Abstract Submitted
for the CAL11 Meeting of
The American Physical Society

Transient-Grating Study of Electron and Hole Diffusion in (Ga,Mn)As ERIC KITTLAUS, Santa Clara University — Dilute magnetic semiconductors are a class of materials exhibiting both semiconducting and ferromagnetic properties while being chemically similar to traditional semiconductors. This dual nature presents the opportunity for new "spintronic" devices, with the caveat that current dilute magnetic semiconductors are only ferromagnetic above their subzero Curie temperature, Tc. In order to develop new materials functional at room temperature, it is necessary to develop a better theoretical understanding of how such materials become magnetic, a result of microscopic electronic processes. One of the most common dilute magnetic semiconductors, (Ga,Mn)As, is produced by doping Gallium Arsenide with manganese. We use a laser-based experiment, transient-grating spectroscopy, to measure the diffusive motion of electrons and holes in (Ga,Mn)As, which provides information related to the processes which control magnetism in these materials. We present preliminary data and calculations and discuss further improvements in experimental design that will provide unprecedented insight into the microscopic workings of dilute magnetic semiconductors.

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Date submitted: 30 Sep 2011 Electronic form version 1.4