



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/830/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
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/830/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: 3000K
 Nominal Lumen Output: 1500lm

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_f , 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**

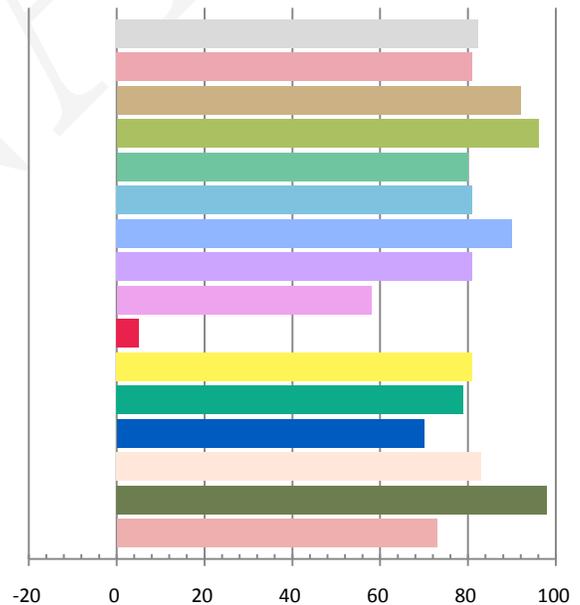
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.0977	11.47	0.9779	1516.5	132.24

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
4.536	2975	0.00005	0.4388	0.4048	0.2514	0.5220

Color Rendering Index

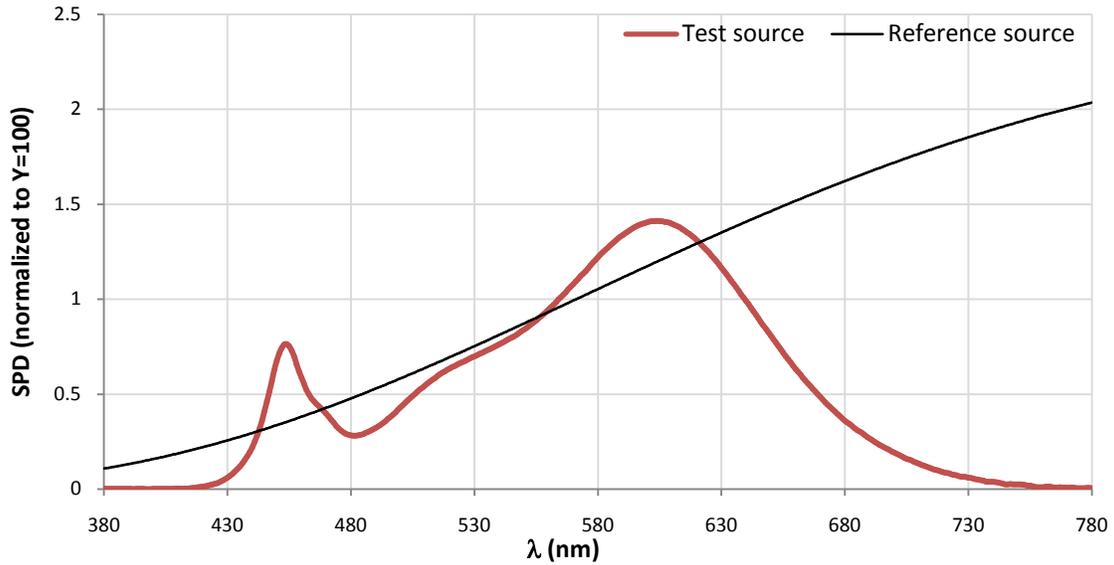
Ra			
82.3			
R1	R2	R3	R4
81	92	96	80
R5	R6	R7	R8
81	90	81	58
R9	R10	R11	R12
5	81	79	70
R13	R14	R15	
83	98	73	



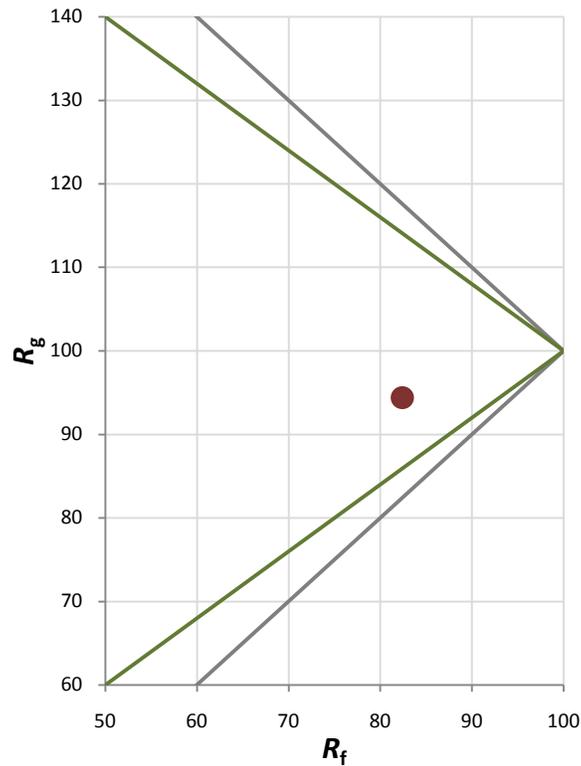
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	94

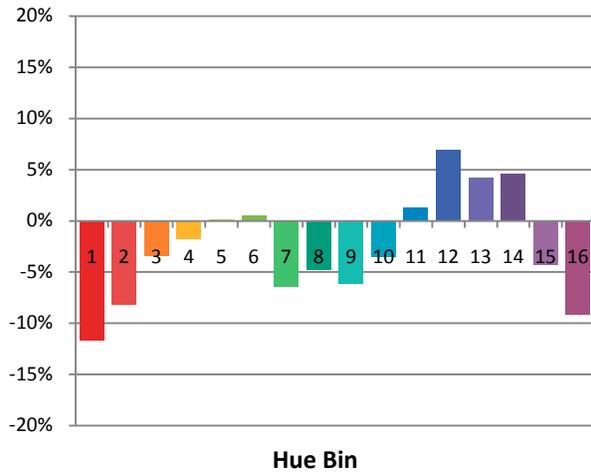
Spectral Power Distribution Comparison



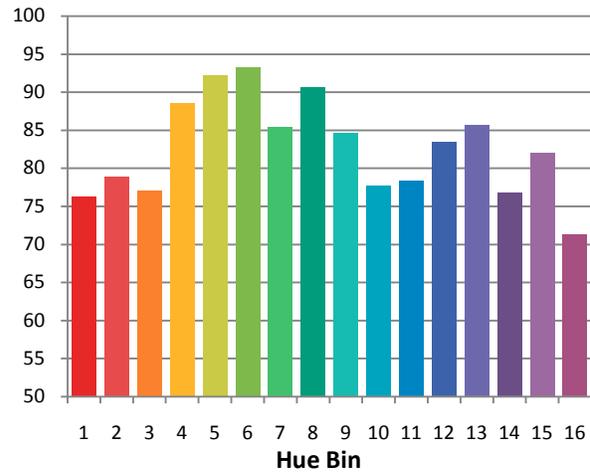
Plot of R_g versus R_f



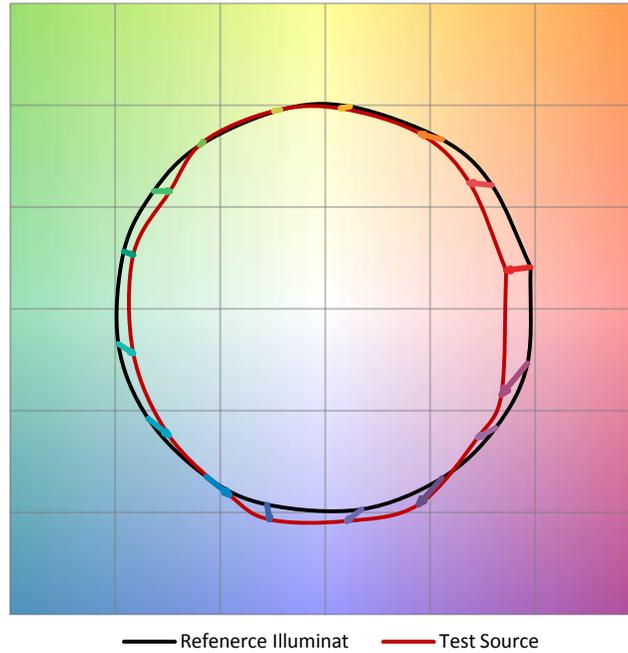
Chroma Shift by Hue



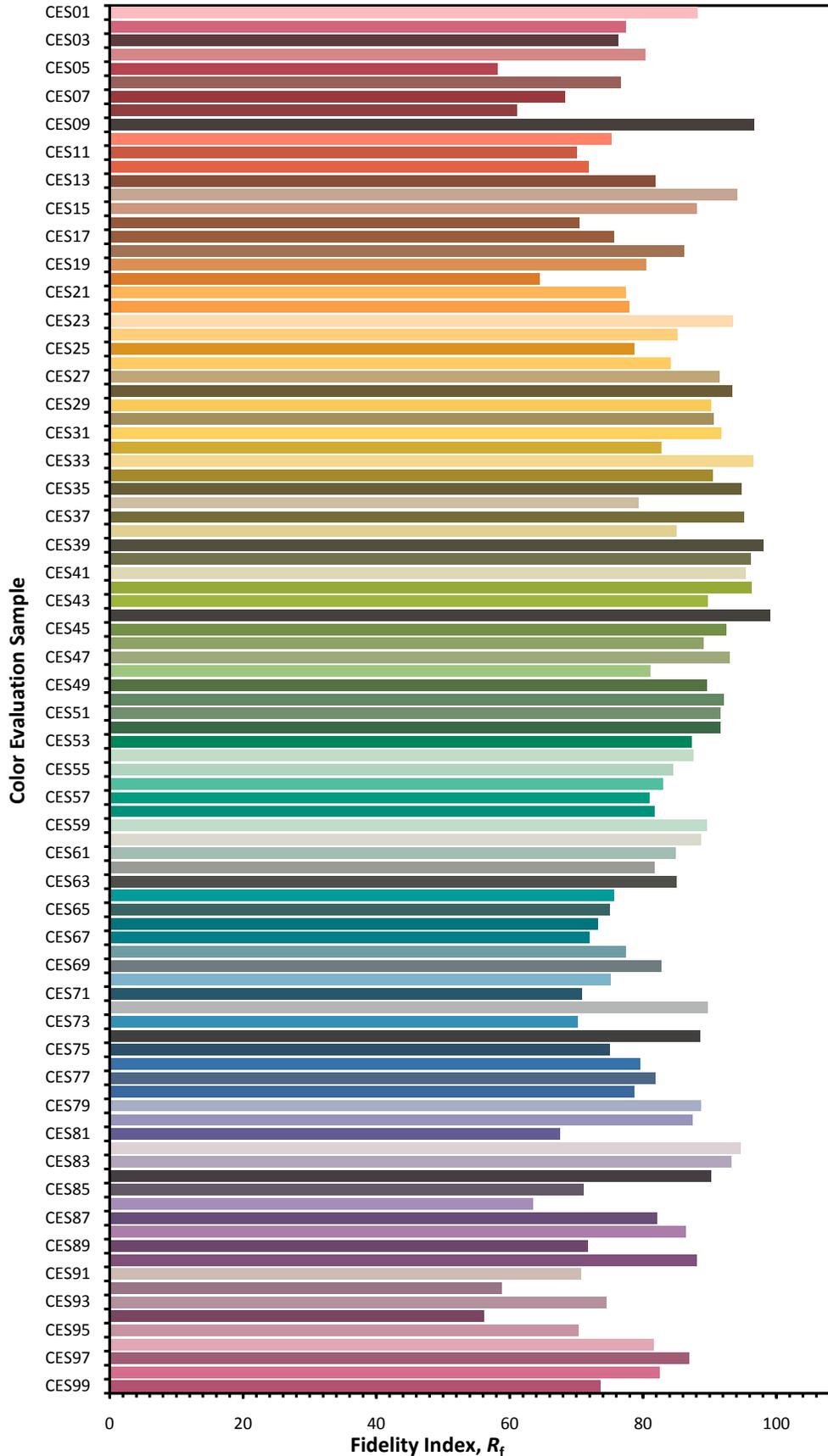
R_f by Hue



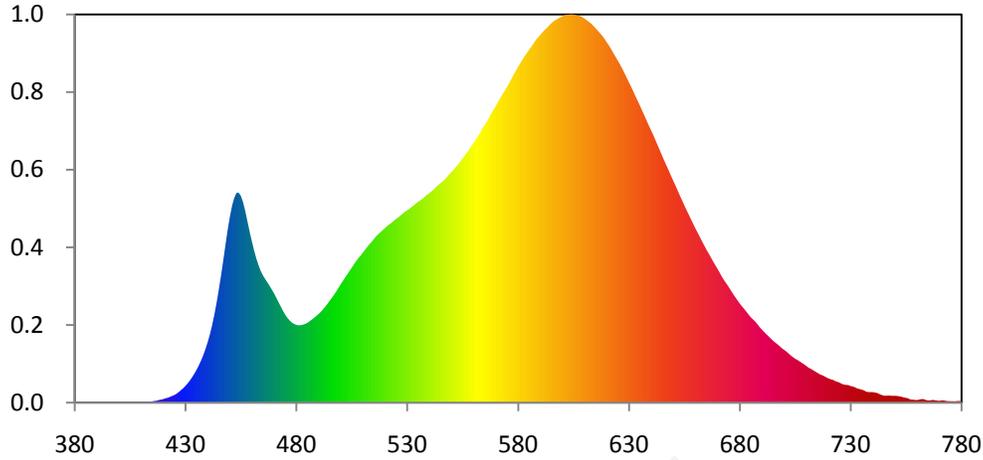
Color Vector Graphic



Color Fidelity by CES Sample



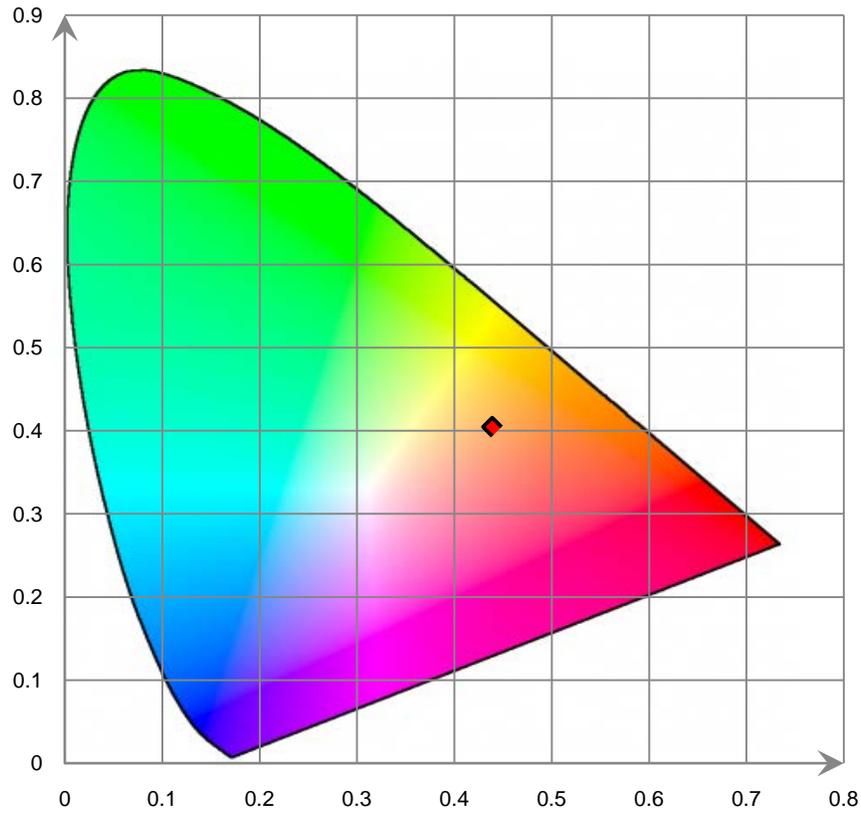
Relative Spectral Power Distribution



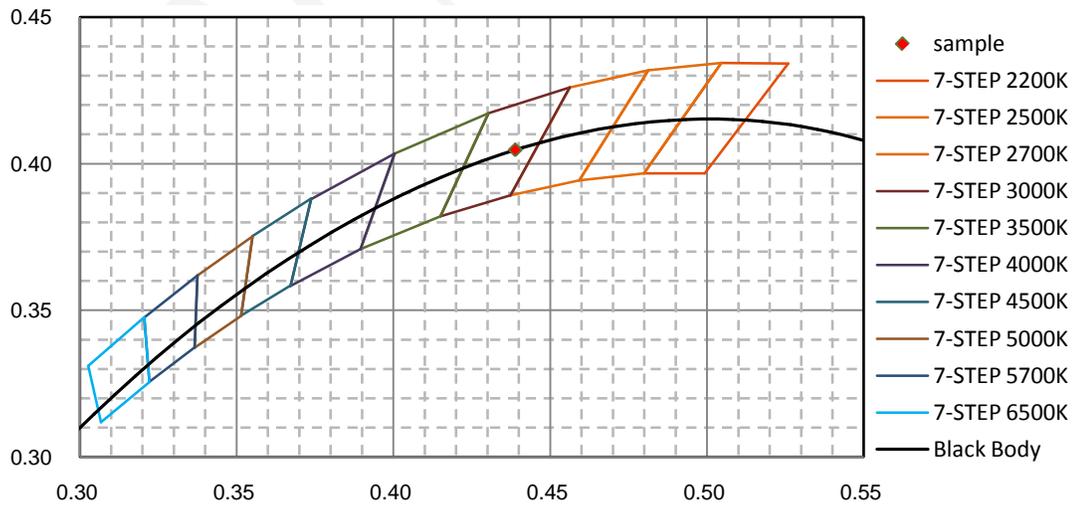
nm	mW								
380	5.480E-02	421	3.506E-01	462	1.161E+01	503	1.037E+01	544	1.757E+01
381	4.270E-02	422	3.964E-01	463	1.108E+01	504	1.063E+01	545	1.772E+01
382	4.200E-02	423	4.635E-01	464	1.061E+01	505	1.090E+01	546	1.786E+01
383	4.530E-02	424	5.430E-01	465	1.026E+01	506	1.117E+01	547	1.803E+01
384	5.110E-02	425	6.160E-01	466	9.970E+00	507	1.143E+01	548	1.823E+01
385	3.860E-02	426	7.219E-01	467	9.701E+00	508	1.167E+01	549	1.844E+01
386	2.960E-02	427	8.602E-01	468	9.419E+00	509	1.188E+01	550	1.862E+01
387	2.530E-02	428	1.012E+00	469	9.115E+00	510	1.211E+01	551	1.881E+01
388	2.370E-02	429	1.166E+00	470	8.811E+00	511	1.235E+01	552	1.903E+01
389	3.560E-02	430	1.354E+00	471	8.462E+00	512	1.258E+01	553	1.925E+01
390	3.590E-02	431	1.559E+00	472	8.104E+00	513	1.280E+01	554	1.948E+01
391	1.880E-02	432	1.786E+00	473	7.758E+00	514	1.299E+01	555	1.971E+01
392	1.450E-02	433	2.052E+00	474	7.410E+00	515	1.321E+01	556	1.998E+01
393	1.870E-02	434	2.338E+00	475	7.100E+00	516	1.343E+01	557	2.020E+01
394	2.300E-02	435	2.652E+00	476	6.846E+00	517	1.361E+01	558	2.046E+01
395	2.960E-02	436	2.999E+00	477	6.635E+00	518	1.377E+01	559	2.072E+01
396	2.500E-02	437	3.384E+00	478	6.465E+00	519	1.393E+01	560	2.099E+01
397	1.280E-02	438	3.825E+00	479	6.354E+00	520	1.410E+01	561	2.126E+01
398	7.500E-03	439	4.311E+00	480	6.283E+00	521	1.426E+01	562	2.153E+01
399	3.800E-03	440	4.878E+00	481	6.247E+00	522	1.440E+01	563	2.184E+01
400	1.780E-02	441	5.496E+00	482	6.258E+00	523	1.453E+01	564	2.215E+01
401	2.190E-02	442	6.235E+00	483	6.299E+00	524	1.468E+01	565	2.243E+01
402	2.090E-02	443	7.073E+00	484	6.361E+00	525	1.483E+01	566	2.271E+01
403	2.130E-02	444	8.031E+00	485	6.446E+00	526	1.496E+01	567	2.303E+01
404	2.230E-02	445	9.080E+00	486	6.571E+00	527	1.510E+01	568	2.337E+01
405	3.730E-02	446	1.021E+01	487	6.705E+00	528	1.526E+01	569	2.367E+01
406	3.630E-02	447	1.141E+01	488	6.845E+00	529	1.541E+01	570	2.397E+01
407	4.120E-02	448	1.268E+01	489	6.996E+00	530	1.552E+01	571	2.428E+01
408	4.330E-02	449	1.391E+01	490	7.152E+00	531	1.565E+01	572	2.460E+01
409	6.650E-02	450	1.498E+01	491	7.322E+00	532	1.579E+01	573	2.490E+01
410	7.530E-02	451	1.589E+01	492	7.521E+00	533	1.593E+01	574	2.518E+01
411	5.630E-02	452	1.653E+01	493	7.741E+00	534	1.608E+01	575	2.549E+01
412	4.850E-02	453	1.693E+01	494	7.974E+00	535	1.622E+01	576	2.580E+01
413	7.080E-02	454	1.695E+01	495	8.213E+00	536	1.634E+01	577	2.613E+01
414	8.400E-02	455	1.669E+01	496	8.452E+00	537	1.647E+01	578	2.647E+01
415	1.037E-01	456	1.618E+01	497	8.706E+00	538	1.664E+01	579	2.679E+01
416	1.386E-01	457	1.545E+01	498	8.976E+00	539	1.679E+01	580	2.712E+01
417	1.578E-01	458	1.461E+01	499	9.266E+00	540	1.692E+01	581	2.741E+01
418	2.141E-01	459	1.377E+01	500	9.553E+00	541	1.706E+01	582	2.770E+01
419	2.464E-01	460	1.300E+01	501	9.827E+00	542	1.722E+01	583	2.799E+01
420	2.875E-01	461	1.226E+01	502	1.010E+01	543	1.740E+01	584	2.825E+01

nm	mW								
585	2.850E+01	626	2.731E+01	667	1.173E+01	708	3.215E+00	749	5.501E-01
586	2.874E+01	627	2.697E+01	668	1.140E+01	709	3.097E+00	750	5.541E-01
587	2.900E+01	628	2.661E+01	669	1.109E+01	710	2.969E+00	751	5.425E-01
588	2.927E+01	629	2.624E+01	670	1.080E+01	711	2.827E+00	752	5.114E-01
589	2.949E+01	630	2.588E+01	671	1.048E+01	712	2.739E+00	753	4.779E-01
590	2.968E+01	631	2.551E+01	672	1.016E+01	713	2.628E+00	754	4.164E-01
591	2.990E+01	632	2.513E+01	673	9.870E+00	714	2.521E+00	755	3.886E-01
592	3.009E+01	633	2.473E+01	674	9.613E+00	715	2.417E+00	756	3.495E-01
593	3.026E+01	634	2.436E+01	675	9.347E+00	716	2.301E+00	757	2.531E-01
594	3.045E+01	635	2.398E+01	676	9.059E+00	717	2.229E+00	758	2.380E-01
595	3.063E+01	636	2.358E+01	677	8.781E+00	718	2.147E+00	759	2.236E-01
596	3.079E+01	637	2.319E+01	678	8.516E+00	719	2.050E+00	760	2.075E-01
597	3.091E+01	638	2.278E+01	679	8.258E+00	720	1.958E+00	761	2.472E-01
598	3.101E+01	639	2.237E+01	680	8.005E+00	721	1.889E+00	762	2.923E-01
599	3.109E+01	640	2.199E+01	681	7.781E+00	722	1.845E+00	763	2.836E-01
600	3.119E+01	641	2.161E+01	682	7.571E+00	723	1.746E+00	764	2.089E-01
601	3.129E+01	642	2.120E+01	683	7.345E+00	724	1.682E+00	765	1.734E-01
602	3.131E+01	643	2.078E+01	684	7.114E+00	725	1.620E+00	766	1.838E-01
603	3.133E+01	644	2.036E+01	685	6.893E+00	726	1.519E+00	767	2.192E-01
604	3.135E+01	645	1.994E+01	686	6.720E+00	727	1.459E+00	768	1.957E-01
605	3.133E+01	646	1.952E+01	687	6.546E+00	728	1.434E+00	769	1.663E-01
606	3.130E+01	647	1.913E+01	688	6.330E+00	729	1.417E+00	770	1.518E-01
607	3.125E+01	648	1.874E+01	689	6.096E+00	730	1.341E+00	771	1.758E-01
608	3.121E+01	649	1.833E+01	690	5.901E+00	731	1.308E+00	772	1.775E-01
609	3.112E+01	650	1.792E+01	691	5.708E+00	732	1.236E+00	773	1.423E-01
610	3.102E+01	651	1.754E+01	692	5.530E+00	733	1.151E+00	774	1.217E-01
611	3.087E+01	652	1.714E+01	693	5.358E+00	734	1.102E+00	775	1.181E-01
612	3.074E+01	653	1.672E+01	694	5.177E+00	735	1.054E+00	776	1.148E-01
613	3.061E+01	654	1.634E+01	695	5.008E+00	736	9.926E-01	777	1.062E-01
614	3.042E+01	655	1.594E+01	696	4.857E+00	737	8.921E-01	778	1.286E-01
615	3.023E+01	656	1.555E+01	697	4.715E+00	738	8.525E-01	779	1.336E-01
616	3.003E+01	657	1.519E+01	698	4.564E+00	739	8.538E-01	780	1.181E-01
617	2.983E+01	658	1.481E+01	699	4.396E+00	740	8.533E-01		
618	2.962E+01	659	1.444E+01	700	4.266E+00	741	8.158E-01		
619	2.938E+01	660	1.408E+01	701	4.134E+00	742	7.821E-01		
620	2.910E+01	661	1.373E+01	702	3.973E+00	743	6.960E-01		
621	2.884E+01	662	1.339E+01	703	3.816E+00	744	6.223E-01		
622	2.855E+01	663	1.303E+01	704	3.678E+00	745	5.676E-01		
623	2.823E+01	664	1.269E+01	705	3.546E+00	746	5.591E-01		
624	2.792E+01	665	1.235E+01	706	3.455E+00	747	5.762E-01		
625	2.762E+01	666	1.204E+01	707	3.336E+00	748	5.634E-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**

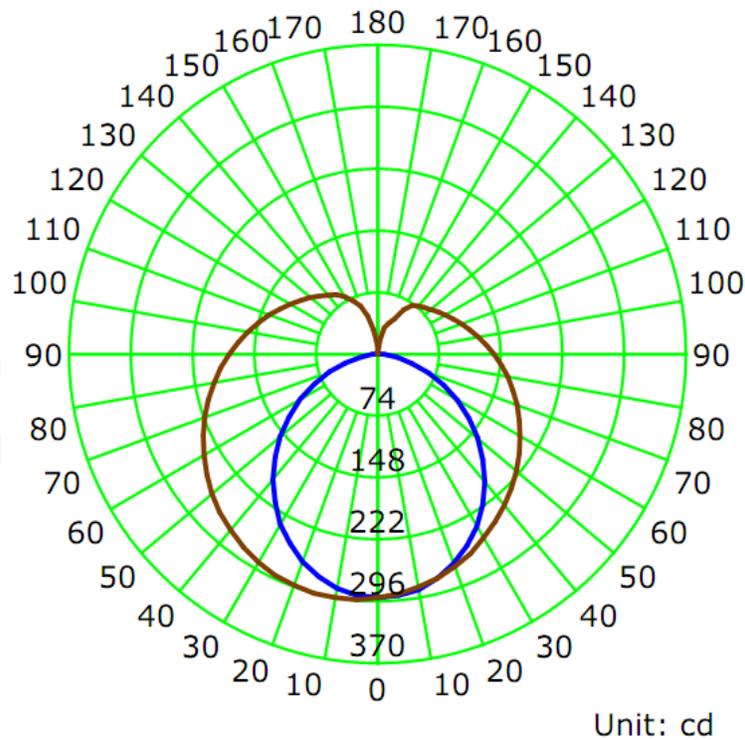
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0980	11.55	0.9810

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1519.9	131.64	296.7	1.21	1.39

Luminous Intensity Distribution



Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	292	292	292	292	292	292	292	292
5.0°	291	290	289	289	288	289	289	289
10.0°	287	284	284	283	284	285	284	284
15.0°	278	276	275	277	278	278	276	275
20.0°	267	265	267	268	271	271	268	265
25.0°	254	252	255	260	264	262	257	252
30.0°	238	236	242	250	255	253	245	237
35.0°	220	219	228	240	246	243	232	221
40.0°	200	202	215	228	237	233	219	203
45.0°	179	182	200	217	228	222	206	185
50.0°	157	163	185	206	218	211	192	166
55.0°	134	144	171	194	208	200	178	148
60.0°	111	124	157	183	198	189	165	130
65.0°	88	105	145	173	188	179	152	112
70.0°	66	88	132	162	178	168	139	96
75.0°	44	72	119	152	169	158	127	81
80.0°	24	58	108	142	159	148	117	68
85.0°	8	47	98	133	149	138	107	57
90.0°	1	40	90	124	141	129	98	50
95.0°	2	35	83	116	131	121	91	44
100.0°	3	33	78	108	123	113	84	41
105.0°	3	32	73	102	115	106	79	39
110.0°	3	33	69	96	108	99	75	39
115.0°	2	35	66	90	101	93	71	39
120.0°	1	36	63	85	95	87	68	40
125.0°	1	32	62	81	89	83	65	39
130.0°	1	30	61	77	84	78	64	33
135.0°	1	29	60	74	80	75	62	30
140.0°	1	30	56	71	76	71	57	29
145.0°	1	29	47	69	72	68	44	29
150.0°	1	28	42	57	62	53	37	24
155.0°	2	25	39	46	48	42	32	16
160.0°	2	22	36	39	40	37	19	11
165.0°	2	18	28	33	33	21	11	7
170.0°	2	10	17	20	18	9	4	2
175.0°	2	2	4	6	4	2	2	2
180.0°	0	0	0	0	0	0	0	0

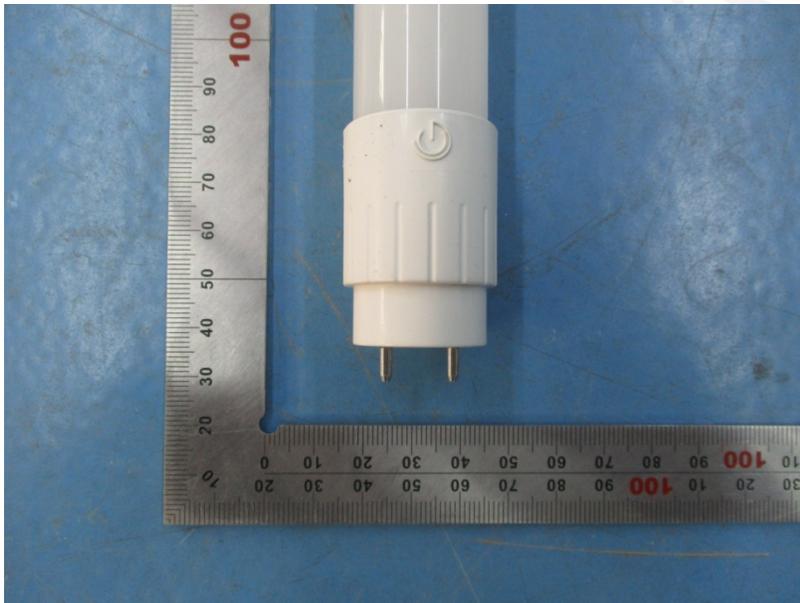
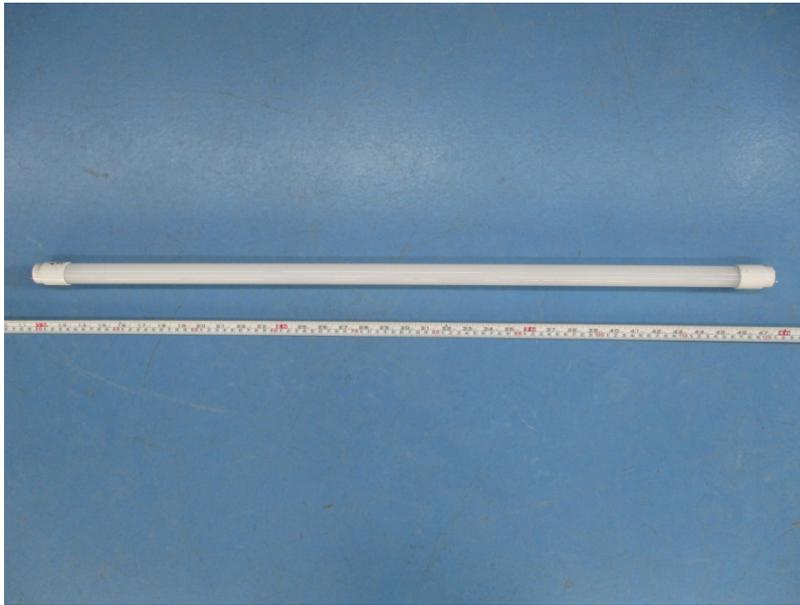
Luminous Intensity (cd) Distribution Data (cont.)

C \ Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	292	292	292	292	292	292	292	292
5.0°	290	292	293	295	295	295	293	291
10.0°	285	288	292	295	297	296	293	288
15.0°	277	282	288	294	297	295	289	282
20.0°	265	273	282	290	295	292	284	273
25.0°	251	261	273	286	292	288	276	262
30.0°	235	246	263	280	288	282	267	248
35.0°	216	230	251	272	282	275	256	232
40.0°	196	212	237	263	276	266	244	216
45.0°	175	192	223	253	269	258	231	197
50.0°	153	172	209	243	261	248	217	178
55.0°	131	152	195	232	251	238	204	160
60.0°	108	132	180	220	242	227	190	141
65.0°	85	113	166	209	232	216	177	123
70.0°	62	94	153	197	221	205	164	106
75.0°	41	78	140	186	211	193	152	91
80.0°	21	64	129	175	201	182	141	79
85.0°	7	53	118	166	190	172	130	68
90.0°	1	46	109	156	179	163	122	61
95.0°	1	42	102	146	169	154	115	57
100.0°	2	41	97	137	159	144	109	54
105.0°	2	41	92	130	149	136	103	53
110.0°	2	42	87	122	139	127	98	52
115.0°	1	43	83	115	130	120	93	52
120.0°	1	45	80	108	121	113	89	53
125.0°	1	43	77	102	113	106	85	55
130.0°	1	44	75	96	106	100	82	52
135.0°	1	42	73	91	100	94	79	51
140.0°	1	38	68	86	93	89	77	50
145.0°	1	33	63	82	88	85	69	46
150.0°	1	25	59	72	80	75	64	40
155.0°	2	18	49	66	70	68	59	33
160.0°	2	12	35	57	62	60	48	26
165.0°	2	8	22	40	48	45	35	19
170.0°	2	3	12	19	30	29	22	9
175.0°	2	2	3	5	10	10	7	3
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	7.0	0.46	0-5	7.0	0.46
5-10	20.7	1.36	0-10	27.7	1.82
10-15	33.8	2.23	0-15	61.5	4.05
15-20	45.9	3.02	0-20	107.4	7.07
20-25	56.6	3.73	0-25	164.0	10.79
25-30	65.7	4.32	0-30	229.8	15.12
30-35	73.0	4.80	0-35	302.7	19.92
35-40	78.3	5.15	0-40	381.0	25.07
40-45	81.7	5.38	0-45	462.8	30.45
45-50	83.3	5.48	0-50	546.1	35.93
50-55	83.1	5.47	0-55	629.2	41.40
55-60	81.4	5.36	0-60	710.6	46.75
60-65	78.4	5.16	0-65	789.0	51.91
65-70	74.3	4.89	0-70	863.3	56.80
70-75	69.4	4.57	0-75	932.7	61.36
75-80	64.0	4.21	0-80	996.7	65.58
80-85	58.7	3.86	0-85	1055.4	69.44
85-90	53.9	3.55	0-90	1109.3	72.99
90-95	49.9	3.28	0-95	1159.3	76.27
95-100	46.4	3.05	0-100	1205.7	79.33
100-105	43.1	2.84	0-105	1248.8	82.16
105-110	39.9	2.62	0-110	1288.6	84.79
110-115	36.7	2.42	0-115	1325.4	87.20
115-120	33.7	2.22	0-120	1359.1	89.42
120-125	30.6	2.01	0-125	1389.7	91.43
125-130	27.4	1.80	0-130	1417.0	93.23
130-135	24.3	1.60	0-135	1441.3	94.83
135-140	21.2	1.40	0-140	1462.5	96.23
140-145	17.9	1.18	0-145	1480.4	97.41
145-150	14.2	0.94	0-150	1494.7	98.34
150-155	10.6	0.69	0-155	1505.2	99.04
155-160	7.3	0.48	0-160	1512.6	99.52
160-165	4.5	0.30	0-165	1517.1	99.82
165-170	2.1	0.14	0-170	1519.2	99.96
170-175	0.6	0.04	0-175	1519.8	100.00
175-180	0.0	0.00	0-180	1519.9	100.00

6. Product Photo



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