Post-doc position: spin-photon interfaces for quantum information

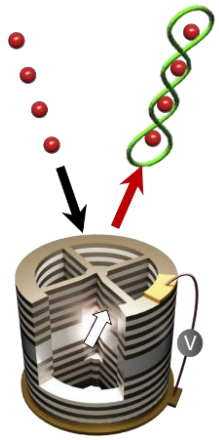
Location: Center for Nanoscience & Nanotechnology – Palaiseau (south of Paris Area)

Duration: 24 months

Gross salary: between 3081.33 € and 4291,70 € per month (depending on experience)

Contacts
Loïc Lanco (loic.lanco@u-paris.fr),
Olivier Krebs (olivier.krebs@c2n.upsaclay.fr)
Pascale Senellart (pascale.senellart-mardon@c2n.upsaclay.fr)

Our group on Solid-State Quantum Optics, at the Center for Nanoscience & Nanotechnology, has developed a strong expertise in harnessing light-matter interaction at the most fundamental level. We develop crucial resources for optical quantum technologies, including high-performance single-photon sources [1]. In parallel, we have developed **efficient interfaces between a single material qubit** (the spin of a single charge in a semiconductor quantum dot (QD) and **single photonic qubits** (the polarization of a single photon) [2]. We have also acquired an important expertise in the understanding of the quantum and solid-state physics governing the QD-photon interactions [3].



Such spin-photon interfaces have long been envisioned, for example, to engineer photon-mediated operations between distant spins, as well as spin-mediated operations between single photons. Our main objective is to develop experiments using these devices as **receivers of incoming photons**, as required for the future implementation of **deterministic spin-photon and photon-photon gates**. By doing so, we aim at **demonstrating new forms of entanglement**, where the spin qubit is used to entangle several incoming photons. A crucial requirement, finally, will be to improve the spin coherence, i.e. **increase the memory time of the spin qubit**, for successfully entangling more and more photons with the same solid-state spin.

In the framework of the consortium OQuLus, gathering leading teams from 15 French laboratories, **we are looking for excellent post-doctoral candidates, with a PhD degree in quantum technologies, quantum optics, or solid-state quantum physics**.

The successful candidate will be part of our research effort by devising and implementing experiments on our QD-based spin-photon interfaces, and participating to the management of PhD students and interns. All the technological, experimental and theoretical expertise of the C2N group will be available to successfully lead this project.

[1] Nature Photonics 10, 340 (2016); Nature Photonics 13, 803 (2019); Optica Quantum 3, 289 (2025)
[2] Nature Communications 6, 6236 (2015); Nature Photonics 17, 582 (2023); Nature Communications 15, 598 (2024)
[3] Physical Review Letters 134, 036902 (2025); Physical Review Applied 24, 024047 (2025); arXiv:2503.23593 (2025)