

# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

### GREEN CREATIVE LTD

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

**Test Model: AD4LEM9027DIM010UNVVNRBL**

<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 -10-5
<b>Test Date:</b>	2018-05-26
<b>Report Date:</b>	2018-06-06
<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: AD4LEM9027DIM010UNVVNRBL  
 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 50/60Hz  
 Rated Power: 12.5W  
 Nominal CCT: 2700K  
 Nominal Lumen Output: 2060lm

## 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**

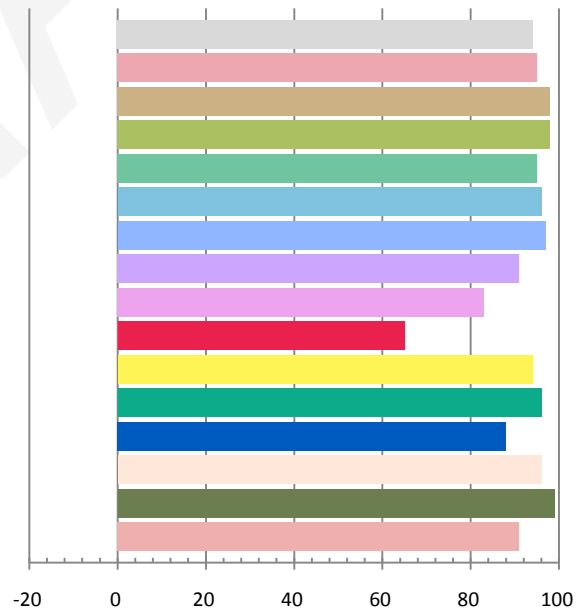
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.02	60	0.2643	31.51	0.9933	2071.6	65.74

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
7.354	2767	-0.00167	0.4517	0.4042	0.2601	0.5237

### Color Rendering Index

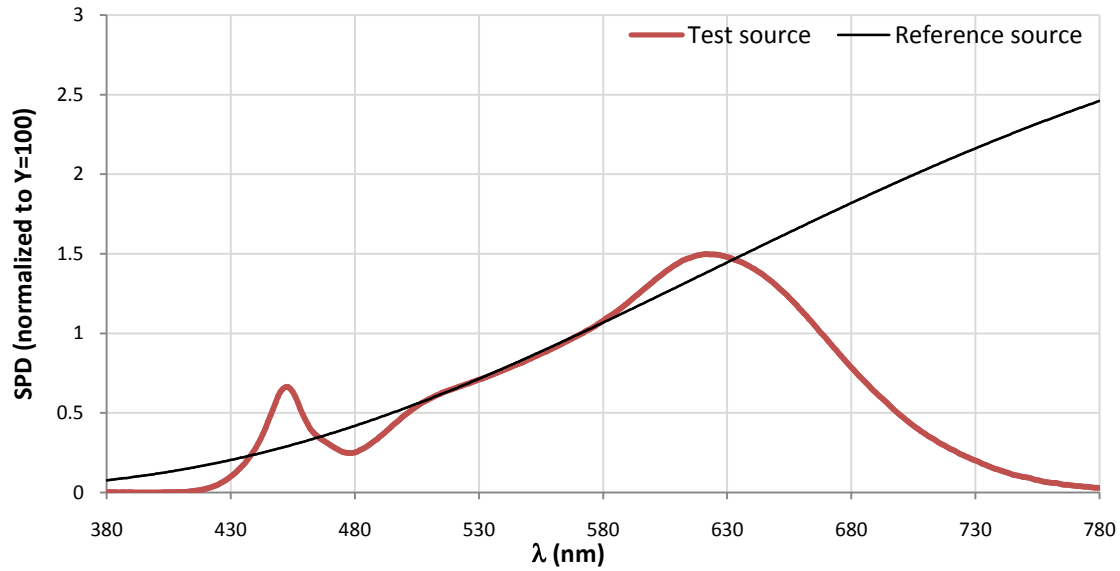
<b>Ra</b>			
94.1			
<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>
95	98	98	95
<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>
96	97	91	83
<b>R9</b>	<b>R10</b>	<b>R11</b>	<b>R12</b>
65	94	96	88
<b>R13</b>	<b>R14</b>	<b>R15</b>	
96	99	91	



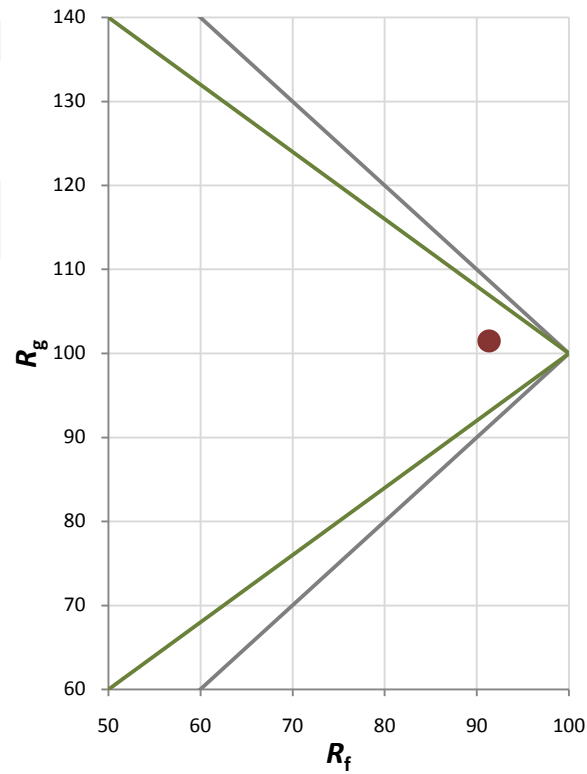
### Fidelity Index and Gamut Index

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

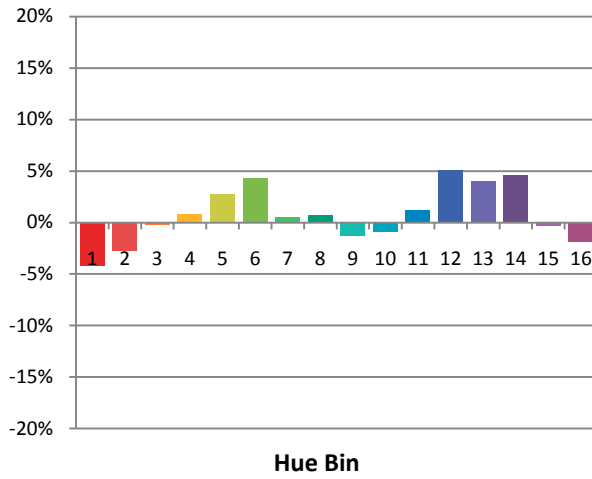
### Spectral Power Distribution Comparison



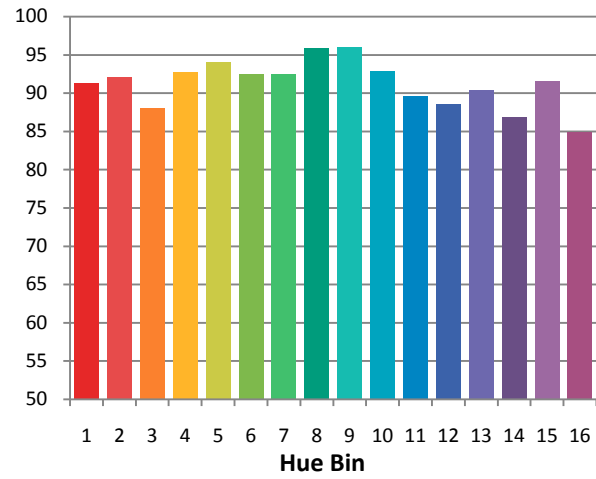
### Plot of $R_g$ versus $R_f$



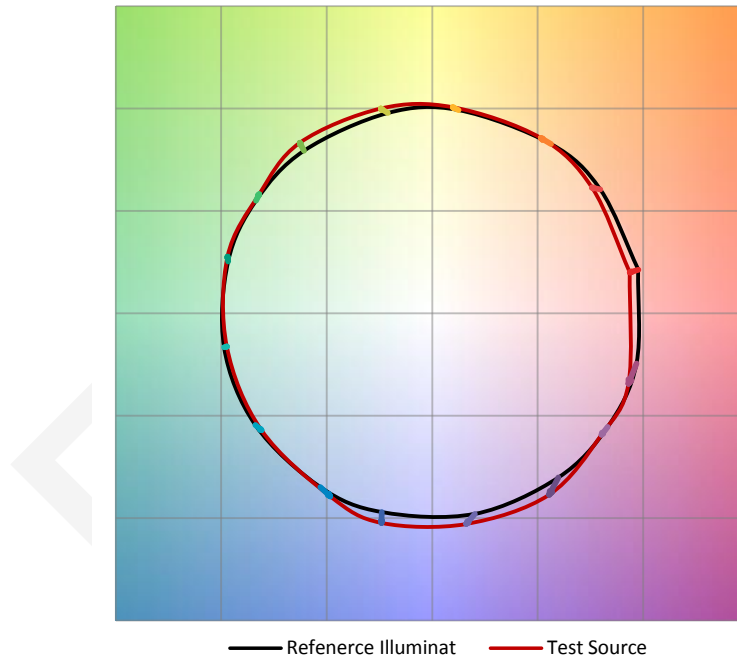
Chroma Shift by Hue



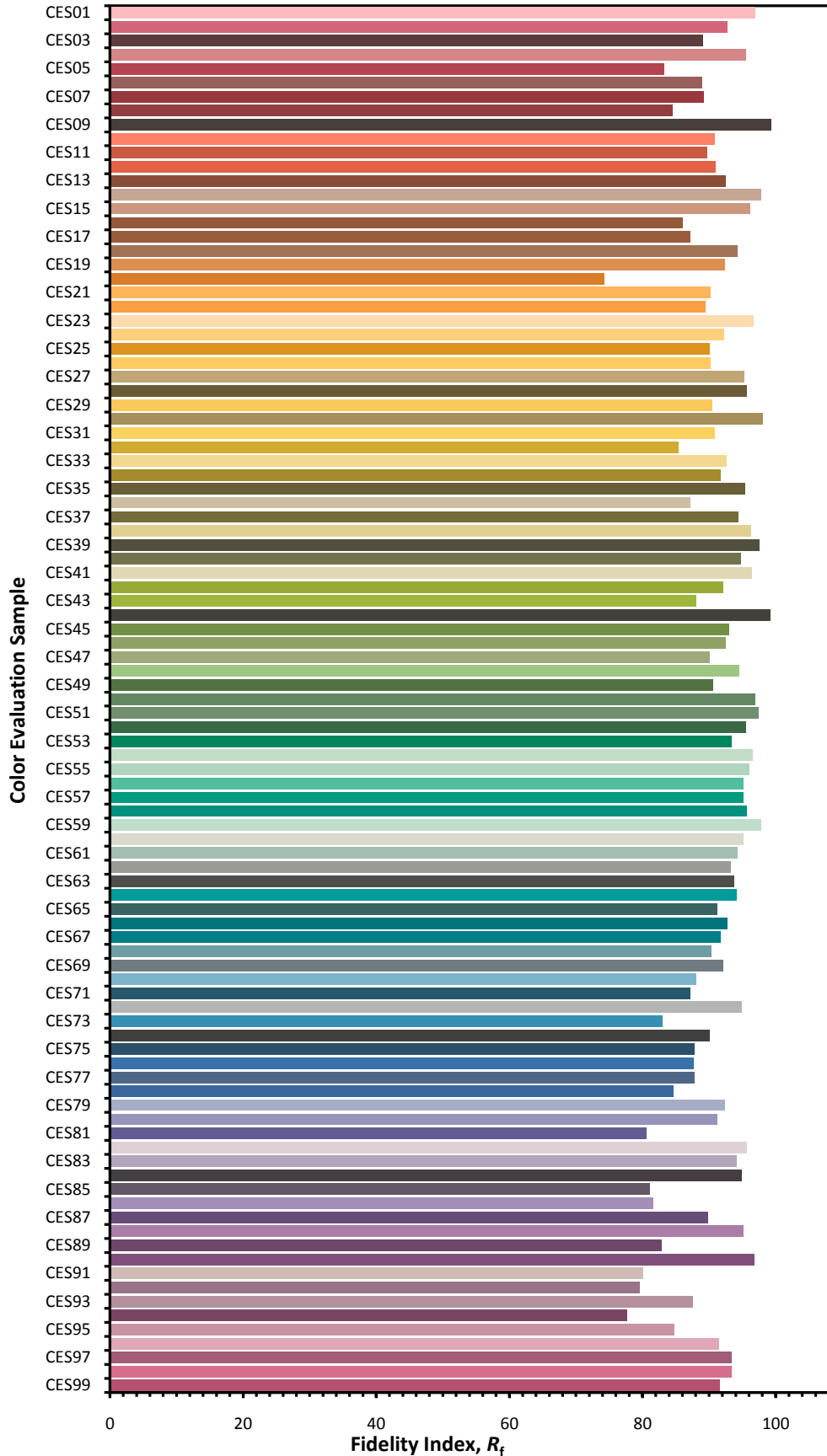
$R_f$  by Hue



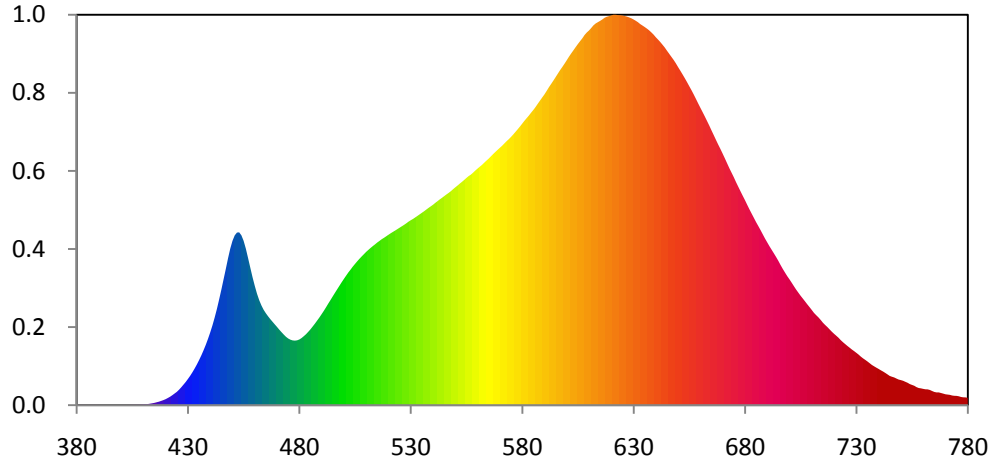
Color Vector Graphic



### Color Fidelity by CES Sample



### Relative Spectral Power Distribution

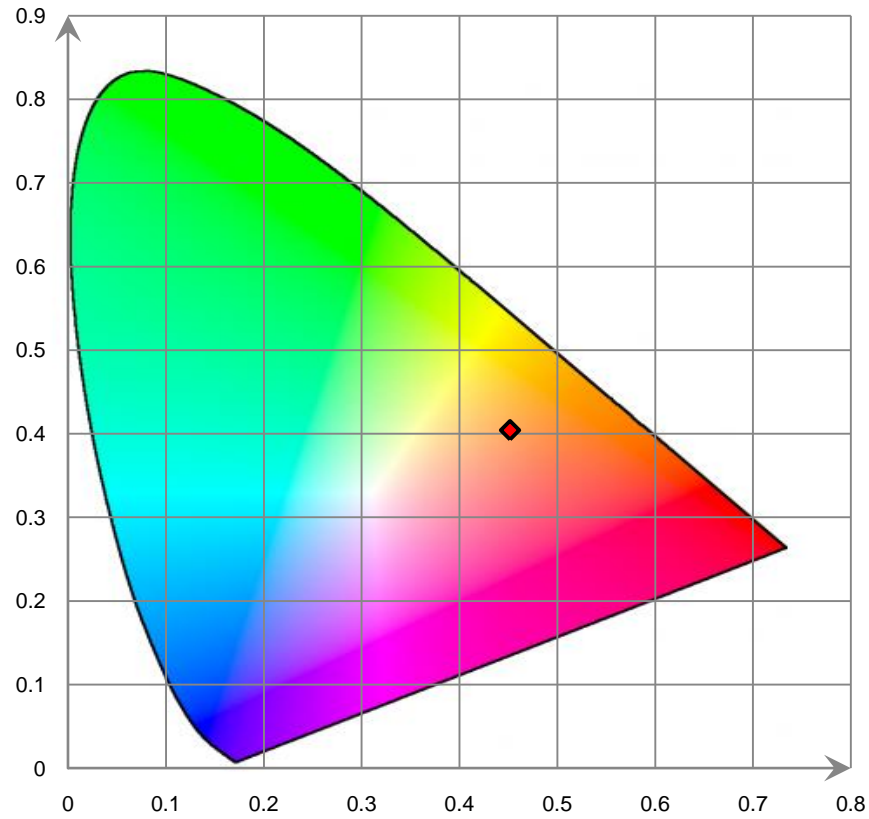


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.760E-02	421	8.399E-01	462	1.221E+01	503	1.578E+01	544	2.412E+01
381	3.020E-02	422	9.846E-01	463	1.160E+01	504	1.612E+01	545	2.432E+01
382	2.900E-02	423	1.164E+00	464	1.109E+01	505	1.644E+01	546	2.452E+01
383	3.120E-02	424	1.354E+00	465	1.068E+01	506	1.675E+01	547	2.470E+01
384	2.850E-02	425	1.550E+00	466	1.033E+01	507	1.704E+01	548	2.490E+01
385	2.470E-02	426	1.796E+00	467	1.000E+01	508	1.731E+01	549	2.513E+01
386	2.700E-02	427	2.082E+00	468	9.699E+00	509	1.757E+01	550	2.535E+01
387	2.970E-02	428	2.390E+00	469	9.394E+00	510	1.784E+01	551	2.556E+01
388	2.600E-02	429	2.700E+00	470	9.100E+00	511	1.807E+01	552	2.578E+01
389	3.500E-02	430	3.047E+00	471	8.789E+00	512	1.830E+01	553	2.599E+01
390	3.340E-02	431	3.419E+00	472	8.495E+00	513	1.851E+01	554	2.621E+01
391	1.580E-02	432	3.827E+00	473	8.220E+00	514	1.872E+01	555	2.644E+01
392	1.120E-02	433	4.264E+00	474	7.960E+00	515	1.893E+01	556	2.666E+01
393	1.370E-02	434	4.733E+00	475	7.761E+00	516	1.912E+01	557	2.683E+01
394	1.360E-02	435	5.242E+00	476	7.620E+00	517	1.931E+01	558	2.706E+01
395	1.530E-02	436	5.787E+00	477	7.539E+00	518	1.948E+01	559	2.730E+01
396	1.240E-02	437	6.377E+00	478	7.510E+00	519	1.965E+01	560	2.754E+01
397	9.000E-03	438	7.016E+00	479	7.547E+00	520	1.983E+01	561	2.775E+01
398	4.500E-03	439	7.712E+00	480	7.646E+00	521	2.000E+01	562	2.796E+01
399	2.400E-03	440	8.465E+00	481	7.809E+00	522	2.016E+01	563	2.822E+01
400	1.880E-02	441	9.278E+00	482	8.028E+00	523	2.032E+01	564	2.846E+01
401	2.580E-02	442	1.020E+01	483	8.262E+00	524	2.049E+01	565	2.870E+01
402	2.480E-02	443	1.120E+01	484	8.539E+00	525	2.065E+01	566	2.896E+01
403	2.850E-02	444	1.230E+01	485	8.829E+00	526	2.081E+01	567	2.922E+01
404	3.410E-02	445	1.345E+01	486	9.155E+00	527	2.098E+01	568	2.947E+01
405	4.660E-02	446	1.464E+01	487	9.493E+00	528	2.116E+01	569	2.971E+01
406	5.190E-02	447	1.585E+01	488	9.847E+00	529	2.136E+01	570	2.995E+01
407	5.950E-02	448	1.709E+01	489	1.021E+01	530	2.152E+01	571	3.018E+01
408	6.040E-02	449	1.822E+01	490	1.059E+01	531	2.167E+01	572	3.045E+01
409	9.290E-02	450	1.912E+01	491	1.098E+01	532	2.184E+01	573	3.071E+01
410	1.149E-01	451	1.976E+01	492	1.140E+01	533	2.202E+01	574	3.095E+01
411	1.192E-01	452	2.009E+01	493	1.183E+01	534	2.221E+01	575	3.122E+01
412	1.331E-01	453	2.011E+01	494	1.224E+01	535	2.239E+01	576	3.150E+01
413	1.762E-01	454	1.977E+01	495	1.266E+01	536	2.257E+01	577	3.180E+01
414	2.213E-01	455	1.912E+01	496	1.308E+01	537	2.276E+01	578	3.211E+01
415	2.724E-01	456	1.820E+01	497	1.349E+01	538	2.296E+01	579	3.242E+01
416	3.446E-01	457	1.712E+01	498	1.390E+01	539	2.314E+01	580	3.275E+01
417	4.089E-01	458	1.599E+01	499	1.430E+01	540	2.332E+01	581	3.308E+01
418	5.000E-01	459	1.489E+01	500	1.469E+01	541	2.354E+01	582	3.339E+01
419	5.893E-01	460	1.389E+01	501	1.507E+01	542	2.374E+01	583	3.369E+01
420	7.006E-01	461	1.298E+01	502	1.545E+01	543	2.394E+01	584	3.403E+01

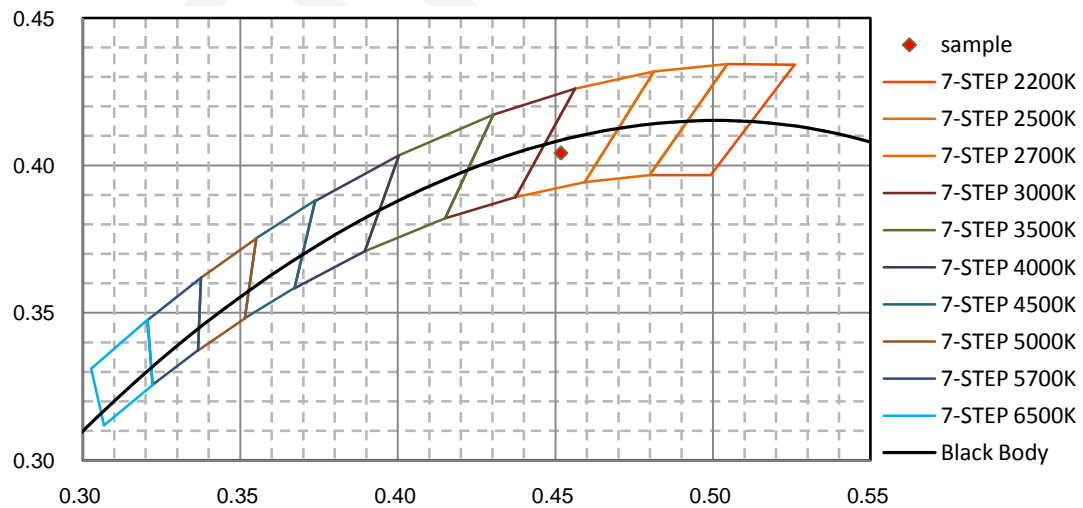


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.434E+01	626	4.529E+01	667	3.087E+01	708	1.173E+01	749	2.979E+00
586	3.469E+01	627	4.522E+01	668	3.033E+01	709	1.141E+01	750	2.917E+00
587	3.507E+01	628	4.513E+01	669	2.981E+01	710	1.108E+01	751	2.841E+00
588	3.543E+01	629	4.502E+01	670	2.927E+01	711	1.074E+01	752	2.724E+00
589	3.580E+01	630	4.488E+01	671	2.872E+01	712	1.047E+01	753	2.609E+00
590	3.616E+01	631	4.473E+01	672	2.815E+01	713	1.021E+01	754	2.459E+00
591	3.657E+01	632	4.457E+01	673	2.758E+01	714	9.919E+00	755	2.359E+00
592	3.699E+01	633	4.435E+01	674	2.706E+01	715	9.596E+00	756	2.263E+00
593	3.737E+01	634	4.418E+01	675	2.653E+01	716	9.336E+00	757	2.102E+00
594	3.776E+01	635	4.401E+01	676	2.596E+01	717	9.093E+00	758	2.001E+00
595	3.816E+01	636	4.382E+01	677	2.542E+01	718	8.820E+00	759	1.957E+00
596	3.857E+01	637	4.362E+01	678	2.490E+01	719	8.553E+00	760	1.898E+00
597	3.897E+01	638	4.338E+01	679	2.438E+01	720	8.303E+00	761	1.851E+00
598	3.934E+01	639	4.312E+01	680	2.387E+01	721	8.080E+00	762	1.840E+00
599	3.972E+01	640	4.281E+01	681	2.333E+01	722	7.848E+00	763	1.772E+00
600	4.013E+01	641	4.255E+01	682	2.280E+01	723	7.568E+00	764	1.651E+00
601	4.054E+01	642	4.226E+01	683	2.230E+01	724	7.329E+00	765	1.541E+00
602	4.092E+01	643	4.195E+01	684	2.181E+01	725	7.111E+00	766	1.484E+00
603	4.129E+01	644	4.163E+01	685	2.131E+01	726	6.892E+00	767	1.484E+00
604	4.166E+01	645	4.126E+01	686	2.085E+01	727	6.690E+00	768	1.418E+00
605	4.202E+01	646	4.089E+01	687	2.037E+01	728	6.481E+00	769	1.344E+00
606	4.235E+01	647	4.053E+01	688	1.989E+01	729	6.292E+00	770	1.267E+00
607	4.269E+01	648	4.018E+01	689	1.940E+01	730	6.092E+00	771	1.237E+00
608	4.307E+01	649	3.978E+01	690	1.895E+01	731	5.887E+00	772	1.199E+00
609	4.336E+01	650	3.934E+01	691	1.850E+01	732	5.658E+00	773	1.127E+00
610	4.360E+01	651	3.892E+01	692	1.808E+01	733	5.452E+00	774	1.092E+00
611	4.389E+01	652	3.850E+01	693	1.766E+01	734	5.275E+00	775	1.083E+00
612	4.420E+01	653	3.806E+01	694	1.724E+01	735	5.083E+00	776	1.035E+00
613	4.442E+01	654	3.760E+01	695	1.679E+01	736	4.884E+00	777	9.540E-01
614	4.457E+01	655	3.713E+01	696	1.631E+01	737	4.680E+00	778	9.126E-01
615	4.472E+01	656	3.666E+01	697	1.585E+01	738	4.520E+00	779	9.049E-01
616	4.489E+01	657	3.617E+01	698	1.542E+01	739	4.368E+00	780	8.565E-01
617	4.508E+01	658	3.565E+01	699	1.501E+01	740	4.218E+00		
618	4.520E+01	659	3.512E+01	700	1.464E+01	741	4.062E+00		
619	4.527E+01	660	3.461E+01	701	1.425E+01	742	3.915E+00		
620	4.536E+01	661	3.411E+01	702	1.384E+01	743	3.751E+00		
621	4.544E+01	662	3.359E+01	703	1.345E+01	744	3.579E+00		
622	4.543E+01	663	3.307E+01	704	1.309E+01	745	3.405E+00		
623	4.539E+01	664	3.254E+01	705	1.273E+01	746	3.309E+00		
624	4.538E+01	665	3.198E+01	706	1.240E+01	747	3.224E+00		
625	4.535E+01	666	3.143E+01	707	1.207E+01	748	3.098E+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**

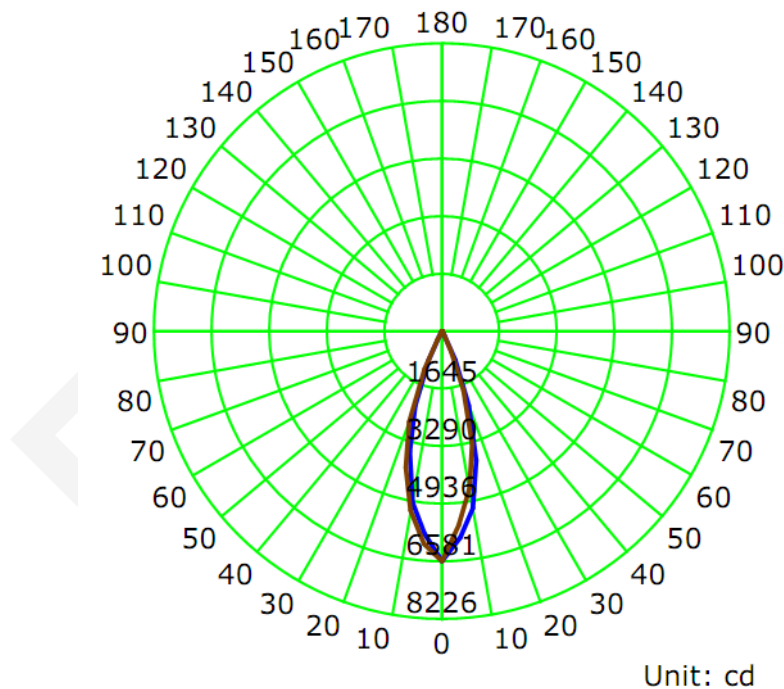
### Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2640	31.53	0.9950

### Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
2076.6	65.91	6581.4	0.54	0.54

### Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	32.7	33.0	33.0	32.5	32.9
Field Angle (10% I <sub>max</sub> ):	53.5	53.3	53.0	53.4	53.3

**Luminous Intensity (cd) Distribution Data**

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	6581	6581	6581	6581	6581	6581	6581	6581
5.0°	5933	5796	5603	5537	5568	5634	5676	5698
10.0°	5142	4912	4660	4555	4561	4622	4658	4758
15.0°	3817	3605	3430	3298	3331	3365	3440	3484
20.0°	2269	2004	1872	1780	1803	1872	2037	2156
25.0°	910	826	734	665	666	716	808	871
30.0°	169	160	135	128	124	129	138	150
35.0°	77	79	49	68	63	66	69	79
40.0°	31	36	38	40	41	36	45	45
45.0°	20	12	12	9	9	0	12	18
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	0	0
165.0°	0	0	0	0	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

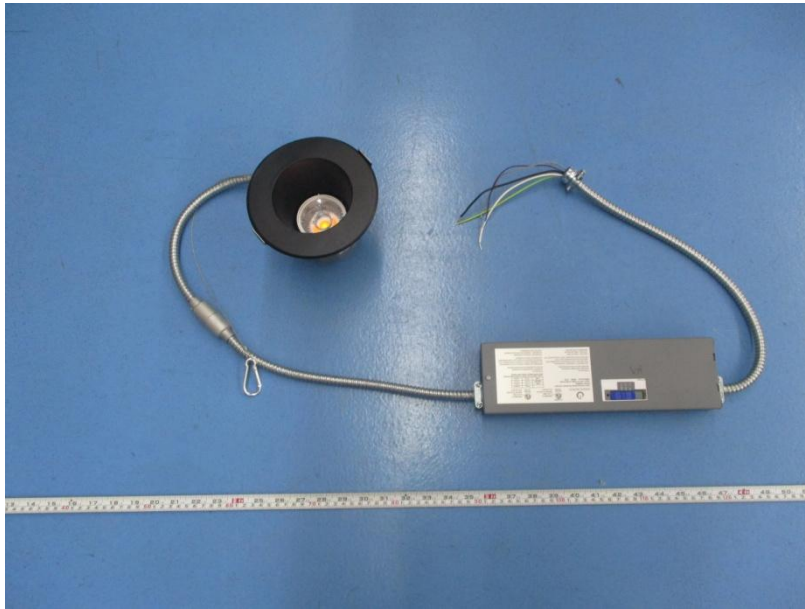
Luminous Intensity (cd) Distribution Data (cont.)

C γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	6581	6581	6581	6581	6581	6581	6581	6581
5.0°	5800	5921	6017	6059	6088	6020	5865	5809
10.0°	4958	5111	5304	5252	5197	5147	5061	5031
15.0°	3552	3778	3964	4033	4027	3897	3816	3726
20.0°	2267	2476	2642	2748	2752	2605	2480	2301
25.0°	925	1026	1129	1209	1197	1099	1024	929
30.0°	167	218	256	295	289	264	226	174
35.0°	81	77	91	88	87	88	82	79
40.0°	48	43	48	48	46	46	48	44
45.0°	23	25	20	29	23	22	22	19
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	0	0
165.0°	0	0	0	0	0	0	0	0
170.0°	0	0	0	0	0	0	0	0
175.0°	0	0	0	0	0	0	0	0
180.0°	0	0	0	0	0	0	0	0

### Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	148.2	7.14	0-5	148.2	7.14
5-10	384.5	18.51	0-10	532.6	25.65
10-15	509.7	24.55	0-15	1042.4	50.20
15-20	487.4	23.47	0-20	1529.8	73.67
20-25	333.0	16.03	0-25	1862.7	89.70
25-30	140.4	6.76	0-30	2003.2	96.46
30-35	39.0	1.88	0-35	2042.2	98.34
35-40	19.8	0.96	0-40	2062.1	99.30
40-45	11.1	0.53	0-45	2073.1	99.83
45-50	3.5	0.17	0-50	2076.6	100.00
50-55	0.0	0.00	0-55	2076.6	100.00
55-60	0.0	0.00	0-60	2076.6	100.00
60-65	0.0	0.00	0-65	2076.6	100.00
65-70	0.0	0.00	0-70	2076.6	100.00
70-75	0.0	0.00	0-75	2076.6	100.00
75-80	0.0	0.00	0-80	2076.6	100.00
80-85	0.0	0.00	0-85	2076.6	100.00
85-90	0.0	0.00	0-90	2076.6	100.00
90-95	0.0	0.00	0-95	2076.6	100.00
95-100	0.0	0.00	0-100	2076.6	100.00
100-105	0.0	0.00	0-105	2076.6	100.00
105-110	0.0	0.00	0-110	2076.6	100.00
110-115	0.0	0.00	0-115	2076.6	100.00
115-120	0.0	0.00	0-120	2076.6	100.00
120-125	0.0	0.00	0-125	2076.6	100.00
125-130	0.0	0.00	0-130	2076.6	100.00
130-135	0.0	0.00	0-135	2076.6	100.00
135-140	0.0	0.00	0-140	2076.6	100.00
140-145	0.0	0.00	0-145	2076.6	100.00
145-150	0.0	0.00	0-150	2076.6	100.00
150-155	0.0	0.00	0-155	2076.6	100.00
155-160	0.0	0.00	0-160	2076.6	100.00
160-165	0.0	0.00	0-165	2076.6	100.00
165-170	0.0	0.00	0-170	2076.6	100.00
170-175	0.0	0.00	0-175	2076.6	100.00
175-180	0.0	0.00	0-180	2076.6	100.00

## 6. Product Photo



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