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Optical Control of Ultrafast Spin-wave Relaxation by Magnetic Anisotropy in a Ferromagnet KEVIN SMITH, Y. FAN, R.A. LUKASZEW, J.R. SKUZA, C. CLAVERO, K. YANG, College of William and Mary, O. AMPONSAH, N. NOGINOVA, Norfolk State University, A. REILLY, University of Houston - Clear Lake, G. LUPKE, College of William and Mary — Ultrafast switching of magnetization requires a detailed understanding and control of spin-wave excitation and relaxation, which is important in spintronic applications such as magnetic logic and memories. To this end, there has been a recent wealth of activity in utilizing ultrafast lasers and the Time-Resolved Magneto-Optical Kerr Effect (TR-MOKE) to generate and study spin wave dynamics. However, there is still an incomplete understanding of damping and reports have shown that TR-MOKE in particular, while capturing the precession frequency quite well, often yields stronger damping than that seen in ferromagnetic resonance (FMR) experiments. In this talk, we demonstrate that an ultrafast pump pulse can control the effective damping by interacting with magnetic anisotropy in 10 nm thick Ni(001)/MgO(001) thin-films and that TR-MOKE and FMR are inconsistent for geometries in which the magnetization is pulled away from the easy axis. We thus introduce a novel optically mediated decay mechanism: pump-induced anisotropic damping (PIAD).

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