

Contrats doctoraux 2026

Titre du projet de thèse : Exploration of Topological Phases in Dynamical Systems with Ultracold Quantum Gases

Directeur(s) de thèses : Radu Chicireanu

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

Topological phases form a class of quantum states that exhibit global properties robust against defects and perturbations. Although often associated with exotic materials such as topological insulators, these phases can also emerge in periodically driven systems (Floquet systems), which provide an ideal framework for studying nonequilibrium topology.

This PhD project will focus on the numerical study and experimental realization of a topological model using a potassium Bose–Einstein condensate (BEC) subjected to periodic light pulses, inspired by the quantum kicked rotor paradigm. The project will build on a scheme recently demonstrated by the team, combining spin-dependent optical potentials with a modulated Raman coupling, enabling the creation of an effective spin–orbit coupling.

The main objective will be to identify and characterize signatures of topological phases, such as transitions between localized and delocalized states or the emergence of topological invariants in the quasi-energy spectrum. The work will include participation in the PhLAM BEC experiments, analysis of atomic dynamics, and development of numerical simulations in collaboration with theorists. This PhD is part of an ongoing ANR-funded project.

Date de recrutement envisagée : 09/01/2026

Contact (adresse e-mail) : radu.chicireanu@univ-lille.fr

Remarques/commentaires supplémentaires :
