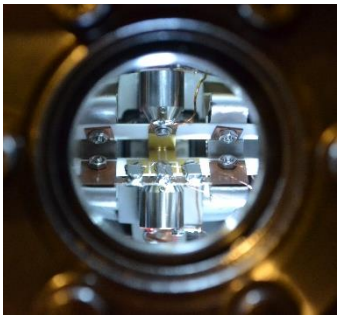
# PhD position in
# Quantum Processor Development

A fully funded 3.5 year PhD position is available in the Ion Trap Cavity-QED and Molecular Physics (ITCM) Group in the Department of Physics & Astronomy at the University of Sussex. The project is within the **Networked Quantum Information Technologies Hub**.
For more information, please contact Prof Matthias Keller (m.k.keller@sussex.ac.uk).
**Application Deadline: 18th April 2019**

**Introduction:**

This project unites two distinct areas of quantum information processing: single ions stored in radio-frequency traps and single photons in optical fibres. Both fields have seen spectacular advances in recent years. Strings of ions are presently the most successful implementation of quantum computing, with elementary quantum algorithms and quantum simulations realised. Photons are used to distribute entanglement over ever increasing distances.


Ion trap with integrated cavity.

The principal challenge in the field is to enhance quantum processing power by scaling up current devices to larger quantum systems. We are pursuing one of the most promising strategies, distributed quantum computation, in which multiple small-scale ion processors are interlinked by exchanging photonic quantum bits via optical fibres. This requires novel ion trap structures that facilitate high-performance quantum computation and a photonic interconnect for networking. To create a high efficiency ion-photon interconnect for networking, we use miniature optical cavities. The Ion Trap Cavity-QED and Molecular Physics group in Sussex has a leading role in this field.

**Project:**

The aim of this project is to design, build and test a compact ion based quantum information processor. It consists of a linear ion trap with several separate trapping regions in which the ions can be loaded, cooled and quantum information processing can be performed. In addition, the structure contains a trapping region in which an optical micro-cavity is employed as a quantum interconnect between different quantum processors. The project involves the simulation of the ion trapping structure and the ion dynamic in the ion trap as well as the shuttling between different trapping regions. The optimised trapping structure will then be fabricated using micro-fabrication techniques and characterised. The transfer of ions between the various trapping regions and the quantum interconnect will be tested.

**Skills and training:**

An important part of this PhD project is the skills development and training. Local training through lecture courses, transferable skills training modules and practical training in the laboratory will be complemented by SEPNet wide training events. These include workshops and training schools.

**Award Amount**

£14,777 per annum tax-free bursary and waiver of UK/EU fees each year for 3.5 years, as well as funding for research training and travel. Additional funding may also be available to support placements with outside partners for a further period of six months in total.

**Eligibility**

Applicants should hold, or expect to hold, a UK undergraduate degree in physics or engineering. If you are unsure about the equivalence of your qualifications, please contact us at mpsresearchsupport@sussex.ac.uk

Due to funding restrictions, the studentship is open to UK and EU resident students only. However, we also welcome applications from self-funded non-EU students

**Procedure**

Apply on-line via the University of Sussex portal, http://www.sussex.ac.uk/study/phd/apply. State in the Funding section of the application form that you are applying for the "PhD Studentships in Experimental Atomic Physics."