

Spin+X Job Offer #0001: Ph.D. position in numerical simulations of spin current properties

A Ph.D. position is available in the field of spintronics studying pure spin currents and their employment in devices, such as non-local spin valves. The three key stages of these devices will be investigated, from the initial spin current generation to the spin current transport and ultimately its functionalization for the ultra-efficient manipulation of spin. Numerical spin current drift and diffusion calculations of the spin current transport will be performed to understand the full 3 dimensional distribution of the spin currents and the important contributions to spin relaxation. Ultimately we particularly study novel effects that occur due to the interaction of spin currents and magnetization, leading to highly efficient spin dynamics such as magnetization switching and domain wall propagation. In addition to the study of the fundamental physical processes, this project has a strong outlook towards technological applications such as data storage and logic, since such devices have even received industrial interest in, for example, read-head sensing applications.

The group has experience with a variety of software for the micromagnetic simulation of domain structures, magnetization dynamics and spin current transport (OOMMF, MicroMagnum, SpinFlow3D, etc.) and has access to high performance computing facilities of the university. The lab boasts advanced fabrication techniques (full clean room with lithography and pattern transfer techniques), a range of materials deposition tools (molecular beam epitaxy, sputtering, pulsed laser deposition, etc.) and a number of sophisticated characterization techniques. Low temperature magneto-transport measurements (10mK to room temperatures with fields up to 15T) will be carried out to detect spin injection, spin dynamics and quantum transport effects. A novel scanning electron microscope with polarization analysis was recently installed that allows for high resolution magnetic imaging and which will be further customized to provide unique functionality and allow more precise comparison with the simulations. Depending on the interest of the candidate, the work can be primarily focused on simulations, and depending on interest also include an instrumental development / experimental component.

Potential applicants need to hold a Masters or equivalent degree in Physics or Materials Science. Experience in magnetic materials or spintronics is an advantage.

In the recent Shanghai and CHE rankings Physics at Mainz was selected for the excellence group in Europe and top 5 in Germany and is the only physics department in Germany that houses both a Research Cluster and a Graduate School funded by the German Excellence Initiative. It is particularly strong in the area of condensed matter physics / material sciences with the Graduate School of Excellence Materials Science in Mainz. Very good candidates will be considered for this Graduate School that provides a structured graduate education with additional tailored training.

For further information and applications (including a full CV) contact:

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