Investigation of Skyrmion Crystal Properties

Skyrmions are named after the nuclear physicist Tony Skyrme, who developed a nonlinear field theory for interacting pions in the 1960s and showed that topologically stable field configurations occur as particle-like solutions. Magnetic skyrmions are chiral spin structures with a whirling configuration (Fig. 1). As their structure cannot be continuously deformed to a ferromagnetic or other magnetic state, skyrmions are topologically protected and stable structures. Moreover, they are appealing because of their potential applications in novel spintronic devices, for example, information storage or logic devices based on the controlled motion of these particle like magnetic nanostructures.

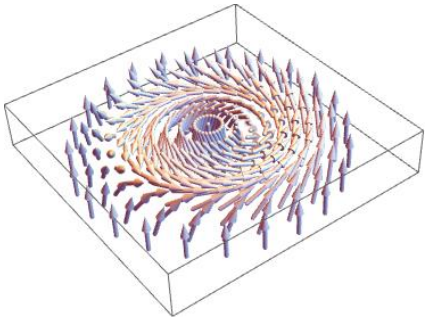

Figure 1

The project will involve cutting edge research experience in investigation of skyrmion crystal properties. The student will be involved in the design and fabrication of coplanar resonators, followed by microwave measurements using vector network analyzer and superconducting magnets at liquid helium temperatures in order to probe magnetic excitations of skyrmions. The work will also involve sample characterization using the X-ray Laue and SQUID magnetometer. Data analysis will be performed using MATLAB or Python programming packages.

Interested students should contact Prof. Henrik M.Ronnow (Head, Laboratory of Quantum Magnetism, EPFL). Email: henrik.ronnow@epfl.ch