IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: AD4LEM9027DIM010UNVVNSCC

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang
Report Number:	RKS180131081-10-1
Test Date:	2018-05-22 to 2018-05-24
Report Date:	2018-05-25
Reviewed By:	Ray Gao/EE Engineer
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 2018- 03-10 and used for testing.

Model Tested:	AD4LEM9027DIM010UNVVNSCC
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:	120-277VAC, 50/60Hz
Rated Power:	31.5W
Nominal CCT:	2700K
Nominal Lumen Output:	2350lm

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	2018-01-24	2019-01-24
Power Meter	INVENTFINE	WT500	GSJWQ20009	2018-03-23	2019-03-22
Spectral photometer	INVENTFINE	CMS-3S	GSGSE100017	2018-01-24	2019-01-24
AC Power Supply	INVENTFINE	CHP500	JWJSD010071	2018-03-23	2019-03-22
Standard Light Source	INVENTFINE	N/A	JWWCR020106	2018-01-24	2019-01-24
Thermal Meter	KEJIAN	TA298	N/A	2017-11-14	2018-11-14
DC Power Supply	INVENTFINE	WL3005	JWWCP020069	2018-03-23	2019-03-22
AC Power Supply	INVENTFINE	CHP-5KVA	900511765	2018-03-23	2019-03-22
DC Power Supply	INVENTFINE	WL3010	JWDMP030001	2018-03-23	2019-03-22
Power Meter	INVENTFINE	WT500	GSDSQ200007	2018-03-23	2019-03-22
Goniophotometer	INVENTFINE	GPM-1900	YWGCF120001	2018-01-24	2019-01-24
Wireless Weather Station	ZHONGXING	KG218	N/A	2017-11-14	2018-11-14
Standard Light Source	INVENTFINE	N/A	JWBYR040007	2018-01-24	2019-01-24

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°C±1°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=2.6% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=24K (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=0.16 % of rdg, AC Voltage U=0.18% of rdg, Power U=0.14%) (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=2.6% (K=2), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_f, 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 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)
120.0	60	0.2635	31.44	0.9941	2361.5	75.11

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
8.374	2747	-0.00219	0.4524	0.4030	0.2611	0.5233

Color Rendering Index

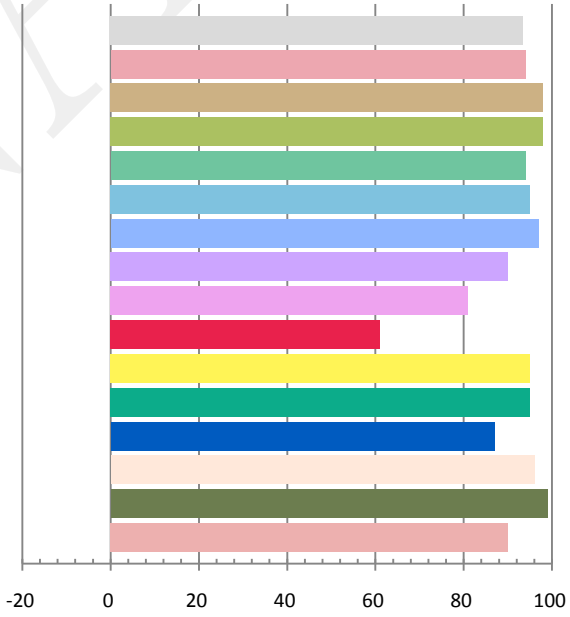
Ra
93.4

R1	R2	R3	R4
94	98	98	94

R5	R6	R7	R8
95	97	90	81

R9	R10	R11	R12
61	95	95	87

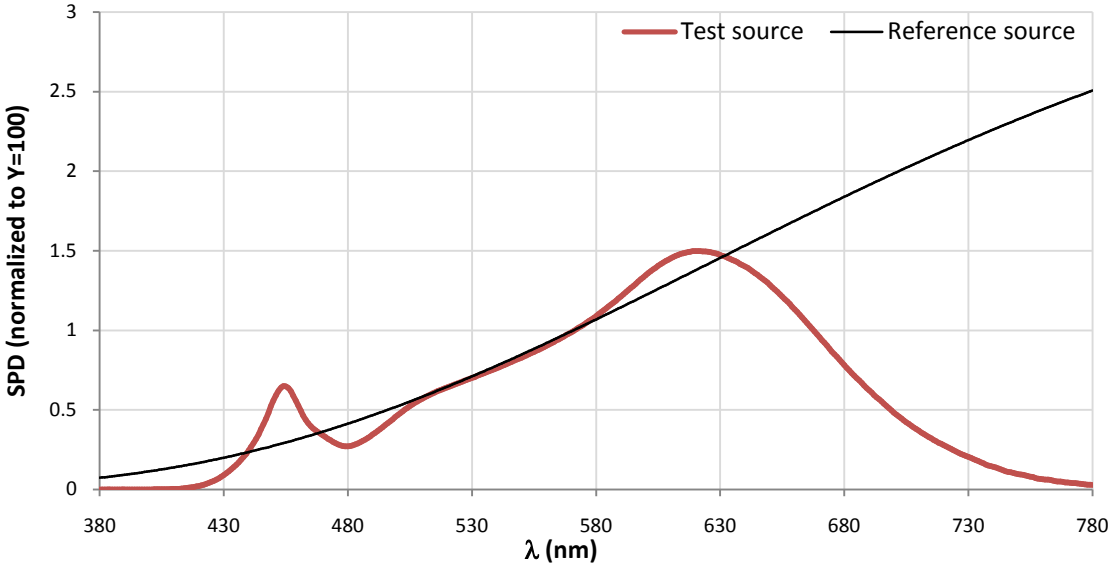
R13	R14	R15
96	99	90



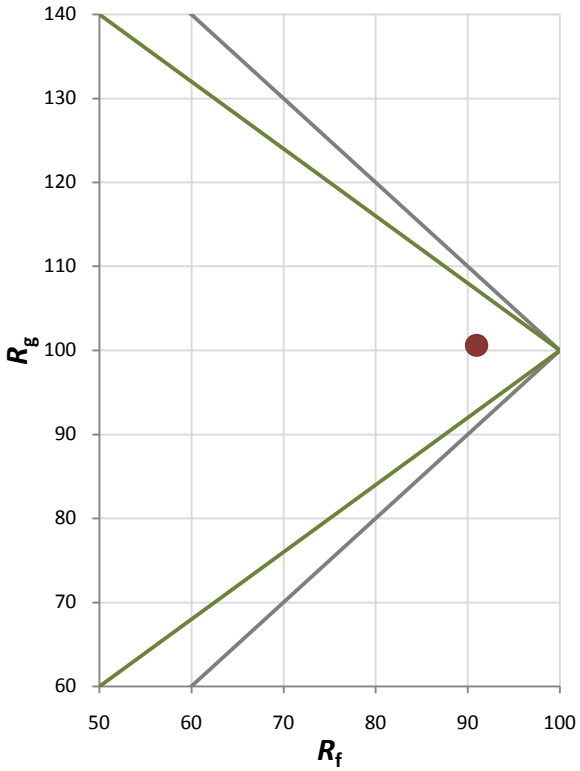
Fidelity Index and Gamut Index

Fidelity Index R_f	91
Gamut Index R_g	101

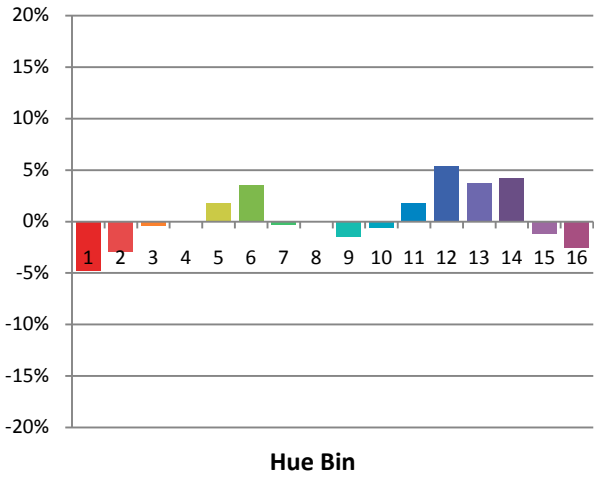
Spectral Power Distribution Comparison



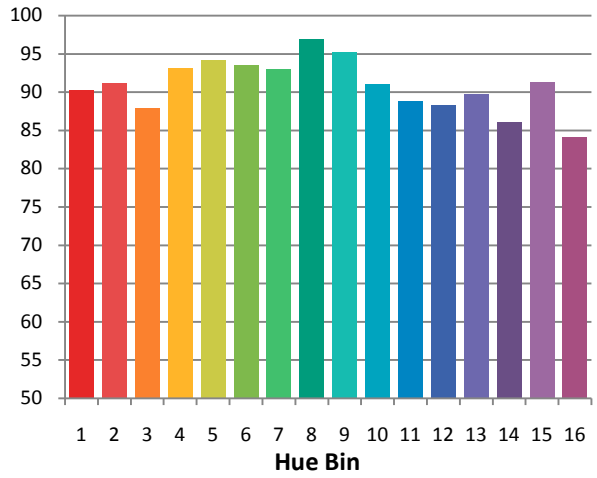
Plot of R_g versus R_f



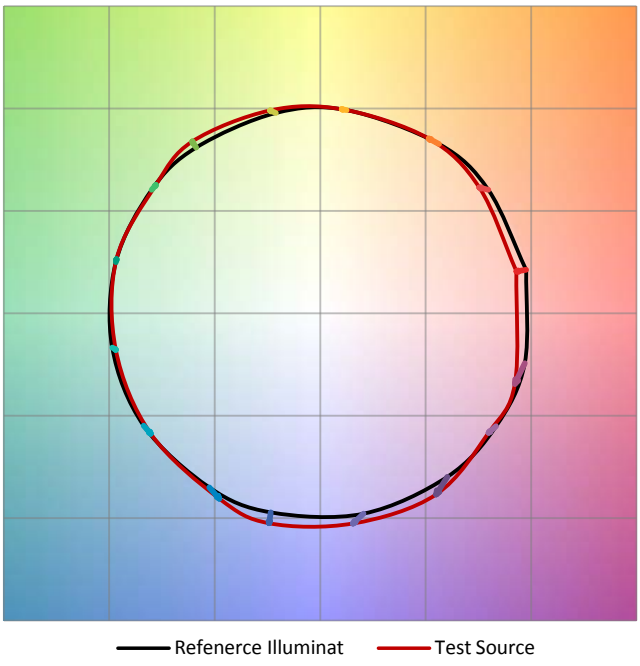
Chroma Shift by Hue

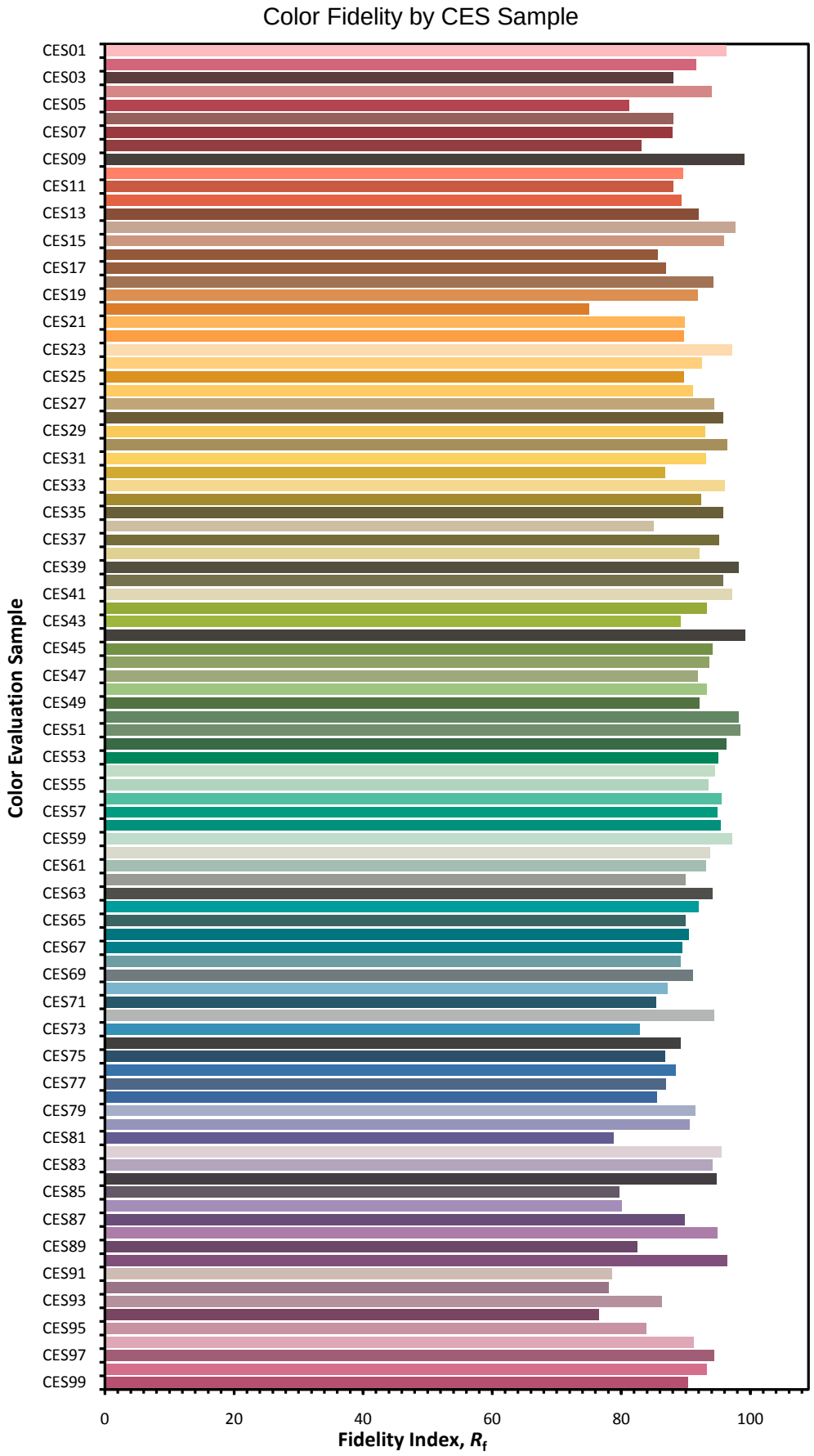


R_f by Hue



Color Vector Graphic




Color Fidelity by CES Sample
Color Evaluation Sample
CES01
CES03
CES05
CES07
CES09
CES11
CES13
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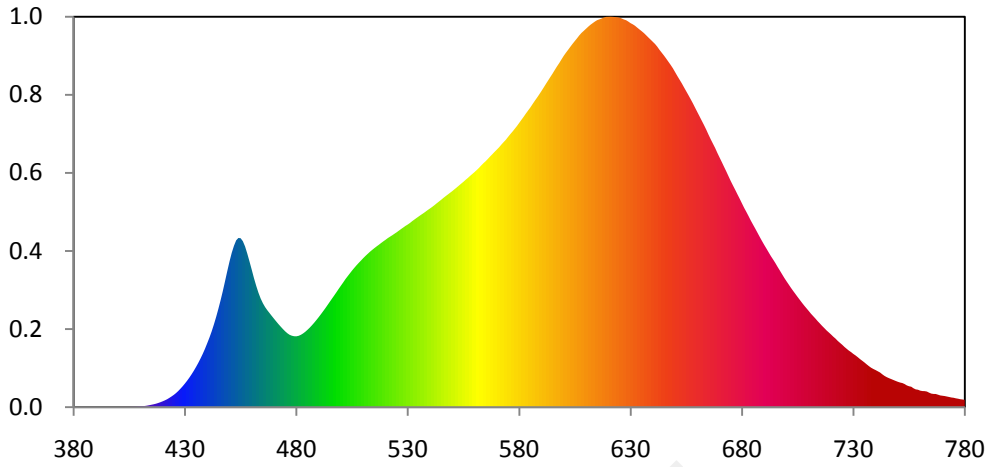
CES99
0
20
40
60
80
100
Fidelity Index, R_f

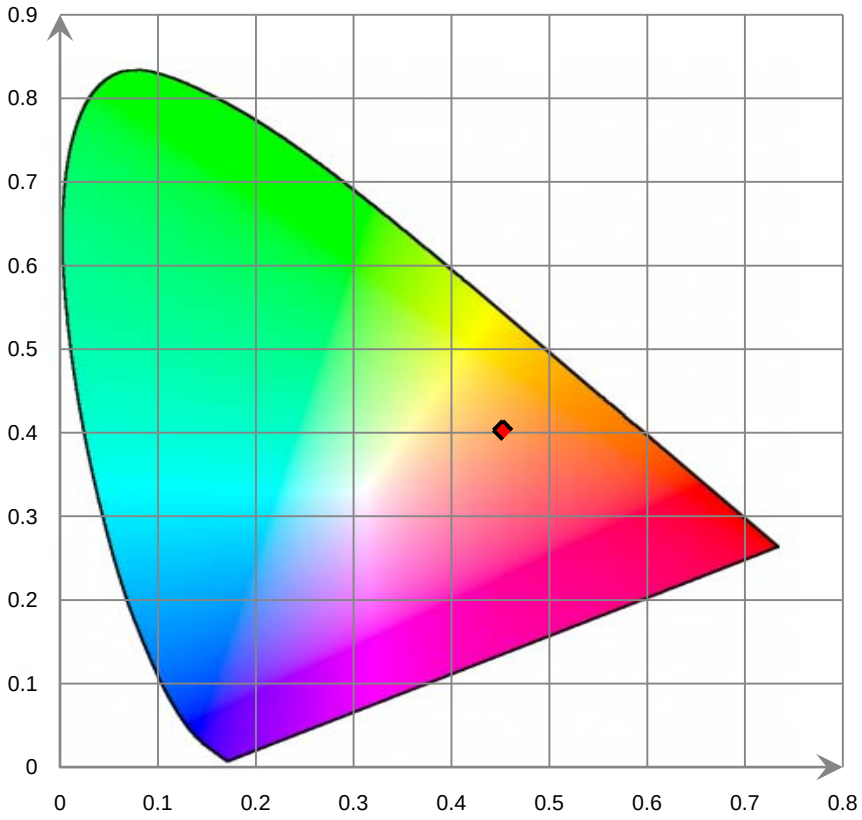
Relative Spectral Power Distribution



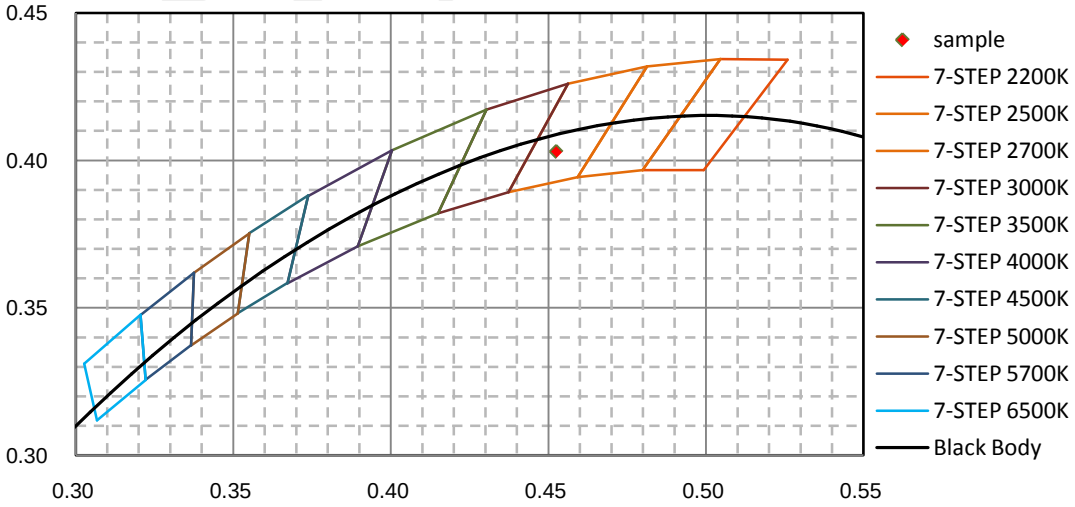
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.010E-02	421	9.085E-01	462	1.609E+01	503	1.735E+01	544	2.727E+01
381	2.620E-02	422	1.051E+00	463	1.518E+01	504	1.773E+01	545	2.750E+01
382	1.990E-02	423	1.233E+00	464	1.440E+01	505	1.811E+01	546	2.775E+01
383	2.760E-02	424	1.424E+00	465	1.378E+01	506	1.847E+01	547	2.798E+01
384	2.990E-02	425	1.632E+00	466	1.327E+01	507	1.881E+01	548	2.820E+01
385	1.420E-02	426	1.867E+00	467	1.285E+01	508	1.913E+01	549	2.843E+01
386	2.590E-02	427	2.145E+00	468	1.247E+01	509	1.944E+01	550	2.866E+01
387	2.670E-02	428	2.452E+00	469	1.209E+01	510	1.975E+01	551	2.890E+01
388	1.990E-02	429	2.782E+00	470	1.172E+01	511	2.005E+01	552	2.914E+01
389	2.920E-02	430	3.140E+00	471	1.136E+01	512	2.032E+01	553	2.939E+01
390	2.840E-02	431	3.514E+00	472	1.101E+01	513	2.060E+01	554	2.964E+01
391	1.310E-02	432	3.926E+00	473	1.068E+01	514	2.084E+01	555	2.989E+01
392	1.490E-02	433	4.365E+00	474	1.035E+01	515	2.109E+01	556	3.015E+01
393	1.760E-02	434	4.834E+00	475	1.005E+01	516	2.131E+01	557	3.040E+01
394	1.630E-02	435	5.343E+00	476	9.799E+00	517	2.153E+01	558	3.067E+01
395	2.020E-02	436	5.875E+00	477	9.596E+00	518	2.176E+01	559	3.093E+01
396	1.950E-02	437	6.456E+00	478	9.474E+00	519	2.198E+01	560	3.118E+01
397	1.390E-02	438	7.072E+00	479	9.409E+00	520	2.219E+01	561	3.146E+01
398	6.700E-03	439	7.743E+00	480	9.397E+00	521	2.241E+01	562	3.174E+01
399	3.900E-03	440	8.474E+00	481	9.458E+00	522	2.260E+01	563	3.206E+01
400	2.080E-02	441	9.228E+00	482	9.587E+00	523	2.279E+01	564	3.236E+01
401	2.670E-02	442	1.005E+01	483	9.772E+00	524	2.299E+01	565	3.263E+01
402	3.250E-02	443	1.097E+01	484	9.994E+00	525	2.318E+01	566	3.293E+01
403	3.510E-02	444	1.196E+01	485	1.026E+01	526	2.341E+01	567	3.325E+01
404	3.340E-02	445	1.303E+01	486	1.054E+01	527	2.362E+01	568	3.355E+01
405	3.840E-02	446	1.417E+01	487	1.086E+01	528	2.383E+01	569	3.386E+01
406	5.280E-02	447	1.539E+01	488	1.119E+01	529	2.404E+01	570	3.416E+01
407	6.530E-02	448	1.671E+01	489	1.155E+01	530	2.422E+01	571	3.446E+01
408	6.870E-02	449	1.804E+01	490	1.193E+01	531	2.443E+01	572	3.481E+01
409	1.111E-01	450	1.931E+01	491	1.231E+01	532	2.467E+01	573	3.514E+01
410	1.409E-01	451	2.046E+01	492	1.271E+01	533	2.489E+01	574	3.545E+01
411	1.453E-01	452	2.140E+01	493	1.312E+01	534	2.510E+01	575	3.582E+01
412	1.613E-01	453	2.212E+01	494	1.354E+01	535	2.531E+01	576	3.619E+01
413	2.049E-01	454	2.244E+01	495	1.397E+01	536	2.552E+01	577	3.654E+01
414	2.651E-01	455	2.241E+01	496	1.439E+01	537	2.571E+01	578	3.690E+01
415	3.266E-01	456	2.201E+01	497	1.481E+01	538	2.593E+01	579	3.728E+01
416	3.887E-01	457	2.130E+01	498	1.525E+01	539	2.615E+01	580	3.769E+01
417	4.632E-01	458	2.035E+01	499	1.568E+01	540	2.635E+01	581	3.810E+01
418	5.562E-01	459	1.930E+01	500	1.611E+01	541	2.656E+01	582	3.850E+01
419	6.560E-01	460	1.822E+01	501	1.653E+01	542	2.679E+01	583	3.893E+01
420	7.758E-01	461	1.710E+01	502	1.696E+01	543	2.703E+01	584	3.933E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.973E+01	626	5.155E+01	667	3.494E+01	708	1.346E+01	749	3.477E+00
586	4.017E+01	627	5.141E+01	668	3.436E+01	709	1.310E+01	750	3.365E+00
587	4.062E+01	628	5.132E+01	669	3.370E+01	710	1.275E+01	751	3.265E+00
588	4.103E+01	629	5.114E+01	670	3.309E+01	711	1.239E+01	752	3.198E+00
589	4.146E+01	630	5.093E+01	671	3.249E+01	712	1.207E+01	753	3.069E+00
590	4.192E+01	631	5.077E+01	672	3.187E+01	713	1.175E+01	754	2.890E+00
591	4.238E+01	632	5.058E+01	673	3.125E+01	714	1.141E+01	755	2.773E+00
592	4.286E+01	633	5.034E+01	674	3.061E+01	715	1.110E+01	756	2.716E+00
593	4.332E+01	634	5.009E+01	675	2.998E+01	716	1.077E+01	757	2.505E+00
594	4.378E+01	635	4.986E+01	676	2.939E+01	717	1.048E+01	758	2.361E+00
595	4.423E+01	636	4.961E+01	677	2.882E+01	718	1.017E+01	759	2.315E+00
596	4.472E+01	637	4.932E+01	678	2.822E+01	719	9.913E+00	760	2.196E+00
597	4.519E+01	638	4.903E+01	679	2.764E+01	720	9.640E+00	761	2.140E+00
598	4.563E+01	639	4.874E+01	680	2.704E+01	721	9.350E+00	762	2.130E+00
599	4.611E+01	640	4.846E+01	681	2.643E+01	722	9.097E+00	763	2.074E+00
600	4.659E+01	641	4.817E+01	682	2.589E+01	723	8.794E+00	764	1.926E+00
601	4.700E+01	642	4.781E+01	683	2.532E+01	724	8.531E+00	765	1.801E+00
602	4.740E+01	643	4.739E+01	684	2.474E+01	725	8.278E+00	766	1.756E+00
603	4.780E+01	644	4.701E+01	685	2.420E+01	726	7.996E+00	767	1.751E+00
604	4.819E+01	645	4.663E+01	686	2.367E+01	727	7.744E+00	768	1.655E+00
605	4.856E+01	646	4.623E+01	687	2.312E+01	728	7.505E+00	769	1.558E+00
606	4.892E+01	647	4.581E+01	688	2.258E+01	729	7.299E+00	770	1.520E+00
607	4.930E+01	648	4.539E+01	689	2.204E+01	730	7.065E+00	771	1.475E+00
608	4.964E+01	649	4.495E+01	690	2.152E+01	731	6.861E+00	772	1.412E+00
609	4.990E+01	650	4.444E+01	691	2.103E+01	732	6.628E+00	773	1.352E+00
610	5.018E+01	651	4.392E+01	692	2.053E+01	733	6.377E+00	774	1.286E+00
611	5.045E+01	652	4.344E+01	693	2.003E+01	734	6.158E+00	775	1.248E+00
612	5.071E+01	653	4.295E+01	694	1.958E+01	735	5.928E+00	776	1.174E+00
613	5.092E+01	654	4.242E+01	695	1.911E+01	736	5.680E+00	777	1.126E+00
614	5.114E+01	655	4.190E+01	696	1.861E+01	737	5.444E+00	778	1.057E+00
615	5.132E+01	656	4.137E+01	697	1.813E+01	738	5.232E+00	779	1.022E+00
616	5.143E+01	657	4.084E+01	698	1.764E+01	739	5.064E+00	780	9.729E-01
617	5.154E+01	658	4.029E+01	699	1.715E+01	740	4.920E+00		
618	5.167E+01	659	3.970E+01	700	1.670E+01	741	4.758E+00		
619	5.176E+01	660	3.912E+01	701	1.627E+01	742	4.596E+00		
620	5.177E+01	661	3.856E+01	702	1.583E+01	743	4.360E+00		
621	5.178E+01	662	3.797E+01	703	1.542E+01	744	4.146E+00		
622	5.176E+01	663	3.740E+01	704	1.502E+01	745	3.980E+00		
623	5.174E+01	664	3.679E+01	705	1.461E+01	746	3.849E+00		
624	5.171E+01	665	3.614E+01	706	1.422E+01	747	3.727E+00		
625	5.166E+01	666	3.552E+01	707	1.383E+01	748	3.602E+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**

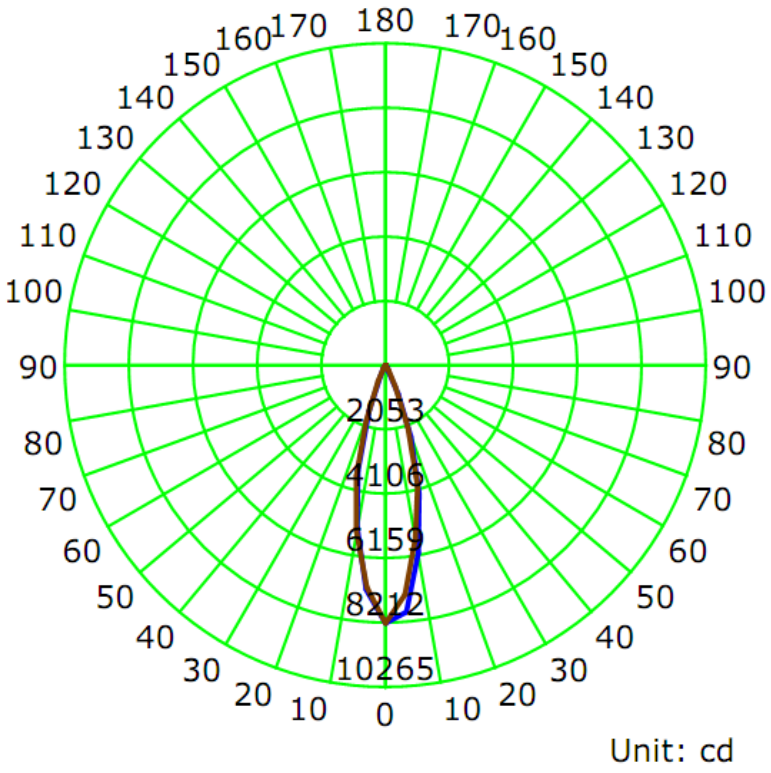
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2710	31.45	0.9950

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2363.2	75.19	8212.7	0.47	0.47

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	28.5	28.1	28.3	28.3	28.4
Field Angle (10% I_{max}):	49.4	56.3	48.8	57.3	53.0

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	8213	8213	8213	8213	8213	8213	8213	8213
5.0°	7891	7953	7854	7579	7347	7248	7306	7310
10.0°	6074	6000	5749	5532	5603	5609	5438	5327
15.0°	4205	4128	4043	3962	3987	3902	3771	3598
20.0°	2429	2746	2799	2573	2113	2474	2406	1972
25.0°	1002	1108	1624	1014	748	907	1339	894
30.0°	238	319	601	231	193	225	569	229
35.0°	164	176	204	169	161	161	152	144
40.0°	118	127	100	116	110	112	80	84
45.0°	56	55	44	53	52	49	31	36
50.0°	23	28	0	22	25	18	0	0
55.0°	0	0	0	0	0	0	0	0
60.0°	0	0	0	0	0	0	0	0
65.0°	0	0	0	0	0	0	0	0
70.0°	0	0	0	0	0	0	0	0
75.0°	0	0	0	0	0	0	0	0
80.0°	0	0	0	0	0	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

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	8213	8213	8213	8213	8213	8213	8213	8213
5.0°	7176	7091	7001	6991	7096	7322	7558	7623
10.0°	5242	5219	5222	5255	5363	5523	5707	5887
15.0°	3500	3499	3515	3566	3653	3724	3865	4045
20.0°	1573	1718	2141	2032	1881	2212	2511	2573
25.0°	417	787	1083	948	576	1005	1390	1014
30.0°	200	201	527	211	197	248	659	287
35.0°	134	136	127	142	144	158	162	173
40.0°	72	85	73	95	92	100	83	116
45.0°	35	33	18	30	47	43	28	57
50.0°	0	0	0	0	15	20	0	17
55.0°	0	0	0	0	0	0	0	0
60.0°	0	0	0	0	0	0	0	0
65.0°	0	0	0	0	0	0	0	0
70.0°	0	0	0	0	0	0	0	0
75.0°	0	0	0	0	0	0	0	0
80.0°	0	0	0	0	0	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)	%
0-5	186.6	7.90
5-10	463.0	19.59
10-15	555.1	23.49
15-20	500.2	21.17
20-25	340.9	14.43
25-30	166.0	7.03
30-35	70.3	2.98
35-40	42.4	1.79
40-45	25.8	1.09
45-50	10.5	0.45
50-55	2.3	0.10
55-60	0.0	0.00
60-65	0.0	0.00
65-70	0.0	0.00
70-75	0.0	0.00
75-80	0.0	0.00
80-85	0.0	0.00
85-90	0.0	0.00
90-95	0.0	0.00
95-100	0.0	0.00
100-105	0.0	0.00
105-110	0.0	0.00
110-115	0.0	0.00
115-120	0.0	0.00
120-125	0.0	0.00
125-130	0.0	0.00
130-135	0.0	0.00
135-140	0.0	0.00
140-145	0.0	0.00
145-150	0.0	0.00
150-155	0.0	0.00
155-160	0.0	0.00
160-165	0.0	0.00
165-170	0.0	0.00
170-175	0.0	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	186.6	7.90
0-10	649.6	27.49
0-15	1204.7	50.98
0-20	1704.9	72.14
0-25	2045.9	86.57
0-30	2211.9	93.60
0-35	2282.2	96.57
0-40	2324.6	98.37
0-45	2350.4	99.46
0-50	2360.9	99.90
0-55	2363.2	100.00
0-60	2363.2	100.00
0-65	2363.2	100.00
0-70	2363.2	100.00
0-75	2363.2	100.00
0-80	2363.2	100.00
0-85	2363.2	100.00
0-90	2363.2	100.00
0-95	2363.2	100.00
0-100	2363.2	100.00
0-105	2363.2	100.00
0-110	2363.2	100.00
0-115	2363.2	100.00
0-120	2363.2	100.00
0-125	2363.2	100.00
0-130	2363.2	100.00
0-135	2363.2	100.00
0-140	2363.2	100.00
0-145	2363.2	100.00
0-150	2363.2	100.00
0-155	2363.2	100.00
0-160	2363.2	100.00
0-165	2363.2	100.00
0-170	2363.2	100.00
0-175	2363.2	100.00
0-180	2363.2	100.00

6. Product Photo

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