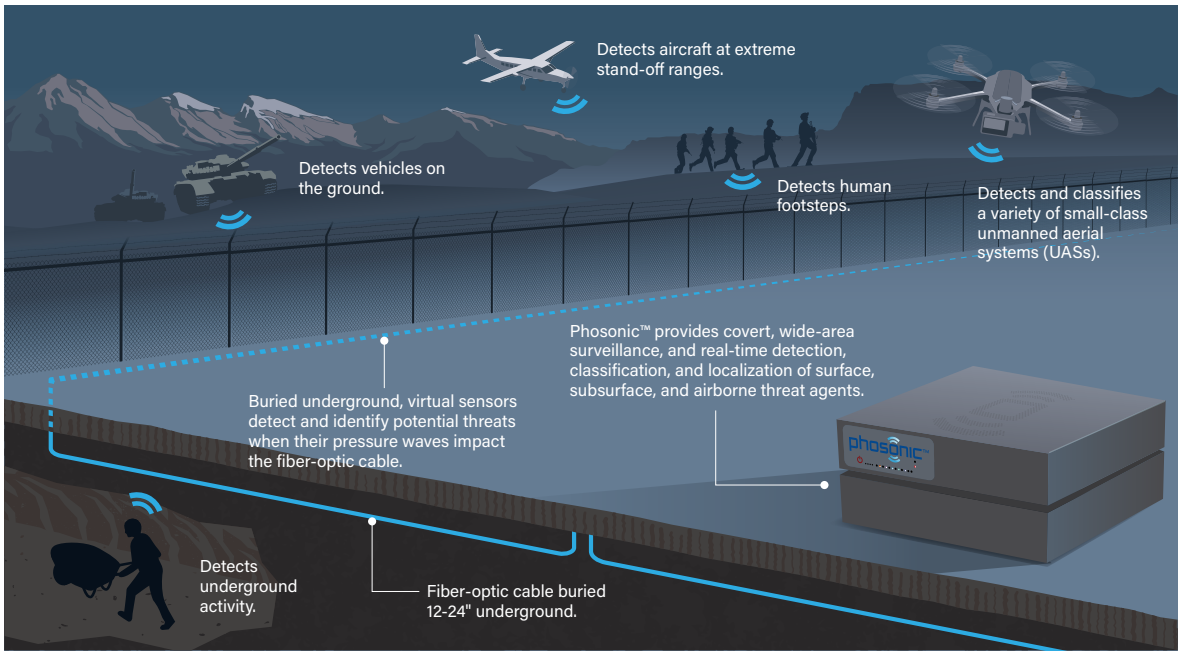
SOLUTION BRIEF

Secure High-Priority Facilities from Perimeter Threats

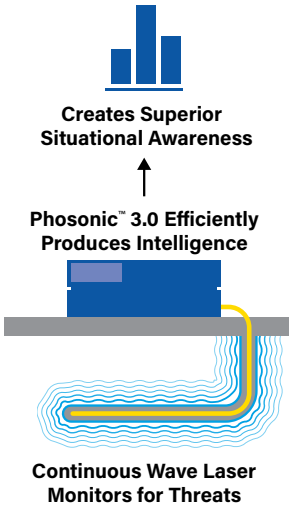
Detect, classify, and localize a variety of air, surface, and subsurface threats in real-time, across all terrain

Securing highly sensitive military sites is a top priority for the United States Department of Defense (DoD), especially as our adversaries become more advanced and threats become more sophisticated. Proximity sensors have long been used for detecting these threats, but they fall short in their ability to differentiate between real threats and benign activity, such as animals, wind, and other nuisance alarms. Fiber-optic perimeter security sensor systems offer advanced capabilities for detecting, locating, and classifying real threats in real time. They are an integral part of any comprehensive solution for securing highly sensitive sites.

Adelos™ Phosonic™ 3.0 uses patented continuous wave laser interrogation technology to accurately detect, classify, and localize air, surface, and subsurface threats across wide areas and varied terrain. Phosonic accurately identifies airborne and unmanned aircraft, biological and mechanical surface activity (humans and vehicles), and subsurface activity (tunneling), and can be extended to any threat target of interest. Based on patented U.S. Navy technology, Phosonic provides outstanding performance for perimeter security solutions, outperforming its competition in protecting critical infrastructure and providing the first line of defense for multi-layered security applications.[1] Phosonic is ideal for advanced border security applications, multi-layered perimeter security applications, sensor-to-sensor cue-to-slew applications, intelligence and surveillance scenarios, and other special requirements.



Adelos™ Phosonic™ 3.0 detects threats above the surface, on the surface, and below the surface.



Benefits of Phosonic™ 3.0

Threat Detection

Phosonic detects and identifies activity in the air, on the surface, and beneath the surface simultaneously.

Response Efficiency

Phosonic classifies the intrusion and its location, reducing the cost of deploying personnel for non-threat activity, such as animals or other nuisance alarms.

Intelligence Production

Adelos provides advanced machine-learning capabilities for high-quality signal intelligence, enabling superior situational awareness.

Covert, Wide-area Surveillance

Phosonic provides continuous, real-time feeds associated with a wide variety of configurable and customizable intrusion scenarios ideal for advanced border security applications, multi-layered perimeter security applications, sensor-to-sensor cue-to-slew applications, intelligence and surveillance scenarios, and other special requirements.

Highly Sensitive Military Sites Face Evolving and Sophisticated Threats

Securing intercontinental ballistic missile (ICBM) launch facilities (LFs), submarine base perimeters, and other strategic and weapon system sites remains a top priority for the United States Department of Defense (DoD). When proximity sensors trigger an alarm, military personnel are deployed to the location from the nearest base, which can be costly, especially for nuisance alarms. Upgrades to camera systems over the past ten years have helped reduce unnecessary deployments, but these don't provide adequate threat detection overall. Detecting threats can be difficult with cameras unless they are near the site, and almost impossible if the threat involves tunneling. And with technological advances, serious threats are becoming more sophisticated and harder to detect.

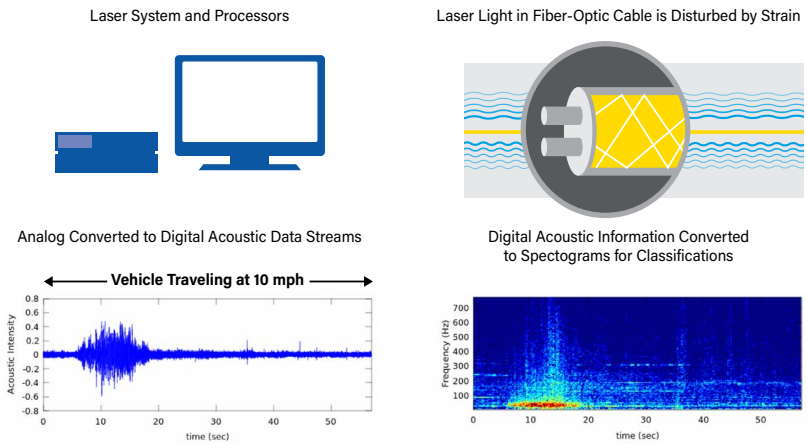
The addition of advanced fiber-optic sensor systems provides a comprehensive, next-generation solution for securing highly sensitive military and civilian sites. With continuous, real-time data feeds in a wide variety of configurable and customizable intrusion scenarios, Adelos™ Phosonic™ 3.0 provides real-time, low false-positive alerts and uses state-of-the-art digital signal processing, machine-learning classification algorithms, and standards-based data formats and communications protocols.

Detect, Classify, and Localize Threats Across All Terrain

Phosonic accurately detects, classifies, and localizes a variety of surface, subsurface, and airborne threat objects including unmanned aerial systems (UASs), vehicles, and humans, as well as tunneling activity.

Phosonic's passive, opto-acoustic fiber-optic sensor system measures the micro-strain of sound waves on a continuous wave laser light in a buried fiber-optic cable array. Because Phosonic does not put energy into the field, it is difficult or impossible for adversaries to detect its presence. Using a modulated pseudo-random number

(PRN) code sequence, Phosonic detects changes in the laser light phase to localize and deliver situational awareness of threats across air, surface, and subsurface domains. A patented method of Rayleigh Optical Backscattering conveys the light phase shift data to a photo-receiver for digitization, signal processing, and real-time analysis.[2]



Adelos™ Phosonic™ 3.0 detects changes in laser light in a fiber-optic cable and converts this analog information to digital acoustic data streams and spectrograms for target analysis and classification.

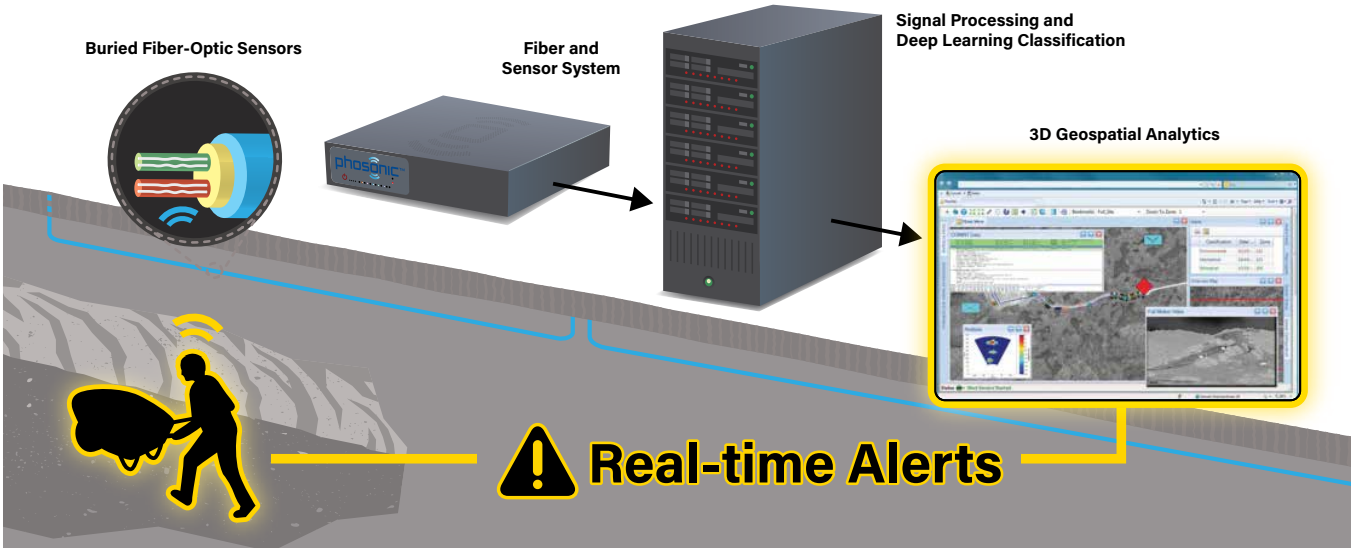
Using a deep convolutional neural network (DCNN) algorithm trained on a labeled dataset, Phosonic produces a real-time spectrogram for each 3-second acoustic signal per installed mandrel to classify targets. Phosonic detects the spectral signatures of specific threats such as the following:[3]

- **UAS.** Large- and small-class UAS targets have distinct acoustic signatures that Phosonic can detect, classify, and localize at more than 300 meters from the sensor array.
- **Humans and vehicles.** Phosonic detects footsteps from as far as 20 meters from the fiber, as well as differentiate humans from animals and other natural occurrences. It detects motor vehicles from as far as 70 meters from the fiber,
- **Tunneling activity.** Phosonic detects tunnel creation and activity and for surveillance and intelligence production.

Benefits

- **Simultaneous threat detection.** Phosonic detects and identifies security threats above, on, and below the surface by extending the perimeter security zone with advanced passive detection, which does not put energy into the field, making it difficult or impossible for these threats to detect its presence.
- **Greater response efficiency.** Identifying the exact intrusion—human, vehicle, aircraft, tunneling—and location helps security personnel make precise decisions about tactical responses. This can help reduce the cost of deploying personnel for nuisance alarms.
- **Improved intelligence production.** Phosonic uses DCNN algorithms to collect data to improve its classification models. For each installed location, it continuously learns, reducing its false-positive and nuisance alarm rates, and leverages its superior signal-to-noise ratio (SNR) to provide advanced situational awareness.
- **Covert, wide-area surveillance.** Phosonic is ideal for advanced border security applications, multi-layered perimeter security applications, sensor-to-sensor cue-to-slew applications, intelligence and surveillance scenarios, and other special requirements. It provides continuous, real-time feeds associated with a wide variety of configurable and customizable intrusion scenarios. Each meter of fiber is a virtual, independently configurable sensor that provides real-time, low false-positive alerts of people walking, large and small vehicles, low-flying aircraft, gunshots, tunneling, and other events that cause minute disturbances to the buried fiber-optic cable sensor. It uses state-of-the-art digital signal processing, machine-learning classification algorithms, and standards-based data formats and communications protocols for alert notification, sensor-to-sensor communication, and wide-area situational awareness.

Based on patented U.S. Navy technology, Phosonic has established its superiority in protecting critical infrastructure and providing the first line of defense for multi-layered security applications. Phosonic enables easy integration of sensors, data acquisition tools, and analytics systems based on the Security Equipment Integration Working Group (SEIWG) standards. For example, Phosonic integrates with Video Management Systems (VMSs), such as AirShip; C4ISR solutions; and other integrated solutions using GeoJSON, JSON, and Python scripts for interoperability. It is internet-ready, making it easy to include in a diverse, integrated Internet-of-Things (IoT) security solution.



Each meter of fiber is a virtual sensor that can be configured independently to provide real-time alerts of threat activity.

Phosonic outperforms pulse laser systems by sampling all zones concurrently and continuously, delivering more data at a higher SNR for better insights. Phosonic uses DCNN algorithms to create a superior learning environment to provide advanced computational signal analytics. This enables superior threat detection, classification, and localization for greater situational awareness.

Conclusion

Phosonic 3.0 moves beyond traditional proximity sensors and cameras to greatly extend the security perimeter and simultaneously identify surface, subsurface, and airborne threats. Using a blend of patented technology from Adelos and the U.S. Navy, Phosonic provides an integrated solution that combines highly sensitive continuous wave optical interrogation, advanced fiber-optic cable systems, opto-acoustic amplifiers, and a robust DCNN for detection, classification, and localization. Phosonic detects, classifies, and localizes a variety of threat targets.

Understanding what the threat is, where it is, and the direction of its movement is a critical step in securing highly sensitive military sites and other strategic sites. Phosonic significantly improves security surveillance for informed decision making and response.

You may also find the following resource useful: Adelos awarded Rapid Innovation Fund contract with USAF

For more information about this and other Adelos products visit adelosinc.com or contact Brian Castaldi, Director of Business Development at 406-698-9631.

[1] Contractor Performance Assessment Report (CPAR): FAR 2.101, 3.104, AND 42.1503 compared to competitors' published performance. [2] U.S. Patent: 7,030,971.
[3] See endnote 1

About Adelos

Adelos, Inc. is a fiber-optic sensor company based in Polson, Montana. Adelos systems are built on technology originally developed by the U.S. Navy and are used in a diverse range of applications directly applicable to the defense industry. A subsidiary of S&K Technologies, a federally chartered Native American corporation owned by the Confederated Salish and Kootenai Tribes, Adelos Inc. has invested nearly a decade in engineering and deploying fiber-optic solutions for the U.S. Federal government, including the U.S. Navy, the U.S. Air Force, and Department of Energy. Adelos was granted worldwide exclusive license to the U.S. Navy's seminal BLUE ROSE fiber-optic sensor patents, which were developed by the Naval Undersea Warfare Center in Newport, Rhode Island.