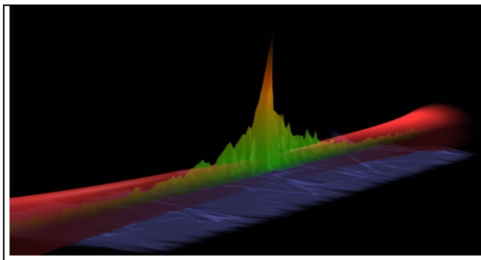
PhD in Experimental Quantum Physics
Ultracold atoms at Institut d'Optique

Anderson transition with ultracold atoms in tailored disordered potential

Anderson localization is an intriguing phenomenon of wave propagation in random media, where destructive interference between various diffusion paths yields to a complete suppression of transport. It has attracted a lot of attention over past decade, from electronic to classical waves (light, acoustic and even seismic waves). However fundamental questions remain open, especially in 3D where an insulator to metal (localization to delocalization) quantum phase transition occurs.



Observation of 1D Anderson localization, from Billy et al., Nature 2008

In this context, studying the propagation of ultracold atoms in optical random potentials offers new perspectives to study this phenomenon in a renewed perspective. Our team at IOGS has produced landmark results (see our web page). However, in in our demonstration of 3D Anderson localization, the limited resolution has prevented us to study quantitatively the critical parameters of the Anderson transition.

The goal of the PhD project is to provide a detailed study of the 3D Anderson transition based on a new experimental method that we are developing.

The PhD work will be essentially experimental. However significative interactions are expected, in the context of the WAVE project funded by the SIMONS foundation (http://wave.umn.edu), with M. Filoche and S. Mayboroda, who are developing a new theoretical framework of the Anderson localization.

Funding: WAVE Simons project - http://wave.umn.edu

Location: Quantum Gases group, Laboratoire Charles Fabry, IOGS, Palaiseau, France.

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