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Fluctuation spectrums of a noise-driven micromachined oscillator with tunable nonlinearity K. NINIOS, H.B. CHAN, Department of Physics, University of Florida — We measure the spectrum of fluctuations of a nonlinear underdamped micromechanical oscillator, whose nonlinearity can be electrostatically tuned. In the linear regime where the eigenfrequency is independent of the energy of the oscillator, the spectral peaks are well-characterized by a lorentzian lineshape, the width of which is determined by the relaxation rate. In the presence of cubic nonlinearity in the restoring force, the eigenfrequency depends monotonically on the energy. As a result, the energy straggling due to fluctuations gives rise to frequency straggling. For sufficiently large fluctuation intensity the frequency straggling exceeds the frequency uncertainty due to relaxation and broadening of the spectral peaks with fluctuation intensity is observed. We also measure the fluctuation spectrum when the dependence of the eigenfrequency of the oscillator on energy is not monotonic due to higher order nonlinearities. Our measurements indicate that for a certain range of parameters, it is possible for the width of the spectral peak to decrease as the fluctuation intensity increases.

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