INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: Eviden Quantum Lab
CNRS identification code: N/A
Internship director'surname: Thomas Ayral
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Web page: https://eviden.com/solutions/advanced-computing/quantum-computing/
Internship location: Les Clayes-sous-Bois

Thesis possibility after internship: YES
Funding: YES If YES, which type of funding: Eviden

From qubit noise to dissipative baths of electrons: how to take advantage of imperfect hardware

Noise in quantum computers is usually considered negatively as it destroys quantum information exponentially fast and therefore poses huge constraints on the duration or depth of quantum algorithm. However, noise is also a source of dissipation, which is a fundamental aspect in condensed matter physics: for instance, dissipation is often instrumental in driving physical systems to equilibrium or at least to a steady state.
It turns out that noise can possibly be used to one's advantage by using advanced algorithms. In this internship, we will explore how to take advantage of qubit noise to build quantum algorithms for the study of systems of interacting fermions coupled to dissipative baths.

The Eviden quantum laboratory is based in les Clayes-sous-Bois in the Paris area. It is a research and development team whose focus is quantum computing. Our goal is to make quantum computing useful by providing quantum programming languages and libraries (including compilation tools for most existing quantum hardware), by delivering powerful realistic classical simulators (digital twins) of quantum processors to predict and improve the outcome of experimental quantum computations, and by developing new algorithms for a wide spectrum of applications ranging from quantum many-body physics (condensed matter, quantum chemistry) to combinatorial optimization over differential equations. These developments are made concrete, in particular, in Eviden's Qaptiva platform, our quantum programming platform.
The internships we propose typically involve Python programming. Basic knowledge in quantum mechanics, a solid understanding of linear algebra, fluent Python and English, and a will to learn are skills you will definitely put to use here. Experience with tensor networks, condensed matter physics, git, linux or C++ are also appreciated.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES Soft Matter and Biological Physics: NO
Quantum Physics: YES Theoretical Physics: YES