Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Anomalous spin precession and spin Hall effect in semiconductor quantum wells PEIRU HE, XINTAO BI, ICQD, University of Science and Technology of China, E.M. HANKIEWICZ, Universität Würzburg, R. WINKLER, Argonne National Laboratory, GIOVANNI VIGNALE, University of Missouri, DIMITRIE CULCER, ICQD, University of Science and Technology of China — We study the contributions of the anomalous position operator to the spin-Hall effect in quasi two-dimensional semiconductor quantum wells with strong band structure spin-orbit interactions. The skew scattering and side-jump *scattering* terms in the SHE vanish, but we identify two additional terms in the SHE due to the anomalous position operator. One term reflects the modification of the spin precession due to the action of the external electric field, which produces an effective magnetic field perpendicular to the plane of the quantum well. The other term reflects a similar modification of the spin precession due to the action of the electric field created by random impurities. We refer to these two effects collectively as *anomalous spin precession*. In electron systems with weak momentum scattering, anomalous spin precession due to the external electric field equals 1/2 the side-jump SHE, while the additional impurity-dependent contribution depends on the form of the band structure SO coupling. For band structure SO linear in wave vector the two additional contributions cancel. For band structure SO cubic in wave vector external electric field contribution can be detected through its density dependence. In 2D hole systems both additional contributions vanish.

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Date submitted: 09 Nov 2012 Electronic form version 1.4