CMOS spin qubits

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Stage pouvant se poursuivre en thèse : Oui

Résumé :
Introduction:

Quantum computing is a major new frontier in information technology with the potential for a disruptive impact. Many different materials and approaches have been explored so far, with an increasing effort on scalable implementations based on solid-state platforms. Among these, silicon is emerging as a promising route to quantum computing. Elementary silicon qubit devices made in academic research labs have already shown high-fidelity operation. Following these successful developments, a collaborative research action is being deployed in Grenoble with the purpose to take this technology to the next readiness level by showing that silicon-based qubits can be realized within an industrial level CMOS platform. In doing so we want to establish the true potential of silicon-based qubits in terms of scalability and manufacturability.

Sujet détaillé :
Project outline:

This master project deals with the realization of the first silicon spin qubits based on CMOS technology. The qubit devices are fabricated using 300-mm silicon-on-insulator (SOI) technology, which is available at CEA-LETI. They consist of multiple-gate devices (the simplest device geometries are shown in Fig. 1). The master student will integrate a research team at CEA-INAC and contribute to the study of spin qubits obtained from electrostatically confined electrons in multi-gate devices. Priority will be given to the development of hole-based spin qubits, whose first demonstration was recently reported (Maurand et al., https://arxiv.org/abs/1605.07599).
The proposed research subject is part of a recently started long-term effort involving multiple laboratories in Grenoble (see www.quantumsilicon-grenoble.eu) as well as a European network of collaborations (see www.mos-quito.eu).

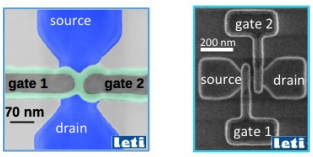

Fig. 1. SEM images of dual-gate silicon nanowire transistors fabricated on 300-mm silicon-on-insulator wafers.

Compétences requises :

connaissance de la physique quantique et physique de l'état solide