Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Nonlinear dynamics in tunable graphene nanoelectromechanical systems FEN GUAN, PIRANAVAN KUMARAVADIVEL, DMITRI AVERIN, XU DU, Stony Brook University — We report the fabrication and characterization of graphene nanoelectromechanical resonators (GNEMR) on flexible substrates. The intrinsic stain in graphene is tuned by bending the substrate, during which a transition from hardening to softening resonance behavior and a minimum resonance frequency are observed. To explain these observations, a resonator model taking into account the intrinsic strain and electrostatic force is developed. Including higher-order nonlinear terms, a minimum frequency is obtained analytically from the model and matches with experimental data. Results from numerical simulation demonstrate also the transition in the nonlinear behavior. Additionally, the model-based fittings determine the intrinsic strain and mass of graphene samples accurately. Our devices allow thorough exploration of the nonlinear dynamics in GNEMR and may help further study of the intrinsic electrical properties of the materials under strain.

Fen Guan
Stony Brook University

Date submitted: 14 Nov 2014 Electronic form version 1.4