

Finite temperature Casimir effects

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The Casimir effect is an intriguing quantum effect which has attracted much attention since it was first discovered in 1948. It predicts an attractive force between plane mirrors, possibly caused by vacuum fluctuations. Initial experiments have already confirmed the existence of such a force but have also opened the door for a range of alternative explanations.

This project aims at improving our understanding of the Casimir effect as well as providing the theoretical background for further experimental tests. More concretely, we are interested in applying an alternative approach to electromagnetic field quantisation near semitransparent mirror surfaces [1,2] to optical cavities. This will allow us to derive the Casimir effect from the zero point energy of the electromagnetic field without relying on gauge-dependent models. It will also allow us to obtain general results, which take into account the properties of the cavity mirrors, such as their reflection rate and temperature.

[1] R. Bennett, T. M. Barlow, and A. Beige, *Eur. J. Phys.* 37, 014001 (2016).

[2] N. Furtak-Wells, L. A. Clark, R. Purdy and A. Beige, *Photon emission from an atom in front of a semi-transparent mirror*, to be submitted (2016).