1.453E+00	766	1.217E-01
603	3.940E+01	644	2.153E+01	685	6.864E+00	726	1.371E+00	767	1.714E-01
604	3.915E+01	645	2.106E+01	686	6.658E+00	727	1.296E+00	768	1.586E-01
605	3.890E+01	646	2.061E+01	687	6.463E+00	728	1.257E+00	769	1.243E-01
606	3.863E+01	647	2.014E+01	688	6.239E+00	729	1.256E+00	770	1.428E-01
607	3.834E+01	648	1.970E+01	689	5.995E+00	730	1.186E+00	771	1.483E-01
608	3.802E+01	649	1.927E+01	690	5.795E+00	731	1.133E+00	772	1.376E-01
609	3.768E+01	650	1.879E+01	691	5.618E+00	732	1.079E+00	773	1.134E-01
610	3.733E+01	651	1.833E+01	692	5.424E+00	733	1.023E+00	774	9.800E-02
611	3.697E+01	652	1.788E+01	693	5.242E+00	734	9.941E-01	775	1.182E-01
612	3.659E+01	653	1.745E+01	694	5.055E+00	735	9.228E-01	776	1.109E-01
613	3.619E+01	654	1.704E+01	695	4.862E+00	736	8.489E-01	777	9.790E-02
614	3.581E+01	655	1.662E+01	696	4.694E+00	737	8.056E-01	778	8.470E-02
615	3.541E+01	656	1.618E+01	697	4.526E+00	738	7.681E-01	779	1.006E-01
616	3.501E+01	657	1.575E+01	698	4.353E+00	739	7.346E-01	780	8.720E-02
617	3.461E+01	658	1.536E+01	699	4.174E+00	740	7.223E-01		
618	3.419E+01	659	1.496E+01	700	4.028E+00	741	6.994E-01		
619	3.375E+01	660	1.453E+01	701	3.896E+00	742	6.971E-01		
620	3.328E+01	661	1.414E+01	702	3.747E+00	743	6.141E-01		
621	3.281E+01	662	1.379E+01	703	3.612E+00	744	5.270E-01		
622	3.234E+01	663	1.342E+01	704	3.465E+00	745	4.533E-01		
623	3.188E+01	664	1.303E+01	705	3.307E+00	746	4.268E-01		
624	3.143E+01	665	1.263E+01	706	3.199E+00	747	4.462E-01		
625	3.093E+01	666	1.229E+01	707	3.086E+00	748	4.207E-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**

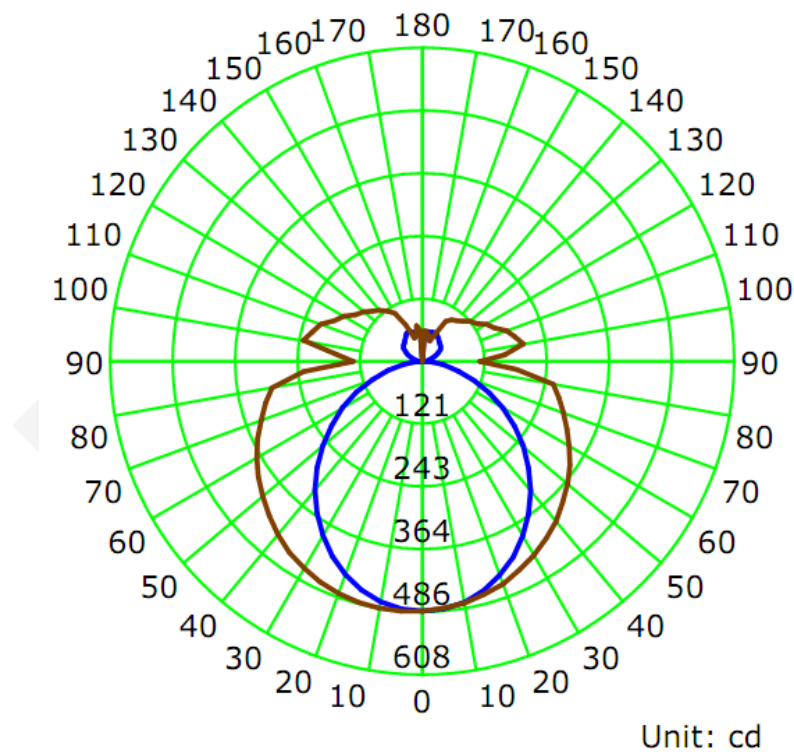
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1470	17.1	0.9700

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2360.4	138.09	486.5	1.20	1.39

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	103.7	140.1	165.3	135.4	136.1
Field Angle (10% I_{max}):	351.5	350.2	352.0	351.8	351.4

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	485	485	485	485	485	485	485	485
5.0°	482	482	480	481	481	481	482	482
10.0°	475	473	474	474	476	475	474	472
15.0°	460	460	463	467	468	466	463	460
20.0°	442	442	449	456	459	456	449	442
25.0°	419	422	433	443	448	443	431	420
30.0°	391	397	413	429	435	428	411	396
35.0°	361	369	392	413	420	412	390	367
40.0°	328	341	370	396	405	394	366	337
45.0°	294	309	346	378	388	374	341	306
50.0°	257	279	322	359	370	356	316	274
55.0°	221	247	298	340	351	336	291	241
60.0°	183	217	275	320	331	315	267	210
65.0°	145	188	252	301	312	297	243	178
70.0°	108	159	231	282	292	277	221	149
75.0°	73	133	210	263	276	258	200	121
80.0°	40	110	190	245	259	240	179	96
85.0°	13	85	147	177	185	177	142	72
90.0°	0	39	80	106	113	102	72	30
95.0°	0	55	124	154	161	148	113	41
100.0°	7	50	130	187	200	181	119	37
105.0°	13	48	122	174	187	169	110	37
110.0°	21	50	114	163	175	156	103	41
115.0°	29	51	107	142	155	137	98	42
120.0°	36	53	97	129	145	123	92	45
125.0°	43	53	83	118	130	113	83	41
130.0°	47	44	81	109	122	104	76	27
135.0°	49	30	79	104	111	100	73	28
140.0°	51	32	80	98	105	94	66	33
145.0°	55	34	71	96	99	89	46	41
150.0°	59	40	55	85	91	73	38	55
155.0°	62	47	42	60	61	42	47	59
160.0°	61	53	42	45	43	44	60	60
165.0°	59	63	54	52	50	56	58	54
170.0°	60	63	70	67	57	58	51	50
175.0°	59	60	48	55	60	55	59	60
180.0°	0	0	0	0	0	0	0	0

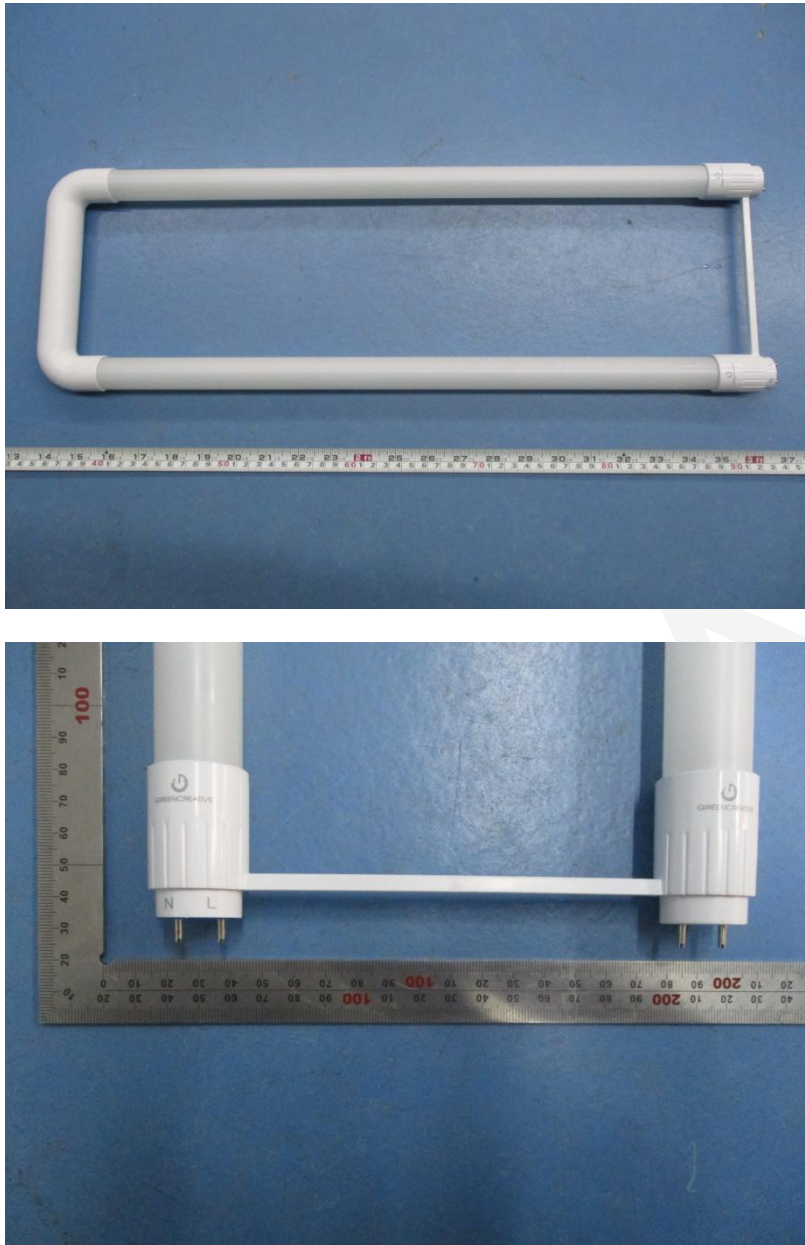
Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	485	485	485	485	485	485	485	485
5.0°	482	484	485	486	486	487	485	483
10.0°	473	477	482	486	486	485	480	476
15.0°	460	466	474	482	483	482	473	463
20.0°	440	449	464	475	479	474	462	448
25.0°	417	430	450	466	472	466	447	426
30.0°	389	406	433	456	463	454	429	402
35.0°	359	379	413	443	452	441	408	374
40.0°	326	351	393	428	439	425	386	345
45.0°	291	320	370	412	423	408	362	313
50.0°	254	289	347	394	407	389	338	281
55.0°	217	257	323	375	391	370	314	247
60.0°	180	226	299	357	373	352	289	216
65.0°	143	196	276	338	355	332	265	184
70.0°	105	168	254	319	335	314	243	156
75.0°	70	141	234	300	316	294	222	127
80.0°	38	117	213	282	297	276	202	104
85.0°	11	92	177	224	233	219	167	80
90.0°	0	42	91	126	135	120	83	36
95.0°	1	62	130	164	170	163	129	50
100.0°	8	59	153	221	237	217	143	48
105.0°	16	56	145	210	224	205	135	48
110.0°	23	60	136	197	212	192	128	53
115.0°	31	62	129	172	189	167	122	55
120.0°	39	63	117	156	177	150	115	58
125.0°	46	61	105	143	160	139	104	55
130.0°	50	49	99	135	150	132	95	37
135.0°	52	33	96	127	139	125	93	32
140.0°	55	35	91	120	130	118	88	35
145.0°	59	40	79	111	120	110	75	41
150.0°	63	46	46	97	108	97	45	50
155.0°	67	63	45	55	78	56	45	64
160.0°	61	66	49	49	50	49	50	65
165.0°	56	61	63	51	52	53	66	65
170.0°	55	53	63	63	71	76	71	63
175.0°	56	51	52	63	61	60	59	58
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	11.6	0.49	0-5	11.6	0.49
5-10	34.4	1.46	0-10	45.9	1.95
10-15	56.1	2.38	0-15	102.0	4.32
15-20	76.1	3.22	0-20	178.1	7.55
20-25	93.8	3.98	0-25	272.0	11.52
25-30	108.9	4.61	0-30	380.8	16.13
30-35	120.8	5.12	0-35	501.6	21.25
35-40	129.5	5.49	0-40	631.2	26.74
40-45	135.0	5.72	0-45	766.1	32.46
45-50	137.2	5.81	0-50	903.3	38.27
50-55	136.6	5.79	0-55	1039.9	44.06
55-60	133.3	5.65	0-60	1173.3	49.71
60-65	127.8	5.42	0-65	1301.1	55.12
65-70	120.6	5.11	0-70	1421.7	60.23
70-75	112.0	4.74	0-75	1533.6	64.97
75-80	102.5	4.34	0-80	1636.1	69.31
80-85	86.4	3.66	0-85	1722.5	72.97
85-90	57.7	2.45	0-90	1780.2	75.42
90-95	48.5	2.06	0-95	1828.8	77.48
95-100	62.1	2.63	0-100	1890.9	80.11
100-105	65.1	2.76	0-105	1956.0	82.87
105-110	60.8	2.58	0-110	2016.8	85.44
110-115	55.6	2.36	0-115	2072.4	87.80
115-120	49.9	2.11	0-120	2122.3	89.91
120-125	44.3	1.88	0-125	2166.6	91.79
125-130	38.5	1.63	0-130	2205.1	93.42
130-135	33.2	1.41	0-135	2238.3	94.82
135-140	29.0	1.23	0-140	2267.2	96.05
140-145	25.0	1.06	0-145	2292.2	97.11
145-150	20.4	0.86	0-150	2312.6	97.97
150-155	15.4	0.65	0-155	2328.0	98.62
155-160	11.4	0.48	0-160	2339.4	99.11
160-165	9.1	0.38	0-165	2348.4	99.49
165-170	7.1	0.30	0-170	2355.5	99.79
170-175	4.3	0.18	0-175	2359.7	99.97
175-180	0.7	0.03	0-180	2360.4	100.00

6. Product Photo



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