

# Nanofabrication of Industrial Quantum Photonic Circuits

Record number : OPR-945

## 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  
Département de génie mécanique  
Institut quantique

### LEVEL(S)

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 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, the Quantum Institute and the National Institute for Optics.

### Topic:

The assignment of the graduate applicant is the development of nanofabrication protocols for the large-scale commercialization of quantum photonic devices. In addition to miniaturization, this project seeks to achieve a significant increase in efficiency compared to alternative commercial products by exploiting an integrated optically detected magnetic resonance technology (ODMR). 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. The PhD candidate will have the opportunity to thrive in the cleanroom environment of 3IT to develop various industrial microfabrication processes:

- Preparation of thin films samples: Metals, Diamond, Al<sub>2</sub>O<sub>3</sub>, Si<sub>3</sub>N<sub>4</sub>, SiO<sub>2</sub>.
- Resin coating, electro and photo lithography, plasma deposition and etching.
- Wet bench manipulations.
- Nanostructure metrology using ellipsometry, electron and atomic force microscopy.

### 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 optics/photonics/quantum sciences. Familiarity with cleanroom environments, photonic systems or micromanipulations would be advantageous.

Because the research project involves sensitive technology, the applicant should not be affiliated with any of the countries where Canada is imposing sanctions. (see additional link)

Proficiency in French communication is a plus.

Contact: [dominic.lepage@usherbrooke.ca](mailto:dominic.lepage@usherbrooke.ca)

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

**Discipline(s) by sector**

**Funding offered**

**Partner(s)**

To be discussed

SBQuantum

**Sciences naturelles et génie**

Génie électrique et génie électronique,  
Génie mécanique

The last update was on 23 April 2024. The University reserves the right to modify its projects without notice.