Measurements of the Casimir force in fluids

JEREMY MUNDAY, Department of Physics, Harvard University, Cambridge MA 02138, FEDERICO CAPASSO, Division of Engineering and Applied Sciences, Harvard University, Cambridge MA 02138 — Confinement of the quantum fluctuations of electromagnetic fields between two grounded, conducting surfaces gives rise to an attractive force first predicted by H. B. G. Casimir. During the past decade, there have been many experimental demonstrations of this force between two metal surfaces in vacuum. While high precision experiments have been performed for this case, few experiments have been done between metallized or dielectric objects in fluids. For this situation, a more general formalism was developed by Lifshitz. If materials are chosen with suitable dielectric response functions, repulsive quantum electrodynamical (QED) forces can also arise. We will discuss experimental results using an atomic force microscope (AFM) to measure the interaction force between a metallized sphere and a plate, made of either metal or dielectric, in fluid.