



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 10.5/T8/4F/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:	PKS181012082-10-5
Test Date:	2018-10-16
Report Date:	2018-10-18
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 2018-10-16 and used for testing.

Model Tested: 10.5/T8/4F/850/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 50/60Hz
 Rated Power: 10.5W
 Nominal CCT: 5000K
 Nominal Lumen Output: 1750lm

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**

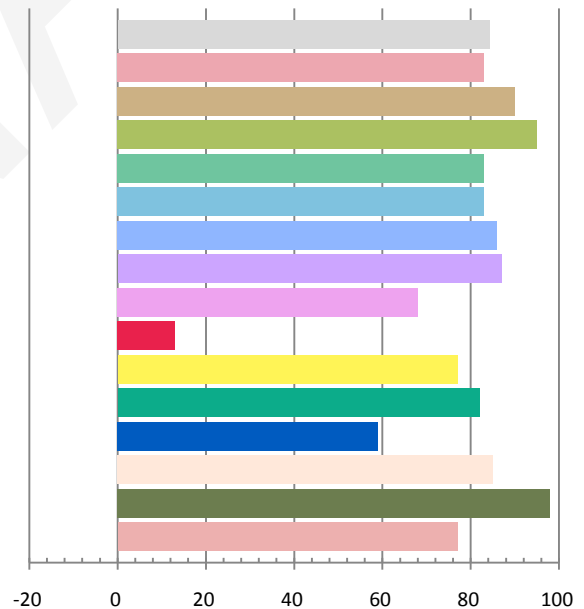
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0949	11.14	0.9774	1759.1	157.97

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
5.434	4968	0.00223	0.3465	0.3572	0.2102	0.4876

Color Rendering Index

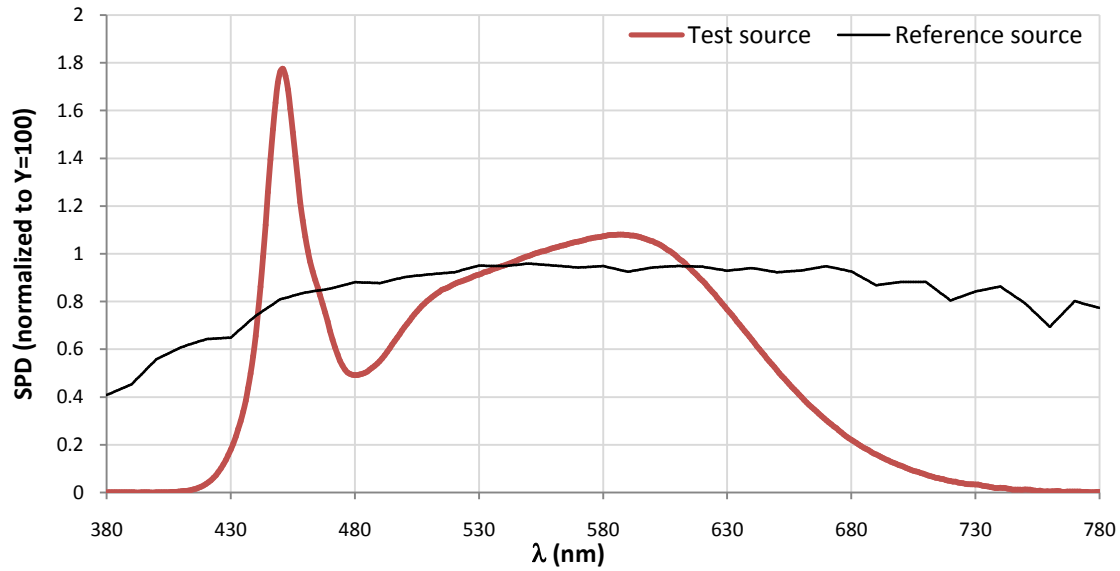
Ra 84.3			
R1 83	R2 90	R3 95	R4 83
R5 83	R6 86	R7 87	R8 68
R9 13	R10 77	R11 82	R12 59
R13 85	R14 98	R15 77	



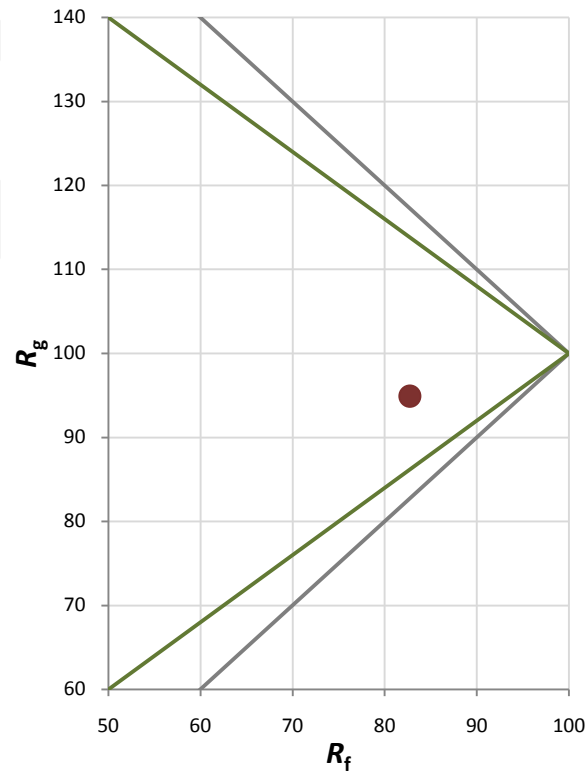
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	95

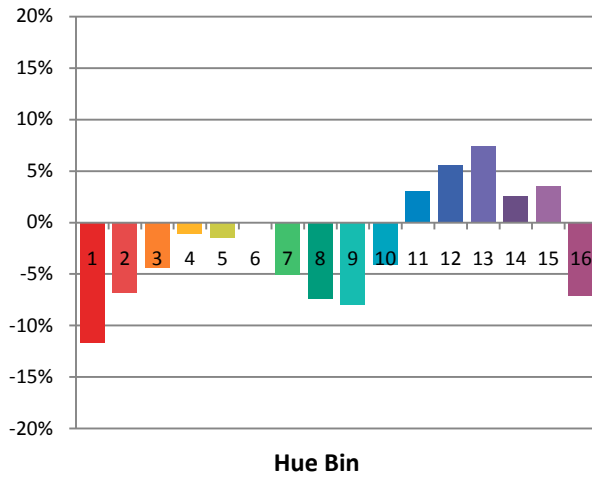
Spectral Power Distribution Comparison



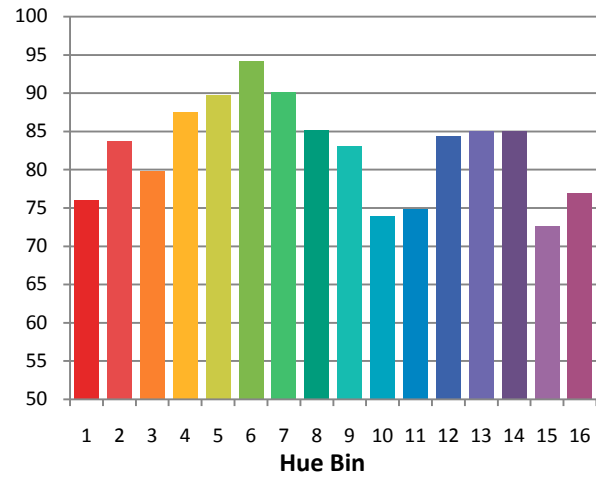
Plot of R_g versus R_f



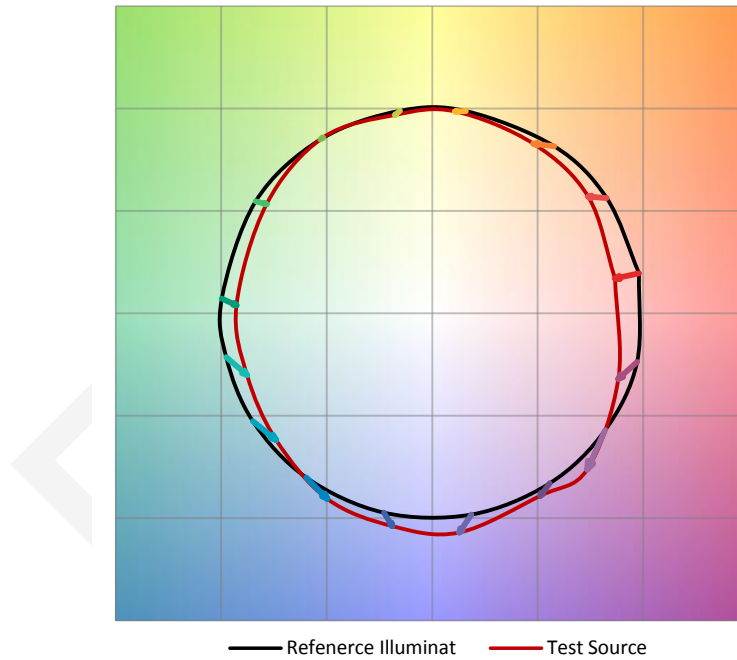
Chroma Shift by Hue



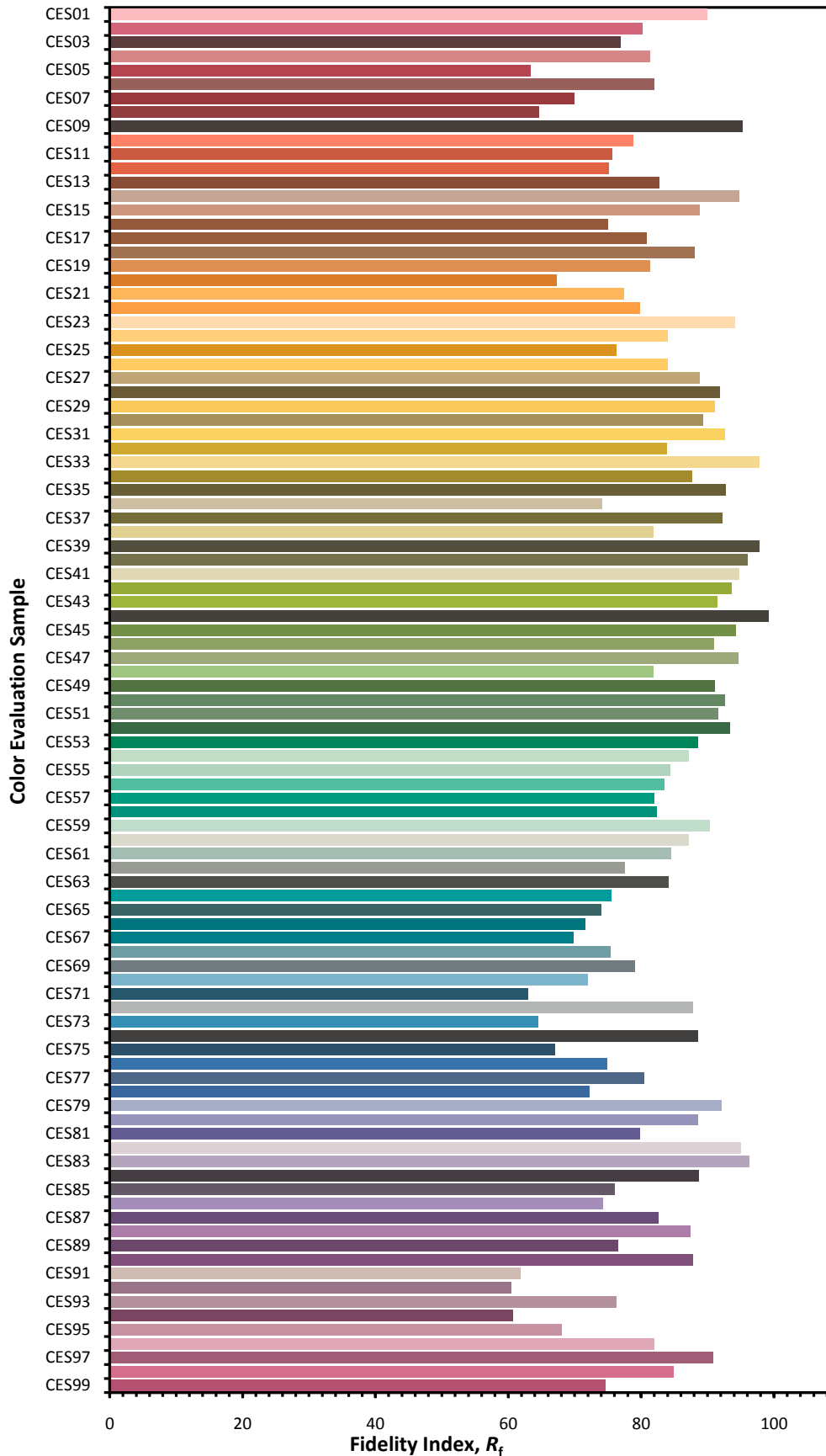
R_f by Hue



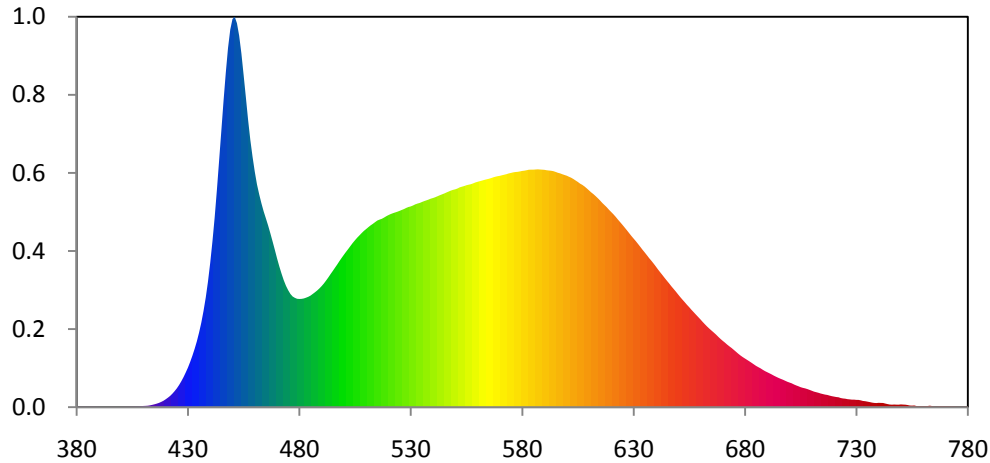
Color Vector Graphic



Color Fidelity by CES Sample



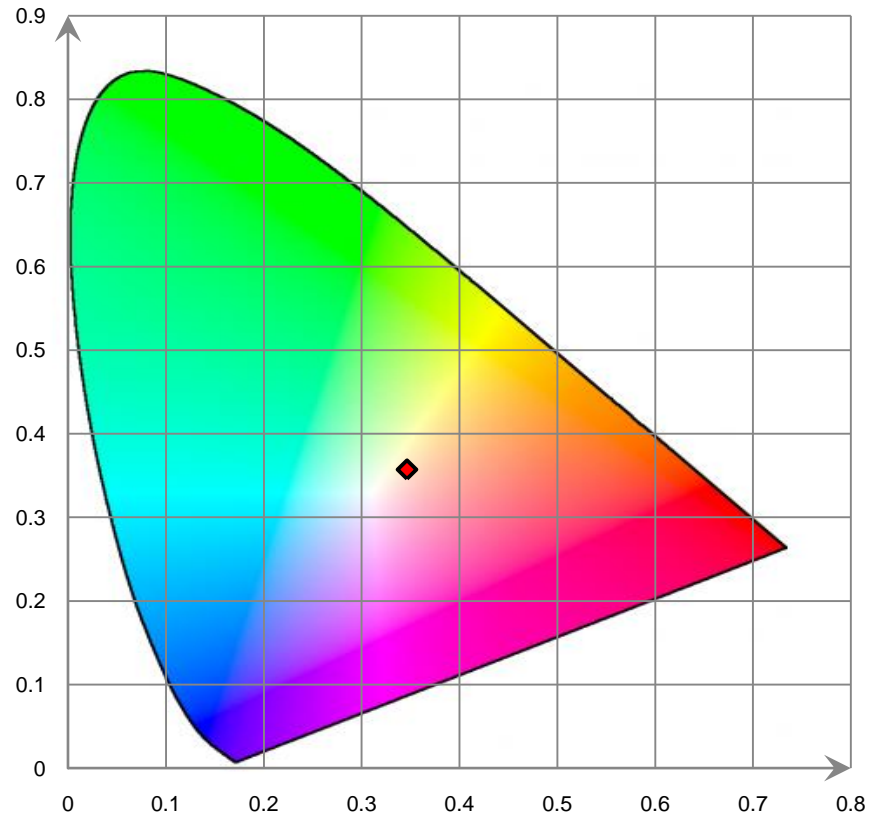
Relative Spectral Power Distribution



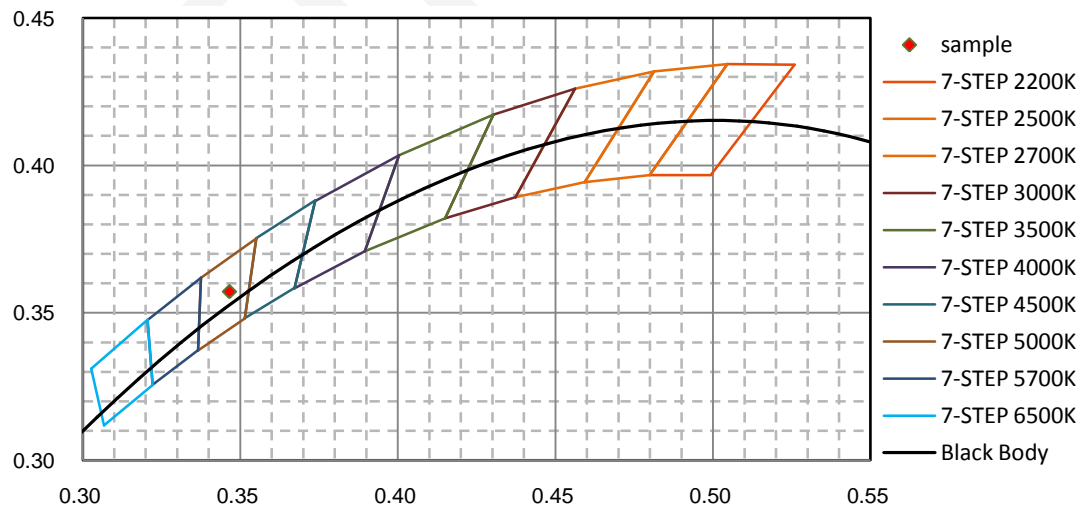
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.730E-02	421	1.110E+00	462	2.490E+01	503	1.889E+01	544	2.490E+01
381	4.380E-02	422	1.318E+00	463	2.385E+01	504	1.923E+01	545	2.500E+01
382	3.560E-02	423	1.576E+00	464	2.291E+01	505	1.955E+01	546	2.512E+01
383	3.860E-02	424	1.867E+00	465	2.209E+01	506	1.984E+01	547	2.523E+01
384	4.550E-02	425	2.198E+00	466	2.126E+01	507	2.011E+01	548	2.535E+01
385	3.420E-02	426	2.584E+00	467	2.035E+01	508	2.038E+01	549	2.544E+01
386	4.200E-02	427	3.023E+00	468	1.940E+01	509	2.064E+01	550	2.550E+01
387	4.490E-02	428	3.507E+00	469	1.842E+01	510	2.085E+01	551	2.560E+01
388	3.550E-02	429	4.051E+00	470	1.742E+01	511	2.107E+01	552	2.573E+01
389	3.940E-02	430	4.631E+00	471	1.649E+01	512	2.127E+01	553	2.580E+01
390	3.320E-02	431	5.293E+00	472	1.564E+01	513	2.145E+01	554	2.588E+01
391	1.710E-02	432	6.026E+00	473	1.487E+01	514	2.166E+01	555	2.598E+01
392	1.130E-02	433	6.821E+00	474	1.421E+01	515	2.184E+01	556	2.604E+01
393	1.320E-02	434	7.710E+00	475	1.369E+01	516	2.195E+01	557	2.610E+01
394	1.920E-02	435	8.732E+00	476	1.325E+01	517	2.205E+01	558	2.619E+01
395	2.460E-02	436	9.894E+00	477	1.296E+01	518	2.219E+01	559	2.630E+01
396	2.650E-02	437	1.126E+01	478	1.279E+01	519	2.234E+01	560	2.638E+01
397	1.980E-02	438	1.284E+01	479	1.268E+01	520	2.248E+01	561	2.645E+01
398	1.300E-02	439	1.469E+01	480	1.266E+01	521	2.260E+01	562	2.653E+01
399	7.100E-03	440	1.689E+01	481	1.268E+01	522	2.270E+01	563	2.660E+01
400	1.950E-02	441	1.938E+01	482	1.272E+01	523	2.279E+01	564	2.666E+01
401	3.140E-02	442	2.221E+01	483	1.281E+01	524	2.288E+01	565	2.673E+01
402	3.740E-02	443	2.544E+01	484	1.292E+01	525	2.298E+01	566	2.680E+01
403	3.890E-02	444	2.887E+01	485	1.306E+01	526	2.309E+01	567	2.690E+01
404	4.500E-02	445	3.239E+01	486	1.325E+01	527	2.319E+01	568	2.697E+01
405	4.760E-02	446	3.589E+01	487	1.345E+01	528	2.333E+01	569	2.704E+01
406	5.450E-02	447	3.917E+01	488	1.365E+01	529	2.343E+01	570	2.708E+01
407	5.830E-02	448	4.204E+01	489	1.389E+01	530	2.350E+01	571	2.714E+01
408	6.620E-02	449	4.420E+01	490	1.416E+01	531	2.360E+01	572	2.721E+01
409	1.064E-01	450	4.542E+01	491	1.447E+01	532	2.373E+01	573	2.727E+01
410	1.432E-01	451	4.570E+01	492	1.482E+01	533	2.383E+01	574	2.736E+01
411	1.565E-01	452	4.493E+01	493	1.518E+01	534	2.390E+01	575	2.742E+01
412	1.721E-01	453	4.347E+01	494	1.557E+01	535	2.401E+01	576	2.748E+01
413	2.179E-01	454	4.139E+01	495	1.594E+01	536	2.412E+01	577	2.752E+01
414	2.727E-01	455	3.887E+01	496	1.632E+01	537	2.420E+01	578	2.755E+01
415	3.370E-01	456	3.628E+01	497	1.670E+01	538	2.430E+01	579	2.759E+01
416	4.137E-01	457	3.364E+01	498	1.710E+01	539	2.441E+01	580	2.765E+01
417	5.025E-01	458	3.129E+01	499	1.748E+01	540	2.448E+01	581	2.768E+01
418	6.152E-01	459	2.933E+01	500	1.784E+01	541	2.457E+01	582	2.773E+01
419	7.488E-01	460	2.757E+01	501	1.819E+01	542	2.469E+01	583	2.779E+01
420	9.193E-01	461	2.607E+01	502	1.853E+01	543	2.480E+01	584	2.780E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.780E+01	626	2.104E+01	667	8.506E+00	708	2.121E+00	749	2.914E-01
586	2.782E+01	627	2.071E+01	668	8.246E+00	709	2.026E+00	750	3.234E-01
587	2.783E+01	628	2.038E+01	669	7.996E+00	710	1.923E+00	751	3.057E-01
588	2.782E+01	629	2.005E+01	670	7.772E+00	711	1.824E+00	752	2.936E-01
589	2.780E+01	630	1.974E+01	671	7.564E+00	712	1.757E+00	753	2.512E-01
590	2.778E+01	631	1.944E+01	672	7.337E+00	713	1.686E+00	754	1.977E-01
591	2.773E+01	632	1.912E+01	673	7.123E+00	714	1.600E+00	755	1.828E-01
592	2.770E+01	633	1.878E+01	674	6.931E+00	715	1.537E+00	756	1.989E-01
593	2.767E+01	634	1.844E+01	675	6.710E+00	716	1.471E+00	757	1.349E-01
594	2.762E+01	635	1.812E+01	676	6.487E+00	717	1.430E+00	758	1.132E-01
595	2.754E+01	636	1.779E+01	677	6.258E+00	718	1.354E+00	759	1.289E-01
596	2.744E+01	637	1.745E+01	678	6.049E+00	719	1.291E+00	760	1.102E-01
597	2.737E+01	638	1.714E+01	679	5.866E+00	720	1.240E+00	761	1.198E-01
598	2.727E+01	639	1.682E+01	680	5.698E+00	721	1.188E+00	762	1.389E-01
599	2.718E+01	640	1.647E+01	681	5.535E+00	722	1.162E+00	763	1.793E-01
600	2.710E+01	641	1.611E+01	682	5.364E+00	723	1.068E+00	764	1.340E-01
601	2.697E+01	642	1.578E+01	683	5.193E+00	724	1.018E+00	765	6.600E-02
602	2.686E+01	643	1.545E+01	684	5.012E+00	725	9.964E-01	766	7.060E-02
603	2.671E+01	644	1.511E+01	685	4.833E+00	726	9.391E-01	767	1.023E-01
604	2.653E+01	645	1.480E+01	686	4.689E+00	727	9.124E-01	768	1.118E-01
605	2.636E+01	646	1.448E+01	687	4.546E+00	728	8.815E-01	769	1.027E-01
606	2.617E+01	647	1.414E+01	688	4.379E+00	729	8.797E-01	770	9.560E-02
607	2.602E+01	648	1.384E+01	689	4.223E+00	730	8.524E-01	771	9.370E-02
608	2.583E+01	649	1.353E+01	690	4.093E+00	731	8.510E-01	772	8.550E-02
609	2.561E+01	650	1.320E+01	691	3.969E+00	732	8.008E-01	773	7.180E-02
610	2.537E+01	651	1.288E+01	692	3.832E+00	733	7.273E-01	774	7.060E-02
611	2.514E+01	652	1.258E+01	693	3.689E+00	734	6.992E-01	775	6.780E-02
612	2.494E+01	653	1.228E+01	694	3.562E+00	735	6.488E-01	776	4.660E-02
613	2.470E+01	654	1.198E+01	695	3.435E+00	736	5.987E-01	777	4.080E-02
614	2.445E+01	655	1.170E+01	696	3.320E+00	737	5.411E-01	778	4.850E-02
615	2.418E+01	656	1.140E+01	697	3.221E+00	738	4.965E-01	779	6.270E-02
616	2.390E+01	657	1.112E+01	698	3.096E+00	739	4.829E-01	780	5.710E-02
617	2.365E+01	658	1.084E+01	699	2.978E+00	740	5.062E-01		
618	2.339E+01	659	1.056E+01	700	2.883E+00	741	4.974E-01		
619	2.310E+01	660	1.028E+01	701	2.791E+00	742	4.922E-01		
620	2.283E+01	661	9.990E+00	702	2.660E+00	743	4.258E-01		
621	2.257E+01	662	9.712E+00	703	2.550E+00	744	3.620E-01		
622	2.228E+01	663	9.446E+00	704	2.448E+00	745	3.087E-01		
623	2.196E+01	664	9.199E+00	705	2.338E+00	746	2.945E-01		
624	2.166E+01	665	8.971E+00	706	2.263E+00	747	3.123E-01		
625	2.136E+01	666	8.740E+00	707	2.202E+00	748	2.971E-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**

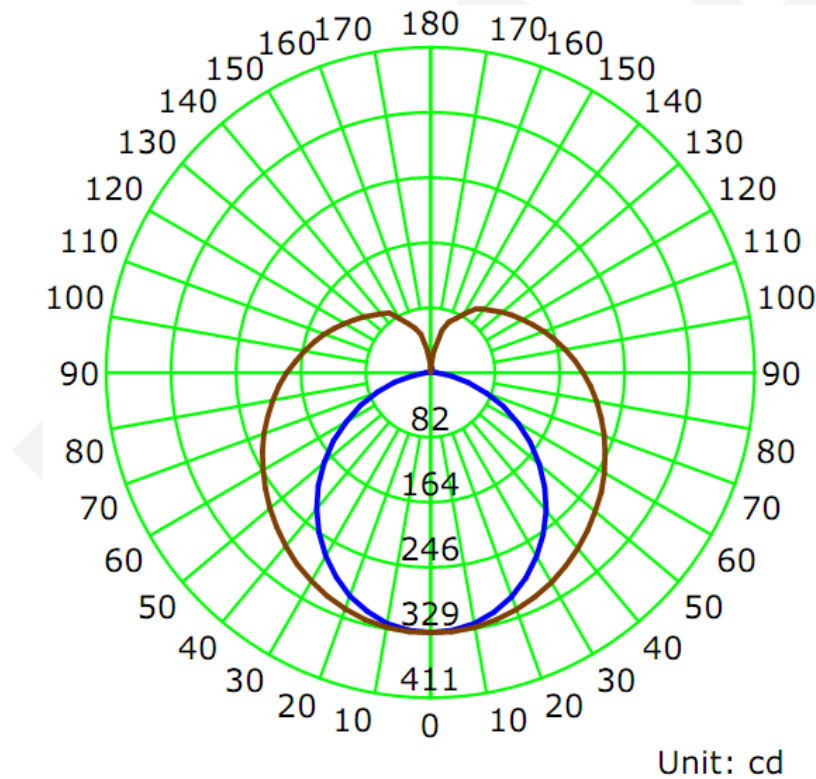
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0950	11.15	0.9810

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1761.9	158.06	329.2	1.21	1.39

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	105.6	141.7	203.7	146.1	149.3
Field Angle (10% I _{max}):	156.8	331.6	338.5	326.2	288.3

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	329	329	329	329	329	329	329	329
5.0°	328	328	328	329	329	329	328	328
10.0°	322	323	324	326	327	326	325	323
15.0°	314	315	318	322	324	322	319	316
20.0°	302	304	310	316	319	317	311	305
25.0°	287	291	299	309	313	310	301	292
30.0°	270	275	287	300	306	302	289	276
35.0°	250	257	273	290	299	293	275	258
40.0°	228	238	258	280	291	283	262	239
45.0°	205	217	243	269	282	273	247	219
50.0°	181	196	228	258	273	262	232	198
55.0°	155	175	212	247	264	251	218	177
60.0°	129	153	198	237	255	240	203	155
65.0°	102	132	184	226	245	230	190	135
70.0°	76	112	169	215	235	219	176	116
75.0°	50	94	157	204	225	208	163	99
80.0°	27	79	145	193	215	197	152	84
85.0°	9	66	135	182	204	186	141	71
90.0°	1	58	126	172	194	175	131	63
95.0°	1	53	118	164	184	166	123	57
100.0°	0	50	112	155	174	157	116	55
105.0°	0	49	106	147	163	148	109	53
110.0°	0	49	100	139	154	140	104	52
115.0°	0	50	96	131	145	132	99	53
120.0°	1	52	92	123	136	124	94	54
125.0°	1	50	88	117	127	117	91	52
130.0°	1	50	86	110	119	110	88	51
135.0°	1	50	83	104	112	104	85	51
140.0°	1	51	80	99	105	98	77	50
145.0°	1	51	73	95	99	92	69	44
150.0°	2	49	69	83	87	78	59	35
155.0°	4	46	65	75	77	69	48	28
160.0°	7	41	61	67	69	52	34	19
165.0°	7	33	49	57	56	35	18	11
170.0°	4	18	32	36	28	18	7	4
175.0°	2	5	9	12	7	4	2	2
180.0°	0	0	0	0	0	0	0	0

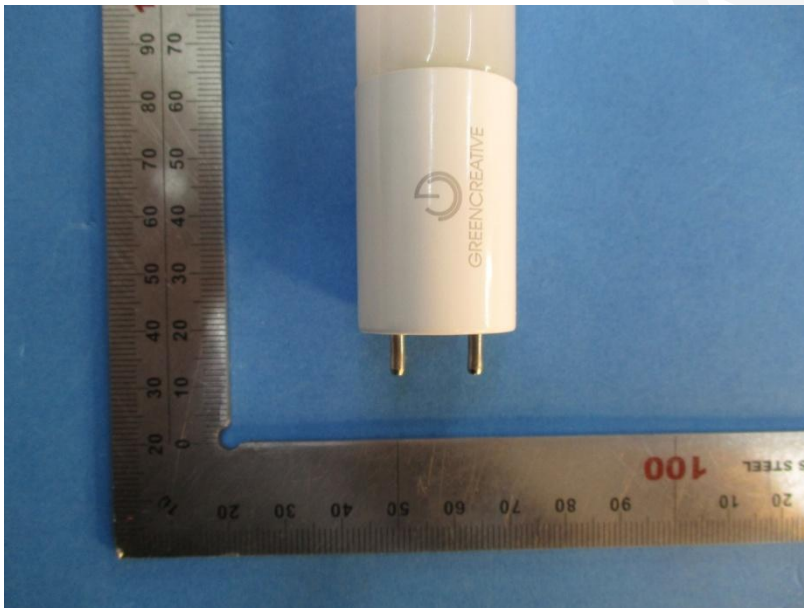
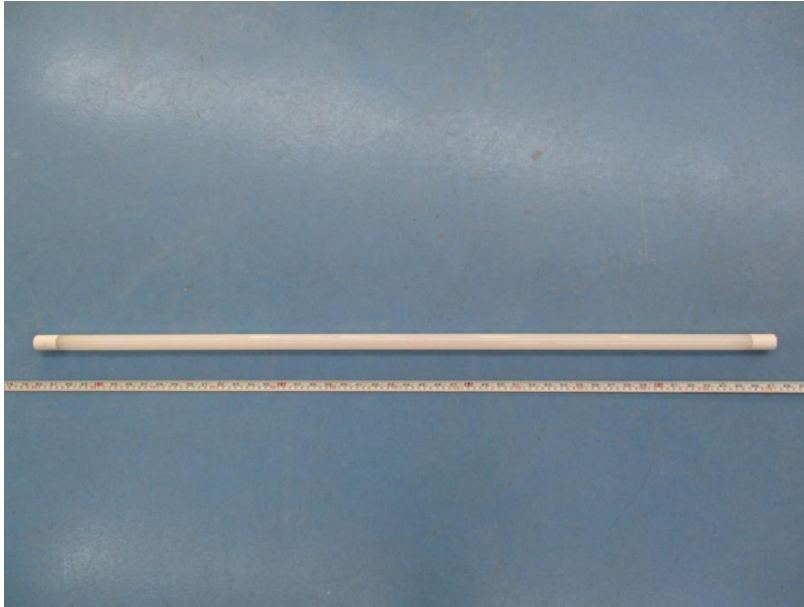
Luminous Intensity (cd) Distribution Data (cont.)

C γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	329	329	329	329	329	329	329	329
5.0°	327	328	328	329	329	328	328	328
10.0°	322	323	325	326	327	326	324	322
15.0°	313	314	318	321	323	321	318	314
20.0°	300	303	309	315	318	315	309	303
25.0°	285	289	298	307	312	307	298	290
30.0°	268	273	285	298	304	298	285	274
35.0°	247	255	271	288	296	289	272	256
40.0°	225	235	256	276	287	277	257	236
45.0°	202	214	240	265	277	266	242	216
50.0°	177	193	224	253	267	254	227	195
55.0°	151	171	209	241	257	243	212	173
60.0°	125	149	193	229	246	232	197	152
65.0°	98	127	178	217	236	220	183	131
70.0°	72	107	164	206	225	208	169	113
75.0°	47	89	150	194	215	196	156	96
80.0°	24	74	138	182	204	184	144	81
85.0°	7	62	127	172	193	174	132	69
90.0°	1	53	118	163	183	165	124	60
95.0°	1	48	110	152	173	155	115	55
100.0°	1	46	104	144	163	146	108	52
105.0°	1	44	98	136	153	138	102	50
110.0°	1	45	92	129	144	130	97	49
115.0°	1	46	88	121	135	122	92	50
120.0°	1	48	84	114	126	115	88	52
125.0°	1	44	81	107	118	109	85	50
130.0°	1	43	79	101	111	103	82	47
135.0°	1	43	77	96	104	97	80	47
140.0°	1	41	69	91	98	92	76	46
145.0°	1	35	62	87	93	88	66	44
150.0°	1	25	55	72	81	73	61	40
155.0°	2	22	46	64	69	65	56	32
160.0°	2	16	39	55	61	58	50	26
165.0°	2	10	24	38	51	48	36	17
170.0°	2	4	15	22	31	30	21	8
175.0°	2	2	4	6	10	9	6	2
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	7.9	0.45	0-5	7.9	0.45
5-10	23.3	1.32	0-10	31.2	1.77
10-15	38.1	2.16	0-15	69.3	3.93
15-20	51.8	2.94	0-20	121.1	6.87
20-25	63.9	3.63	0-25	185.0	10.50
25-30	74.2	4.21	0-30	259.1	14.71
30-35	82.4	4.68	0-35	341.5	19.39
35-40	88.6	5.03	0-40	430.1	24.41
40-45	92.6	5.26	0-45	522.8	29.67
45-50	94.7	5.37	0-50	617.4	35.04
50-55	94.8	5.38	0-55	712.2	40.42
55-60	93.1	5.29	0-60	805.3	45.71
60-65	90.0	5.11	0-65	895.3	50.82
65-70	85.7	4.86	0-70	981.0	55.68
70-75	80.4	4.56	0-75	1061.4	60.24
75-80	74.7	4.24	0-80	1136.1	64.48
80-85	68.8	3.91	0-85	1204.9	68.39
85-90	63.5	3.61	0-90	1268.5	72.00
90-95	59.2	3.36	0-95	1327.6	75.35
95-100	55.3	3.14	0-100	1382.9	78.49
100-105	51.5	2.92	0-105	1434.4	81.42
105-110	47.8	2.71	0-110	1482.2	84.13
110-115	44.1	2.50	0-115	1526.3	86.63
115-120	40.5	2.30	0-120	1566.7	88.93
120-125	36.7	2.08	0-125	1603.4	91.01
125-130	32.8	1.86	0-130	1636.3	92.87
130-135	29.3	1.66	0-135	1665.5	94.53
135-140	25.6	1.45	0-140	1691.1	95.98
140-145	21.6	1.23	0-145	1712.7	97.21
145-150	17.2	0.98	0-150	1729.9	98.19
150-155	12.9	0.73	0-155	1742.9	98.92
155-160	9.3	0.53	0-160	1752.2	99.45
160-165	5.9	0.33	0-165	1758.1	99.79
165-170	2.9	0.16	0-170	1761.0	99.95
170-175	0.8	0.05	0-175	1761.8	100.00
175-180	0.1	0.00	0-180	1761.9	100.00

6. Product Photo



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