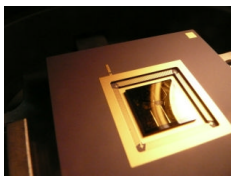
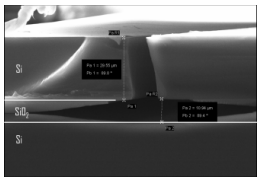
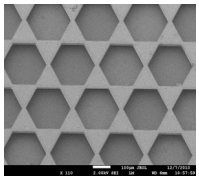
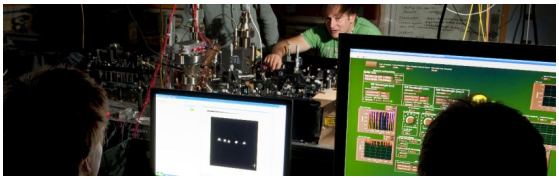
PhD position in trapped ion quantum technology and nanoscience at the University of Sussex, Brighton, UK

A three-year PhD position is available in the Ion Quantum Technology Group in the Department of Physics & Astronomy at the University of Sussex. The position is part of the SEPnet South East Physics Network and in collaboration with the University of Surrey and the University of Southampton. It is in conjunction with an EPSRC funded £1.4M Leadership fellowship for the development of quantum technology with nanofabricated ion trap chips.

Application deadline: 10 February 2012 (applications after this deadline may be considered if position is not filled)

Research in novel quantum technologies will likely lead to step changing innovations which will affect many areas of modern sciences. Implementing such technologies with trapped ions quantum bits has been widely accepted as one of the most promising pathways. The aim of this studentship is to combine the scalability of condensed matter science and nano-fabrication with the unprecedented level of coherent control possible with trapped ions to produce a large scale architecture for quantum information processing with large numbers of trapped ions.

One of the main aims of the project is to develop ion chips that feature on-chip digital signal processing and incorporating approaches such as flip chip bonding in order to connectorize an ion chip with a digital signal processing chip creating hundreds of analogue voltages for all the ion chip electrodes, however, only requiring a few digital data inputs. The project will also focus on the surface science required to limit voltage fluctuations on the electrode surfaces within the ion chip electrode array. Such fluctuations limit how small such ion chips can be made and current studies show that some investigations into the appropriate surface science may be able create fabrication designs which are able to massively suppress such fluctuations. Furthermore, we will also carry out studies to implement basic cavities and fibre interconnects to the ion trap array for advanced ion quantum state detection capabilities. Based on what we have learnt so far in developing ion microchips, we also want to create microchips for large scale creation of coherent control of trapped ions on a chip. In order to do this we aim to implement microwave quantum gates on a chip.

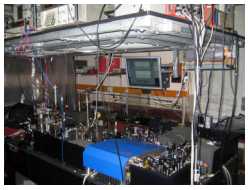
You will learn all the experimental skills and theoretical background needed in this emerging field of science. Some of the skills you will acquire include nano-fabrication, lasers and optics, ultra-high vacuum techniques, quantum information science, electronics and many other skills. You will spend your first year primarily at Sussex where you will become an expert in ion trapping. Following that you will spend extended periods of time at the University of Surrey and Southampton carrying out microfabrication in state-of-the-art clean rooms. Once the first chips have been created, you will carry out quantum information experiments with trapped ions at Sussex. The position consists of current UK/EU fees and a yearly stipend of £ 13590 which can be supplemented by tutoring. In addition a research training support grant of £1,200 p.a. will be awarded for travel and conferences.

The city of Brighton & Hove has everything - sun, sea, brilliant clubs, great places to eat, fabulous shops, a truly cosmopolitan vibe and is located only 50min from central London. Located on the beach, Brighton boasts beautiful seaside views and beaches, boating, sports and beach activities. The South Downs provide breathtaking views, tranquil walks and plenty of opportunities for mountain biking, hiking or picnics.

You can find out more about the group here (including a BBC documentary about our research):
http://www.sussex.ac.uk/physics/iqt/

Detailled reading about some of our research directions can be found here:

- Microfabricated Ion Traps, Marcus D. Hughes, Bjoern Lekitsch, Jiddu A. Broersma and Winfried K. Hensinger, Contemporary Physics 52, 505 (2011)
- Microwave ion-trap quantum computing, Winfried K. Hensinger, Nature 476, 155 (2011)




For more information, please email the head of group,
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(w.k.hensinger@sussex.ac.uk).

To apply please email a CV, and your degree results **preferentially before 10/2/12** to the email address above.