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Fluctuation relations in a driven, nonlinear micromechanical torsional oscillator COREY STAMBAUGH, H.B. CHAN, University of Florida — Fluctuation relations in a periodically driven micromechanical oscillator are investigated. The system is first studied in a linear regime by applying a weak drive. The ratio of the work variance to the mean work is shown to be independent of the driving frequency, consistent with standard fluctuation relations for a steady state system near thermal equilibrium. When a strong drive is applied to the system the response becomes nonlinear and the system displays bistability. The work variance in this nonlinear system, driven far from equilibrium, is predicted to show a strong frequency dependence not seen in the linear case. For such bistable system the total variance has two contributing components. The first component, involving intrastate fluctuations about one stable attractor, is expected to scale with a power law dependence as the system approaches the bifurcation point where the occupied state disappears. The second component of the work variance for interstate fluctuations is shown to have a strong frequency dependence near the kinetic phase transition where the populations of the two states are comparable. The relationship between the work and variance is compared to previous results, the work variance in the linear regime, and to theory.

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