

Contrats doctoraux 2026

Titre du projet de thèse : Stochastic turbulence and Superfluidity in quantum fluid of light

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Résumé du projet de thèse (en 20 lignes maximum) :

The first part of this PhD project addresses a fundamental question: how does two-dimensional turbulence emerge as a function of disorder in a quantum fluid of light? Using optical excitations to impose both a controlled spatial periodicity and tunable disorder landscapes, our experimental system can be driven across regimes ranging from linear-wave dynamics to solitonic states and fully developed turbulence. By systematically varying an externally imposed disorder (amplitude and correlation properties), we will explore how spatial inhomogeneities initiate, shape, or suppress the onset of turbulent behavior and vortex proliferation. Ultrafast single-shot DFG imaging will provide direct access to vortex distributions and spatial correlations across these regimes.

The second part of the project investigates whether forces can emerge in a quantum fluid of light, a question that remains non-trivial given the absence of viscosity in superfluids. To address this, we propose to study how a polariton superfluid interacts with a controlled repulsive potential, and whether such an encounter can lead to measurable momentum transfer. In particular, we will explore the possibility that turbulence and vortex nucleation provide the microscopic mechanism through which effective quantized forces of finite range appear. By monitoring the transition from frictionless flow to turbulence-induced momentum exchange, this work aims to clarify the physical origin of forces in driven-dissipative quantum superfluids.

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Remarques/commentaires supplémentaires :
