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Curvature sensor based on cascaded dual-core photonic crystal fiber

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Introduction

We propose a curvature sensor based on the cascade single-mode fiber, few-mode fiber and dual-core photonic crystal fiber (SMF-FMF- D-FMF-SMF, SFDFS), which can measure the distribution curvature using one sensor. The main mode of interference is obtained through the spectrum analysis of the transmission spectrum, and the curvature response spectrum of different curved points is measured. The experiment results show that within 0 to 1.06m^{-1} curvature ange, each test point's curvature sensitivity and linearity are -1.58 nm/m^{-1} and 0.98135, -1.62 nm/m^{-1} and 0.99504, -1.56 nm/m^{-1} and 0.98301, -1.74 nm/m^{-1} and 0.99701, and -1.31 nm/m^{-1} and 0.97315.

Experimental diagram

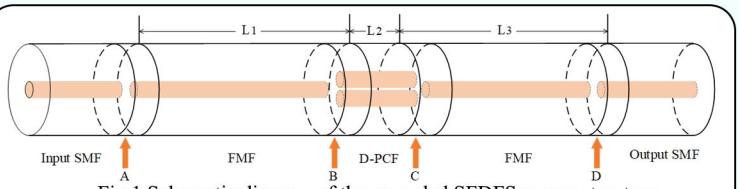

Fig.1 Schematic diagram of the cascaded SFDFS sensor structure

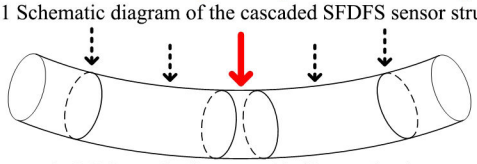

Fig.2 Schematic diagram of half curved points

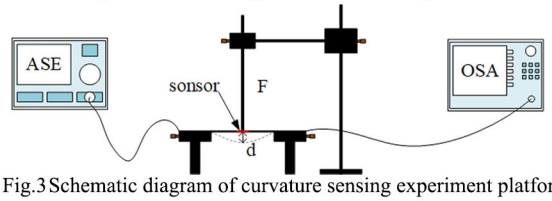

Fig.3 Schematic diagram of curvature sensing experiment platform

Experiment results

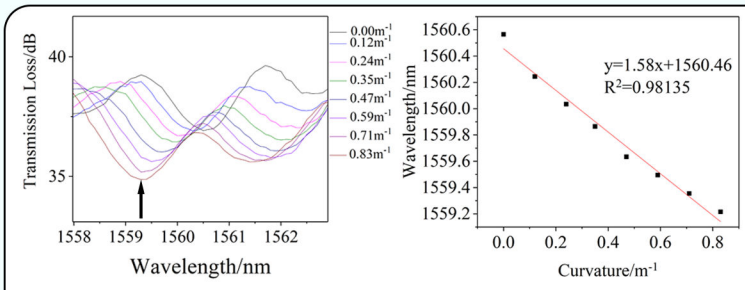

Fig.4 The curved response spectrum of the left endpoint

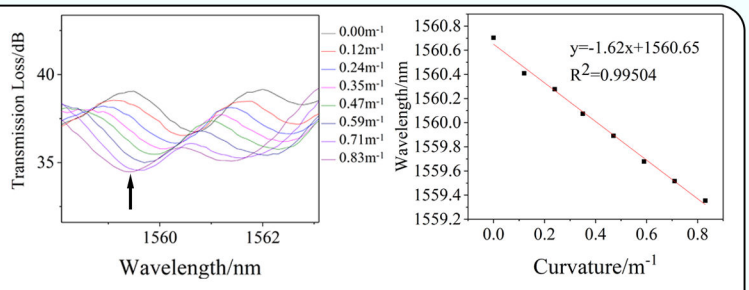

Fig.5 The curved response spectrum of the left quarter-point

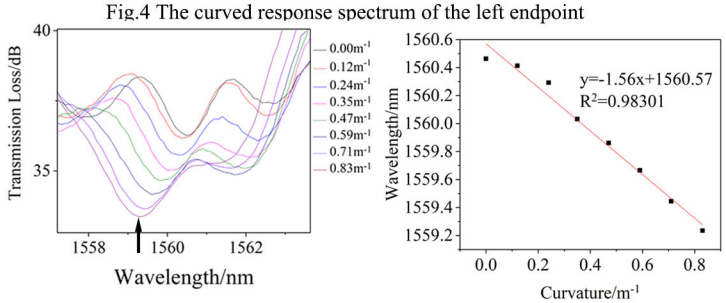

Fig.6 The curved response spectrum of the half point

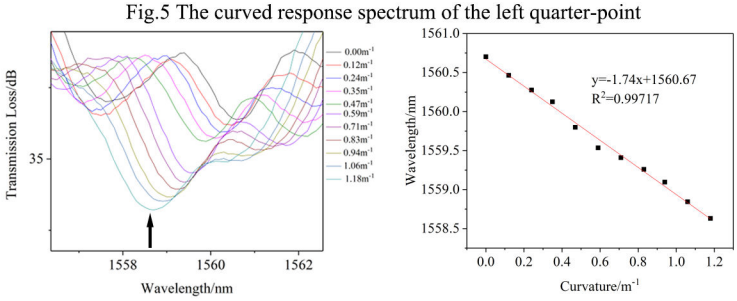

Fig.7 The curved response spectrum of the right quarter-point

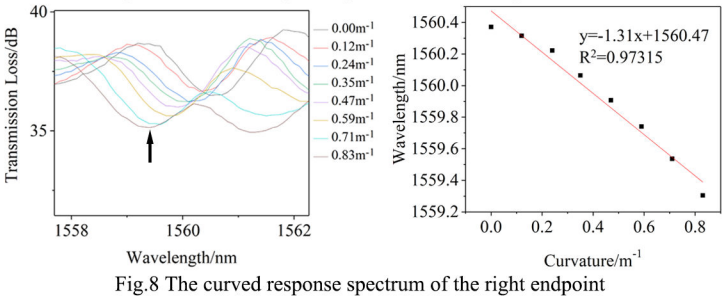

Fig.8 The curved response spectrum of the right endpoint

Conclusion:

- SFDFS curvature sensor has a shortwave-drift at different curved points.
- Different curved points have different curvature responses.
- Cascaded FMF reduce the influence of the sensor structure on the spectrum transmission process.