Long-Range Interferometric Displacement Sensing With Tapered Optical Fiber Tips

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Abstract

A Fabry-Perot interferometer built with a properly selected tapered optical fiber tip and a flat reflecting target is proposed for long range displacement sensing. By scaling down the diameter of the core and cladding of the optical fiber that forms the interferometer, the divergence of the output beam is reduced. The tapered fiber tip also couples the reflected light from the target more efficiently. As a result, well-defined interference patterns are observed even for long cavities which allows to sense displacements as long as 80 mm. The fabrication of the fiber tips is simple and reproducible and the interrogation of the interference patterns is fast as a conventional fiber Bragg grating interrogator can be used. The possibility of multiaxis displacement sensing is discussed.