Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Zeptogram Scale Nanomechanical Mass Sensing Y.T. YANG, CARLO CALLEGARI, X.L. FENG, Condensed Matter Physics, California Institute of Technolgy, K.L. EKINCI, Department of Aerospace and Mechanical Engineering, Boston University, M.L. ROUKES, Condensed Matter Physics, California Institute of Technology — We show very high frequency nanoelectromechanical systems (NEMS) that provide a profound sensitivity increase for inertial mass sensing into zeptogram-scale. Measurement and analysis from our still unoptimized experiments already demonstrate mass sensitivity at the level of 7 zg, the mass of an individual 4 kDa molecule or 30 xenon atoms. Implication of the detailed analysis of the ultimate sensitivity of such devices based on experimental results is especially compelling: they indicate NEMS can ultimately provide inertial mass sensing of individual electrically neutral macromolecules with single Dalton sensitivity. The scheme has been employed to study noise arising from adsorption desorption of xenon on the NEMS surface. We also anticipate this will offer an unprecedented opportunity for many interesting applications in surface science, atomic physics and biology.

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Date submitted: 30 Nov 2004 Electronic form version 1.4