Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Confinement-induced Berry phase and helicity-dependent photocurrents J. ORENSTEIN, JOEL E. MOORE, Lawrence Berkeley National Laboratory and University of California Berkeley — The photocurrent in an optically active metal is known to contain a component that switches sign with the helicity of the incident radiation. At low frequencies, this current depends on the orbital Berry phase of the Bloch electrons via the "anomalous velocity" of Karplus and Luttinger. We consider quantum wells in which the parent material, such as GaAs, is not optically active and the relevant Berry phase only arises as a result of quantum confinement. Using an envelope approximation that is supported by numerical tight-binding results, it is shown that the Berry phase contribution is determined for realistic wells by a cubic Berry phase intrinsic to the bulk material, the well width, and the well direction. These results for the magnitude of the Berry-phase effect suggest that it may already have been observed in quantum well experiments.

Lu-Yi Yang
Lawrence Berkeley National Laboratory and UC Berkeley

Date submitted: 20 Nov 2009 Electronic form version 1.4