LNCMI

LNCMI-Grenoble

Development of a Faraday balance for low temperature and high magnetic field

M1

Summary *(400 caractères maxi)*

Development of a Faraday balance magnetometer for applications at high magnetic fields and low temperatures

Detailed subject *(1200 caractères maxi dont une figure possible)*

The laboratory wants to broaden the experimental techniques offered to (European and international) users on our resistive high field magnets (35T) to the domain of magnetization – hence a probe for the longitudinal magnetization (in absolute values) suitable for very low temperatures (50mK in a dilution refrigerator) is being developed. One possible realization is a magnetometer following the working principle of a Faraday balance, i.e. detecting the force induced displacement (via a capacitance change) of a magnetized material when it is placed in a magnetic field *gradient*. So far, three prototypes have been realized and numerous tests performed, mainly at temperatures between 1.3 and 4.2K. The aim of the internship is to push further the performance of the balance: a) broaden the applicable temperature range (up to 50K and down to 100mK) b) increase its sensitivity (stronger field gradient) c) develop a calibration procedure (absolute values) d) create and test different types of CuBe sample platforms e) improve the associated instrumentation (Labview program).

As a working environment, there is access to a superconducting magnet (16/18T), and also some magnet time on our 12MW/24MW magnets for tests in the resistive environment are planned.

This internship is primarily aiming at M1 students, but depending on recent experimental advances, M2 might be possible as well (magnetization study of quantum magnets, quantum oscillations, etc.).

Publications linked to the theme

T. Sakon, M. Motokawa, Rev. Sci. Instrum. 71, 3474 (2000)

A. McCollam et al., Rev. Sci. Instrum. 82, 053909 (2011)

Background and skills expected :

Basic solid state physics

Labview programming

Enthusiasm for experiments

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