Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Probing topological superfluidity in a system of repulsive alkaline-earth atoms in optical lattices[1] GERARDO ORTIZ, Department of Physics, Indiana University Bloomington, LEONID ISAEV, JILA, University of Colorado Boulder, ADAM KAUFMAN, ANA MARIA REY, JILA, NIST and Department of Physics, University of Colorado Boulder — Topological superfluids are of technological relevance since they are believed to host Majorana bound states, a powerful resource for quantum computation and memory. I will describe an experimentally feasible realization of topological superfluidity with fermionic atoms in an optical lattice. We consider a situation where atoms in two internal states experience different lattice potentials: one species is localized and the other itinerant, and show how quantum fluctuations of the localized fermions give rise to an attraction and strong spin-orbit coupling in the itinerant band. At low temperature, these effects stabilize a topological superfluid of mobile atoms even if their bare interactions are repulsive. This emergent state can be engineered with ^{87}Sr atoms in a superlattice with a dimerized unit cell. To probe its unique properties we describe protocols that use high spectral resolution and controllability of the Sr clock transition, such as momentum-resolved spectroscopy and emergent magneto-electric phenomena when the system exhibits a supercurrent response to a synthetic (laser-induced) magnetic field.

[1]Supported by NSF (PHY-1211914, PHY-1521080 and JILA-PFC-PHY-1734006), AFOSR FA9550-13-1-0086, AFOSR-MURI Advanced Quantum Materials, NIST and DARPA W911NF-16-1-0576 through ARO.

Leonid Isaev
JILA, University of Colorado Boulder

Date submitted: 26 Jan 2018 Electronic form version 1.4