

LM-79-08 Test Report

Representative (Tested) Model: LP-2X2-45W-35K-D
LP-2X2-45W-40K-D
LP-2X2-45W-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-B
Laboratory Contact Name	Tommy Liang

Product Information:

Model Number	LP-2X2-45W-D	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	2x2 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	

Electrical Measurements:	Integrating Sphere Output	Goniophotometer Output	
Input Wattage	--	44.79	
Input Current	--	0.3766	A
Input Voltage (ac)	--	120.1	V
Power Factor	--	0.9906	
Off-State Power	--	0	W

Photometric Characteristics

Total Initial Lumen Output	--	3908.9	lm
Initial Lumen Efficacy	--	87.28	lm/w
Correlated color temperature / CCT	2880	--	K
Color rendering index / CRI	81.5	--	
R9 Value	12	--	
Duv	0.0002	--	
Luminous Intensity Distribution			
Center beam candlepower (if applicable)	-----	1369	cd
Beam angle (if applicable)		112.2	°
Zonal lumens in the 0 °-60 °zone		78.4	%
Zonal lumens in the 60 °-90 °zone		21.5	%
Zonal lumens in the 90 °-120 °zone		0	%
Zonal lumens in the 120 °-180 °zone		0	%

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SKU (if available)	N/A	
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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	44.72	--	W
Input Current	0.3758	--	A
Input Voltage (ac)	120.0	--	V
Power Factor	0.9917	--	
Off-State Power	0	--	W
Photometric Characteristics			
Total Initial Lumen Output	4466	--	lm
Initial Lumen Efficacy	99.87	--	lm/w
Correlated color temperature / CCT	4021	--	K
Color rendering index / CRI	82.4	--	
R9 Value	6	--	
Duv	0.0014	--	
Luminous Intensity Distribution			
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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SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	2x2 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	44.23	--	W
Input Current	0.3719	--	
Input Voltage (ac)	120.0	--	V
Power Factor	0.991	--	
Off-State Power	0	--	W
Photometric Characteristics			
Total Initial Lumen Output	4673	--	lm
Initial Lumen Efficacy	105.65	--	lm/w
Correlated color temperature / CCT	4836	--	K
Color rendering index / CRI	83.5	--	
R9 Value	10	--	
Duv	0.0037	--	
Luminous Intensity Distribution			
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, 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 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. 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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. 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 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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1. Product Information:

Model Number	LP-2X2-45W-D
Luminaire Type	2x2 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	140948-4(3000K),-5(4000K),-6(5000K)

Photo



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2.1 Electrical, Photometric and Chromaticity Measurements (Refer to Work Instruction QD25)	IES LM-79 2008
--	-----------------------

Test date	2014-11-12	Test Ambient:	25.0 °C
Test Orientation	horizontal	Stabilization Time (min)	90
Model Number	LP-2X2-45W-D		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
140948-4	120.1	60	0.3766	44.79	0.9906	10.38
	277.0	60	0.1725	44.85	0.9384	15.63

Sphere-Spectroradiometer Method:

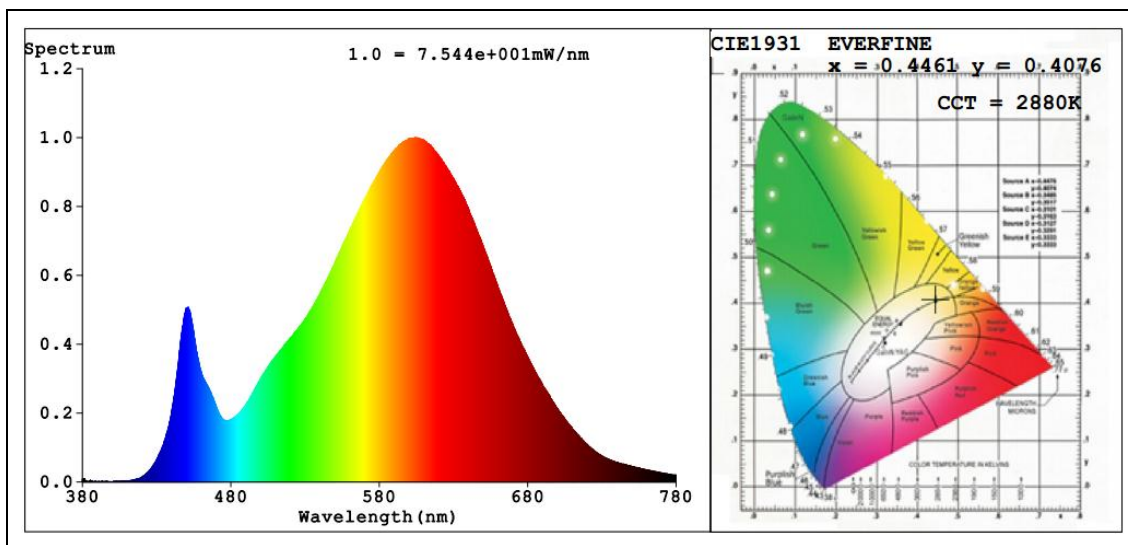
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	81.5
R9	12
CCT (K)	2880
Chromaticity (x, y)	x=0.4461 y=0.4076
Chromaticity (u', v')	u'=0.2549 v'=0.5241
Duv	0.0002

Special Color Rendering Indices			
R1	79	R9	12
R2	90	R10	76
R3	97	R11	75
R4	78	R12	68
R5	79	R13	81
R6	86	R14	99
R7	84	R15	74
R8	60	--	--

Goniophotometer Method:

Parameter	Result
Test Voltage (V)	120.1
Frequency (Hz)	60
Total Luminous (lm)	3908.9
Luminous Efficacy (lm/W)	87.28
Beam Angle °	112.2
Center Beam Candle Power (cd)	1369
S/MH(C0/180)	1.26
S/MH(C90/270)	1.27

Spectral Power Distribution & Chromaticity Diagram



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Zonal Lumen Tabulation

Zonal Lumen Summary			
Zone	Lumens	% Lamp	% Luminaire
0-30	1,060.0	27.1%	27.1%
0-40	1,734.4	44.4%	44.4%
0-60	3,064.5	78.4%	78.4%
60-90	842.1	21.5%	21.5%
70-100	358.0	9.2%	9.2%
90-120	0.3	0%	0%
0-90	3,906.6	99.9%	100%
90-180	1.9	0%	0%
0-180	3,908.5	100%	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	129.4	3.3%	90-100	0.2	0%
10-20	370.3	9.5%	100-110	0.0	0%
20-30	560.3	14.3%	110-120	0.1	0%
30-40	674.4	17.3%	120-130	0.2	0%
40-50	698.7	17.9%	130-140	0.3	0%
50-60	631.4	16.2%	140-150	0.4	0%
60-70	484.3	12.4%	150-160	0.4	0%
70-80	283.0	7.2%	160-170	0.3	0%
80-90	74.9	1.9%	170-180	0.1	0%

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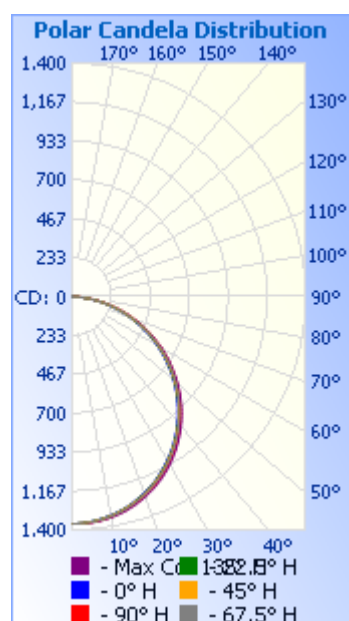
NVLAP CODE: 201011-0

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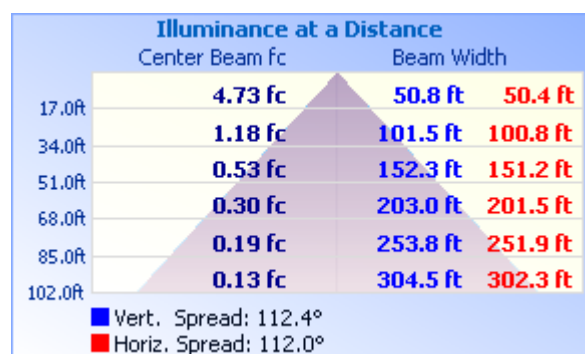
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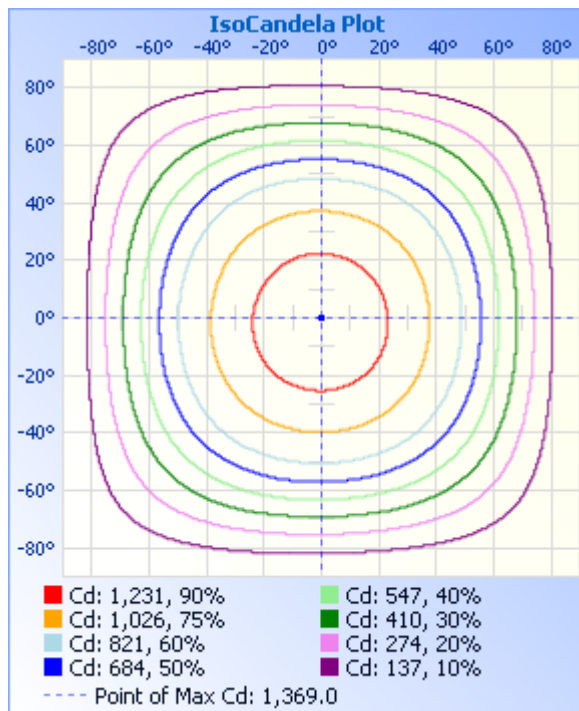
Photometric Data



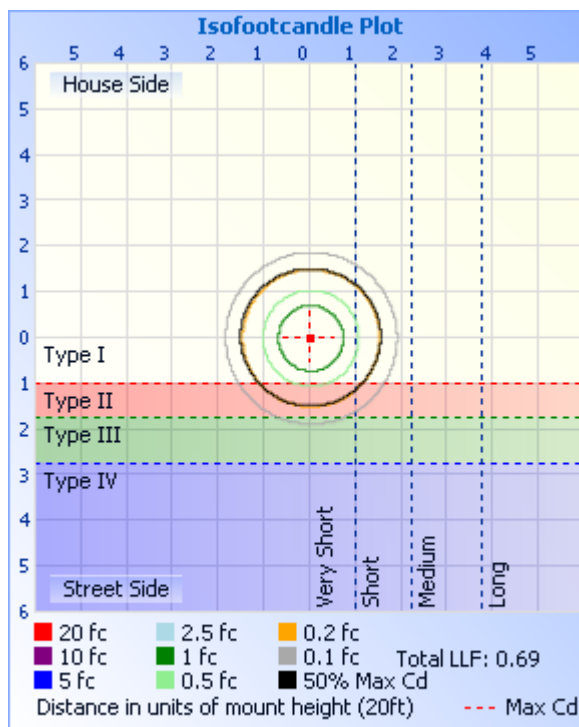
Illuminance Plots



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	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368	1368
1	1367	1367	1368	1368	1369	1369	1369	1368	1368	1368	1368	1368	1368	1367	1367	1367	1367
2	1366	1366	1367	1367	1368	1368	1369	1368	1369	1368	1367	1367	1366	1366	1366	1365	1366
3	1364	1365	1365	1366	1368	1368	1368	1368	1367	1367	1367	1366	1365	1364	1364	1364	1364
4	1361	1362	1363	1364	1366	1367	1367	1367	1366	1366	1365	1364	1362	1362	1361	1361	1361
5	1359	1359	1360	1362	1364	1365	1366	1365	1365	1364	1363	1361	1360	1359	1359	1358	1359
6	1355	1356	1357	1359	1362	1363	1363	1363	1363	1362	1361	1359	1356	1355	1355	1354	1355
7	1351	1352	1354	1356	1359	1360	1361	1361	1360	1359	1357	1356	1353	1351	1351	1351	1351
8	1347	1349	1350	1352	1356	1357	1358	1358	1358	1356	1354	1351	1348	1347	1346	1346	1347
9	1342	1344	1346	1348	1352	1353	1354	1354	1354	1352	1350	1347	1344	1342	1342	1341	1342
10	1337	1339	1341	1343	1348	1349	1350	1350	1350	1348	1345	1343	1339	1337	1336	1336	1337
11	1331	1333	1335	1338	1343	1344	1346	1346	1345	1343	1340	1337	1333	1331	1330	1330	1331
12	1325	1328	1329	1332	1338	1339	1341	1341	1341	1338	1334	1331	1327	1325	1324	1323	1325
13	1319	1321	1323	1326	1332	1334	1335	1335	1335	1332	1328	1325	1320	1318	1317	1317	1319
14	1312	1314	1316	1319	1326	1328	1329	1329	1329	1326	1322	1318	1313	1311	1309	1310	1312
15	1304	1307	1309	1312	1319	1321	1323	1323	1322	1319	1315	1311	1305	1303	1302	1302	1304
16	1296	1299	1301	1304	1312	1314	1316	1316	1315	1312	1308	1303	1297	1294	1294	1294	1296
17	1288	1290	1293	1296	1304	1306	1309	1308	1308	1304	1299	1294	1289	1286	1285	1285	1288
18	1279	1282	1284	1287	1296	1298	1300	1301	1300	1297	1291	1286	1280	1277	1276	1276	1279
19	1269	1272	1275	1279	1287	1290	1292	1292	1292	1288	1282	1276	1270	1268	1266	1267	1269
20	1259	1263	1266	1269	1278	1281	1283	1284	1283	1279	1273	1267	1260	1257	1256	1256	1259
21	1250	1253	1256	1259	1268	1271	1274	1274	1274	1269	1263	1257	1250	1247	1246	1246	1250
22	1239	1243	1245	1248	1259	1261	1264	1265	1264	1259	1253	1246	1239	1236	1235	1235	1239
23	1228	1232	1234	1238	1248	1251	1254	1255	1254	1249	1242	1235	1228	1225	1224	1224	1228
24	1217	1221	1223	1226	1237	1240	1243	1244	1243	1238	1231	1224	1216	1213	1212	1213	1217
25	1205	1209	1211	1215	1226	1229	1232	1233	1231	1227	1219	1212	1204	1201	1200	1201	1205
26	1193	1197	1199	1203	1214	1217	1220	1221	1220	1215	1207	1200	1192	1188	1187	1189	1193
27	1180	1184	1187	1191	1202	1206	1208	1209	1208	1203	1195	1187	1178	1175	1175	1176	1180
28	1167	1171	1174	1178	1190	1193	1196	1196	1196	1190	1182	1174	1165	1162	1161	1163	1167
29	1154	1158	1161	1165	1177	1180	1183	1184	1183	1177	1169	1160	1152	1148	1148	1149	1154

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30	1140	1144	1148	1151	1164	1167	1170	1170	1170	1164	1155	1147	1138	1134	1134	1135	1140
31	1126	1130	1134	1137	1150	1153	1156	1157	1156	1150	1141	1132	1123	1120	1120	1121	1126
32	1112	1116	1119	1123	1136	1139	1142	1143	1142	1136	1127	1118	1109	1105	1105	1107	1112
33	1097	1101	1105	1108	1121	1125	1128	1128	1127	1121	1112	1103	1093	1090	1090	1093	1097
34	1082	1087	1090	1093	1107	1110	1113	1114	1113	1106	1097	1088	1078	1074	1075	1077	1082
35	1066	1071	1075	1078	1091	1095	1098	1098	1097	1091	1081	1072	1062	1059	1059	1061	1066
36	1051	1055	1059	1062	1076	1079	1082	1083	1082	1075	1065	1056	1046	1043	1043	1046	1051
37	1035	1039	1043	1046	1060	1063	1067	1067	1065	1059	1049	1040	1029	1026	1027	1029	1035
38	1018	1023	1027	1030	1044	1047	1050	1050	1049	1042	1032	1023	1012	1009	1010	1013	1018
39	1002	1007	1010	1014	1028	1031	1034	1034	1032	1025	1015	1006	995	992	993	996	1002
40	985	990	993	997	1011	1014	1017	1017	1015	1008	998	989	978	975	976	979	985
41	967	972	976	980	994	996	999	1000	998	990	981	971	960	957	958	962	967
42	950	955	959	962	976	979	982	982	980	973	963	953	941	940	941	944	950
43	932	937	941	944	958	961	964	964	962	954	945	935	924	921	923	926	932
44	914	919	923	926	940	943	946	946	943	936	926	917	905	903	904	907	914
45	895	901	905	908	922	925	927	927	924	917	907	898	886	884	886	889	895
46	876	882	886	889	903	906	909	908	905	898	888	879	867	865	867	870	876
47	857	863	867	871	884	887	889	889	885	879	869	859	848	846	847	851	857
48	838	844	849	852	865	868	870	869	866	859	849	839	828	827	828	832	838
49	819	825	829	832	845	848	850	849	846	839	829	820	808	807	809	813	819
50	799	806	809	813	825	829	830	829	826	819	809	800	788	787	789	793	799
51	779	785	790	793	806	809	811	809	806	798	788	779	768	767	769	773	779
52	759	765	770	774	785	789	790	788	784	778	768	759	747	747	749	753	759
53	739	745	750	753	765	768	769	768	764	756	747	738	727	726	728	732	739
54	718	724	729	733	745	747	749	747	743	735	726	717	706	705	707	712	718
55	697	704	709	713	725	727	728	726	722	714	705	696	685	684	687	691	697
56	676	683	688	692	704	705	706	704	700	692	683	674	663	663	666	670	676
57	655	662	667	671	683	684	685	682	678	671	661	653	642	642	644	649	655
58	634	641	646	649	662	663	663	661	657	648	639	631	621	620	623	628	634
59	613	620	625	628	640	642	641	639	634	626	618	610	599	598	602	606	613
60	592	598	603	607	619	620	619	617	612	604	596	588	578	577	580	585	592
61	571	576	582	585	597	598	597	595	590	582	573	566	556	555	558	564	571

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62	549	555	560	564	576	576	575	573	568	559	551	544	534	533	536	542	549
63	527	533	538	542	554	554	553	550	545	537	528	522	512	511	514	520	527
64	505	511	517	520	532	532	531	527	523	514	506	499	490	489	493	498	505
65	484	489	495	498	510	510	508	505	500	492	484	477	468	467	471	476	484
66	461	467	472	476	488	488	486	482	477	469	461	455	446	445	448	454	461
67	440	446	450	454	466	465	466	460	455	446	439	433	424	423	426	432	440
68	418	424	429	432	444	443	440	437	432	423	416	411	401	401	404	411	418
69	396	402	407	411	423	420	418	414	409	401	394	388	379	379	382	388	396
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71	352	358	363	366	378	376	373	368	363	356	349	343	334	334	338	345	352
72	330	336	341	344	355	353	351	346	341	333	327	320	311	311	316	323	330
73	308	314	319	322	333	331	328	324	318	311	304	298	288	288	295	301	308
74	286	293	298	301	310	309	306	302	295	288	282	275	266	267	273	279	286
75	265	271	276	279	288	286	284	280	273	266	260	253	244	245	251	258	265
76	244	250	255	257	266	264	262	257	251	245	239	231	222	223	229	237	244
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81	140	147	151	151	159	156	155	153	147	141	133	127	119	121	126	134	140
82	121	127	130	131	139	136	135	133	127	121	112	108	100	101	106	114	121
83	102	108	111	111	119	116	115	113	107	101	93	89	81	83	87	95	102
84	83	89	91	92	100	97	95	93	88	81	74	70	63	65	69	76	83
85	64	70	72	74	81	78	76	74	69	62	56	52	46	47	51	57	64
86	47	52	54	56	63	60	58	55	51	44	38	35	29	30	34	40	47
87	30	34	37	39	46	43	40	37	33	27	21	19	14	15	18	23	30
88	15	18	20	22	30	27	23	20	17	11	7	6	2	3	5	9	15
89	2	5	7	8	14	12	9	6	3	1	1	1	0	0	0	1	2
90	0	0	1	1	3	2	1	1	1	1	1	0	0	0	0	0	0

Test date	2014-11-12	Test Ambient:	25.0 °C
Test Orientation	As Intended	Stabilization Time (min)	90
Model Number	LP-2X2-45W-D		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
140948-5	120.0	60	0.3758	44.72	0.9917	10.37
	277.0	60	0.1746	44.91	0.9285	15.98

Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	82.4
R9	6
CCT (K)	4021
Chromaticity (x, y)	x=0.3804 y=0.3797
Chromaticity (u', v')	u'=0.2239 v'=0.5029
Duv	0.0014
Total Luminous (lm)	4466
Luminous Efficacy (lm/W)	99.87

Special Color Rendering Indices			
R1	80	R9	6
R2	90	R10	75
R3	96	R11	78
R4	80	R12	62
R5	80	R13	82
R6	85	R14	98
R7	86	R15	74
R8	63	--	--

Laboratory: Standard-Tech Co. Ltd Testing Center

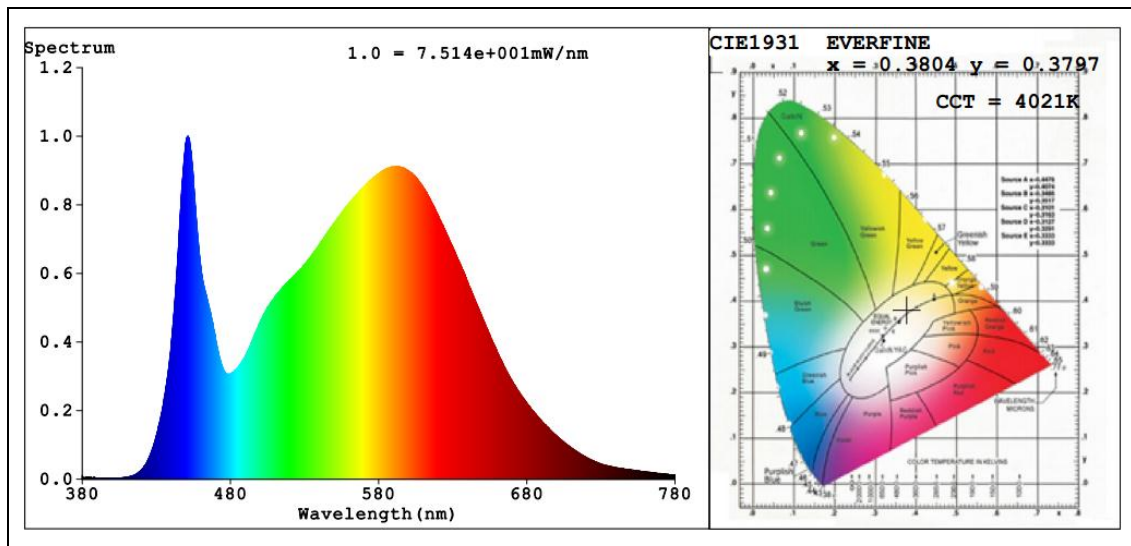
NVLAP CODE: 201011-0

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Spectral Power Distribution & Chromaticity Diagram



Laboratory: Standard-Tech Co. Ltd Testing Center

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Test date	2014-11-12	Test Ambient:	25.0 °C
Test Orientation	As Intended	Stabilization Time (min)	90
Model Number	LP-2X2-45W-D		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
140948-6	120.0	60	0.3719	44.23	0.991	8.98
	277.0	60	0.1752	44.69	0.9211	15.38

Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	83.5
R9	10
CCT (K)	4836
Chromaticity (x, y)	x=0.3509 y=0.3636
Chromaticity (u', v')	u'=0.2107 v'=0.4912
Duv	0.0037
Total Luminous (lm)	4673
Luminous Efficacy (lm/W)	105.65

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

Laboratory: Standard-Tech Co. Ltd Testing Center

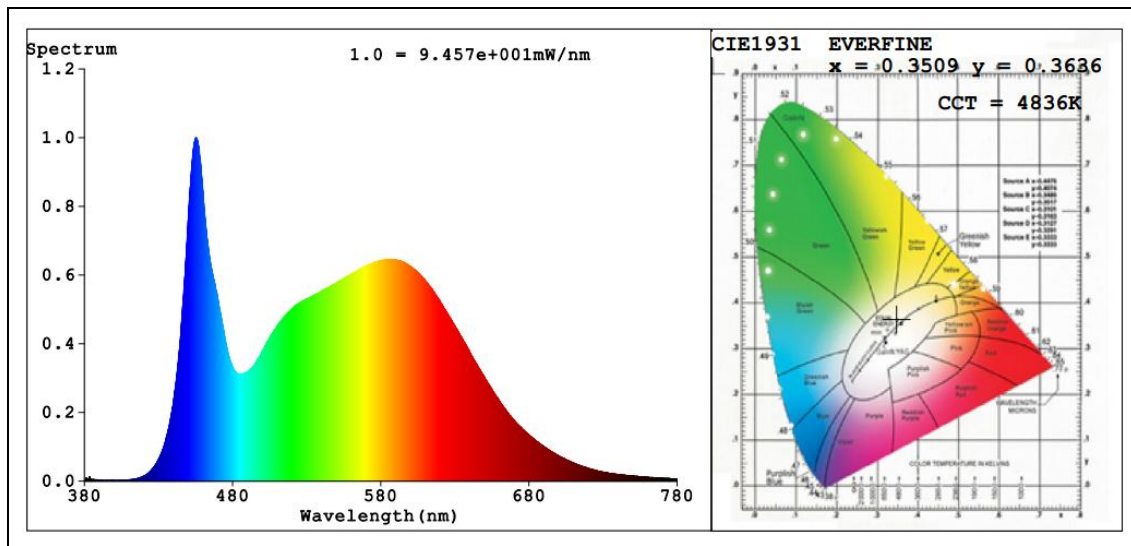
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Spectral Power Distribution & Chromaticity Diagram



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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 *******

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