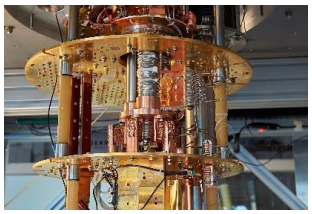
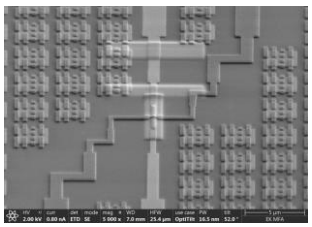
Institut de Recherche Interdisciplinaire de Grenoble

Pheliqs
Quantum Physics & Engineering

Master / PhD Thesis Project

Superconducting Devices in Silicon





In the race towards building a quantum computer, there is clearly a need for a large scale integration of quantum devices. As silicon technology is by far the most advanced technology, the possibility to fabricate quantum devices based on silicon will provide a serious and may be determinant advantage to solid state qubits.

The project focuses on the study of superconducting devices with silicon as a semiconductor. Those include standard silicon transistors with superconducting source and drain contacts and superconducting resonators. The common properties is the superconducting material which is elaborated with the constrain of being compatible with the silicon CMOS technology.

In the actual situation of the project, devices with CoSi2, PtSi and Si:B superconducting contacts have been fabricated using the 300 mm clean room facility at the LETI and in collaboration with our partners at Uppsala university and C2N Paris Saclay. The main issue is now to characterize the electronic transport properties at very low temperature. Depending on the quality of the contact interface between the S/D contacts and the silicon channel, various behavior are expected. In the case of opaque contacts, the current at very low S/D bias is blocked due to the opening of the superconducting gap. In the opposite case, superconducting correlations extend in the channel and a gate-tunable non-dissipative supercurrent is expected to flow though the transistors. This situation, met for other materials like germanium (see other master project on protected qubit), is the ultimate goal of the project.

The master internship will focus on measurements at very low temperature of existing devices. Low frequency characterization will be performed on superconducting transistors and the effect of controlled parameters (gate voltage, S/D bias, temperature, magnetic field) will be explored. Radio-frequency measurements on superconducting transistors could also be addressed during the master thesis.

The candidate will be full time at the LaTEQS (IRIG/PHELIQS) at the CEA Grenoble. She or he will have full access to a dedicated dilution fridge equipped with rf lines.

This proposal is therefore at the frontier between state-of-the art technology and solid-state physics, applied technology and basic research, in the growing context of quantum technologies.

The candidate should have a strong interest for nanotechnology and experimental physics, together with a background in solid state physics.

This project is sponsored by a QUANTERA project SIQUOS and the European project JoGATE.

APPLY NOW!

To apply for this position, send your application (including CV) by e-mail to: francois.lefloch@cea.fr

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