



Report: 80110126 - 2
Project: 80110126
Client: Atreum Lighting

**PHOTOMETRIC TESTING & EVALUATION TO IES LM-79-19
HORTICULTURAL TEST RESULTS**

Sample Tested
H3200 (L+T)

Prepared for:

Atreum Lighting

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This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. The Results in this report relate only to the sample tested.

Program Description

Photometric and electrical testing of an “H3200 (L+T)” to IES LM-79-19.

Executive Summary

Sample Tested = **H3200 (L+T)**

Luminous Efficacy* (Lumens/Watt)	Luminous Flux* (Lumens)	Input Power* (Watts)	Power Factor*
163.64	52210.00	319.05	0.9980

Stabilization Time (Light & Power)
60 minutes

* The above results are recorded / derived from measurements made using a Goniophotometer.



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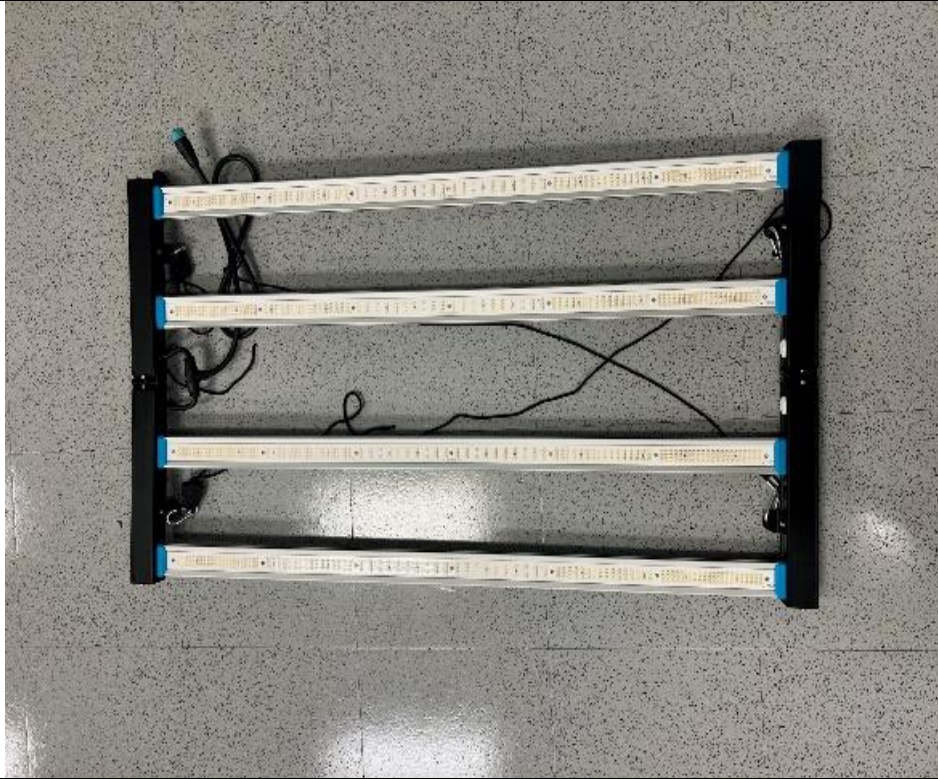
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Sample

The following sample was submitted for evaluation:

Atreum Lighting.: H3200 (L+T)

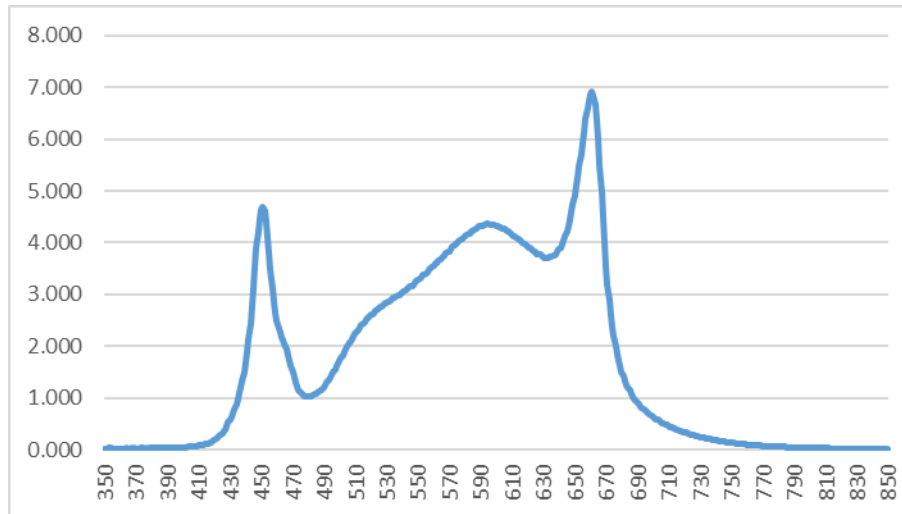


H3200 (L+T)



Test Results –	
The following results were measured after stabilization of the sample in the Goniophotometer (unless otherwise stated). Stability shall be achieved when the variation (Maximum to minimum) of at least three readings of the light output and electrical power consumption, taken at a maximum of 10-minute intervals over a period of 20 minutes and divided by the last of these measurements chronologically, is less than 0.5%.	
Key Photometric Results	Photosynthetic Photon Flux
	H3200 (L+T)
Total PPF 380-780nm (µmol/s)	850.10
Total PPF 400-780nm (µmol/s)	849.42
PPF 400-700nm (µmol/s)	830.49
Total Radiant Flux (W)	178.9
PPE 380-780nm (µmol/Joule)	2.66
PPE 400-780nm (µmol/Joule)	2.66
PPF 400-500nm (µmol/s)	140.75
PPF 500-600nm (µmol/s)	328.13
PPF 600-700nm (µmol/s)	361.61
	Far Red Photon Flux
PPF 400-800nm (µmol/s)	850.25
PF fr 700-800nm (µmol/s)	19.77
PF fr / PPF 400-800nm	2.32%
Electrical Input Results:	Sample Reference
	H3200 (L+T)
	Goniophotometer
Input Power (Watts)	319.05
Input Voltage (Volts AC)	120.05
Input Current (Amps)	2.6628
Input Frequency (Hertz)	60.0
Power Factor	0.9980
Additional Information	Sample Reference
	H3200 (L+T)
Ambient Temperature	25.1°C

Spectral Quantum Distribution-



Photon Flux (μmol/s)				
WL (nm)	50 nm BIN	100 nm bin	300 nm bin	Total Bin
350-399	1.41 0.2%			852.70 100%
400-449	44.81 5.3%	140.75	830.49	
450-499	95.93 11.3%	16.5%		
500-549	131.76 15.5%	328.13		
550-599	196.37 23.0%	38.5%		
600-649	201.19 23.6%	361.61	97.4%	
650-699	160.42 18.8%	42.4%		
700-749	16.14 1.9%	19.77		
750-799	3.63 0.4%	2.3%		
800-849	1.01 0.1%			



Photosynthetic Photon Intensity Distribution (PPID) (μmol)

Angles (Degree)	<u>0</u>	<u>5</u>	<u>10</u>	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>
0	272.97	272.97	272.97	272.97	272.97	272.97	272.97	272.97	272.97	272.97
5	270.59	270.7	270.81	271.05	271.28	271.25	271.21	271.22	271.23	271.51
10	267.07	267.45	267.82	267.78	267.74	267.99	268.23	268.13	268.02	268.25
15	262.07	262.32	262.56	262.63	262.69	262.66	262.62	262.9	263.18	263.23
20	255.02	255.37	255.72	255.59	255.45	255.35	255.24	255.57	255.89	255.91
25	245.71	246.23	246.75	246.49	246.22	246.36	246.49	246.71	246.93	246.85
30	235.39	235.55	235.7	235.79	235.88	235.42	234.96	235.56	236.15	236.02
35	222.99	223.18	223.37	223.14	222.91	222.79	222.67	222.76	222.85	222.85
40	209	208.79	208.57	208.66	208.75	208.17	207.58	207.81	208.04	208.05
45	191.84	192.15	192.46	192.18	191.9	191.71	191.52	191.49	191.46	191.37
50	174.08	174.06	174.03	173.76	173.49	173.3	173.11	173.19	173.27	173.19
55	153.85	153.75	153.65	153.44	153.22	152.97	152.72	152.95	153.17	152.76
60	132.07	131.87	131.67	131.6	131.52	131.09	130.65	130.75	130.84	130.75
65	108.96	108.62	108.27	108.07	107.87	107.7	107.53	107.58	107.62	107.32
70	83.97	83.86	83.75	83.54	83.32	82.97	82.62	82.58	82.53	82.11
75	57.79	57.79	57.79	57.69	57.58	57.82	58.06	57.74	57.41	57.33
80	31.76	32.11	32.45	32.68	32.9	32.56	32.21	32.26	32.31	32.27
85	11.45	11.74	12.03	12.13	12.23	11.69	11.14	9.69	8.24	6.87
90	0.67	0.68	0.68	0.67	0.66	0.64	0.62	0.7	0.78	0.69

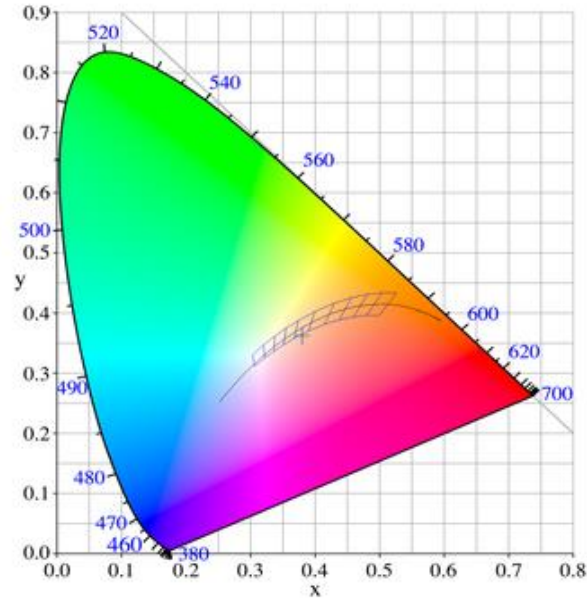


**Vertical
Angles**

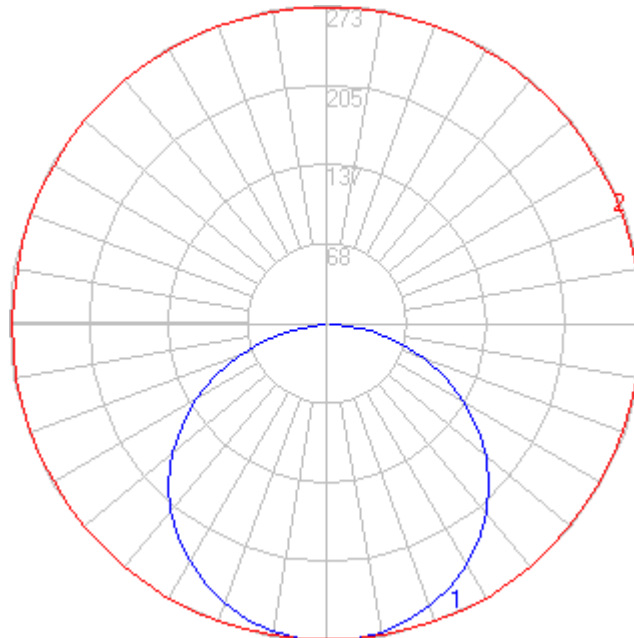
Horizontal Angles

	50	55	60	65	70	75	80	85	90
0	272.97	272.97	272.97	272.97	272.97	272.97	272.97	272.97	272.97
5	271.78	272.05	272.32	272.13	271.94	271.87	271.8	271.9	271.99
10	268.47	268.74	269	268.94	268.87	268.59	268.31	268.5	268.69
15	263.27	263.32	263.36	263.41	263.45	263.17	262.88	262.96	263.04
20	255.92	255.99	256.06	255.88	255.7	255.71	255.72	255.96	256.19
25	246.76	246.88	246.99	246.83	246.67	246.48	246.29	246.5	246.7
30	235.88	235.78	235.68	235.35	235.01	235.26	235.5	235.57	235.64
35	222.85	222.9	222.95	222.62	222.29	222.46	222.62	222.8	222.97
40	208.06	208.04	208.02	207.68	207.33	207.66	207.99	207.91	207.83
45	191.28	191.17	191.06	191.01	190.95	190.95	190.95	190.91	190.86
50	173.11	172.73	172.35	172.34	172.32	172.28	172.24	172.31	172.37
55	152.34	152.28	152.21	151.86	151.5	151.8	152.1	152.12	152.13
60	130.66	130.31	129.96	129.84	129.71	129.9	130.09	129.97	129.85
65	107.01	106.65	106.28	105.97	105.66	105.53	105.4	105.43	105.46
70	81.69	81.37	81.04	80.79	80.53	80.11	79.68	79.25	78.82
75	57.25	56.82	56.38	55.81	55.23	54.69	54.14	53.96	53.77
80	32.23	32.04	31.84	30.93	30.01	28.99	27.97	27.77	27.57
85	5.5	4.8	4.1	3.58	3.05	2.92	2.79	2.73	2.66
90	0.6	0.95	1.29	0.97	0.64	0.68	0.71	0.66	0.61

Diagrams



CIE 1931 Chromaticity Diagram



Photosynthetic Photo Intensity Distribution

#1 Vertical Plane through Horizontal Angles (0-180) (Blue)

#2 Horizontal Cone through Vertical Angle (0) (Red)

Photometric Testing Information

The sample was evaluated for photometric and electrical characteristics using a goniophotometer, located in purpose-built, temperature and humidity-controlled, draft free environments.

Luminaire Stabilization.

The results were measured after stabilization of the sample in the Goniophotometer (unless otherwise stated). Stability shall be achieved when the variation (Maximum to minimum) of at least three readings of the light output and electrical power consumption, taken at a maximum of 10-minute intervals over a period of 20 minutes and divided by the last of these measurements chronologically, is less than 0.5%.

The goniophotometer Mayer Engineering Type C is calibrated using a frosted tungsten filament FDS/DZE lamp with the following specifications:

Manufacturer: GE
Part Number: DZE 88
Bulb Number: 114-A
Voltage: 16.59 Volts DC reference
Calibration Current: 4.810 Amperes
Luminous Intensity: 154.7 Candelas
Calibration Date: 7/12/12 (NIST traceable)

Manufacturer: GE
Part Number: DZE 88
Bulb Number: 114-B
Voltage: 16.61 Volts DC reference
Calibration Current: 4.819 Amperes
Luminous Intensity: 150.6 Candelas
Calibration Date: 7/12/12(NIST traceable)

Manufacturer: GE
Part Number: DZE 88
Bulb Number: 114-C
Voltage: 16.66 Volts DC reference
Calibration Current: 4.815 Amperes
Luminous Intensity: 155.4 Candelas
Calibration Date: 7/12/12 (NIST traceable)

A *Yokogawa WT210 Power Analyzer* was used to measure all electrical characteristics of the sample.



Accreditation Information:

CSA is accredited to IESNA LM79-19 by:
 National Voluntary Laboratory Accreditation Program (NVLAP)
 200732-0

Equipment List: Goniophotometer Type C (Mirror 2)

Description	Manufacturer and Model Number	CSA Instrument Reference Number	Calibration Due Date
Optometer	Gigahertz Optik P9801	N/A	N/A
Miniature Spectrometer	Ocean Insight OCEANFX	N/A	N/A
Regulated Power Supply	Chroma Instruments 61602P-80-60	DCP401	N/A
Regulated Power Supply	Chroma Instruments 61602	DCP301	N/A
Power Analyzer	Yokogawa WT310E	POA405	9/2022

Equipment List: Sphere D Equipment

Description	Manufacturer and Model Number	CSA Instrument Reference Number	Calibration Due Date
Integrating Sphere 109"	Labsphere LMS760	SPH400	N/A
Spectroradiometer	Labsphere CDS1100	N/A	N/A
Auxiliary Lamp PSU	Labsphere LPS100	LPS100	N/A
Power Analyzer	Yokogawa WT210	PA108	6/2022
Regulated Power Supply	Chroma Instruments 61603	N/A	N/A

All equipment is calibrated to ISO / IEC 17025-2017 guidelines.