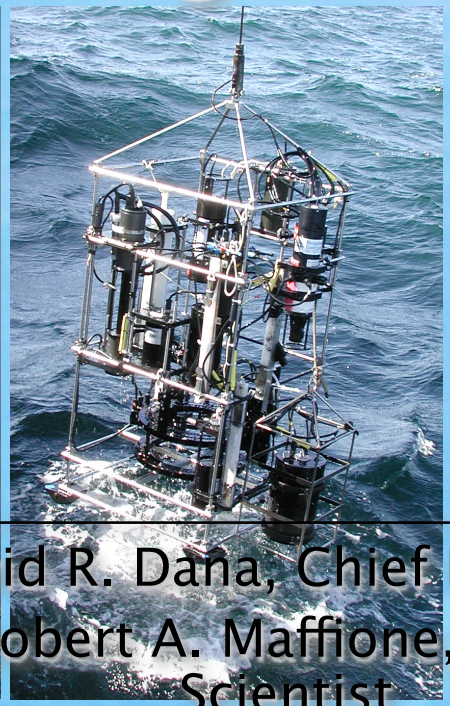
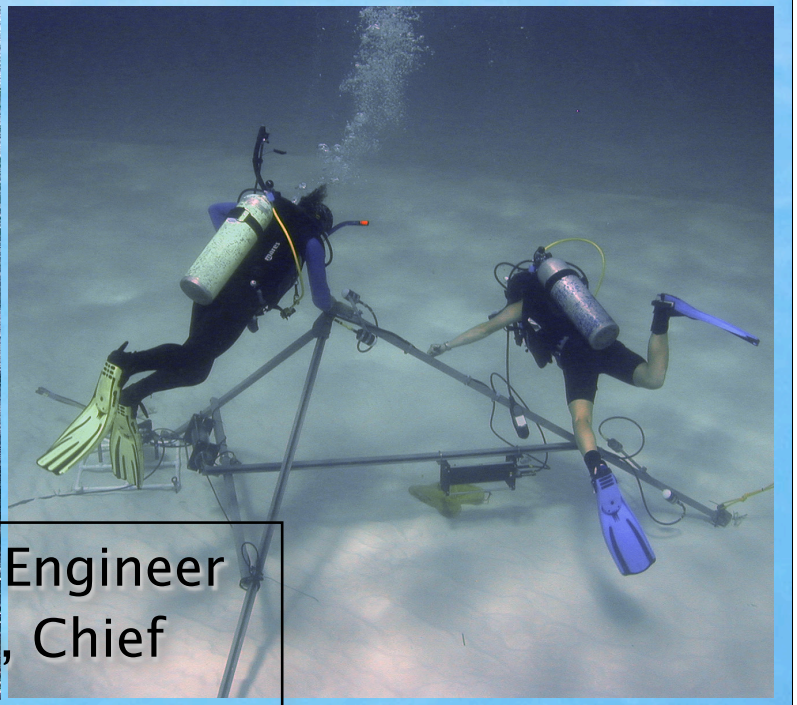
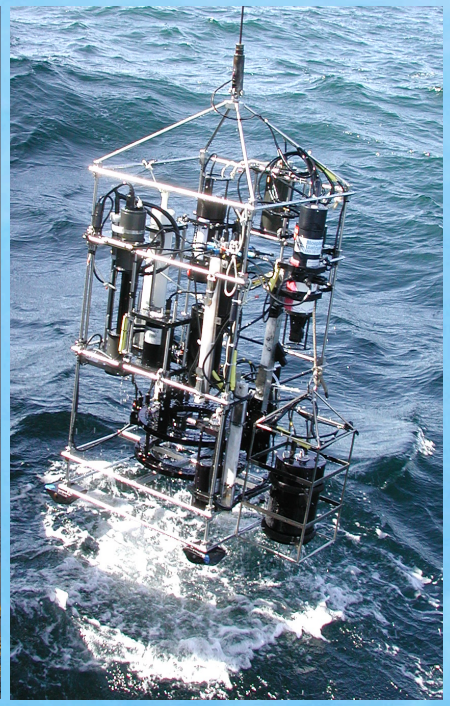
Hyperspectral AOP Processing at HOBI Labs

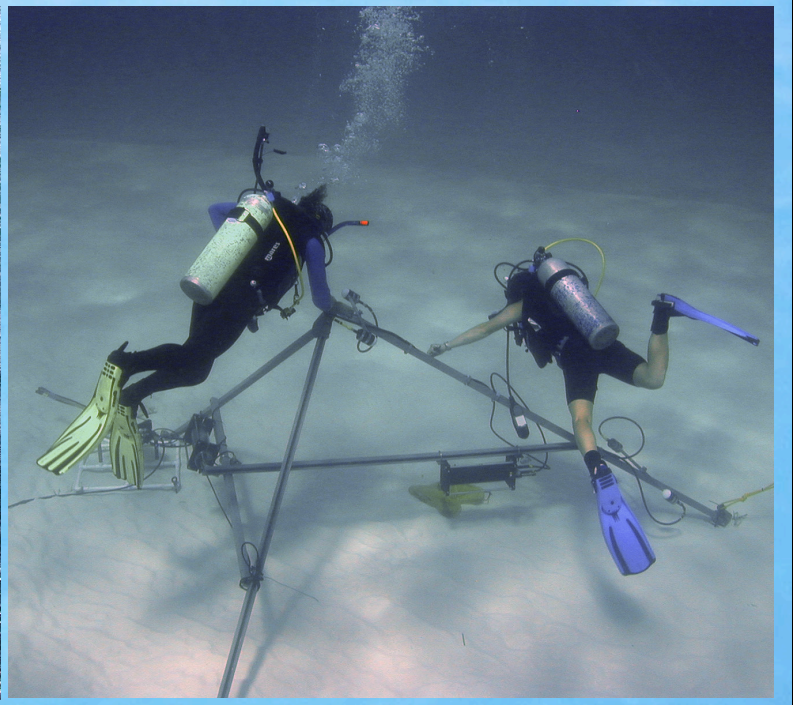




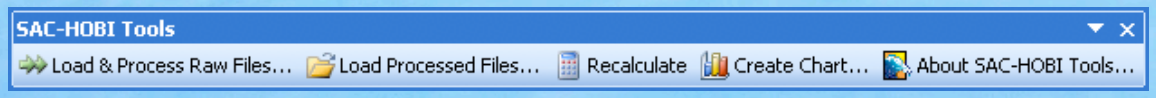
David R. Dana, Chief Engineer
Robert A. Maffione, Chief Scientist

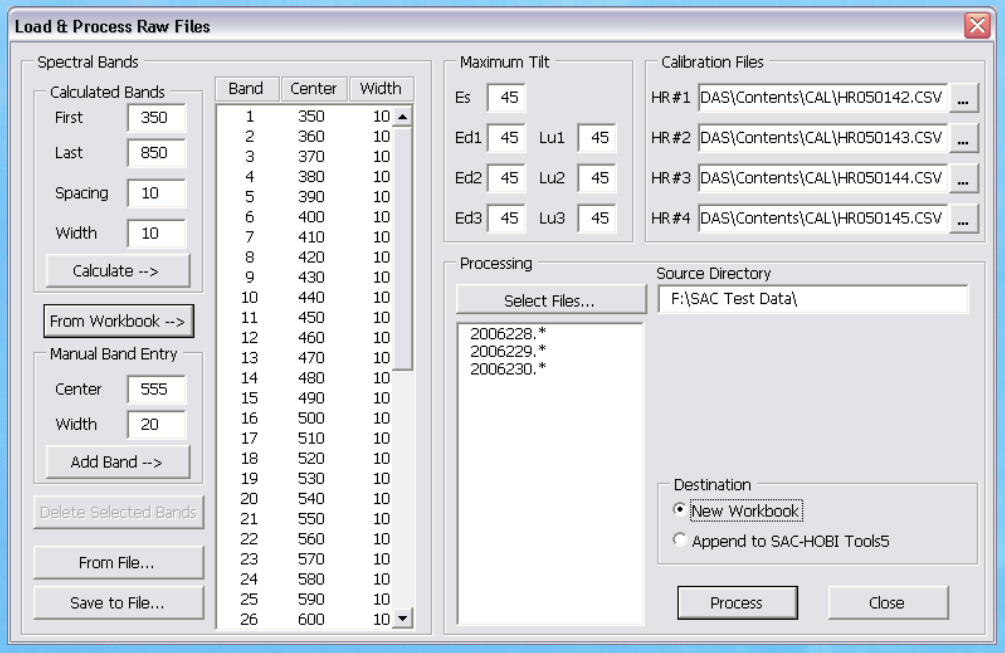
Hyperspectral AOP Processing at HOBI Labs



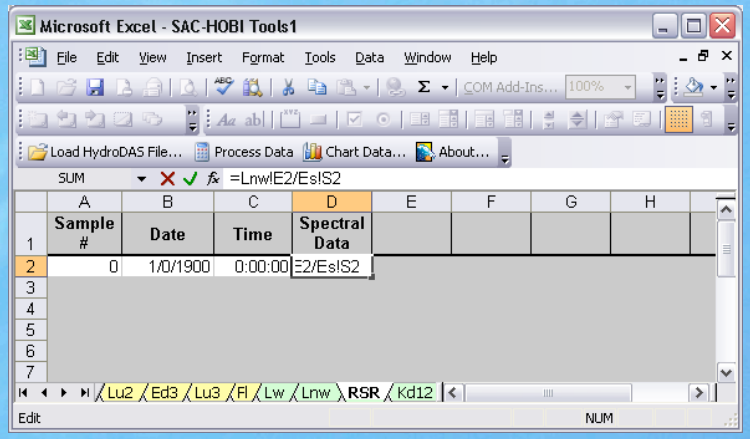


Custom Processing Software



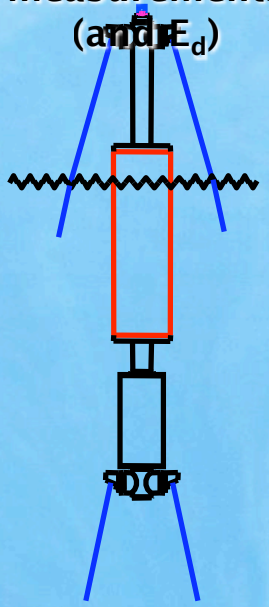


Sample #	Date	Time	Spectrum Count	QC Flags	Integ. Time
323	8/18/2006	9:06:29	1	High	4314
324	8/18/2006	9:09:23	2	High	3375
325	8/18/2006	11:29:23	8		134

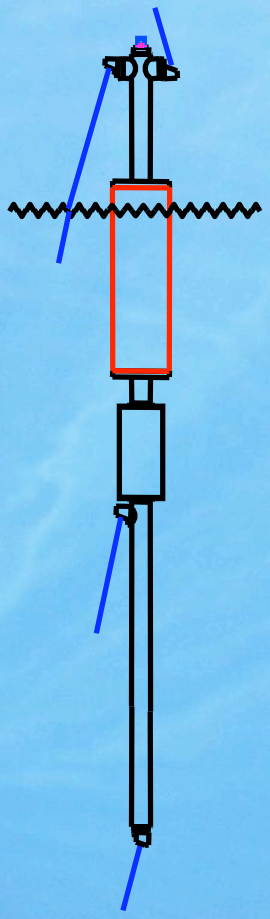


WALRUS
(WAter-Leaving Radiance Unison Spectrometer)

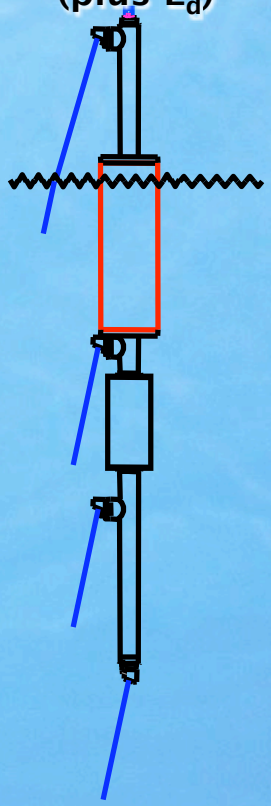
Multiple, redundant L_u measurements (and E_d)



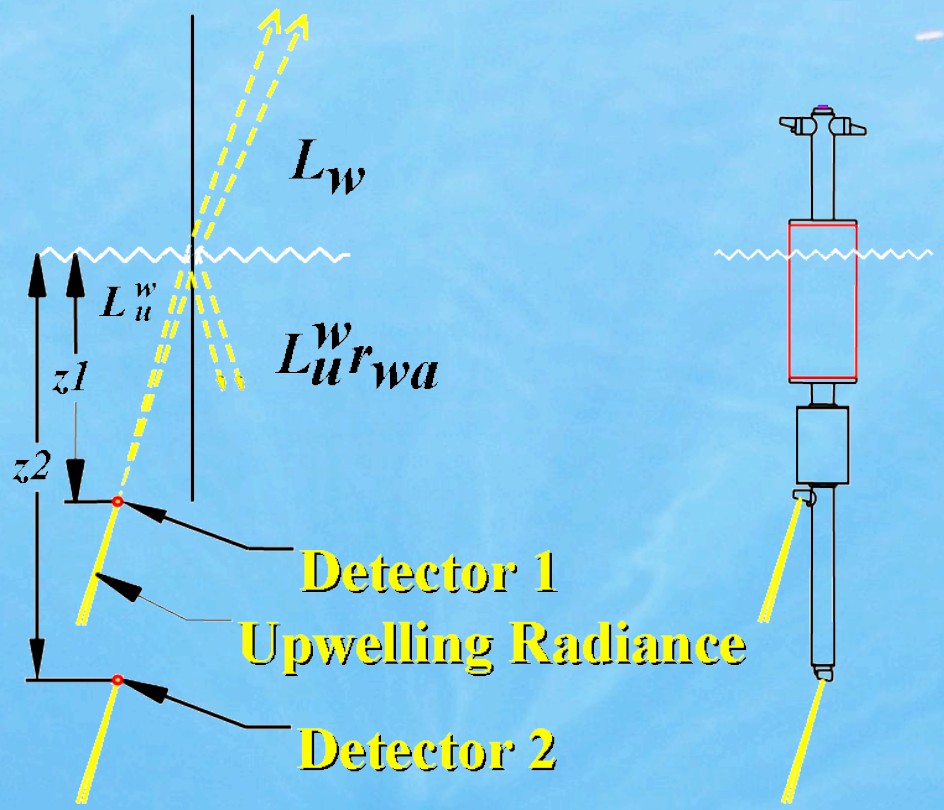
E_d, L_d & K_{Lu} Measurements



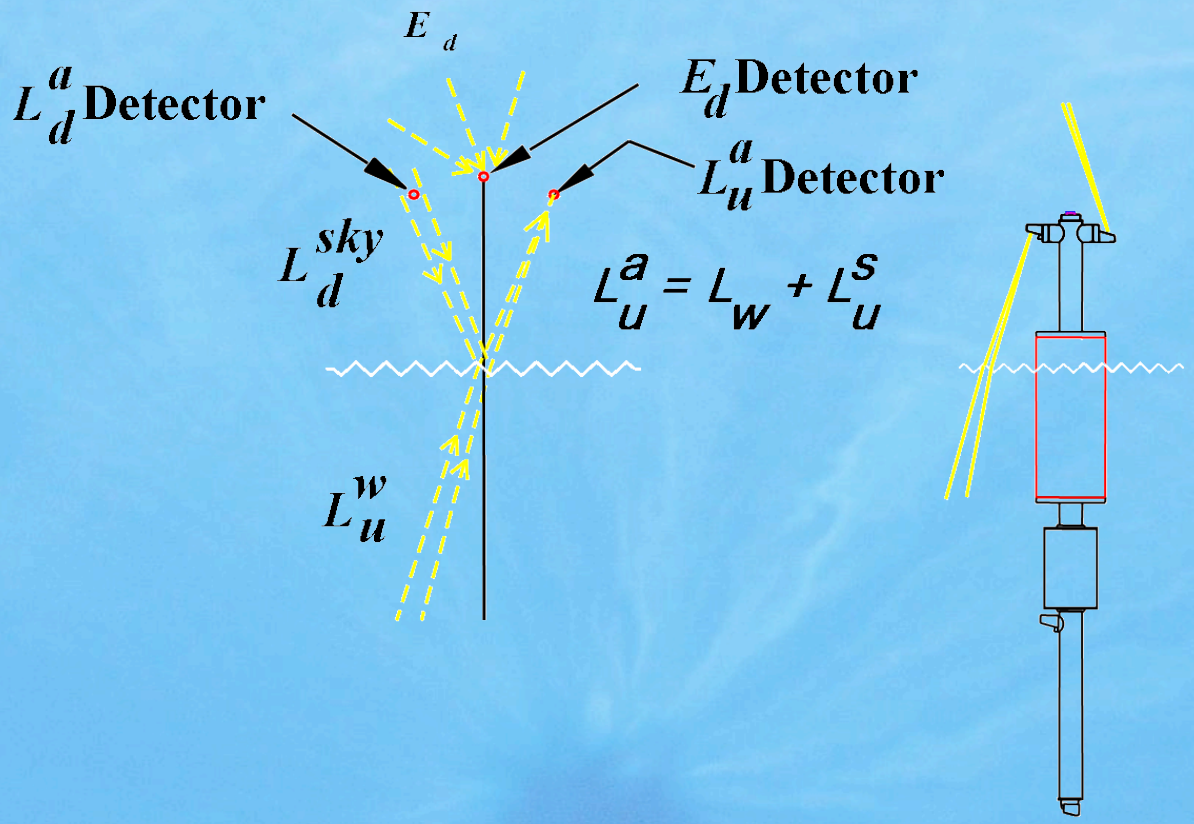
L_u at three depths for K_{Lu} determination (plus E_d)



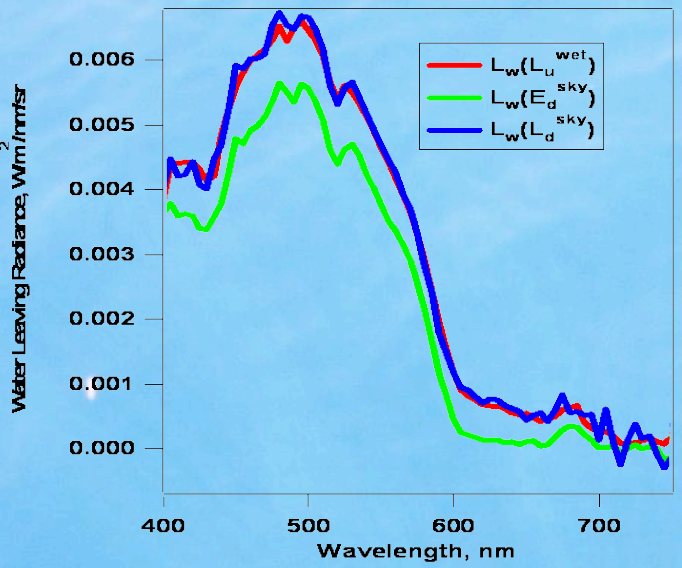
L_w Measured Below Surface

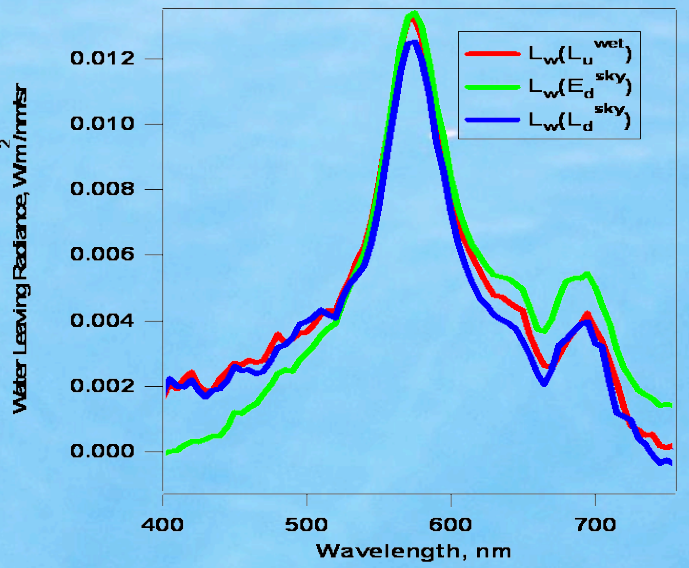


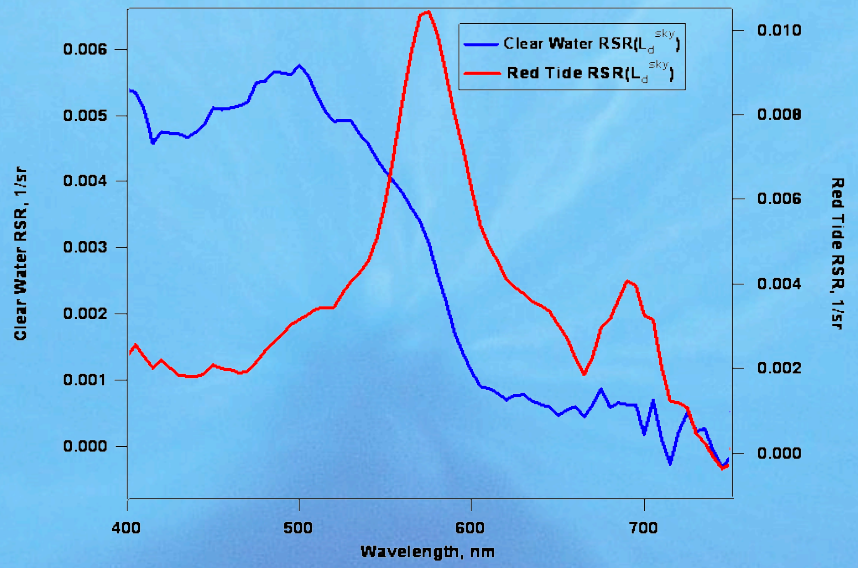
L_w Measured Above Water



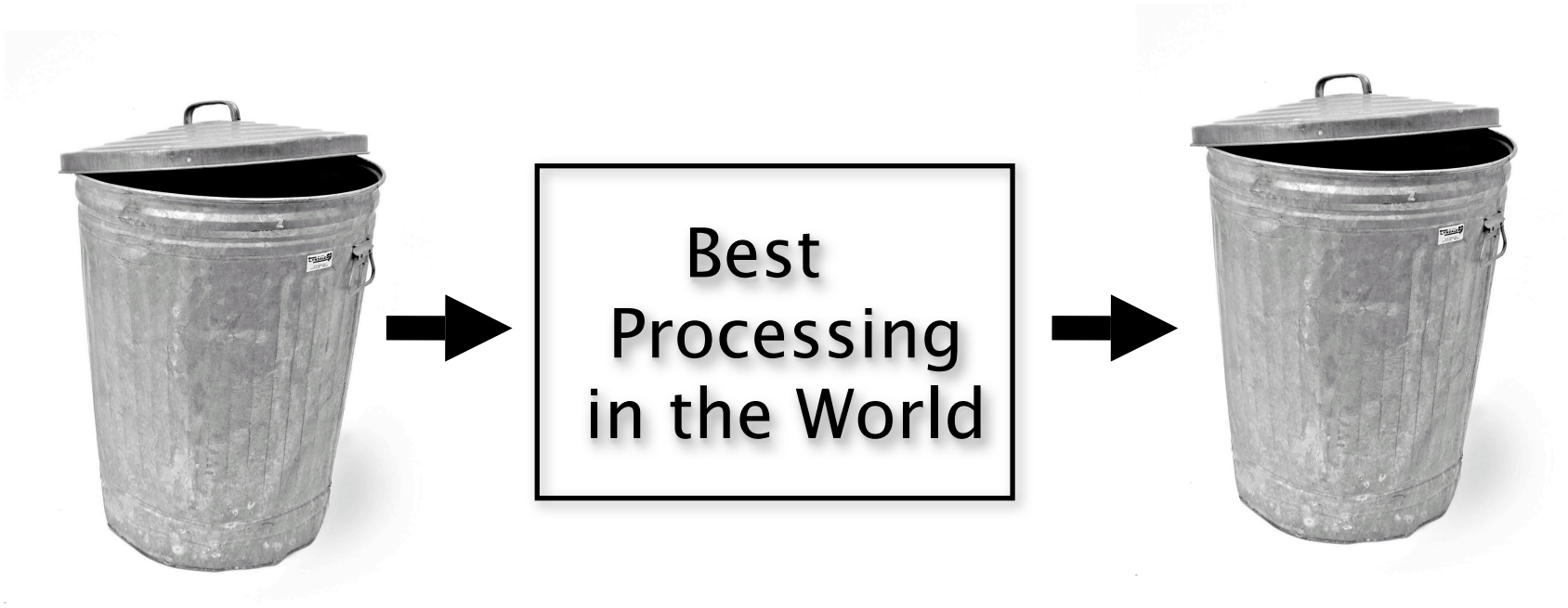
WALRUS Data


Water Leaving Radiance, W/m²/nm/sr
0.006
0.005
0.004
0.003
0.002
0.001
0.000
400
500
600
700
Wavelength, nm
$L_w(L_u^{wet})$
$L_w(E_d^{sky})$
$L_w(L_d^{sky})$

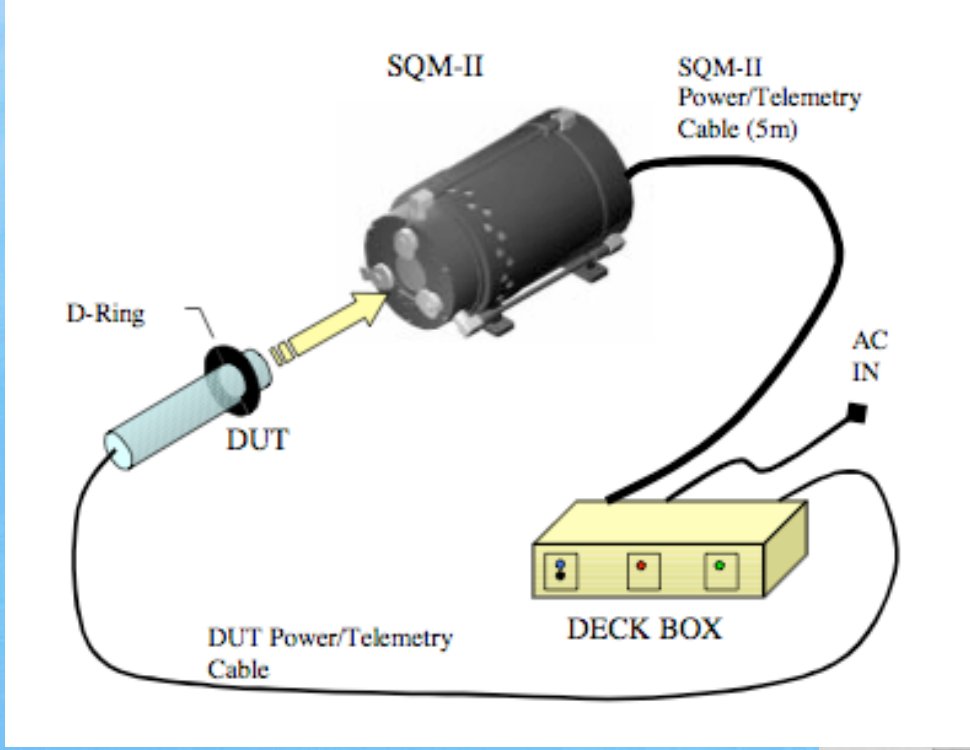

Water Leaving Radiance, W/m²/nm/sr
0.012
0.010
0.008
0.006
0.004
0.002
0.000
400
500
600
700
Wavelength, nm
$L_w(L_u^{wet})$
$L_w(E_d^{sky})$
$L_w(L_d^{sky})$

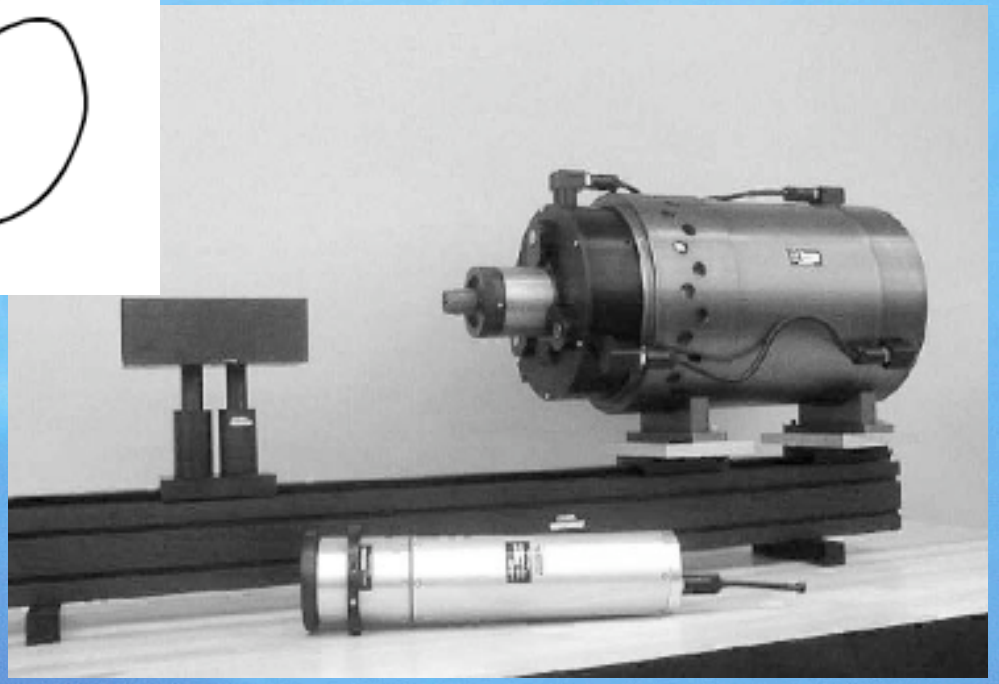

Clear Water RSR, 1/sr
Red Tide RSR, 1/sr
0.006
0.005
0.004
0.003
0.002
0.001
0.000
0.010
0.008
0.006
0.004
0.002
0.000
400
500
600
700
Wavelength, nm
Clear Water RSR(L_d^{sky})
Red Tide RSR(L_d^{sky})

What about Measurement Quality?



SeaWIFs Quality Monitor (SQM)



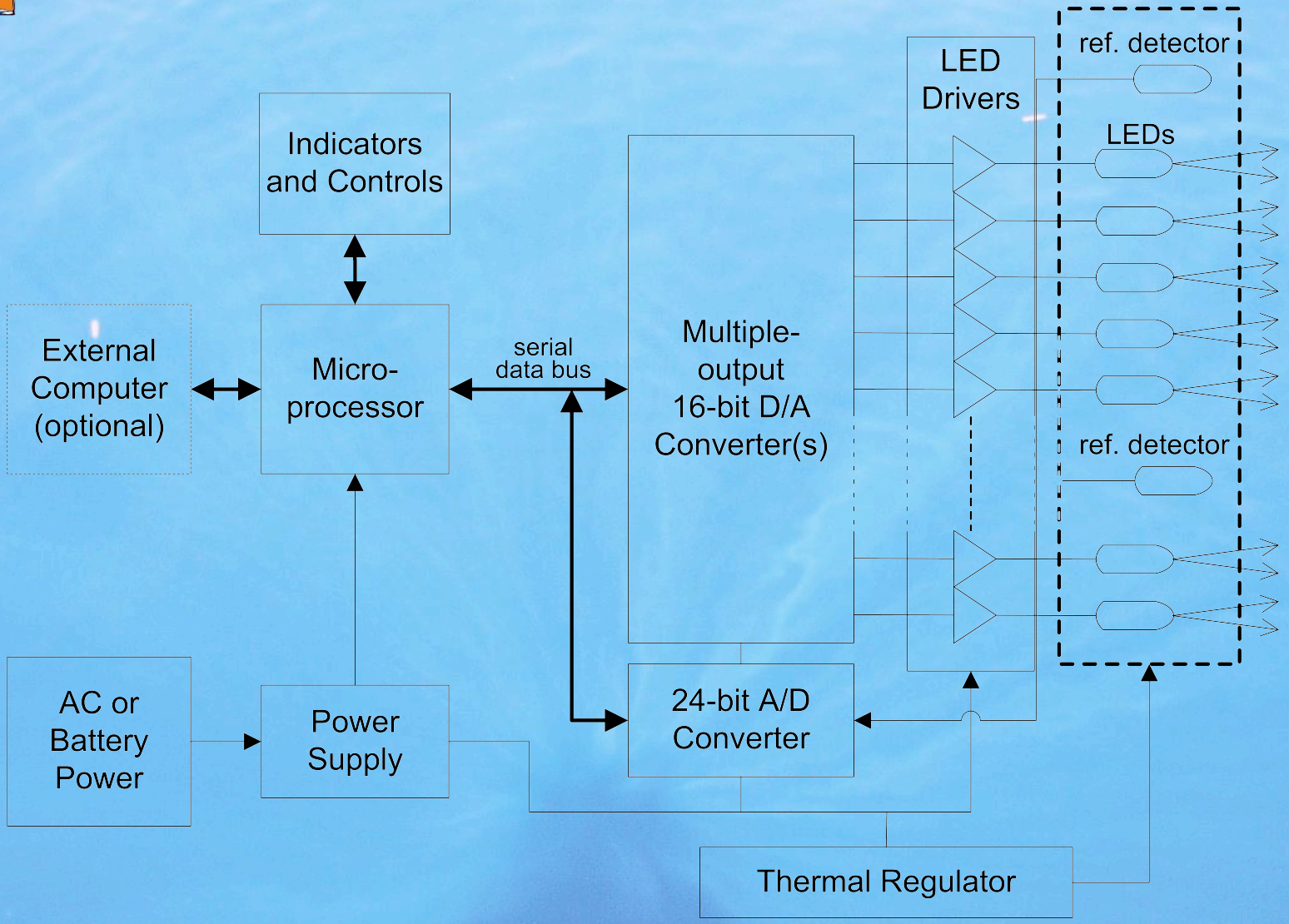


Illustrations from Satlantic SQM-II User's Manual

Portable Universal Radiometer Light Source (PURLS)

LED Array

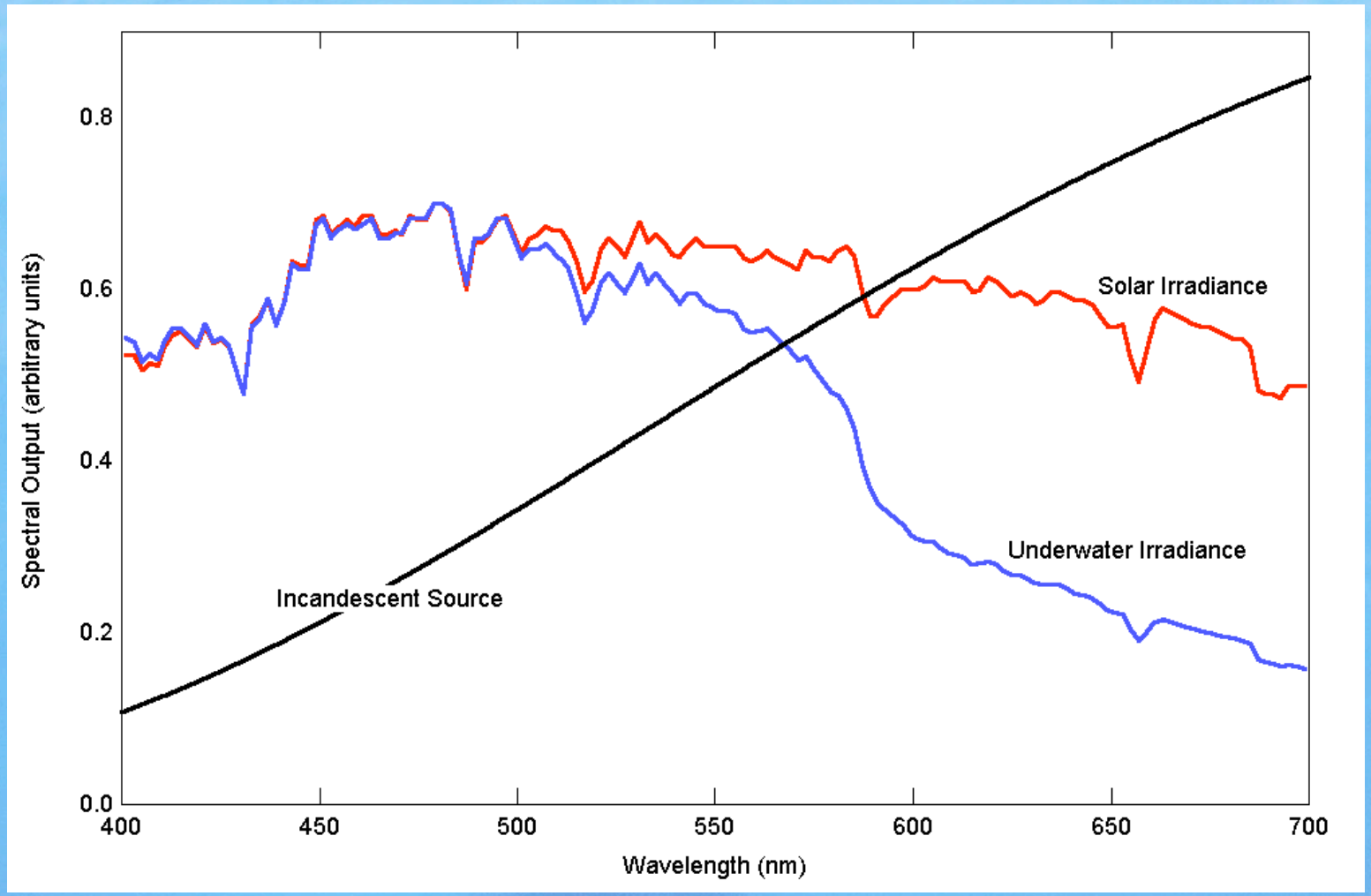
Electronic Architecture



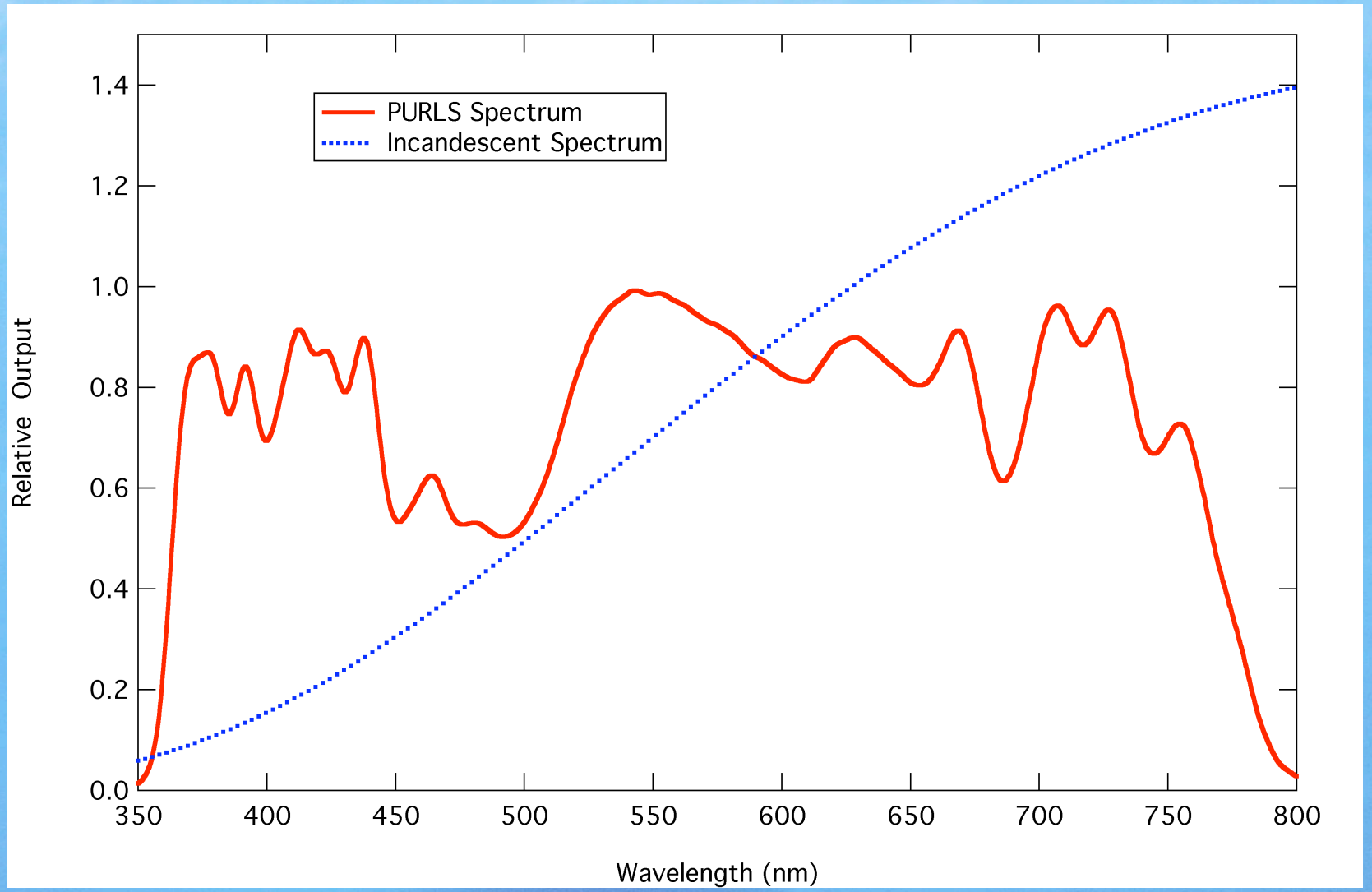
Comparison between SQM-II and PURLS

	SQM-II	PURLS
Weight	30 kg, not including optical mounts or shipping containers	10 kg shipping weight
Size & Configuration	Light source: 50 x 35 x 30 cm Power supply: 48 x 40 x 14 cm	Single unit integrated into shipping case: 45 x 41 x 30 cm
Power Consumption	Up to 600W	30W
Spectral Control	Incandescent spectrum, switchable bulb banks	Programmable spectrum, electronically controlled
Warmup Time	>1 hour	10 minutes
Stability	0.4% over 24 hours	0.1% over 7 days
Cost	Approx. $40k	Approx. $10k

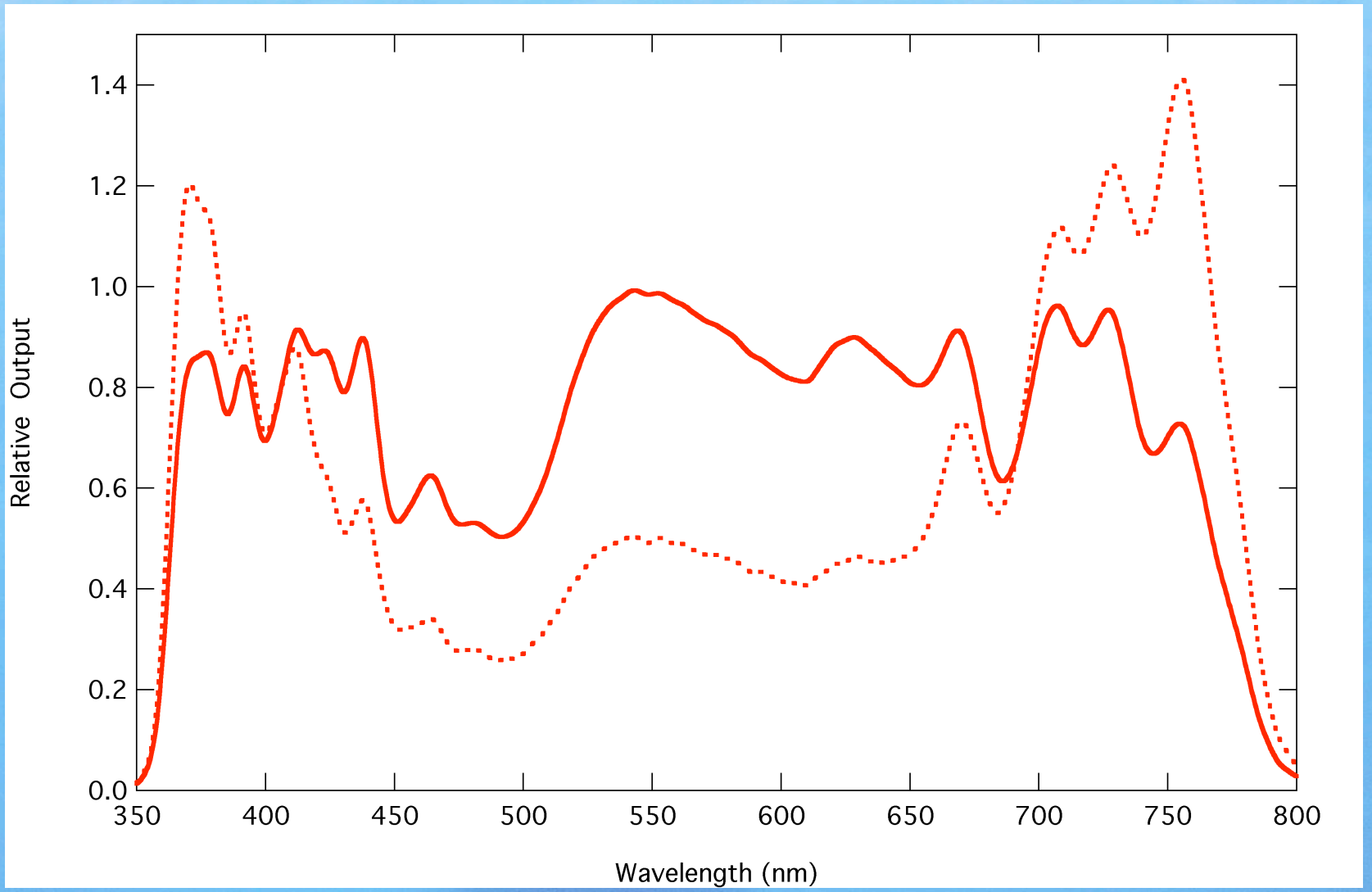
Incandescent Spectrum Mismatch



PURLS Spectral Balance

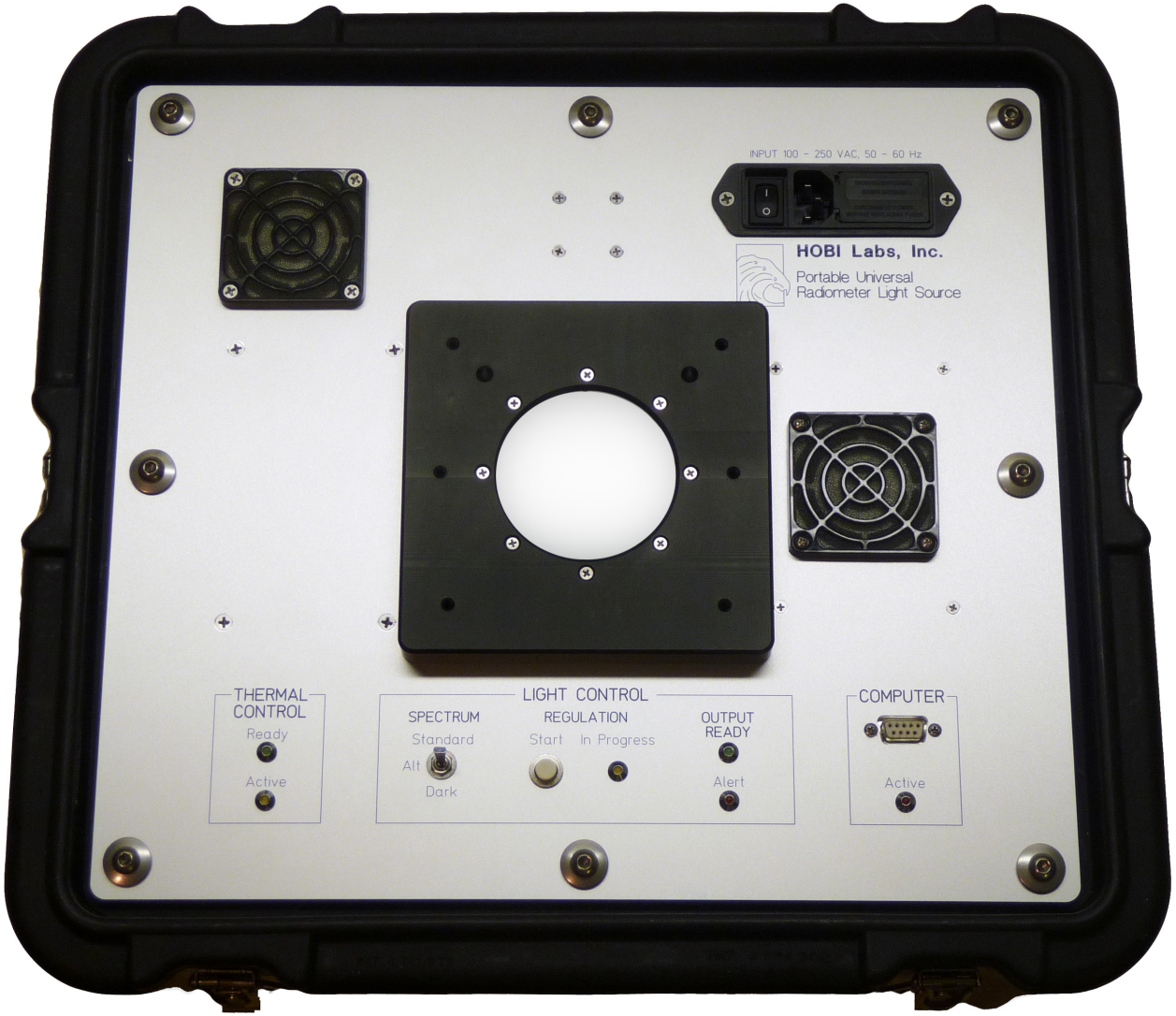


PURLS Spectral Adjustment Capability

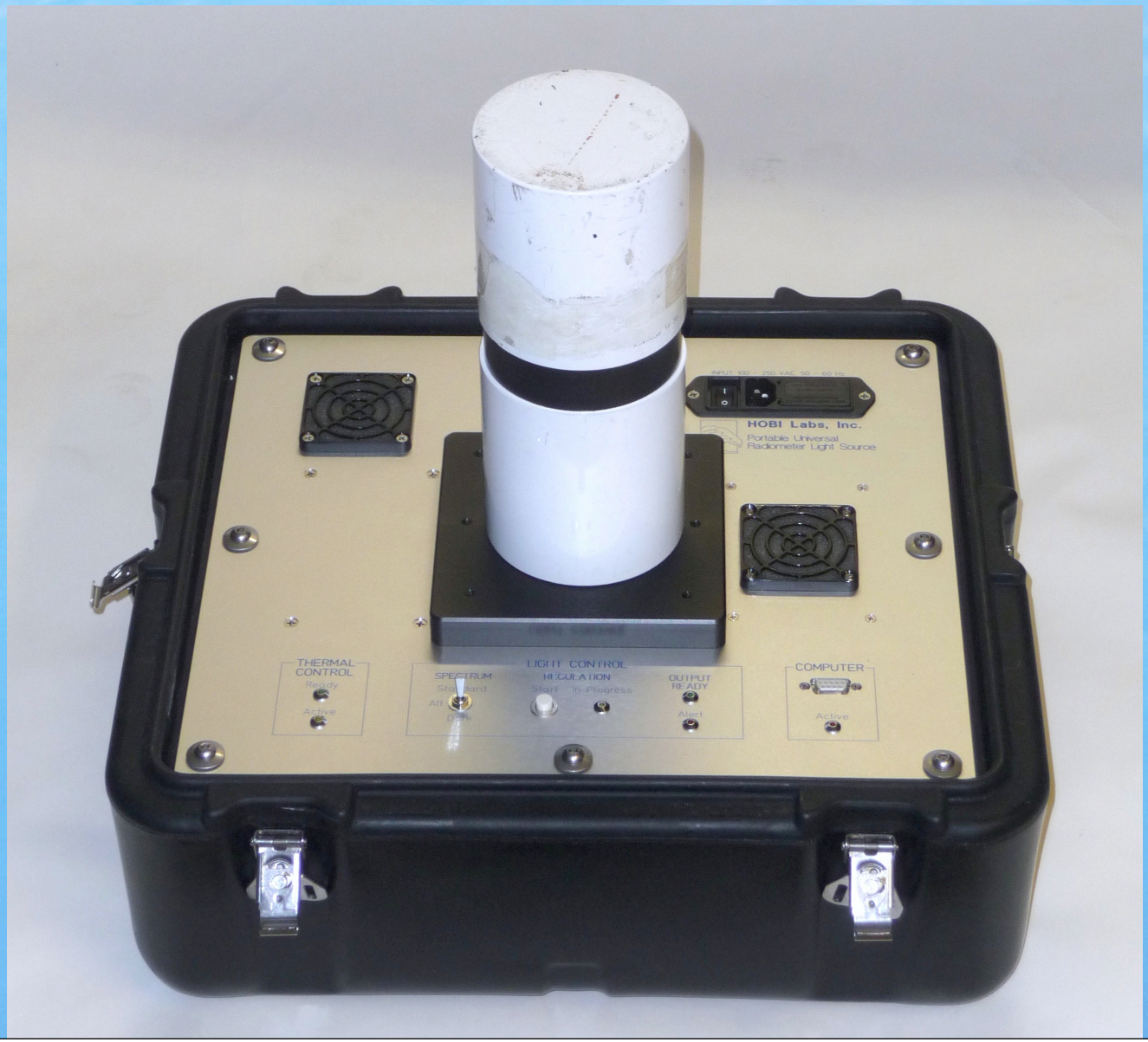


PURLS Closed for Shipping

PURLS Front Panel

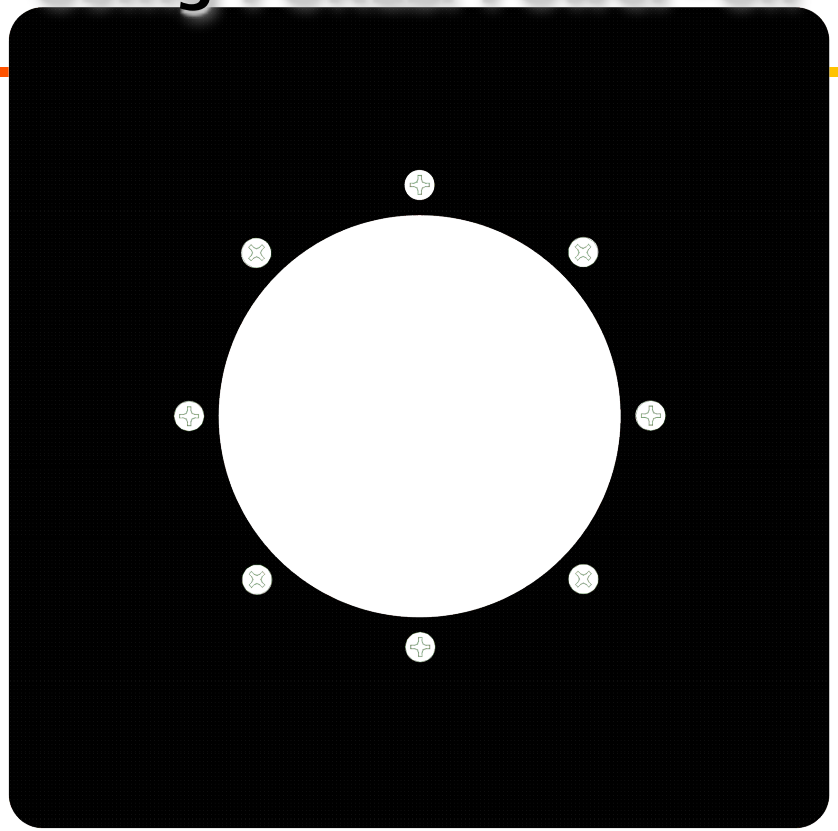


Radiometer Placed for Testing



Front Panel Detail

Using PURLS: Power-on



THERMAL CONTROL

Ready

Active

LIGHT CONTROL

SPECTRUM

Standard

Alt

Dark

REGULATION

Start

In Progress

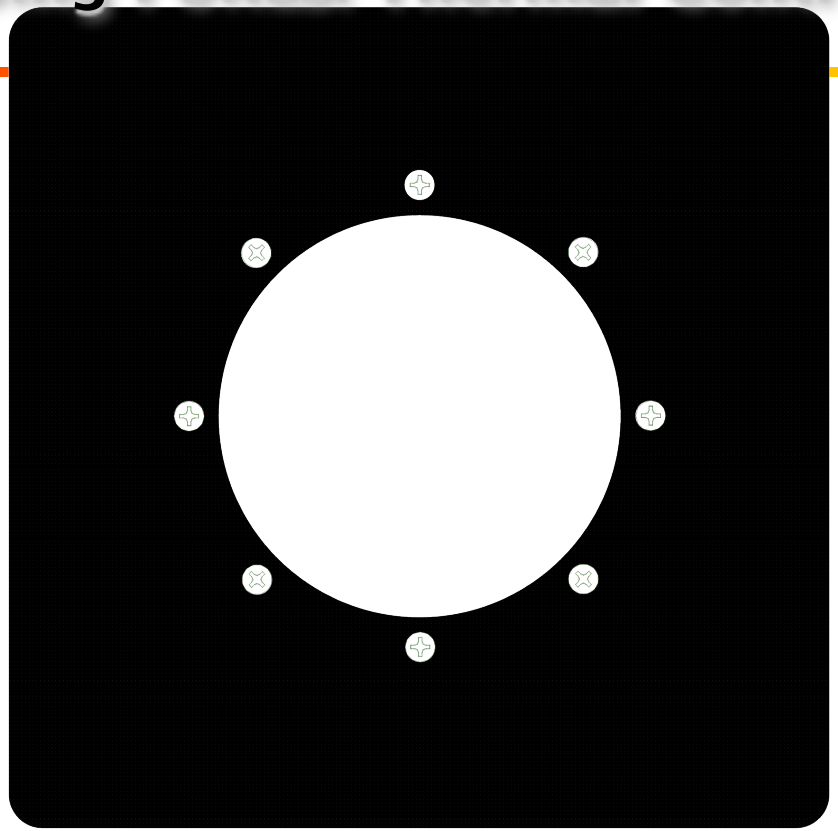
OUTPUT READY

Alert

COMPUTER

Active

Using PURLS: Thermal Control



THERMAL CONTROL

Ready

Active

LIGHT CONTROL

SPECTRUM

Standard

Alt

Dark

REGULATION

Start

In Progress

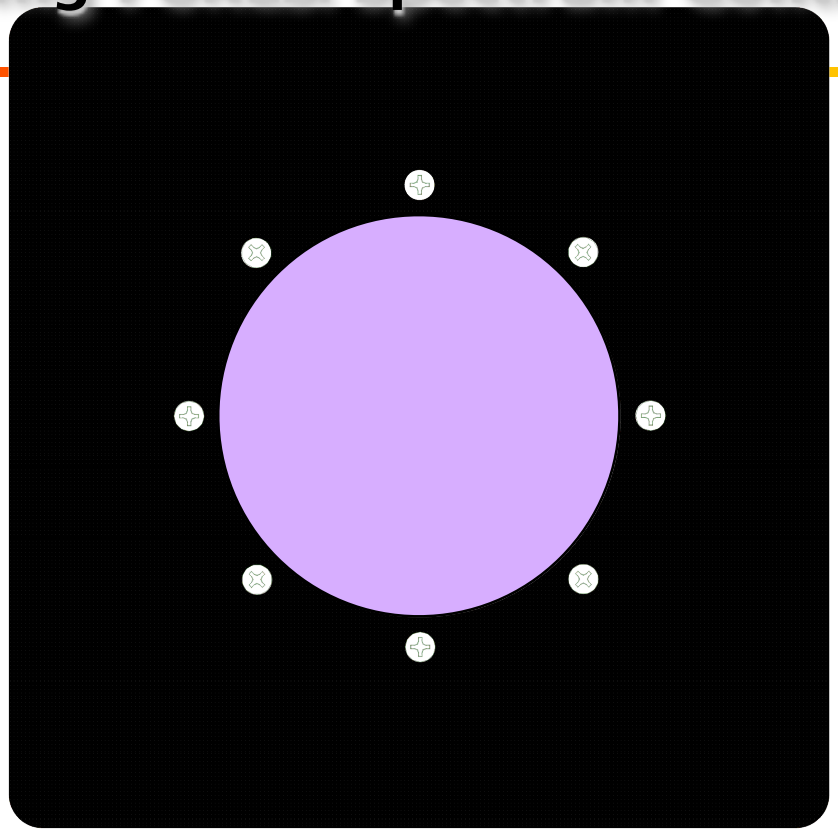
OUTPUT READY

Alert

COMPUTER

Active

Using PURLS: Spectrum Control



THERMAL CONTROL

Ready

Active

LIGHT CONTROL

SPECTRUM

Standard

Alt

Dark

REGULATION

Start

In Progress

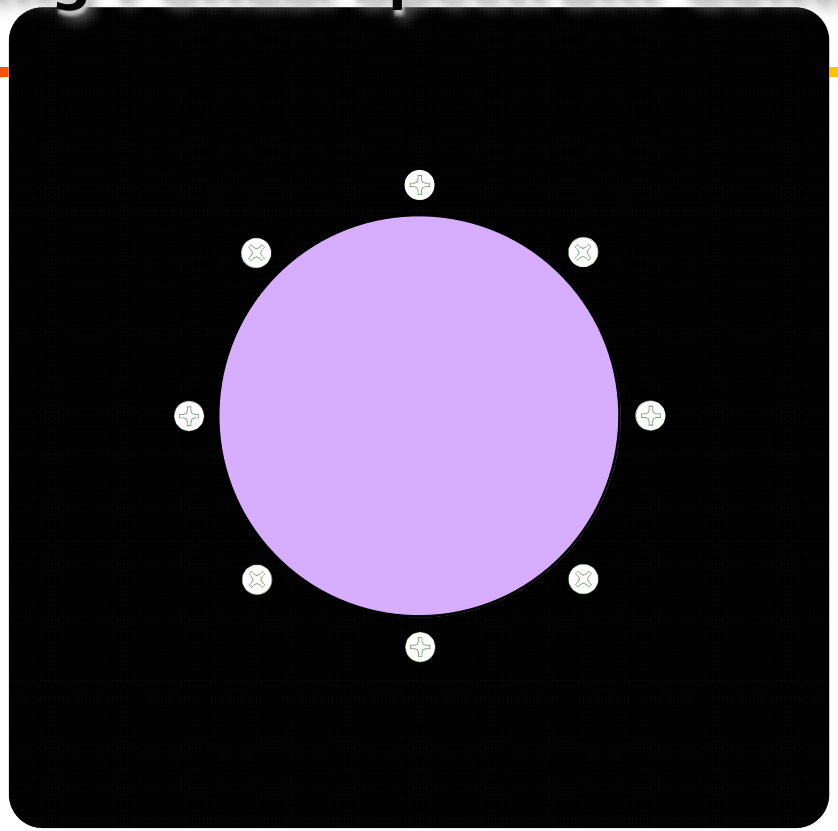
OUTPUT READY

Alert

COMPUTER

Active

Using PURLS: Spectrum Control



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SPECTRUM

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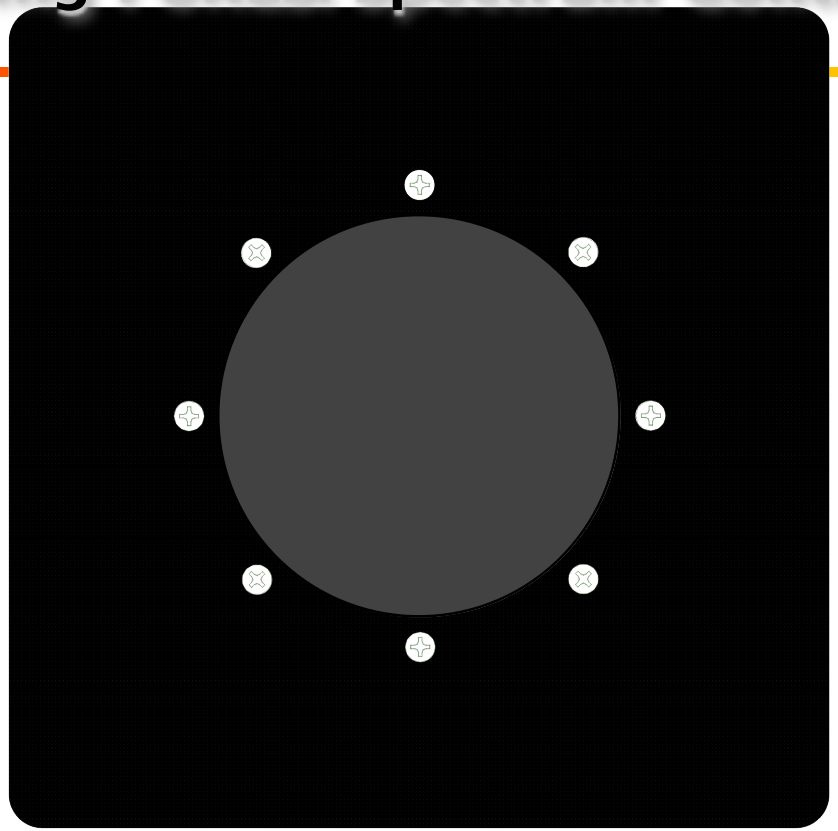
Alert

COMPUTER

Active

Using PURLS: Spectrum Control



THERMAL CONTROL

Ready

Active

LIGHT CONTROL

SPECTRUM

Standard

Alt

Dark

REGULATION

Start

In Progress

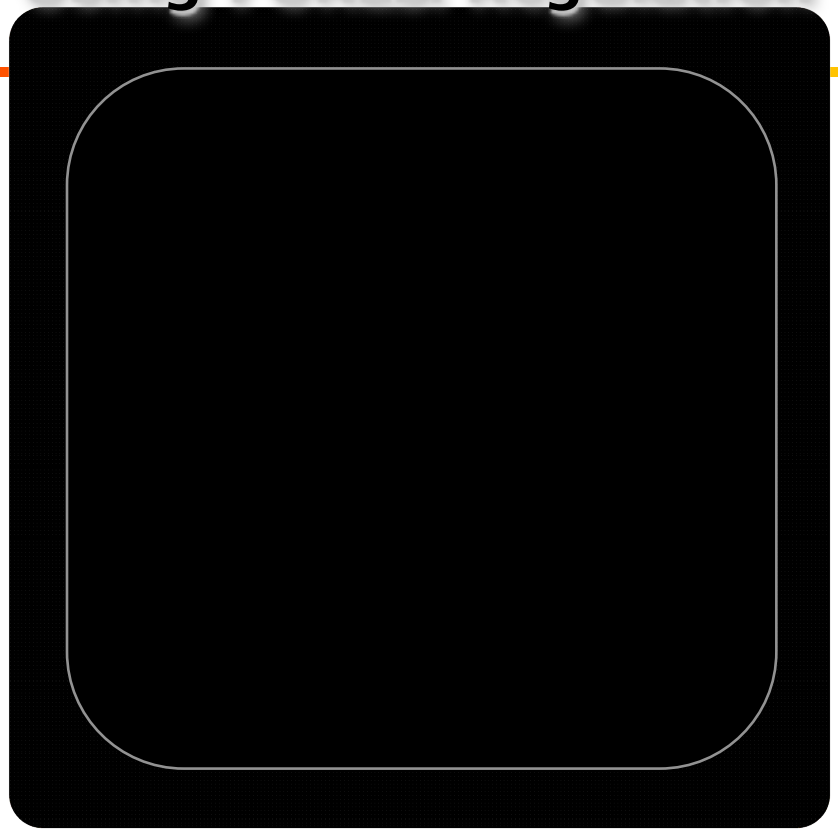
OUTPUT READY

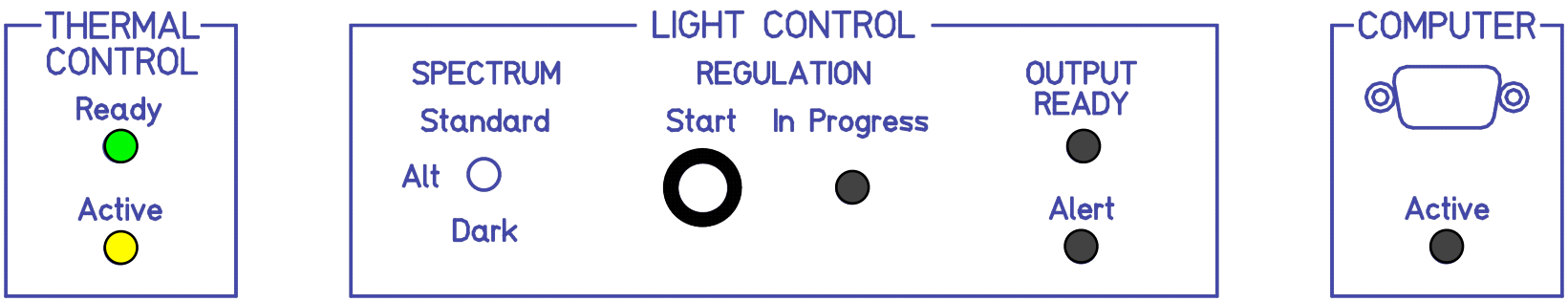
Alert

COMPUTER

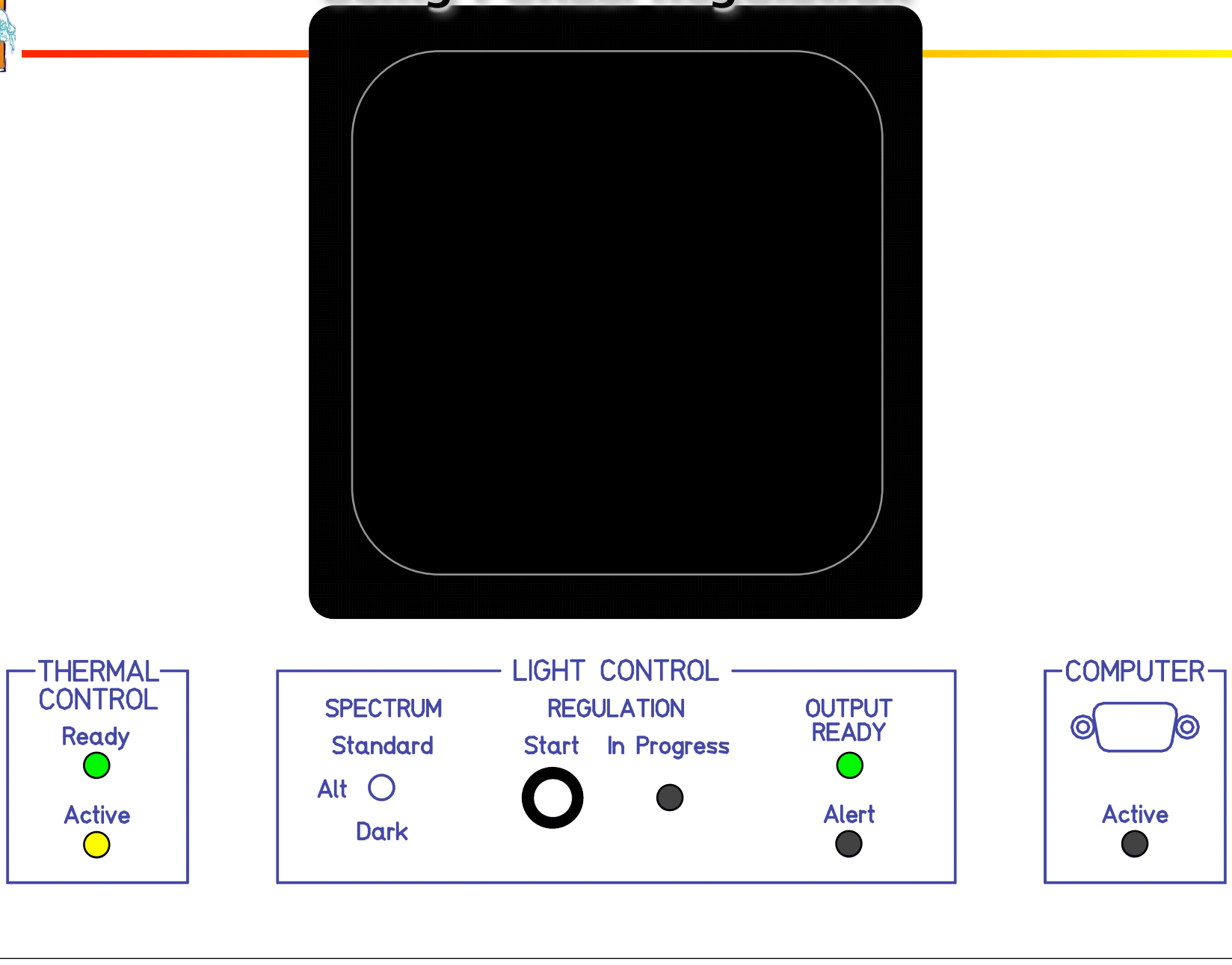
Active

Using PURLS: Regulation

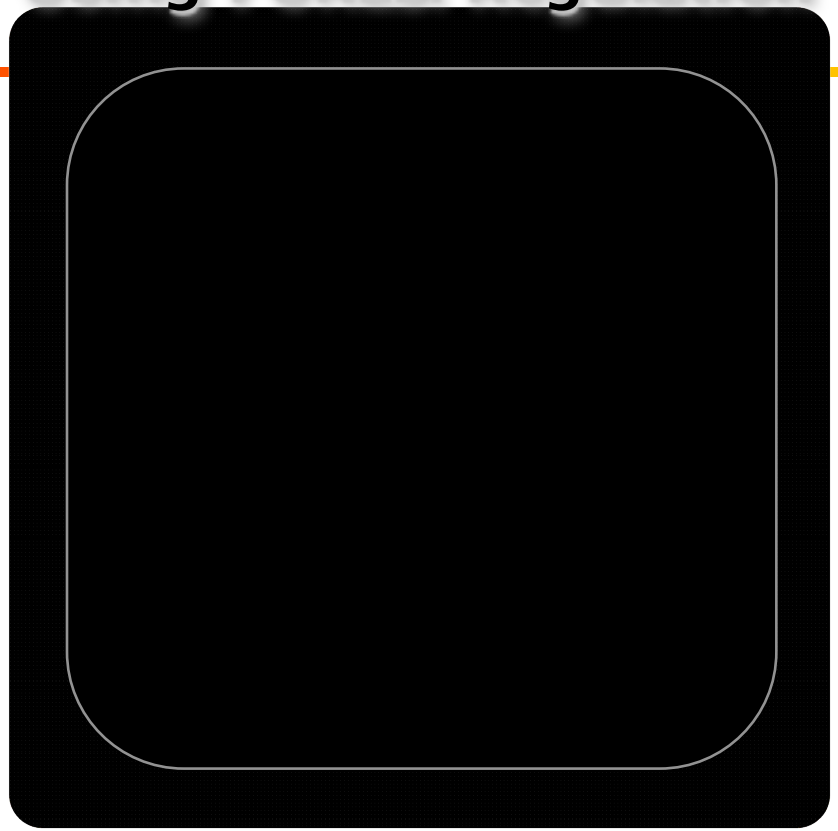


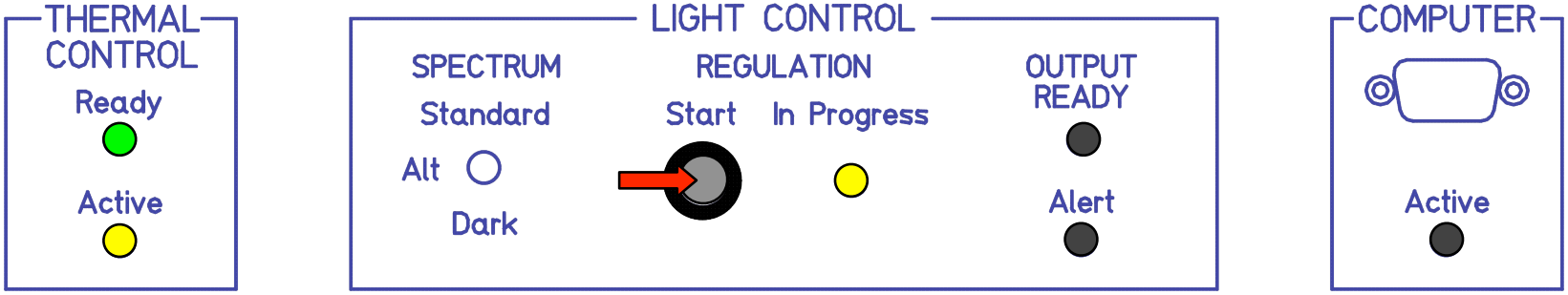


Using PURLS: Regulation

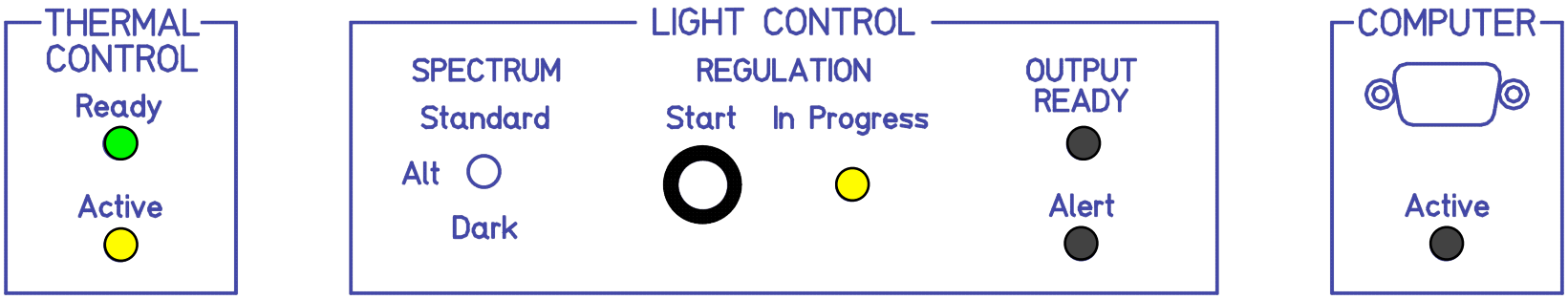


Using PURLS: Regulation

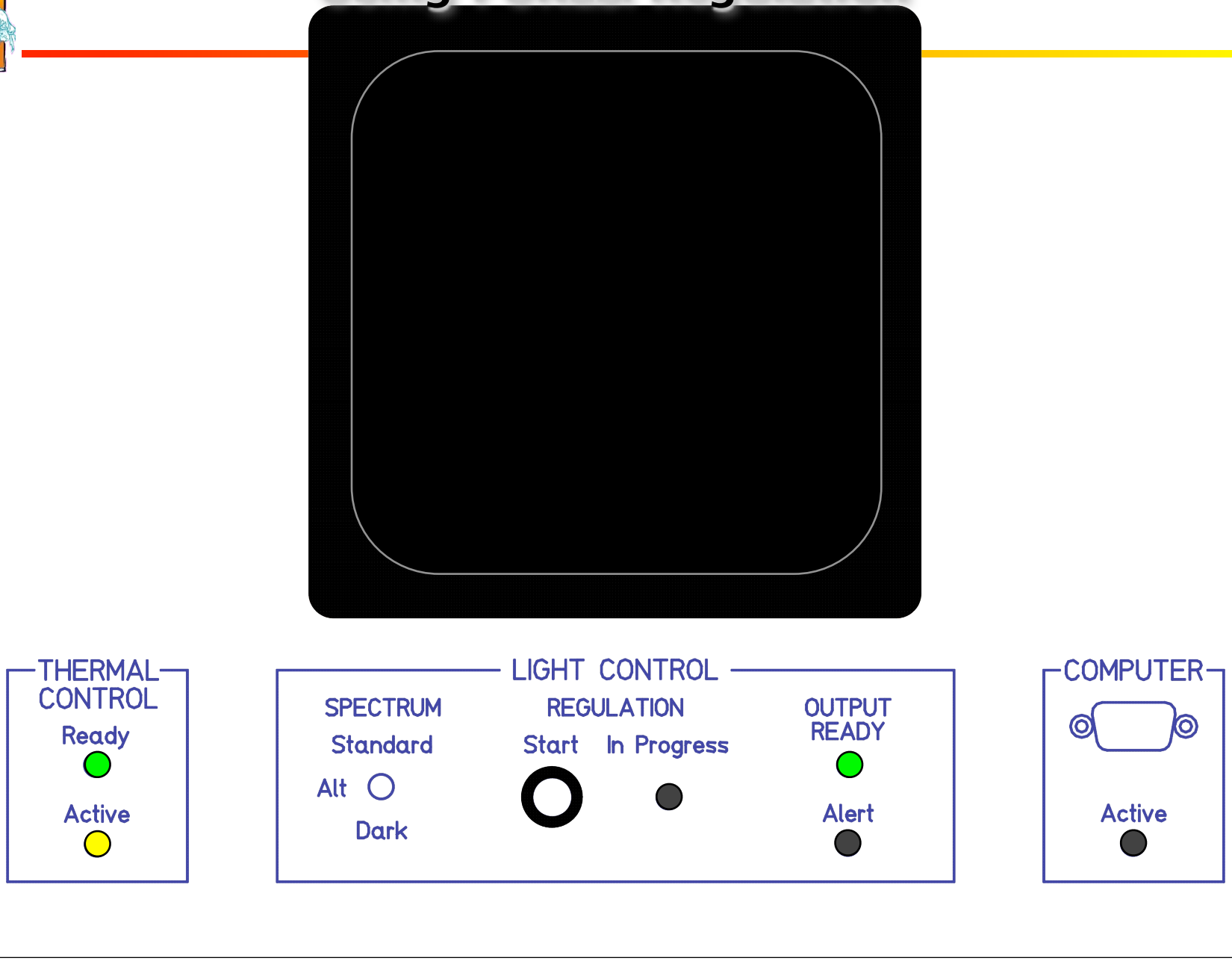




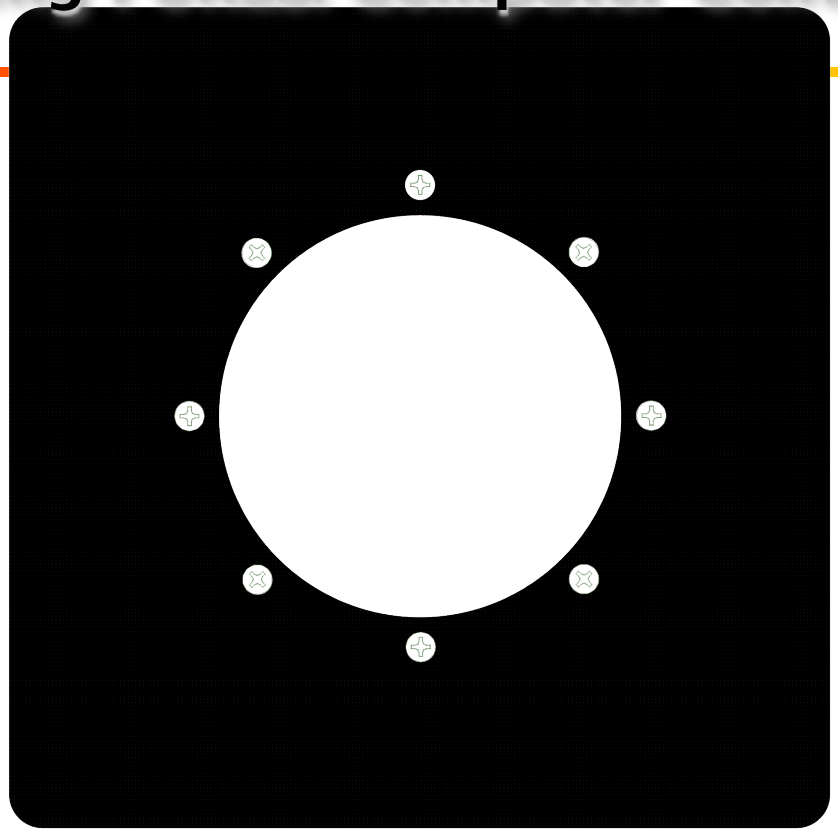
Using PURLS: Regulation



Using PURLS: Regulation



Using PURLS: Computer Control



THERMAL CONTROL

Ready

Active

LIGHT CONTROL

SPECTRUM

Standard

Alt

Dark

REGULATION

Start

In Progress

OUTPUT READY

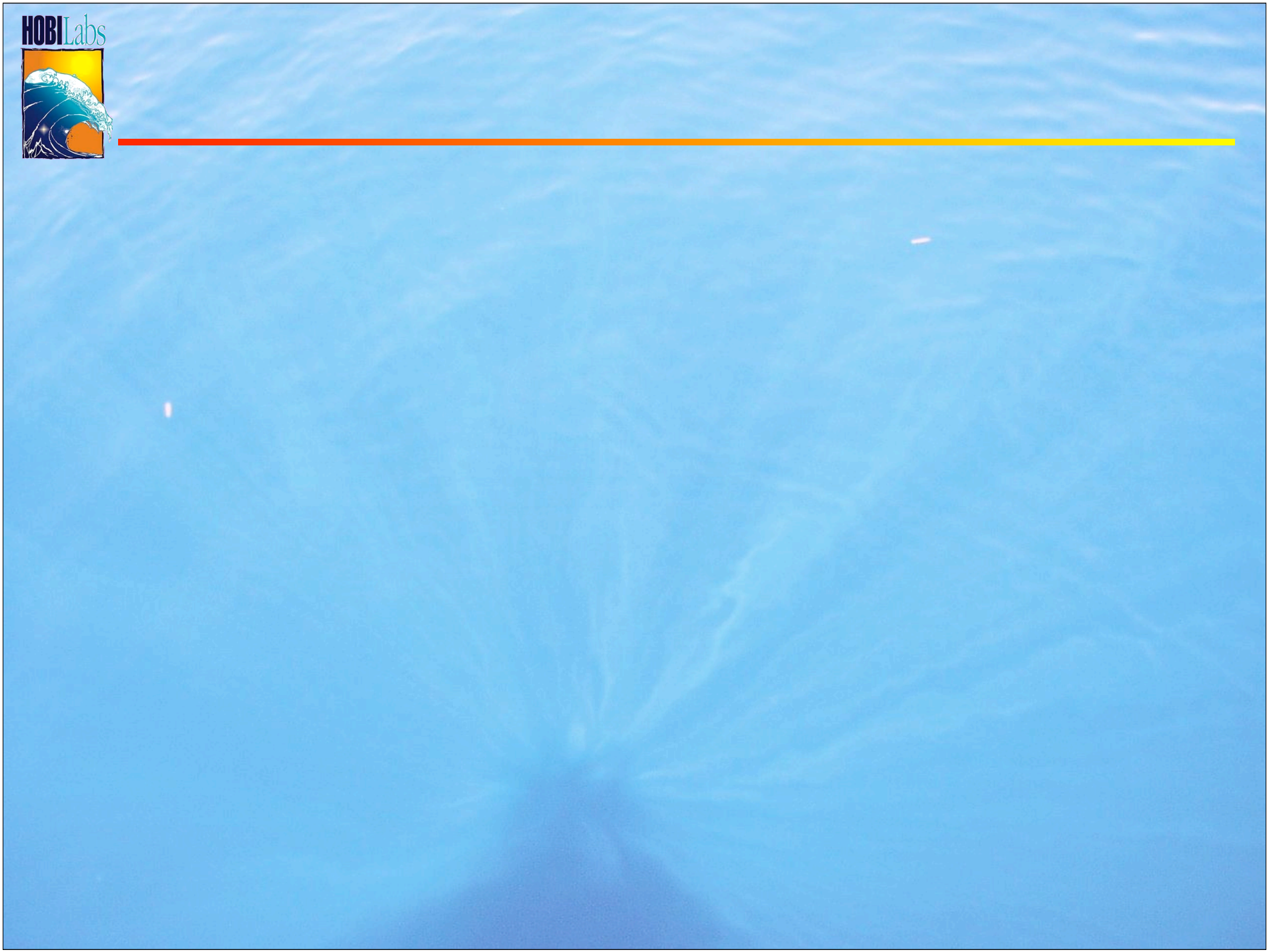
Alert

COMPUTER

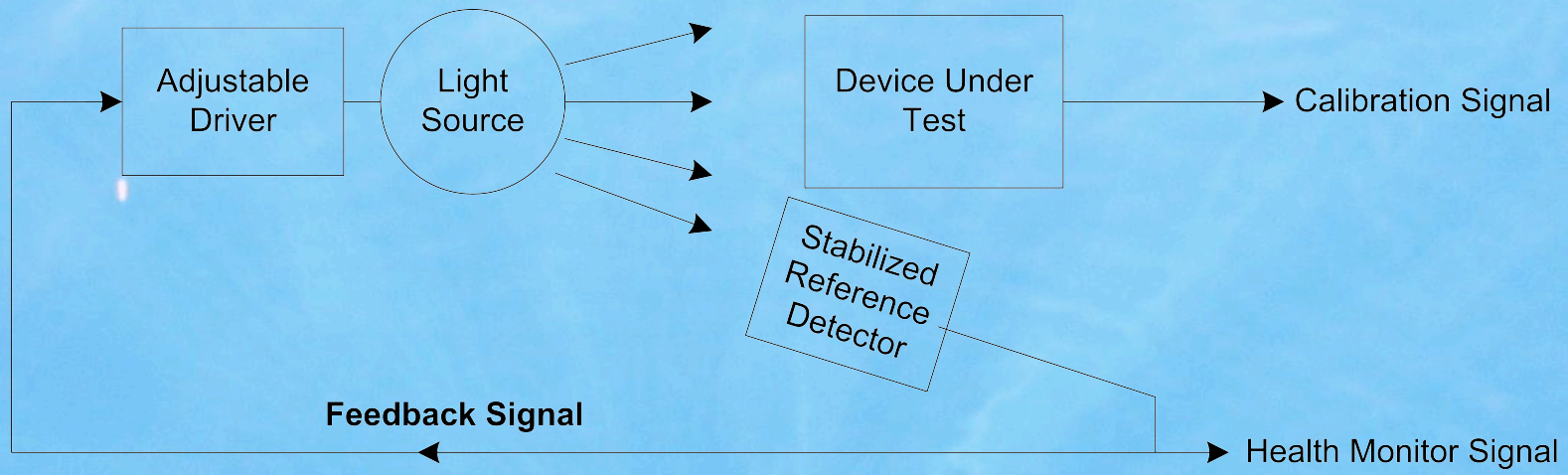
Active

The End

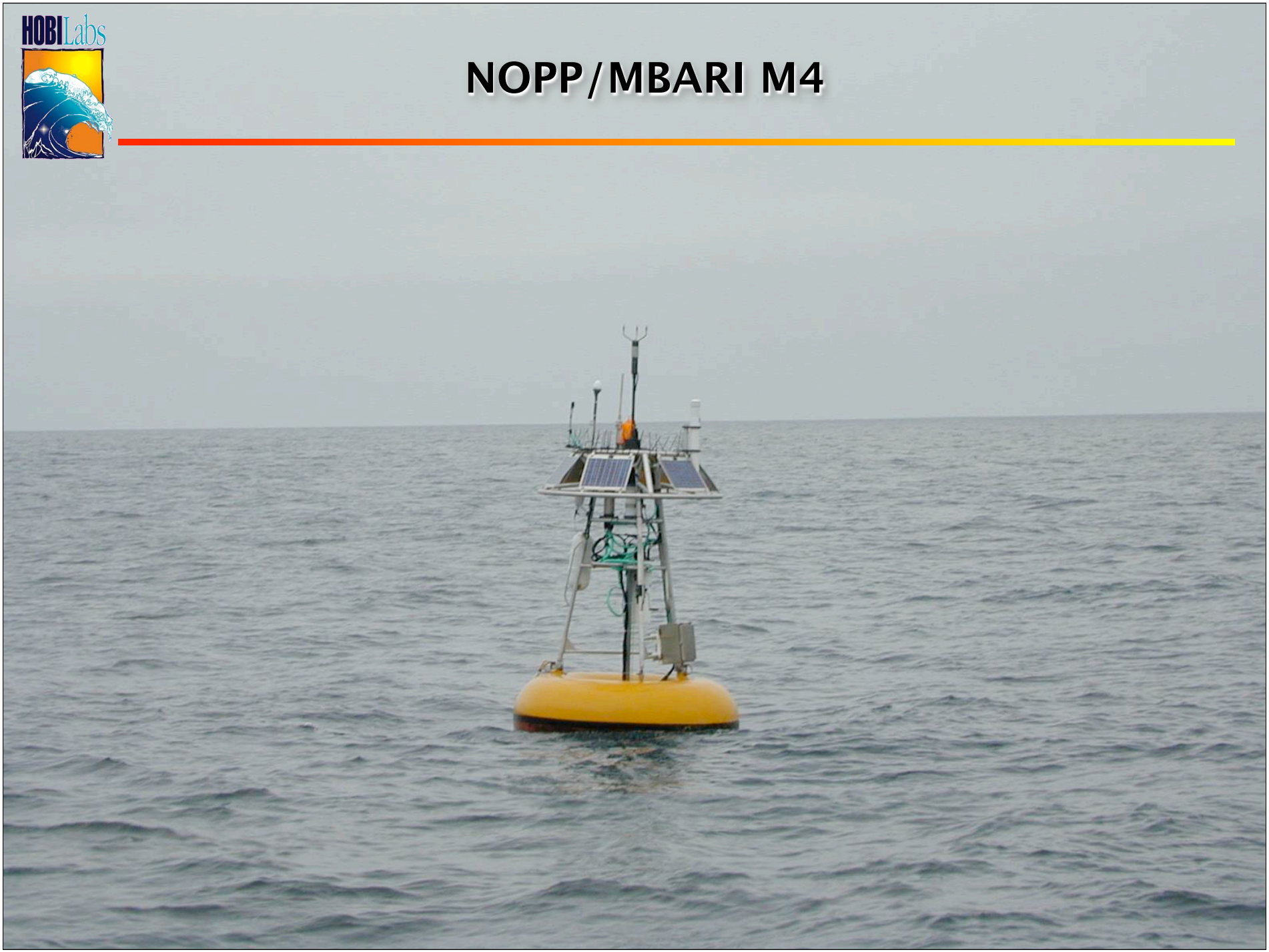

HOBI Labs, Inc.
Portable Universal
Radiometer Light Source
THERMAL CONTROL
Ready
Active
SPECTRUM
Dark
LIGHT CONTROL
REGULATION
Start
In Progress
OUTPUT READY
Alert
COMPUTER
Active



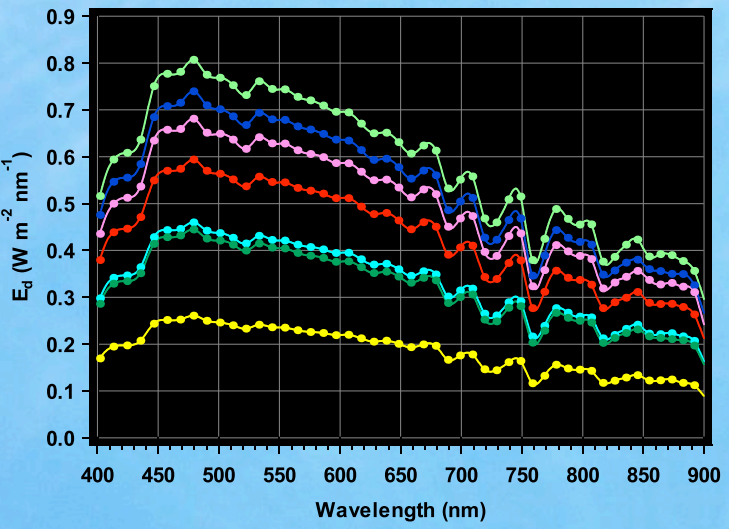
Feedback Control Loop

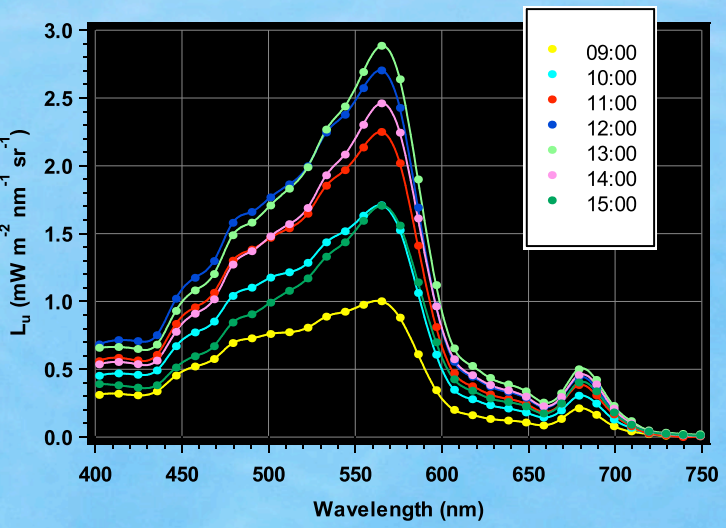


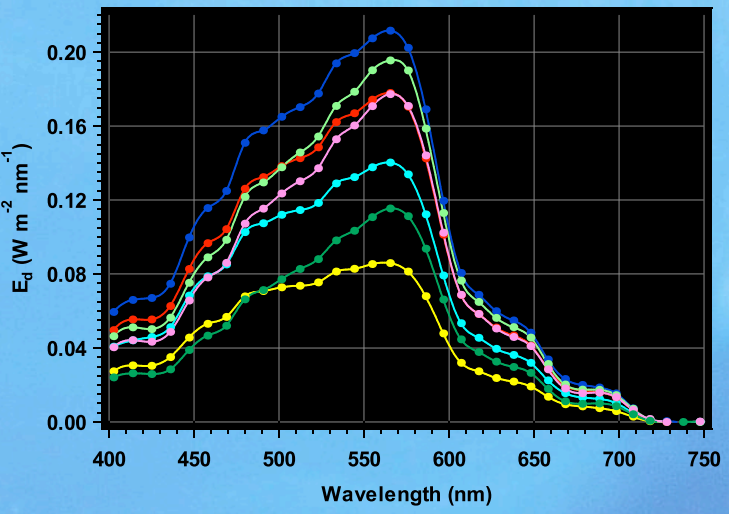
NOPP/MBARI M4

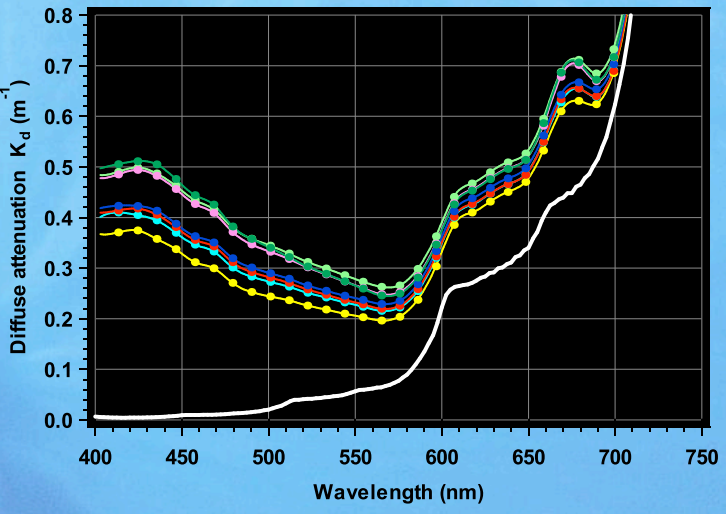


M4 Data


E_d (W m^{-2} nm^{-1})
Wavelength (nm)


L_u (mW m^{-2} nm^{-1} sr^{-1})
Wavelength (nm)
09:00
10:00
11:00
12:00
13:00
14:00
15:00


E_d (W m^{-2} nm^{-1})
Wavelength (nm)


Diffuse attenuation K_d (m^{-1})
Wavelength (nm)