Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Manipulating nonlinear optical response from electron spins in a 2D electron gas via exciton injection SHANNON O'LEARY, HAILIN WANG, University of Oregon — The well-known robustness of electron spin coherences in semiconductors has stimulated intense interest in the use of electron spins in semiconductors for spintronics, quantum information processing, and coherent nonlinear optics. Of special importance to these efforts is the understanding and the manipulation of nonlinear optical processes of electron spins. Here, we report experimental studies of coherent nonlinear optical processes of electron spins in a modulation-doped CdTe semiconductor quantum well. These studies elucidate the important roles of trions and excitons and the underlying manybody interactions in the nonlinear optical process. By exploiting a two-color three-pulse pump-control-probe technique, we demonstrate that nonlinear optical responses of electron spins can be effectively manipulated through the injection of an exciton population at an appropriate time. The manipulation of the nonlinear response takes place without electron spin rotation, providing a new approach for the control and applications of electron spins in semiconductors.

Shannon O'Leary
University of Oregon

Date submitted: 27 Nov 2007 Electronic form version 1.4