

IES LM-79-08

MEASUREMENT AND TEST REPORT For

GREEN CREATIVE LTD

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

Test Model: MM2/930/FL/DIM120

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	RKSB190214009-10-4
Test Date:	2019-02-15
Report Date:	2019-02-21
Reviewed By:	Ray Gao/EE Engineer <i>Ry Gao</i>
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan). No.248 Chenghu Road, Kunshan, Jiangsu province, China. Tel: +86-0512-86175000 Fax: +86-0512-88934268
Test Facility:	Test facility was located at No.248 Chenghu Road, Kunshan, Jiangsu province, China.
Accreditation:	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: MM2/930/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: 3000K
 Nominal Lumen Output: 750lm

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.

4π 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 (γ) 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**

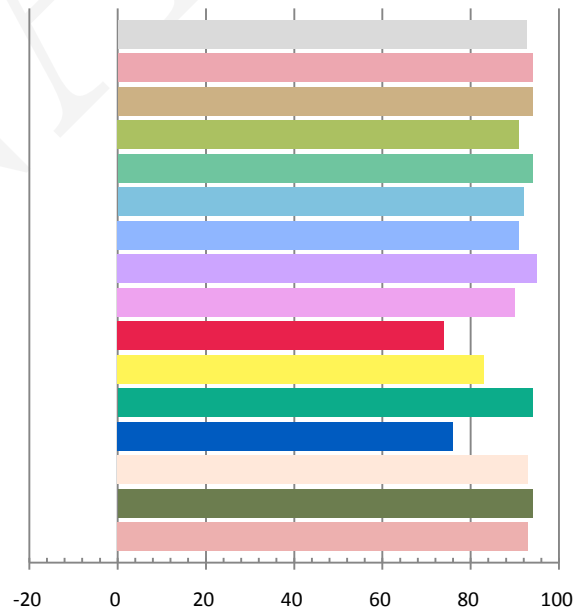
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.01	60	0.0633	7.39	0.9728	763.79	103.35

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
2.710	3072	0.00090	0.4331	0.4050	0.2477	0.5212

Color Rendering Index

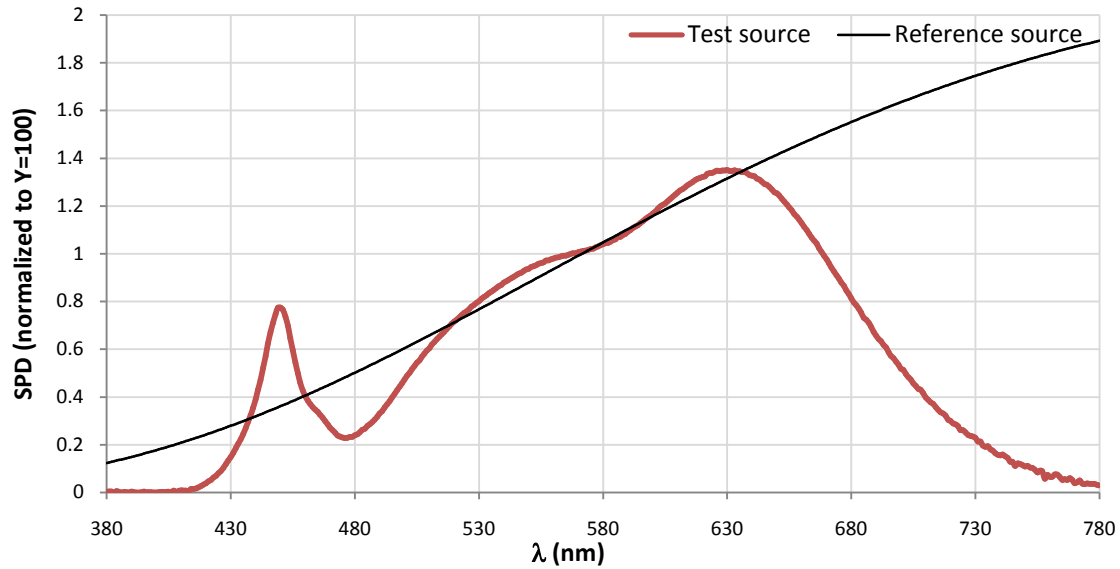
Ra			
92.6			
R1	R2	R3	R4
94	94	91	94
R5	R6	R7	R8
92	91	95	90
R9	R10	R11	R12
74	83	94	76
R13	R14	R15	
93	94	93	



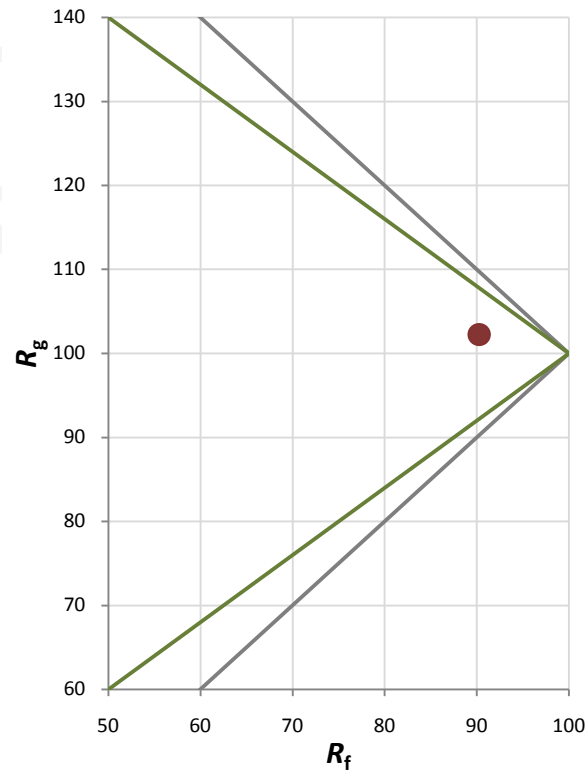
Fidelity Index and Gamut Index

Fidelity Index R_f	90
Gamut Index R_g	102

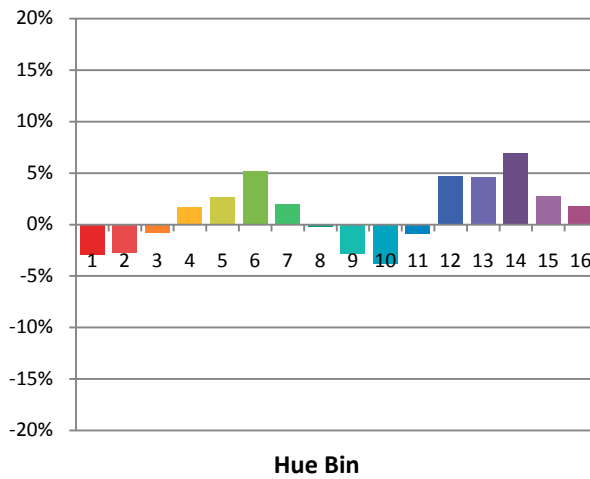
Spectral Power Distribution Comparison



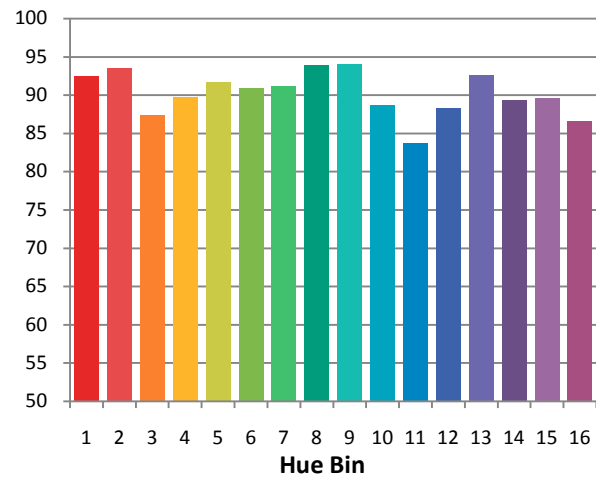
Plot of R_g versus R_f



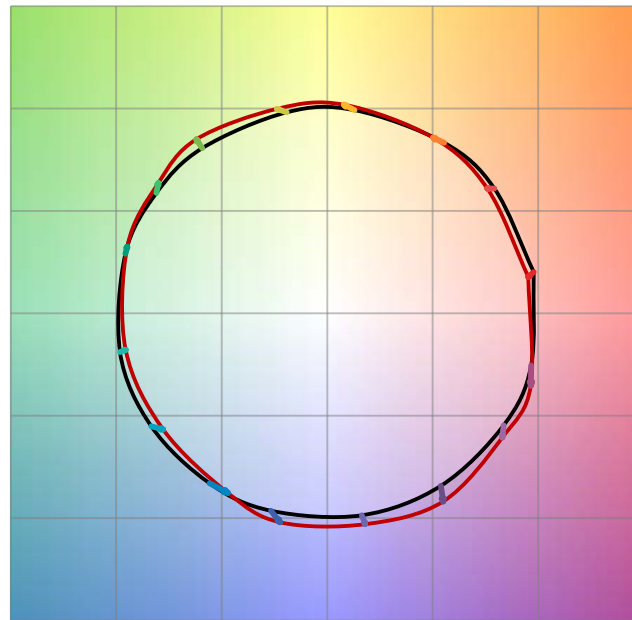
Chroma Shift by Hue



R_t by Hue

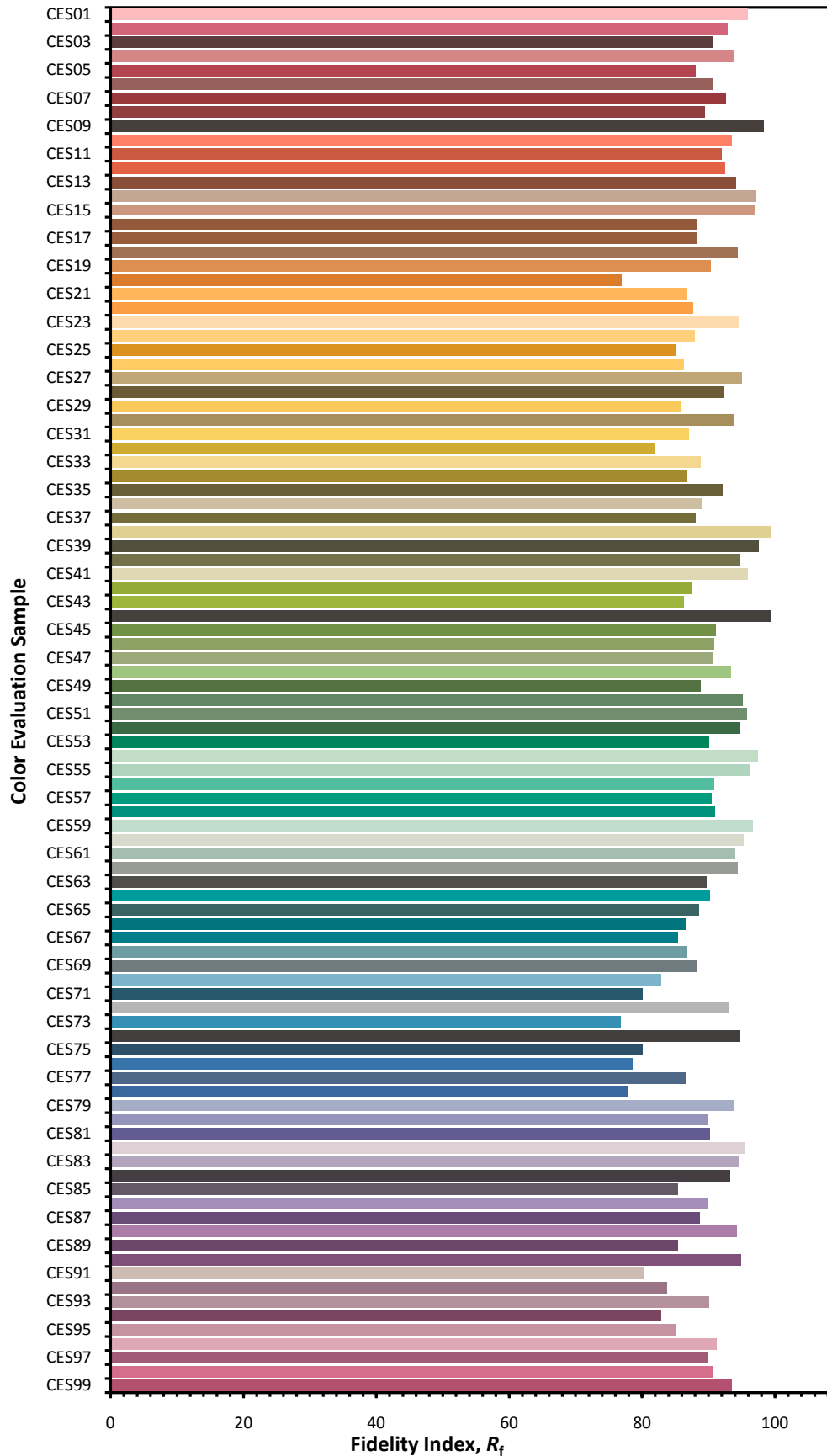


Color Vector Graphic

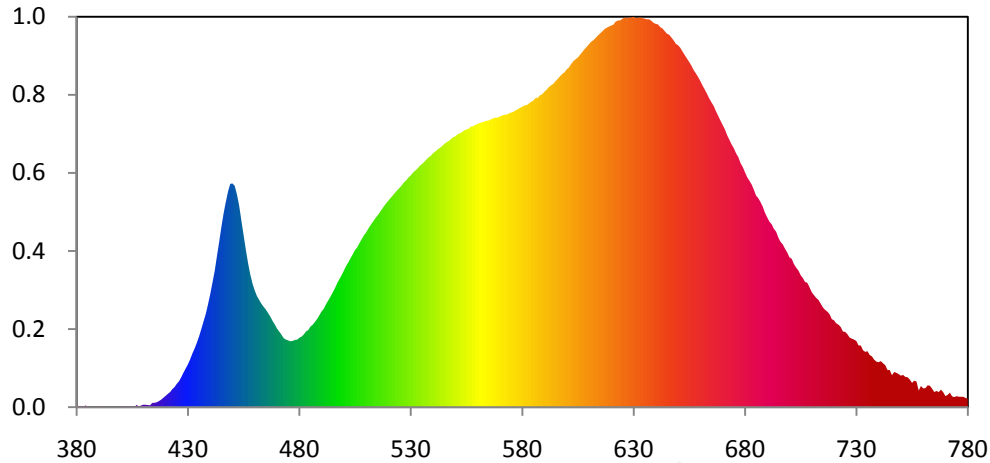


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



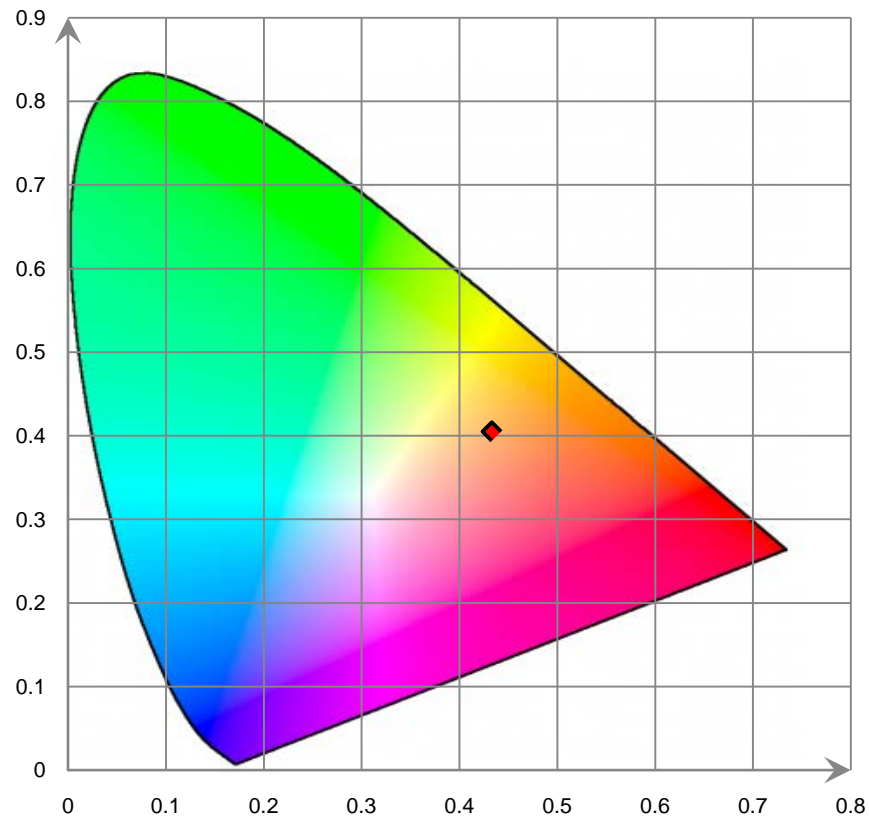
Relative Spectral Power Distribution



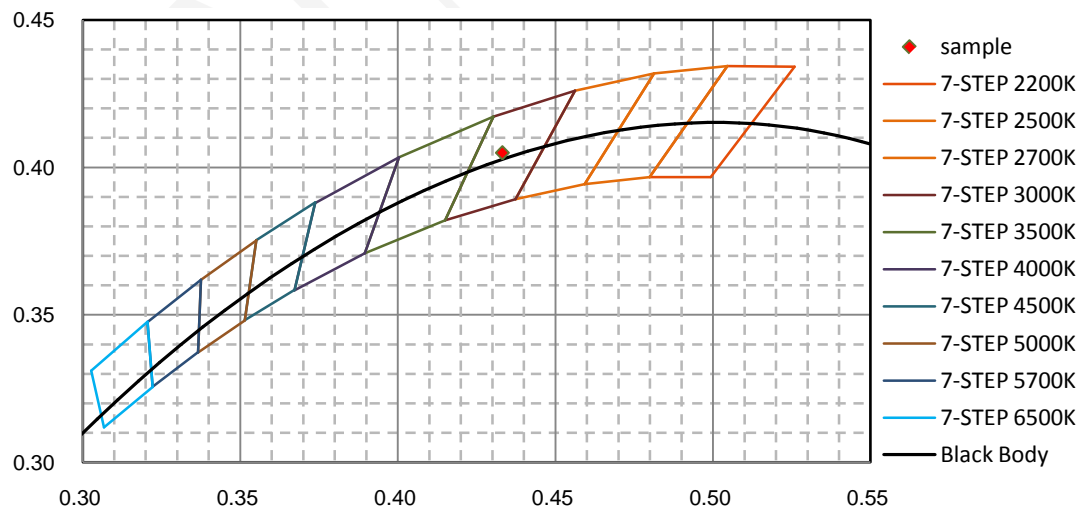
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.820E-02	421	5.172E-01	462	4.149E+00	503	5.766E+00	544	1.010E+01
381	4.680E-02	422	5.852E-01	463	4.000E+00	504	5.920E+00	545	1.018E+01
382	4.570E-02	423	6.980E-01	464	3.880E+00	505	6.083E+00	546	1.025E+01
383	9.700E-03	424	7.795E-01	465	3.774E+00	506	6.187E+00	547	1.030E+01
384	6.640E-02	425	9.035E-01	466	3.639E+00	507	6.353E+00	548	1.037E+01
385	2.760E-02	426	1.003E+00	467	3.503E+00	508	6.501E+00	549	1.044E+01
386	1.900E-03	427	1.160E+00	468	3.338E+00	509	6.650E+00	550	1.048E+01
387	2.870E-02	428	1.337E+00	469	3.199E+00	510	6.766E+00	551	1.056E+01
388	1.350E-02	429	1.498E+00	470	3.041E+00	511	6.917E+00	552	1.060E+01
389	3.300E-03	430	1.658E+00	471	2.923E+00	512	7.047E+00	553	1.065E+01
390	4.510E-02	431	1.853E+00	472	2.802E+00	513	7.172E+00	554	1.071E+01
391	1.520E-02	432	2.077E+00	473	2.669E+00	514	7.300E+00	555	1.075E+01
392	3.300E-03	433	2.270E+00	474	2.616E+00	515	7.407E+00	556	1.078E+01
393	3.000E-03	434	2.493E+00	475	2.583E+00	516	7.525E+00	557	1.086E+01
394	1.010E-02	435	2.739E+00	476	2.550E+00	517	7.656E+00	558	1.087E+01
395	3.690E-02	436	3.022E+00	477	2.564E+00	518	7.780E+00	559	1.093E+01
396	1.830E-02	437	3.314E+00	478	2.603E+00	519	7.891E+00	560	1.096E+01
397	1.160E-02	438	3.608E+00	479	2.611E+00	520	7.999E+00	561	1.101E+01
398	7.000E-03	439	3.975E+00	480	2.684E+00	521	8.100E+00	562	1.102E+01
399	4.000E-04	440	4.370E+00	481	2.730E+00	522	8.198E+00	563	1.106E+01
400	0.000E+00	441	4.813E+00	482	2.814E+00	523	8.302E+00	564	1.108E+01
401	1.870E-02	442	5.266E+00	483	2.932E+00	524	8.401E+00	565	1.110E+01
402	3.100E-02	443	5.832E+00	484	2.984E+00	525	8.489E+00	566	1.114E+01
403	3.070E-02	444	6.389E+00	485	3.119E+00	526	8.590E+00	567	1.118E+01
404	2.200E-02	445	6.966E+00	486	3.190E+00	527	8.703E+00	568	1.121E+01
405	3.630E-02	446	7.495E+00	487	3.301E+00	528	8.782E+00	569	1.121E+01
406	9.000E-03	447	7.940E+00	488	3.413E+00	529	8.891E+00	570	1.125E+01
407	9.030E-02	448	8.348E+00	489	3.557E+00	530	8.969E+00	571	1.129E+01
408	1.610E-02	449	8.643E+00	490	3.707E+00	531	9.078E+00	572	1.132E+01
409	6.760E-02	450	8.658E+00	491	3.813E+00	532	9.155E+00	573	1.132E+01
410	9.780E-02	451	8.564E+00	492	3.988E+00	533	9.230E+00	574	1.137E+01
411	9.410E-02	452	8.233E+00	493	4.135E+00	534	9.336E+00	575	1.140E+01
412	8.360E-02	453	7.799E+00	494	4.282E+00	535	9.407E+00	576	1.143E+01
413	7.300E-02	454	7.217E+00	495	4.443E+00	536	9.488E+00	577	1.148E+01
414	1.670E-01	455	6.652E+00	496	4.608E+00	537	9.581E+00	578	1.152E+01
415	1.685E-01	456	6.090E+00	497	4.796E+00	538	9.669E+00	579	1.158E+01
416	1.908E-01	457	5.573E+00	498	4.956E+00	539	9.727E+00	580	1.162E+01
417	2.362E-01	458	5.134E+00	499	5.114E+00	540	9.828E+00	581	1.168E+01
418	2.936E-01	459	4.775E+00	500	5.288E+00	541	9.892E+00	582	1.169E+01
419	3.663E-01	460	4.514E+00	501	5.466E+00	542	9.971E+00	583	1.175E+01
420	4.391E-01	461	4.295E+00	502	5.606E+00	543	1.004E+01	584	1.182E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.186E+01	626	1.508E+01	667	1.145E+01	708	4.814E+00	749	1.282E+00
586	1.196E+01	627	1.505E+01	668	1.128E+01	709	4.639E+00	750	1.218E+00
587	1.197E+01	628	1.508E+01	669	1.109E+01	710	4.447E+00	751	1.249E+00
588	1.207E+01	629	1.508E+01	670	1.092E+01	711	4.336E+00	752	1.171E+00
589	1.211E+01	630	1.511E+01	671	1.075E+01	712	4.227E+00	753	1.157E+00
590	1.221E+01	631	1.506E+01	672	1.053E+01	713	4.152E+00	754	1.070E+00
591	1.229E+01	632	1.507E+01	673	1.035E+01	714	4.008E+00	755	9.415E-01
592	1.239E+01	633	1.509E+01	674	1.017E+01	715	3.861E+00	756	1.025E+00
593	1.246E+01	634	1.505E+01	675	1.003E+01	716	3.765E+00	757	9.946E-01
594	1.251E+01	635	1.504E+01	676	9.829E+00	717	3.700E+00	758	6.435E-01
595	1.262E+01	636	1.501E+01	677	9.685E+00	718	3.598E+00	759	8.210E-01
596	1.271E+01	637	1.501E+01	678	9.453E+00	719	3.407E+00	760	7.300E-01
597	1.281E+01	638	1.496E+01	679	9.300E+00	720	3.360E+00	761	7.357E-01
598	1.290E+01	639	1.487E+01	680	9.098E+00	721	3.242E+00	762	8.450E-01
599	1.296E+01	640	1.483E+01	681	8.902E+00	722	3.194E+00	763	8.311E-01
600	1.307E+01	641	1.481E+01	682	8.766E+00	723	3.103E+00	764	7.176E-01
601	1.315E+01	642	1.471E+01	683	8.620E+00	724	2.925E+00	765	5.881E-01
602	1.328E+01	643	1.466E+01	684	8.419E+00	725	2.916E+00	766	6.274E-01
603	1.339E+01	644	1.455E+01	685	8.188E+00	726	2.824E+00	767	5.861E-01
604	1.347E+01	645	1.445E+01	686	8.088E+00	727	2.696E+00	768	6.796E-01
605	1.353E+01	646	1.441E+01	687	7.936E+00	728	2.650E+00	769	5.794E-01
606	1.364E+01	647	1.431E+01	688	7.759E+00	729	2.616E+00	770	4.288E-01
607	1.375E+01	648	1.420E+01	689	7.525E+00	730	2.561E+00	771	4.756E-01
608	1.385E+01	649	1.406E+01	690	7.345E+00	731	2.389E+00	772	5.627E-01
609	1.395E+01	650	1.401E+01	691	7.181E+00	732	2.389E+00	773	4.173E-01
610	1.405E+01	651	1.391E+01	692	7.082E+00	733	2.205E+00	774	3.918E-01
611	1.414E+01	652	1.376E+01	693	6.901E+00	734	2.140E+00	775	4.248E-01
612	1.420E+01	653	1.363E+01	694	6.794E+00	735	2.167E+00	776	4.048E-01
613	1.429E+01	654	1.349E+01	695	6.568E+00	736	2.019E+00	777	4.014E-01
614	1.438E+01	655	1.336E+01	696	6.395E+00	737	1.968E+00	778	4.014E-01
615	1.446E+01	656	1.321E+01	697	6.298E+00	738	1.841E+00	779	3.601E-01
616	1.454E+01	657	1.304E+01	698	6.131E+00	739	1.764E+00	780	3.215E-01
617	1.463E+01	658	1.292E+01	699	5.984E+00	740	1.739E+00		
618	1.469E+01	659	1.278E+01	700	5.798E+00	741	1.782E+00		
619	1.473E+01	660	1.262E+01	701	5.744E+00	742	1.698E+00		
620	1.477E+01	661	1.244E+01	702	5.539E+00	743	1.624E+00		
621	1.481E+01	662	1.229E+01	703	5.397E+00	744	1.436E+00		
622	1.492E+01	663	1.212E+01	704	5.290E+00	745	1.440E+00		
623	1.496E+01	664	1.195E+01	705	5.111E+00	746	1.238E+00		
624	1.497E+01	665	1.180E+01	706	4.997E+00	747	1.362E+00		
625	1.503E+01	666	1.166E+01	707	4.845E+00	748	1.328E+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**

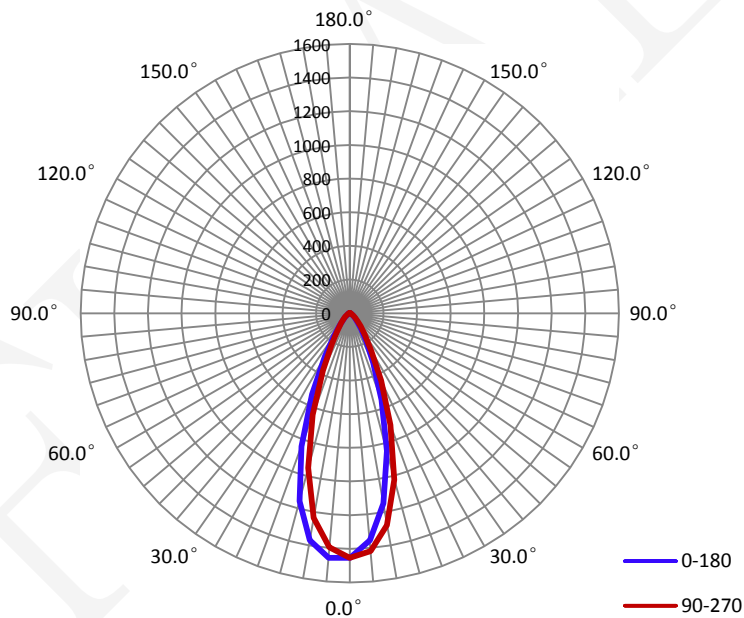
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0630	7.43	0.9780

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
776.9	104.61	1466.7	0.64	0.63

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	38.8	38.7	38.4	38.9	38.7
Field Angle (10% I _{max}):	69.4	69.5	70.2	69.7	69.7

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1454	1454	1454	1454	1454	1454	1454	1454
5.0°	1355	1359	1376	1397	1419	1440	1457	1467
10.0°	1148	1158	1188	1232	1280	1322	1358	1377
15.0°	849	861	904	954	1025	1091	1153	1181
20.0°	547	562	602	649	709	772	840	872
25.0°	325	334	364	397	442	490	532	559
30.0°	191	197	213	233	258	280	304	320
35.0°	114	117	129	144	158	165	171	178
40.0°	68	71	79	91	101	104	104	105
45.0°	39	42	50	59	66	69	67	66
50.0°	21	25	33	40	44	46	45	42
55.0°	14	15	19	24	27	32	31	27
60.0°	11	11	12	13	15	17	20	18
65.0°	8	8	9	10	10	12	12	12
70.0°	4	5	5	6	8	7	8	9
75.0°	2	2	3	4	4	5	6	5
80.0°	0	0	0	1	2	2	2	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

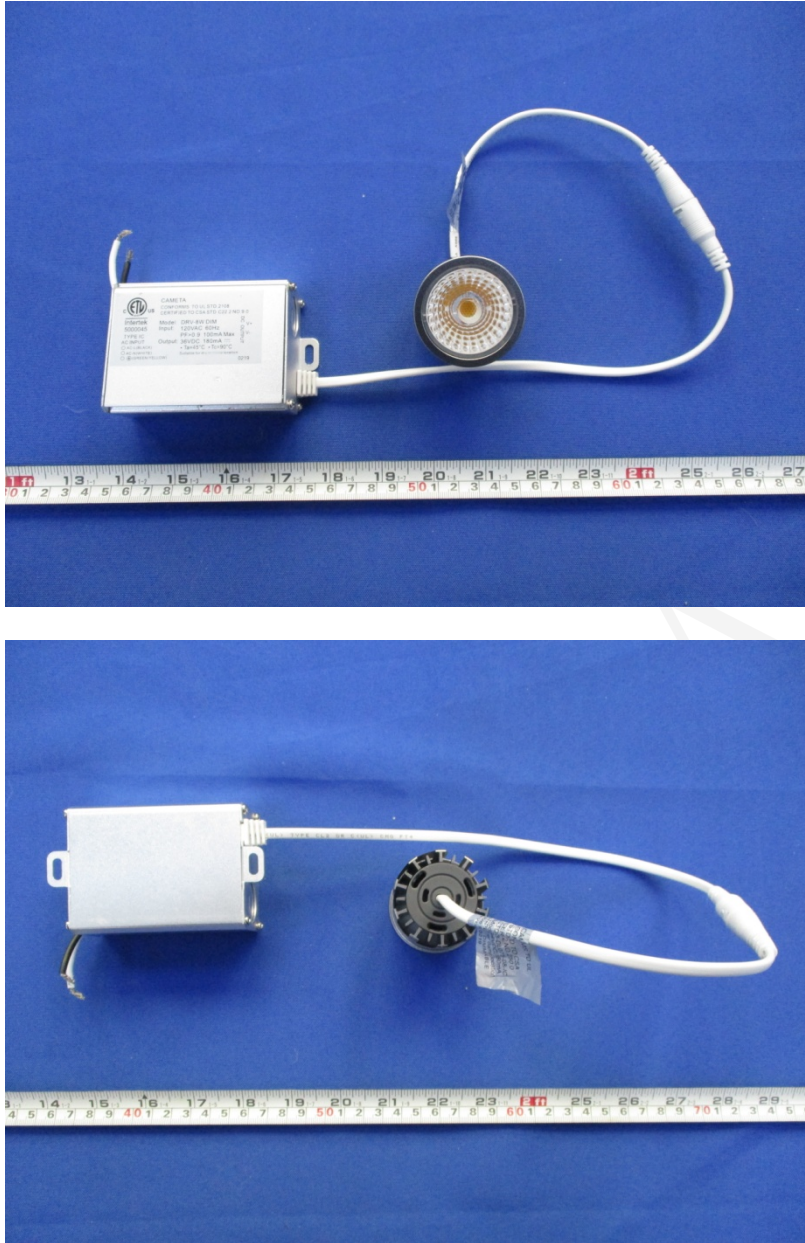
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1454	1454	1454	1454	1454	1454	1454	1454
5.0°	1459	1451	1437	1418	1397	1376	1359	1348
10.0°	1370	1358	1330	1288	1236	1190	1158	1133
15.0°	1157	1136	1086	1023	953	904	856	832
20.0°	844	818	771	712	643	591	554	539
25.0°	533	506	471	422	378	343	319	314
30.0°	299	286	259	238	217	199	188	184
35.0°	166	162	151	140	129	120	114	111
40.0°	98	97	91	87	78	72	72	67
45.0°	59	59	58	56	50	45	45	40
50.0°	39	38	37	37	34	31	28	22
55.0°	25	25	26	27	22	19	17	14
60.0°	17	16	17	16	13	12	11	10
65.0°	12	11	12	11	9	9	8	7
70.0°	8	9	8	8	7	6	6	4
75.0°	5	5	5	5	3	4	2	2
80.0°	2	2	2	2	2	1	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	34.2	4.40	0-5	34.2	4.40
5-10	95.3	12.27	0-10	129.5	16.68
10-15	133.8	17.22	0-15	263.3	33.90
15-20	139.0	17.89	0-20	402.4	51.79
20-25	116.4	14.98	0-25	518.7	66.77
25-30	83.8	10.78	0-30	602.5	77.56
30-35	56.4	7.26	0-35	658.9	84.82
35-40	38.1	4.90	0-40	697.0	89.72
40-45	26.1	3.36	0-45	723.1	93.08
45-50	18.1	2.33	0-50	741.2	95.40
50-55	12.6	1.62	0-55	753.8	97.02
55-60	8.6	1.11	0-60	762.3	98.13
60-65	5.9	0.76	0-65	768.2	98.89
65-70	4.2	0.54	0-70	772.4	99.43
70-75	2.7	0.35	0-75	775.1	99.78
75-80	1.4	0.18	0-80	776.5	99.95
80-85	0.4	0.05	0-85	776.9	100.00
85-90	0.0	0.00	0-90	776.9	100.00
90-95	0.0	0.00	0-95	776.9	100.00
95-100	0.0	0.00	0-100	776.9	100.00
100-105	0.0	0.00	0-105	776.9	100.00
105-110	0.0	0.00	0-110	776.9	100.00
110-115	0.0	0.00	0-115	776.9	100.00
115-120	0.0	0.00	0-120	776.9	100.00
120-125	0.0	0.00	0-125	776.9	100.00
125-130	0.0	0.00	0-130	776.9	100.00
130-135	0.0	0.00	0-135	776.9	100.00
135-140	0.0	0.00	0-140	776.9	100.00
140-145	0.0	0.00	0-145	776.9	100.00
145-150	0.0	0.00	0-150	776.9	100.00
150-155	0.0	0.00	0-155	776.9	100.00
155-160	0.0	0.00	0-160	776.9	100.00
160-165	0.0	0.00	0-165	776.9	100.00
165-170	0.0	0.00	0-170	776.9	100.00
170-175	0.0	0.00	0-175	776.9	100.00
175-180	0.0	0.00	0-180	776.9	100.00

6. Product Photo



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