Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Measurement of near-field radiative heat transfer and implications for Casimir force measurements[1] ARVIND NARAYANASWAMY, Columbia University, SHENG SHEN, GANG CHEN, MIT — Near–field force and energy exchange between two objects due to quantum electrodynamic fluctuations give rise to interesting phenomena such as Casimir and van der Waals forces, and thermal radiative transfer exceeding Planck's theory of blackbody radiation. Although significant progress has been made in the past on the precise measurement of Casimir force related to zero-point energy, experimental demonstration of near-field enhancement of radiative heat transfer is difficult. In this work, we present a sensitive technique of measuring near–field radiative transfer between a microsphere and a substrate using a bi–material atomic force microscope (AFM) cantilever, resulting in "heat transfer-distance" curves. Measurements of radiative transfer between a sphere and a flat substrate show the presence of strong near–field effects resulting in enhancement of heat transfer over the predictions of the Planck blackbody radiation theory. The implications of measurement of near-field radiative heat transfer for determining of the magnitude of the thermal component of the Casimir force will be discussed.

[1]This work is supported by DOE (DE-FG02-02ER45977) and ONR (N00014-03-1-0835).

Arvind Narayanaswamy
Columbia University

Date submitted: 27 Oct 2007 Electronic form version 1.4