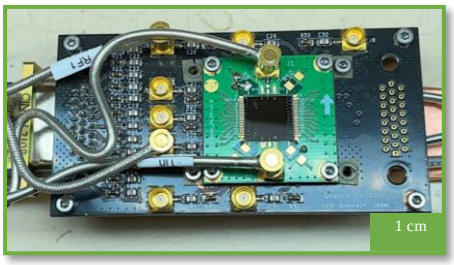
Master /PhD thesis Project

Hole spin and Circuit Quantum Electrodynamics



Wired sample before cryogenic cooling

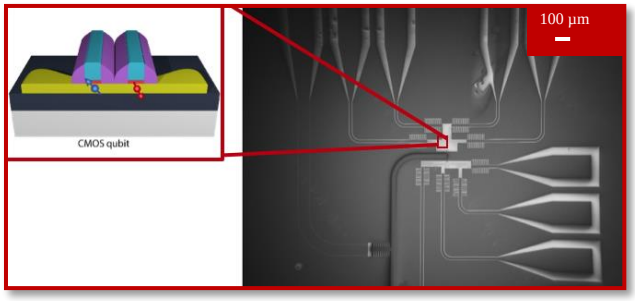
Quantum computing is currently pushing further the frontier of information technology. Among other fields, solid-state hole-spin qubits are a promising research area. Recently, we reached the strong-coupling regime between the spin of a single hole trapped inside the channel of a silicon transistor and a single microwave photon enclosed in a superconducting resonator[1]. This milestone paves the way to Circuit Quantum Electrodynamics (CQED) type experiments where such large spin-photon coupling is leveraged to perform advance quantum information experiments.

The aim of this project is to advance the field of spin CQED. First, we will probe the quantum state of the spin via the microwave photon through a quantum non-destructive protocol[2]. In parallel, we will study the spin coherence in such environment where its quantum properties may be strongly correlated to electro-magnetic noise.

Our research team is part of the French national "Plan Quantique" and is a founder member of the "Grenoble Quantum Silicon" group. We also strongly collaborate with the L-SIM group for theoretical support.

During the master project, you will collaborate on a daily basis with a lively team of two permanent researchers with one PostDoc and one PhD and take part of an exciting adventure to bring spin qubits to a new development step. You will participate to the development of the samples that includes design, theory and nano-fabrication done in our cleanroom facility. You will also learn to cool down samples to reach cryogenic temperatures. Finally, you will perform measurements in these cryogenic environments using state-of-the-art DC and RF setups. Your experimental results will be discussed and understood via theory models as well. This master project may continue as a PhD thesis.

[1] Submitted, arXiv:2206.14082, **2022**
[2] Phys. Rev. A 75, 032329, **2007**



Photons and spin circuits on the same silicon chip!

APPLY NOW!

To apply for this position, send your application (including CV) by e-mail to: etienne.dumur@cea.fr & romain.maurand@cea.fr

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