Assistant Professor Position Open: Scalable Quantum Information Devices

TEACHING Université Paris Cité and its Physics Department are actively involved in the French Quantum Technologies Program, in particular through the "Graduate School Quantum Technologies" and the French National Quantum Technologies Program.
It will therefore be essential for the Physics Department to reinforce a culture of quantum information in the undergraduate courses (in particular optics and quantum mechanics), which will make it possible to inspire vocations and to feed the more specialized masters.
In addition to participating in the physics courses in the standard curriculum (undergraduate), the person recruited will be able to participate in the M1 and M2 courses with a 'quantum' coloration (M1 Fundamental Physics and Applications, M1 Paris Physics Master, M2 Quantum Devices course).

RESEARCH The MPQ laboratory is developing several world-renowned activities in the field of quantum technologies, in particular on the development, miniaturization and integration of innovative quantum devices. The laboratory team dedicated to the development of these devices (QITE, Quantum Information Technologies) is developing two complementary experimental platforms: semiconductor sources of quantum correlated photons and laser cooled trapped ions.
Trapped ions are one of the main approaches for the realization of large-scale quantum computing, presenting the highest fidelities associated with quantum logic operations as well as the longest coherence times (with respect to all technologies). However, the scaling of these devices remains a major challenge. The key to address this challenge is the integration of control techniques so that they can be scaled up through reliable and reproducible fabrication. As ions are manipulated using laser light, the integration of light steering into "ion chips" is a critical step that the QITE team is currently pursuing.
Another fundamental asset for the integration is given by the phenomena of ion-photon entanglement and quantum state transfer which allow to link together distant quantum systems. During the emission of a spontaneous photon, the spin state of a trapped ion and the polarization state of the emitted photon have a perfect quantum correlation. However, the wavelength of the photons emitted by the ions is generally in the ultraviolet or near infrared range, where the transmission through optical fibers is very low. The solution envisaged by the team, which will be developed by the candidate, consists in converting the wavelength of the photons emitted by the ion to the telecom wavelength, for example with waveguides and/or non-linear resonators, while preserving the entanglement. More generally, the connection between matter qubits and photon qubits propagating in telecom fibers is crucial for the realization and deployment of future quantum networks. The subject is therefore expected to have important scientific repercussions for the whole community developing quantum computation and information on all platforms. The unique context of our laboratory will allow us to open the way to matter-photon entanglement "on a chip" by relying on a synergy between the "trapped ions" axis and the "photonics" axis of the QITE team.
With a background in atomic physics/quantum optics and an expertise in experimental techniques in quantum information, the candidate will be involved in the development of a new thematic combining quantum photonics and trapped ions.

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