

Demodulation of Fiber Bragg Grating Spectrometer



Article Overview

Demodulation of FBG sensors involves extracting the wavelength shift of the reflected spectrum, using methods ranging from cross-correlation algorithms to advanced signal processing and AI-based approaches.

Overview of FBG Demodulation

Fiber Bragg Grating (FBG) sensors encode information in the wavelength of reflected light, which shifts in response to physical parameters like temperature, strain, or pressure. Accurate demodulation of this wavelength shift is critical for precise measurements. The main challenge is to determine the Bragg wavelength accurately while minimizing the influence of noise, spectral distortions, and overlapping spectra from multiple sensors .

Common Demodulation Methods

- **Cross-Correlation Algorithms** Cross-correlation is widely used to compare the measured FBG spectrum with a reference spectrum. Techniques such as variable-step-size cross-correlation allow high-resolution demodulation (pm-level) while reducing computational load. This method can achieve stable results even in noisy environments and is suitable for multi-sensor systems .
- **Spectrum Preprocessing and Filtering** Preprocessing methods, including wavelet transforms, geometric mean filters, and Savitzky-Golay filters, are applied to reduce noise and enhance spectral features. Nonlinear filtering techniques, such as the geometric mean filter, improve signal quality by mitigating the effects of extreme s...

Article Content

Sep 01, 2025

(PDF) Demodulation of Fiber Bragg Grating Sensor Using Cross ...

In this letter, a demodulation algorithm for fiber Bragg grating (FBG) sensor is presented. The proposed demodulation

May 22, 2026

Large range wavelength demodulation for ultra-short fiber Bragg ...

A wavelength demodulation method for ultra-short fiber Bragg grating (US-FBG) sensors based on an arrayed

Mar 01, 2026

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A system of fiber Bragg grating (FBG) temperature sensing demodulation based on light power detection is proposed in this paper.

Dec 27, 2025

Demodulation system for WDM/TDM-based UWFBG array employed

We have proposed an UWFBG array demodulation system based on compact fiber grating spectrometer which has a resolution of 3

Nov 28, 2025

Fast Demodulation of Fiber Bragg Grating Wavelength From Low

Abstract: This paper presents a fast demodulation algorithm to determine fiber Bragg grating (FBG) from spectra

Jun 09, 2026

Full article: Fiber Bragg grating demodulation through innovative ...

Fiber Bragg grating demodulation through innovative numerical procedures Giuseppe Dinardo Department of

Apr 05, 2026

Spectral Demodulation of Fiber Bragg Grating Sensor Based on Deep ...

This paper presents a new method of demodulating the spectrum of fiber Bragg grating (FBG) based sensors by

May 01, 2026

Demodulation of Fibre Bragg Grating Sensors by Using Cumulative

Fibre Bragg gratings are one of the most popular sensors with a huge number of applications. Their most important

Jan 29, 2026

High-speed demodulation system of fiber Bragg grating based on

A demodulation system built upon the F-P filter has a relatively slow demodulation frequency, leading to demodulation

Sep 18, 2025

Ultra-short fiber Bragg grating used for spectral analysis of guided ...

Abstract—An ultra-short fiber Bragg grating with a grating length of 0.2 mm and constant grating period (uniform FBG) is proposed

Feb 24, 2026

Analysis of a demodulation system for Fiber Bragg Grating sensors using ...

The analysis of a demodulation system for Fiber Bragg Grating sensors based on two fixed spectral filters has been

Oct 26, 2025

Asymmetric fiber grating overlapping spectrum demodulation

We have designed a novel Convolutional Neural Network (CNN) model specifically developed for the demodulation of

Feb 01, 2026

Principle of Ultra-high-speed Parallel Acquisition and Demodulation of ...

In order to improve the demodulation speed of the fiber Bragg grating demodulation system, this article puts forward the principle of

Nov 27, 2025

Fiber Bragg grating sensors demodulated by a speckle

Fiber Bragg gratings (FBGs) are widely used as sensors for temperature, strain, and

Jan 19, 2026

Discrimination methods and demodulation techniques for fiber Bragg ...

Another problem is how to measure a small Bragg wavelength shift accurately. This article presents a comprehensive

Mar 27, 2026

Demodulation method for vibration sensors of ultra-weak Fiber Bragg ...

However, the ultra-weak fiber Bragg grating (UWFBG) distributed vibration sensors face challenges from temperature

Sep 13, 2025

Fibre Bragg Grating Wavelength Shift Demodulation with Filtering and ...

A novel approach to fibre Bragg grating spectra processing is proposed. The method is based on the use of nonlinear

Sep 05, 2025

Fiber Bragg grating sensor demodulation technique by synthesis of ...

Fiber Bragg grating (FBG) sensors have been rapidly considered as excellent sensor elements since they were first

Apr 13, 2026

Fiber Bragg grating demodulation through innovative numerical

Extrinsic (or hybrid) optical sensors use the fiber only as a signal transmission mean, while intrinsic optical sensors use the optical

Nov 05, 2025

Demodulation system for fiber Bragg grating sensors using digital ...

Abstract and Figures A discrimination measurement method and demodulation technique for fiber Bragg grating (FBG)

Mar 24, 2026

A Fiber Laser Spectrometer Demodulation of Fiber Bragg Grating

Abstract A novel fiber-optic sensor system is suggested in which fiber Bragg grating sensors are demodulated by a

Jul 13, 2026

Discrimination methods and demodulation techniques for fiber Bragg ...

Fiber Bragg grating (FBG) sensors are one of the most exciting developments in the fields of fiber-optic sensors in

Jul 21, 2026

Research on Demodulation System for Fiber Bragg Grating Sensor Based

In order to measure the signals greater than kHz such as vibration, high frequency strain and ultrasonic wave, a high-speed

Feb 14, 2026

Design and Verification of an 850 nm Fiber Bragg Grating

This work presents a practical and high-precision wavelength demodulation method for 850 nm FBG sensing based

May 04, 2026

Demodulation Algorithm for Fiber Bragg Grating Sensors

A demodulation algorithm is vital for a fiber Bragg grating (FBG) sensing system. In this paper, a novel demodulation algorithm based

Jan 25, 2026

Spectral Demodulation System Based on Two Transmission Volume

In this paper, a fiber grating demodulation system based on two transmission volume Bragg gratings (VBGs) was

Aug 19, 2025

A high efficient method for demodulation of FBG sensors

FIBER Bragg grating (FBG) has been widely used in monitoring structural health , mechanical operation and

Oct 01, 2025

Fast and High-Precision Shape Sensing Based on Dual-Comb Fiber Bragg ...

This paper presents an innovative and efficient shape-sensing approach for optical fiber Bragg grating (FBG) arrays,

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For more information, pricing, or custom solutions, please contact us:

Website: <https://www.chromadecksigns-eastrand.co.za>

Email: sales@chromadecksigns-eastrand.co.za

Phone: +32 2 318 5792

Address: Avenue Louise 500, 1050 Brussels, Belgium

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