# Optoelectronic spin addressing

Record number : OPR-943

## Overview


**RESEARCH DIRECTION**

Dominique Drouin, Professeur - Department of Electrical and Computer Engineering

**INFORMATION**

dominique.drouin@usherbrooke.ca

**RESEARCH CO-DIRECTION**

Dominic Lepage, Responsable de recherche - Department of Electrical and Computer Engineering

**INFORMATION**

dominic.lepage@usherbrooke.ca


**ADMINISTRATIVE UNIT(S)**

Faculté de génie
Département de génie électrique et de génie informatique
Département de génie mécanique
Institut quantique

**LEVEL(S)**

2e cycle
3e cycle

**LOCATION(S)**

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

## Project Description

Context: The goal of this project is the realization of integrated nanophotonic circuits enabling the addressing of qubits for industrial quantum sensors. Such systems are to be employed as room temperature ultra-sensitive magnetometers in the fields of geological exploration, defense, navigation, medical imaging, and for the development of quantum computers. This embodies a pioneering quantum technology to be brought early to the market and adopted on a large scale.
This fully funded graduate project is part of the Canadian National Quantum Strategy and the Quebec Quantum Innovation Zone. Our team at the Interdisciplinary Institute for Technological Innovation (3IT) is developing impactful and practical solutions in close collaboration with SB Quantum, the National Research Council of Canada, the MiQro Innovation Collaborative Centre, and the Quantum Institute.

Research project: Our large-scale commercialization of ultra-sensitive magnetometers is based on optically detected magnetic resonance (ODMR) technology. To offer a quality product, it is necessary to develop radio frequency (RF) addressing algorithms to manipulate the qubits at the heart of these devices. The PhD candidate will have the opportunity to thrive in the 3IT environment and have the responsibility to develop the following processes:

- Understand the RF addressing algorithms developed by our partners.
- Design microcircuits compatible with existing optoelectronic devices.
- Supervise the manufacturing of RF microcircuits and confirm their performance at high frequencies.
- Validate the performance of the algorithms by quantifying the ODMR sensitivity.

The completion of this project is expected to have a major impact for the research partners and the quantum industry in Canada as a whole.

Supervision & work environment: The project will be conducted under the co-supervision of Dr Dominic Lepage and Pr Dominique Drouin. The selected individual will interact regularly with all collaborators but will conduct most of the work at the 3IT. The candidate will benefit from an exceptional research environment where students, professionals, teachers, and industry experts closely collaborate for the

advancement of future technologies.

Researched profile:
The desired candidate should have a strong academic record, skills in applied physics or engineering, hands-on laboratory experience, a sense of creativity, strong adaptability, and an interest in research for the development of RF circuits / photonics / quantum sciences. Familiarity with laboratory environments, RF circuits design and/or systems would be advantageous. Proficiency in French communication is a plus.
Because the research project involves sensitive technology, the applicant should not be affiliated with any of the countries where Canada is imposing sanctions.

Contacts: jobnano@usherbrooke.ca
Documents to provide: CV, transcripts of the past two years and references

## Discipline(s) by sector

### Sciences naturelles et génie

Génie électrique et génie électronique,
Génie mécanique

## Funding offered

To be discussed

## Partner(s)

SBQuantum, Centre de Collaboration MiQro Innovation (C2MI)

The last update was on 13 September 2024. The University reserves the right to modify its projects without notice.