Mobility edge of atoms in laser speckle potentials: exact calculations versus self-consistent approaches

Giuliano Orso[1], **and Dominique Delande**[2]

[1] *Laboratoire Matériaux et Phénomènes Quantiques, Université Paris Diderot-Paris 7 and CNRS, UMR 7162, 75205 Paris Cedex 13, France*

[2] *Laboratoire Kastler Brossel, UPMC-Paris6, ENS, CNRS; 4 Place Jussieu, F-75005 Paris, France*

giuliano.orso@univ-paris-diderot.fr

A major experimental challenge with cold atoms is to study Anderson localization of three-dimensional samples exposed to laser speckles potentials. These patterns are characterized by an exponential on-site distribution $P(V)$ and finite spatial correlations.

In this talk I will present numerically exact results [1] for the position of the mobility edge obtained by discretizing the system on a finite grid and applying the transfer matrix technique to the effective Anderson model. These results deviate significantly from previous implementations of the self-consistent theory of localization and I will explain the reasons of the discrepancy. In particular the asymmetry of $P(V) \neq P(-V)$ plays a key role leading to completely different predictions for the mobility edge of atoms in blue and in red speckles.

[1] D. Delande and G. Orso, PRL **113**, 060601 (2014).