



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 9.5T5HE/2F/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:	PKS180820081-10-4
Test Date:	2018-08-21 to 2018-08-23
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: 9.5T5HE/2F/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: 9.5W
 Nominal CCT: 4000K
 Nominal Lumen Output: 1200lm

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**

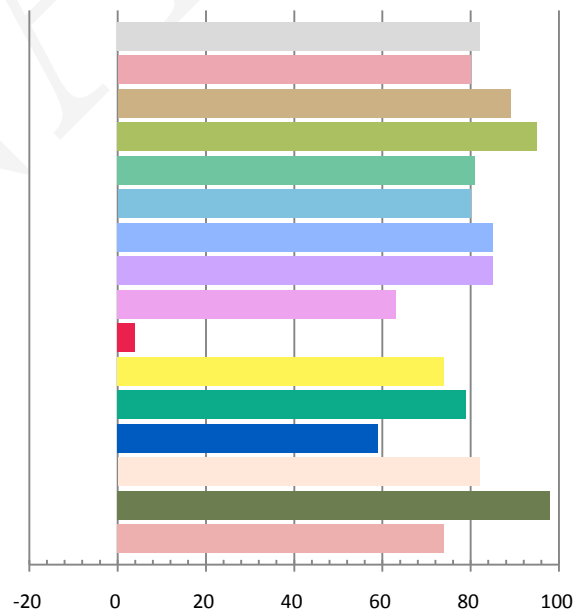
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0764	9.02	0.984	1252.2	138.84

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
3.721	3952	0.00156	0.3838	0.3822	0.2251	0.5044

Color Rendering Index

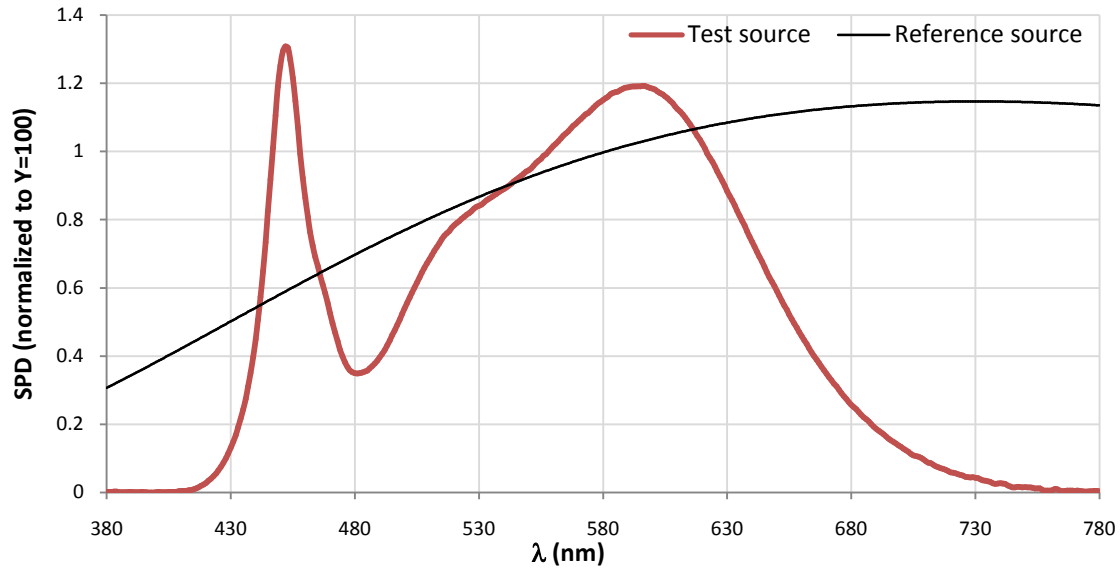
Ra 82.2			
R1 80	R2 89	R3 95	R4 81
R5 80	R6 85	R7 85	R8 63
R9 4	R10 74	R11 79	R12 59
R13 82	R14 98	R15 74	



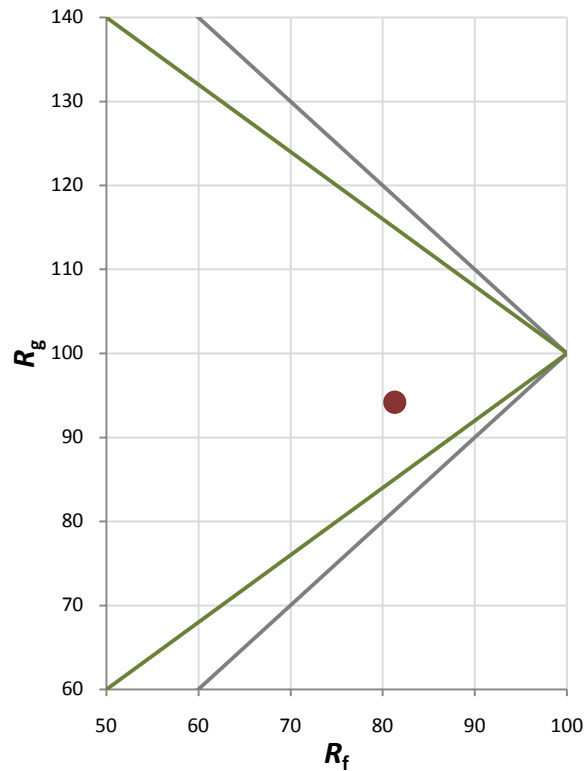
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	94

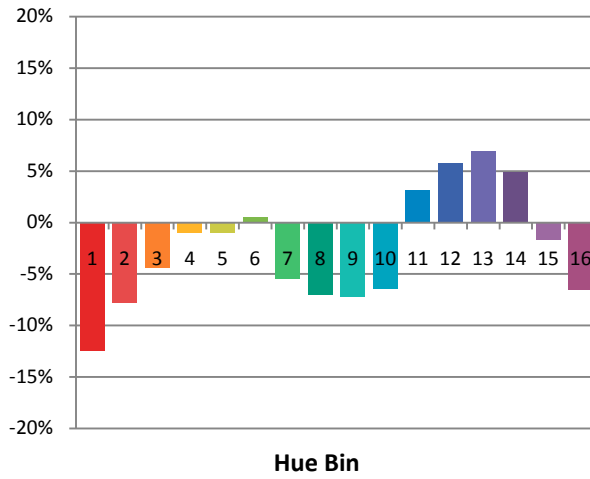
Spectral Power Distribution Comparison



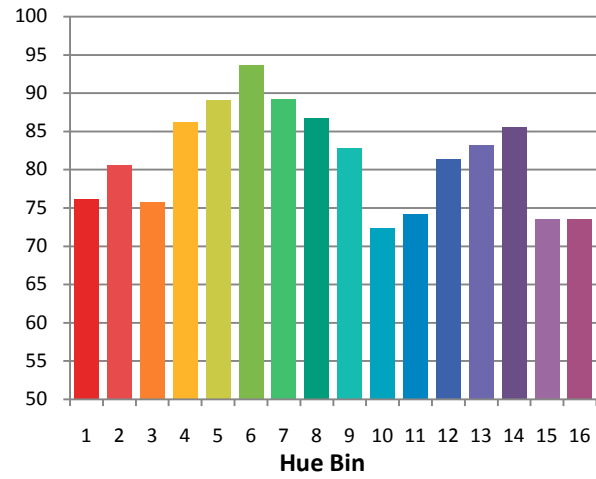
Plot of R_g versus R_f



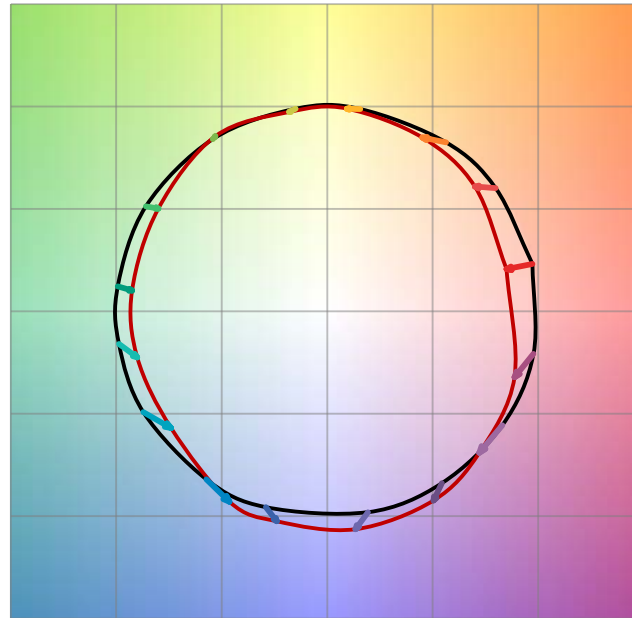
Chroma Shift by Hue



R_t by Hue

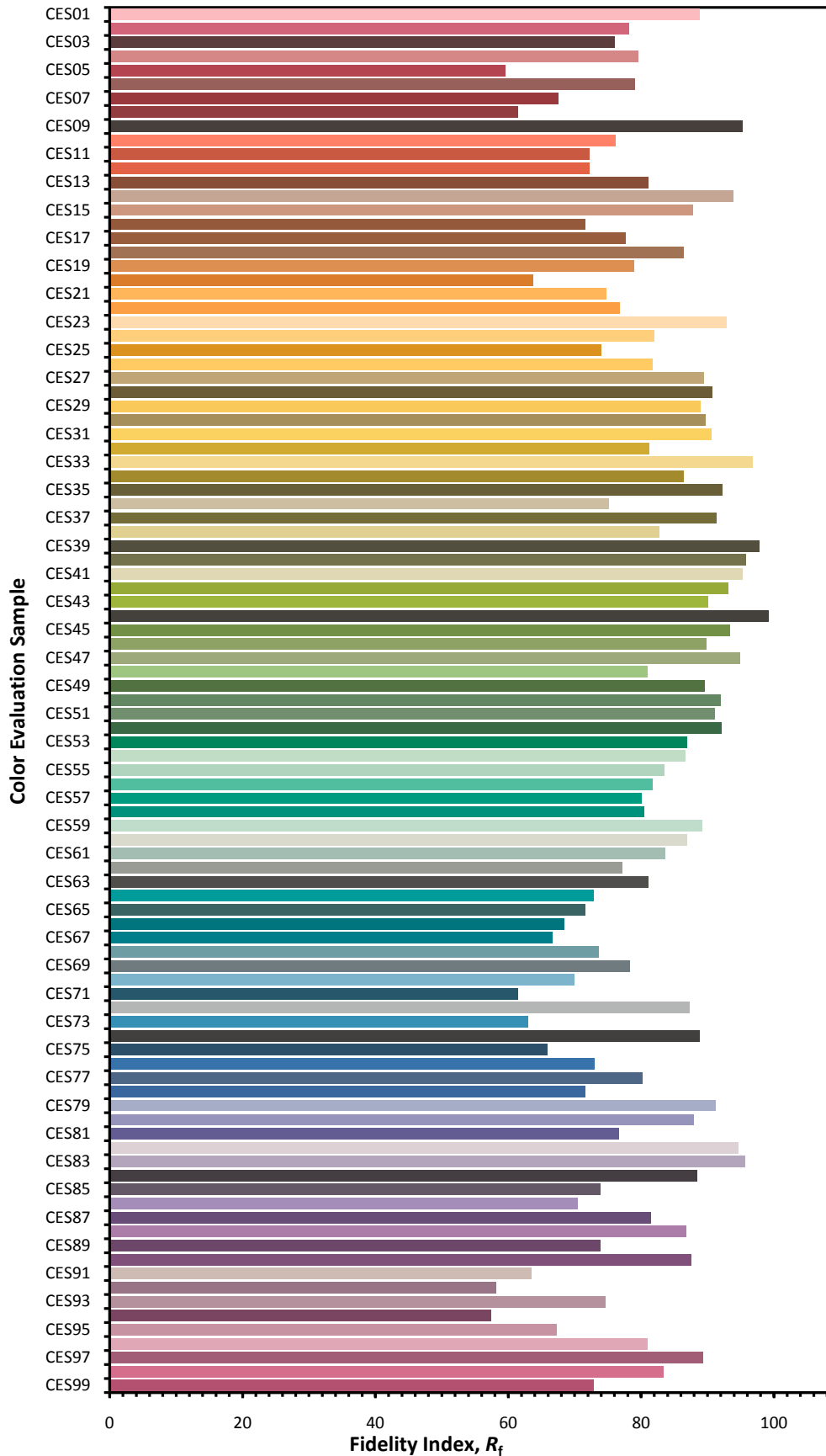


Color Vector Graphic

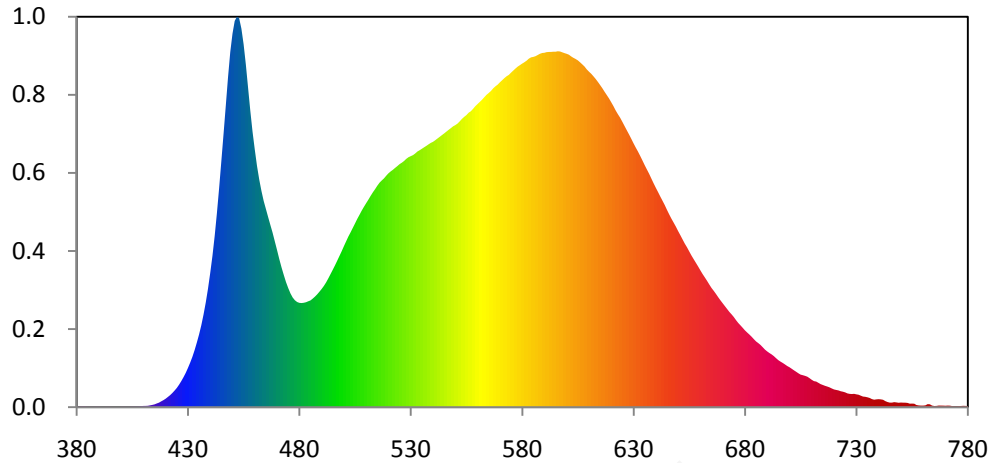


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



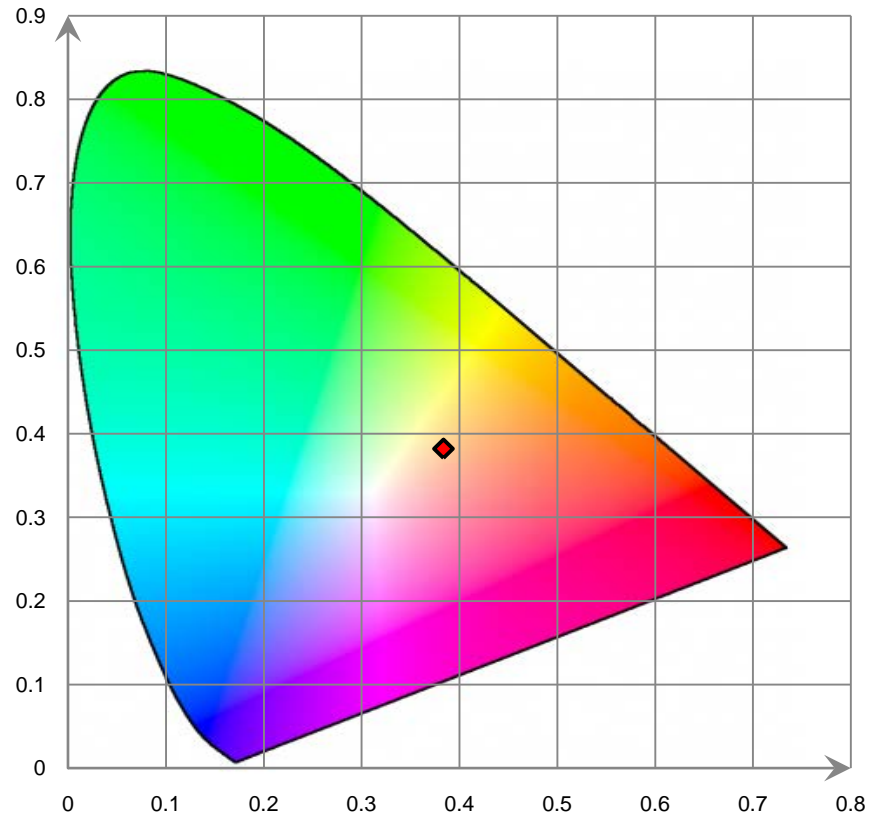
Relative Spectral Power Distribution



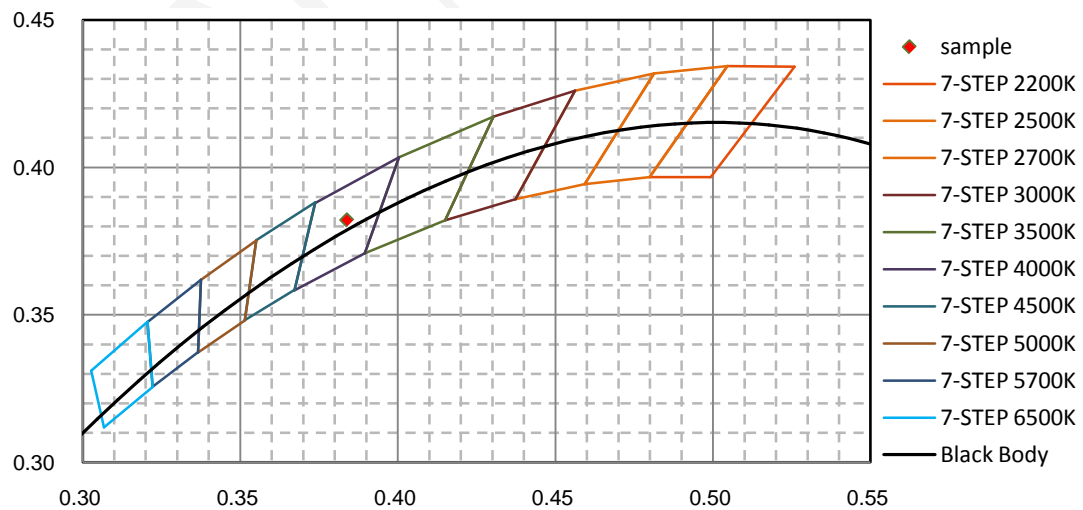
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.610E-02	421	6.292E-01	462	1.399E+01	503	1.074E+01	544	1.671E+01
381	2.930E-02	422	7.396E-01	463	1.328E+01	504	1.101E+01	545	1.681E+01
382	3.510E-02	423	8.699E-01	464	1.267E+01	505	1.129E+01	546	1.692E+01
383	4.190E-02	424	1.020E+00	465	1.217E+01	506	1.156E+01	547	1.704E+01
384	4.200E-02	425	1.179E+00	466	1.168E+01	507	1.182E+01	548	1.714E+01
385	2.440E-02	426	1.378E+00	467	1.119E+01	508	1.207E+01	549	1.725E+01
386	2.070E-02	427	1.598E+00	468	1.072E+01	509	1.231E+01	550	1.733E+01
387	1.920E-02	428	1.838E+00	469	1.018E+01	510	1.253E+01	551	1.742E+01
388	2.100E-02	429	2.103E+00	470	9.650E+00	511	1.275E+01	552	1.756E+01
389	3.170E-02	430	2.407E+00	471	9.100E+00	512	1.298E+01	553	1.771E+01
390	3.130E-02	431	2.734E+00	472	8.593E+00	513	1.320E+01	554	1.783E+01
391	1.390E-02	432	3.091E+00	473	8.131E+00	514	1.339E+01	555	1.794E+01
392	9.300E-03	433	3.507E+00	474	7.691E+00	515	1.360E+01	556	1.809E+01
393	2.020E-02	434	3.973E+00	475	7.321E+00	516	1.379E+01	557	1.818E+01
394	2.510E-02	435	4.468E+00	476	6.992E+00	517	1.393E+01	558	1.833E+01
395	2.300E-02	436	5.031E+00	477	6.738E+00	518	1.405E+01	559	1.849E+01
396	1.180E-02	437	5.689E+00	478	6.568E+00	519	1.422E+01	560	1.862E+01
397	6.700E-03	438	6.428E+00	479	6.460E+00	520	1.437E+01	561	1.875E+01
398	3.500E-03	439	7.272E+00	480	6.407E+00	521	1.448E+01	562	1.888E+01
399	1.900E-03	440	8.239E+00	481	6.395E+00	522	1.458E+01	563	1.904E+01
400	1.890E-02	441	9.288E+00	482	6.412E+00	523	1.470E+01	564	1.918E+01
401	2.500E-02	442	1.051E+01	483	6.447E+00	524	1.481E+01	565	1.930E+01
402	2.200E-02	443	1.191E+01	484	6.504E+00	525	1.493E+01	566	1.942E+01
403	1.920E-02	444	1.346E+01	485	6.558E+00	526	1.501E+01	567	1.958E+01
404	2.060E-02	445	1.512E+01	486	6.667E+00	527	1.512E+01	568	1.971E+01
405	3.040E-02	446	1.680E+01	487	6.790E+00	528	1.525E+01	569	1.981E+01
406	3.090E-02	447	1.853E+01	488	6.928E+00	529	1.535E+01	570	1.995E+01
407	3.430E-02	448	2.027E+01	489	7.089E+00	530	1.542E+01	571	2.008E+01
408	3.990E-02	449	2.181E+01	490	7.257E+00	531	1.548E+01	572	2.021E+01
409	6.620E-02	450	2.294E+01	491	7.445E+00	532	1.558E+01	573	2.032E+01
410	7.750E-02	451	2.373E+01	492	7.660E+00	533	1.570E+01	574	2.041E+01
411	7.960E-02	452	2.398E+01	493	7.909E+00	534	1.578E+01	575	2.054E+01
412	8.640E-02	453	2.389E+01	494	8.173E+00	535	1.587E+01	576	2.067E+01
413	1.120E-01	454	2.325E+01	495	8.439E+00	536	1.596E+01	577	2.080E+01
414	1.387E-01	455	2.228E+01	496	8.710E+00	537	1.605E+01	578	2.092E+01
415	1.734E-01	456	2.104E+01	497	8.995E+00	538	1.614E+01	579	2.101E+01
416	2.276E-01	457	1.962E+01	498	9.286E+00	539	1.623E+01	580	2.110E+01
417	2.789E-01	458	1.820E+01	499	9.576E+00	540	1.630E+01	581	2.119E+01
418	3.584E-01	459	1.692E+01	500	9.888E+00	541	1.640E+01	582	2.128E+01
419	4.320E-01	460	1.583E+01	501	1.019E+01	542	1.650E+01	583	2.141E+01
420	5.212E-01	461	1.482E+01	502	1.048E+01	543	1.660E+01	584	2.149E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.151E+01	626	1.726E+01	667	6.957E+00	708	1.872E+00	749	2.698E-01
586	2.156E+01	627	1.700E+01	668	6.756E+00	709	1.782E+00	750	2.850E-01
587	2.163E+01	628	1.675E+01	669	6.566E+00	710	1.682E+00	751	2.773E-01
588	2.171E+01	629	1.648E+01	670	6.386E+00	711	1.601E+00	752	2.764E-01
589	2.176E+01	630	1.621E+01	671	6.209E+00	712	1.574E+00	753	2.611E-01
590	2.177E+01	631	1.595E+01	672	6.032E+00	713	1.495E+00	754	2.156E-01
591	2.181E+01	632	1.570E+01	673	5.854E+00	714	1.416E+00	755	2.218E-01
592	2.182E+01	633	1.543E+01	674	5.703E+00	715	1.363E+00	756	2.144E-01
593	2.182E+01	634	1.515E+01	675	5.540E+00	716	1.310E+00	757	1.309E-01
594	2.183E+01	635	1.487E+01	676	5.347E+00	717	1.267E+00	758	1.071E-01
595	2.183E+01	636	1.460E+01	677	5.174E+00	718	1.216E+00	759	9.860E-02
596	2.186E+01	637	1.434E+01	678	5.027E+00	719	1.148E+00	760	9.850E-02
597	2.185E+01	638	1.404E+01	679	4.875E+00	720	1.090E+00	761	1.123E-01
598	2.180E+01	639	1.375E+01	680	4.720E+00	721	1.058E+00	762	1.866E-01
599	2.175E+01	640	1.348E+01	681	4.587E+00	722	1.030E+00	763	1.764E-01
600	2.170E+01	641	1.321E+01	682	4.463E+00	723	9.779E-01	764	9.890E-02
601	2.165E+01	642	1.294E+01	683	4.329E+00	724	9.509E-01	765	7.210E-02
602	2.155E+01	643	1.268E+01	684	4.179E+00	725	9.094E-01	766	7.990E-02
603	2.146E+01	644	1.242E+01	685	4.038E+00	726	8.468E-01	767	1.007E-01
604	2.139E+01	645	1.212E+01	686	3.937E+00	727	8.166E-01	768	9.720E-02
605	2.130E+01	646	1.185E+01	687	3.824E+00	728	8.076E-01	769	9.510E-02
606	2.118E+01	647	1.158E+01	688	3.682E+00	729	8.209E-01	770	8.800E-02
607	2.106E+01	648	1.134E+01	689	3.536E+00	730	7.880E-01	771	9.730E-02
608	2.092E+01	649	1.109E+01	690	3.425E+00	731	7.645E-01	772	9.250E-02
609	2.075E+01	650	1.082E+01	691	3.327E+00	732	7.074E-01	773	6.860E-02
610	2.061E+01	651	1.057E+01	692	3.239E+00	733	6.534E-01	774	5.320E-02
611	2.048E+01	652	1.031E+01	693	3.136E+00	734	6.374E-01	775	5.820E-02
612	2.033E+01	653	1.005E+01	694	3.007E+00	735	6.066E-01	776	7.030E-02
613	2.016E+01	654	9.821E+00	695	2.887E+00	736	5.661E-01	777	7.400E-02
614	1.998E+01	655	9.566E+00	696	2.797E+00	737	4.959E-01	778	8.440E-02
615	1.979E+01	656	9.317E+00	697	2.715E+00	738	4.609E-01	779	7.880E-02
616	1.959E+01	657	9.089E+00	698	2.625E+00	739	4.795E-01	780	6.980E-02
617	1.938E+01	658	8.866E+00	699	2.528E+00	740	4.911E-01		
618	1.917E+01	659	8.642E+00	700	2.453E+00	741	4.806E-01		
619	1.896E+01	660	8.407E+00	701	2.360E+00	742	4.548E-01		
620	1.873E+01	661	8.178E+00	702	2.264E+00	743	3.736E-01		
621	1.849E+01	662	7.972E+00	703	2.176E+00	744	3.175E-01		
622	1.822E+01	663	7.760E+00	704	2.081E+00	745	2.808E-01		
623	1.799E+01	664	7.537E+00	705	2.001E+00	746	2.815E-01		
624	1.778E+01	665	7.324E+00	706	1.965E+00	747	3.092E-01		
625	1.752E+01	666	7.146E+00	707	1.923E+00	748	2.937E-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**

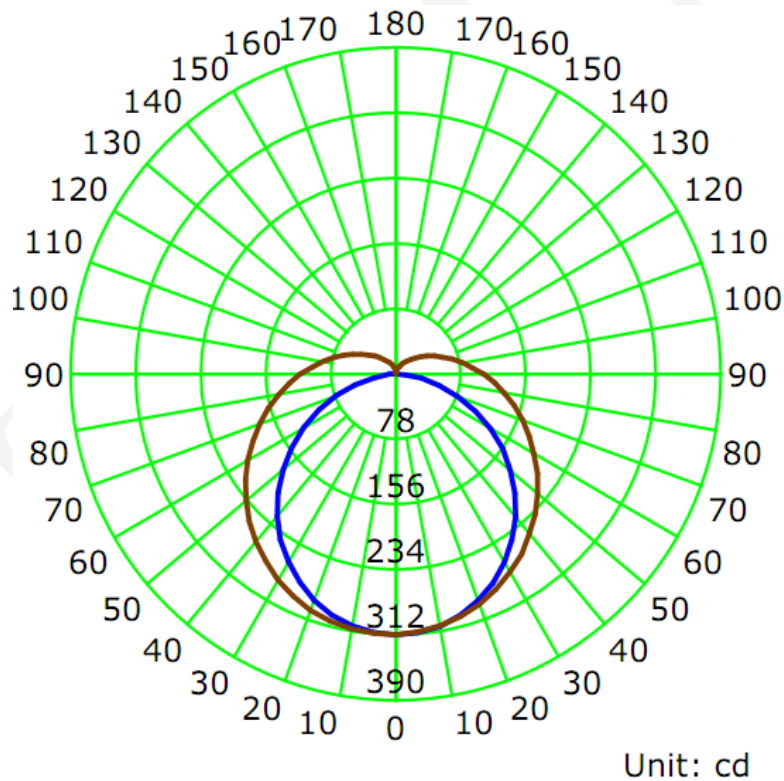
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0760	9.02	0.9870

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1255	139.18	312.4	1.24	1.33

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	109.6	123.9	148.0	128.2	127.4
Field Angle (10% I _{max}):	159.1	219.6	262.3	231.7	218.2

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	312	312	312	312	312	312	312	312
5.0°	311	310	310	311	310	311	310	311
10.0°	306	306	305	307	306	307	306	306
15.0°	299	298	299	301	300	301	300	299
20.0°	288	288	289	292	293	294	291	289
25.0°	276	275	278	282	284	284	281	277
30.0°	260	260	264	270	274	273	268	263
35.0°	243	243	249	258	263	260	254	246
40.0°	224	224	233	243	250	247	238	228
45.0°	202	203	215	228	237	232	221	208
50.0°	180	182	197	212	223	217	203	188
55.0°	157	160	177	196	208	202	185	166
60.0°	132	137	159	180	192	185	167	144
65.0°	106	114	140	164	177	170	149	122
70.0°	80	91	122	147	162	154	131	101
75.0°	54	70	105	133	147	139	114	80
80.0°	31	51	89	118	133	125	99	63
85.0°	11	36	75	104	119	111	85	48
90.0°	1	24	63	91	106	98	72	35
95.0°	0	17	52	79	93	86	62	27
100.0°	1	12	43	69	82	75	52	20
105.0°	1	9	36	59	71	64	43	15
110.0°	1	7	29	50	61	55	36	12
115.0°	1	7	24	43	52	46	30	10
120.0°	1	6	20	36	44	39	25	9
125.0°	1	6	17	30	37	33	21	8
130.0°	1	5	15	25	31	27	18	7
135.0°	1	5	13	21	26	23	15	7
140.0°	1	5	12	18	21	19	12	6
145.0°	1	5	10	15	17	15	10	6
150.0°	1	5	9	13	14	12	8	5
155.0°	1	5	8	10	11	10	7	4
160.0°	1	5	7	9	9	7	5	2
165.0°	2	2	6	7	7	6	2	2
170.0°	2	2	2	4	4	2	2	2
175.0°	2	2	2	2	2	2	2	2
180.0°	0	0	0	0	0	0	0	0

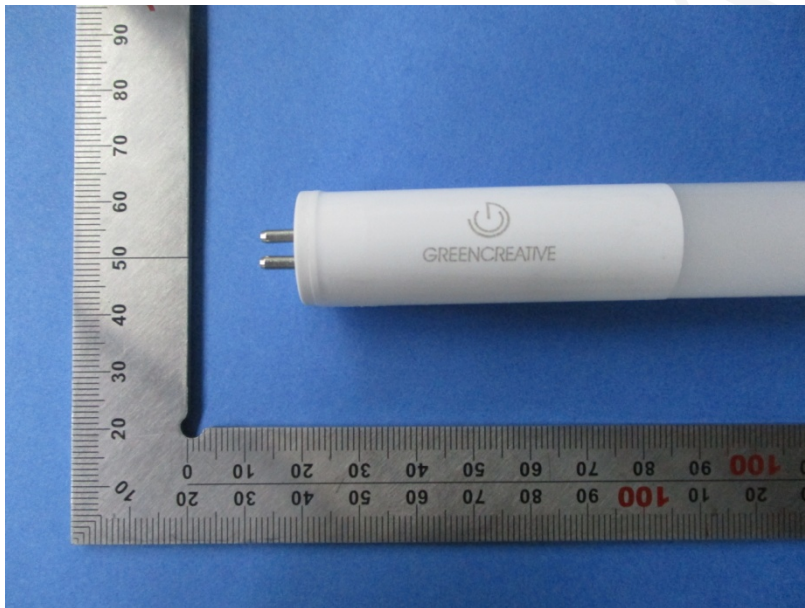
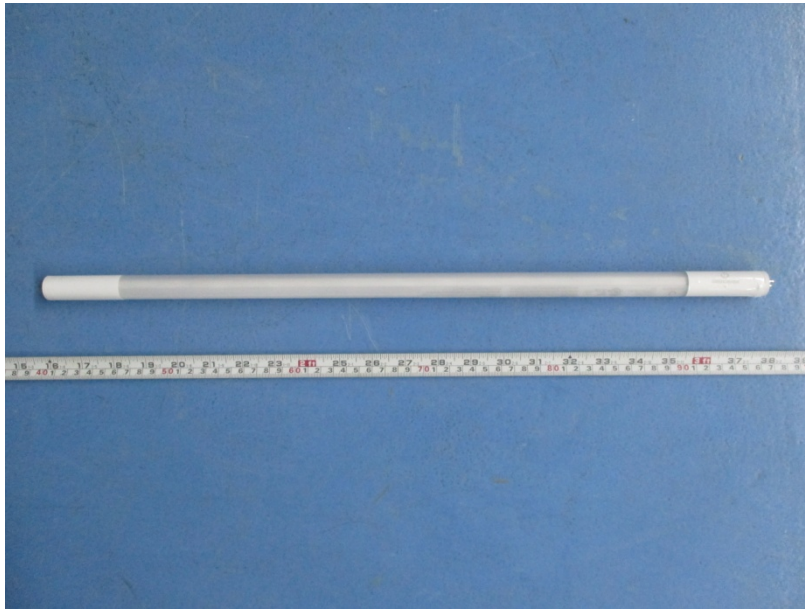
Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	312	312	312	312	312	312	312	312
5.0°	311	311	312	311	311	312	311	310
10.0°	306	307	309	310	310	310	308	306
15.0°	299	301	302	305	306	305	302	300
20.0°	288	290	295	299	301	299	295	290
25.0°	275	279	284	291	293	291	284	278
30.0°	259	263	271	280	285	281	272	264
35.0°	243	247	256	268	274	270	259	247
40.0°	222	228	241	255	262	256	243	229
45.0°	201	208	223	240	249	242	227	210
50.0°	178	186	206	225	236	228	210	189
55.0°	154	164	187	209	221	213	192	168
60.0°	129	141	168	192	206	197	174	146
65.0°	103	117	149	176	190	180	157	124
70.0°	76	94	131	159	175	163	139	103
75.0°	51	73	113	143	159	148	122	84
80.0°	28	53	96	128	144	133	105	66
85.0°	9	37	81	113	129	119	91	50
90.0°	1	25	67	99	115	106	78	38
95.0°	0	17	56	86	102	93	67	30
100.0°	0	13	47	75	89	82	57	23
105.0°	1	10	39	65	78	71	48	18
110.0°	0	8	33	55	67	61	41	15
115.0°	0	7	27	47	57	52	34	12
120.0°	0	6	23	40	49	44	29	11
125.0°	0	6	19	34	41	37	24	10
130.0°	0	6	16	28	34	31	21	9
135.0°	1	5	14	23	28	26	18	8
140.0°	1	5	12	19	24	22	15	8
145.0°	1	5	11	16	19	18	13	7
150.0°	1	4	9	13	16	15	11	7
155.0°	1	4	8	11	13	12	9	6
160.0°	2	4	7	9	10	10	8	5
165.0°	2	3	4	7	8	8	6	5
170.0°	2	2	3	5	6	6	5	3
175.0°	2	2	2	2	3	3	3	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	0.59	0-5	7.4	0.59
5-10	22.1	1.76	0-10	29.5	2.35
10-15	36.1	2.87	0-15	65.6	5.23
15-20	48.9	3.90	0-20	114.5	9.13
20-25	60.3	4.80	0-25	174.8	13.93
25-30	69.8	5.56	0-30	244.5	19.49
30-35	77.2	6.15	0-35	321.7	25.64
35-40	82.4	6.57	0-40	404.1	32.20
40-45	85.3	6.80	0-45	489.4	39.00
45-50	85.9	6.85	0-50	575.3	45.84
50-55	84.4	6.73	0-55	659.8	52.57
55-60	81.0	6.45	0-60	740.7	59.02
60-65	75.7	6.03	0-65	816.4	65.06
65-70	69.1	5.50	0-70	885.5	70.56
70-75	61.4	4.90	0-75	946.9	75.46
75-80	53.4	4.26	0-80	1000.4	79.71
80-85	45.5	3.62	0-85	1045.8	83.34
85-90	38.3	3.05	0-90	1084.1	86.39
90-95	32.3	2.57	0-95	1116.4	88.96
95-100	27.2	2.17	0-100	1143.7	91.13
100-105	22.8	1.82	0-105	1166.4	92.95
105-110	18.9	1.51	0-110	1185.3	94.45
110-115	15.5	1.24	0-115	1200.9	95.69
115-120	12.6	1.01	0-120	1213.5	96.70
120-125	10.2	0.81	0-125	1223.7	97.51
125-130	8.1	0.65	0-130	1231.8	98.15
130-135	6.4	0.51	0-135	1238.2	98.66
135-140	5.0	0.40	0-140	1243.2	99.06
140-145	3.8	0.30	0-145	1247.0	99.37
145-150	2.9	0.23	0-150	1249.9	99.59
150-155	2.1	0.17	0-155	1252.0	99.76
155-160	1.4	0.11	0-160	1253.4	99.88
160-165	0.9	0.07	0-165	1254.3	99.95
165-170	0.5	0.04	0-170	1254.8	99.98
170-175	0.2	0.01	0-175	1254.9	100.00
175-180	0.0	0.00	0-180	1255.0	100.00

6. Product Photo



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