Ecole Doctorale de Physique de la Région Parisienne (ED107)

PROPOSITION DE SUJET DE THESE

(Attention: ne pas dépasser une page pour l'ensemble de ce formulaire)

Nom Laboratoire : LPTMS
Code d'identification CNRS : UMR8626
Nom du ou des responsables de la thèse : Thorsten EMIG
e-mail : emig@lptms.u-psud.fr Téléphone : 01 69 15 31 80
Page web: http://lptms.u-psud.fr/membres/emig/
Lieu de la thèse: LPTMS, Université Paris-Sud, 15 rue Georges Clémenceau, 91405 Orsay

Financement proposé : NON
Si oui, type de financement :

Fluctuation (Casimir) Forces and Heat Transfer

Neutral objects exert a force on one another through electromagnetic fields even if they do not possess permanent multipole moments. Materials that couple to the electromagnetic field alter the spectrum of the field's quantum and thermal fluctuations. The resulting change in energy depends on the relative positions of the objects, leading to a fluctuation-induced force, usually called the Casimir force. The Casimir force has been the subject of precision experimental measurements and can influence the operation of nanoscale devices. Current research efforts include the influence of shape and material composition on the interaction of the objects, development of new approaches to compute the interaction, effect of motion of objects on their interaction and non-equilibrium effects where objects are kept at different temperatures, leading to a plethora of new effects in the interaction and the technologically important effect of heat transfer.

Within this stage (and following PhD work) we propose to study the effects (forces, heat transfer) induced by fluctuating fields (electromagnetic, or classical thermal) that couple to matter (macroscopic or nano-objects of various shapes, molecules, atoms). After introductory work (stage) the focus will be non-equilibrium effects and moving objects. The research will build on techniques (both analytical and numerical) that have been developed by our group recently, and novel approaches to be developed (further). For a review of our recent work on Casimir interactions and a research article on the influence of shape on these forces, see

* S. J. Rahi, T. Emig, R. L. Jaffe in Casimir Physics (Lecture Notes in Physics), Springer; 1st Edition (2011).
* M. F. Maghrebi, S. J.Rahi, T. Emig, N. Graham, R. L. Jaffe, M. Kardar, Analytical results on Casimir forces for conductors with edges and tips PNAS 108, 6867 (2011).