Master thesis available

Fast Vortex Dynamics in Superconductors

Quantized magnetic vortices driven by electric current determine key transport properties of superconductors. While the dynamics of slow vortices (<1 km/s) was thoroughly investigated in the past, the physics of ultrafast vortices under strong currents remains largely unexplored. Very recently, we experimentally discovered a superconducting system with fast relaxation of heated electrons [1]. We are now using it as a platform for the exploration of the rich physics of ultrafast vortices and the development of superconducting single-photon detectors.

We are currently searching for a master student to work on a research project that aims at the enhancement of the pair-breaking current and the speed limits of the vortex motion in nanoscale superconductors. In your master thesis you will design superconducting 3D nano-architectures with engineered edge barriers to control the dynamics of magnetic flux quanta (Abrikosov vortices). You will test your superconducting devices and model their performance relying upon the state-of-the-art theoretical models. You will be working in a team with a PhD student, as well as with international collaborators from the Goethe University Frankfurt am Main, the Leibniz Institute for Solid State and Materials Research Dresden, and the Russian Academy of Sciences.

We offer a cutting-edge research program at the interface of physics and nanotechnology, that offers plenty of room for the implementation of your ideas. **You are** a highly curious and motivated student who loves to work experimentally. Attendance of solid-state physics courses and programming skills are of advantage.

For more information, please inquire Oleksandr Dobrovolskiy (oleksandr.dobrovolskiy@univie.ac.at) at your earliest convenience.

The Superconductivity and Spintronics Laboratory is part of the Nanomagnetism and Magnonics Group at the Faculty of Physics of the University of Vienna.

[1] O. V. Dobrovolskiy, *et al.* Nat. Commun. 11 (2020) 3291, see also press-release