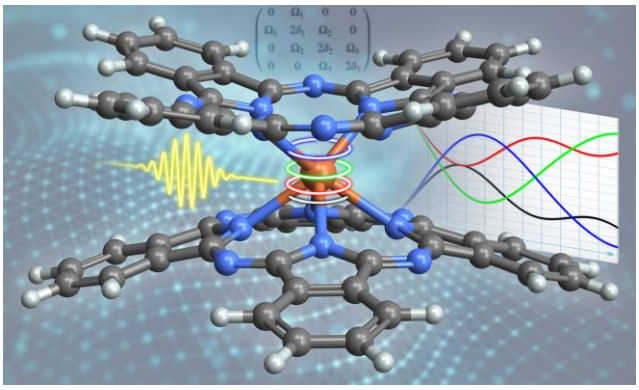
Open PhD position

Title: Optimally Controlled Quantum Information Processing on Single-Molecule Magnets



Type: Theory & programming

Short description: This project forms part of a collaboration with applied mathematicians, chemists and experimentalists in Karlsruhe (KIT), with the aim of realizing quantum computing applications using single molecule magnets. Specifically, we focus on the theoretical modelling of higher-dimensional qu*d*its that arise from the nuclear spins (and the associated hyperfine interaction) of rare-earth atoms embedded in these molecules. Addressing and manipulation of individual hyperfine states can be performed using microwave electric pulses. The latter can be shaped using optimal control techniques for quantum optimization and will enable faster, more noise-robust or low-consumption logical gates. The objective of the PhD thesis is to study this issue theoretically using different optimal control techniques.

Hosting institution: University of Strasbourg, Institute of Physics and Chemistry of Materials of Strasbourg (IPCMS) https://www.ipcms.fr/en/home/. This project is funded by the QuantEdu-France program, in connection with the ITI QMat https://qmat.unistra.fr/. The duration is 3 years**.**

Supervisor and email address: Prof. Paul-Antoine Hervieux, hervieux@unistra.fr

Group website: https://www.ipcms.fr/en/equipe/theoretical-quantum-dynamics-of-nano-objects-dyno/

Eligibility requirements: We are looking for a highly motivated candidate with a master degree in theoretical physics. A strong background in quantum mechanics and computer simulations is required. Experience in molecular physics would be strongly appreciated. The candidate will have to collaborate cross-border and in a multidisciplinary context with partners working in quantum chemistry, materials chemistry and applied mathematics. Proficiency in English is also required. Good knowledge of Python and/or Mathematica and/or Matlab, good knowledge of linear algebra, quantum mechanics (ideally, but not strictly required, density matrix formalism and Liouville equations).

How to apply: Applicants should send a detailed CV (with references, i.e., names and email addresses of undergraduate and master internship supervisors), Master's report cards (M1 and M2 grades for applicants studying in French universities), and a letter of motivation to P. -A. Hervieux (hervieux@unistra.fr).