



**Biospherical Instruments Inc.**

## **System Calibration Certificate**

**THE INSTRUMENTS REFERENCED BELOW WERE FACTORY TESTED AND CALIBRATED BY**

**BIOSPHERICAL INSTRUMENTS INC.**

**5340 Riley Street**

**San Diego, California 92110 USA**

**Instrument: C-OPS S/N 000413**

### **Pressure Testing:**

The housing for this instrument has been tested to 125 meters.

### **NIST-traceable Optical Calibrations:**

The instrument was calibrated using a 1000 Watt FEL lamp with serial number V-031 . This lamp was calibrated on 3/3/15 against the NIST Standard of Spectral Irradiance F-616 . Traceability of lamps, the calibration set up (e.g., shunts, voltmeters, power supplies) and calibration procedures follow recommendations published by the National Bureau of Standards (US), specifically “NBS Special Publication 250-20 Spectral Irradiance Calibrations (1987)” and “NBS Publication 594–13 Optical Radiation Measurements: The 1973 Scale of Spectral Irradiance (1977).”

All calibration information provided on the following pages is a subset of calibration information stored internally in the instrument.



C-OPS

Serial Number: 000413

Date of Certificate 6/26/2015

Optical Channels, Radiance (LuZ) Calibration

Acquisition Rate 5Hz

Aggregator Vin (Avg) 6.36 V

Date of Calibration 6/25/2015

Aggregator Iin (Avg) 99.6 mA

Calibration Engineer TPC

Internal Temperature (Max) 25.371 °C

Aggregator Internal Temperature (Avg) 24.92 °C

Internal Temperature (Min) 24.091 °C

Aggregator Internal Pressure (Avg) 11.79 psi

Standard of Spectral Irradiance V-031

Channel	Wavelength (nm)	Tag	Firmware Version	Offset High Gain (mV)	Offset Medium Gain (mV)	Offset Low Gain (mV)	Signal/Noise Ratio	Immersion Coefficient	Responsivity in Water 1	Calibrated Units
LuZ320	320	A	v:2.003 03/04/11 3Gain	-0.135	-0.019	-0.020	1439.37	0.5598	3.34734	μW/(sr cm <sup>2</sup> nm)
LuZ340	340	B	v:2.003 03/04/11 3Gain	-0.175	-0.047	-0.049	1701.11	0.5624	2.43335	μW/(sr cm <sup>2</sup> nm)
LuZ380	380	C	v:2.003 03/04/11 3Gain	-0.261	-0.127	-0.127	1339.93	0.5665	0.82338	μW/(sr cm <sup>2</sup> nm)
LuZ395	395	D	v:2.003 03/04/11 3Gain	-0.155	-0.028	-0.028	3021.22	0.5677	2.64560	μW/(sr cm <sup>2</sup> nm)
LuZ412	412	E	v:2.003 03/04/11 3Gain	-0.086	0.031	0.031	3432.43	0.5689	4.69901	μW/(sr cm <sup>2</sup> nm)
LuZ443	443	F	v:2.003 03/04/11 3Gain	-0.031	0.083	0.083	3522.93	0.5707	3.02008	μW/(sr cm <sup>2</sup> nm)
LuZ465	465	G	v:2.003 03/04/11 3Gain	0.224	0.333	0.333	3557.13	0.5719	2.11495	μW/(sr cm <sup>2</sup> nm)
LuZ490	490	H	v:2.003 03/04/11 3Gain	-0.134	-0.021	-0.022	3734.02	0.5730	5.73049	μW/(sr cm <sup>2</sup> nm)
LuZ510	510	I	v:2.003 03/04/11 3Gain	-0.320	-0.193	-0.194	3717.58	0.5737	5.94512	μW/(sr cm <sup>2</sup> nm)
LuZ532	532	J	v:2.003 03/04/11 3Gain	-0.298	-0.166	-0.166	3791.60	0.5745	5.36933	μW/(sr cm <sup>2</sup> nm)
LuZ555	555	K	v:2.003 03/04/11 3Gain	-0.136	-0.022	-0.023	3778.36	0.5752	9.88625	μW/(sr cm <sup>2</sup> nm)
LuZ560	560	L	v:2.003 03/04/11 3Gain	0.275	0.375	0.375	3786.97	0.5754	6.25247	μW/(sr cm <sup>2</sup> nm)
LuZ625	625	M	v:2.003 03/04/11 3Gain	-0.062	0.049	0.048	3898.78	0.5770	10.22994	μW/(sr cm <sup>2</sup> nm)
LuZ665	665	N	v:2.003 03/04/11 3Gain	-0.049	0.089	0.088	3387.18	0.5778	11.86633	μW/(sr cm <sup>2</sup> nm)
LuZ670	670	O	v:2.003 03/04/11 3Gain	0.124	0.030	0.030	3888.35	0.5779	6.74597	μW/(sr cm <sup>2</sup> nm)
LuZ683	683	P	v:2.003 03/04/11 3Gain	0.127	0.249	0.249	3798.69	0.5781	13.18290	μW/(sr cm <sup>2</sup> nm)
LuZ710	710	Q	v:2.003 03/04/11 3Gain	-0.338	-0.222	-0.223	3589.77	0.5786	13.95258	μW/(sr cm <sup>2</sup> nm)
LuZ780	780	R	v:2.003 03/04/11 3Gain	-0.292	-0.168	-0.168	3845.75	0.5795	12.75447	μW/(sr cm <sup>2</sup> nm)
LuZChl	27 FWHM	S	v:2.003 03/04/11 3Gain	-0.132	0.066	0.065	-	-	.01001159	nE/(sr m <sup>2</sup> s)

1: Volts/Calibrated Units



**C-OPS**

**Serial Number: 000413**

**Date of Certificate** 6/26/2015

**Optical Channels, Radiance (LuZ) Calibration**

The values listed in the section below are common for all optical microradiometers

**Date of Calibration** 6/25/2015

**Calibration Engineer** TPC

<b>Model Number</b> uRv2:3G	<b>Adc Rate</b> Rate_125_Hz	<b>Ranging Mode</b> Auto	<b>Switch Point High</b> 31000
<b>Firmware Version</b> v:2.003 03/04/11 3Gain	<b>Adc Buffer Enabled</b> False	<b>Ranging Delay High</b> 3	<b>Switch Point Low</b> 7782400
	<b>Adc Channel Type</b> Primary Input	<b>Ranging Delay Medium</b> 3	
	<b>Adc Gain</b> Gain_1	<b>Ranging Delay Low</b> 3	

**C-OPS**

**Serial Number: 000413**

**Date of Certificate** 6/26/2015

**Angle Channels, Radiance (LuZ) Calibration**

Pitch and roll sensors zeroed according to manufacturer's specifications.

**Date of Calibration** 6/25/2015

**Calibration Engineer** TPC



<b>C-OPS</b> Serial Number: 000413		Date of Certificate 6/26/2015	
<b>Pressure Channel</b>		<b>Temperature Channel</b>	
Date of Calibration	6/15/15	Date of Calibration	6/15/15
Calibration Engineer	TPC	Calibration Engineer	TPC
Slope (Sensitivity)	-0120026	volts/meter	
Offset (High/Low)	8153157	counts	
Reference Sensor	Paroscientific		
Pressure Depth Relationship	1.008064516	dbar/meter	
Reference Offset	14.67	psi	
Psi/Decibars	.6894757		
R <sup>2</sup>	.99999851		
Test Depth (Min)	-4.19	meter	
Test Depth (Max)	195.239	meter	
Gain Ratio	1.000		
Ranging Mode	HIGH		
Adc Gain	Gain_32		
Channel Type	Depth		
Observations	2924		
Offset	-.11496631	volts	
<b>Note:</b> decibars/meter at 30 degree latitude, temp=0C, salinity=35, 500 decibars pressure			
Slope (Sensitivity)		-016592	volts/°C
Offset (High/Low)		7462321	counts
R <sup>2</sup>		.999987	
Test Temperature (Min)		-476	°C
Test Temperature (Max)		33.265	°C
Gain Ratio		1	
Ranging Mode		High Gain	
Adc Gain		Gain_128	
Channel Type		Temp	
Observations		2751	
Offset		-.452288	volts

