

On-line SPICE-SPIN+X Seminars



Wednesday, 10th March 2021, 15:00 (German Time)

The seminar will be via Zoom ([Meeting ID: 891 1486 4059](#)) and live streamed in the SPICE YouTube Channel.



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All-optical control of magnetism: from fundamentals to brain-inspired computing concepts

The ability to switch magnets between two stable bit states is the main principle of digital data storage technologies since the early days of the computer. Due to many new ideas, originating from fundamental research during the last 50 years, this technology has developed in a breath-taking fashion. However, the explosive growth of digital data and its related energy consumption is pushing the need to develop fundamentally new physical principles and materials for faster, smaller and more energy-efficient processing and storage of data.

Since our demonstration of magnetization reversal by a single 40 femtosecond laser pulse, the manipulation of magnetism by ultra-short laser pulses has developed into an alternative and energy efficient approach to magnetic recording. Plasmonic antennas have allowed to push this even down to nanometer length scales while photonic networks allow the development of an optically switchable MRAM. However, new ICT technologies, such as Artificial Intelligence push the exponentially increasing energy requirement of data manipulation even more. Therefore, the development of radically new physical principles that combine energy-efficiency with high speeds and high densities is crucial for a sustainable future. One of those is neuromorphic computing, that is inspired by the notion that our brain uses a million times less energy than a supercomputer while, at least for some tasks, it even outperforms the latter.

In this talk, I will discuss the state of the art in ultrafast optical manipulation of magnetic bits and present some first results and the potential of optical control of magnetism to implement brain-inspired computing concepts in magnetic materials.