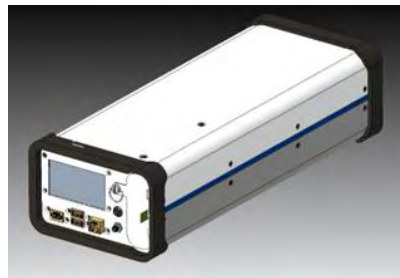


Advanced Analyzers for Monitoring Submarine Atmosphere Open-path, Mid-Infrared iCRDS Analyzer for the Accurate Measurement of Reactive and Adsorbing VOCs



Nikira Labs Inc.
Mountain View, CA
www.nikiralabs.com



Contact:

Manish Gupta
Chief Technology Officer
Nikira Labs Inc.
manish.gupta@nikiralabs.com

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SYSCOM: Naval Sea Systems Command
(NAVSEA) | www.navsea.navy.mil

Program Sponsor: NAVSEA

Other Potential Programs: SSN(X),
Virginia-Class, Colombia-Class, and Los
Angeles-Class Submarines

Current TRL:

Distributed System: 5
Centralized System: 6

Projected TRL:

Distributed System: 7 / 2026
Centralized System: 9 / 2027

Keywords: DAMS, CAMS, Submarine Air
Monitoring, Submarine Life Support,
Volatile Compounds

THE CHALLENGE

Modern submarines have sophisticated atmospheric systems to generate oxygen, remove carbon dioxide, and purify air. To confirm that these systems are working and assure crew safety, the Navy must measure submarine life gases and volatile organic compounds. The latter is challenging since volatile organic compounds (VOCs) are present in trace amounts, are highly reactive, and absorb into surfaces. Current methods do not address these issues so new technologies are required to measure gases in submarines.

THE INNOVATION

Nikira Labs, Inc. employs a variety of analytical methods based on cavity-enhanced, tunable diode laser absorption spectrometry to measure both life gases and VOCs. These methods use both near-infrared and mid-infrared lasers to measure the absorption of light by specific compounds, providing a first-principle measurement of gas concentration. This technology is coupled with a high-finesse optical cavity to enhance the pathlength and allow for quantification of trace gas concentrations.

THE NAVY BENEFIT

The Navy will utilize the resulting analyzers for both centralized and distributed gas monitoring aboard current (e.g., Virginia-class, Colombia-class, and Los Angeles-class) and future (e.g., SSN(X)) submarines. The analyzers will allow for more accurate control of oxygen generators, carbon dioxide scrubbers, and VOC burners to enhance crew safety and health. Additionally, because of the technology's robustness and modularity, it will reduce cost to Navy due to maintenance and obsolescence issues.

THE FUTURE

Centralized Monitoring

The centralized monitor – Submarine Total Air Monitor (STAM) – will be tested against Navy requirements (e.g., shock, vibe, EMI) in early 2025. The first few units are expected to be deployed as TEMP-ALTs in late 2025 or early 2026. Pending successful testing and completion of other key requirements, the STAM will transition into the fleet in 2027.

Distributed Monitoring

The initial prototype distributed monitors for life gases and VOCs will be delivered to NAVSEA in late 2024. These units may be temporarily deployed in 2025 and then be evaluated for incorporation into the SSN(X) fleet with potential backfill opportunities on existing vessels.

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