

# Optoelectronic spin addressing

Record number : OPR-943

## Overview

### RESEARCH DIRECTION

Dominique Drouin, Professeur -  
Department of Electrical and Computer  
Engineering

### INFORMATION

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### RESEARCH CO-DIRECTION

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

### INFORMATION

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### ADMINISTRATIVE UNIT(S)

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

### LEVEL(S)

2e cycle  
3e cycle

### LOCATION(S)

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

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## 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.

### Topic:

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.

### Work Supervision:

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.

**Desired 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.

Contact: JobNano@usherbrooke.ca

Documents to provide: Cover letter, curriculum vitae and the contact information of two individuals familiar with your work.

Funding : Funded by the NSERC Alliance Quantum grants, NRC and PROMPT-Québec

<b>Discipline(s) by sector</b>	<b>Funding offered</b>	<b>Partner(s)</b>
Sciences naturelles et génie Génie électrique et génie électronique	Yes	CRSNG, Conseil National de la Recherche du Canada (CNRC), SBQuantum, PROMPT Québec

The last update was on 11 December 2024. The University reserves the right to modify its projects without notice.