



# IES LM-79-08

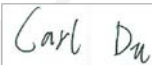

## MEASUREMENT AND TEST REPORT

For

**P.Q.L., Inc.**

2285 Ward Avenue / Simi Valley, CA 93065

**Test Model:**  
**83757**

<b>Report Type:</b>	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution
<b>Test Engineer:</b>	Carl Du 
<b>Report Number:</b>	R2XM161128055-10
<b>Test Date:</b>	2016-11-30 to 2016-12-01
<b>Report Date:</b>	2016-12-02
<b>Reviewed By:</b>	Blake Zhang / EE Engineer 
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Dongguan). Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China. Tel: +86-0769-86858888 Fax: +86-0769-86858588
<b>Accreditation:</b>	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 2016-11-28 and used for testing.

Model Tested: 83757  
 Manufacturer: P.Q.L., Inc.  
 Brand Name: Superior Life®  
 Product Designation: LED Ceiling light  
 Burning Time Before Test: 0hour(For New Products)

### Rated Values:

Rated Voltage/Frequency: 120 V AC 50/60Hz  
 Rated Power: 16 W  
 Nominal CCT: 4000K  
 Nominal Lumen Output: 1100 lm

## 2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- 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	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	SPR-600	S09008	25~50°C	2016-03-10	2017-03-09
High Accuracy Array spectroradiometer	EVERFINE	HAAS-2000	M112048CA1361125	380-780nm	2016-07-08	2017-07-07
Power meter	YOKOGAWA	WT310	C20E17024V	2kV/20A	2016-07-08	2017-07-07
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2016-03-04	2017-03-03
Thermal Meter	SENSING	N/A	N/A	25、50°C	2016-03-10	2017-03-09
Standard Light Source	SENSING	N/A	LSD090808	N/A	2016-09-24	2017-09-23
AC Power Supply	ALL Power	APW-105N	970613	220V±10% 50Hz	2016-03-04	2017-03-03
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2016-03-04	2017-03-03
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2016-03-04	2017-03-03
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2016-03-04	2017-03-03
Goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2016-03-10	2017-03-09
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;- 20°C~60°C	2016-03-21	2017-03-20

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Standard Light Source	EVERFINE	D908	1012003	N/A	2016-09-07	2017-09-06

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.

$4\pi$  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  $U=32\text{K}$  ( $K=2$ ), 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  $U=0.15\%$  of rdg, Power  $U=0.20\%$  ( $K=2$ ), 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 ( $\gamma$ ) 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  $U=1.6\%$  ( $K=2$ ), 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**

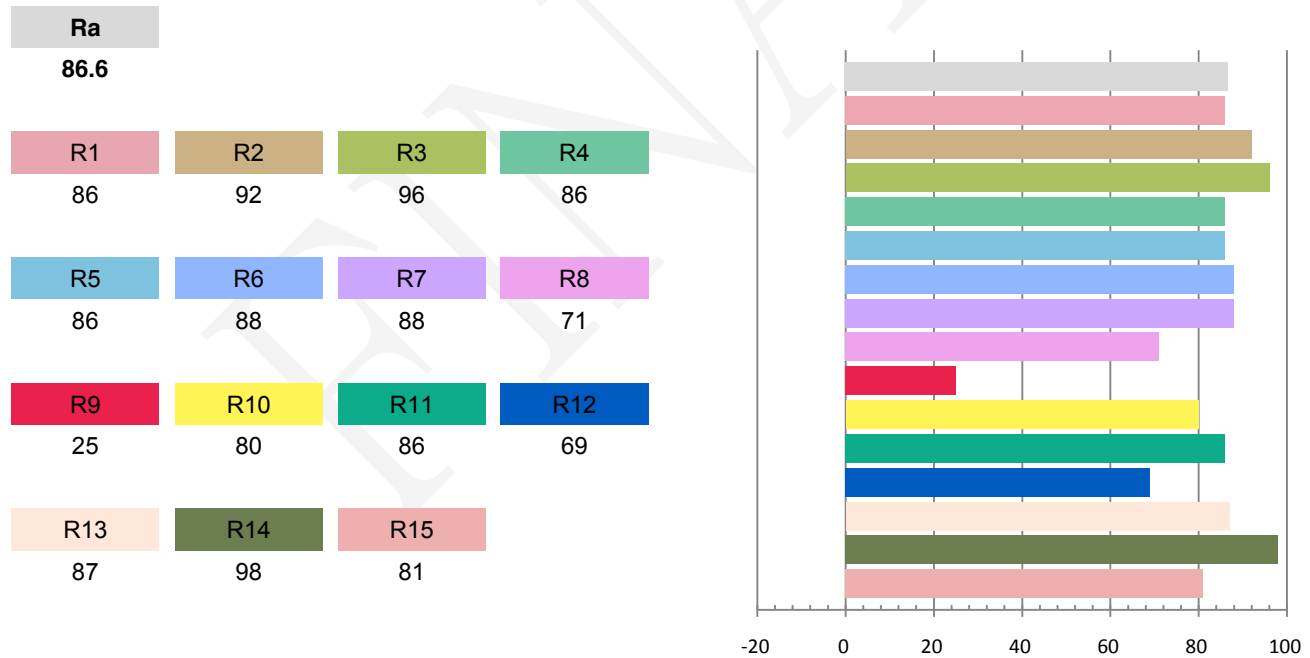
Test orientation: **Downward**

### Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.1568	17.21	0.9143	1194.8	69.43

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
3.773	4134	-0.00114	0.3740	0.3703	0.2235	0.4977

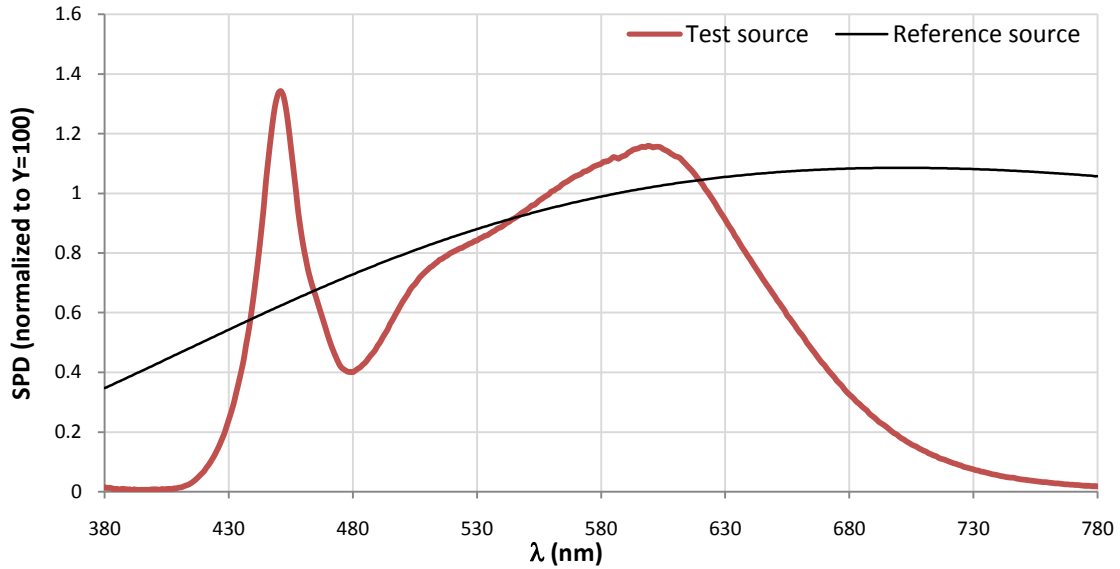
### Color Rendering Index



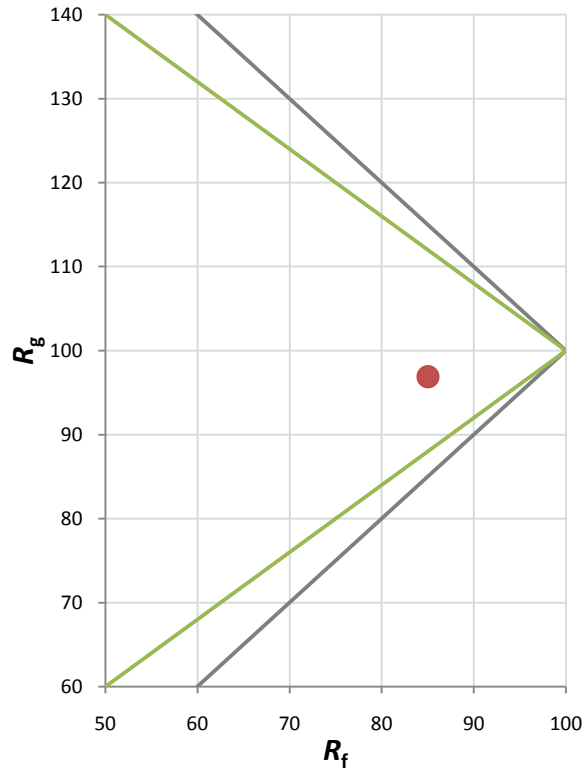
Fidelity Index and Gamut Index

Fidelity Index $R_f$	85
Gamut Index $R_g$	97

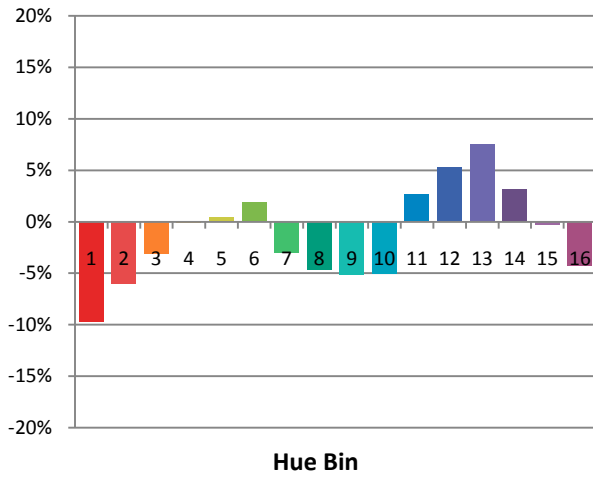
Spectral Power Distribution Comparison



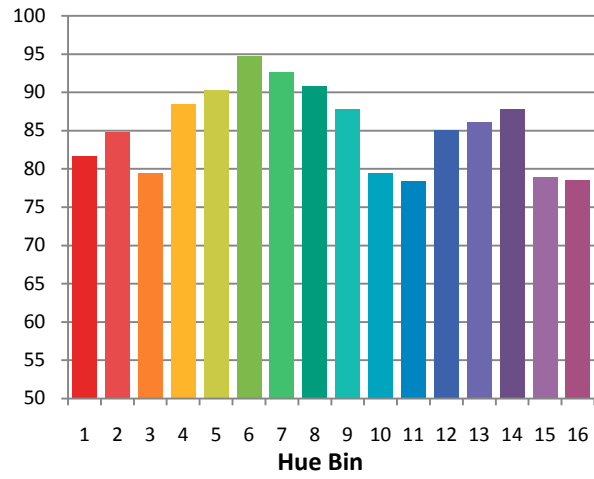
Plot of  $R_g$  versus  $R_f$



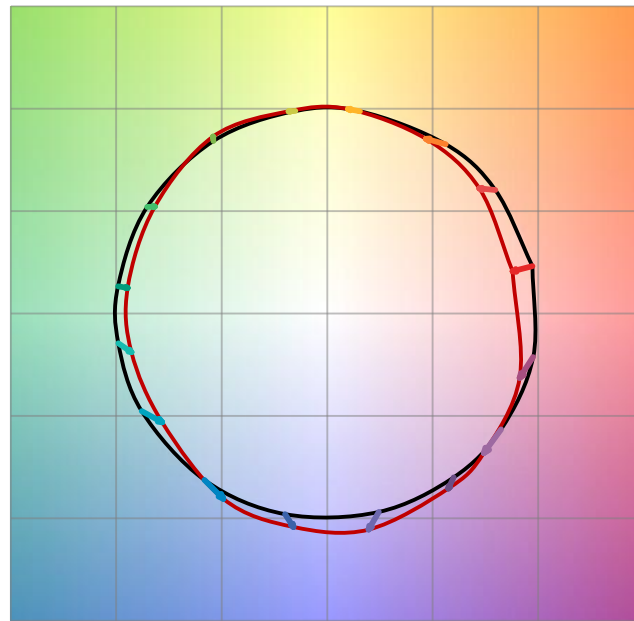
Chroma Shift by Hue



$R_f$  by Hue

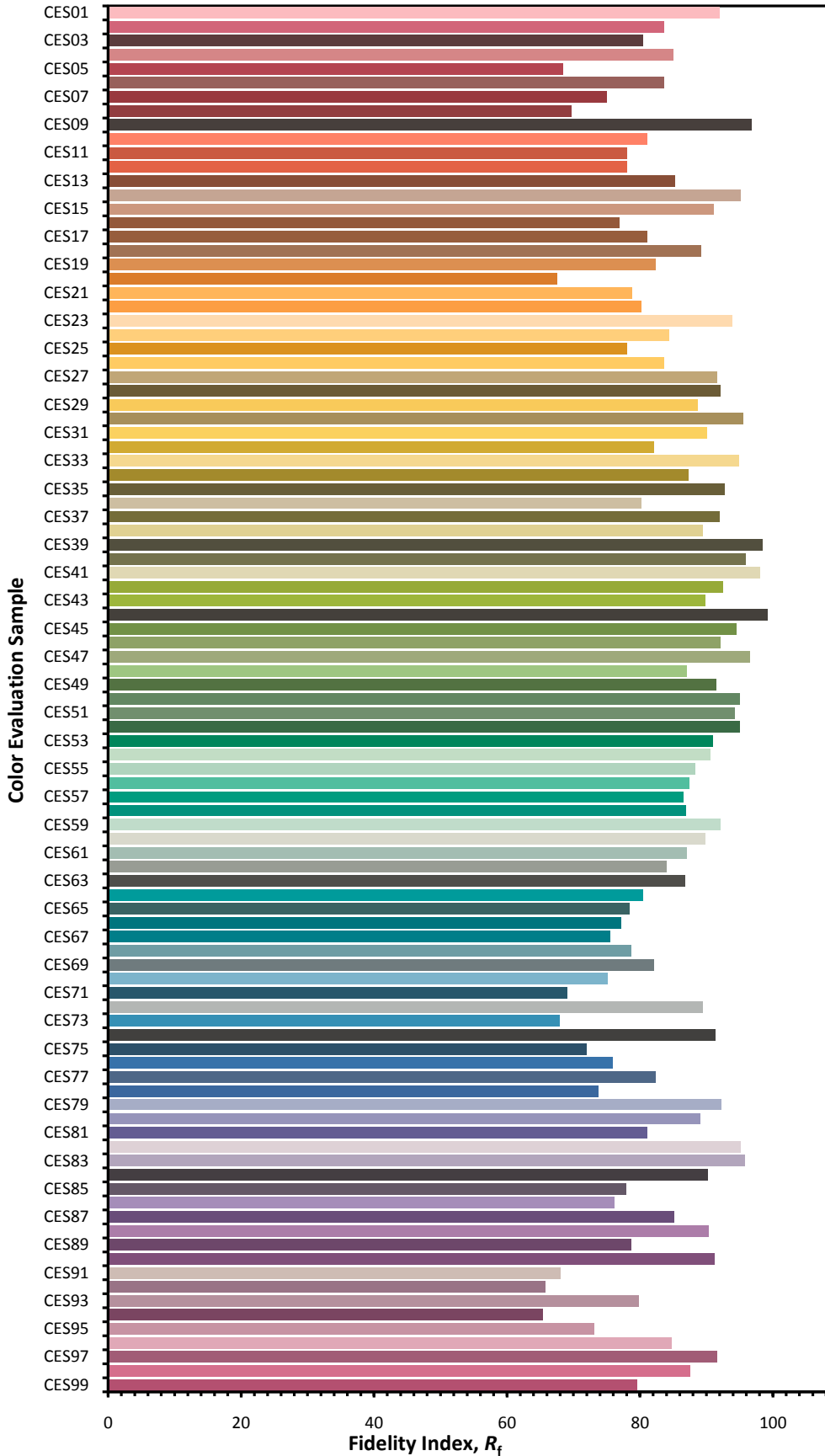


Color Vector Graphic

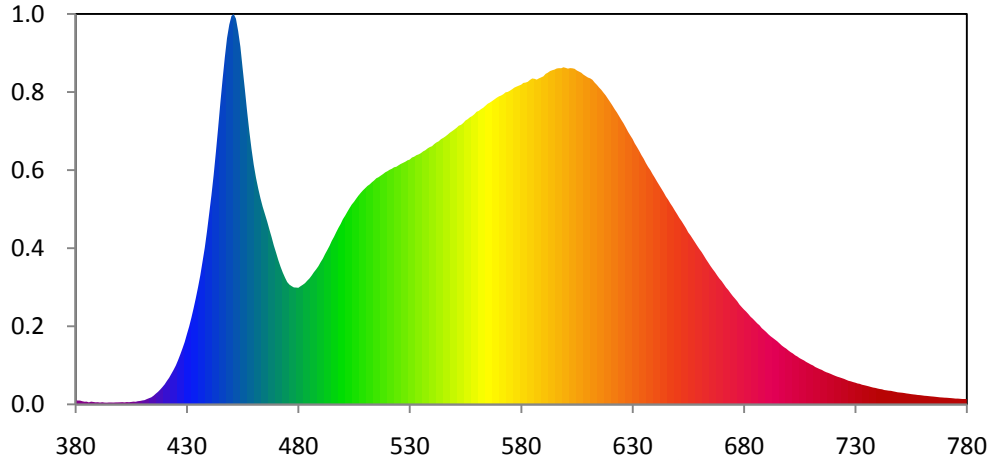


— Reference Illuminat    — Test Source

**Color Fidelity by CES Sample**



Relative Spectral Power Distribution

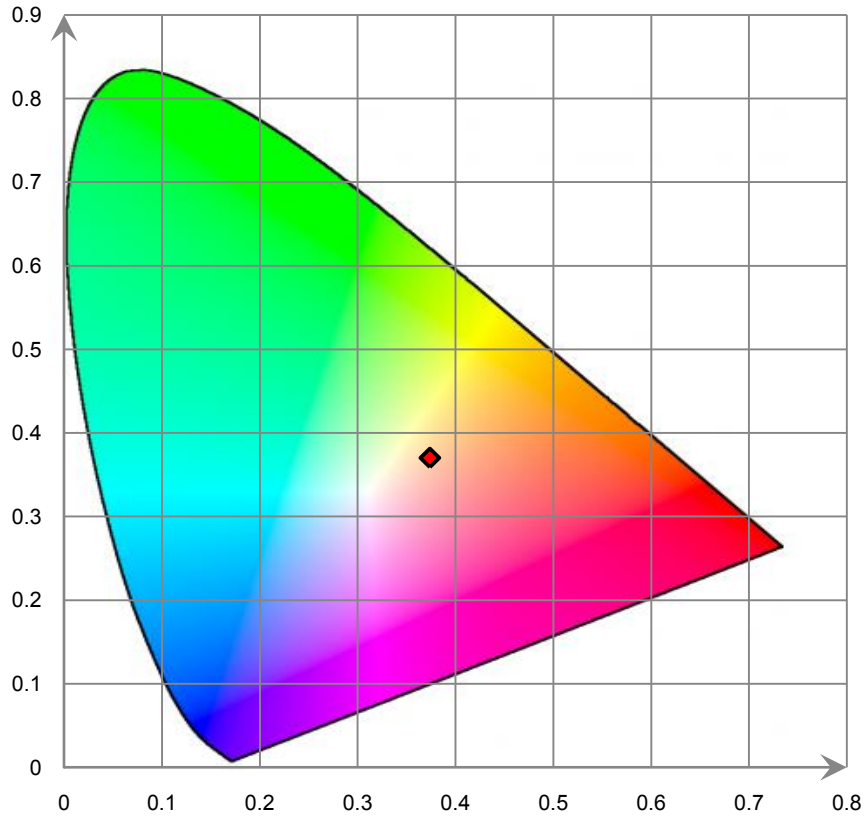


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	2.542E-01	421	1.408E+00	462	1.298E+01	503	1.181E+01	544	1.595E+01
381	2.321E-01	422	1.598E+00	463	1.239E+01	504	1.202E+01	545	1.602E+01
382	2.313E-01	423	1.837E+00	464	1.189E+01	505	1.218E+01	546	1.611E+01
383	1.910E-01	424	2.073E+00	465	1.144E+01	506	1.238E+01	547	1.622E+01
384	1.589E-01	425	2.335E+00	466	1.100E+01	507	1.256E+01	548	1.634E+01
385	1.634E-01	426	2.650E+00	467	1.052E+01	508	1.272E+01	549	1.643E+01
386	1.210E-01	427	2.995E+00	468	1.006E+01	509	1.287E+01	550	1.653E+01
387	1.676E-01	428	3.361E+00	469	9.557E+00	510	1.300E+01	551	1.663E+01
388	1.461E-01	429	3.749E+00	470	9.130E+00	511	1.313E+01	552	1.676E+01
389	1.238E-01	430	4.224E+00	471	8.680E+00	512	1.323E+01	553	1.681E+01
390	1.316E-01	431	4.683E+00	472	8.282E+00	513	1.335E+01	554	1.692E+01
391	1.110E-01	432	5.214E+00	473	7.933E+00	514	1.347E+01	555	1.707E+01
392	1.307E-01	433	5.784E+00	474	7.628E+00	515	1.360E+01	556	1.715E+01
393	1.082E-01	434	6.402E+00	475	7.355E+00	516	1.366E+01	557	1.726E+01
394	1.027E-01	435	7.054E+00	476	7.202E+00	517	1.376E+01	558	1.734E+01
395	1.142E-01	436	7.764E+00	477	7.109E+00	518	1.385E+01	559	1.745E+01
396	1.139E-01	437	8.581E+00	478	7.033E+00	519	1.395E+01	560	1.760E+01
397	1.113E-01	438	9.410E+00	479	7.024E+00	520	1.402E+01	561	1.765E+01
398	1.191E-01	439	1.040E+01	480	7.012E+00	521	1.411E+01	562	1.776E+01
399	1.232E-01	440	1.149E+01	481	7.105E+00	522	1.417E+01	563	1.784E+01
400	1.262E-01	441	1.257E+01	482	7.193E+00	523	1.426E+01	564	1.796E+01
401	1.335E-01	442	1.380E+01	483	7.292E+00	524	1.429E+01	565	1.808E+01
402	1.201E-01	443	1.518E+01	484	7.439E+00	525	1.438E+01	566	1.815E+01
403	1.400E-01	444	1.662E+01	485	7.574E+00	526	1.446E+01	567	1.824E+01
404	1.314E-01	445	1.814E+01	486	7.751E+00	527	1.453E+01	568	1.834E+01
405	1.448E-01	446	1.954E+01	487	7.950E+00	528	1.459E+01	569	1.844E+01
406	1.639E-01	447	2.086E+01	488	8.119E+00	529	1.468E+01	570	1.852E+01
407	1.584E-01	448	2.203E+01	489	8.310E+00	530	1.473E+01	571	1.857E+01
408	1.924E-01	449	2.283E+01	490	8.548E+00	531	1.484E+01	572	1.865E+01
409	2.071E-01	450	2.336E+01	491	8.766E+00	532	1.490E+01	573	1.876E+01
410	2.341E-01	451	2.347E+01	492	9.036E+00	533	1.498E+01	574	1.879E+01
411	2.562E-01	452	2.319E+01	493	9.281E+00	534	1.503E+01	575	1.887E+01
412	3.200E-01	453	2.244E+01	494	9.536E+00	535	1.511E+01	576	1.896E+01
413	3.718E-01	454	2.150E+01	495	9.830E+00	536	1.521E+01	577	1.905E+01
414	4.255E-01	455	2.021E+01	496	1.007E+01	537	1.528E+01	578	1.911E+01
415	5.185E-01	456	1.895E+01	497	1.035E+01	538	1.539E+01	579	1.917E+01
416	6.420E-01	457	1.764E+01	498	1.062E+01	539	1.547E+01	580	1.922E+01
417	7.518E-01	458	1.642E+01	499	1.085E+01	540	1.552E+01	581	1.933E+01
418	8.907E-01	459	1.535E+01	500	1.113E+01	541	1.565E+01	582	1.935E+01
419	1.040E+00	460	1.440E+01	501	1.134E+01	542	1.575E+01	583	1.940E+01
420	1.202E+00	461	1.363E+01	502	1.158E+01	543	1.582E+01	584	1.951E+01

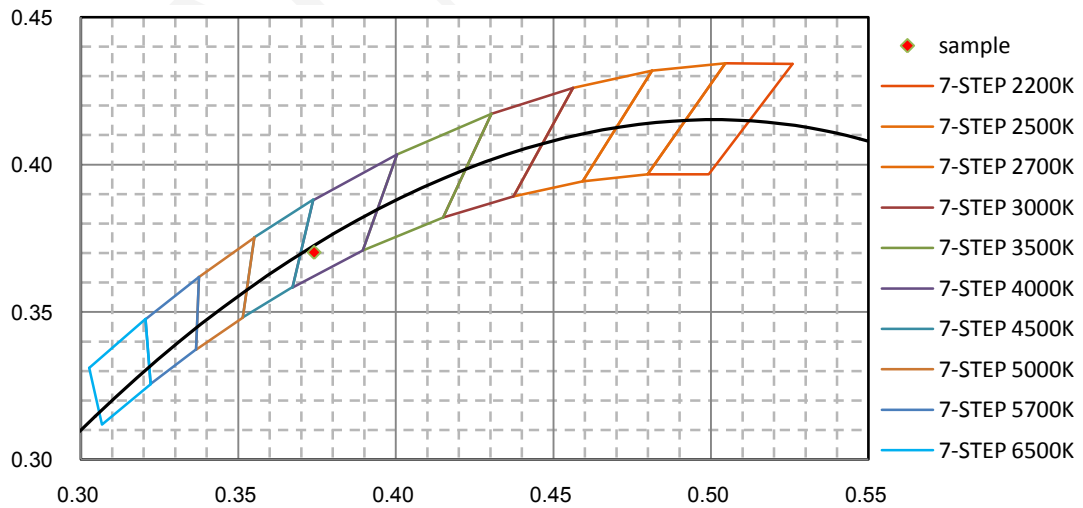


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.960E+01	626	1.689E+01	667	7.953E+00	708	2.547E+00	749	7.267E-01
586	1.958E+01	627	1.664E+01	668	7.754E+00	709	2.477E+00	750	7.128E-01
587	1.953E+01	628	1.639E+01	669	7.566E+00	710	2.401E+00	751	6.997E-01
588	1.961E+01	629	1.617E+01	670	7.415E+00	711	2.340E+00	752	6.800E-01
589	1.967E+01	630	1.596E+01	671	7.220E+00	712	2.246E+00	753	6.585E-01
590	1.973E+01	631	1.569E+01	672	7.028E+00	713	2.186E+00	754	6.392E-01
591	1.988E+01	632	1.548E+01	673	6.873E+00	714	2.122E+00	755	6.181E-01
592	1.995E+01	633	1.524E+01	674	6.689E+00	715	2.072E+00	756	6.016E-01
593	2.005E+01	634	1.499E+01	675	6.514E+00	716	1.994E+00	757	5.867E-01
594	2.009E+01	635	1.477E+01	676	6.361E+00	717	1.932E+00	758	5.662E-01
595	2.013E+01	636	1.451E+01	677	6.202E+00	718	1.885E+00	759	5.569E-01
596	2.020E+01	637	1.428E+01	678	6.003E+00	719	1.831E+00	760	5.368E-01
597	2.022E+01	638	1.409E+01	679	5.852E+00	720	1.772E+00	761	5.184E-01
598	2.021E+01	639	1.385E+01	680	5.706E+00	721	1.715E+00	762	5.102E-01
599	2.027E+01	640	1.363E+01	681	5.578E+00	722	1.661E+00	763	4.943E-01
600	2.024E+01	641	1.340E+01	682	5.428E+00	723	1.623E+00	764	4.816E-01
601	2.019E+01	642	1.318E+01	683	5.271E+00	724	1.576E+00	765	4.699E-01
602	2.022E+01	643	1.296E+01	684	5.150E+00	725	1.531E+00	766	4.561E-01
603	2.021E+01	644	1.274E+01	685	5.010E+00	726	1.471E+00	767	4.388E-01
604	2.018E+01	645	1.250E+01	686	4.870E+00	727	1.416E+00	768	4.230E-01
605	2.008E+01	646	1.230E+01	687	4.754E+00	728	1.386E+00	769	4.159E-01
606	2.001E+01	647	1.208E+01	688	4.589E+00	729	1.341E+00	770	4.042E-01
607	1.994E+01	648	1.188E+01	689	4.472E+00	730	1.305E+00	771	3.990E-01
608	1.983E+01	649	1.165E+01	690	4.352E+00	731	1.256E+00	772	3.884E-01
609	1.974E+01	650	1.144E+01	691	4.211E+00	732	1.234E+00	773	3.762E-01
610	1.966E+01	651	1.121E+01	692	4.095E+00	733	1.182E+00	774	3.642E-01
611	1.961E+01	652	1.102E+01	693	3.995E+00	734	1.153E+00	775	3.477E-01
612	1.952E+01	653	1.081E+01	694	3.892E+00	735	1.119E+00	776	3.474E-01
613	1.935E+01	654	1.059E+01	695	3.789E+00	736	1.086E+00	777	3.366E-01
614	1.922E+01	655	1.034E+01	696	3.666E+00	737	1.047E+00	778	3.235E-01
615	1.905E+01	656	1.016E+01	697	3.539E+00	738	1.013E+00	779	3.248E-01
616	1.891E+01	657	9.959E+00	698	3.439E+00	739	9.875E-01	780	3.254E-01
617	1.874E+01	658	9.752E+00	699	3.351E+00	740	9.533E-01		
618	1.857E+01	659	9.543E+00	700	3.238E+00	741	9.240E-01		
619	1.837E+01	660	9.342E+00	701	3.139E+00	742	9.053E-01		
620	1.817E+01	661	9.163E+00	702	3.058E+00	743	8.609E-01		
621	1.797E+01	662	8.948E+00	703	2.951E+00	744	8.455E-01		
622	1.775E+01	663	8.727E+00	704	2.877E+00	745	8.246E-01		
623	1.755E+01	664	8.526E+00	705	2.780E+00	746	8.147E-01		
624	1.733E+01	665	8.322E+00	706	2.708E+00	747	7.836E-01		
625	1.711E+01	666	8.131E+00	707	2.639E+00	748	7.557E-01		

**CIE 1931 x y Chromaticity Diagram**



**7-Step Chromaticity Quadrangles**



**[Goniophotometer System]**

Total operating time for luminous intensity distribution: **1.0 hour**

Test orientation: **Downward**

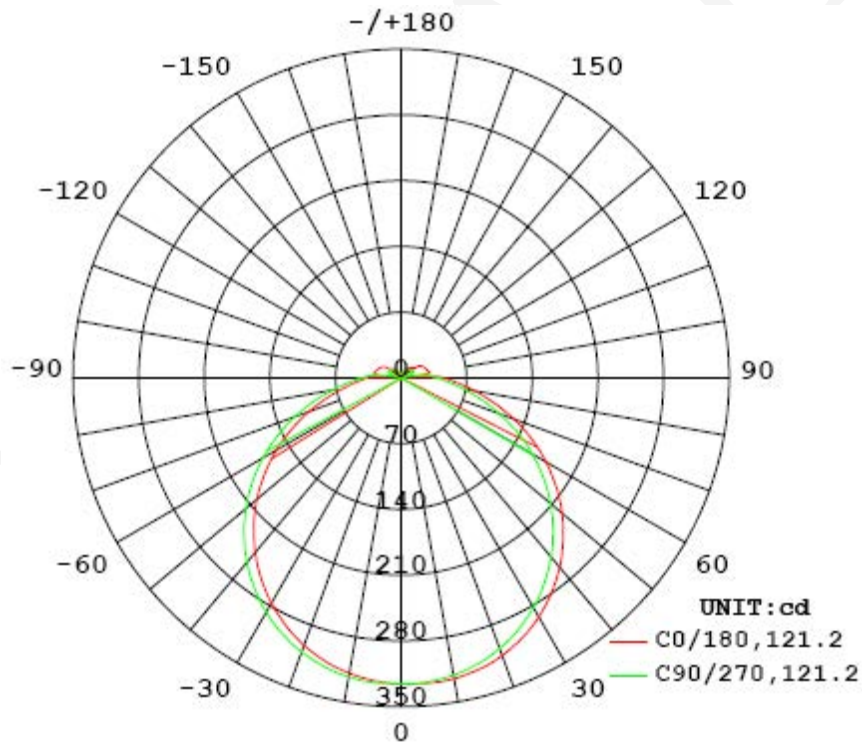
**Electrical Measurement**

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.0	60	0.1565	17.29	0.9208

**Photometric Measurement**

Luminous Flux (lm)	Efficacy (lm/W)	I <sub>max</sub> (cd)	S/MH (C0/180)	S/MH (C90/270)
1201.52	69.49	326.2	1.34	1.29

**Luminous Intensity Distribution**



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I <sub>max</sub> ):	121.2	123.4	121.2	123.4	122.3
Field Angle (10% I <sub>max</sub> ):	184.7	187.6	188.4	188.0	187.2

Luminous Intensity (cd) Distribution Data

C \ Y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	326	326	326	326	326	326	326	326
5.0°	324	324	325	325	326	326	326	326
10.0°	319	320	321	322	323	324	324	325
15.0°	312	313	315	317	318	320	321	321
20.0°	303	305	307	309	311	313	315	315
25.0°	291	293	297	299	301	303	306	306
30.0°	277	280	284	286	288	292	295	294
35.0°	261	264	269	271	273	278	281	280
40.0°	242	247	251	254	256	261	265	264
45.0°	223	227	233	235	237	243	247	246
50.0°	201	206	212	215	216	223	227	226
55.0°	178	183	190	193	194	200	205	204
60.0°	154	160	166	169	171	177	182	180
65.0°	129	135	142	145	146	153	157	156
70.0°	105	111	117	120	121	128	132	130
75.0°	82	88	94	96	96	103	107	106
80.0°	62	68	73	75	74	81	84	82
85.0°	47	52	57	58	56	62	65	63
90.0°	37	42	45	45	43	47	51	49
95.0°	16	0	21	29	30	31	24	17
100.0°	30	31	12	10	13	12	13	34
105.0°	28	29	27	8	5	9	26	31
110.0°	27	27	27	15	11	17	29	29
115.0°	25	25	24	18	16	20	27	27
120.0°	24	23	21	16	15	19	24	25
125.0°	16	19	19	15	14	17	22	22
130.0°	15	15	18	14	13	16	20	18
135.0°	14	13	15	13	12	14	18	15
140.0°	12	12	13	11	11	13	15	11
145.0°	5	10	10	10	10	11	12	9
150.0°	9	9	8	8	9	9	10	11
155.0°	7	6	7	7	7	7	8	9
160.0°	6	6	5	5	5	5	7	7
165.0°	4	4	4	4	4	4	3	6
170.0°	4	4	3	3	3	3	3	3
175.0°	2	2	2	3	2	3	3	3
180.0°	0	1	1	0	0	1	2	3

Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	326	326	326	326	326	326	326	326
5.0°	326	326	326	325	325	324	324	324
10.0°	325	324	324	322	321	321	320	320
15.0°	321	320	319	317	315	314	314	313
20.0°	315	314	312	309	307	306	305	304
25.0°	305	305	303	299	296	295	294	293
30.0°	294	293	291	286	282	281	281	279
35.0°	279	279	277	272	266	266	265	263
40.0°	263	263	260	254	249	248	247	245
45.0°	244	244	242	236	229	228	228	226
50.0°	224	224	221	215	208	207	207	204
55.0°	202	202	200	193	185	185	184	182
60.0°	178	179	176	169	162	161	161	158
65.0°	153	154	152	145	137	137	137	133
70.0°	128	128	126	119	112	112	111	109
75.0°	102	104	102	95	88	88	88	86
80.0°	79	81	80	74	67	68	69	66
85.0°	60	62	61	56	51	52	53	51
90.0°	46	48	48	44	39	41	43	41
95.0°	20	13	27	33	31	33	27	20
100.0°	32	31	13	14	16	14	10	30
105.0°	30	29	26	8	3	6	25	29
110.0°	28	27	29	16	9	14	27	27
115.0°	27	26	27	20	15	18	24	25
120.0°	25	24	24	18	15	16	22	23
125.0°	23	21	22	17	14	15	20	20
130.0°	17	17	20	15	13	14	18	15
135.0°	16	14	18	14	12	13	16	13
140.0°	14	11	15	13	11	11	13	11
145.0°	2	7	11	12	10	10	10	10
150.0°	11	10	10	10	9	8	8	9
155.0°	9	9	9	8	7	7	7	7
160.0°	8	8	6	7	6	6	5	5
165.0°	6	6	5	3	5	5	5	3
170.0°	2	2	2	3	3	2	3	3
175.0°	3	3	3	3	3	3	3	3
180.0°	2	2	2	2	2	1	1	1

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	7.8	0.65	0-5	7.8	0.65
5-10	23.2	1.92	0-10	30.9	2.57
10-15	37.9	3.16	0-15	68.9	5.73
15-20	51.6	4.30	0-20	120.5	10.03
20-25	63.8	5.31	0-25	184.3	15.34
25-30	74.1	6.16	0-30	258.3	21.50
30-35	82.1	6.84	0-35	340.5	28.34
35-40	87.7	7.30	0-40	428.2	35.64
40-45	90.7	7.55	0-45	518.9	43.19
45-50	91.0	7.57	0-50	609.9	50.76
50-55	88.5	7.37	0-55	698.5	58.13
55-60	83.5	6.95	0-60	782.0	65.08
60-65	76.1	6.34	0-65	858.1	71.42
65-70	66.7	5.55	0-70	924.8	76.97
70-75	56.0	4.66	0-75	980.8	81.63
75-80	45.1	3.76	0-80	1026.0	85.39
80-85	35.3	2.94	0-85	1061.3	88.33
85-90	27.4	2.28	0-90	1088.7	90.61
90-95	19.3	1.60	0-95	1107.9	92.21
95-100	10.9	0.91	0-100	1118.8	93.12
100-105	10.3	0.85	0-105	1129.1	93.97
105-110	11.2	0.94	0-110	1140.4	94.91
110-115	11.6	0.96	0-115	1151.9	95.87
115-120	10.6	0.89	0-120	1162.5	96.76
120-125	9.2	0.76	0-125	1171.8	97.52
125-130	7.2	0.60	0-130	1178.9	98.12
130-135	6.1	0.51	0-135	1185.1	98.63
135-140	5.0	0.42	0-140	1190.1	99.05
140-145	3.5	0.29	0-145	1193.6	99.34
145-150	2.8	0.23	0-150	1196.4	99.57
150-155	2.1	0.18	0-155	1198.5	99.75
155-160	1.4	0.12	0-160	1199.9	99.87
160-165	0.9	0.07	0-165	1200.8	99.94
165-170	0.4	0.04	0-170	1201.3	99.98
170-175	0.2	0.02	0-175	1201.5	100.00
175-180	0.1	0.00	0-180	1201.5	100.00

**Product Photo**



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