Casimir Forces and Torques: Recent Experimental Progress and the Effect of Patch Potentials

Jeremy Munday

University of Maryland, US

Email of Presenting Author: jnmunday@umd.edu

In this talk, I will first present our recent work to measure the Casimir torque, a mechanical rotation induced by quantum fluctuations between optically anisotropic materials. When optically anisotropic materials are placed in close proximity, the zero-point energy depends on the orientation of the objects. The objects will rotate in order to minimize the total free energy of the system, resulting in a Casimir torque. We have designed an all-optical experimental technique to measure this torque between a birefringent plate and an anisotropic liquid crystal film separated by an isotropic spacer layer. Second, I will discuss how electrostatic patch potentials can lead to additional force contributions in measurements of the Casimir force. The electrostatic potential difference can vary by >100 mV across a plate used in such experiments, as determined by Kelvin Probe Force Microscopy (KPFM). This electrostatic potential variation can lead to additional force contributions on the order of >1% of the total measured force, which is comparable to the discrepancies found between different models used to describe the low frequency dependence of the Casimir force.