Research Fellow in High Precision Spectroscopy

Department of Physics and Astronomy

University of Sussex - School of Mathematical and Physical Sciences

Fixed Term until 30th November 2019 with the possibility of an extension, full time
Salary range: starting at £32,548 and rising to £38,833 per annum
Expected start date: 01 July 2018 or as soon as possible thereafter

The laws of physics are governed by a set of fundamental constants which determine the structure of the universe from sub-atomic particles to large galaxy clusters. Many theories which aim to unify all fundamental forces and cosmological models predict that fundamental constants change in time. Two particularly interesting constants are the fine structure constant and the proton-to-electron mass ratio, both of which influence the internal structure of atoms and molecules. At the ITCM group at Sussex, we have set up an experiment which aims to measure how the proton-to-electron mass ratio changes with time to a higher accuracy than currently possible by employing high resolution spectroscopy of molecular ions.
Single molecular ions are confined in time-varying electric fields (rf ion trap), and further localised via a co-trapped atomic ion that is laser cooled. By using quantum logic spectroscopy the quantum state of the molecule can be transferred to the atomic ion, due to the joint motion between the two ions within the trapping potential. In this way the ion's state is measured without destroying it, which is problematic to achieve without the state transfer between the ions. Utilizing this scheme the spectrum of the molecular ion can be measured very accurately and compared to an existing optical atomic clock via an optical frequency comb. Repeating this measurement over time, changes in the proton-to-electron mass ratio show as a change in the relative transition frequency of the atomic and molecular transitions.
The project is part of an interdisciplinary collaboration between the ITCM research group at Sussex and the research of Prof Tim Softley (University of Birmingham) and Dr Brianna Heazlewood (University of Oxford).

For further information please contact Dr Matthias Keller. Phone: +44 (1273) 877673, email: M.K.Keller@sussex.ac.uk

Closing date: 8 June 2018

Please include with your completed application form a CV, at least two references and a list of relevant publications.

The University of Sussex is committed to equality of opportunity.