Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Drift and diffusion of spin and charge density waves in a two-dimensional electron gas LUYI YANG, J.D. KORALEK, J. ORENSTEIN, Lawrence Berkeley National Laboratory and University of California Berkeley, D.R. TIBBETTS, J.L. RENO, M.P. LILLY, Sandia National Laboratories — We use transient grating spectroscopy (TGS) to study the persistent spin helix (PSH) state and electron-hole density wave (EHDW) in a 2D electron gas in the presence of an in-plane electric field parallel to the wavevector of the PSH or EHDW. By directly measuring the phase, we can measure the PSH and EHDW displacement with 10 nm spatial and sub-picosecond time resolution. We obtain both the spin diffusion and mobility and ambipolar diffusion and mobility from the TGS measurements of PSH and EHDW, respectively. The spin transresistivity extracted from the spin diffusion is in excellent agreement with the RPA theory of spin Coulomb drag (SCD). The spin mobility data indicate that SCD may also play a role in the spin wave drifting process. From the ambipolar diffusion and mobility, we obtain the transresistivity of electrons and holes in the same layer, which is much stronger than is typically seen in the conventional Coulomb drag experiments on coupled quantum wells.

Luyi Yang
Lawrence Berkeley National Laboratory and UC Berkeley

Date submitted: 20 Dec 2010 Electronic form version 1.4