

# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

### GREEN CREATIVE LTD

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

**Test Model: MM2/950/FL/DIM120**

<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>	RKSB190214009-10-6
<b>Test Date:</b>	2019-02-15 to 2019-02-16
<b>Report Date:</b>	2019-02-21
<b>Reviewed By:</b>	Ray Gao/EE Engineer <i>Ry 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 2019-02-14 and used for testing.

Model Tested: MM2/950/FL/DIM120  
 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: 120VAC 60Hz  
 Rated Power: 8W  
 Nominal CCT: 5000K  
 Nominal Lumen Output: 780lm

## 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	2018-04-08	2019-04-08
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2019-01-23	2020-01-23
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2018-04-08	2019-04-08
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	2018-04-08	2019-04-08
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	2018-04-08	2019-04-08
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	2018-04-08	2019-04-08
Power Meter	INVENTFINE	WT500	GSDSQ200007	2018-04-08	2019-04-08
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	2019-01-24	2020-01-24

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  $U_{\text{rel}}=2.61\%$  ( $k=2$ ), 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  $U_{\text{rel}}=0.48\%$  of rdg, AC Voltage  $U_{\text{rel}}=0.25\%$  of rdg, Power  $U_{\text{rel}}=0.44\%$ , ( $k=2$ ), 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  $U_{\text{rel}}=2.6\%$  ( $k=2$ ), 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**

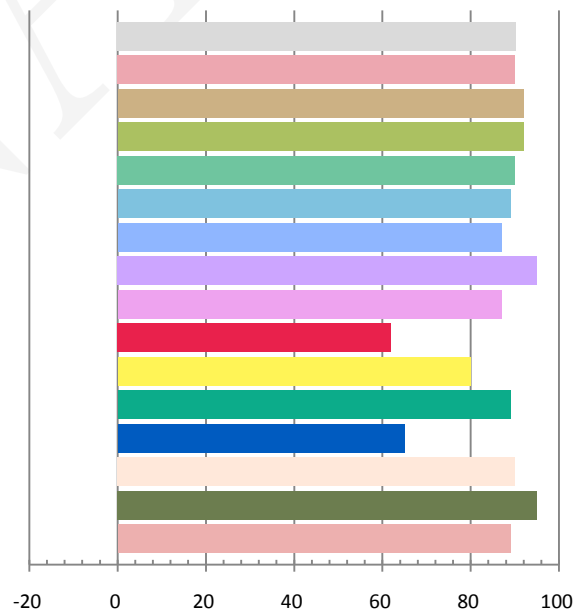
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.0633	7.37	0.9702	851.27	115.5

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
2.896	5012	0.00343	0.3454	0.3588	0.2089	0.4882

### Color Rendering Index

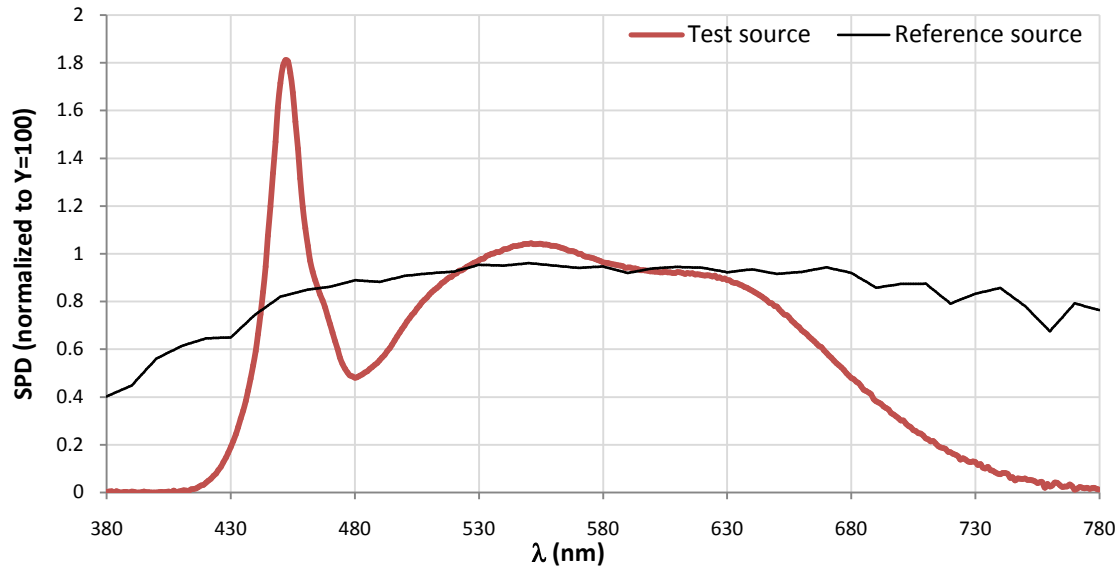
<b>Ra</b>			
90.2			
<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>
90	92	92	90
<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>
89	87	95	87
<b>R9</b>	<b>R10</b>	<b>R11</b>	<b>R12</b>
62	80	89	65
<b>R13</b>	<b>R14</b>	<b>R15</b>	
90	95	89	



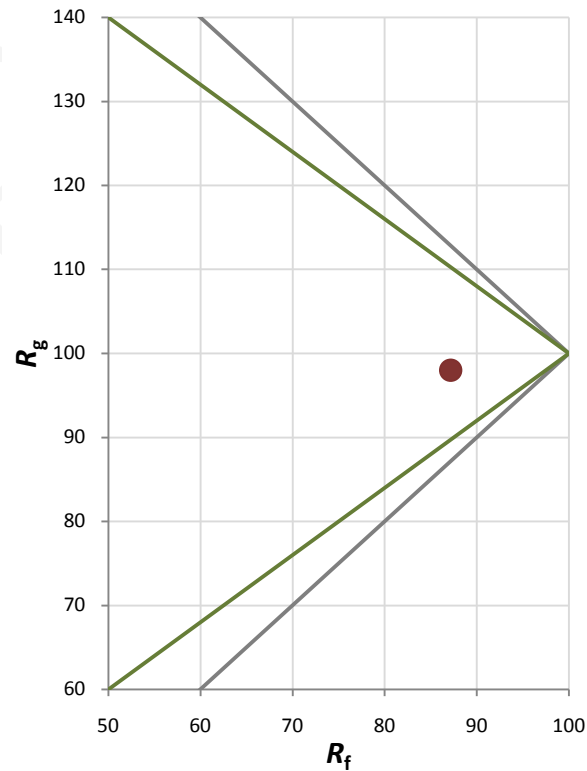
### Fidelity Index and Gamut Index

Fidelity Index $R_f$	87
Gamut Index $R_g$	98

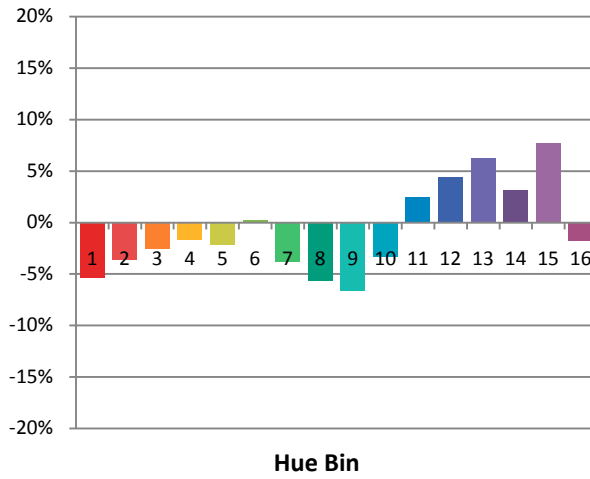
### Spectral Power Distribution Comparison



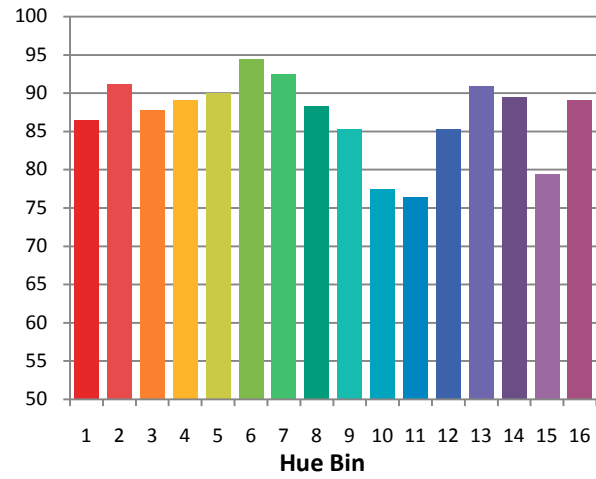
### Plot of $R_g$ versus $R_f$



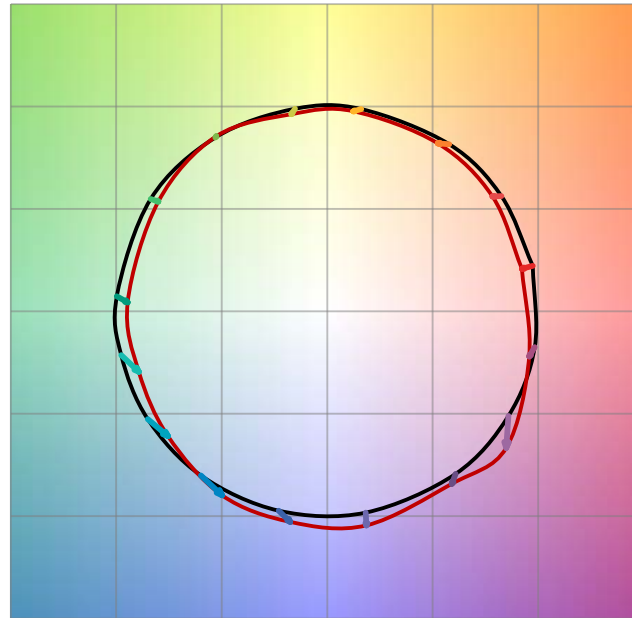
Chroma Shift by Hue



$R_t$  by Hue

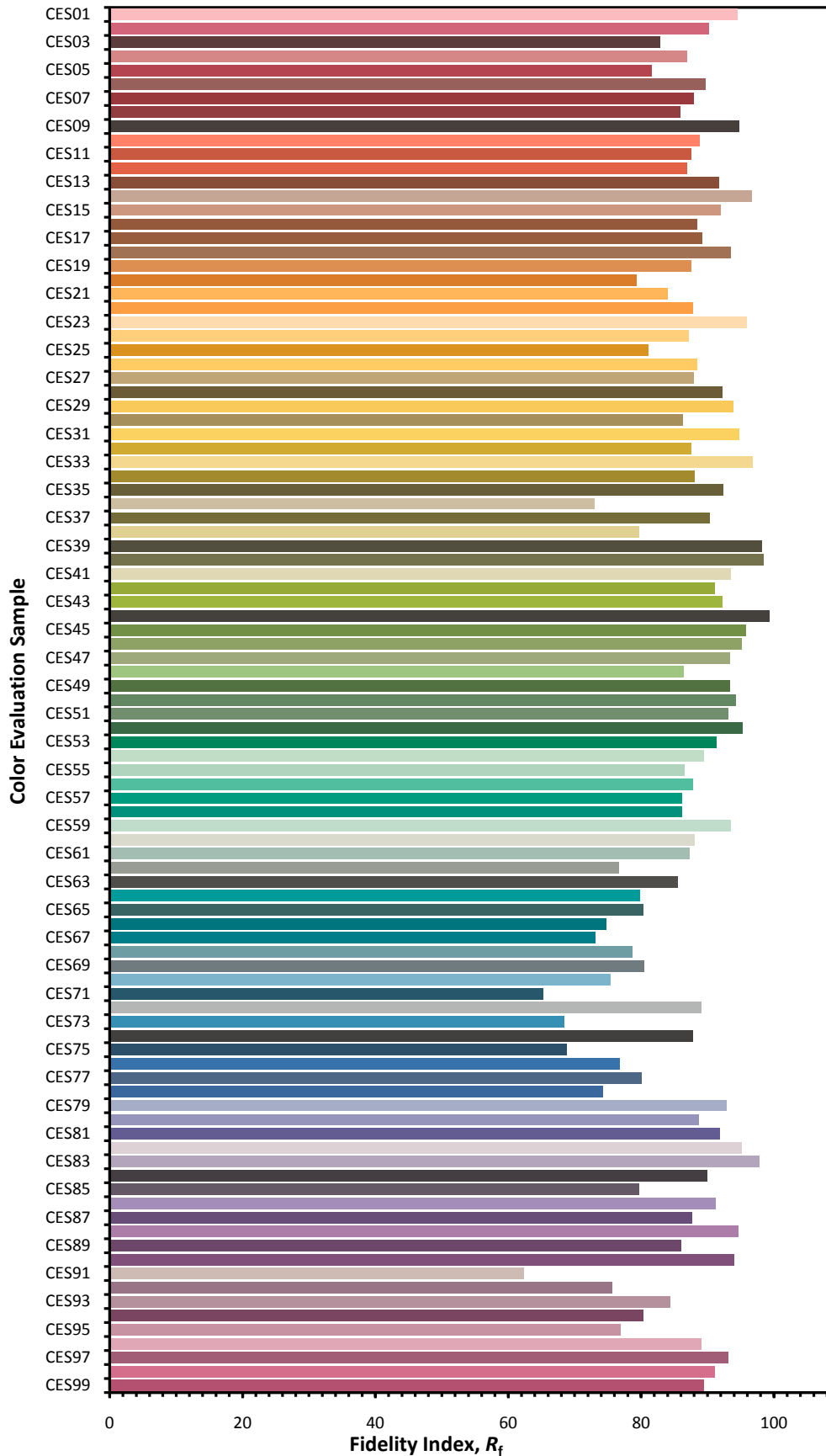


Color Vector Graphic

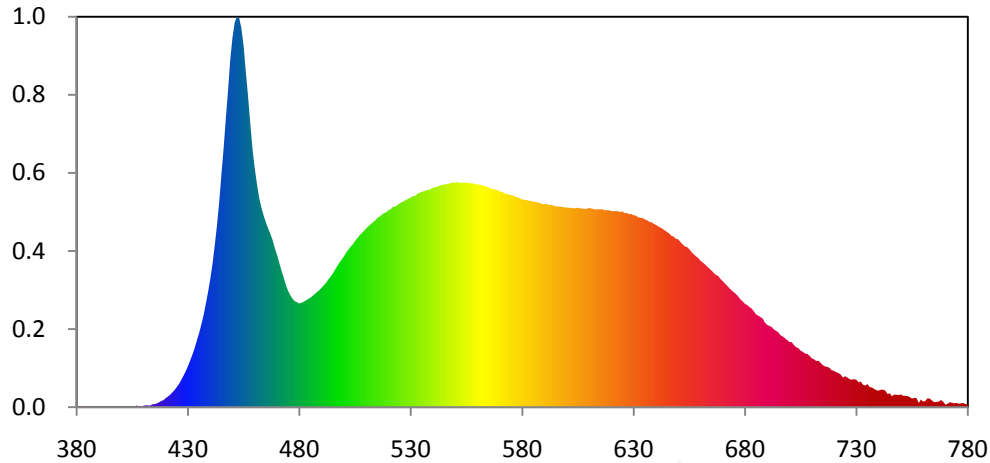


— Reference Illuminant — Test Source

### Color Fidelity by CES Sample



### Relative Spectral Power Distribution

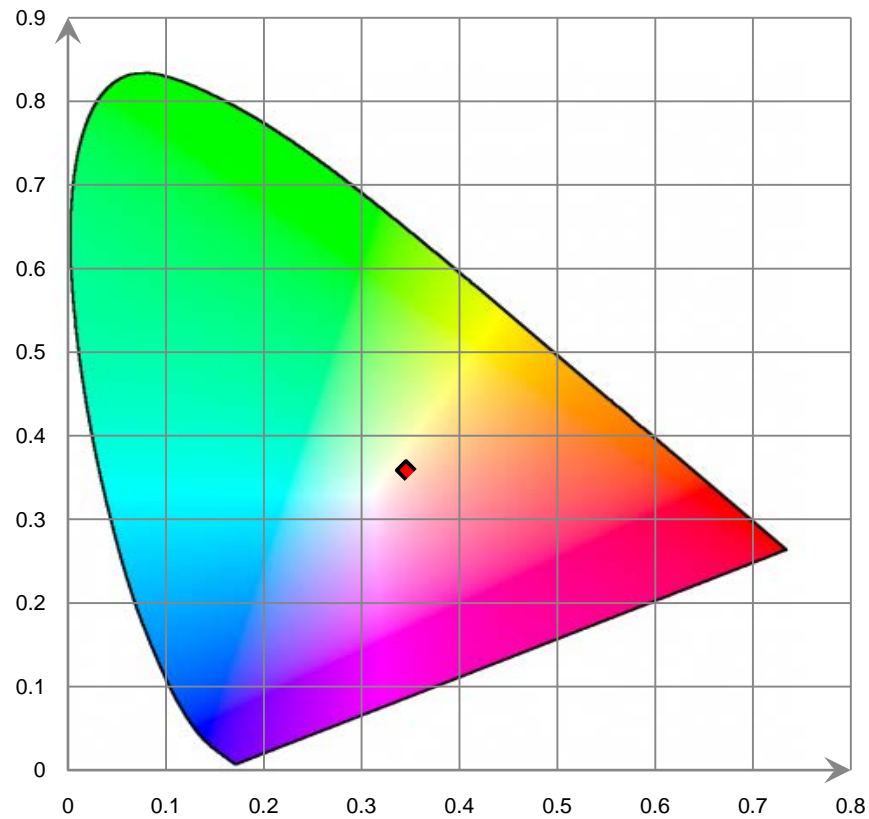


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.250E-02	421	6.155E-01	462	1.209E+01	503	9.271E+00	544	1.285E+01
381	5.370E-02	422	7.143E-01	463	1.152E+01	504	9.412E+00	545	1.286E+01
382	6.350E-02	423	8.605E-01	464	1.107E+01	505	9.604E+00	546	1.289E+01
383	1.810E-02	424	9.909E-01	465	1.069E+01	506	9.758E+00	547	1.291E+01
384	6.500E-02	425	1.162E+00	466	1.033E+01	507	9.928E+00	548	1.297E+01
385	2.130E-02	426	1.340E+00	467	1.001E+01	508	1.006E+01	549	1.298E+01
386	2.300E-03	427	1.580E+00	468	9.660E+00	509	1.018E+01	550	1.298E+01
387	3.020E-02	428	1.819E+00	469	9.195E+00	510	1.033E+01	551	1.301E+01
388	3.450E-02	429	2.073E+00	470	8.803E+00	511	1.046E+01	552	1.297E+01
389	6.600E-03	430	2.372E+00	471	8.348E+00	512	1.057E+01	553	1.296E+01
390	4.320E-02	431	2.692E+00	472	7.899E+00	513	1.068E+01	554	1.298E+01
391	3.960E-02	432	3.035E+00	473	7.483E+00	514	1.079E+01	555	1.298E+01
392	3.200E-03	433	3.405E+00	474	7.052E+00	515	1.093E+01	556	1.295E+01
393	1.000E-03	434	3.854E+00	475	6.709E+00	516	1.101E+01	557	1.295E+01
394	7.900E-03	435	4.276E+00	476	6.462E+00	517	1.112E+01	558	1.293E+01
395	4.570E-02	436	4.771E+00	477	6.257E+00	518	1.122E+01	559	1.288E+01
396	1.350E-02	437	5.305E+00	478	6.121E+00	519	1.126E+01	560	1.288E+01
397	1.420E-02	438	5.946E+00	479	6.067E+00	520	1.139E+01	561	1.286E+01
398	3.400E-03	439	6.629E+00	480	5.992E+00	521	1.144E+01	562	1.282E+01
399	4.500E-03	440	7.380E+00	481	6.033E+00	522	1.158E+01	563	1.277E+01
400	1.000E-04	441	8.255E+00	482	6.103E+00	523	1.159E+01	564	1.275E+01
401	1.800E-02	442	9.310E+00	483	6.168E+00	524	1.167E+01	565	1.270E+01
402	3.170E-02	443	1.047E+01	484	6.257E+00	525	1.178E+01	566	1.263E+01
403	2.350E-02	444	1.179E+01	485	6.338E+00	526	1.185E+01	567	1.261E+01
404	2.550E-02	445	1.339E+01	486	6.439E+00	527	1.191E+01	568	1.259E+01
405	4.120E-02	446	1.493E+01	487	6.551E+00	528	1.199E+01	569	1.254E+01
406	9.200E-03	447	1.668E+01	488	6.664E+00	529	1.205E+01	570	1.246E+01
407	1.042E-01	448	1.830E+01	489	6.768E+00	530	1.212E+01	571	1.245E+01
408	2.680E-02	449	2.009E+01	490	6.903E+00	531	1.220E+01	572	1.237E+01
409	4.980E-02	450	2.136E+01	491	7.049E+00	532	1.221E+01	573	1.232E+01
410	8.150E-02	451	2.225E+01	492	7.188E+00	533	1.234E+01	574	1.229E+01
411	1.101E-01	452	2.257E+01	493	7.376E+00	534	1.239E+01	575	1.226E+01
412	1.036E-01	453	2.250E+01	494	7.540E+00	535	1.245E+01	576	1.223E+01
413	9.050E-02	454	2.190E+01	495	7.722E+00	536	1.248E+01	577	1.218E+01
414	1.650E-01	455	2.088E+01	496	7.938E+00	537	1.254E+01	578	1.213E+01
415	1.809E-01	456	1.936E+01	497	8.156E+00	538	1.255E+01	579	1.207E+01
416	2.109E-01	457	1.795E+01	498	8.352E+00	539	1.262E+01	580	1.201E+01
417	2.814E-01	458	1.638E+01	499	8.534E+00	540	1.269E+01	581	1.199E+01
418	3.590E-01	459	1.490E+01	500	8.716E+00	541	1.272E+01	582	1.197E+01
419	4.050E-01	460	1.380E+01	501	8.931E+00	542	1.274E+01	583	1.194E+01
420	5.237E-01	461	1.287E+01	502	9.101E+00	543	1.281E+01	584	1.191E+01

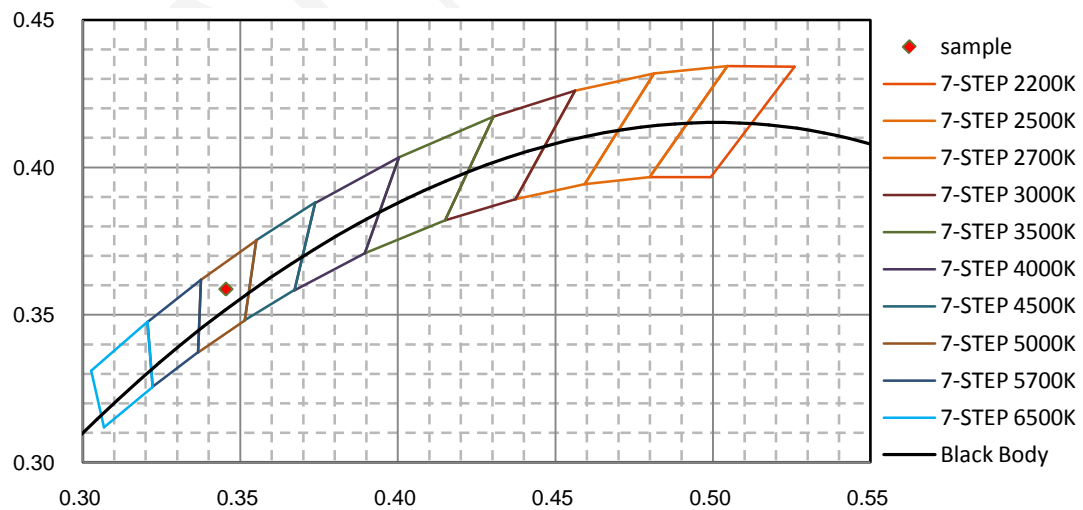


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.189E+01	626	1.121E+01	667	7.643E+00	708	3.081E+00	749	7.022E-01
586	1.187E+01	627	1.123E+01	668	7.588E+00	709	2.973E+00	750	7.326E-01
587	1.184E+01	628	1.115E+01	669	7.417E+00	710	2.823E+00	751	6.587E-01
588	1.180E+01	629	1.117E+01	670	7.287E+00	711	2.771E+00	752	6.585E-01
589	1.173E+01	630	1.109E+01	671	7.153E+00	712	2.668E+00	753	6.377E-01
590	1.174E+01	631	1.108E+01	672	7.026E+00	713	2.689E+00	754	5.877E-01
591	1.174E+01	632	1.098E+01	673	6.880E+00	714	2.556E+00	755	4.944E-01
592	1.169E+01	633	1.094E+01	674	6.753E+00	715	2.427E+00	756	5.399E-01
593	1.170E+01	634	1.093E+01	675	6.649E+00	716	2.356E+00	757	5.274E-01
594	1.165E+01	635	1.086E+01	676	6.535E+00	717	2.327E+00	758	2.448E-01
595	1.160E+01	636	1.081E+01	677	6.402E+00	718	2.272E+00	759	4.439E-01
596	1.161E+01	637	1.072E+01	678	6.227E+00	719	2.129E+00	760	3.173E-01
597	1.159E+01	638	1.069E+01	679	6.113E+00	720	2.100E+00	761	3.663E-01
598	1.158E+01	639	1.061E+01	680	5.973E+00	721	2.021E+00	762	5.169E-01
599	1.154E+01	640	1.054E+01	681	5.907E+00	722	1.975E+00	763	4.930E-01
600	1.154E+01	641	1.046E+01	682	5.786E+00	723	1.887E+00	764	3.800E-01
601	1.152E+01	642	1.038E+01	683	5.708E+00	724	1.712E+00	765	2.871E-01
602	1.153E+01	643	1.031E+01	684	5.540E+00	725	1.792E+00	766	3.096E-01
603	1.149E+01	644	1.022E+01	685	5.361E+00	726	1.712E+00	767	3.199E-01
604	1.150E+01	645	1.012E+01	686	5.291E+00	727	1.623E+00	768	4.145E-01
605	1.153E+01	646	1.004E+01	687	5.209E+00	728	1.591E+00	769	3.146E-01
606	1.149E+01	647	9.904E+00	688	5.120E+00	729	1.621E+00	770	1.478E-01
607	1.149E+01	648	9.866E+00	689	4.880E+00	730	1.587E+00	771	1.996E-01
608	1.146E+01	649	9.734E+00	690	4.757E+00	731	1.443E+00	772	2.851E-01
609	1.147E+01	650	9.705E+00	691	4.694E+00	732	1.482E+00	773	2.566E-01
610	1.151E+01	651	9.552E+00	692	4.632E+00	733	1.295E+00	774	2.209E-01
611	1.149E+01	652	9.415E+00	693	4.496E+00	734	1.252E+00	775	2.475E-01
612	1.146E+01	653	9.294E+00	694	4.414E+00	735	1.335E+00	776	1.917E-01
613	1.142E+01	654	9.255E+00	695	4.326E+00	736	1.165E+00	777	2.262E-01
614	1.145E+01	655	9.137E+00	696	4.154E+00	737	1.138E+00	778	2.374E-01
615	1.143E+01	656	8.966E+00	697	4.083E+00	738	1.056E+00	779	1.862E-01
616	1.144E+01	657	8.846E+00	698	3.983E+00	739	9.826E-01	780	1.520E-01
617	1.138E+01	658	8.721E+00	699	3.878E+00	740	9.538E-01		
618	1.139E+01	659	8.635E+00	700	3.764E+00	741	1.012E+00		
619	1.138E+01	660	8.474E+00	701	3.760E+00	742	1.010E+00		
620	1.134E+01	661	8.372E+00	702	3.590E+00	743	9.604E-01		
621	1.133E+01	662	8.261E+00	703	3.467E+00	744	7.630E-01		
622	1.134E+01	663	8.138E+00	704	3.415E+00	745	8.020E-01		
623	1.133E+01	664	8.017E+00	705	3.263E+00	746	6.318E-01		
624	1.128E+01	665	7.901E+00	706	3.199E+00	747	7.277E-01		
625	1.132E+01	666	7.764E+00	707	3.097E+00	748	7.204E-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**

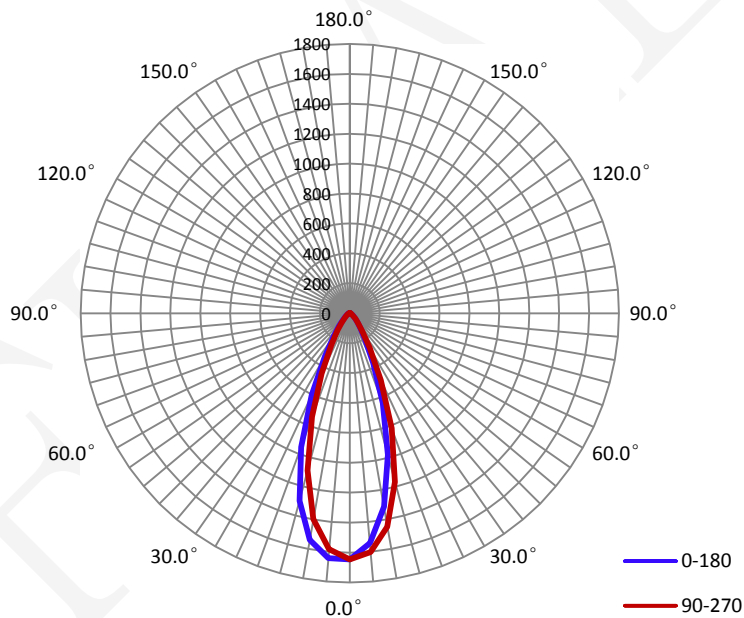
### Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0630	7.39	0.9770

### Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
867.7	117.46	1653.0	0.64	0.63

### Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	39.2	39.0	38.7	38.9	39.0
Field Angle (10% I <sub>max</sub> ):	69.1	68.8	68.1	68.0	68.5

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1646	1646	1646	1646	1646	1646	1646	1646
5.0°	1544	1552	1568	1585	1604	1627	1646	1653
10.0°	1314	1331	1364	1406	1450	1490	1535	1554
15.0°	980	997	1046	1108	1168	1226	1286	1320
20.0°	640	656	691	749	819	882	937	969
25.0°	368	378	401	446	494	545	591	624
30.0°	205	212	220	242	266	296	325	346
35.0°	123	128	129	138	148	159	176	189
40.0°	74	77	80	84	88	93	103	112
45.0°	48	50	51	53	55	58	63	69
50.0°	29	33	35	34	36	36	40	45
55.0°	17	19	24	22	22	24	26	31
60.0°	12	12	14	15	15	17	19	21
65.0°	8	9	9	11	11	12	13	13
70.0°	5	6	7	7	7	8	10	9
75.0°	3	3	3	4	5	5	6	6
80.0°	0	0	1	2	3	3	4	3
85.0°	0	0	0	0	0	1	0	1
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

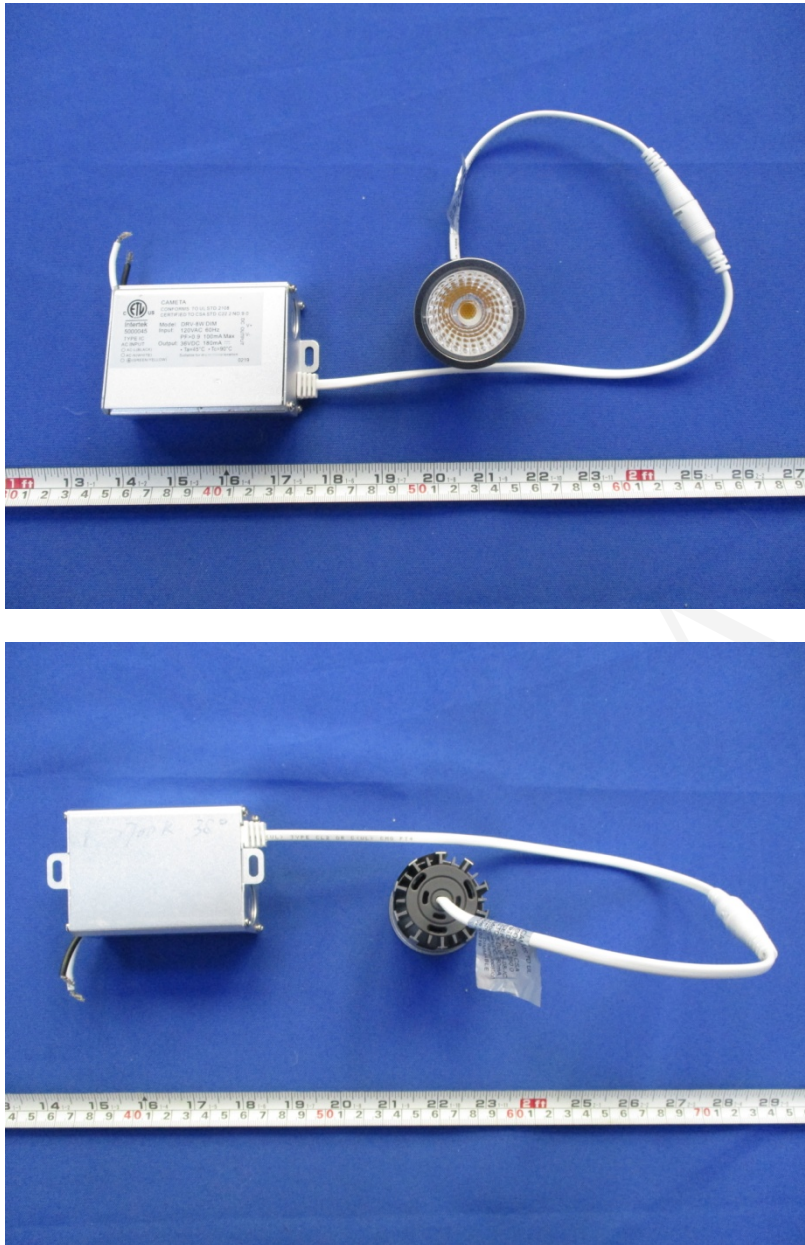
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1646	1646	1646	1646	1646	1646	1646	1646
5.0°	1644	1645	1629	1608	1584	1560	1546	1537
10.0°	1540	1526	1497	1455	1398	1345	1316	1301
15.0°	1300	1279	1228	1163	1088	1022	975	955
20.0°	953	932	883	804	737	676	633	622
25.0°	603	586	553	498	446	394	365	351
30.0°	337	332	309	276	243	217	201	195
35.0°	189	188	176	157	139	125	120	118
40.0°	116	112	105	96	85	75	73	70
45.0°	72	71	66	59	52	45	44	43
50.0°	44	44	43	37	32	28	27	27
55.0°	30	29	27	23	20	18	19	17
60.0°	19	17	17	15	14	13	13	12
65.0°	11	12	11	11	10	10	9	9
70.0°	9	9	9	8	7	6	6	5
75.0°	5	6	6	5	4	4	3	2
80.0°	3	3	3	3	2	2	1	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	38.8	4.47	0-5	38.8	4.47
5-10	108.1	12.46	0-10	146.9	16.93
10-15	151.9	17.50	0-15	298.7	34.43
15-20	158.2	18.24	0-20	457.0	52.67
20-25	132.6	15.28	0-25	589.6	67.95
25-30	93.9	10.82	0-30	683.4	78.77
30-35	61.0	7.03	0-35	744.4	85.79
35-40	40.1	4.62	0-40	784.4	90.41
40-45	27.1	3.12	0-45	811.5	93.53
45-50	18.5	2.13	0-50	830.0	95.66
50-55	12.7	1.47	0-55	842.7	97.13
55-60	8.8	1.02	0-60	851.5	98.14
60-65	6.2	0.72	0-65	857.8	98.86
65-70	4.5	0.52	0-70	862.3	99.39
70-75	3.1	0.35	0-75	865.4	99.74
75-80	1.7	0.19	0-80	867.1	99.94
80-85	0.5	0.06	0-85	867.6	100.00
85-90	0.0	0.00	0-90	867.6	100.00
90-95	0.0	0.00	0-95	867.6	100.00
95-100	0.0	0.00	0-100	867.6	100.00
100-105	0.0	0.00	0-105	867.6	100.00
105-110	0.0	0.00	0-110	867.6	100.00
110-115	0.0	0.00	0-115	867.6	100.00
115-120	0.0	0.00	0-120	867.6	100.00
120-125	0.0	0.00	0-125	867.6	100.00
125-130	0.0	0.00	0-130	867.6	100.00
130-135	0.0	0.00	0-135	867.6	100.00
135-140	0.0	0.00	0-140	867.6	100.00
140-145	0.0	0.00	0-145	867.6	100.00
145-150	0.0	0.00	0-150	867.6	100.00
150-155	0.0	0.00	0-155	867.6	100.00
155-160	0.0	0.00	0-160	867.6	100.00
160-165	0.0	0.00	0-165	867.6	100.00
165-170	0.0	0.00	0-170	867.6	100.00
170-175	0.0	0.00	0-175	867.6	100.00
175-180	0.0	0.00	0-180	867.6	100.00

## 6. Product Photo



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