FIELD AND SPIN TORQUE DRIVEN DYNAMICS IN MAGNETIC NANOSTRUCTURES

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Magnetic nanostructures still attract substantial scientific interest, especially because their dynamic can not only be driven by magnetic fields but also spin polarized currents, offering new possibilities for technological applications. Beyond the trivial configuration with a homogeneous magnetization, the simplest configuration of a soft magnetic platelet is a closed-flux vortex state. The nanometer sized, out-of-plane magnetized vortex core plays a key role in the dynamics of these structures and makes it is interesting subject for the study of micro magnetism as well as for future applications.

We have studied the vortex dynamics in micron and submicron Permalloy thin film elements by means of micromagnetic simulations and time-resolved magnetic X-ray microscopy. With an advanced pump-and-probe approach, the dynamic response was recorded with high spatial (30 nm) and temporal (70 ps) resolution, after the application of different excitations with magnetic fields and spin-polarized currents. These studies have revealed a new reversal mechanism for the out-of-plane vortex core [1]. Experiments using RF magnetic fields [1,2], rotating magnetic fields [3], short magnetic field pulses [4], spin-polarized currents [5] and induced spin waves [6] have been set-up and have given great insight into the complex magnetization dynamics of vortices.

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