

# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

### GREEN CREATIVE LTD

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

**Test Model: AD4LEM9027DIM010UNVMDRBL**

<b>Report Type:</b>	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
<b>Test Engineer:</b>	Joker Gu <i>Joker . Gu</i>
<b>Report Number:</b>	RKSB180522002-10-2
<b>Test Date:</b>	2018-05-22
<b>Report Date:</b>	2018-05-25
<b>Reviewed By:</b>	Ray Gao/EE Engineer <i>Ray Gao</i>
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Kunshan). No.248 Chenghu Road, Kunshan, Jiangsu province, China. Tel: +86-0512-86175000 Fax: +86-0512-88934268
<b>Test Facility:</b>	Test facility was located at No.248 Chenghu Road, Kunshan, Jiangsu province, China.
<b>Accreditation:</b>	The IAS Accreditation Number TL-749.

## 1. Product Description

### General Information:

One sample was received on 2018-05-22 and used for testing.

Model Tested: AD4LEM9027DIM010UNVMDBL  
 Manufacturer: GREEN CREATIVE LTD  
 Brand Name: GREEN CREATIVE  
 Product Designation: LED Downlight  
 Aging Time Before Test: 0hour(For New Products)

### Rated Values:

Rated Voltage/Frequency: 120-277 VAC 60Hz  
 Rated Power: 31.5W  
 Nominal CCT: 2700K  
 Nominal Lumen Output: 2200lm

## 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	2018-03-23	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.

$4\pi$  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 ( $\gamma$ ) 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**

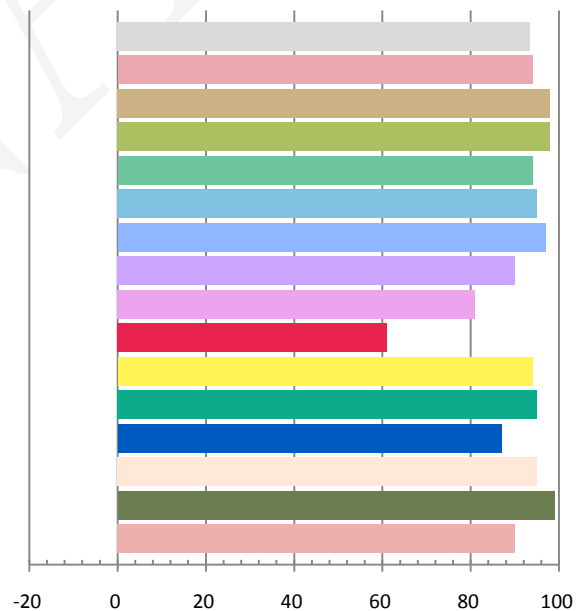
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.2644	31.54	0.994	2238.4	70.97

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
7.926	2769	-0.00183	0.4513	0.4037	0.2600	0.5234

### Color Rendering Index

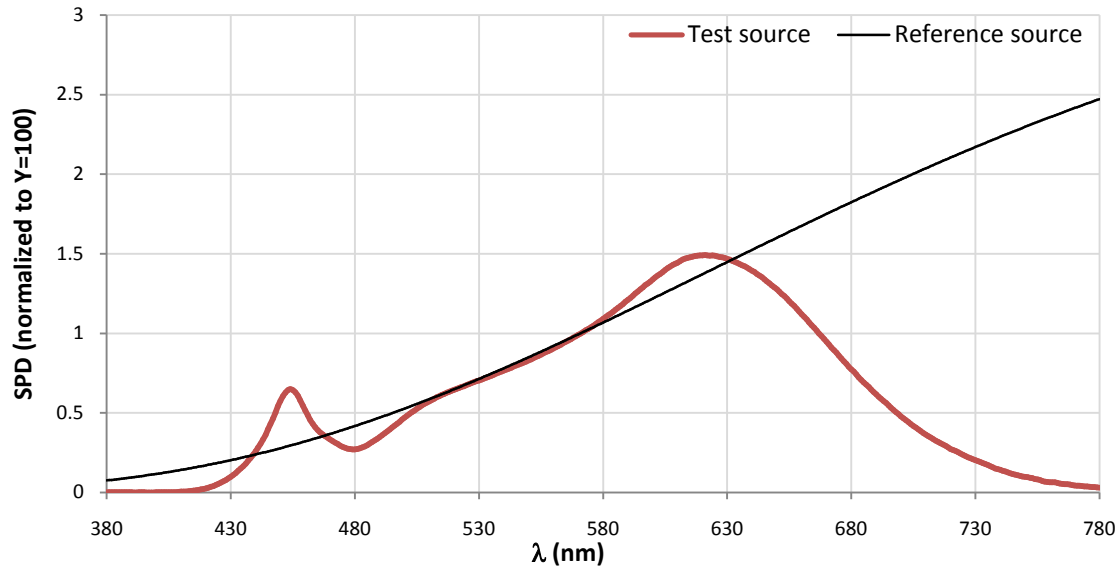
<b>Ra</b>			
<b>93.4</b>			
<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>
94	98	98	94
<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>
95	97	90	81
<b>R9</b>	<b>R10</b>	<b>R11</b>	<b>R12</b>
61	94	95	87
<b>R13</b>	<b>R14</b>	<b>R15</b>	
95	99	90	



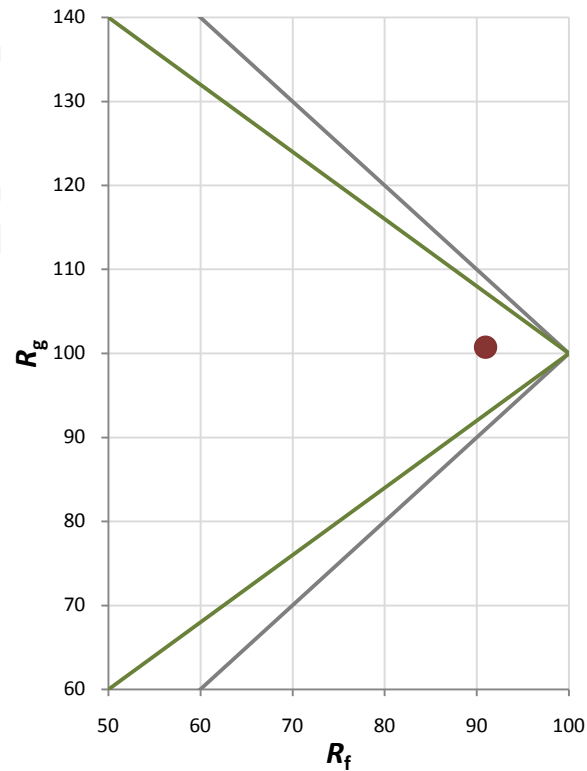
### Fidelity Index and Gamut Index

Fidelity Index $R_f$	91
Gamut Index $R_g$	101

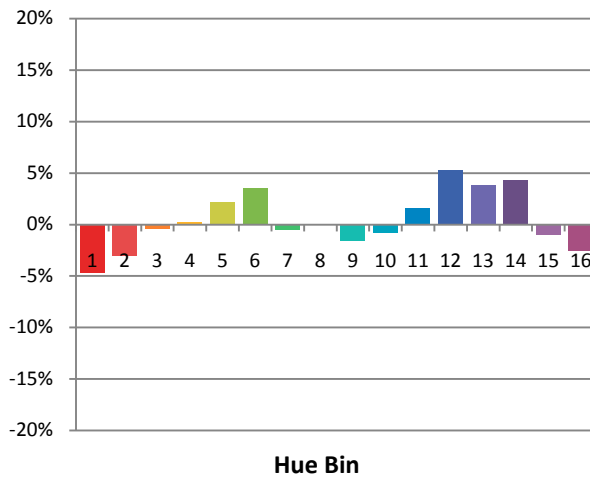
### Spectral Power Distribution Comparison



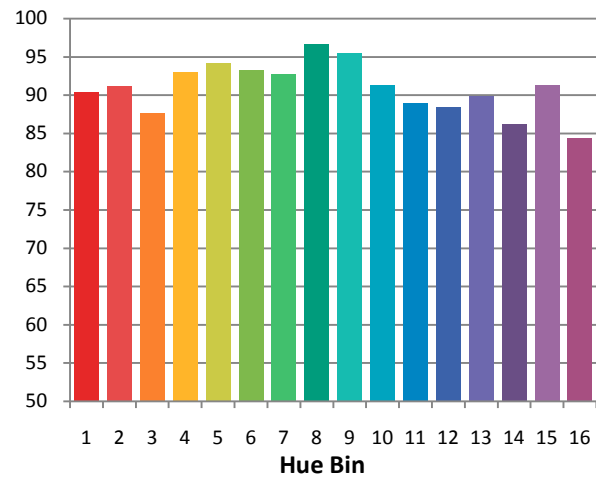
### Plot of $R_g$ versus $R_f$



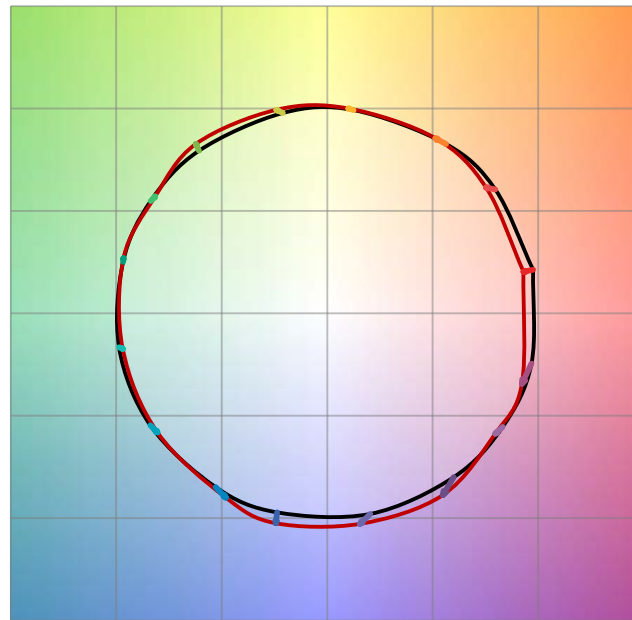
Chroma Shift by Hue



$R_t$  by Hue

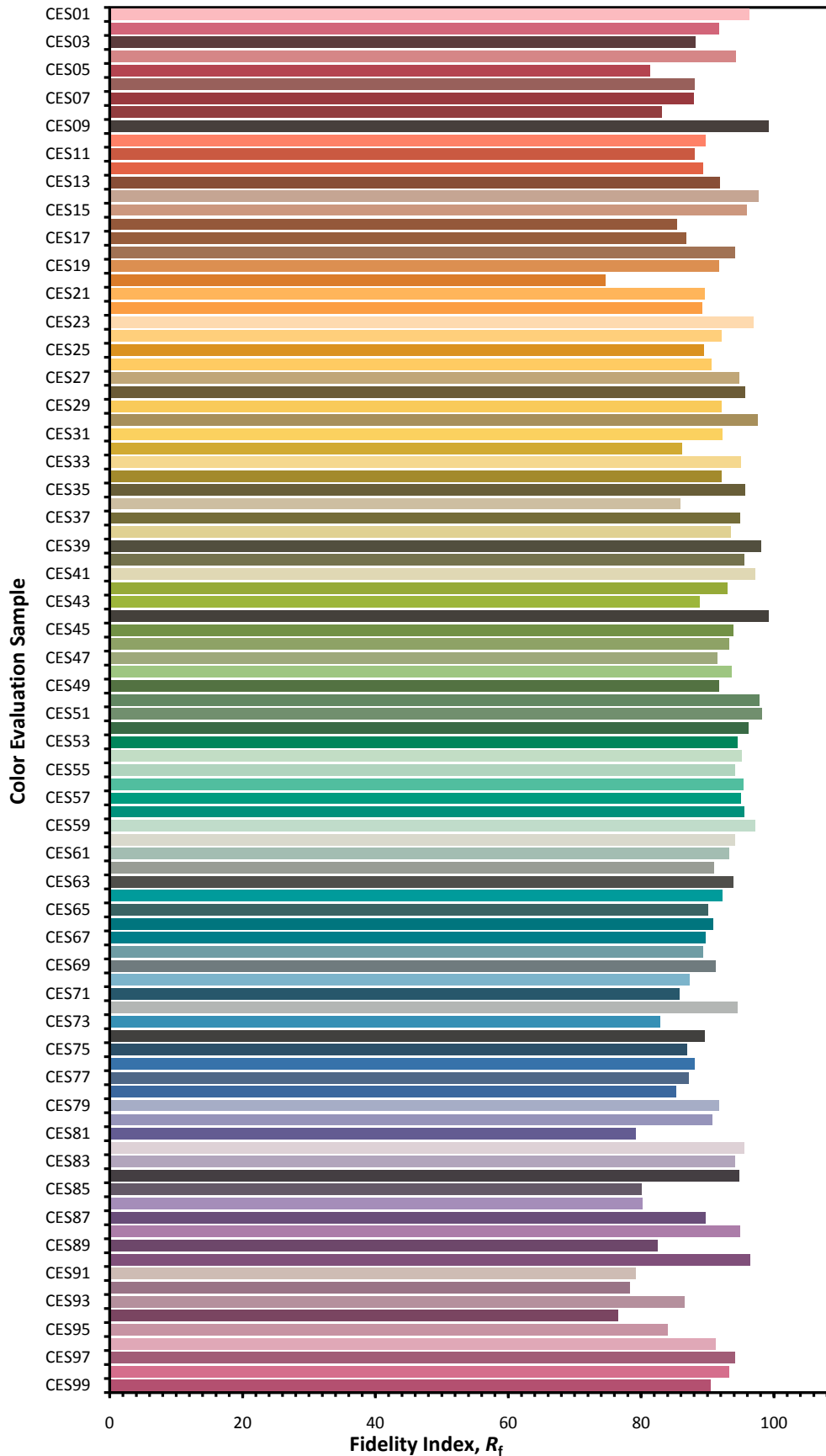


Color Vector Graphic

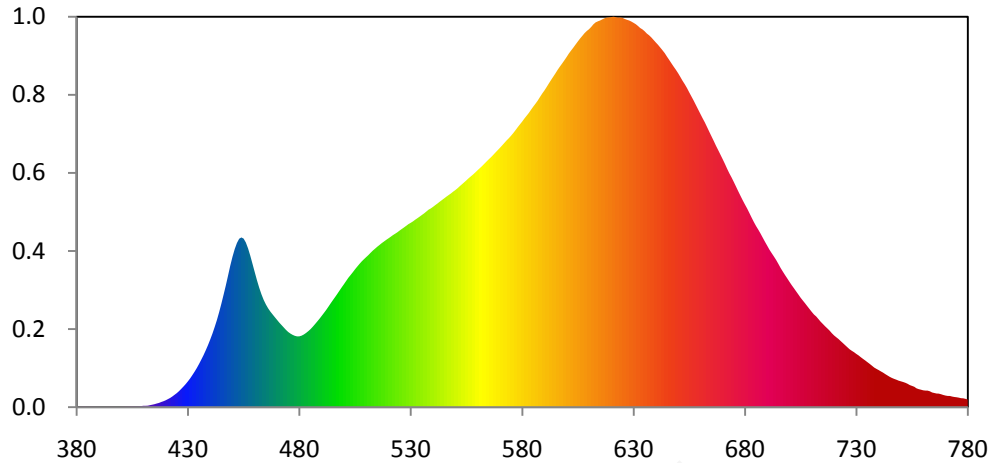


— Reference Illuminant — Test Source

### Color Fidelity by CES Sample



### Relative Spectral Power Distribution

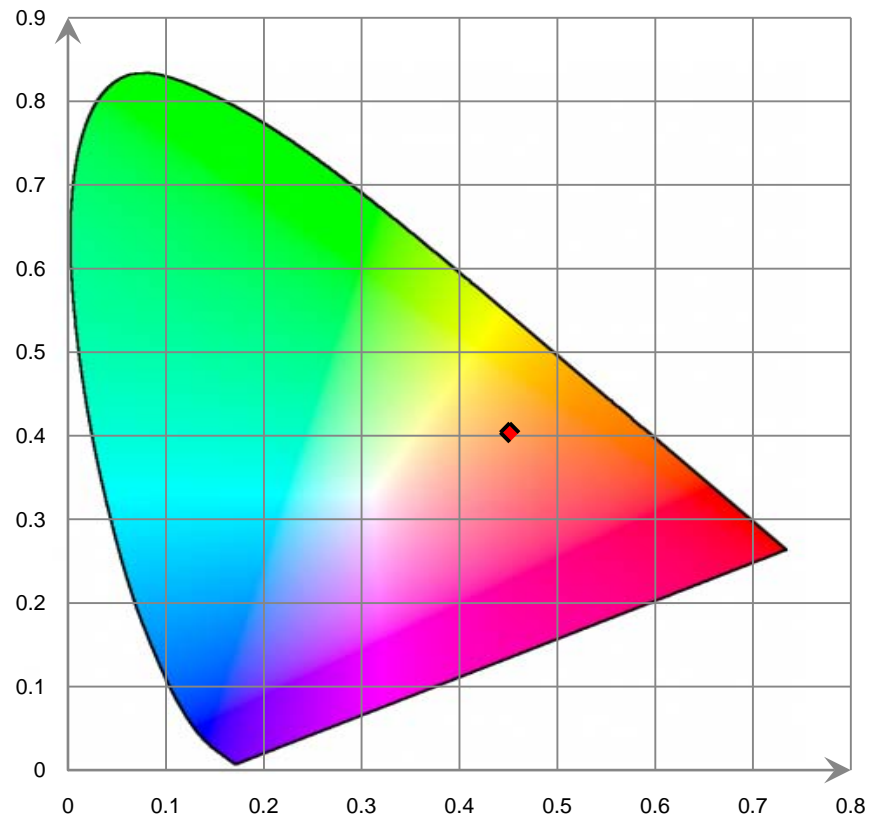


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.830E-02	421	1.009E+00	462	1.495E+01	503	1.654E+01	544	2.593E+01
381	3.480E-02	422	1.154E+00	463	1.413E+01	504	1.689E+01	545	2.614E+01
382	4.090E-02	423	1.338E+00	464	1.343E+01	505	1.726E+01	546	2.635E+01
383	6.020E-02	424	1.548E+00	465	1.286E+01	506	1.760E+01	547	2.655E+01
384	6.260E-02	425	1.759E+00	466	1.237E+01	507	1.793E+01	548	2.675E+01
385	4.630E-02	426	2.010E+00	467	1.197E+01	508	1.825E+01	549	2.697E+01
386	4.570E-02	427	2.291E+00	468	1.161E+01	509	1.852E+01	550	2.718E+01
387	4.840E-02	428	2.587E+00	469	1.127E+01	510	1.879E+01	551	2.740E+01
388	3.420E-02	429	2.894E+00	470	1.093E+01	511	1.905E+01	552	2.766E+01
389	3.790E-02	430	3.236E+00	471	1.059E+01	512	1.933E+01	553	2.791E+01
390	3.500E-02	431	3.602E+00	472	1.028E+01	513	1.961E+01	554	2.815E+01
391	2.290E-02	432	4.016E+00	473	9.983E+00	514	1.985E+01	555	2.840E+01
392	1.960E-02	433	4.449E+00	474	9.681E+00	515	2.009E+01	556	2.866E+01
393	3.500E-02	434	4.907E+00	475	9.417E+00	516	2.031E+01	557	2.890E+01
394	3.670E-02	435	5.416E+00	476	9.213E+00	517	2.054E+01	558	2.914E+01
395	3.610E-02	436	5.953E+00	477	9.054E+00	518	2.074E+01	559	2.939E+01
396	2.830E-02	437	6.509E+00	478	8.930E+00	519	2.095E+01	560	2.966E+01
397	2.280E-02	438	7.121E+00	479	8.862E+00	520	2.114E+01	561	2.992E+01
398	1.260E-02	439	7.766E+00	480	8.865E+00	521	2.133E+01	562	3.018E+01
399	6.500E-03	440	8.467E+00	481	8.949E+00	522	2.154E+01	563	3.047E+01
400	2.870E-02	441	9.208E+00	482	9.096E+00	523	2.171E+01	564	3.075E+01
401	3.950E-02	442	1.003E+01	483	9.288E+00	524	2.190E+01	565	3.102E+01
402	5.280E-02	443	1.091E+01	484	9.514E+00	525	2.211E+01	566	3.129E+01
403	6.540E-02	444	1.189E+01	485	9.764E+00	526	2.231E+01	567	3.157E+01
404	7.310E-02	445	1.295E+01	486	1.006E+01	527	2.251E+01	568	3.188E+01
405	8.410E-02	446	1.408E+01	487	1.038E+01	528	2.271E+01	569	3.216E+01
406	7.560E-02	447	1.523E+01	488	1.071E+01	529	2.292E+01	570	3.246E+01
407	7.960E-02	448	1.647E+01	489	1.105E+01	530	2.308E+01	571	3.276E+01
408	8.510E-02	449	1.772E+01	490	1.142E+01	531	2.326E+01	572	3.307E+01
409	1.367E-01	450	1.883E+01	491	1.178E+01	532	2.347E+01	573	3.339E+01
410	1.759E-01	451	1.980E+01	492	1.215E+01	533	2.366E+01	574	3.367E+01
411	1.768E-01	452	2.056E+01	493	1.256E+01	534	2.386E+01	575	3.398E+01
412	1.900E-01	453	2.109E+01	494	1.297E+01	535	2.406E+01	576	3.431E+01
413	2.541E-01	454	2.125E+01	495	1.337E+01	536	2.426E+01	577	3.467E+01
414	3.115E-01	455	2.110E+01	496	1.376E+01	537	2.449E+01	578	3.505E+01
415	3.741E-01	456	2.062E+01	497	1.417E+01	538	2.472E+01	579	3.540E+01
416	4.592E-01	457	1.987E+01	498	1.458E+01	539	2.488E+01	580	3.575E+01
417	5.314E-01	458	1.895E+01	499	1.499E+01	540	2.507E+01	581	3.613E+01
418	6.471E-01	459	1.792E+01	500	1.539E+01	541	2.529E+01	582	3.648E+01
419	7.436E-01	460	1.689E+01	501	1.579E+01	542	2.550E+01	583	3.683E+01
420	8.581E-01	461	1.588E+01	502	1.620E+01	543	2.572E+01	584	3.724E+01

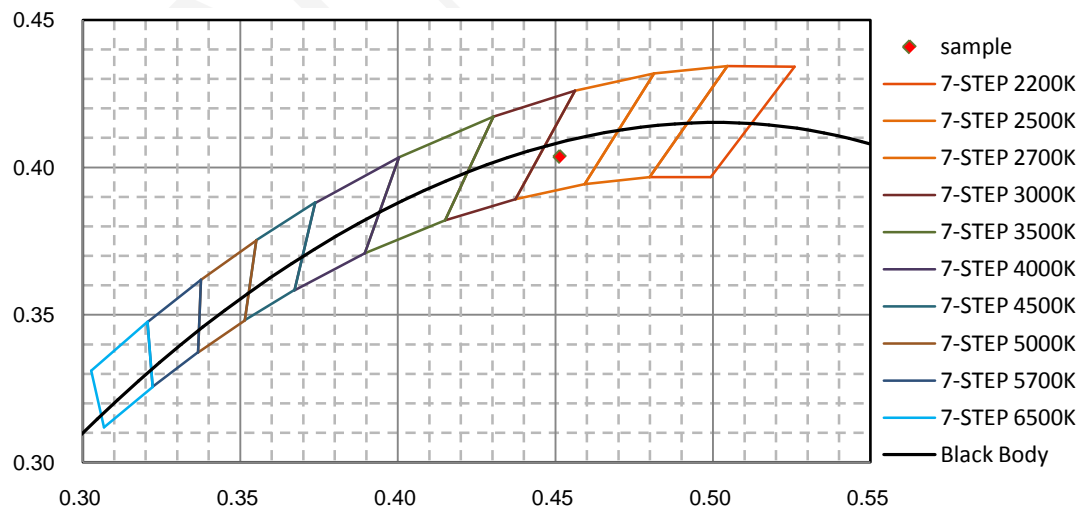


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.763E+01	626	4.861E+01	667	3.274E+01	708	1.264E+01	749	3.319E+00
586	3.799E+01	627	4.850E+01	668	3.219E+01	709	1.228E+01	750	3.237E+00
587	3.838E+01	628	4.841E+01	669	3.162E+01	710	1.193E+01	751	3.153E+00
588	3.883E+01	629	4.828E+01	670	3.106E+01	711	1.160E+01	752	3.056E+00
589	3.926E+01	630	4.812E+01	671	3.048E+01	712	1.136E+01	753	2.928E+00
590	3.965E+01	631	4.795E+01	672	2.986E+01	713	1.103E+01	754	2.769E+00
591	4.008E+01	632	4.772E+01	673	2.928E+01	714	1.070E+01	755	2.666E+00
592	4.053E+01	633	4.747E+01	674	2.876E+01	715	1.041E+01	756	2.554E+00
593	4.097E+01	634	4.730E+01	675	2.820E+01	716	1.012E+01	757	2.360E+00
594	4.139E+01	635	4.706E+01	676	2.762E+01	717	9.862E+00	758	2.257E+00
595	4.181E+01	636	4.677E+01	677	2.703E+01	718	9.587E+00	759	2.191E+00
596	4.226E+01	637	4.656E+01	678	2.647E+01	719	9.265E+00	760	2.114E+00
597	4.266E+01	638	4.629E+01	679	2.591E+01	720	8.984E+00	761	2.079E+00
598	4.305E+01	639	4.597E+01	680	2.538E+01	721	8.755E+00	762	2.074E+00
599	4.344E+01	640	4.566E+01	681	2.487E+01	722	8.533E+00	763	1.991E+00
600	4.385E+01	641	4.536E+01	682	2.431E+01	723	8.272E+00	764	1.843E+00
601	4.429E+01	642	4.503E+01	683	2.374E+01	724	8.018E+00	765	1.773E+00
602	4.466E+01	643	4.468E+01	684	2.319E+01	725	7.760E+00	766	1.712E+00
603	4.502E+01	644	4.432E+01	685	2.268E+01	726	7.497E+00	767	1.698E+00
604	4.541E+01	645	4.389E+01	686	2.222E+01	727	7.245E+00	768	1.622E+00
605	4.578E+01	646	4.348E+01	687	2.174E+01	728	7.054E+00	769	1.532E+00
606	4.615E+01	647	4.306E+01	688	2.122E+01	729	6.876E+00	770	1.456E+00
607	4.648E+01	648	4.264E+01	689	2.071E+01	730	6.667E+00	771	1.409E+00
608	4.682E+01	649	4.225E+01	690	2.022E+01	731	6.481E+00	772	1.405E+00
609	4.709E+01	650	4.182E+01	691	1.972E+01	732	6.259E+00	773	1.330E+00
610	4.731E+01	651	4.135E+01	692	1.929E+01	733	6.046E+00	774	1.275E+00
611	4.760E+01	652	4.087E+01	693	1.887E+01	734	5.846E+00	775	1.241E+00
612	4.793E+01	653	4.043E+01	694	1.843E+01	735	5.631E+00	776	1.191E+00
613	4.818E+01	654	3.995E+01	695	1.795E+01	736	5.421E+00	777	1.126E+00
614	4.831E+01	655	3.941E+01	696	1.744E+01	737	5.195E+00	778	1.109E+00
615	4.842E+01	656	3.890E+01	697	1.698E+01	738	4.967E+00	779	1.043E+00
616	4.855E+01	657	3.838E+01	698	1.654E+01	739	4.801E+00	780	9.628E-01
617	4.869E+01	658	3.782E+01	699	1.612E+01	740	4.648E+00		
618	4.877E+01	659	3.727E+01	700	1.569E+01	741	4.485E+00		
619	4.880E+01	660	3.672E+01	701	1.528E+01	742	4.328E+00		
620	4.884E+01	661	3.618E+01	702	1.489E+01	743	4.141E+00		
621	4.888E+01	662	3.565E+01	703	1.449E+01	744	3.968E+00		
622	4.883E+01	663	3.507E+01	704	1.410E+01	745	3.800E+00		
623	4.878E+01	664	3.448E+01	705	1.370E+01	746	3.656E+00		
624	4.879E+01	665	3.390E+01	706	1.335E+01	747	3.541E+00		
625	4.875E+01	666	3.333E+01	707	1.300E+01	748	3.436E+00		

### 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**

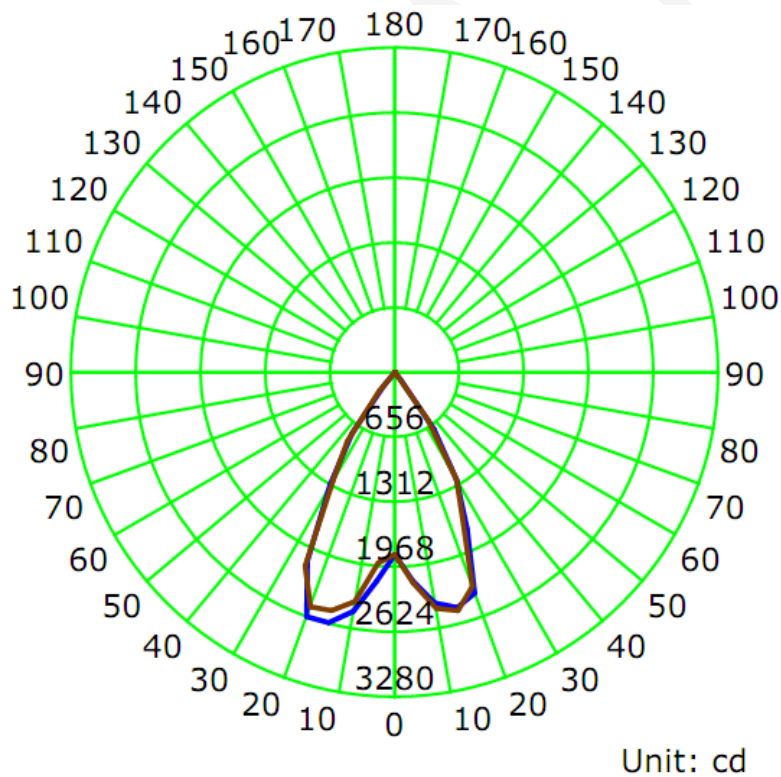
### Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2640	31.52	0.9960

### Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
2240	71.12	2624.6	1.12	1.11

### Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	59.5	59.2	59.9	59.2	59.7
Field Angle (10% I <sub>max</sub> ):	78.0	78.7	78.2	78.0	78.2

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1845	1845	1845	1845	1845	1845	1845	1845
5.0°	2119	2128	2132	2136	2135	2142	2139	2114
10.0°	2369	2366	2368	2404	2421	2454	2471	2473
15.0°	2463	2456	2447	2446	2491	2521	2615	2625
20.0°	2377	2291	2243	2242	2303	2415	2502	2561
25.0°	1746	1617	1562	1564	1627	1747	1871	2063
30.0°	1259	1236	1227	1235	1255	1271	1282	1324
35.0°	703	655	621	630	588	613	685	756
40.0°	103	85	76	72	54	63	100	150
45.0°	2	3	3	2	3	3	5	5
50.0°	0	0	0	0	0	0	0	0
55.0°	0	0	0	0	0	0	0	0
60.0°	0	0	0	0	0	0	0	0
65.0°	0	0	0	0	0	0	0	0
70.0°	0	0	0	0	0	0	0	0
75.0°	0	0	0	0	0	0	0	0
80.0°	0	0	0	0	0	0	0	0
85.0°	0	0	0	0	0	0	0	0
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	2	0	2	0	0	0
165.0°	0	0	2	2	2	3	2	2
170.0°	2	3	3	4	3	3	2	3
175.0°	3	4	5	5	5	5	5	4
180.0°	0	0	0	0	0	0	0	0

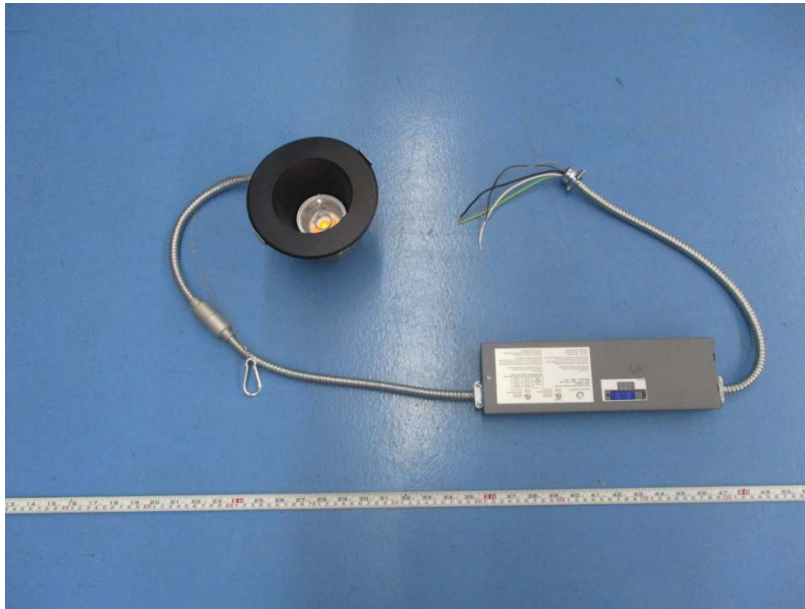
Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1845	1845	1845	1845	1845	1845	1845	1845
5.0°	2121	2067	1991	1950	1935	1972	2036	2102
10.0°	2454	2426	2373	2356	2354	2350	2346	2344
15.0°	2621	2593	2545	2519	2494	2490	2503	2464
20.0°	2623	2592	2585	2564	2520	2532	2488	2465
25.0°	2101	2193	2185	2180	2158	2066	1966	1782
30.0°	1316	1311	1312	1311	1261	1238	1222	1226
35.0°	760	819	859	868	849	814	769	709
40.0°	180	244	281	273	255	222	185	131
45.0°	4	7	9	10	8	7	5	5
50.0°	0	0	0	0	0	0	0	0
55.0°	0	0	0	0	0	0	0	0
60.0°	0	0	0	0	0	0	0	0
65.0°	0	0	0	0	0	0	0	0
70.0°	0	0	0	0	0	0	0	0
75.0°	0	0	0	0	0	0	0	0
80.0°	0	0	0	0	0	0	0	0
85.0°	0	0	0	0	0	0	0	0
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	0	0	0	0	0	0	0
115.0°	0	0	0	0	0	0	0	0
120.0°	0	0	0	0	0	0	0	0
125.0°	0	0	0	0	0	0	0	0
130.0°	0	0	0	0	0	0	0	0
135.0°	0	0	0	0	0	0	0	0
140.0°	0	0	0	0	0	0	0	0
145.0°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	0	0	0	0	0
160.0°	0	0	0	0	0	0	2	0
165.0°	0	0	2	2	3	3	3	3
170.0°	0	2	3	3	3	3	3	4
175.0°	2	3	4	5	4	4	4	4
180.0°	0	0	0	0	0	0	0	0

### Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	46.9	2.09	0-5	46.9	2.09
5-10	160.0	7.14	0-10	206.8	9.23
10-15	291.5	13.01	0-15	498.3	22.25
15-20	410.0	18.30	0-20	908.3	40.55
20-25	457.1	20.41	0-25	1365.4	60.96
25-30	401.1	17.91	0-30	1766.5	78.86
30-35	294.4	13.14	0-35	2060.9	92.00
35-40	147.8	6.60	0-40	2208.6	98.60
40-45	29.6	1.32	0-45	2238.2	99.92
45-50	1.0	0.05	0-50	2239.2	99.97
50-55	0.0	0.00	0-55	2239.2	99.97
55-60	0.0	0.00	0-60	2239.2	99.97
60-65	0.0	0.00	0-65	2239.2	99.97
65-70	0.0	0.00	0-70	2239.2	99.97
70-75	0.0	0.00	0-75	2239.2	99.97
75-80	0.0	0.00	0-80	2239.2	99.97
80-85	0.0	0.00	0-85	2239.2	99.97
85-90	0.0	0.00	0-90	2239.2	99.97
90-95	0.0	0.00	0-95	2239.2	99.97
95-100	0.0	0.00	0-100	2239.2	99.97
100-105	0.0	0.00	0-105	2239.2	99.97
105-110	0.0	0.00	0-110	2239.2	99.97
110-115	0.0	0.00	0-115	2239.2	99.97
115-120	0.0	0.00	0-120	2239.2	99.97
120-125	0.0	0.00	0-125	2239.2	99.97
125-130	0.0	0.00	0-130	2239.2	99.97
130-135	0.0	0.00	0-135	2239.2	99.97
135-140	0.0	0.00	0-140	2239.2	99.97
140-145	0.0	0.00	0-145	2239.2	99.97
145-150	0.0	0.00	0-150	2239.2	99.97
150-155	0.0	0.00	0-155	2239.2	99.97
155-160	0.0	0.00	0-160	2239.3	99.97
160-165	0.2	0.01	0-165	2239.4	99.97
165-170	0.3	0.01	0-170	2239.7	99.99
170-175	0.2	0.01	0-175	2239.9	100.00
175-180	0.0	0.00	0-180	2240.0	100.00

## 6. Product Photo



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