Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Experiments on BECs with Synthetic Gauge Fields and Spin Orbit Coupling ROBERT NIFFENEGGER, ABRAHAM OLSON, YONG P. CHEN, Purdue University, QUANTUM MATTER AND DEVICES TEAM — We report experiments on ^{87}Rb BECs subject to synthetic gauge fields and spin orbit interactions created by optical Raman fields that couple different hyperfine spin and momentum states. We have reproduced several recently shown results of the effects of such synthetic gauge potentials by characterizing the quasimomentum of the dressed states. We have also observed a spin Hall-like effect on our BECs in a spatially inhomogeneous synthetic spin orbit coupling. We create BECs with equal populations of $|F = 1, m_F = -1 >$ and $|F = 1, m_F = 0 >$, representing a pseudo spin 1/2 system, and launch them into a common mode oscillation within an optical dipole trap. When an inhomogeneous spin orbit coupling Raman field is applied, they exhibit an anticorrelated transverse oscillation, manifesting in cyclotron motions of opposite chirality. Measurements of such a spin dependent transport versus the intensity and detuning of the Raman coupling and versus the position of the BEC are also presented with discussions of possible interpretations.

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Date submitted: 09 Nov 2012 Electronic form version 1.4