The search for a semiclassical theory of the de haas-van alphen oscillations in the superconducting state

**Project ID:** FMBI983194

**Funded under:** FP4-TMR

**Objective**

Research objectives and content

Superconductors acquire their valuable properties below their critical temperature. BCS theory describes this by the Cooper pairing of electrons for low critical temperatures, but there is not a theory explaining high temperature superconductivity. Strong indications exist that the Cooper pairs of high temperature superconductors have d-wave symmetry. This could be one of the keys to that theory. The de Haas-van Alphen oscillations in normal metals were explained by Onsager with a semiclassical argument and are used to probe their Fermi Surface. Recently they have also been observed in superconductors. The main purpose is to develop the first ever quantitative theory of the de Haas-van Alphen oscillations in superconductors, using semiclassical mechanics to describe Andreev scattering in the Abrikosov lattice. Such theory would allow us to determine experimentally the quasi-particle spectra, providing a definitive proof of the d-wave symmetry.

Training content (objective, benefit and expected impact)

The applicant would develop skills in Superconductor Physics, a fundamental area of physics and the basis of a growing and diversifying industry, and in the methods of Quantum Chaology and Semiclassical Mechanics, that have a wide range of applications from acoustics to the quantum theory of measurement. In both cases the training would be provided by top specialists in the field.

**Coordinator**

UNIVERSITY OF BRISTOL

Tyndall Avenue

BS8 1TL BRISTOL, CLIFTON

United Kingdom

See on map

**Subjects**

Total cost: Not available

EU contribution: Not available

Coordinated in: United Kingdom

Topic(s):

- 0301 - Post-graduate research training grants
- TP10 - Condensed Matter - Electronic, Magnetic & Superconduct.Properties

Funding scheme:

- RGI - Research grants (individual fellowships)