Product Evaluation Report - Integrated Photon Flux

Method: LM-79:2019

Test results reported for:
LED board
Product Description: NA

Issued Report:
ATRG002-012

Original issue date:
Thursday, February 20, 2020

Revision Issue Date:
Wednesday, February 26, 2020

Prepared for:
Atreum Lighting

Testing performed by:
CSA Group
14833 NE 87th St
Redmond, WA 98052
425-605-8500
www.csagroupseattle.org/

Test report prepared by:

Marius Timbus

Marius Timbus
Test Technician
Test & Measurement Services

Test report approved by:

Aaron Miller

Aaron Miller
Laboratory Manager
Test & Measurement Services

TABLE OF CONTENTS

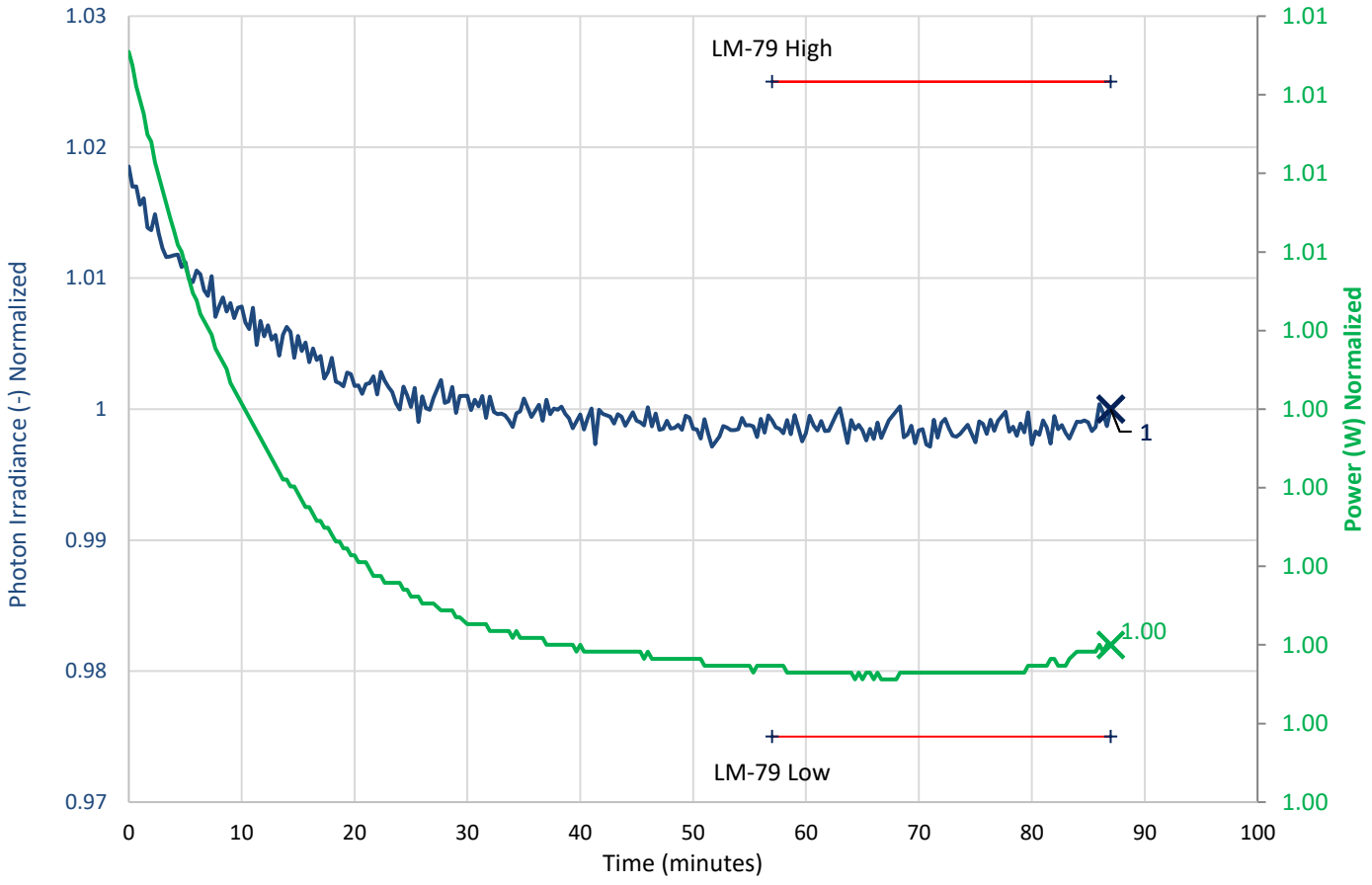
CSA Group
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org

RADIOMETRIC STABILIZATION

Stabilization Description - A series of 247 measurements are recorded during the stabilization period. The final stabilized measurement, as defined by LM-79:2019, is reported after 87 minutes of device runtime.

% of range	Irradiance (-) Normalized	Measurements in Range
99.714%	1.00	6
99.746%	1.00	5
99.779%	1.00	10
99.811%	1.00	14
99.844%	1.00	14
99.876%	1.00	11
99.909%	1.00	11
99.941%	1.00	5
99.974%	1.00	4
100.006%	1.00	3
100.000%	1.00	Reported

% of range	Power (W) Normalized	Measurements in Range
99.939%	1.00	0
99.945%	1.00	0
99.951%	1.00	6
99.957%	1.00	0
99.963%	1.00	51
99.969%	1.00	13
99.975%	1.00	0
99.982%	1.00	3
99.988%	1.00	7
99.994%	1.00	3
100.000%	1.00	Reported



CSA Group
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org

Product Evaluation Report - Integrated Photon Flux

Manufacturer: LED board
Product Description: NA
Report Number: ATRG002-012
Release Date: 2/20/2020

HORTICULTURE SUMMARY

Photosynthetic Photon Flux µmol/s				
WL (nm)	50 nm BIN	100 nm bin	300 nm bin	Total Bin
400-450	13.74	42.87	297.10	305.70
450-500	30.23			
500-550	49.82	131.83		
550-600	83.25			
600-650	85.29	125.02		
650-700	41.07			
700-750	7.34	8.89		
750-800	1.61			

	Value	*units*	*Description*
[1]**Photosynthetic Photon Flux:**	297	µmol/s	(400 - 700nm)
PPF Efficacy :	2.607	µmol/joule	(PPF/Active Power)
Photon Flux:	304.1	µmol/s	(350 - 1000nm)
Photon Efficacy :	2.668	µmol/joule	(Photon Flux/Active Power)
Total Intergated YPF (µmol/s):	266.7	µmol/s	(Yeild Photon Flux)
[2]**YPF Efficacy:**	2.340	µmol/joule	(Total Integrated YPF/Active Power)
Photosynthetically Active Yeild Efficiency :	89.76	%	(YPF/PPF)

NOTE 1: Photosynthetic Photon Flux: weighted equally by wavelength and summed between 400nm and 700nm.
NOTE 2: Yield Photon Flux: PPF weighted by action spectrum (average of 20 plant species as defined by McCree) and summed between 350nm and 750nm. (See Spectrum)

Electrical Performance

Voltage:	49.0	V
Current:	2.3	A
Frequency:	-	Hz
Power:	114.0	W
Apparent Power:	-	W
Power Factor:	-	cos θ

THD Voltage:	-	%
THD Current:	-	%

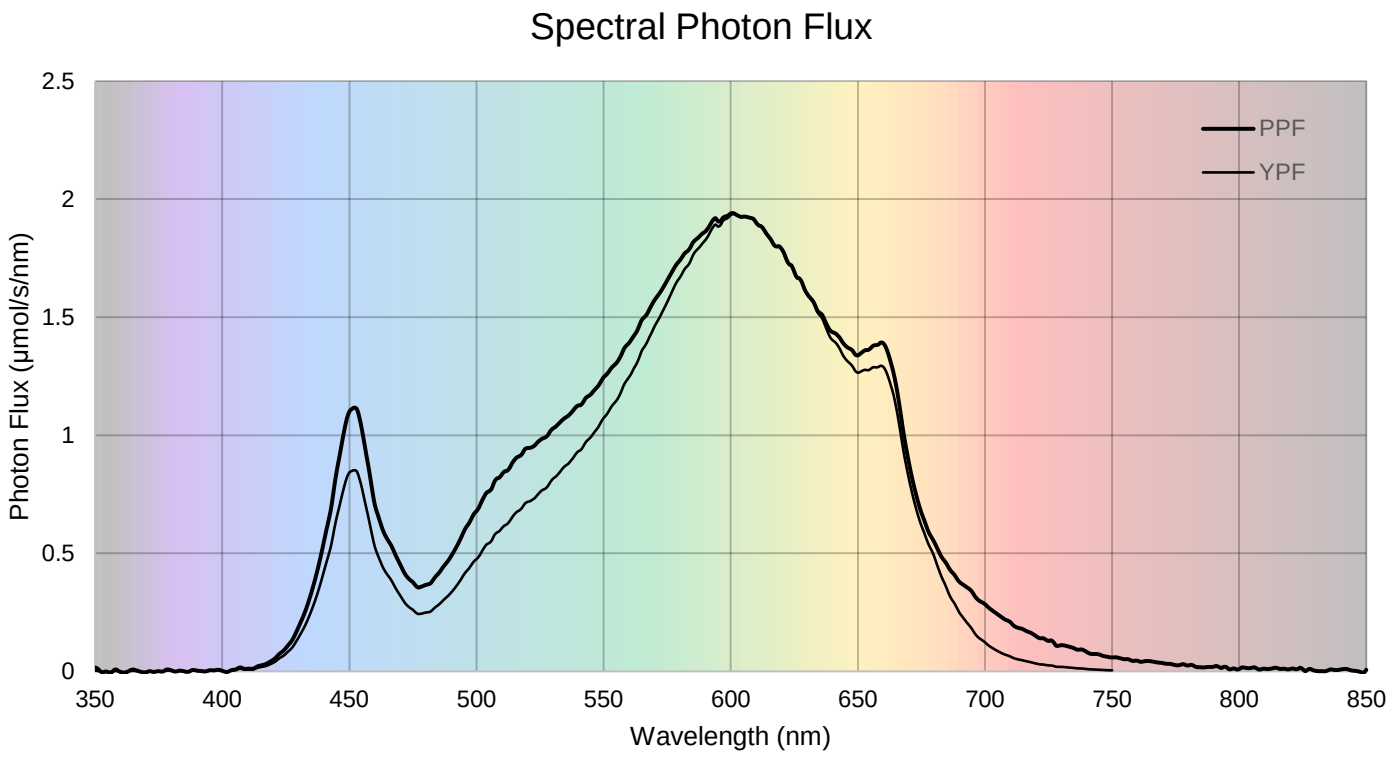
Thermal Performance

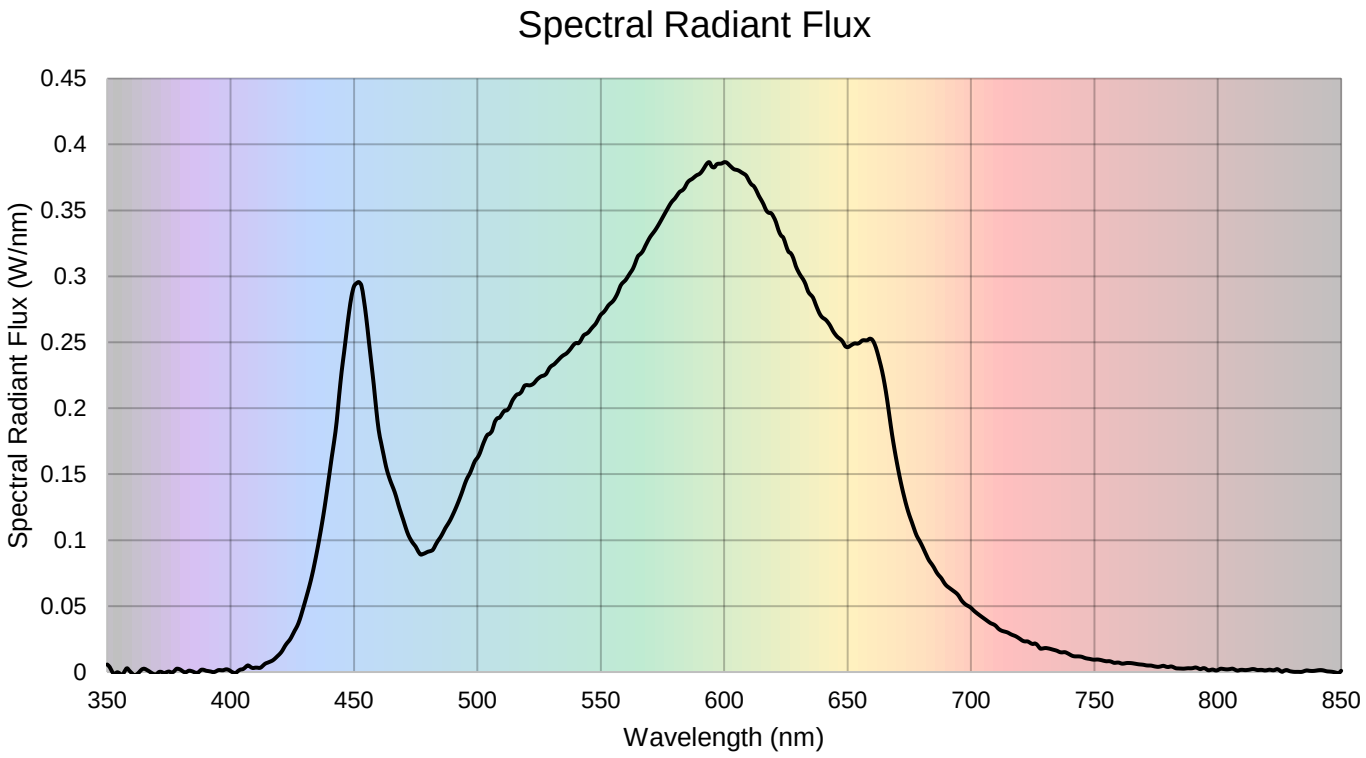
Ambient Temperature:	25.0	°C

CSA Group
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org

Manufacturer: LED board
Product Description: NA
Report Number: ATRG002-012
Release Date: 2/20/2020

SPECTRAL PHOTON FLUX

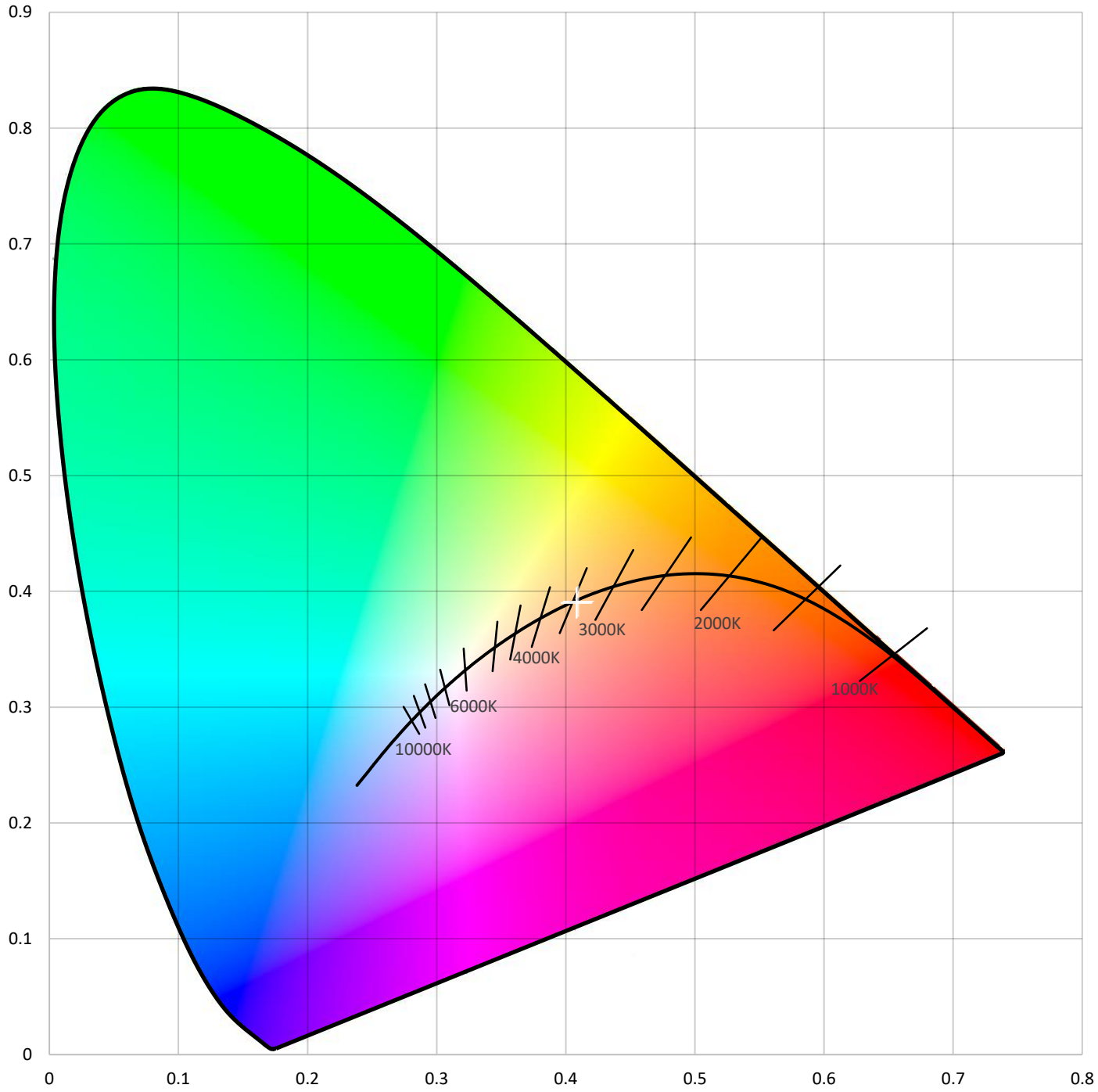




CSA Group
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org

Manufacturer: LED board
Product Description: NA
Report Number: ATRG002-012
Release Date: 2/20/2020

CIE 1931

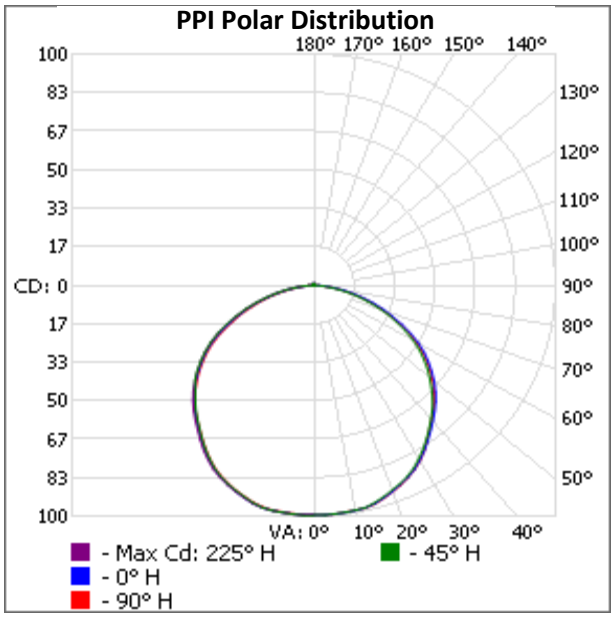


CSA Group
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org

Product Evaluation Report - Integrated Photon Flux

Manufacturer: LED board
Report Number: ATRG002-012
Product Description: NA
Release Date: 2/20/2020

PHOTOSYNTHETIC PHOTON INTENSITY



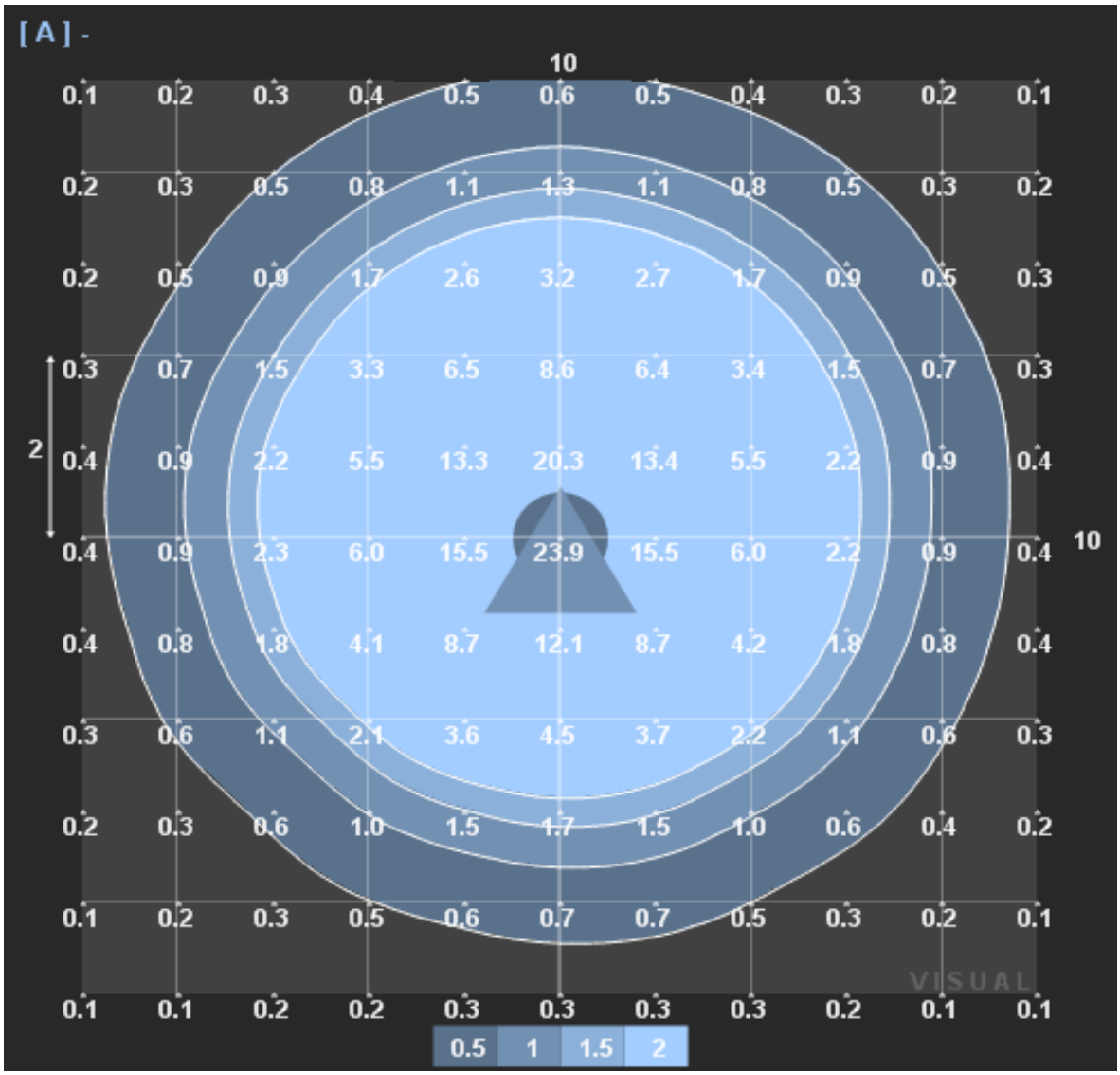
ZONAL PPF SUMMARY

Zonal PPF Summary		
Zone	µmol/s	% Luminaire
0-30	79.1	26.60%
0-40	129.9	43.70%
0-60	233.7	78.70%
60-90	63.1	21.30%
70-100	25.2	8.50%
90-120	0	0.00%
0-90	296.9	99.90%
90-180	0.2	0.10%
0-180	297.1	100.00%

PPF Per Zone			PPF Per Zone		
Zone	µmol/s	% Total	Zone	µmol/s	% Total
0-10	9.5	3.2%	90-100	0	0.0%
10-20	27.5	9.3%	100-110	0	0.0%
20-30	42.1	14.2%	110-120	0	0.0%
30-40	50.8	17.1%	120-130	0	0.0%
40-50	53.8	18.1%	130-140	0	0.0%
50-60	50.1	16.9%	140-150	0	0.0%
60-70	38	12.8%	150-160	0	0.0%
70-80	20.5	6.9%	160-170	0	0.0%
80-90	4.7	1.6%	170-180	0	0.0%

CSA Group
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org

PPFD at 24"



* grid: 10 x 10Ft
**units in µmol/m²/s

CSA Group
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org

Manufacturer: LED board
Report Number: ATRG002-012
Product Description: NA
Release Date: 2/20/2020

EQUIPMENT

Item	Description/use	Manufacturer	Model	Serial #	Calibration Due
Spectrometer	Spectrum	Orb Optronix	SP-100	2913927	10/29/2020
Power Supply	DUT power supply	Chroma	31015	QT3101500128	-
Type C Goniometer	Light Distribution	Orb Optronix		GONI003	at use
Power Meter	Luminous Intensity	Newport	2936-R	18963	-
Power Analyzer	DUT electrical meas.	Yokogawa	WT210	91L137852	8/16/2020

CSA Group
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org

REVISION HISTORY

REVISION	DATE	APPROVED	DESCRIPTION OF REVISION
010	2/20/2020	ACM	⓪ORIGINAL
011	2/24/2020	ACM	①Page 4: Corrected calculation error (YPF/PPF) from 111.40 to 89.76
012	2/26/2020	ACM	①Removed Contact information on cover page at Customer Request
013			
014			
015			
016			
017			
018			

END OF REPORT

CSA Group
14833 NE 87th St, Redmond, WA 98052
425-605-8500
www.csagroupseattle.org