LM-79-08 Test Report

For

P.Q.L., Inc.

2285 Ward Avenue
Simi Valley, CA 93065

High-bay Luminaires for Commercial and Industrial Buildings

Model name(s): 90374_30K, 9037X_35K, 9037X_40K, 9037X_45K, 90375_50K, 9037X_57K

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

Test & Report By:

Candice Liao

Engineer: Candice Liao
Date: Aug.14,2017

Review By:

Tommy Liang

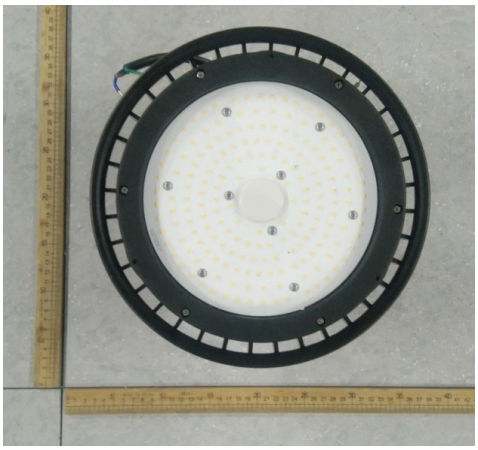
Manager: Tommy Liang

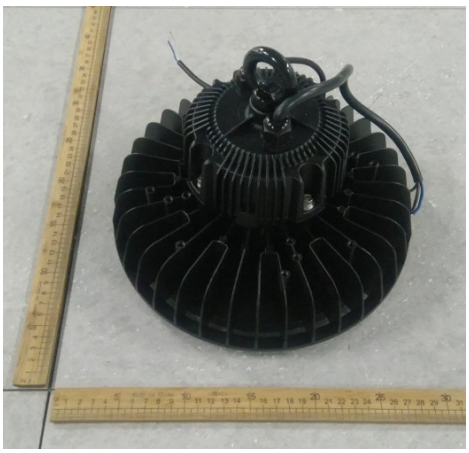
Note: This report does not imply product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

1.1 Product Information:

Organization Name	P.Q.L., Inc.	
Brand Name	Superior Life	
Model Number	90374, 9037X_57K	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	High-bay Luminaires for Commercial and Industrial Buildings	
Rated Voltage / Frequency	100-277 Vac, 50/60 Hz	
Nominal Power	100W	
Rated Initial Lamp Lumen	--	
Declared CCT	3000K, 3500K, 4000K, 4500K, 5000K, 5700K	
LED Manufacturer	Philips Lumileds	
LED Model	LUXEON 3030 2D	
Sample Number	GZE1708033-A1(3000K),A2(5700K)	
Lamp Length	--	mm
Lamp Width	--	mm
Number of Units (modular products)	N/A	s

Photo





1.2 Test Specifications:

Date of Receipt	Aug.10,2017
Date of Test	Aug.10,,2017
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 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	QD25

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° C ± 1° 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 25º C ± 1º 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 25º C ± 1º 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 QD25)

Test date	2017-08-10	Test Ambient:	25.2 ° C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	90374		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE170803 3-A1	120.0	60	0.8473	101.2	0.9953	7.33
	277.0	60	0.3716	99.47	0.9663	11.84
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement - Sphere-Spectroradiometer Method:

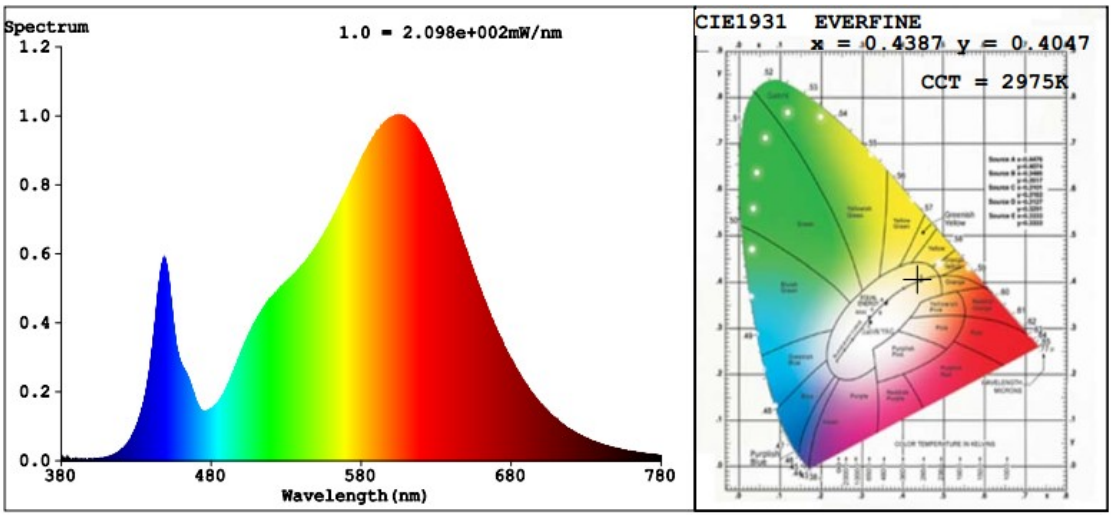
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	2975
Duv	-0.0000
Chromaticity (x, y)	x=0.4387 y=0.4047
Chromaticity (u', v')	u'=0.2515 v'=0.5219
Color Rendering Index (CRI)	82.7
R9	10

Special Color Rendering Indices			
R1	81	R9	10
R2	90	R10	76
R3	97	R11	81
R4	82	R12	70
R5	81	R13	83
R6	87	R14	98
R7	84	R15	74
R8	61	--	--

Photometric Measurement –Goniophotometer Method:

Parameter	Result		DLC V4.2 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	13527	13149	>=10000(-10%)	
Luminous Efficacy (lm/W)	133.67	132.19	Standard: >= 105(-3%)	Premium: >= 130(-3%)
Most Worst Luminous/Highest Watts	129.93			
Zonal lumens in the 20-50° zone (%)	53.3	--	>= 30(-10)	
Beam Angle (°)	55.6	--	--	
Center Beam Candle Power (cd)	4987	--	--	

Spectral Power Distribution & Chromaticity Diagram

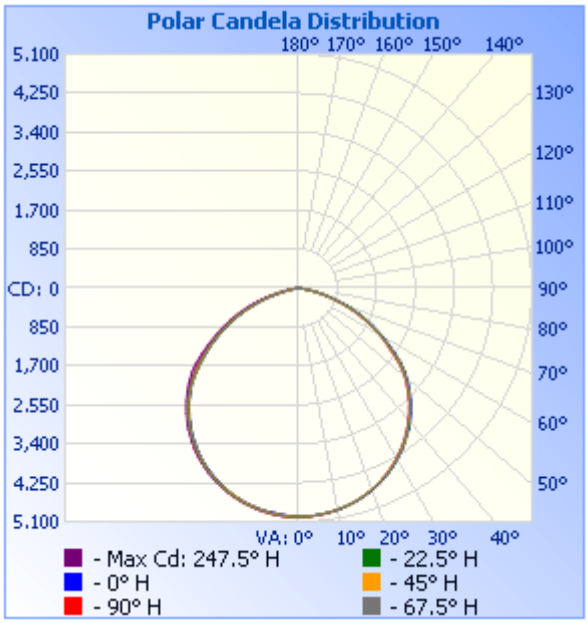


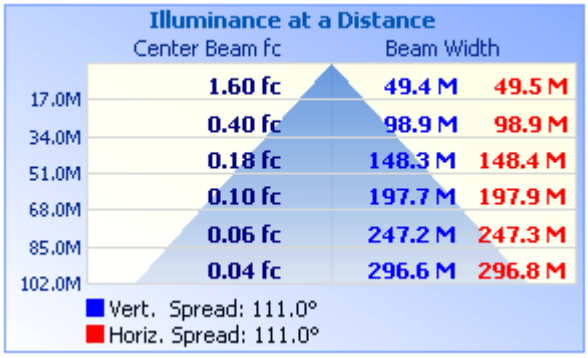
Zonal Lumen Tabulation

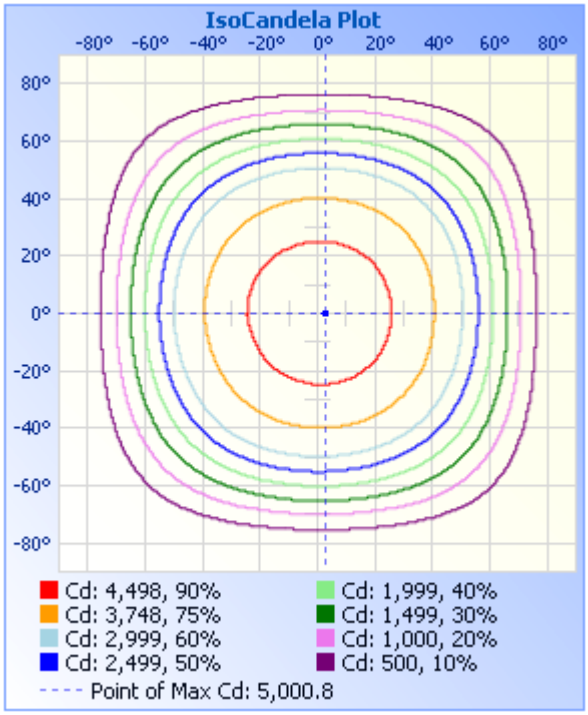
Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	3,902.2	28.8%
0-40	6,425.7	47.4%
0-60	11,326.3	83.6%
60-90	2,204.2	16.3%
70-100	673.7	5%
90-120	5.4	0%
0-90	13,530.5	99.9%
90-180	14.4	0.1%
0-180	13,544.9	100%

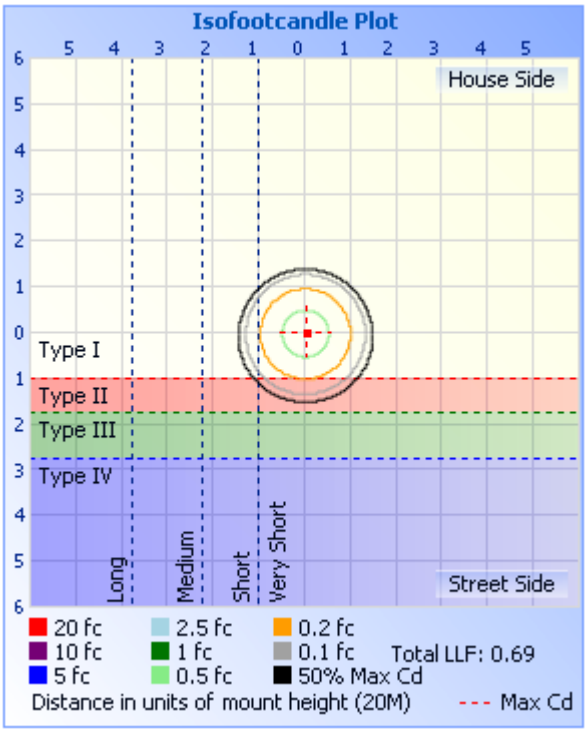
Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	471.7	3.5%	90-100	2.3	0%
10-20	1,357.0	10.0%	100-110	1.5	0%
20-30	2,073.5	15.3%	110-120	1.6	0%
30-40	2,523.4	18.6%	120-130	1.8	0%
40-50	2,626.8	19.4%	130-140	2.0	0%
50-60	2,273.9	16.8%	140-150	2.0	0%
60-70	1,532.7	11.3%	150-160	1.7	0%
70-80	615.1	4.5%	160-170	1.1	0%
80-90	56.3	0.4%	170-180	0.4	0%

Photometric Data









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	4987	4987	4987	4987	4987	4987	4987	4987	4987	4987	4987	4987	4987	4987	4987	4987	4987
1	4979	4989	4981	4997	4993	4981	4976	4983	4977	4985	4990	**5001**	4999	4982	4980	4986	4979
2	4973	4981	4983	4991	4990	4981	4970	4977	4974	4978	4985	4998	4999	4980	4976	4986	4973
3	4974	4978	4981	4984	4989	4971	4965	4972	4963	4973	4976	4993	4997	4974	4972	4981	4974
4	4971	4972	4973	4974	4979	4965	4959	4959	4954	4972	4968	4987	4988	4971	4966	4974	4971
5	4963	4963	4964	4962	4972	4956	4944	4949	4944	4963	4961	4979	4981	4964	4959	4967	4963
6	4949	4952	4952	4955	4965	4951	4933	4943	4933	4952	4954	4968	4972	4951	4949	4962	4949
7	4944	4949	4942	4943	4953	4937	4922	4927	4924	4935	4943	4954	4963	4941	4939	4950	4944
8	4931	4935	4930	4932	4940	4925	4912	4920	4917	4924	4933	4939	4948	4929	4927	4936	4931
9	4923	4921	4919	4919	4927	4904	4896	4903	4901	4911	4912	4928	4936	4917	4916	4925	4923
10	4911	4903	4902	4906	4913	4892	4883	4888	4890	4899	4899	4915	4919	4902	4901	4911	4911
11	4897	4891	4885	4886	4890	4874	4863	4868	4871	4878	4888	4901	4903	4889	4888	4893	4897
12	4876	4872	4873	4872	4872	4855	4848	4854	4855	4865	4864	4881	4884	4872	4868	4872	4876
13	4860	4858	4859	4850	4854	4834	4825	4831	4835	4846	4849	4866	4865	4856	4853	4858	4860
14	4841	4835	4834	4832	4839	4812	4804	4807	4817	4825	4822	4843	4847	4833	4832	4842	4841
15	4822	4814	4812	4813	4812	4787	4782	4785	4793	4808	4803	4818	4827	4814	4813	4821	4822
16	4797	4784	4782	4789	4787	4763	4752	4759	4768	4773	4776	4794	4796	4791	4787	4794	4797
17	4778	4763	4764	4765	4764	4737	4732	4734	4750	4745	4750	4772	4774	4765	4767	4771	4778
18	4744	4736	4733	4736	4734	4703	4704	4702	4717	4712	4722	4744	4751	4735	4743	4744	4744
19	4720	4714	4708	4712	4701	4673	4676	4674	4686	4690	4698	4716	4716	4711	4720	4720	4720
20	4690	4680	4674	4675	4677	4642	4637	4638	4654	4658	4662	4690	4691	4679	4685	4685	4690
21	4657	4649	4643	4649	4644	4611	4611	4610	4625	4631	4631	4661	4655	4656	4656	4657	4657
22	4625	4611	4606	4613	4608	4571	4572	4571	4583	4596	4595	4621	4626	4627	4622	4622	4625
23	4595	4580	4578	4584	4576	4538	4541	4539	4548	4565	4563	4587	4594	4590	4591	4595	4595
24	4558	4543	4536	4540	4533	4496	4497	4500	4512	4521	4528	4551	4560	4560	4557	4557	4558
25	4521	4510	4506	4506	4496	4463	4459	4465	4479	4487	4497	4505	4516	4520	4525	4524	4521
26	4483	4480	4470	4468	4451	4416	4413	4417	4435	4445	4450	4468	4478	4485	4494	4490	4483
27	4439	4431	4424	4430	4415	4378	4378	4377	4394	4411	4420	4428	4434	4444	4451	4445	4439
28	4402	4393	4386	4391	4369	4327	4333	4327	4358	4359	4379	4391	4395	4410	4415	4404	4402

29	4355	4347	4338	4340	4329	4285	4291	4289	4311	4320	4324	4337	4349	4372	4366	4360	4355
30	4313	4303	4297	4298	4285	4230	4235	4239	4266	4277	4282	4300	4308	4321	4323	4323	4313
31	4270	4249	4253	4243	4230	4187	4193	4198	4212	4228	4229	4243	4253	4280	4266	4280	4270
32	4217	4206	4206	4200	4183	4144	4147	4154	4165	4180	4185	4200	4209	4232	4226	4225	4217
33	4172	4163	4160	4141	4131	4087	4089	4096	4110	4121	4132	4144	4169	4185	4182	4181	4172
34	4115	4109	4103	4090	4084	4042	4041	4045	4060	4074	4082	4096	4112	4126	4121	4124	4115
35	4067	4060	4056	4037	4034	3979	3976	3989	3999	4017	4020	4038	4064	4075	4078	4077	4067
36	4007	3992	3993	3979	3970	3925	3928	3937	3953	3968	3972	3988	3997	4028	4017	4013	4007
37	3960	3942	3940	3928	3917	3865	3865	3875	3887	3899	3910	3937	3949	3972	3967	3964	3960
38	3909	3896	3871	3860	3855	3810	3809	3824	3834	3847	3859	3869	3884	3918	3917	3915	3909
39	3843	3827	3816	3809	3803	3737	3740	3756	3763	3779	3788	3819	3833	3855	3854	3849	3843
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49	3175	3152	3145	3143	3118	3026	3037	3039	3045	3045	3052	3086	3119	3189	3193	3182	3175
50	3089	3063	3056	3053	3033	2954	2965	2959	2959	2952	2962	2979	3011	3115	3121	3097	3089
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56	2534	2514	2472	2464	2429	2360	2357	2353	2364	2368	2385	2433	2466	2520	2537	2542	2534
57	2421	2395	2378	2374	2342	2273	2270	2267	2279	2285	2299	2331	2361	2414	2426	2428	2421
58	2330	2284	2269	2259	2237	2168	2162	2160	2170	2181	2196	2230	2260	2329	2338	2337	2330
59	2220	2198	2180	2169	2155	2056	2055	2056	2062	2078	2113	2148	2176	2225	2232	2226	2220
60	2111	2093	2071	2058	2048	1967	1969	1970	1978	1997	2013	2041	2070	2143	2125	2119	2111

61	2024	2006	1983	1970	1963	1861	1860	1862	1869	1889	1907	1957	1984	2039	2039	2034	2024
62	1916	1897	1872	1860	1854	1773	1773	1776	1786	1804	1823	1854	1877	1955	1931	1925	1916
63	1830	1809	1784	1770	1743	1665	1658	1668	1681	1695	1716	1746	1771	1852	1845	1838	1830
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66	1518	1501	1477	1461	1452	1361	1349	1354	1375	1388	1411	1438	1485	1541	1537	1532	1518
67	1430	1412	1391	1372	1344	1248	1245	1245	1288	1300	1316	1343	1378	1454	1448	1446	1430
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70	1133	1111	1090	1061	1057	953	943	943	959	979	999	1026	1050	1136	1145	1141	1133
71	1039	992	971	944	937	843	838	840	856	873	892	919	945	1045	1048	1047	1039
72	924	906	881	858	853	743	755	739	773	790	810	835	857	935	934	932	924
73	836	800	774	756	753	663	657	661	670	689	713	734	752	849	847	844	836
74	731	718	694	675	670	568	566	572	580	588	606	653	674	746	744	744	731
75	635	621	601	579	574	497	492	496	499	508	528	548	567	650	649	646	635
76	558	549	527	509	500	402	397	399	408	420	437	456	471	572	577	569	558
77	466	454	433	414	405	318	314	318	329	356	372	391	405	471	479	477	466
78	395	381	361	348	319	261	255	257	264	273	287	305	320	403	406	402	395
79	312	299	282	270	260	191	187	191	198	204	217	231	258	320	321	319	312
80	254	241	214	202	191	138	132	146	139	157	166	180	192	258	264	261	254
81	187	177	166	155	146	99	95	98	102	108	114	125	134	191	195	194	187
82	133	124	114	105	98	64	61	62	65	70	75	90	98	146	149	137	133
83	96	89	80	75	69	39	42	43	44	48	52	58	63	99	100	99	96
84	60	57	51	46	43	26	25	25	26	28	30	35	38	63	64	63	60
85	40	38	33	27	25	16	15	15	16	16	18	22	24	42	43	43	40
86	24	22	19	18	16	11	11	11	11	12	12	14	15	24	25	25	24
87	15	13	12	11	10	7	6	6	7	7	8	9	10	15	16	16	15
88	10	10	9	8	7	4	4	4	4	4	5	5	6	10	10	10	10
89	6	5	5	4	3	4	4	4	4	4	4	4	4	6	6	6	6
90	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
91	3	2	2	3	2	3	3	3	3	3	3	3	3	3	3	3	3
92	2	2	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2

93	2	2	2	2	2	3	3	3	3	3	3	3	3	2	2	2	2
94	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
95	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
96	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
97	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2
98	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	1
99	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
100	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
101	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
102	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
103	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
104	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
105	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
106	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
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110	1	1	1	1	1	2	2	2	2	2	2	2	2	1	1	1	1
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179	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
180	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

2.2 Electrical, Photometric and Chromaticity Measurements

(Refer to Work Instruction QD25)

Test date	2017-07-25	Test Ambient:	25.2 ° C
Test Orientation	Horizontal	Stabilization Time (min)	90
Model Number	9037X_57K		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
GZE170803 3-A2	120.0	60	0.8682	103.7	0.9953	7.32
	277.0	60	0.3760	101.6	0.9754	11.77
				DLC Pass Criteria	>= 0.9(-3%)	<= 20(+5)

Chromaticity Measurement - Sphere-Spectroradiometer Method:

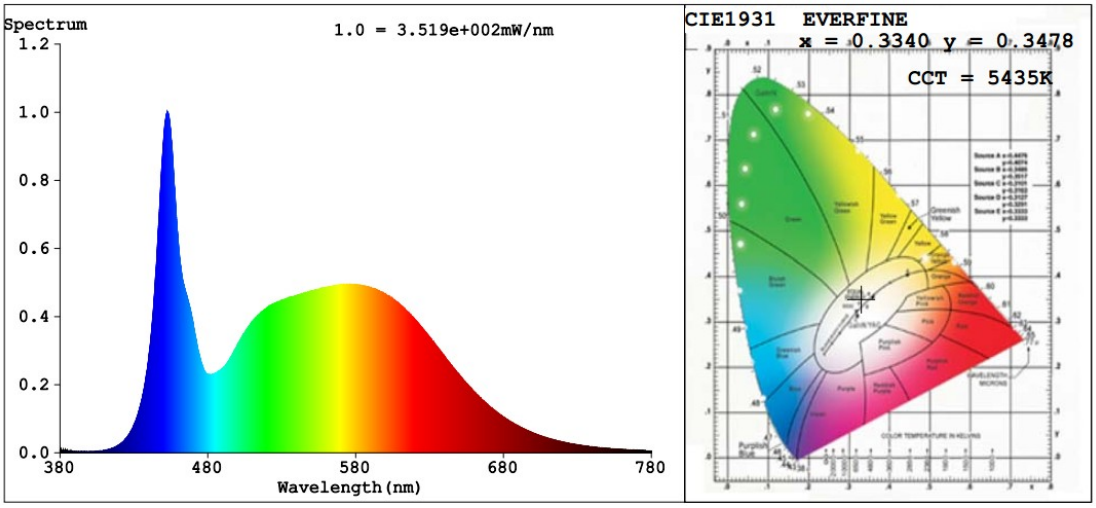
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
CCT (K)	5435
Duv	0.0027
Chromaticity (x, y)	x=0.3340 y=0.3478
Chromaticity (u', v')	u'=0.2054 v'=0.4812
Color Rendering Index (CRI)	84.4
R9	14

Special Color Rendering Indices			
R1	83	R9	14
R2	90	R10	75
R3	93	R11	82
R4	83	R12	59
R5	83	R13	85
R6	85	R14	97
R7	88	R15	78
R8	70	--	--

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result		DLC V4.2 Pass Criteria	
Test Voltage (V)	120.0	277.0	--	
Frequency (Hz)	60	60		
Total Luminous (lm)	14734	14357	>=10000(-10%)	
Luminous Efficacy (lm/W)	142.08	141.31	Standard: >=	Premium: >=
Most Worst Luminous/Highest Watts	138.45		105(-3%)	130(-3%)

Spectral Power Distribution & Chromaticity Diagram



2.3 Performance Assessment:

Model name	CCT(K)	Total Luminous (lm)	Power (W)	Luminous Efficacy (lm/W)
90374	3000	13527	101.2	133.67
9037X_35K	3500	13768*1	102.45*2	134.39*3
9037X_40K	4000	14009*1	102.45*2	136.74*3
9037X_45K	4500	14250*1	102.45*2	139.09*3
90375	5000	14491*1	102.45*2	141.44*3
9037X_57K	5700	14734	103.7	142.08

*1: This value is calculated and the calculation formula is as below:

13768=(14734-13527)/5+13527

14009=(14734-13527)/5+13768

14250=(14734-13527)/5+14009

14491=(14734-13527)/5+14250

*2: This value is calculated and the calculation formula is as below:

102.45= (101.2+103.7)/2

*3: This value is calculated and the calculation formula is as below:

134.39 =13768/102.45

136.74=14009/102.45

139.09 =14250/102.45

141.44=14491/102.45

3. Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-331	2 meter Integrating Sphere	2017-07-01	2018-06-30
ST-R-327	Spectral analysis system HAAS-2000	2017-07-01	2018-06-30
D204	Standard Lamp	2017-07-12	2018-07-11
PF2010	Power Meter for Integrating Sphere	2017-07-01	2018-06-30
GO-R5000	Goniophotometer system	2017-07-01	2018-06-30
D908S	Standard Lamp	2017-07-12	2018-07-11
PF210	Power Meter for Goniophotometer	2017-07-07	2018-07-06
Expand Uncertainty: Photometric Measurement (Sphere):2.04%, k=2 Chromaticity Measurement(Sphere):28.8K, k=2 Photometric Measurement(Goniophotometer):2.36%, k=2			

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