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Interference visibility oscillation in a multimode laser interferometer, and its use in optimizing path lengths EDWARD L. RUDEN, Air Force Research Laboratory, Directed Energy Directorate, J. FRANK CAMACHO, NumerEx, LCC, ALAN G. LYNN, University of New Mexico — A 632.8 nm HeNe laser interferometer with multiple single-mode optical fiber-fed probe beams probes a field-reversed configuration (FRC) for AFRL/LANL's magnetized target fusion (MTF) experiment. The long coherence length of the individual laser modes permits the probe optical path length to excede that of the reference beam by $\sim$100 m. This permits the main optical table to be located far from the (highly destructive) experiment with only a short reference path on the table. The multiple modes, however, require that the optical path length difference be an integer multiple of twice the laser resonator length to within a few cm. Fiber nonuniformities make simply measuring the length of the fiber insufficiently accurate, so path length error must be inferred from the interference signal. An oscillation in the interference signal visibility due to mode sweeping on an acoustic time scale provides this information. A model of this phenomenon is presented and corroborated by measurements of the visibility oscillation versus path length error.

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