

# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

### GREEN CREATIVE LTD

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

**Test Model: MM2/940/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>	RKSB190214009-10-5
<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.

**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 2019-02-14 and used for testing.

Model Tested: MM2/940/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: 4000K  
 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**

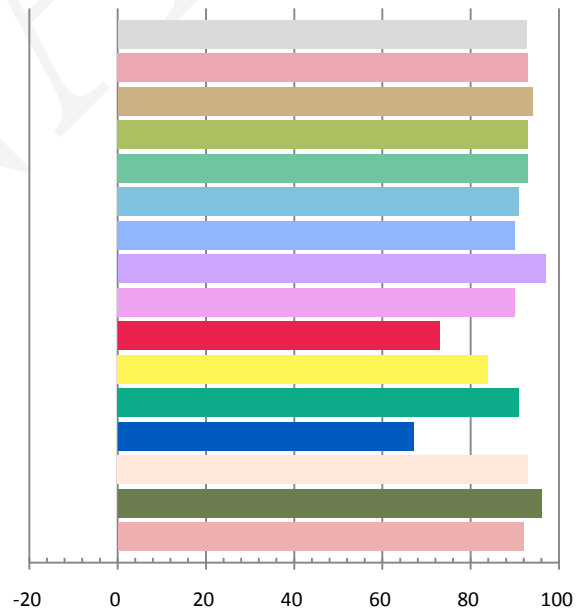
### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.0631	7.36	0.972	812.42	110.38

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
2.785	4007	0.00272	0.3821	0.3837	0.2234	0.5048

### Color Rendering Index

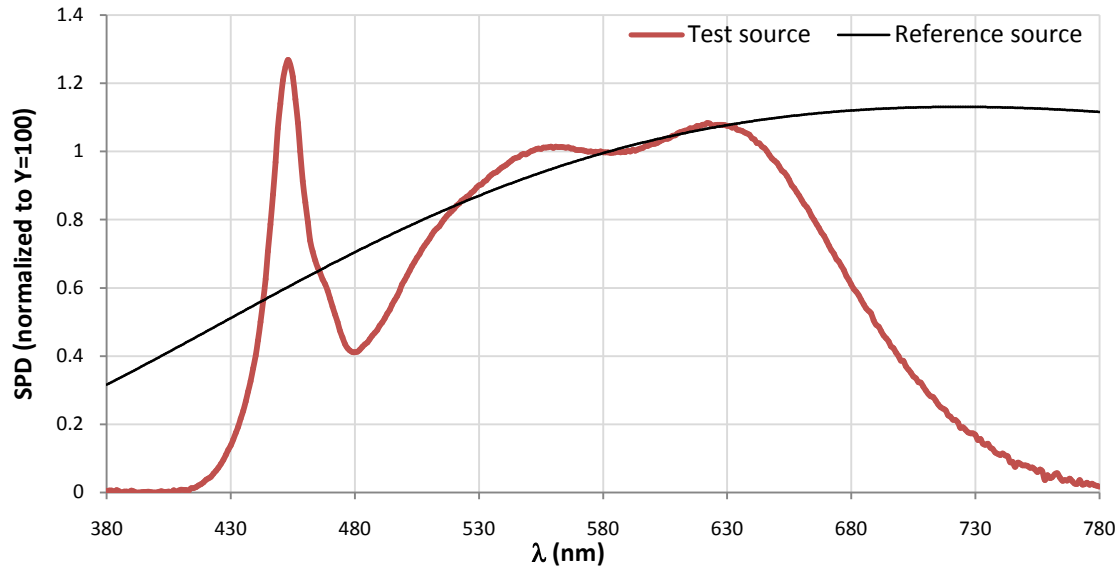
<b>Ra</b>			
92.6			
<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>
93	94	93	93
<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>
91	90	97	90
<b>R9</b>	<b>R10</b>	<b>R11</b>	<b>R12</b>
73	84	91	67
<b>R13</b>	<b>R14</b>	<b>R15</b>	
93	96	92	



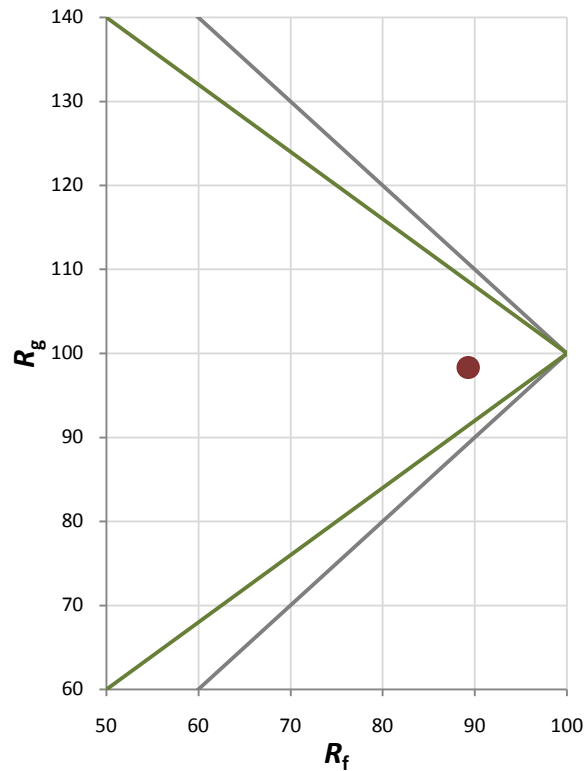
### Fidelity Index and Gamut Index

Fidelity Index $R_f$	89
Gamut Index $R_g$	98

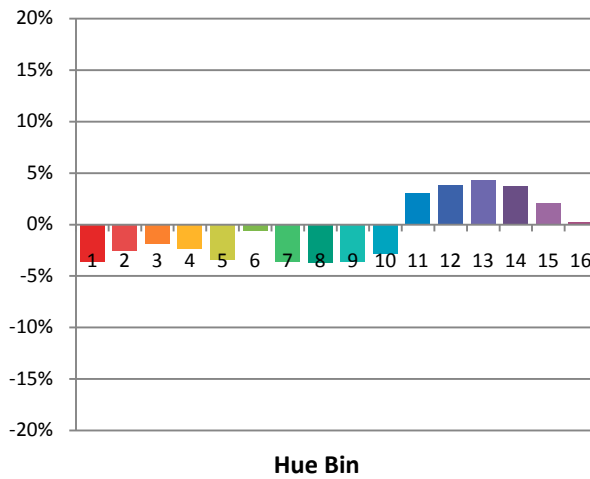
### Spectral Power Distribution Comparison



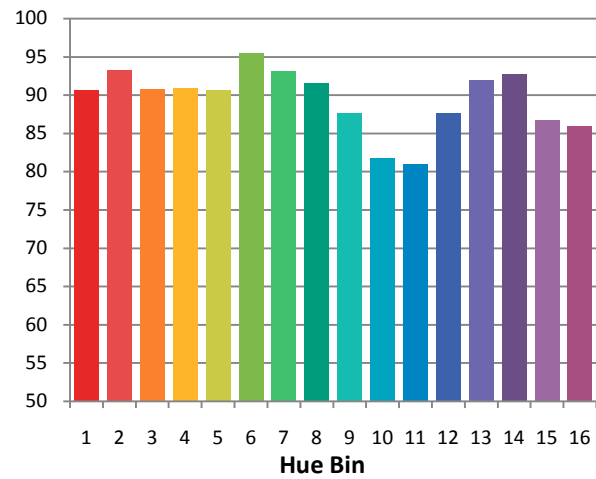
### Plot of $R_g$ versus $R_f$



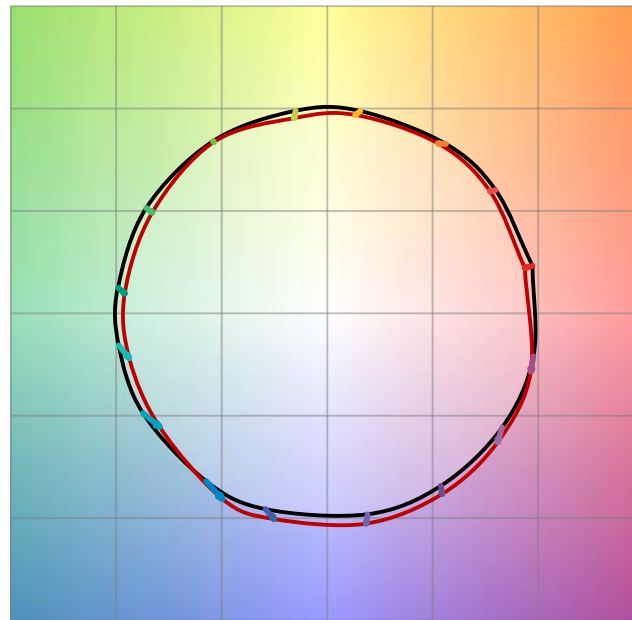
Chroma Shift by Hue



$R_t$  by Hue

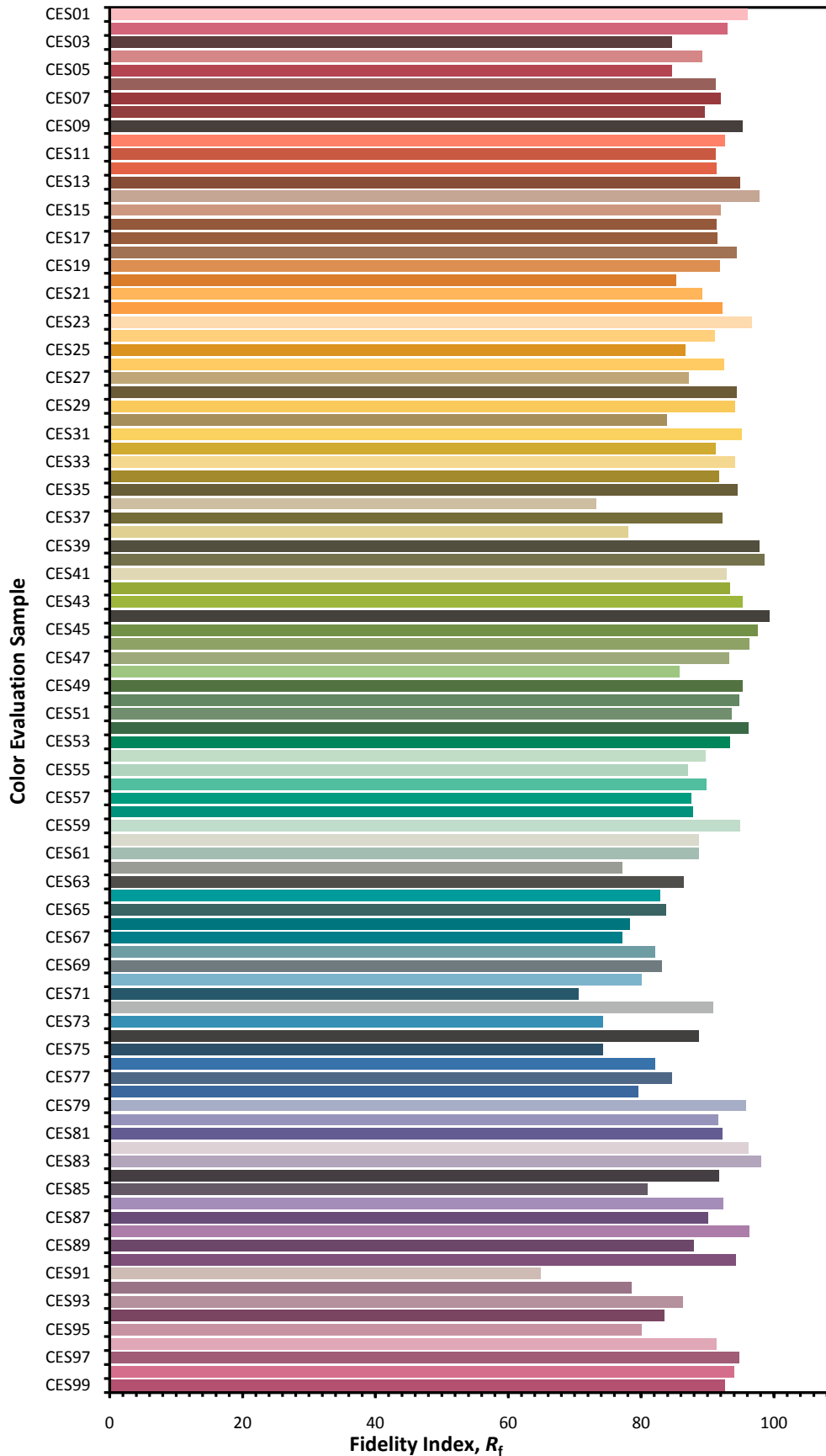


Color Vector Graphic

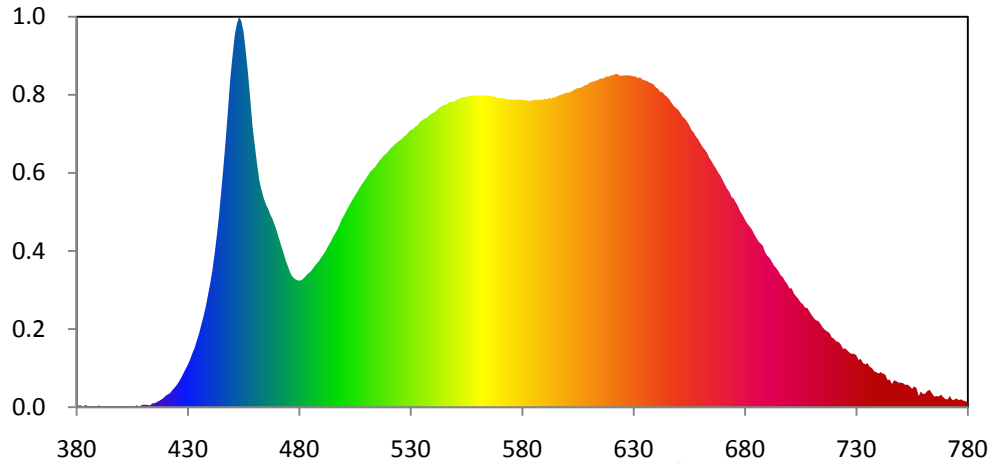


— Reference Illuminat — Test Source

### Color Fidelity by CES Sample



### Relative Spectral Power Distribution

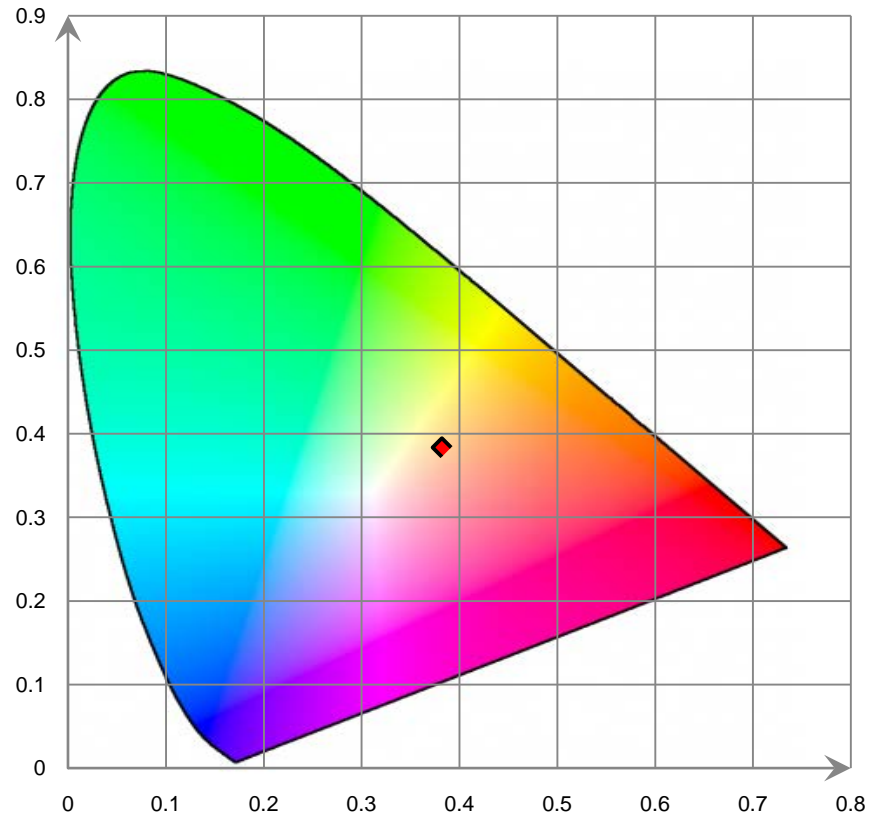


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.960E-02	421	4.914E-01	462	8.780E+00	503	7.890E+00	544	1.164E+01
381	6.570E-02	422	5.429E-01	463	8.398E+00	504	8.035E+00	545	1.167E+01
382	6.710E-02	423	6.579E-01	464	8.086E+00	505	8.185E+00	546	1.170E+01
383	2.710E-02	424	7.527E-01	465	7.836E+00	506	8.317E+00	547	1.178E+01
384	8.100E-02	425	8.602E-01	466	7.666E+00	507	8.470E+00	548	1.180E+01
385	4.780E-02	426	9.916E-01	467	7.435E+00	508	8.600E+00	549	1.179E+01
386	3.800E-03	427	1.141E+00	468	7.266E+00	509	8.724E+00	550	1.185E+01
387	3.160E-02	428	1.315E+00	469	7.030E+00	510	8.854E+00	551	1.190E+01
388	3.610E-02	429	1.484E+00	470	6.778E+00	511	8.981E+00	552	1.193E+01
389	2.650E-02	430	1.643E+00	471	6.485E+00	512	9.112E+00	553	1.197E+01
390	6.800E-02	431	1.848E+00	472	6.204E+00	513	9.202E+00	554	1.200E+01
391	2.950E-02	432	2.086E+00	473	5.942E+00	514	9.282E+00	555	1.198E+01
392	3.300E-03	433	2.290E+00	474	5.646E+00	515	9.409E+00	556	1.202E+01
393	4.000E-03	434	2.575E+00	475	5.415E+00	516	9.528E+00	557	1.203E+01
394	6.500E-03	435	2.849E+00	476	5.182E+00	517	9.637E+00	558	1.204E+01
395	2.070E-02	436	3.181E+00	477	5.037E+00	518	9.733E+00	559	1.206E+01
396	2.140E-02	437	3.511E+00	478	4.957E+00	519	9.803E+00	560	1.202E+01
397	2.640E-02	438	3.886E+00	479	4.904E+00	520	9.898E+00	561	1.206E+01
398	1.040E-02	439	4.333E+00	480	4.893E+00	521	1.001E+01	562	1.204E+01
399	5.000E-04	440	4.778E+00	481	4.911E+00	522	1.008E+01	563	1.205E+01
400	0.000E+00	441	5.304E+00	482	4.981E+00	523	1.017E+01	564	1.204E+01
401	2.080E-02	442	5.942E+00	483	5.075E+00	524	1.024E+01	565	1.202E+01
402	4.070E-02	443	6.662E+00	484	5.172E+00	525	1.031E+01	566	1.204E+01
403	2.710E-02	444	7.447E+00	485	5.236E+00	526	1.037E+01	567	1.200E+01
404	2.320E-02	445	8.397E+00	486	5.349E+00	527	1.046E+01	568	1.199E+01
405	3.390E-02	446	9.349E+00	487	5.467E+00	528	1.052E+01	569	1.196E+01
406	1.170E-02	447	1.039E+01	488	5.569E+00	529	1.063E+01	570	1.194E+01
407	7.550E-02	448	1.152E+01	489	5.673E+00	530	1.071E+01	571	1.194E+01
408	2.330E-02	449	1.269E+01	490	5.812E+00	531	1.074E+01	572	1.193E+01
409	6.810E-02	450	1.356E+01	491	5.930E+00	532	1.084E+01	573	1.191E+01
410	9.570E-02	451	1.437E+01	492	6.068E+00	533	1.089E+01	574	1.188E+01
411	9.320E-02	452	1.483E+01	493	6.239E+00	534	1.100E+01	575	1.190E+01
412	8.570E-02	453	1.509E+01	494	6.372E+00	535	1.108E+01	576	1.188E+01
413	6.550E-02	454	1.491E+01	495	6.550E+00	536	1.114E+01	577	1.189E+01
414	1.477E-01	455	1.449E+01	496	6.705E+00	537	1.117E+01	578	1.187E+01
415	1.507E-01	456	1.372E+01	497	6.853E+00	538	1.124E+01	579	1.190E+01
416	1.927E-01	457	1.289E+01	498	7.046E+00	539	1.133E+01	580	1.187E+01
417	2.396E-01	458	1.189E+01	499	7.253E+00	540	1.137E+01	581	1.186E+01
418	2.918E-01	459	1.086E+01	500	7.396E+00	541	1.143E+01	582	1.186E+01
419	3.508E-01	460	1.012E+01	501	7.569E+00	542	1.150E+01	583	1.184E+01
420	4.447E-01	461	9.426E+00	502	7.730E+00	543	1.158E+01	584	1.185E+01

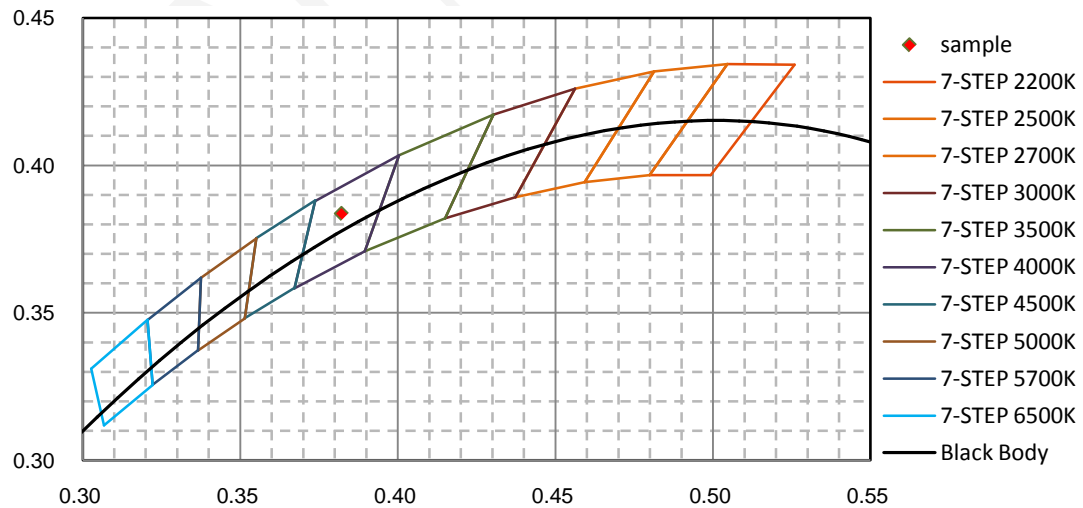


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.186E+01	626	1.282E+01	667	9.225E+00	708	3.834E+00	749	9.458E-01
586	1.189E+01	627	1.282E+01	668	9.066E+00	709	3.693E+00	750	9.464E-01
587	1.186E+01	628	1.282E+01	669	8.946E+00	710	3.558E+00	751	9.255E-01
588	1.189E+01	629	1.281E+01	670	8.775E+00	711	3.438E+00	752	8.618E-01
589	1.187E+01	630	1.279E+01	671	8.609E+00	712	3.354E+00	753	8.739E-01
590	1.192E+01	631	1.278E+01	672	8.445E+00	713	3.329E+00	754	8.035E-01
591	1.189E+01	632	1.272E+01	673	8.321E+00	714	3.206E+00	755	7.115E-01
592	1.195E+01	633	1.275E+01	674	8.130E+00	715	3.072E+00	756	7.995E-01
593	1.192E+01	634	1.266E+01	675	8.054E+00	716	2.979E+00	757	7.409E-01
594	1.197E+01	635	1.264E+01	676	7.901E+00	717	2.925E+00	758	4.329E-01
595	1.199E+01	636	1.261E+01	677	7.751E+00	718	2.862E+00	759	6.062E-01
596	1.202E+01	637	1.255E+01	678	7.548E+00	719	2.691E+00	760	5.033E-01
597	1.207E+01	638	1.252E+01	679	7.422E+00	720	2.645E+00	761	5.324E-01
598	1.208E+01	639	1.247E+01	680	7.254E+00	721	2.537E+00	762	6.368E-01
599	1.213E+01	640	1.235E+01	681	7.101E+00	722	2.524E+00	763	6.706E-01
600	1.215E+01	641	1.231E+01	682	6.993E+00	723	2.427E+00	764	5.230E-01
601	1.216E+01	642	1.219E+01	683	6.889E+00	724	2.256E+00	765	4.074E-01
602	1.220E+01	643	1.217E+01	684	6.721E+00	725	2.274E+00	766	4.316E-01
603	1.225E+01	644	1.206E+01	685	6.564E+00	726	2.191E+00	767	4.162E-01
604	1.230E+01	645	1.200E+01	686	6.416E+00	727	2.102E+00	768	4.825E-01
605	1.234E+01	646	1.190E+01	687	6.328E+00	728	2.063E+00	769	3.890E-01
606	1.233E+01	647	1.177E+01	688	6.244E+00	729	2.061E+00	770	3.140E-01
607	1.238E+01	648	1.165E+01	689	6.003E+00	730	2.005E+00	771	3.023E-01
608	1.244E+01	649	1.157E+01	690	5.852E+00	731	1.828E+00	772	4.361E-01
609	1.246E+01	650	1.150E+01	691	5.779E+00	732	1.865E+00	773	2.807E-01
610	1.252E+01	651	1.138E+01	692	5.634E+00	733	1.706E+00	774	2.902E-01
611	1.257E+01	652	1.123E+01	693	5.479E+00	734	1.658E+00	775	3.394E-01
612	1.258E+01	653	1.116E+01	694	5.379E+00	735	1.699E+00	776	2.704E-01
613	1.262E+01	654	1.104E+01	695	5.265E+00	736	1.565E+00	777	3.038E-01
614	1.263E+01	655	1.090E+01	696	5.098E+00	737	1.514E+00	778	2.535E-01
615	1.270E+01	656	1.071E+01	697	5.028E+00	738	1.391E+00	779	2.299E-01
616	1.269E+01	657	1.062E+01	698	4.876E+00	739	1.350E+00	780	1.958E-01
617	1.274E+01	658	1.046E+01	699	4.758E+00	740	1.301E+00		
618	1.278E+01	659	1.035E+01	700	4.598E+00	741	1.356E+00		
619	1.278E+01	660	1.020E+01	701	4.589E+00	742	1.295E+00		
620	1.283E+01	661	1.006E+01	702	4.391E+00	743	1.259E+00		
621	1.283E+01	662	9.955E+00	703	4.281E+00	744	1.053E+00		
622	1.288E+01	663	9.832E+00	704	4.184E+00	745	1.066E+00		
623	1.286E+01	664	9.644E+00	705	4.048E+00	746	8.951E-01		
624	1.280E+01	665	9.506E+00	706	3.981E+00	747	1.040E+00		
625	1.282E+01	666	9.355E+00	707	3.845E+00	748	1.005E+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**

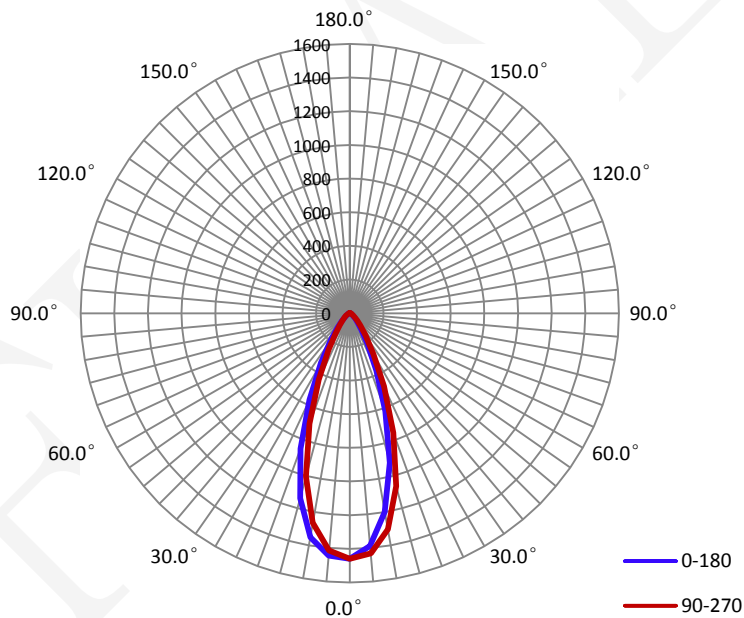
### Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0630	7.41	0.9780

### Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
826.6	111.60	1459.8	0.65	0.65

### Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	40.4	40.1	40.0	40.5	40.3
Field Angle (10% I <sub>max</sub> ):	71.6	72.1	71.1	71.6	71.6

**Luminous Intensity (cd) Distribution Data**

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1460	1460	1460	1460	1460	1460	1460	1460
5.0°	1389	1395	1407	1422	1432	1443	1449	1452
10.0°	1201	1214	1242	1273	1304	1332	1356	1363
15.0°	922	933	970	1012	1064	1107	1142	1160
20.0°	622	630	660	700	757	816	857	880
25.0°	377	384	408	439	481	529	567	590
30.0°	210	219	238	259	283	319	344	360
35.0°	122	128	139	151	161	181	193	204
40.0°	73	79	87	93	97	107	111	116
45.0°	45	50	55	59	62	67	69	70
50.0°	28	32	37	39	40	41	42	42
55.0°	19	20	24	25	26	27	26	26
60.0°	12	13	14	14	15	17	17	17
65.0°	9	9	9	11	11	12	11	13
70.0°	4	5	6	7	8	9	9	10
75.0°	2	3	3	4	5	5	6	7
80.0°	0	0	1	1	2	3	3	3
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

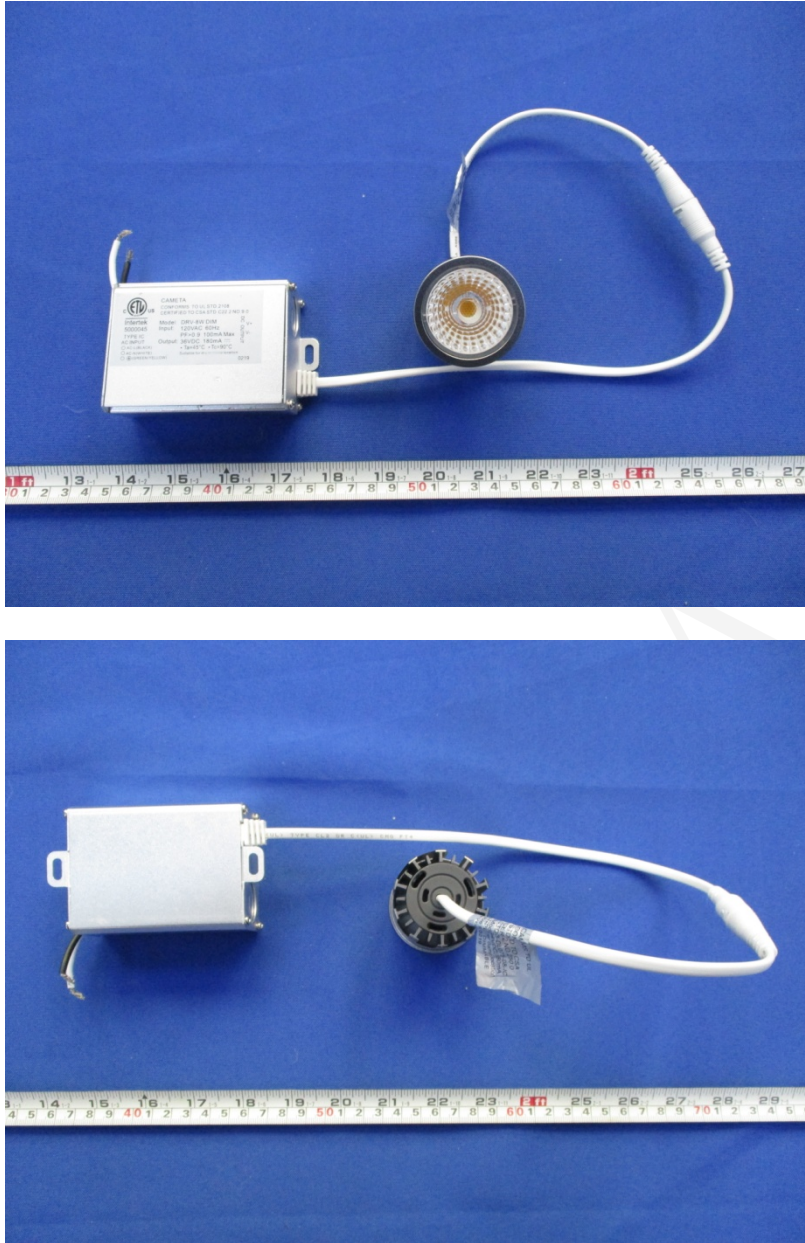
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1460	1460	1460	1460	1460	1460	1460	1460
5.0°	1447	1443	1438	1430	1415	1399	1385	1383
10.0°	1353	1344	1328	1298	1265	1229	1198	1184
15.0°	1140	1128	1098	1051	1006	958	923	904
20.0°	858	840	801	746	701	656	627	595
25.0°	569	557	519	475	437	405	381	361
30.0°	341	329	309	281	250	231	215	201
35.0°	195	191	180	164	145	133	122	115
40.0°	111	112	111	102	91	83	75	70
45.0°	68	70	71	66	59	53	45	42
50.0°	41	44	47	45	40	33	29	27
55.0°	26	30	33	31	27	22	19	17
60.0°	18	20	19	17	16	15	13	12
65.0°	13	13	12	10	11	10	9	9
70.0°	10	10	9	7	7	7	6	5
75.0°	6	5	5	5	4	4	3	2
80.0°	2	2	2	2	2	1	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	34.4	4.17	0-5	34.4	4.17
5-10	96.6	11.69	0-10	131.0	15.85
10-15	137.2	16.59	0-15	268.2	32.45
15-20	145.6	17.61	0-20	413.8	50.06
20-25	126.0	15.25	0-25	539.8	65.31
25-30	93.9	11.35	0-30	633.7	76.66
30-35	63.6	7.70	0-35	697.3	84.36
35-40	42.2	5.10	0-40	739.4	89.46
40-45	28.5	3.45	0-45	768.0	92.91
45-50	19.6	2.37	0-50	787.6	95.29
50-55	13.6	1.65	0-55	801.3	96.94
55-60	9.4	1.13	0-60	810.6	98.07
60-65	6.4	0.77	0-65	817.0	98.84
65-70	4.6	0.55	0-70	821.6	99.39
70-75	3.0	0.37	0-75	824.6	99.76
75-80	1.6	0.19	0-80	826.2	99.95
80-85	0.4	0.05	0-85	826.6	100.00
85-90	0.0	0.00	0-90	826.6	100.00
90-95	0.0	0.00	0-95	826.6	100.00
95-100	0.0	0.00	0-100	826.6	100.00
100-105	0.0	0.00	0-105	826.6	100.00
105-110	0.0	0.00	0-110	826.6	100.00
110-115	0.0	0.00	0-115	826.6	100.00
115-120	0.0	0.00	0-120	826.6	100.00
120-125	0.0	0.00	0-125	826.6	100.00
125-130	0.0	0.00	0-130	826.6	100.00
130-135	0.0	0.00	0-135	826.6	100.00
135-140	0.0	0.00	0-140	826.6	100.00
140-145	0.0	0.00	0-145	826.6	100.00
145-150	0.0	0.00	0-150	826.6	100.00
150-155	0.0	0.00	0-155	826.6	100.00
155-160	0.0	0.00	0-160	826.6	100.00
160-165	0.0	0.00	0-165	826.6	100.00
165-170	0.0	0.00	0-170	826.6	100.00
170-175	0.0	0.00	0-175	826.6	100.00
175-180	0.0	0.00	0-180	826.6	100.00

## 6. Product Photo



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