



Ocean Optics, Inc.
Calibration Laboratories located in:
Winter Park, Florida, USA
Ostfildern, Germany

Certificate of Radiometric Calibration

Certificate Number: 17045

Date: 8/22/2014

Calibration Performed By:

OOI WINTER PARK
4301 METRIC DRIVE
WINTER PARK, FL 32792

For:

OCEAN OPTICS B.V. SALES
GEOGRAAF 24
DUIVEN, THE NETHERLANDS 6921EW

Calibrated Equipment Information

Description: SPECTROMETER, VIS
Model Number: USB2000
Serial Number: USB2G14742
Nomenclature: SPECTROMETER
Temp. [°C] / RH [%]: 72 / 49
Cal. Interval: 12 MONTHS
Cal Date [MM/DD/YYYY]: 8/20/2014
Cal. Due Date: 8/20/2015

Manufacturer: OCEAN OPTICS INC.
Performed By: BERNARDA CYGAN
Signature:
Calibration Result: PASS

The calibration values in units [uJoule/count] are stored on CD provided with this certificate.
As Found and As Left data are the same unless indicated otherwise in Calibration Notes

Calibration Notes

Calibration is voided if fiber is removed.

Standards Used To Calibrate Equipment

ID	Model Number	Description	Last Cal.	Cal. Due Date
10000005	OL 410-200	PRECISION LAMP SOURCE	9/25/2013	9/25/2014
11066045	TH803	TEMPERATURE / HUMIDITY RECORDER	8/21/2014	8/21/2015
18271	953.46317178	CALIPER, VERNIER, 24 INCH	10/5/2012	10/5/2014
M-1298	OL 220C	STANDARD LAMP, QUARTZ-HALOGEN	5/29/2014	

Procedures Used In This Event

Procedure	Title	Revision	Revision Date
MET.009	CAL OF SPECTROMETERS	5	8/2/2013

Ocean Optics Inc. is an ISO9001:2008 certified company. All radiometric calibrations were performed in compliance with National Institute of Standards & Technology practices recommended in NIST Handbook 150-2E, Technical Guide for Optical Radiation Measurements. All standards used are traceable to the National Institute of Standards & Technology; or an equivalent national organization, if the standard was calibrated outside the US; or have been derived from accepted values of naturally occurring physical constants. Ocean Optics Inc. responsibilities shall in no event, nor for cause whatsoever exceed the cost of the service represented. This report applies only to the item(s) identified above, at the time of calibration. This report shall not be reproduced, except in full, without written permission from Ocean Optics Inc.



Wavelength Calibration Data

Built For: **Ocean Optics, B.V.**
Order Number: **1415694**
Model: **USB2000**
Description: USB Fiber Optic Spectrometer
Grating: 600 Lines Blazed at 500 nm
Bandwidth: 350 - 1000 nm
Options Installed: ILX511 Detector, OFLV-3 Filter, L2 Lens, 25um Slit
Serial Number: **USB2G14742** **Master**

λ	Pixel #	Predicted λ	$\Delta\lambda$
365.015	67	365.151	-0.136
404.656	171	404.623	0.033
407.781	179	407.640	0.141
435.835	254	435.782	0.053
546.074	555	546.179	-0.105
576.959	641	576.958	0.001
579.065	647	579.093	-0.028
696.543	985	696.593	-0.050
706.722	1015	706.757	-0.035
738.398	1109	738.322	0.076
751.465	1148	751.292	0.173
763.510	1185	763.526	-0.016
772.421	1212	772.412	0.009
794.817	1281	794.954	-0.137
801.479	1301	801.444	0.035
811.531	1332	811.463	0.068
826.452	1379	826.562	-0.110
840.820	1424	840.914	-0.094
852.144	1459	852.005	0.139
912.297	1653	912.346	-0.049
922.450	1686	922.417	0.033

Calibration Coefficients

First Coefficient: 0.384732932
Second Coefficient: -2.16588E-05
Third Coefficient: -8.65199E-10
Intercept: 339.4714017
Regression Fit: 0.999999866

Stray Light Measurements (AU)

Holmium Oxide (444nm): 1.55
Yellow Dye: 2.80
Blue Dye: 3.47
Molybdate: N/A
OG550 Filter: 2.87
RG850 Filter: 3.87
FG3 Filter: 1.18

Linearity Test

Serial Number **USB2G14742**

Tech: Debra.Jenkins

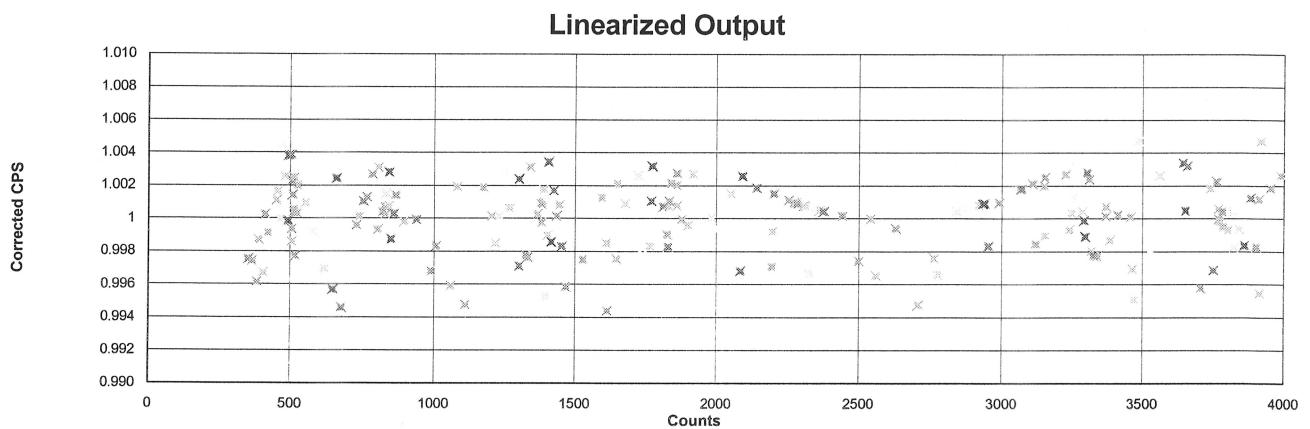
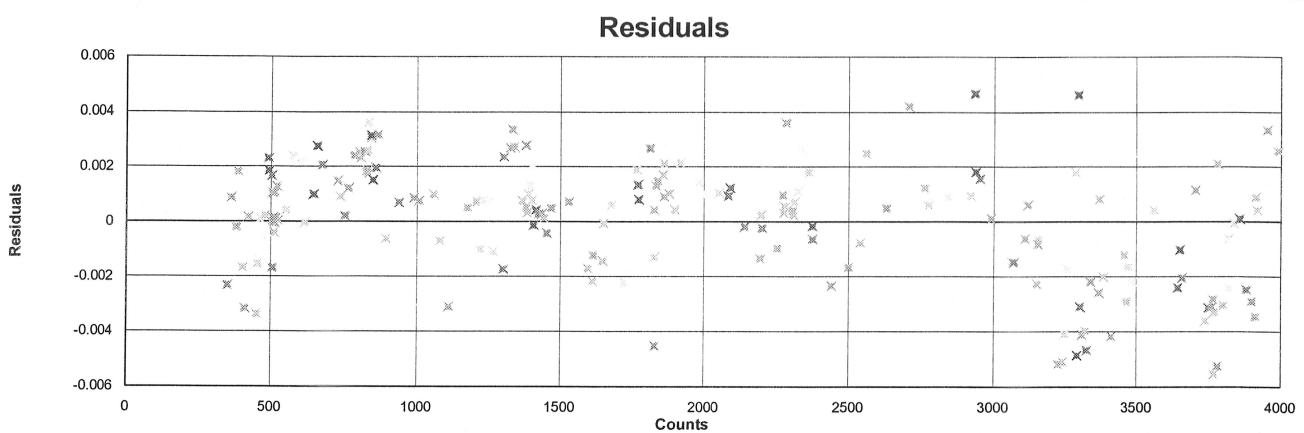
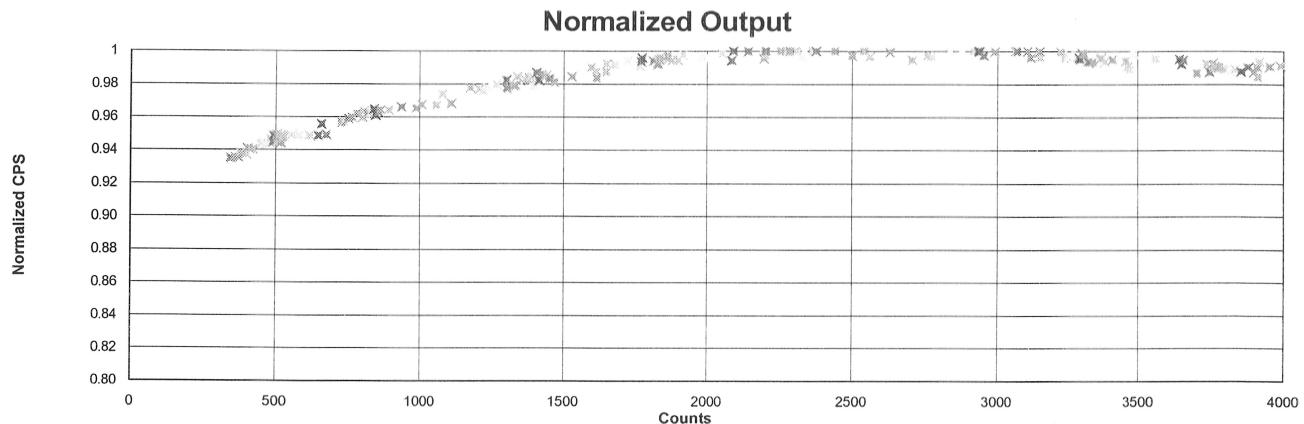
Intercept 0.913531
Coefficient 1 8.08128e-005
Coefficient 2 -5.26448e-008
Coefficient 3 5.08913e-011
Coefficient 4 -3.33995e-014
Coefficient 5 1.15662e-017
Coefficient 6 -2.01735e-021
Coefficient 7 1.40784e-025

Linearity: **99.78678**



Tested: 8/13/14

Test # 109,416.00



Max **1.00469673**

Min **0.99439162**