



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 12T8/3F/840/BYP/FF

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180910086-10-4
Test Date:	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: 12T8/3F/840/BYP/FF
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: 12W
Nominal CCT: 4000K
Nominal Lumen Output: 1550lm

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**

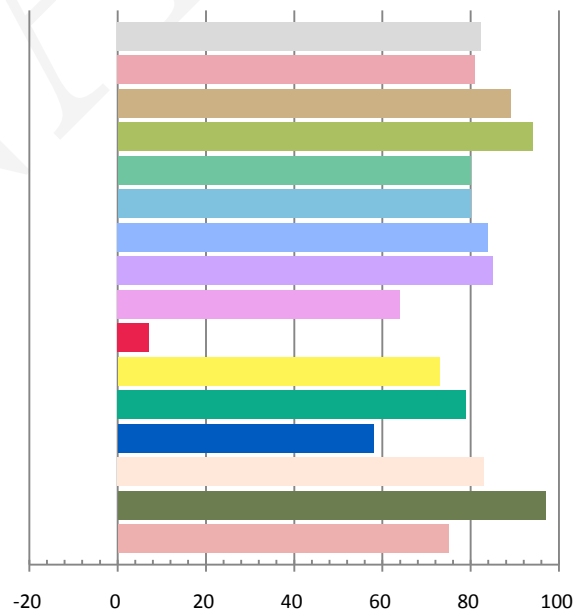
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.099	11.62	0.9783	1578.5	135.84

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
4.710	3925	0.00087	0.3845	0.3811	0.2260	0.5041

Color Rendering Index

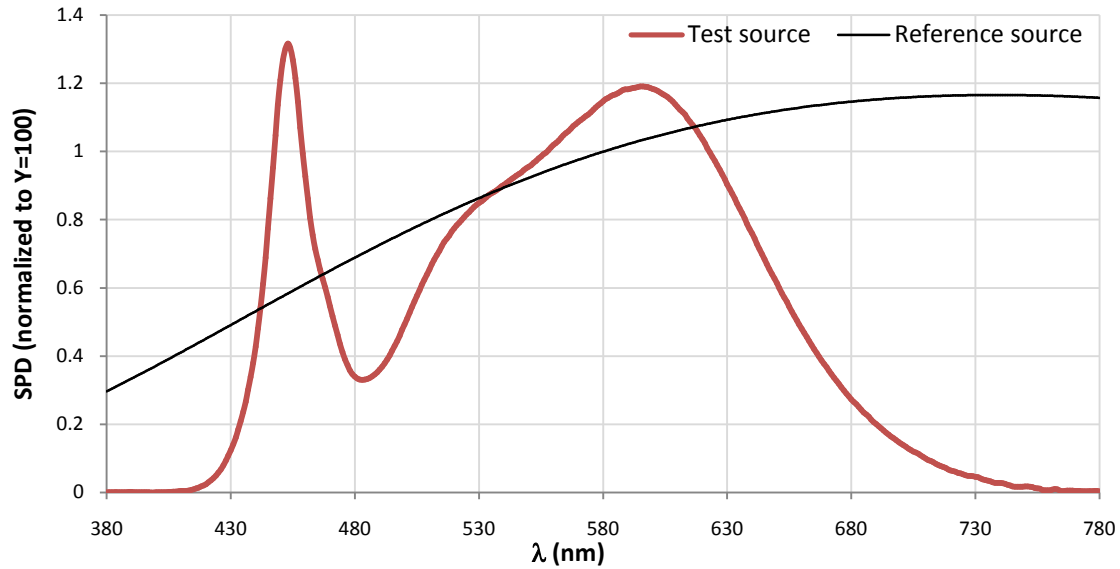
Ra 82.3			
R1 81	R2 89	R3 94	R4 80
R5 80	R6 84	R7 85	R8 64
R9 7	R10 73	R11 79	R12 58
R13 83	R14 97	R15 75	



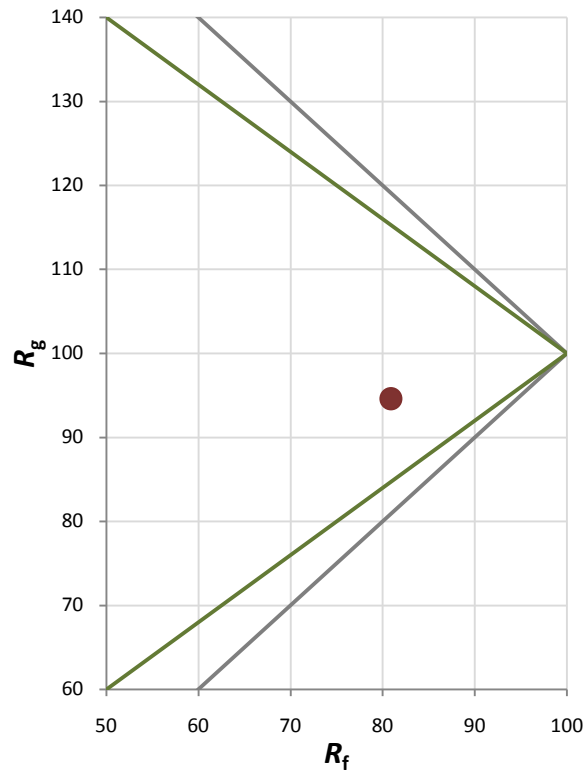
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	95

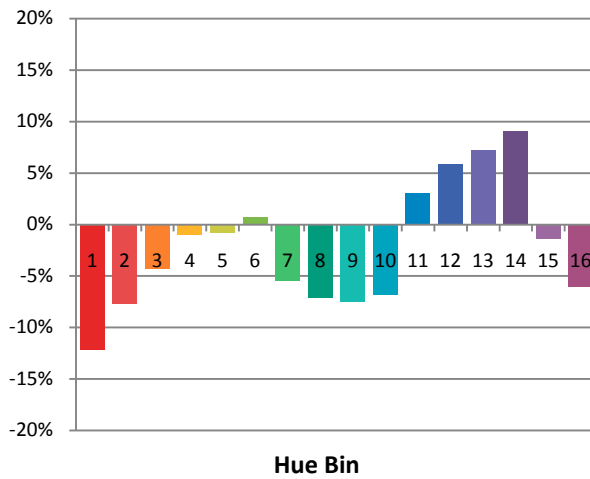
Spectral Power Distribution Comparison



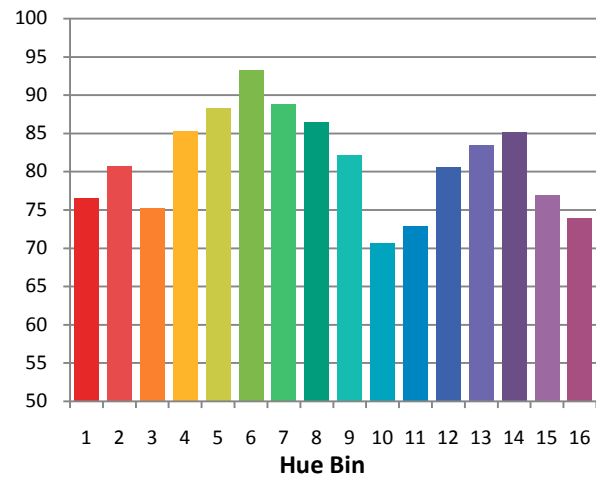
Plot of R_g versus R_f



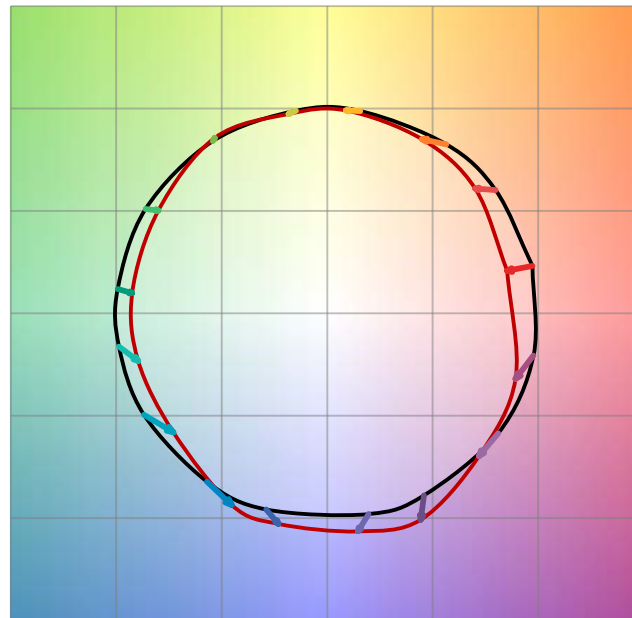
Chroma Shift by Hue



R_t by Hue

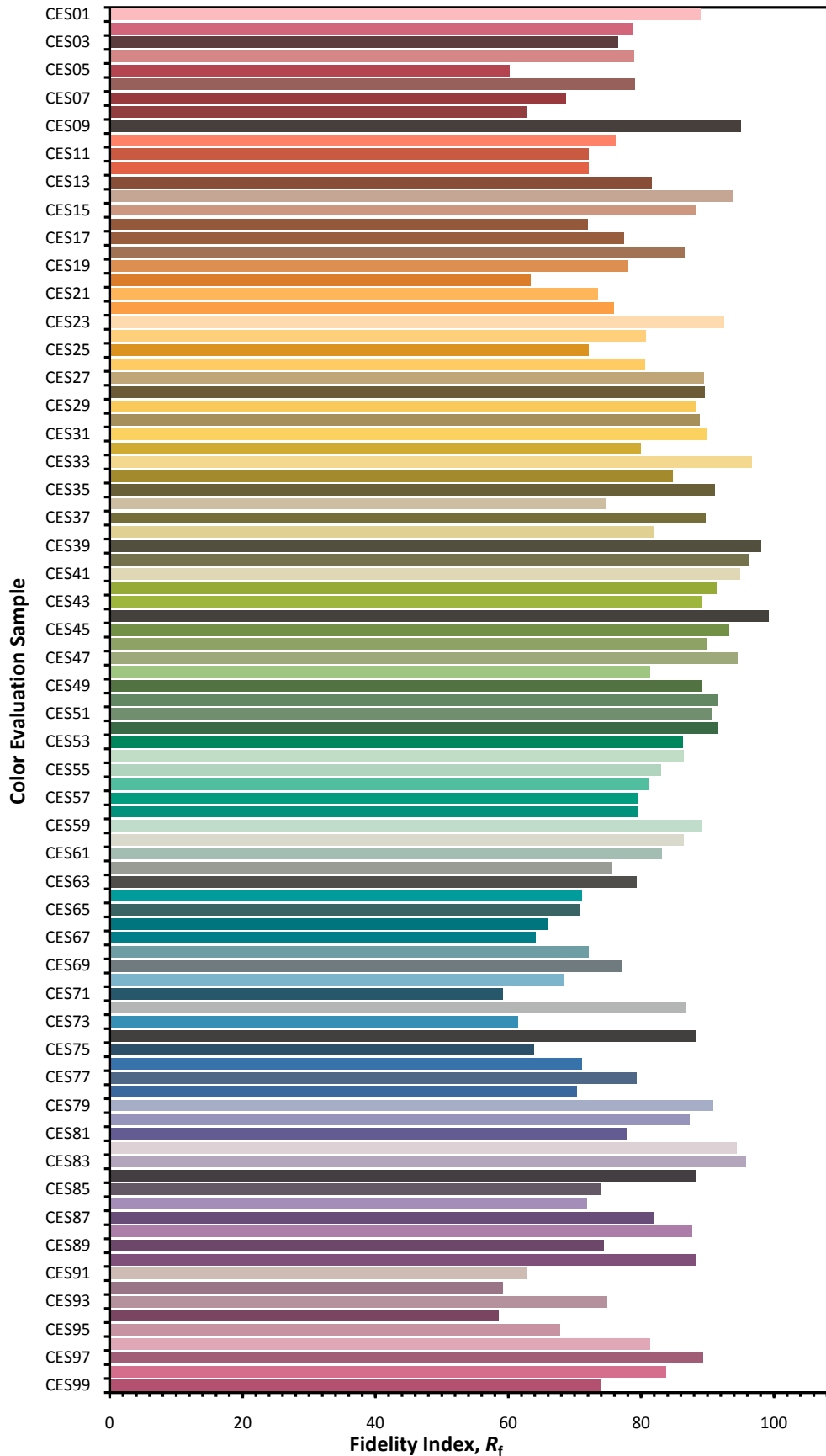


Color Vector Graphic

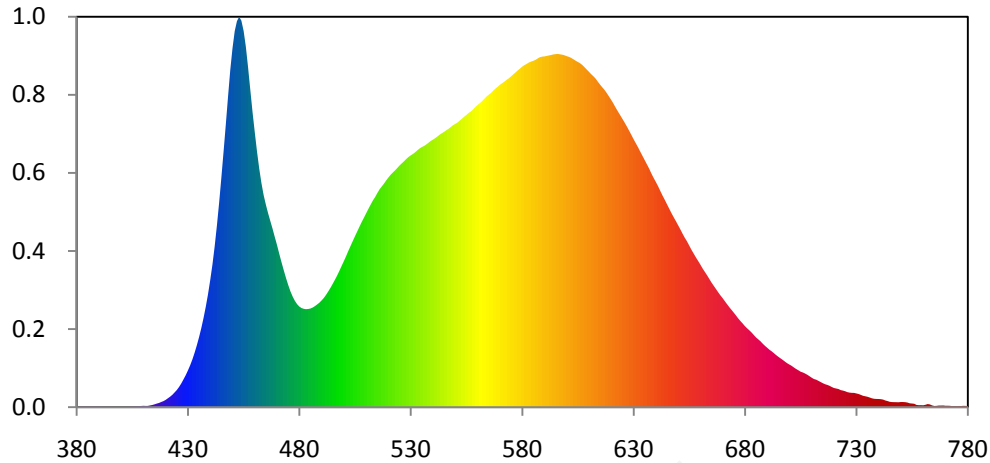


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



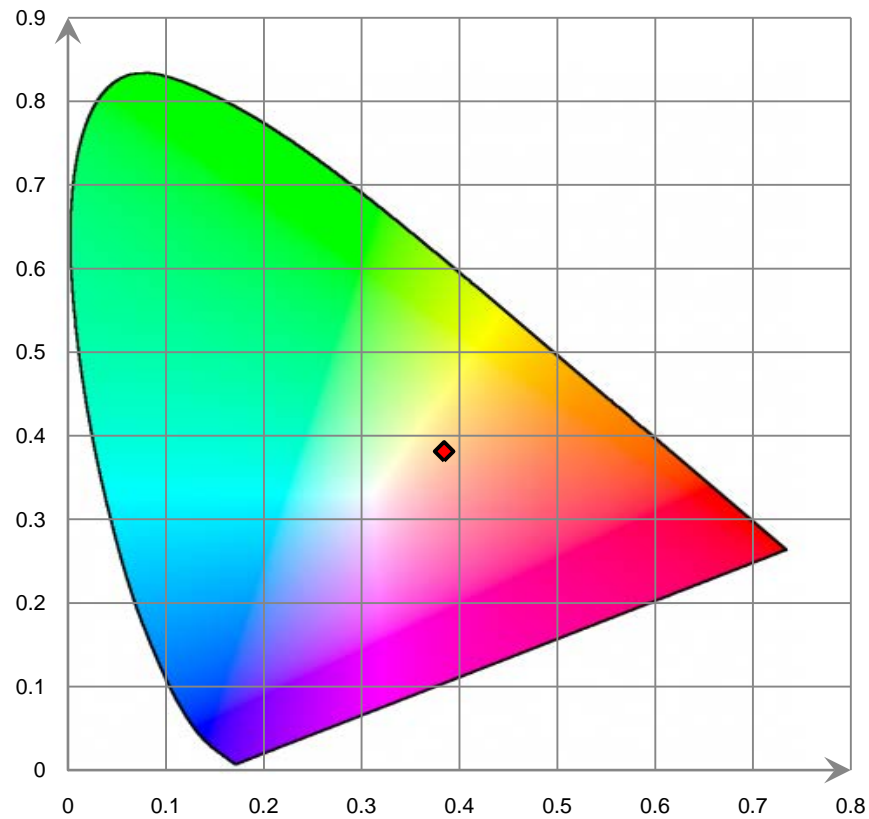
Relative Spectral Power Distribution



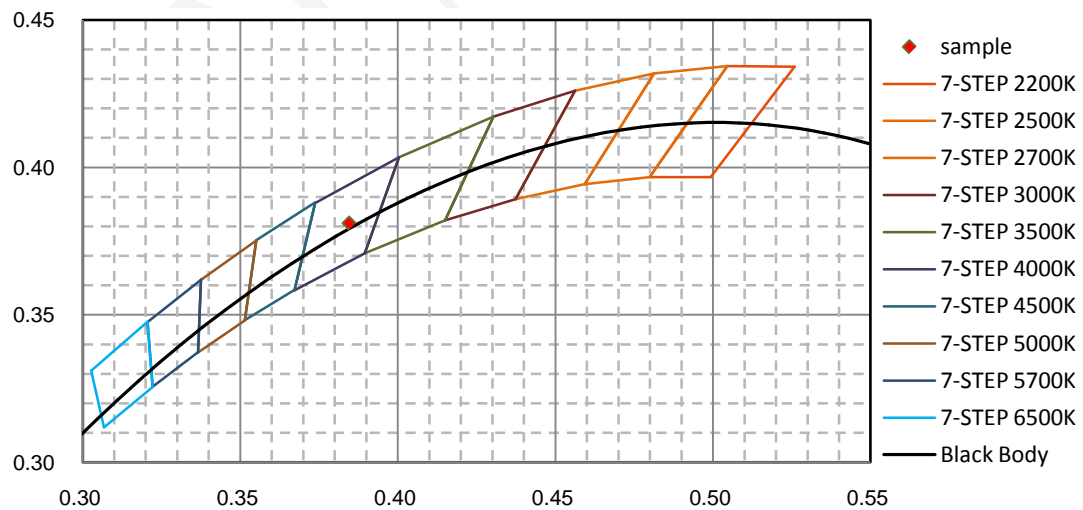
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.540E-02	421	6.929E-01	462	1.860E+01	503	1.256E+01	544	2.134E+01
381	2.150E-02	422	8.186E-01	463	1.745E+01	504	1.294E+01	545	2.145E+01
382	2.930E-02	423	9.642E-01	464	1.651E+01	505	1.333E+01	546	2.157E+01
383	2.890E-02	424	1.148E+00	465	1.576E+01	506	1.369E+01	547	2.169E+01
384	3.010E-02	425	1.336E+00	466	1.510E+01	507	1.406E+01	548	2.183E+01
385	2.090E-02	426	1.569E+00	467	1.449E+01	508	1.443E+01	549	2.197E+01
386	1.960E-02	427	1.846E+00	468	1.389E+01	509	1.476E+01	550	2.207E+01
387	2.620E-02	428	2.162E+00	469	1.325E+01	510	1.510E+01	551	2.217E+01
388	2.890E-02	429	2.492E+00	470	1.262E+01	511	1.545E+01	552	2.232E+01
389	3.530E-02	430	2.862E+00	471	1.195E+01	512	1.578E+01	553	2.247E+01
390	3.360E-02	431	3.265E+00	472	1.129E+01	513	1.610E+01	554	2.263E+01
391	1.760E-02	432	3.721E+00	473	1.067E+01	514	1.636E+01	555	2.277E+01
392	1.340E-02	433	4.244E+00	474	1.007E+01	515	1.668E+01	556	2.292E+01
393	2.530E-02	434	4.824E+00	475	9.527E+00	516	1.697E+01	557	2.303E+01
394	2.790E-02	435	5.459E+00	476	9.029E+00	517	1.719E+01	558	2.319E+01
395	2.260E-02	436	6.160E+00	477	8.620E+00	518	1.742E+01	559	2.338E+01
396	1.640E-02	437	6.948E+00	478	8.286E+00	519	1.767E+01	560	2.354E+01
397	9.600E-03	438	7.817E+00	479	8.025E+00	520	1.790E+01	561	2.368E+01
398	6.400E-03	439	8.784E+00	480	7.838E+00	521	1.811E+01	562	2.384E+01
399	3.100E-03	440	9.896E+00	481	7.723E+00	522	1.828E+01	563	2.402E+01
400	2.150E-02	441	1.111E+01	482	7.662E+00	523	1.845E+01	564	2.420E+01
401	2.580E-02	442	1.253E+01	483	7.634E+00	524	1.864E+01	565	2.434E+01
402	2.340E-02	443	1.414E+01	484	7.651E+00	525	1.883E+01	566	2.447E+01
403	2.250E-02	444	1.592E+01	485	7.685E+00	526	1.900E+01	567	2.465E+01
404	2.450E-02	445	1.787E+01	486	7.762E+00	527	1.916E+01	568	2.482E+01
405	3.840E-02	446	1.991E+01	487	7.872E+00	528	1.933E+01	569	2.495E+01
406	4.460E-02	447	2.201E+01	488	8.004E+00	529	1.949E+01	570	2.511E+01
407	5.370E-02	448	2.419E+01	489	8.140E+00	530	1.962E+01	571	2.523E+01
408	5.780E-02	449	2.626E+01	490	8.317E+00	531	1.973E+01	572	2.536E+01
409	9.420E-02	450	2.796E+01	491	8.512E+00	532	1.986E+01	573	2.550E+01
410	1.049E-01	451	2.930E+01	492	8.750E+00	533	2.001E+01	574	2.561E+01
411	9.620E-02	452	3.007E+01	493	9.022E+00	534	2.016E+01	575	2.577E+01
412	1.011E-01	453	3.042E+01	494	9.305E+00	535	2.026E+01	576	2.592E+01
413	1.364E-01	454	3.011E+01	495	9.613E+00	536	2.035E+01	577	2.607E+01
414	1.717E-01	455	2.931E+01	496	9.932E+00	537	2.047E+01	578	2.623E+01
415	2.229E-01	456	2.808E+01	497	1.026E+01	538	2.060E+01	579	2.637E+01
416	2.808E-01	457	2.647E+01	498	1.063E+01	539	2.074E+01	580	2.653E+01
417	3.300E-01	458	2.472E+01	499	1.101E+01	540	2.084E+01	581	2.664E+01
418	4.060E-01	459	2.299E+01	500	1.138E+01	541	2.096E+01	582	2.674E+01
419	4.729E-01	460	2.143E+01	501	1.177E+01	542	2.109E+01	583	2.685E+01
420	5.683E-01	461	1.993E+01	502	1.218E+01	543	2.123E+01	584	2.692E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.698E+01	626	2.218E+01	667	9.207E+00	708	2.525E+00	749	3.843E-01
586	2.706E+01	627	2.187E+01	668	8.951E+00	709	2.413E+00	750	4.059E-01
587	2.717E+01	628	2.155E+01	669	8.711E+00	710	2.294E+00	751	4.020E-01
588	2.727E+01	629	2.122E+01	670	8.491E+00	711	2.190E+00	752	3.893E-01
589	2.731E+01	630	2.089E+01	671	8.254E+00	712	2.141E+00	753	3.603E-01
590	2.733E+01	631	2.057E+01	672	8.019E+00	713	2.049E+00	754	3.021E-01
591	2.736E+01	632	2.026E+01	673	7.790E+00	714	1.958E+00	755	2.861E-01
592	2.740E+01	633	1.991E+01	674	7.576E+00	715	1.864E+00	756	2.635E-01
593	2.744E+01	634	1.958E+01	675	7.365E+00	716	1.788E+00	757	1.753E-01
594	2.748E+01	635	1.925E+01	676	7.141E+00	717	1.735E+00	758	1.564E-01
595	2.750E+01	636	1.892E+01	677	6.915E+00	718	1.665E+00	759	1.582E-01
596	2.752E+01	637	1.859E+01	678	6.707E+00	719	1.570E+00	760	1.480E-01
597	2.749E+01	638	1.821E+01	679	6.518E+00	720	1.494E+00	761	1.867E-01
598	2.746E+01	639	1.787E+01	680	6.314E+00	721	1.455E+00	762	2.423E-01
599	2.741E+01	640	1.755E+01	681	6.141E+00	722	1.414E+00	763	2.150E-01
600	2.734E+01	641	1.722E+01	682	5.987E+00	723	1.329E+00	764	1.388E-01
601	2.729E+01	642	1.685E+01	683	5.814E+00	724	1.292E+00	765	9.370E-02
602	2.721E+01	643	1.649E+01	684	5.620E+00	725	1.240E+00	766	1.027E-01
603	2.710E+01	644	1.616E+01	685	5.429E+00	726	1.171E+00	767	1.286E-01
604	2.699E+01	645	1.582E+01	686	5.283E+00	727	1.135E+00	768	1.274E-01
605	2.690E+01	646	1.547E+01	687	5.130E+00	728	1.116E+00	769	1.325E-01
606	2.680E+01	647	1.513E+01	688	4.947E+00	729	1.112E+00	770	1.127E-01
607	2.666E+01	648	1.480E+01	689	4.778E+00	730	1.069E+00	771	1.124E-01
608	2.649E+01	649	1.450E+01	690	4.630E+00	731	1.029E+00	772	1.063E-01
609	2.630E+01	650	1.418E+01	691	4.478E+00	732	9.609E-01	773	8.570E-02
610	2.612E+01	651	1.386E+01	692	4.352E+00	733	8.896E-01	774	7.650E-02
611	2.594E+01	652	1.352E+01	693	4.209E+00	734	8.503E-01	775	8.600E-02
612	2.578E+01	653	1.320E+01	694	4.061E+00	735	8.106E-01	776	9.530E-02
613	2.559E+01	654	1.292E+01	695	3.926E+00	736	7.556E-01	777	9.130E-02
614	2.535E+01	655	1.259E+01	696	3.803E+00	737	6.916E-01	778	1.046E-01
615	2.512E+01	656	1.226E+01	697	3.681E+00	738	6.537E-01	779	1.009E-01
616	2.492E+01	657	1.197E+01	698	3.548E+00	739	6.418E-01	780	8.410E-02
617	2.471E+01	658	1.167E+01	699	3.419E+00	740	6.396E-01		
618	2.447E+01	659	1.139E+01	700	3.318E+00	741	6.221E-01		
619	2.420E+01	660	1.111E+01	701	3.217E+00	742	5.941E-01		
620	2.393E+01	661	1.081E+01	702	3.090E+00	743	5.224E-01		
621	2.364E+01	662	1.054E+01	703	2.975E+00	744	4.775E-01		
622	2.333E+01	663	1.028E+01	704	2.873E+00	745	4.210E-01		
623	2.304E+01	664	9.996E+00	705	2.764E+00	746	3.986E-01		
624	2.275E+01	665	9.712E+00	706	2.703E+00	747	3.939E-01		
625	2.246E+01	666	9.456E+00	707	2.622E+00	748	3.903E-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**

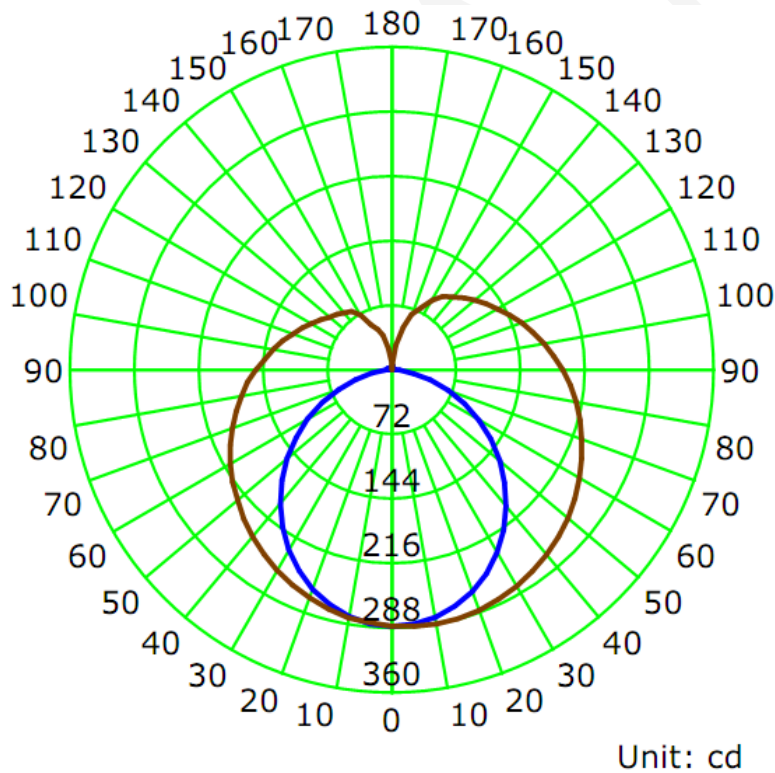
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0990	11.63	0.9810

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1582.6	136.13	288.6	1.22	1.41

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	105.8	142.4	210.7	155.5	153.6
Field Angle (10% I _{max}):	157.7	329.5	338.6	326.0	288.0

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	286	286	286	286	286	286	286	286
5.0°	285	285	286	288	288	287	287	286
10.0°	281	282	284	288	289	287	285	283
15.0°	273	276	281	286	288	286	281	276
20.0°	264	268	275	282	286	283	277	268
25.0°	251	256	267	278	283	279	270	257
30.0°	236	243	257	272	280	274	261	244
35.0°	219	228	246	265	275	268	251	230
40.0°	199	211	234	258	270	261	240	214
45.0°	179	192	221	249	264	254	229	196
50.0°	158	174	207	240	257	246	218	179
55.0°	136	154	194	231	250	238	205	162
60.0°	113	135	181	221	243	229	194	144
65.0°	90	116	169	212	235	220	182	127
70.0°	67	97	157	203	227	212	171	111
75.0°	45	81	145	193	219	202	159	97
80.0°	25	67	134	185	210	193	149	84
85.0°	9	56	125	176	201	184	140	74
90.0°	2	49	117	167	192	175	132	67
95.0°	2	45	111	159	182	167	125	62
100.0°	4	44	105	151	173	159	119	60
105.0°	4	44	101	143	164	150	114	59
110.0°	4	46	97	136	155	142	109	58
115.0°	3	48	93	129	146	134	104	59
120.0°	3	50	90	122	137	127	100	59
125.0°	2	49	87	116	129	120	96	59
130.0°	1	48	85	110	121	113	92	55
135.0°	1	48	84	105	114	107	89	52
140.0°	1	46	80	100	107	101	84	50
145.0°	1	44	74	96	101	95	72	45
150.0°	1	41	69	85	91	82	63	38
155.0°	2	37	64	75	78	70	49	26
160.0°	5	33	55	65	66	56	29	17
165.0°	6	27	42	50	50	33	16	11
170.0°	4	16	26	31	29	13	7	5
175.0°	2	5	9	12	6	5	2	2
180.0°	0	0	0	0	0	0	0	0

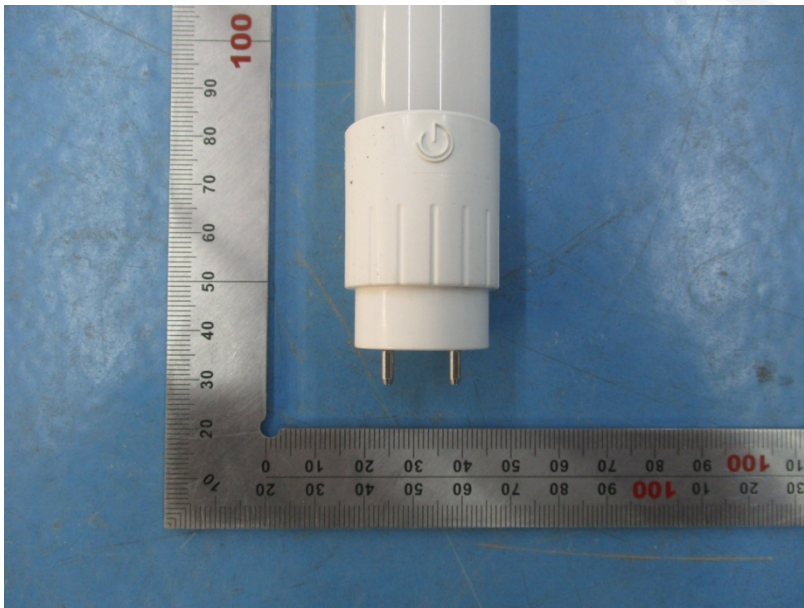
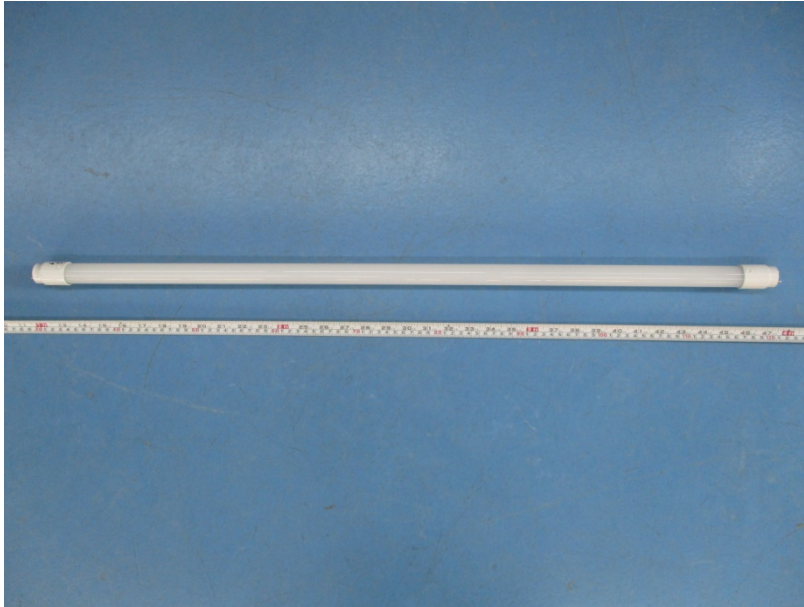
Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	286	286	286	286	286	286	286	286
5.0°	285	284	284	284	284	284	284	284
10.0°	280	279	279	281	281	281	280	280
15.0°	272	271	273	275	276	276	274	272
20.0°	261	260	264	269	271	270	267	263
25.0°	248	248	254	261	265	263	257	251
30.0°	232	233	242	253	259	255	247	237
35.0°	214	217	229	244	251	247	235	222
40.0°	195	199	216	234	244	238	223	205
45.0°	175	181	202	224	235	229	211	187
50.0°	154	162	188	214	227	219	198	170
55.0°	132	142	174	203	218	210	186	152
60.0°	110	123	160	192	210	199	173	134
65.0°	87	104	147	182	200	190	160	117
70.0°	64	86	135	171	191	179	149	102
75.0°	43	70	123	161	182	169	137	87
80.0°	23	57	112	150	172	159	126	74
85.0°	8	46	101	142	163	150	116	64
90.0°	3	38	93	133	153	142	108	56
95.0°	4	34	86	124	144	133	100	51
100.0°	4	32	81	117	135	124	95	48
105.0°	6	32	76	110	127	117	89	46
110.0°	6	34	72	104	119	110	85	45
115.0°	5	36	69	98	111	103	80	46
120.0°	5	36	67	92	104	97	77	48
125.0°	4	32	66	88	98	92	74	49
130.0°	4	32	65	84	93	88	73	44
135.0°	3	32	65	80	88	84	71	40
140.0°	2	30	57	78	84	81	70	39
145.0°	1	27	48	75	80	78	59	37
150.0°	1	20	45	60	71	66	50	34
155.0°	1	14	39	51	56	53	46	29
160.0°	2	10	29	45	49	47	40	22
165.0°	2	6	18	33	40	38	31	16
170.0°	2	2	10	16	25	24	18	7
175.0°	2	2	3	4	7	8	5	2
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	6.8	0.43	0-5	6.8	0.43
5-10	20.3	1.28	0-10	27.1	1.71
10-15	33.2	2.10	0-15	60.3	3.81
15-20	45.1	2.85	0-20	105.5	6.66
20-25	55.8	3.53	0-25	161.3	10.19
25-30	64.9	4.10	0-30	226.2	14.29
30-35	72.4	4.57	0-35	298.6	18.87
35-40	78.0	4.93	0-40	376.6	23.80
40-45	81.8	5.17	0-45	458.4	28.97
45-50	83.8	5.30	0-50	542.2	34.26
50-55	84.2	5.32	0-55	626.4	39.58
55-60	83.0	5.24	0-60	709.4	44.83
60-65	80.5	5.09	0-65	789.9	49.91
65-70	76.9	4.86	0-70	866.8	54.77
70-75	72.4	4.57	0-75	939.2	59.34
75-80	67.4	4.26	0-80	1006.6	63.60
80-85	62.4	3.94	0-85	1069.0	67.55
85-90	57.8	3.65	0-90	1126.8	71.20
90-95	53.9	3.41	0-95	1180.7	74.61
95-100	50.6	3.20	0-100	1231.3	77.80
100-105	47.4	2.99	0-105	1278.7	80.80
105-110	44.2	2.79	0-110	1322.9	83.59
110-115	40.9	2.59	0-115	1363.8	86.17
115-120	37.7	2.38	0-120	1401.4	88.55
120-125	34.3	2.17	0-125	1435.8	90.72
125-130	30.8	1.95	0-130	1466.6	92.67
130-135	27.4	1.73	0-135	1494.0	94.40
135-140	23.9	1.51	0-140	1517.9	95.91
140-145	20.2	1.28	0-145	1538.1	97.19
145-150	16.1	1.02	0-150	1554.2	98.21
150-155	11.9	0.75	0-155	1566.1	98.96
155-160	8.3	0.52	0-160	1574.4	99.48
160-165	5.1	0.32	0-165	1579.5	99.80
165-170	2.4	0.15	0-170	1581.9	99.95
170-175	0.7	0.04	0-175	1582.6	100.00
175-180	0.1	0.00	0-180	1582.6	100.00

6. Product Photo



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