IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Beyond LED Technology

1939 Parker Ct Stone Mountain, GA 30087

#Test Model: L11-A19DF-9W-30

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Mick Huang
Report Number:	RSZ191120503-10-1
Test Date:	2019-11-25 to 2019-11-27
Report Date:	2019-11-29
Reviewed By:	Blake Zhang / 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 test samples were in good condition and received on 2019-11-20. One was tested in integrating sphere and the other was tested in goniophotometer

#Model Tested:	L11-A19DF-9W-30
#Manufacturer:	Xiamen Longstar Lighting Co., Ltd
#Product Designation:	Omnidirectional LED Lamp
Burning Time Before Test:	0hour(For New Products)

#Rated Values:

Rated Voltage/Frequency:	120 V AC 60Hz
Rated Power:	9W
Nominal CCT:	3000K

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	2019-05-09	2020-05-08
Digital power meter	EVERFINE	PF9811	G135717CN1361159	2018-12-13	2019-12-13
High-precision rapid spectral radiometer	EVERFINE	HAAS-2000	N/A	2019-05-09	2020-05-08
Precision frequency power supply	ALL Power	APW-105N	970663	2019-03-08	2020-03-07
Standard Light Source	EVERFINE	D204	N/A	2019-07-19	2020-07-18
thermometer	SENSING	NA	NA	2019-03-08	2020-03-07
Programmable Precision DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	2019-03-08	2020-03-07
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	2019-03-08	2020-03-07
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	2019-04-10	2020-04-09
Digital power meter	YOKOGAWA	WT-210	91j926132	2019-03-08	2020-03-07
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	2019-03-08	2020-03-07
Wireless Remote Sensor	N/A	433MHz	N/A	2019-03-08	2020-03-07

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
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°C±1°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=21K (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_f, 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**

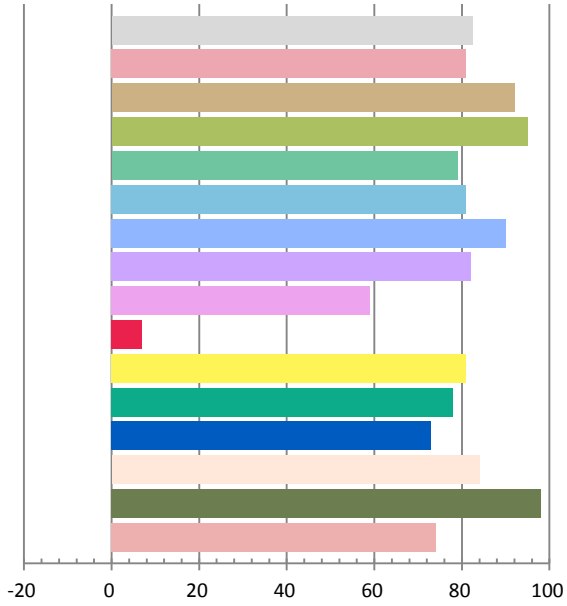
Photometric and Electrical Measurement Result

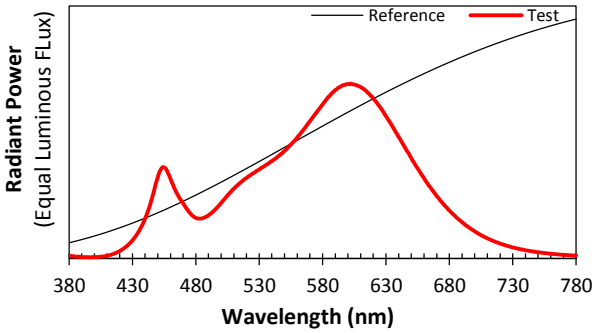
Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	0.08950	8.450	0.7868	864.55	102.32

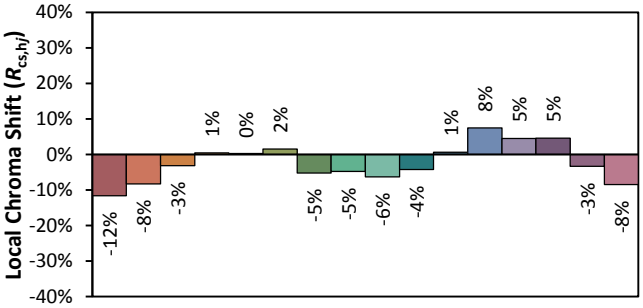
Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
2.6499	3071	-0.001180	0.4303	0.3988	0.2486	0.5183

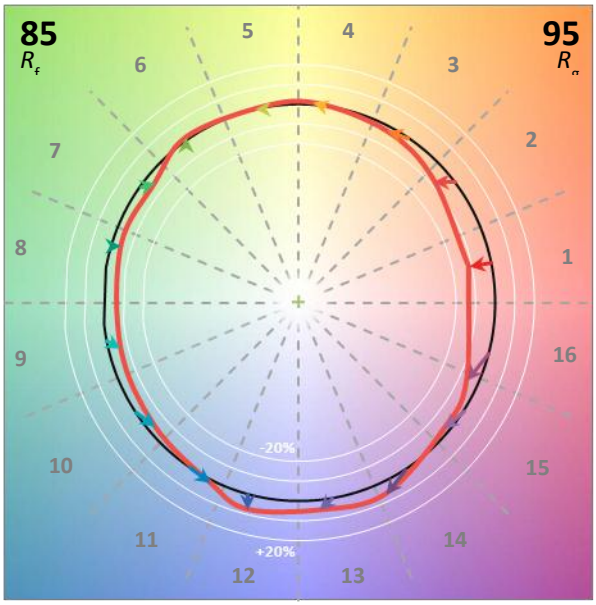
Color Rendering Index

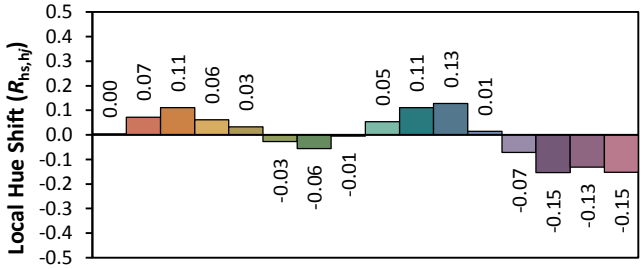
Ra			
82.4			
R1	R2	R3	R4
81	92	95	79
R5	R6	R7	R8
81	90	82	59
R9	R10	R11	R12
7	81	78	73
R13	R14	R15	
84	98	74	

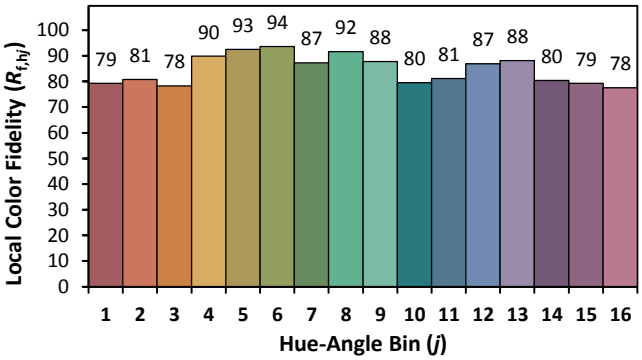


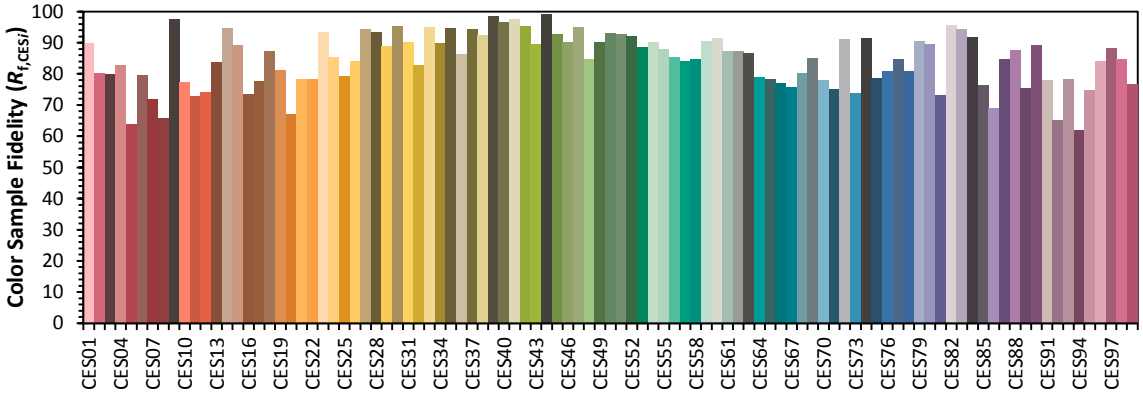

Reference
Test
Radiant Power
(Equal Luminous FLux)
380 430 480 530 580 630 680 730 780
Wavelength (nm)


Local Chroma Shift ($R_{cs,hj}$)
40% 30% 20% 10% 0% -10% -20% -30% -40%
-12% -8% -3% 1% 0% 2% -5% -5% -6% -4% 1% 8% 5% 5% -3% -8%

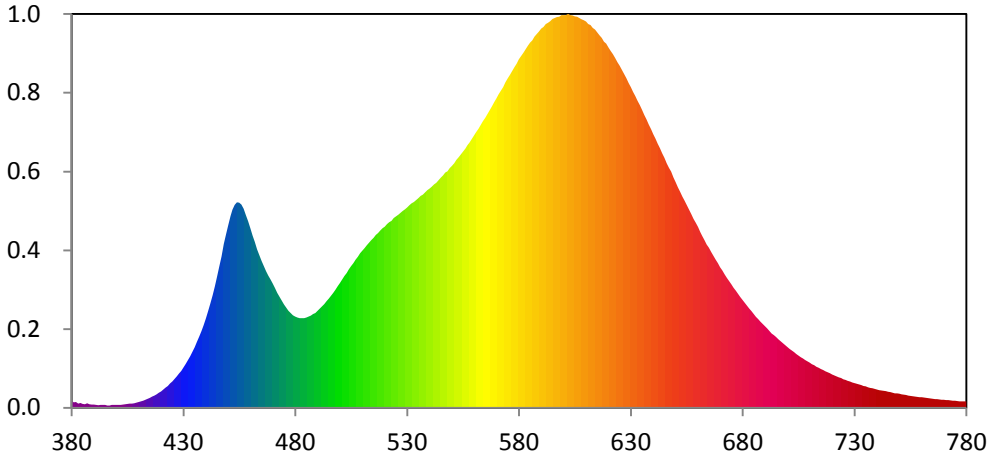

85
R_f
95
R_g
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
-20%
+20%


Local Hue Shift ($R_{hs,hj}$)
0.5 0.4 0.3 0.2 0.1 0.0 -0.1 -0.2 -0.3 -0.4 -0.5
0.00 0.07 0.11 0.06 0.03 -0.03 -0.06 -0.01 0.05 0.11 0.13 0.01 -0.07 -0.15 -0.13 -0.15


Local Color Fidelity ($R_{f,hj}$)
100 90 80 70 60 50 40 30 20 10 0
79 81 78 90 93 94 87 92 88 80 81 87 88 80 79 78
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Hue-Angle Bin (j)


Color Sample Fidelity ($R_{f,CESi}$)
100 90 80 70 60 50 40 30 20 10 0
CES01 CES04 CES07 CES10 CES13 CES16 CES19 CES22 CES25 CES28 CES31 CES34 CES37 CES40 CES43 CES46 CES49 CES52 CES55 CES58 CES61 CES64 CES67 CES70 CES73 CES76 CES79 CES82 CES85 CES88 CES91 CES94 CES97

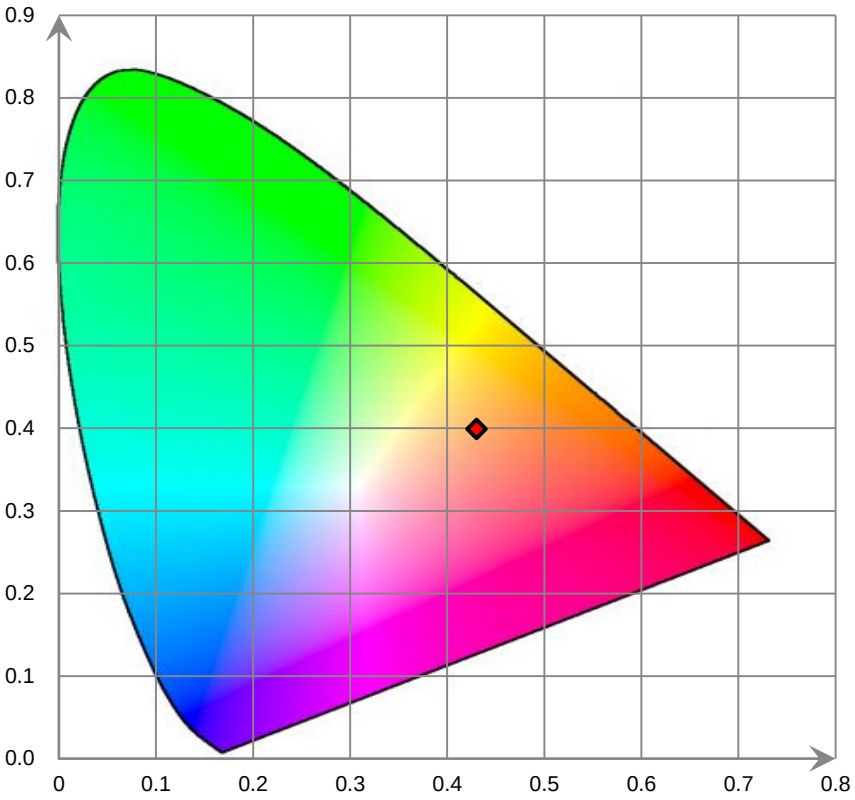
Relative Spectral Power Distribution



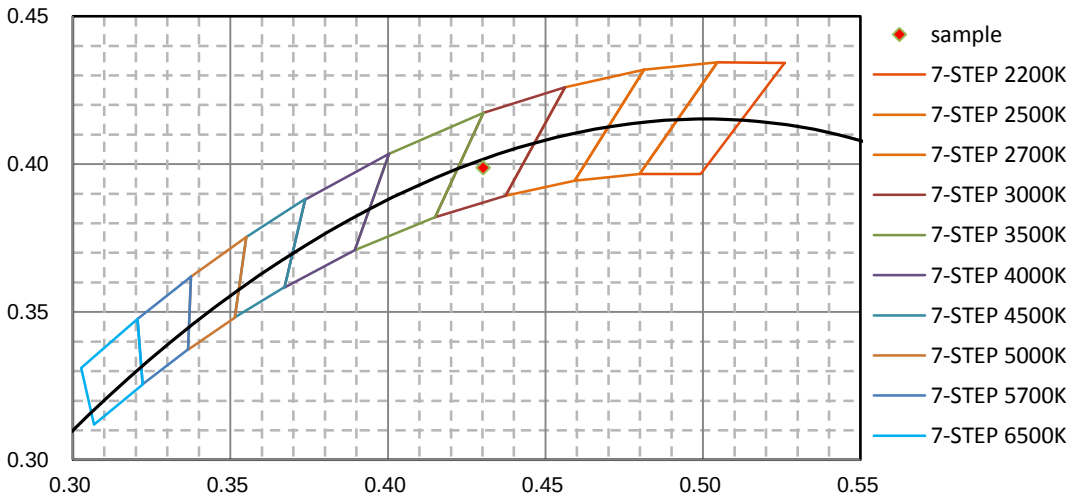
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.104E-01	421	8.095E-01	462	7.378E+00	503	5.999E+00	544	1.013E+01
381	2.352E-01	422	8.905E-01	463	7.051E+00	504	6.158E+00	545	1.023E+01
382	2.491E-01	423	9.730E-01	464	6.795E+00	505	6.311E+00	546	1.033E+01
383	1.881E-01	424	1.078E+00	465	6.532E+00	506	6.441E+00	547	1.046E+01
384	2.102E-01	425	1.172E+00	466	6.311E+00	507	6.593E+00	548	1.052E+01
385	1.647E-01	426	1.283E+00	467	6.081E+00	508	6.718E+00	549	1.067E+01
386	1.526E-01	427	1.391E+00	468	5.877E+00	509	6.872E+00	550	1.077E+01
387	1.922E-01	428	1.527E+00	469	5.710E+00	510	6.983E+00	551	1.088E+01
388	1.545E-01	429	1.641E+00	470	5.517E+00	511	7.110E+00	552	1.103E+01
389	1.466E-01	430	1.799E+00	471	5.318E+00	512	7.238E+00	553	1.115E+01
390	1.474E-01	431	1.956E+00	472	5.116E+00	513	7.343E+00	554	1.128E+01
391	1.273E-01	432	2.119E+00	473	4.936E+00	514	7.465E+00	555	1.140E+01
392	1.166E-01	433	2.294E+00	474	4.774E+00	515	7.564E+00	556	1.154E+01
393	1.287E-01	434	2.494E+00	475	4.593E+00	516	7.685E+00	557	1.167E+01
394	1.214E-01	435	2.687E+00	476	4.460E+00	517	7.776E+00	558	1.181E+01
395	1.222E-01	436	2.926E+00	477	4.312E+00	518	7.884E+00	559	1.196E+01
396	1.050E-01	437	3.166E+00	478	4.220E+00	519	7.983E+00	560	1.212E+01
397	1.011E-01	438	3.397E+00	479	4.117E+00	520	8.058E+00	561	1.228E+01
398	1.226E-01	439	3.679E+00	480	4.062E+00	521	8.172E+00	562	1.241E+01
399	1.228E-01	440	3.971E+00	481	4.011E+00	522	8.259E+00	563	1.259E+01
400	1.266E-01	441	4.301E+00	482	3.985E+00	523	8.321E+00	564	1.275E+01
401	1.281E-01	442	4.639E+00	483	3.989E+00	524	8.437E+00	565	1.290E+01
402	1.311E-01	443	4.997E+00	484	3.989E+00	525	8.516E+00	566	1.306E+01
403	1.391E-01	444	5.397E+00	485	4.008E+00	526	8.580E+00	567	1.324E+01
404	1.525E-01	445	5.838E+00	486	4.050E+00	527	8.669E+00	568	1.342E+01
405	1.730E-01	446	6.290E+00	487	4.099E+00	528	8.761E+00	569	1.360E+01
406	1.836E-01	447	6.735E+00	488	4.176E+00	529	8.834E+00	570	1.376E+01
407	1.897E-01	448	7.285E+00	489	4.220E+00	530	8.911E+00	571	1.395E+01
408	1.987E-01	449	7.723E+00	490	4.320E+00	531	9.007E+00	572	1.412E+01
409	2.294E-01	450	8.134E+00	491	4.419E+00	532	9.093E+00	573	1.427E+01
410	2.541E-01	451	8.534E+00	492	4.508E+00	533	9.159E+00	574	1.447E+01
411	2.892E-01	452	8.819E+00	493	4.608E+00	534	9.244E+00	575	1.465E+01
412	3.124E-01	453	9.032E+00	494	4.736E+00	535	9.326E+00	576	1.481E+01
413	3.560E-01	454	9.146E+00	495	4.855E+00	536	9.420E+00	577	1.497E+01
414	3.978E-01	455	9.122E+00	496	4.989E+00	537	9.475E+00	578	1.515E+01
415	4.358E-01	456	9.042E+00	497	5.113E+00	538	9.582E+00	579	1.531E+01
416	4.968E-01	457	8.856E+00	498	5.255E+00	539	9.679E+00	580	1.550E+01
417	5.409E-01	458	8.570E+00	499	5.404E+00	540	9.755E+00	581	1.564E+01
418	6.025E-01	459	8.298E+00	500	5.549E+00	541	9.842E+00	582	1.579E+01
419	6.652E-01	460	7.985E+00	501	5.712E+00	542	9.934E+00	583	1.594E+01
420	7.263E-01	461	7.663E+00	502	5.862E+00	543	1.001E+01	584	1.610E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	1.624E+01	626	1.504E+01	667	6.763E+00	708	2.118E+00	749	6.319E-01
586	1.634E+01	627	1.485E+01	668	6.597E+00	709	2.070E+00	750	6.210E-01
587	1.652E+01	628	1.466E+01	669	6.437E+00	710	2.007E+00	751	5.920E-01
588	1.663E+01	629	1.445E+01	670	6.243E+00	711	1.941E+00	752	5.786E-01
589	1.675E+01	630	1.426E+01	671	6.111E+00	712	1.888E+00	753	5.654E-01
590	1.687E+01	631	1.405E+01	672	5.941E+00	713	1.828E+00	754	5.419E-01
591	1.694E+01	632	1.387E+01	673	5.782E+00	714	1.780E+00	755	5.313E-01
592	1.707E+01	633	1.365E+01	674	5.635E+00	715	1.723E+00	756	5.139E-01
593	1.713E+01	634	1.347E+01	675	5.489E+00	716	1.675E+00	757	5.016E-01
594	1.720E+01	635	1.326E+01	676	5.332E+00	717	1.623E+00	758	4.818E-01
595	1.730E+01	636	1.303E+01	677	5.206E+00	718	1.580E+00	759	4.750E-01
596	1.735E+01	637	1.282E+01	678	5.073E+00	719	1.530E+00	760	4.632E-01
597	1.739E+01	638	1.260E+01	679	4.929E+00	720	1.480E+00	761	4.515E-01
598	1.740E+01	639	1.240E+01	680	4.792E+00	721	1.438E+00	762	4.361E-01
599	1.747E+01	640	1.217E+01	681	4.663E+00	722	1.398E+00	763	4.274E-01
600	1.747E+01	641	1.198E+01	682	4.538E+00	723	1.352E+00	764	4.172E-01
601	1.747E+01	642	1.175E+01	683	4.416E+00	724	1.325E+00	765	3.981E-01
602	1.752E+01	643	1.154E+01	684	4.302E+00	725	1.273E+00	766	3.870E-01
603	1.747E+01	644	1.132E+01	685	4.170E+00	726	1.242E+00	767	3.799E-01
604	1.746E+01	645	1.111E+01	686	4.046E+00	727	1.201E+00	768	3.703E-01
605	1.741E+01	646	1.088E+01	687	3.944E+00	728	1.168E+00	769	3.523E-01
606	1.740E+01	647	1.068E+01	688	3.836E+00	729	1.125E+00	770	3.547E-01
607	1.734E+01	648	1.051E+01	689	3.729E+00	730	1.092E+00	771	3.431E-01
608	1.729E+01	649	1.026E+01	690	3.628E+00	731	1.066E+00	772	3.361E-01
609	1.724E+01	650	1.004E+01	691	3.524E+00	732	1.037E+00	773	3.218E-01
610	1.719E+01	651	9.803E+00	692	3.422E+00	733	1.005E+00	774	3.146E-01
611	1.708E+01	652	9.617E+00	693	3.305E+00	734	9.715E-01	775	3.113E-01
612	1.703E+01	653	9.397E+00	694	3.227E+00	735	9.471E-01	776	2.966E-01
613	1.690E+01	654	9.205E+00	695	3.143E+00	736	9.157E-01	777	2.898E-01
614	1.683E+01	655	9.010E+00	696	3.040E+00	737	8.886E-01	778	2.845E-01
615	1.669E+01	656	8.810E+00	697	2.962E+00	738	8.733E-01	779	2.846E-01
616	1.657E+01	657	8.614E+00	698	2.877E+00	739	8.400E-01	780	2.852E-01
617	1.646E+01	658	8.402E+00	699	2.787E+00	740	8.125E-01		
618	1.629E+01	659	8.228E+00	700	2.703E+00	741	7.872E-01		
619	1.621E+01	660	8.038E+00	701	2.617E+00	742	7.701E-01		
620	1.603E+01	661	7.822E+00	702	2.550E+00	743	7.480E-01		
621	1.588E+01	662	7.645E+00	703	2.468E+00	744	7.343E-01		
622	1.573E+01	663	7.455E+00	704	2.397E+00	745	7.069E-01		
623	1.556E+01	664	7.267E+00	705	2.325E+00	746	6.907E-01		
624	1.538E+01	665	7.114E+00	706	2.253E+00	747	6.691E-01		
625	1.522E+01	666	6.935E+00	707	2.190E+00	748	6.453E-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: **Base up**

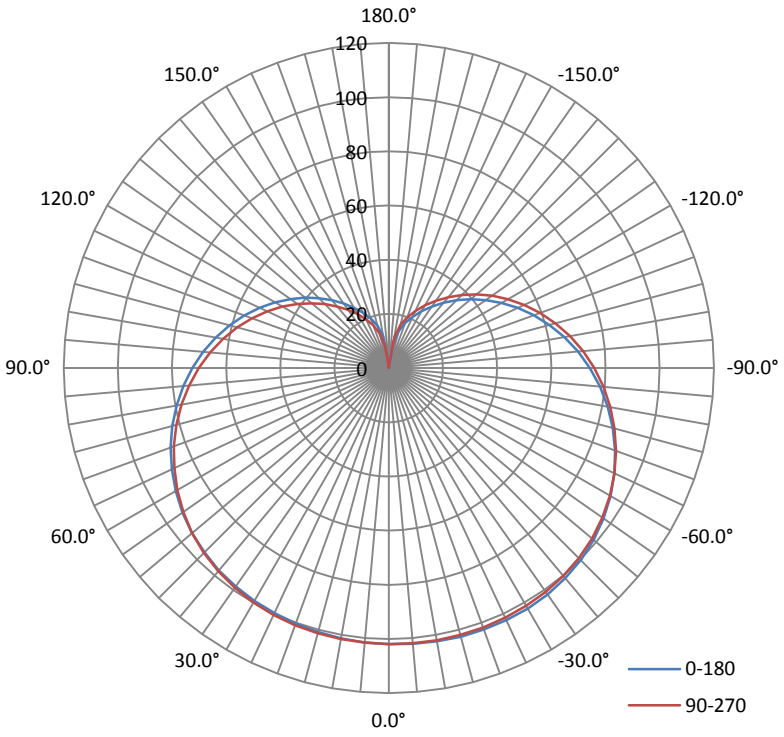
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	0.0884	8.410	0.7919

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
863.276	102.65	102.9	1.53	1.52

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	232.8	232.6	232.9	233.1	232.9
Field Angle (10% I_{max}):	340.0	339.8	339.3	340.1	339.8

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	102	102	102	102	102	102	102	102
5.0°	102	102	102	102	102	102	102	102
10.0°	101	101	101	101	102	102	102	102
15.0°	101	101	101	101	101	102	102	102
20.0°	100	100	101	101	101	102	102	102
25.0°	100	100	100	100	101	101	102	102
30.0°	99	99	99	99	100	101	101	102
35.0°	98	98	98	99	99	100	101	102
40.0°	97	97	97	97	98	99	100	101
45.0°	96	96	96	96	96	97	99	100
50.0°	95	94	94	94	95	96	97	98
55.0°	93	92	92	92	93	93	95	96
60.0°	91	90	90	90	90	91	92	94
65.0°	88	88	87	87	87	88	90	91
70.0°	86	85	84	84	84	85	87	88
75.0°	83	82	81	81	81	82	83	85
80.0°	80	79	78	77	78	78	80	81
85.0°	76	75	74	74	74	75	76	77
90.0°	72	71	71	70	70	71	72	73
95.0°	69	68	67	66	66	67	68	69
100.0°	65	64	63	62	62	62	63	65
105.0°	61	60	59	58	58	58	59	60
110.0°	57	56	55	54	54	54	55	56
115.0°	53	52	50	50	50	50	50	51
120.0°	49	47	46	46	45	45	46	47
125.0°	44	43	42	42	41	41	42	43
130.0°	40	39	38	38	37	37	38	39
135.0°	37	35	34	34	33	33	34	34
140.0°	33	32	31	30	30	30	30	31
145.0°	29	28	27	27	26	26	26	27
150.0°	26	25	24	23	23	23	23	24
155.0°	23	22	21	20	20	20	20	20
160.0°	19	19	18	17	17	17	17	17
165.0°	16	16	15	14	13	13	13	13
170.0°	12	11	10	9	8	6	7	7
175.0°	3	3	1	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°	102	102	102	102	102	102	102	102
5.0°	102	102	102	102	102	102	102	102
10.0°	102	103	102	102	102	102	102	101
15.0°	103	103	103	102	102	102	101	101
20.0°	103	103	103	102	102	101	101	101
25.0°	103	103	103	102	102	101	101	100
30.0°	102	103	102	102	101	101	100	100
35.0°	102	102	102	102	101	100	99	99
40.0°	101	102	101	101	100	99	99	98
45.0°	100	101	100	100	99	98	98	97
50.0°	99	99	99	99	98	97	96	95
55.0°	97	97	97	97	96	95	95	93
60.0°	95	95	95	95	94	93	92	91
65.0°	92	93	93	93	92	91	90	89
70.0°	89	90	90	90	89	89	88	86
75.0°	86	87	87	87	86	86	85	84
80.0°	82	83	84	83	83	82	81	80
85.0°	78	79	80	80	80	79	78	77
90.0°	74	75	76	76	76	75	74	73
95.0°	70	71	72	72	72	71	71	70
100.0°	66	67	68	68	68	68	67	66
105.0°	61	63	63	64	64	63	63	62
110.0°	57	58	59	60	59	59	59	58
115.0°	53	54	55	55	55	55	54	54
120.0°	48	49	50	51	51	51	50	49
125.0°	44	45	46	46	47	46	46	45
130.0°	40	41	42	42	42	42	42	41
135.0°	35	37	37	38	38	38	38	37
140.0°	31	32	33	34	34	34	34	33
145.0°	28	29	29	30	30	30	30	30
150.0°	24	25	26	26	27	27	27	26
155.0°	21	21	22	23	23	23	23	23
160.0°	18	18	19	19	20	20	20	20
165.0°	14	14	15	16	16	17	17	17
170.0°	9	9	10	11	11	12	12	12
175.0°	0	0	0	1	1	2	3	3
180.0°	0	0	0	0	0	0	0	0

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	2.4	0.28
5-10	7.3	0.85
10-15	12.1	1.40
15-20	16.8	1.94
20-25	21.3	2.46
25-30	25.6	2.96
30-35	29.6	3.43
35-40	33.3	3.85
40-45	36.5	4.24
45-50	39.3	4.55
50-55	41.6	4.82
55-60	43.3	5.01
60-65	44.3	5.14
65-70	44.8	5.19
70-75	44.7	5.18
75-80	44.0	5.10
80-85	42.8	4.96
85-90	41.1	4.76
90-95	39.0	4.52
95-100	36.5	4.23
100-105	33.8	3.91
105-110	30.8	3.57
110-115	27.7	3.20
115-120	24.5	2.84
120-125	21.3	2.47
125-130	18.2	2.11
130-135	15.3	1.77
135-140	12.6	1.46
140-145	10.1	1.17
145-150	7.9	0.91
150-155	5.9	0.68
155-160	4.2	0.49
160-165	2.8	0.32
165-170	1.5	0.18
170-175	0.5	0.05
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	2.4	0.28
0-10	9.7	1.13
0-15	21.8	2.53
0-20	38.6	4.47
0-25	59.8	6.93
0-30	85.4	9.89
0-35	115.0	13.32
0-40	148.2	17.17
0-45	184.8	21.41
0-50	224.1	25.96
0-55	265.7	30.78
0-60	309.0	35.79
0-65	353.3	40.93
0-70	398.1	46.12
0-75	442.8	51.30
0-80	486.9	56.40
0-85	529.7	61.36
0-90	570.8	66.12
0-95	609.8	70.64
0-100	646.4	74.87
0-105	680.1	78.78
0-110	710.9	82.35
0-115	738.6	85.55
0-120	763.0	88.39
0-125	784.4	90.86
0-130	802.6	92.97
0-135	817.9	94.74
0-140	830.5	96.20
0-145	840.6	97.37
0-150	848.4	98.28
0-155	854.3	98.96
0-160	858.5	99.45
0-165	861.3	99.77
0-170	862.8	99.95
0-175	863.3	100.00
0-180	863.3	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**********