Nanofabrication of Industrial Quantum Photonic Circuits

Record number : OPR-945

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
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.

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, Al2O3, Si3N4, SiO2.
• 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. Proficiency in French communication is a plus.

Contact: inpaqt@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

Discipline(s) by sector

Sciences naturelles et génie

Génie électrique et génie électronique

Funding offered

Yes

Partner(s)

CRSNG, Conseil National de la Recherche du Canada (CNRC), SBQuantum, PROMPT Québec