

Multimode fiber optic signal demodulation chip



Overview

Herein, we propose and experimentally validate a fiber FP sensor system based on a silicon-on-insulator (SOI) chip. The demodulation principle is on the basis of mapping environmentally induced spectral shifts into speckle patterns through multimode interferences. In this paper, we demonstrate for the first time a purely optical, chip-scale AI solution for high-mode isolation, speed-of-light demultiplexing of MMF modes using a three-dimensional diffractive neural network (DNN). To do so, we propose to use the MUSIC algorithm. It is shown that the use of traditional methods for estimating the number of signal components leads to poor operation of the MUSIC. This paper addresses the issue of low demodulation accuracy in interferometric signals caused by significant errors in direct peak finding and positioning during multi-peak demodulation of fiber-optic MEMS Fabry Perot Sensors.

Article Content

Aug 17, 2025

DPSK signals demodulation based on a multimode fiber with a central

Differential Phase Shift Keying (DPSK) modulation format has been shown as a robust solution for next-generation optical transmission systems. One key device enabling such systems is a delay

Nov 16, 2025

On-chip silicon electro-optical modulator with ultra-high extinction ...

On-chip optoelectronic devices are promising to build compact and efficient distributed acoustic sensing (DAS) systems. Here, the authors demonstrate an ultra-high extinction ratio electro

Sep 10, 2025

Microwave Photonic Systems for Demodulation of

Fiber optic sensors have been gradually used in aerospace, petrochemical, electronic power, civil engineering, and biomedical fields because

Apr 17, 2026

Demultiplexing through a multimode fiber using chip-scale diffractive ...

ABSTRACT In today's information age, advanced fiber optic transmission technology is of paramount importance. Multimode fibers (MMFs) using space-division multiplexing (SDM) are promising for

Feb 20, 2026

Singlemode-Multimode-Singlemode Fiber-Optic Interferometer Signal ...

Reviewer 3 Report In this manuscript, the authors proposed a method for processing signals of optical fiber intermode interferometer. In signal processing, MUSIC method, which is

May 12, 2026

Accurate demodulation algorithm for multi-peak FBG sensor based on ...

The proposed algorithm has high precision with respect to micro-strain measurement. A multi-peak fiber Bragg grating (FBG) sensor demodulation algorithm is proposed. To the best of

Apr 12, 2026

Fiber-Chip-Fiber Mode/Polarization/Wavelength Transmission and ...

Despite significant progress in multi-dimensional multiplexing for capacity scaling in fiber-optic communications or photonic networks-on-chip, achieving high-capacity data transmission

Feb 01, 2026

FBG Sensor Demodulated by Multimode Interference of Multimode Fiber ...

We demonstrate an novel intensity based demodulation scheme for FBG sensors. The wavelength shifts of FBG sensors are transferred to the light power changes by a demodulator based on the multimode

Dec 03, 2025

Multidimensional Fiber-to-Chip Optical Processing

However, challenges remain to realize multidimensional hybrid multiplexing data transmission and signal processing between few-mode fiber

Jun 29, 2025

Multimodal demodulation algorithm for fiber optic MEMS fabry

To verify the practical application of the multi-peak spectral demodulation algorithm, an experimental system was set up to validate the demodulation results of the fiber-optic MEMS sensor.

Feb 19, 2026

Demodulation of a fiber Fabry-Perot sensor

Herein, we propose and experimentally validate a fiber FP sensor system based on a silicon-on-insulator (SOI) chip. The demodulation principle is on the basis of mapping

Aug 23, 2025

Ultrahigh-Speed Demodulation for Fabry-Pérot Sensors Based on

Traditional demodulation techniques for F-P cavity suffer from low speed, high cost, and poor robustness. Here, we propose a novel ultrahigh-speed demodulation system for F-P interferometric

Jan 07, 2026

Mode-Division Multiplexing for Silicon Photonic Network-on-chip

Multimode communication in fiber-optic networks has already been widely demonstrated, but MDM is only now emerging as a possible approach for photonic integrated circuits to increase the bandwidth

Aug 09, 2025

On chip broadband and high extinction ratios Mach-Zehnder ...

In this paper, we demonstrate a broadband on-chip Mach-Zehnder interferometer (MZI) for multiple channel DPSK signal demodulation. The chip is constructed using a single-mode high

Sep 14, 2025

Photonics | Free Full-Text | Singlemode-Multimode-Singlemode Fiber ...

Photonics 2022, 9 (11), 879; doi /10.3390/photonics9110879

Jul 30, 2025

National Center for Biotechnology Information

Hier sollte eine Beschreibung angezeigt werden, diese Seite lässt dies jedoch nicht zu.

May 31, 2026

Singlemode-Multimode-Singlemode Fiber-Optic

The advantage of the proposed signal processing for demodulating the signals of an intermode interferometer over the Fourier transform has been

Dec 23, 2025

Study of hybrid integrated PLC-AWG chip for FBG demodulation

At the same time, using the wavelength division multiplexing (WDM) function of AWG, simultaneous measurement of multiple fiber grating sensors can be achieved. These features greatly

Jun 12, 2026

A Tracking-Based High-Speed Demodulation Method for Fiber Bragg

The vibration measurement of spacecraft structures in space applications has raised higher requirements for the demodulation frequency of the fiber Bragg grating (FBG) demodulator. In

Dec 12, 2025

A Novel Demodulation Scheme of Fiber-Optic Interferometric Sensor

A novel vibration signal demodulation scheme of fiber-optic interferometric sensor is proposed and demonstrated. A frequency-modulated (FM) single sideband (SSB) light-wave signal is

Dec 21, 2025

(PDF) Demultiplexing through a multimode fiber using chip-scale ...

In this paper, we demonstrate for the first time a purely optical, chip-scale AI solution for high-mode isolation, speed-of-light demultiplexing of MMF modes using a three-dimensional...

Dec 18, 2025

On-Chip Demodulation Approach Based on Microring Resonator for

We present a chip-scale integrated demodulation approach based on a microring resonator (MRR) for fiber-optic interferometric sensors. The system consists of a temperature sensor based on a Sagnac

Oct 20, 2025

Speckle Analysis in Multimode Optical Fibers for Chemical and

This article presents a comparative study on the performance of three widely used speckle demodulation algorithms, average intensity algorithm (AIA), normalized inner product coefficient

Apr 02, 2026

High accuracy, multi-signal demodulation method for distributed, wide ...

In this paper, we propose and demonstrate a high accuracy, multi-signal demodulation method for distributed, wide-frequency domain optical fiber sensing. For real time detection, wavelet

May 04, 2026

Study of hybrid integrated PLC-AWG chip for FBG demodulation

In 2017, Tianjin Polytechnic University fabricated an input/output grating coupler, a multimode interference coupler, and an arrayed waveguide grating integrated chip on SOI, realizing

Jun 11, 2026

[2512.04767] Demultiplexing through a multimode fiber using chip

In this paper, we demonstrate for the first time a purely optical, chip-scale AI solution for high-mode isolation, speed-of-light demultiplexing of MMF modes using a three-dimensional

Mar 29, 2026

Fiber-Chip-Fiber Mode/Polarization/Wavelength Transmission and ...

Combined with the 2D silicon chip fabricated by a standard lithography process, a multi-dimensional fiber-chip-fiber communication system designed to transmit and process the hybrid

Jun 29, 2025

(PDF) DPSK signals demodulation based on a

In this paper, we develop an MZI which is based on all-fiber Multimode Interference (MI) structure: a multimode fiber (MMF) with a central dip, located

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