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A Fiber Optic Sensor for Strain and Stress Measurement in Superconducting Accelerator Magnets

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A fiber optics sensor for strain and stress measurement in superconducting accelerator magnets.* J.M. VAN OORT, H.H.J. TEN KATE (†), Lawrence Berkeley Laboratory, Berkeley, California 94720, USA

A novel cryogenic interferometric fiber optics sensor for the measurement of strain or stress in the coil windings of superconducting accelerator magnets is described. The sensor can operate with two different readout sources, monochromatic laser light and white light respectively. The sensor head is built up as an extrinsic Fabry-Perot interferometer formed with two cleaved fiber surfaces, and can be mounted in several configurations. When read with laser light, the sensor is an extremely sensitive relative strain or temperature detector. When read with white light the absolute strain and pressure can be measured. Results are presented of tests in several configurations at 77K and 4.2K, both for the relative and absolute readout method. Finally, the possible use for quench localization using the temperature sensitivity is described.

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