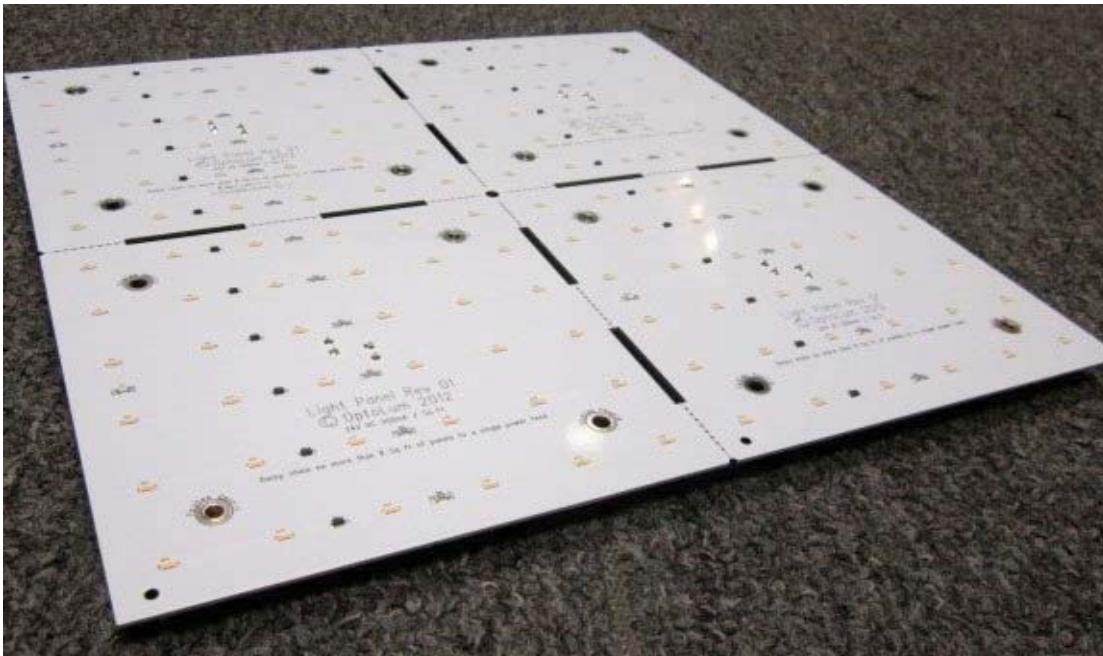


Report of Test LLI-15225-1

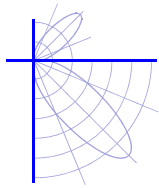
OptoLum, Inc. - Panel back lighting fixture. Product ID: LightLam 3000 LL-----308U-----12x12
One foot square white PCB with 1/2" mounting standoffs. Fixture extends ~ 12" x 12".
144 LEDs mounted to PCB in 12 x 12 array. PCB marked in part "Light Panel Rev D1"
One Mean Well power supply. Model: HLG-60H-24A.
Operating at 120 Vac and 60 Hz.



Performance Summary

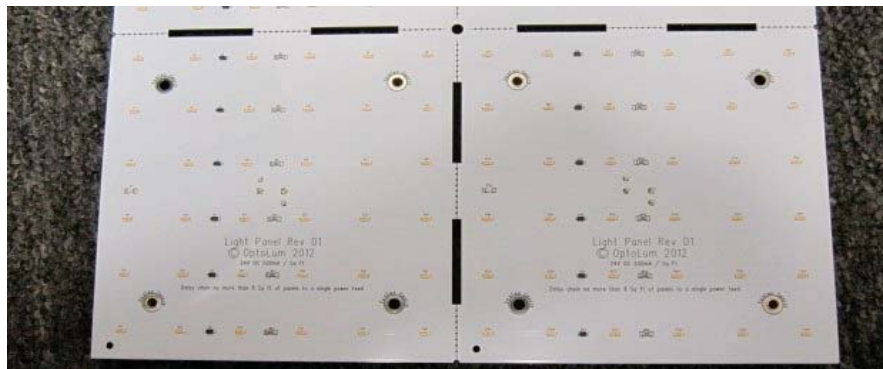
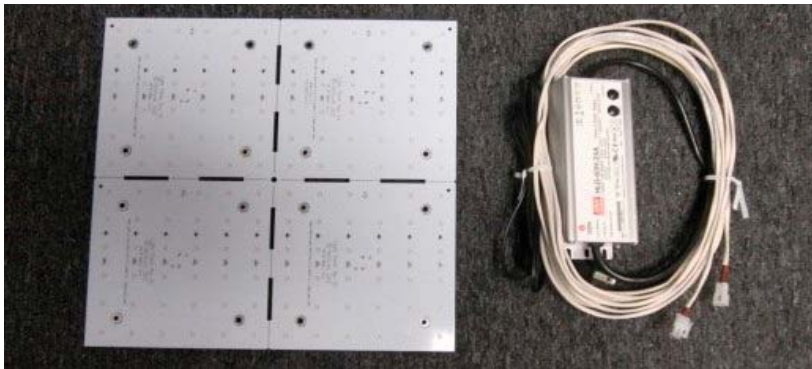
Total Light Output	960 lm	Min Power Factor	0.36 @ 277 V
Luminaire Power	12.2 W	Max THD(i)*	93.4 % @ 120 V
Luminous Efficacy	78.7 lm/W	SC along*, across*	1.28 , 1.30
CCT	3010 K	SC Diagonal*	1.40
CIE(x,y) 1931	(0.436, 0.403)		
CRI	83		

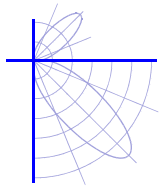
PREPARED FOR : OptoLum, Inc., Tempe, AZ 85281



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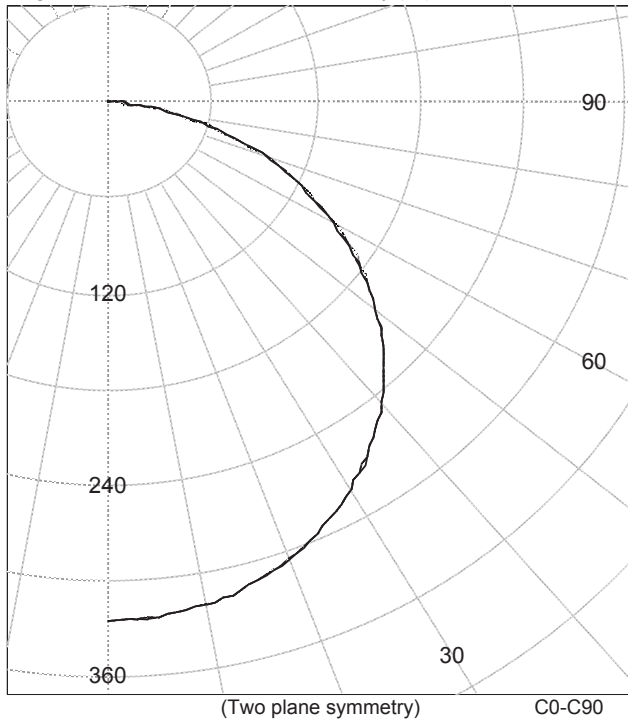




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Legend: C0-Solid, C45-Dashed, C90-Grey (cd)



INTENSITY SUMMARY (cd)


Gamma	C-Plane					Flux (lm)
	C0	C22.5	C45	C67.5	C90	
0.0	325	325	325	325	325	
5.0	324	324	324	324	324	31
10.0	320	320	320	320	320	
15.0	314	314	314	314	313	89
20.0	305	305	305	305	305	
25.0	294	293	294	293	293	135
30.0	280	280	280	280	280	
35.0	264	264	264	264	264	165
40.0	245	245	245	245	245	
45.0	224	225	225	225	225	173
50.0	202	202	202	202	202	
55.0	177	177	177	177	177	158
60.0	150	150	150	151	151	
65.0	122	122	122	123	123	121
70.0	94	94	94	94	93	
75.0	65	65	65	64	64	69
80.0	39	39	39	37	36	
85.0	18	18	16	15	12	19
90.0	0	0	0	0	0	

ZONAL FLUX AND PERCENTAGES

Zone	Flux (lm)	% Lamp	% Luminaire
0-30	255	N / A	26.5
0-40	420	N / A	43.7
0-60	751	N / A	78.3
0-90	960	N / A	100.0
40-90	540	N / A	56.3
60-90	209	N / A	21.7
90-180	0	N / A	0.0
0-180	960	N / A	100.0

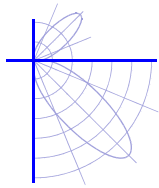
Total Light Output = 960 lm

Signed:


Ryder Tunney
Authorized Signatory

Date of test 16-Sep-2015
Date of report 23-Sep-2015

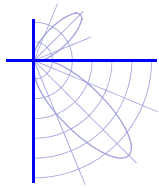
Page 3 of 8 RT



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Operating at 120 Vac and 60 Hz.

Intensity data (cd)					
Gamma	C-Plane				
	C0	C22.5	C45	C67.5	C90
0.0	325	325	325	325	325
2.5	325	325	325	325	324
5.0	324	324	324	324	324
7.5	322	322	322	322	322
10.0	320	320	320	320	320
12.5	317	317	317	317	317
15.0	314	314	314	314	313
17.5	310	309	310	310	309
20.0	305	305	305	305	305
22.5	300	299	300	299	299
25.0	294	293	294	293	293
27.5	287	287	287	287	287
30.0	280	280	280	280	280
32.5	272	272	272	272	272
35.0	264	264	264	264	264
37.5	255	255	255	255	255
40.0	245	245	245	245	245
42.5	235	235	235	235	235
45.0	224	225	225	225	225
47.5	213	213	214	214	214
50.0	202	202	202	202	202
52.5	189	189	190	190	190
55.0	177	177	177	177	177
57.5	163	163	164	164	164
60.0	150	150	150	151	151
62.5	136	136	136	137	137
65.0	122	122	122	123	123
67.5	108	108	108	108	108
70.0	94	94	94	94	93
72.5	79	79	79	79	79
75.0	65	65	65	64	64
77.5	52	52	52	50	49
80.0	39	39	39	37	36
82.5	27	27	27	26	23
85.0	18	18	16	15	12
87.5	10	10	9	7	4
90.0	0	0	0	0	0



Test Report No. LLI-15225-1

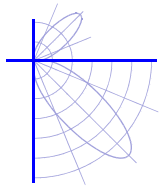
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LM-79 Performance Data

Spectral	CIE 1931 (x, y)	(0.436, 0.403)	
	CIE 1976 (u', v')	(0.250, 0.521)	
	Correlated Color Temperature (CCT)	3010 K	
	Color Spatial Uniformity	0.0080	
	Color Rendering Index (Ra)	83	
	Special CRI 9 (R _g)	20	
	Distance from Planckian Locus (Duv)	-0.0001	
	Scotopic/Photopic Ratio	1.33	
Electrical	Voltage	120 V	(Setpoint 1)
	Frequency	60 Hz	
	Current	0.212 A	
	Power	12.2 W	
	Power Factor	0.481	
	Current THD	93.35 %	
	Voltage	277 V	(Setpoint 2)
	Frequency	60 Hz	
	Current	0.127 A	
	Power	12.5 W	
	Power Factor	0.355	
	Current THD	86.30 %	

Performance data in accordance with IESNA LM-79-08. Spectral calculations are for a CIE 2° observer
Photometric and spectral values were measured at Setpoint 1

- (1) Value is computed from the weighted average of the spatial measurements
(2) Value is the maximum deviation of the spatial u' and v' measurements from the weighted average
(3) Quantity is in addition to the scope of IESNA LM-79-08



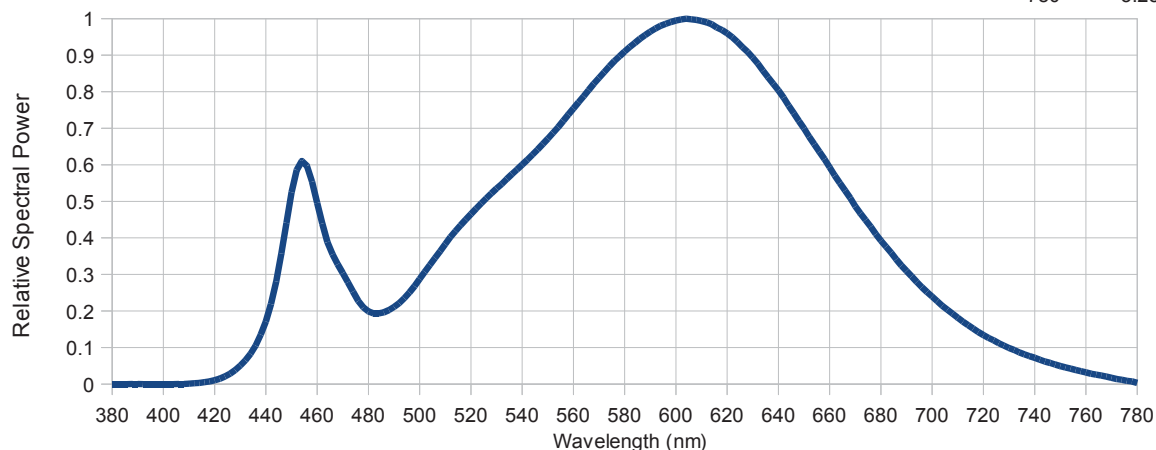
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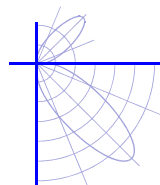
LM-79 Performance Data

Summary Relative Spectral Irradiance Distribution (wavelength – nm, irradiance – relative to peak = 1)

380	0.00E+00	480	1.99E-01	580	9.10E-01	680	3.92E-01
385	0.00E+00	485	1.95E-01	585	9.39E-01	685	3.50E-01
390	0.00E+00	490	2.11E-01	590	9.65E-01	690	3.09E-01
395	0.00E+00	495	2.43E-01	595	9.83E-01	695	2.72E-01
400	0.00E+00	500	2.87E-01	600	9.95E-01	700	2.40E-01
405	0.00E+00	505	3.36E-01	605	9.99E-01	705	2.09E-01
410	1.04E-03	510	3.83E-01	610	9.94E-01	710	1.81E-01
415	4.09E-03	515	4.27E-01	615	9.80E-01	715	1.57E-01
420	1.05E-02	520	4.65E-01	620	9.60E-01	720	1.34E-01
425	2.46E-02	525	5.02E-01	625	9.29E-01	725	1.16E-01
430	5.02E-02	530	5.35E-01	630	8.94E-01	730	9.89E-02
435	9.38E-02	535	5.68E-01	635	8.49E-01	735	8.40E-02
440	1.71E-01	540	6.00E-01	640	8.04E-01	740	7.17E-02
445	3.19E-01	545	6.35E-01	645	7.51E-01	745	5.98E-02
450	5.25E-01	550	6.72E-01	650	7.00E-01	750	4.93E-02
455	6.04E-01	555	7.12E-01	655	6.46E-01	755	4.03E-02
460	4.96E-01	560	7.54E-01	660	5.94E-01	760	3.18E-02
465	3.72E-01	565	7.96E-01	665	5.40E-01	765	2.43E-02
470	3.04E-01	570	8.38E-01	670	4.86E-01	770	1.69E-02
475	2.40E-01	575	8.77E-01	675	4.40E-01	775	1.02E-02
						780	3.28E-03



* The spectral power distribution combines the weighted spectral power distributions of all spatial measurements.



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LM-79 Performance Data

Spatial measurements

Vertical angle (deg)	CIE 1976 (u',v') coordinates	
	Horizontal 0 plane	Horizontal 90 plane
0	(0.249, 0.519)	(0.249, 0.519)
10	(0.249, 0.519)	(0.249, 0.519)
20	(0.249, 0.519)	(0.250, 0.520)
30	(0.250, 0.520)	(0.250, 0.520)
40	(0.250, 0.520)	(0.250, 0.521)
50	(0.250, 0.521)	(0.250, 0.522)
60	(0.250, 0.521)	(0.251, 0.523)
70	(0.251, 0.522)	(0.251, 0.523)
80	(0.255, 0.527)	(0.252, 0.524)
90	I <= 10 %	I <= 10 %

Spatial measurements

Vertical angle (deg)	CIE 1976 (u',v') coordinates	
	Horizontal 0 plane	Horizontal 90 plane
90	I <= 10 %	I <= 10 %
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Test procedure

All measurements were performed in an environmentally controlled laboratory employing suitable baffling to minimize stray light. The sample was mounted in its normal operating orientation on a rotating mirror goniophotometer and operated from a stabilized supply. The photometric output was monitored and measurements were performed once stability was achieved.

The goniophotometer was used to measure the spatial distribution of both luminous intensity and, in conjunction with a spectroradiometer, spectral irradiance. The distribution locus comprises points in two or more planes (as indicated in the table above) at no more than 10° vertical intervals. The CIE (x,y) coordinates and other derived metrics (CIE (u', v'), CCT and CRI) are calculated from the weighted sum (weighted for intensity and represented solid angle) of the measured spectral irradiances.

Sample Orientation Horizontal

Stabilization Time 1.25 hour
Total Operation Time 2 hour

Equipment and uncertainties

LightLab International R80A C-gamma rotating mirror goniophotometer with a test distance of 8 m.

Luminous Intensity	± 4 %	Temperature	± 1 °C
Luminous Flux	± 4 %	Luminous Efficacy	± 4.5 %
Horizontal, Vertical Angles	± 0.25°		

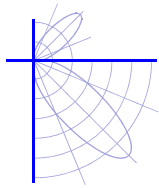
PhotoResearch PR-670 spectroradiometer (380 - 780 nm., 2 nm. per pixel) measuring at a distance from the sample deemed greater than five times the maximum observed luminous opening dimension.

CIE (x, y) coordinates	± 0.003	CCT	± 100 K
CIE (u', v') coordinates	± 0.002	CRI (Ra)	± 2
Δ (u', v') Color difference	± 0.001	Scotopic / Photopic Ratio *	± 0.02
Relative Spectral Irradiance *	± 2 %	R9 *	± 2

Yokogawa WT210 power meter connected in circuit to the sample electrical supply

Voltage	± 0.5 %	Frequency *	± 0.1 Hz
Current	± 0.5 %	Power	± 0.5 %
Current THD *	± 3 %	Power Factor	± 0.02

This report contains data that are not covered by the NVLAP accreditation. Quantities marked with * are not covered.
IESNA LM-79-08 Calculator v5 (17th Apr 2015)



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Test Distance 8.0 m
Test Temperature 24.9 °C

Notes The laboratory has not participated in the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent that the test sample is representative of production units.

Tested in accordance with the applicable sections of IESNA publication LM-79-08.

The luminous intensity values, and other derived quantities, contained in this report are based on the absolute data, as measured.

Prorating the performance of the sample for the use of other component combinations (such as lamp / LED / Ballast / driver), or for use in different environmental conditions than that tested, may produce erroneous results.

This report is free of erasures and corrections.

Photometric intensity values are reported using the CIE Gamma coordinate system as defined in CIE publication number 121.

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This report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the Federal Government.