PHELIQS (CEA) / NEEL INSTITUTE (CNRS)

Quantum internship – Academic year 2025-2026

Spin qubits for education

Level : Master 1

General Scope :

In the global effort to scale up quantum processors, spin qubits appear as a promising candidate owing to their small footprints combined with long coherence times [1]. The standardization of spin qubit devices made from advanced manufacturing platforms offer highly reliable devices [2], that could potentially be used for academic practicals. In this view, a novel experimental platform is being developed in the QuanTEDU program, aiming to provide Master students the necessary experimental skills required for spin qubits measurements. The first steps of this ambitious education goal consist in testing spin qubit devices that may be used for future practicals.

[1] Burkard et al., Rev. Mod. Phys. **95**, 025003 (2023)
[2] Koch, NPJ Quantum Information **11**, 59 (2025)

Research topic and facilities available :

The candidate will develop a fast charge readout method for spin qubits, and benchmark devices. The measurements will involve radio-frequency readout at ultra-low temperature, in a dilution refrigerator. Among challenges, the candidate will connect a superconducting resonator to a quantum dot, and carefully adapt the readout circuit to reach a high quality charge readout. Both the resonators and the spin qubit devices are readily available in the host teams. The internship will therefore consist of a bibliographic study of readout techniques for spin qubits and matching of radio-frequency reflectometry circuits, followed by ultra-low temperature measurements in a second time. In case of success, the candidate will then measure the spin qubit coherence times and lay the ground for the development of a future lab practical to measure them.

Required skills :

- Knowledge in semiconductor, quantum dots and spin qubits physics
- Autonomy and interest for experimental developments
- Strong team spirit and ability to integrate in a collaborative environment
- An interest for pedagogical aspects would be a plus

Starting date and duration : 8 weeks, from May 18th to July 10th, potentially longer under mutual agreement prior to the internship start.

Contact :

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