

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 17T8U6/840/BYP

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180428080-10-1
Test Date:	2018-04-28 to 2018-05-02
Report Date:	2018-05-07
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.

1. Product Description

General Information:

one sample was received on 2018-04-28 and used for testing.

Model Tested: 17T8U6/840/BYP
 Manufacturer: GREEN CREATIVE LTD
 Brand Name: GREEN CREATIVE
 Product Designation: LED Tube
 Lamp Shape: U tube
 Lamp base: G13
 Aging Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120-277VAC 60Hz
 Rated Power: 17W
 Nominal CCT: 4000K
 Nominal Lumen Output: 2300lm

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
- 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	2018-03-23	2019-03-22
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2018-01-24	2019-01-24
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2018-03-23	2019-03-22
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	2018-03-23	2019-03-22
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	2018-03-23	2019-03-22
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	2018-03-23	2019-03-22
Power Meter	INVENTFINE	WT500	GSDSQ200007	2018-03-23	2019-03-22
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**

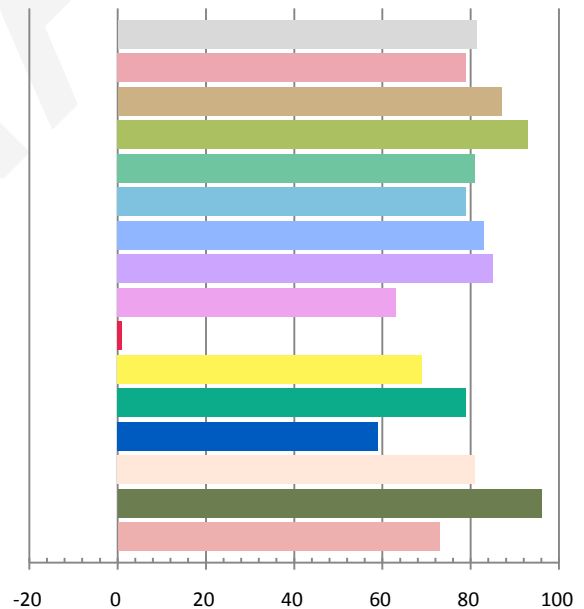
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1491	17.31	0.9673	2318.5	133.94

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
6.882	4050	0.00167	0.3794	0.3797	0.2233	0.5027

Color Rendering Index

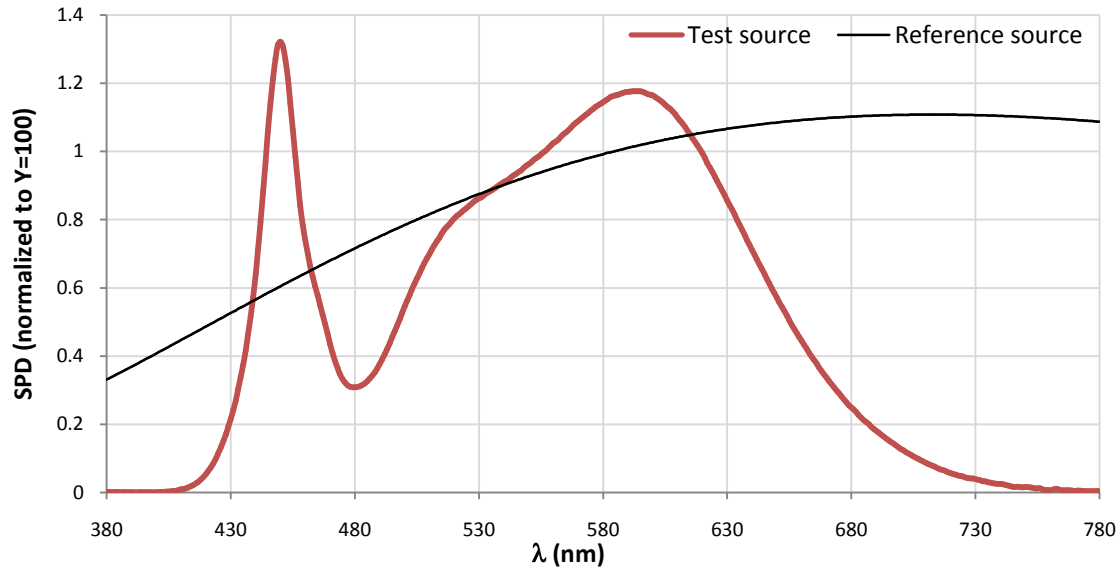
Ra 81.3			
R1 79	R2 87	R3 93	R4 81
R5 79	R6 83	R7 85	R8 63
R9 1	R10 69	R11 79	R12 59
R13 81	R14 96	R15 73	



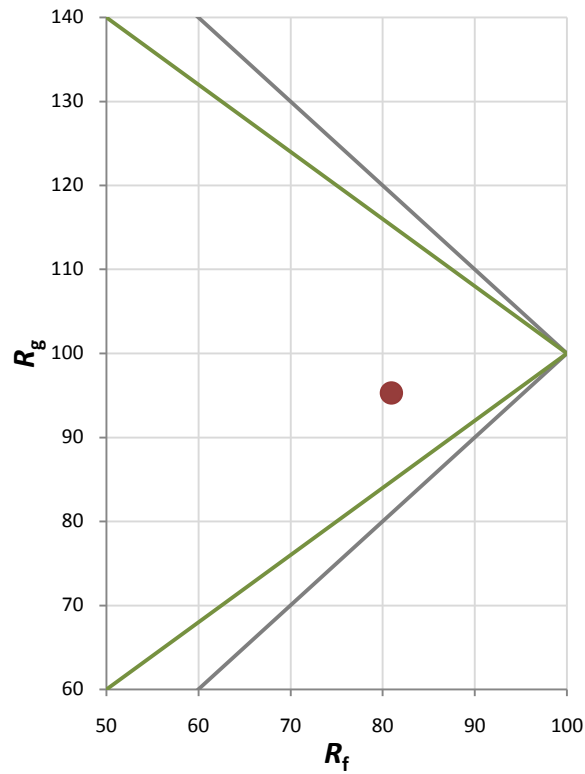
Fidelity Index and Gamut Index

Fidelity Index R_f	81
Gamut Index R_g	95

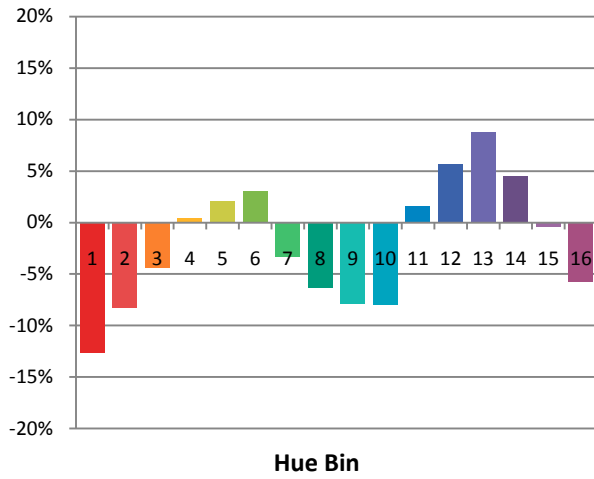
Spectral Power Distribution Comparison



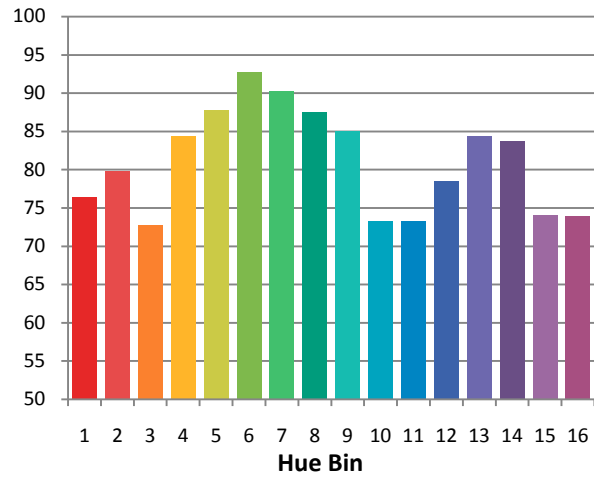
Plot of R_g versus R_f



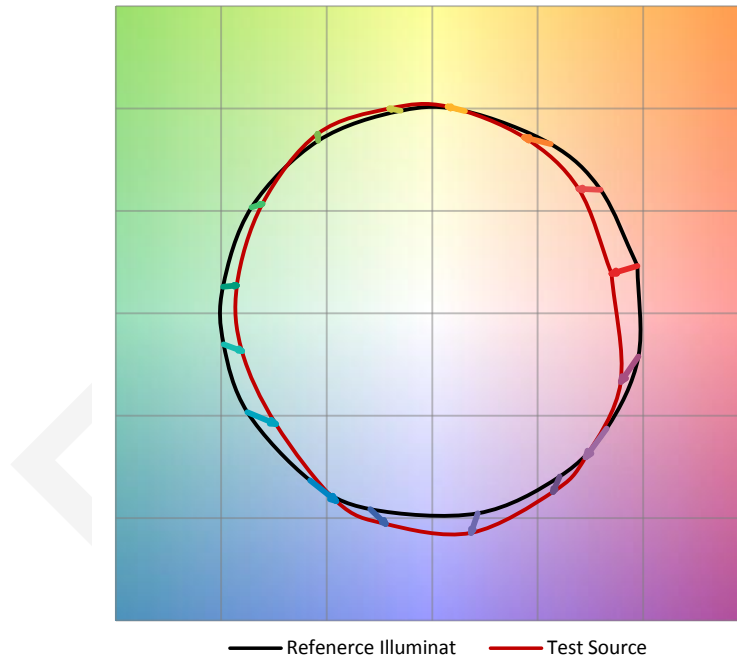
Chroma Shift by Hue



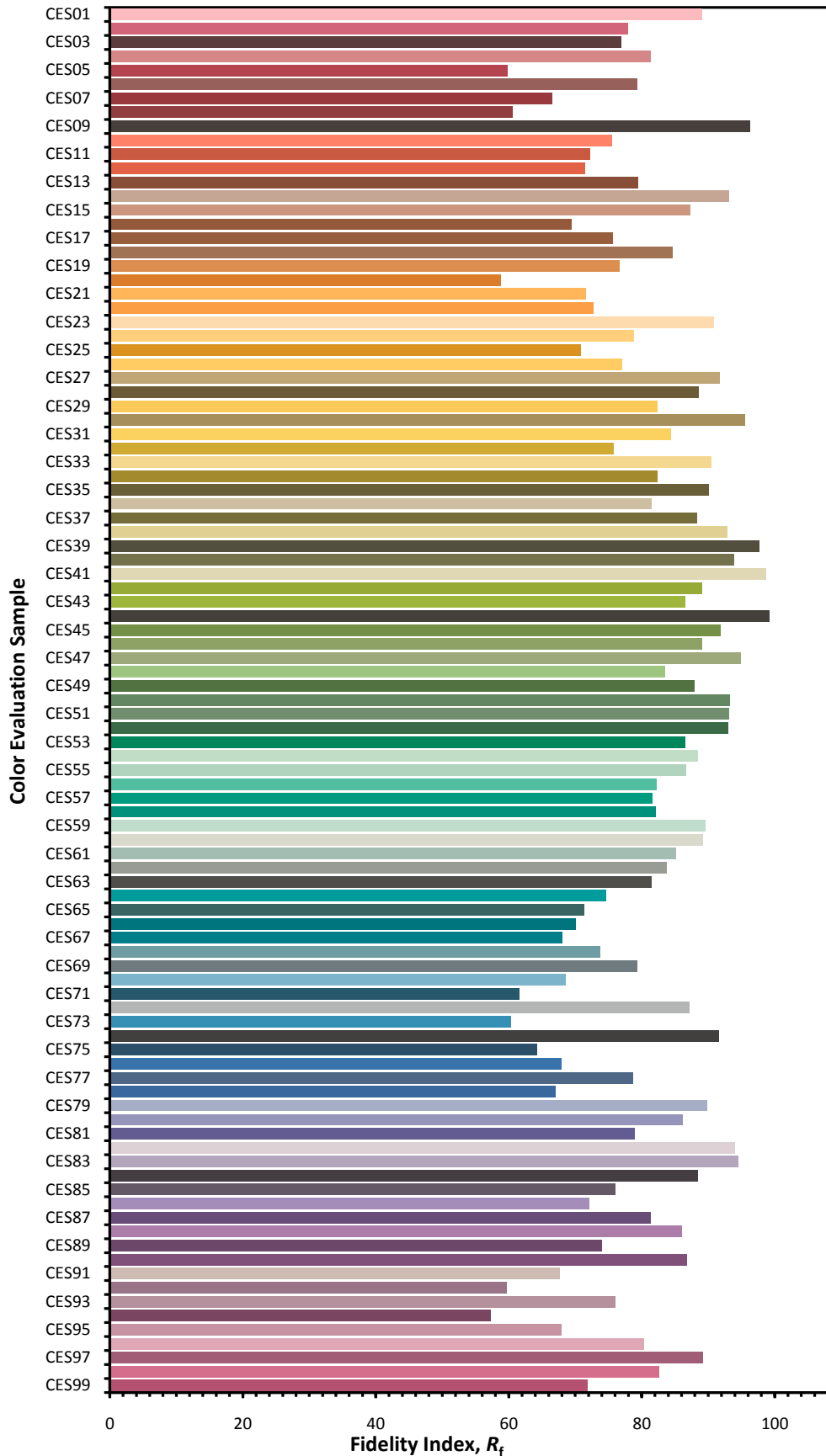
R_f by Hue



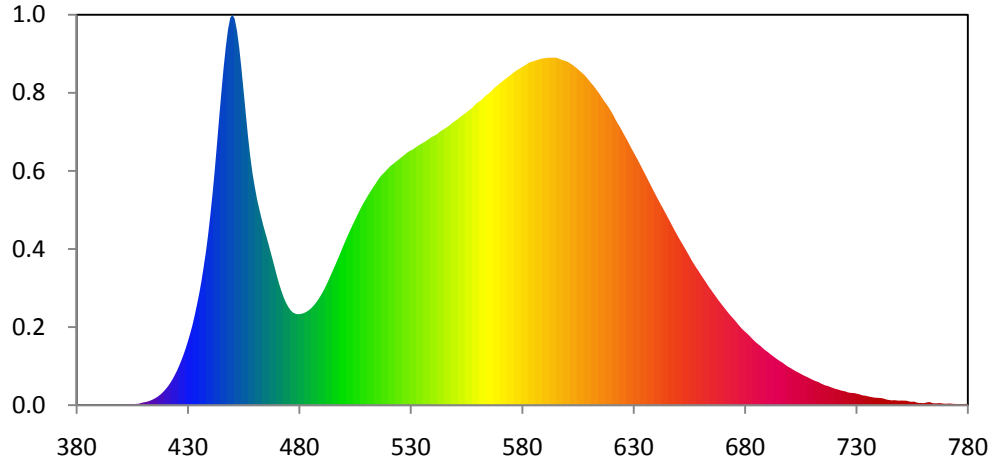
Color Vector Graphic



Color Fidelity by CES Sample



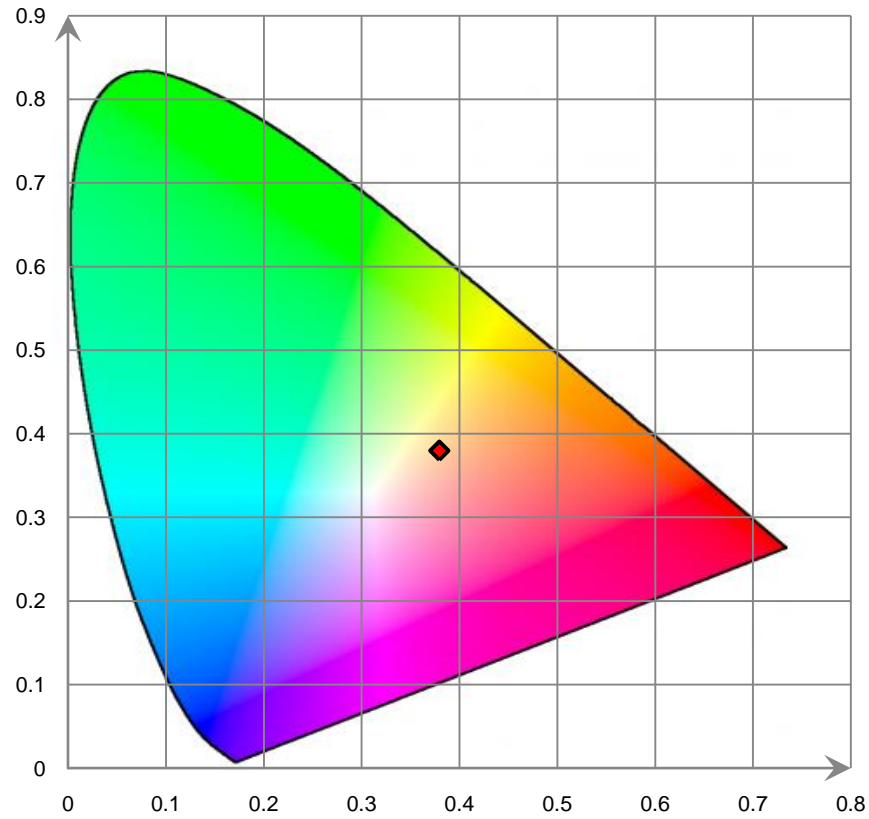
Relative Spectral Power Distribution



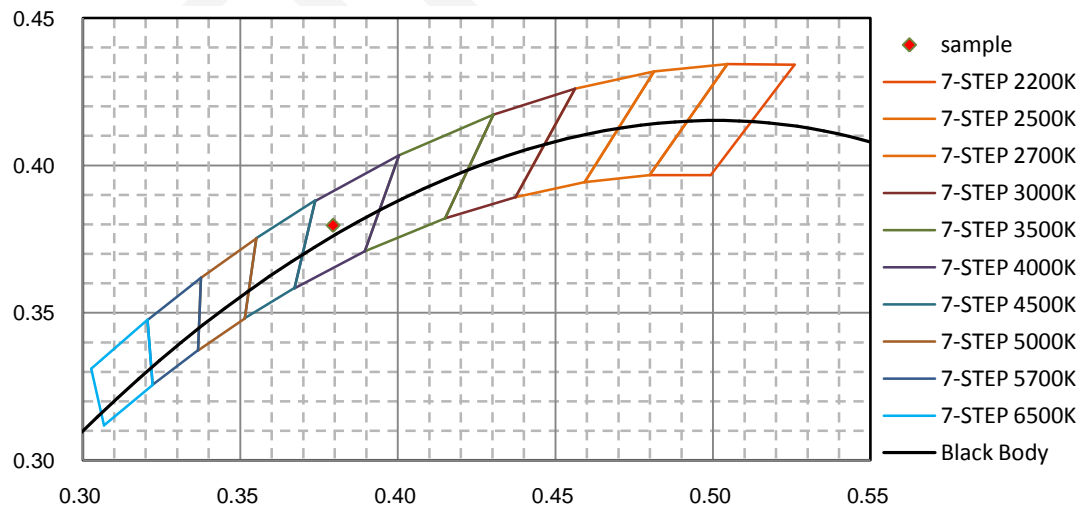
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.060E-02	421	2.159E+00	462	2.255E+01	503	2.021E+01	544	3.157E+01
381	5.130E-02	422	2.523E+00	463	2.148E+01	504	2.075E+01	545	3.173E+01
382	4.380E-02	423	2.934E+00	464	2.049E+01	505	2.129E+01	546	3.190E+01
383	4.740E-02	424	3.405E+00	465	1.958E+01	506	2.181E+01	547	3.208E+01
384	5.220E-02	425	3.917E+00	466	1.866E+01	507	2.233E+01	548	3.228E+01
385	4.230E-02	426	4.494E+00	467	1.771E+01	508	2.285E+01	549	3.251E+01
386	4.210E-02	427	5.112E+00	468	1.675E+01	509	2.330E+01	550	3.268E+01
387	4.510E-02	428	5.787E+00	469	1.576E+01	510	2.373E+01	551	3.286E+01
388	3.420E-02	429	6.523E+00	470	1.480E+01	511	2.418E+01	552	3.308E+01
389	3.920E-02	430	7.338E+00	471	1.388E+01	512	2.458E+01	553	3.326E+01
390	3.370E-02	431	8.219E+00	472	1.308E+01	513	2.498E+01	554	3.344E+01
391	1.810E-02	432	9.169E+00	473	1.238E+01	514	2.536E+01	555	3.365E+01
392	1.120E-02	433	1.028E+01	474	1.178E+01	515	2.576E+01	556	3.386E+01
393	2.720E-02	434	1.148E+01	475	1.132E+01	516	2.614E+01	557	3.403E+01
394	3.540E-02	435	1.275E+01	476	1.094E+01	517	2.644E+01	558	3.429E+01
395	3.310E-02	436	1.415E+01	477	1.068E+01	518	2.669E+01	559	3.455E+01
396	2.070E-02	437	1.576E+01	478	1.053E+01	519	2.697E+01	560	3.477E+01
397	1.680E-02	438	1.749E+01	479	1.046E+01	520	2.725E+01	561	3.494E+01
398	1.550E-02	439	1.945E+01	480	1.046E+01	521	2.751E+01	562	3.514E+01
399	1.160E-02	440	2.170E+01	481	1.050E+01	522	2.770E+01	563	3.541E+01
400	2.610E-02	441	2.415E+01	482	1.058E+01	523	2.790E+01	564	3.564E+01
401	3.440E-02	442	2.690E+01	483	1.070E+01	524	2.811E+01	565	3.583E+01
402	4.760E-02	443	2.990E+01	484	1.087E+01	525	2.831E+01	566	3.605E+01
403	6.420E-02	444	3.295E+01	485	1.107E+01	526	2.852E+01	567	3.632E+01
404	8.250E-02	445	3.594E+01	486	1.132E+01	527	2.872E+01	568	3.656E+01
405	1.021E-01	446	3.871E+01	487	1.161E+01	528	2.893E+01	569	3.677E+01
406	1.227E-01	447	4.116E+01	488	1.195E+01	529	2.913E+01	570	3.698E+01
407	1.478E-01	448	4.319E+01	489	1.234E+01	530	2.926E+01	571	3.718E+01
408	1.701E-01	449	4.451E+01	490	1.276E+01	531	2.939E+01	572	3.739E+01
409	2.458E-01	450	4.486E+01	491	1.323E+01	532	2.958E+01	573	3.759E+01
410	3.143E-01	451	4.439E+01	492	1.374E+01	533	2.976E+01	574	3.776E+01
411	3.620E-01	452	4.303E+01	493	1.430E+01	534	2.993E+01	575	3.798E+01
412	4.252E-01	453	4.113E+01	494	1.488E+01	535	3.008E+01	576	3.820E+01
413	5.154E-01	454	3.872E+01	495	1.545E+01	536	3.022E+01	577	3.838E+01
414	6.221E-01	455	3.609E+01	496	1.603E+01	537	3.038E+01	578	3.855E+01
415	7.580E-01	456	3.339E+01	497	1.662E+01	538	3.056E+01	579	3.869E+01
416	9.093E-01	457	3.081E+01	498	1.723E+01	539	3.075E+01	580	3.886E+01
417	1.088E+00	458	2.853E+01	499	1.785E+01	540	3.089E+01	581	3.901E+01
418	1.303E+00	459	2.663E+01	500	1.847E+01	541	3.102E+01	582	3.917E+01
419	1.550E+00	460	2.509E+01	501	1.906E+01	542	3.119E+01	583	3.935E+01
420	1.838E+00	461	2.371E+01	502	1.966E+01	543	3.141E+01	584	3.945E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.951E+01	626	3.098E+01	667	1.246E+01	708	3.230E+00	749	5.142E-01
586	3.960E+01	627	3.052E+01	668	1.210E+01	709	3.092E+00	750	5.326E-01
587	3.969E+01	628	3.004E+01	669	1.176E+01	710	2.967E+00	751	5.264E-01
588	3.976E+01	629	2.954E+01	670	1.143E+01	711	2.840E+00	752	5.213E-01
589	3.983E+01	630	2.907E+01	671	1.111E+01	712	2.745E+00	753	4.884E-01
590	3.986E+01	631	2.861E+01	672	1.078E+01	713	2.657E+00	754	4.054E-01
591	3.990E+01	632	2.814E+01	673	1.046E+01	714	2.509E+00	755	3.961E-01
592	3.993E+01	633	2.764E+01	674	1.017E+01	715	2.393E+00	756	4.144E-01
593	3.992E+01	634	2.713E+01	675	9.887E+00	716	2.277E+00	757	3.110E-01
594	3.994E+01	635	2.665E+01	676	9.589E+00	717	2.225E+00	758	2.539E-01
595	3.993E+01	636	2.614E+01	677	9.274E+00	718	2.121E+00	759	2.578E-01
596	3.986E+01	637	2.562E+01	678	8.967E+00	719	2.018E+00	760	2.266E-01
597	3.977E+01	638	2.513E+01	679	8.701E+00	720	1.934E+00	761	2.672E-01
598	3.966E+01	639	2.464E+01	680	8.455E+00	721	1.849E+00	762	3.329E-01
599	3.959E+01	640	2.412E+01	681	8.233E+00	722	1.788E+00	763	3.522E-01
600	3.951E+01	641	2.365E+01	682	7.988E+00	723	1.695E+00	764	2.508E-01
601	3.937E+01	642	2.317E+01	683	7.712E+00	724	1.640E+00	765	2.110E-01
602	3.920E+01	643	2.271E+01	684	7.454E+00	725	1.589E+00	766	2.096E-01
603	3.902E+01	644	2.224E+01	685	7.210E+00	726	1.490E+00	767	2.314E-01
604	3.882E+01	645	2.176E+01	686	6.994E+00	727	1.430E+00	768	2.283E-01
605	3.861E+01	646	2.128E+01	687	6.800E+00	728	1.400E+00	769	1.857E-01
606	3.838E+01	647	2.079E+01	688	6.560E+00	729	1.397E+00	770	1.674E-01
607	3.817E+01	648	2.030E+01	689	6.335E+00	730	1.331E+00	771	1.805E-01
608	3.793E+01	649	1.983E+01	690	6.155E+00	731	1.276E+00	772	1.917E-01
609	3.763E+01	650	1.936E+01	691	5.948E+00	732	1.195E+00	773	1.601E-01
610	3.732E+01	651	1.893E+01	692	5.751E+00	733	1.119E+00	774	1.432E-01
611	3.700E+01	652	1.849E+01	693	5.558E+00	734	1.098E+00	775	1.407E-01
612	3.671E+01	653	1.804E+01	694	5.368E+00	735	1.029E+00	776	1.225E-01
613	3.638E+01	654	1.761E+01	695	5.182E+00	736	9.747E-01	777	1.300E-01
614	3.603E+01	655	1.716E+01	696	5.015E+00	737	9.203E-01	778	1.333E-01
615	3.566E+01	656	1.670E+01	697	4.863E+00	738	8.754E-01	779	1.464E-01
616	3.527E+01	657	1.627E+01	698	4.668E+00	739	8.524E-01	780	1.380E-01
617	3.489E+01	658	1.587E+01	699	4.477E+00	740	8.442E-01		
618	3.454E+01	659	1.548E+01	700	4.328E+00	741	8.214E-01		
619	3.416E+01	660	1.509E+01	701	4.187E+00	742	7.772E-01		
620	3.374E+01	661	1.469E+01	702	4.020E+00	743	6.918E-01		
621	3.329E+01	662	1.431E+01	703	3.877E+00	744	6.255E-01		
622	3.278E+01	663	1.392E+01	704	3.748E+00	745	5.847E-01		
623	3.234E+01	664	1.353E+01	705	3.605E+00	746	5.521E-01		
624	3.192E+01	665	1.318E+01	706	3.464E+00	747	5.741E-01		
625	3.145E+01	666	1.282E+01	707	3.342E+00	748	5.536E-01		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	452	452	452	452	452	452	452	452
5.0°	449	452	454	455	456	454	454	452
10.0°	443	447	452	456	458	456	452	447
15.0°	430	438	447	456	458	454	446	437
20.0°	414	425	439	452	457	451	437	422
25.0°	393	408	429	447	454	444	426	405
30.0°	368	387	416	441	450	436	411	384
35.0°	341	364	400	433	442	428	395	360
40.0°	311	339	383	424	435	417	377	333
45.0°	279	312	365	413	427	406	357	305
50.0°	245	285	347	401	416	393	337	276
55.0°	211	256	327	388	405	379	316	245
60.0°	175	229	308	374	389	364	295	216
65.0°	140	201	288	358	375	349	275	186
70.0°	104	175	271	343	360	333	254	158
75.0°	70	150	252	326	345	316	235	131
80.0°	39	128	232	311	329	299	214	107
85.0°	13	102	179	221	231	218	172	82
90.0°	0	49	102	139	149	133	91	36
95.0°	2	73	165	210	219	201	147	51
100.0°	9	67	176	253	272	243	156	49
105.0°	18	65	166	240	257	231	149	52
110.0°	27	69	153	223	240	213	141	57
115.0°	36	76	148	193	211	190	134	59
120.0°	45	78	134	178	198	172	130	62
125.0°	53	76	122	163	178	156	117	55
130.0°	57	64	118	156	169	149	107	38
135.0°	60	42	115	150	161	142	103	37
140.0°	63	44	111	142	151	134	93	43
145.0°	68	45	103	134	140	123	59	53
150.0°	74	49	75	119	125	97	50	73
155.0°	78	54	57	80	79	56	55	75
160.0°	76	65	55	59	58	56	76	75
165.0°	75	81	63	61	59	71	73	66
170.0°	74	82	89	85	72	73	62	60
175.0°	70	75	61	70	76	66	68	70
180.0°	0	0	0	0	0	0	0	0

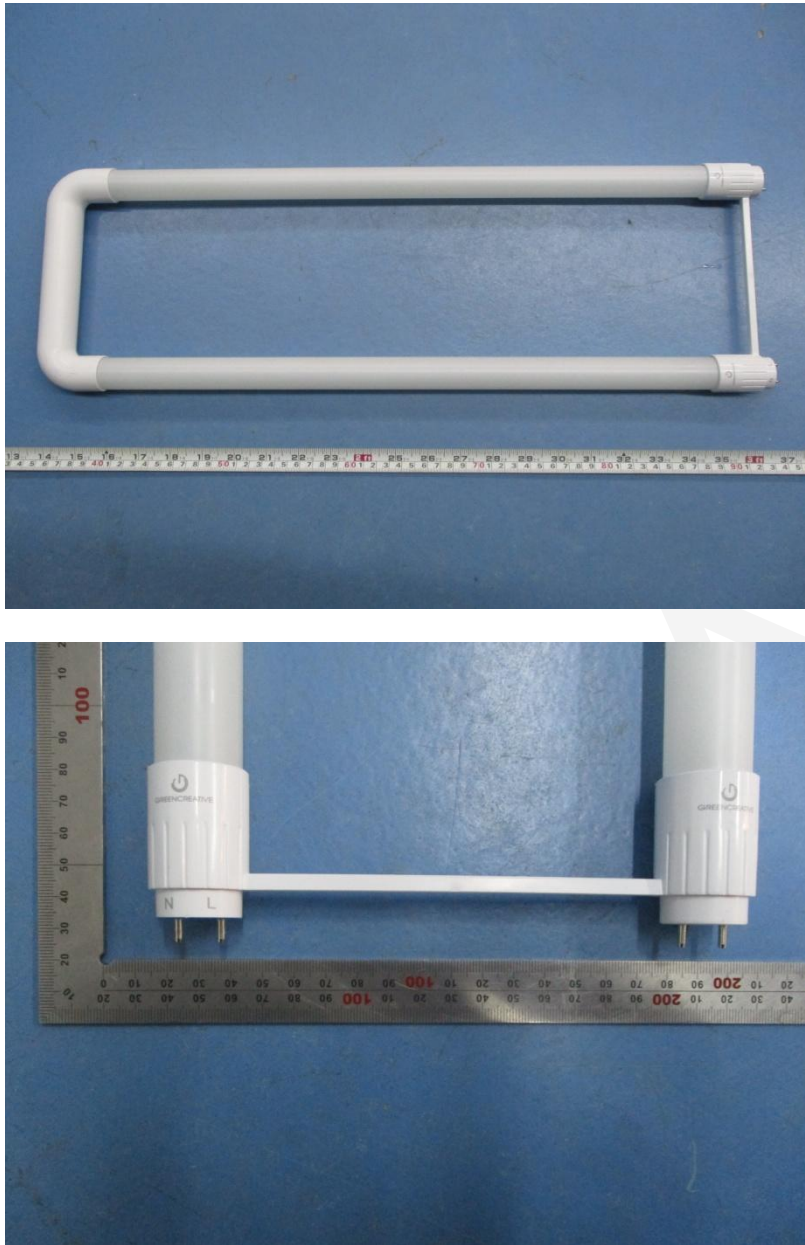
Luminous Intensity (cd) Distribution Data (cont.)

C γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	452	452	452	452	452	452	452	452
5.0°	448	448	447	448	446	447	448	449
10.0°	441	439	439	440	440	439	439	439
15.0°	428	427	428	431	431	429	427	426
20.0°	411	409	414	420	420	418	412	409
25.0°	389	390	398	407	408	404	396	388
30.0°	364	366	380	393	396	390	376	365
35.0°	337	342	360	377	382	375	356	338
40.0°	306	315	339	362	367	358	333	311
45.0°	275	286	317	345	351	341	311	282
50.0°	241	257	296	329	337	323	289	252
55.0°	206	229	274	313	321	306	266	221
60.0°	171	200	253	296	306	289	244	191
65.0°	135	173	232	279	291	272	222	162
70.0°	101	146	213	263	274	256	202	135
75.0°	67	123	195	246	256	239	183	110
80.0°	35	101	177	229	240	222	165	87
85.0°	10	78	148	185	192	180	137	65
90.0°	0	36	76	104	111	99	70	29
95.0°	0	50	102	128	133	126	101	37
100.0°	8	47	121	174	186	169	110	36
105.0°	16	45	114	165	175	159	103	36
110.0°	25	47	107	155	165	149	98	40
115.0°	34	50	101	135	148	131	94	43
120.0°	42	53	92	123	139	118	89	47
125.0°	50	53	83	114	126	110	82	42
130.0°	54	43	81	109	120	106	77	31
135.0°	58	31	80	104	114	102	77	31
140.0°	62	33	78	100	108	98	74	34
145.0°	68	39	66	96	102	94	61	46
150.0°	74	52	44	81	94	77	44	53
155.0°	78	65	45	54	68	51	45	64
160.0°	72	70	53	48	49	48	55	68
165.0°	68	65	65	57	56	60	69	69
170.0°	67	59	69	68	75	78	74	70
175.0°	66	58	59	70	68	66	66	65
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	10.8	0.46	0-5	10.8	0.46
5-10	32.0	1.37	0-10	42.8	1.83
10-15	52.3	2.24	0-15	95.2	4.07
15-20	71.1	3.04	0-20	166.3	7.11
20-25	87.8	3.75	0-25	254.1	10.86
25-30	102.1	4.36	0-30	356.1	15.23
30-35	113.7	4.86	0-35	469.8	20.09
35-40	122.4	5.23	0-40	592.2	25.32
40-45	128.2	5.48	0-45	720.5	30.80
45-50	131.3	5.61	0-50	851.7	36.42
50-55	131.6	5.63	0-55	983.3	42.04
55-60	129.4	5.53	0-60	1112.8	47.58
60-65	125.1	5.35	0-65	1237.9	52.93
65-70	119.1	5.09	0-70	1357.0	58.02
70-75	111.6	4.77	0-75	1468.5	62.79
75-80	103.0	4.40	0-80	1571.5	67.19
80-85	87.1	3.72	0-85	1658.6	70.91
85-90	58.8	2.51	0-90	1717.4	73.43
90-95	50.8	2.17	0-95	1768.1	75.60
95-100	64.9	2.77	0-100	1833.0	78.37
100-105	68.0	2.91	0-105	1901.0	81.28
105-110	63.7	2.72	0-110	1964.7	84.00
110-115	58.4	2.50	0-115	2023.1	86.50
115-120	52.9	2.26	0-120	2076.0	88.76
120-125	47.3	2.02	0-125	2123.3	90.79
125-130	41.6	1.78	0-130	2164.9	92.56
130-135	36.5	1.56	0-135	2201.4	94.12
135-140	32.1	1.37	0-140	2233.5	95.49
140-145	27.8	1.19	0-145	2261.3	96.68
145-150	22.8	0.97	0-150	2284.0	97.66
150-155	17.3	0.74	0-155	2301.3	98.39
155-160	13.0	0.56	0-160	2314.3	98.95
160-165	10.5	0.45	0-165	2324.9	99.40
165-170	8.2	0.35	0-170	2333.1	99.75
170-175	5.0	0.21	0-175	2338.1	99.97
175-180	0.8	0.03	0-180	2338.9	100.00

6. Product Photo



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