

INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: MPQ

CNRS identification code: UMR 7162

Internship director's surname: Valentin CAMBIER

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Internship location: Laboratoire MPQ 10 rue Alice Domon et Léonie Duquet, 75013, Paris

Thesis possibility after internship: YES

Funding: TBD

If YES, which type of funding:

Towards a quantum interface between ionic qubits and entangled photons

Recent advances in quantum physics have given rise to cutting-edge fields such as quantum computing, quantum simulation, and quantum communication—driving the rapid development of quantum technologies. Over the past few years, our research team has developed two experimental components using complementary quantum platforms: laser-cooled trapped ions and semiconductor sources of correlated photons.

This internship proposal is at the intersection of these two areas, with the goal of developing a hybrid quantum platform. The project focuses on addressing one of the key challenges in quantum communication networks: creating a seamless connection between static qubits (trapped ions) and flying qubits (single photons).

The intern will work directly on the experimental setup dedicated to trap the strontium ions and collect their light (strontium lab). He or she will implement a new imaging system in order to collect photons entangled with the internal states of the ions. These photons will be brought to the photonic lab where Bell measurements can be performed. He or she will also have the possibility to work on a quantum frequency conversion setup. This step is crucial to carry the entanglement towards long distances via optical fibers.

The successful applicant will be integrated in a dynamic team with 3 permanent staff and 3 PhD students in a motivating scientific environment. The master's internship is planned to start in spring 2025, and can be ideally followed by a PhD thesis.

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

Condensed Matter Physics: YES/NO Soft Matter and Biological Physics: YES/NO

Quantum Physics: YES/NO

Theoretical Physics: YES/NO