



# IES LM-79-08

## MEASUREMENT AND TEST REPORT

For

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

2285 Ward Avenue / Simi Valley, CA 93065

**Test Model: 91761**

<b>Report Type:</b>	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
<b>Test Engineer:</b>	Hill Liu
<b>Report Number:</b>	R1KS181016082-10
<b>Test Date:</b>	2018-10-23
<b>Report Date:</b>	2020-06-11
<b>Reviewed By:</b>	Bill Xiong / EE Engineer
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Dongguan). No.69, Pulongcun, Puxinhu Industrial Area, Tangxia, Dongguan, Guangdong, 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:

Two samples were received on 2018-10-16. One was tested in integrating sphere and the other was tested in goniophotometer.

Model Tested: 91761  
 Manufacturer: P.Q.L., Inc.  
 Brand Name: Superior Life®  
 Product Designation: Directional LED Lamp  
 Burning Time Before Test: 0hour(For New Products)

### Rated Values:

Rated Voltage/Frequency: 120-277VAC 60Hz  
 Rated Power: 25W  
 Nominal CCT: 4000K  
 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  
 IES TM-30-18: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
1.5m integrating sphere	SENSING	1.5m	NA	2018-03-18	2019-03-18
Digital power meter	EVERFINE	PF9811	G135717CN1361159	2017-12-14	2018-12-14
High-precision rapid spectral radiometer	EVERFINE	HAAS-2000	N/A	2018-03-18	2019-03-18
Precision frequency power supply	ALL Power	APW-105N	970663	2018-03-19	2019-03-19
Standard Light Source	EVERFINE	D204	G100283CA8351158	2018-01-08	2019-01-08
thermometer	SENSING	NA	NA	2018-03-17	2019-03-17
Programmable Precision DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	2018-03-26	2019-03-26
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2018-03-19	2019-03-19
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2018-03-26	2019-03-26
Digital power meter	YOKOGAWA	WT-210	91j926132	2018-03-26	2019-03-26
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	2018-03-18	2019-03-18
Wireless Remote Sensor	N/A	433MHz	N/A	2018-03-17	2019-03-17

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Standard Light Source	EVERFINE	D908	1012003	2018-01-05	2019-01-05

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  $U=1.6\%$  ( $K=2$ ), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is  $U=20\text{K}$  ( $K=2$ ), at the 95% confidence level. The uncertainty of the CRI is  $U=1.6(K=2)$ , at the 95% confidence level.

The uncertainty of power meter AC current  $U=0.19\%$  of rdg, AC Voltage  $U=0.17\%$  of rdg, Power  $U=0.48\%$  ( $K=2$ ), 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  $U=2.82\%$  ( $K=2$ ), at the 95% confidence level.

##### **Fidelity Index and GamutIndex Calculation**

The  $R_i$ ,  $R_g$  was calculated according to IES TM-30-18 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**

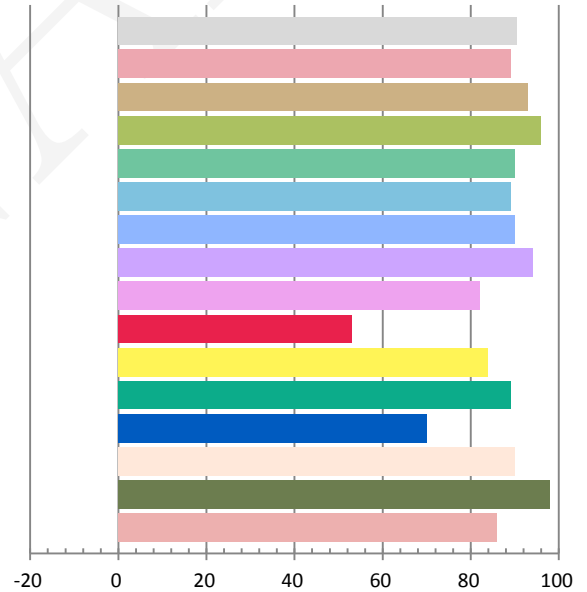
### Photometric and Electrical Measurement Result

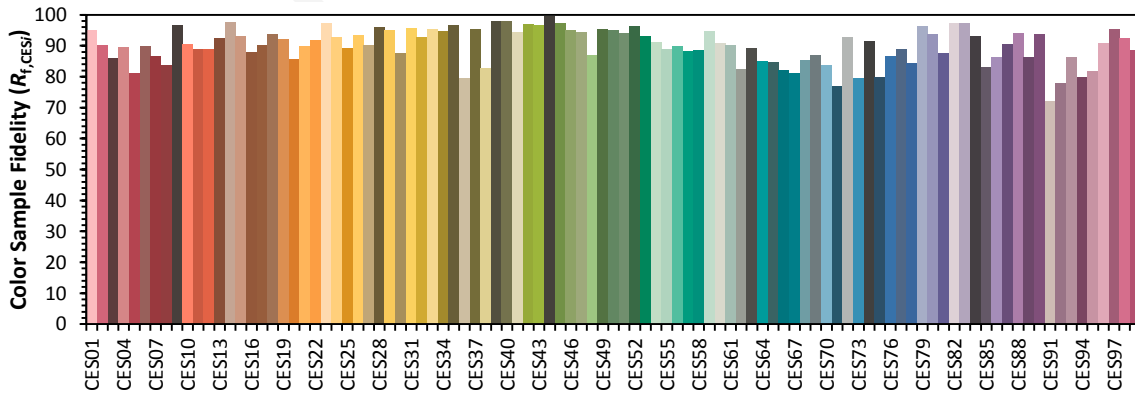
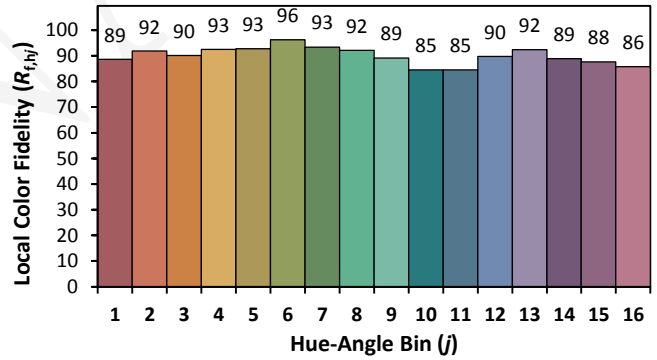
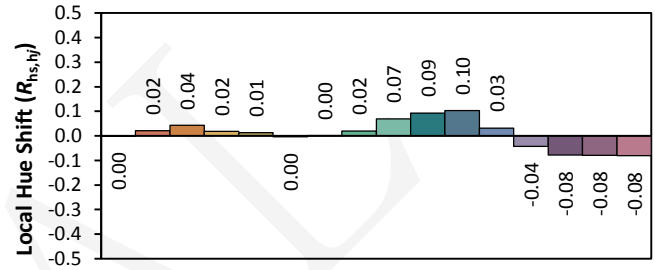
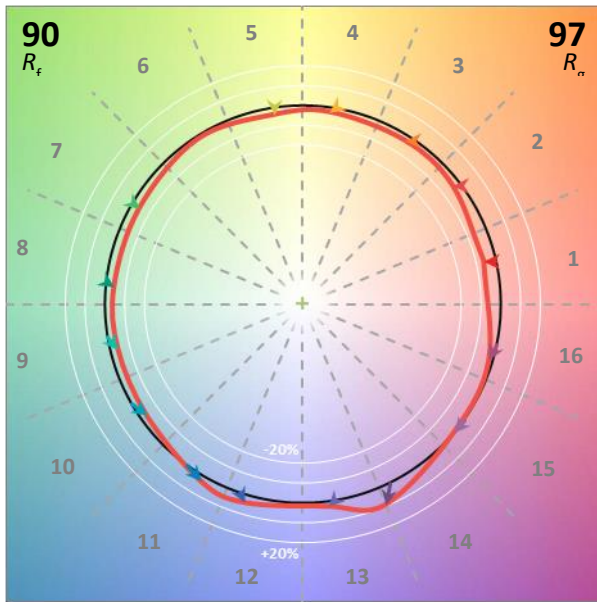
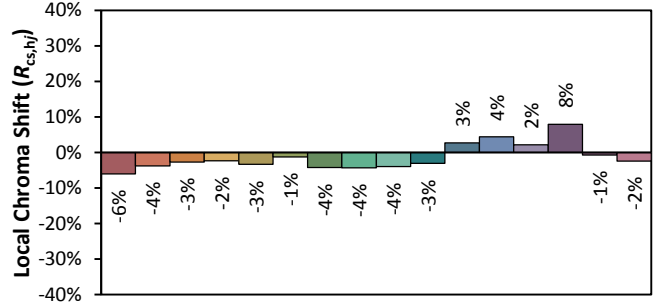
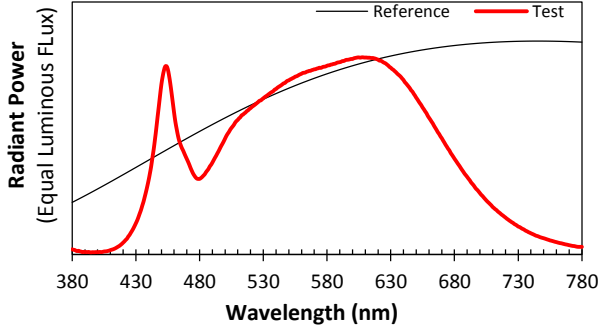
Voltage(V)	Frequency(Hz)	Current(A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy(lm/W)
119.9	60	0.2088	24.91	0.9951	2793.6	112.15

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
9.3164	3888	0.00378	0.3885	0.3899	0.2251	0.5084

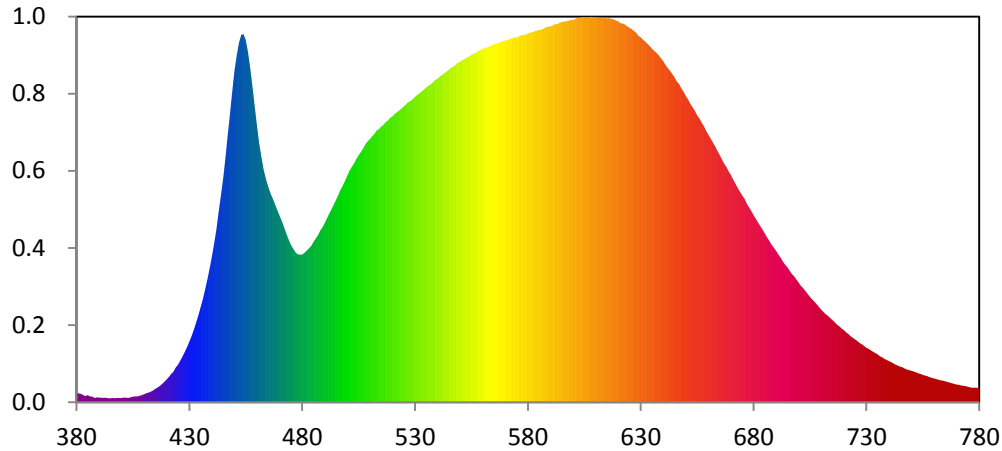
### Color Rendering Index

<b>Ra</b>			
90.4			
<b>R1</b>	<b>R2</b>	<b>R3</b>	<b>R4</b>
89	93	96	90
<b>R5</b>	<b>R6</b>	<b>R7</b>	<b>R8</b>
89	90	94	82
<b>R9</b>	<b>R10</b>	<b>R11</b>	<b>R12</b>
53	84	89	70
<b>R13</b>	<b>R14</b>	<b>R15</b>	
90	98	86	





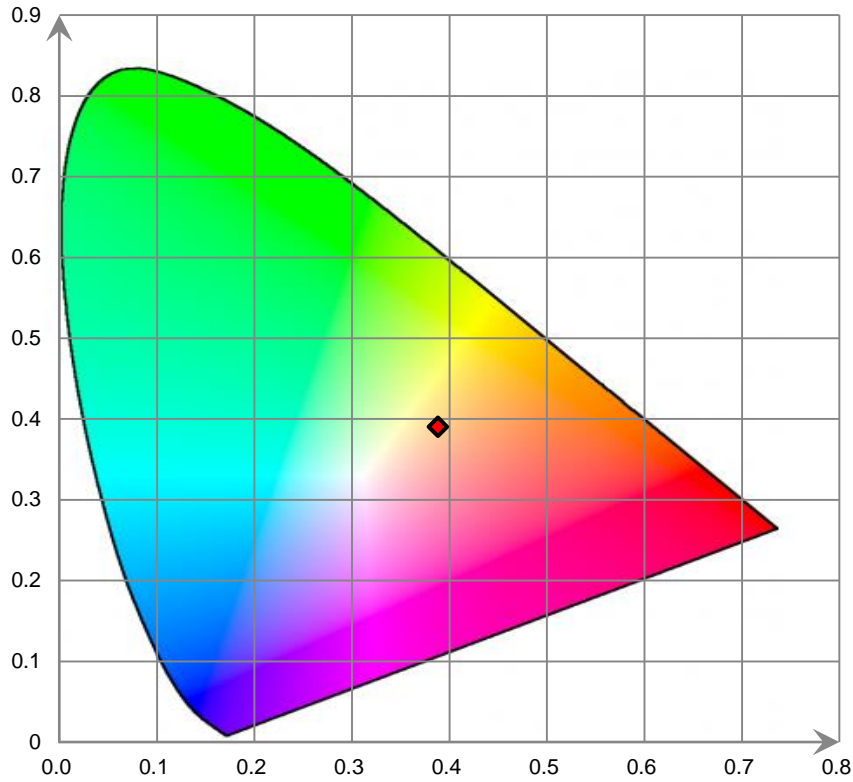
**Relative Spectral Power Distribution**



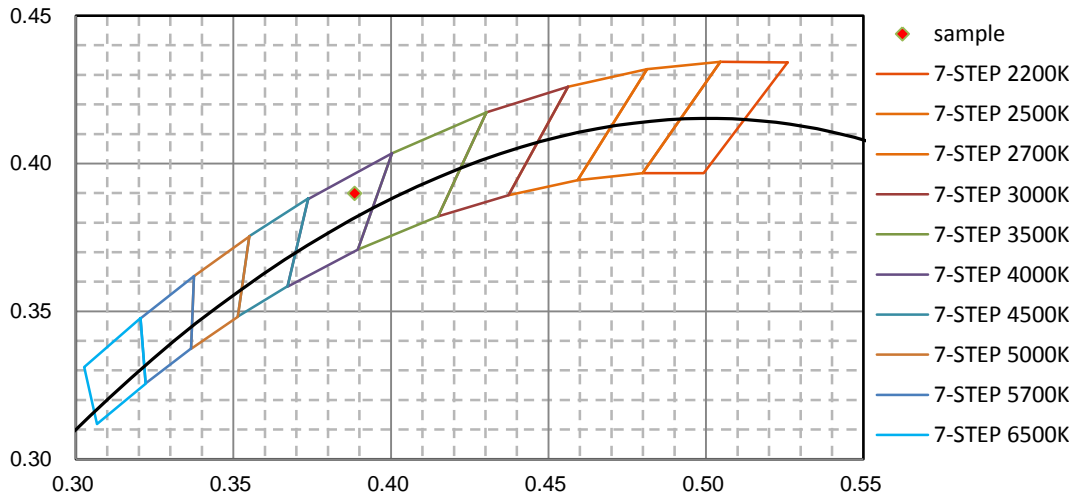
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.142E+00	421	2.939E+00	462	2.843E+01	503	2.775E+01	544	3.835E+01
381	1.034E+00	422	3.274E+00	463	2.694E+01	504	2.826E+01	545	3.857E+01
382	9.950E-01	423	3.544E+00	464	2.575E+01	505	2.867E+01	546	3.879E+01
383	8.230E-01	424	4.026E+00	465	2.492E+01	506	2.903E+01	547	3.888E+01
384	7.365E-01	425	4.393E+00	466	2.416E+01	507	2.942E+01	548	3.917E+01
385	8.219E-01	426	4.885E+00	467	2.358E+01	508	2.991E+01	549	3.937E+01
386	6.782E-01	427	5.347E+00	468	2.290E+01	509	3.025E+01	550	3.946E+01
387	6.300E-01	428	5.863E+00	469	2.223E+01	510	3.051E+01	551	3.966E+01
388	4.962E-01	429	6.444E+00	470	2.161E+01	511	3.086E+01	552	3.979E+01
389	5.659E-01	430	7.054E+00	471	2.097E+01	512	3.111E+01	553	3.996E+01
390	5.273E-01	431	7.687E+00	472	2.027E+01	513	3.153E+01	554	4.009E+01
391	5.314E-01	432	8.427E+00	473	1.952E+01	514	3.168E+01	555	4.029E+01
392	5.159E-01	433	9.253E+00	474	1.887E+01	515	3.195E+01	556	4.038E+01
393	5.447E-01	434	1.005E+01	475	1.827E+01	516	3.216E+01	557	4.052E+01
394	4.660E-01	435	1.104E+01	476	1.781E+01	517	3.247E+01	558	4.070E+01
395	4.544E-01	436	1.196E+01	477	1.741E+01	518	3.266E+01	559	4.084E+01
396	4.890E-01	437	1.308E+01	478	1.716E+01	519	3.295E+01	560	4.096E+01
397	4.809E-01	438	1.424E+01	479	1.711E+01	520	3.316E+01	561	4.114E+01
398	4.917E-01	439	1.550E+01	480	1.712E+01	521	3.343E+01	562	4.118E+01
399	5.144E-01	440	1.685E+01	481	1.730E+01	522	3.364E+01	563	4.124E+01
400	4.941E-01	441	1.834E+01	482	1.755E+01	523	3.385E+01	564	4.141E+01
401	5.326E-01	442	1.996E+01	483	1.786E+01	524	3.408E+01	565	4.149E+01
402	5.397E-01	443	2.196E+01	484	1.815E+01	525	3.432E+01	566	4.160E+01
403	5.129E-01	444	2.386E+01	485	1.862E+01	526	3.456E+01	567	4.163E+01
404	5.662E-01	445	2.614E+01	486	1.900E+01	527	3.483E+01	568	4.177E+01
405	6.490E-01	446	2.850E+01	487	1.939E+01	528	3.491E+01	569	4.185E+01
406	6.688E-01	447	3.109E+01	488	1.994E+01	529	3.516E+01	570	4.196E+01
407	7.022E-01	448	3.357E+01	489	2.031E+01	530	3.540E+01	571	4.199E+01
408	7.706E-01	449	3.613E+01	490	2.080E+01	531	3.563E+01	572	4.213E+01
409	8.499E-01	450	3.853E+01	491	2.134E+01	532	3.584E+01	573	4.219E+01
410	9.584E-01	451	4.029E+01	492	2.188E+01	533	3.603E+01	574	4.233E+01
411	1.051E+00	452	4.170E+01	493	2.238E+01	534	3.627E+01	575	4.228E+01
412	1.136E+00	453	4.260E+01	494	2.292E+01	535	3.648E+01	576	4.239E+01
413	1.254E+00	454	4.268E+01	495	2.345E+01	536	3.670E+01	577	4.253E+01
414	1.394E+00	455	4.202E+01	496	2.404E+01	537	3.686E+01	578	4.256E+01
415	1.559E+00	456	4.060E+01	497	2.461E+01	538	3.707E+01	579	4.263E+01
416	1.741E+00	457	3.874E+01	498	2.511E+01	539	3.738E+01	580	4.277E+01
417	1.909E+00	458	3.658E+01	499	2.566E+01	540	3.751E+01	581	4.286E+01
418	2.136E+00	459	3.432E+01	500	2.626E+01	541	3.778E+01	582	4.289E+01
419	2.376E+00	460	3.209E+01	501	2.685E+01	542	3.798E+01	583	4.303E+01
420	2.663E+00	461	3.003E+01	502	2.734E+01	543	3.816E+01	584	4.307E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.318E+01	626	4.329E+01	667	2.767E+01	708	1.137E+01	749	3.730E+00
586	4.322E+01	627	4.304E+01	668	2.728E+01	709	1.108E+01	750	3.653E+00
587	4.333E+01	628	4.282E+01	669	2.676E+01	710	1.073E+01	751	3.560E+00
588	4.348E+01	629	4.251E+01	670	2.635E+01	711	1.050E+01	752	3.462E+00
589	4.353E+01	630	4.232E+01	671	2.584E+01	712	1.023E+01	753	3.357E+00
590	4.359E+01	631	4.204E+01	672	2.537E+01	713	1.003E+01	754	3.274E+00
591	4.367E+01	632	4.185E+01	673	2.487E+01	714	9.724E+00	755	3.160E+00
592	4.383E+01	633	4.157E+01	674	2.443E+01	715	9.499E+00	756	3.094E+00
593	4.384E+01	634	4.132E+01	675	2.395E+01	716	9.272E+00	757	3.013E+00
594	4.397E+01	635	4.101E+01	676	2.357E+01	717	9.003E+00	758	2.928E+00
595	4.410E+01	636	4.075E+01	677	2.300E+01	718	8.811E+00	759	2.837E+00
596	4.412E+01	637	4.051E+01	678	2.259E+01	719	8.566E+00	760	2.772E+00
597	4.416E+01	638	4.021E+01	679	2.215E+01	720	8.355E+00	761	2.684E+00
598	4.424E+01	639	3.985E+01	680	2.169E+01	721	8.100E+00	762	2.604E+00
599	4.431E+01	640	3.954E+01	681	2.127E+01	722	7.907E+00	763	2.540E+00
600	4.431E+01	641	3.907E+01	682	2.084E+01	723	7.673E+00	764	2.498E+00
601	4.446E+01	642	3.876E+01	683	2.042E+01	724	7.487E+00	765	2.411E+00
602	4.453E+01	643	3.840E+01	684	2.001E+01	725	7.276E+00	766	2.343E+00
603	4.459E+01	644	3.804E+01	685	1.955E+01	726	7.118E+00	767	2.265E+00
604	4.465E+01	645	3.767E+01	686	1.912E+01	727	6.870E+00	768	2.215E+00
605	4.466E+01	646	3.720E+01	687	1.871E+01	728	6.721E+00	769	2.148E+00
606	4.461E+01	647	3.690E+01	688	1.827E+01	729	6.532E+00	770	2.072E+00
607	4.466E+01	648	3.642E+01	689	1.792E+01	730	6.310E+00	771	2.015E+00
608	4.469E+01	649	3.600E+01	690	1.755E+01	731	6.204E+00	772	1.949E+00
609	4.464E+01	650	3.552E+01	691	1.715E+01	732	6.037E+00	773	1.901E+00
610	4.463E+01	651	3.511E+01	692	1.680E+01	733	5.830E+00	774	1.877E+00
611	4.463E+01	652	3.464E+01	693	1.633E+01	734	5.709E+00	775	1.805E+00
612	4.459E+01	653	3.421E+01	694	1.599E+01	735	5.535E+00	776	1.736E+00
613	4.460E+01	654	3.381E+01	695	1.565E+01	736	5.339E+00	777	1.699E+00
614	4.456E+01	655	3.330E+01	696	1.523E+01	737	5.221E+00	778	1.696E+00
615	4.452E+01	656	3.289E+01	697	1.485E+01	738	5.041E+00	779	1.699E+00
616	4.453E+01	657	3.242E+01	698	1.458E+01	739	4.918E+00	780	1.702E+00
617	4.445E+01	658	3.201E+01	699	1.423E+01	740	4.769E+00		
618	4.438E+01	659	3.144E+01	700	1.386E+01	741	4.640E+00		
619	4.426E+01	660	3.099E+01	701	1.350E+01	742	4.515E+00		
620	4.416E+01	661	3.056E+01	702	1.323E+01	743	4.368E+00		
621	4.394E+01	662	3.010E+01	703	1.288E+01	744	4.229E+00		
622	4.392E+01	663	2.967E+01	704	1.255E+01	745	4.154E+00		
623	4.379E+01	664	2.914E+01	705	1.222E+01	746	4.044E+00		
624	4.358E+01	665	2.866E+01	706	1.193E+01	747	3.914E+00		
625	4.343E+01	666	2.818E+01	707	1.166E+01	748	3.814E+00		

CIE 1931xy Chromaticity Diagram



7-Step Chromaticity Quadrangles





**[Goniophotometer System]**

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

Test orientation: **Base up**

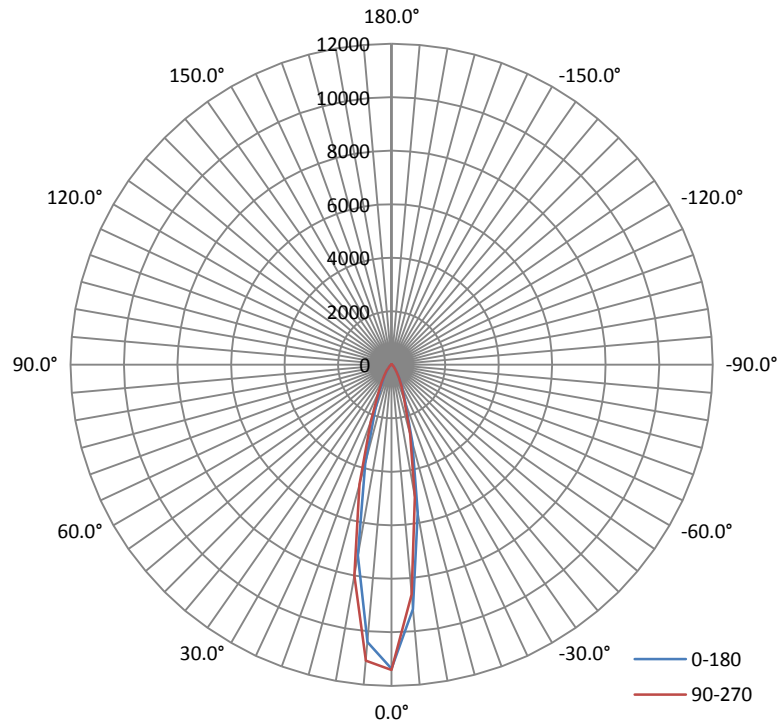
**Electrical Measurement**

Input Voltage(V)	Frequency(Hz)	Input Current(A)	Power (W)	Power Factor
120.0	60	0.2092	24.99	0.9951

**Photometric Measurement**

Luminous Flux(lm)	Efficacy(lm/W)	I <sub>max</sub> (cd)	S/MH(C0/180)	S/MH(C90/270)
2793.68	111.79	12327	0.34	0.31

**Luminous Intensity Distribution**



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle(50%I <sub>max</sub> ):	21.6	21.0	21.3	21.7	21.4
Field Angle(10%I <sub>max</sub> ):	45.9	45.1	46.6	47.2	46.2

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	11363	11425	11455	11463	11411	11326	11290	11412
5.0°	10407	11072	11497	11494	11101	10545	9985	9423
10.0°	7235	7906	8251	8237	7999	7446	6700	5965
15.0°	3827	4347	4686	4768	4623	4187	3721	3239
20.0°	1806	1991	2189	2285	2273	2127	1887	1658
25.0°	966	1033	1117	1182	1205	1156	1071	971
30.0°	601	633	687	737	763	747	691	618
35.0°	357	373	412	448	474	466	427	376
40.0°	217	224	243	267	282	280	256	230
45.0°	138	139	146	160	168	168	158	146
50.0°	98	99	104	110	112	111	108	102
55.0°	77	77	80	83	84	83	81	79
60.0°	60	61	63	65	65	63	62	62
65.0°	47	48	50	51	51	49	48	47
70.0°	36	38	39	40	40	38	36	34
75.0°	26	28	29	30	29	27	25	23
80.0°	16	18	19	19	19	17	15	13
85.0°	8	9	10	10	9	8	7	5
90.0°	1	2	2	2	2	1	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°	1	1	1	1	1	1	1	1
140.0°	2	1	1	1	1	2	2	2
145.0°	3	3	3	3	3	3	3	3
150.0°	5	4	4	4	4	4	5	5
155.0°	6	6	6	6	6	6	6	6
160.0°	7	7	7	6	6	6	6	7
165.0°	7	7	7	6	6	6	6	6
170.0°	6	6	6	6	5	5	5	5
175.0°	4	5	4	4	4	4	4	4
180.0°	3	3	3	3	3	3	3	2

Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	11363	11425	11455	11463	11411	11326	11290	11412
5.0°	9166	8777	8546	8492	8617	8883	9347	9926
10.0°	5610	5186	4951	4909	5027	5359	5911	6673
15.0°	2976	2704	2558	2541	2645	2848	3176	3575
20.0°	1534	1403	1343	1346	1396	1470	1573	1707
25.0°	910	849	829	838	868	902	933	965
30.0°	567	524	511	522	548	579	598	615
35.0°	341	311	302	312	333	352	363	370
40.0°	213	196	188	192	203	215	223	225
45.0°	138	128	125	126	132	138	143	143
50.0°	99	92	88	89	92	96	102	101
55.0°	77	73	70	70	72	75	76	77
60.0°	61	58	55	54	56	58	60	60
65.0°	46	43	41	40	41	43	45	47
70.0°	33	31	30	29	30	31	33	35
75.0°	22	20	19	19	20	21	23	25
80.0°	12	11	10	10	10	12	13	15
85.0°	4	3	2	2	3	4	5	7
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°	1	1	1	1	1	1	1	0
145.0°	1	1	1	1	1	1	1	1
150.0°	1	2	2	1	1	1	1	1
155.0°	2	2	2	2	2	2	2	2
160.0°	2	2	2	2	2	2	2	2
165.0°	2	2	2	2	2	2	2	2
170.0°	2	2	2	2	2	2	2	2
175.0°	2	2	2	2	2	2	2	2
180.0°	3	3	3	3	3	3	3	3

Zonal Lumen Density Measurement

Deg	Flux (lm)	%	Deg	Flux (lm)	%
0-5	254.7	9.12	0-5	254.7	9.12
5-10	572.1	20.48	0-10	826.8	29.60
10-15	572.8	20.50	0-15	1399.6	50.10
15-20	411.0	14.71	0-20	1810.6	64.81
20-25	273.5	9.79	0-25	2084.1	74.60
25-30	199.0	7.12	0-30	2283.1	81.72
30-35	143.6	5.14	0-35	2426.7	86.86
35-40	98.4	3.53	0-40	2525.1	90.39
40-45	66.9	2.39	0-45	2592.0	92.78
45-50	48.2	1.72	0-50	2640.1	94.50
50-55	38.3	1.37	0-55	2678.4	95.87
55-60	31.5	1.13	0-60	2710.0	97.00
60-65	25.8	0.93	0-65	2735.7	97.93
65-70	20.3	0.72	0-70	2756.1	98.65
70-75	15.3	0.55	0-75	2771.3	99.20
75-80	10.2	0.37	0-80	2781.6	99.57
80-85	5.4	0.19	0-85	2787.0	99.76
85-90	1.5	0.06	0-90	2788.5	99.82
90-95	0.1	0.00	0-95	2788.6	99.82
95-100	0.0	0.00	0-100	2788.6	99.82
100-105	0.0	0.00	0-105	2788.6	99.82
105-110	0.0	0.00	0-110	2788.7	99.82
110-115	0.0	0.00	0-115	2788.7	99.82
115-120	0.0	0.00	0-120	2788.7	99.82
120-125	0.1	0.00	0-125	2788.8	99.82
125-130	0.1	0.01	0-130	2788.9	99.83
130-135	0.1	0.00	0-135	2789.0	99.83
135-140	0.3	0.01	0-140	2789.3	99.84
140-145	0.5	0.02	0-145	2789.8	99.86
145-150	0.7	0.03	0-150	2790.5	99.89
150-155	0.9	0.03	0-155	2791.4	99.92
155-160	0.9	0.03	0-160	2792.2	99.95
160-165	0.7	0.02	0-165	2792.9	99.97
165-170	0.5	0.02	0-170	2793.4	99.99
170-175	0.2	0.01	0-175	2793.6	100.00
175-180	0.1	0.00	0-180	2793.7	100.00

## 6. Product Photo



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