Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Ultrafast Photo-induced Ferromagnetism in III-Mn-V Semiconductors INGRID COTOROS, University of California and Lawrence Berkeley National Lab, Berkeley CA 94720, JIGANG WANG, K.M. DANI, Lawrence Berkeley National Lab, Berkeley CA 94720, X. LIU, J.K. FURDYNA, University of Notre Dame, Notre Dame, IN 46556, DANIEL CHEMLA, University of California and Lawrence Berkeley National Lab, Berkeley CA 94720 — We report on ultrafast photoenhancement of hole-mediated ferromagnetism, and paramagnetic to ferromagnetic phase transition in III-Mn-V semiconductor GaMnAs via laser excited transient carriers. Our femtosecond UV pump/NIR probe vectorial MOKE spectroscopy reveals sub-picosecond demagnetization, precessional trajectory of the magnetization vector, and establishment of the ferromagnetic order on a 100-ps time scale. The dynamic enhancement of the magnetic ordering, manifesting as the photo-induced magnetization below and above the Curie temperature T_c, is well explained by a transient increase of T_c via a population of photo-generated holes. This constitutes the first evidence for an ultrafast, nonthermal manipulation of the magnetic order in ferromagnetic semiconductors, thereby opening up fascinating opportunities for future high-speed spin-photon-carrier integrated devices, and above GHz magneto-optical recording.

Ingrid Cotoros
University of California and Lawrence Berkeley National Lab,
Berkeley CA 94720

Date submitted: 22 Nov 2006 Electronic form version 1.4