Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Ultracold Fermions in an Optical Lattice with Tunable Geometry GREGOR JOTZU, LETICIA TARRUELL, DANIEL GREIF, THOMAS UEHLINGER, TILMAN ESSLINGER, Institute for Quantum Electronics, ETH Zurich, 8093 Zurich, Switzerland — Ultracold Fermi gases in optical lattices have emerged as a versatile tool to simulate condensed matter phenomena. We present an optical lattice whose potential can be dynamically deformed to take on square, triangular, honeycomb, dimer and different one-dimensional geometries. Using Bloch-Oscillations of a Fermi gas, we probe the bandstructure of this lattice for various configurations. In particular, we observe the appearance of Dirac points with tunable properties. When introducing a lattice anisotropy, two Dirac points approach each other and eventually anihilate. A band-gap can be created at the Dirac points by continously breaking the inversion symmetry of the system. Furthermore, we study how the effects of interactions change depending on the geometry of the lattice. We report on recent progress on using the dynamic tunability of the lattice as a method to study spin correlations in the system.

Gregor Jotzu
Institute for Quantum Electronics, ETH Zurich, 8093 Zurich, Switzerland

Date submitted: 27 Jan 2012 Electronic form version 1.4