Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Ultrafast demagnetization: the effect of the pulse length GERARD SALVATELLA, ANDREAS FOGNINI, THOMAS MICHLMAYR, ANDREAS VATERLAUS, YVES ACREMANN, None — Upon excitation by a femtosecond laser pulse a ferromagnet can be demagnetized on a sub-picosecond timescale. During the demagnetization both energy and angular momentum are exchanged between the electron gas and the lattice. However, the mechanisms and the characteristic times through which such exchanges occur are still controversial. A strong debate remains on whether bulk spin-flips or spin-currents are the primary cause of momentum transfer. To shed light on this topic two types of experiments are undertaken. First, demagnetization is studied in a pump-probe experiment in Ni for different pump-pulse durations. It is observed that shorter laser pulses demagnetize nickel more effciently than longer pulses. The experiment reveals two processes: a fast process demagnetizes the sample within less than a picosecond and causes a remagnetization on the same timescale. Simultaneously, a slower process causes a magnetization loss that lasts tens of picoseconds. For long pulses only the slow remagnetization process is relevant. Second, a delayed double pulse experiment is performed in which the induced heat from the first pump pulse influences the demagnetization caused by the second through the increase of either the lattice or the electron temperatures.

Gerard Salvatella
None

Date submitted: 14 Nov 2014 Electronic form version 1.4