



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/840/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
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/840/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: 4000K
 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**

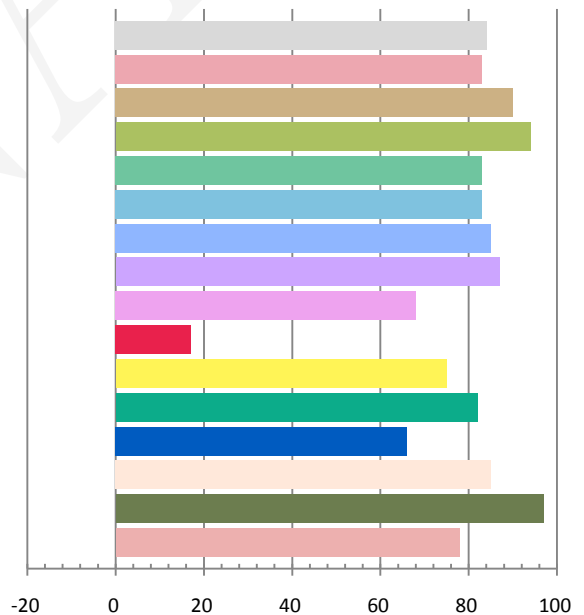
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.7413	88.03	0.9896	12410	140.98

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
38.887	4068	-0.00162	0.3764	0.3708	0.2248	0.4983

Color Rendering Index

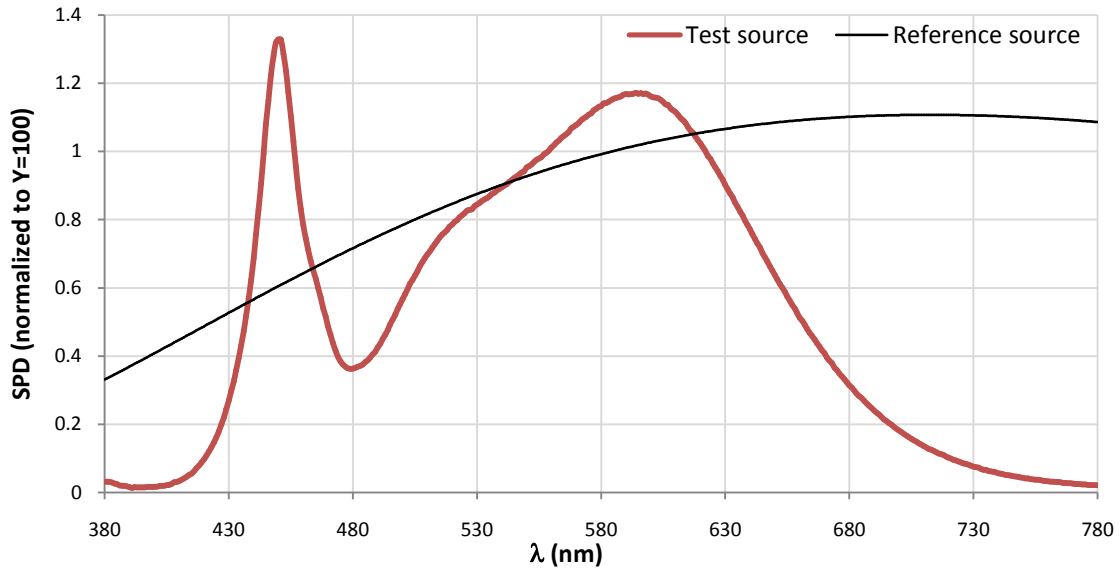
Ra			
84.2			
R1	R2	R3	R4
83	90	94	83
R5	R6	R7	R8
83	85	87	68
R9	R10	R11	R12
17	75	82	66
R13	R14	R15	
85	97	78	



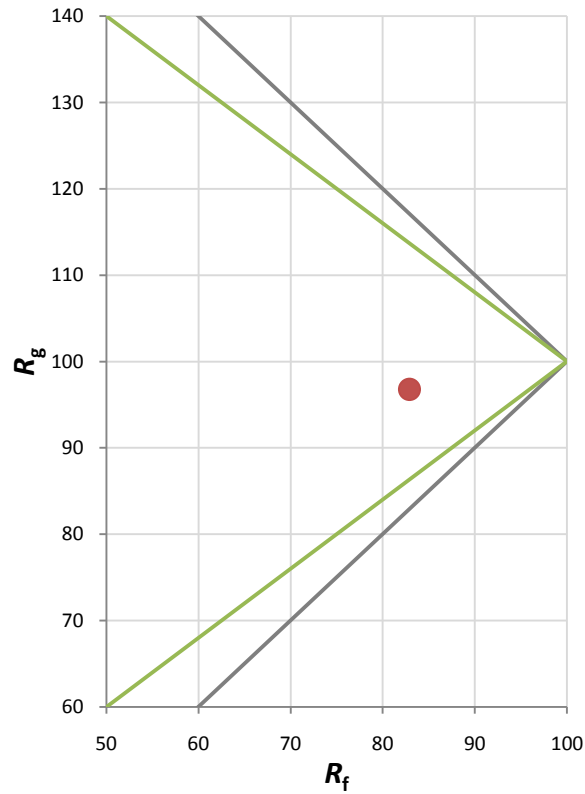
Fidelity Index and Gamut Index

Fidelity Index R_f	83
Gamut Index R_g	97

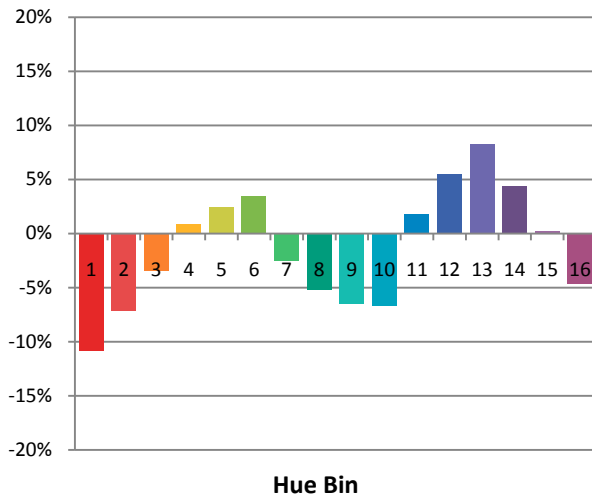
Spectral Power Distribution Comparison



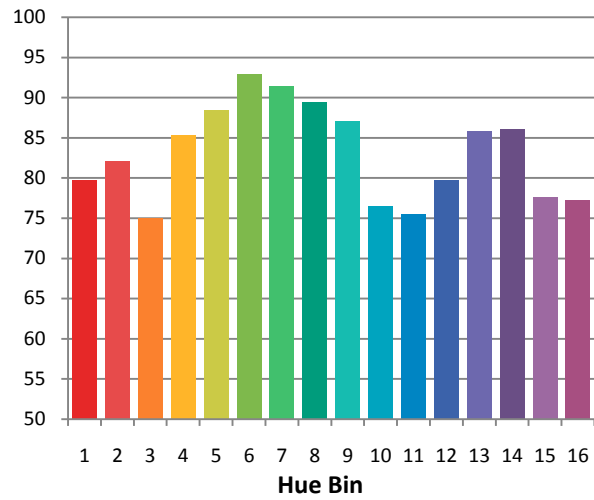
Plot of R_g versus R_f



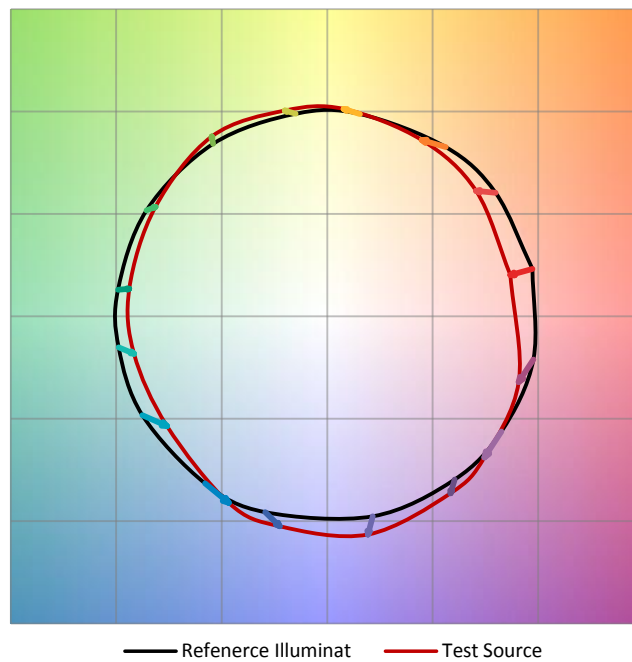
Chroma Shift by Hue



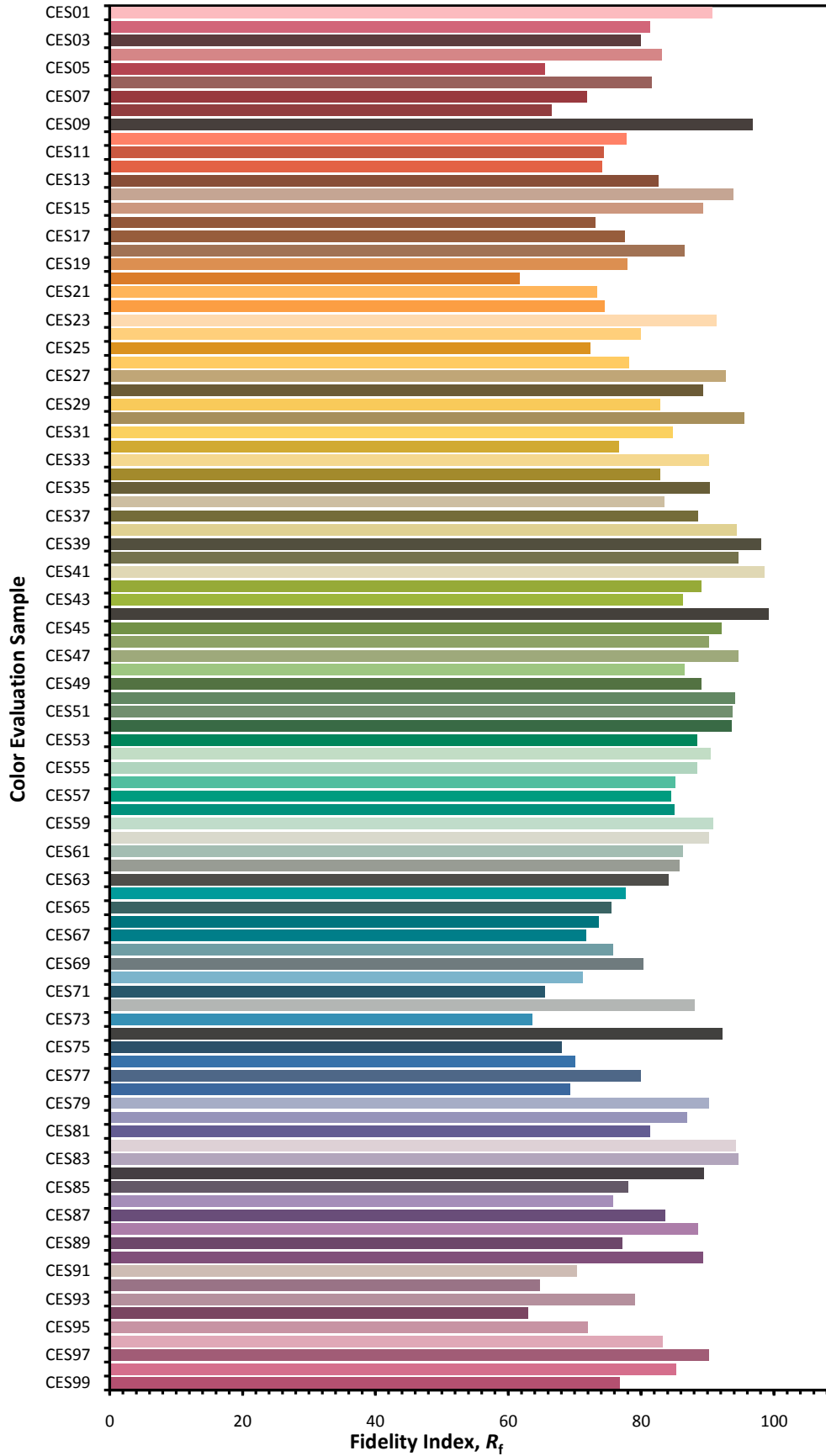
R_f by Hue



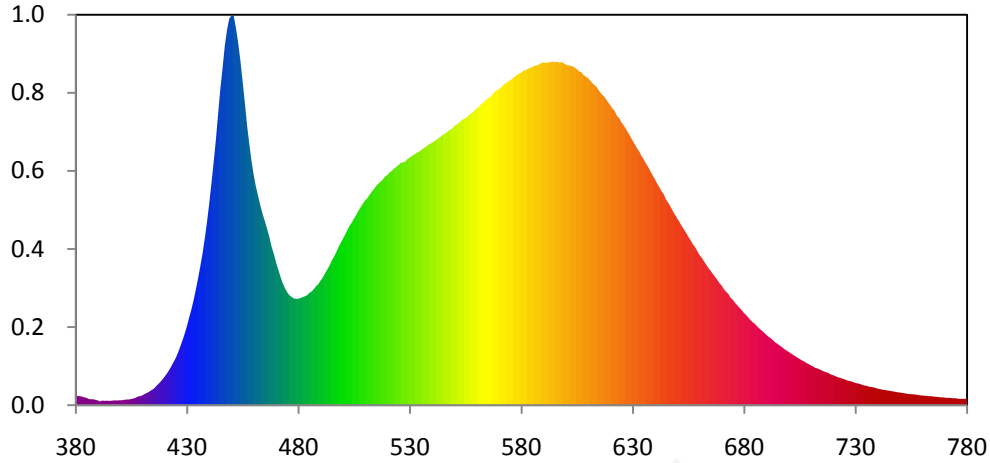
Color Vector Graphic



Color Fidelity by CES Sample



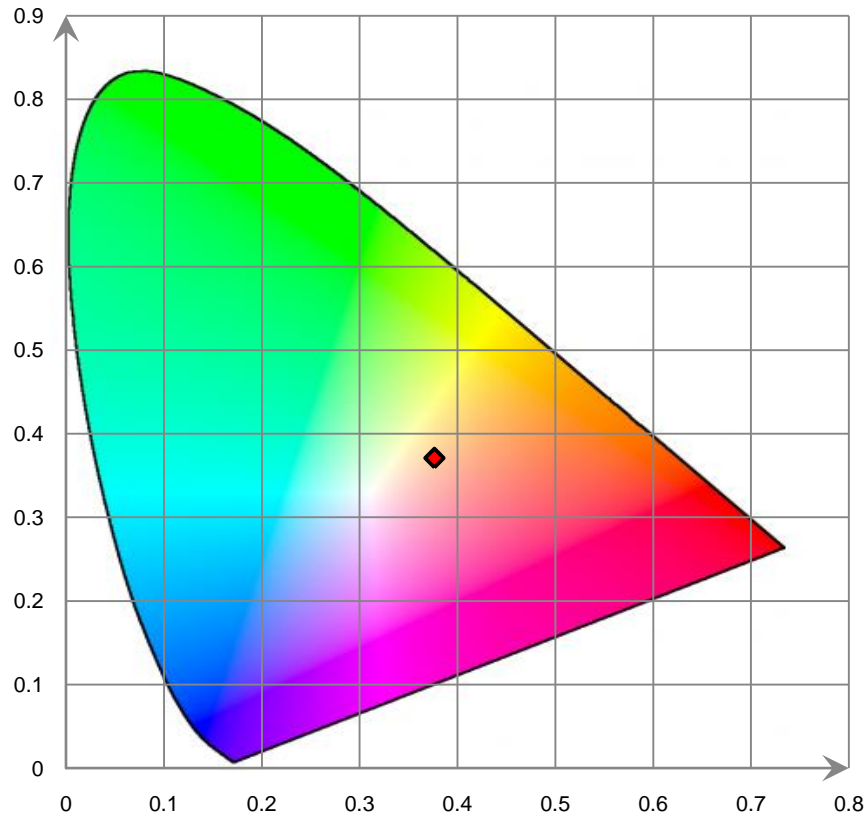
Relative Spectral Power Distribution



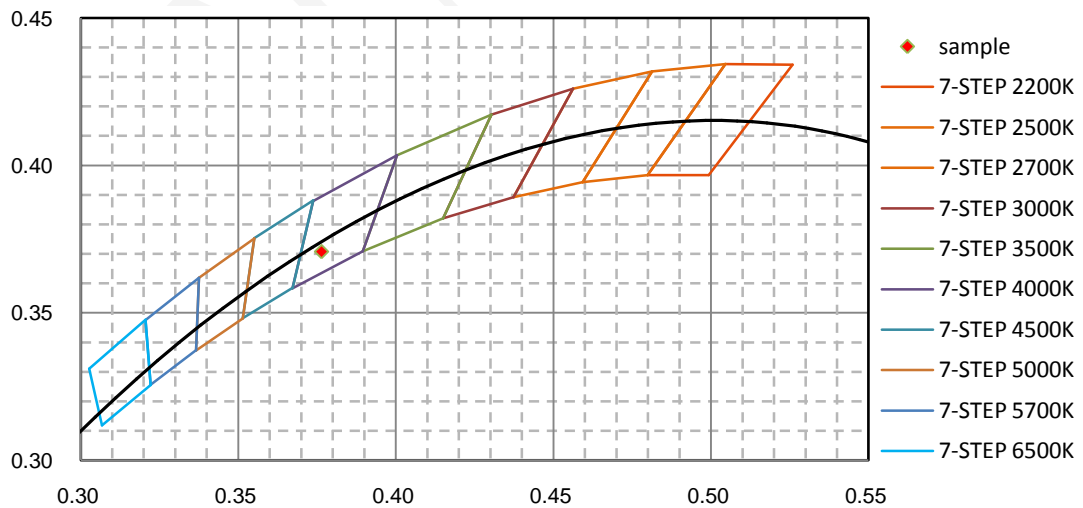
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	5.594E+00	421	1.957E+01	462	1.293E+02	503	1.111E+02	544	1.664E+02
381	5.743E+00	422	2.173E+01	463	1.234E+02	504	1.132E+02	545	1.676E+02
382	5.533E+00	423	2.411E+01	464	1.183E+02	505	1.156E+02	546	1.684E+02
383	5.291E+00	424	2.672E+01	465	1.139E+02	506	1.179E+02	547	1.694E+02
384	4.808E+00	425	2.932E+01	466	1.091E+02	507	1.205E+02	548	1.705E+02
385	4.504E+00	426	3.255E+01	467	1.041E+02	508	1.227E+02	549	1.712E+02
386	3.793E+00	427	3.627E+01	468	9.819E+01	509	1.249E+02	550	1.731E+02
387	3.659E+00	428	4.012E+01	469	9.374E+01	510	1.269E+02	551	1.738E+02
388	3.650E+00	429	4.429E+01	470	8.847E+01	511	1.283E+02	552	1.748E+02
389	3.311E+00	430	4.898E+01	471	8.402E+01	512	1.304E+02	553	1.760E+02
390	2.946E+00	431	5.422E+01	472	7.942E+01	513	1.323E+02	554	1.772E+02
391	2.347E+00	432	5.933E+01	473	7.558E+01	514	1.341E+02	555	1.779E+02
392	2.842E+00	433	6.509E+01	474	7.246E+01	515	1.359E+02	556	1.787E+02
393	2.673E+00	434	7.164E+01	475	6.995E+01	516	1.373E+02	557	1.802E+02
394	2.786E+00	435	7.852E+01	476	6.811E+01	517	1.386E+02	558	1.811E+02
395	2.673E+00	436	8.600E+01	477	6.705E+01	518	1.399E+02	559	1.823E+02
396	2.703E+00	437	9.390E+01	478	6.609E+01	519	1.417E+02	560	1.838E+02
397	2.933E+00	438	1.032E+02	479	6.588E+01	520	1.426E+02	561	1.849E+02
398	2.981E+00	439	1.134E+02	480	6.592E+01	521	1.442E+02	562	1.865E+02
399	2.925E+00	440	1.248E+02	481	6.639E+01	522	1.451E+02	563	1.875E+02
400	3.077E+00	441	1.374E+02	482	6.695E+01	523	1.466E+02	564	1.888E+02
401	3.058E+00	442	1.507E+02	483	6.744E+01	524	1.476E+02	565	1.899E+02
402	3.357E+00	443	1.645E+02	484	6.820E+01	525	1.488E+02	566	1.909E+02
403	3.517E+00	444	1.805E+02	485	6.961E+01	526	1.501E+02	567	1.921E+02
404	3.542E+00	445	1.961E+02	486	7.045E+01	527	1.505E+02	568	1.939E+02
405	3.863E+00	446	2.088E+02	487	7.198E+01	528	1.508E+02	569	1.949E+02
406	4.111E+00	447	2.227E+02	488	7.369E+01	529	1.525E+02	570	1.958E+02
407	4.651E+00	448	2.325E+02	489	7.504E+01	530	1.534E+02	571	1.968E+02
408	5.370E+00	449	2.395E+02	490	7.721E+01	531	1.543E+02	572	1.984E+02
409	5.614E+00	450	2.413E+02	491	7.912E+01	532	1.552E+02	573	1.993E+02
410	6.103E+00	451	2.412E+02	492	8.173E+01	533	1.562E+02	574	2.002E+02
411	6.890E+00	452	2.336E+02	493	8.401E+01	534	1.569E+02	575	2.013E+02
412	7.539E+00	453	2.245E+02	494	8.653E+01	535	1.578E+02	576	2.020E+02
413	8.330E+00	454	2.133E+02	495	8.948E+01	536	1.590E+02	577	2.035E+02
414	9.292E+00	455	2.006E+02	496	9.197E+01	537	1.598E+02	578	2.044E+02
415	1.006E+01	456	1.872E+02	497	9.464E+01	538	1.609E+02	579	2.054E+02
416	1.147E+01	457	1.733E+02	498	9.777E+01	539	1.618E+02	580	2.059E+02
417	1.293E+01	458	1.618E+02	499	1.003E+02	540	1.626E+02	581	2.072E+02
418	1.430E+01	459	1.512E+02	500	1.029E+02	541	1.635E+02	582	2.075E+02
419	1.595E+01	460	1.423E+02	501	1.056E+02	542	1.644E+02	583	2.082E+02
420	1.767E+01	461	1.352E+02	502	1.084E+02	543	1.655E+02	584	2.089E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.096E+02	626	1.734E+02	667	7.961E+01	708	2.619E+01	749	7.964E+00
586	2.102E+02	627	1.712E+02	668	7.770E+01	709	2.548E+01	750	7.855E+00
587	2.105E+02	628	1.688E+02	669	7.561E+01	710	2.473E+01	751	7.537E+00
588	2.111E+02	629	1.665E+02	670	7.409E+01	711	2.405E+01	752	7.405E+00
589	2.119E+02	630	1.639E+02	671	7.187E+01	712	2.309E+01	753	7.123E+00
590	2.123E+02	631	1.616E+02	672	7.030E+01	713	2.275E+01	754	6.940E+00
591	2.121E+02	632	1.592E+02	673	6.887E+01	714	2.212E+01	755	6.848E+00
592	2.122E+02	633	1.572E+02	674	6.655E+01	715	2.148E+01	756	6.742E+00
593	2.124E+02	634	1.544E+02	675	6.532E+01	716	2.086E+01	757	6.610E+00
594	2.129E+02	635	1.523E+02	676	6.339E+01	717	2.038E+01	758	6.351E+00
595	2.124E+02	636	1.497E+02	677	6.195E+01	718	1.986E+01	759	6.071E+00
596	2.127E+02	637	1.475E+02	678	6.034E+01	719	1.903E+01	760	6.026E+00
597	2.123E+02	638	1.449E+02	679	5.885E+01	720	1.858E+01	761	5.865E+00
598	2.125E+02	639	1.425E+02	680	5.715E+01	721	1.803E+01	762	5.776E+00
599	2.119E+02	640	1.401E+02	681	5.586E+01	722	1.741E+01	763	5.595E+00
600	2.110E+02	641	1.373E+02	682	5.424E+01	723	1.697E+01	764	5.552E+00
601	2.105E+02	642	1.352E+02	683	5.265E+01	724	1.655E+01	765	5.391E+00
602	2.103E+02	643	1.326E+02	684	5.128E+01	725	1.609E+01	766	5.182E+00
603	2.100E+02	644	1.306E+02	685	5.031E+01	726	1.552E+01	767	5.089E+00
604	2.091E+02	645	1.275E+02	686	4.869E+01	727	1.510E+01	768	4.891E+00
605	2.082E+02	646	1.254E+02	687	4.741E+01	728	1.479E+01	769	4.876E+00
606	2.067E+02	647	1.231E+02	688	4.618E+01	729	1.432E+01	770	4.708E+00
607	2.064E+02	648	1.205E+02	689	4.502E+01	730	1.377E+01	771	4.523E+00
608	2.045E+02	649	1.181E+02	690	4.364E+01	731	1.348E+01	772	4.539E+00
609	2.036E+02	650	1.158E+02	691	4.245E+01	732	1.322E+01	773	4.417E+00
610	2.027E+02	651	1.136E+02	692	4.152E+01	733	1.260E+01	774	4.283E+00
611	2.011E+02	652	1.112E+02	693	4.030E+01	734	1.216E+01	775	4.314E+00
612	1.994E+02	653	1.091E+02	694	3.890E+01	735	1.203E+01	776	4.040E+00
613	1.982E+02	654	1.069E+02	695	3.805E+01	736	1.149E+01	777	3.863E+00
614	1.969E+02	655	1.045E+02	696	3.697E+01	737	1.130E+01	778	3.926E+00
615	1.947E+02	656	1.023E+02	697	3.610E+01	738	1.107E+01	779	3.931E+00
616	1.928E+02	657	9.987E+01	698	3.491E+01	739	1.070E+01	780	3.935E+00
617	1.916E+02	658	9.805E+01	699	3.393E+01	740	1.023E+01		
618	1.897E+02	659	9.564E+01	700	3.311E+01	741	9.997E+00		
619	1.876E+02	660	9.314E+01	701	3.214E+01	742	9.660E+00		
620	1.859E+02	661	9.145E+01	702	3.125E+01	743	9.444E+00		
621	1.838E+02	662	8.926E+01	703	3.036E+01	744	9.181E+00		
622	1.821E+02	663	8.721E+01	704	2.947E+01	745	9.005E+00		
623	1.793E+02	664	8.512E+01	705	2.862E+01	746	8.743E+00		
624	1.778E+02	665	8.331E+01	706	2.779E+01	747	8.501E+00		
625	1.752E+02	666	8.143E+01	707	2.708E+01	748	8.265E+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**

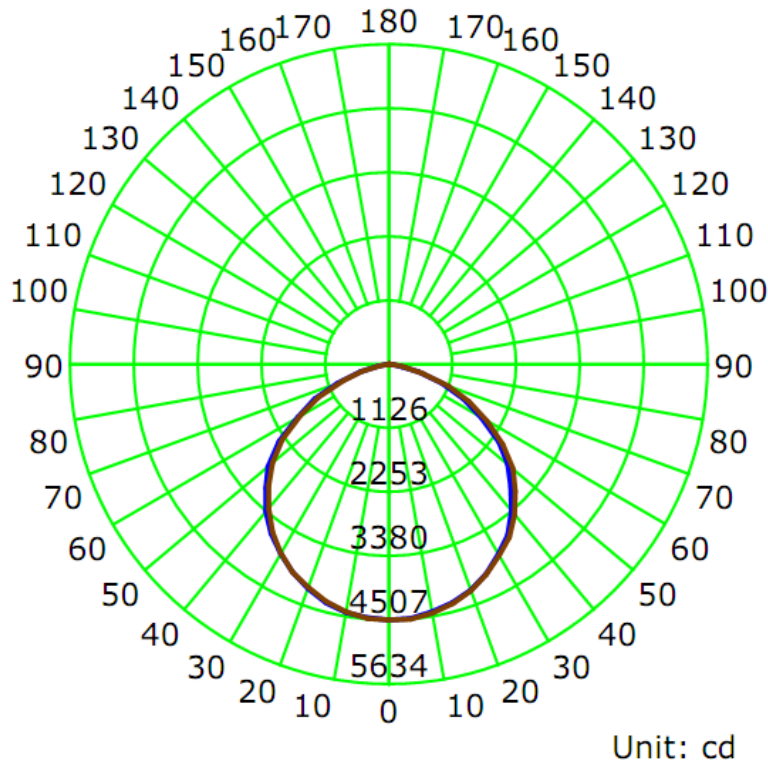
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.7360	88.01	0.9970

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
12435.1	141.34	4507.8	1.27	1.28

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	112.4	112.4	112.8	112.5	112.5
Field Angle (10% I _{max}):	152.8	153.0	153.0	152.9	152.9

Luminous Intensity (cd) Distribution Data

C Y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	4508	4508	4508	4508	4508	4508	4508	4508
5.0°	4490	4486	4492	4501	4508	4500	4499	4497
10.0°	4427	4428	4435	4441	4452	4454	4445	4446
15.0°	4350	4349	4369	4364	4357	4346	4347	4370
20.0°	4228	4227	4254	4245	4242	4238	4232	4241
25.0°	4068	4084	4102	4102	4089	4084	4094	4080
30.0°	3871	3903	3913	3921	3904	3920	3902	3914
35.0°	3664	3676	3675	3721	3712	3698	3686	3702
40.0°	3383	3405	3425	3460	3460	3463	3436	3424
45.0°	3047	3058	3094	3133	3152	3172	3171	3161
50.0°	2744	2771	2795	2848	2868	2899	2885	2871
55.0°	2378	2399	2429	2445	2452	2465	2471	2467
60.0°	1885	1886	1970	1983	1998	2021	2017	1998
65.0°	1455	1504	1529	1541	1572	1562	1524	1559
70.0°	991	1013	1098	1102	1128	1167	1114	1058
75.0°	544	599	583	611	619	617	613	605
80.0°	235	248	260	263	261	256	254	251
85.0°	56	58	53	67	66	64	64	64
90.0°	0	0	0	0	0	0	0	8
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	7	0	0	0
160.0°	0	8	0	8	14	11	10	12
165.0°	9	11	9	14	18	0	9	13
170.0°	13	14	15	13	12	9	9	15
175.0°	0	8	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°	4508	4508	4508	4508	4508	4508	4508	4508
5.0°	4477	4471	4468	4476	4486	4491	4490	4485
10.0°	4434	4412	4404	4416	4420	4440	4452	4439
15.0°	4347	4327	4327	4314	4322	4336	4351	4353
20.0°	4205	4208	4207	4175	4183	4186	4198	4234
25.0°	4038	4046	4030	4016	4037	4013	4027	4063
30.0°	3848	3851	3833	3815	3830	3825	3835	3865
35.0°	3640	3651	3620	3612	3603	3602	3583	3601
40.0°	3386	3369	3363	3366	3322	3297	3296	3304
45.0°	3084	3059	3069	3042	3016	2991	2999	2981
50.0°	2800	2785	2768	2729	2698	2694	2711	2703
55.0°	2368	2361	2298	2294	2317	2283	2264	2282
60.0°	1864	1825	1827	1787	1801	1808	1790	1815
65.0°	1449	1379	1384	1386	1376	1362	1341	1362
70.0°	972	953	927	890	866	872	875	893
75.0°	541	541	514	486	492	486	487	496
80.0°	199	191	188	183	178	175	191	198
85.0°	43	49	47	40	40	48	47	50
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	8	0	0	7	10	0
165.0°	9	10	11	13	17	13	12	14
170.0°	0	8	12	11	14	14	15	13
175.0°	0	0	0	0	0	7	0	7
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	107.5	0.86	0-5	107.5	0.86
5-10	319.2	2.57	0-10	426.7	3.43
10-15	520.8	4.19	0-15	947.5	7.62
15-20	705.8	5.68	0-20	1653.3	13.30
20-25	868.4	6.98	0-25	2521.7	20.28
25-30	1003.9	8.07	0-30	3525.6	28.35
30-35	1108.1	8.91	0-35	4633.7	37.26
35-40	1174.2	9.44	0-40	5807.8	46.71
40-45	1196.4	9.62	0-45	7004.2	56.33
45-50	1184.6	9.53	0-50	8188.8	65.85
50-55	1121.7	9.02	0-55	9310.5	74.87
55-60	985.9	7.93	0-60	10296.4	82.80
60-65	813.8	6.54	0-65	11110.2	89.35
65-70	620.4	4.99	0-70	11730.7	94.34
70-75	404.4	3.25	0-75	12135.0	97.59
75-80	206.7	1.66	0-80	12341.8	99.25
80-85	74.5	0.60	0-85	12416.3	99.85
85-90	14.8	0.12	0-90	12431.0	99.97
90-95	0.1	0.00	0-95	12431.2	99.97
95-100	0.0	0.00	0-100	12431.2	99.97
100-105	0.0	0.00	0-105	12431.2	99.97
105-110	0.0	0.00	0-110	12431.2	99.97
110-115	0.0	0.00	0-115	12431.2	99.97
115-120	0.0	0.00	0-120	12431.2	99.97
120-125	0.0	0.00	0-125	12431.2	99.97
125-130	0.0	0.00	0-130	12431.2	99.97
130-135	0.0	0.00	0-135	12431.2	99.97
135-140	0.0	0.00	0-140	12431.2	99.97
140-145	0.0	0.00	0-145	12431.2	99.97
145-150	0.0	0.00	0-150	12431.2	99.97
150-155	0.1	0.00	0-155	12431.2	99.97
155-160	0.6	0.01	0-160	12431.8	99.97
160-165	1.4	0.01	0-165	12433.2	99.99
165-170	1.4	0.01	0-170	12434.6	100.00
170-175	0.5	0.00	0-175	12435.0	100.00
175-180	0.0	0.00	0-180	12435.1	100.00

6. Product Photo



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