Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Design and Fabrication of a Nanoscale Force Sensor for High-Speed Atomic Force Microscopy J. M. CAMPBELL, B. LUCHT, R. G. KNOBEL, Queens University — The atomic force microscope (AFM) has become an important tool in many fields ranging from materials science to biology. Conventional microfabricated AFM cantilevers have resonance frequencies of 10–300 kHz; some specialized cantilevers are available with frequencies up to 2 MHz. However, this represents the practical limit of the resonance frequency of microcantilevers. Three modeling methods were used to design a 200 MHz silicon nitride cantilever suitable for integration into an atomic resolution, frequency-modulation AFM. A process was developed to fabricate the cantilever coupled to an atomic point contact (APC) displacement detector, a device first demonstrated by Flowers-Jacobs et al. (2007). The cantilever mask and APC electrodes were defined through electron-beam lithography and triple-angle evaporation. The cantilever pattern was transferred to the nitride layer through focused ion beam milling and a subsequent wet etch into the underlying Si substrate suspended the structure. Then, using an active feedback system similar to that developed by Strachan et al. (2005), electromigration was used to form the APC at 77 K and 10^{-6} Torr. Progress toward measuring cantilever motion with the APC displacement detector through microwave reflectometry will be discussed.

Robert Knobel
Queens University

Date submitted: 21 Nov 2008 Electronic form version 1.4