

Abstract Submitted  
for the MAR10 Meeting of  
The American Physical Society

**The spectrum of an oscillator with fluctuating mass and nanomechanical mass sensing** J. PORTMAN, M. KHASIN, S.W SHAW, M.I. DYKMAN, Michigan State University — We study resonant response of an underdamped oscillator with shot-noise type mass fluctuations. The model describes a nano-mechanical resonator which at random adsorbs and desorbs molecules. We derive an analytical expression for the spectrum of the oscillator. It applies for an arbitrary interrelation between the essential parameters: the oscillator damping rate, the adsorption-desorption rate, and the oscillator frequency shift due to a single adsorption event. Depending on this interrelation the spectrum may have fine structure or display a single peak. The fine structure emerges if the frequency shift exceeds damping which in turn exceeds the adsorption-desorption rate. However, even in this case the spectrum differs, generally, from a superposition of individual spectral lines for different numbers of adsorbed molecules. With decreasing frequency shift or increasing adsorption-desorption rate the fine structure disappears, and the spectrum becomes a single asymmetric peak. The results can be used for high-precision fast measurements of molecular mass with nano-mechanical resonators.

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Date submitted: 23 Nov 2009

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