



Report No.: RHL21062801-9

LM-79-08 Test Report

For

P.Q.L., Inc.

(Brand Name: PQL)

Internal Driver/Line Voltage (UL Type A+B)Lamps

2285 Ward Avenue / Simi Valley, CA 93065

Model name(s): 91838-**K

Remark: **K represents for different CCT can be 30K =3000K,
35K=3500K, 40K=4000K, 41K=4100K, 45K=4500K, 50K=5000K,
57K=5700K, 65K=6500K

Representative (Tested) Model:

91838-30K

91838-65K

Model Different: All construction and rating are the same, except CCT

Test & Report By:

Peter Zhou

Engineer: Peter Zhou

Date: Jun,30,2021

Review By:

Ryan Liang

Manager: Ryan Liang

**1.1 Product Information:**

Organization Name	P.Q.L., Inc.	
Brand Name	PQL	
Model Number	91838-**K	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	Internal Driver/Line Voltage (UL Type A+B) Lamps	
Rated Voltage / Frequency	120-277Vac, 50/60 Hz	
Nominal Power	24W	
Rated Initial Lamp Lumen	--	
Declared CCT	3000K,3500K,4000K,4100K,4500K,5000K, 5700K,6500K	
Test Ballast	ICN-4S54-90C-2LS-G	
LED Manufacturer	Lumileds Holding B.V.	
LED Model	L128-AA80RA35000G1	
Sample Number	RHL21062801-901(3000K) RHL21062801-902(6500K)	
Lamp Length	1200	mm
Lamp Width	--	mm
Number of Units (modular products)	N/A	s
Photo		
		



1.2 Test Specifications:

Date of Receipt	Jun. 28, 2021
Date of Test	Jun. 29, 2021
Test item	1. Total Luminous Flux 2. Luminous Distribution Intensity 3. Luminous Efficacy 4. Correlated Color Temperature 5. Color Rendering Index 6. Chromaticity Coordinate 7. Electrical Parameters
Reference Standard	1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products and IES-LM-79-2019 OPTICAL AND ELECTRICAL MEASUREMENTS OF SOLID-STATE LIGHTING PRODUCTS 2. ANSI C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products 3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources 4. CIE 15-2004 Technical Report Colorimetry 5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source 6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems
Reference Work Instruction	HL-WI-EE-001, HL-WI-EE-002

1.3 Test Methods

1) Photometric and Light Distribution Measurement – Goniophotometer Method:

Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals.

2) Chromaticity Measurement – Sphere-Spectroradiometer Method:

Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm.

3) Electrical Measurements:

Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.



2.1 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction HL-WI-EE-001, HL-WI-EE-002)

Test date	2021-06-29	Test Ambient:	25.1 ° C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	91838-30K, Connected to line voltage		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
RHL2106	120.0	60	0.200	23.40	0.975	21.9
2801-901	277.0	60	0.088	22.79	0.935	20.7

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result	Special Color Rendering Indices			
Test Voltage (V)	120.0	R1	81	R9	10
Frequency (Hz)	60	R2	91	R10	80
CCT (K)	2944	R3	96	R11	80
Duv	-0.0026	R4	80	R12	76
Chromaticity (x, y)	x = 0.4370 y = 0.3975	R5	82	R13	84
Chromaticity (u', v')	u' = 0.2535 v' = 0.5188	R6	89	R14	98
Color Rendering Index (CRI)	83.0	R7	82	R15	75
R9	10	R8	60	--	--
Rf	84	--	--	--	--
Rg	98	--	--	--	--
Rcs,h1(%)	-11	--	--	--	--

Photometric Measurement – Sphere-Spectroradiometer Method:

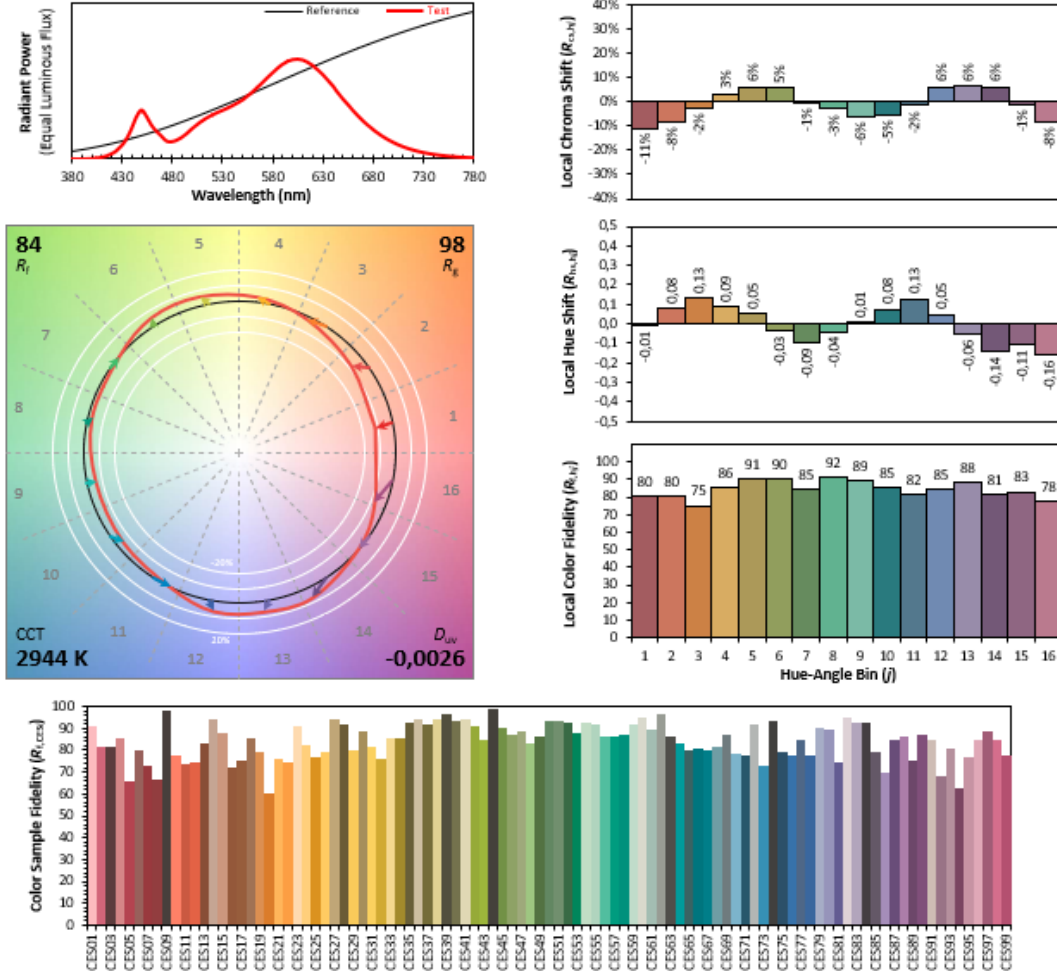
Parameter	Result		DLC V5.1 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	2963.6	2996.8	Bare Lamp: >= 3200(-10%)
Luminous Efficacy (lm/W)	126.65	129.14	Bare lamp: >= 120(-3%)
Most worst Luminous/Highest Watts	126.65		



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Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	0.0056	485	0.1913	590	0.9475	695	0.1935
385	0.0033	490	0.2190	595	0.9772	700	0.1675
390	0.0036	495	0.2588	600	0.9939	705	0.1439
395	0.0049	500	0.3034	605	0.9986	710	0.1239
400	0.0069	505	0.3454	610	0.9900	715	0.1063
405	0.0113	510	0.3832	615	0.9669	720	0.0914
410	0.0190	515	0.4141	620	0.9338	725	0.0780
415	0.0320	520	0.4416	625	0.8909	730	0.0670
420	0.0534	525	0.4656	630	0.8423	735	0.0576
425	0.0845	530	0.4868	635	0.7879	740	0.0492
430	0.1334	535	0.5090	640	0.7302	745	0.0421
435	0.2013	540	0.5343	645	0.6602	750	0.0362
440	0.3022	545	0.5613	650	0.6001	755	0.0312
445	0.4241	550	0.5906	655	0.5423	760	0.0263
450	0.4912	555	0.6298	660	0.4849	765	0.0228
455	0.4276	560	0.6705	665	0.4317	770	0.0196
460	0.3377	565	0.7159	670	0.3814	775	0.0167
465	0.2792	570	0.7642	675	0.3360	780	0.0157
470	0.2296	575	0.8145	680	0.2946		
475	0.1811	580	0.8622	685	0.2572		
480	0.1762	585	0.9093	690	0.2234		

TM-30



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0, 4370
 y 0, 3975
 u' 0, 2535
 v' 0, 5188

CIE 13.3-1995 (CRI)

R_a 83
 R_g 10



2.2 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction HL-WI-EE-001, HL-WI-EE-002)

Test date	2021-06-29	Test Ambient:	25.1 °C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	91838-30K, with Ballast ICN-4S54-90C-2LS-G		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
RHL2106	120.0	60	0.252	30.00	0.992	6.30
2801-901	277.0	60	0.110	29.95	0.983	10.8

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result	Special Color Rendering Indices			
Test Voltage (V)	120.0	R1	81	R9	9
Frequency (Hz)	60	R2	91	R10	80
CCT (K)	2955	R3	96	R11	80
Duv	-0.0030	R4	80	R12	76
Chromaticity (x, y)	x = 0.4358 y = 0.3962	R5	82	R13	84
Chromaticity (u', v')	u' = 0.2532 v' = 0.5181	R6	90	R14	98
Color Rendering Index (CRI)	83.0	R7	82	R15	75
R9	10	R8	59	--	--
Rf	84	--	--	--	--
Rg	97	--	--	--	--
Rcs,h1(%)	-11	--	--	--	--

Photometric Measurement – Sphere-Spectroradiometer Method:

Parameter	Result		DLC V5.1 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	3510.5	3506.6	Bare Lamp: >= 3200(-10%)
Luminous Efficacy (lm/W)	117.02	117.08	Bare lamp: >= 120(-3%)
Most worst Luminous/Highest Watts	116.89		

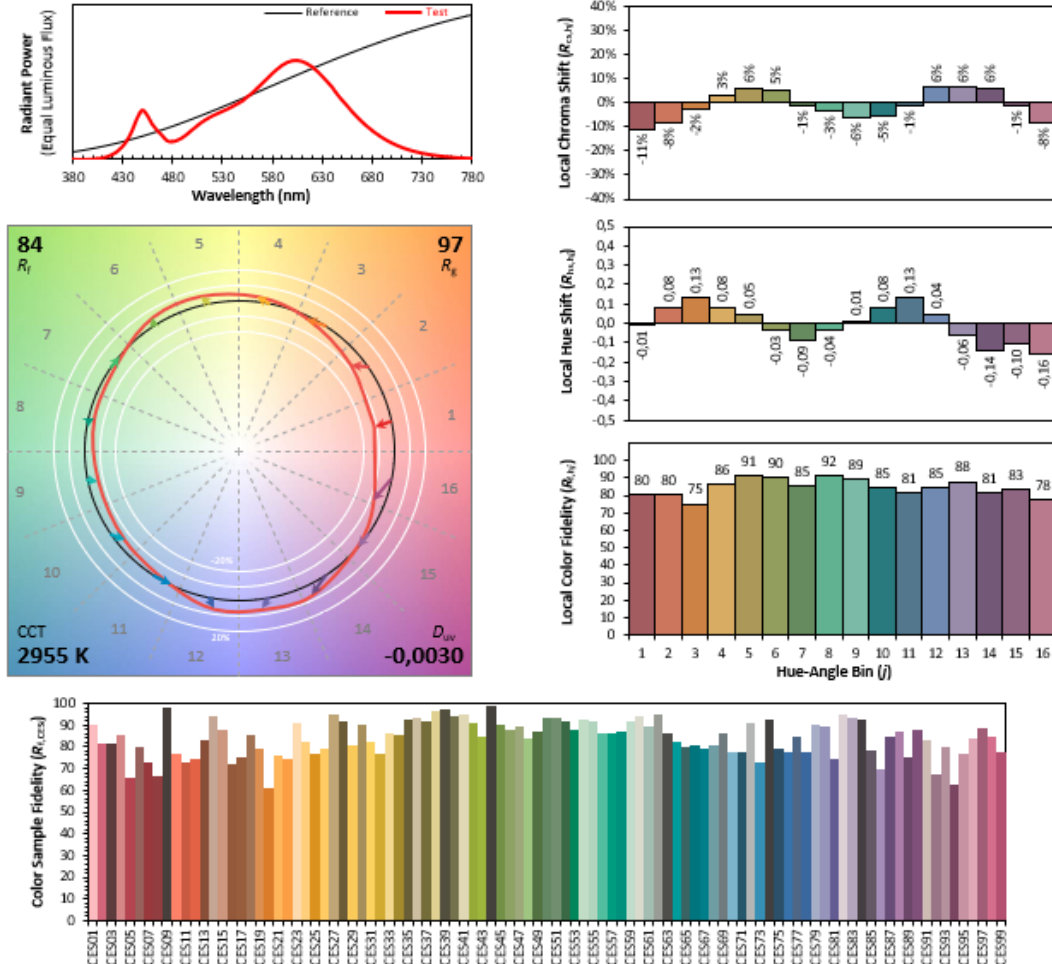


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Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	0,0077	485	0,1963	590	0,9503	695	0,1939
385	0,0049	490	0,2216	595	0,9789	700	0,1680
390	0,0039	495	0,2591	600	0,9957	705	0,1448
395	0,0054	500	0,3015	605	0,9989	710	0,1244
400	0,0071	505	0,3431	610	0,9884	715	0,1068
405	0,0116	510	0,3811	615	0,9652	720	0,0919
410	0,0191	515	0,4128	620	0,9333	725	0,0789
415	0,0321	520	0,4408	625	0,8910	730	0,0676
420	0,0523	525	0,4641	630	0,8400	735	0,0580
425	0,0831	530	0,4872	635	0,7867	740	0,0498
430	0,1292	535	0,5094	640	0,7286	745	0,0427
435	0,1958	540	0,5347	645	0,6584	750	0,0368
440	0,2915	545	0,5622	650	0,5989	755	0,0315
445	0,4161	550	0,5909	655	0,5410	760	0,0273
450	0,4991	555	0,6313	660	0,4841	765	0,0230
455	0,4514	560	0,6721	665	0,4301	770	0,0201
460	0,3616	565	0,7173	670	0,3808	775	0,0172
465	0,2990	570	0,7671	675	0,3358	780	0,0161
470	0,2478	575	0,8158	680	0,2939		
475	0,1932	580	0,8661	685	0,2577		
480	0,1837	585	0,9117	690	0,2239		



TM-30



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0,4358
 y 0,3962
 u' 0,2532
 v' 0,5181

CIE 13.3-1995
(CRI)
 R_a 83
 R_g 10



Summary

Sample No.	Test Method	Voltage (Vac)	Frequency (Hz)	Lumen Output(lm)	Power (W)	Lumen Efficacy(lm/w)
RHL21062801-901	With Ballast	120.0	60	3510.5	30.00	117.02
RHL21062801-901	Connected to line voltage	120.0	60	2963.6	23.40	126.65

The measured lumen efficacy of test condition “with ballast” was less than test condition “Connect to line voltage”. So the following test will be “with ballast”.



2.3 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction HL-WI-EE-001, HL-WI-EE-002)

Test date	2021-06-29	Test Ambient:	25.1 °C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	91838-30K, with ballast ICN-4S54-90C-2LS-G		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
RHL2106	120.0	60	0.254	29.41	0.997	6.7
2801-901	277.0	60	0.111	29.78	0.984	10.6

Photometric Measurement – Goniophotometer Method:

Parameter	Result		DLC V5.1 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	3508.1	3518.8	Bare Lamp: >= 3200(-10%)
Luminous Efficacy (lm/W)	119.28	118.16	Bare lamp: >= 120(-3%)
Most worst Luminous/Highest Watts	117.80		
Beam Angle (°)	186.5		140° (-5°)
Center Beam Candle Power (cd)	721		--



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Zonal Lumen Tabulation

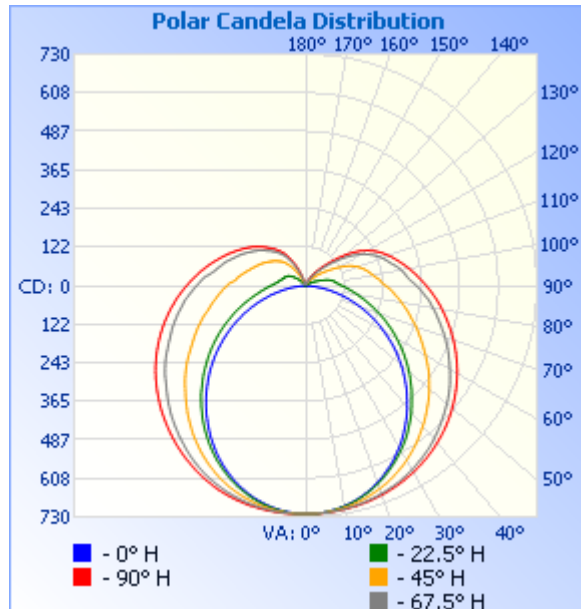
Zonal Lumen Summary

Zone	Lumens	% Lamp	% Luminaire
0-30	570.1	16.2%	16.2%
0-40	948.4	27%	27%
0-60	1,776.9	50.7%	50.7%
60-90	994.2	28.3%	28.3%
70-100	837.8	23.9%	23.9%
90-120	552.1	15.7%	15.7%
0-90	2,771.1	79%	79%
90-180	737.0	21%	21%
0-180	3,508.1	100%	100%

Lumens Per Zone

Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	68.3	1.9%	90-100	227.7	6.5%
10-20	197.4	5.6%	100-110	184.4	5.3%
20-30	304.4	8.7%	110-120	140.0	4%
30-40	378.3	10.8%	120-130	94.0	2.7%
40-50	414.3	11.8%	130-140	54.3	1.5%
50-60	414.2	11.8%	140-150	26.5	0.8%
60-70	384.1	10.9%	150-160	8.2	0.2%
70-80	333.6	9.5%	160-170	1.4	0%
80-90	276.6	7.9%	170-180	0.4	0%

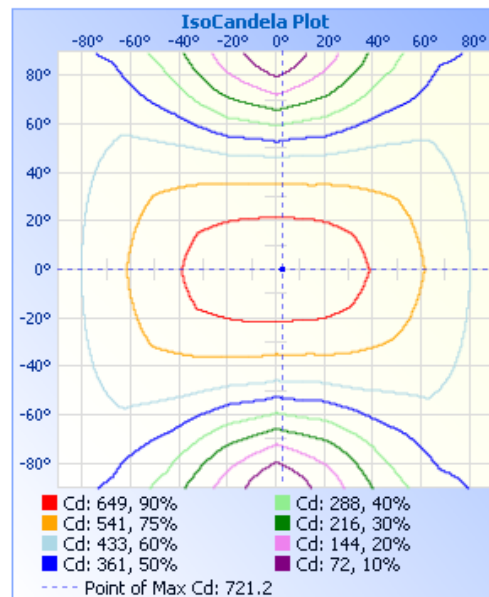
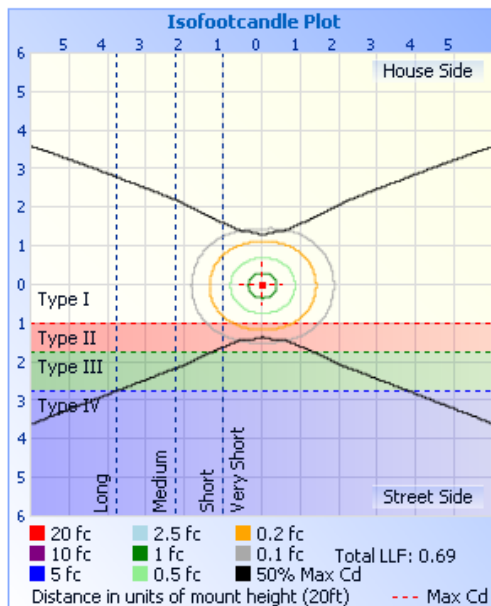
Photometric Data



Illuminance at a Distance

	Center Beam fc	Beam Width
17.0ft	2.49 fc	45.4 ft
34.0ft	0.62 fc	90.7 ft
51.0ft	0.28 fc	136.1 ft
68.0ft	0.16 fc	181.4 ft
85.0ft	0.10 fc	226.8 ft
102.0ft	0.07 fc	272.1 ft

■ Beam Spread: 106.3°





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Candela Table - Type C

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	721	721	721	721	721	721	721	721	721	721	721	721	721	721	721	721	721
1	720	721	720	720	720	720	720	720	720	720	720	721	721	721	720	720	720
2	720	720	720	720	720	720	720	720	719	720	720	721	721	720	720	720	720
3	719	720	719	720	720	720	720	719	718	719	720	720	721	720	720	719	719
4	718	719	719	719	720	720	719	718	717	718	719	720	721	720	719	718	718
5	717	717	718	719	719	719	718	717	715	717	718	720	721	720	718	717	717
6	715	716	717	718	719	719	717	715	713	715	717	719	721	720	718	716	715
7	714	714	716	718	718	718	716	713	711	713	716	719	720	719	716	714	714
8	711	712	714	717	717	717	714	711	709	710	714	718	720	718	715	712	711
9	709	710	713	716	717	716	712	709	706	708	713	717	719	717	713	709	709
10	706	707	711	715	716	715	711	706	703	705	711	716	719	716	712	707	706
11	703	704	709	713	715	714	708	702	699	702	709	715	718	715	710	704	703
12	699	701	706	712	714	713	707	699	695	699	707	713	717	714	707	701	699
13	695	697	704	711	713	712	704	696	691	695	704	712	716	713	705	697	695
14	691	693	701	709	712	711	702	692	687	691	701	711	715	711	703	694	691
15	687	689	699	708	710	709	699	688	682	687	698	709	714	710	700	690	687
16	682	685	695	706	709	707	695	684	677	682	696	707	713	708	697	685	682
17	678	680	692	704	708	706	692	679	672	677	692	705	711	706	693	680	678
18	673	676	689	702	706	704	689	674	666	672	689	703	710	704	690	675	673
19	666	671	686	700	704	702	686	669	661	667	686	701	708	702	687	671	666
20	661	665	682	698	702	700	682	664	655	661	682	698	706	700	682	665	661
21	655	660	678	696	701	698	678	659	649	655	677	696	704	697	679	660	655
22	649	654	674	694	699	695	674	653	642	650	673	693	702	695	674	654	649
23	642	648	670	691	697	693	669	647	635	644	669	690	700	692	670	648	642
24	635	641	665	689	695	690	665	641	628	637	664	687	698	689	666	642	635
25	628	635	661	686	692	688	660	634	621	631	660	684	695	686	661	635	628
26	621	629	656	683	690	685	655	628	613	624	654	681	692	683	656	629	621
27	614	622	652	680	688	682	651	621	606	617	649	677	689	679	651	622	614
28	606	615	647	677	685	679	646	614	598	609	644	674	686	675	646	615	606
29	598	608	641	674	682	676	641	607	589	602	638	670	683	672	640	608	598
30	590	601	636	671	680	672	635	600	581	595	633	666	680	668	635	600	590

Laboratory: Hopestar Test Lab Limited, NVLAP Code: 600245-0
Add: Room 212, 24 Building, 7 Qingyi Road, Hi-Tech Zone, Ningbo, China
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31	581	593	631	667	677	669	630	592	573	587	626	662	676	664	629	593	581
32	573	586	625	663	674	665	624	585	564	579	620	658	673	660	623	585	573
33	564	578	619	659	670	662	619	576	556	571	614	654	669	656	617	578	564
34	555	570	614	656	667	658	613	569	546	563	608	649	666	651	611	569	555
35	546	562	608	652	664	654	608	561	537	554	602	644	662	647	605	561	546
36	537	553	602	648	661	650	602	553	527	546	595	640	658	643	599	552	537
37	527	545	595	644	658	646	596	544	518	537	589	634	654	638	592	544	527
38	518	536	588	640	654	642	589	536	509	529	581	629	650	633	585	535	518
39	508	528	582	635	650	638	583	527	499	519	575	625	647	628	578	527	508
40	498	519	576	630	646	634	577	518	489	510	568	620	642	624	571	518	498
41	488	509	569	626	642	630	571	509	479	502	561	615	638	618	565	509	488
42	478	500	563	621	638	625	565	500	469	493	554	609	634	613	558	500	478
43	469	491	556	616	634	621	558	491	459	483	547	604	629	608	551	491	469
44	459	482	550	611	630	616	551	483	449	474	539	599	625	603	543	482	459
45	448	473	543	606	626	611	544	473	438	465	532	594	621	598	536	474	448
46	437	464	537	601	621	606	537	464	428	454	525	589	616	593	530	465	437
47	427	454	530	596	617	601	531	455	418	445	518	584	611	588	522	455	427
48	417	445	523	591	613	596	524	445	407	436	510	578	607	583	515	446	417
49	406	436	516	586	608	590	517	437	397	427	503	572	602	578	508	436	406
50	395	426	509	581	603	584	509	427	385	417	496	567	597	572	502	427	395
51	385	417	502	576	598	579	502	418	375	407	490	561	592	567	495	418	385
52	373	408	495	571	593	573	495	409	364	397	483	555	587	561	488	408	373
53	362	398	487	566	588	568	489	400	353	388	476	549	582	556	481	398	362
54	351	388	481	561	583	563	481	390	342	379	469	543	577	550	474	389	351
55	340	379	474	555	578	557	474	381	331	369	461	538	572	545	467	380	340
56	329	370	466	549	573	552	467	372	319	360	454	533	568	540	460	371	329
57	317	361	459	543	568	547	460	362	309	350	447	528	562	535	453	361	317
58	306	350	451	537	563	541	453	353	297	341	439	523	557	530	446	352	306
59	295	341	444	531	557	535	446	344	286	331	432	518	552	525	440	343	295
60	284	332	437	525	552	529	440	336	275	322	424	512	547	520	432	334	284
61	273	323	429	519	547	523	433	327	264	313	416	506	541	515	425	325	273
62	261	314	422	514	541	517	426	317	252	303	408	501	536	509	419	316	261
63	250	305	415	508	535	511	419	308	242	294	402	495	530	503	412	307	250

Laboratory: Hopestar Test Lab Limited, NVLAP Code: 600245-0
Add: Room 212, 24 Building, 7 Qingyi Road, Hi-Tech Zone, Ningbo, China
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64	238	295	408	502	530	505	413	299	231	285	395	489	525	496	406	298	238
65	228	286	402	496	524	499	406	291	220	276	389	482	520	490	400	290	228
66	217	277	395	491	519	494	399	281	209	266	382	476	514	484	393	281	217
67	205	268	388	485	513	489	393	273	197	258	376	470	508	477	386	273	205
68	194	259	382	478	507	483	387	264	186	249	370	464	503	471	380	263	194
69	183	250	376	473	501	476	381	256	176	241	363	459	497	466	373	255	183
70	172	242	369	467	496	470	375	248	165	233	357	453	491	461	366	246	172
71	161	233	362	461	490	463	368	240	154	224	350	448	486	455	360	238	161
72	150	226	356	454	484	457	362	232	143	216	344	443	480	449	353	230	150
73	139	217	349	448	478	450	355	224	132	208	338	438	474	442	347	222	139
74	129	209	343	442	473	444	350	217	122	200	331	432	468	436	340	215	129
75	119	202	337	437	467	439	343	210	113	193	324	427	463	429	334	208	119
76	108	195	331	431	461	434	337	202	102	185	317	421	457	421	328	200	108
77	98	187	325	425	455	428	330	195	92	178	312	416	451	415	323	194	98
78	88	180	319	420	449	423	324	188	82	171	307	411	445	408	318	187	88
79	78	173	313	414	444	417	318	182	73	165	302	404	439	402	312	180	78
80	69	167	307	409	438	410	312	175	64	159	297	399	434	396	306	174	69
81	59	161	302	403	432	404	306	168	55	152	291	394	428	392	300	168	59
82	51	155	297	398	426	396	300	163	46	146	286	389	422	387	295	162	51
83	42	149	291	393	421	389	295	157	38	141	281	384	416	383	290	156	42
84	35	144	285	387	415	382	290	153	31	136	277	378	410	379	282	150	35
85	27	139	280	380	409	376	286	146	24	131	271	372	405	376	276	146	27
86	20	134	275	374	403	371	281	141	17	127	267	366	398	371	271	141	20
87	14	128	270	368	398	366	273	137	12	123	263	360	393	365	268	135	14
88	9	124	264	362	392	361	266	132	7	118	258	355	387	360	266	131	9
89	6	120	259	356	386	357	262	126	5	114	253	350	382	355	262	128	6
90	4	115	253	350	381	353	259	122	3	111	248	344	376	349	257	125	4
91	3	111	247	344	375	348	255	120	2	106	245	339	370	344	253	121	3
92	3	107	242	337	370	343	251	117	2	102	239	334	365	338	249	118	3
93	2	104	239	331	364	338	247	113	2	98	231	329	360	333	243	114	2
94	2	101	237	326	359	333	243	110	2	97	224	324	354	327	239	111	2
95	2	99	232	321	354	328	238	107	2	94	221	318	348	322	234	107	2
96	2	97	227	318	349	324	233	105	2	92	218	311	343	318	230	105	2

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97	2	95	222	315	343	319	228	102	1	89	216	304	338	313	225	102	2
98	2	92	218	311	338	315	225	99	2	88	212	298	333	308	221	100	2
99	2	90	215	307	333	309	222	97	2	86	208	293	327	303	217	98	2
100	2	88	211	303	328	305	217	94	1	84	204	288	322	298	213	96	2
101	2	85	208	298	322	300	213	91	2	83	201	284	317	293	209	94	2
102	2	82	205	293	317	294	210	87	1	81	198	280	312	288	205	93	2
103	2	79	202	288	312	290	206	83	1	80	194	275	307	283	201	91	2
104	2	75	198	282	308	285	202	78	2	79	190	272	303	279	197	90	2
105	2	70	195	278	302	280	198	73	1	78	187	269	298	274	194	88	2
106	2	66	191	273	298	276	195	68	1	77	183	265	292	269	191	87	2
107	2	61	187	269	293	271	191	62	1	76	181	261	288	265	188	86	2
108	2	56	183	265	288	266	186	57	1	75	178	256	283	260	185	84	2
109	2	51	179	261	283	262	182	52	1	74	175	252	279	256	182	83	2
110	2	47	174	257	279	257	177	48	2	73	172	248	274	251	179	82	2
111	2	43	169	253	273	252	172	44	2	72	170	243	269	247	177	81	2
112	2	40	164	247	268	247	167	40	1	71	167	240	265	243	174	80	2
113	2	36	159	242	264	242	161	37	2	70	164	236	261	238	171	79	2
114	2	33	153	236	258	237	156	34	1	69	162	233	256	234	168	78	2
115	2	31	147	231	253	231	148	32	2	68	159	229	252	230	165	77	2
116	2	28	140	224	247	226	141	29	1	67	157	226	248	227	163	76	2
117	2	26	133	219	241	219	134	27	2	66	154	222	244	223	160	75	2
118	2	23	126	213	235	213	126	25	2	64	152	218	240	219	157	73	2
119	2	21	119	205	229	206	119	23	1	63	149	214	235	216	155	72	2
120	2	19	112	199	222	198	112	21	1	61	146	210	232	213	153	71	2
121	2	17	105	191	215	191	105	20	2	59	144	206	227	209	150	69	2
122	2	15	99	182	208	183	99	18	2	57	141	202	223	206	147	67	2
123	2	13	93	174	200	175	92	16	1	55	139	199	219	202	145	65	2
124	2	12	87	166	192	166	86	15	2	52	136	196	216	198	142	63	2
125	2	11	81	158	183	157	81	14	2	49	134	192	212	195	140	60	2
126	2	9	76	149	174	150	75	13	2	47	131	188	208	191	137	57	2
127	2	8	71	141	165	140	71	12	2	44	129	185	204	187	135	55	2
128	2	7	66	132	156	132	66	11	2	41	126	181	200	183	132	52	2
129	2	6	62	125	147	124	62	10	2	38	124	177	196	179	129	49	2

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130	2	6	58	117	139	116	58	9	2	35	121	173	192	175	127	46	2
131	2	5	54	110	129	109	54	9	1	31	118	169	187	171	124	42	2
132	2	5	50	102	121	102	51	8	2	28	116	165	183	167	121	39	2
133	2	5	46	96	114	95	47	8	2	25	113	162	179	163	119	36	2
134	2	5	43	90	106	89	44	8	2	22	111	159	175	160	116	32	2
135	2	4	39	83	99	83	41	7	2	18	108	155	170	156	113	29	2
136	2	4	36	78	93	78	38	7	2	16	105	151	166	153	110	25	2
137	2	4	33	72	86	72	35	7	2	12	102	148	162	150	107	22	2
138	2	4	30	67	80	68	32	6	2	9	98	144	158	146	103	19	2
139	2	4	27	62	75	63	29	6	2	6	94	140	154	142	99	16	2
140	2	4	25	58	69	58	26	6	2	5	89	137	150	139	95	12	2
141	2	4	22	53	64	54	24	5	2	4	84	133	146	134	90	9	2
142	2	4	20	49	60	49	21	5	2	4	79	129	142	131	85	7	2
143	2	4	18	45	55	45	19	5	2	3	75	125	138	127	80	6	2
144	3	4	16	41	51	41	17	4	2	3	70	120	134	122	75	5	3
145	3	4	15	38	47	37	15	4	2	3	65	116	129	117	70	5	3
146	3	4	13	34	43	33	13	4	2	3	59	110	124	112	65	5	3
147	3	4	12	31	39	30	12	4	2	3	54	104	119	106	59	5	3
148	3	4	10	28	35	26	10	4	2	3	48	98	113	99	54	5	3
149	3	4	10	25	32	23	10	4	2	3	43	91	106	93	48	5	3
150	3	4	9	22	28	20	9	4	2	3	37	84	100	87	43	5	3
151	3	4	8	19	25	17	8	4	2	3	32	78	92	80	37	5	3
152	3	4	8	17	21	15	8	4	2	3	27	71	85	73	32	5	3
153	3	4	7	15	18	13	7	5	3	3	21	64	78	67	26	5	3
154	3	4	7	13	16	11	6	4	3	3	16	57	72	59	21	5	3
155	3	4	7	11	14	10	6	5	2	4	10	50	64	52	15	5	3
156	3	4	6	10	12	9	5	5	3	3	6	43	56	45	11	5	3
157	3	4	6	9	11	8	5	5	3	4	5	36	48	38	7	5	3
158	3	4	6	8	9	8	5	5	3	3	5	28	41	31	5	5	3
159	3	4	5	7	8	7	5	5	3	4	5	22	34	24	5	5	3
160	3	4	5	7	8	6	5	5	3	4	5	15	26	18	5	5	3
161	3	4	5	6	7	5	5	5	3	3	4	9	19	11	5	5	3
162	3	4	4	6	6	5	5	5	3	3	4	5	12	6	5	5	3

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163	3	4	4	5	5	5	5	5	3	4	4	5	7	5	5	5	3
164	3	4	4	5	5	5	5	5	3	4	4	5	5	5	5	5	3
165	3	4	4	5	5	5	5	5	3	4	4	5	5	5	5	5	3
166	3	4	4	4	5	5	5	5	3	4	4	5	5	5	5	5	3
167	3	4	4	4	5	5	5	5	3	4	4	5	5	5	5	5	3
168	3	4	4	5	5	5	5	5	3	4	5	5	5	5	5	5	3
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176	3	4	5	5	5	5	5	5	3	4	4	5	5	5	5	5	3
177	4	4	5	5	5	5	5	5	3	4	4	5	4	5	5	5	4
178	3	4	5	5	5	5	5	5	3	4	5	5	5	5	5	5	3
179	4	4	5	5	5	5	5	5	3	4	4	5	5	5	5	5	4
180	4	4	5	5	5	5	5	5	3	4	4	5	5	5	5	5	4



2.3 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction HL-WI-EE-001, HL-WI-EE-002)

Test date	2021-06-29	Test Ambient:	25.1 ° C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	91838-65K, with Ballast ICN-4S54-90C-2LS-G		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
RHL210628	120.0	60	0.252	30.09	0.997	6.90
01-902	277.0	60	0.110	29.95	0.983	9.80
DLC Pass Criteria					>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result	Special Color Rendering Indices			
Test Voltage (V)	120.0	R1	81	R9	16
Frequency (Hz)	60	R2	89	R10	73
CCT (K)	6534	R3	93	R11	80
Duv	0.0067	R4	81	R12	59
Chromaticity (x, y)	x = 0.3113 y = 0.3346	R5	82	R13	84
Chromaticity (u', v')	u' = 0.1948 v' = 0.4711	R6	84	R14	96
Color Rendering Index (CRI)	84.0	R7	90	R15	77
R9	17	R8	72	--	--
Rf	84				
Rg	93				
Rcs,h1(%)	-12				

Photometric Measurement – Goniophotometer Method:

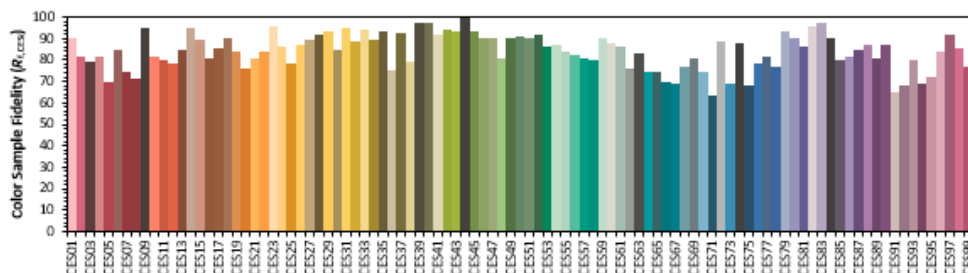
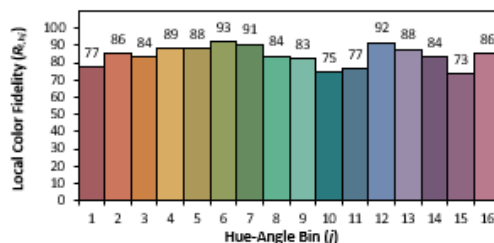
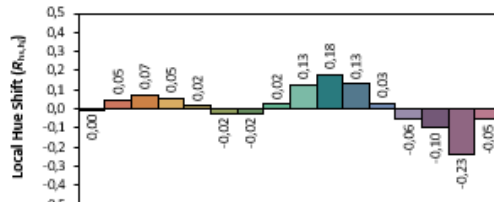
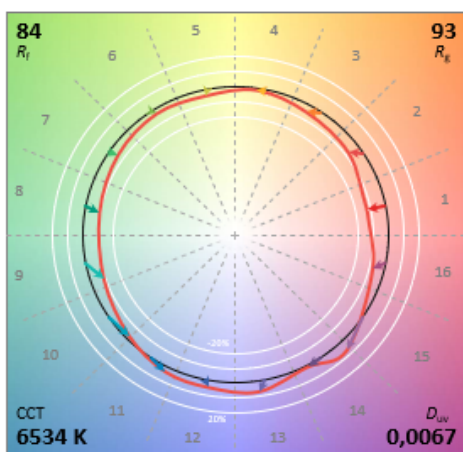
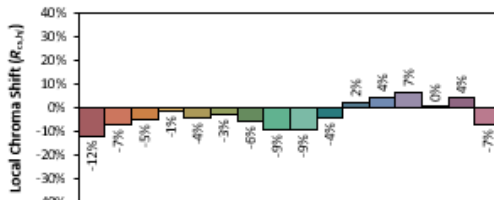
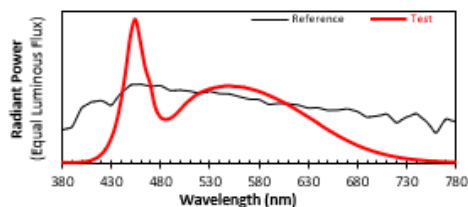
Parameter	Result		DLC V5.1 Pass Criteria
Test Voltage (V)	120.0	277.0	--
Frequency (Hz)	60	60	
Total Luminous (lm)	3754.5	3773.8	Bare Lamp: >= 3200(-10%)
Luminous Efficacy (lm/W)	124.78	126.00	Bare lamp: >= 120(-3%)
Most worst Luminous/Highest Watts	124.78		



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Spectral Distribution over Visible Wavelength							
WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)	WL(nm)	Radiant(Watts)
380	0.0074	485	0.3053	590	0.4729	695	0,0856
385	0.0058	490	0.3117	595	0.4577	700	0,0753
390	0.0052	495	0.3357	600	0.4409	705	0,0657
395	0.0061	500	0.3708	605	0.4246	710	0,0572
400	0.0084	505	0.4083	610	0.4054	715	0,0499
405	0.0120	510	0.4406	615	0.3857	720	0,0434
410	0.0197	515	0.4680	620	0.3649	725	0,0375
415	0.0343	520	0.4893	625	0.3434	730	0,0325
420	0.0583	525	0.5048	630	0.3223	735	0,0282
425	0.0987	530	0.5168	635	0.3010	740	0,0245
430	0.1642	535	0.5248	640	0.2795	745	0,0212
435	0.2633	540	0.5318	645	0.2538	750	0,0182
440	0.4170	545	0.5370	650	0.2333	755	0,0157
445	0.6298	550	0.5396	655	0.2130	760	0,0136
450	0.8824	555	0.5343	660	0.1928	765	0,0118
455	0.9980	560	0.5328	665	0.1743	770	0,0101
460	0.8482	565	0.5275	670	0.1564	775	0,0088
465	0.6644	570	0.5200	675	0.1399	780	0,0082
470	0.5540	575	0.5111	680	0.1241		
475	0.3934	580	0.5004	685	0.1104		
480	0.3245	585	0.4879	690	0.0980		

TM-30



Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x 0,3113
 y 0,3346
 u' 0,1948
 v' 0,4711

CIE 13.3-1995
(CRI)

R_a 84
 R_g 17



2.4 Performance Assessment:

Model Number	Luminous Flux (lm)	Power (W)	Efficacy (lm/W)
91838-30K	3510.50	30.00	117.02
91838-35K	3541.00	30.01	117.99
91838-40K	3571.50	30.02	118.96
91838-41K	3602.00	30.03	119.93
91838-45K	3632.50	30.05	120.90
91838-50K	3663.00	30.06	121.87
91838-57K	3693.50	30.07	122.84
91838-65K	3754.50	30.09	124.78

**3. Test Equipment**

Equipment Name	Model No.	Serial No.	Next Calibration Date
Goniophotometric System	GPM-3000	91N827816	2021-09-26
AC Power Source	CHP-1000	213630	2021-09-19
Total Luminous Flux Standard Lamp	24V150W	24V150W	2021-08-10
Digital Power Meter	WT500	TBS1012 C020506	2021-09-19
Integral Sphere (2M)	2m sphere	N.A	N/A
Digital Power Meter	PF310A	P609877CD1391157	2022-04-01
Optical Color and Electrical Measurement System	HAAS-2000	M108544CM5351115	2021-09-26
Expand Uncertainty: Photometric Measurement (Sphere): 2.08%, k=2 Chromaticity Measurement(Sphere):25.6K, k=2 Photometric Measurement(Goniophotometer):2.645%, k=2			

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