Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Theoretical foundation of the time-resolved magneto-optical Kerr effect for femtosecond magnetism[1] GUOPING ZHANG, Indiana State University, WOLFGANG HÜBNER, GEORG LEFKIDIS, Kaiserslautern University of Technology, YIHUA BAI, Indiana State University, THOMAS F. GEORGE, University of Missouri-St. Louis — Laser-induced femtosecond magnetism or femtomagnetism opens a new frontier for a faster magnetic storage device, but to probe such a rapid magnetization change challenges the existing experimental and theoretical wisdom. We establish a new paradigm through a first-principles investigation in ferromagnetic nickel [1]. We show that the time-resolved optical and magnetic responses energetically follow their respective optical and magneto-optical susceptibilities; as a result, the one-to-one correspondence between them sensitively depends on the incident photon energy. For a shorter laser pulse, a delay of 10 fs in the magnetic signal with respect to the optical one is revealed through a phase-sensitive polarization-magnetization diagram; for a longer pulse, such a delay diminishes and the correlation can be established unambiguously [2].

[1] Zhang *et al*, Nature Physics **5**, 499 (2009);
[2] Zhang, Phys. Rev. Lett **101**, 187203 (2008).

[1]Supported by the U. S. DOE grant DE-FG02-06ER46304, NERSC at LBNL under Contract No. DE-AC02-05CH11231 and the Argonne Leadership Computing Facility at ANL.

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Date submitted: 02 Dec 2009 Electronic form version 1.4