



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/835/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:	PKS180910086-10-3
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/835/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: 3500K
 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**

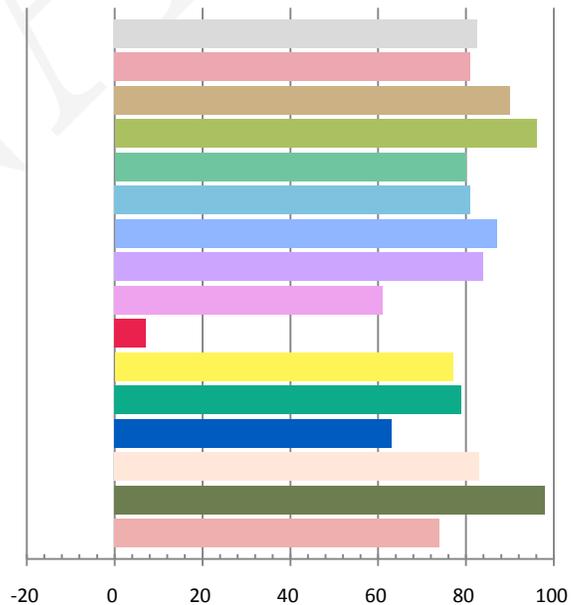
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1001	11.74	0.9773	1536.9	130.96

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
4.574	3445	0.00018	0.4086	0.3928	0.2370	0.5126

Color Rendering Index

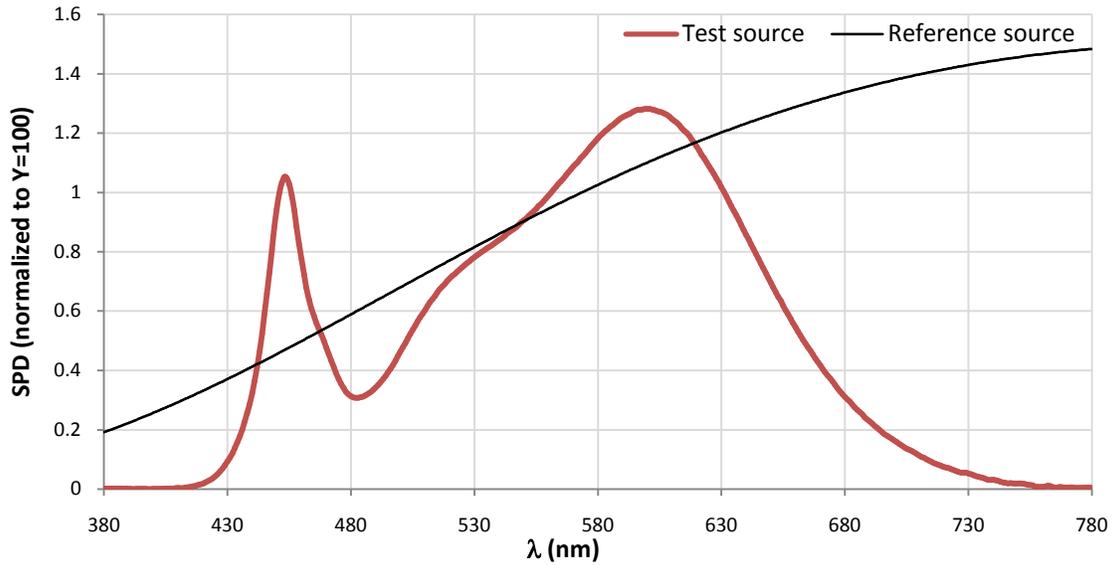
Ra			
82.6			
R1	R2	R3	R4
81	90	96	80
R5	R6	R7	R8
81	87	84	61
R9	R10	R11	R12
7	77	79	63
R13	R14	R15	
83	98	74	



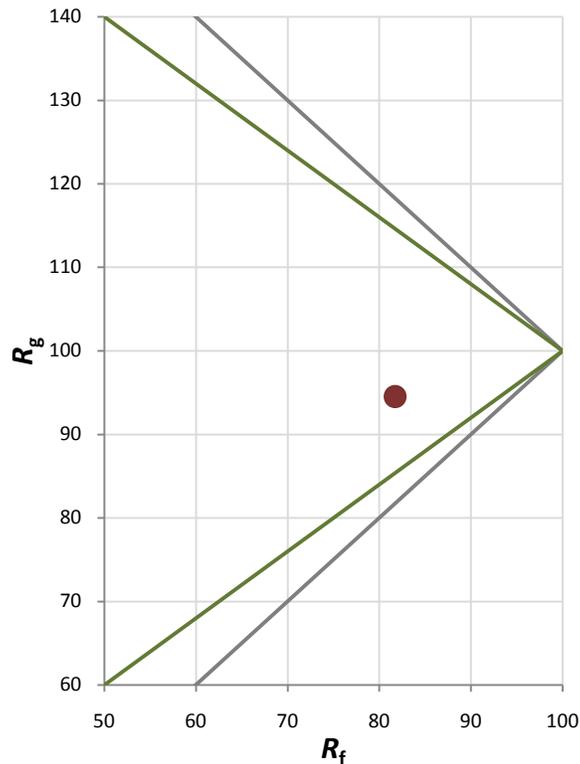
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	95

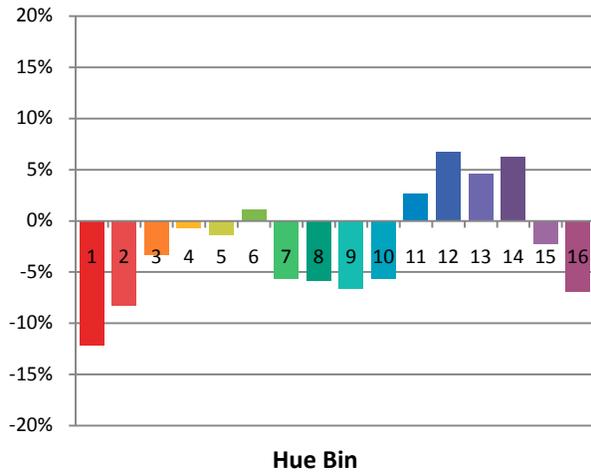
Spectral Power Distribution Comparison



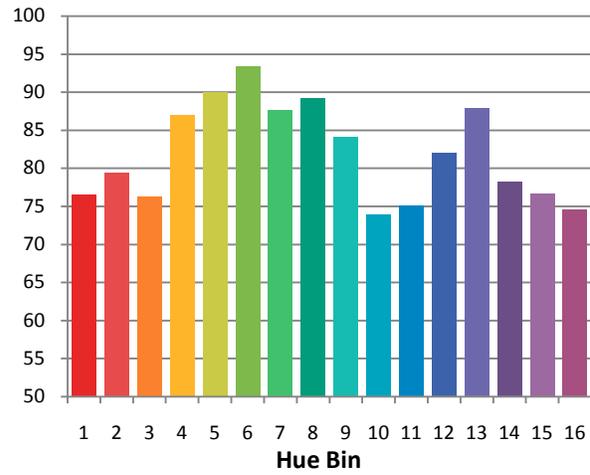
Plot of R_g versus R_f



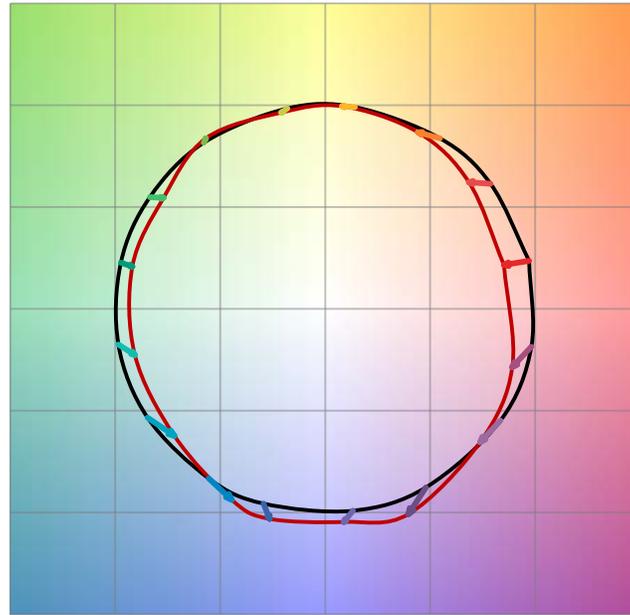
Chroma Shift by Hue



R_f by Hue

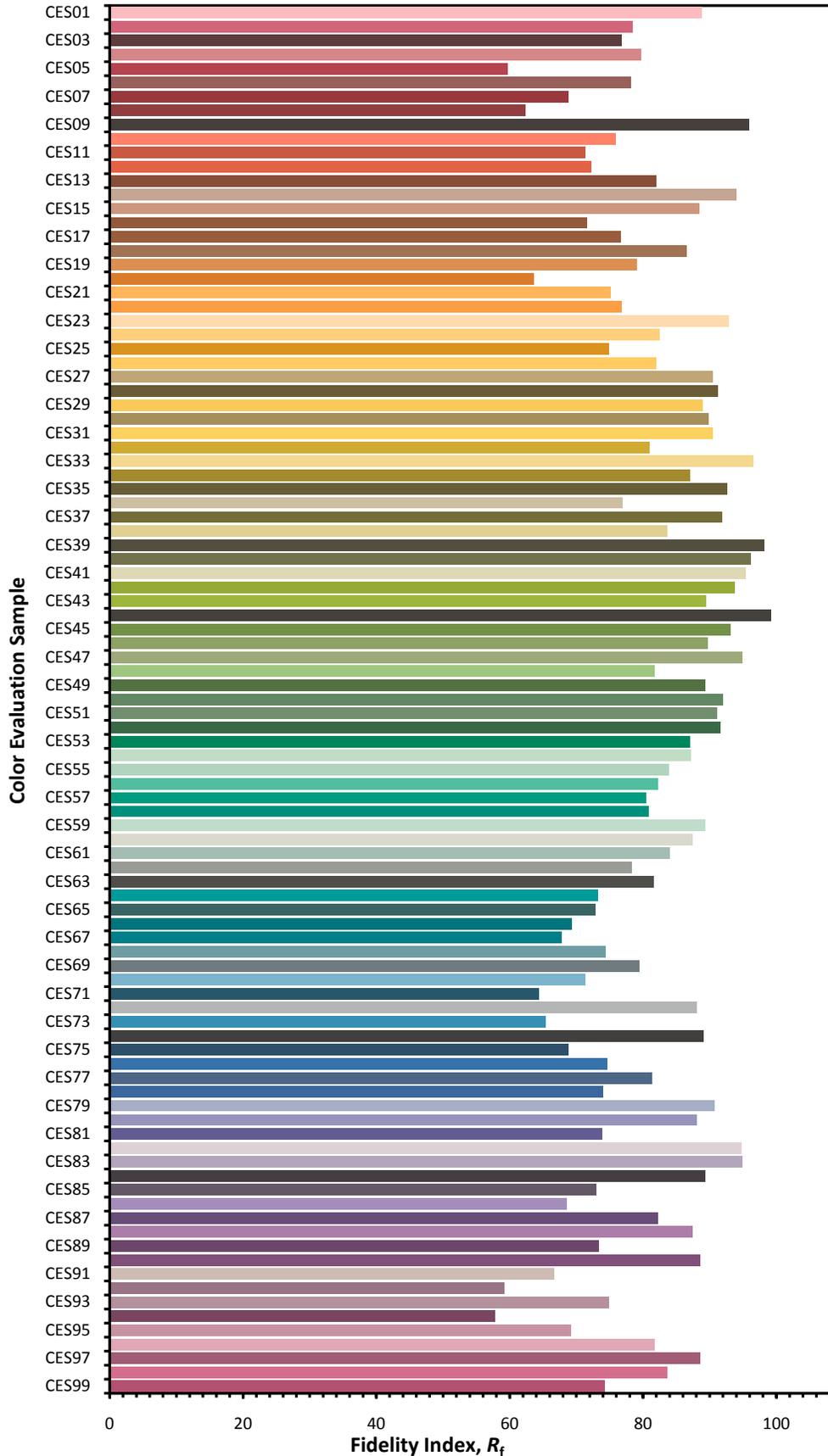


Color Vector Graphic

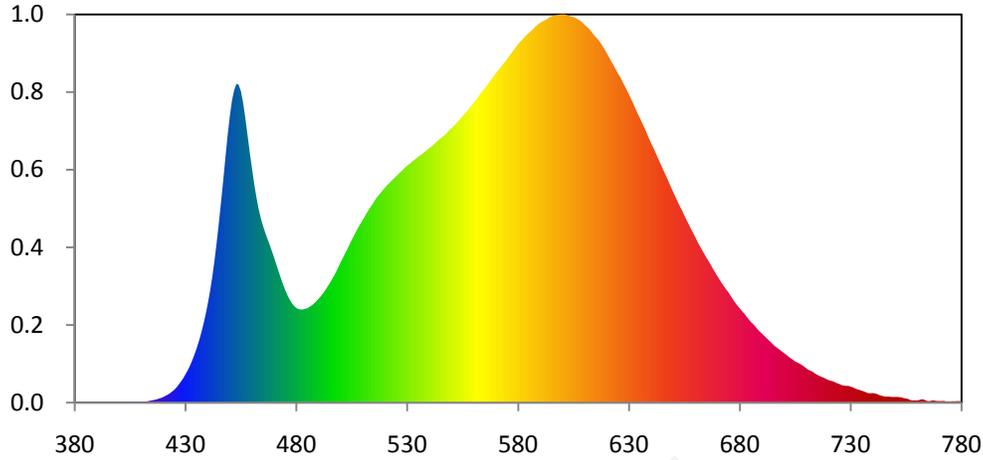


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



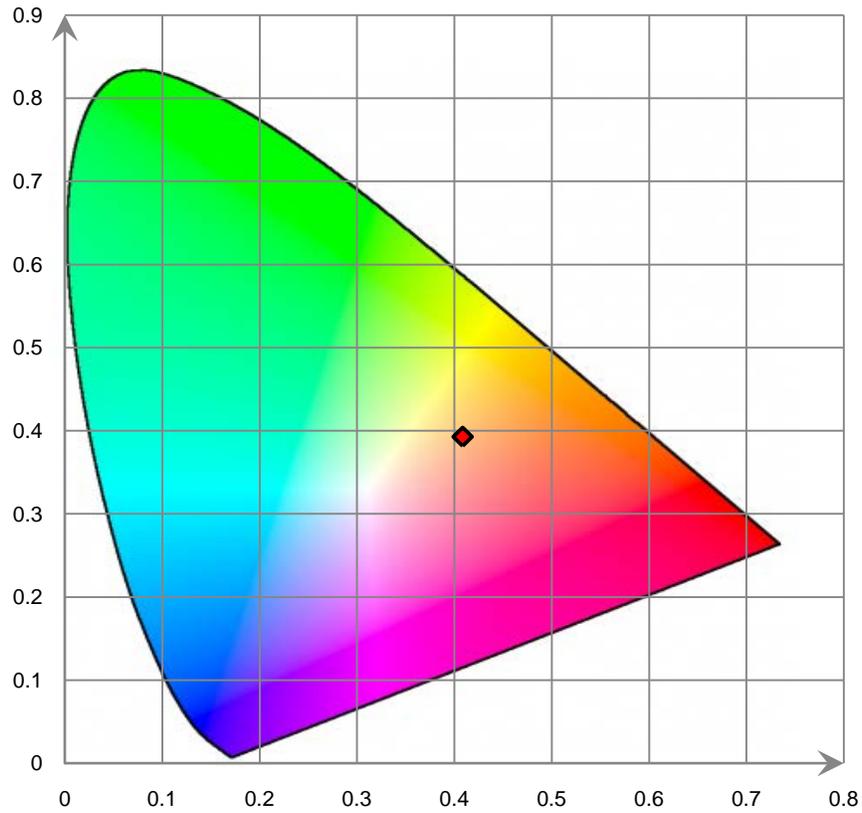
Relative Spectral Power Distribution



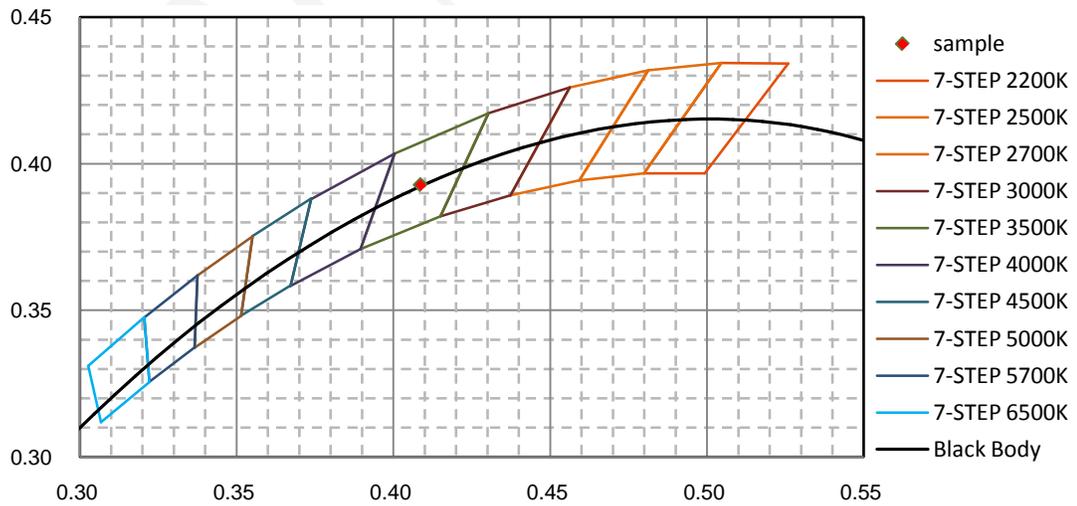
nm	mW								
380	4.980E-02	421	5.116E-01	462	1.525E+01	503	1.140E+01	544	1.948E+01
381	3.520E-02	422	5.897E-01	463	1.440E+01	504	1.175E+01	545	1.961E+01
382	3.920E-02	423	6.979E-01	464	1.369E+01	505	1.208E+01	546	1.974E+01
383	4.200E-02	424	8.289E-01	465	1.312E+01	506	1.240E+01	547	1.988E+01
384	4.320E-02	425	9.593E-01	466	1.262E+01	507	1.272E+01	548	2.005E+01
385	3.560E-02	426	1.137E+00	467	1.216E+01	508	1.303E+01	549	2.024E+01
386	3.610E-02	427	1.350E+00	468	1.172E+01	509	1.330E+01	550	2.038E+01
387	3.770E-02	428	1.574E+00	469	1.125E+01	510	1.357E+01	551	2.054E+01
388	3.400E-02	429	1.815E+00	470	1.077E+01	511	1.387E+01	552	2.072E+01
389	3.690E-02	430	2.096E+00	471	1.025E+01	512	1.415E+01	553	2.089E+01
390	3.200E-02	431	2.395E+00	472	9.755E+00	513	1.441E+01	554	2.107E+01
391	1.510E-02	432	2.729E+00	473	9.267E+00	514	1.465E+01	555	2.126E+01
392	1.000E-02	433	3.121E+00	474	8.796E+00	515	1.491E+01	556	2.147E+01
393	1.980E-02	434	3.550E+00	475	8.365E+00	516	1.517E+01	557	2.162E+01
394	2.590E-02	435	4.009E+00	476	7.985E+00	517	1.538E+01	558	2.184E+01
395	3.090E-02	436	4.531E+00	477	7.660E+00	518	1.557E+01	559	2.205E+01
396	2.140E-02	437	5.112E+00	478	7.392E+00	519	1.577E+01	560	2.225E+01
397	1.300E-02	438	5.761E+00	479	7.183E+00	520	1.597E+01	561	2.247E+01
398	6.400E-03	439	6.471E+00	480	7.036E+00	521	1.616E+01	562	2.269E+01
399	3.500E-03	440	7.284E+00	481	6.948E+00	522	1.632E+01	563	2.293E+01
400	1.900E-02	441	8.188E+00	482	6.916E+00	523	1.648E+01	564	2.314E+01
401	2.380E-02	442	9.229E+00	483	6.921E+00	524	1.665E+01	565	2.333E+01
402	2.330E-02	443	1.043E+01	484	6.967E+00	525	1.681E+01	566	2.354E+01
403	2.860E-02	444	1.178E+01	485	7.015E+00	526	1.697E+01	567	2.378E+01
404	2.780E-02	445	1.324E+01	486	7.113E+00	527	1.712E+01	568	2.401E+01
405	3.840E-02	446	1.481E+01	487	7.227E+00	528	1.728E+01	569	2.423E+01
406	4.120E-02	447	1.644E+01	488	7.364E+00	529	1.745E+01	570	2.446E+01
407	4.710E-02	448	1.816E+01	489	7.524E+00	530	1.760E+01	571	2.467E+01
408	5.090E-02	449	1.982E+01	490	7.704E+00	531	1.772E+01	572	2.486E+01
409	7.490E-02	450	2.125E+01	491	7.895E+00	532	1.785E+01	573	2.509E+01
410	8.480E-02	451	2.245E+01	492	8.102E+00	533	1.799E+01	574	2.528E+01
411	8.170E-02	452	2.322E+01	493	8.338E+00	534	1.813E+01	575	2.551E+01
412	7.950E-02	453	2.367E+01	494	8.591E+00	535	1.826E+01	576	2.573E+01
413	1.075E-01	454	2.360E+01	495	8.850E+00	536	1.837E+01	577	2.595E+01
414	1.424E-01	455	2.313E+01	496	9.120E+00	537	1.849E+01	578	2.617E+01
415	1.729E-01	456	2.228E+01	497	9.413E+00	538	1.863E+01	579	2.640E+01
416	2.129E-01	457	2.115E+01	498	9.737E+00	539	1.877E+01	580	2.662E+01
417	2.430E-01	458	1.987E+01	499	1.008E+01	540	1.890E+01	581	2.680E+01
418	3.031E-01	459	1.859E+01	500	1.042E+01	541	1.902E+01	582	2.697E+01
419	3.522E-01	460	1.741E+01	501	1.075E+01	542	1.916E+01	583	2.715E+01
420	4.202E-01	461	1.626E+01	502	1.108E+01	543	1.934E+01	584	2.732E+01

nm	mW								
585	2.747E+01	626	2.419E+01	667	1.022E+01	708	2.799E+00	749	4.215E-01
586	2.761E+01	627	2.388E+01	668	9.921E+00	709	2.688E+00	750	4.257E-01
587	2.778E+01	628	2.355E+01	669	9.639E+00	710	2.554E+00	751	4.277E-01
588	2.795E+01	629	2.323E+01	670	9.378E+00	711	2.433E+00	752	4.129E-01
589	2.809E+01	630	2.290E+01	671	9.108E+00	712	2.376E+00	753	3.893E-01
590	2.820E+01	631	2.255E+01	672	8.854E+00	713	2.278E+00	754	3.340E-01
591	2.830E+01	632	2.220E+01	673	8.607E+00	714	2.159E+00	755	3.057E-01
592	2.839E+01	633	2.182E+01	674	8.383E+00	715	2.067E+00	756	2.761E-01
593	2.848E+01	634	2.146E+01	675	8.167E+00	716	1.980E+00	757	1.827E-01
594	2.858E+01	635	2.112E+01	676	7.907E+00	717	1.910E+00	758	1.668E-01
595	2.868E+01	636	2.077E+01	677	7.649E+00	718	1.840E+00	759	1.630E-01
596	2.875E+01	637	2.042E+01	678	7.417E+00	719	1.758E+00	760	1.652E-01
597	2.876E+01	638	2.004E+01	679	7.201E+00	720	1.680E+00	761	1.972E-01
598	2.879E+01	639	1.965E+01	680	7.002E+00	721	1.629E+00	762	2.508E-01
599	2.882E+01	640	1.928E+01	681	6.812E+00	722	1.592E+00	763	2.347E-01
600	2.883E+01	641	1.894E+01	682	6.622E+00	723	1.509E+00	764	1.559E-01
601	2.883E+01	642	1.859E+01	683	6.409E+00	724	1.435E+00	765	1.081E-01
602	2.879E+01	643	1.820E+01	684	6.195E+00	725	1.381E+00	766	1.279E-01
603	2.873E+01	644	1.784E+01	685	5.997E+00	726	1.304E+00	767	1.654E-01
604	2.867E+01	645	1.746E+01	686	5.841E+00	727	1.262E+00	768	1.459E-01
605	2.862E+01	646	1.711E+01	687	5.659E+00	728	1.249E+00	769	1.250E-01
606	2.856E+01	647	1.675E+01	688	5.457E+00	729	1.249E+00	770	1.171E-01
607	2.846E+01	648	1.638E+01	689	5.279E+00	730	1.191E+00	771	1.223E-01
608	2.837E+01	649	1.600E+01	690	5.140E+00	731	1.141E+00	772	1.305E-01
609	2.823E+01	650	1.563E+01	691	4.971E+00	732	1.062E+00	773	9.920E-02
610	2.807E+01	651	1.529E+01	692	4.808E+00	733	9.880E-01	774	8.710E-02
611	2.792E+01	652	1.493E+01	693	4.653E+00	734	9.493E-01	775	8.950E-02
612	2.777E+01	653	1.458E+01	694	4.495E+00	735	8.907E-01	776	1.069E-01
613	2.757E+01	654	1.427E+01	695	4.326E+00	736	8.395E-01	777	1.019E-01
614	2.735E+01	655	1.391E+01	696	4.175E+00	737	7.640E-01	778	1.163E-01
615	2.716E+01	656	1.356E+01	697	4.055E+00	738	7.007E-01	779	1.163E-01
616	2.699E+01	657	1.324E+01	698	3.934E+00	739	6.973E-01	780	1.022E-01
617	2.678E+01	658	1.291E+01	699	3.803E+00	740	7.091E-01		
618	2.651E+01	659	1.259E+01	700	3.681E+00	741	6.830E-01		
619	2.625E+01	660	1.228E+01	701	3.558E+00	742	6.371E-01		
620	2.597E+01	661	1.193E+01	702	3.419E+00	743	5.599E-01		
621	2.566E+01	662	1.163E+01	703	3.292E+00	744	5.110E-01		
622	2.535E+01	663	1.134E+01	704	3.183E+00	745	4.698E-01		
623	2.508E+01	664	1.105E+01	705	3.057E+00	746	4.410E-01		
624	2.477E+01	665	1.076E+01	706	2.984E+00	747	4.491E-01		
625	2.446E+01	666	1.050E+01	707	2.897E+00	748	4.364E-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**

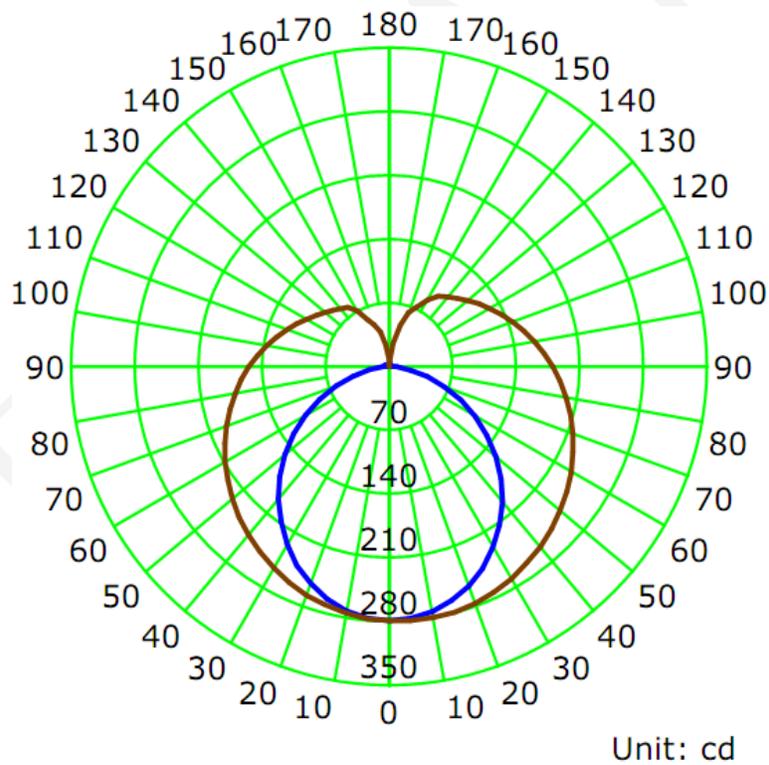
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1000	11.74	0.9810

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1539.8	131.20	280.2	1.21	1.41

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	105.7	142.5	211.1	154.8	153.5
Field Angle (10% I _{max}):	157.6	329.3	338.6	325.8	287.8

Luminous Intensity (cd) Distribution Data

C Y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	279	279	279	279	279	279	279	279
5.0°	278	278	279	280	280	280	280	278
10.0°	273	275	277	279	280	280	277	275
15.0°	266	269	273	277	279	277	273	269
20.0°	257	261	267	273	277	274	268	260
25.0°	244	249	259	268	273	270	261	250
30.0°	229	236	250	262	269	264	252	236
35.0°	212	221	237	255	264	258	242	223
40.0°	194	205	226	247	259	251	232	207
45.0°	174	187	213	238	252	244	221	190
50.0°	153	168	200	229	246	235	209	173
55.0°	132	150	187	220	239	227	197	156
60.0°	110	130	175	211	231	219	185	139
65.0°	88	111	162	202	223	210	175	123
70.0°	65	94	150	192	215	201	163	107
75.0°	44	78	139	183	207	192	152	93
80.0°	24	64	128	175	198	183	142	81
85.0°	9	53	119	166	190	174	133	70
90.0°	2	46	111	157	181	165	125	63
95.0°	2	43	105	149	172	157	118	59
100.0°	4	41	100	141	163	149	112	56
105.0°	4	42	95	134	154	141	107	55
110.0°	4	43	91	127	145	133	102	54
115.0°	3	45	88	120	137	125	97	55
120.0°	3	46	84	114	128	119	93	56
125.0°	2	46	82	108	121	112	89	56
130.0°	1	46	80	102	114	106	86	52
135.0°	1	46	79	98	107	100	83	51
140.0°	1	44	75	93	100	94	79	49
145.0°	1	42	69	89	95	89	68	44
150.0°	1	39	66	79	85	76	61	36
155.0°	2	34	62	71	73	67	48	23
160.0°	4	30	53	63	64	54	27	16
165.0°	5	24	39	48	47	30	15	10
170.0°	3	15	24	28	26	12	5	4
175.0°	2	4	7	10	5	4	2	2
180.0°	0	0	0	0	0	0	0	0

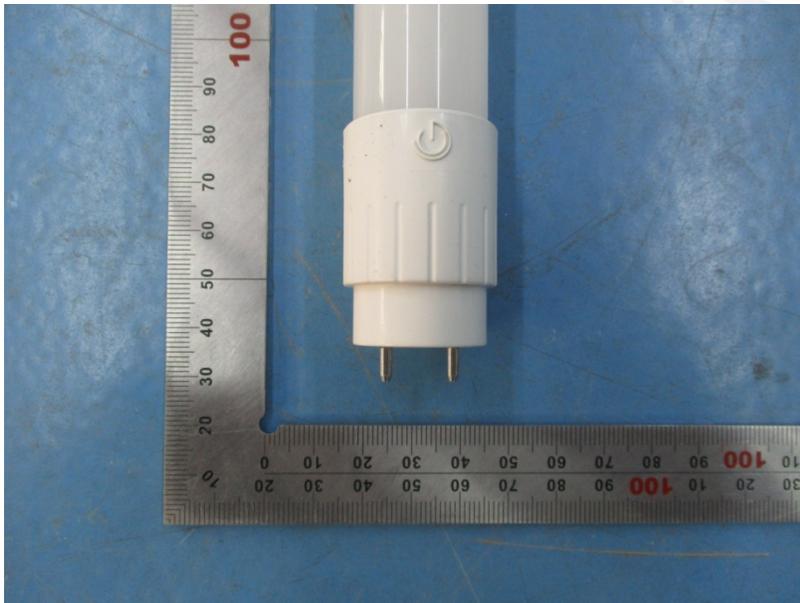
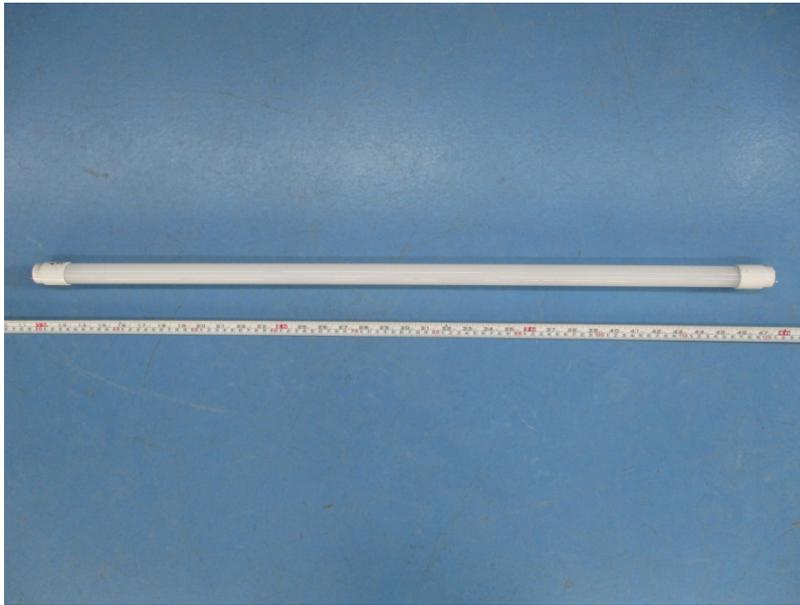
Luminous Intensity (cd) Distribution Data (cont.)

C \ Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	279	279	279	279	279	279	279	279
5.0°	277	278	278	278	278	278	277	277
10.0°	273	273	274	275	275	275	274	273
15.0°	264	265	267	270	271	271	269	266
20.0°	254	256	260	264	267	265	261	257
25.0°	242	243	250	257	262	259	253	245
30.0°	226	229	238	250	256	252	243	232
35.0°	209	213	227	241	249	244	232	217
40.0°	190	196	214	232	242	235	221	201
45.0°	171	177	200	222	234	227	208	184
50.0°	150	159	186	212	226	218	196	167
55.0°	129	141	173	202	218	208	183	149
60.0°	107	121	159	191	209	199	171	132
65.0°	85	103	147	181	200	189	159	116
70.0°	63	85	135	171	191	179	148	100
75.0°	42	70	123	161	182	169	136	86
80.0°	23	56	112	151	173	159	126	73
85.0°	8	46	102	143	164	151	116	63
90.0°	2	38	94	134	155	142	108	56
95.0°	3	35	87	125	146	134	101	51
100.0°	5	33	82	118	137	125	95	48
105.0°	5	33	77	111	128	118	90	46
110.0°	5	34	73	105	120	111	85	46
115.0°	5	37	70	99	112	104	81	46
120.0°	4	36	68	93	105	98	78	48
125.0°	3	33	66	88	99	93	75	49
130.0°	2	33	66	84	93	88	73	44
135.0°	2	33	65	81	88	84	71	41
140.0°	1	31	58	78	84	81	70	40
145.0°	1	27	50	75	80	78	59	39
150.0°	1	20	46	60	71	65	52	35
155.0°	1	15	40	52	57	55	47	29
160.0°	2	10	29	46	50	48	41	23
165.0°	2	6	19	33	40	38	31	16
170.0°	2	3	10	16	25	24	19	7
175.0°	2	2	3	4	8	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	6.7	0.43	0-5	6.7	0.43
5-10	19.8	1.29	0-10	26.5	1.72
10-15	32.4	2.10	0-15	58.9	3.82
15-20	44.0	2.86	0-20	102.9	6.68
20-25	54.4	3.54	0-25	157.3	10.22
25-30	63.4	4.11	0-30	220.7	14.33
30-35	70.6	4.58	0-35	291.2	18.92
35-40	76.1	4.94	0-40	367.3	23.85
40-45	79.7	5.18	0-45	447.0	29.03
45-50	81.7	5.31	0-50	528.7	34.34
50-55	82.0	5.33	0-55	610.8	39.67
55-60	80.9	5.25	0-60	691.6	44.92
60-65	78.4	5.09	0-65	770.0	50.01
65-70	74.8	4.86	0-70	844.9	54.87
70-75	70.5	4.58	0-75	915.3	59.45
75-80	65.6	4.26	0-80	980.9	63.71
80-85	60.7	3.94	0-85	1041.6	67.65
85-90	56.2	3.65	0-90	1097.8	71.30
90-95	52.4	3.40	0-95	1150.2	74.70
95-100	49.1	3.19	0-100	1199.4	77.89
100-105	46.0	2.98	0-105	1245.3	80.88
105-110	42.8	2.78	0-110	1288.1	83.66
110-115	39.6	2.57	0-115	1327.7	86.23
115-120	36.4	2.37	0-120	1364.1	88.59
120-125	33.2	2.15	0-125	1397.3	90.75
125-130	29.8	1.94	0-130	1427.1	92.68
130-135	26.5	1.72	0-135	1453.6	94.40
135-140	23.2	1.51	0-140	1476.8	95.91
140-145	19.6	1.27	0-145	1496.4	97.19
145-150	15.6	1.01	0-150	1512.0	98.20
150-155	11.6	0.76	0-155	1523.7	98.96
155-160	8.1	0.53	0-160	1531.8	99.48
160-165	5.0	0.32	0-165	1536.7	99.80
165-170	2.3	0.15	0-170	1539.0	99.95
170-175	0.6	0.04	0-175	1539.7	100.00
175-180	0.1	0.00	0-180	1539.7	100.00

6. Product Photo



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