



IES LM-79-08

MEASUREMENT AND TEST REPORT

For

P.Q.L., Inc.

2285 Ward Avenue / Simi Valley, CA 93065

Test Model: 91762

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Hill Liu
Report Number:	R1KS200413080-10
Test Date:	2020-04-16 to 2020-06-19
Report Date:	2020-06-28
Reviewed By:	Bill Xiong / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69, Pulongcun, Puxinhu Industrial Area, Tangxia, Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.

1. Product Description

General Information:

Two samples were received on 2020-04-15. One was tested in integrating sphere and the other was tested in goniophotometer.

Model Tested: 91762
 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: 5000K
 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	2020-05-09	2021-05-08
Digital power meter	EVERFINE	PF9811	G135717CN1361159	2019-11-05	2020-11-04
High-precision rapid spectral radiometer	EVERFINE	HAAS-2000	N/A	2020-05-09	2021-05-08
Precision frequency power supply	ALL Power	APW-105N	970663	2020-03-10	2021-03-09
Standard Light Source	EVERFINE	D204	N/A	2019-07-19	2020-07-18
thermometer	SENSING	NA	NA	2020-03-13	2021-03-12
Programmable Precision DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	2020-03-08	2021-03-07
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2020-03-13	2021-03-12
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2020-03-13	2021-03-12
Digital power meter	YOKOGAWA	WT-210	91j926132	2020-03-13	2021-03-12
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	2020-03-13	2021-03-12
Wireless Remote Sensor	N/A	433MHz	N/A	2020-03-13	2021-03-12

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
Standard Light Source	EVERFINE	D908	1012003	2019-11-27	2020-11-26

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 $U=21\text{K}$ ($K=2$), 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 $U=0.17\%$ 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 (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 $U=2.00\%$ ($K=2$), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

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

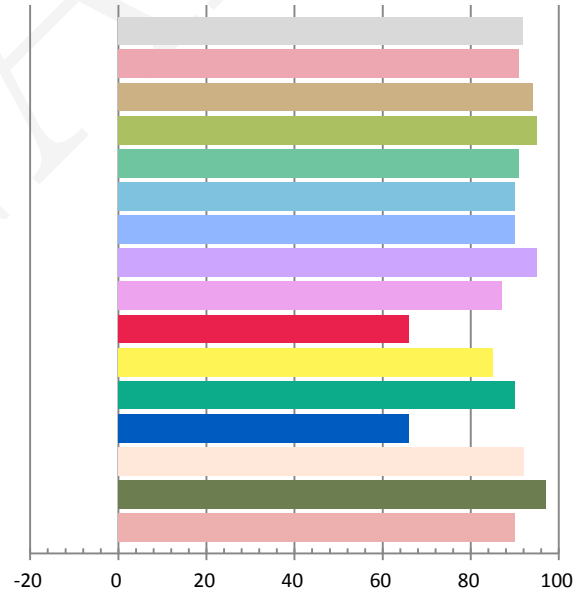
Photometric and Electrical Measurement Result

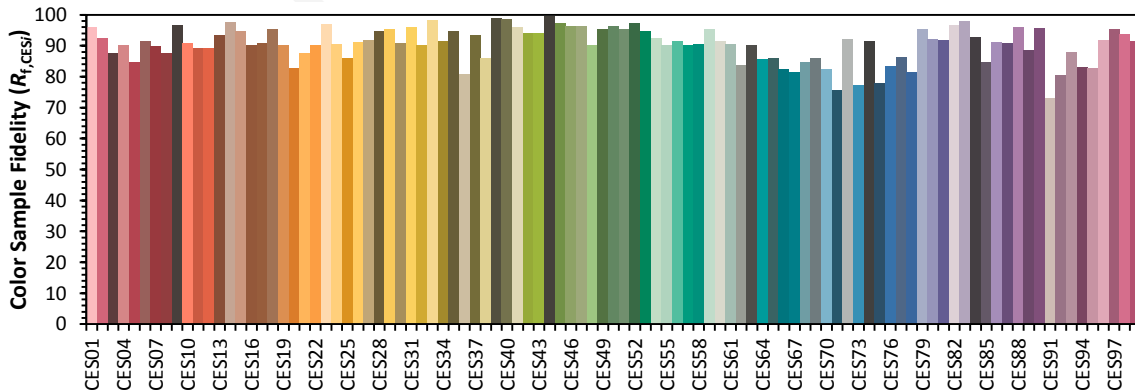
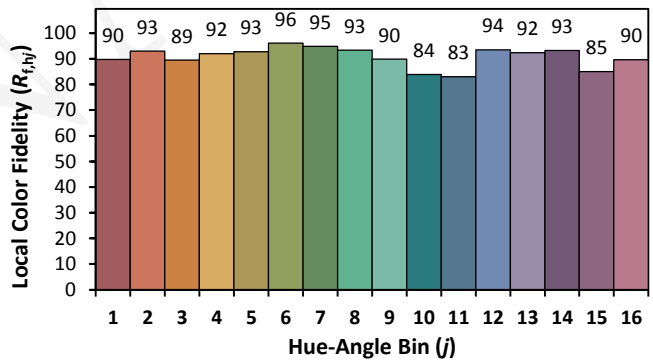
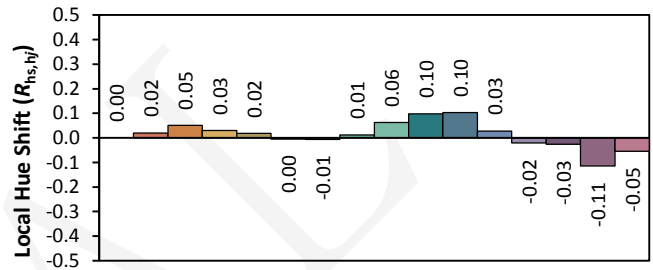
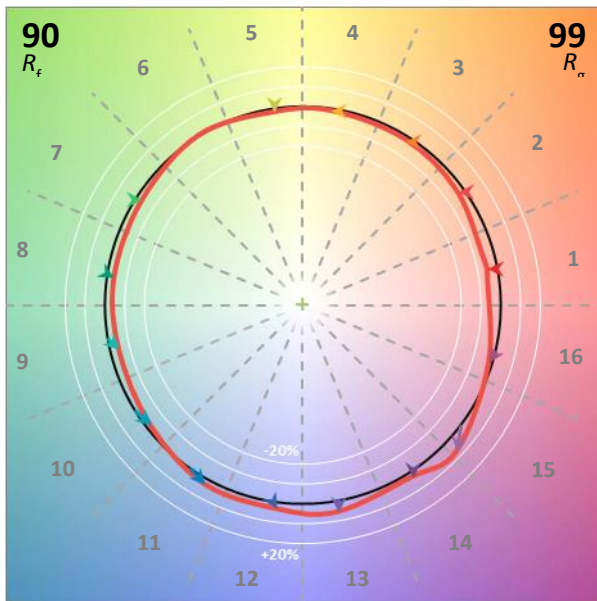
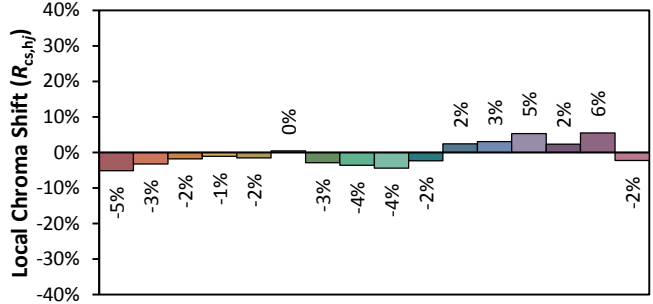
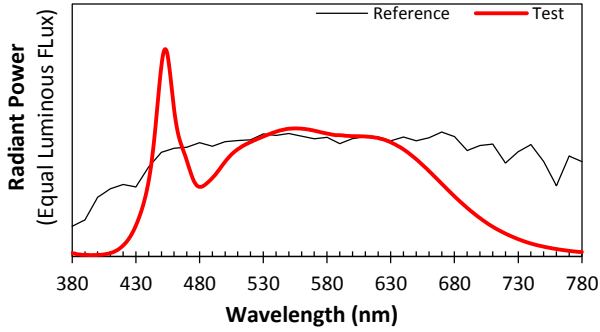
Voltage(V)	Frequency(Hz)	Current(A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy(lm/W)
120.0	60	0.2085	24.89	0.9950	2885.2	115.92

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
9.9691	4972	0.00253	0.3464	0.3578	0.2099	0.4878

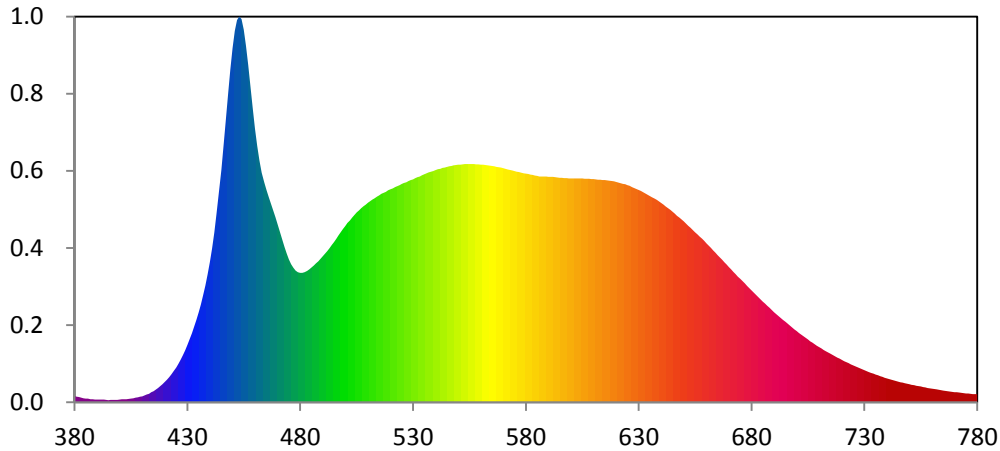
Color Rendering Index

Ra			
91.8			
R1	R2	R3	R4
91	94	95	91
R5	R6	R7	R8
90	90	95	87
R9	R10	R11	R12
66	85	90	66
R13	R14	R15	
92	97	90	





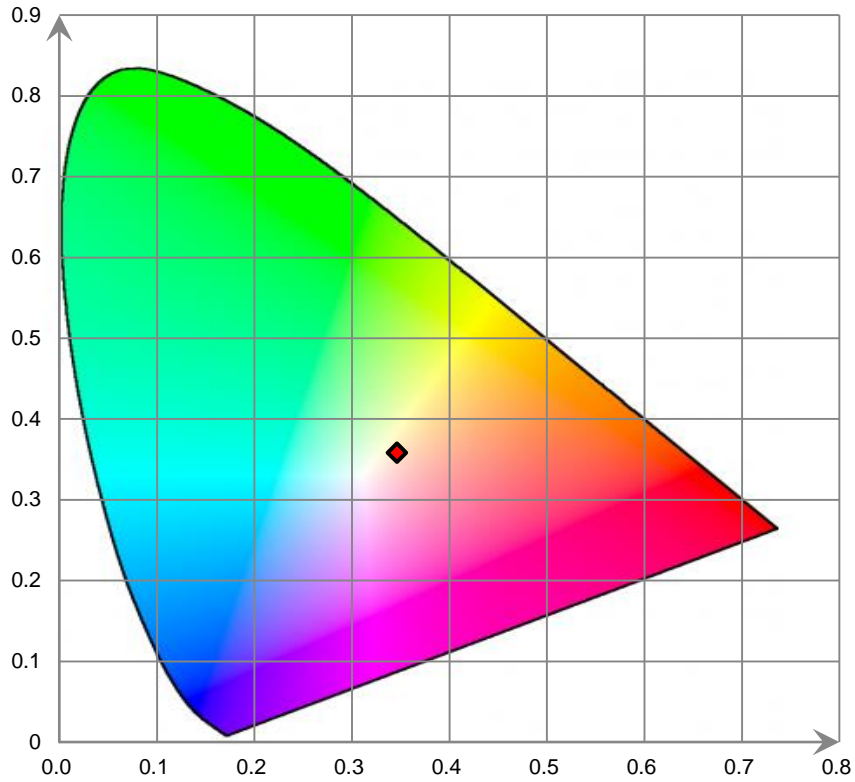
Relative Spectral Power Distribution



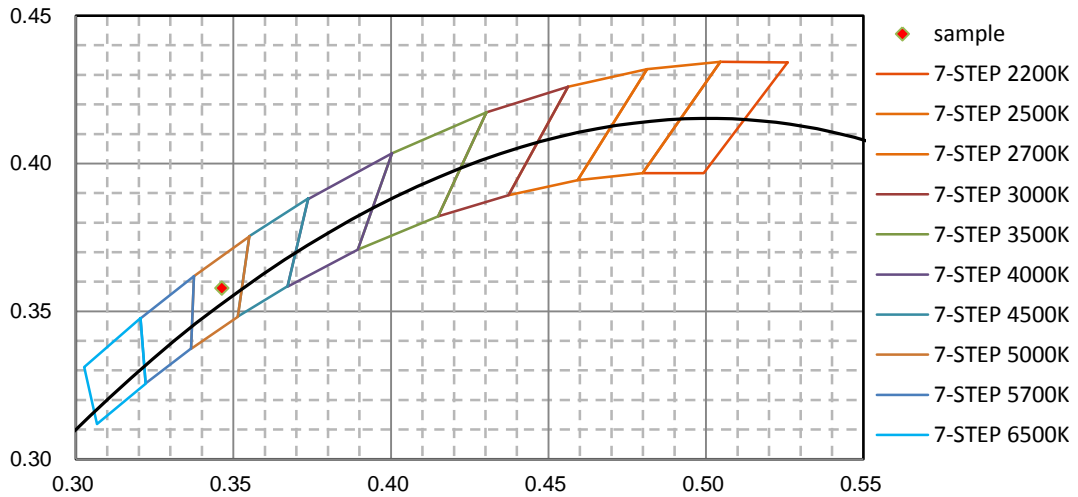
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.094E+00	421	4.073E+00	462	4.346E+01	503	3.319E+01	544	4.220E+01
381	9.862E-01	422	4.516E+00	463	4.127E+01	504	3.364E+01	545	4.228E+01
382	9.463E-01	423	5.028E+00	464	3.954E+01	505	3.411E+01	546	4.239E+01
383	8.047E-01	424	5.603E+00	465	3.813E+01	506	3.448E+01	547	4.247E+01
384	6.989E-01	425	6.234E+00	466	3.688E+01	507	3.486E+01	548	4.260E+01
385	6.640E-01	426	6.913E+00	467	3.565E+01	508	3.521E+01	549	4.264E+01
386	6.572E-01	427	7.671E+00	468	3.447E+01	509	3.553E+01	550	4.272E+01
387	5.213E-01	428	8.468E+00	469	3.327E+01	510	3.586E+01	551	4.270E+01
388	5.214E-01	429	9.345E+00	470	3.197E+01	511	3.612E+01	552	4.276E+01
389	5.056E-01	430	1.032E+01	471	3.061E+01	512	3.641E+01	553	4.279E+01
390	5.057E-01	431	1.135E+01	472	2.929E+01	513	3.668E+01	554	4.279E+01
391	4.932E-01	432	1.241E+01	473	2.799E+01	514	3.697E+01	555	4.281E+01
392	4.880E-01	433	1.358E+01	474	2.678E+01	515	3.717E+01	556	4.282E+01
393	4.591E-01	434	1.481E+01	475	2.569E+01	516	3.745E+01	557	4.279E+01
394	4.295E-01	435	1.615E+01	476	2.481E+01	517	3.762E+01	558	4.276E+01
395	3.976E-01	436	1.760E+01	477	2.415E+01	518	3.781E+01	559	4.276E+01
396	4.298E-01	437	1.923E+01	478	2.364E+01	519	3.807E+01	560	4.271E+01
397	4.530E-01	438	2.094E+01	479	2.335E+01	520	3.825E+01	561	4.268E+01
398	4.328E-01	439	2.296E+01	480	2.326E+01	521	3.842E+01	562	4.264E+01
399	4.484E-01	440	2.516E+01	481	2.325E+01	522	3.866E+01	563	4.259E+01
400	4.955E-01	441	2.764E+01	482	2.337E+01	523	3.886E+01	564	4.252E+01
401	5.174E-01	442	3.051E+01	483	2.359E+01	524	3.899E+01	565	4.247E+01
402	5.184E-01	443	3.394E+01	484	2.387E+01	525	3.923E+01	566	4.241E+01
403	5.367E-01	444	3.757E+01	485	2.422E+01	526	3.939E+01	567	4.228E+01
404	5.999E-01	445	4.173E+01	486	2.457E+01	527	3.954E+01	568	4.225E+01
405	6.572E-01	446	4.618E+01	487	2.496E+01	528	3.975E+01	569	4.214E+01
406	7.212E-01	447	5.077E+01	488	2.534E+01	529	3.993E+01	570	4.205E+01
407	8.027E-01	448	5.536E+01	489	2.577E+01	530	4.007E+01	571	4.193E+01
408	8.605E-01	449	5.978E+01	490	2.622E+01	531	4.026E+01	572	4.186E+01
409	9.748E-01	450	6.362E+01	491	2.669E+01	532	4.047E+01	573	4.176E+01
410	1.089E+00	451	6.670E+01	492	2.714E+01	533	4.059E+01	574	4.166E+01
411	1.227E+00	452	6.866E+01	493	2.770E+01	534	4.079E+01	575	4.154E+01
412	1.383E+00	453	6.934E+01	494	2.826E+01	535	4.094E+01	576	4.144E+01
413	1.548E+00	454	6.884E+01	495	2.881E+01	536	4.111E+01	577	4.135E+01
414	1.783E+00	455	6.698E+01	496	2.936E+01	537	4.128E+01	578	4.127E+01
415	1.993E+00	456	6.405E+01	497	2.997E+01	538	4.143E+01	579	4.116E+01
416	2.256E+00	457	6.059E+01	498	3.054E+01	539	4.156E+01	580	4.109E+01
417	2.558E+00	458	5.670E+01	499	3.110E+01	540	4.170E+01	581	4.100E+01
418	2.887E+00	459	5.288E+01	500	3.164E+01	541	4.188E+01	582	4.092E+01
419	3.246E+00	460	4.917E+01	501	3.221E+01	542	4.197E+01	583	4.085E+01
420	3.623E+00	461	4.606E+01	502	3.268E+01	543	4.212E+01	584	4.072E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	4.069E+01	626	3.888E+01	667	2.559E+01	708	1.043E+01	749	3.337E+00
586	4.058E+01	627	3.867E+01	668	2.516E+01	709	1.016E+01	750	3.240E+00
587	4.055E+01	628	3.850E+01	669	2.473E+01	710	9.925E+00	751	3.147E+00
588	4.054E+01	629	3.835E+01	670	2.429E+01	711	9.657E+00	752	3.065E+00
589	4.056E+01	630	3.815E+01	671	2.388E+01	712	9.402E+00	753	2.980E+00
590	4.053E+01	631	3.796E+01	672	2.345E+01	713	9.160E+00	754	2.894E+00
591	4.051E+01	632	3.773E+01	673	2.302E+01	714	8.934E+00	755	2.817E+00
592	4.049E+01	633	3.754E+01	674	2.260E+01	715	8.699E+00	756	2.733E+00
593	4.044E+01	634	3.730E+01	675	2.217E+01	716	8.479E+00	757	2.653E+00
594	4.036E+01	635	3.707E+01	676	2.175E+01	717	8.263E+00	758	2.581E+00
595	4.032E+01	636	3.682E+01	677	2.133E+01	718	8.037E+00	759	2.508E+00
596	4.031E+01	637	3.661E+01	678	2.090E+01	719	7.822E+00	760	2.449E+00
597	4.030E+01	638	3.636E+01	679	2.049E+01	720	7.619E+00	761	2.372E+00
598	4.025E+01	639	3.606E+01	680	2.009E+01	721	7.410E+00	762	2.305E+00
599	4.024E+01	640	3.579E+01	681	1.968E+01	722	7.206E+00	763	2.237E+00
600	4.021E+01	641	3.550E+01	682	1.927E+01	723	7.019E+00	764	2.176E+00
601	4.022E+01	642	3.519E+01	683	1.890E+01	724	6.819E+00	765	2.112E+00
602	4.023E+01	643	3.490E+01	684	1.849E+01	725	6.642E+00	766	2.061E+00
603	4.020E+01	644	3.457E+01	685	1.810E+01	726	6.458E+00	767	2.001E+00
604	4.020E+01	645	3.422E+01	686	1.772E+01	727	6.277E+00	768	1.942E+00
605	4.020E+01	646	3.392E+01	687	1.734E+01	728	6.098E+00	769	1.886E+00
606	4.019E+01	647	3.352E+01	688	1.696E+01	729	5.924E+00	770	1.834E+00
607	4.014E+01	648	3.321E+01	689	1.659E+01	730	5.757E+00	771	1.785E+00
608	4.017E+01	649	3.285E+01	690	1.619E+01	731	5.592E+00	772	1.733E+00
609	4.013E+01	650	3.249E+01	691	1.585E+01	732	5.435E+00	773	1.689E+00
610	4.010E+01	651	3.213E+01	692	1.548E+01	733	5.274E+00	774	1.641E+00
611	4.008E+01	652	3.174E+01	693	1.513E+01	734	5.126E+00	775	1.595E+00
612	4.002E+01	653	3.135E+01	694	1.479E+01	735	4.976E+00	776	1.553E+00
613	4.001E+01	654	3.095E+01	695	1.444E+01	736	4.832E+00	777	1.510E+00
614	3.994E+01	655	3.057E+01	696	1.409E+01	737	4.678E+00	778	1.466E+00
615	3.995E+01	656	3.017E+01	697	1.376E+01	738	4.549E+00	779	1.455E+00
616	3.988E+01	657	2.977E+01	698	1.344E+01	739	4.425E+00	780	1.458E+00
617	3.980E+01	658	2.938E+01	699	1.310E+01	740	4.291E+00		
618	3.973E+01	659	2.898E+01	700	1.280E+01	741	4.164E+00		
619	3.968E+01	660	2.854E+01	701	1.248E+01	742	4.046E+00		
620	3.958E+01	661	2.813E+01	702	1.217E+01	743	3.932E+00		
621	3.948E+01	662	2.773E+01	703	1.188E+01	744	3.824E+00		
622	3.933E+01	663	2.729E+01	704	1.157E+01	745	3.718E+00		
623	3.924E+01	664	2.686E+01	705	1.128E+01	746	3.613E+00		
624	3.916E+01	665	2.645E+01	706	1.098E+01	747	3.521E+00		
625	3.900E+01	666	2.602E+01	707	1.070E+01	748	3.432E+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**

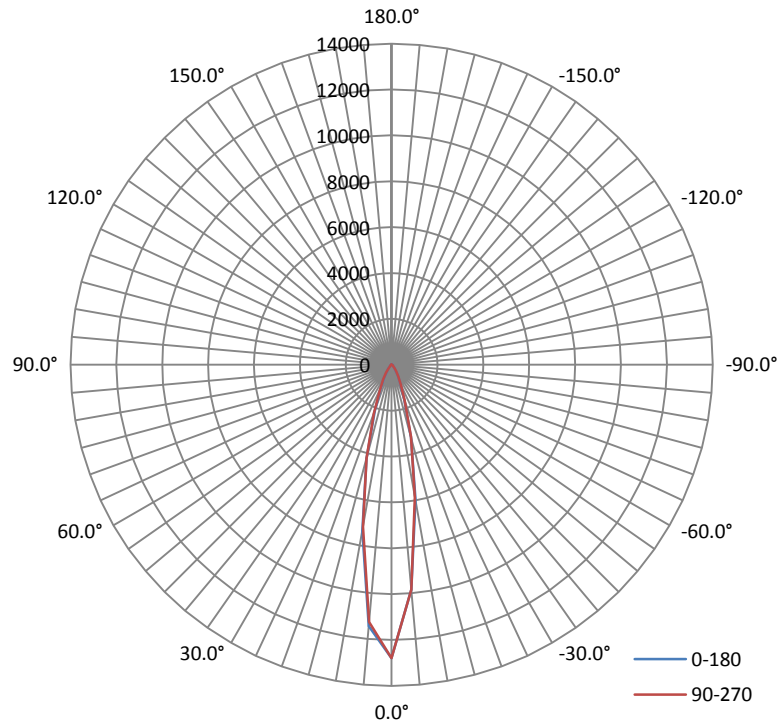
Electrical Measurement

Input Voltage(V)	Frequency(Hz)	Input Current(A)	Power (W)	Power Factor
120.04	60	0.2088	24.940	0.9950

Photometric Measurement

Luminous Flux(lm)	Efficacy(lm/W)	I _{max} (cd)	S/MH(C0/180)	S/MH(C90/270)
2892.72	115.99	12949	0.32	0.32

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle(50%I _{max}):	20.5	20.3	20.2	20.4	20.4
Field Angle(10%I _{max}):	45.7	46.1	46.6	45.8	46.1

Luminous Intensity (cd) Distribution Data

C γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	12790	12790	12790	12790	12790	12790	12790	12790
5.0°	11442	11669	11673	11521	11255	10941	10567	10223
10.0°	7350	7587	7595	7423	7174	6857	6545	6267
15.0°	4222	4398	4449	4378	4227	3994	3726	3497
20.0°	2134	2255	2326	2325	2249	2095	1920	1749
25.0°	1101	1170	1220	1237	1205	1114	1027	959
30.0°	657	711	747	756	733	670	615	573
35.0°	379	417	442	448	422	378	345	330
40.0°	222	242	253	253	237	212	194	188
45.0°	137	142	144	141	130	120	117	118
50.0°	99	99	97	93	88	85	87	89
55.0°	78	77	75	73	71	70	71	73
60.0°	63	62	60	59	58	57	59	58
65.0°	47	47	46	46	46	45	45	44
70.0°	35	35	36	36	36	35	34	33
75.0°	25	26	26	27	26	26	24	23
80.0°	16	16	16	17	16	16	15	14
85.0°	7	8	8	8	8	7	6	6
90.0°	1	1	1	1	1	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°	1	1	1	1	1	1	1	1
140.0°	2	2	2	2	2	2	2	2
145.0°	3	3	3	3	3	3	4	4
150.0°	5	5	5	5	5	5	5	5
155.0°	6	6	6	6	6	6	6	7
160.0°	7	7	7	7	7	7	7	7
165.0°	7	7	7	7	7	7	7	7
170.0°	6	6	6	6	6	6	6	6
175.0°	5	5	5	5	5	4	4	4
180.0°	3	3	3	3	3	3	3	3

Luminous Intensity (cd) Distribution Data (cont.)

C Y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	12790	12790	12790	12790	12790	12790	12790	12790
5.0°	9847	9618	9555	9643	9845	10188	10566	11031
10.0°	5956	5762	5657	5689	5869	6165	6509	6922
15.0°	3269	3121	3085	3123	3245	3435	3647	3920
20.0°	1623	1563	1560	1587	1640	1721	1824	1965
25.0°	916	901	912	926	947	957	987	1040
30.0°	551	548	554	566	571	566	583	619
35.0°	315	315	319	323	322	318	324	350
40.0°	184	184	185	187	185	184	190	204
45.0°	118	118	119	119	116	115	120	130
50.0°	89	87	87	88	87	88	92	95
55.0°	72	70	69	69	70	71	74	76
60.0°	57	56	55	55	55	56	59	61
65.0°	43	43	42	41	41	42	45	47
70.0°	32	32	31	31	31	32	33	35
75.0°	22	22	22	22	22	23	24	25
80.0°	13	13	12	12	13	14	14	15
85.0°	5	5	4	4	5	5	6	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°	2	2	2	2	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	278.2	9.62	0-5	278.2	9.62
5-10	595.8	20.59	0-10	874.0	30.21
10-15	591.6	20.46	0-15	1465.6	50.67
15-20	444.3	15.36	0-20	1909.9	66.03
20-25	294.4	10.17	0-25	2204.3	76.20
25-30	205.3	7.10	0-30	2409.7	83.30
30-35	141.5	4.89	0-35	2551.1	88.19
35-40	91.9	3.18	0-40	2643.0	91.37
40-45	59.4	2.05	0-45	2702.4	93.42
45-50	42.6	1.47	0-50	2745.0	94.89
50-55	35.1	1.22	0-55	2780.2	96.11
55-60	30.1	1.04	0-60	2810.3	97.15
60-65	24.8	0.86	0-65	2835.1	98.01
65-70	19.7	0.68	0-70	2854.7	98.69
70-75	15.0	0.52	0-75	2869.8	99.21
75-80	10.3	0.35	0-80	2880.0	99.56
80-85	5.6	0.19	0-85	2885.6	99.75
85-90	1.6	0.06	0-90	2887.2	99.81
90-95	0.0	0.00	0-95	2887.2	99.81
95-100	0.0	0.00	0-100	2887.2	99.81
100-105	0.0	0.00	0-105	2887.3	99.81
105-110	0.0	0.00	0-110	2887.3	99.81
110-115	0.0	0.00	0-115	2887.3	99.81
115-120	0.0	0.00	0-120	2887.3	99.81
120-125	0.1	0.01	0-125	2887.4	99.82
125-130	0.1	0.00	0-130	2887.5	99.82
130-135	0.2	0.00	0-135	2887.6	99.82
135-140	0.3	0.01	0-140	2887.9	99.83
140-145	0.5	0.02	0-145	2888.5	99.85
145-150	0.8	0.03	0-150	2889.3	99.88
150-155	0.9	0.03	0-155	2890.2	99.91
155-160	0.9	0.03	0-160	2891.1	99.94
160-165	0.8	0.03	0-165	2891.9	99.97
165-170	0.5	0.02	0-170	2892.4	99.99
170-175	0.3	0.01	0-175	2892.6	100.00
175-180	0.1	0.00	0-180	2892.7	100.00

6. Product Photo



Directions

1. The information marked "superscript #" is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
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*****END OF REPORT*****