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Distributed Fiber Optic Acoustic Emission Sensor (FAESense™) System for Condition Based Maintenance of Advanced Structures

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This paper describes progress towards the development and demonstration of a distributed fiber optic acoustic emission sensor (FAESense™) system for the in-situ unattended detection and localization of structural damage caused by shock events, impacts, fractures, cracks, voids, corrosion, and delaminations in new and aging infrastructures found in the petroleum and chemical industries, solar and wind power plants, nuclear, coal, and gas utilities industries, in civil and geophysical engineering, biomedical engineering, aerospace and naval industries, and transportation security. ROI's FAESense™ system is based on the integration of proven state-of-the-art technologies: 1) distributed multi-point array of in-line fiber Bragg gratings (FBGs) sensors sensitive to strain, vibration, and acoustic emissions, 2) dynamic and adaptive spectral demodulation of FBG sensor dynamic signals using two-wave mixing interferometry on photorefractive semiconductors, and 3) integration of all the sensor system passive and active opto-electronic components within a 0.5-cm x 1-cm photonic integrated circuit microchip. ROI's FAESense™ system represents a next generation fiber optic sensing technology that is environmentally robust, reliable, and can be used for structural health monitoring and prognostics of new and aging commercial and military infrastructures. Its miniaturized package, low power operation, state-of-the-art data communications, and affordable price makes it a very attractive solution for applications where cost, weight, size, and power are critical for operation.

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Ключевые слова:

Содержание

Abstract

Introduction

Dynamically reconfigure and adaptive multi-channel fiber optic acoustic emission sensor (FAESense™) system

Experimental test results

Summary

Acknowledgement