Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Towards measuring quantum electrodynamic torque with a levitated nanorod[1] ZHUJING XU, JAEHOON BANG, JONGHOON AHN, THAI M. HOANG, TONGCANG LI, Purdue University — According to quantum electrodynamics, quantum fluctuations of electromagnetic fields give rise to a zero-point energy that never vanishes, even in the absence of electromagnetic sources. The interaction energy will not only lead to the well-known Casimir force but will also contribute to the Casimir torque for anisotropic materials. We propose to use an optically levitated nanorod in vacuum and a birefringent substrate to experimentally investigate the QED torque. We have previously observed the libration of an optically levitated non-spherical nanoparticle in vacuum and found it to be an ultrasensitive torque sensor. A nanorod with a long axis of 300nm and a diameter of 60nm levitated in vacuum at 10ˆ(-8) torr will have a remarkable torque detection sensitivity on the order of 10ˆ(-28) Nm/$\sqrt{}$Hz, which will be sufficient to detect the Casimir torque.

[1]This work is partially supported by the National Science Foundation under grant no.1555035-PHY.

Zhujing Xu
Purdue University

Date submitted: 23 Jan 2017 Electronic form version 1.4