



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 90HIDHB/850/BYP/EX39

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	George Yang <i>George Yang</i>
Report Number:	PKS180801080-10-1
Test Date:	2018-08-02 to 2018-08-06
Report Date:	2018-08-07
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 2018-08-01 and used for testing.

Model Tested: 90HIDHB/850/BYP/EX39
 Manufacturer: GREEN CREATIVE LTD
 Brand Name: GREEN CREATIVE
 Product Designation: Highbay
 Aging Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 100-277VAC 50/60Hz
 Rated Power: 90W
 Nominal CCT: 5000K
 Nominal Lumen Output: 12400lm

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
2.0m integrating sphere	EVERFINE	R98	G121960CS1361154D	2017-12-24	2018-12-24
spectroradiometer	EVERFINE	HAAS-2000	M12048CS1361148	2017-12-24	2018-12-24
Digital Power Meter	YOKOGAWA	WT210	91KB35700	2018-04-16	2019-04-16
Digital CC&CV DC Power Supply	EVERFINE	WY305	G115986CN1361134	2018-02-02	2019-02-02
Temperature/humidity/clock	KEJIAN	TA298	EE053	2017-11-14	2018-11-14
Standard Light Source	EVERFINE	D215S	G119786CS1361115	2017-12-19	2018-12-19
Intelligence ac power supply	EVERFINE	DPS1005	G119890CS1361121	2018-02-02	2019-02-02
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	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 $U=2.46\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=27\text{K}$ ($K=2$), 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 $U=0.18\%$ of rdg, AC Voltage $U=0.14\%$ of rdg, Power $U=0.16\%$ ($K=2$), 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: **1.0 hour**

Test orientation: **Downward**

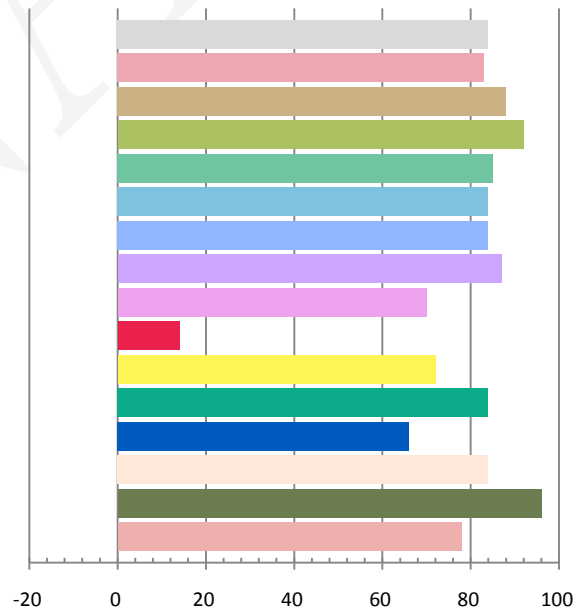
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.1	60	0.755	89.75	0.9902	12531	139.61

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
40.045	5196	0.00042	0.3399	0.3482	0.2092	0.4822

Color Rendering Index

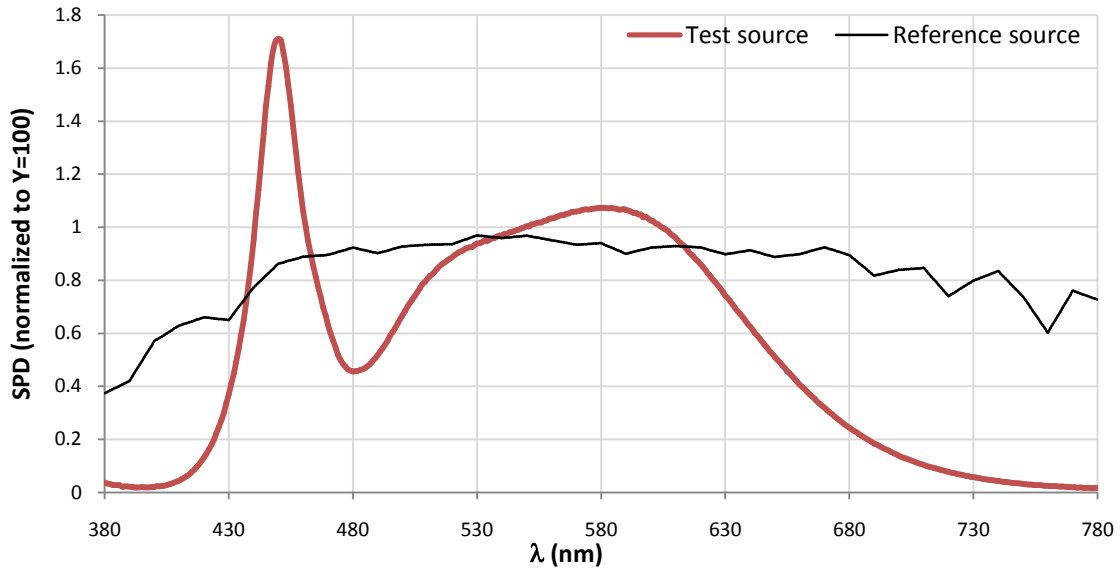
Ra			
84.0			
R1	R2	R3	R4
83	88	92	85
R5	R6	R7	R8
84	84	87	70
R9	R10	R11	R12
14	72	84	66
R13	R14	R15	
84	96	78	



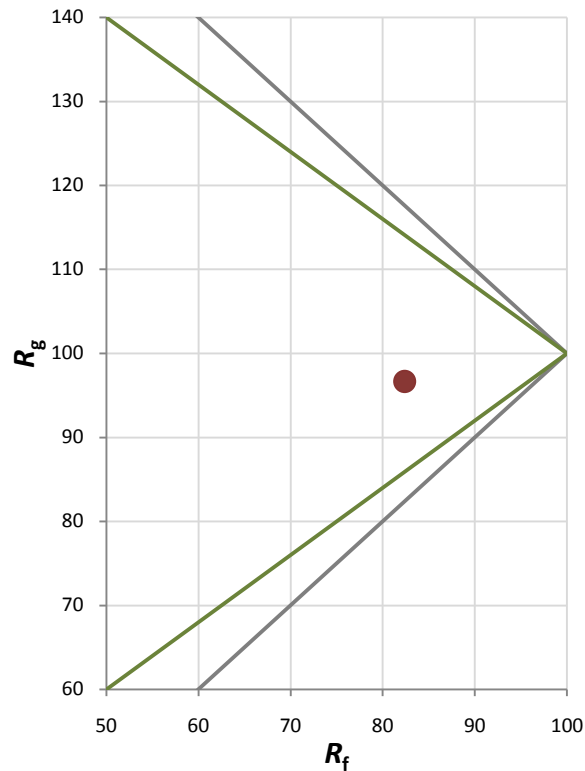
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	97

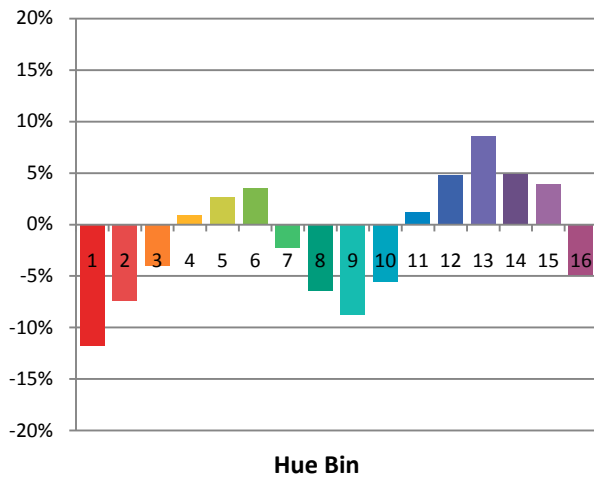
Spectral Power Distribution Comparison



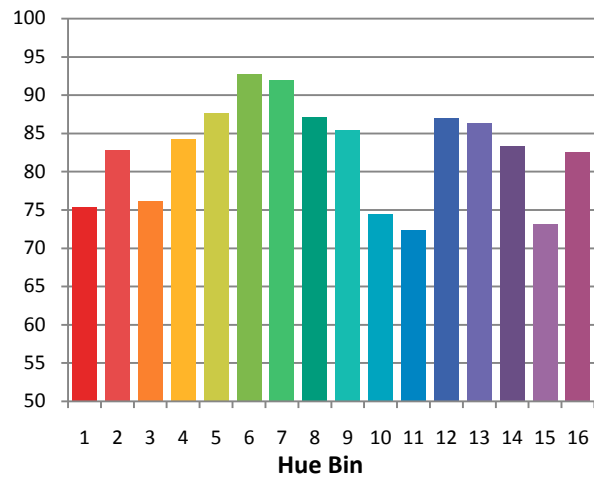
Plot of R_g versus R_f



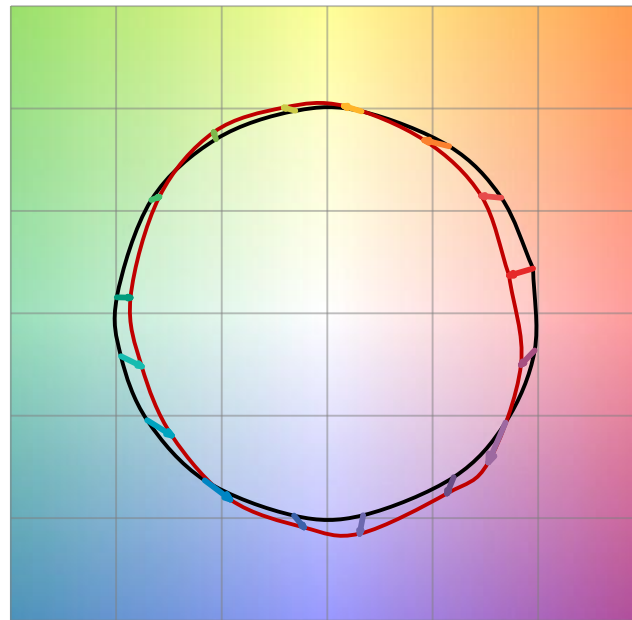
Chroma Shift by Hue



R_f by Hue

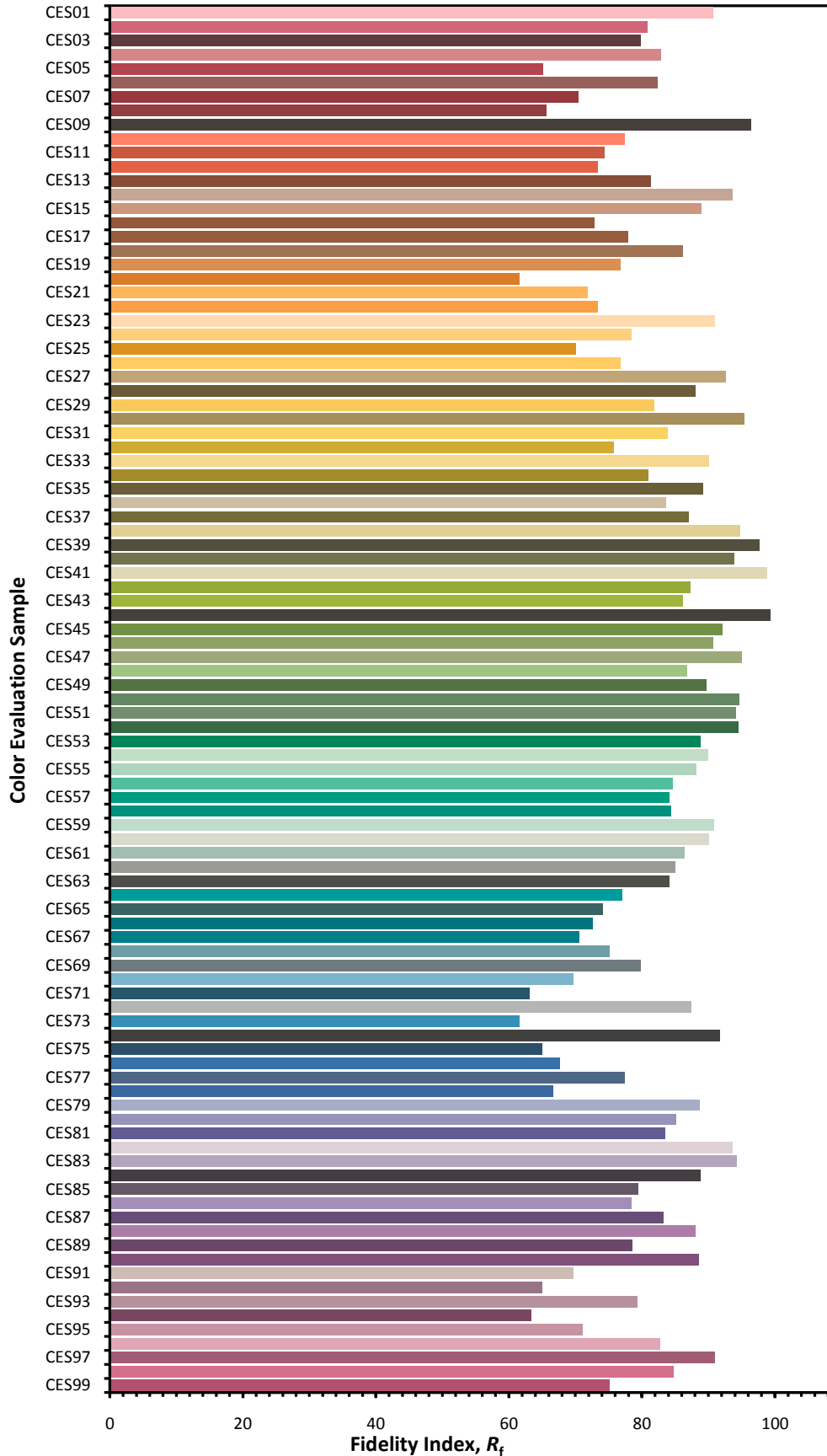


Color Vector Graphic

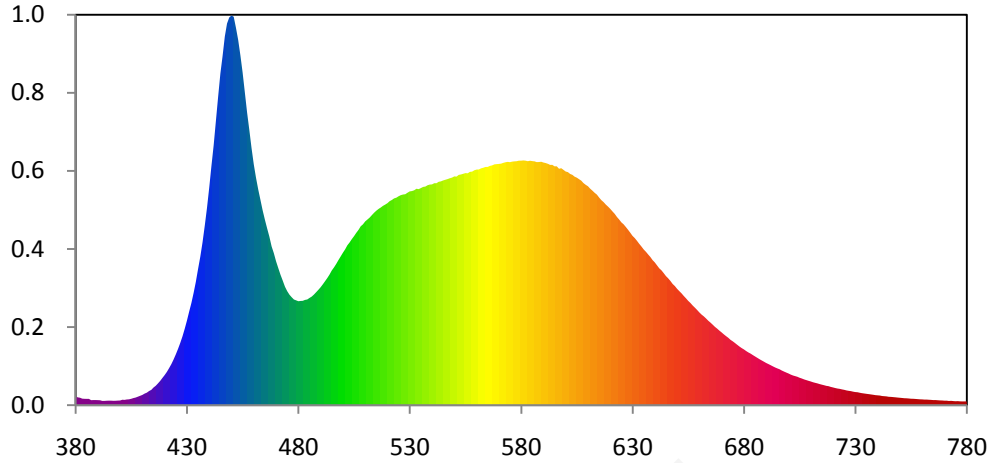


— Reference Illuminat — Test Source

Color Fidelity by CES Sample



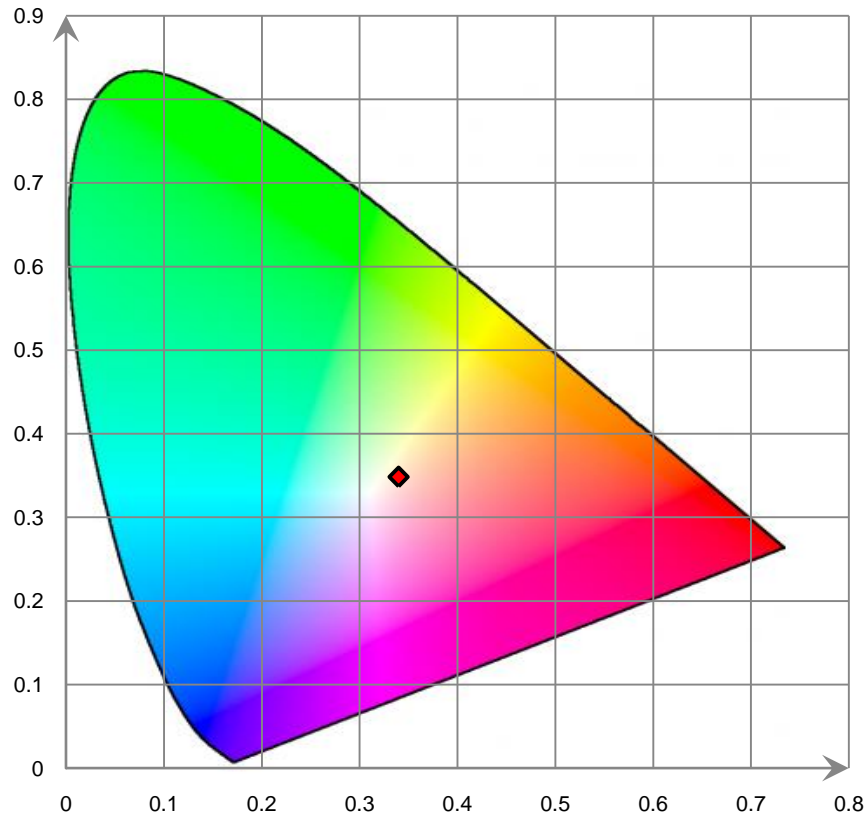
Relative Spectral Power Distribution



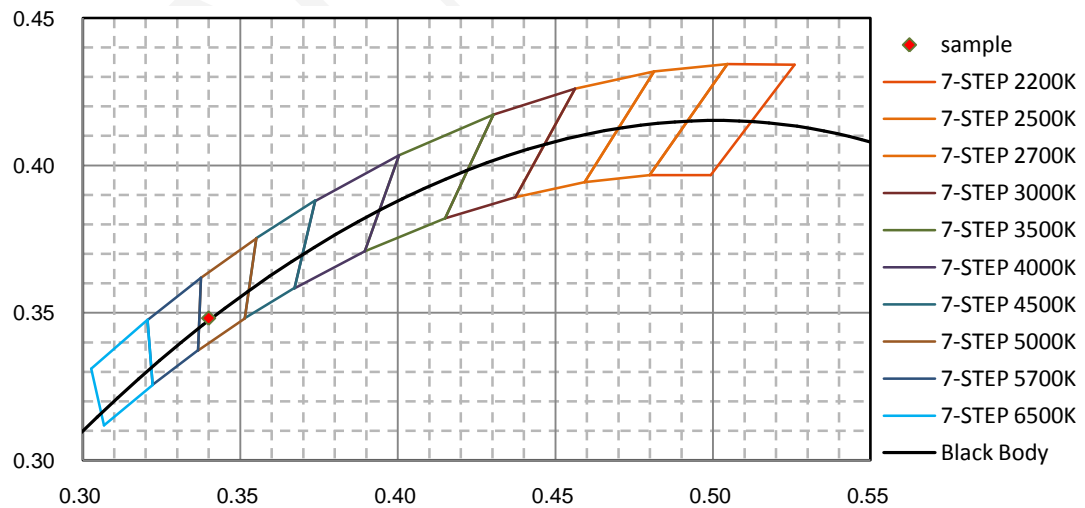
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	7.135E+00	421	2.682E+01	462	1.737E+02	503	1.310E+02	544	1.802E+02
381	6.288E+00	422	2.984E+01	463	1.652E+02	504	1.337E+02	545	1.809E+02
382	6.004E+00	423	3.303E+01	464	1.567E+02	505	1.361E+02	546	1.815E+02
383	5.261E+00	424	3.674E+01	465	1.492E+02	506	1.387E+02	547	1.820E+02
384	5.113E+00	425	4.085E+01	466	1.423E+02	507	1.411E+02	548	1.827E+02
385	5.080E+00	426	4.525E+01	467	1.357E+02	508	1.440E+02	549	1.832E+02
386	5.101E+00	427	5.011E+01	468	1.279E+02	509	1.456E+02	550	1.842E+02
387	4.013E+00	428	5.535E+01	469	1.224E+02	510	1.479E+02	551	1.840E+02
388	4.119E+00	429	6.145E+01	470	1.159E+02	511	1.495E+02	552	1.854E+02
389	4.115E+00	430	6.801E+01	471	1.103E+02	512	1.510E+02	553	1.857E+02
390	4.058E+00	431	7.531E+01	472	1.050E+02	513	1.530E+02	554	1.863E+02
391	3.949E+00	432	8.229E+01	473	1.003E+02	514	1.549E+02	555	1.868E+02
392	3.432E+00	433	9.038E+01	474	9.537E+01	515	1.565E+02	556	1.867E+02
393	3.444E+00	434	9.932E+01	475	9.180E+01	516	1.580E+02	557	1.878E+02
394	3.578E+00	435	1.096E+02	476	8.897E+01	517	1.591E+02	558	1.880E+02
395	3.661E+00	436	1.196E+02	477	8.695E+01	518	1.605E+02	559	1.891E+02
396	3.628E+00	437	1.310E+02	478	8.510E+01	519	1.615E+02	560	1.896E+02
397	3.506E+00	438	1.444E+02	479	8.439E+01	520	1.626E+02	561	1.897E+02
398	3.543E+00	439	1.587E+02	480	8.372E+01	521	1.642E+02	562	1.906E+02
399	3.669E+00	440	1.750E+02	481	8.390E+01	522	1.652E+02	563	1.911E+02
400	3.783E+00	441	1.925E+02	482	8.402E+01	523	1.665E+02	564	1.918E+02
401	4.356E+00	442	2.092E+02	483	8.473E+01	524	1.671E+02	565	1.918E+02
402	4.271E+00	443	2.289E+02	484	8.509E+01	525	1.682E+02	566	1.927E+02
403	4.585E+00	444	2.481E+02	485	8.630E+01	526	1.691E+02	567	1.930E+02
404	4.703E+00	445	2.669E+02	486	8.741E+01	527	1.696E+02	568	1.939E+02
405	5.153E+00	446	2.810E+02	487	8.906E+01	528	1.698E+02	569	1.941E+02
406	5.713E+00	447	2.968E+02	488	9.094E+01	529	1.710E+02	570	1.942E+02
407	6.164E+00	448	3.072E+02	489	9.290E+01	530	1.721E+02	571	1.945E+02
408	6.840E+00	449	3.122E+02	490	9.492E+01	531	1.724E+02	572	1.951E+02
409	7.531E+00	450	3.137E+02	491	9.732E+01	532	1.730E+02	573	1.956E+02
410	8.270E+00	451	3.127E+02	492	9.981E+01	533	1.742E+02	574	1.958E+02
411	9.306E+00	452	3.038E+02	493	1.024E+02	534	1.739E+02	575	1.956E+02
412	1.010E+01	453	2.940E+02	494	1.052E+02	535	1.748E+02	576	1.961E+02
413	1.137E+01	454	2.815E+02	495	1.084E+02	536	1.757E+02	577	1.963E+02
414	1.232E+01	455	2.677E+02	496	1.109E+02	537	1.760E+02	578	1.964E+02
415	1.420E+01	456	2.516E+02	497	1.137E+02	538	1.770E+02	579	1.968E+02
416	1.561E+01	457	2.357E+02	498	1.168E+02	539	1.776E+02	580	1.968E+02
417	1.750E+01	458	2.216E+02	499	1.197E+02	540	1.778E+02	581	1.970E+02
418	1.954E+01	459	2.071E+02	500	1.227E+02	541	1.787E+02	582	1.968E+02
419	2.190E+01	460	1.939E+02	501	1.254E+02	542	1.787E+02	583	1.964E+02
420	2.422E+01	461	1.832E+02	502	1.287E+02	543	1.798E+02	584	1.968E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.965E+02	626	1.456E+02	667	6.301E+01	708	2.019E+01	749	6.131E+00
586	1.963E+02	627	1.434E+02	668	6.161E+01	709	1.961E+01	750	5.978E+00
587	1.957E+02	628	1.412E+02	669	6.000E+01	710	1.909E+01	751	5.776E+00
588	1.957E+02	629	1.388E+02	670	5.855E+01	711	1.844E+01	752	5.607E+00
589	1.960E+02	630	1.363E+02	671	5.698E+01	712	1.797E+01	753	5.524E+00
590	1.953E+02	631	1.345E+02	672	5.557E+01	713	1.754E+01	754	5.369E+00
591	1.949E+02	632	1.323E+02	673	5.421E+01	714	1.698E+01	755	5.182E+00
592	1.943E+02	633	1.299E+02	674	5.257E+01	715	1.650E+01	756	5.152E+00
593	1.934E+02	634	1.277E+02	675	5.138E+01	716	1.606E+01	757	5.018E+00
594	1.935E+02	635	1.254E+02	676	5.006E+01	717	1.557E+01	758	4.885E+00
595	1.923E+02	636	1.235E+02	677	4.858E+01	718	1.528E+01	759	4.712E+00
596	1.923E+02	637	1.214E+02	678	4.721E+01	719	1.470E+01	760	4.650E+00
597	1.903E+02	638	1.193E+02	679	4.597E+01	720	1.427E+01	761	4.503E+00
598	1.908E+02	639	1.168E+02	680	4.489E+01	721	1.381E+01	762	4.492E+00
599	1.894E+02	640	1.149E+02	681	4.360E+01	722	1.338E+01	763	4.377E+00
600	1.881E+02	641	1.126E+02	682	4.248E+01	723	1.313E+01	764	4.278E+00
601	1.876E+02	642	1.102E+02	683	4.152E+01	724	1.269E+01	765	4.096E+00
602	1.861E+02	643	1.085E+02	684	4.032E+01	725	1.235E+01	766	4.132E+00
603	1.854E+02	644	1.063E+02	685	3.922E+01	726	1.189E+01	767	3.971E+00
604	1.840E+02	645	1.039E+02	686	3.812E+01	727	1.157E+01	768	3.843E+00
605	1.831E+02	646	1.021E+02	687	3.701E+01	728	1.130E+01	769	3.769E+00
606	1.819E+02	647	1.000E+02	688	3.600E+01	729	1.086E+01	770	3.626E+00
607	1.807E+02	648	9.758E+01	689	3.497E+01	730	1.057E+01	771	3.630E+00
608	1.788E+02	649	9.591E+01	690	3.395E+01	731	1.041E+01	772	3.395E+00
609	1.774E+02	650	9.367E+01	691	3.309E+01	732	9.997E+00	773	3.494E+00
610	1.763E+02	651	9.182E+01	692	3.219E+01	733	9.648E+00	774	3.296E+00
611	1.742E+02	652	9.001E+01	693	3.125E+01	734	9.388E+00	775	3.180E+00
612	1.727E+02	653	8.791E+01	694	3.036E+01	735	9.159E+00	776	3.272E+00
613	1.710E+02	654	8.604E+01	695	2.959E+01	736	8.883E+00	777	3.086E+00
614	1.695E+02	655	8.394E+01	696	2.890E+01	737	8.636E+00	778	3.031E+00
615	1.671E+02	656	8.228E+01	697	2.791E+01	738	8.389E+00	779	3.035E+00
616	1.651E+02	657	8.024E+01	698	2.706E+01	739	8.089E+00	780	3.038E+00
617	1.635E+02	658	7.848E+01	699	2.627E+01	740	7.921E+00		
618	1.615E+02	659	7.663E+01	700	2.551E+01	741	7.773E+00		
619	1.599E+02	660	7.465E+01	701	2.463E+01	742	7.398E+00		
620	1.580E+02	661	7.291E+01	702	2.393E+01	743	7.240E+00		
621	1.560E+02	662	7.148E+01	703	2.338E+01	744	7.057E+00		
622	1.540E+02	663	6.980E+01	704	2.285E+01	745	6.763E+00		
623	1.515E+02	664	6.799E+01	705	2.207E+01	746	6.650E+00		
624	1.495E+02	665	6.644E+01	706	2.148E+01	747	6.495E+00		
625	1.472E+02	666	6.479E+01	707	2.074E+01	748	6.312E+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**

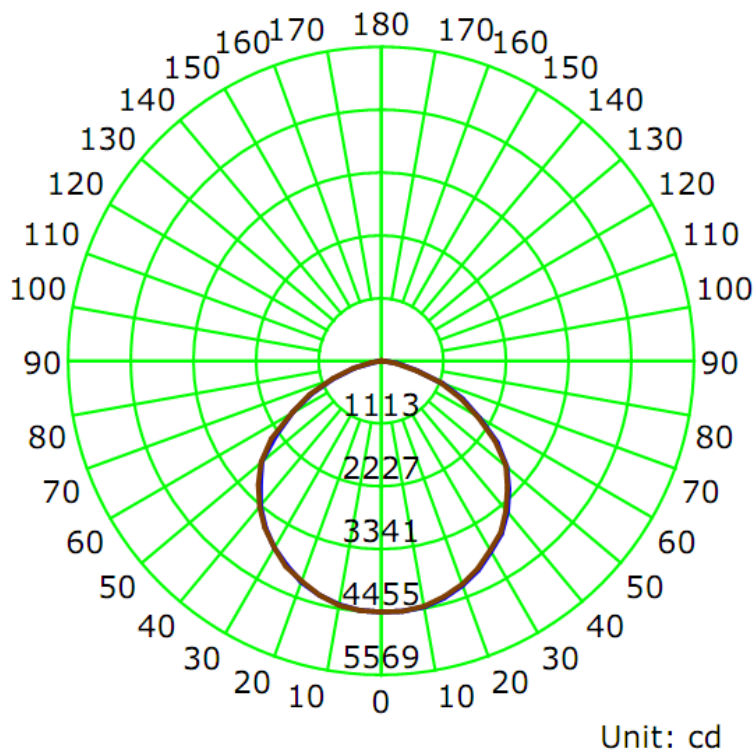
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.7500	89.72	0.9970

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
12589.9	140.37	4455.8	1.29	1.29

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	113.8	113.8	114.2	113.9	113.9
Field Angle (10% I _{max}):	153.6	153.6	154.0	154.1	153.8

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	4450	4450	4450	4450	4450	4450	4450	4450
5.0°	4452	4450	4446	4446	4450	4456	4446	4445
10.0°	4420	4410	4405	4418	4411	4405	4398	4397
15.0°	4346	4341	4357	4356	4327	4319	4292	4309
20.0°	4236	4235	4247	4249	4217	4198	4184	4191
25.0°	4090	4091	4102	4093	4069	4062	4047	4048
30.0°	3904	3912	3916	3922	3886	3887	3871	3871
35.0°	3737	3723	3730	3708	3704	3689	3670	3657
40.0°	3497	3505	3501	3492	3459	3460	3409	3403
45.0°	3208	3186	3182	3190	3176	3154	3131	3128
50.0°	2922	2931	2912	2931	2892	2887	2855	2847
55.0°	2519	2520	2529	2515	2477	2442	2415	2395
60.0°	2027	2025	2042	2014	2002	1991	1942	1923
65.0°	1593	1628	1612	1599	1568	1551	1500	1496
70.0°	1178	1180	1196	1124	1128	1124	1036	984
75.0°	667	684	673	671	656	619	591	571
80.0°	294	315	315	287	273	264	236	214
85.0°	74	76	75	70	70	66	58	57
90.0°	0	0	10	8	8	11	10	7
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	7	0	7
160.0°	0	7	0	11	11	13	12	12
165.0°	0	13	0	11	15	12	14	13
170.0°	0	13	10	0	13	10	14	12
175.0°	0	0	0	7	8	9	9	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°	4450	4450	4450	4450	4450	4450	4450	4450
5.0°	4435	4432	4432	4438	4439	4452	4444	4455
10.0°	4392	4379	4376	4397	4399	4422	4420	4426
15.0°	4295	4289	4287	4292	4301	4345	4347	4348
20.0°	4168	4179	4165	4156	4156	4194	4209	4222
25.0°	3997	4013	4004	4013	4017	4031	4035	4062
30.0°	3818	3810	3813	3819	3822	3847	3847	3876
35.0°	3613	3621	3602	3618	3620	3642	3641	3669
40.0°	3354	3369	3367	3377	3384	3385	3419	3439
45.0°	3054	3044	3066	3097	3107	3113	3139	3159
50.0°	2780	2746	2780	2802	2793	2848	2861	2874
55.0°	2307	2316	2297	2338	2396	2388	2405	2442
60.0°	1813	1787	1798	1808	1839	1901	1920	1962
65.0°	1358	1350	1355	1390	1424	1477	1465	1504
70.0°	915	899	886	916	936	997	1018	1061
75.0°	488	468	472	494	531	563	593	611
80.0°	168	158	167	178	186	210	226	241
85.0°	42	39	40	43	49	58	57	63
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	7	10	8	8	10
165.0°	7	7	11	9	16	13	16	11
170.0°	9	0	11	12	13	13	16	13
175.0°	0	0	0	0	0	0	0	10
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	106.3	0.84	0-5	106.3	0.84
5-10	316.6	2.51	0-10	422.9	3.36
10-15	517.7	4.11	0-15	940.6	7.47
15-20	702.4	5.58	0-20	1642.9	13.05
20-25	865.1	6.87	0-25	2508.1	19.92
25-30	1001.3	7.95	0-30	3509.3	27.87
30-35	1108.7	8.81	0-35	4618.0	36.68
35-40	1183.2	9.40	0-40	5801.2	46.08
40-45	1214.6	9.65	0-45	7015.8	55.73
45-50	1209.8	9.61	0-50	8225.5	65.33
50-55	1146.4	9.11	0-55	9372.0	74.44
55-60	1003.9	7.97	0-60	10375.9	82.41
60-65	830.5	6.60	0-65	11206.4	89.01
65-70	640.1	5.08	0-70	11846.5	94.10
70-75	423.6	3.36	0-75	12270.1	97.46
75-80	218.8	1.74	0-80	12488.8	99.20
80-85	79.2	0.63	0-85	12568.1	99.83
85-90	16.9	0.13	0-90	12585.0	99.96
90-95	0.9	0.01	0-95	12585.9	99.97
95-100	0.0	0.00	0-100	12585.9	99.97
100-105	0.0	0.00	0-105	12585.9	99.97
105-110	0.0	0.00	0-110	12585.9	99.97
110-115	0.0	0.00	0-115	12585.9	99.97
115-120	0.0	0.00	0-120	12585.9	99.97
120-125	0.0	0.00	0-125	12585.9	99.97
125-130	0.0	0.00	0-130	12585.9	99.97
130-135	0.0	0.00	0-135	12585.9	99.97
135-140	0.0	0.00	0-140	12585.9	99.97
140-145	0.0	0.00	0-145	12585.9	99.97
145-150	0.0	0.00	0-150	12585.9	99.97
150-155	0.1	0.00	0-155	12586.0	99.97
155-160	0.8	0.01	0-160	12586.8	99.98
160-165	1.4	0.01	0-165	12588.2	99.99
165-170	1.2	0.01	0-170	12589.4	100.00
170-175	0.5	0.00	0-175	12589.9	100.00
175-180	0.0	0.00	0-180	12589.9	100.00

6. Product Photo



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