Doctoral Fellowship on effective equations in relativistic quantum mechanics

Advisor: N. Boussaid **Co-advisor:** S. Rota Nodari **Co-advisor:** J. Lampart

Scientific description

The aim of the PhD project is to study systems of partial differential equations involving the Dirac equation, coupled to scalar or vector fields, and containing large parameters, like coupling strengths, masses and characteristic velocities. Such equations arise naturally in the description of relativistic quantum systems, but in practice they are often replaced by effective equations.

The first mathematical challenge is to rigorously establish the connection between the solutions of the effective equation and those of the original problem. As a second step, the dynamical stability of special solutions (solitons) can be investigated. In both problems the dispersive properties of the Dirac equation are expected to play an important role, and the solution might well lead to tools that are applicable more generally to dispersive equations.

Profile

The candidate has a master's degree (or equivalent) in Mathematics, or in Physics with a strong mathematical component. A solid background in analysis is required, preferably with an expertise in PDE theory, spectral theory, or relativistic quantum physics.

Practical information

The doctoral fellowship is 3-year fellowship funded by EUR-EIPHI and BFC-Region.
Interested candidates may send their application to nabile.boussaid@univ-fcomte.fr, jonas.lampart@u-bourgogne.fr and simona.rota-nodari@u-bourgogne.fr.
Applications must contain:

- An academic CV
- A cover letter/statement of purpose
- At least two letters of recommendation
- A transcript of records for the past two years

The deadline for application is May 7th, 2021.

For any further question, please contact simona.rota-nodari@u-bourgogne.fr.