

Nonlinear Dynamics of Ferromagnetic Nanostructures

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The magnetic domain configuration and its correlation to magnetization reversal dynamics in micro- and nano-sized magnets has been actively studied during the last few years due to their possible applications in high-density magnetic storage devices. In our study dynamic behavior of nonequilibrium magnetization configurations undergoing ultrafast magnetization reversal was studied with time-resolved scanning Kerr microscope and micromagnetic modeling. Magnetization reversal enters a fully dynamic regime when the external field conditions are changed much faster than the sample is able to respond. The dynamic pathway develops a complexity not seen in quasi-static reversal, but still retains a high level of order with well-developed dynamic domain patterns formed in response to sub-nanosecond transitions of the external applied magnetic field. In this talk, we will discuss the magnetization vortex and spin-wave-related phenomena occurring on the sub-nanosecond time scale.

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