



BRANDON ANDERSON 'Synthetic Spin-Orbit Coupling Without Light'

BRANDON ANDERSON

Joint Quantum Institute, NIST, Maryland, USA

May 19, 2014

Seminar, May 19, 2014, 10:15. Seminar Room

BRANDON ANDERSON

Joint Quantum Institute, NIST, Maryland, USA

Recent experimental successes in Raman-induced spin-orbit coupling in ultracold atomic systems opened the door to the study of a novel class of many-body Hamiltonians. However, these techniques have been limited thus far to Abelian spin-orbit couplings. In this talk I will present a new technique for producing two- and three-dimensional non-Abelian (Rashba-like) spin-orbit couplings for ultracold atoms without involving light. Instead, a sequence of pulsed inhomogeneous magnetic fields imprint suitable phase gradients on the atoms. These techniques can be easily implemented on an atom chip. I will then consider the implementation of this spin-orbit coupling on a lattice. Exploiting the geometry of the

atom-chip, both staggered and non-staggered non-Abelian fluxes can be induced. Finally, I demonstrate how combining the pulsed spin-orbit coupling with lattice shaking techniques can be used to produce Chern bands with $C > 1$. Using exact diagonalization, we explore the novel Fractional Chern Insulating states that emerge in these models.

Seminar, May 19, 2014, 10:15. Seminar Room

Hosted by Prof. Maciej Lewenstein