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The effect of frequency noise on the spectral response of nanomechanical oscillators FENGPEI SUN, Department of Physics, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong, JIE ZOU, Department of Physics, University of Florida, Gainesville, Florida 32611, USA, HO BUN CHAN, Department of Physics, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong — We study the spectral response of an underdamped nanomechanical oscillator in the presence of frequency noise. Motion of a nanobeam is excited and measured using the magnetomotive technique. Telegraph noise is applied on nearby side gates, so that the eignenfrequency of the nanobeam randomly jumps back and forth between two values due to electrostatic coupling. This arrangement is analogous to a mechanical oscillator dispersively coupled to a classical or quantum two-level system. The spectrum displays two distinct peaks when the two eigenfrequencies are separated by a distance larger than the damping constant λ of the oscillator. As the switching rate W of the telegraph noise increases, we observe that the two peaks merge into one. The width of the single spectral peak decreases with increasing W. At $W >> \lambda$, the spectral width approaches its intrinsic value as if frequency noise is absent. The results are in agreement with theoretical predictions.

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