



NVLAP LAB CODE 201011-0

Report No.:GZN140948-D

## LM-79-08 Test Report

Model name(s): ] **LP-1X4-45W-35K-D**  
] **LP-1X4-45W-40K-D**  
Representative (Tested) ] **LP-1X4-45W-50K-D**

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

Test & Report By:

*Sean Zhuo*

Engineer: Sean Zhuo

Date: Nov.13,2014

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.

**Laboratory: Standard-Tech Co. Ltd Testing Center**

**NVLAP CODE: 201011-0**

Report Format Number STD/QR4909-A/2

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U.S. Department of Energy

**Lighting Facts™ Uniform LM-79 Reporting Template**
**Laboratory Information:**

Name of Test Laboratory	Standard-Tech Co. Ltd
Date of Test Report	Nov.13,2014
Test Report No.	GZN140948-D
Laboratory Contact Name	Tommy Liang

**Product Information:**

Model Number	LP-1X4-45W	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces	
Luminaire Aperture (for downlights)	--	in.
Luminaire Length	--	mm
Luminaires Width	--	mm
Number of Units (modular products)	N/A	

**Integrating Sphere**
**Goniophotometer**
**Electrical Measurements:**
**Output**
**Output**

Input Wattage	--	42.47	W
Input Current	--	0.3577	A
Input Voltage (ac)	--	120.0	V
Power Factor	--	0.9894	
Off-State Power	--	0	

**Photometric Characteristics**

Total Initial Lumen Output	--	3511.1	lm
Initial Lumen Efficacy	--	82.66	lm/w
Correlated color temperature / CCT	2906	--	K
Color rendering index / CRI	83.4	--	
R9 Value	18	--	
Duv	0.0020	--	
<b>Luminous Intensity Distribution</b>			
Center beam candlepower (if applicable)		1154	cd
Beam angle (if applicable)		117.4	°
Zonal lumens in the 0°-60° zone		77.4	%
Zonal lumens in the 60°-90° zone	-----	22.6	%
Zonal lumens in the 90°-120° zone		0	%
Zonal lumens in the 120°-180° zone		0.1	%

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**Product Information:**

Model Number	LP-1X4-45W	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces	
Luminaire Aperture (for downlights)	--	in.
Luminaire Length	--	mm
Luminaires Width	--	mm
Number of Units (modular products)	N/A	

	Integrating Sphere	Goniophotometer	
Electrical Measurements:	Output	Output	
Input Wattage	43.54	--	W
Input Current	0.3661	--	A
Input Voltage (ac)	120.0	--	V
Power Factor	0.9908	--	
Off-State Power	0	--	W

**Photometric Characteristics**

Total Initial Lumen Output	4123	--	lm
Initial Lumen Efficacy	94.71	--	lm/w
Correlated color temperature / CCT	3859	--	K
Color rendering index / CRI	82.7	--	
R9 Value	8	--	
Duv	0.0021	--	
<b>Luminous Intensity Distribution</b>			
Center beam candlepower (if applicable)	-----	--	cd
Beam angle (if applicable)		--	°
Zonal lumens in the 0°-60° zone		--	%
Zonal lumens in the 60°-90° zone		--	%
Zonal lumens in the 90°-120° zone		--	%
Zonal lumens in the 120°-180° zone		--	%

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**Product Information:**

Model Number	LP-1X4-45W	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces	
Luminaire Aperture (for downlights)	--	in.
Luminaire Length	--	mm
Luminaires Width	--	mm
Number of Units (modular products)	N/A	

	Integrating Sphere	Goniophotometer	
Electrical Measurements:	Output	Output	
Input Wattage	43.29	--	W
Input Current	0.3640	--	A
Input Voltage (ac)	120.0	--	V
Power Factor	0.9909	--	
Off-State Power	0	--	W

**Photometric Characteristics**

Total Initial Lumen Output	4281	--	lm
Initial Lumen Efficacy	98.90	--	lm/w
Correlated color temperature / CCT	4833	--	K
Color rendering index / CRI	83.5	--	
R9 Value	10	--	
Duv	0.0036	--	
<b>Luminous Intensity Distribution</b>			
Center beam candlepower (if applicable)	-----	--	cd
Beam angle (if applicable)		--	°
Zonal lumens in the 0°-60° zone		--	%
Zonal lumens in the 60°-90° zone		--	%
Zonal lumens in the 90°-120° zone		--	%
Zonal lumens in the 120°-180° zone		--	%

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Test Specifications:	
Date of Receipt	: Nov.11,2014
Date of Test	: Nov.12,2014
Test item	: Total Luminous Flux, Luminous Distribution Intensity, Luminous Efficacy, Correlated Color Temperature, Color Rendering Index, Chromaticity Coordinate, Electrical parameters
Reference Standard	IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products ANSI C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources CIE 15-2004 Technical Report Colorimetry IESNA LM-16-93 Practical Guide to Colorimetry of Light Source IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems
Reference Work Instruction	QD25

### Test Methods

#### 1. Photometric and Electrical measurements – Light Distribution Method:

Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at  $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ , 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 Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at  $1\text{ }^{\circ}$  vertical intervals and  $22.5\text{ }^{\circ}$  horizontal intervals.

#### 2. Photometric and Electrical Measurements – Integrating Sphere Method:

Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at  $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$ . 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 Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at least 5 nm intervals over the range of 380 to 780 nm.

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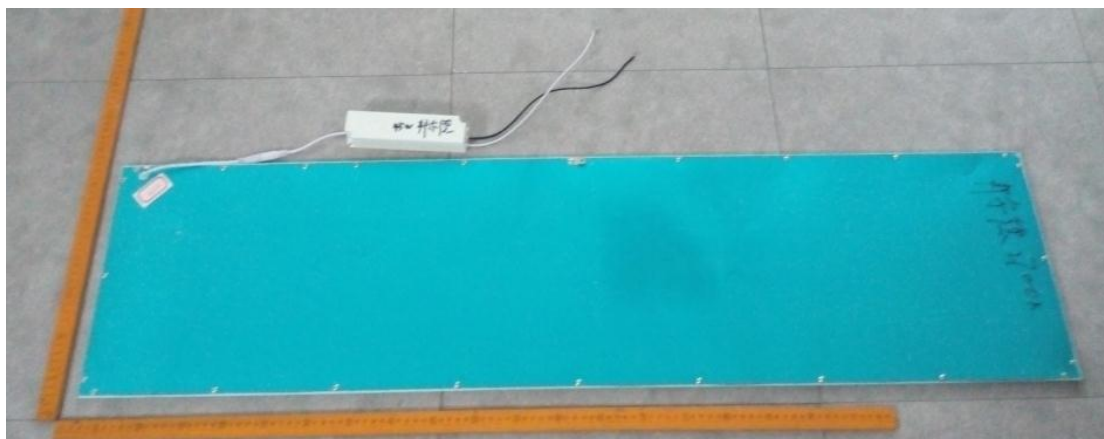
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**1. Product Information:**

Model Number	LP-1X4-45W
Luminaire Type	1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces
Rated Voltage / Frequency	100 ~ 277 Vac, 50/60 Hz
Nominal Power	45W
Rated Initial Lamp Lumen	--
Declared CCT	3000K, 4000K, 5000K
LED Manufacturer	ShenZhen JuFei Optoelectronics Co., Ltd.
LED Model	4014
Sample Receipt Date	Nov.12,2014
Sample Number	140948-10(3000K),-11(4000K),-12(5000K)

**Photo**



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<b>2.1 Electrical, Photometric and Chromaticity Measurements</b> (Refer to Work Instruction QD25)	<b>IES LM-79 2008</b>
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<b>Test date</b>	2014-11-12	<b>Test Ambient:</b>	25.0 °C
<b>Test Orientation</b>	horizontal	<b>Stabilization Time (min)</b>	90

### Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
140948-10	120.0	60	0.3577	42.47	0.9894	8.79
	277.0	60	0.1673	43.11	0.9305	14.31

### Sphere-Spectroradiometer Method:

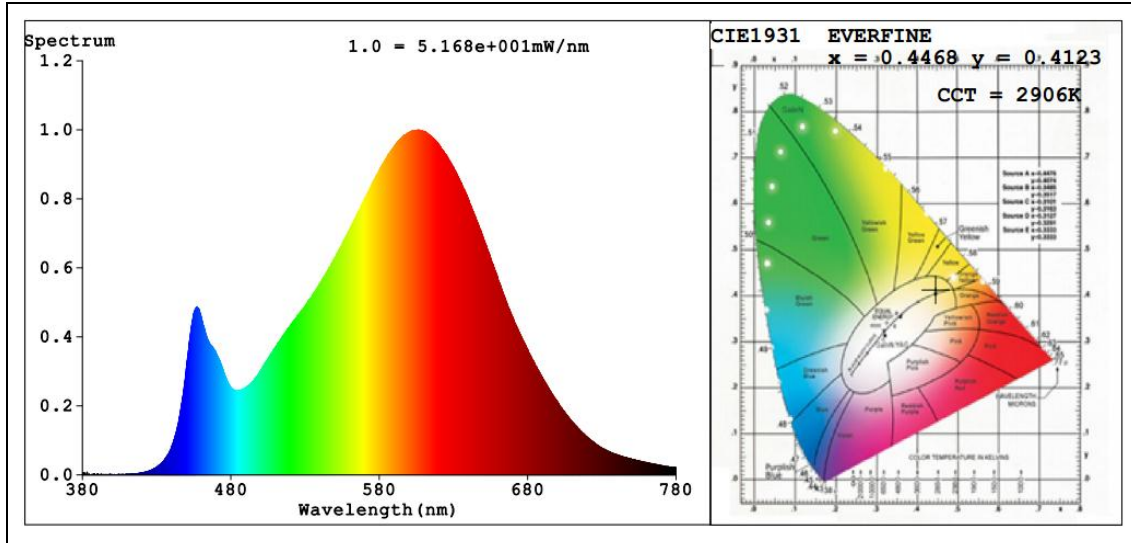
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	82.7
R9	8
CCT (K)	2906
Chromaticity (x, y)	x=0.3886 y=0.3863
Chromaticity (u', v')	u'=0.2266 v'=0.5069
Duv	0.0021

Special Color Rendering Indices			
R1	81	R9	8
R2	92	R10	81
R3	95	R11	76
R4	78	R12	61
R5	81	R13	85
R6	89	R14	98
R7	83	R15	75
R8	62	--	--

### Goniophotometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Total Luminous (lm)	3511.1
Luminous Efficacy (lm/W)	82.66
Beam Angle °	117.4
Center Beam Candle Power (cd)	1154
S/MH(C0/180)	1.30
S/MH(C90/270)	1.32

**Spectral Power Distribution & Chromaticity Diagram**



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**Zonal Lumen Tabulation**

Zonal Lumen Summary			
Zone	Lumens	% Lamp	% Luminaire
0-30	908.7	25.9%	25.9%
0-40	1,505.1	42.9%	42.9%
0-60	2,716.7	77.4%	77.4%
60-90	791.8	22.6%	22.6%
70-100	344.1	9.8%	9.8%
90-120	0.8	0%	0%
0-90	3,508.5	99.9%	99.9%
90-180	2.3	0.1%	0.1%
0-180	3,510.8	100%	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	109.2	3.1%	90-100	0.7	0%
10-20	315.0	9.0%	100-110	0.0	0%
20-30	484.5	13.8%	110-120	0.1	0%
30-40	596.3	17.0%	120-130	0.1	0%
40-50	631.8	18.0%	130-140	0.2	0%
50-60	579.9	16.5%	140-150	0.3	0%
60-70	448.4	12.8%	150-160	0.4	0%
70-80	265.5	7.6%	160-170	0.3	0%
80-90	77.9	2.2%	170-180	0.1	0%

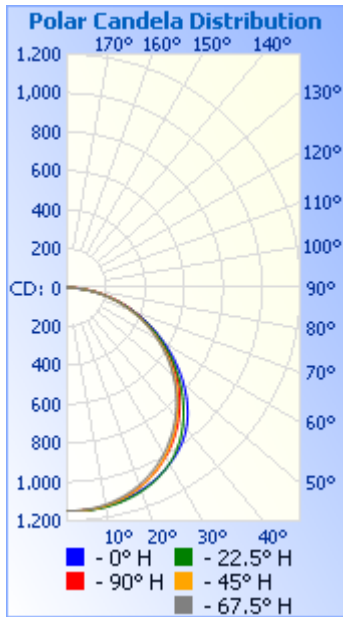
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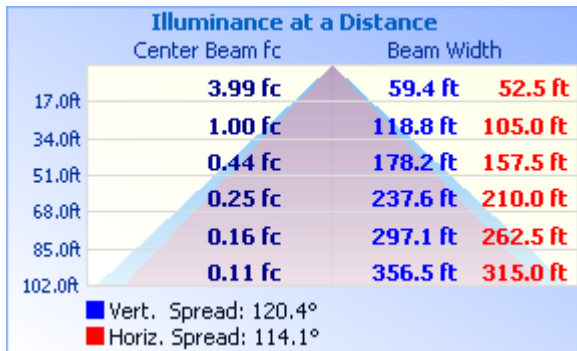
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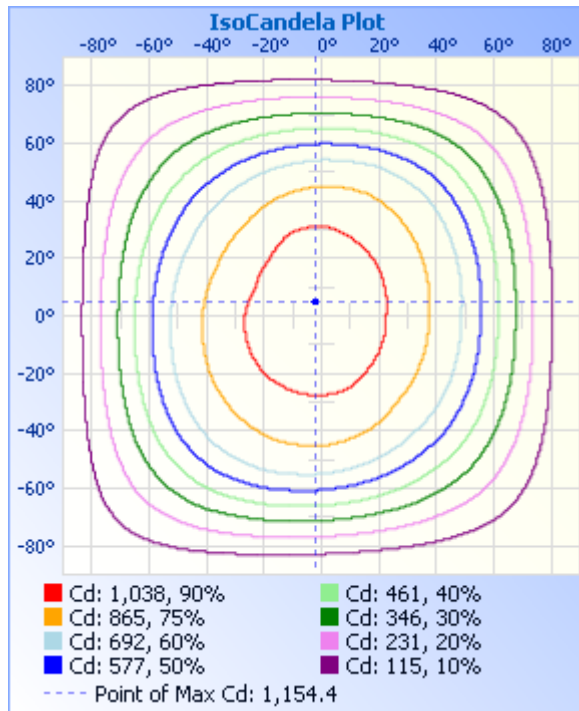
### Photometric Data



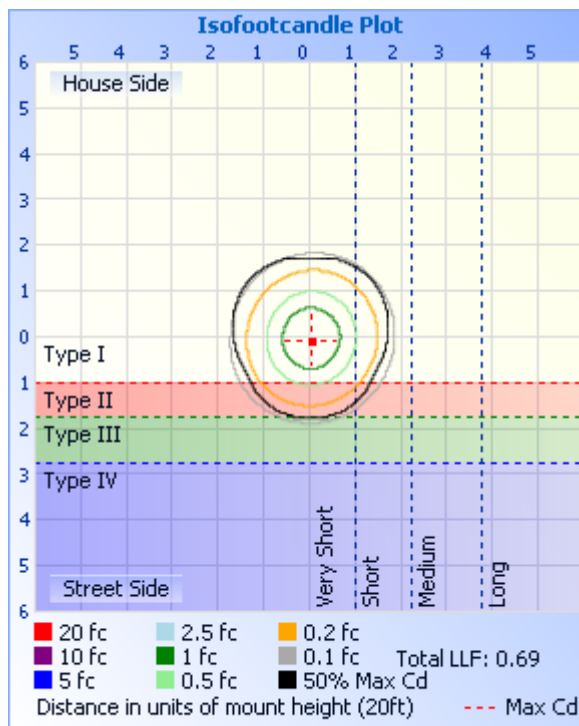
### Illuminance Plots



### ISOCANDELA DIAGRAM



### ISOLUX DIAGRAM



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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	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152
1	1153	1153	1153	1152	1153	1152	1152	1152	1151	1151	1151	1151	1151	1151	1152	1152	1153
2	1153	1154	1153	1152	1153	1153	1152	1151	1150	1150	1150	1150	1149	1150	1151	1152	1153
3	1153	1154	1153	1152	1154	1153	1151	1150	1149	1147	1148	1148	1147	1148	1150	1152	1153
4	1153	1154	1153	1151	1153	1152	1150	1148	1147	1146	1146	1146	1144	1146	1149	1151	1153
5	1153	1154	1152	1149	1152	1151	1149	1147	1145	1144	1143	1144	1142	1144	1148	1150	1153
6	1152	1154	1151	1148	1151	1150	1148	1145	1143	1140	1141	1141	1139	1141	1145	1149	1152
7	1151	1153	1150	1146	1150	1148	1146	1143	1141	1138	1138	1138	1135	1138	1143	1147	1151
8	1150	1152	1148	1144	1148	1146	1143	1140	1138	1135	1134	1134	1132	1135	1141	1145	1150
9	1148	1151	1146	1141	1146	1144	1141	1137	1134	1132	1130	1131	1127	1131	1138	1143	1148
10	1146	1150	1143	1138	1143	1141	1138	1135	1132	1129	1127	1126	1123	1127	1135	1140	1146
11	1144	1148	1140	1134	1140	1139	1135	1132	1128	1125	1122	1121	1117	1123	1131	1138	1144
12	1142	1146	1137	1130	1137	1135	1132	1128	1124	1121	1118	1116	1112	1119	1127	1135	1142
13	1140	1143	1133	1125	1133	1132	1128	1124	1120	1116	1112	1111	1106	1113	1123	1132	1140
14	1137	1141	1129	1121	1129	1127	1124	1120	1115	1112	1107	1105	1100	1108	1118	1128	1137
15	1133	1138	1125	1115	1124	1123	1120	1116	1111	1107	1102	1098	1094	1102	1114	1124	1133
16	1130	1135	1120	1110	1120	1119	1115	1110	1106	1103	1095	1092	1087	1096	1109	1120	1130
17	1126	1132	1115	1104	1114	1113	1110	1105	1101	1097	1089	1084	1080	1090	1103	1115	1126
18	1122	1127	1109	1097	1108	1108	1105	1100	1096	1092	1082	1077	1072	1083	1097	1110	1122
19	1118	1124	1103	1091	1102	1102	1099	1095	1091	1086	1075	1069	1064	1076	1091	1105	1118
20	1113	1119	1096	1084	1096	1097	1094	1089	1086	1081	1068	1061	1056	1069	1085	1100	1113
21	1108	1114	1089	1076	1089	1090	1088	1083	1080	1074	1060	1053	1047	1061	1079	1094	1108
22	1103	1109	1082	1068	1082	1083	1082	1077	1074	1068	1052	1043	1039	1053	1071	1089	1103
23	1098	1103	1074	1060	1075	1077	1075	1071	1068	1062	1044	1035	1029	1044	1064	1082	1098
24	1092	1098	1065	1051	1067	1069	1068	1064	1061	1055	1035	1025	1020	1036	1056	1076	1092
25	1087	1091	1057	1042	1058	1061	1061	1058	1054	1048	1026	1015	1009	1026	1049	1069	1087
26	1081	1084	1048	1033	1050	1053	1053	1051	1047	1040	1016	1004	999	1017	1041	1062	1081
27	1074	1077	1038	1024	1041	1045	1045	1043	1040	1033	1006	994	988	1008	1032	1054	1074
28	1067	1069	1028	1014	1031	1036	1037	1036	1033	1025	996	983	977	997	1023	1046	1067
29	1060	1060	1017	1003	1021	1027	1029	1028	1026	1017	985	972	966	987	1014	1038	1060

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30	1053	1051	1007	993	1011	1018	1020	1020	1018	1008	974	960	955	976	1004	1030	1053
31	1045	1042	995	982	1001	1008	1011	1012	1010	999	963	948	943	965	995	1022	1045
32	1037	1031	984	970	990	998	1002	1002	1002	990	951	936	931	954	985	1013	1037
33	1029	1020	972	959	979	988	992	994	994	980	939	923	918	942	974	1004	1029
34	1020	1009	960	947	968	977	982	985	985	970	926	910	905	930	963	995	1020
35	1010	997	947	934	956	966	972	975	976	960	913	897	892	918	952	985	1010
36	1001	984	937	922	944	955	962	966	968	948	900	883	879	906	941	976	1001
37	990	970	921	909	931	943	951	956	958	937	886	870	866	893	929	965	990
38	978	956	907	896	918	931	940	946	948	924	872	856	851	880	917	954	978
39	966	942	893	882	905	919	928	936	938	911	858	841	837	866	905	943	966
40	953	927	879	868	892	906	917	925	927	898	843	827	823	852	892	932	953
41	939	911	865	854	878	893	905	915	916	884	828	812	808	838	879	920	939
42	925	895	850	840	864	880	893	903	904	869	813	797	793	824	866	907	925
43	909	879	835	825	850	867	880	892	891	854	797	781	777	809	852	894	909
44	894	862	820	810	835	853	866	880	878	837	781	766	762	794	838	881	894
45	877	846	804	795	820	838	853	867	864	821	765	750	746	779	824	867	877
46	860	828	788	780	805	824	840	855	849	804	749	734	730	764	809	851	860
47	842	811	772	764	789	809	826	842	833	786	732	717	714	748	794	836	842
48	823	793	756	748	774	794	812	827	817	769	716	701	697	732	778	819	823
49	805	776	740	732	758	779	798	813	800	750	699	684	680	715	762	802	805
50	786	757	723	715	742	763	783	797	781	732	681	667	663	699	746	785	786
51	766	739	706	698	725	747	767	781	763	714	664	650	646	682	729	766	766
52	747	721	689	682	708	731	751	763	743	695	646	633	629	665	712	747	747
53	727	702	672	665	691	714	735	746	724	676	629	615	611	647	694	728	727
54	707	683	654	647	674	697	719	727	704	657	611	597	593	630	676	708	707
55	687	665	637	630	656	680	701	709	684	637	592	579	576	612	658	688	687
56	666	645	619	613	638	663	685	689	663	618	574	561	557	594	640	667	666
57	646	626	600	595	620	645	666	670	642	598	556	543	539	575	620	646	646
58	625	607	582	577	602	627	648	649	622	579	537	524	521	556	601	625	625
59	604	587	563	559	584	608	629	628	600	559	519	506	502	538	581	604	604
60	583	567	545	540	565	590	610	607	580	539	500	487	483	518	561	582	583
61	561	547	526	522	546	571	591	586	558	519	481	468	465	499	540	560	561

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62	541	527	507	503	528	552	571	564	537	499	462	450	446	480	520	539	541
63	519	507	488	484	509	533	550	542	516	478	442	431	427	460	498	516	519
64	498	486	469	466	489	513	529	520	494	458	423	411	408	440	477	495	498
65	477	466	450	447	470	494	509	499	473	438	404	393	389	420	456	473	477
66	455	445	431	428	451	474	487	477	452	417	385	374	369	400	435	451	455
67	434	425	412	409	431	454	466	455	430	396	365	354	350	380	413	429	434
68	413	405	393	390	412	433	444	433	409	376	346	335	331	360	391	406	413
69	391	384	373	370	392	413	422	411	387	355	327	316	312	340	369	385	391
70	369	364	354	352	373	393	401	388	366	335	308	297	293	320	348	362	369
71	348	344	335	332	353	372	379	367	344	315	289	278	274	300	327	341	348
72	326	324	316	313	334	351	357	345	323	295	270	260	255	280	305	319	326
73	305	303	296	295	314	331	335	323	302	275	251	241	237	260	284	297	305
74	284	283	277	276	295	310	314	302	281	255	233	223	219	240	263	276	284
75	263	263	259	257	275	290	293	280	260	236	214	205	200	221	242	255	263
76	242	244	240	238	256	270	271	259	239	217	196	187	183	201	221	234	242
77	222	224	221	220	237	250	250	238	220	198	178	170	165	182	201	213	222
78	202	205	203	202	218	229	230	218	200	179	160	152	148	164	181	193	202
79	182	186	185	185	200	210	209	198	180	160	143	135	131	145	161	173	182
80	163	167	167	167	182	191	189	178	161	142	126	119	115	127	142	153	163
81	144	148	149	150	164	171	169	158	142	124	109	103	99	110	123	134	144
82	124	130	131	133	146	153	150	139	124	107	93	87	82	92	104	115	124
83	105	112	115	117	129	134	130	119	105	89	77	72	67	76	86	96	105
84	87	94	98	101	112	116	112	101	87	73	62	57	52	59	68	78	87
85	69	77	81	85	95	98	94	83	69	56	47	43	38	44	51	60	69
86	52	60	66	70	79	81	76	65	52	40	32	29	24	28	34	43	52
87	36	44	50	55	64	64	58	47	35	25	19	16	12	14	19	27	36
88	21	29	36	40	48	48	41	31	20	13	8	6	1	2	7	13	21
89	9	16	22	26	34	32	25	16	9	5	2	1	0	0	0	4	9
90	1	6	10	14	19	17	10	4	2	0	0	0	0	0	0	0	1

<b>Test date</b>	2014-11-12	<b>Test Ambient:</b>	25.0 °C
<b>Test Orientation</b>	As Intended	<b>Stabilization Time (min)</b>	90

**Electrical Measurement:**

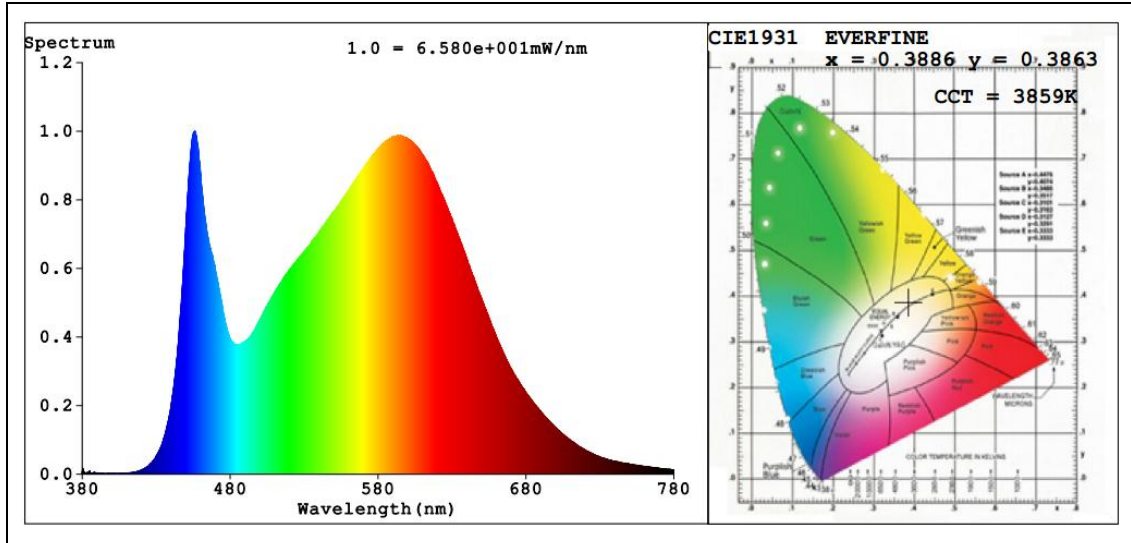
Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
140948-11	120.0	60	0.3661	43.54	0.9908	10.74
	277.0	60	0.1703	43.86	0.9297	16.13

**Sphere-Spectroradiometer Method:**

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	82.7
R9	8
CCT (K)	3859
Chromaticity (x, y)	x=0.3886 y=0.3863
Chromaticity (u', v')	u'=0.2266 v'=0.5069
Duv	0.0021
Total Luminous (lm)	4123
Luminous Efficacy (lm/W)	94.71

Special Color Rendering Indices			
R1	81	R9	8
R2	92	R10	81
R3	95	R11	76
R4	78	R12	61
R5	81	R13	85
R6	89	R14	98
R7	83	R15	75
R8	62	--	--

**Spectral Power Distribution & Chromaticity Diagram**



**Laboratory: Standard-Tech Co. Ltd Testing Center**  
**NVLAP CODE: 201011-0**

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<b>Test date</b>	2014-11-12	<b>Test Ambient:</b>	25.0 °C
<b>Test Orientation</b>	As Intended	<b>Stabilization Time (min)</b>	90

**Electrical Measurement:**

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
140948-12	120.0	60	0.3640	43.29	0.9909	9.37
	277.0	60	0.1694	43.75	0.9324	17.04

**Sphere-Spectroradiometer Method:**

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	83.5
R9	10
CCT (K)	4833
Chromaticity (x, y)	x=0.3509 y=0.3635
Chromaticity (u', v')	u'=0.2108 v'=0.4912
Duv	0.0036
Total Luminous (lm)	4281
Luminous Efficacy (lm/W)	98.90

Special Color Rendering Indices			
R1	82	R9	10
R2	92	R10	80
R3	95	R11	78
R4	79	R12	56
R5	81	R13	85
R6	87	R14	98
R7	85	R15	76
R8	66	--	--

Laboratory: Standard-Tech Co. Ltd Testing Center

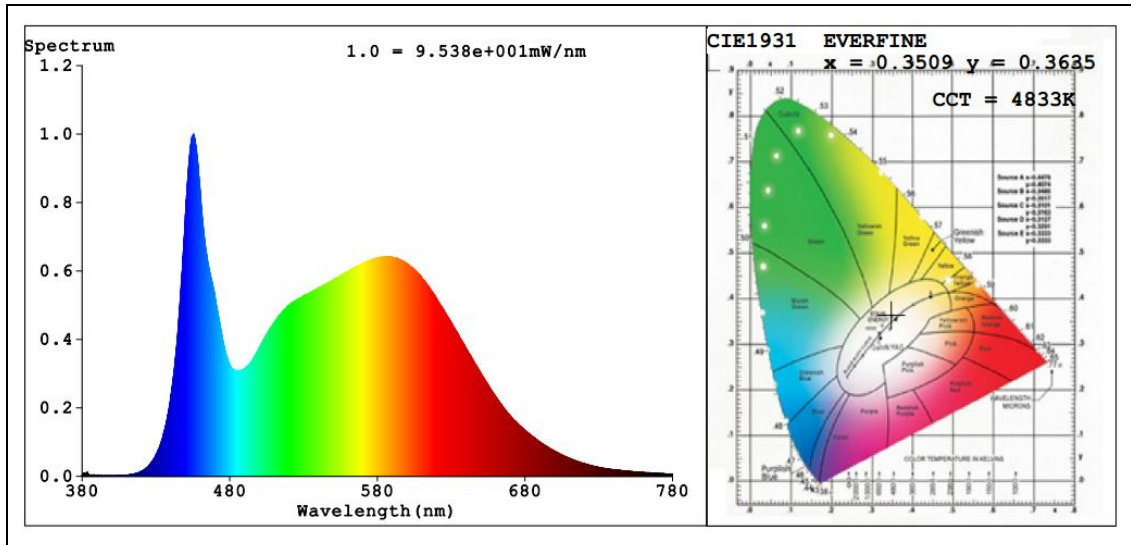
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**Spectral Power Distribution & Chromaticity Diagram**



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**3. Test Equipment**

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-336	2 meter Integrating Sphere	2014-07-01	2015-06-30
ST-R-331	Spectral analysis system HAAS-2000	2014-07-01	2015-06-30
D204	Standard Lamp	2014-07-01	2015-06-30
PF2010	Power Meter for Integrating Sphere	2014-07-01	2015-06-30
EE-09	Goniophotometer system	2014-07-01	2015-06-30
D908S	Standard Lamp	2014-07-01	2015-06-30
PF210	Power Meter for Goniophotometer	2014-07-01	2015-06-30
ST-R-181A	Temperature Tester	2014-07-01	2015-06-30

**\*\*\*\*\* END OF DATASHEET PACKAGE \*\*\*\*\***