

Development of systemic characterization protocols for the performance of superconducting quantum devices.

Record number : OPR-876

Overview

RESEARCH DIRECTION

Max Hofheinz, Professeur - Department of Electrical and Computer Engineering

INFORMATION

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RESEARCH CO-DIRECTION

Mathieu Juan, Professeur - Department of Physics

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ADMINISTRATIVE UNIT(S)

Faculté de génie
Département de génie électrique et de génie informatique
Institut interdisciplinaire d'innovation technologique (3IT)
Institut quantique

LEVEL(S)

3e cycle

LOCATION(S)

3IT - Institut interdisciplinaire d'innovation technologique
Institut Quantique Sherbrooke
Campus de Sherbrooke

Project Description

Context : Quantum information technology is currently transiting from academia to industry and the complexity of nanofabrication processes for state-of-the-art devices is growing rapidly. It is now exceeding the research and development capacity of start-up companies or academic research groups. In order to ensure continuous progress of quantum information technology, it is, therefore, necessary to pool the manufacturing efforts of small companies and research groups so as not to restrict the use of this strategic technology to a few large multinational companies.

The goal of this project is to set up a pilot line for shared nanofabrication of state-of-the-art superconducting circuits in Canada. The project is based on a close collaboration between experts in superconducting quantum circuits at Institut Quantique (IQ) of Université de Sherbrooke (UdeS) and experts in micro- and nanofabrication at 3IT of UdeS where the transition to shared manufacturing has already taken place. The industrial partner CMC Microsystems, an expert in the mutualization of processes and tools for the Canadian academic and industrial world, will ensure that the project corresponds to the needs of the market. Equipment manufacturers Angstrom Engineering and Raith will contribute their expertise in thin film deposition and e-beam lithography to the project which will in turn help them to optimize their tools for quantum systems. The results of this project will be used directly by the industrial partner Nord Quantique, a start-up company in Sherbrooke which is developing a new generation of quantum processors based on bosonic codes encoded in superconducting circuits.

Main tasks : Development of rapid measurement protocols for Josephson junctions and superconducting resonators for future on-line control of the manufacturing process. The objective is to establish relationships between rapid structural and electrical measurements throughout manufacturing and the final performance of the circuit in a cryogenic environment.

Researched profile:

- Specialization in electrical engineering, physics, nanotechnology, quantum science and technology
- Strengths: knowledge in nanofabrication, cryogenic measurements, microwave measurements and circuit characterization.
- Excellent adaptability, autonomy, teamwork and problem solving skills
- Strong taste for design, experimental cleanroom work and interdisciplinary research and development

Supervision & work environment: The thesis will be realized under the direction of Pr. Max Hofheinz and Pr. Mathieu Juan. The work will be carried out mainly at the Quantum Institute (IQ) and at the Interdisciplinary Institute for Technological Innovation (3IT) of UdeS. IQ is a state-of-the-art institute whose mission is to invent the quantum technologies of tomorrow and transfer them to the industry. 3IT is a unique institute in Canada, specializing in the research and development of innovative technologies for energy, electronics, robotics and health.

Contact: jobnano@usherbrooke.ca

Documents to provide:

- Motivation letter
- CV
- Transcripts of the past two years
- Name and contact of 2 references

This project can accommodate one or more students in the following program:
Doctoral thesis

Discipline(s) by sector

Sciences naturelles et génie

Génie électrique et génie électronique

Funding offered

Yes

Partner(s)

CMC Microsystems, Nord Quantique, Angstrom Engineering , Raith

The last update was on 12 March 2024. The University reserves the right to modify its projects without notice.