Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Electrically-induced Spin Coherence by Ultrafast Electrical Spin Injection. B. BESCHOTEN, L. SCHREIBER, J. MORITZ, C. SCHWARK, G. GUENTHERODT, II. Physikalisches Institut, RWTH Aachen University, 52056 Aachen, Germany, X. LOU, P. CROWELL, School of Physics and Astronomy, University of Minnesota, Minneapolis, MN, C. ADELMANN, C. PALMSTROM, Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, MN — Efficient electrical spin injection from a ferromagnet into a semiconductor has been demonstrated for various material systems by steady-state experiments. We introduce a novel time-resolved technique based on electrical pumping and optical probing. As a pump we apply ultrafast current pulses (∼200ps) to electrically inject spin packets from an iron layer through a reverse biased Schottky barrier into a n-GaAs layer. Spin coherence in the semiconductor is probed by subsequent spin precession in a transverse magnetic field using time-resolved Faraday rotation. We observe spin precession for current pulse widths down to 200 ps. The spin polarization of the spin packets is directly measured by Faraday rotation and is found to increase linearly with the current pulse width for pulses shorter than 3 ns at small magnetic fields. This finding together with independent measurements of the samples' high frequency bandwidth indicate that even shorter than 200 ps pulses might be used for generating coherent spin currents in our devices. Work supported by BMBF, DFG and HGF.

Bernd Beschoten
II. Physikalisches Institut, RWTH Aachen University, 52056 Aachen, Germany

Date submitted: 27 Nov 2007 Electronic form version 1.4