Coastal Surface Piercing Profiler Integration and Verification Plan Verification Event CG-VE-3091

Control Number: 3166-90000
Version: 0-06
Date: 2013-09-10

Coastal and Global Scale Nodes
Ocean Observatories Initiative
Woods Hole Oceanographic Institution
Oregon State University
Scripps Institution of Oceanography

Revision History

Version	Description	Originator	ECR No.	Release Date
0-01	Initial Draft	David Neiman		
1-00	Initial release	D. Neiman	1303-01130	

Table of Contents

List of Figures

List of Tables

1 Scope

1.1 Identification

This Integration and Verification Plan applies to the Coastal Surface Piercing Profiler (CSPP, further designated u- for uncabled and c- for cabled) to be produced for the Coastal and Global Scale Nodes (CGSN) and Endurance Array (EA) Implementing Organizations (IOs) of the Ocean Observatories Initiative (OOI). This plan describes the Integration and Verification (I&V) activities leading up to the Product Verification Test (PVT) to demonstrate compliance to the requirements specified for the Uncabled Coastal Surface Piercing Profiler and its constituting sub-systems.

1.2 System Overview

The OOI CSPP is a moored water column profiling system produced for installation in waters <100m depth. Briefly, the system comprises a seafloor anchor and an instrumented buoy. In the uncabled embodiment, the buoy contains control systems, an internal power source, winch, and both acoustic and radio/satellite phone telemetry along with the scientific and engineering sensors. In the cabled embodiment, a cable connection to the Regional Scale Nodes cable infrastructure will supply power and data services to the seafloor winch controller, which then supplies isolated power and data connections to the profiler buoy.

The profiler system selected for the uCSPP is the Autonomous Moored Profiler (AMP) from Western Environmental Technologies (WET Labs). The anchor is passive and serves strictly as a mooring point. The buoy has a small amount of positive buoyancy, on the order of 25lbs.. Normally, the buoy resides near the seafloor. At programmed intervals, the buoy rises to the surface at a controlled rate by paying out the winch line. Typical rise rate is ~25cm/s. During a data-collection cycle, the onboard sensors sample the water column up to and including the water's surface. Upon reaching the surface, the system controller activates the onboard telemetry to relay data to and receive commands from the shore station. After concluding the telemetry session, the onboard winch retracts the mooring line and the buoy descends to the seafloor. The system can also rise to the surface in response to surface commands, relayed in the case of the OOI uCSPP by acoustic modem from the nearby OOI surface mooring. This allows the profiler to be recovered for servicing.

A schematic diagram of the test article of the uCSPP is shown below (Figure 1-1). The

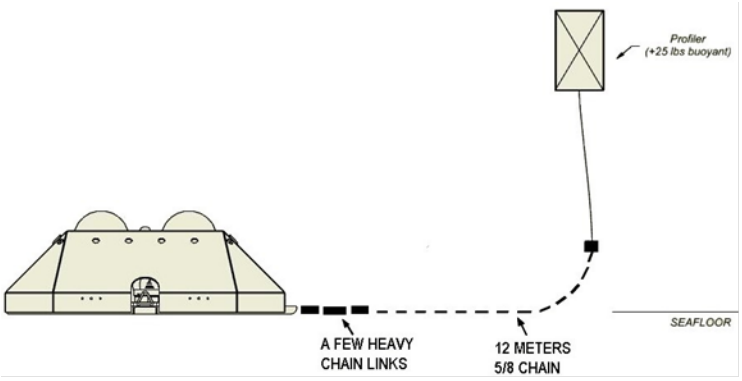

Figure 1-1 Uncabled Surface Piercing Profiler schematic drawing

anchor system shown will be used in the Endurance Array deployments of the uCSPP. A schematic of the telemetry system is shown in Figure 1-2. Note that the shore telemetry link to the surface buoy (1) is not shown. The buoy in the diagram refers to OOI Coastal Surface Buoy deployed near the profiler site. Shore-to-buoy controller and buoy controller-to-profiler acoustic modem communications will be governed by their respective Interface Control Documents (ICDs).

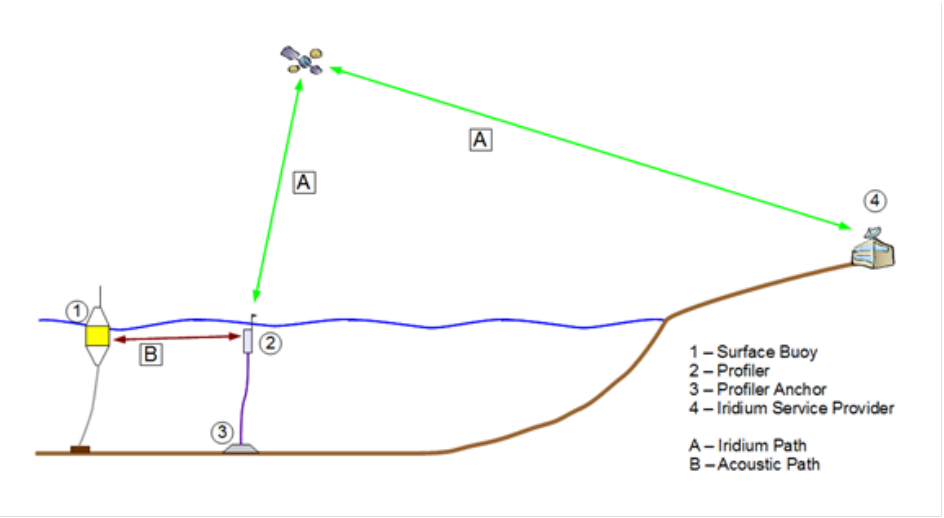

Figure 1-2: Telemetry schematic for the uCSPP

As of revision 1-00 of the test plan, details of the cabled implementation have not been finalized.

The purpose of keeping the profiler at the seafloor most of the time is to help protect the profiler from sea surface hazards such as marine traffic and weather effects. While current profiler technology cannot adequately protect against the former, there are several risk-mitigation possibilities for the latter. Through the subsurface communication pathways mentioned above, the shore station can command the profiler to stay on the bottom. A second way to mitigate surface-condition risks is through winch controller software. Tension sensors on the winch that can detect sudden stress on the line can indicate to the controller that water conditions are too rough to allow the profiler to safely ascend to the surface. Other hazard-protection methods may be developed.

For PVT tests of platform end-to-end operation (PVT phases 2 and 3), vendor provided shore processing software will be hosted on deliverable, configuration managed OMC hardware (CGSN Profilers Platform Shore Server (Windows) and CG-PSS (Linux), probably at the OSU OMC site). The vendor-provided COTS software will be impounded in the CG software CM system (Subversion CM tool) and the software versions used for COTS uCSPP and CG software will be noted in the test reports.

1.3 Document Overview

Sections 1-3 provide general information relevant to this plan. Section 4 describes the environments in which I&V is executed for the Uncabled Coastal Surface Piercing Profiler. Section 5 contains the integration plan. Section 6 contains the verification plan and list of test cases to be conducted during formal test. Section 7 contains information about traceability to requirements. The integration checklist is provided in Appendix A; platform verification procedures in Appendix B.

Refer to the CGSN IVP for general process description and definition of terms utilized within this document, including identification of the verification events and activities described herein.

1.4 Roles and Responsibilities

Table 1-1 Roles and Responsibilities for uCSPP PVT

Organization	Roles and Responsibilities

Organization	Roles and Responsibilities
WHOI – Woods Hole Oceanographic Institution	Lead CGSN organization and supporting organization for uncabled Coastal Surface Piercing Profiler PVT.
OSU – Oregon State University	Leading organization for EA and the uncabled Coastal Surface Piercing Profiler PVT. Responsible for overall coordination with other organizations. Responsible for supporting test planning and preparations, sea trials, and post-test analysis efforts. Responsible for post-test analyses and final test reporting.
WET Labs	Manufacturer. Responsible for provision of test article with applicable FATs, profiler specific training needed for deployment and recovery, and profiler operations during sea trials. Supplies all instrument calibration and other supporting documentation for sensors.
Raytheon Company (WHOI subcontract)	Systems engineering consultant. Responsible for Overall planning support including test documentation and process development.

2 Referenced Documents

The following documents are referenced in this IVP. The latest revision of each applies unless noted in the text.

Table 2-1 Referenced Documents for the CSPP PVT

Document Identifier	Document Title
3101-00033	CGSN Integration and Verification Plan (IVP)
3102-10011	Uncabled Coastal Surface Piercing Profiler ICD
3166-90101	TC-002/Ver-CG-165 Inspection and Analysis, CSPP L4 Requirements
3166-90102	TC-003/Ver-CG-275 Inspection and Analysis, CSPP L3 Requirements
3166-90103	TC-004/Ver-CG-276 Roll-up of CSPP L4 Requirements
3166-90104	TC-005/Ver-CG-277 Cabled CSPP System Only L3 and L4 Requirements
3166-90105	TC-006/Ver-CG-278 CSPP End-to-end L3 and L4 Requirements
3166-90106	TC-001/Ver-CG-279 CSPP Inspection and Analysis (Instruments)
3310-00004	Coastal Surface Piercing Profiler Specifications
L3 CG System Requirements	DOORS L3 requirements
L4 CG Profiler Requirements	DOORS L4 requirements
L4 CG Instrument Package Requirements	DOORS L4 requirements

3 Definitions & Acronyms

Table 3-1 Definitions and Acronyms for the CSPP PVT

Acronym	Definition
AMP	Autonomous Moored Profiler
CDOM	Colored Dissolved Organic Matter Sensor
CGSN	Coastal and Global Scale Nodes
CHLa	Chlorophyll-a sensor
CI	Cyberinfrastructure
COTS	Commercial Off-The-Shelf
CSPP	Coastal Surface Piercing Profiler (designated u- for uncabled and c- for cabled)
CTDPF	Conductivity-Temperature-Depth Instrument
DO	Dissolved Oxygen
DOFST	Dissolved Oxygen, Fast Instrument
DOSTA	Dissolved Oxygen, Stable Instrument
EA	Endurance Array of the OOI
FAT	Factory Acceptance Test
FLORT	3-Channel Fluorescence Instrument
GPS	Global Positioning System
ICD	Interface Control Document
IO	Implementing Organization
IVP	Integration and Verification Plan
I&V	Integration and Verification
LOS	Line Of Sight
NUTNR	Inorganic Nitrate Instrument
OMC	Operations and Management Component
OOC	Ocean Observing Center (at OSU)
OOI	Ocean Observatories Initiative
OPTAA	Optical Attenuation and Absorption Instrument
OSU	Oregon State University
PARAD	Photosynthetically-Available Radiation Instrument
PCO2W	Partial Pressure of CO_2 in Water Instrument
PRR	Production Readiness Review
PVT	Product Verification Test
RUDICS	Router-Based Unrestricted Digital Interworking Connectivity Solution

Acronym	Definition
SPKIR	Spectral Irradiance Instrument
UTC	Coordinated Universal Time
VEL3D	Three Axis Point Velocity of Water Instrument
WET Labs	Western Environmental Technologies Laboratories (vendor for the uCSPP)
WHOI	Woods Hole Oceanographic Institution

The following terminology is used in this document:

Table 3-2 Terminology Used in CSPP PVT

Term	Definition
Deployment Interval	The period between launch and recovery.
Mission	An operational task, defined by a mission plan, during which the Profiler is active and sampling.
Mission Plan –	A set of Profiler and sensor commands defining sampling protocols; mission parameters include but are not limited to profiling depth, speed, sensors active and sensor sampling rates, data compaction and selection for telemetry to shore.
Pilot	A human (or computer routine) that issues mission or other commands to the profiler
Operate	Correctly performing designed functionality.
Shore station	In the context of these specifications, observatory management center(s) used to command and control profilers during a deployment through the use of bi-directional wireless communications (e.g., Iridium) or the OOI undersea power and data cables.

4 Test Approach

The primary test approaches to be used with the first-article OOI uCSPP and cCSPP will include inspection of the test article and its supporting documentation, sea trial demonstrations of the test article, and post-deployment analysis of engineering and science data.

4.1 Test Objectives

The objective of the test is verification that the first-article profiler meets the specifications described in document 3310-00004 and the applicable OOI requirements in the OOI DOORS database.

4.2 Test Environments and Configurations

For the uCSPP PVTs, the profiler will be fitted with winch line sufficient for deployment in 85m water depth. The profiler will be inspected at WET Labs by OOI representatives prior to its first in-water tests to verify requirements for which inspection of the profiler and accompanying documentation suffices. After confirming the operation of the profiler systems, the profiler will be taken to a local body of water near WET Labs and OSU for preliminary operational tests. After operational tests, the

profiler will be deployed in the permitted 85m EA Oregon Shelf site for approximately four months under prevailing conditions. After recovery of the profiler from sea trials, the engineering and science data will be examined for its ability to satisfy OOI science and engineering requirements.

Details of the testing of the cCSPP will be available in later revisions of this document, but will follow the same approach of predeployment inspections, sea trials, and post-deployment analysis.

5 Planned Tests

There will be three phases of verification testing. The first phase consists of pre-deployment activities designed to confirm operation of the profiler systems. The profiler and documentation will first be inspected at WET Labs. Simulated missions will be run at WET Labs and/or OSU to test communication by Iridium and acoustic modem for the uCSPP and cabled power/communications for the cCSPP. These tests will confirm operation of profiler controls for in-water readiness. The final part of this phase is testing of the winch system and abort protocols in a body of water local to WET Labs and OSU. Phase two is ocean deployment at the EA Oregon Shelf site (uCSPP) or Friday Harbor (cCSPP). Phase three will be analysis of deployment engineering and science data to assess the ability of the profiler system to meet OOI requirements for payload, system control, data collection and telemetering, and mission endurance.

6 Integration Plan

The CSPPs are acquired as fully-integrated sensor platforms. OOI will be responsible for final integration of the profiler to a bottom anchor system for the uncabled implementation.

6.1 Assembly and Platform Construction

Platform construction and integration will occur at the WET Labs factory in Philomath, Oregon. It includes a 22000 square foot headquarters, manufacturing facility, machine shop, clean assembly area, calibration facilities, a Research & Development department, and a staff of over 50. It has nearby access to a testing pond with ~15m fresh water depth and a brackish water test facility at Yaquina Bay, Newport, OR (http://yaquina.loboviz.com). In addition to fabricating the profiler itself, they also produce a subset of the instrumentation load for the profiler. As part of SeaBird Scientific, they partner with two other producers of scientific sensors for the profiler.

The sensor load for the AMP will be fully integrated by WET Labs. The scientific sensor set is:

Property	Instrument Series	Instrument WET Labs PN	First article serial number
Dissolved Inorganic Nitrate	NUTNR-J	Satlantic SUNA V2 RXA-ZX0108	337
Photosynthetically-Available Radiation	PARAD-J	WET Labs PARS FAS-016001	PARS-365
Spectral Irradiance with bio-shutter	SPKIR-J	Satlantic OCR-507 RXA-ZX0109	Sensor SN 237 Shutter SN 183
Conductivity-Temperature-Depth	CTDPF-J	SeaBird Electronics SBE-49 RXA-ZX0063	4974683-0308
Three Axis Point Velocity of Water	VEL3D-J	Nortek Aquadopp RXA-ZX0112	Head SN AQS-6032 Hardware SN AQD11259

Dissolved Oxygen	DOFST-J*	Aanderaa Optode 4831, 200m RXA-ZX0113 (part#:0 300 520 4831)	209
Colored Dissolved Organic Matter (CDOM)/Optical Backscatter/Chlorophyll-a Fluorescence (Chl-a)	FLORT-J	WET Labs ECO triplet FAS-015253	BBFL2W-1084
Spectral Absorption and Attenuation	OPTAA-J	WET Labs AC-S FAS-000308	ACS-137

- Note that elsewhere in OOI, the Aanderaa optode is referenced as DOSTA.

Additionally, the uncabled profiler carries a Teledyne-Benthos ATM-914-LF1 Acoustic Modem, WET Labs PN EXA-ZX0284 SN 60649 with transducer SN 60162. The profiler carries a MetOcean CABO Iridium beacon for emergency location.

6.2 Integration Testing

Integration is entirely the responsibility of the vendor, as the profiler is purchased as a fully-integrated platform.

7 Verification Plan

7.1 Assembly DVTs

NA. All requirements verification will be at the platform level.

7.2 Platform PVT

7.2.1 Objectives

The objective of the platform PVT is verification that OOI requirements on the profiler platform are satisfied in the first article unit produced by WET Labs.

7.2.2 Verification/Test Phases

Three test phases will be employed. These phases cover predeployment inspection, deployment/operation/recovery, and post-recovery assessment of the recovered data and profiler mechanical state.

Phase 1 is inspection of the profiler and documentation. Scientific and engineering instrument load, battery and data-storage capacity, and system physical characteristics will be compared to requirements. All scientific instrumentation will be verified against requirements. This phase also includes inspection and analysis of the results of pre-delivery testing done by the vendor. Phase 2 assesses the ability of the profiling system to be deployed, operated, and recovered successfully in an oceanic environment. It will also test the profiler's ability to withstand ocean-deployment conditions and mitigate weather hazards. This phase will include evaluation of such operational characteristics as: the profiler's ability to acquire and telemeter scientifically valid data; to receive, acknowledge, and execute shore commands while submerged and while at the surface; to be deployed and recovered safely and completely. Phase 3 is post-recovery analysis of the performance of the profiler during the deployment period. Included in the performance evaluation will be analysis of the power and data-storage consumption of the profiler during the deployment, analysis of the ability of the profiler to successfully complete the planned deployment period, and

analysis of the profiler to adapt to unfavorable weather conditions either through internal or external control.

7.2.3 Test Case Descriptions

7.2.3.1 TC-001/Ver-CG-279- CSPP Inspection and Analysis (Instruments)

This test case will include a review of instrument vendor-provided documentation to verify that instrument performance requirements are met.

7.2.3.1.1 Requirements addressed

CTDPF-J:L4-CG-IP-RQ-159, L4-CG-IP-RQ-162, L4-CG-IP-RQ-594, L4-CG-IP-RQ-440, L4-CG-IP-RQ-163, L4-CG-IP-RQ-593, L4-CG-IP-RQ-167, L4-CG-IP-RQ-171, L4-CG-IP-RQ-176, L4-CG-IP-RQ-177, L4-CG-IP-RQ-180, L4-CG-IP-RQ-342, L4-CG-IP-RQ-343, L4-CG-IP-RQ-344, L4-CG-IP-RQ-346, L4-CG-IP-RQ-239, L4-CG-IP-RQ-446, L4-CG-IP-RQ-442, L4-CG-IP-RQ-443, L4-CG-IP-RQ-292, L4-CG-IP-RQ-288, L4-CG-IP-RQ-291, L4-CG-IP-RQ-297, L4-CG-IP-RQ-294, L4-CG-IP-RQ-449, L4-CG-IP-RQ-660, L4-CG-IP-RQ-286

DOFST-J: L4-CG-IP-RQ-182, L4-CG-IP-RQ-183, L4-CG-IP-RQ-186, L4-CG-IP-RQ-187, L4-CG-IP-RQ-348, L4-CG-IP-RQ-561, L4-CG-IP-RQ-239, L4-CG-IP-RQ-446, L4-CG-IP-RQ-442, L4-CG-IP-RQ-443, L4-CG-IP-RQ-292, L4-CG-IP-RQ-182, L4-CG-IP-RQ-183, L4-CG-IP-RQ-186, L4-CG-IP-RQ-187, L4-CG-IP-RQ-348, L4-CG-IP-RQ-561, L4-CG-IP-RQ-239, L4-CG-IP-RQ-446, L4-CG-IP-RQ-442, L4-CG-IP-RQ-443, L4-CG-IP-RQ-292, L4-CG-IP-RQ-288, L4-CG-IP-RQ-291, L4-CG-IP-RQ-297, L4-CG-IP-RQ-294, L4-CG-IP-RQ-449, L4-CG-IP-RQ-660, L4-CG-IP-RQ-286

FLORT-J: L4-CG-IP-RQ-213, L4-CG-IP-RQ-214, L4-CG-IP-RQ-215, L4-CG-IP-RQ-216, L4-CG-IP-RQ-217, L4-CG-IP-RQ-218, L4-CG-IP-RQ-219, L4-CG-IP-RQ-397, L4-CG-IP-RQ-395, L4-CG-IP-RQ-393, L4-CG-IP-RQ-223, L4-CG-IP-RQ-551, L4-CG-IP-RQ-659, L4-CG-IP-RQ-239, L4-CG-IP-RQ-446, L4-CG-IP-RQ-442, L4-CG-IP-RQ-443, L4-CG-IP-RQ-292, L4-CG-IP-RQ-288, L4-CG-IP-RQ-291, L4-CG-IP-RQ-297, L4-CG-IP-RQ-294, L4-CG-IP-RQ-449, L4-CG-IP-RQ-660, L4-CG-IP-RQ-286

PARAD-J: L4-CG-IP-RQ-387, L4-CG-IP-RQ-388, L4-CG-IP-RQ-389, L4-CG-IP-RQ-390, L4-CG-IP-RQ-391, L4-CG-IP-RQ-239, L4-CG-IP-RQ-446, L4-CG-IP-RQ-442, L4-CG-IP-RQ-443, L4-CG-IP-RQ-292, L4-CG-IP-RQ-288, L4-CG-IP-RQ-291, L4-CG-IP-RQ-297, L4-CG-IP-RQ-294, L4-CG-IP-RQ-449, L4-CG-IP-RQ-660, L4-CG-IP-RQ-286

SPKIR-J: L4-CG-IP-RQ-374, L4-CG-IP-RQ-527, L4-CG-IP-RQ-206, L4-CG-IP-RQ-373, L4-CG-IP-RQ-207, L4-CG-IP-RQ-377, L4-CG-IP-RQ-208, L4-CG-IP-RQ-446, L4-CG-IP-RQ-442, L4-CG-IP-RQ-443, L4-CG-IP-RQ-292: L4-CG-IP-RQ-288, L4-CG-IP-RQ-447, L4-CG-IP-RQ-291, L4-CG-IP-RQ-297, L4-CG-IP-RQ-294, L4-CG-IP-RQ-449, L4-CG-IP-RQ-450, L4-CG-IP-RQ-660, L4-CG-IP-RQ-286

NUTNR-J: L4-CG-IP-RQ-233, L4-CG-IP-RQ-403, L4-CG-IP-RQ-558, L4-CG-IP-RQ-234, L4-CG-IP-RQ-404, L4-CG-IP-RQ-239, L4-CG-IP-RQ-446, L4-CG-IP-RQ-442, L4-CG-IP-RQ-443, L4-CG-IP-RQ-292, L4-CG-IP-RQ-288, L4-CG-IP-RQ-291, L4-CG-IP-RQ-297, L4-CG-IP-RQ-294, L4-CG-IP-RQ-449, L4-CG-IP-RQ-660, L4-CG-IP-RQ-286

VEL3D-J: L4-CG-IP-RQ-260, L4-CG-IP-RQ-261, L4-CG-IP-RQ-264, L4-CG-IP-RQ-265, L4-CG-IP-RQ-266, L4-CG-IP-RQ-385, L4-CG-IP-RQ-606, L4-CG-IP-RQ-596, L4-CG-IP-RQ-597, L4-

CG-IP-RQ-598, L4-CG-IP-RQ-267, L4-CG-IP-RQ-442, L4-CG-IP-RQ-443, L4-CG-IP-RQ-292, L4-CG-IP-RQ-288, L4-CG-IP-RQ-291, L4-CG-IP-RQ-297, L4-CG-IP-RQ-294, L4-CG-IP-RQ-607, L4-CG-IP-RQ-449, L4-CG-IP-RQ-450, L4-CG-IP-RQ-660, L4-CG-IP-RQ-286

OPTAA-J: L4-CG-IP-RQ-226, L4-CG-IP-RQ-514, L4-CG-IP-RQ-516, L4-CG-IP-RQ-518, L4-CG-IP-RQ-519, L4-CG-IP-RQ-228, L4-CG-IP-RQ-231, L4-CG-IP-RQ-399, L4-CG-IP-RQ-520, L4-CG-IP-RQ-522, L4-CG-IP-RQ-525, L4-CG-IP-RQ-401, L4-CG-IP-RQ-402, L4-CG-IP-RQ-446, L4-CG-IP-RQ-442, L4-CG-IP-RQ-443, L4-CG-IP-RQ-292, L4-CG-IP-RQ-520, L4-CG-IP-RQ-291, L4-CG-IP-RQ-297, L4-CG-IP-RQ-294, L4-CG-IP-RQ-449, L4-CG-IP-RQ-450, L4-CG-IP-RQ-660, L4-CG-IP-RQ-286

7.2.3.1.2 Pre-conditions

The profiler instrument suite is completely acquired and is ready for integration with other profiler systems.

7.2.3.1.3 Hardware Preparation

None

7.2.3.1.4 Software Preparation

None

7.2.3.1.5 Test Inputs

Test results and other documentation from profiler instruments

7.2.3.1.6 Expected Results

All instrumentation requirements are addressed and either passed or have appropriate waivers

7.2.3.1.7 Criteria for Evaluating Results

Compliance with all relevant instrument requirements

7.2.3.2 TC-002/Ver-CG-165- Inspection and Analysis, CSPP L4 Requirements

This test case will include a review of profiler vendor-provided documentation and inspection of the first article unit to verify that profiler L3 performance requirements are met.

7.2.3.2.1 Requirements addressed

L4-CG-PR-RQ-195,L4-CG-PR-RQ-354,L4-CG-PR-RQ-181,L4-CG-PR-RQ-182,L4-CG-PR-RQ-196,L4-CG-PR-RQ-340,L4-CG-PR-RQ-198,L4-CG-PR-RQ-335,L4-CG-PR-RQ-200,L4-CG-PR-RQ-201,L4-CG-PR-RQ-202,L4-CG-PR-RQ-203,L4-CG-PR-RQ-204,L4-CG-PR-RQ-205,L4-CG-PR-RQ-206,L4-CG-PR-RQ-208,L4-CG-PR-RQ-209,L4-CG-PR-RQ-210,L4-CG-PR-RQ-211,L4-CG-PR-RQ-212,L4-CG-PR-RQ-184,L4-CG-PR-RQ-213,L4-CG-PR-RQ-214,L4-CG-PR-RQ-215,L4-CG-PR-RQ-216,L4-CG-PR-RQ-217,L4-CG-PR-RQ-69,L4-CG-PR-RQ-78,L4-CG-PR-RQ-355,L4-CG-PR-RQ-71,L4-CG-PR-RQ-72,L4-CG-PR-RQ-73,L4-CG-PR-RQ-81,L4-CG-PR-RQ-82,L4-CG-PR-RQ-84,L4-CG-PR-RQ-218,L4-CG-PR-RQ-87,L4-CG-PR-RQ-88,L4-CG-PR-RQ-89,L4-CG-PR-RQ-90,L4-CG-PR-RQ-91,L4-CG-PR-RQ-96, L4-CG-PR-RQ-98,L4-CG-PR-RQ-264,L4-CG-PR-RQ-106,L4-CG-PR-RQ-107,L4-CG-PR-RQ-108,L4-CG-PR-RQ-372,

7.2.3.2.2 Pre-conditions

The profiler is fully assembled and all systems integrated. The shipping container is presented for inspection. The mission-planning tool has been demonstrated.

7.2.3.2.3 Hardware Preparation

None

7.2.3.2.4 Software Preparation

None

7.2.3.2.5 Test Inputs

Data supporting sustainability and survivability will be presented.

7.2.3.2.6 Expected Results

All test case requirements will be verified as in compliance

7.2.3.2.7 Criteria for Evaluating Results

Required systems will be present.

7.2.3.3 TC-003/Ver-CG-275- Inspection and Analysis, CSPP L3 Requirements

This test case will include a review of profiler vendor-provided documentation and inspection of the first article uncabled CSPP unit to verify that profiler L3 performance requirements are met.

7.2.3.3.1 Requirements addressed

L3-CG-RQ-489,L3-CG-RQ-490,L3-CG-RQ-445,L3-CG-RQ-273,L3-CG-RQ-585,L3-CG-RQ-586,L3-CG-RQ-1032,L3-CG-RQ-589,L3-CG-RQ-590,L3-CG-RQ-887, L3-CG-RQ-777,L3-CG-RQ-277,L3-CG-RQ-278,L3-CG-RQ-279,L3-CG-RQ-280,L3-CG-RQ-282,L3-CG-RQ-283,L3-CG-RQ-284,L3-CG-RQ-285,L3-CG-RQ-584,L3-CG-RQ-999, L3-CG-RQ-1001

7.2.3.3.2 Pre-conditions

The profiler is fully assembled and all systems integrated. The shipping container is presented for inspection. The mission-planning tool has been demonstrated.

7.2.3.3.3 Hardware Preparation

7.2.3.3.4 None

7.2.3.3.5 Software Preparation

7.2.3.3.6 None

7.2.3.3.7 Test Inputs

7.2.3.3.8 Expected Results

All test case requirements will be verified as in compliance

7.2.3.3.9 Criteria for Evaluating Results

Data to support analysis of profiles per deployment will be present.

7.2.3.4 TC-004/Ver-CG-276- Roll-up of CSPP L4 Requirements

This test case includes an analysis of the DOORS database to verify that all L4 children of the specified L3 requirements have been verified for the CSPP.

7.2.3.4.1 Requirements addressed

L3-CG-RQ-477,L3-CG-RQ-920,L3-CG-RQ-485,L3-CG-RQ-166,L3-CG-RQ-495,L3-CG-RQ-855,L3-CG-RQ-856,L3-CG-RQ-494,L3-CG-RQ-432,L3-CG-RQ-993, L3-CG-RQ-438,L3-CG-RQ-439,L3-CG-RQ-885,L3-CG-RQ-444,L3-CG-RQ-987,L3-CG-RQ-867,L3-CG-RQ-555,L3-CG-RQ-430,L3-CG-RQ-431,L3-CG-RQ-800,L3-CG-RQ-922, L3-CG-RQ-433,L3-CG-RQ-923,L3-CG-RQ-496,L3-CG-RQ-497

7.2.3.4.2 Pre-conditions

All the L4 requirements needed for L3 roll-up verification are verified as in compliance

7.2.3.4.3 Hardware Preparation

None

7.2.3.4.4 Software Preparation

None

7.2.3.4.5 Test Inputs

Previous test cases containing the L4 requirements needed for L3 roll-up verification

7.2.3.4.6 Expected Results

All test case requirements will be verified as in compliance

7.2.3.4.7 Criteria for Evaluating Results

7.2.3.5 TC-005/Ver-CG-277 Cabled CSPP System Only L3 and L4 Requirements

This test case will include a review of profiler vendor-provided documentation and inspection of the first article cabled CSPP unit to verify that profiler L3 performance requirements are met.

7.2.3.5.1 Requirements addressed

L4-CG-PR-RQ-262,L4-CG-PR-RQ-376,L4-CG-PR-RQ-377,L4-CG-PR-RQ-247,L4-CG-PR-RQ-337,L4-CG-PR-RQ-339,L4-CG-PR-RQ-250,L4-CG-PR-RQ-358, L3-CG-RQ-920,L3-CG-RQ-497, L3-CG-RQ-461,L3-CG-RQ-753,L3-CG-RQ-755,

7.2.3.5.2 Pre-conditions

The cabled CSPP platform is complete and documented

7.2.3.5.3 Hardware Preparation

None

7.2.3.5.4 Software Preparation

None

7.2.3.5.5 Test Inputs

Documentation required for verification of relevant cCSPP L3 and L4 requirements

7.2.3.5.6 Expected Results

7.2.3.5.7 Criteria for Evaluating Results

7.2.3.6 TC-006/Ver-CG-278 CSPP End-to-end L3 and L4 Requirements

This test case will include a review of profiler vendor-provided documentation and reports from first article end-to-end testing to verify that profiler L4 and L3 performance requirements are met.

7.2.3.6.1 Requirements addressed

L4-CG-PR-RQ-74, L4-CG-PR-RQ-183, L4-CG-PR-RQ-207, L4-CG-PR-RQ-79, L4-CG-PR-RQ-94, L4-CG-PR-RQ-374, L4-CG-PR-RQ-379, L3-CG-RQ-163, L3-CG-RQ-1002, L3-CG-RQ-164

7.2.3.6.2 Pre-conditions

The profiler has completed sufficient test deployment duration to make meaningful analysis of functionality. Profiles have been acquired at <25cm vertical resolution.

7.2.3.6.3 Hardware Preparation

The profiler has been deployed, operated, and recovered.

7.2.3.6.4 Software Preparation

Applicable software to operate the profiler is present

7.2.3.6.5 Test Inputs

Acoustically-sent commands to the profiler will be transmitted either as isolated tests or in response to weather conditions.

7.2.3.6.6 Expected Results

7.2.3.6.7 Criteria for Evaluating Results

8 Requirements Traceability

To view requirement traceability for the Coastal Surface Piercing Profiler: In the DOORS database, open the L3 CG System Requirements module (/L3 System/CG System/L3 CG System Requirements). Once the module is open, use the 'View' pull-down to select the "RVCM_CSPPM" view. This view will show the CGSN L3 requirements linked to Verification Event and Verification Procedure.

To view the L4 requirements allocated to this test event, In the DOORS database, open each applicable L4 CG Requirements module. Once a module is open, use the 'View' pull-down to select the "RVCM_CSPP" view. This view will show the CGSN L4 requirements linked to the Coastal Surface Piercing Profiler. Only those requirements with "Platform" in the Verification Level field are linked to this test event.

The applicable L4 Modules are:

- CG Instrument Package
- CG Profiler

Refer to the CGSN IVP (3101-00033) for a description of the requirement, event, and procedure relationships shown in the RCVM views in DOORS.

Table 8-1: I&V Schedule for uCSPP (subject to change)

Date	Milestone
April 26, 2013	uCSPP contract signed
May 2, 2013	uCSPP Kickoff Meeting
September 10, 2013	Critical Design Review
To August 2013	First Article development. Begin IVP test phase 1.
To October 2013	First Article construction, integration, and pre-delivery testing.
October 2013	Pre-deployment verification activities. IVP test phase 1 concludes with delivery of first article.
October 2013	First article PVT deployment. IVP test phase 2 begins at delivery of first article.
January 2014	First article recovery and refurbishment. IVP test phase 2 ends at demobilization after first article recovery, and IVP test phase 3 begins.
February 2014	IVP test phase 3 ends. Final report on I&V activities
February 2014	Production Readiness Review

APPENDIX A: Integration Checklist(s)

A.1.1 <XYZ> Assembly Integration Checklist

No.	Integration Step/Action	Pass	Fail	Notes

<repeat tables as needed to cover all applicable assemblies>

A.1.2 <Platform Name> Integration Checklist

No.	Integration Step/Action	Pass	Fail	Notes

APPENDIX B: Verification Procedures

B.1.1 Assembly <XYZ> Verification Procedure List

Test Case ID	Test Case Name	Procedure Document Number

B.1.2 Coastal Surface-Piercing Profiler Verification Procedure List

Test Case ID	Testing Phase	Test Case Name	Procedure Document Number
TC-001/Ver-CG-279	1	CSPP Inspection and Analysis (Instruments)	3166-90106
TC-002/Ver-CG-165	1	Inspection and Analysis, CSPP L4 Requirements	3166-90101
TC-003/Ver-CG-275	1	Inspection and Analysis, CSPP L3 Requirements	3166-90102
TC-004/Ver-CG-276	1	Roll-up of CSPP L4 Requirements	3166-90103
TC-005/Ver-CG-277	1	Cabled CSPP System Only L3 and L4 Requirements	3166-90104
TC-006/Ver-CG-278	2 (deployment through recovery), 3 (analysis)	CSPP End-to-end L3 and L4 Requirements	3166-90105