Atom Interferometry: from Stonehenge to Space

Three PhD positions

Applications are invited for a three 3½-year studentships leading to the award of a Ph.D. in physics. The studentship will be based in the Cold Atoms research group at the University of Birmingham, in the heart of the second largest city in the UK.

Our Group

The Cold Atom group at Birmingham started off in 2008 as part of the Midlands Ultracold Atoms Research Centre (MUARC, http://mpa.ac.uk/muarc/) initiative. MUARC is designed to be a world-class centre of excellence at the interface between cold atoms, condensed matter, and optical physics. It comprises a total of six experimental research groups at the Universities of Nottingham and Birmingham.

The Projects

The research will be carried out in the frame of the two projects that our group is leading, the European Integrated Quantum Sensors (iSense, www.isense-gravimeter.com) and the British Gravity Gradient - Technologies and Opportunities Programme (GG-TOP).

Both projects are devoted to the development of mobile atom interferometric sensors. The unprecedented control over cold atoms has resulted in extremely precise sensors such as atomic clocks and atom interferometers. The two main goals are included in fundamental science and technological development. From the scientific point of view, it aims at realising precise force or force gradient sensors. The iSense project utilises state-of-the-art methods developed recently in the information and communication sector, where integrated optics is enabling ubiquitous high-speed internet and communications infrastructure. Transferring Information and Communication Technologies (ICT) has the potential to reduce the form factor of atom-based quantum sensors by at least an order of magnitude which would enable a step change towards commercial applications. The GG-TOP project looks at atom interferometry from the user perspective and aims at the development of practical sensors for applications in civil engineering and archaeology - with potential test runs in Stonehenge. The developments achieved in the frame of these projects will also be a tool for space missions, where compact, low power, ultra-high precision investigation of the local space-time manifold is required, or indeed where a distributed network of such sensors would be appropriate. In brief, applications include fundamental physics tests, quantum ICT devices, satellite geodesy, archaeological underground investigations, civil engineering and oil or mineral prospecting. In addition to the mentioned projects, the candidate will also have the opportunity to collaborate in several space related projects (QUANTUSIII from DLR, SAI and STE-QUEST from ESA).

Eligibility

Physics background with some lab experience in quantum optics or cold atoms is certainly beneficial. However, we are mainly looking for highly motivated people irrespective of their backgrounds. You can send your queries about the project to Prof. Kai Bongs (k.bongs@bham.ac.uk) Dr. Vincent Boyer (v.boyer@bham.ac.uk) and Dr. Tristan Valenzuela (t.valenzuela@bham.ac.uk).

Please submit formal applications via http://www.ph.bham.ac.uk/admissions/pg/phd.shtml.