

Fiber optic sonar array detection range



AI Overview

Fiber optic sonar arrays, including towed arrays and DAS-enabled undersea cables, can detect acoustic signals over tens to hundreds of kilometers depending on array length, sensitivity, and environmental conditions.

Overview of Fiber Optic Sonar Arrays

Fiber optic sonar arrays use optical fibers as acoustic sensors, converting pressure waves in water into measurable changes in light phase or intensity. These systems include towed arrays for submarines and distributed acoustic sensing (DAS) along undersea cables for wide-area maritime surveillance. Compared to traditional electric hydrophones, fiber optic sensors offer higher sensitivity, immunity to electromagnetic interference, and extended operational range.

Detection Range Factors

Array Length and Configuration: Longer arrays with multiple fiber optic sensors improve detection range and directional resolution. Towed arrays can extend several kilometers behind a submarine, while DAS-enabled undersea cables can span hundreds to thousands of kilometers across the ocean floor.

Sensor Sensitivity: Advanced systems, such as spiral-sensitized optical cables, achieve high sensitivity (e.g., around $-145.69 \text{ dB re: } 1 \text{ rad}/(\mu\text{Pa}\cdot\text{m})$), enabling detection of weak acoustic signals in noisy environments.

Environmental Conditions: Water temperature, salinity, and ambient noise affect sound propagation. Passive detection relies on the target's noise, while active systems depend on transmitted pulses and reflection strength.

Deployment Type:

- Towed Arrays:** Provide high-resolution detection for submarines and anti-submarine warfare, typically effective over tens of kilometers depending on frequency and target signature.
- Bottom-Mounted or DAS Cables:** Offer continuous, long-range monitoring over vast areas, potentially covering hundreds of kilometers, suitable for harbor defense or ocean-wide surveillance.

Practical Applications

Submarine Operations: Towed fiber optic arrays enhance threat detection, navigation, and situational awareness with compact, low-power designs

Article Content

(PDF) Analysis and improvement of dynamic range in

Abstract Dynamic range, the ratio of maximum detectable amplitude, and the noise level, are of great importance in characterizing the performance of

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The official website of Hamamatsu Corporation whose mission is to advance science and industry through photonic technologies. Our products include optical sensors

Navy using optical sonar sensors to enhance submarine detection and ...

Sonar experts from the Northrop Grumman Navigation Systems Division in Woodland Hills, Calif., envision a vast ocean-floor optical sensor array that can detect and track some ...

Fiber optic acoustic sensor technology

The Fiber Optic Wide Aperture array is a large channel count planar array mounted on the side of the submarine, but fiber sensor technology is also being developed for both towed arrays (as

US, EU navies to use 750,000-mile cable network to track submarines

Undersea fiber-optic cables, which stretch over 1.2 million kilometers (750,000 miles) across the ocean floor, are being used in a new way for anti-submarine warfare. A developing

Fiber-optic hydrophone array in USS Virginia .

Fiber-optic hydrophone (FOH) is a significant type of acoustic sensor, which can be used in both military and civilian fields such as underwater target detection, oil and natural gas prospecting ...

Fiber-Optic Sensor Array for Distributed Underwater Ultrasound Sensing

The method was used to interrogate a Quasi-Distributed Acoustic Sensing (Q-DAS) array with a maximum length of 4 km, having a classical maximum interrogation rate of 25 kHz. The array

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Dexter[/searchmatch];135512931364960606]Jetzt bin ich wirklich gespannt, wobei ich davon ausgehe, dass diese "Regelung" vllt auch wieder nur bei AT-Spielen gilt!

"They Turned the Internet Into Sonar": How Undersea

Undersea fiber-optic cables, initially designed for communication, are now being repurposed as expansive sonar arrays through Distributed Acoustic

Towed Array Sonar Systems (TASS)

Towed array sonar systems, commonly referred to as towed arrays, represent one of the most powerful sonar detection

Finding the edge: sonar technologies and programmes

Improved detection ranges and accuracy are a feature of the ISUS 100 sonar suite that can include large acoustic aperture long-range flank arrays

Submarines

The OptiArray system incorporates optic-fiber sensors that overcome the limitations of traditional electric sensors. They deliver key advantages like extended range, durability, and EMI & EMC immunity,

Recent Advances in Fibre Optic Array Technologies

Early investment in optical fibre hydrophones was stimulated by the apparent benefits of fiber optic telemetry as well as claims of a range of significant advantages over conventional piezoelectric

Introduction to Fiber Optic Sensing

Distributed and quasi-distributed fiber optic sensors are systems that connect opto-electronic interrogators to an optical fiber (or cable), converting the fiber to an array of distributed sensors. The

Towed Array Sonar

Operationally flexible and customizable; interchangeable active sonar projector can be changed at-sea, resulting in sonar optimization in both deep water and littoral environments

Thin Fiber-Optic Hydrophone Towed Array for Autonomous

The fiber-optic hydrophone (FOH) provides new possibilities for underwater acoustic detection and surveillance, particularly when integrated with autonomous underwater vehicles

Optical Fiber Sensors and Sensing Networks: Overview

Optical fiber sensors present several advantages in relation to other types of sensors. These advantages are essentially related to the optical fiber

Towed Array White Paper FINAL REVIEW 4-11-13 v3

There have been extensive R& D programs to develop an all-optical towed array (or seismic streamer) system that incorporates fiber optic sensors along with the optical signal path MUX schemes.

Fiber-Optic Sensor Array for Distributed Underwater ...

Fiber-optic hydrophone arrays can overcome these limitations as they offer extended detection volume and synchronized measurements at multiple positions.

Fiber Optic Hydrophones for towed array applications

A “towed hydrophone array” is a collection of hydrophones arranged in a line and towed behind a platform . An advantage of towing a sensor array, instead of mounting it on the platform,

Fibre Optic Towed Array Technology

The FOTA system performance assessment verified and confirmed the towed array sonar detection range at different bearings and speeds by using a sound source producing multiple tones (300Hz,

Robust Detection of Underwater Target Against Non-Uniform Noise

In this paper, we present a novel approach that leverages an optical fiber distributed acoustic sensing (DAS) system combined with a broadband generalized sparse covariance-fitting

Fiber Optic Sonar Sensor | Springer Nature Link

BBN has been working with the Naval Research Laboratory to develop a Fiber Optic Sonar System. The acoustic sensing element is 10,000 meters of single mode optical fiber. The acoustic pressure

Leveraging Distributed Acoustic Sensing for monitoring vessels using ...

This study focuses on the automatic detection and localization of vessels near submarine fiber-optic cables using distributed fiber-optic sensing employing a methodology that incorporates

Fiber Optic Sensor with a Gold Nanowire Group Array

To achieve high performance and wide range detection, we propose an ultra-wide range high sensitivity plasmonic fiber optic sensor with a gold (Au)

Fiber Optic Hydrophones for towed array applications

In this paper, we report the design and development of a fiber optic hydrophone for underwater applications. The sensing configuration is based on a Michelson interferometer where a

(PDF) Fibre Optic Towed Array: The High Tech

The Fibre Optic Towed Array (FOTA) system enhances naval warfare capabilities through lightweight, compact design. FOTA achieved a significant

“The Use of Optical Fiber Rotary Joints in Towed Sonar Array and ...

But since the source level of this noise radiating from the object is not known, detecting it and identifying its" location becomes a bit more difficult. Here is where the sonar equations come into play with such

US, EU navies to use 750,000-mile cable network to

US, EU navies turning 750,000 miles of seafloor cables into submarine-hunting sonars
Originally designed for communications, these cables

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