LM-79-08 Test Report

Representative (Tested) Model: LP-2X4-60W-35K-D
LP-2X4-60W-40K-D
LP-2X4-60W-50K-D

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

Test & Report By:

Sean Zhuo

Engineer: Sean Zhuo

Date: 2014-11-13

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.

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	2014-11-13
Test Report No.	GZN140948-E
Laboratory Contact Name	Tommy Liang

Product Information:

Model Number	LP-2X4-60W-D	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	2x4 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	--	59.14	W
Input Current	--	0.5012	A
Input Voltage (ac)	--	120.0	V
Power Factor	--	0.9886	
Off-State Power	--	0	W
Photometric Characteristics			
Total Initial Lumen Output	--	4968.7	lm
Initial Lumen Efficacy	--	84.02	lm/w
Correlated color temperature / CCT	2898	--	K
Color rendering index / CRI	83.6	--	
R9 Value	19	--	
du'v'	0.0016	--	
Luminous Intensity Distribution			
Center beam candlepower (if applicable)	-----	1621	cd
Beam angle (if applicable)		115.2	°
Zonal lumens in the 0°-60°zone		77.3	%
Zonal lumens in the 60°-90°zone		22.6	%
Zonal lumens in the 90°-120°zone		0.1	%
Zonal lumens in the 120°-180°zone		0	%

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Date of Test Report	2014-11-13
Test Report No.	GZN140948-E
Laboratory Contact Name	Tommy Liang

Product Information:

Model Number	LP-2X4-60W-D	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces	
Luminaire Aperture (for downlights)	--	in.
Luminaire Length	--	mm
Luminaires Width	--	
Number of Units (modular products)	N/A	

Electrical Measurements:	**Integrating Sphere Output**	**Goniophotometer Output**	
Input Wattage	59.20	--	W
Input Current	0.4971	--	A
Input Voltage (ac)	120.0	--	V
Power Factor	0.9924	--	
Off-State Power	0	--	W
Photometric Characteristics			
Total Initial Lumen Output	5336	--	lm
Initial Lumen Efficacy	90.14	--	lm/w
Correlated color temperature / CCT	3858	--	K
Color rendering index / CRI	81.8	--	
R9 Value	4	--	
du'v'	0.028	--	
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		--	%

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	2014-11-13
Test Report No.	GZN140948-E
Laboratory Contact Name	Tommy Liang

Product Information:

Model Number	LP-2X4-60W--D	
SKU (if available)	N/A	
Type of Luminaire (for integral lamps, list base type and lamp type)	2x4 Luminaires for Ambient Lighting of Interi... 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	61.05	--	W
Input Current	0.5211	--	A
Input Voltage (ac)	120.0	--	V
Power Factor	0.9924	--	
Off-State Power	0	--	W
Photometric Characteristics			
Total Initial Lumen Output	5568	--	lm
Initial Lumen Efficacy	92.72	--	lm/w
Correlated color temperature / CCT	4823	--	K
Color rendering index / CRI	82.8	--	
R9 Value	6	--	
du'v'	0.0043	--	
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		--	%

Test Specifications:	
Date of Receipt	: Oct.29,2014
Date of Test	: Oct.30,2014
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 °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 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:

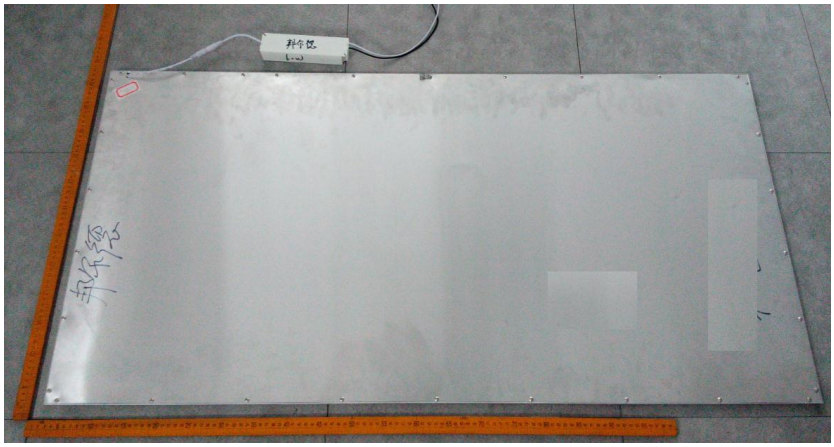
Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 ºC ±1 ºC. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the 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.

1. Product Information:

Model Number	LP-2X4-60W-D
Luminaire Type	2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces
Rated Voltage / Frequency	100 ~ 277 Vac, 50/60 Hz
Nominal Power	60W
Rated Initial Lamp Lumen	--
Declared CCT	3000K,4000K,5000K

LED Model	4014
Sample Receipt Date	Oct.29,2014
Sample Number	141031-13(3000K), 14(4000K),-15(5000K)

Photo



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

Test date	2014-11-13	**Test Ambient:**	25.0 ºC
Test Orientation	As Intended	**Stabilization Time (min)**	90
Model Number	LP-2X4-60W-D		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
141031-13	120.0	60	0.5012	59.14	0.9886	10.2
	277.0	60	0.2339	59.84	0.9236	11.9

Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	83.6
R9	19
CCT (K)	2898
Chromaticity (x, y)	x=0.4470 y=0.4115
Chromaticity (u', v')	u'=0.2538 v'=0.5258
du'v'	0.0016

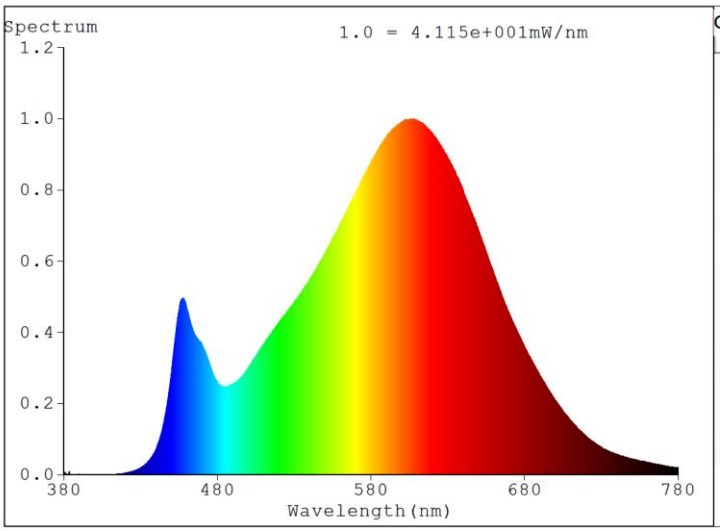
Special Color Rendering Indices			
R1	82	R9	19
R2	93	R10	83
R3	96	R11	77
R4	79	R12	69
R5	82	R13	85
R6	91	R14	98
R7	83	R15	76
R8	63	--	--

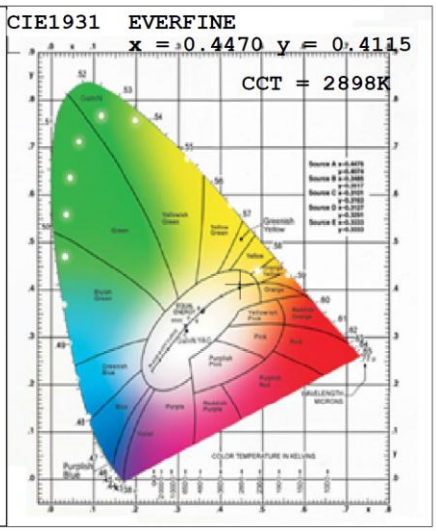
Goniophotometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Total Luminous (lm)	4968.7
Luminous Efficacy (lm/W)	84.02
Beam Angle °	115.2
Center Beam Candle Power (cd)	1621
S/MH(C0/180)	1.30
S/MH(C90/270)	1.32

Spectral Power Distribution

Spectral Power Distribution and Chromaticity Diagram:



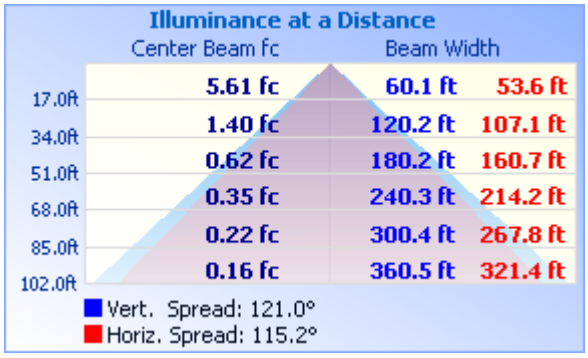


Zonal Lumen Tabulation

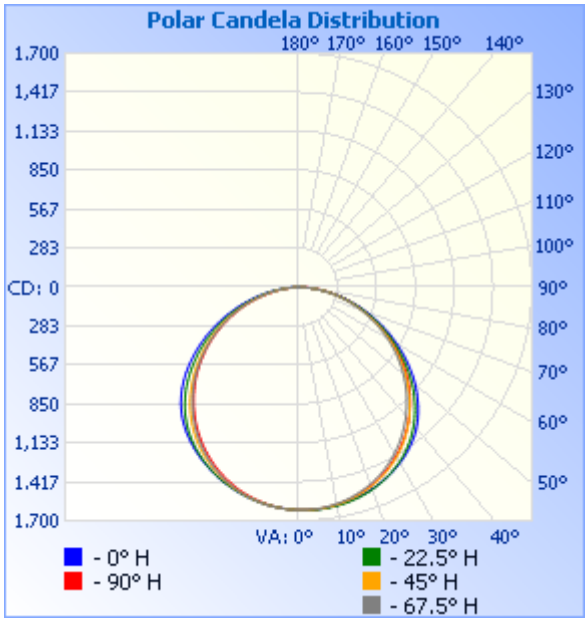
Zonal Lumen Summary			
Zone	Lumens	% Lamp	% Luminaire
0-30	1,280.5	25.8%	25.8%
0-40	2,123.1	42.7%	42.7%
0-60	3,841.9	77.3%	77.3%
60-90	1,124.2	22.6%	22.6%
70-100	486.6	9.8%	9.8%
90-120	0.6	0%	0%
0-90	4,966.1	99.9%	100%
90-180	2.1	0%	0%
0-180	4,968.2	100%	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	153.6	3.1%	90-100	0.4	0%
10-20	443.6	8.9%	100-110	0.1	0%
20-30	683.2	13.8%	110-120	0.1	0%
30-40	842.6	17.0%	120-130	0.1	0%
40-50	895.2	18.0%	130-140	0.2	0%
50-60	823.6	16.6%	140-150	0.3	0%
60-70	638.0	12.8%	150-160	0.4	0%
70-80	378.1	7.6%	160-170	0.3	0%
80-90	108.1	2.2%	170-180	0.1	0%

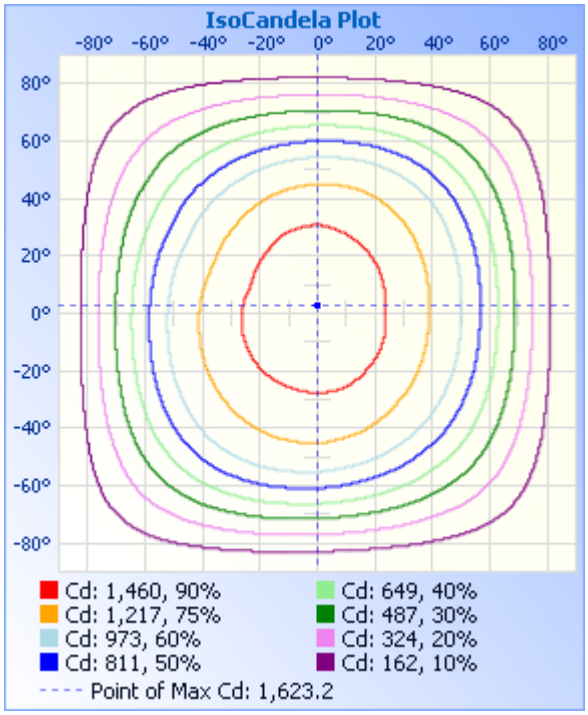
Photometric Data



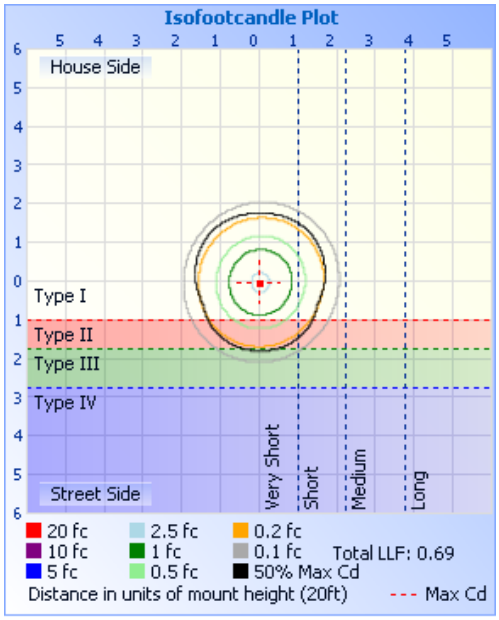
Illuminance Plots



ISOCANDELA DIAGRAM



ISOLUX DIAGRAM



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	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621	1621
1	1621	1622	1621	1621	1622	1621	1620	1619	1619	1620	1620	1620	1620	1620	1621	1621	1621
2	1622	1623	1622	1621	1622	1621	1620	1619	1618	1618	1619	1619	1618	1619	1620	1621	1622
3	1622	1623	1622	1620	1621	1621	1619	1617	1616	1616	1616	1617	1615	1617	1619	1621	1622
4	1622	1623	1621	1618	1621	1619	1617	1614	1613	1613	1614	1615	1613	1615	1617	1619	1622
5	1621	1623	1619	1617	1620	1618	1615	1613	1611	1611	1611	1612	1609	1611	1615	1618	1621
6	1620	1622	1618	1614	1618	1616	1612	1609	1607	1607	1608	1609	1605	1608	1613	1617	1620
7	1618	1620	1616	1611	1616	1614	1610	1606	1604	1603	1604	1605	1601	1605	1610	1614	1618
8	1616	1619	1613	1608	1613	1611	1606	1602	1600	1600	1600	1601	1596	1601	1607	1612	1616
9	1614	1616	1610	1604	1609	1607	1603	1598	1596	1595	1595	1596	1591	1596	1603	1609	1614
10	1611	1614	1606	1599	1605	1603	1599	1594	1592	1591	1590	1591	1585	1591	1599	1606	1611
11	1608	1611	1602	1595	1601	1599	1593	1589	1587	1585	1585	1585	1579	1585	1594	1602	1608
12	1604	1608	1598	1589	1596	1594	1589	1584	1581	1580	1579	1578	1572	1579	1589	1598	1604
13	1601	1605	1593	1583	1590	1589	1584	1578	1576	1575	1573	1571	1564	1573	1583	1593	1601
14	1596	1600	1587	1576	1584	1583	1577	1572	1569	1569	1566	1564	1556	1565	1577	1588	1596
15	1591	1596	1581	1569	1578	1577	1571	1566	1563	1563	1558	1557	1548	1558	1571	1583	1591
16	1587	1591	1574	1562	1571	1570	1565	1559	1557	1556	1551	1549	1539	1550	1564	1577	1587
17	1581	1585	1567	1553	1564	1562	1557	1552	1550	1549	1542	1540	1530	1541	1556	1570	1581
18	1575	1579	1560	1544	1555	1556	1550	1545	1542	1541	1534	1530	1520	1532	1549	1564	1575
19	1569	1573	1552	1535	1547	1547	1542	1536	1535	1534	1525	1520	1509	1523	1541	1557	1569
20	1562	1566	1543	1525	1538	1538	1534	1529	1527	1526	1516	1510	1498	1513	1532	1549	1562
21	1555	1559	1534	1515	1528	1530	1525	1520	1519	1518	1506	1500	1487	1503	1523	1541	1555
22	1548	1551	1524	1504	1517	1519	1515	1511	1510	1508	1495	1488	1475	1492	1513	1533	1548
23	1540	1543	1514	1492	1507	1509	1506	1502	1502	1499	1484	1476	1463	1480	1504	1524	1540
24	1532	1534	1503	1480	1496	1499	1496	1493	1492	1490	1473	1463	1450	1469	1493	1515	1532
25	1524	1524	1492	1467	1484	1488	1485	1483	1483	1480	1461	1451	1437	1457	1482	1506	1524
26	1515	1515	1480	1454	1472	1476	1474	1472	1473	1470	1449	1437	1423	1444	1471	1496	1515
27	1506	1504	1467	1441	1459	1464	1463	1462	1463	1459	1436	1423	1408	1431	1460	1486	1506
28	1496	1492	1454	1426	1446	1452	1452	1451	1453	1448	1423	1409	1394	1417	1447	1474	1496

29	1486	1480	1441	1411	1432	1439	1440	1440	1442	1437	1409	1393	1379	1404	1435	1464	1486
30	1476	1468	1427	1396	1418	1426	1427	1428	1431	1424	1395	1378	1363	1389	1422	1452	1476
31	1465	1455	1412	1381	1403	1412	1414	1416	1420	1412	1380	1362	1347	1374	1409	1441	1465
32	1453	1441	1397	1364	1388	1398	1401	1404	1408	1399	1365	1345	1331	1359	1395	1428	1453
33	1441	1426	1381	1347	1373	1383	1388	1392	1397	1386	1349	1329	1313	1343	1380	1415	1441
34	1428	1411	1364	1330	1356	1368	1374	1378	1385	1372	1332	1311	1296	1326	1366	1403	1428
35	1414	1395	1347	1312	1340	1352	1358	1365	1372	1357	1316	1293	1279	1310	1351	1389	1414
36	1400	1379	1329	1294	1323	1336	1344	1352	1359	1341	1298	1275	1260	1293	1335	1376	1400
37	1385	1361	1311	1275	1305	1319	1329	1338	1346	1326	1280	1256	1242	1275	1319	1361	1385
38	1369	1343	1292	1256	1287	1302	1313	1324	1331	1309	1261	1237	1222	1257	1303	1346	1369
39	1353	1324	1272	1237	1268	1285	1296	1308	1316	1291	1242	1217	1203	1239	1285	1331	1353
40	1335	1305	1252	1217	1250	1266	1280	1294	1301	1274	1222	1197	1183	1220	1268	1314	1335
41	1316	1285	1230	1197	1230	1248	1263	1278	1285	1254	1202	1176	1163	1201	1250	1297	1316
42	1296	1264	1209	1176	1210	1229	1246	1262	1268	1235	1181	1155	1142	1181	1232	1280	1296
43	1276	1242	1187	1155	1190	1210	1228	1246	1251	1215	1160	1134	1121	1161	1213	1261	1276
44	1254	1219	1165	1134	1169	1190	1210	1229	1232	1194	1138	1112	1100	1140	1194	1242	1254
45	1232	1197	1143	1112	1148	1170	1191	1212	1213	1172	1115	1090	1078	1119	1174	1222	1232
46	1208	1173	1120	1090	1126	1150	1172	1194	1193	1149	1092	1067	1056	1098	1154	1200	1208
47	1185	1149	1096	1067	1104	1128	1152	1175	1171	1126	1069	1044	1033	1076	1133	1179	1185
48	1161	1124	1072	1045	1082	1107	1132	1154	1149	1102	1045	1021	1011	1054	1112	1155	1161
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54	1002	967	923	901	939	969	1000	1014	996	947	895	875	866	911	968	1002	1002
55	974	940	898	876	915	945	975	988	969	920	868	849	842	887	943	974	974
56	945	912	872	851	889	920	950	960	940	892	842	824	816	861	916	946	945
57	916	885	845	825	864	894	924	933	912	864	816	798	790	835	889	918	916
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60	827	800	765	748	786	816	843	847	824	779	735	719	712	756	804	830	827

61	798	771	738	721	759	789	815	818	795	750	708	693	685	728	776	800	798
62	767	742	710	695	733	763	786	788	765	722	681	666	659	701	746	770	767
63	737	713	683	668	705	735	757	758	735	693	653	639	632	673	716	740	737
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66	645	626	600	587	623	651	668	667	644	606	570	558	551	589	626	648	645
67	615	597	572	561	596	622	638	636	613	577	543	531	524	560	596	617	615
68	584	568	544	533	568	593	608	606	582	548	515	504	496	532	566	587	584
69	554	539	517	507	540	564	577	574	552	519	487	477	469	503	535	555	554
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78	288	284	273	269	292	304	307	302	286	265	246	240	231	250	270	285	288
79	260	257	247	243	265	276	279	273	258	239	221	215	206	223	241	256	260
80	232	230	222	219	239	249	251	245	230	212	196	190	181	197	214	227	232
81	205	204	198	194	214	221	223	217	204	186	172	166	157	171	187	200	205
82	178	178	173	170	189	195	196	189	177	161	148	143	133	146	160	172	178
83	152	152	149	147	164	169	168	162	150	136	124	119	110	121	134	146	152
84	126	127	125	124	140	143	143	136	125	112	101	97	87	97	108	119	126
85	100	102	102	101	116	118	116	109	99	88	78	74	65	73	83	93	100
86	75	78	79	79	92	93	91	84	75	64	56	53	45	50	59	68	75
87	52	55	57	58	70	70	66	59	51	41	35	33	25	29	36	44	52
88	29	34	36	37	48	47	42	36	29	22	17	14	7	9	15	22	29
89	11	15	17	18	28	25	21	16	11	6	4	3	1	1	1	5	11
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2.2 Electrical, Photometric and Chromaticity Measurements *(Refer to Work Instruction QD25)*	**IES LM-79 2008**

Test date	2014-11-13	**Test Ambient:**	25.0 ºC
Test Orientation	As Intended	**Stabilization Time (min)**	90
Model Number	LP-2X4-60W-D		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
141031-14	120.0	60	0.4971	59.20	0.9924	12.1
	277.0	60	0.2319	59.87	0.9321	13.0

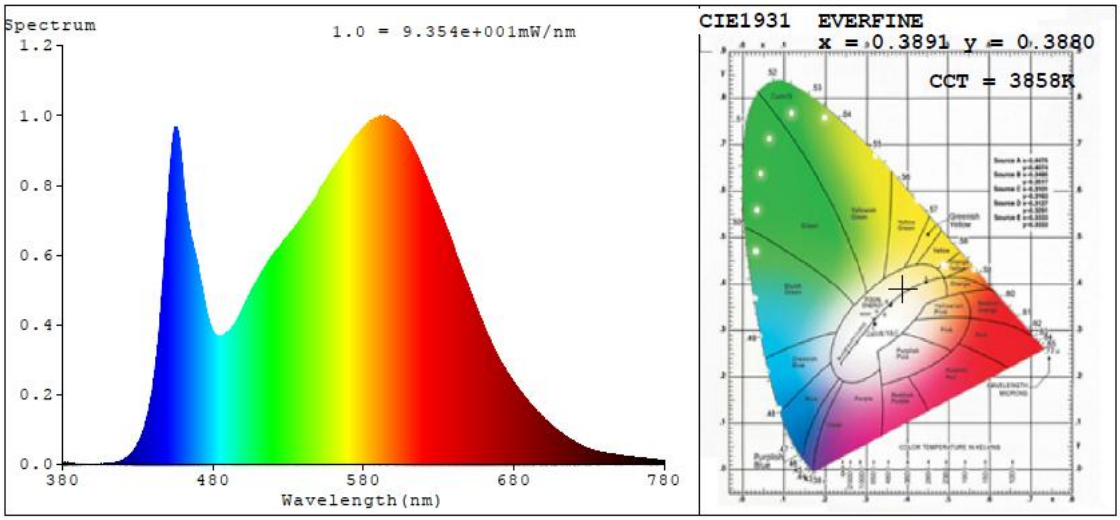
Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	81.8
R9	4
CCT (K)	3858
Chromaticity (x, y)	x=0.3891 y=0.3880
Chromaticity (u', v')	u'=0.2263 v'=0.5077
du'v'	0.0028
Total Luminous (lm)	5336
Luminous Efficacy (lm/W)	90.14

Special Color Rendering Indices			
R1	80	R9	4
R2	91	R10	79
R3	96	R11	75
R4	77	R12	60
R5	79	R13	83
R6	87	R14	98
R7	84	R15	73
R8	61	--	--

Spectral Power Distribution

Spectral Power Distribution and Chromaticity Diagram:



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

Test date	2014-11-13	**Test Ambient:**	25.0 ºC
Test Orientation	As Intended	**Stabilization Time (min)**	90
Model Number	LP-2X4-60W-D		

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
141031-15	120.0	60	0.5211	61.05	0.9924	10.9
	277.0	60	0.2384	61.66	0.9339	12.3

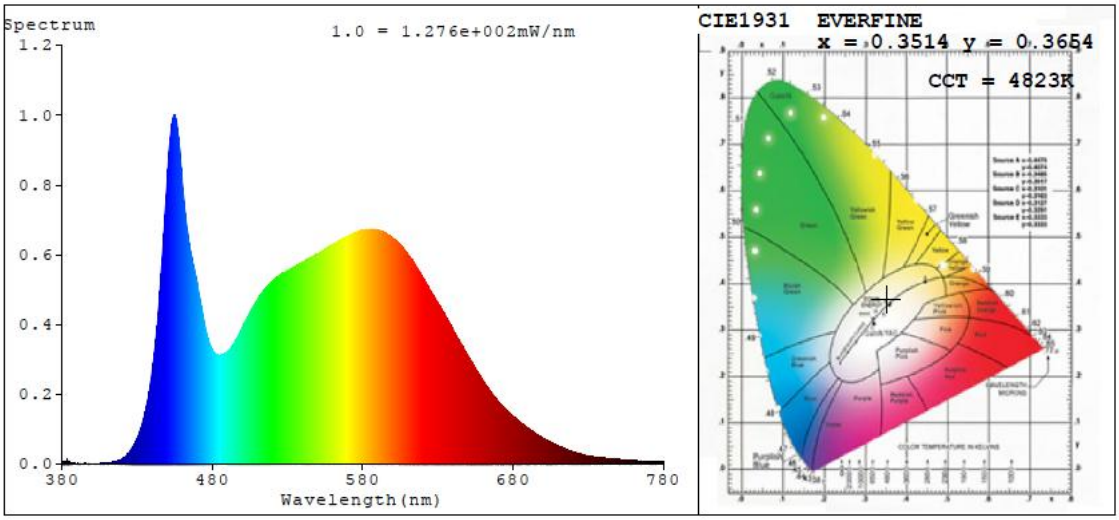
Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Color Rendering Index (CRI)	82.8
R9	6
CCT (K)	4823
Chromaticity (x, y)	x=0.3514 y=0.3654
Chromaticity (u’, v’)	u'=0.2104 v'=0.4921
du’v’	0.0043
Total Luminous (lm)	5568
Luminous Efficacy (lm/W)	92.72

Special Color Rendering Indices			
R1	81	R9	6
R2	91	R10	78
R3	95	R11	77
R4	78	R12	56
R5	80	R13	84
R6	86	R14	98
R7	86	R15	74
R8	65	--	--

Spectral Power Distribution

Spectral Power Distribution and Chromaticity Diagram:



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

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