

Spécialité de M2 : Concepts Fondamentaux de la Physique Ecole Doctorale de Physique de la Région Parisienne (ED107)

PROPOSITION DE SUJET DE STAGE DE M2 ET/OU DE THESE

(Attention: ne pas dépasser une page)

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Stage uniquement : NON

Thèse uniquement: NON

Stage pouvant déboucher sur une thèse : OUI

Financement proposé : OUI/NON

si oui, type de financement :

Interacting Bose-Einstein condensates in optical lattices

Résumé (demi page maximum)

By means of Feshbach resonances and optical lattices, degenerate quantum gases have entered the regime of strongly correlated systems and become suited for the study of many-body quantum physics in an unprecedented controlled manner. Characterizing these novel quantum phases requires new observation methods and in particular methods that allow detection at the single-atom level. Our plan is to use metastable Helium atoms (He^*) loaded in optical lattices to provide measurements of particle-particle correlations in interacting quantum phases using single atom detection.

We are currently building a novel dedicated experimental apparatus to cool down to degeneracy He^* atoms. To do so we intend to use an all-optical approach that overcomes the magnetic trapping used so far with Helium atoms for different reasons (magnetic-free environment, large optical access, fast and reproducible experimental cycle). During the internship the student will participate to the realization of all-optical Bose-Einstein condensation of He^* . This first phase will be followed by the implementation of 3D optical lattices (a periodic potential for the atoms) to observe the celebrated Superfluid-to-Mott transition on the apparatus.

Afterwards, our single-atom detection scheme will allow us to perform measurements of correlation functions along this conductor-to-insulator phase transition in optical lattices. Such studies will be at the center of the PhD thesis following the intership.

Indiquez le ou les parcours (ex DEA) qui vous semblent les plus adaptés au sujet :

Physique de la matière condensée : OUI

Physique des Liquides

OUI

Physique Quantique:

OUI

Physique Théorique

OUI