



Report No.: GZE160819-B

NVLAP LAB CODE 201011-0

## LM-79-08 Test Report

For

### LED Waves, Inc.

4100 1st. Ave. Brooklyn, NY 11232,  
USA

### Linear Retrofit Kits for 2x2 Luminaires

Model name(s): LWQR-2x2-30W

Representative (Tested) Model: LWQR-2x2-30W-3000K  
LWQR-2x2-40W-4000K

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

Test & Report By:

**Jack Luo**

Engineer: Jack Luo

Date: Sept 20,2016

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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## 1.2 Test Specifications:

Date of Receipt	Aug.18,2016
Date of Test	Aug.24,2016
Test item	<ol style="list-style-type: none"> <li>1. Total Luminous Flux</li> <li>2. Luminous Distribution Intensity</li> <li>3. Luminous Efficacy</li> <li>4. Correlated Color Temperature</li> <li>5. Color Rendering Index</li> <li>6. Chromaticity Coordinate</li> <li>7. Electrical Parameters</li> </ol>
Reference Standard	<ol style="list-style-type: none"> <li>1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products</li> <li>2. ANSI C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products</li> <li>3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources</li> <li>4. CIE 15-2004 Technical Report Colorimetry</li> <li>5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source</li> <li>6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems</li> </ol>
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  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ , 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  $1^{\circ}$  vertical intervals and  $22.5^{\circ}$  horizontal intervals.

### 2) Chromaticity Measurement – Sphere-Spectroradiometer Method:

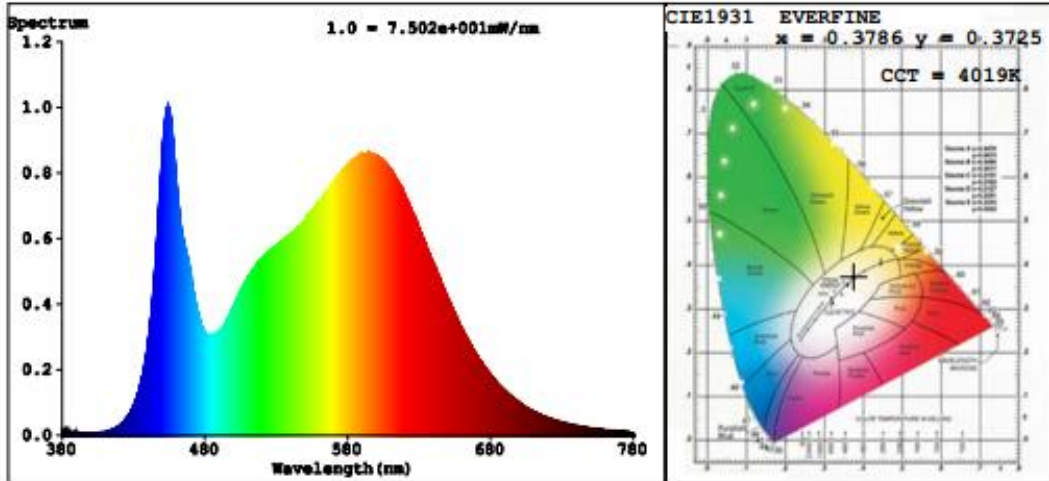
Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . The sample measurements were made using a spectroradiometer connected by a fiber optic 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.



**Spectral Power Distribution & Chromaticity Diagram**

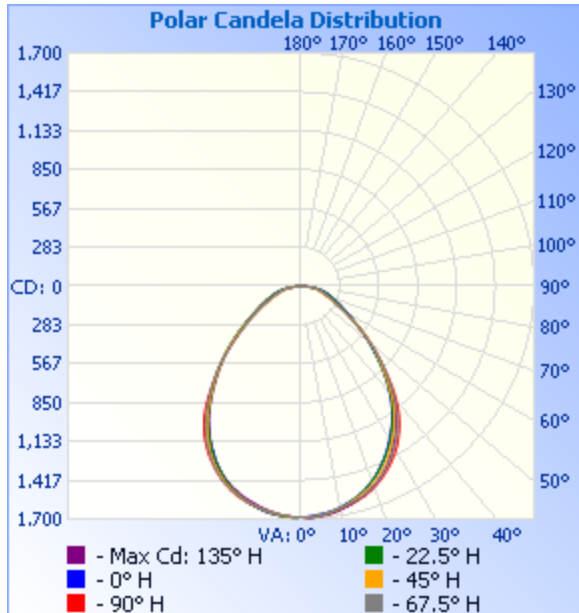


**Zonal Lumen Tabulation**

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1,277.6	34.8%
0-40	2,022.5	55.1%
0-60	3,133.2	85.4%
60-90	530.5	14.5%
70-100	241.7	6.6%
90-120	1.5	0%
0-90	3,663.6	99.8%
90-180	6.4	0.2%
0-180	3,670.0	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	159.2	4.3%	90-100	0.1	0%
10-20	452.2	12.3%	100-110	0.5	0%
20-30	666.3	18.2%	110-120	1.0	0%
30-40	744.8	20.3%	120-130	1.3	0%
40-50	654.2	17.8%	130-140	1.2	0%
50-60	456.5	12.4%	140-150	1.0	0%
60-70	288.9	7.9%	150-160	0.7	0%
70-80	181.0	4.9%	160-170	0.4	0%
80-90	60.5	1.6%	170-180	0.2	0%

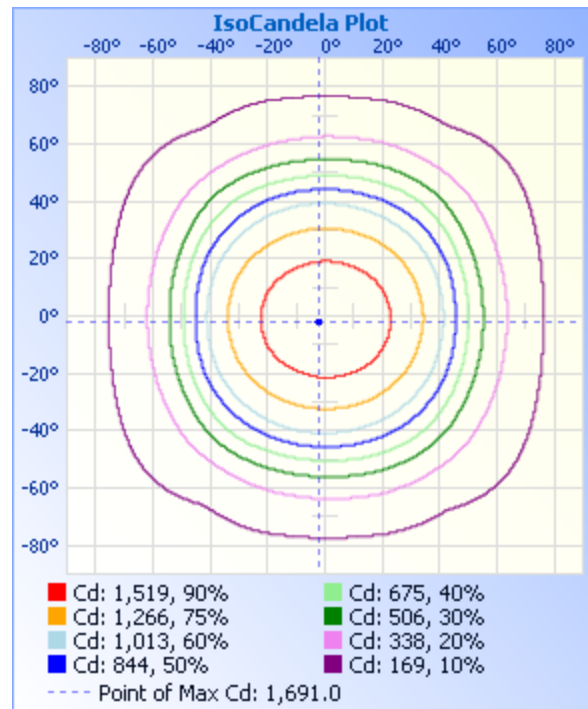
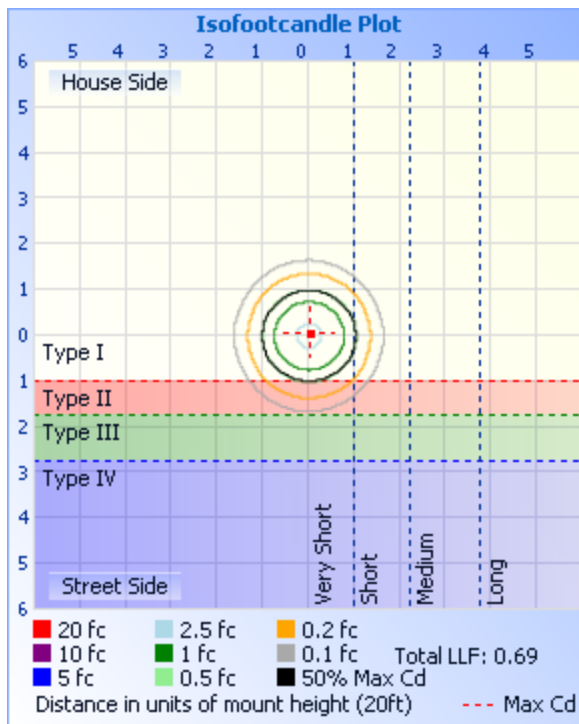
**Photometric Data**



**Illuminance at a Distance**

	Center Beam fc	Beam Width	
17.0ft	5.83 fc	33.8 ft	34.5 ft
34.0ft	1.46 fc	67.7 ft	68.9 ft
51.0ft	0.65 fc	101.5 ft	103.4 ft
68.0ft	0.36 fc	135.3 ft	137.9 ft
85.0ft	0.23 fc	169.2 ft	172.4 ft
102.0ft	0.16 fc	203.0 ft	206.8 ft

■ Vert. Spread: 89.7°  
■ Horiz. Spread: 90.8°



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Table--1

UNIT: cd

C (DEG) \ y (DEG)	0	23	45	68	90	113	135	158	180	203	225	248	270	293	315	338
0	1684	1684	1684	1684	1684	1684	1684	1684	1684	1684	1684	1684	1684	1684	1684	1684
5	1674	1671	1675	1674	1669	1676	1677	1679	1679	1682	1684	1684	1681	1683	1678	1674
10	1651	1645	1640	1636	1638	1642	1644	1645	1652	1652	1657	1658	1657	1652	1651	1649
15	1617	1607	1594	1583	1586	1588	1592	1608	1616	1614	1610	1611	1609	1609	1613	1615
20	1560	1547	1532	1512	1510	1511	1528	1550	1563	1559	1546	1538	1537	1540	1551	1558
25	1477	1461	1443	1412	1410	1413	1440	1468	1482	1478	1460	1440	1439	1441	1463	1473
30	1372	1347	1321	1294	1289	1298	1322	1358	1381	1369	1342	1322	1319	1323	1341	1358
35	1239	1205	1174	1155	1156	1165	1185	1227	1251	1234	1204	1190	1182	1182	1193	1216
40	1053	1033	1003	990	1001	1010	1021	1059	1080	1066	1039	1032	1026	1015	1018	1039
45	854	853	837	824	828	832	841	870	869	872	852	849	854	847	851	860
50	662	661	674	667	656	659	674	673	668	674	684	672	680	687	684	668
55	502	486	506	513	509	504	505	488	494	488	510	514	527	530	515	494
60	396	367	371	389	393	378	359	356	380	356	360	384	402	400	380	372
65	312	282	272	303	307	293	259	270	301	270	258	295	311	310	278	285
70	241	219	200	241	244	235	191	211	235	210	190	236	244	246	204	221
75	179	165	151	185	194	184	149	163	178	162	147	182	192	187	154	168
80	123	112	111	128	136	130	112	114	124	111	110	127	134	127	112	112
85	47.1	47.6	50.7	66.4	66.1	68.4	55.5	53.6	53.2	50.4	52.1	65.5	63.7	63.9	50.1	46.0
90	0.06	0.12	0.25	0.35	0.37	0.41	0.29	0.34	0.00	0.00	0.00	0.10	0.26	0.00	0.00	0.10
95	0.00	0.10	0.00	0.05	0.11	0.05	0.11	0.05	0.00	0.00	0.00	0.21	0.26	0.11	0.00	0.05
100	0.00	0.00	0.00	0.05	0.11	0.05	0.21	0.05	0.26	0.32	0.42	0.21	0.26	0.16	0.27	0.27
105	0.37	0.26	0.37	0.32	0.42	0.42	0.42	0.47	0.53	0.58	0.74	0.58	0.37	0.11	0.64	0.69
110	0.74	0.74	0.58	0.48	0.42	0.53	0.74	0.80	1.01	1.01	0.90	0.69	0.69	0.48	0.90	1.22
115	1.16	1.21	0.95	0.58	0.63	0.53	1.11	1.17	1.32	1.27	1.22	0.69	0.74	0.48	1.22	1.43
120	1.32	1.37	1.27	0.74	0.63	0.69	1.33	1.27	1.48	1.43	1.38	1.28	0.90	0.90	1.27	1.54
125	1.59	1.64	1.27	1.27	1.32	1.38	1.33	1.64	1.69	1.48	1.33	1.80	1.27	1.54	1.27	1.59
130	1.80	1.69	1.33	1.48	1.53	1.43	1.33	1.59	1.80	1.54	1.22	2.07	1.48	1.65	1.27	1.64
135	1.91	1.69	1.38	1.54	1.84	1.54	1.33	1.59	1.96	1.69	1.17	2.12	1.43	1.65	1.06	1.64
140	2.07	1.75	1.17	1.59	1.85	1.54	1.27	1.59	2.17	1.69	0.95	1.96	1.43	1.59	1.06	1.64
145	2.12	1.90	1.11	1.59	1.85	1.54	1.17	1.54	2.12	1.80	1.01	1.75	1.64	1.59	1.27	1.64
150	2.17	1.75	1.06	1.59	1.90	1.54	1.01	1.54	2.17	1.85	1.27	1.75	1.64	1.59	1.33	1.59
155	2.12	1.75	1.06	1.59	2.06	1.54	1.27	1.54	1.96	2.06	1.38	1.54	1.64	1.59	1.38	1.54
160	1.91	1.48	1.01	1.59	2.06	1.54	1.06	1.70	2.01	2.01	1.38	1.22	1.64	1.59	1.38	1.27
165	1.96	1.32	1.01	1.49	1.85	1.38	1.17	1.43	1.91	1.85	1.59	1.38	1.48	1.59	1.38	1.38
170	1.85	1.38	1.11	1.69	1.69	1.48	1.27	1.48	1.80	1.69	1.70	1.43	2.17	2.23	2.02	1.38
175	1.91	1.43	1.32	2.12	2.22	1.75	1.27	1.54	1.70	1.69	1.43	1.54	2.17	2.33	2.02	1.33
180	1.75	1.43	1.64	2.17	2.22	2.07	1.27	1.38	1.70	1.69	1.43	1.59	2.17	2.23	1.91	1.33

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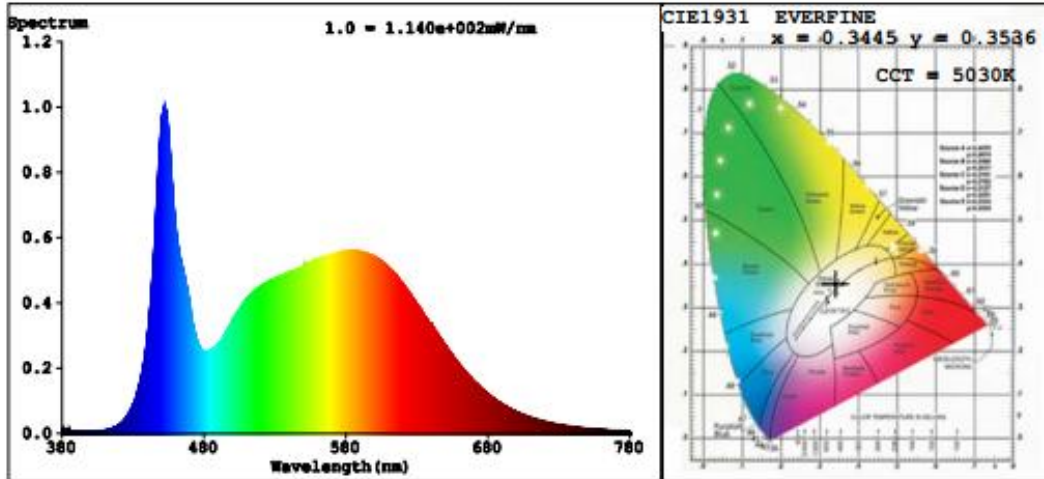
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**Spectral Power Distribution & Chromaticity Diagram**



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### 3. Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-336	2 meter Integrating Sphere	2016-07-01	2017-06-30
ST-R-331	Spectral analysis system HAAS-2000	2016-07-01	2017-06-30
D204	Standard Lamp	2016-07-01	2017-06-30
PF2010	Power Meter for Integrating Sphere	2016-07-01	2017-06-30
EE-09	Goniophotometer system	2016-07-01	2017-06-30
D908S	Standard Lamp	2016-07-01	2017-06-30
PF210	Power Meter for Goniophotometer	2016-07-01	2017-06-30
ST-R-181A	Temperature Tester	2016-07-01	2017-06-30
Uncertainty: Photometric Measurement (Sphere):1.74% Chromaticity Measurement(Sphere):14.3K Photometric Measurement(Goniophotometer):1.62%			

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