

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: AD4LEM9027DIM010UNVNRRL

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Joker Gu <i>Joker . Gu</i>
Report Number:	RKSB180522002-10-1
Test Date:	2018-05-22
Report Date:	2018-05-25
Reviewed By:	Ray Gao/EE Engineer <i>Ray 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.

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 2018-05-22 and used for testing.

Model Tested: AD4LEM9027DIM010UNVNRRBL
 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: 120-277 VAC 60Hz
 Rated Power: 31.5W
 Nominal CCT: 2700K
 Nominal Lumen Output: 2200lm

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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ 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 $U=2.6\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=24\text{K}$ ($K=2$), 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 $U=0.16\%$ 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_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**

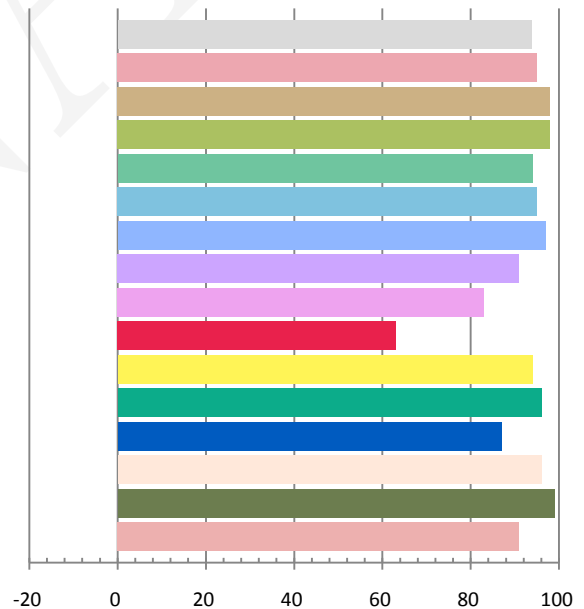
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.2641	31.47	0.993	2212.7	70.31

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
7.841	2763	-0.00166	0.4520	0.4043	0.2602	0.5237

Color Rendering Index

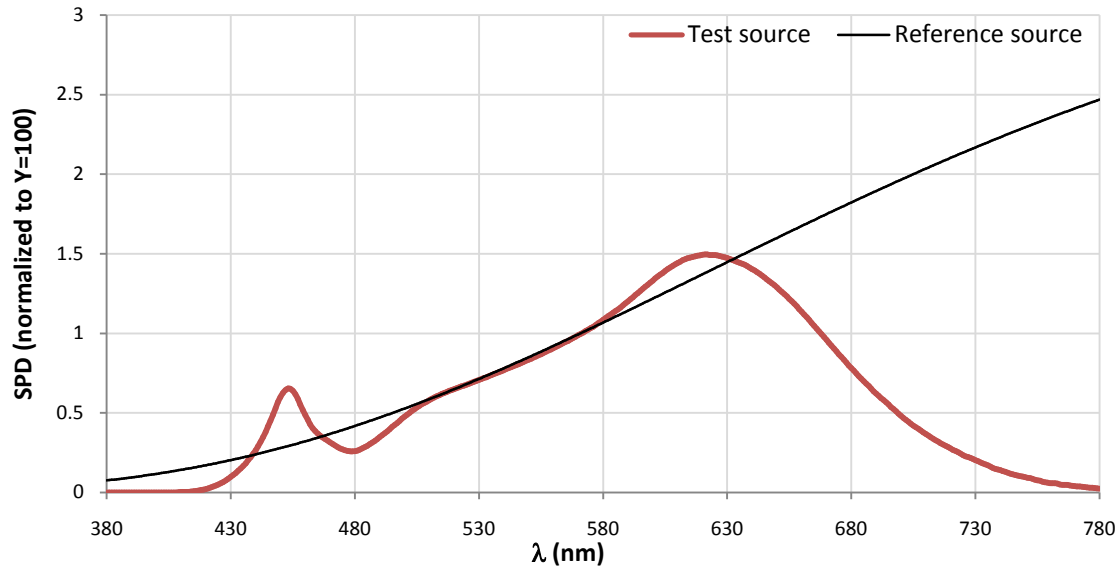
Ra			
93.8			
R1	R2	R3	R4
95	98	98	94
R5	R6	R7	R8
95	97	91	83
R9	R10	R11	R12
63	94	96	87
R13	R14	R15	
96	99	91	



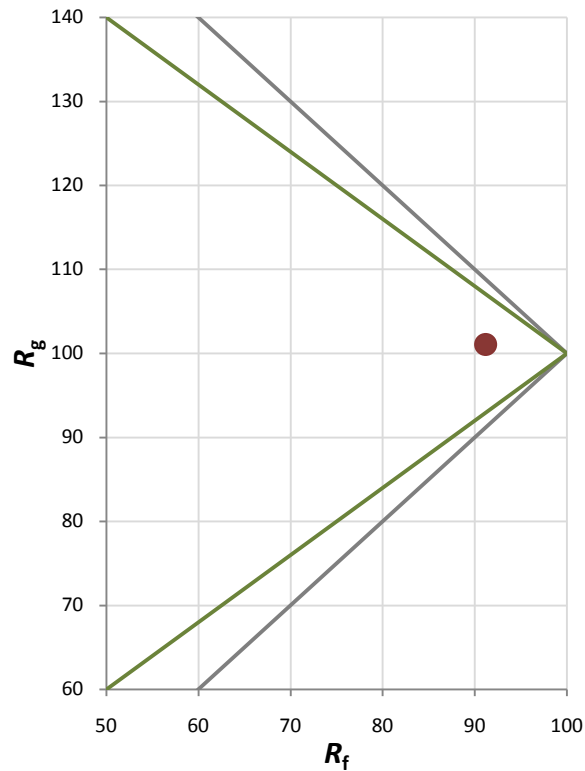
Fidelity Index and Gamut Index

Fidelity Index R_f	91
Gamut Index R_g	101

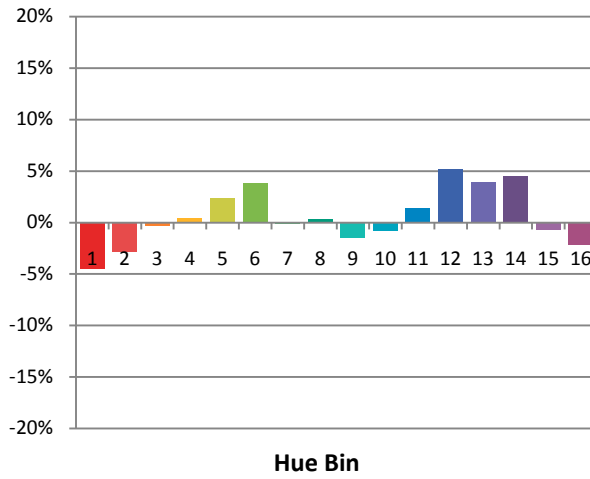
Spectral Power Distribution Comparison



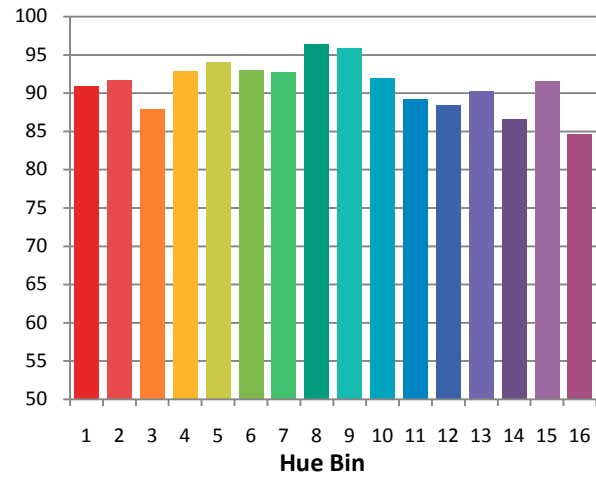
Plot of R_g versus R_f



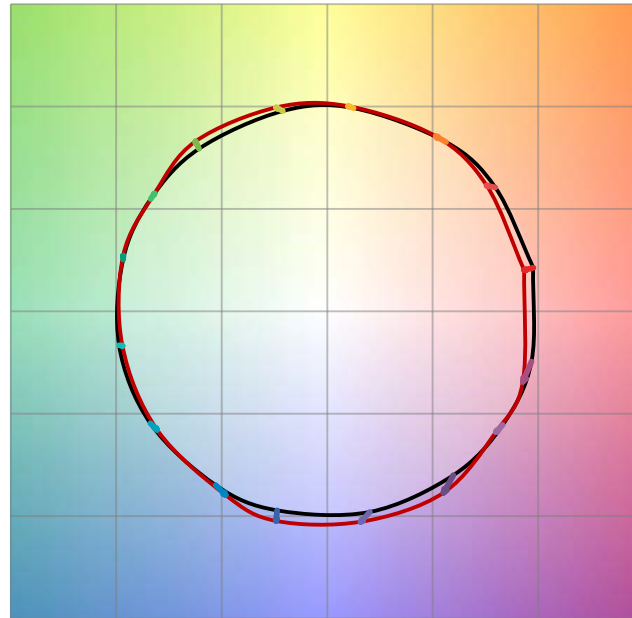
Chroma Shift by Hue



R_t by Hue

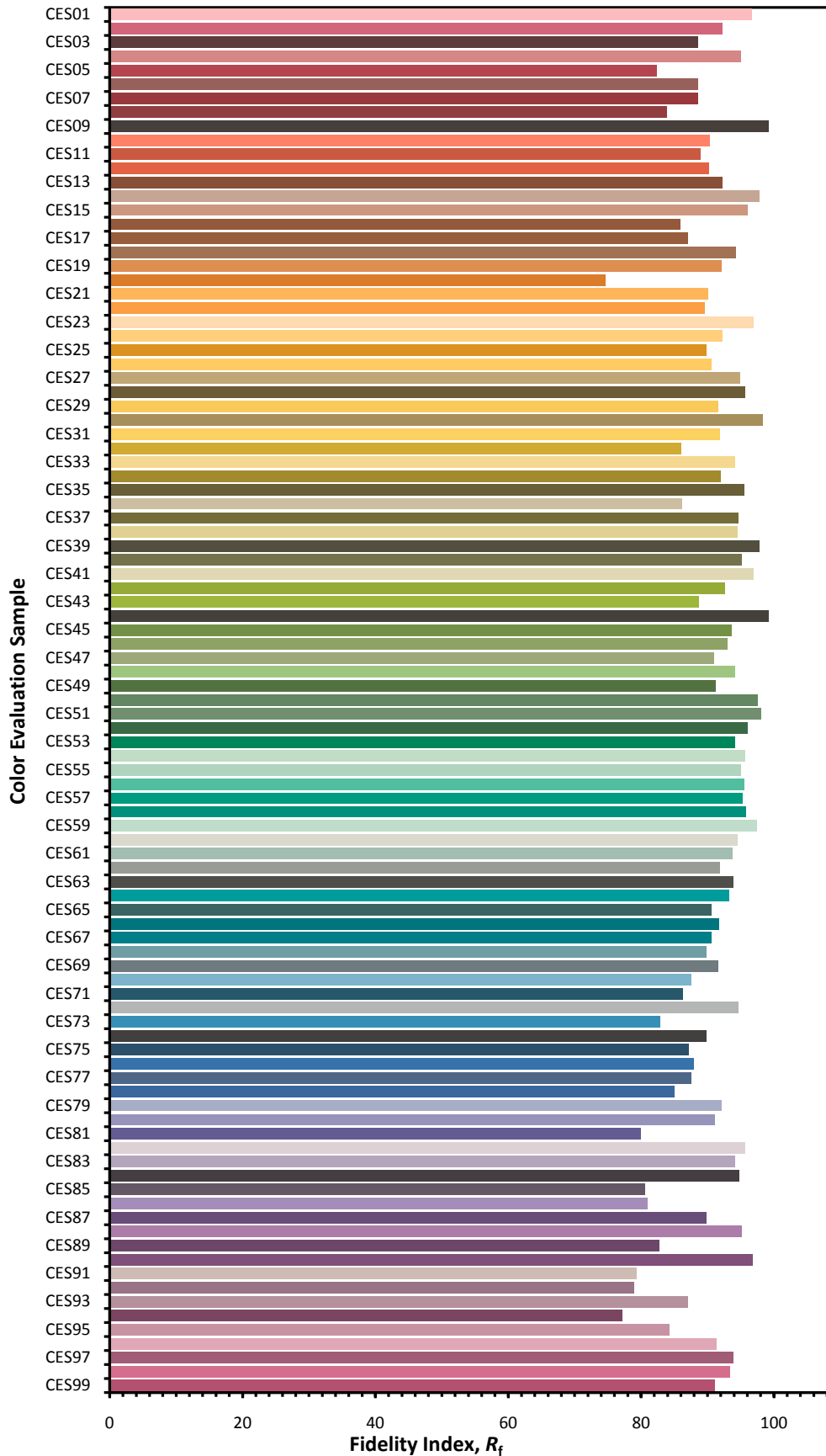


Color Vector Graphic

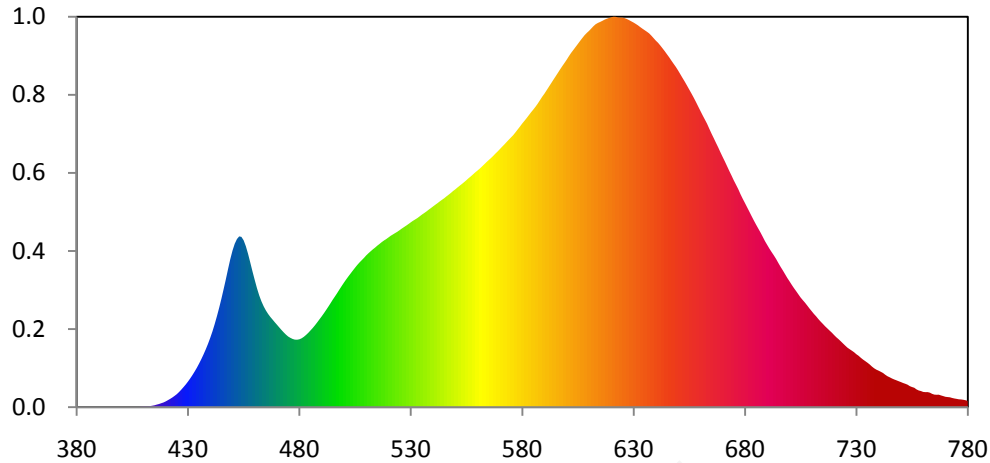


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



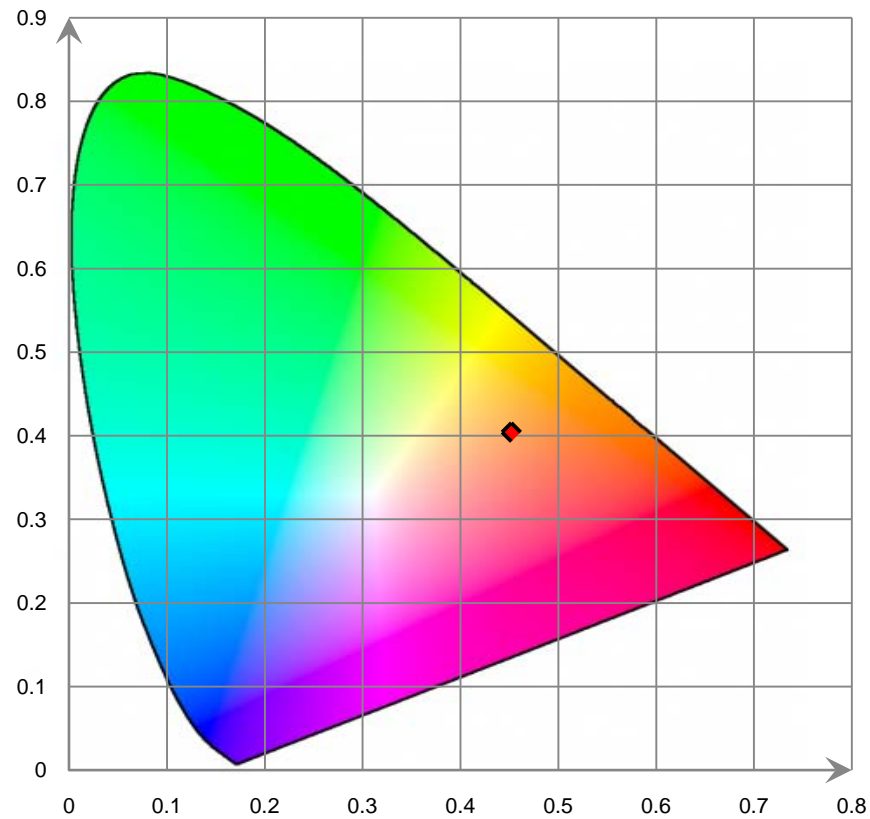
Relative Spectral Power Distribution



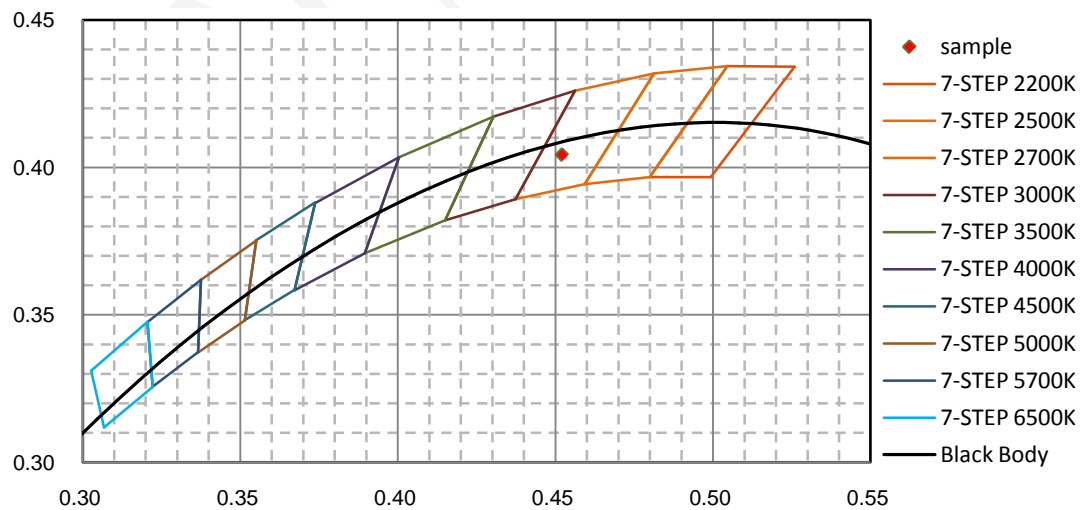
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.500E-03	421	8.686E-01	462	1.386E+01	503	1.658E+01	544	2.572E+01
381	8.000E-04	422	1.028E+00	463	1.312E+01	504	1.694E+01	545	2.591E+01
382	4.000E-04	423	1.201E+00	464	1.250E+01	505	1.730E+01	546	2.614E+01
383	2.000E-04	424	1.402E+00	465	1.199E+01	506	1.764E+01	547	2.635E+01
384	1.000E-04	425	1.613E+00	466	1.156E+01	507	1.795E+01	548	2.657E+01
385	1.300E-03	426	1.873E+00	467	1.119E+01	508	1.823E+01	549	2.681E+01
386	3.200E-03	427	2.169E+00	468	1.086E+01	509	1.851E+01	550	2.702E+01
387	3.800E-03	428	2.485E+00	469	1.053E+01	510	1.882E+01	551	2.725E+01
388	2.100E-03	429	2.810E+00	470	1.021E+01	511	1.909E+01	552	2.748E+01
389	1.700E-03	430	3.168E+00	471	9.891E+00	512	1.934E+01	553	2.769E+01
390	1.300E-03	431	3.556E+00	472	9.577E+00	513	1.958E+01	554	2.793E+01
391	6.000E-04	432	3.970E+00	473	9.274E+00	514	1.980E+01	555	2.816E+01
392	3.000E-04	433	4.417E+00	474	8.999E+00	515	2.004E+01	556	2.841E+01
393	3.400E-03	434	4.889E+00	475	8.764E+00	516	2.025E+01	557	2.864E+01
394	3.900E-03	435	5.404E+00	476	8.600E+00	517	2.048E+01	558	2.889E+01
395	3.700E-03	436	5.951E+00	477	8.460E+00	518	2.068E+01	559	2.914E+01
396	1.400E-03	437	6.544E+00	478	8.378E+00	519	2.085E+01	560	2.936E+01
397	8.000E-04	438	7.175E+00	479	8.368E+00	520	2.105E+01	561	2.960E+01
398	4.000E-04	439	7.851E+00	480	8.417E+00	521	2.126E+01	562	2.986E+01
399	2.000E-04	440	8.595E+00	481	8.539E+00	522	2.143E+01	563	3.013E+01
400	1.000E-04	441	9.398E+00	482	8.723E+00	523	2.160E+01	564	3.040E+01
401	1.000E-04	442	1.030E+01	483	8.957E+00	524	2.176E+01	565	3.065E+01
402	8.000E-04	443	1.127E+01	484	9.219E+00	525	2.196E+01	566	3.090E+01
403	3.300E-03	444	1.231E+01	485	9.518E+00	526	2.216E+01	567	3.116E+01
404	8.600E-03	445	1.343E+01	486	9.820E+00	527	2.234E+01	568	3.145E+01
405	1.800E-02	446	1.462E+01	487	1.015E+01	528	2.253E+01	569	3.172E+01
406	2.140E-02	447	1.584E+01	488	1.051E+01	529	2.272E+01	570	3.201E+01
407	2.600E-02	448	1.712E+01	489	1.089E+01	530	2.292E+01	571	3.230E+01
408	2.670E-02	449	1.835E+01	490	1.125E+01	531	2.312E+01	572	3.258E+01
409	6.280E-02	450	1.942E+01	491	1.164E+01	532	2.329E+01	573	3.288E+01
410	9.550E-02	451	2.027E+01	492	1.204E+01	533	2.346E+01	574	3.317E+01
411	9.640E-02	452	2.085E+01	493	1.246E+01	534	2.367E+01	575	3.346E+01
412	9.380E-02	453	2.119E+01	494	1.289E+01	535	2.388E+01	576	3.375E+01
413	1.328E-01	454	2.113E+01	495	1.333E+01	536	2.407E+01	577	3.409E+01
414	1.828E-01	455	2.070E+01	496	1.374E+01	537	2.427E+01	578	3.445E+01
415	2.389E-01	456	1.996E+01	497	1.416E+01	538	2.449E+01	579	3.480E+01
416	3.202E-01	457	1.901E+01	498	1.460E+01	539	2.469E+01	580	3.517E+01
417	3.946E-01	458	1.793E+01	499	1.502E+01	540	2.490E+01	581	3.551E+01
418	4.886E-01	459	1.682E+01	500	1.544E+01	541	2.510E+01	582	3.585E+01
419	5.803E-01	460	1.576E+01	501	1.584E+01	542	2.530E+01	583	3.622E+01
420	7.125E-01	461	1.475E+01	502	1.622E+01	543	2.552E+01	584	3.658E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.691E+01	626	4.826E+01	667	3.280E+01	708	1.260E+01	749	3.223E+00
586	3.727E+01	627	4.816E+01	668	3.223E+01	709	1.224E+01	750	3.115E+00
587	3.765E+01	628	4.801E+01	669	3.162E+01	710	1.189E+01	751	2.997E+00
588	3.808E+01	629	4.787E+01	670	3.104E+01	711	1.156E+01	752	2.904E+00
589	3.851E+01	630	4.772E+01	671	3.048E+01	712	1.126E+01	753	2.790E+00
590	3.889E+01	631	4.755E+01	672	2.989E+01	713	1.092E+01	754	2.613E+00
591	3.931E+01	632	4.737E+01	673	2.930E+01	714	1.061E+01	755	2.500E+00
592	3.975E+01	633	4.715E+01	674	2.873E+01	715	1.033E+01	756	2.411E+00
593	4.017E+01	634	4.695E+01	675	2.813E+01	716	1.003E+01	757	2.207E+00
594	4.060E+01	635	4.677E+01	676	2.760E+01	717	9.769E+00	758	2.074E+00
595	4.103E+01	636	4.658E+01	677	2.705E+01	718	9.501E+00	759	2.001E+00
596	4.145E+01	637	4.637E+01	678	2.643E+01	719	9.245E+00	760	1.892E+00
597	4.188E+01	638	4.609E+01	679	2.586E+01	720	8.958E+00	761	1.867E+00
598	4.230E+01	639	4.578E+01	680	2.533E+01	721	8.678E+00	762	1.871E+00
599	4.270E+01	640	4.547E+01	681	2.479E+01	722	8.442E+00	763	1.800E+00
600	4.310E+01	641	4.520E+01	682	2.425E+01	723	8.180E+00	764	1.655E+00
601	4.354E+01	642	4.488E+01	683	2.370E+01	724	7.910E+00	765	1.561E+00
602	4.396E+01	643	4.452E+01	684	2.316E+01	725	7.643E+00	766	1.540E+00
603	4.432E+01	644	4.416E+01	685	2.265E+01	726	7.385E+00	767	1.549E+00
604	4.469E+01	645	4.378E+01	686	2.216E+01	727	7.195E+00	768	1.459E+00
605	4.505E+01	646	4.341E+01	687	2.166E+01	728	7.010E+00	769	1.375E+00
606	4.543E+01	647	4.299E+01	688	2.114E+01	729	6.817E+00	770	1.291E+00
607	4.578E+01	648	4.260E+01	689	2.060E+01	730	6.574E+00	771	1.252E+00
608	4.614E+01	649	4.221E+01	690	2.013E+01	731	6.381E+00	772	1.227E+00
609	4.642E+01	650	4.177E+01	691	1.966E+01	732	6.132E+00	773	1.142E+00
610	4.667E+01	651	4.130E+01	692	1.923E+01	733	5.907E+00	774	1.078E+00
611	4.696E+01	652	4.084E+01	693	1.882E+01	734	5.718E+00	775	1.034E+00
612	4.726E+01	653	4.038E+01	694	1.838E+01	735	5.518E+00	776	9.765E-01
613	4.750E+01	654	3.990E+01	695	1.789E+01	736	5.297E+00	777	9.585E-01
614	4.766E+01	655	3.940E+01	696	1.741E+01	737	5.042E+00	778	9.185E-01
615	4.779E+01	656	3.891E+01	697	1.697E+01	738	4.825E+00	779	8.619E-01
616	4.792E+01	657	3.840E+01	698	1.651E+01	739	4.654E+00	780	7.772E-01
617	4.807E+01	658	3.787E+01	699	1.604E+01	740	4.531E+00		
618	4.819E+01	659	3.732E+01	700	1.562E+01	741	4.390E+00		
619	4.828E+01	660	3.676E+01	701	1.519E+01	742	4.236E+00		
620	4.837E+01	661	3.621E+01	702	1.477E+01	743	4.021E+00		
621	4.844E+01	662	3.569E+01	703	1.439E+01	744	3.835E+00		
622	4.843E+01	663	3.516E+01	704	1.399E+01	745	3.705E+00		
623	4.835E+01	664	3.454E+01	705	1.360E+01	746	3.561E+00		
624	4.833E+01	665	3.394E+01	706	1.327E+01	747	3.439E+00		
625	4.833E+01	666	3.338E+01	707	1.295E+01	748	3.334E+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**

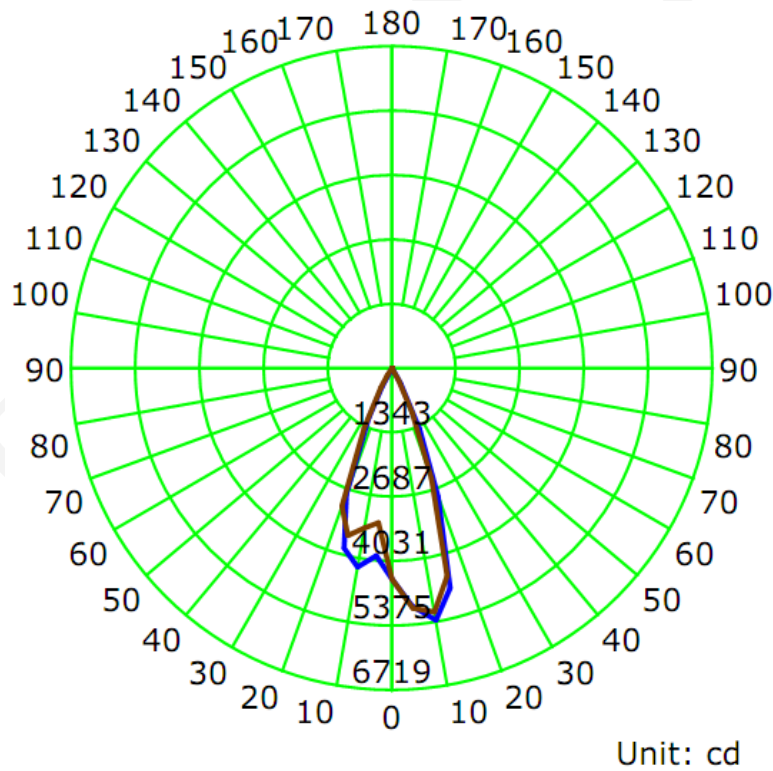
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2640	31.49	0.9940

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2216.8	70.45	5375.8	0.75	0.74

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	41.1	40.6	41.1	42.3	41.1
Field Angle (10% I_{max}):	58.6	58.3	58.2	58.8	58.5

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	4394	4394	4394	4394	4394	4394	4394	4394
5.0°	4983	5118	5143	5104	5032	4902	4694	4363
10.0°	5343	5376	5332	5260	5173	5114	4948	4643
15.0°	4747	4754	4696	4600	4497	4354	4276	4109
20.0°	2867	2720	2601	2448	2453	2539	2623	2723
25.0°	1402	1284	1155	1048	1030	1049	1090	1140
30.0°	388	345	312	293	294	325	349	402
35.0°	31	18	0	0	0	11	34	63
40.0°	0	0	0	0	0	0	0	0
45.0°	0	0	0	0	0	0	0	0
50.0°	0	0	0	0	0	0	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

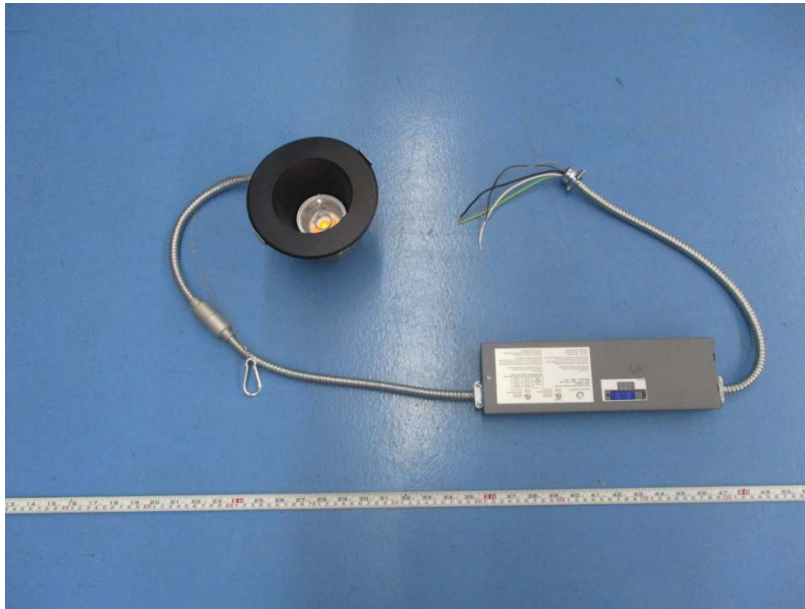
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	4394	4394	4394	4394	4394	4394	4394	4394
5.0°	3937	3320	2851	2812	3237	3823	4323	4712
10.0°	4206	3560	2905	2858	3390	4099	4637	5080
15.0°	3889	3671	3387	3319	3619	4027	4375	4484
20.0°	2810	2858	2893	2933	3071	3069	3068	2925
25.0°	1149	1218	1291	1371	1379	1409	1410	1380
30.0°	436	460	469	471	475	469	458	410
35.0°	80	131	181	190	186	141	99	50
40.0°	0	0	0	0	0	0	0	0
45.0°	0	0	0	0	0	0	0	0
50.0°	0	0	0	0	0	0	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

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	103.6	4.67	0-5	103.6	4.67
5-10	313.6	14.15	0-10	417.2	18.82
10-15	514.3	23.20	0-15	931.6	42.02
15-20	573.8	25.89	0-20	1505.4	67.91
20-25	422.2	19.05	0-25	1927.6	86.95
25-30	206.9	9.33	0-30	2134.5	96.29
30-35	69.6	3.14	0-35	2204.1	99.43
35-40	12.7	0.57	0-40	2216.8	100.00
40-45	0.0	0.00	0-45	2216.8	100.00
45-50	0.0	0.00	0-50	2216.8	100.00
50-55	0.0	0.00	0-55	2216.8	100.00
55-60	0.0	0.00	0-60	2216.8	100.00
60-65	0.0	0.00	0-65	2216.8	100.00
65-70	0.0	0.00	0-70	2216.8	100.00
70-75	0.0	0.00	0-75	2216.8	100.00
75-80	0.0	0.00	0-80	2216.8	100.00
80-85	0.0	0.00	0-85	2216.8	100.00
85-90	0.0	0.00	0-90	2216.8	100.00
90-95	0.0	0.00	0-95	2216.8	100.00
95-100	0.0	0.00	0-100	2216.8	100.00
100-105	0.0	0.00	0-105	2216.8	100.00
105-110	0.0	0.00	0-110	2216.8	100.00
110-115	0.0	0.00	0-115	2216.8	100.00
115-120	0.0	0.00	0-120	2216.8	100.00
120-125	0.0	0.00	0-125	2216.8	100.00
125-130	0.0	0.00	0-130	2216.8	100.00
130-135	0.0	0.00	0-135	2216.8	100.00
135-140	0.0	0.00	0-140	2216.8	100.00
140-145	0.0	0.00	0-145	2216.8	100.00
145-150	0.0	0.00	0-150	2216.8	100.00
150-155	0.0	0.00	0-155	2216.8	100.00
155-160	0.0	0.00	0-160	2216.8	100.00
160-165	0.0	0.00	0-165	2216.8	100.00
165-170	0.0	0.00	0-170	2216.8	100.00
170-175	0.0	0.00	0-175	2216.8	100.00
175-180	0.0	0.00	0-180	2216.8	100.00

6. Product Photo



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