

Abstract Submitted  
for the DAMOP16 Meeting of  
The American Physical Society

**Atom optics simulator of lattice transport phenomena** FANGZHAO AN, ERIC MEIER, BRYCE GADWAY, University of Illinois at Urbana-Champaign — We report on a novel scheme for studying lattice transport phenomena, based on the controlled momentum-space dynamics of ultracold atomic matter waves. In the effective tight binding models that can be simulated, we demonstrate that this technique allows for a local and time-dependent control over all system parameters, and additionally allows for single-site resolved detection of atomic populations. We demonstrate full control over site-to-site off-diagonal tunneling elements (amplitude and phase) and diagonal site-energies, through the observation of continuous time quantum walks, Bloch oscillations, and negative tunneling. These capabilities open up new prospects in the experimental study of disordered and topological systems.

Eric Meier  
Univ of Illinois - Urbana

Date submitted: 28 Jan 2016

Electronic form version 1.4