IES LM-79-08

MEASUREMENT AND TEST REPORT

For

Beyond LED Technology

Test Model: L9-DL6DWP-18W-27

Report Type:	Electrical and Photometric tests including: Luminous Flux, Chromaticity, Luminous Intensity Distribution
Test Engineer:	Hexy He
Report Number:	RSZ170807519-10A1
Test Date:	2017-08-13 to 2017-08-15
Report Date:	2017-08-23
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:

One sample was received on 2017-08-07 and used for testing. This retrofit is suitable for both 5" and 6" downlight housings and was tested with 5" housing for luminous intensity distribution.

Model Tested:	L9-DL6DWP-18W-27
Manufacturer:	Xiamen Longstar Lighting Co., Ltd.
Product Designation:	SSL downlight retrofit
Burning Time Before Test:	0hour(For New Products)

Rated Values:

Rated Voltage/Frequency:	120 V AC 60Hz
Rated Power:	18 W
Nominal CCT:	2700K
Auxiliary Equipment:	H25ICAT Cooper Lighting,LLC (The can was only used in goniophotometer)

Note: The samples were assembled with E26 lamp base that connect to driver by a connector or wiring. Products may also be sold with GU24，GU10 base together in packaging.

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
2.0m integrating sphere	EVERFINE	R98	11010018	R98	2016-11-18	2017-11-18
spectroradiometer	EVERFINE	HAAS-2000	20140912	380-780nm	2016-11-18	2017-11-18
Digital Power Meter	EVERFINE	PF2010A	1011004	600V/20A	2017-07-11	2018-07-11
Digital CC&CV DC Power Supply	EVERFINE	WY305-V1	1101047	30V/5A	2017-07-07	2018-07-07
Rapid Recording Photometer	EVERFINE	PHOTO-2000F	1007010	0.1lm—200klm	2016-11-18	2017-11-18
Standard Light Source	SENSING	N/A	LSD090808	N/A	2016-12-05	2017-12-05
Special zero-voltage synchronous switching AC	EVERFINE	DPS1010-YF	1011001T	0-150V，0-300V	2017-03-03	2018-03-03
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	0-150V，0-300V	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2017-03-03	2018-03-03
Digital power meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2017-03-03	2018-03-03
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2017-03-09	2018-03-09
Wireless Remote	N/A	433MHz	N/A	0°C~50°C;-	2017-03-20	2018-03-20

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Sensor				20°C~60°C		
Standard Light Source	EVERFINE	D908	1012003	N/A	2016-12-17	2017-12-17

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=1.9% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=25K (K=2), at the 95% confidence level. The uncertainty of the CRI is U=1.9(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 luminaire was tested in a can.

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_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	60	0.1793	17.2	0.7997	1385.5	80.56

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
4.4448	2694	-0.00056	0.4594	0.4090	0.2629	0.5267

Color Rendering Index

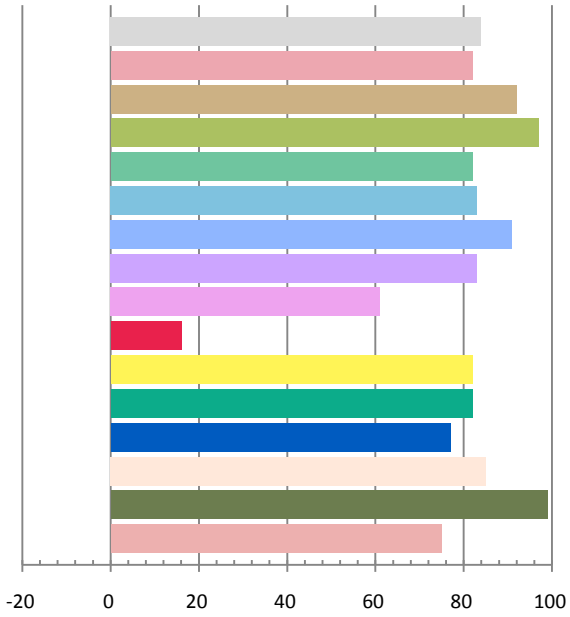
Ra
83.9

R1	R2	R3	R4
82	92	97	82

R5	R6	R7	R8
83	91	83	61

R9	R10	R11	R12
16	82	82	77

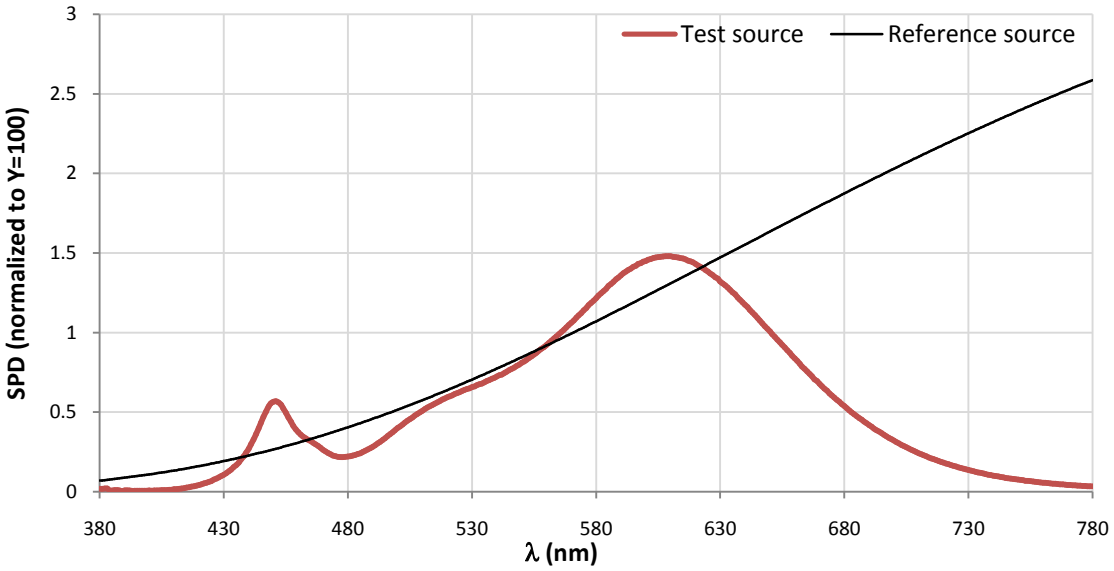
R13	R14	R15
85	99	75



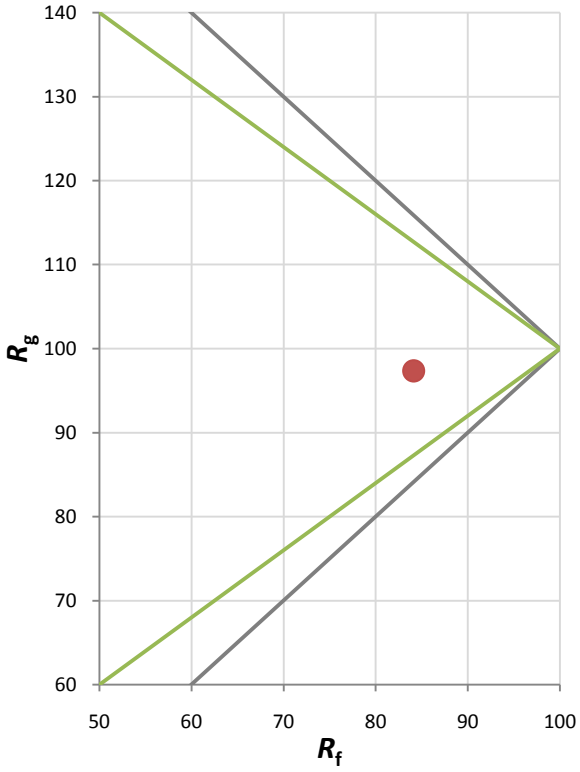
Fidelity Index and Gamut Index

Fidelity Index R_f	84
Gamut Index R_g	97

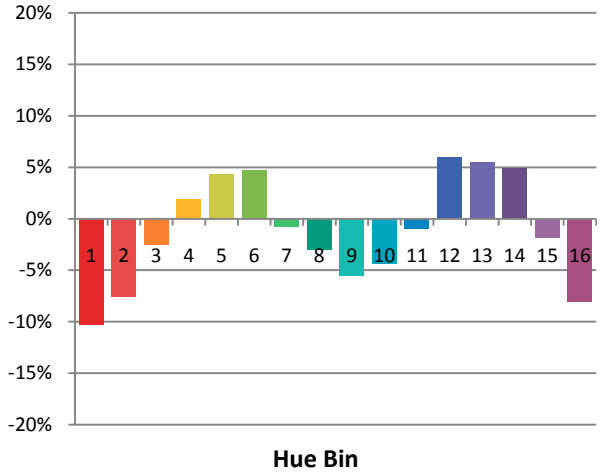
Spectral Power Distribution Comparison



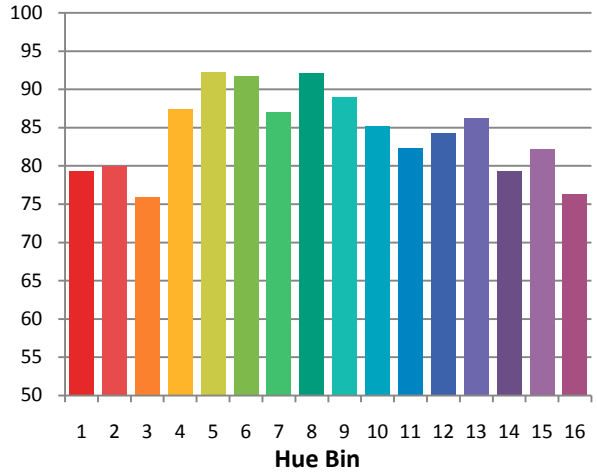
Plot of R_g versus R_f



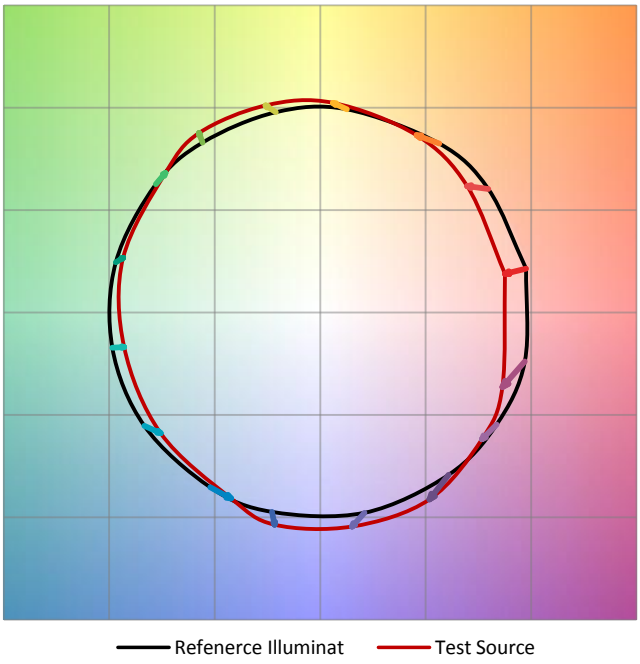
Chroma Shift by Hue

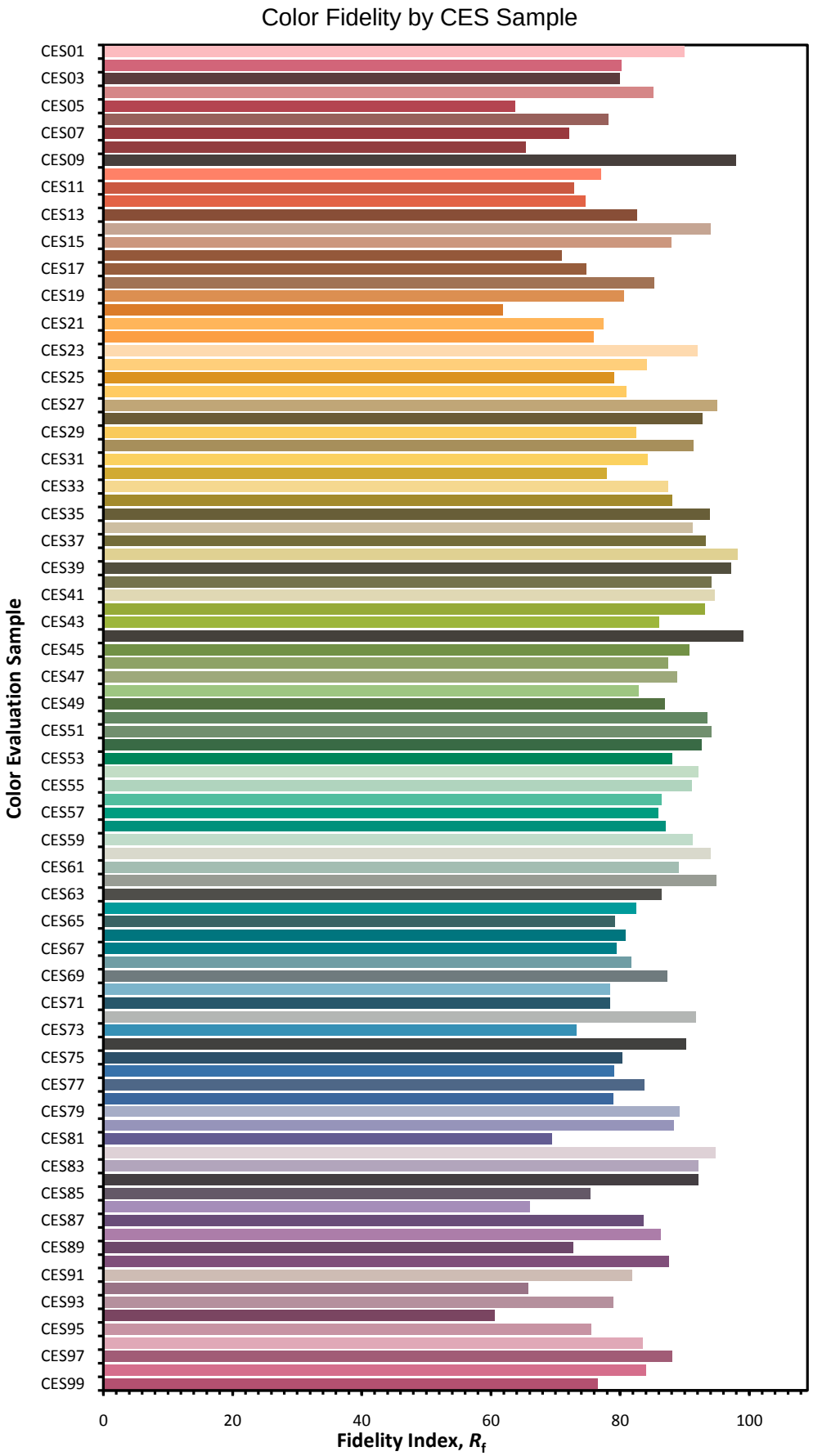


R_f by Hue



Color Vector Graphic




Color Fidelity by CES Sample
Color Evaluation Sample
CES01
CES03
CES05
CES07
CES09
CES11
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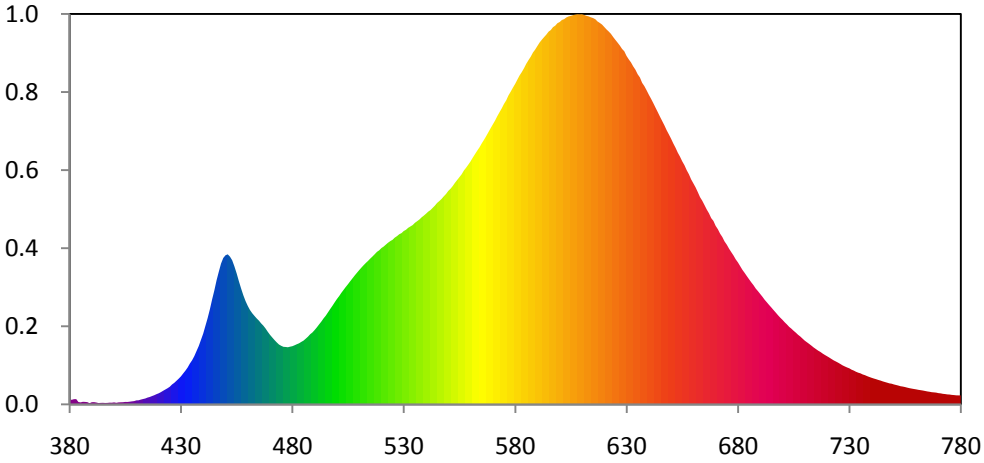
0
20
40
60
80
100
Fidelity Index, R_f

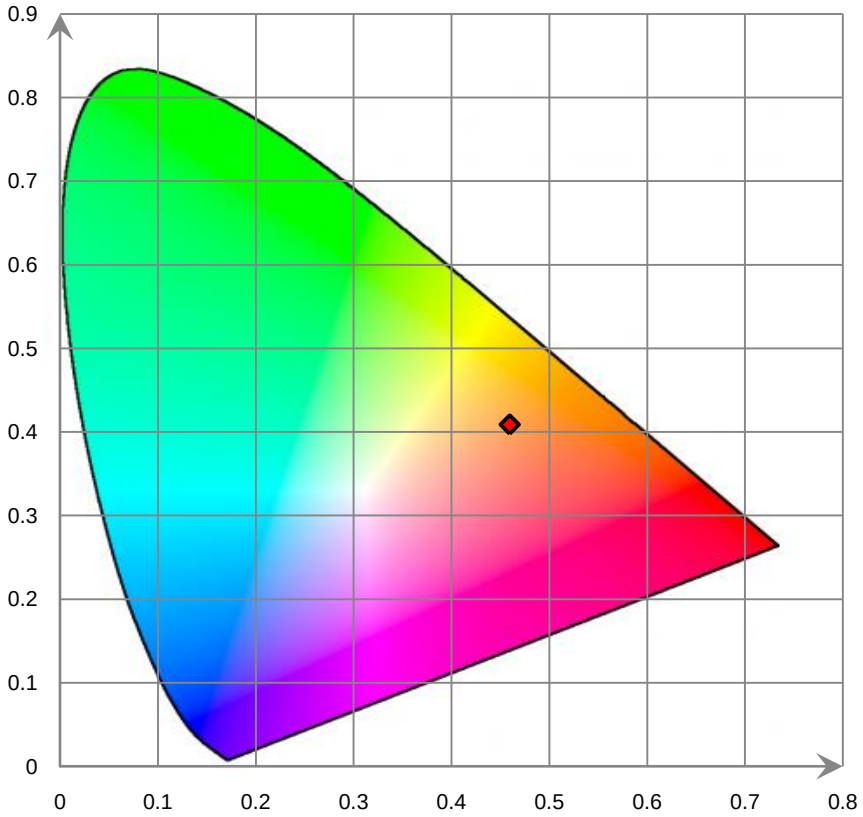
Relative Spectral Power Distribution



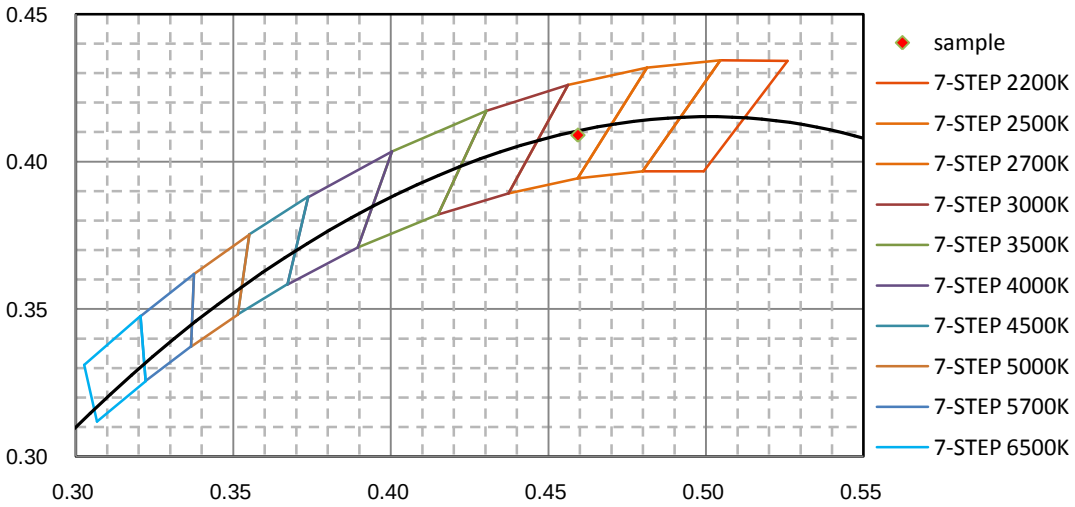
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.691E-01	421	9.387E-01	462	7.010E+00	503	8.808E+00	544	1.529E+01
381	3.523E-01	422	1.046E+00	463	6.807E+00	504	9.033E+00	545	1.550E+01
382	3.984E-01	423	1.146E+00	464	6.613E+00	505	9.251E+00	546	1.564E+01
383	4.063E-01	424	1.243E+00	465	6.438E+00	506	9.476E+00	547	1.581E+01
384	1.795E-01	425	1.359E+00	466	6.232E+00	507	9.696E+00	548	1.601E+01
385	1.555E-01	426	1.528E+00	467	6.052E+00	508	9.916E+00	549	1.619E+01
386	1.993E-01	427	1.654E+00	468	5.833E+00	509	1.012E+01	550	1.642E+01
387	1.879E-01	428	1.814E+00	469	5.579E+00	510	1.032E+01	551	1.659E+01
388	1.718E-01	429	1.977E+00	470	5.346E+00	511	1.052E+01	552	1.680E+01
389	9.000E-02	430	2.154E+00	471	5.144E+00	512	1.071E+01	553	1.704E+01
390	1.688E-01	431	2.376E+00	472	4.946E+00	513	1.088E+01	554	1.726E+01
391	1.734E-01	432	2.591E+00	473	4.768E+00	514	1.104E+01	555	1.748E+01
392	1.452E-01	433	2.831E+00	474	4.606E+00	515	1.122E+01	556	1.770E+01
393	1.009E-01	434	3.139E+00	475	4.504E+00	516	1.138E+01	557	1.799E+01
394	1.139E-01	435	3.387E+00	476	4.426E+00	517	1.155E+01	558	1.821E+01
395	1.197E-01	436	3.709E+00	477	4.416E+00	518	1.173E+01	559	1.844E+01
396	1.081E-01	437	4.101E+00	478	4.394E+00	519	1.185E+01	560	1.869E+01
397	1.127E-01	438	4.490E+00	479	4.440E+00	520	1.202E+01	561	1.898E+01
398	1.308E-01	439	4.964E+00	480	4.474E+00	521	1.214E+01	562	1.925E+01
399	1.302E-01	440	5.446E+00	481	4.544E+00	522	1.229E+01	563	1.952E+01
400	1.575E-01	441	6.043E+00	482	4.625E+00	523	1.244E+01	564	1.977E+01
401	1.216E-01	442	6.643E+00	483	4.698E+00	524	1.256E+01	565	2.007E+01
402	1.546E-01	443	7.323E+00	484	4.802E+00	525	1.266E+01	566	2.034E+01
403	1.609E-01	444	8.070E+00	485	4.902E+00	526	1.283E+01	567	2.064E+01
404	1.685E-01	445	8.773E+00	486	5.048E+00	527	1.295E+01	568	2.093E+01
405	1.880E-01	446	9.546E+00	487	5.204E+00	528	1.309E+01	569	2.124E+01
406	1.849E-01	447	1.021E+01	488	5.390E+00	529	1.317E+01	570	2.154E+01
407	2.077E-01	448	1.083E+01	489	5.529E+00	530	1.334E+01	571	2.183E+01
408	2.303E-01	449	1.126E+01	490	5.715E+00	531	1.343E+01	572	2.217E+01
409	2.522E-01	450	1.147E+01	491	5.923E+00	532	1.358E+01	573	2.248E+01
410	3.077E-01	451	1.154E+01	492	6.148E+00	533	1.369E+01	574	2.277E+01
411	3.161E-01	452	1.137E+01	493	6.365E+00	534	1.379E+01	575	2.311E+01
412	3.709E-01	453	1.109E+01	494	6.610E+00	535	1.396E+01	576	2.339E+01
413	4.110E-01	454	1.062E+01	495	6.820E+00	536	1.409E+01	577	2.376E+01
414	4.532E-01	455	1.008E+01	496	7.079E+00	537	1.422E+01	578	2.405E+01
415	5.226E-01	456	9.478E+00	497	7.334E+00	538	1.438E+01	579	2.436E+01
416	5.704E-01	457	8.925E+00	498	7.584E+00	539	1.452E+01	580	2.465E+01
417	6.360E-01	458	8.397E+00	499	7.846E+00	540	1.467E+01	581	2.498E+01
418	7.042E-01	459	7.947E+00	500	8.100E+00	541	1.483E+01	582	2.530E+01
419	7.843E-01	460	7.571E+00	501	8.323E+00	542	1.494E+01	583	2.556E+01
420	8.494E-01	461	7.256E+00	502	8.580E+00	543	1.512E+01	584	2.586E+01

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	2.620E+01	626	2.782E+01	667	1.470E+01	708	5.220E+00	749	1.590E+00
586	2.648E+01	627	2.760E+01	668	1.433E+01	709	5.059E+00	750	1.533E+00
587	2.674E+01	628	2.734E+01	669	1.411E+01	710	4.902E+00	751	1.490E+00
588	2.706E+01	629	2.716E+01	670	1.373E+01	711	4.774E+00	752	1.447E+00
589	2.730E+01	630	2.680E+01	671	1.347E+01	712	4.649E+00	753	1.395E+00
590	2.757E+01	631	2.654E+01	672	1.313E+01	713	4.517E+00	754	1.369E+00
591	2.784E+01	632	2.631E+01	673	1.287E+01	714	4.377E+00	755	1.334E+00
592	2.805E+01	633	2.600E+01	674	1.253E+01	715	4.256E+00	756	1.288E+00
593	2.825E+01	634	2.574E+01	675	1.229E+01	716	4.137E+00	757	1.247E+00
594	2.844E+01	635	2.539E+01	676	1.198E+01	717	4.036E+00	758	1.213E+00
595	2.867E+01	636	2.515E+01	677	1.171E+01	718	3.911E+00	759	1.184E+00
596	2.879E+01	637	2.474E+01	678	1.146E+01	719	3.805E+00	760	1.153E+00
597	2.902E+01	638	2.448E+01	679	1.116E+01	720	3.704E+00	761	1.122E+00
598	2.913E+01	639	2.416E+01	680	1.092E+01	721	3.600E+00	762	1.093E+00
599	2.932E+01	640	2.382E+01	681	1.064E+01	722	3.489E+00	763	1.065E+00
600	2.941E+01	641	2.351E+01	682	1.035E+01	723	3.386E+00	764	1.029E+00
601	2.957E+01	642	2.318E+01	683	1.012E+01	724	3.296E+00	765	9.983E-01
602	2.963E+01	643	2.283E+01	684	9.867E+00	725	3.205E+00	766	9.706E-01
603	2.976E+01	644	2.249E+01	685	9.626E+00	726	3.106E+00	767	9.369E-01
604	2.984E+01	645	2.214E+01	686	9.387E+00	727	2.999E+00	768	9.215E-01
605	2.989E+01	646	2.180E+01	687	9.163E+00	728	2.917E+00	769	9.039E-01
606	2.994E+01	647	2.146E+01	688	8.910E+00	729	2.840E+00	770	8.655E-01
607	2.998E+01	648	2.109E+01	689	8.706E+00	730	2.774E+00	771	8.469E-01
608	3.001E+01	649	2.077E+01	690	8.495E+00	731	2.669E+00	772	8.108E-01
609	3.000E+01	650	2.043E+01	691	8.277E+00	732	2.601E+00	773	7.935E-01
610	3.001E+01	651	2.007E+01	692	8.047E+00	733	2.508E+00	774	7.651E-01
611	2.995E+01	652	1.974E+01	693	7.847E+00	734	2.439E+00	775	7.580E-01
612	2.989E+01	653	1.937E+01	694	7.646E+00	735	2.388E+00	776	7.301E-01
613	2.985E+01	654	1.906E+01	695	7.453E+00	736	2.303E+00	777	7.158E-01
614	2.977E+01	655	1.870E+01	696	7.255E+00	737	2.246E+00	778	6.946E-01
615	2.972E+01	656	1.840E+01	697	7.057E+00	738	2.173E+00	779	6.899E-01
616	2.962E+01	657	1.802E+01	698	6.853E+00	739	2.107E+00	780	6.912E-01
617	2.945E+01	658	1.770E+01	699	6.671E+00	740	2.045E+00		
618	2.934E+01	659	1.731E+01	700	6.503E+00	741	1.988E+00		
619	2.922E+01	660	1.700E+01	701	6.315E+00	742	1.936E+00		
620	2.903E+01	661	1.669E+01	702	6.149E+00	743	1.879E+00		
621	2.884E+01	662	1.632E+01	703	5.966E+00	744	1.834E+00		
622	2.868E+01	663	1.594E+01	704	5.823E+00	745	1.768E+00		
623	2.850E+01	664	1.566E+01	705	5.661E+00	746	1.719E+00		
624	2.826E+01	665	1.533E+01	706	5.515E+00	747	1.670E+00		
625	2.804E+01	666	1.499E+01	707	5.352E+00	748	1.617E+00		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.5 hours**

Test orientation: **Downward**

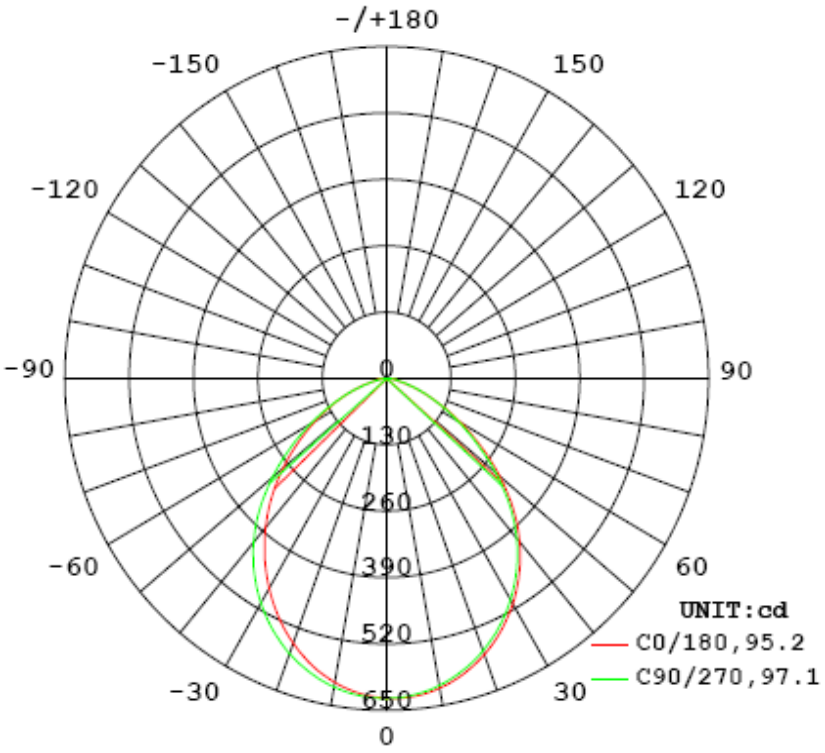
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	0.1751	17.16	0.8162

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1404.92	81.88	626.9	1.21	1.19

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	95.2	97.6	97.1	94.3	96.1
Field Angle (10% I_{max}):	143.5	144.0	143.6	142.9	143.5

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	626	626	626	626	626	626	626	626
5.0°	620	620	622	623	624	624	624	625
10.0°	604	607	609	612	614	614	614	615
15.0°	582	586	591	595	596	597	597	598
20.0°	552	559	567	572	574	573	573	573
25.0°	516	526	536	542	544	543	542	542
30.0°	475	488	500	507	508	506	504	505
35.0°	430	445	458	466	466	463	460	461
40.0°	381	397	411	419	419	414	410	411
45.0°	329	344	357	364	363	358	352	353
50.0°	274	286	297	303	302	296	289	290
55.0°	219	228	236	240	239	232	225	226
60.0°	167	173	178	180	179	172	166	166
65.0°	120	123	126	127	124	119	114	114
70.0°	78	80	81	81	78	74	71	70
75.0°	44	45	45	44	41	39	37	36
80.0°	21	21	20	19	18	16	15	15
85.0°	9	9	8	8	7	7	6	6
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°	0	0	0	0	0	0	0	0
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Luminous Intensity (cd) Distribution Data (cont.)

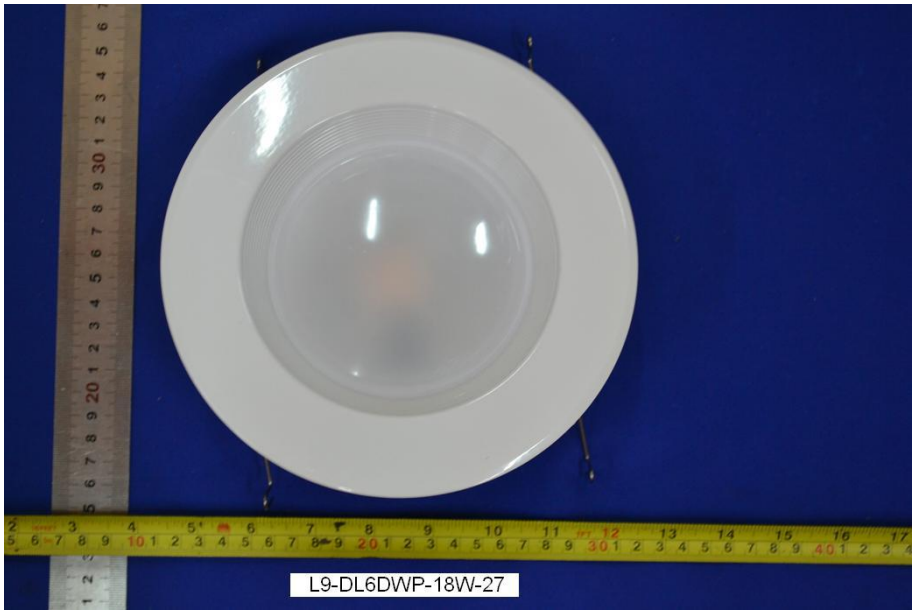
C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	626	626	626	626	626	626	626	626
5.0°	625	625	624	623	622	621	620	620
10.0°	615	616	615	613	611	608	606	605
15.0°	599	600	599	596	592	588	583	582
20.0°	576	577	576	573	568	560	554	551
25.0°	546	548	547	544	537	527	518	514
30.0°	509	512	512	508	500	488	476	472
35.0°	467	470	470	466	457	443	430	425
40.0°	418	422	422	418	408	393	380	376
45.0°	361	364	364	360	351	338	327	324
50.0°	298	299	299	294	287	277	271	270
55.0°	233	234	232	228	223	217	215	217
60.0°	172	172	170	168	165	163	163	166
65.0°	118	118	117	116	115	115	116	119
70.0°	73	74	74	74	74	75	76	78
75.0°	38	40	41	42	43	43	44	45
80.0°	16	18	19	20	21	21	22	22
85.0°	7	7	8	9	9	10	10	10
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°	0	0	0	0	0	0	0	0
145.0°	0	0	0	0	0	0	0	0
150.0°	0	0	0	0	0	0	0	0
155.0°	0	0	0	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

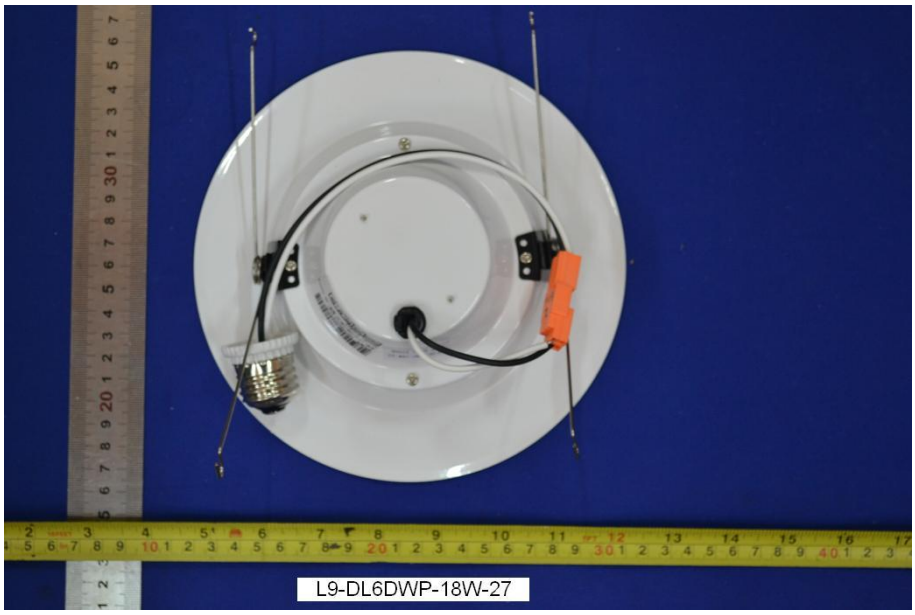
Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	14.9	1.06
5-10	44.1	3.14
10-15	71.4	5.09
15-20	95.6	6.80
20-25	115.7	8.23
25-30	130.8	9.32
30-35	140.3	9.98
35-40	143.6	10.23
40-45	140.2	9.97
45-50	129.3	9.21
50-55	112.3	7.99
55-60	91.6	6.52
60-65	69.9	4.97
65-70	48.8	3.48
70-75	30.3	2.15
75-80	15.6	1.11
80-85	7.2	0.52
85-90	1.7	0.12
90-95	0.0	0.00
95-100	0.0	0.00
100-105	0.0	0.00
105-110	0.0	0.01
110-115	0.1	0.00
115-120	0.1	0.01
120-125	0.1	0.00
125-130	0.1	0.01
130-135	0.1	0.01
135-140	0.1	0.01
140-145	0.1	0.01
145-150	0.2	0.01
150-155	0.2	0.01
155-160	0.2	0.01
160-165	0.1	0.01
165-170	0.1	0.00
170-175	0.1	0.01
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	14.9	1.06
0-10	59.1	4.20
0-15	130.5	9.29
0-20	226.0	16.09
0-25	341.7	24.32
0-30	472.6	33.64
0-35	612.9	43.62
0-40	756.5	53.85
0-45	896.7	63.82
0-50	1026.0	73.03
0-55	1138.2	81.02
0-60	1229.8	87.54
0-65	1299.7	92.51
0-70	1348.5	95.99
0-75	1378.8	98.14
0-80	1394.4	99.25
0-85	1401.7	99.77
0-90	1403.3	99.89
0-95	1403.4	99.89
0-100	1403.4	99.89
0-105	1403.4	99.89
0-110	1403.5	99.90
0-115	1403.5	99.90
0-120	1403.6	99.91
0-125	1403.7	99.91
0-130	1403.8	99.92
0-135	1403.9	99.93
0-140	1404.0	99.94
0-145	1404.2	99.95
0-150	1404.3	99.96
0-155	1404.5	99.97
0-160	1404.6	99.98
0-165	1404.8	99.99
0-170	1404.8	99.99
0-175	1404.9	100.00
0-180	1404.9	100.00

6. Product Photo





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