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Characterizing Random Telegraph Frequency Noise in a Micromechanical Oscillator FENGPEI SUN, The Hong Kong University of Science and Technology, JIE ZOU, University of Florida, ZAKHAR MAIZELIS, Kharkiv National University, HO BUN CHAN, The Hong Kong University of Science and Technology — We perform a comprehensive study of the effect of random telegraph frequency noise(RTFN) on a micromechanical torsional oscillator. A sinusoidal driving voltage is applied to one electrode of the oscillator to excite its torsional vibration. Telegraph noise is applied to the other electrode so that the eigenfrequency of the oscillator randomly jumps back and forth between two states. This arrangement resembles a mechanical oscillator dispersively coupled to a classical or quantum two-level system. As the jumping rate of the eigenfrequency is increased, the two peaks in the spectrum of the time-averaged vibration amplitude merge into a single peak, displaying spectral broadening followed by motional narrowing. Furthermore, we analyze the ratios of the moments of the complex vibration amplitude to the powers of the averaged complex amplitude as a function of the driving frequency. If RTFN is absent, the ratios are equal to one; otherwise they deviate from one near resonance and approach to one far off resonance. The shape of the spectra depends strongly on the characteristics of RTFN and this dependence remains valid even in the presence of strong thermal or detector noise. Our results are in good agreement with theoretical predictions.

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