

Post-Doctoral Research Associate

Microcalorimetry studies of superconductors in pulsed magnetic field

The role

This Postdoctoral Research Associate position is focused on developing a new method of measuring heat capacity of small single crystal samples at low temperature and high magnetic fields. High magnetic field measurements of the electronic properties of materials have produced seminal breakthroughs which have transformed science. These advances, such as the quantum Hall effects were made by measuring electrical transport (resistivity, Hall effect etc). Thermodynamic probes have unique capabilities as they can reveal quantum states hidden to other probes, such as the vortex unbinding transition in thin-film helium or the 'hidden' order in heavy-fermion compounds but thermodynamic measurements are rarely attempted at very high fields because of the technical difficulties with performing them.

In this role you will develop a new generation device for measuring specific heat in very high pulsed magnetic fields (up to or in excess of 70 Tesla) , and a complementary low-cost device for creating pulsed fields inside a non-facility environment. The new techniques have the potential to transform the subject as it will allow us to study the evolution of entropy to unprecedented high fields and thus get new insights into the nature of field-induced states, such as the normal state of high temperature superconductors or quantum critical magnetic transitions.

The project will run within the research group of Professor Antony Carrington who works in the Quantum Matter group at the School of Physics and studies high-temperature superconductivity using a variety of thermodynamic and electrical transport techniques. Experiments are performed both in Bristol using low temperature, high magnetic field cryostats and at international facilities within the European High Magnetic Field Laboratory. In particular, for this project we will be working closely with colleagues at the pulse magnetic field facility LNCMI-Toulouse.

The contract will be open ended although funding on the above-described project will be for 18 months. During this time, you will:

- **Develop the microcalorimetry method for pulse magnetic field.** This will involve using thin-film deposition techniques to produce thermometry with the shortest possible response time and with high sensitivity to temperature and low sensitivity to magnetic field. Several different approaches have already been identified and it will be your role to test these and find which is optimal.
- **Develop a micro-pulsed magnetic field set up.** Pulsed magnetic field set-ups are usually very large and are located at international facilities such as LNCMI-Toulouse or HLD-Dresden. Here we will develop an existing apparatus to allow us to create a pulsed field above 40T in our Bristol lab.
- **Conduct ground-breaking research.** We will use the above apparatus to perform ground-breaking original research in high-temperature superconductors – measuring the thermodynamic properties in unprecedented high magnetic fields.

You should apply if:

- You are excited about undertaking research in the very active area of high-temperature superconductivity and the prospect to make some high-impact contributions to the field.

- You are excited to work on a technical development project which will be of benefit to a wide spectrum of scientists world-wide.
- You have a strong track record in research, with experience relevant for this project. This could include: conducting experiments at cryogenic temperatures, working with high magnetic fields, thin-film deposition techniques, experiment development, electrical/thermal transport measurements, thermodynamic measurements.
- You have a PhD in Physics or related subject, or you are close to completion of a PhD
- You are keen to work in a dynamic team with other postdocs and PhD students.
- You are someone who can get up to speed quickly, thrives on digesting lots of information, is mindful of competing priorities, and can drive activity forward.

The University of Bristol is a research-intensive elite university in the vibrant city of Bristol in the beautiful west of England.

The Research Associate position is available to start May 2021 or soon afterwards.

Research Associate will be Grade I - £33,797 - £38,017

The closing date for applications is midnight, 31th March 2021. Interviews will be held in early April 2021.

For informal enquiries please contact;

Professor Antony Carrington (a.carrington@bristol.ac.uk)