Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Nanoscale Torsional Optomechanics[1] PAUL H. KIM, CALLUM DOOLIN, BRADLEY D. HAUER, ALLISON J. R. MACDONALD, MARK R. FREEMAN, University of Alberta, PAUL E. BARCLAY, University of Calgary, JOHN P. DAVIS, University of Alberta — Torsional resonators, which can be designed to measure torques with high sensitivity, have been an effective tool to study magnetism, gravity, and various material and optical properties. Taking advantage of improved micro-fabrication techniques, these torque sensors are now pushing the limit in terms of size - scaling all the way down to the nanoscale regime - and therefore must be equipped with sensitive mechanical transduction schemes. Here we present a method for measuring torques as little as 4 $\times 10^{20} N$m, using optomechanics. Recently optomechanics has been revealed as a reliable method for mechanical transduction, with higher sensitivity than previously possible. This sensitivity of the optomechanical system comes from the evanescent coupling between a high quality factor optical resonator and the mechanical device, and is fully integratable on a chip using the silicon-on-insulator platform. We present our first generation torsional optomechanics, using a dimpled optical fiber system for measurement, with a calibrated sensitivity down to 7 fm/$\sqrt{\text{Hz}}$. This torsional optomechanical platform will now serve as a basis for further experiments to explore new physics and technology, in particular quantum resonators at low temperatures.

[1]This work was supported by the University of Alberta, Faculty of Science; CFI; NSERC; and CSEE.

Paul Kim
University of Alberta

Date submitted: 09 Nov 2012 Electronic form version 1.4