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# Strain sensing based on a core diameter mismatch structure

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## Abstract

In this paper, it is proposed and experimentally investigated a sensor structure based on a core diameter mismatch technique for strain sensing. An uncoated short section of multimode fiber is spliced between two standard single mode fibers forming the sensor structure, called the SMS (single-mode-multimode-single-mode) sensor. The proposed SMS sensor, in the strain analysis, generates destructive or constructive interference patterns as load or strain are applied, changing the power of the optical signal only, without varying the wavelength. The sensor configuration offers several motivating attributes, such as easy fabrication, low-cost, high-efficiency and high sensitivity, moreover allows interrogation of the optical signal using the transmitted or reflected total optical power. The results and these advantages indicate that the proposed SMS sensor device is suitable for strain measurement, which is helpful in a broad range of applications, for instance, structural health monitoring.

## 1 INTRODUCTION

Mainly, due to some intrinsic properties including reduced size, lightweight, immunity to electromagnetic interference, high sensitivity and good stability, optical fiber sensors have been extensively used to measure different physical and mechanical parameters.[1-3] Besides, they present the possibility of applications in a variety of areas such as oil industry,[2] environment safety[1] and structural health monitoring (SHM).[4, 5] Structural impairment in SHM can be localized, identified and quantified using real time measurements of curvature, strain, vibration and other mechanisms. These measurements also enable to improve safety and maintenance of monitored structures.[6-9]