PhD position in Ion-Photon Entanglement

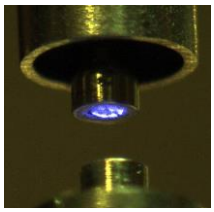
A fully funded 3.5 year PhD position is available in the Ion Trap Cavity-QED and Molecular Physics (ITCM) Group in the Department of Physics & Astronomy at the University of Sussex. The project is within the **Networked Quantum Information Technologies Hub** and in collaboration with Dr Peter Horak (University of Southampton).

For more information please contact Prof Matthias Keller (m.k.keller@sussex.ac.uk).

Introduction:

The project unites two distinct areas of quantum information processing, single ions stored in radio-frequency traps, and single photons in optical fibres. In both fields, there have been spectacular advances recently. Strings of ions are presently the most successful implementation of quantum computing, with elementary quantum algorithms and quantum simulations realized. 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 the 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. It requires an efficient quantum interface between ions and photons, mapping ionic to photonic quantum states and vice versa. To maximise fidelity and the success rate of the scheme, the interaction of ions and photons must take place in an optical cavity with high finesse, a technology in which the Ion Trap Cavity-QED and Molecular Physics group in Sussex has a leading role.



Ion trap with integrated cavity.

Project:

The aim of this project is to investigate, optimise and evaluate schemes to generate entangled states between trapped ions and photons in different implementations such as polarisation, time bin or phase decoding. For this, cavity assisted Raman transitions will be employed to transfer the ion's state onto the photon in a deterministic way. The project is mainly experimental and will be conducted in the research labs in Sussex, the theoretical study of the schemes and possible developments of novel schemes will be pursued in collaboration with Peter Horak, University of Southampton.

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

£14,553 (2017/18) 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, 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."