Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Observation of Quantized Displacement in Nanomechanical Oscillators ALEXEI GAIDARZHY, Department of Aerospace and Mechanical Engineering, Boston University, Boston, MA 02215, GUITI ZOLFAGHARKHANI, Department of Physics, Boston University, Boston, MA 02215, ROBERT BADZEY, Department of Physics, Boston University, Boston, MA 02215, PRITIRAJ MOHANTY, Department of Physics, Boston University, Boston, MA 02215 — We report the first observation of discrete response in gigahertz-frequency mechanical resonance modes of an antenna-like nanobeam oscillator. The hybrid design of the structure produces effective amplification of gigahertz frequency motion, which we detect magnetomotively with an RF network analyzer. High order ($>$ 1.5 GHz) transverse modes of the structure cooled below 100 mK have thermal occupation numbers close to 1 ($N_{th} = k_B T/hf \sim 1$). The discrete nature of the observed response is possible evidence of transitions between the lowest energy levels of the macroscopic mechanical oscillator. This work is supported by the NSF (DMR, CCF, ECS), DOD (ARL), ACS (PRF), and the Sloan Foundation.

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Date submitted: 01 Dec 2004 Electronic form version 1.4