Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Measurement of Casimir Force between Monolithic Silicon Microstructures LU TANG, HO BUN CHAN, The Hong Kong University of Science and Technology, JIE ZOU, ZSOLT MARCET, YILIANG BAO, University of Florida, ALEJANDRO RODRIGUEZ , HOMER REID, ALEXANDER MCCAULEY, STEVEN JOHNSON, Massachusetts Institute of Technology, IVAN KRAVCHENKO, Oak Ridge National Laboratory — We present measurements of the Casimir force between silicon components in a near-planar geometry. We create the device from a silicon-on-insulator wafer using microfabrication. It contains a force-sensing micromechanical beam and an electrostatic comb actuator for controlling the distance. The two lithographically-defined micromechanical components are on the same silicon substrate and are automatically aligned after fabrication. Thus, we can achieve a high degree of parallelism between the two interacting surfaces. We employ a magneto-motive technique to measure the shift in the resonance frequency of the force sensing beam. Periodic Lorentz forces are exerted on the beam when an ac current is applied in a perpendicular magnetic field. As the movable electrode is pushed towards the silicon beam by the comb drives, the Casimir force increases. The force gradient is proportional to the resonance frequency shift of the beam. After the calibration using electrostatic forces and balancing the residual voltage, we measure the Casimir force gradient. Our results are in reasonable agreement with theoretical calculations, considering possible contributions of patch potentials. Apart from providing a compact platform for Casimir force measurements, this scheme also opens new opportunities for the measurement of Casimir force in complex geometries.

Ho Bun Chan
The Hong Kong University of Science and Technology

Date submitted: 15 Nov 2013 Electronic form version 1.4