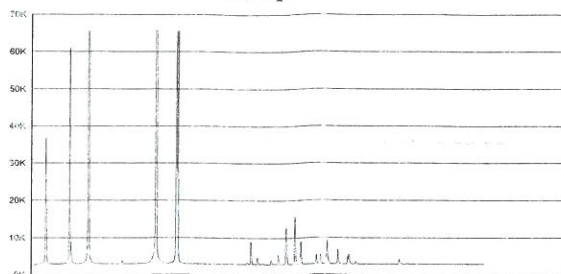




Wavelength Calibration Data Sheet

Test Spectrum



Built for:
 Order Number: **1419835**
 Model: **FLAME-S-VIS-NIR-ES**
 Grating: GRATING #3 - 600 Lines Blazed at 500 nm
 Bandwidth: 349 - 1023 nm
 Options: DET2B-350-1000 Detector, L2Lens, INTSMA-025 Slit,

Serial Number: **FLMS00440**

λ	Pixel #	Predicted λ	$\Delta\lambda$
365.015	65	365.172	-0.157
404.656	170	404.616	0.040
427.397	230	427.424	-0.027
431.958	242	431.951	0.007
435.834	253	435.789	0.045
467.816	339	467.833	-0.017
472.216	351	472.222	-0.006
481.053	375	481.081	-0.028
508.582	451	508.606	-0.024
557.029	585	557.017	0.012
576.959	641	577.009	-0.050
602.999	715	603.025	-0.026
614.306	747	614.310	-0.004
626.649	783	626.678	-0.029
630.479	794	630.501	-0.022
633.443	802	633.426	0.017
636.235	810	636.213	0.022
640.225	822	640.197	0.028
653.288	859	653.265	0.023
671.704	913	671.700	0.004
696.543	987	696.565	-0.022
703.241	1006	703.243	-0.002
706.722	1017	706.730	-0.008
717.394	1049	717.374	0.020
724.516	1070	724.507	0.009
738.398	1112	738.402	-0.004
743.890	1129	743.902	-0.012
748.887	1144	748.863	0.024
763.511	1188	763.570	-0.059
785.482	1256	785.460	0.022
794.318	1283	794.342	-0.024
794.818	1285	794.874	-0.056
805.950	1320	805.954	-0.004
811.531	1337	811.460	0.071
819.006	1360	818.978	0.028
826.452	1384	826.445	0.007
852.144	1466	852.056	0.088
912.297	1663	912.454	-0.157

This is a sample of calibration peaks used as there were more than can be shown on this page

Calibration Coefficients

First Coefficient: 0.3838928938
 Second Coefficient: -2.15822e-005
 Third Coefficient: -1.39946e-009
 Intercept: 340.16506958
 Regression Fit: 0.9999992847

Stray Light Measurements (AU)

Holmium Oxide (444nm): 1.89
 Yellow Dye: 2.33
 Blue Dye: 2.80
 Molybdate: N/A
 OG550 Filter: 2.39
 RG850 Filter: 3.31
 FG3 Filter: 1.29

Naika Y. Delgado

Calibrated By: Bill.Hays
 Calibrated: 24-May-2016

Linearity Test

Serial Number **FLMS00440**

Tech: Bill.Hays

Linearity: **99.87162**

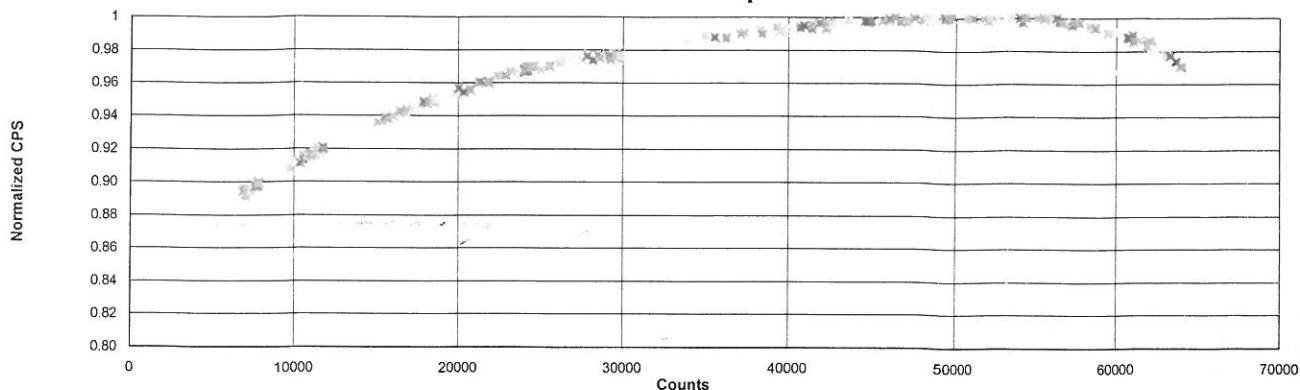
Tested: 5/24/16

Test # 150,094.00

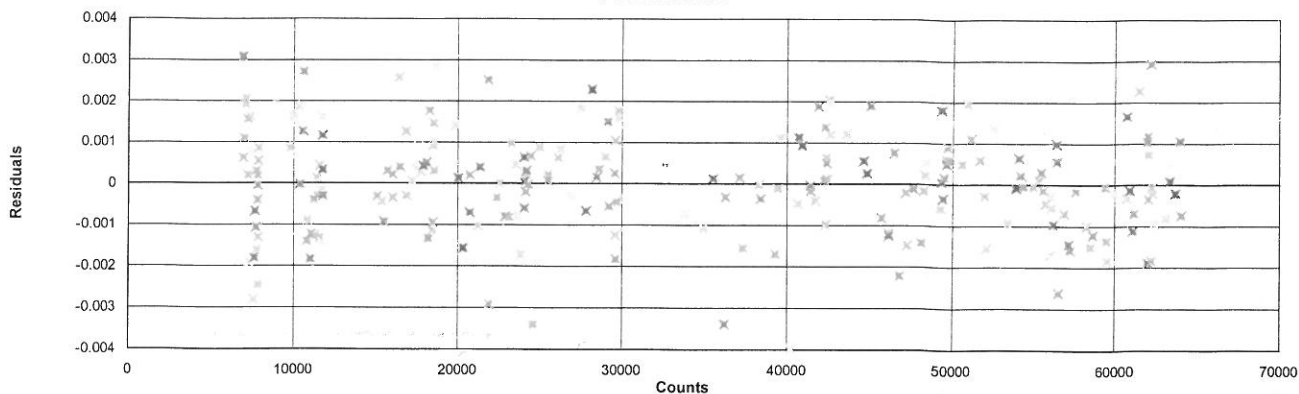
Intercept 0.847773
Coefficient 1 6.69476e-006
Coefficient 2 2.72833e-011
Coefficient 3 -9.19219e-015
Coefficient 4 3.13902e-019
Coefficient 5 -5.59827e-024
Coefficient 6 5.83296e-029
Coefficient 7 -2.88581e-034



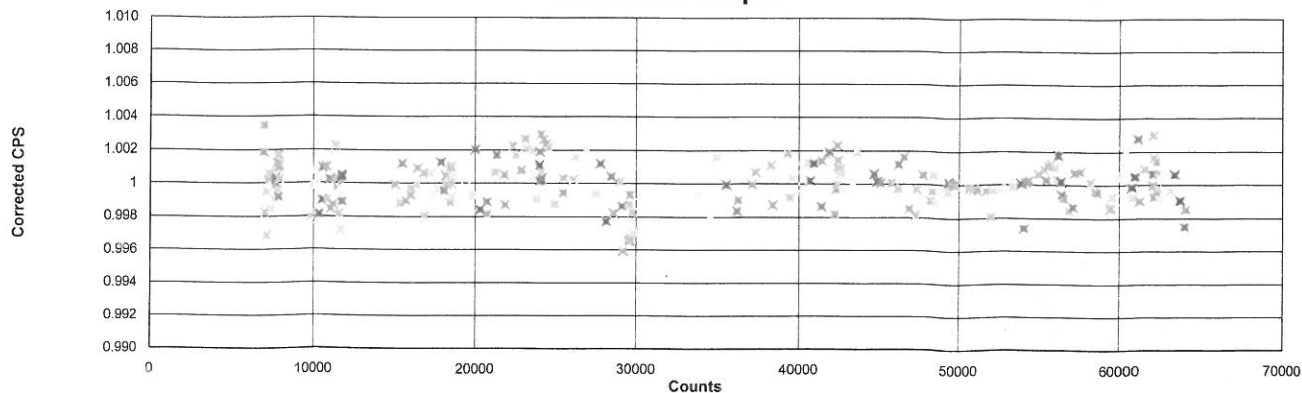
Normalized Output



Residuals



Linearized Output



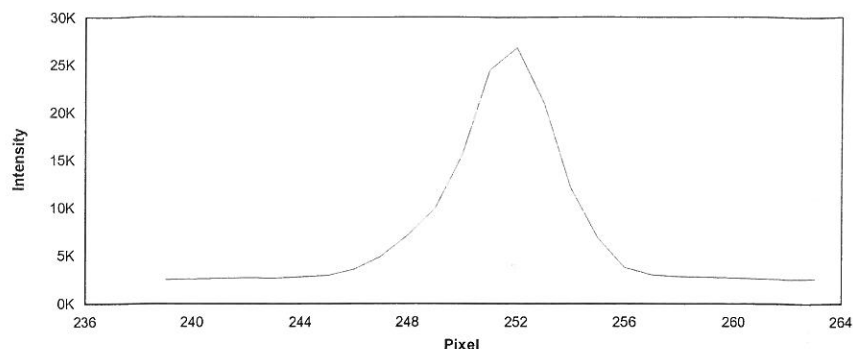
Max 1.00345900

Min 0.99593010

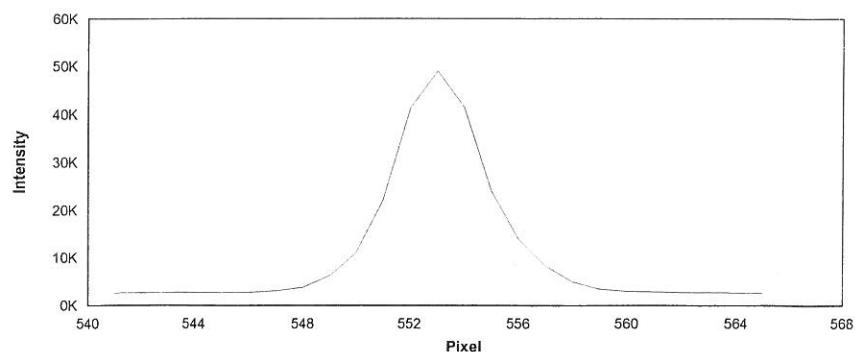
Resolution and Accuracy for FLMS00440



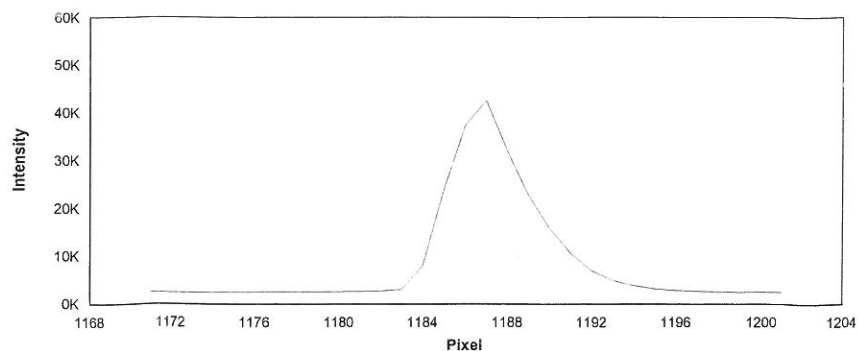
<u>Result</u>	<u>FWHM in Pixels</u>	<u>Delta</u>	<u>Wavelength</u>	<u>Peak Source</u>	<u>Date</u>
Passed	3.88	-0.03	435.83	HG-1	5/23/16 4:25 pm



<u>Result</u>	<u>FWHM in Pixels</u>	<u>Delta</u>	<u>Wavelength</u>	<u>Peak Source</u>	<u>Date</u>
Passed	3.72	0.05	546.07	HG-1	5/23/16 4:25 pm



<u>Result</u>	<u>FWHM in Pixels</u>	<u>Delta</u>	<u>Wavelength</u>	<u>Peak Source</u>	<u>Date</u>
Passed	4.16	-0.01	763.51	Ar	5/23/16 4:26 pm





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

Certificate of Radiometric Calibration

Certificate Number: 20265

Date: 6/3/2016

Calibration Performed By:

OOI WINTER PARK
4301 METRIC DRIVE
WINTER PARK, FL 32792

For:

Calibrated Equipment Information

Description: SPECTROMETER, VIS-NIR

Model Number: FLAME-S-VIS-NIR-ES

Serial Number: FLMS00440

Nomenclature: SPECTROMETER

Temp. [°F] / RH [%]: 67 / 61

Cal. Interval: 12 MONTHS

Cal Date [MM/DD/YYYY]: 6/3/2016

Cal. Due Date: 6/3/2017

Manufacturer: OCEAN OPTICS INC.

Performed By: BERNARDA CYGAN

Signature: 

Calibration Result: PASS

The calibration values in units [uJoule/counts] 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

Calibrated System Configuration: FLAME-S-VIS-NIR-ES S/N:FLMS00440 with OCF-101317 FIBER and J1002-SMA-117 DIFFUSER
Calibration is voided if fiber or diffuser is removed.

Standards Used To Calibrate Equipment

ID	Model Number	Description	Last Cal.	Cal. Due Date
11066045	TH803	TEMPERATURE / HUMIDITY RECORDER	8/24/2015	8/24/2016
12221337	OL 83A	PROGRAMMABLE DC CURRENT SOURCE	10/8/2015	10/8/2016
665	68840	POWER SUPPLY, DEUTERIUM	9/29/2015	9/29/2016
AS012494	953.46317178	CALIPER, VERNIER, 24 INCH	11/13/2015	11/13/2017
CH6907	63345	STANDARD LAMP, DEUTERIUM, CATHODEON R48	6/2/2015	
F-1305	OL FEL-C	STANDARD OF SPECTRAL IRRADIANCE, 1000W C	9/29/2014	

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.



A HALMA COMPANY

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Fax: +31 26 319 0505
E-mail: info@oceanoptics.eu
Internet: <http://www.oceanoptics.eu>
Reg.no. at C.o.C. in Arnhem: 09112807

Packing Slip

Sales Order: 1506036, Delivery Number: 12956326
Ship Date: 06-JUN-16

Page 1

Ship To

Finnish Meteorological Institute
Erik Palménin aukio1
FI-00560 Helsinki
Finland

Bill To

Finnish Meteorological Institute
Erik Palménin aukio1
FI-00560 Helsinki
Finland

Bill To Contact	Phone	Ship To Contact	Phone
e-mail	Fax	e-mail	Fax
Customer Number 89692	Customer TAX/VAT IdNr FI02446647	Supplier Number at Customer	Currency EUR
Sales Rep Tellegen, Henri	Incoterms EXW Ostfildern		
Customer P.O. Number		e-mail henri.tellegen@oceanoptics.eu	
Customer Shipping Account Number		Carrier UPS Standard	
Freight Terms Prepay & Add		Payment Terms Net Due in 30 Days	

Line	Description of Item	Ship Quantity	Backorder
1.1	OOI-SERVICE Shipping Method: UPS Standard Customer-owned product	1	0
2.1	REPAIR-FLAME-2 Shipping Method: UPS Standard Level two repair fee for FLAME series spectrometers	1	0
3.1	TRANSPORT Shipping Method: UPS Standard Transportation Charges	1	0

Warranty: All miniature spectrometers and accessories manufactured by Ocean Optics are warranted for 3 years.

Bank Details:

ABN AMRO Bank, Eindhoven, The Netherlands. EUR Account 24.35.65.089. IBAN: NL78ABNA0243565089, Swift/BIC: ABNANL2A
ABN AMRO Bank, Eindhoven, The Netherlands. USD Account 43.10.53.855. IBAN: NL14ABNA0431053855, Swift/BIC: ABNANL2A
ABN AMRO Bank, London, UK. GBP Account 20011424. Sort code 406252. IBAN: GB53FTSB40625220011424, Swift/BIC: FTSBGB2L

For all activities of Ocean Optics BV the General Terms of Delivery from FHI, federation of (Dutch) technology branches, are applied (filed at Utrecht District Court on December 22nd 1998, number 429/1998, and also the Chamber of Commerce and Producers for Eemland in Amersfoort on November 29th 1998). We will forward the General Terms of Delivery on request.