



SPECIFICATIONS FOR MULTIPLE WAVELENGTH FLUOROMETER/OPTICAL BACKSCATTER INSTRUMENTS ON FIXED PLATFORMS

Version 2-00-P
Document Control Number 1336-00003
2011-02-15

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**Specifications for Multiple Wavelength Fluorometer/Optical Backscatter Instruments
on Fixed Platforms**

Document Control Sheet

Version	Description
2-00-P	Public Version

Note: This document has been edited to remove information that is considered confidential and/or sensitive to ongoing or future financial negotiations for OOI procurements. Information removed has been replaced by the insertion of “[redacted]”

Specifications for Multiple Wavelength Fluorometer/Optical Backscatter Instruments on Fixed Platforms

Signature Page

This document has been reviewed and approved for release to Configuration Management.

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OOI Senior Systems Engineer: _____

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Specifications for Multiple Wavelength Fluorometer/Optical Backscatter Instruments on Fixed Platforms

1 General

1.1 Ocean Observatories Initiative (OOI) Overview

See “Common Specifications for Instruments on Fixed Platforms”

1.2 Document Scope and Purpose

This document contains specifications for instruments that measure Optical Backscatter, Chlorophyll-a Fluorescence, and CDOM Fluorescence in seawater. These instruments will be deployed on fixed platforms.

The instrument shall meet the specifications in this document and those contained in the “Common Specifications for Instruments on Fixed Platforms”, document control number 1336-00000. Parameters specified in neither the “Common Specifications for Instruments on Fixed Platforms” nor in this document are not applicable. This instrument specifications shall have precedence over the Common Specifications for conflicting items.

1.3 Documents

1.3.1 Informational

The documents listed in this section are for informational purposes only and may not have been referenced in this specification.

- Consortium for Ocean Leadership, Inc. 2010, “Final Network Design”, Washington, D.C. [Online] Available: <http://www.oceanleadership.org/programs-and-partnerships/ocean-observing/ooi/network-design/>

1.3.2 Applicable

These documents contain requirements and specifications applicable to the instrument specified. The referenced section, requirement, or specification shall be met by the instrument specified herein.

“Common Specifications for Instruments on Fixed Platforms”, document control number 1336-00000

1.4 Definitions

1.4.1 Glossary and Acronyms

- **bb(λ)** – Optical Backscatter coefficient
- **CDOM** – Colored Dissolved Organic Matter
- **ppb** – Parts per billion
- See “Common Specifications for Instruments on Fixed Platforms” for additional definitions.

1.4.2 Conventions

All values contained in this document are Threshold Values unless specifically stated otherwise.

The bidder shall ignore the references in angle brackets < > at the end of each specification. They are for internal OOI use only.

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2 Specifications

2.1 Measurement

MEAS-001 All measurements (optical backscatter, chlorophyll-a fluorescence, and CDOM fluorescence) should be made by the same instrument. This is an objective.

2.1.1 Optical Backscatter

a) Measurement with unit(s)

Optical Backscatter coefficient ($bb(\lambda) \text{ m}^{-1}$)

b) Minimum Value

BACK-001 The instrument shall measure optical backscatter over a range with a minimum value of $0.001 \text{ bb}(\lambda) \text{ m}^{-1}$. <L2-SR-RQ-3541, L4-CG-IP-RQ-393, L4-RSN-IP-RQ-360>

c) Maximum Value

BACK-002 The instrument shall measure optical backscatter over a range with a maximum value of $0.2 \text{ bb}(\lambda) \text{ m}^{-1}$. <L2-SR-RQ-3541, L4-CG-IP-RQ-393, L4-RSN-IP-RQ-360>

d) Accuracy

While accuracy is important to this measurement, a threshold value for accuracy is not provided in this document

e) Precision

While precision is important to this measurement, a threshold value for precision is not provided in this document.

f) Resolution

While resolution is important to this measurement, a threshold value for resolution is not provided in this document.

g) Drift

While drift is important to this measurement, a threshold value for drift is not provided in this document.

h) Response Times

Not specified.

i) Sampling Frequency

BACK-003 The instrument shall be capable of measuring optical backscatter at a sampling frequency of 1 Hz. <L2-SR-RQ-3542, L4-CG-IP-RQ-223, L4-RSN-IP-RQ-361>

See Appendix A-1 for typical sampling frequencies.

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j) Dependencies

Not specified

k) Wavelength bands

BACK-004 The instrument shall excite and measure optical backscatter in at least one band in the visible spectrum. <L2-SR-RQ-3787, L4-CG-IP-RQ-551, L4-RSN-IP-RQ-609>

BACK-005 The instrument should excite and measure optical backscatter in two or more bands in the visible spectrum. This is an objective. <L2-SR-RQ-3788, L4-CG-IP-RQ-552, L4-RSN-IP-RQ-610>

BACK-006 The instrument should provide the capability for optical backscatter bands to be user selectable. This is an objective. <L2-SR-RQ-3789, L4-CG-IP-RQ-553, L4-RSN-IP-RQ-611>

2.1.2 Chlorophyll-a Fluorescence

a) Measurement with unit(s)

Chlorophyll-a Concentration ($\mu\text{g/L}$)

b) Minimum Value

CHLO-001 The instrument shall measure chlorophyll-a concentration over a range with a minimum value of $0.03 \mu\text{g/L}$ for the coastal ocean. <L2-SR-RQ-3554, L4-CG-IP-RQ-217>

CHLO-002 The instrument shall measure chlorophyll-a concentration over a range with a minimum value of $0.01 \mu\text{g/L}$ for the open ocean. <L2-SR-RQ-3791, L4-CG-IP-RQ-555, L4-RSN-IP-RQ-366>

c) Maximum Value

CHLO-003 The instrument shall measure chlorophyll-a concentration over a range with a maximum value of $50 \mu\text{g/L}$ for the coastal ocean. <L2-SR-RQ-3554, L4-CG-IP-RQ-217>

CHLO-004 The instrument should measure chlorophyll-a concentration over a range with a maximum value of $125 \mu\text{g/L}$ for the coastal ocean. This is an objective. <L2-SR-RQ-3790, L4-CG-IP-RQ-554>

CHLO-005 The instrument shall measure chlorophyll-a concentration over a range with a maximum value of $10 \mu\text{g/L}$ for the open ocean. <L2-SR-RQ-3791, L4-CG-IP-RQ-555, L4-RSN-IP-RQ-366>

d) Accuracy

While accuracy is important to this measurement, a threshold value for accuracy is not provided in this document.

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e) Precision

While precision is important to this measurement, a threshold value for precision is not provided in this document.

f) Resolution

While resolution is important to this measurement, a threshold value for resolution is not provided in this document.

g) Drift

While drift is important to this measurement, a threshold value for drift is not provided in this document.

h) Response Times

Not specified.

i) Sampling Frequency

CHLO-006 The instrument shall be capable of measuring chlorophyll-a fluorescence at a sampling frequency of 1 Hz. <L2-SR-RQ-3555, L4-CG-IP-RQ-395, L4-RSN-IP-RQ-367>

See Appendix A-1 for typical sampling frequencies.

j) Dependencies

Not specified

k) Wavelengths

CHLO-007 The instrument shall measure fluorescence between 675 and 700 nm induced by excitation between 460 and 490 nm. <L4-CG-IP-RQ-213, L4-RSN-IP-RQ-612>

2.1.3 CDOM Fluorescence

a) Measurement with unit(s)

CDOM Concentration (ppb)

b) Minimum Value

CDOM-001 The instrument shall measure CDOM concentration over a range with a minimum value of 0.09 ppb relative to a quinine sulfate standard. <L2-SR-RQ-3557, L4-CG-IP-RQ-219, L4-RSN-IP-RQ-372>

c) Maximum Value

CDOM-002 The instrument shall measure CDOM concentration over a range with a maximum value of 500 ppb relative to a quinine sulfate standard. <L2-SR-RQ-3557, L4-CG-IP-RQ-219, L4-RSN-IP-RQ-372>

d) Accuracy

While accuracy is important to this measurement, a threshold value for accuracy is not provided in this document.

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e) Precision

While precision is important to this measurement, a threshold value for precision is not provided in this document.

f) Resolution

While resolution is important to this measurement, a threshold value for resolution is not provided in this document.

g) Drift

While drift is important to this measurement, a threshold value for drift is not provided in this document.

h) Response Times

Not specified.

i) Sampling Frequency

CDOM-003 The instrument shall be capable of measuring CDOM fluorescence at a sampling frequency of 1 Hz. <L2-SR-RQ-3558, L4-CG-IP-RQ-397, L4-RSN-IP-RQ-373>

See Appendix A-1 for typical sampling frequencies.

j) Dependencies

Not specified

k) Wavelengths

CDOM-004 The instrument shall measure fluorescence between 450 and 480 nm induced by excitation between 360 and 380 nm. <L4-CG-IP-RQ-214, L4-RSN-IP-RQ-613>

2.2 Operational

2.2.1 Operational Depth Range

See Appendix A-1 for operational depth ranges.

2.2.2 Environmental

See "Common Specifications for Instruments on Fixed Platforms"

2.2.3 Service Requirements

See "Common Specifications for Instruments on Fixed Platforms"

2.2.4 Calibration Requirement

See "Common Specifications for Instruments on Fixed Platforms"

2.2.5 Maintenance Interval

See "Common Specifications for Instruments on Fixed Platforms"

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2.2.6 Survivable Depth

See Appendix A-1 for survivable depths.

2.3 Mechanical/Physical

See “Common Specifications for Instruments on Fixed Platforms”

2.4 Electrical

See “Common Specifications for Instruments on Fixed Platforms”

2.5 Data Storage and Processing

See Appendix A-1 for storage capacities at the typical sampling frequency.

See “Common Specifications for Instruments on Fixed Platforms”

2.6 Software/Firmware

See “Common Specifications for Instruments on Fixed Platforms”

2.7 Platform Interfaces

See “Common Specifications for Instruments on Fixed Platforms”

2.8 Compliance

See “Common Specifications for Instruments on Fixed Platforms”

2.9 Safety

See “Common Specifications for Instruments on Fixed Platforms”

2.10 Shipping and Storage

See “Common Specifications for Instruments on Fixed Platforms”

2.11 Identification

See “Common Specifications for Instruments on Fixed Platforms”

2.12 Quality

See “Common Specifications for Instruments on Fixed Platforms”

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3 Appendices

A-1. Specification Values by the Platform on Which the Instruments are Deployed

The following table provides specifications that vary by the platform on which the instrument is deployed.

Specifications for Multiple Wavelength Fluorometer/Optical Backscatter Instruments on Fixed Platforms

Instrument Series	Cabled	Location	# Optical Backscatter Bands	Chlorophyll-a Measurement Required	Chlorophyll-a Range (µg/L)	CDOM Measurement Required	Operational Depth Range (m)	Survivable Depth (m)	Typical Sampling Frequency	Deployment Interval (months)	Inductive Modem Required on the Instrument	Internal Batteries Required	Internal data Storage Required (# of samples)
A	C	O	1	Y	0.01 - 10	N	0-300	300	1 Hz	13	N	N	N
B	C	O	1	Y	0.01 - 10	Y	0-300	300	1 Hz	13	N	N	N
C	C	O	1	Y	0.01 - 10	N	0-300	300	1/min	13	N	N	N
D	U	C	1	Y	0.03 - 50 (see note 1)	Y	0-25	600	1/min	7	N	N (see note 2)	Y 310,000
E	U	O	1 (see note 3)	Y	0.01 - 10	N (see note 4)	0-100	6000	1/min	13	N (see note 5)	N	Y 580,000

(see next page for table key and notes)

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Key:

Cabled:

C denotes platforms attached to the electro-optic cable in the Pacific Northwest (cabled)

U denotes platforms that have no cable connection to shore for power or data (uncabled)

Location:

O is open ocean

C is coastal

Series A and B may be on a shallow profiler.

Note 1: The objective value for the upper limit of the range is 125 µg/L for Series C.

Note 2: Internal batteries are optional on some of the Series D platforms.

Note 3: Additional optical backscatter wavelength bands may be included if they do not impact biofouling mitigation, chlorophyll -a accuracy, size, weight, or power usage.

Note 4: CDOM may be included if it does not impact biofouling mitigation, chlorophyll -a accuracy, size, weight, or power usage.

Note 5: Inductive modems are optional on some of the Series E platforms, but communication via inductive modem is required by specification INTF-015 in the Common Specifications for Instruments on Fixed Platforms. This could be implemented by an attached instrument.