

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: MM2/927/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:	RKSB190214009-10-1
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: MM2/927/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: 2700K
 Nominal Lumen Output: 720lm

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**

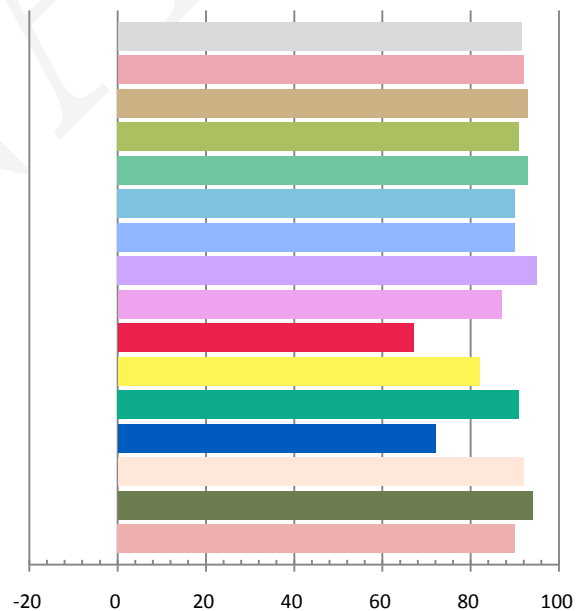
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.01	60	0.0631	7.38	0.9746	739.03	100.14

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
2.637	2772	0.00170	0.4569	0.4145	0.2589	0.5284

Color Rendering Index

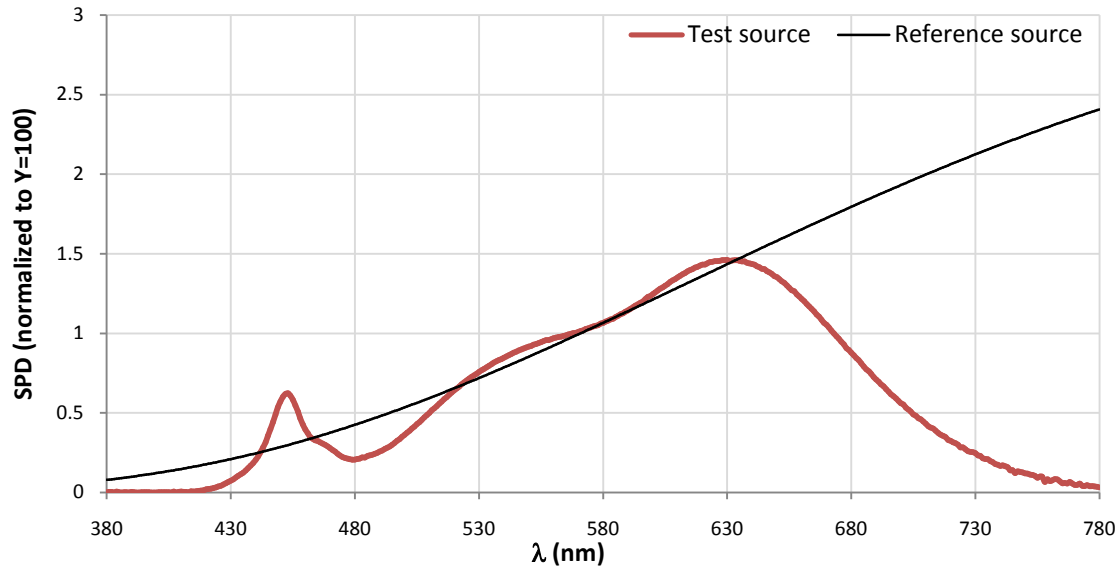
Ra			
91.5			
R1	R2	R3	R4
92	93	91	93
R5	R6	R7	R8
90	90	95	87
R9	R10	R11	R12
67	82	91	72
R13	R14	R15	
92	94	90	



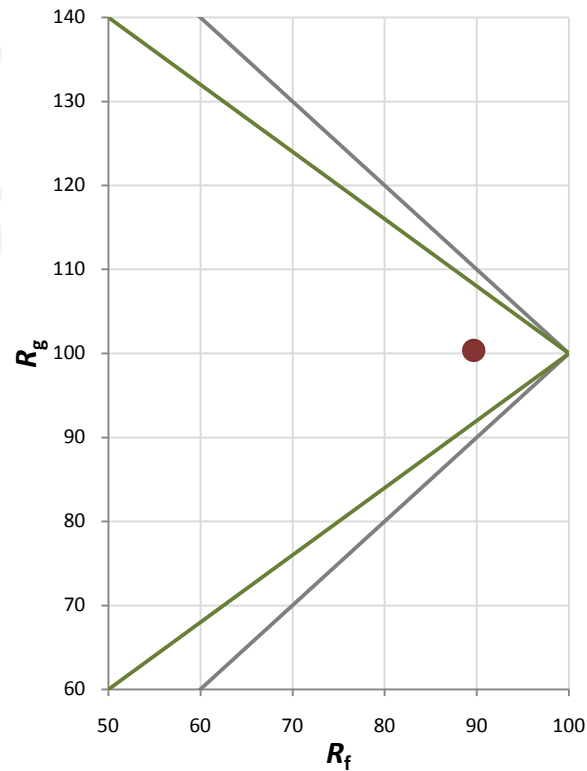
Fidelity Index and Gamut Index

Fidelity Index R_f	90
Gamut Index R_g	100

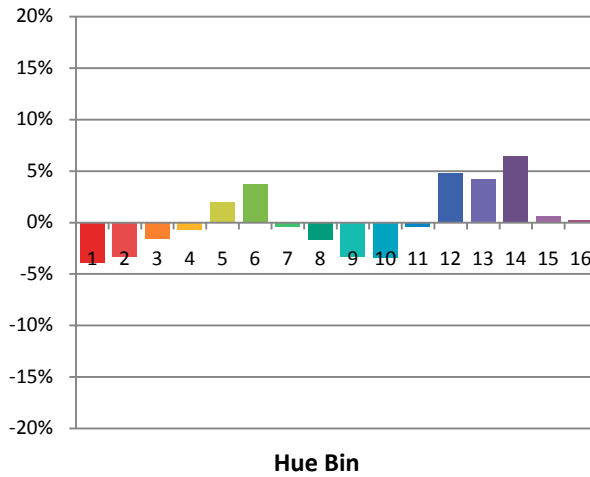
Spectral Power Distribution Comparison



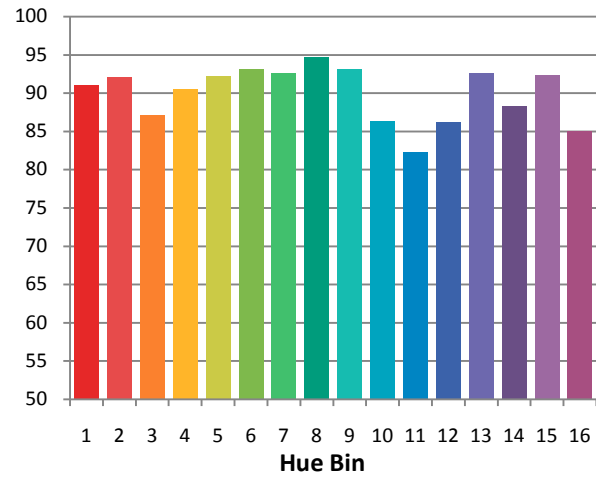
Plot of R_g versus R_f



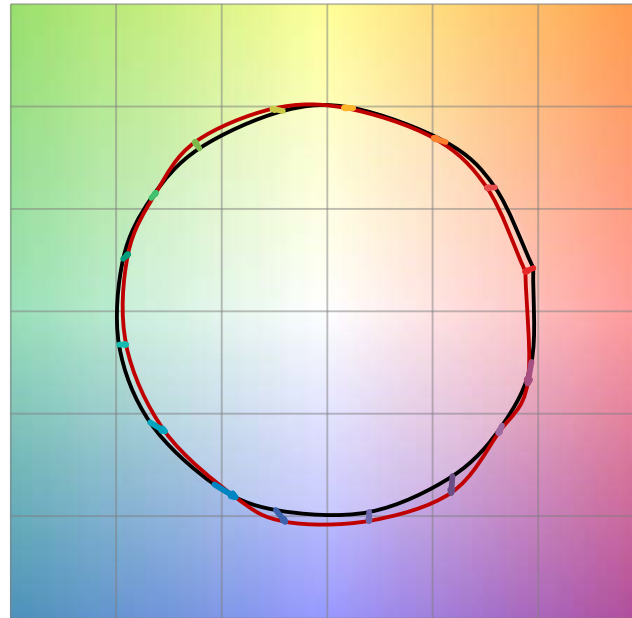
Chroma Shift by Hue



R_t by Hue

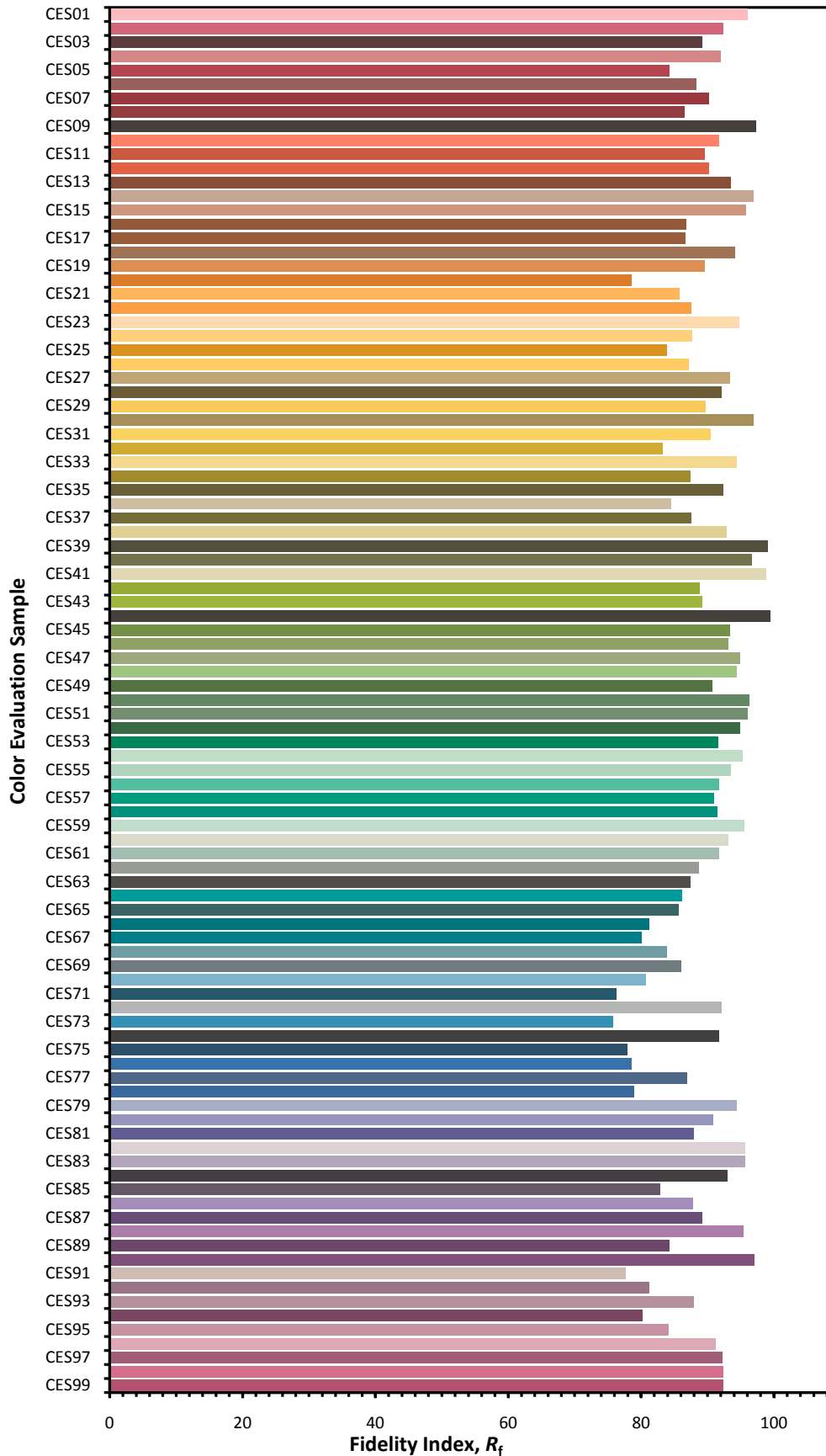


Color Vector Graphic

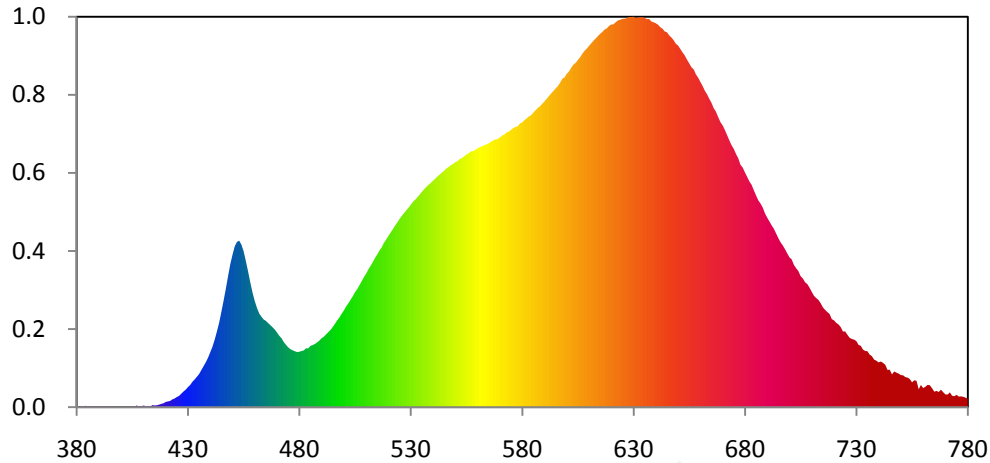


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



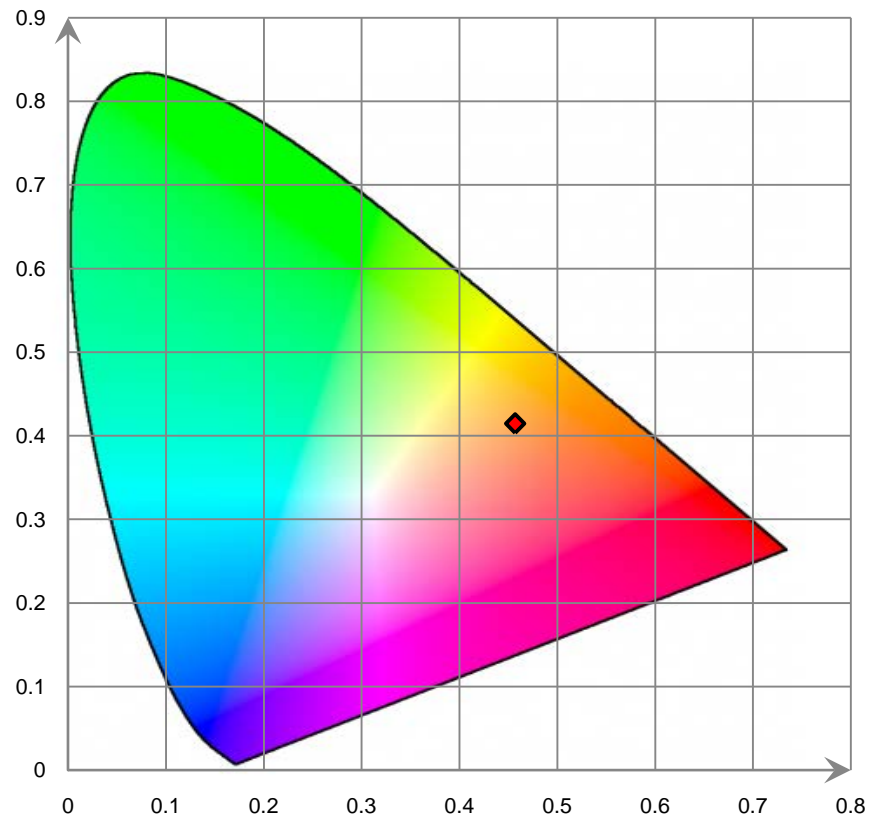
Relative Spectral Power Distribution



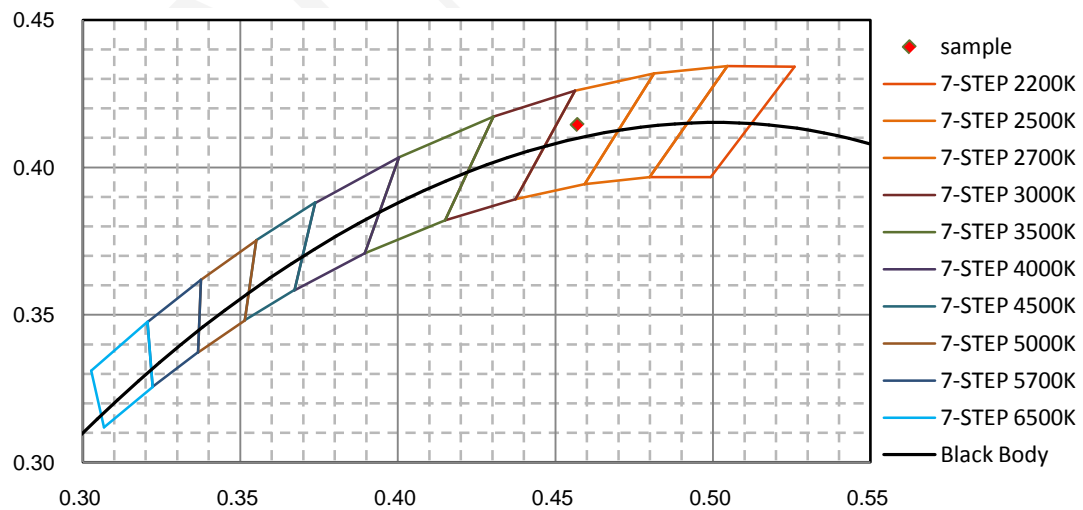
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.980E-02	421	2.320E-01	462	3.793E+00	503	4.348E+00	544	9.496E+00
381	4.300E-02	422	2.532E-01	463	3.660E+00	504	4.490E+00	545	9.568E+00
382	3.410E-02	423	3.138E-01	464	3.548E+00	505	4.654E+00	546	9.662E+00
383	8.500E-03	424	3.509E-01	465	3.495E+00	506	4.779E+00	547	9.719E+00
384	5.850E-02	425	4.113E-01	466	3.403E+00	507	4.939E+00	548	9.795E+00
385	2.650E-02	426	4.547E-01	467	3.322E+00	508	5.100E+00	549	9.842E+00
386	1.900E-03	427	5.446E-01	468	3.234E+00	509	5.266E+00	550	9.920E+00
387	2.660E-02	428	6.339E-01	469	3.142E+00	510	5.408E+00	551	9.959E+00
388	1.110E-02	429	7.102E-01	470	3.020E+00	511	5.581E+00	552	1.004E+01
389	4.700E-03	430	8.113E-01	471	2.892E+00	512	5.719E+00	553	1.009E+01
390	4.000E-02	431	8.969E-01	472	2.792E+00	513	5.877E+00	554	1.015E+01
391	1.700E-02	432	1.028E+00	473	2.639E+00	514	6.049E+00	555	1.023E+01
392	7.000E-04	433	1.121E+00	474	2.525E+00	515	6.186E+00	556	1.028E+01
393	0.000E+00	434	1.229E+00	475	2.423E+00	516	6.345E+00	557	1.035E+01
394	1.070E-02	435	1.341E+00	476	2.348E+00	517	6.475E+00	558	1.036E+01
395	2.970E-02	436	1.497E+00	477	2.300E+00	518	6.655E+00	559	1.042E+01
396	1.540E-02	437	1.656E+00	478	2.262E+00	519	6.785E+00	560	1.048E+01
397	1.680E-02	438	1.817E+00	479	2.231E+00	520	6.933E+00	561	1.053E+01
398	7.400E-03	439	1.998E+00	480	2.242E+00	521	7.069E+00	562	1.056E+01
399	4.000E-04	440	2.219E+00	481	2.274E+00	522	7.206E+00	563	1.060E+01
400	0.000E+00	441	2.444E+00	482	2.296E+00	523	7.353E+00	564	1.064E+01
401	1.350E-02	442	2.730E+00	483	2.385E+00	524	7.479E+00	565	1.068E+01
402	2.190E-02	443	3.061E+00	484	2.380E+00	525	7.622E+00	566	1.074E+01
403	1.830E-02	444	3.415E+00	485	2.482E+00	526	7.745E+00	567	1.079E+01
404	1.410E-02	445	3.853E+00	486	2.514E+00	527	7.853E+00	568	1.084E+01
405	2.370E-02	446	4.309E+00	487	2.559E+00	528	7.966E+00	569	1.085E+01
406	4.400E-03	447	4.786E+00	488	2.623E+00	529	8.076E+00	570	1.092E+01
407	7.250E-02	448	5.299E+00	489	2.696E+00	530	8.190E+00	571	1.099E+01
408	6.200E-03	449	5.783E+00	490	2.791E+00	531	8.312E+00	572	1.103E+01
409	4.350E-02	450	6.167E+00	491	2.851E+00	532	8.401E+00	573	1.112E+01
410	6.300E-02	451	6.510E+00	492	2.948E+00	533	8.498E+00	574	1.115E+01
411	4.890E-02	452	6.688E+00	493	3.036E+00	534	8.604E+00	575	1.123E+01
412	4.610E-02	453	6.741E+00	494	3.129E+00	535	8.716E+00	576	1.129E+01
413	1.520E-02	454	6.581E+00	495	3.245E+00	536	8.821E+00	577	1.134E+01
414	8.310E-02	455	6.311E+00	496	3.376E+00	537	8.916E+00	578	1.137E+01
415	7.190E-02	456	5.916E+00	497	3.515E+00	538	9.002E+00	579	1.148E+01
416	7.790E-02	457	5.493E+00	498	3.631E+00	539	9.078E+00	580	1.153E+01
417	1.009E-01	458	5.048E+00	499	3.782E+00	540	9.163E+00	581	1.161E+01
418	1.348E-01	459	4.637E+00	500	3.915E+00	541	9.250E+00	582	1.169E+01
419	1.557E-01	460	4.294E+00	501	4.076E+00	542	9.341E+00	583	1.177E+01
420	2.112E-01	461	4.015E+00	502	4.200E+00	543	9.418E+00	584	1.181E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.192E+01	626	1.573E+01	667	1.196E+01	708	4.983E+00	749	1.359E+00
586	1.202E+01	627	1.575E+01	668	1.174E+01	709	4.838E+00	750	1.297E+00
587	1.211E+01	628	1.580E+01	669	1.154E+01	710	4.668E+00	751	1.290E+00
588	1.218E+01	629	1.579E+01	670	1.141E+01	711	4.507E+00	752	1.216E+00
589	1.228E+01	630	1.580E+01	671	1.122E+01	712	4.415E+00	753	1.196E+00
590	1.237E+01	631	1.575E+01	672	1.101E+01	713	4.341E+00	754	1.140E+00
591	1.248E+01	632	1.577E+01	673	1.080E+01	714	4.207E+00	755	1.005E+00
592	1.259E+01	633	1.578E+01	674	1.060E+01	715	4.040E+00	756	1.087E+00
593	1.270E+01	634	1.578E+01	675	1.045E+01	716	3.938E+00	757	1.070E+00
594	1.279E+01	635	1.576E+01	676	1.025E+01	717	3.850E+00	758	7.260E-01
595	1.290E+01	636	1.571E+01	677	1.008E+01	718	3.771E+00	759	9.008E-01
596	1.299E+01	637	1.571E+01	678	9.813E+00	719	3.563E+00	760	7.734E-01
597	1.313E+01	638	1.561E+01	679	9.699E+00	720	3.513E+00	761	8.271E-01
598	1.329E+01	639	1.558E+01	680	9.504E+00	721	3.413E+00	762	9.025E-01
599	1.335E+01	640	1.554E+01	681	9.325E+00	722	3.351E+00	763	8.874E-01
600	1.349E+01	641	1.548E+01	682	9.137E+00	723	3.241E+00	764	7.658E-01
601	1.358E+01	642	1.538E+01	683	9.000E+00	724	3.064E+00	765	6.278E-01
602	1.373E+01	643	1.532E+01	684	8.778E+00	725	3.067E+00	766	6.590E-01
603	1.387E+01	644	1.521E+01	685	8.565E+00	726	2.931E+00	767	6.145E-01
604	1.394E+01	645	1.517E+01	686	8.373E+00	727	2.808E+00	768	7.073E-01
605	1.405E+01	646	1.505E+01	687	8.244E+00	728	2.760E+00	769	6.060E-01
606	1.416E+01	647	1.496E+01	688	8.079E+00	729	2.733E+00	770	5.148E-01
607	1.430E+01	648	1.486E+01	689	7.843E+00	730	2.677E+00	771	5.143E-01
608	1.442E+01	649	1.471E+01	690	7.669E+00	731	2.521E+00	772	5.988E-01
609	1.451E+01	650	1.464E+01	691	7.518E+00	732	2.485E+00	773	4.613E-01
610	1.462E+01	651	1.450E+01	692	7.357E+00	733	2.331E+00	774	4.445E-01
611	1.472E+01	652	1.436E+01	693	7.221E+00	734	2.276E+00	775	4.992E-01
612	1.483E+01	653	1.424E+01	694	7.031E+00	735	2.263E+00	776	4.277E-01
613	1.492E+01	654	1.407E+01	695	6.841E+00	736	2.129E+00	777	4.373E-01
614	1.502E+01	655	1.392E+01	696	6.675E+00	737	2.062E+00	778	4.190E-01
615	1.511E+01	656	1.376E+01	697	6.547E+00	738	1.926E+00	779	3.848E-01
616	1.519E+01	657	1.367E+01	698	6.391E+00	739	1.881E+00	780	3.515E-01
617	1.529E+01	658	1.347E+01	699	6.225E+00	740	1.813E+00		
618	1.533E+01	659	1.334E+01	700	6.063E+00	741	1.848E+00		
619	1.543E+01	660	1.317E+01	701	5.980E+00	742	1.792E+00		
620	1.549E+01	661	1.300E+01	702	5.756E+00	743	1.716E+00		
621	1.550E+01	662	1.281E+01	703	5.623E+00	744	1.508E+00		
622	1.558E+01	663	1.267E+01	704	5.507E+00	745	1.518E+00		
623	1.565E+01	664	1.248E+01	705	5.303E+00	746	1.327E+00		
624	1.568E+01	665	1.232E+01	706	5.209E+00	747	1.444E+00		
625	1.572E+01	666	1.210E+01	707	5.056E+00	748	1.399E+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**

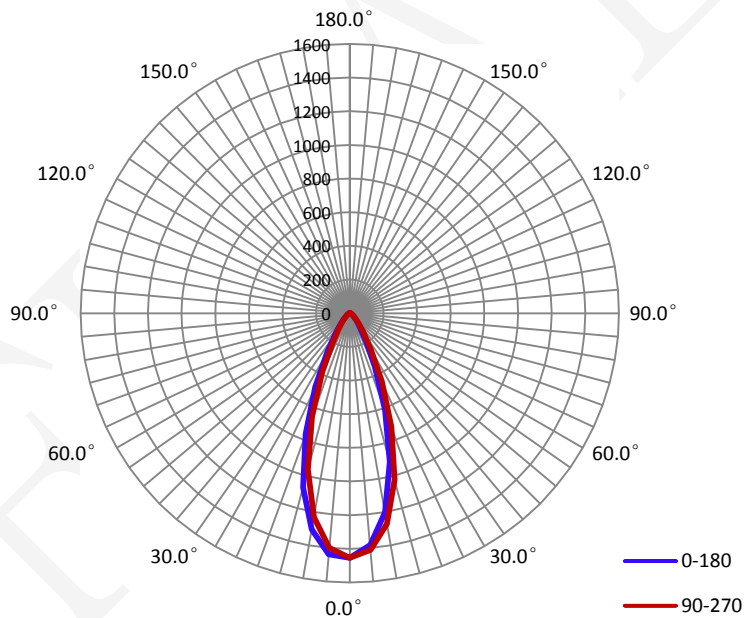
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.0630	7.43	0.9800

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
750.7	101.09	1454.8	0.63	0.63

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	38.8	38.7	38.7	38.6	38.7
Field Angle (10% I _{max}):	67.6	68.3	67.9	67.0	67.7

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	1455	1455	1455	1455	1455	1455	1455	1455
5.0°	1384	1390	1391	1401	1412	1426	1434	1440
10.0°	1204	1216	1237	1257	1272	1290	1303	1315
15.0°	915	930	960	989	1027	1053	1074	1085
20.0°	611	627	650	687	721	751	768	788
25.0°	349	364	385	418	448	473	489	504
30.0°	184	194	208	225	247	266	273	281
35.0°	107	114	122	128	138	145	147	151
40.0°	63	68	73	78	83	87	87	89
45.0°	39	43	45	48	51	53	52	52
50.0°	25	27	29	29	31	33	31	31
55.0°	16	18	20	20	20	20	19	19
60.0°	11	11	11	12	13	13	13	14
65.0°	7	8	7	8	9	10	9	10
70.0°	4	4	5	6	7	6	7	6
75.0°	2	2	3	3	4	5	4	4
80.0°	0	0	0	0	2	2	2	2
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

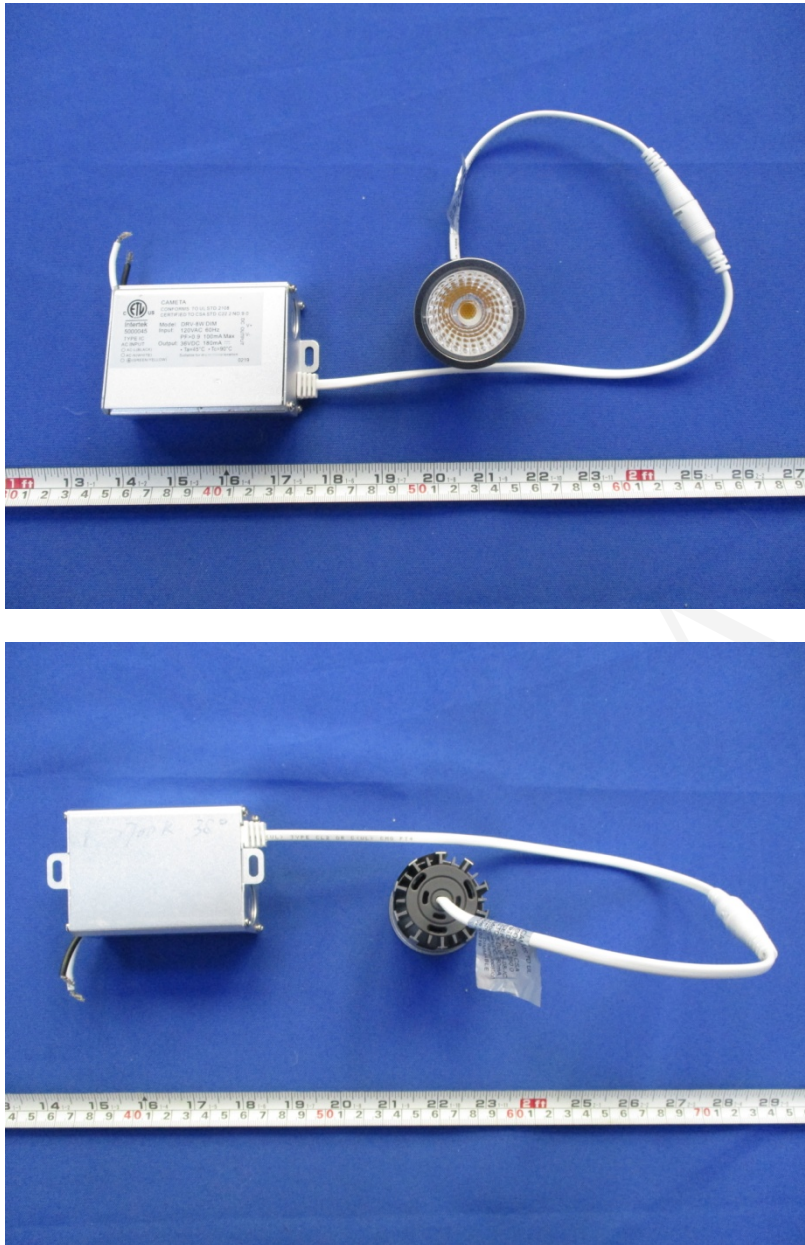
Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	1455	1455	1455	1455	1455	1455	1455	1455
5.0°	1440	1438	1428	1416	1402	1391	1381	1375
10.0°	1306	1297	1282	1253	1231	1206	1190	1181
15.0°	1072	1056	1033	994	963	926	903	888
20.0°	766	752	724	688	657	616	596	579
25.0°	484	471	446	416	386	352	333	325
30.0°	267	259	246	226	203	183	174	169
35.0°	147	143	139	129	116	105	98	97
40.0°	86	88	85	79	70	66	60	58
45.0°	50	52	52	49	44	41	38	37
50.0°	31	33	33	32	28	26	24	22
55.0°	21	22	22	21	18	16	15	15
60.0°	14	13	11	13	12	12	11	10
65.0°	9	9	9	9	8	8	7	7
70.0°	6	6	6	6	5	6	5	4
75.0°	3	3	4	4	3	3	2	2
80.0°	2	1	1	2	2	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	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	4.56	0-5	34.2	4.56
5-10	95.2	12.68	0-10	129.5	17.24
10-15	133.1	17.73	0-15	262.6	34.98
15-20	138.3	18.42	0-20	400.9	53.40
20-25	115.5	15.39	0-25	516.4	68.79
25-30	81.0	10.79	0-30	597.4	79.58
30-35	51.8	6.90	0-35	649.2	86.48
35-40	33.8	4.51	0-40	683.0	90.99
40-45	22.7	3.03	0-45	705.8	94.02
45-50	15.3	2.04	0-50	721.1	96.05
50-55	10.4	1.39	0-55	731.5	97.44
55-60	7.2	0.95	0-60	738.6	98.39
60-65	5.0	0.67	0-65	743.6	99.06
65-70	3.5	0.47	0-70	747.1	99.53
70-75	2.2	0.30	0-75	749.4	99.82
75-80	1.1	0.14	0-80	750.5	99.97
80-85	0.2	0.03	0-85	750.7	100.00
85-90	0.0	0.00	0-90	750.7	100.00
90-95	0.0	0.00	0-95	750.7	100.00
95-100	0.0	0.00	0-100	750.7	100.00
100-105	0.0	0.00	0-105	750.7	100.00
105-110	0.0	0.00	0-110	750.7	100.00
110-115	0.0	0.00	0-115	750.7	100.00
115-120	0.0	0.00	0-120	750.7	100.00
120-125	0.0	0.00	0-125	750.7	100.00
125-130	0.0	0.00	0-130	750.7	100.00
130-135	0.0	0.00	0-135	750.7	100.00
135-140	0.0	0.00	0-140	750.7	100.00
140-145	0.0	0.00	0-145	750.7	100.00
145-150	0.0	0.00	0-150	750.7	100.00
150-155	0.0	0.00	0-155	750.7	100.00
155-160	0.0	0.00	0-160	750.7	100.00
160-165	0.0	0.00	0-165	750.7	100.00
165-170	0.0	0.00	0-170	750.7	100.00
170-175	0.0	0.00	0-175	750.7	100.00
175-180	0.0	0.00	0-180	750.7	100.00

6. Product Photo



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