Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Driving coherent spin reorientation transition with femtosecond laser pulses VLADIMIR STOICA, ROY CLARKE, Physics Department, University of Michigan — Ultrafast studies of spin reorientation transition provide insight in magnetization switching processes and are important for the magnetic recording technology. Using femtosecond optical techniques, we demonstrate coherent control of the magnetization vector in epitaxial Fe films. These films feature uniaxial anisotropy that is thermally modulated by an optical pulse. We observe an optically-induced spin reorientation transition of first-order that provides an efficient route to ultrafast coherent magnetization switching. The switching is found to be a three-step temporal process: a coherent reorientation ($\sim$ 100 ps) is followed by a spin precession in a newly created metastable state ($\sim$ 300 ps), which evolves into a dual domain state that undergoes relaxation within $\sim$ 2 - 4 ns. We provide a model to explain the experimental data and predict further applications of this technique. The details of the experiments compare favorably with the simulated magnetization trajectories, opening new pathways for coherent control of magnetic dynamics with pulsed lasers.

Vladimir Stoica
Physics Department, University of Michigan

Date submitted: 28 Nov 2011 Electronic form version 1.4