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Birefringent Stability of a Monolithic High-Finesse Optical Cavity FRANCISCO MONSALVE, MICHAEL HOHENSEE, HOLGER MÜLLER, University of California, Berkeley, CA 94720 — We investigate the stability and achievable linewidths of high-finesse optical cavities made from monolithic blocks of fused silica (suprasil 3001). Since the cavity modes are entirely supported within the dielectric substrate, the resonances will be shifted and broadened by stress-induced birefringence, scattering from impurities and imperfections in the medium, Faraday rotation, and thermal variations in the cavity length. We study the relative stability of cavity resonances for light with two orthogonal polarizations. Since the two polarization modes spatially overlap, the effects of many external perturbations are common to both modes. This work has applications to fundamental tests of Lorentz Invariance for electrodynamics [1,2]. We also consider the use of total internal reflection cavities to circumvent the problem of thermal noise of mirror coatings, which presently limits the stability of the very best lasers [3].

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[2] V.A. Kostelecký and M. Mewes, PRD 80, 015020 (2009).
[3] M. Notcutt *et al.*, PRA 73, 031804 (2006).

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