

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: AD4LEM9027DIM010UNVMDRCC

Report Type:	Electrical and Photometric tests including: Input Current, Power, Power Factor, Luminous Flux, Luminous Efficacy, CRI, CCT, Chromaticity Coordinate, Spectral Power Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	RKS180131081-10-3
Test Date:	2018-05-23 to 2018-05-24
Report Date:	2018-05-25
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 2018- 03-10 and used for testing.

Model Tested: AD4LEM9027DIM010UNVMRCC
 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: 2500lm

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 hour**

Test orientation: **Downward**

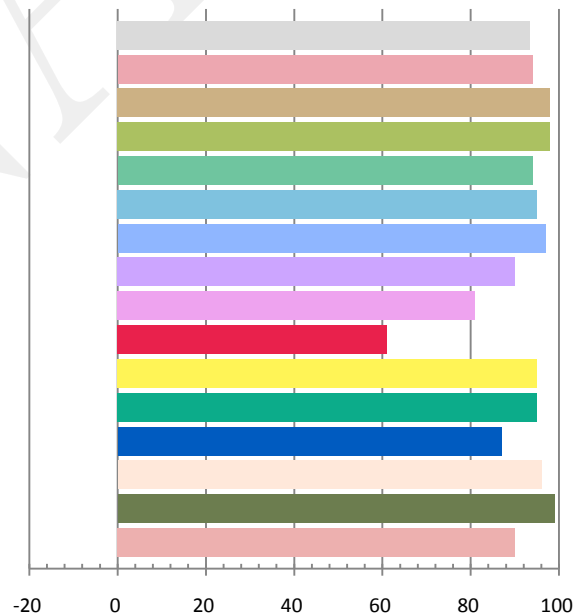
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.2638	31.48	0.994	2533	80.47

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
8.985	2746	-0.00188	0.4530	0.4040	0.2610	0.5238

Color Rendering Index

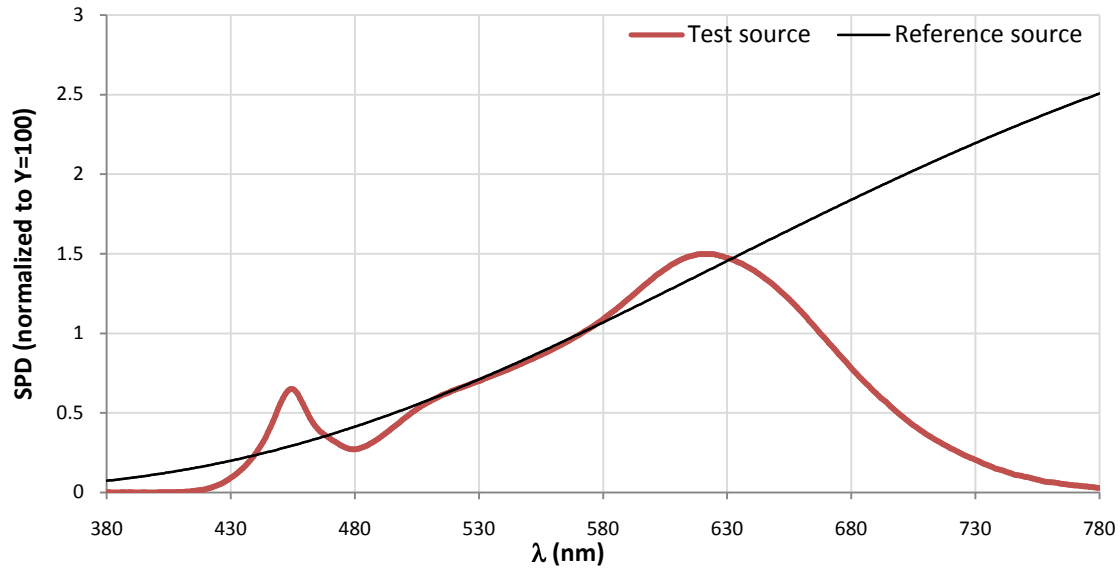
Ra			
93.4			
R1	R2	R3	R4
94	98	98	94
R5	R6	R7	R8
95	97	90	81
R9	R10	R11	R12
61	95	95	87
R13	R14	R15	
96	99	90	



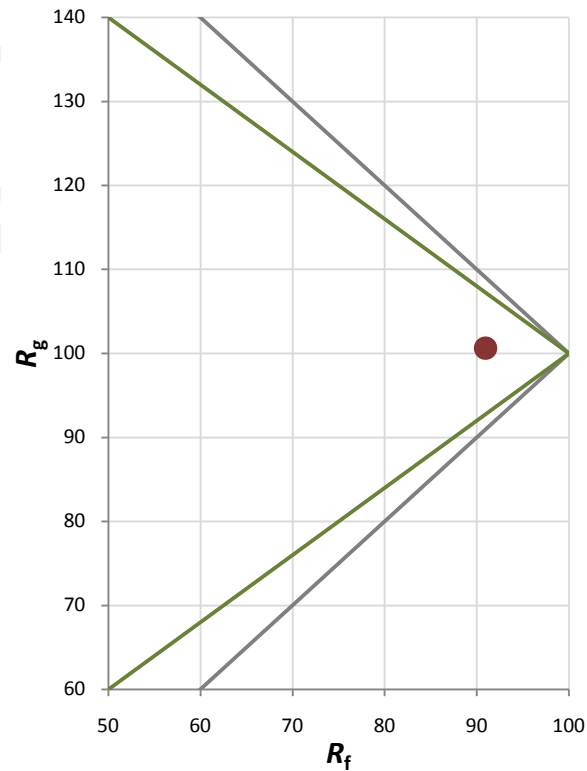
Fidelity Index and Gamut Index

Fidelity Index R_f	91
Gamut Index R_g	101

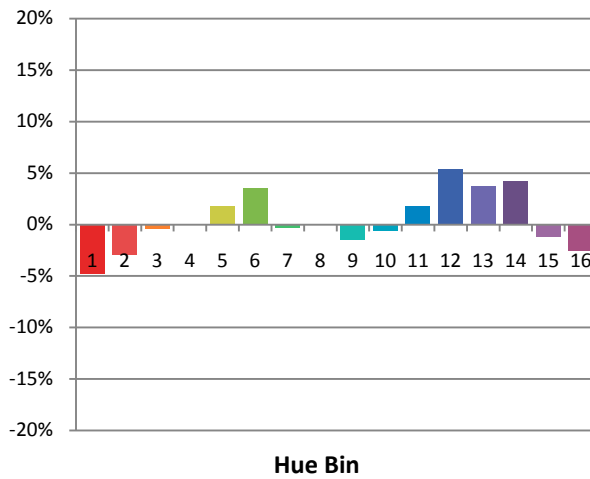
Spectral Power Distribution Comparison



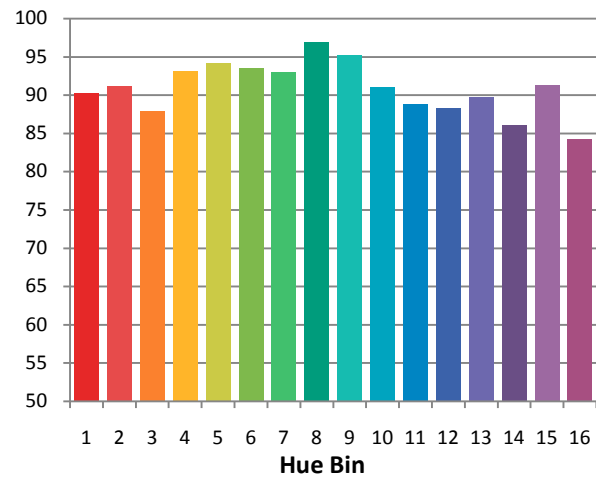
Plot of R_g versus R_f



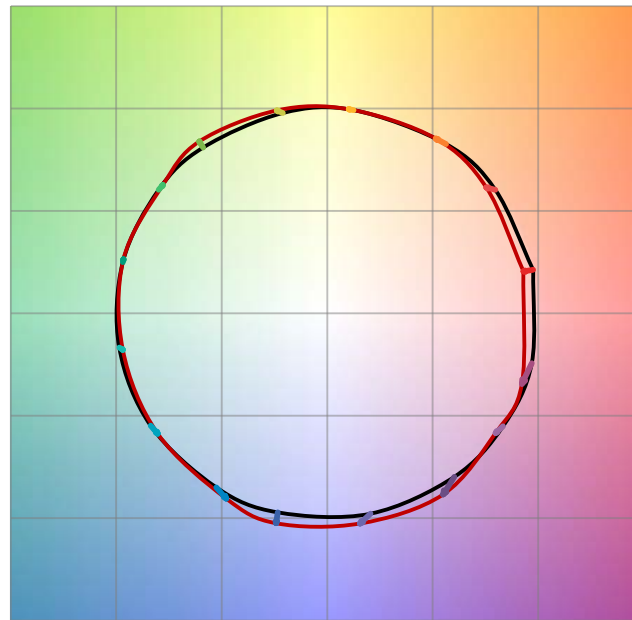
Chroma Shift by Hue



R_t by Hue

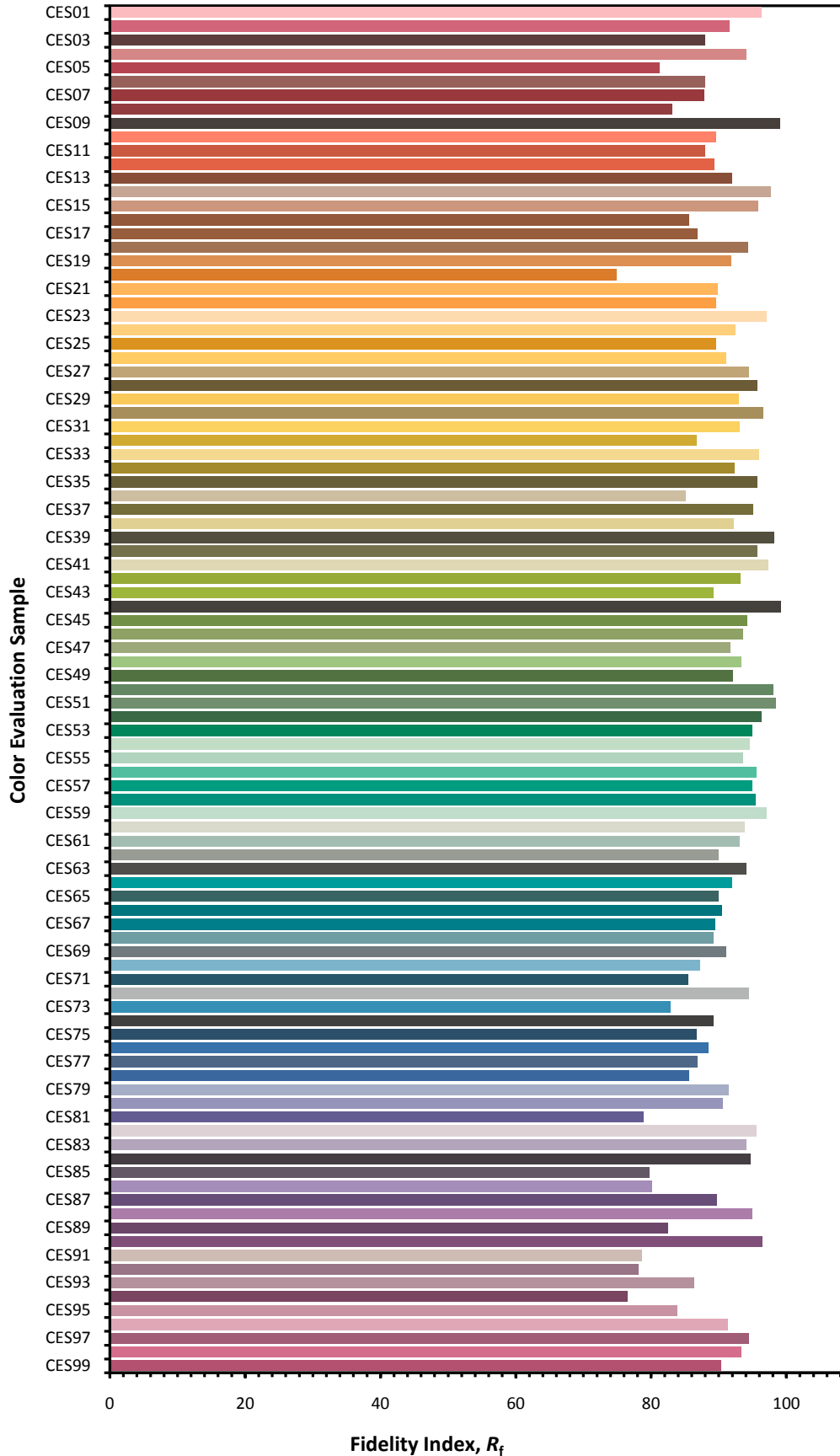


Color Vector Graphic

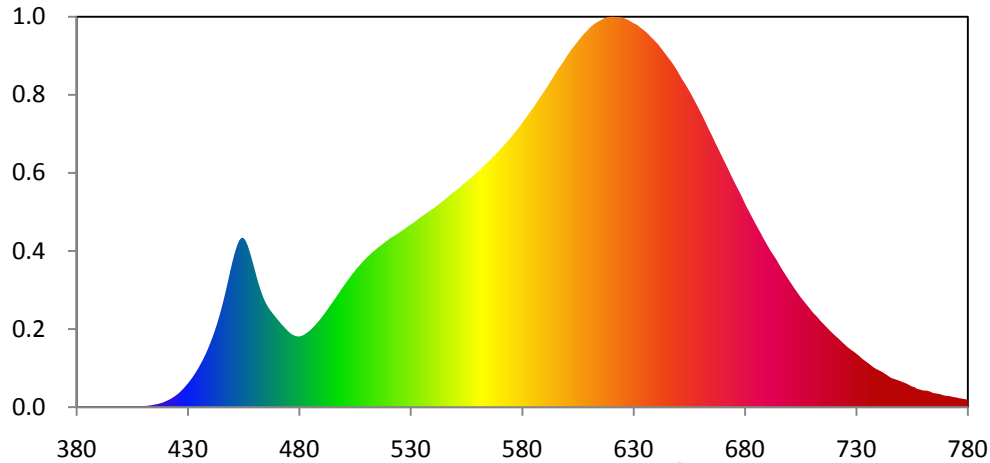


— Reference Illuminant — Test Source

Color Fidelity by CES Sample



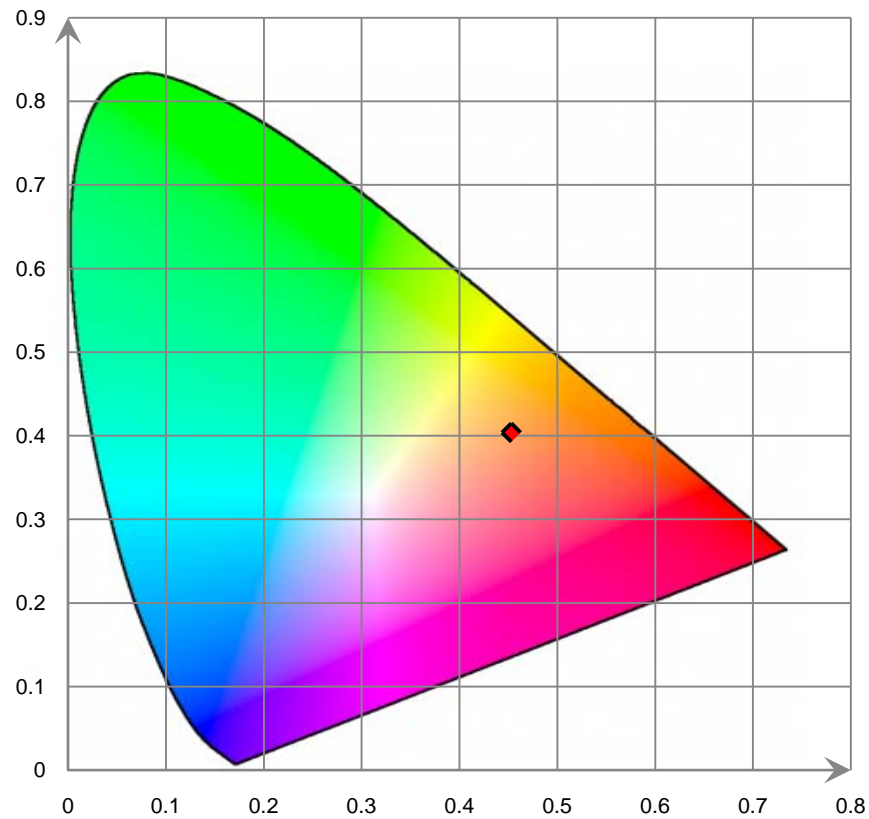
Relative Spectral Power Distribution



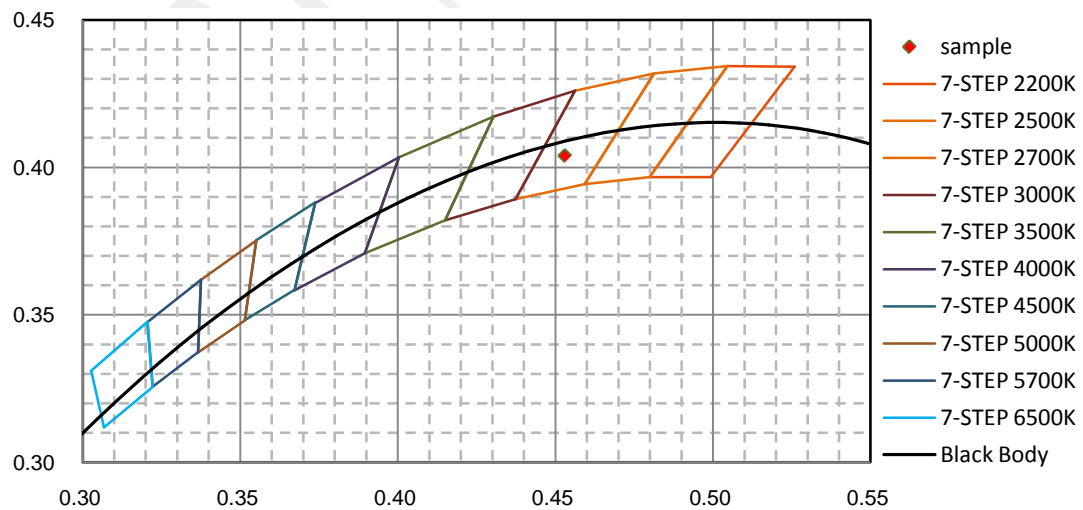
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	4.920E-02	421	9.809E-01	462	1.727E+01	503	1.860E+01	544	2.922E+01
381	3.720E-02	422	1.133E+00	463	1.632E+01	504	1.903E+01	545	2.947E+01
382	2.200E-02	423	1.332E+00	464	1.547E+01	505	1.942E+01	546	2.975E+01
383	2.590E-02	424	1.535E+00	465	1.480E+01	506	1.981E+01	547	3.000E+01
384	3.050E-02	425	1.761E+00	466	1.424E+01	507	2.017E+01	548	3.026E+01
385	1.970E-02	426	2.029E+00	467	1.378E+01	508	2.051E+01	549	3.052E+01
386	3.340E-02	427	2.329E+00	468	1.336E+01	509	2.087E+01	550	3.075E+01
387	3.430E-02	428	2.656E+00	469	1.295E+01	510	2.121E+01	551	3.099E+01
388	3.180E-02	429	3.015E+00	470	1.257E+01	511	2.150E+01	552	3.126E+01
389	3.840E-02	430	3.393E+00	471	1.218E+01	512	2.180E+01	553	3.155E+01
390	3.800E-02	431	3.790E+00	472	1.181E+01	513	2.210E+01	554	3.183E+01
391	1.920E-02	432	4.222E+00	473	1.147E+01	514	2.236E+01	555	3.209E+01
392	1.380E-02	433	4.701E+00	474	1.113E+01	515	2.263E+01	556	3.237E+01
393	1.960E-02	434	5.205E+00	475	1.080E+01	516	2.287E+01	557	3.260E+01
394	2.730E-02	435	5.743E+00	476	1.051E+01	517	2.311E+01	558	3.288E+01
395	3.500E-02	436	6.317E+00	477	1.030E+01	518	2.336E+01	559	3.319E+01
396	2.250E-02	437	6.933E+00	478	1.016E+01	519	2.360E+01	560	3.348E+01
397	1.080E-02	438	7.593E+00	479	1.008E+01	520	2.385E+01	561	3.377E+01
398	8.500E-03	439	8.319E+00	480	1.006E+01	521	2.409E+01	562	3.407E+01
399	5.800E-03	440	9.099E+00	481	1.014E+01	522	2.427E+01	563	3.439E+01
400	2.460E-02	441	9.915E+00	482	1.029E+01	523	2.445E+01	564	3.470E+01
401	3.400E-02	442	1.081E+01	483	1.049E+01	524	2.466E+01	565	3.499E+01
402	3.710E-02	443	1.179E+01	484	1.073E+01	525	2.488E+01	566	3.530E+01
403	4.010E-02	444	1.284E+01	485	1.099E+01	526	2.510E+01	567	3.563E+01
404	5.540E-02	445	1.398E+01	486	1.130E+01	527	2.531E+01	568	3.596E+01
405	6.250E-02	446	1.522E+01	487	1.163E+01	528	2.555E+01	569	3.629E+01
406	7.850E-02	447	1.653E+01	488	1.199E+01	529	2.578E+01	570	3.663E+01
407	8.380E-02	448	1.794E+01	489	1.236E+01	530	2.597E+01	571	3.696E+01
408	7.860E-02	449	1.936E+01	490	1.276E+01	531	2.619E+01	572	3.733E+01
409	1.226E-01	450	2.071E+01	491	1.318E+01	532	2.644E+01	573	3.769E+01
410	1.641E-01	451	2.194E+01	492	1.362E+01	533	2.668E+01	574	3.802E+01
411	1.772E-01	452	2.294E+01	493	1.407E+01	534	2.691E+01	575	3.840E+01
412	2.081E-01	453	2.372E+01	494	1.453E+01	535	2.714E+01	576	3.879E+01
413	2.542E-01	454	2.409E+01	495	1.498E+01	536	2.737E+01	577	3.917E+01
414	3.056E-01	455	2.406E+01	496	1.543E+01	537	2.759E+01	578	3.957E+01
415	3.596E-01	456	2.362E+01	497	1.588E+01	538	2.780E+01	579	3.999E+01
416	4.196E-01	457	2.285E+01	498	1.635E+01	539	2.803E+01	580	4.044E+01
417	4.984E-01	458	2.185E+01	499	1.683E+01	540	2.823E+01	581	4.087E+01
418	5.930E-01	459	2.072E+01	500	1.729E+01	541	2.847E+01	582	4.129E+01
419	6.983E-01	460	1.955E+01	501	1.773E+01	542	2.873E+01	583	4.176E+01
420	8.337E-01	461	1.835E+01	502	1.817E+01	543	2.899E+01	584	4.219E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.260E+01	626	5.531E+01	667	3.743E+01	708	1.448E+01	749	3.788E+00
586	4.308E+01	627	5.518E+01	668	3.679E+01	709	1.408E+01	750	3.671E+00
587	4.357E+01	628	5.503E+01	669	3.614E+01	710	1.367E+01	751	3.555E+00
588	4.404E+01	629	5.483E+01	670	3.548E+01	711	1.330E+01	752	3.433E+00
589	4.452E+01	630	5.463E+01	671	3.484E+01	712	1.299E+01	753	3.285E+00
590	4.499E+01	631	5.449E+01	672	3.419E+01	713	1.263E+01	754	3.101E+00
591	4.547E+01	632	5.429E+01	673	3.351E+01	714	1.225E+01	755	2.952E+00
592	4.597E+01	633	5.403E+01	674	3.286E+01	715	1.193E+01	756	2.854E+00
593	4.647E+01	634	5.379E+01	675	3.220E+01	716	1.160E+01	757	2.659E+00
594	4.697E+01	635	5.354E+01	676	3.157E+01	717	1.127E+01	758	2.543E+00
595	4.750E+01	636	5.328E+01	677	3.096E+01	718	1.093E+01	759	2.473E+00
596	4.802E+01	637	5.295E+01	678	3.034E+01	719	1.062E+01	760	2.364E+00
597	4.848E+01	638	5.261E+01	679	2.968E+01	720	1.032E+01	761	2.360E+00
598	4.891E+01	639	5.231E+01	680	2.899E+01	721	1.004E+01	762	2.320E+00
599	4.939E+01	640	5.198E+01	681	2.835E+01	722	9.764E+00	763	2.239E+00
600	4.990E+01	641	5.164E+01	682	2.776E+01	723	9.448E+00	764	2.075E+00
601	5.040E+01	642	5.124E+01	683	2.714E+01	724	9.144E+00	765	1.994E+00
602	5.084E+01	643	5.081E+01	684	2.654E+01	725	8.858E+00	766	1.937E+00
603	5.124E+01	644	5.040E+01	685	2.596E+01	726	8.563E+00	767	1.893E+00
604	5.164E+01	645	4.997E+01	686	2.538E+01	727	8.320E+00	768	1.807E+00
605	5.205E+01	646	4.955E+01	687	2.480E+01	728	8.070E+00	769	1.697E+00
606	5.245E+01	647	4.914E+01	688	2.421E+01	729	7.870E+00	770	1.626E+00
607	5.284E+01	648	4.870E+01	689	2.363E+01	730	7.613E+00	771	1.608E+00
608	5.320E+01	649	4.820E+01	690	2.309E+01	731	7.363E+00	772	1.567E+00
609	5.351E+01	650	4.767E+01	691	2.253E+01	732	7.074E+00	773	1.478E+00
610	5.385E+01	651	4.710E+01	692	2.201E+01	733	6.802E+00	774	1.421E+00
611	5.416E+01	652	4.656E+01	693	2.154E+01	734	6.581E+00	775	1.379E+00
612	5.443E+01	653	4.608E+01	694	2.106E+01	735	6.329E+00	776	1.291E+00
613	5.466E+01	654	4.555E+01	695	2.052E+01	736	6.100E+00	777	1.246E+00
614	5.484E+01	655	4.500E+01	696	1.996E+01	737	5.848E+00	778	1.180E+00
615	5.501E+01	656	4.445E+01	697	1.944E+01	738	5.606E+00	779	1.132E+00
616	5.519E+01	657	4.385E+01	698	1.894E+01	739	5.425E+00	780	1.048E+00
617	5.535E+01	658	4.326E+01	699	1.845E+01	740	5.264E+00		
618	5.545E+01	659	4.265E+01	700	1.797E+01	741	5.105E+00		
619	5.552E+01	660	4.202E+01	701	1.749E+01	742	4.938E+00		
620	5.555E+01	661	4.140E+01	702	1.700E+01	743	4.714E+00		
621	5.556E+01	662	4.075E+01	703	1.655E+01	744	4.518E+00		
622	5.552E+01	663	4.007E+01	704	1.610E+01	745	4.298E+00		
623	5.551E+01	664	3.940E+01	705	1.565E+01	746	4.109E+00		
624	5.551E+01	665	3.876E+01	706	1.524E+01	747	4.017E+00		
625	5.543E+01	666	3.810E+01	707	1.486E+01	748	3.919E+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**

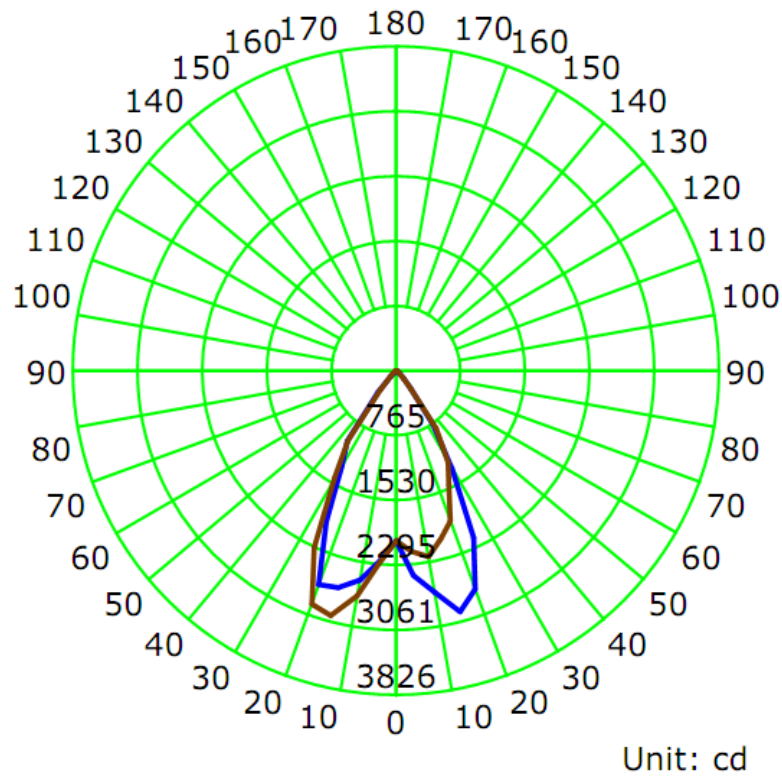
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.2630	31.49	0.9960

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2535.1	80.56	3061.1	1.10	1.10

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	57.8	57.7	54.7	55.9	56.3
Field Angle (10% I _{max}):	80.5	81.0	79.7	80.3	80.4

Luminous Intensity (cd) Distribution Data

C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	2008	2008	2008	2008	2008	2008	2008	2008
5.0°	2424	2372	2295	2212	2139	2126	2153	2175
10.0°	2652	2524	2391	2293	2227	2215	2298	2409
15.0°	2946	2703	2379	2173	2055	2066	2251	2446
20.0°	2742	2500	2265	2022	1886	1981	2157	2422
25.0°	2172	1951	1723	1554	1488	1491	1670	1869
30.0°	1332	1278	1251	1262	1243	1235	1253	1291
35.0°	775	784	799	822	826	890	944	1006
40.0°	268	261	258	265	270	301	333	351
45.0°	135	132	127	121	116	110	104	103
50.0°	67	63	61	59	55	53	50	49
55.0°	31	30	28	27	25	24	23	22
60.0°	14	14	13	13	12	11	11	11
65.0°	5	6	6	6	6	5	5	5
70.0°	2	2	2	2	2	2	1	2
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	1	1	2	2	2	2	1
150.0°	1	2	3	3	3	3	3	2
155.0°	3	3	4	5	4	4	4	4
160.0°	4	5	6	6	6	5	5	5
165.0°	5	6	6	6	6	6	6	6
170.0°	6	7	7	7	7	7	7	7
175.0°	8	8	8	8	9	8	8	8
180.0°	0	0	0	0	0	0	0	0

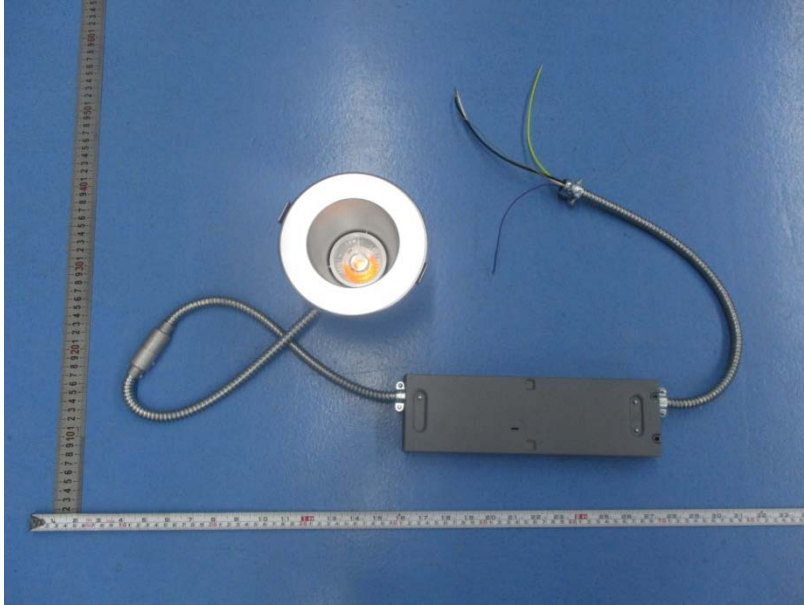
Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	2008	2008	2008	2008	2008	2008	2008	2008
5.0°	2245	2233	2203	2223	2270	2342	2409	2441
10.0°	2504	2548	2570	2631	2697	2729	2747	2722
15.0°	2650	2749	2802	2942	2992	3028	3058	3061
20.0°	2684	2829	2898	2905	2928	2961	3012	2919
25.0°	1971	2159	2277	2307	2299	2346	2364	2285
30.0°	1290	1346	1420	1479	1468	1422	1374	1333
35.0°	1016	1068	1091	1062	1004	880	810	776
40.0°	333	359	360	328	299	284	268	255
45.0°	93	94	98	104	112	118	123	129
50.0°	43	43	46	50	55	59	63	65
55.0°	19	19	20	22	24	27	29	30
60.0°	8	8	9	10	11	13	14	15
65.0°	3	3	4	4	5	5	6	7
70.0°	0	0	1	2	1	2	2	3
75.0°	0	0	0	0	0	0	0	1
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°	1	1	1	1	1	2	2	2
155.0°	2	3	2	3	3	3	3	3
160.0°	4	4	4	4	4	5	4	5
165.0°	5	5	5	5	5	6	6	6
170.0°	6	6	6	6	7	7	6	7
175.0°	7	7	7	8	8	8	8	9
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	51.1	2.02	0-5	51.1	2.02
5-10	170.9	6.74	0-10	222.0	8.76
10-15	305.7	12.06	0-15	527.7	20.81
15-20	429.6	16.95	0-20	957.3	37.76
20-25	478.8	18.88	0-25	1436.1	56.65
25-30	420.8	16.60	0-30	1856.9	73.25
30-35	329.8	13.01	0-35	2186.7	86.25
35-40	201.7	7.96	0-40	2388.4	94.21
40-45	76.5	3.02	0-45	2464.9	97.23
45-50	34.1	1.34	0-50	2499.0	98.58
50-55	17.4	0.69	0-55	2516.4	99.26
55-60	8.5	0.34	0-60	2524.9	99.60
60-65	4.0	0.16	0-65	2529.0	99.76
65-70	1.6	0.07	0-70	2530.6	99.82
70-75	0.4	0.02	0-75	2531.0	99.84
75-80	0.0	0.00	0-80	2531.0	99.84
80-85	0.0	0.00	0-85	2531.0	99.84
85-90	0.0	0.00	0-90	2531.0	99.84
90-95	0.0	0.00	0-95	2531.0	99.84
95-100	0.0	0.00	0-100	2531.0	99.84
100-105	0.0	0.00	0-105	2531.0	99.84
105-110	0.0	0.00	0-110	2531.0	99.84
110-115	0.0	0.00	0-115	2531.0	99.84
115-120	0.0	0.00	0-120	2531.0	99.84
120-125	0.0	0.00	0-125	2531.0	99.84
125-130	0.0	0.00	0-130	2531.0	99.84
130-135	0.0	0.00	0-135	2531.0	99.84
135-140	0.0	0.00	0-140	2531.0	99.84
140-145	0.1	0.00	0-145	2531.1	99.84
145-150	0.3	0.01	0-150	2531.5	99.86
150-155	0.7	0.03	0-155	2532.1	99.88
155-160	0.8	0.03	0-160	2532.9	99.91
160-165	0.8	0.03	0-165	2533.8	99.95
165-170	0.7	0.03	0-170	2534.5	99.98
170-175	0.5	0.02	0-175	2535.0	100.00
175-180	0.1	0.00	0-180	2535.1	100.00

6. Product Photo



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