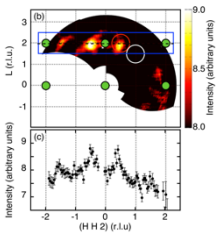
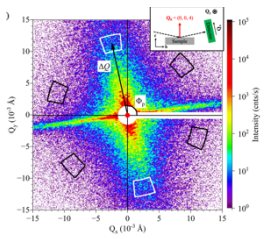
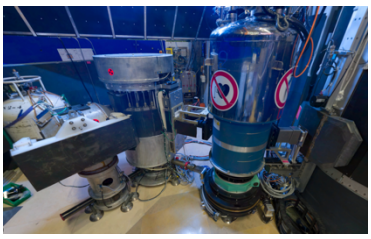
Faculty of Science
Department of Physics
Division for Synchrotron Radiation Research

Science Directorate
Spectroscopy Group

## PhD on the microscopic origin of the Thermal Hall Effect in Quantum Materials

At the Division for Synchrotron Radiation Research we perform fundamental research into materials using X-ray and neutron scattering techniques. The division is part of the Department of Physics within the Faculty of Science at Lund University (LU), Sweden, one of world's top universities and founded in 1666.

As the world's flagship centre for neutron science, the Institut Laue-Langevin (ILL), France, provides scientists with a state-of-the-art suite of neutron scattering instruments for research in a variety of fields and in particular for fundamental material science and condensed matter. Neutron spectroscopy probes the dynamics of materials which hold the key for understanding quantum phenomena.

The interactions of electrons in materials are a rich and complex source of physical problems, in part due to the problems of dealing with the large number of many-body interactions. These interactions give rise to fundamentally quantum mechanical states such as superconductivity and magnetism. New quantum states of matter are being uncovered on a regular basis. External perturbations are able to drive a magnetic state into a new phase, providing vital information on the internal exchange interactions.

The main research topic of this position is the investigation of how thermal transport in crystals can be affected by the application of magnetic field. This is observed in the thermal Hall effect, which is thermal analogue to the Hall effect. In many materials, when a thermal gradient is applied, and a magnetic field is then applied, an orthogonal thermal gradient develops. The mechanisms for this are as yet unknown. In this project this will be investigated by focusing on the thermal carriers, using inelastic neutron scattering to identify and characterize potential carriers, with the aim of explaining how they couple to an external magnetic field. With this information, we will be able to test theoretical explanations, and provide clarity on what types of mechanism are permissible in such quantum materials.

**We offer** a challenging and exciting project in the field of experimental quantum magnetism under the supervision of Prof. Elizabeth Blackburn and instrument scientists PD Dr. Arno Hiess (ILL) and Dr. Ursula B. Hansen (ILL). A large part of this project will be carried out at the Institut Laue-Langevin, Grenoble, France. The selected PhD student will benefit from the full integration in these dynamic international research communities and take part at the graduate schools available at LU and ILL.

**We are looking for** a highly motivated candidate with a master in physics or related fields. You will primarily devote yourself to your doctoral education, which mainly consists of writing a doctoral thesis. You will do experimental work at large-scale facilities (synchrotron and neutron sources) around the world, although primarily in Europe, supplemented by laboratory experiments. You will present your results at seminars and conferences. This experimental work will involve preparing samples, setting up the experimental equipment and collecting data. You will also be involved in designing and building a sample holder that will permit thermal transport measurements, in collaboration with experts. For the work at large-scale facilities, experimental time is awarded by competitive peer-review, and you will learn how to write successful proposals. You will also work on analyzing the experimental data and testing them against theoretical predications. As a part of your doctoral education you will also take some taught courses, both in the subject area and in transferable skills. In addition to studies, a maximum of 20% of working time may be spent on teaching and other departmental work.

**Applications:** For further details refer to https://lu.varbi.com/what:job/jobID:944071/%20

**Last application date**: 16. Aug. 2026