

# PhD studentship in Quantum Technology for Fundamental Physics

**Department of Physics and Astronomy**  
**School of Mathematical and Physical Sciences, University of Sussex**

We invite applications for a fully funded 3.5 year PhD position in the Ion Trap Cavity-QED and Molecular Physics (ITCM) Group ([www.itcm-sussex.com](http://www.itcm-sussex.com)) in the Department of Physics and Astronomy at the University of Sussex.

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

The research project is part of the UK '**Network of clocks for measuring the stability of fundamental constants**' consortium. The consortium aims to build a network of dissimilar clocks to search for spatio-temporal changes in fundamental constants. Our partners in the network are the National Physical Laboratory, Imperial College London, the University of Birmingham and the University of Sussex.

The goal of the project at Sussex is to measure the frequency of a vibrational transition in molecular nitrogen ions with unparalleled precision and compare it with an electronic transition in calcium ions. The nitrogen ion's vibrational transition and the calcium ion's electronic transition exhibit different sensitivities to the proton-to-electron mass ratio, and therefore any relative changes in the frequencies of these transitions can be used to establish the degree to which the proton-to-electron mass ratio is constant.

In order to measure the vibrational frequency, a single molecular nitrogen ion will be trapped alongside a single calcium ion. The calcium ion will be used to read out the state of the molecule using a quantum logic spectroscopy scheme. A second ion trap system, which will hold a single calcium ion, will be used as a reference for the frequency comparison. The project will employ existing systems in the ITCM Group at Sussex and expand it in order to facilitate the frequency comparison. With the two ion traps and the molecular beam line in place, the focus of the project will be to expand the laser system for the vibrational frequency measurement, implement the quantum logic spectroscopy scheme and measure the frequency ratio of the transitions within nitrogen and calcium.

The ITCM Group, which operates several ion-trap systems for research in quantum information and precision spectroscopy. The group currently consists of two research fellows, six PhD students, two MSc and three undergraduate project students lead by Prof Keller. You can read more about us here: <http://itcm-sussex.com>

## **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 chemistry. If you are unsure about the equivalence of your qualifications, please contact us at [mpsresearchsupport@sussex.ac.uk](mailto: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](mailto: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.