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Photometric Test Report

Relevant Standards
IES LM-79-2008, ANSI C82.77-2002, CIE 13.3-1995
CIE 15-2004, ANSI C78.377-2015, IES TM-30-2015

Prepared For
CABA Tech

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Catalog Number

BLOOM

Order Number

11808642

Test Number

11808642.07

Test Date

2017-06-28 - 2017-06-29

Prepared By

A handwritten signature in black ink on a light-colored background, appearing to read 'William Escobar'.

William Escobar, Technician

Approved By

A handwritten signature in black ink on a light-colored background, appearing to read 'Eric M. Gaudreau'.

Eric Gaudreau, Senior Engineering Associate

The results contained in this report pertain only to the tested sample.
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Laboratory results may not be representative of field performance
Ballast factors have not been applied

Testing was performed in a 3-meter integrating sphere using the 4π geometry method.
Absorption correction was employed for Sphere measurement



Luminaire Description: Square white metal housing
Lamp: White LED array
Mounting: Pendant
Ballast/Driver: Two (2) MOON' MU320H800AQ_CP

Luminaire



Luminaire Characteristics

Luminous Length: 36.00 in.
Luminous Width: 33.00 in.

Summary of Results

Integrating Sphere

Luminous Flux: 83440 Lumens
Efficacy: 126.4 lm/w
CCT: 3312 K
CRI (Ra): 84.6

Distribution

Total Luminaire Output: 81700 Lumens
Luminaire Efficacy: 124.9 lm/w
Maximum Candela: 27282 Candela

Electrical Data at 120 VAC

Test Temperature: 25.5 °C
Voltage: 120.1 VAC
Current: 5.531 A
Power: 660.4 W
Power Factor: 0.994
Frequency: 60 Hz
Current THD: 6.66 %



Horticultural Lighting - Definition of Terms

Radiant Flux: The measured radiant power of the test item in units of watts from 350nm to 850 nm.

Luminous Flux: The measured radiant power of the test item in units of lumens from 380nm to 780 nm.

PPF (400-700nm): Photosynthetic Photon Flux - Flux from 400 to 700 nm expressed in units of $\mu\text{mol}/\text{sec}$
This wavelength range has been identified as important to photosynthetic processes.

PBAR Flux(350-800nm): Plant Biologically Active Radiation Flux - Flux from 350 to 800 nm expressed in units of $\mu\text{mol}/\text{sec}$. Plants have photopigments other than chlorophyll that are sensitive to a wider range of wavelengths than chlorophyll.

Radiant Efficiency: The ratio of light flux in watts to electrical input power in watts expressed in percent.

Luminous Efficacy: The ratio of light flux in lumens to electrical input power in watts expressed in lm/W .

PPF Efficacy: The ratio of photosynthetic photon flux to electrical input power in watts expressed in $\mu\text{mol}/\text{sec}/\text{W}$.

PBAR Efficacy: The ratio of photon flux in the wavelength range 350 to 800 nm to electrical input power in watts expressed in $\mu\text{mol}/\text{sec}/\text{W}$.

PPFD: Photosynthetic Photon Flux Density - Flux per unit area expressed in $\mu\text{mol}/\text{sec}/\text{m}^2$.

Lumens to $\mu\text{mol}/\text{sec}$ conversion factor: Multiply flux in lumens by this factor to convert to PPF in units of $\mu\text{mol}/\text{sec}$. This conversion factor can also be used to convert illuminance in lux to photosynthetic photon flux density (PPFD).

To convert from footcandles to PPFD first convert the illuminance in fc to lux by multiplying by 10.7639 lux/fc and then use the lumens to $\mu\text{mol}/\text{sec}$ conversion factor.

Note: This factor applies to the measured spectral distribution only and cannot be applied to other light sources.



Horticultural Lighting - Integrating Sphere

Integrating Sphere Test Conditions

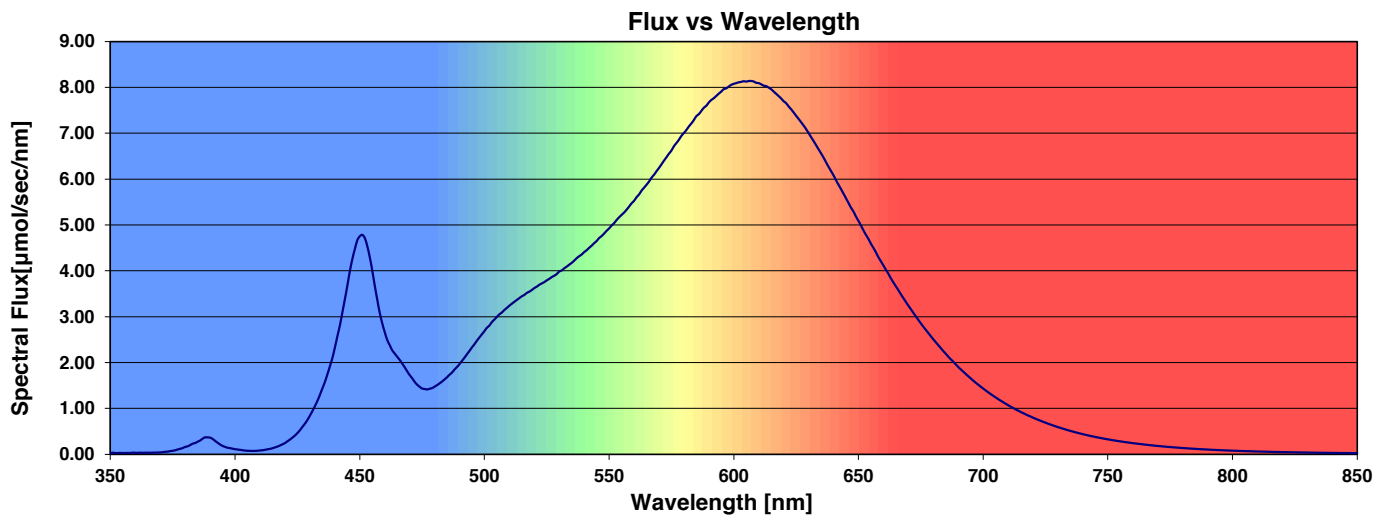
Temperature	Voltage	Current	Power	Power Factor	Frequency	Current THD
25.5 °C	120.1 VAC	5.531 A	660.4 W	0.994	60 Hz	6.66 %

Summary of Results

Radiant Flux	261.90 Watts	Radiant Efficiency:	39.7 %
Luminous Flux:	83440 Lumens	Luminous Efficacy:	126.35 lm/W
PPF (400-700nm):	1199.90 $\mu\text{mol}/\text{sec}$	PPF Efficacy:	1.8169 $\mu\text{mol}/\text{sec}/\text{W}$
PBAR Flux(350-800nm):	1252.43 $\mu\text{mol}/\text{sec}$	PBAR Efficacy:	1.8965 $\mu\text{mol}/\text{sec}/\text{W}$
Lumens to $\mu\text{mol}/\text{sec}$ conversion factor:		0.014380 $\mu\text{mol}/\text{sec}/\text{lm}$	

	Wavelength Range [nm]	Photon Flux [$\mu\text{mol}/\text{sec}$]
UVA	350 - 360	0.309428
	360 - 370	0.349855
	370 - 380	0.855815
	380 - 390	2.767791
	390 - 400	2.073109
Violet	400 - 410	0.847787
	410 - 420	1.436211
	420 - 430	4.914774
	430 - 440	14.775535
Blue	440 - 450	36.382552
	450 - 460	39.087795
	460 - 470	21.424443
	470 - 480	14.980032
Cyan	480 - 490	16.940827
	490 - 500	23.280355
	500 - 510	29.828746
Green	510 - 520	34.377020
	520 - 530	37.940789
	530 - 540	41.832437
Yellow	540 - 550	46.578273
	550 - 560	52.221848
	560 - 570	58.830638
	570 - 580	66.308024
	580 - 590	73.497176

	Wavelength Range [nm]	Photon Flux [$\mu\text{mol}/\text{sec}$]
Orange	590 - 600	78.971500
	600 - 610	81.174454
	610 - 620	79.316997
	620 - 630	73.759685
	630 - 640	65.522698
Red	640 - 650	55.820996
	650 - 660	45.954216
	660 - 670	36.687032
	670 - 680	28.638667
Infrared	680 - 690	21.974312
	690 - 700	16.599117
	700 - 710	12.444757
	710 - 720	9.283270
	720 - 730	6.910731
	730 - 740	5.119883
	740 - 750	3.792827
	750 - 760	2.826129
	760 - 770	2.113884
	770 - 780	1.582914
	780 - 790	1.191579
790 - 800	0.904732	

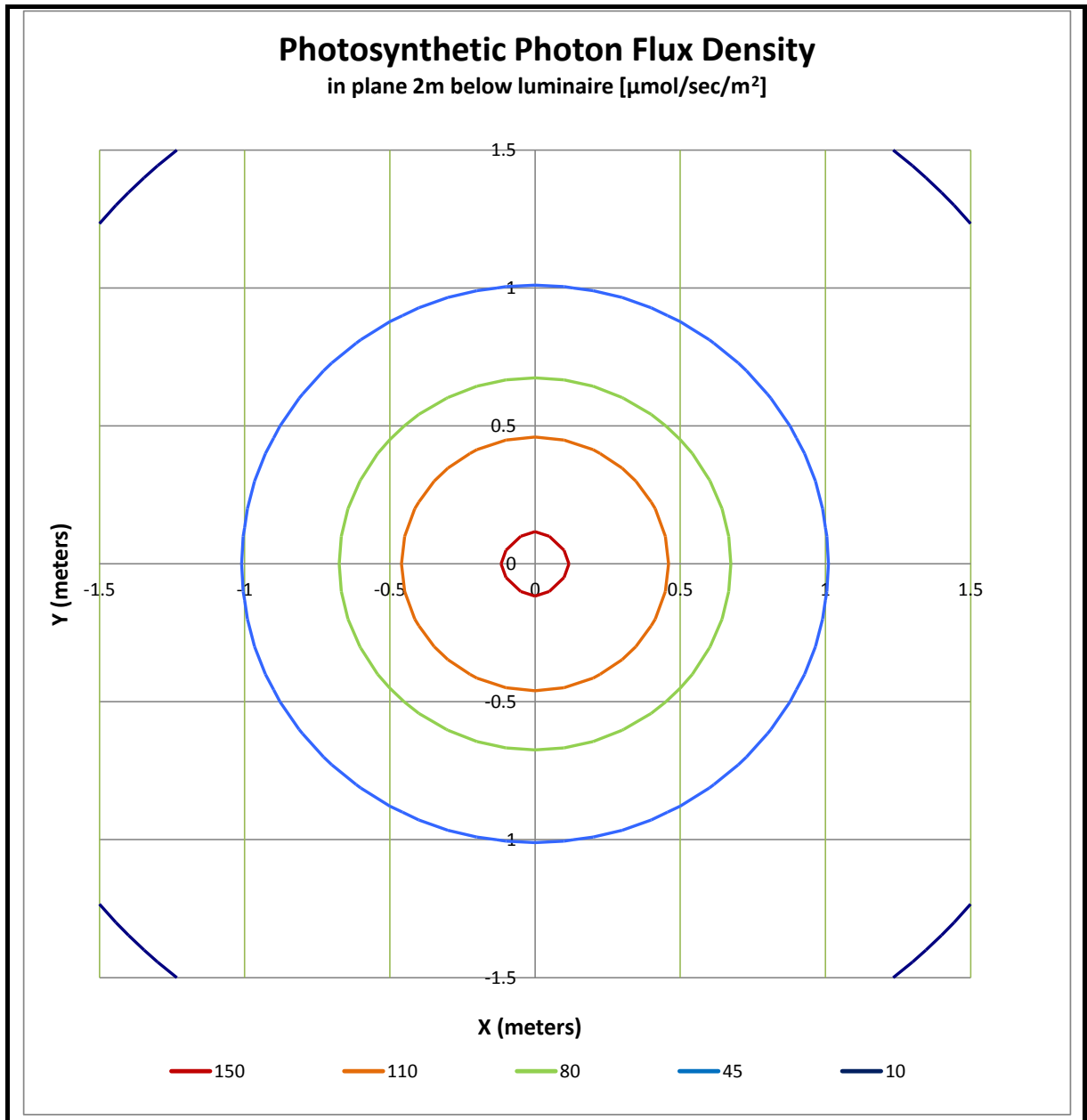




Horticultural Lighting - Goniophotometer

Goniophotometer Test Conditions

Temperature	Voltage	Current	Power	Power Factor	Frequency	Current THD
25.0 °C	120.1 VAC	5.479 A	653.9 W	0.994	60 Hz	6.73 %



Uniformity Data

Maximum PPFD	153.9 $\mu\text{mol}/\text{sec}/\text{m}^2$
Minimum PPFD	7.8 $\mu\text{mol}/\text{sec}/\text{m}^2$
Average PPFD	43.3 $\mu\text{mol}/\text{sec}/\text{m}^2$
Min/Max Ratio	0.05
Min/Ave Ratio	0.18



Horticultural Lighting - PPF [μmol/sec/m²]

Model tested: BLOOM

Test Height: 12"

92.4	179.9	295.5	343.4	368.4	327.7	271.7	146.1	81.4	2ft
150.5	327.9	545.5	657.8	661.1	668.9	541.5	298.5	120.2	1.5
197.8	438.1	827.6	974.1	972.3	965.4	760.4	386.3	178.3	1
219.7	488.5	889.2	1062.0	1045.0	981.5	793.6	446.7	202.6	0.5
207.7	419.4	842.4	1064.0	1051.0	1036.0	828.7	456.9	208.2	0
187.3	462.5	849.9	1061.0	1036.0	1043.0	875.8	470.2	205.3	0.5
150.9	347.8	653.9	818.5	810.6	809.9	659.9	379.4	173.2	1
89.5	210.2	338.0	566.4	529.8	533.4	404.0	251.3	122.0	1.5
54.1	101.1	158.5	202.4	209.8	199.8	171.4	110.1	58.3	2ft
2ft	1.5	1	0.5	0	0.5	1	1.5	2ft	

Maximum PPF: 1064.0 μmol/sec/m²

Minimum PPF: 54.1 μmol/sec/m²

Average PPF: 485.5 μmol/sec/m²

Uniformity (min/max): 0.05

Power: 660 W

Relative Spectral Power Distribution of Center Measurement

Wavelength Bands			PPF%	Radiometric Flux%
UV	250	400	NA	1.0%
Violet/Blue	400	500	12.6%	16.8%
Green/Yellow	500	580	39.7%	40.6%
Orange/Red	580	700	47.7%	40.0%
Far Red	700	780	NA	1.3%
IR	780	850	NA	0.4%



Horticultural Lighting - PPF [μmol/sec/m²]

Model tested: BLOOM

Test Height: 16"

116.7	195.2	292.3	352.4	363.8	347.0	274.3	170.8	102.4	2ft
172.6	313.7	468.8	573.8	566.2	521.2	425.6	273.4	155.3	1.5
231.4	424.0	655.6	788.4	801.7	763.1	614.5	379.5	197.1	1
237.2	454.8	713.6	877.6	898.7	848.4	667.9	412.4	231.2	0.5
248.6	499.0	755.5	902.9	919.3	871.2	706.6	448.6	244.2	0
212.0	437.5	701.0	865.0	881.4	837.6	679.7	421.5	233.0	0.5
168.6	339.7	549.4	683.5	707.5	703.9	573.3	368.8	192.3	1
131.2	252.5	377.9	481.4	463.7	430.4	359.2	250.5	142.0	1.5
77.2	132.3	212.0	249.2	265.7	240.0	201.4	144.4	88.2	2ft
2ft	1.5	1	0.5	0	0.5	1	1.5	2ft	

Maximum PPF: 919.3 μmol/sec/m²

Minimum PPF: 77.2 μmol/sec/m²

Average PPF: 438.7 μmol/sec/m²

Uniformity (min/max): 0.08

Power: 660 W

Relative Spectral Power Distribution of Center Measurement

Wavelength Bands			PPF%	Radiometric Flux%
UV	250	400	NA	1.0%
Violet/Blue	400	500	12.6%	16.8%
Green/Yellow	500	580	39.9%	40.7%
Orange/Red	580	700	47.6%	39.9%
Far Red	700	780	NA	1.2%
IR	780	850	NA	0.4%