

Joint CQSE and CASTS Seminar

Weekly Seminar
Nov. 22, 2013 (Friday)

TIME Nov. 22, 14:30 ~ 15:30
TITLE Quantum simulation of gauge potentials for ultracold neutral atoms
SPEAKER Dr. Yu-Ju Lin
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PLACE Rm716, CCMS & New Physics Building, NTU

Abstract

The systems of quantum gases of ultracold neutral atoms are nearly disorder free, tunable and have precisely known Hamiltonians. They hold great promise for quantum simulation of intricate models in condensed matter physics without many complexities usually associated with materials. One apparent limitation is the charge neutrality of the atoms, preventing access to important physics such as electrons in magnetic fields. We have circumvented this limitation by generating an effective vector gauge potential with an optical Raman coupling between internal states of the atoms. Our optical approach is not subject to the limitations of trap symmetry, and thus should be able to create sufficiently large synthetic magnetic fields in the quantum-Hall regime. Furthermore, in the weak optical coupling limit the vector gauge potentials are spin-dependent, equivalent to a spin-orbit coupling for neutral atoms. This can be generalized to those leading to non-abelian gauge potentials and realization of topological insulators.

