

2531cc1107

Developing spin qubit quantum processors based on industrial Si MOS technology

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ProjectID	2531cc1107
Project title	Developing spin qubit quantum processors based on industrial Si MOS technology
EPSRC theme	Quantum Technologies
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Host faculty and host department	Mathematical and Physical Sciences (MAPS) London Centre for Nanotechnology (LCN) (* Student will be registered at ENG – EEE)
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Standard or collaborative project	Collaborative project
Restrictions for candidates applying	Home and International fees candidates may apply

Project summary

Quantum computers promise to solve computational problems intractable for classical machines. Silicon-based spin qubit approaches to building a scalable quantum processor offer advantages such as high qubit density, record qubit coherence lifetimes for the solid state, and the ability to leverage the advanced nanofabrication methods of CMOS technologies. A full stack 4-qubit quantum computer based on 300mm wafer silicon MOS processing was delivered to the UK's National Quantum Computer Centre in 2025 and the field is rapidly advancing towards large quantum processor units (QPUs).

Scaling up from small proof of concept QPUs to large-scale systems of wide-spread use requires addressing a number of technological challenges including a) fast, high fidelity readout at scale; b) high fidelity quantum operations across the array; c) high fidelity qubit transport on chip. All this must be achieved within the context - including both the huge technological opportunities as well as the tight process restrictions - of large scale industrial grade semiconductor manufacturing.

This PhD project will focus on one of these key elements, addressing the theoretical and experimental challenges through protocol and device design to advance the state of the art. The student will utilize industrially manufactured silicon quantum devices in isotopically enriched silicon on 300 mm wafers, provided by Quantum Motion, and contribute to their design. The devices will be measured in dilution refrigerators at temperatures down to 10 mK using a combination of DC, radio frequency and microwave techniques.