

# Spécialité de Master « Optique, Matière, Paris »

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

## Proposition de stage (ne pas dépasser 1 page)

Date de la proposition : 29 octobre 2019

Responsable du stage / *internship supervisor*:

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Nom du Laboratoire / *laboratory name*: Laboratoire Charles Fabry

Code d'identification : UMR8501

Organisme : Institut d'Optique Graduate School

Site Internet / *web site*: <https://www.lcf.institutoptique.fr/GROUPES-de-recherche/Gaz-quantiques/Experiences/Transport-in-Disorder>

Adresse / *address*: 2 av. Augustin Fresnel, 91127 Palaiseau cedex

Lieu du stage / *internship place*: Institut d'Optique Graduate School

**Titre du stage / *internship title*: Spectroscopic study of the Anderson transition with ultracold atoms suing state dependent disordered potentials**

Résumé / *summary*

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.

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 our first demonstration of 3D Anderson localization, the limited resolution has prevented us to study quantitatively the critical parameters of the Anderson transition.

Our current is to provide a detailed study of the 3D Anderson transition based on a new experimental method that we are developing (based on spectroscopy and state dependent disordered potentials). The work will be essentially experimental, working as a fully integrated team member, but specific project will be envisioned depending on the experimental progress at the time of the training period.

In parallel to the experimental work, note that significative interactions will also be with M. Filoche and S. Mayboroda, who are theoreticians (physicist and mathematician) that develop a new theoretical framework of the Anderson localization. This collaboration is at the heart of the WAVE project funded by the SIMONS foundation (see <http://wave.umn.edu> for further details).

**Toutes les rubriques ci-dessous doivent obligatoirement être remplies**

**Ce stage pourra-t-il se prolonger en thèse ? Possibility of a PhD ? : YES**

**Si oui, financement de thèse envisagé / financial support for the PhD: SIMONS or EDOM**

Lumière, Matière, Interactions : YES

Lasers, Optique, Matière : YES

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