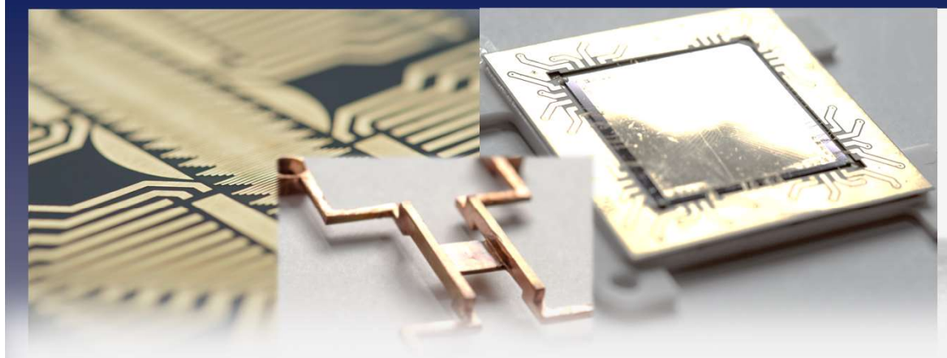


PhD positions in Physics

University of Sussex - Quantum Systems & Devices group

Qualification type: PhD

Project funding: 3.5 years

Location: Brighton, United Kingdom

Supervisors: Prof. Peter Krüger, Dr. Fedja Oručević

Requirements: BSc or MSc in Physics or related discipline, communication skills in English

Applications: accepted year round.

If interested please contact: positions.qsd@sussex.ac.uk

Website: www.sussexquantum.com/open-positions

We are looking for enthusiastic and bright students to join our team in the Quantum Systems & Devices group at the University of Sussex.

Our research team studies quantum physics in atomic gases and their interactions with external electromagnetic fields and materials. We prepare, control and measure these quantum systems in order to understand their fundamental properties. We also exploit the quantum nature of the gases for technology development in various areas, with an emphasis on magnetic sensing. Applications range from novel touch screens and solar cells to intracellular signalling and brain imaging.

PhD projects are available across all research areas of the group. They typically involve experimental work, data analysis, numerical modelling, and theoretical research. These can be adapted according to the student's skills and interests.

Project 1 - Quantum Gas Dynamics

We investigate complex many-body phenomena such as quantum phase transitions, and manipulation of low-dimensional quantum systems both in and out of equilibrium using ultracold atomic gases.

Cold Atom Microscopy Projects

We are developing a quantum microscope that measures surface currents. In this system Bose-Einstein condensates (BEC) are created on atom chips and used as high sensitivity microscopic probes for local magnetic fields.

Project 2 - BEC Microscope Development

This project aims for the improvement of the sensitivity of the microscope to currents flowing in two-dimensional samples. As the main limitation for sensitivity stems from atom-surface interactions, such as Casimir forces and Johnson noise we study these interactions and use novel materials such as graphene to suppress them.

Project 3 - Percolating Networks

This project will focus on percolating networks of silver nanowires and graphene, where a deeper understanding of the conductivity behaviour is expected to lead to a technological breakthrough. We aim to achieve this by experimental studies in our BEC microscope and numerical simulations of the networks.

Bio-magnetic Sensing Projects

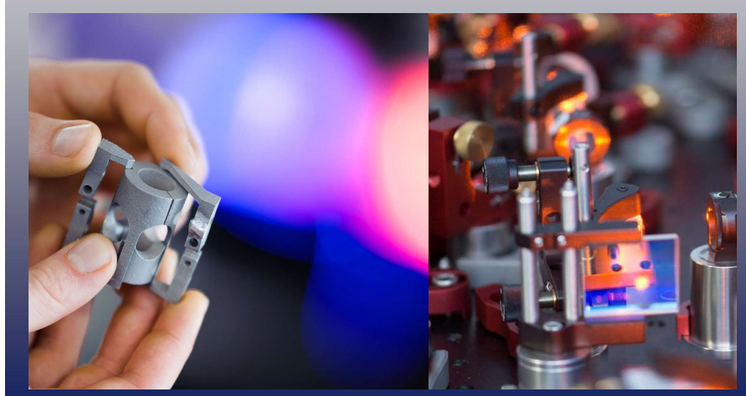
We are investigating ways to use quantum magnetometers to yield uniquely rich information on the spatial, spectral and temporal signatures of human brain function. In a significant advance from current magnetoencephalography (MEG) technology, we can bring sensors to within a few millimetres of the scalp (in contrast to several centimetres in conventional MEG). This promises increased sensitivity compared to traditional imaging systems, enabling new insight into the brain and its behaviour.

Project 4 - Using Quantum Sensors for Bio-Magnetism

Together with the Clinical Imaging Sciences Centre, one project will use these sensors in conjunction with functional Magnetic Resonance Imaging to study demyelination. Using such a multi-modal approach should offer new sights into a range of diseases including multiple sclerosis.

Project 5 - Sensor Development

In a parallel project, a student will work towards the fabrication and characterisation of large arrays of quantum magnetometers. The end-goal being to replace the superconducting, cryogenically-cooled sensors currently being used in MEG.



UNIVERSITY OF SUSSEX

Quantum Systems & Devices