

# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

### GREEN CREATIVE LTD

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

**Test Model: CLKSEN6/10MIN/940/120V**

<b>Report Type:</b>	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
<b>Test Engineer:</b>	George Yang <i>George Yang</i>
<b>Report Number:</b>	RKSB190117009-10-7
<b>Test Date:</b>	2019-01-29 to 2019-04-13
<b>Report Date:</b>	2019-04-15
<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.

**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 2019-01-17 and used for testing.

Model Tested: CLKSEN6/10MIN/940/120V  
 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 VAC 60Hz  
 Rated Power: 10W  
 Nominal CCT: 4000K  
 Nominal Lumen Output: 600lm

## 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	2019-01-23	2020-01-23
Power Meter	INVENTFINE	WT500	GSJWQ20009	2019-04-08	2020-04-08
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2019-01-23	2020-01-23
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2019-04-08	2020-04-08
Standard Light Source	INVENTFINE	N/A	JWWCR020106	2018-12-24	2019-12-24
Thermal Meter	KEJIAN	TA298	N/A	2018-12-01	2019-12-01
DC Power Supply	INVENTFINE	WL3005	JWWCP020069	2019-04-08	2020-04-08
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	2019-04-08	2020-04-08
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	2019-04-08	2020-04-08
Power Meter	INVENTFINE	WT500	GSDSQ200007	2019-04-08	2020-04-08
Goniophotometer	INVENTFINE	GPM-1900	YWGCF120001	2019-01-24	2020-01-24
Wireless Weather Station	ZHONGXING	KG218	N/A	2018-12-01	2019-12-01
Standard Light Source	INVENTFINE	N/A	JWBYR040008	2019-03-08	2020-03-08

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  $U_{re}=2.61\%$  ( $k=2$ ), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is  $U=34\text{K}$  ( $k=2$ ), 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  $U_{re}=0.48\%$  of rdg, AC Voltage  $U_{re}=0.25\%$  of rdg, Power  $U_{re}=0.44\%$ , ( $k=2$ ), 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**

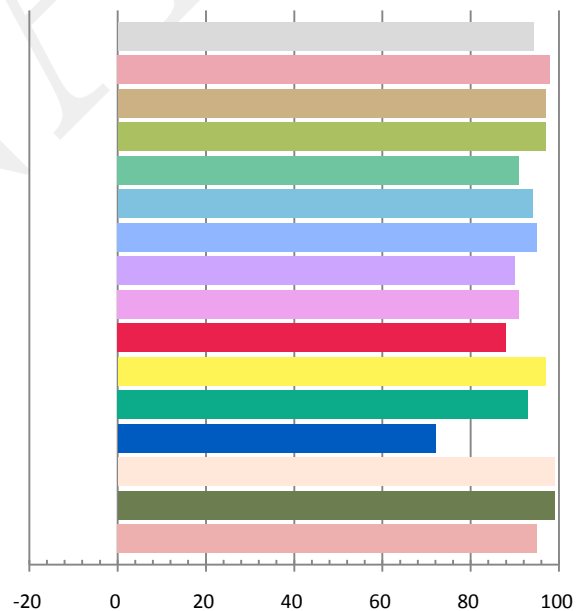
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.0865	9.46	0.9114	631.71	66.78

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
2.240	3846	0.00013	0.3876	0.3814	0.2280	0.5047

### Color Rendering Index

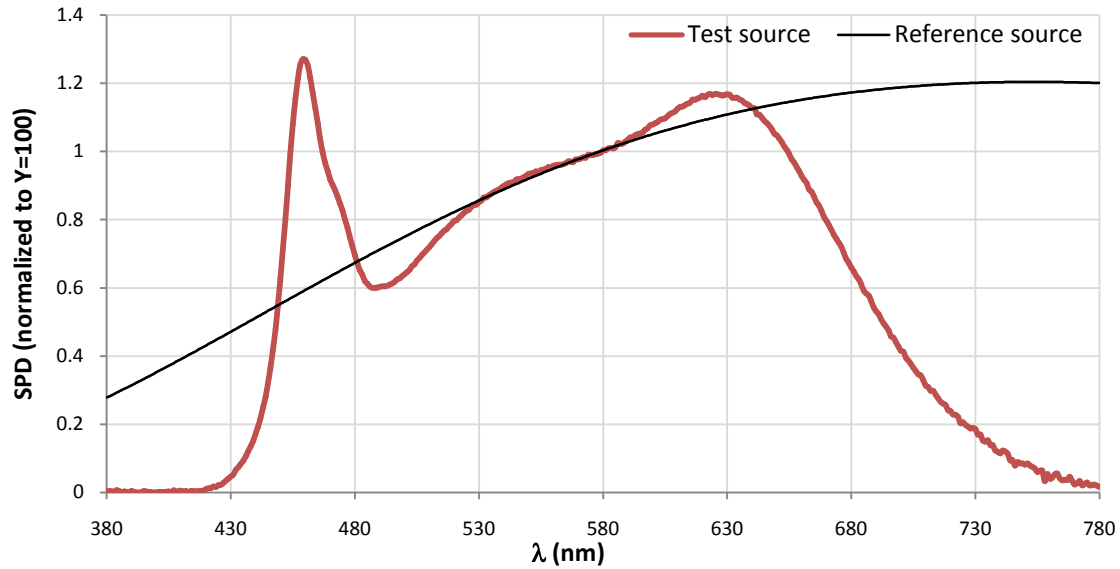
<b>Ra</b>			
94.2			
<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>
98	97	97	91
<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>
94	95	90	91
<b>R9</b>	<b>R10</b>	<b>R11</b>	<b>R12</b>
88	97	93	72
<b>R13</b>	<b>R14</b>	<b>R15</b>	
99	99	95	



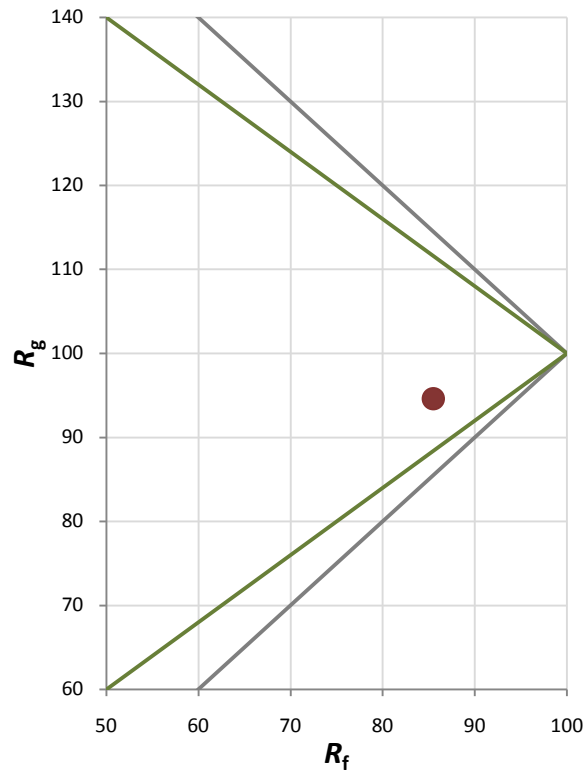
### Fidelity Index and Gamut Index

Fidelity Index $R_f$	85
Gamut Index $R_g$	95

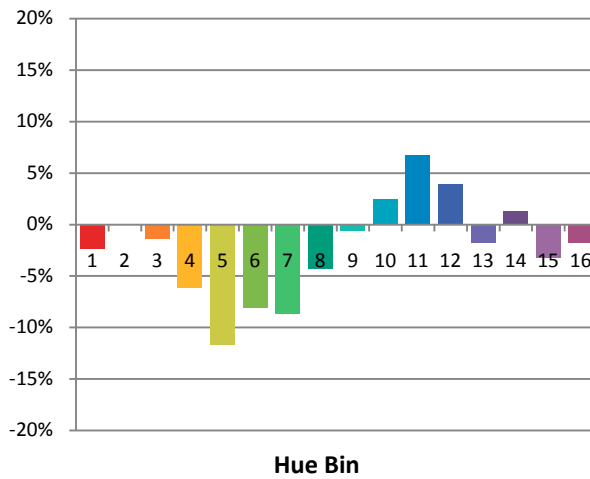
### Spectral Power Distribution Comparison



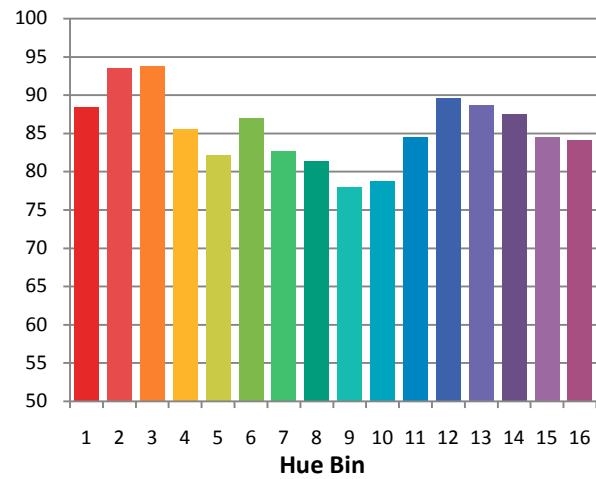
### Plot of $R_g$ versus $R_f$



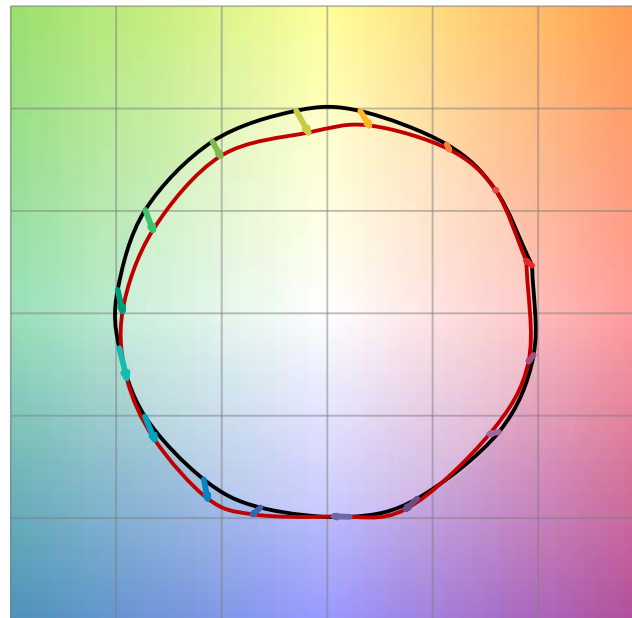
Chroma Shift by Hue



$R_t$  by Hue

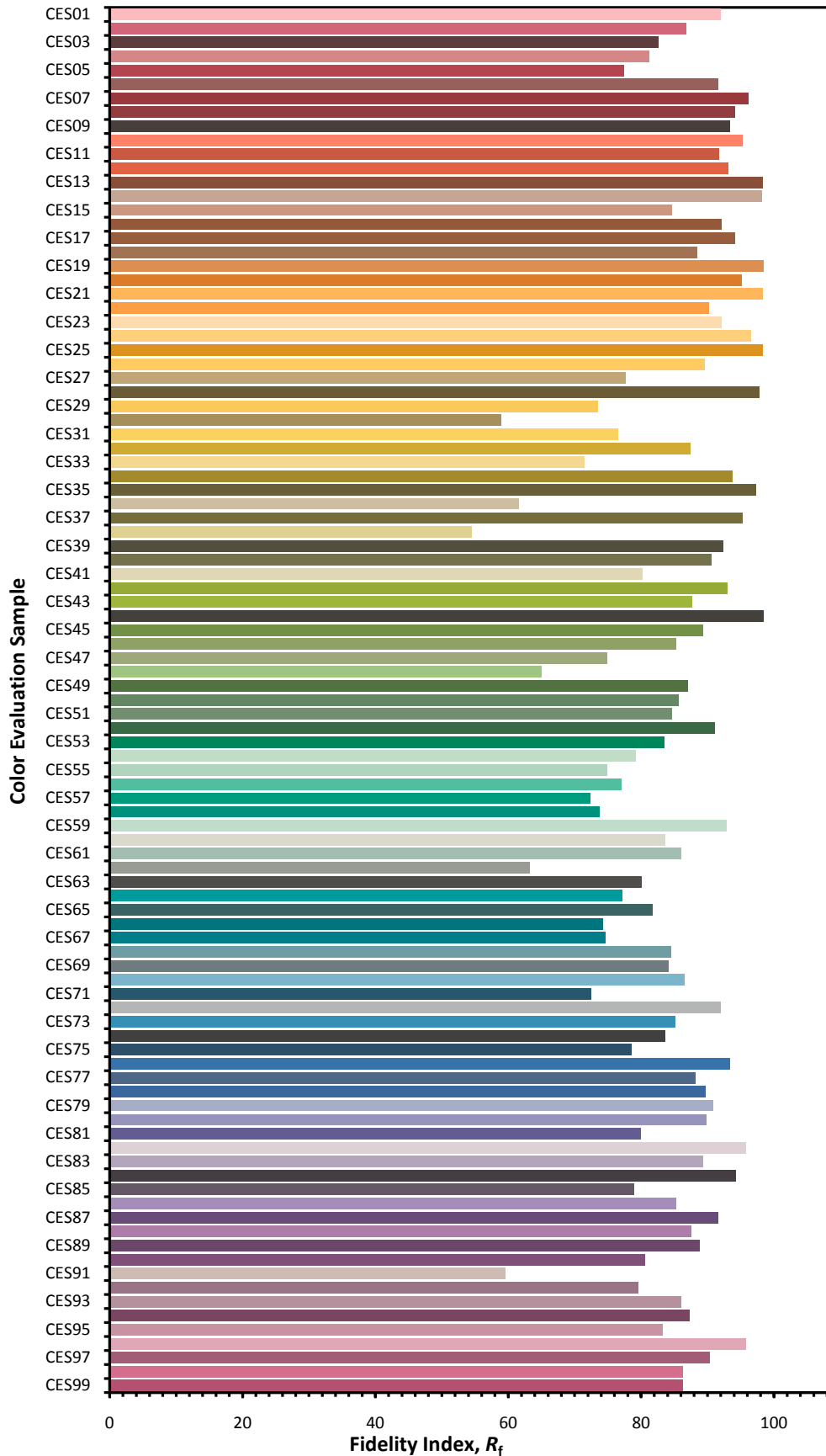


Color Vector Graphic

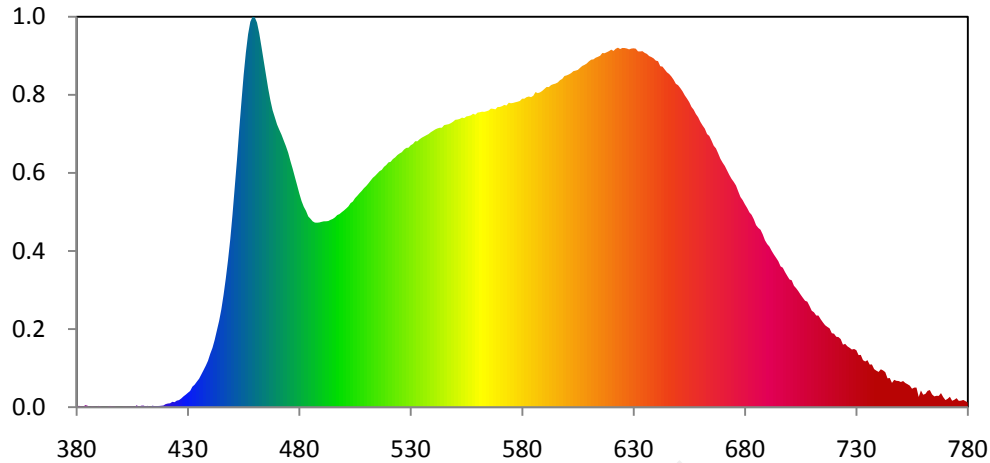


— Reference Illuminant — Test Source

### Color Fidelity by CES Sample



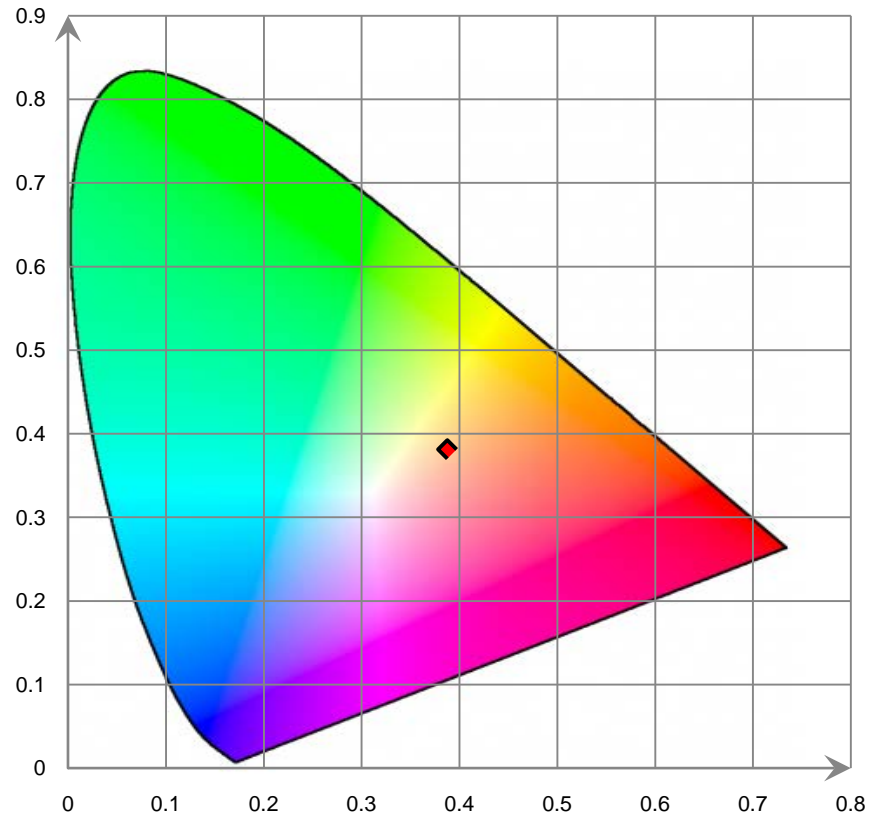
### Relative Spectral Power Distribution



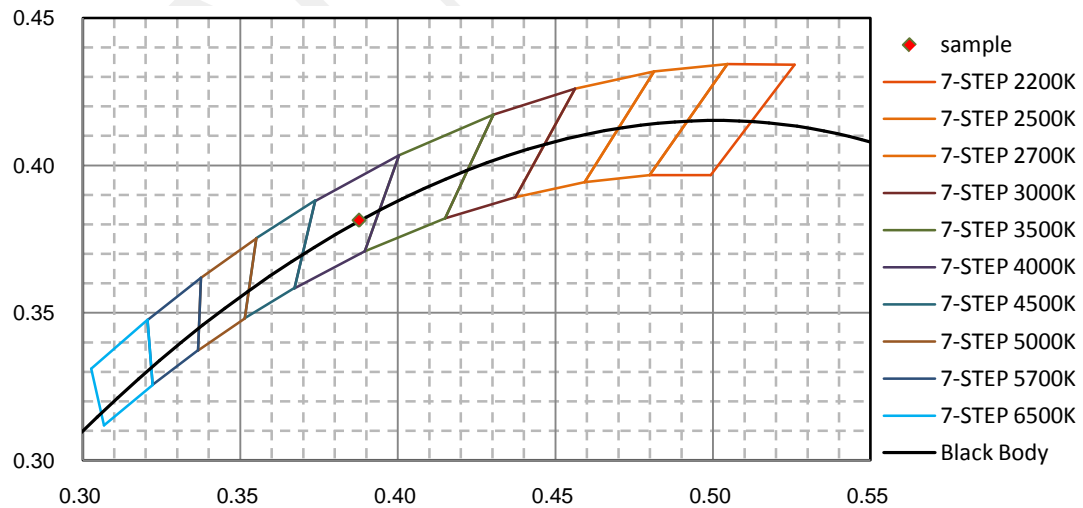
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.520E-02	421	1.100E-01	462	1.125E+01	503	6.138E+00	544	8.407E+00
381	4.040E-02	422	1.175E-01	463	1.085E+01	504	6.185E+00	545	8.485E+00
382	3.290E-02	423	1.618E-01	464	1.043E+01	505	6.287E+00	546	8.499E+00
383	1.790E-02	424	1.504E-01	465	1.001E+01	506	6.357E+00	547	8.513E+00
384	6.170E-02	425	1.976E-01	466	9.596E+00	507	6.436E+00	548	8.543E+00
385	4.280E-02	426	2.120E-01	467	9.236E+00	508	6.506E+00	549	8.587E+00
386	2.900E-03	427	2.619E-01	468	8.933E+00	509	6.588E+00	550	8.645E+00
387	2.960E-02	428	3.241E-01	469	8.721E+00	510	6.651E+00	551	8.653E+00
388	1.800E-02	429	3.758E-01	470	8.505E+00	511	6.731E+00	552	8.671E+00
389	6.200E-03	430	4.337E-01	471	8.345E+00	512	6.817E+00	553	8.710E+00
390	3.960E-02	431	4.883E-01	472	8.197E+00	513	6.901E+00	554	8.695E+00
391	1.320E-02	432	6.171E-01	473	8.021E+00	514	6.958E+00	555	8.747E+00
392	6.000E-04	433	6.761E-01	474	7.848E+00	515	7.029E+00	556	8.759E+00
393	0.000E+00	434	7.680E-01	475	7.654E+00	516	7.099E+00	557	8.778E+00
394	1.130E-02	435	8.549E-01	476	7.405E+00	517	7.139E+00	558	8.827E+00
395	3.850E-02	436	9.830E-01	477	7.176E+00	518	7.229E+00	559	8.799E+00
396	2.300E-02	437	1.113E+00	478	6.926E+00	519	7.284E+00	560	8.860E+00
397	1.940E-02	438	1.246E+00	479	6.680E+00	520	7.363E+00	561	8.873E+00
398	9.400E-03	439	1.396E+00	480	6.426E+00	521	7.381E+00	562	8.888E+00
399	5.000E-04	440	1.603E+00	481	6.202E+00	522	7.464E+00	563	8.884E+00
400	0.000E+00	441	1.781E+00	482	6.028E+00	523	7.514E+00	564	8.902E+00
401	1.590E-02	442	2.023E+00	483	5.905E+00	524	7.584E+00	565	8.925E+00
402	1.820E-02	443	2.310E+00	484	5.738E+00	525	7.632E+00	566	8.982E+00
403	1.360E-02	444	2.596E+00	485	5.669E+00	526	7.671E+00	567	8.974E+00
404	1.700E-02	445	2.946E+00	486	5.590E+00	527	7.749E+00	568	8.959E+00
405	2.780E-02	446	3.382E+00	487	5.552E+00	528	7.799E+00	569	9.029E+00
406	4.800E-03	447	3.874E+00	488	5.550E+00	529	7.805E+00	570	9.031E+00
407	5.850E-02	448	4.428E+00	489	5.557E+00	530	7.880E+00	571	9.055E+00
408	1.010E-02	449	5.050E+00	490	5.576E+00	531	7.919E+00	572	9.094E+00
409	4.460E-02	450	5.789E+00	491	5.591E+00	532	8.000E+00	573	9.074E+00
410	4.970E-02	451	6.611E+00	492	5.592E+00	533	7.999E+00	574	9.158E+00
411	2.390E-02	452	7.430E+00	493	5.601E+00	534	8.061E+00	575	9.143E+00
412	4.160E-02	453	8.334E+00	494	5.636E+00	535	8.107E+00	576	9.155E+00
413	1.400E-03	454	9.177E+00	495	5.663E+00	536	8.144E+00	577	9.173E+00
414	4.560E-02	455	9.989E+00	496	5.709E+00	537	8.181E+00	578	9.190E+00
415	3.250E-02	456	1.067E+01	497	5.779E+00	538	8.216E+00	579	9.212E+00
416	3.470E-02	457	1.122E+01	498	5.809E+00	539	8.271E+00	580	9.279E+00
417	3.650E-02	458	1.159E+01	499	5.864E+00	540	8.312E+00	581	9.280E+00
418	4.370E-02	459	1.175E+01	500	5.916E+00	541	8.356E+00	582	9.326E+00
419	5.210E-02	460	1.173E+01	501	5.975E+00	542	8.386E+00	583	9.344E+00
420	9.280E-02	461	1.157E+01	502	6.038E+00	543	8.405E+00	584	9.327E+00

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	9.366E+00	626	1.080E+01	667	7.785E+00	708	3.175E+00	749	7.873E-01
586	9.479E+00	627	1.079E+01	668	7.633E+00	709	3.044E+00	750	7.581E-01
587	9.447E+00	628	1.076E+01	669	7.471E+00	710	2.901E+00	751	7.867E-01
588	9.469E+00	629	1.079E+01	670	7.355E+00	711	2.854E+00	752	7.272E-01
589	9.512E+00	630	1.079E+01	671	7.254E+00	712	2.758E+00	753	6.904E-01
590	9.574E+00	631	1.078E+01	672	7.120E+00	713	2.756E+00	754	6.479E-01
591	9.632E+00	632	1.070E+01	673	6.986E+00	714	2.646E+00	755	5.555E-01
592	9.629E+00	633	1.070E+01	674	6.868E+00	715	2.551E+00	756	5.895E-01
593	9.689E+00	634	1.071E+01	675	6.776E+00	716	2.465E+00	757	5.902E-01
594	9.716E+00	635	1.066E+01	676	6.667E+00	717	2.415E+00	758	3.073E-01
595	9.734E+00	636	1.063E+01	677	6.490E+00	718	2.371E+00	759	5.023E-01
596	9.768E+00	637	1.056E+01	678	6.322E+00	719	2.225E+00	760	3.756E-01
597	9.836E+00	638	1.053E+01	679	6.227E+00	720	2.210E+00	761	3.997E-01
598	9.875E+00	639	1.049E+01	680	6.103E+00	721	2.118E+00	762	4.925E-01
599	9.963E+00	640	1.042E+01	681	5.992E+00	722	2.109E+00	763	5.139E-01
600	9.981E+00	641	1.041E+01	682	5.862E+00	723	2.047E+00	764	3.846E-01
601	1.001E+01	642	1.026E+01	683	5.786E+00	724	1.880E+00	765	3.252E-01
602	1.005E+01	643	1.024E+01	684	5.652E+00	725	1.905E+00	766	3.427E-01
603	1.011E+01	644	1.016E+01	685	5.477E+00	726	1.832E+00	767	3.389E-01
604	1.012E+01	645	1.007E+01	686	5.393E+00	727	1.786E+00	768	4.236E-01
605	1.015E+01	646	1.002E+01	687	5.338E+00	728	1.735E+00	769	3.046E-01
606	1.021E+01	647	9.946E+00	688	5.198E+00	729	1.751E+00	770	2.143E-01
607	1.027E+01	648	9.850E+00	689	5.020E+00	730	1.714E+00	771	2.523E-01
608	1.030E+01	649	9.727E+00	690	4.907E+00	731	1.567E+00	772	3.137E-01
609	1.034E+01	650	9.685E+00	691	4.830E+00	732	1.573E+00	773	1.925E-01
610	1.040E+01	651	9.599E+00	692	4.703E+00	733	1.414E+00	774	2.235E-01
611	1.045E+01	652	9.502E+00	693	4.593E+00	734	1.376E+00	775	2.716E-01
612	1.046E+01	653	9.381E+00	694	4.493E+00	735	1.414E+00	776	1.904E-01
613	1.051E+01	654	9.283E+00	695	4.390E+00	736	1.281E+00	777	1.961E-01
614	1.054E+01	655	9.176E+00	696	4.236E+00	737	1.287E+00	778	2.178E-01
615	1.057E+01	656	9.035E+00	697	4.195E+00	738	1.145E+00	779	1.824E-01
616	1.065E+01	657	8.948E+00	698	4.065E+00	739	1.098E+00	780	1.443E-01
617	1.065E+01	658	8.818E+00	699	3.951E+00	740	1.062E+00		
618	1.068E+01	659	8.723E+00	700	3.843E+00	741	1.139E+00		
619	1.071E+01	660	8.584E+00	701	3.817E+00	742	1.107E+00		
620	1.076E+01	661	8.474E+00	702	3.653E+00	743	1.053E+00		
621	1.072E+01	662	8.378E+00	703	3.578E+00	744	8.681E-01		
622	1.078E+01	663	8.216E+00	704	3.488E+00	745	8.770E-01		
623	1.081E+01	664	8.160E+00	705	3.386E+00	746	7.301E-01		
624	1.077E+01	665	8.019E+00	706	3.290E+00	747	8.222E-01		
625	1.081E+01	666	7.865E+00	707	3.202E+00	748	7.931E-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**

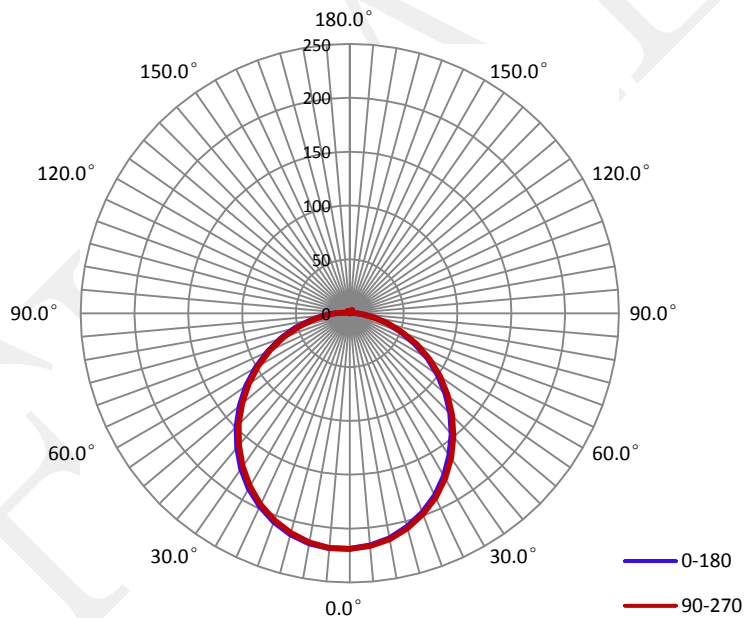
### Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0870	9.46	0.9100

### Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
633.6	67.02	219.3	1.23	1.23

### Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	109.4	109.3	109.3	109.3	109.3
Field Angle (10% I <sub>max</sub> ):	166.8	166.7	165.5	165.7	166.2

### Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	219	219	219	219	219	219	219	219
5.0°	217	216	217	217	217	218	218	219
10.0°	212	212	212	212	213	214	215	216
15.0°	205	205	205	206	207	208	210	212
20.0°	197	196	196	197	199	201	203	205
25.0°	187	186	186	187	189	191	194	196
30.0°	175	174	173	175	177	180	183	186
35.0°	161	160	160	161	164	167	171	174
40.0°	147	145	145	147	150	153	158	161
45.0°	132	130	130	132	134	138	143	147
50.0°	116	114	114	115	119	123	127	131
55.0°	100	98	98	99	102	106	111	116
60.0°	83	81	81	82	86	90	95	99
65.0°	67	65	65	66	69	73	78	83
70.0°	51	49	48	49	52	56	61	66
75.0°	36	34	34	34	37	40	45	50
80.0°	23	22	21	22	23	26	30	35
85.0°	13	12	12	12	12	14	17	22
90.0°	7	6	5	6	6	5	8	12
95.0°	2	2	1	1	2	1	3	6
100.0°	0	0	0	0	0	0	0	2
105.0°	0	0	0	1	0	0	0	0
110.0°	1	1	1	1	1	0	0	0
115.0°	1	1	1	2	2	1	1	0
120.0°	2	2	3	3	3	2	1	1
125.0°	3	4	3	3	3	2	2	1
130.0°	3	3	4	3	3	3	2	2
135.0°	3	3	4	3	3	3	3	2
140.0°	4	4	4	3	4	3	3	2
145.0°	4	3	4	3	4	3	3	3
150.0°	3	3	3	2	3	3	2	2
155.0°	2	3	3	2	2	1	2	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	0	0	0	0	0	0	0	0

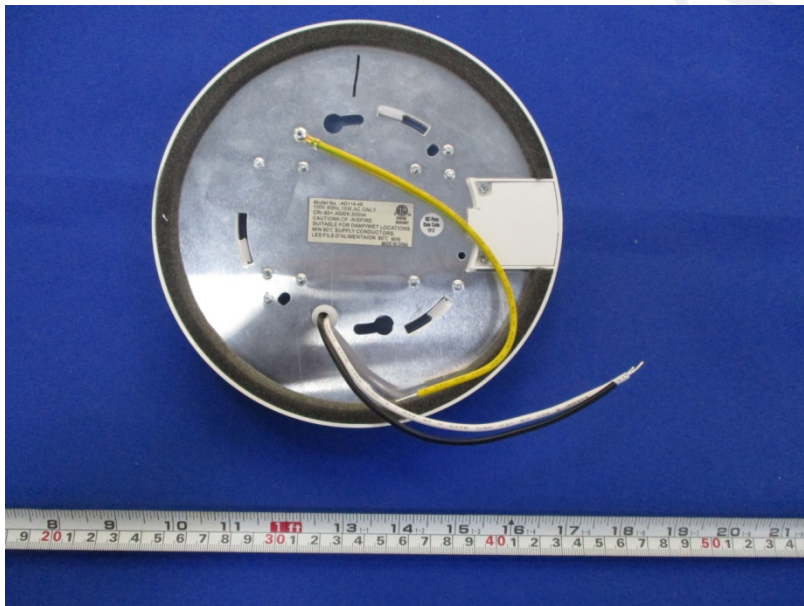
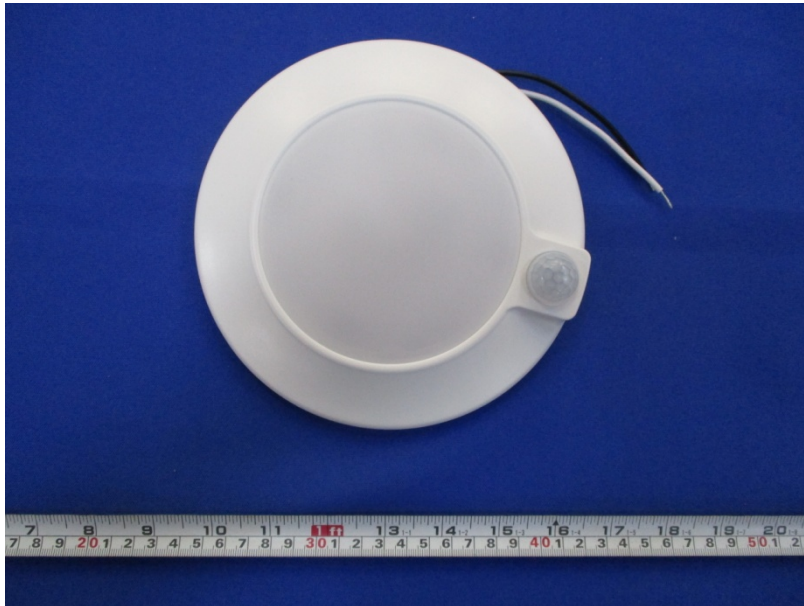
Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	219	219	219	219	219	219	219	219
5.0°	219	219	219	219	219	218	218	217
10.0°	217	217	217	217	216	215	214	213
15.0°	213	213	213	213	211	210	208	207
20.0°	206	207	207	206	205	202	200	198
25.0°	198	199	199	198	196	193	191	188
30.0°	188	189	189	188	186	182	179	177
35.0°	176	178	178	176	173	170	167	163
40.0°	163	165	165	163	160	156	153	149
45.0°	149	151	150	149	146	141	137	134
50.0°	134	135	135	134	130	126	122	118
55.0°	118	119	120	118	115	110	106	101
60.0°	101	103	103	101	98	94	89	85
65.0°	85	87	87	85	82	77	73	68
70.0°	68	70	70	69	65	61	56	52
75.0°	52	54	54	53	50	45	41	37
80.0°	37	39	39	38	35	31	28	24
85.0°	25	26	26	25	22	19	17	14
90.0°	14	16	16	14	13	10	8	7
95.0°	7	8	8	7	6	5	3	2
100.0°	2	3	2	1	2	1	0	0
105.0°	0	0	0	0	0	0	0	0
110.0°	0	1	1	0	0	0	1	0
115.0°	1	1	1	1	1	1	1	1
120.0°	1	1	1	2	2	1	2	2
125.0°	1	2	2	2	2	1	2	2
130.0°	3	2	2	2	3	1	2	2
135.0°	2	3	4	3	3	2	2	3
140.0°	3	3	3	3	3	2	2	3
145.0°	3	3	2	2	3	2	3	3
150.0°	2	2	2	2	2	2	2	3
155.0°	2	2	2	2	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	0	0	0	0	0	0	0	0

### Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	5.2	0.82	0-5	5.2	0.82
5-10	15.5	2.44	0-10	20.7	3.27
10-15	25.1	3.97	0-15	45.8	7.23
15-20	33.8	5.34	0-20	79.7	12.57
20-25	41.3	6.52	0-25	121.0	19.09
25-30	47.3	7.46	0-30	168.2	26.55
30-35	51.5	8.13	0-35	219.7	34.68
35-40	54.0	8.52	0-40	273.7	43.20
40-45	54.6	8.62	0-45	328.4	51.83
45-50	53.5	8.44	0-50	381.8	60.27
50-55	50.6	7.99	0-55	432.5	68.26
55-60	46.3	7.31	0-60	478.8	75.57
60-65	40.7	6.42	0-65	519.4	81.99
65-70	34.1	5.37	0-70	553.5	87.36
70-75	26.8	4.23	0-75	580.3	91.59
75-80	19.5	3.08	0-80	599.8	94.67
80-85	12.9	2.03	0-85	612.7	96.71
85-90	7.5	1.19	0-90	620.2	97.89
90-95	3.7	0.58	0-95	623.9	98.47
95-100	1.3	0.20	0-100	625.2	98.68
100-105	0.3	0.04	0-105	625.5	98.72
105-110	0.2	0.03	0-110	625.7	98.75
110-115	0.4	0.06	0-115	626.1	98.81
115-120	0.6	0.10	0-120	626.7	98.91
120-125	0.9	0.14	0-125	627.6	99.05
125-130	1.0	0.16	0-130	628.6	99.21
130-135	1.1	0.17	0-135	629.6	99.38
135-140	1.1	0.17	0-140	630.7	99.55
140-145	1.0	0.15	0-145	631.7	99.70
145-150	0.8	0.12	0-150	632.4	99.82
150-155	0.5	0.08	0-155	632.9	99.90
155-160	0.3	0.04	0-160	633.2	99.94
160-165	0.2	0.02	0-165	633.4	99.97
165-170	0.1	0.02	0-170	633.5	99.99
170-175	0.1	0.01	0-175	633.6	100.00
175-180	0.0	0.00	0-180	633.6	100.00

## 6. Product Photo



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