

Spécialité de Master « Optique, Matière, Plasmas »

Stage de recherche (4 mois minimum, à partir de début mars)

Proposition de stage (ne pas dépasser 1 page)

Date de la proposition :

Responsable du stage / internship supervisor:			
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Nom du Laboratoire / laboratory name: Laboratoire Charles Fabry			
Code d'identification :UMR8501	Organisme :		
Site Internet / web site: www.lcf.institutoptique.fr			
Adresse / address: Institut d'Optique, 2 av. Augustin Fresnel 91127 Palaiseau			
Lieu du stage / internship place: Laboratoire Charles Fabry			

Titre du stage / internship title: Contact constant in one-dimensional Bose gases
Résumé / summary
<p>With the recent development of many experimental techniques, degenerate quantum gases have become ideal candidates to create many-body quantum states in a highly controlled manner. Characterizing these novel quantum phases requires new observation methods and, in particular ,methods that allow detection of individual particles to measure atom-atom correlations. In our experiment, we use Bose-Einstein condensates of metastable Helium (He*) loaded in optical lattices to engineer strongly correlated states [1]. We probe these systems thanks to a single atom detection method based on the high internal energy of the metastable atoms [2]. The fascinating prospects associated to our original approach is illustrated by our recent observation of quantum depletion in an interacting Bose gas [3].</p> <p>During this internship, the student will participate to the measurement of the contact constant in one-dimensional Bose gases of Helium-4 atoms. Introduced by S. Tan in 2008, the contact constant is a universal quantity that connects contact interactions to the thermodynamics of a many-body system. Never measured in one-dimensional systems, this constant C can be extracted from an accurate investigation of the momentum distribution $n(k)$ which is expected to scale as C/k^4 for large momentum k. Our observation of $1/k^4$ tails in a 3D Bose gas [3] places us in the position to extract the contact constant C in one-dimension.</p> <p>A PhD thesis centered on the measurement of correlation functions in lattice Bose gases (e.g. across the Superfluid to Mott transition) and the implementation of a fermionic species, Helium-3, on the apparatus will follow the internship.</p> <p>[1] Q. Bouton et al., Phys. Rev. A 91, 061402(R) (2015). [2] F. Nogrette et al. Rev. Scient. Instrum. 86, 113105(2015). [3] R. Chang et al., arXiv:1608.04693 (2016).</p>
Toutes les rubriques ci-dessous doivent obligatoirement être remplies

Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : Oui			
Si oui, financement de thèse envisagé/ financial support for the PhD: EDOM			
Lasers, Optique, Matière	x	Lumière, Matière, Interactions	x
Plasmas : de l'espace au laboratoire			

Fiche à transmettre (fichier pdf **obligatoirement**) sur le site <http://stages.master-omp.fr>