

PhD position to develop a multi-zone quantum network node

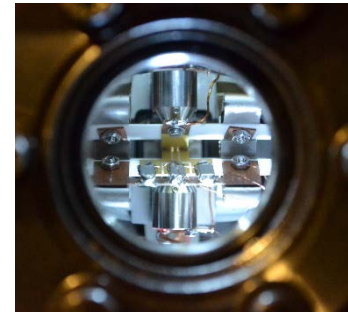
We invite applications for a fully funded 3.5 year PhD position in the Ion Trap Cavity-QED and Molecular Physics (ITCM) Group in the Department of Physics & Astronomy at the University of Sussex. The project is within the **Quantum Computing and Simulation Hub** and funded through the EPSRC DTP.

Intended start date is September 2021 but other starting dates are possible.

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 currently 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.

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.



Ion trap with integrated cavity.

Project:

The aim of this project is to build and operate 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. You will be working within the cavity-QED team to setup a novel ion trap cavity system and to explore schemes for quantum networking with such a node. Focus of the exploration will be on high fidelity ion-photon entanglement schemes and quantum information processing.

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:

£15,285 per annum tax-free bursary (increasing each year with the national minimum stipend) and waiver of UK 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, an undergraduate degree in physics or engineering. If you are unsure about the equivalence of your qualifications, please contact us at

mpsresearchsupport@sussex.ac.uk

This studentship is open to students of all nationalities, but will only cover tuition fees up to the value of the UK home-student fees. We also welcome applications from self-funded students from outside the UK.

Application process:

Applications are to be submitted via the University of Sussex portal,

<http://www.sussex.ac.uk/study/phd/apply>. Please state in the Funding section of the application form that you are applying for the "PhD Studentships in Experimental Atomic Physics."

Informal enquiries are highly encouraged. For more information about the position, please contact Prof Matthias Keller (m.k.keller@sussex.ac.uk).

The School of Mathematical and Physical Sciences is committed to equity, diversity and inclusion and we particularly welcome applications from women, Black and minority ethnic, LGBTQIA+ and disabled candidates, who are underrepresented in academic posts in Science, Technology, Engineering, Medicine and Mathematics (STEMM) at Sussex.

The University of Sussex is committed to equality of opportunity.