Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Pair Production with Ultracold Atoms[1] ALINA PIÑEIRO ESCALERA, DINA GENKINA, MINGWU LU, IAN SPIELMAN, Univ of Maryland-College Park / Joint Quantum Institute / National Institute of Standards and Technology — Electron-positron pair production in quantum electrodynamics (QED) is predicted to occur at electric field strengths beyond Schwingers limit of approximately E=10^{18} V/m. However, fields on this scale are not experimentally accessible, and direct observation of pair production is currently out of reach. The versatility of ultra-cold atomic experiments makes it possible to simulate these quantum phenomena. Here, we exploit the mapping between the Dirac dispersion relation that underlies pair production and the dispersion relation of a 1-D optical lattice at the edge of the Brillouin zone. A linear force applied to the atoms models an electric field, and atoms excited to the second band of the lattice simulate pair production. We load a cloud of ^{87}Rb into the lowest band of such a lattice and study the number of 'pairs' produced as a function of the force applied or the "rest mass", allowing us to probe Schwinger's limit.

[1]This work was supported by the National Science Foundation.

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Date submitted: 07 Feb 2018 Electronic form version 1.4