

PhD position: Ultrafast single-photon detectors based on 2D materials

Record number : OPR-824

Overview

RESEARCH DIRECTION

Mathieu Massicotte, Professeur -
Department of Electrical and Computer
Engineering

INFORMATION

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ADMINISTRATIVE UNIT(S)

Faculté des sciences
Faculté de génie
Institut quantique

LEVEL(S)

3e cycle

LOCATION(S)

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

Project Description

Context - Two-dimensional (2D) materials are a new class of one-atom-thick crystals with spectacular optical and electrical properties. Some of them, like graphene and transition metal dichalcogenides, can convert light into an electrical signal within a few picoseconds [1-2], which makes them very promising for ultrafast single-photon detection. These photodetectors are an essential component of many emergent technologies such as LIDAR, quantum communication and advanced medical imaging systems.

Research project - We are looking for a well-qualified and motivated student to help us develop an ultrafast single-photon detector based on 2D materials. The PhD project will mainly focus on the design, fabrication and characterization of these photodetectors using state-of-the-art nanofabrication and quantum measurement facilities. In collaboration with academic and industrial partners, the resulting detector will be put to use in various proof-of-concept technologies, including quantum photonic integrated circuits and X-ray imaging systems.

Research environment - The PhD student will be supervised by Prof. Mathieu Massicotte, from the Department of Electrical and Computer Engineering of Université de Sherbrooke. The work will be done mainly at the Interdisciplinary Institute for Technological Innovation (3IT) and the Institut quantique (IQ) at the Université de Sherbrooke. 3IT is a unique institute in Canada, specializing in the research and development of innovative technologies for energy, electronics, robotics and health. IQ is a new research institute equipped with cutting-edge research tools, that brings together world-renowned experts in quantum science and engineering. The PhD student will thus benefit from a highly interdisciplinary research environment that combines students, technicians and professors working together to develop the technologies of the future.

Requirements

- Bachelor's or Master's degree in Engineering or Physics
- Experience and skills in laboratory work
- Background knowledge in semiconductor physics and/or optoelectronics
- Strong interest in applied and interdisciplinary research
- Assets: knowledge or experience in cleanroom environment, CAD modeling

(ex.: Lumerical), (opto)electronic measurement, and integrated photonics.

To apply please send the following documents to mathieu.massicotte@usherbrooke.ca

📄 Curriculum Vitae

📄 Transcript (Bachelor's and/or Master's degree)

📄 Cover letter emphasizing the relevance of your experience with the proposed subject

📄 Letters of recommendation and/or contact details of 2 references

Start date: The position is available immediately.

Applications will be reviewed until the position is filled.

References

[1] Massicotte, M. et al. Picosecond photoresponse in van der Waals heterostructures. *Nat. Nanotechnol.* 11, 1–6 (2015).

[2] Massicotte, M. et al. Dissociation of two-dimensional excitons in monolayer WSe₂. *Nat. Commun.* 9, 1633 (2018).

Discipline(s) by

Partner(s)

sector

3IT

Sciences naturelles et génie

Génie électrique et génie électronique,

Physique

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