

## Report of Test

**LLIA002687-003A**

### Indoor Distribution Photometry Test Report

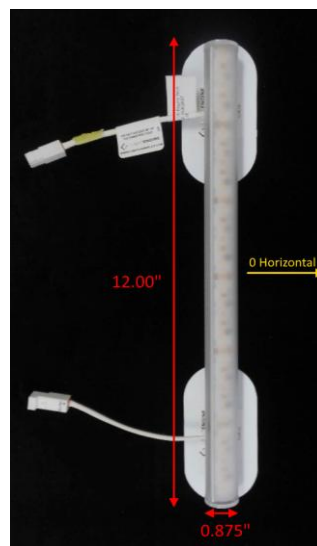
Catalog Number: FWD-I012-3000K 9W

Surface mounted, extruded aluminum housing, lightly frosted plastic lens.

One system with 432 LEDs was tested to create a fully loaded condition.

Optical measurements were performed only on a 12" luminaire containing 48 white LEDs

One ERP VZM100W-24 LED power supply



Prepared For:

Light Engine Technologies

200 Wilson Street

Unit A1

Port Jefferson Station, NY 11776, USA

#### Performance Summary

Input System Voltage	120.0 Vac	12" Section Luminous Flux	858.1 Lumens
Input System Current	0.6212 A	12" Section Efficacy**†	104.6 Lm/W
Input System Power	73.83 W	Downward Flux	88.0 Lumens
12" Section System Power**†	8.203 W	Downward Flux	10.3 % of Total
System Frequency	60.00 Hz		
System Power Factor	0.991		
System Current THD	10.7 %		

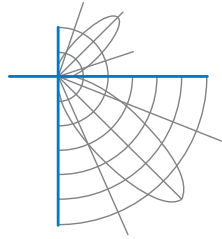
\*\*12" Section System Power and Efficacy is calculated using the fraction (48/432) of measured full-system input power

This test report was issued by LightLab International Allentown, LLC without alterations or erasures.

Test date: 06/18/2025

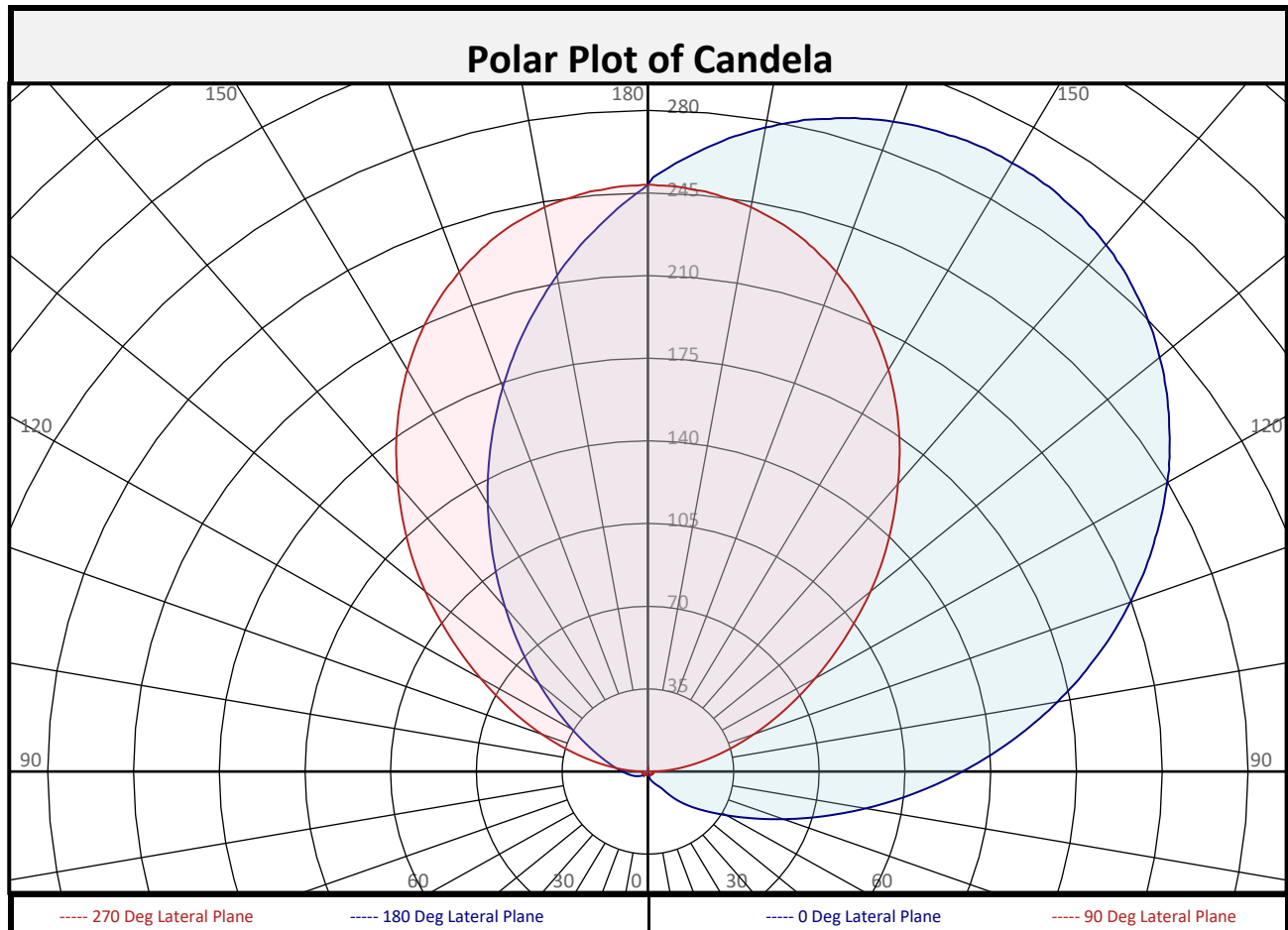
Report date: 06/19/2025

Signed: \_\_\_\_\_

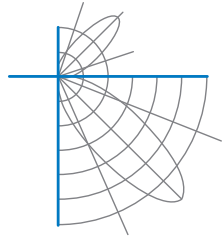


## Report of Test

### LLIA002687-003A



Zonal Flux Summary										
Zone (Deg Vert)	Flux (Lumens)	Percent of Total		Zone (Deg Vert)	Flux (Lumens)	Percent of Total		Zone (Deg Vert)	Flux (Lumens)	Percent of Total
0-10	0.0	0.0%		90-100	52.9	6.2%		0-20	0.5	0.1%
10-20	0.4	0.0%		100-110	74.2	8.7%		0-30	1.6	0.2%
20-30	1.2	0.1%		110-120	95.7	11.2%		0-40	3.8	0.4%
30-40	2.2	0.3%		120-130	113.7	13.3%		0-60	16.0	1.9%
40-50	4.2	0.5%		130-140	123.1	14.3%		0-80	52.5	6.1%
50-60	8.0	0.9%		140-150	119.5	13.9%		10-90	88.0	10.2%
60-70	13.7	1.6%		150-160	100.5	11.7%		20-50	7.6	0.9%
70-80	22.8	2.7%		160-170	67.0	7.8%		40-90	84.2	9.8%
80-90	35.5	4.1%		170-180	23.5	2.7%		60-90	72.0	8.4%
0-90	88.0	10.3%		90-180	770.1	89.7%		0-180	858.1	100.0%



## Report of Test

**LLIA002687-003A**

Luminous Intensity (Candela) Table

Lateral (C-Plane) Angles										
	0	22.5	45	67.5	90	112.5	135	157.5	180	
Vertical (Gamma) Angles - Data was acquired in 0.5° increments, 2.5° increments shown.	0	0	0	0	0	0	0	0	0	0
	2.5	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0
	7.5	0	0	0	0	0	0	0	0	0
	10	1	1	1	1	1	1	1	1	1
	12.5	2	2	1	1	1	1	1	1	1
	15	3	3	2	1	1	1	1	1	1
	17.5	4	4	3	2	1	1	1	1	1
	20	4	4	3	2	1	1	1	1	1
	22.5	5	4	4	3	1	1	1	1	1
	25	5	5	4	3	1	1	1	1	1
	27.5	6	5	4	3	1	1	1	1	2
	30	6	6	5	3	2	2	2	2	2
	32.5	7	6	5	3	2	2	2	2	2
	35	8	7	5	4	2	2	2	2	2
	37.5	9	8	6	4	2	2	2	2	2
	40	11	9	6	4	2	2	2	2	2
	42.5	15	11	7	4	2	2	2	2	2
	45	18	15	7	4	2	2	2	2	2
	47.5	20	17	8	4	2	2	2	2	2
	50	23	20	10	4	2	2	2	2	3
	52.5	26	23	13	4	2	2	2	3	3
	55	29	26	15	4	2	2	2	3	3
	57.5	33	29	18	5	2	2	2	3	3
	60	37	33	20	5	2	2	2	3	4
	62.5	42	37	23	5	2	2	3	4	4
	65	47	41	25	6	2	2	3	4	5
	67.5	53	46	28	8	2	2	3	5	5
	70	59	51	31	9	2	2	3	5	6
	72.5	66	57	35	11	2	2	4	6	6
	75	74	64	40	13	2	2	4	6	7
	77.5	82	71	44	14	2	3	5	7	7
	80	90	78	49	17	2	3	5	7	8
	82.5	99	87	55	19	2	3	6	8	8
	85	109	95	61	23	2	3	6	9	9
	87.5	118	104	68	27	2	4	7	9	10
	90	128	113	75	31	3	5	8	10	10

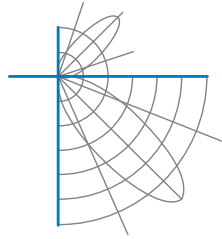
16 lateral half-planes of data were acquired, 22.5 degree increments shown.

**North America (issuing laboratory)**

LightLab International Allentown, LLC  
905 Harrison Street, Suite 135  
Allentown, PA 18103 USA  
Ph: +1 484-273-0705  
Fx: +1 484-209-5779  
www.lightlaballentown.com

**Australasia & S.E. Asia**

LightLab International  
50 Redcliffe Gardens Drive  
Clontarf - Queensland, 4019, Australia  
Ph: +61 7 3283 7862  
Fx: +61 7 3283 8751  
www.lightlabint.com



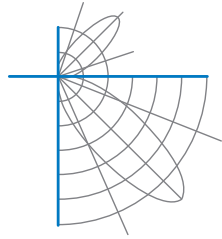
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**LLIA002687-003A**

Luminous Intensity (Candela) Table

Lateral (C-Plane) Angles										
	0	22.5	45	67.5	90	112.5	135	157.5	180	
Vertical (Gamma) Angles - Data was acquired in 0.5° increments shown.	90	128	113	75	31	3	5	8	10	10
	92.5	139	123	82	36	6	6	9	11	11
	95	149	133	90	42	11	8	11	12	12
	97.5	159	142	98	48	15	10	13	14	14
	100	170	152	107	55	20	13	15	15	15
	102.5	180	162	116	62	26	16	17	17	16
	105	190	172	125	69	32	20	20	19	18
	107.5	200	181	134	77	39	25	23	21	20
	110	210	191	143	86	46	30	26	24	22
	112.5	219	200	153	95	53	36	30	27	25
	115	228	209	162	104	62	42	35	30	28
	117.5	237	218	172	114	70	48	39	34	32
	120	245	227	181	124	79	56	45	38	36
	122.5	253	235	191	134	88	63	51	43	40
	125	260	243	200	144	98	72	58	49	46
	127.5	267	250	208	154	108	81	65	55	52
	130	273	257	217	163	119	90	72	62	58
	132.5	279	264	225	173	129	99	80	70	65
	135	283	269	232	182	139	108	89	78	73
	137.5	288	274	239	192	149	118	98	86	82
	140	291	278	245	201	159	128	108	95	91
	142.5	294	282	251	209	169	138	118	105	100
	145	296	284	256	217	178	148	128	115	110
	147.5	297	286	260	224	188	158	138	125	120
	150	297	288	264	230	196	168	148	135	131
	152.5	298	288	266	236	205	177	158	146	141
	155	297	288	269	241	212	187	168	156	152
	157.5	295	287	270	245	219	195	178	167	163
	160	293	286	270	248	225	203	187	177	173
	162.5	290	284	270	251	230	211	196	187	184
	165	286	281	269	253	235	218	205	197	194
	167.5	282	277	267	254	239	225	214	207	204
	170	277	273	265	254	243	231	222	216	213
	172.5	271	268	262	254	245	236	229	225	223
	175	265	262	258	252	247	241	236	233	232
	177.5	258	256	254	251	248	245	243	241	240
	180	249	249	249	249	249	249	249	249	249

16 lateral half-planes of data were acquired, 22.5 degree increments shown.



## Report of Test

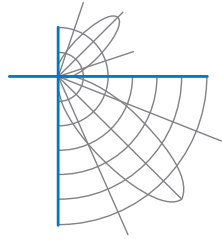
### LLIA002687-003A

#### Coefficients of Utilization/Room Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80					70					50				30				10			0
RW	70	50	30	10		70	50	30	10		50	30	10		50	30	10		50	30	10	0
RCR																						
0	98	98	98	98		85	85	85	85		61	61	61		40	40	40		20	20	20	10
1	87	82	78	74		75	71	67	64		51	48	46		32	30	29		14	13	13	5
2	79	71	64	59		68	61	56	51		43	40	37		27	25	23		12	11	10	3
3	71	62	54	48		61	53	47	42		38	34	30		23	21	19		10	9	8	2
4	65	54	46	40		56	47	40	35		33	29	25		20	18	16		9	7	6	1
5	59	48	40	34		51	41	35	30		29	25	21		18	15	13		8	6	5	1
6	54	43	35	29		47	37	30	25		26	22	18		16	13	11		7	5	4	1
7	50	38	30	25		43	33	27	22		24	19	16		15	12	10		6	5	4	1
8	46	34	27	22		40	30	23	19		21	17	14		13	10	8		6	4	3	0
9	43	31	24	19		37	27	21	17		19	15	12		12	9	7		5	4	3	0
10	40	28	21	17		34	25	19	15		18	13	11		11	8	6		5	3	2	0

For absolute test reports, RUs are expressed as a percentage of total lumen output. For relative test reports, CUs are expressed as a percentage of total lamp output. Calculations were based on published IES procedures, and are based on the zonal cavity method. Basic assumptions: 1) Room surfaces are lambertian reflectors. 2) Incident flux on each surface is uniformly distributed. 3) The room is spectrally neutral. When luminaires are not evenly distributed throughout the room, or do not exhibit lateral symmetry, CU values may differ from actual performance.



## Report of Test

### LLIA002687-003A

#### UGR Table - Corrected

##### Reflectances

Ceiling Cavity	70	70	50	50	30	70	70	50	50	30
Walls	50	30	50	30	30	50	30	50	30	30
Floor Cavity	20	20	20	20	20	20	20	20	20	20

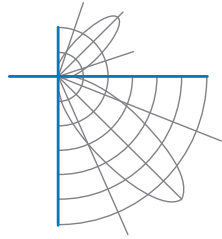
##### Room Size

##### UGR Viewed Crosswise

##### UGR Viewed Endwise

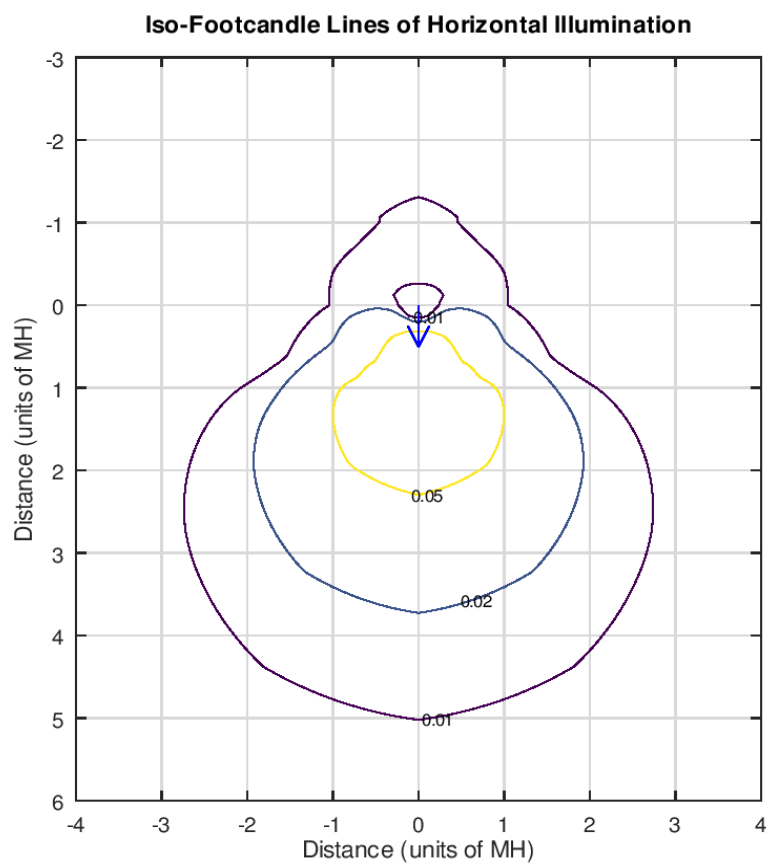
X=2H	Y=2H	10.7	11.3	11.9	12.5	14.3	0.0	0.0	0.0	0.0	0.0
	3H	16.9	17.5	18.2	18.7	20.5	0.0	0.0	0.0	0.0	1.2
	4H	20.2	20.8	21.5	22.0	23.7	0.0	0.1	0.8	1.3	3.1
	6H	23.7	24.2	24.9	25.4	27.2	1.2	1.7	2.4	2.9	4.7
	8H	25.5	25.9	26.7	27.2	28.9	1.9	2.4	3.1	3.6	5.3
	12H	27.3	27.8	28.6	29.0	30.8	2.5	2.9	3.7	4.1	5.9
4H	2H	11.0	11.6	12.3	12.8	14.6	2.9	3.5	4.2	4.7	6.4
	3H	17.6	18.0	18.8	19.3	21.0	5.3	5.8	6.6	7.0	8.8
	4H	21.1	21.5	22.3	22.7	24.5	6.3	6.7	7.5	7.9	9.7
	6H	24.7	25.1	25.9	26.3	28.1	7.3	7.7	8.5	8.9	10.7
	8H	26.6	26.9	27.8	28.2	29.9	7.8	8.1	9.0	9.4	11.2
	12H	28.6	28.9	29.8	30.1	31.9	8.2	8.5	9.5	9.8	11.6
8H	4H	21.3	21.6	22.5	22.9	24.6	11.5	11.9	12.7	13.1	14.9
	6H	25.1	25.4	26.4	26.7	28.5	12.7	13.0	14.0	14.3	16.1
	8H	27.2	27.4	28.4	28.7	30.5	13.2	13.5	14.5	14.7	16.5
	12H	29.4	29.6	30.7	30.9	32.7	13.6	13.8	14.9	15.1	16.9
12H	4H	21.2	21.6	22.5	22.8	24.6	13.2	13.6	14.5	14.8	16.6
	6H	25.1	25.4	26.4	26.7	28.5	14.8	15.0	16.0	16.3	18.1
	8H	27.3	27.5	28.5	28.8	30.6	15.5	15.7	16.7	17.0	18.8

Maximum UGR = 32.7

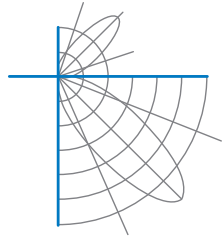


## Report of Test LLIA002687-003A

### Iso-Illuminance Plot

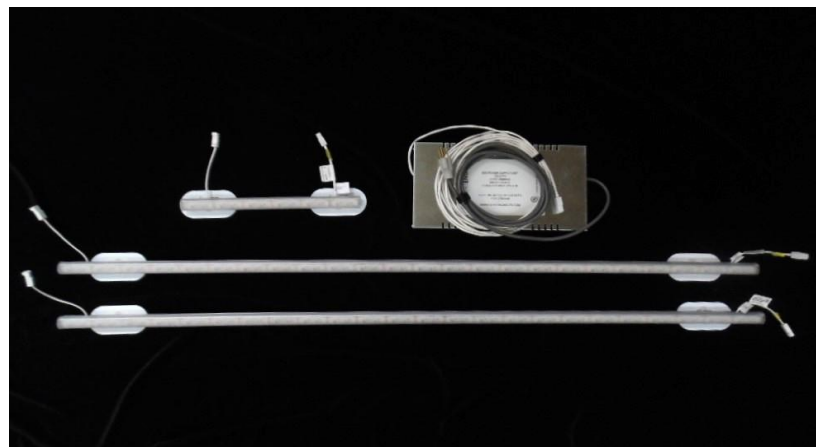
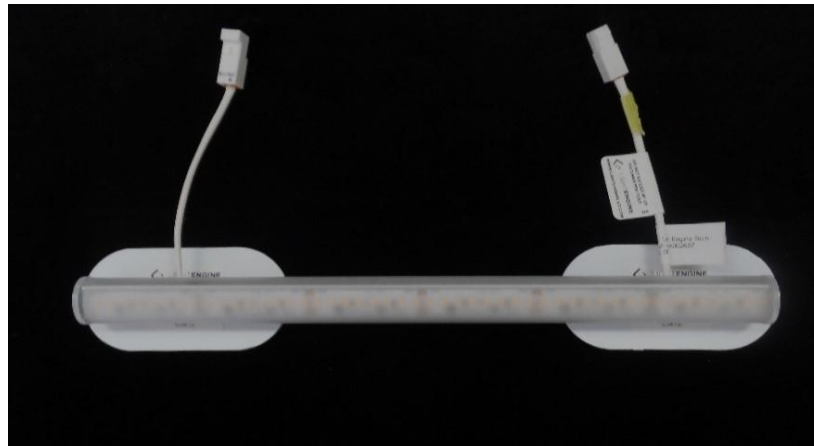


The isofootcandle values shown in the plot above are based on a mounting height of  $h = 8.0$  feet. Grid values show multiples of mounting height. The isoilluminance contour lines are expressed in units of footcandles. The values expressed are based on the direct light from a single unit without the contribution of room reflections.

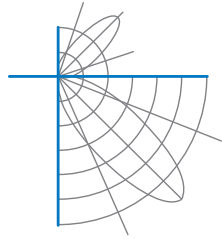


## Report of Test LLIA002687-003A

### Additional Pictures of Test Subject







## Report of Test

### LLIA002687-003A

Test Distance                      9.5 m  
Ambient Temperature            25.1 °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 IES LM-79-24. Format of reports and angular increments based on IES LM-41-20 and LM-46-20.

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

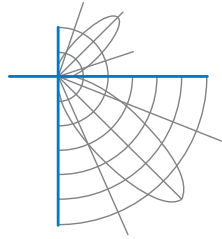
Prorating the performance of the sample for the use of other component combinations (such as lamp / LED / Ballast / driver), or for use in different environmental conditions than that tested, may produce erroneous results.

This report is free of erasures and corrections.

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

This report may contain data that are not covered by the NVLAP accreditation. Quantities marked with ‡ are not covered.

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.



## Report of Test

**LLIA002687-003B**

Integrating Sphere Report

Catalog Number: FWD-I012-3000K 9W

Surface mounted, extruded aluminum housing, lightly frosted plastic lens.

One system with 432 LEDs was tested to create a fully loaded condition.

Optical measurements were performed only on a 12" luminaire containing 48 white LEDs

One ERP VZM100W-24 LED power supply



### Performance Summary

System Voltage	120.0 Vac
System Current	0.6175 A
System Power	73.41 W
12" Section System Power**†	8.157 W
System Frequency	59.99 Hz
System Power Factor	0.991
System Current THD	10.7 %
12" Section Luminous Flux	868.5 lm
12" Section System Efficacy**†	106.5 lm/W
Chromaticity (x,y)	(0.4351, 0.4004)
(u',v')	(0.2510, 0.5197)
Duv	-0.0012
CCT	3000 K
CRI (Ra)	98
R9	93
TM-30: Rf	94
TM-30: Rg	101
TM-30: Rcs,h1	-1

Prepared For:  
Light Engine Technologies

200 Wilson Street

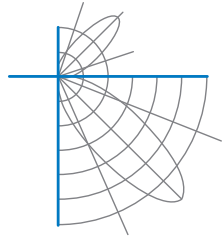
Unit A1

Port Jefferson Station, NY 11776, USA

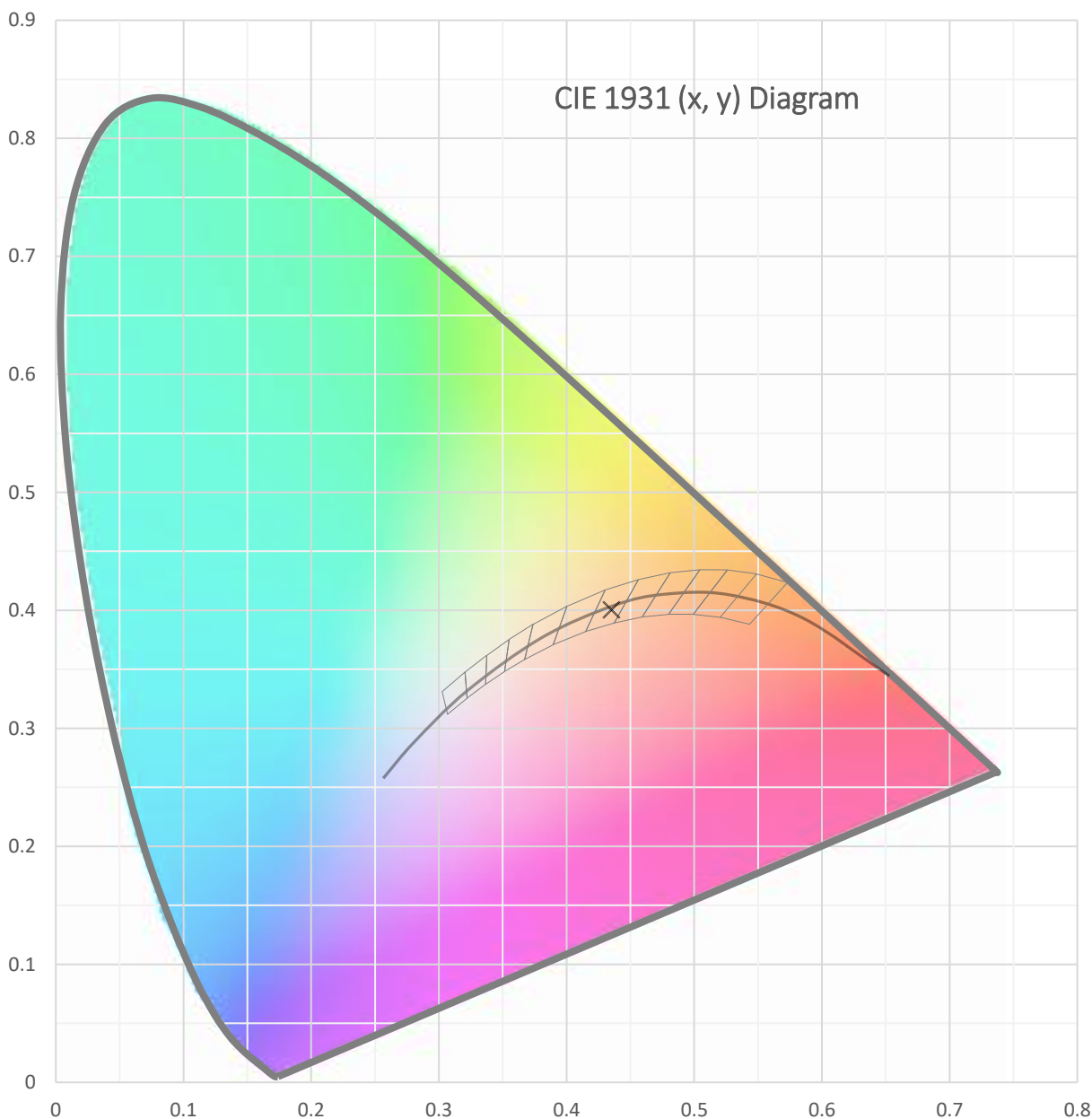
\*\*12" Section System Power and Efficacy is calculated using the fraction (48/432) of measured full-system input power

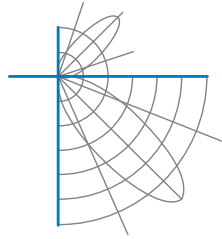
Test date: 06/13/2025

Report date: 06/19/2025

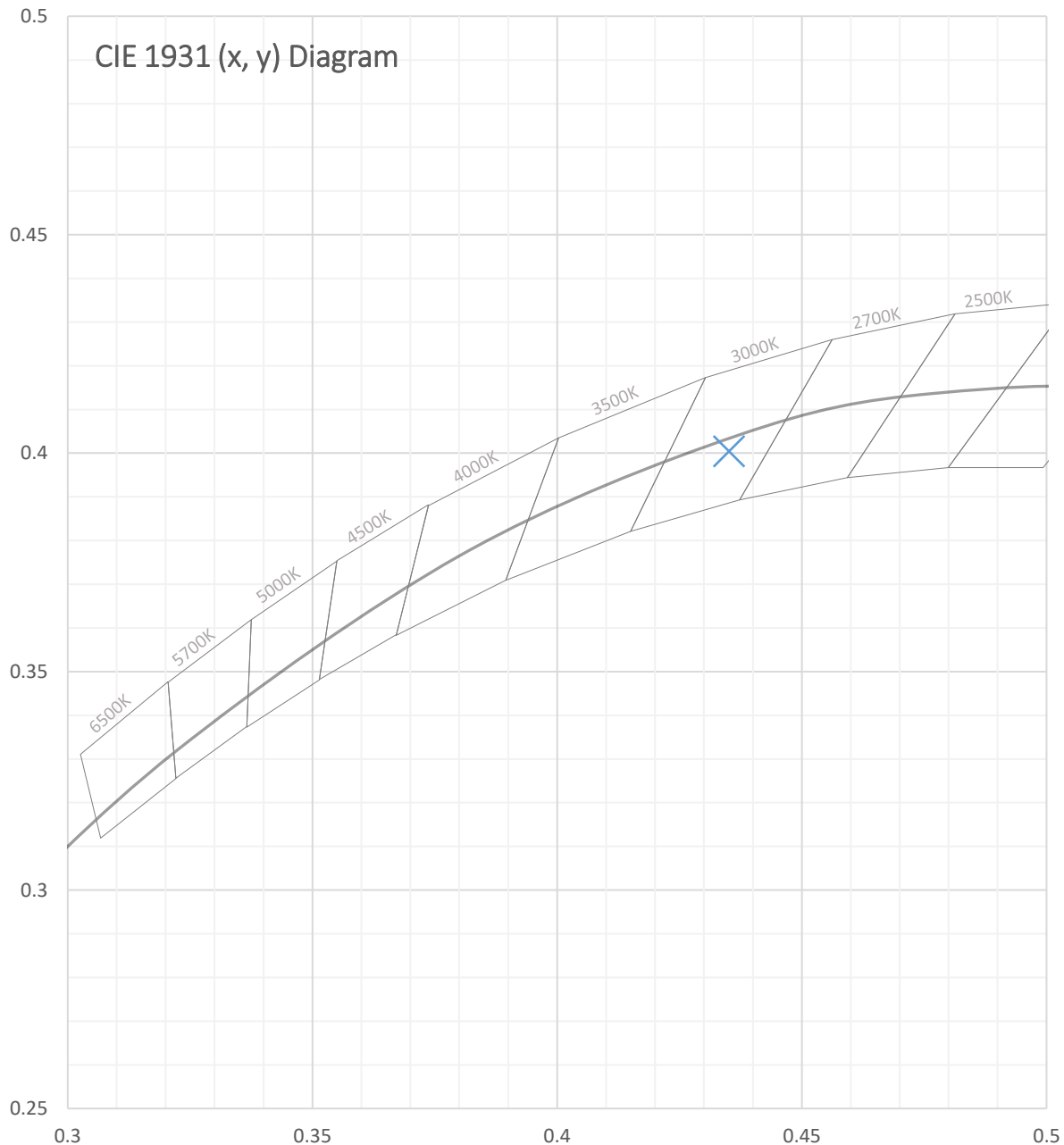


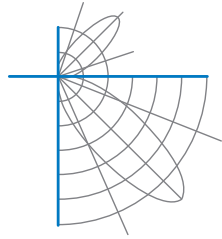
Test Report Number: LLIA002687-003B





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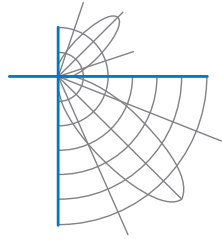


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Total Radiant Flux	3.289 W
Total Luminous Flux	868.5 Lm
Chromaticity CIE 1931 (x, y)	(0.4351, 0.4004)
Chromaticity CIE 1976 (u', v')	(0.2510, 0.5197)
Correlated Color Temperature (CCT)	3000 K
Color Rendering Index (Ra)	98
R1	99
R2	99
R3	97
R4	100
R5	99
R6	97
R7	98
R8	97
R9	93
R10	99
R11	97
R12	84
R13	99
R14	97
TM-30: Rf	94
TM-30: Rg	101
TM-30: Rcs,h1	-1
Distance from Planckian Locus (Duv)	-0.0012
Scotopic/Photopic Ratio $\neq$	1.473

**Electrical Data**

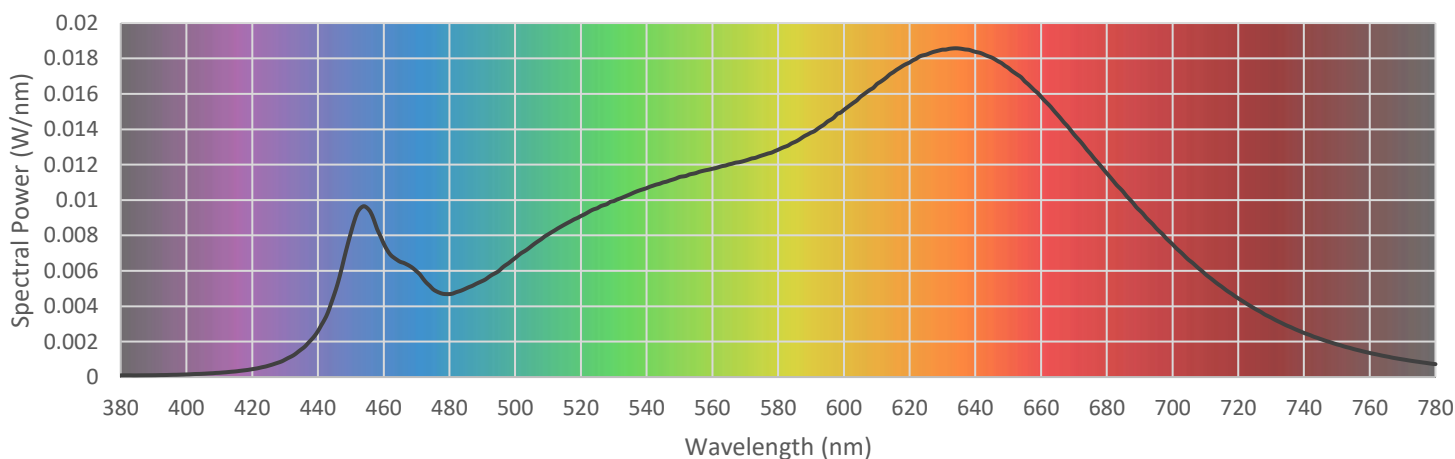
Voltage	120.0 Vac
Current	0.6175 A
Power	73.41 W
Frequency	59.99 Hz
Power Factor	0.991
Current THD	10.7 %

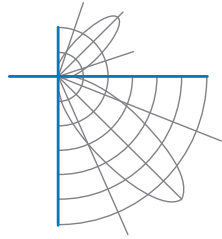


Test Report Number: LLIA002687-003B

Summary Spectral Power Distribution (wavelength - nm, spectral power - W/nm)

380	0.000097	480	0.004688	580	0.012841	680	0.011514
385	0.000096	485	0.005001	585	0.013273	685	0.010472
390	0.000104	490	0.005425	590	0.013808	690	0.009417
395	0.000123	495	0.005989	595	0.014431	695	0.008418
400	0.000149	500	0.006724	600	0.015091	700	0.007503
405	0.000188	505	0.007405	605	0.015830	705	0.006607
410	0.000242	510	0.008056	610	0.016544	710	0.005812
415	0.000320	515	0.008613	615	0.017217	715	0.005102
420	0.000447	520	0.009097	620	0.017771	720	0.004447
425	0.000644	525	0.009540	625	0.018212	725	0.003868
430	0.000985	530	0.009941	630	0.018496	730	0.003359
435	0.001574	535	0.010327	635	0.018564	735	0.002891
440	0.002600	540	0.010673	640	0.018373	740	0.002492
445	0.004692	545	0.010996	645	0.018051	745	0.002153
450	0.008143	550	0.011303	650	0.017475	750	0.001848
455	0.009546	555	0.011525	655	0.016716	755	0.001588
460	0.007537	560	0.011767	660	0.015839	760	0.001362
465	0.006513	565	0.012013	665	0.014819	765	0.001169
470	0.005975	570	0.012227	670	0.013713	770	0.000998
475	0.004964	575	0.012514	675	0.012628	775	0.000855
						780	0.000730





Test Report Number: LLIA002687-003B

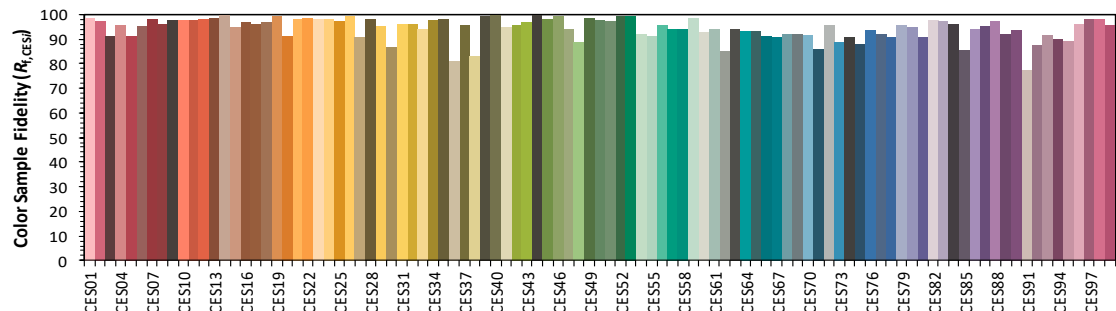
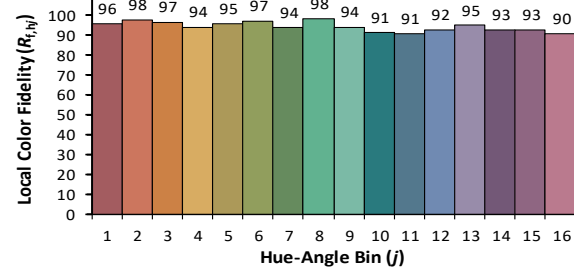
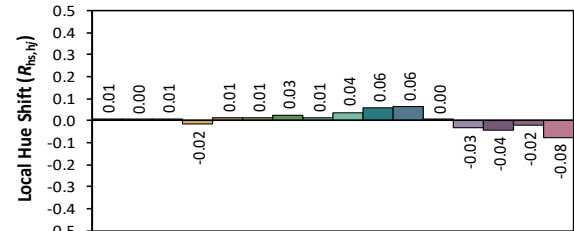
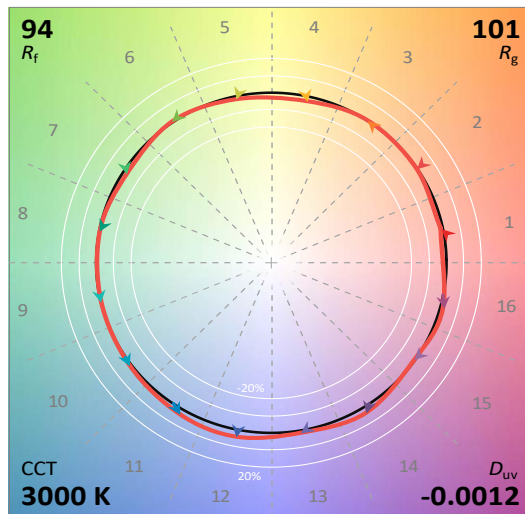
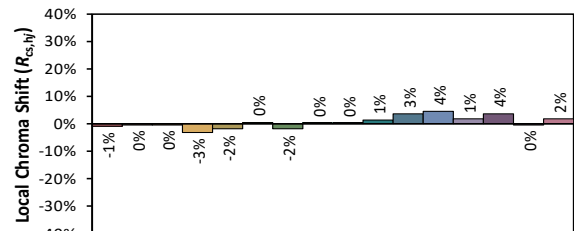
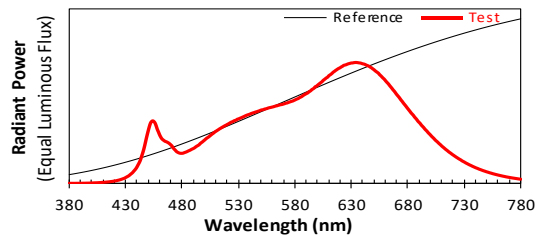
### IES TM-30 Details

Source: LLIA002687-003B

Manufacturer: Light Engine Technologies

Date: 6/19/2025

Model: FWD-I012-3000K 9W

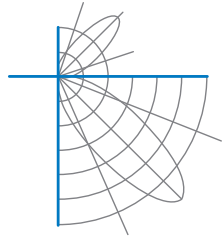


Notes:

x **0.4351**  
y **0.4004**  
u' **0.2510**  
v' **0.5197**

CIE 13.3-1995  
(CRI)

R<sub>a</sub> 98  
R<sub>g</sub> 93



## Test Report Number: LLIA002687-003B

Test Equipment Configuration:	LightLab International Allentown 2m Integrating Sphere Measurements acquired using a Labsphere CDS 2600 spectroradiometer Testing was performed using $4\pi$ geometry
Test Temperature:	24.7 °C
Test Procedure:	Tested in accordance with the applicable sections of: LM-79-24, LM-78-20, LM-58-20, ANSI_ANSLG C78.377-2024, TM-30-24
Significance:	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.
Notes:	<p>The measurements and other derived quantities contained in this report are based on the absolute data as measured.</p> <p>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.</p> <p>This report is free of erasures and corrections</p> <p>This report may contain data that are not covered by the NVLAP accreditation. Quantities marked with ‡ are not covered.</p> <p>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.</p>

Sphere Report Template V2-19

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**North America (issuing laboratory)**

LightLab International Allentown, LLC  
905 Harrison Street, Suite 135  
Allentown, PA 18103 USA  
Ph: +1 484-273-0705  
Fx: +1 484-209-5779  
www.lightlaballentown.com

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**Australasia & S.E. Asia**

LightLab International  
50 Redcliffe Gardens Drive  
Clontarf - Queensland, 4019, Australia  
Ph : +61 7 3283 7862  
Fx : +61 7 3283 8751  
www.lightlabint.com