

# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

### GREEN CREATIVE LTD

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

**Test Model: AD4LEM9027DIM010UNVWDRBL**

<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>	RKSB180522002-10-3
<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: AD4LEM9027DIM010UNVWDRBL  
 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**

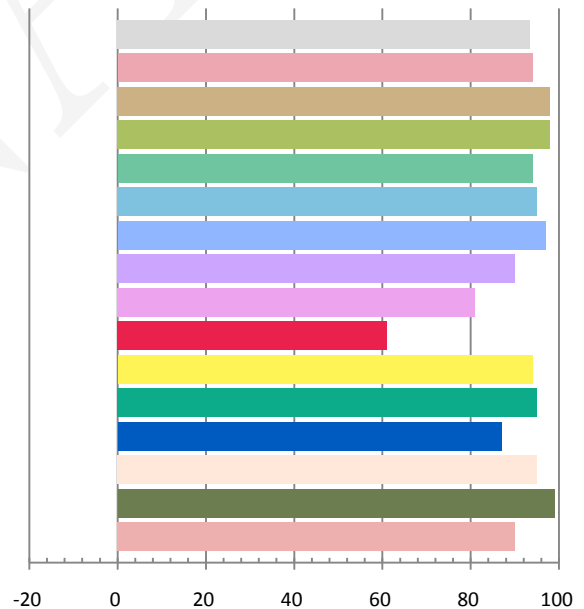
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.2639	31.44	0.9927	2261.6	71.93

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
8.004	2774	-0.00180	0.4509	0.4037	0.2598	0.5233

### Color Rendering Index

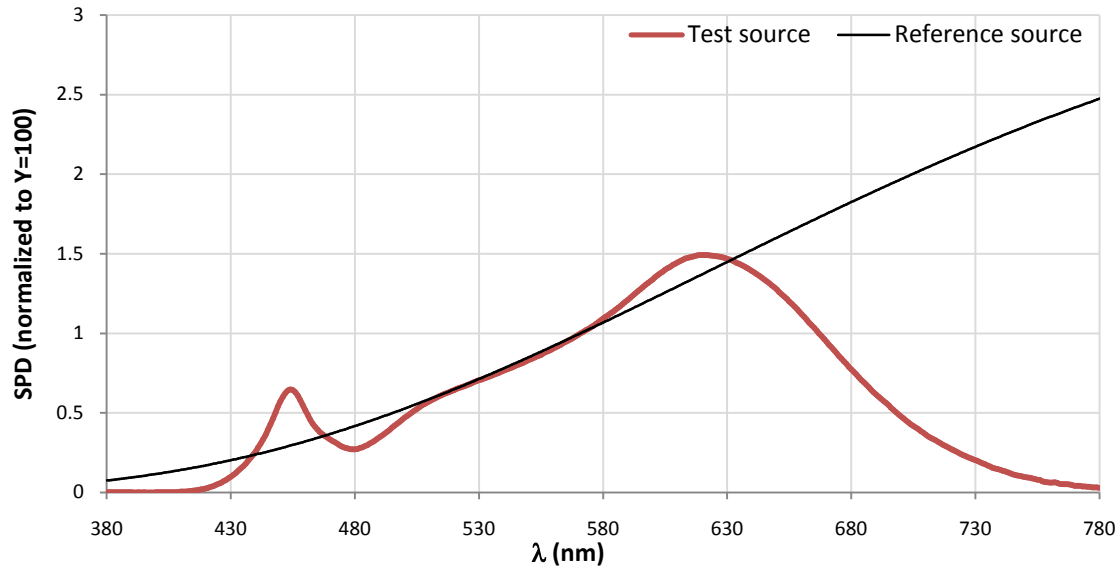
<b>Ra</b>			
<b>93.4</b>			
<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>
94	98	98	94
<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>
95	97	90	81
<b>R9</b>	<b>R10</b>	<b>R11</b>	<b>R12</b>
61	94	95	87
<b>R13</b>	<b>R14</b>	<b>R15</b>	
95	99	90	



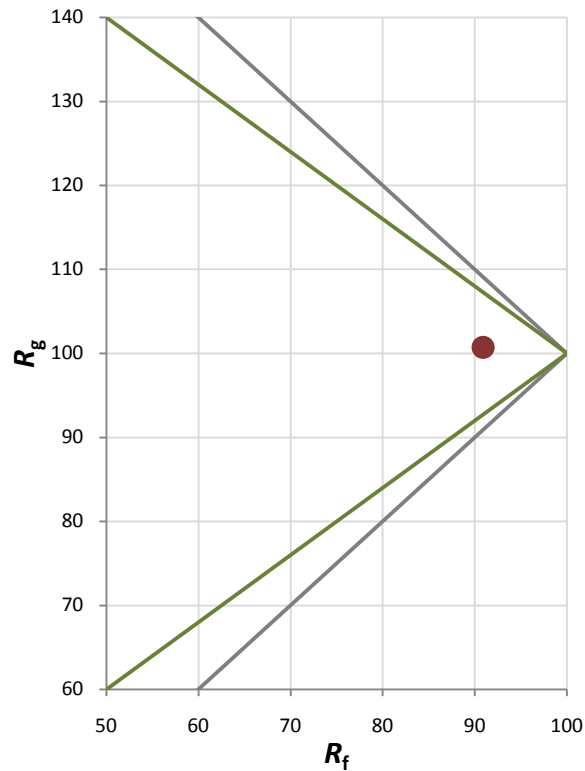
### Fidelity Index and Gamut Index

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

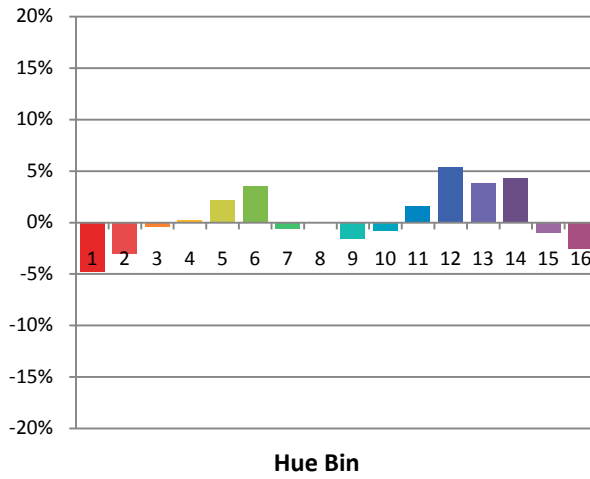
### Spectral Power Distribution Comparison



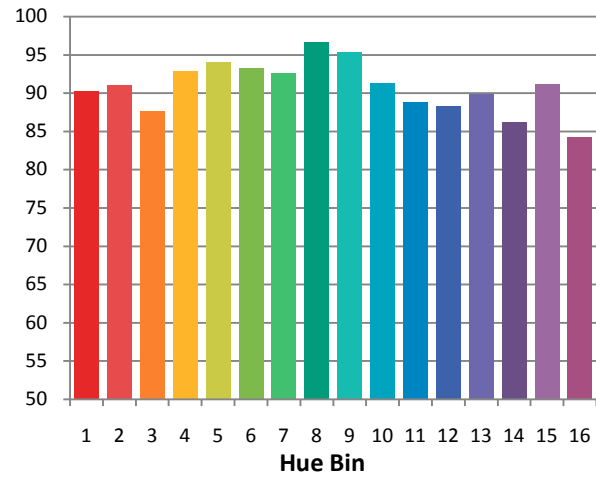
### Plot of $R_g$ versus $R_f$



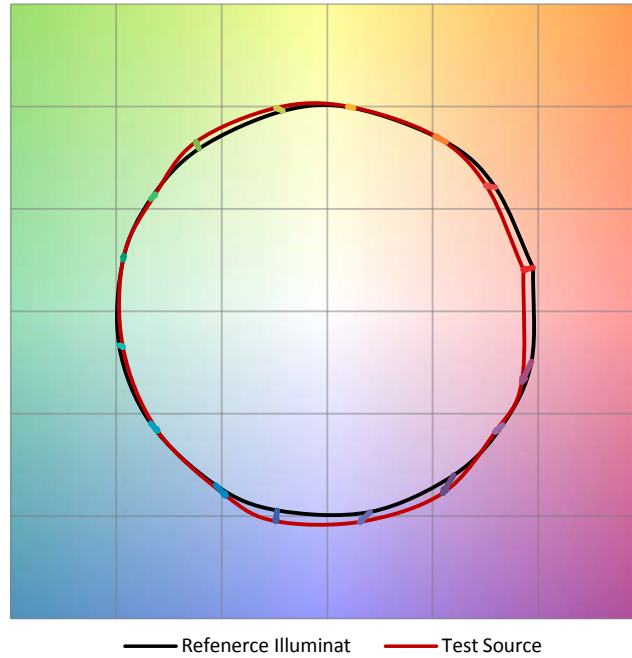
Chroma Shift by Hue



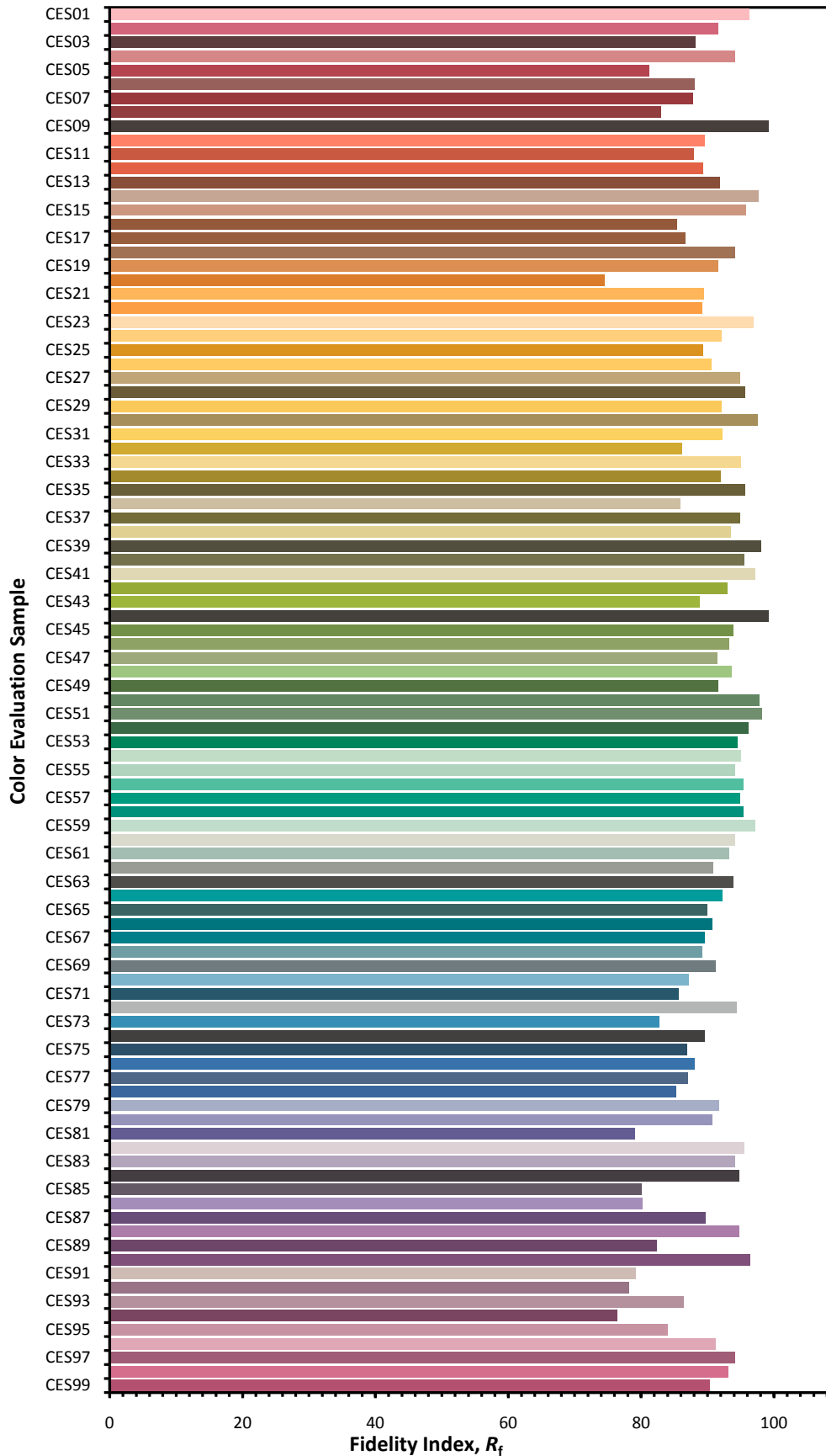
$R_t$  by Hue



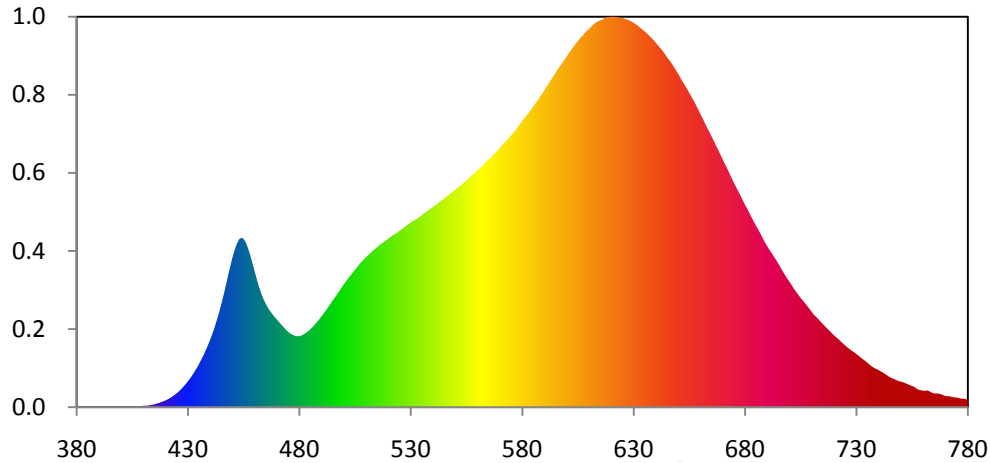
Color Vector Graphic



### Color Fidelity by CES Sample



### Relative Spectral Power Distribution

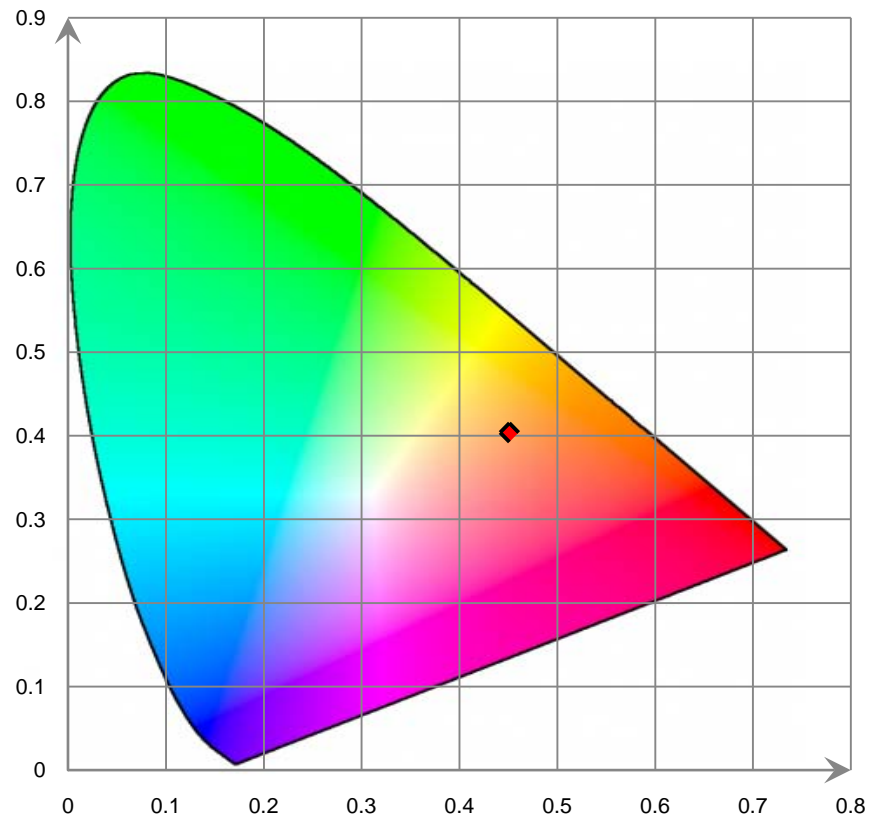


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.310E-02	421	1.010E+00	462	1.515E+01	503	1.666E+01	544	2.619E+01
381	4.070E-02	422	1.165E+00	463	1.433E+01	504	1.704E+01	545	2.641E+01
382	3.770E-02	423	1.359E+00	464	1.362E+01	505	1.739E+01	546	2.663E+01
383	4.750E-02	424	1.563E+00	465	1.303E+01	506	1.774E+01	547	2.684E+01
384	4.880E-02	425	1.765E+00	466	1.253E+01	507	1.808E+01	548	2.704E+01
385	5.280E-02	426	2.011E+00	467	1.211E+01	508	1.840E+01	549	2.731E+01
386	4.640E-02	427	2.293E+00	468	1.173E+01	509	1.869E+01	550	2.753E+01
387	4.120E-02	428	2.601E+00	469	1.139E+01	510	1.898E+01	551	2.774E+01
388	3.010E-02	429	2.923E+00	470	1.106E+01	511	1.926E+01	552	2.797E+01
389	3.670E-02	430	3.272E+00	471	1.073E+01	512	1.952E+01	553	2.820E+01
390	3.470E-02	431	3.648E+00	472	1.042E+01	513	1.978E+01	554	2.842E+01
391	2.010E-02	432	4.057E+00	473	1.012E+01	514	2.002E+01	555	2.865E+01
392	1.620E-02	433	4.494E+00	474	9.799E+00	515	2.025E+01	556	2.894E+01
393	2.950E-02	434	4.966E+00	475	9.525E+00	516	2.049E+01	557	2.919E+01
394	2.720E-02	435	5.482E+00	476	9.304E+00	517	2.072E+01	558	2.944E+01
395	2.920E-02	436	6.016E+00	477	9.154E+00	518	2.092E+01	559	2.971E+01
396	2.110E-02	437	6.589E+00	478	9.037E+00	519	2.112E+01	560	2.997E+01
397	1.570E-02	438	7.204E+00	479	8.975E+00	520	2.132E+01	561	3.021E+01
398	7.100E-03	439	7.851E+00	480	8.979E+00	521	2.155E+01	562	3.047E+01
399	4.000E-03	440	8.532E+00	481	9.066E+00	522	2.174E+01	563	3.077E+01
400	3.150E-02	441	9.285E+00	482	9.216E+00	523	2.191E+01	564	3.107E+01
401	4.280E-02	442	1.014E+01	483	9.400E+00	524	2.210E+01	565	3.134E+01
402	4.140E-02	443	1.103E+01	484	9.616E+00	525	2.231E+01	566	3.160E+01
403	4.380E-02	444	1.200E+01	485	9.864E+00	526	2.252E+01	567	3.188E+01
404	4.940E-02	445	1.305E+01	486	1.015E+01	527	2.272E+01	568	3.218E+01
405	7.360E-02	446	1.419E+01	487	1.046E+01	528	2.293E+01	569	3.250E+01
406	8.570E-02	447	1.538E+01	488	1.079E+01	529	2.314E+01	570	3.284E+01
407	9.360E-02	448	1.662E+01	489	1.115E+01	530	2.334E+01	571	3.312E+01
408	9.090E-02	449	1.783E+01	490	1.152E+01	531	2.353E+01	572	3.343E+01
409	1.409E-01	450	1.894E+01	491	1.188E+01	532	2.371E+01	573	3.375E+01
410	1.781E-01	451	1.992E+01	492	1.226E+01	533	2.387E+01	574	3.403E+01
411	1.884E-01	452	2.069E+01	493	1.267E+01	534	2.407E+01	575	3.435E+01
412	1.940E-01	453	2.124E+01	494	1.307E+01	535	2.430E+01	576	3.469E+01
413	2.506E-01	454	2.144E+01	495	1.350E+01	536	2.451E+01	577	3.503E+01
414	3.074E-01	455	2.129E+01	496	1.388E+01	537	2.471E+01	578	3.541E+01
415	3.750E-01	456	2.081E+01	497	1.428E+01	538	2.491E+01	579	3.581E+01
416	4.591E-01	457	2.009E+01	498	1.470E+01	539	2.513E+01	580	3.619E+01
417	5.349E-01	458	1.920E+01	499	1.514E+01	540	2.533E+01	581	3.654E+01
418	6.499E-01	459	1.817E+01	500	1.556E+01	541	2.553E+01	582	3.691E+01
419	7.440E-01	460	1.713E+01	501	1.594E+01	542	2.574E+01	583	3.725E+01
420	8.594E-01	461	1.609E+01	502	1.630E+01	543	2.597E+01	584	3.763E+01

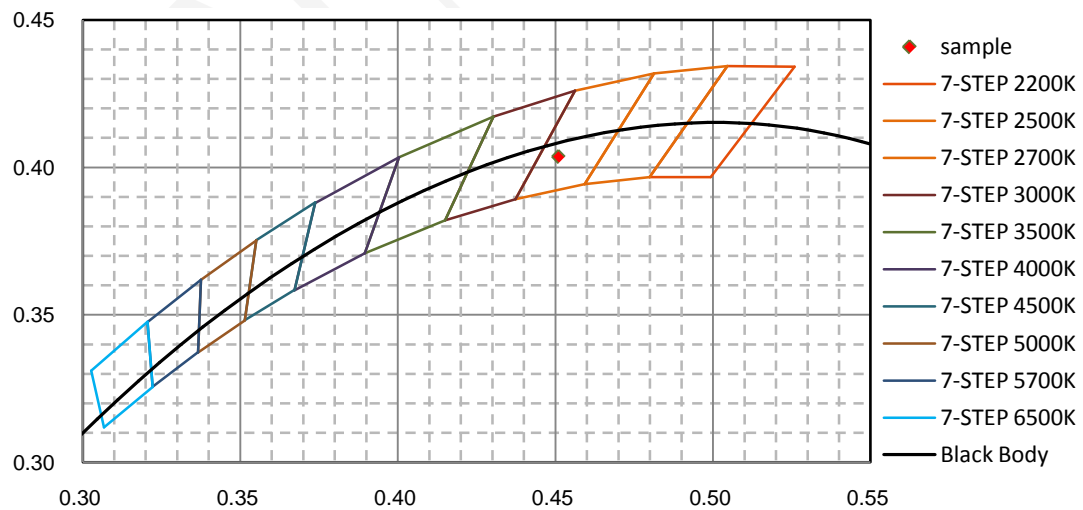


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.804E+01	626	4.912E+01	667	3.310E+01	708	1.279E+01	749	3.293E+00
586	3.842E+01	627	4.905E+01	668	3.253E+01	709	1.242E+01	750	3.224E+00
587	3.882E+01	628	4.893E+01	669	3.195E+01	710	1.204E+01	751	3.154E+00
588	3.924E+01	629	4.879E+01	670	3.134E+01	711	1.167E+01	752	3.038E+00
589	3.965E+01	630	4.862E+01	671	3.076E+01	712	1.140E+01	753	2.916E+00
590	4.006E+01	631	4.844E+01	672	3.021E+01	713	1.112E+01	754	2.786E+00
591	4.053E+01	632	4.823E+01	673	2.962E+01	714	1.081E+01	755	2.678E+00
592	4.099E+01	633	4.797E+01	674	2.900E+01	715	1.051E+01	756	2.571E+00
593	4.141E+01	634	4.776E+01	675	2.841E+01	716	1.022E+01	757	2.342E+00
594	4.184E+01	635	4.752E+01	676	2.787E+01	717	9.942E+00	758	2.212E+00
595	4.229E+01	636	4.727E+01	677	2.732E+01	718	9.647E+00	759	2.146E+00
596	4.272E+01	637	4.700E+01	678	2.677E+01	719	9.370E+00	760	2.085E+00
597	4.312E+01	638	4.671E+01	679	2.618E+01	720	9.085E+00	761	2.080E+00
598	4.352E+01	639	4.642E+01	680	2.563E+01	721	8.839E+00	762	2.113E+00
599	4.393E+01	640	4.608E+01	681	2.512E+01	722	8.599E+00	763	1.980E+00
600	4.435E+01	641	4.576E+01	682	2.456E+01	723	8.319E+00	764	1.821E+00
601	4.479E+01	642	4.542E+01	683	2.400E+01	724	8.056E+00	765	1.733E+00
602	4.518E+01	643	4.508E+01	684	2.346E+01	725	7.812E+00	766	1.730E+00
603	4.556E+01	644	4.470E+01	685	2.293E+01	726	7.563E+00	767	1.724E+00
604	4.596E+01	645	4.427E+01	686	2.245E+01	727	7.338E+00	768	1.632E+00
605	4.632E+01	646	4.391E+01	687	2.192E+01	728	7.132E+00	769	1.533E+00
606	4.665E+01	647	4.352E+01	688	2.137E+01	729	6.949E+00	770	1.414E+00
607	4.694E+01	648	4.310E+01	689	2.084E+01	730	6.727E+00	771	1.389E+00
608	4.730E+01	649	4.264E+01	690	2.035E+01	731	6.518E+00	772	1.375E+00
609	4.760E+01	650	4.217E+01	691	1.990E+01	732	6.284E+00	773	1.284E+00
610	4.784E+01	651	4.168E+01	692	1.948E+01	733	6.051E+00	774	1.239E+00
611	4.812E+01	652	4.119E+01	693	1.904E+01	734	5.846E+00	775	1.218E+00
612	4.840E+01	653	4.074E+01	694	1.861E+01	735	5.607E+00	776	1.167E+00
613	4.864E+01	654	4.028E+01	695	1.816E+01	736	5.370E+00	777	1.083E+00
614	4.880E+01	655	3.976E+01	696	1.765E+01	737	5.142E+00	778	1.084E+00
615	4.892E+01	656	3.925E+01	697	1.717E+01	738	4.969E+00	779	1.033E+00
616	4.903E+01	657	3.876E+01	698	1.672E+01	739	4.827E+00	780	9.330E-01
617	4.920E+01	658	3.823E+01	699	1.627E+01	740	4.690E+00		
618	4.932E+01	659	3.767E+01	700	1.585E+01	741	4.528E+00		
619	4.936E+01	660	3.709E+01	701	1.543E+01	742	4.371E+00		
620	4.938E+01	661	3.653E+01	702	1.498E+01	743	4.177E+00		
621	4.938E+01	662	3.595E+01	703	1.459E+01	744	3.991E+00		
622	4.936E+01	663	3.537E+01	704	1.420E+01	745	3.802E+00		
623	4.931E+01	664	3.482E+01	705	1.382E+01	746	3.669E+00		
624	4.928E+01	665	3.426E+01	706	1.349E+01	747	3.549E+00		
625	4.922E+01	666	3.369E+01	707	1.315E+01	748	3.429E+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**

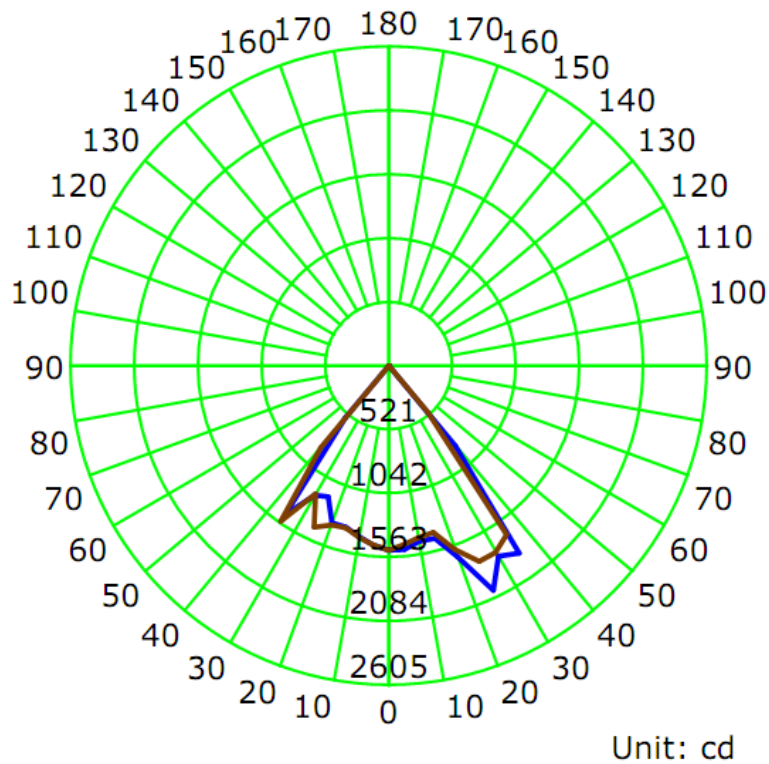
### Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2630	31.47	0.9970

### Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	$I_{max}$ (cd)	S/MH (C0/180)	S/MH (C90/270)
2268.6	72.14	2084.8	1.47	1.45

### Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% $I_{max}$ ):	76.8	77.3	78.3	76.2	77.6
Field Angle (10% $I_{max}$ ):	87.2	87.5	87.4	86.6	87.2

**Luminous Intensity (cd) Distribution Data**

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1507	1507	1507	1507	1507	1507	1507	1507
5.0°	1504	1503	1494	1480	1465	1457	1451	1454
10.0°	1454	1451	1441	1435	1427	1423	1423	1430
15.0°	1462	1463	1453	1432	1408	1385	1367	1355
20.0°	1660	1665	1670	1628	1594	1596	1572	1431
25.0°	2025	1978	1872	1791	1763	1732	1679	1451
30.0°	1795	1817	1755	1736	1757	1743	1660	1433
35.0°	1866	1861	1801	1753	1686	1575	1489	1470
40.0°	856	758	661	600	503	438	446	522
45.0°	16	16	16	15	14	15	15	15
50.0°	9	9	9	9	9	8	9	8
55.0°	5	4	5	5	4	4	5	4
60.0°	1	1	2	1	1	2	2	1
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	1	1
155.0°	0	0	1	1	1	2	2	2
160.0°	0	2	2	2	2	3	3	3
165.0°	2	2	2	3	3	3	4	3
170.0°	1	2	2	2	3	3	3	3
175.0°	2	3	3	3	3	3	4	4
180.0°	0	0	0	0	0	0	0	0

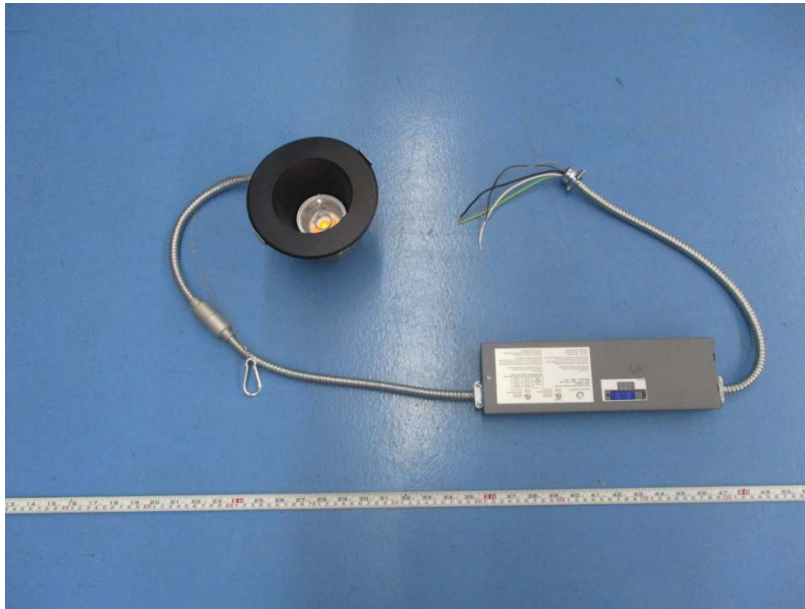
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1507	1507	1507	1507	1507	1507	1507	1507
5.0°	1468	1474	1474	1472	1468	1465	1467	1473
10.0°	1419	1426	1427	1425	1424	1425	1429	1434
15.0°	1367	1375	1375	1370	1369	1380	1393	1410
20.0°	1366	1308	1294	1307	1381	1558	1708	1736
25.0°	1182	1033	1057	1207	1457	1858	2070	2085
30.0°	1218	1006	925	971	1208	1618	1803	1775
35.0°	1483	1417	1358	1394	1548	1672	1793	1828
40.0°	561	636	747	848	874	831	847	850
45.0°	14	15	16	17	18	18	18	17
50.0°	7	7	8	10	10	10	10	9
55.0°	3	4	4	5	5	6	5	4
60.0°	0	0	1	2	2	2	1	2
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	1	1	0	0
155.0°	0	0	2	1	2	2	2	2
160.0°	2	2	2	3	3	2	2	1
165.0°	2	2	3	3	3	3	3	2
170.0°	2	2	3	3	3	3	3	3
175.0°	2	2	3	3	3	3	4	3
180.0°	0	0	0	0	0	0	0	0

### Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	35.6	1.57	0-5	35.6	1.57
5-10	103.9	4.58	0-10	139.5	6.15
10-15	167.8	7.40	0-15	307.3	13.55
15-20	241.2	10.63	0-20	548.5	24.18
20-25	332.4	14.65	0-25	880.9	38.83
25-30	399.1	17.59	0-30	1280.0	56.42
30-35	462.1	20.37	0-35	1742.2	76.80
35-40	385.5	16.99	0-40	2127.7	93.79
40-45	130.0	5.73	0-45	2257.7	99.52
45-50	5.0	0.22	0-50	2262.6	99.74
50-55	2.8	0.13	0-55	2265.5	99.86
55-60	1.3	0.06	0-60	2266.8	99.92
60-65	0.3	0.01	0-65	2267.1	99.93
65-70	0.0	0.00	0-70	2267.1	99.93
70-75	0.0	0.00	0-75	2267.1	99.93
75-80	0.0	0.00	0-80	2267.1	99.93
80-85	0.0	0.00	0-85	2267.1	99.93
85-90	0.0	0.00	0-90	2267.1	99.93
90-95	0.0	0.00	0-95	2267.1	99.93
95-100	0.0	0.00	0-100	2267.1	99.93
100-105	0.0	0.00	0-105	2267.1	99.93
105-110	0.0	0.00	0-110	2267.1	99.93
110-115	0.0	0.00	0-115	2267.1	99.93
115-120	0.0	0.00	0-120	2267.1	99.93
120-125	0.0	0.00	0-125	2267.1	99.93
125-130	0.0	0.00	0-130	2267.1	99.93
130-135	0.0	0.00	0-135	2267.1	99.93
135-140	0.0	0.00	0-140	2267.1	99.93
140-145	0.0	0.00	0-145	2267.1	99.93
145-150	0.0	0.00	0-150	2267.1	99.94
150-155	0.2	0.01	0-155	2267.3	99.94
155-160	0.3	0.02	0-160	2267.7	99.96
160-165	0.4	0.02	0-165	2268.0	99.98
165-170	0.3	0.01	0-170	2268.3	99.99
170-175	0.2	0.01	0-175	2268.5	100.00
175-180	0.0	0.00	0-180	2268.6	100.00

## 6. Product Photo



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