Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

**Quantifying the Dynamics of Thermoelastically Driven Nanoscale Beams in Fluid.** MARGARITA SMITH, MATTHEW CLARK, MARK PAUL, Dept. of Mechanical Engineering, Virginia Tech — A current technological challenge is the efficient on-chip actuation and detection of nanoscale beams in liquid that retain a high frequency response and quality factor. A promising approach is the use of thermoelastically driven doubly-clamped beams. As the beam dimensions decrease the dominance of viscous drag lowers performance resulting in reductions in the resonant frequency and quality factor. However, the quality factor increases with increasing frequency parameter. We explore several strategies to exploit this for nanoscale doubly-clamped beams. First, we tailor the beam geometry to maintain a large resonant frequency while minimizing fluid dissipation and therefore increasing the quality factor. Second, we include pre-tension in the beam to increase the frequency of oscillation. We discuss results from full numerical simulations for the precise conditions of interest. These results are compared with approximate analytical theory valid for long and thin beams. We use our findings to present a quantitative description of the dynamics and to suggest the parameter range of interest for future experiment.

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Date submitted: 03 Aug 2007 Electronic form version 1.4