Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Nonlinear Damping Mechanism in Mechanical Graphene Resonators. ALEXANDER CROY, DANIEL MIDTVEDT, ANDREAS ISACSSON, JARI M. KINARET, Chalmers University of Technology — Based on a continuum mechanical model for single-layer graphene[1] we propose and analyze a microscopic mechanism for dissipation in nano-electromechanical graphene resonators. We find that coupling between flexural modes and in-plane phonons leads to linear and nonlinear damping of out-of-plane vibrations. By tuning external parameters, such as static gate voltage, one can cross over from a linear to a nonlinear-damping dominated regime. We discuss how the effective quality factor depends on parameters such as temperature, and compare our results with recent experiments.

[1]J. Atalaya, A. Isacsson, and J. M. Kinaret, Nano Letters 8, 4196 (2008).

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Date submitted: 11 Nov 2011 Electronic form version 1.4