Superconducting Micro-Resonator: A New Non-Invasive Probe to Explore the Magnetism of Two-Dimensional Quantum Materials

Record number : OPR-367

Overview

RESEARCH DIRECTION

Bertrand Reulet, Professeur - Department of Physics

INFORMATION

bertrand.reulet@usherbrooke.ca

RESEARCH CO-DIRECTION

Jeffrey Quilliam, Directeur de département - Department of Physics

INFORMATION

jeffrey.quilliam@usherbrooke.ca

ADMINISTRATIVE UNIT(S)

Faculté des sciences
Département de physique
Faculté de génie
Département de génie électrique et de génie informatique
Institut quantique

LEVEL(S)

1er cycle
2e cycle

LOCATION(S)

Institut Quantique Sherbrooke

Project Description

The advent of two-dimensional (2D) materials such as graphene, combined with recent technical advances to assemble them in heterostructures with atomic precision, has led to the birth of a promising new platform to study exotic states of matter and to design new quantum technologies. However, the low dimensionality and the small lateral size of these new crystals constitute major obstacles to their study. Consequently, several crucial properties of 2D materials, such as their nuclear magnetic resonance and susceptibility - which are strongly affected by the correlated states in these materials, have not yet been measured. To remedy this situation, we propose to develop new measurement techniques without electrical contacts, which exploit the high sensitivity of superconducting resonators. Based on type II and high-temperature superconductors, these micro-resonators will probe the exotic properties of 2D materials under strong magnetic fields and over a wide range of temperatures. These innovative tools, in addition to their intrinsic commercial potential, will accelerate and greatly expand the study of 2D materials, and that of quantum nanomaterials in general.
Recruiting: 3 master's students and 3 undergraduate interns

Discipline(s) by sector

Sciences naturelles et génie

Génie informatique et génie logiciel,
Physique

The last update was on 24 July 2026. The University reserves the right to modify its projects without notice.