

IES LM-79-08

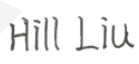
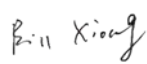
MEASUREMENT AND TEST REPORT

For

GREEN CREATIVE LTD

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

Test Model: 16.5A21/830/277V/R

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Hill Liu 
Report Number:	R1KS181227091-10-3
Test Date:	2018-12-28 to 2018-12-30
Report Date:	2019-05-21
Reviewed By:	Bill Xiong / EE Engineer 
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax: +86-0769-86858888
Test Facility:	Test facility was located at No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China.
Accreditation:	The IAS Accreditation Number TL-460.

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. (Dongguan). 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 2018-18-28 and used for testing.

Model Tested: 16.5A21/830/277V/R
 Manufacturer: GREEN CREATIVE LTD
 Brand Name: GREEN CREATIVE
 Product Designation: LED Lamp
 Aging Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120VAC 60Hz
 Rated Power: 16.5W
 Nominal CCT: 3000K
 Nominal Lumen Output: 2000lm

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 (This method is not in IAS accreditation scope)

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
2.0m integrating sphere	EVERFINE	R98	11010018	2018-12-13	2019-12-13
spectroradiometer	EVERFINE	HAAS-2000	20140912	2018-12-13	2019-12-13
Digital Power Meter	EVERFINE	PF2010A	1011004	2018-07-28	2019-07-28
Digital CC&CV DC Power Supply	EVERFINE	WY305-V1	1101047	2018-06-15	2019-06-15
Rapid Recording Photometer	EVERFINE	PHOTO-2000F	1007010	2018-12-13	2019-12-13
Standard Light Source	EVERFINE	D204	G100283CJ6351178	2018-12-24	2019-12-24
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010-YF	1011001T	2019-03-19	2020-03-18
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2019-03-19	2020-03-18
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2019-03-26	2020-03-25
Digital power meter	YOKOGAWA	WT-210	91j926132	2019-03-26	2020-03-25
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	2019-03-18	2020-03-17
Wireless Remote Sensor	N/A	433MHz	N/A	2019-03-17	2020-03-16
Standard Light Source	EVERFINE	D908	1012001	2018-12-24	2019-12-24

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) 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 $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=31\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.1$ ($K=2$), at the 95% confidence level.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.18\%$ of rdg, Power $U=0.46\%$ ($K=2$), 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 intensity is $U=2.82\%$ ($K=2$), 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: **Base Up**

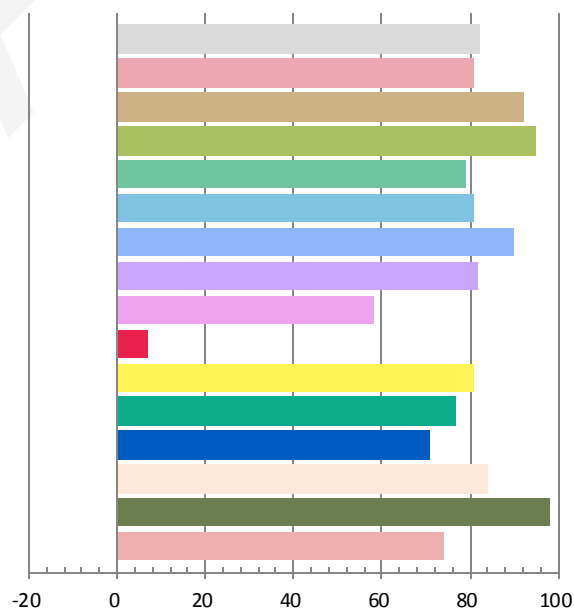
Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120	60	0.1359	16.16	0.9912	2071.6	128.19

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
95.000	3082	-0.00127	0.4295	0.3983	0.2482	0.5180

Color Rendering Index

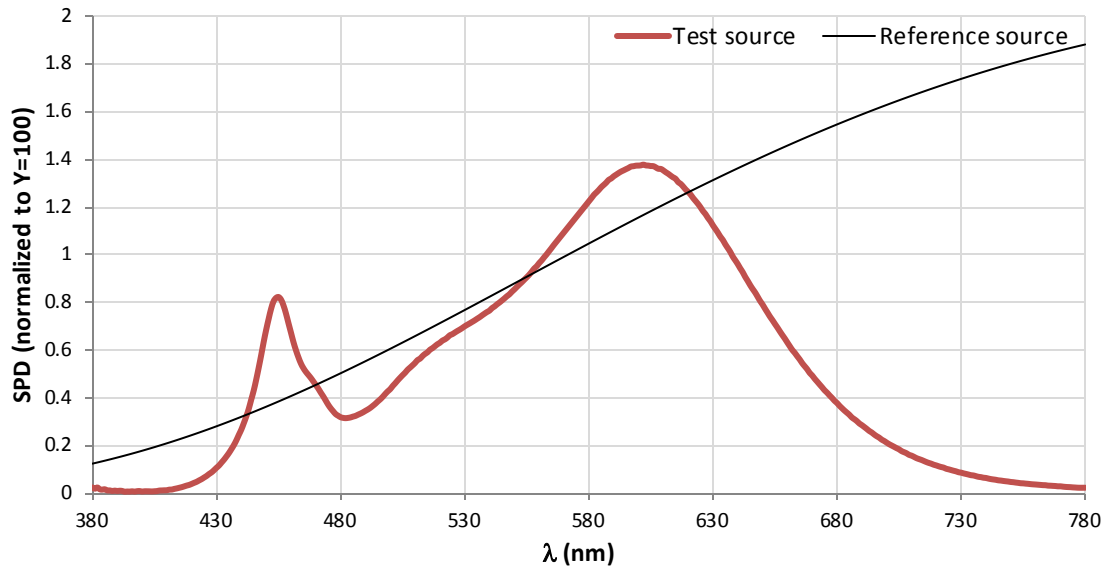
Ra			
82.2			
R1	R2	R3	R4
81	92	95	79
R5	R6	R7	R8
81	90	82	58
R9	R10	R11	R12
7	81	77	71
R13	R14	R15	
84	98	74	



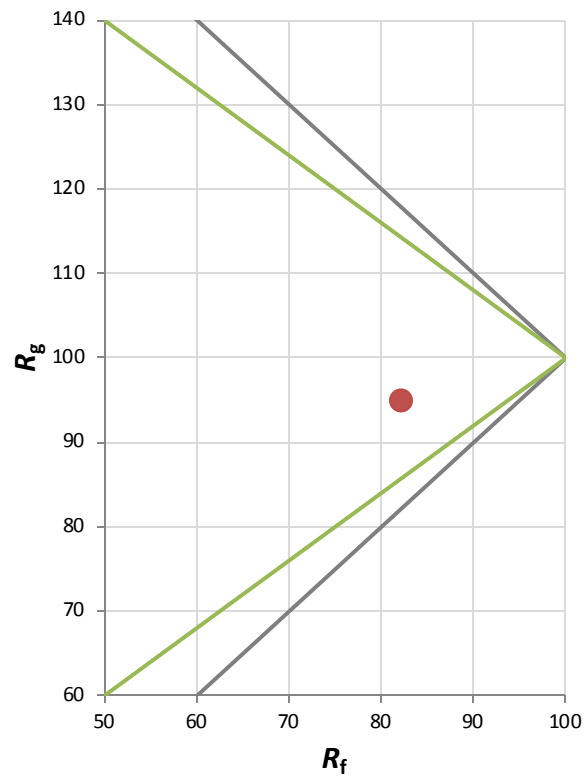
Fidelity Index and Gamut Index

Fidelity Index R_f	82
Gamut Index R_g	95

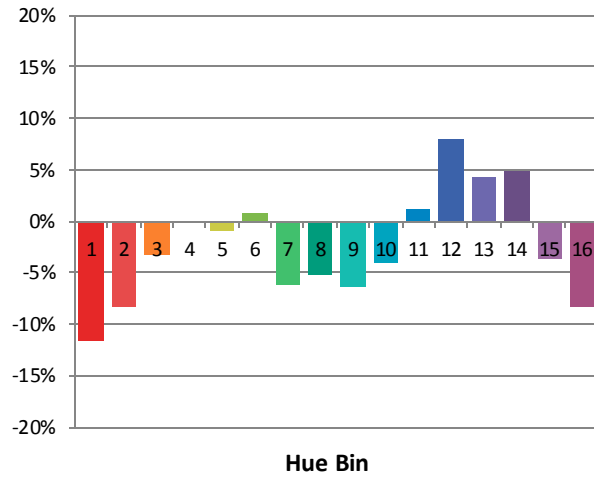
Spectral Power Distribution Comparison



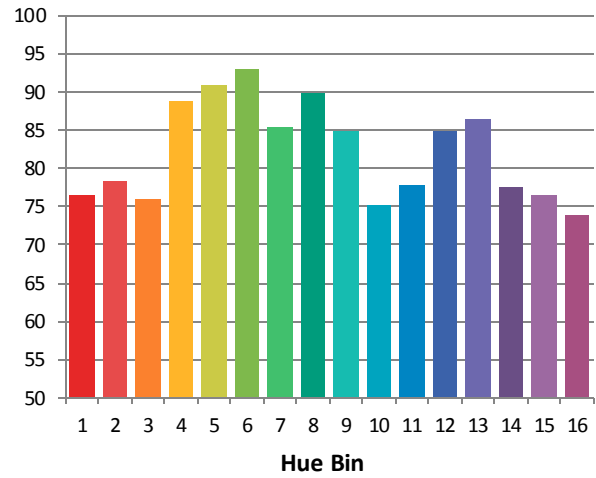
Plot of R_g versus R_f



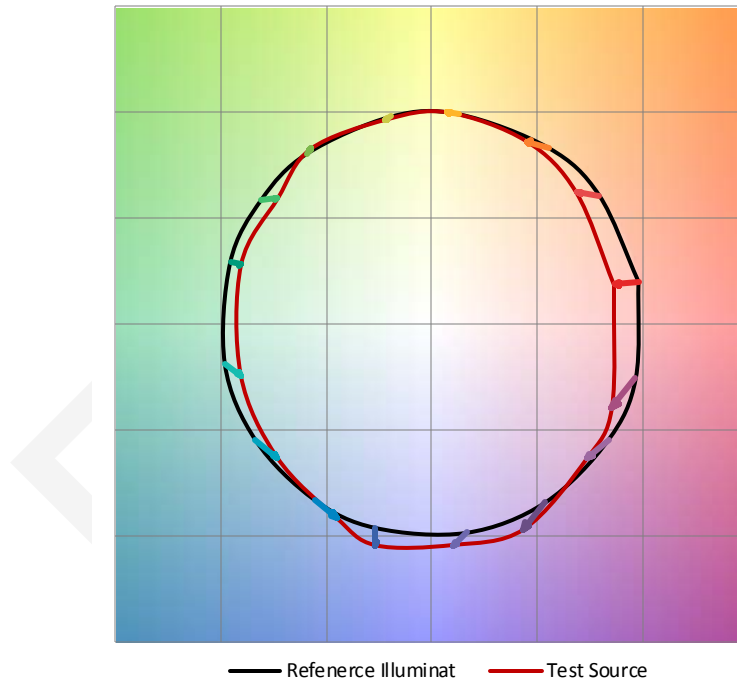
Chroma Shift by Hue



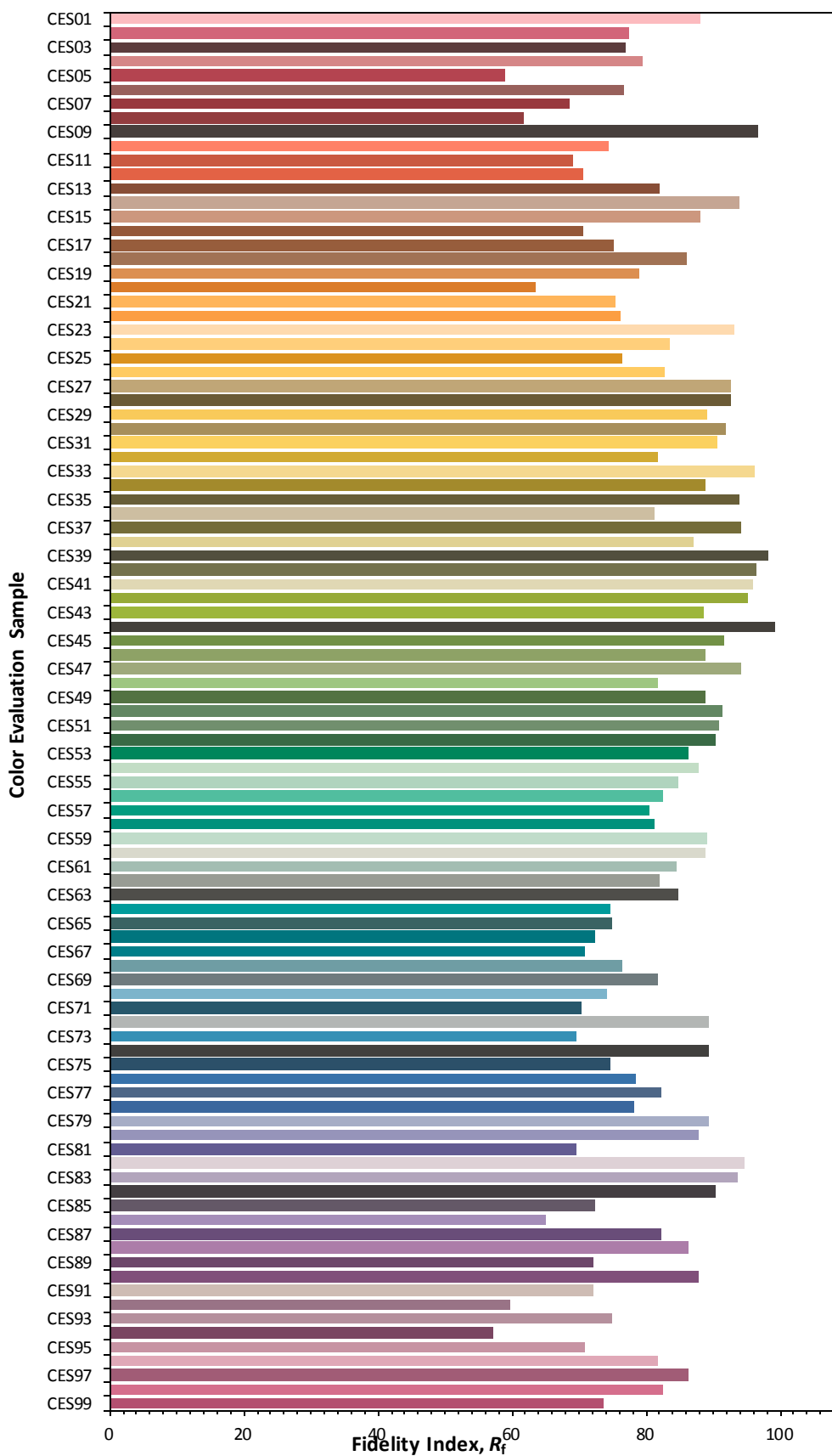
R_f by Hue



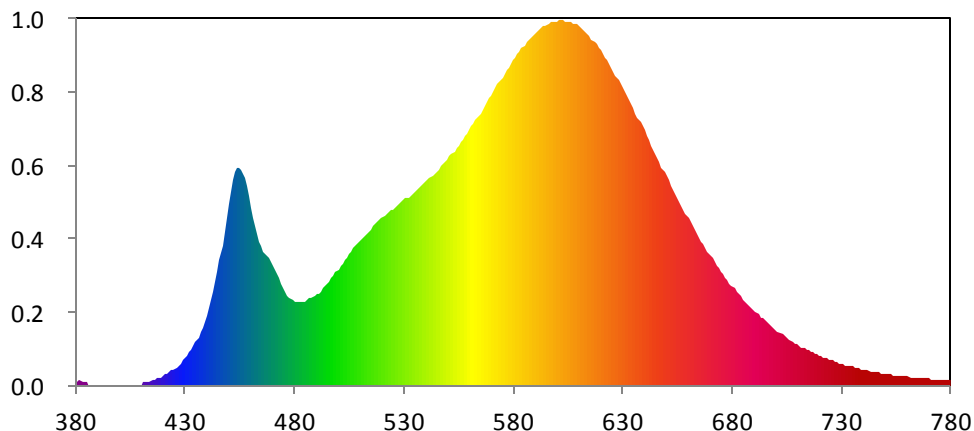
Color Vector Graphic



Color Fidelity by CES Sample



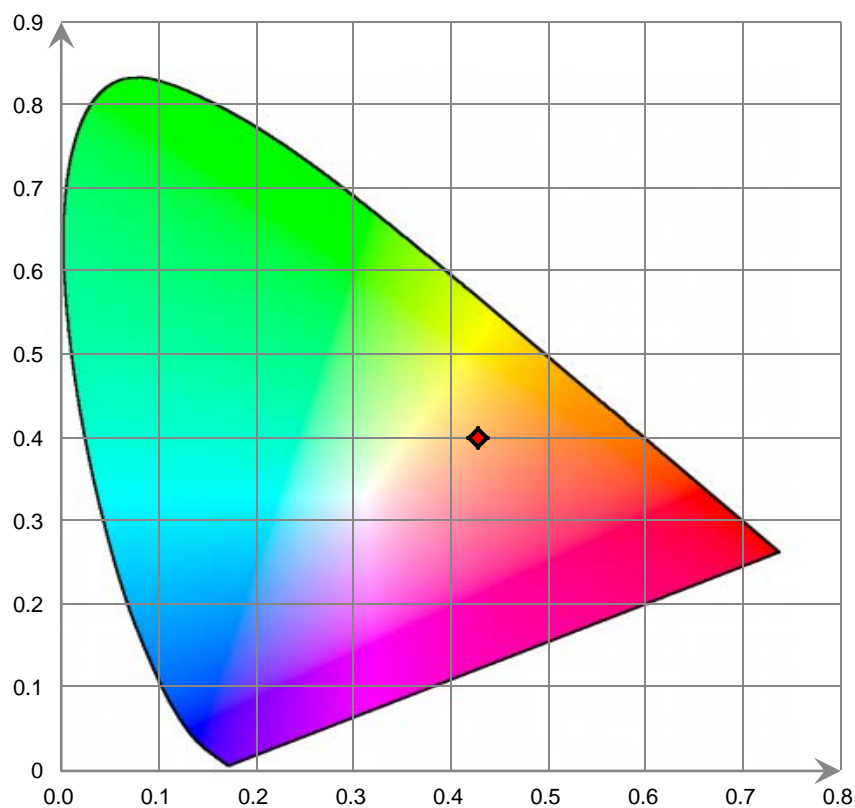
Relative Spectral Power Distribution



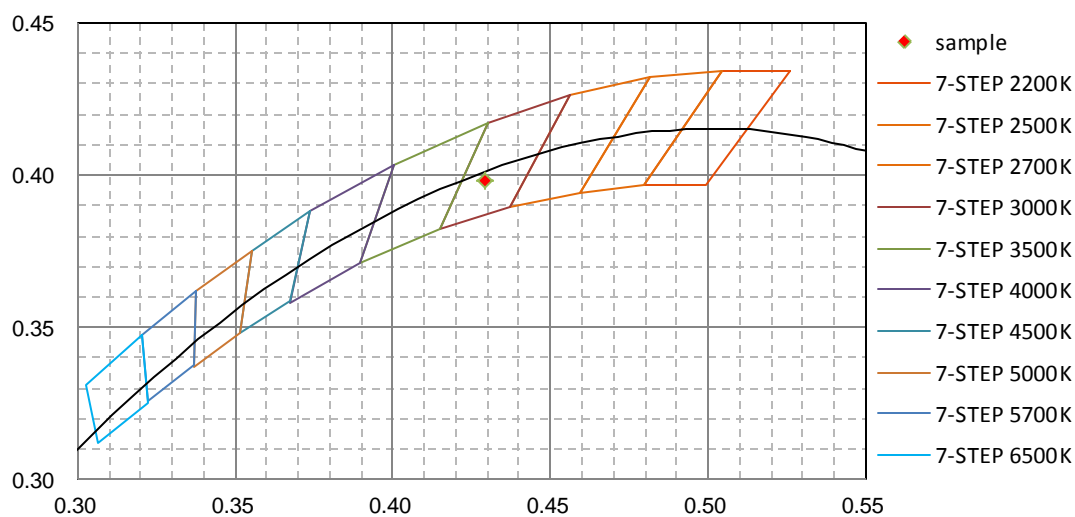
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	7.753E-01	421	1.358E+00	462	1.821E+01	503	1.437E+01	544	2.426E+01
381	6.067E-01	422	1.486E+00	463	1.731E+01	504	1.471E+01	545	2.452E+01
382	7.628E-01	423	1.663E+00	464	1.652E+01	505	1.504E+01	546	2.478E+01
383	5.327E-01	424	1.826E+00	465	1.593E+01	506	1.535E+01	547	2.506E+01
384	4.919E-01	425	2.030E+00	466	1.546E+01	507	1.572E+01	548	2.530E+01
385	5.423E-01	426	2.226E+00	467	1.507E+01	508	1.600E+01	549	2.563E+01
386	3.829E-01	427	2.473E+00	468	1.468E+01	509	1.629E+01	550	2.592E+01
387	3.938E-01	428	2.685E+00	469	1.424E+01	510	1.659E+01	551	2.624E+01
388	3.179E-01	429	2.963E+00	470	1.379E+01	511	1.695E+01	552	2.655E+01
389	3.667E-01	430	3.268E+00	471	1.334E+01	512	1.713E+01	553	2.684E+01
390	3.204E-01	431	3.553E+00	472	1.282E+01	513	1.746E+01	554	2.716E+01
391	3.523E-01	432	3.926E+00	473	1.234E+01	514	1.773E+01	555	2.747E+01
392	3.226E-01	433	4.290E+00	474	1.181E+01	515	1.794E+01	556	2.780E+01
393	2.266E-01	434	4.704E+00	475	1.128E+01	516	1.826E+01	557	2.818E+01
394	2.529E-01	435	5.138E+00	476	1.083E+01	517	1.846E+01	558	2.858E+01
395	2.420E-01	436	5.632E+00	477	1.045E+01	518	1.871E+01	559	2.887E+01
396	2.785E-01	437	6.154E+00	478	1.009E+01	519	1.896E+01	560	2.927E+01
397	2.409E-01	438	6.758E+00	479	9.882E+00	520	1.915E+01	561	2.961E+01
398	2.922E-01	439	7.455E+00	480	9.692E+00	521	1.942E+01	562	3.001E+01
399	3.105E-01	440	8.124E+00	481	9.610E+00	522	1.958E+01	563	3.038E+01
400	2.477E-01	441	8.938E+00	482	9.572E+00	523	1.981E+01	564	3.079E+01
401	2.813E-01	442	9.797E+00	483	9.605E+00	524	2.010E+01	565	3.119E+01
402	2.824E-01	443	1.076E+01	484	9.664E+00	525	2.024E+01	566	3.161E+01
403	2.752E-01	444	1.194E+01	485	9.770E+00	526	2.044E+01	567	3.192E+01
404	2.606E-01	445	1.309E+01	486	9.858E+00	527	2.064E+01	568	3.237E+01
405	2.853E-01	446	1.447E+01	487	1.001E+01	528	2.082E+01	569	3.280E+01
406	3.090E-01	447	1.598E+01	488	1.015E+01	529	2.102E+01	570	3.315E+01
407	3.748E-01	448	1.757E+01	489	1.031E+01	530	2.124E+01	571	3.356E+01
408	3.869E-01	449	1.924E+01	490	1.050E+01	531	2.143E+01	572	3.397E+01
409	4.056E-01	450	2.078E+01	491	1.068E+01	532	2.161E+01	573	3.445E+01
410	4.160E-01	451	2.217E+01	492	1.089E+01	533	2.180E+01	574	3.484E+01
411	4.905E-01	452	2.347E+01	493	1.114E+01	534	2.199E+01	575	3.517E+01
412	5.014E-01	453	2.442E+01	494	1.140E+01	535	2.220E+01	576	3.557E+01
413	5.842E-01	454	2.485E+01	495	1.170E+01	536	2.240E+01	577	3.600E+01
414	6.486E-01	455	2.496E+01	496	1.197E+01	537	2.263E+01	578	3.641E+01
415	7.268E-01	456	2.463E+01	497	1.229E+01	538	2.285E+01	579	3.681E+01
416	8.053E-01	457	2.388E+01	498	1.265E+01	539	2.306E+01	580	3.715E+01
417	9.051E-01	458	2.285E+01	499	1.298E+01	540	2.324E+01	581	3.750E+01
418	1.009E+00	459	2.163E+01	500	1.326E+01	541	2.355E+01	582	3.792E+01
419	1.092E+00	460	2.044E+01	501	1.366E+01	542	2.376E+01	583	3.823E+01
420	1.220E+00	461	1.924E+01	502	1.400E+01	543	2.403E+01	584	3.855E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.891E+01	626	3.588E+01	667	1.616E+01	708	5.114E+00	749	1.519E+00
586	3.920E+01	627	3.550E+01	668	1.578E+01	709	4.915E+00	750	1.466E+00
587	3.949E+01	628	3.501E+01	669	1.532E+01	710	4.812E+00	751	1.438E+00
588	3.984E+01	629	3.459E+01	670	1.499E+01	711	4.660E+00	752	1.391E+00
589	4.002E+01	630	3.407E+01	671	1.458E+01	712	4.496E+00	753	1.353E+00
590	4.029E+01	631	3.361E+01	672	1.422E+01	713	4.377E+00	754	1.305E+00
591	4.050E+01	632	3.314E+01	673	1.385E+01	714	4.268E+00	755	1.291E+00
592	4.071E+01	633	3.263E+01	674	1.349E+01	715	4.133E+00	756	1.255E+00
593	4.090E+01	634	3.221E+01	675	1.311E+01	716	3.998E+00	757	1.229E+00
594	4.105E+01	635	3.166E+01	676	1.281E+01	717	3.882E+00	758	1.191E+00
595	4.121E+01	636	3.118E+01	677	1.246E+01	718	3.783E+00	759	1.164E+00
596	4.136E+01	637	3.069E+01	678	1.214E+01	719	3.654E+00	760	1.143E+00
597	4.154E+01	638	3.010E+01	679	1.178E+01	720	3.565E+00	761	1.116E+00
598	4.158E+01	639	2.963E+01	680	1.150E+01	721	3.454E+00	762	1.090E+00
599	4.165E+01	640	2.915E+01	681	1.115E+01	722	3.361E+00	763	1.062E+00
600	4.166E+01	641	2.861E+01	682	1.084E+01	723	3.285E+00	764	1.052E+00
601	4.169E+01	642	2.812E+01	683	1.054E+01	724	3.144E+00	765	1.003E+00
602	4.178E+01	643	2.753E+01	684	1.027E+01	725	3.068E+00	766	9.905E-01
603	4.168E+01	644	2.702E+01	685	9.995E+00	726	2.977E+00	767	9.681E-01
604	4.166E+01	645	2.648E+01	686	9.661E+00	727	2.889E+00	768	9.506E-01
605	4.160E+01	646	2.599E+01	687	9.436E+00	728	2.810E+00	769	9.139E-01
606	4.159E+01	647	2.554E+01	688	9.196E+00	729	2.700E+00	770	9.133E-01
607	4.143E+01	648	2.501E+01	689	8.898E+00	730	2.648E+00	771	8.723E-01
608	4.125E+01	649	2.447E+01	690	8.686E+00	731	2.556E+00	772	8.391E-01
609	4.124E+01	650	2.401E+01	691	8.447E+00	732	2.484E+00	773	8.187E-01
610	4.105E+01	651	2.348E+01	692	8.203E+00	733	2.407E+00	774	8.053E-01
611	4.082E+01	652	2.298E+01	693	7.946E+00	734	2.325E+00	775	7.778E-01
612	4.062E+01	653	2.247E+01	694	7.750E+00	735	2.290E+00	776	7.592E-01
613	4.038E+01	654	2.202E+01	695	7.497E+00	736	2.202E+00	777	7.370E-01
614	4.016E+01	655	2.154E+01	696	7.278E+00	737	2.120E+00	778	7.302E-01
615	3.997E+01	656	2.108E+01	697	7.094E+00	738	2.078E+00	779	7.316E-01
616	3.956E+01	657	2.059E+01	698	6.847E+00	739	2.006E+00	780	7.330E-01
617	3.934E+01	658	2.012E+01	699	6.674E+00	740	1.973E+00		
618	3.900E+01	659	1.967E+01	700	6.465E+00	741	1.896E+00		
619	3.863E+01	660	1.918E+01	701	6.267E+00	742	1.831E+00		
620	3.832E+01	661	1.870E+01	702	6.101E+00	743	1.784E+00		
621	3.798E+01	662	1.823E+01	703	5.935E+00	744	1.740E+00		
622	3.755E+01	663	1.786E+01	704	5.764E+00	745	1.674E+00		
623	3.717E+01	664	1.743E+01	705	5.609E+00	746	1.644E+00		
624	3.679E+01	665	1.702E+01	706	5.391E+00	747	1.595E+00		
625	3.636E+01	666	1.655E+01	707	5.251E+00	748	1.555E+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: **Base Up**

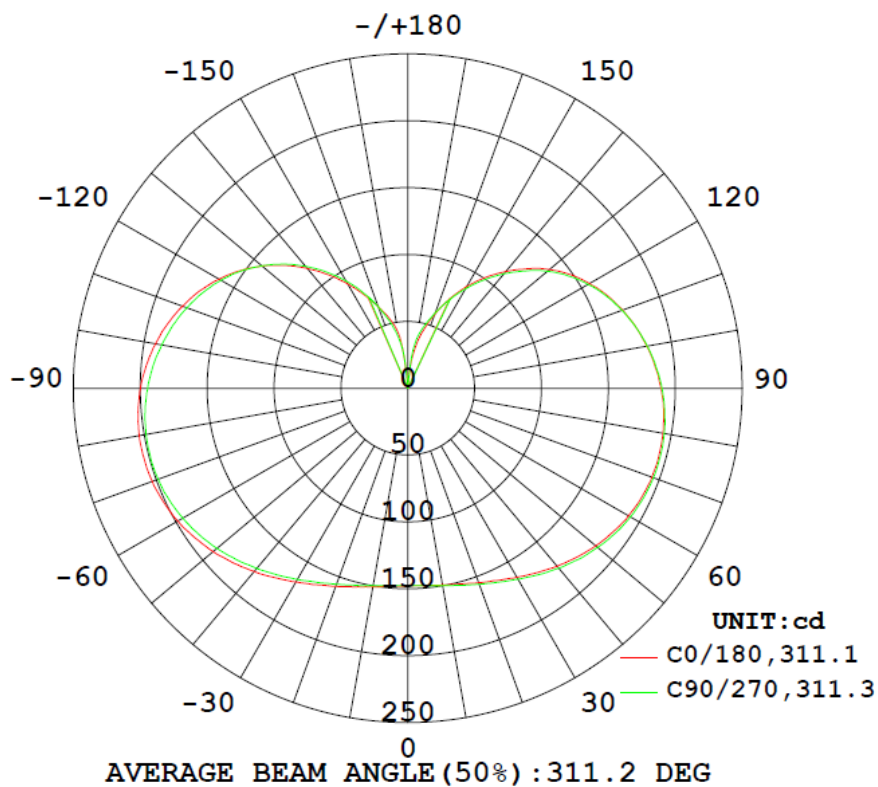
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
119.9	60	0.1373	16.26	0.9876

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
2081.15	127.99	204.3	1.76	1.78

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	311.1	311.1	311.3	311.8	311.2
Field Angle (10% I _{max}):	347.3	347.8	348.4	347.9	347.9

Luminous Intensity (cd) Distribution Data

$\begin{matrix} C \\ \backslash \\ Y \end{matrix}$	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	148	148	148	148	148	148	148	148
5.0°	149	149	149	148	148	148	148	148
10.0°	151	151	150	150	150	150	149	149
15.0°	154	153	153	153	152	152	152	152
20.0°	158	157	157	157	156	155	155	155
25.0°	162	162	161	161	160	160	159	159
30.0°	167	167	167	166	165	164	164	164
35.0°	173	173	172	171	170	170	169	169
40.0°	179	179	178	177	176	175	174	174
45.0°	185	184	183	182	181	180	179	179
50.0°	190	190	189	187	186	185	184	184
55.0°	195	195	193	192	191	190	188	188
60.0°	199	198	197	196	194	193	192	191
65.0°	202	201	200	198	197	196	194	194
70.0°	203	203	201	200	199	197	196	195
75.0°	204	204	202	201	199	198	196	195
80.0°	204	203	201	200	199	197	195	194
85.0°	203	202	200	199	197	196	194	193
90.0°	200	199	197	196	195	193	191	190
95.0°	196	195	193	193	191	190	188	187
100.0°	192	190	189	188	187	185	184	183
105.0°	186	185	184	183	182	180	179	178
110.0°	179	178	178	178	176	175	174	172
115.0°	172	171	171	171	169	168	167	165
120.0°	163	163	162	163	161	161	160	158
125.0°	153	153	153	154	153	152	151	149
130.0°	142	142	143	144	143	142	141	139
135.0°	130	130	131	132	131	131	130	128
140.0°	117	118	119	120	119	119	118	116
145.0°	104	104	106	107	106	106	105	103
150.0°	90	91	92	93	93	92	92	90
155.0°	77	78	79	80	79	79	78	76
160.0°	65	65	66	66	65	64	63	60
165.0°	54	55	54	53	51	50	48	46
170.0°	42	42	42	40	37	35	32	30
175.0°	5	7	9	8	7	6	5	5
180.0°	0	0	0	0	0	0	0	0

Luminous Intensity (cd) Distribution Data (cont.)

$\begin{matrix} C \\ \backslash \\ \gamma \end{matrix}$	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	148	148	148	148	148	148	148	148
5.0°	148	148	148	148	148	149	148	149
10.0°	149	149	150	150	150	150	150	151
15.0°	152	152	152	152	152	153	153	153
20.0°	155	155	155	156	156	156	157	157
25.0°	159	159	159	160	160	161	161	162
30.0°	163	163	164	164	165	165	166	167
35.0°	168	169	169	170	170	171	171	172
40.0°	174	174	174	175	176	176	177	178
45.0°	179	179	179	180	181	182	182	183
50.0°	183	183	184	185	185	186	187	189
55.0°	187	187	188	189	189	190	192	193
60.0°	191	190	191	192	192	193	195	197
65.0°	193	193	193	194	194	195	197	200
70.0°	194	194	194	195	195	196	199	202
75.0°	194	194	194	195	195	196	199	202
80.0°	194	193	193	194	195	195	198	202
85.0°	192	192	192	192	193	194	196	200
90.0°	189	189	189	189	190	191	193	198
95.0°	186	186	185	185	186	187	189	194
100.0°	182	182	181	181	182	182	184	189
105.0°	177	177	176	176	177	177	179	184
110.0°	171	171	170	170	170	171	173	177
115.0°	164	165	164	163	164	164	166	170
120.0°	157	157	156	155	156	157	157	161
125.0°	148	148	147	146	147	147	148	152
130.0°	138	138	137	136	136	137	138	141
135.0°	126	126	125	124	124	125	125	128
140.0°	114	114	113	111	112	113	113	116
145.0°	101	101	99	98	99	100	100	102
150.0°	88	87	86	85	86	87	87	89
155.0°	74	73	72	72	73	74	75	76
160.0°	59	59	58	59	60	62	63	64
165.0°	45	45	45	46	49	51	52	54
170.0°	30	30	31	34	37	39	42	41
175.0°	5	6	6	8	9	10	11	12
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	3.5	0.17	0-5	3.5	0.17
5-10	10.7	0.68	0-10	14.2	0.68
10-15	17.9	1.55	0-15	32.2	1.55
15-20	25.4	2.77	0-20	57.6	2.77
20-25	33.2	4.36	0-25	90.8	4.36
25-30	41.2	6.34	0-30	131.9	6.34
30-35	49.4	8.71	0-35	181.3	8.71
35-40	57.8	11.49	0-40	239.2	11.49
40-45	66.2	14.67	0-45	305.3	14.67
45-50	74.3	18.24	0-50	379.6	18.24
50-55	81.9	22.18	0-55	461.5	22.18
55-60	88.9	26.45	0-60	550.4	26.45
60-65	94.9	31.01	0-65	645.3	31.01
65-70	99.8	35.80	0-70	745.1	35.80
70-75	103.5	40.77	0-75	848.6	40.77
75-80	105.9	45.86	0-80	954.4	45.86
80-85	106.9	51.00	0-85	1061.3	51.00
85-90	106.5	56.11	0-90	1167.8	56.11
90-95	104.8	61.15	0-95	1272.6	61.15
95-100	101.9	66.04	0-100	1374.5	66.04
100-105	97.7	70.74	0-105	1472.2	70.74
105-110	92.5	75.19	0-110	1564.7	75.19
110-115	86.4	79.34	0-115	1651.1	79.34
115-120	79.4	83.15	0-120	1730.5	83.15
120-125	71.6	86.59	0-125	1802.1	86.59
125-130	63.1	89.62	0-130	1865.2	89.62
130-135	54.2	92.23	0-135	1919.4	92.23
135-140	45.2	94.40	0-140	1964.6	94.40
140-145	36.4	96.15	0-145	2001.0	96.15
145-150	28.3	97.51	0-150	2029.3	97.51
150-155	20.9	98.51	0-155	2050.2	98.51
155-160	14.5	99.21	0-160	2064.8	99.21
160-165	9.3	99.66	0-165	2074.0	99.66
165-170	5.2	99.91	0-170	2079.3	99.91
170-175	1.8	100.00	0-175	2081.1	100.00
175-180	0.1	100.00	0-180	2081.2	100.00

6. Product Photo



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