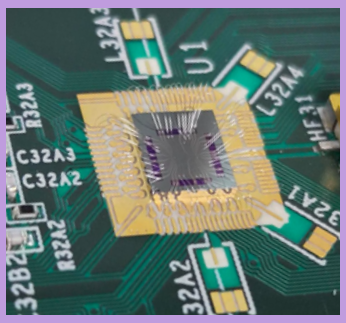
CHATTERJEE LAB, QUTECH

MASTER STUDENT THESIS

Superconductor-Semiconductor Hybrid Qubits

This research focuses on developing new hybrid qubits, taking the best aspects of both spin and superconducting qubits. We want you to help us charactarize new material in Germanium heterostructures to combine these benefits.



You will learn:

- Mesoscopic transport measurements
- Operation of a cryostat
- Characterization of new material

QuTech

Interested? Contact:
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Open Position for MEPs at Chatterjee Lab, QuTech

Exploring Superconducting Material for Hybridized Qubits

Motivation

We are looking for a motivated master student to help us characterize new material, PtIrSiGe for use in Andreev Spin Qubits (ASQ). These qubits combine the coherence time of spin qubits and readout techniques of superconducting qubits to create a semiconductor-superconductor hybrid system. For this reason, we need a superconducting material compatible for our semiconducting Germanium substrate. Thanks to scientific advancements at the Scappucci Lab within QuTech, the Chatterjee lab can make use of these advancements to create ASQ's in Germanium.

Potential Project Direction

This project will focus on performing DC electrical measurements of various superconducting nanodevices at cryogenic temperatures to measure parameters such as superconducting gap, critical temperature and critical magnetic field. As a student on this project, you can gain hands-on experience with the complete experimental pipeline:

- Sample mounting and wire bonding
- Cryostat operation and maintenance
- Low-noise electronics setups for quantum measurements
- *(Optional)* Cleanroom fabrication, atomic force microscopy (AFM) for film uniformity, and optimizing PtIr ratios for superconductivity.

Flexible starting dates within January 2027.

Contact:

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Anasua Chatterjee

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Further Reading:

[1] Lakic et al., 'A quantum dot in Germanium proximitized by a superconductor'

[2] Viswanathan et al., 'Buried Germanium quantum well proximitised by magnetic field-resilient superconducting platinum iridium Germanosilicide'

[3] Tosato et al,. 'Hard superconducting gap in germanium'