

Abstract Submitted  
for the DAMOP18 Meeting of  
The American Physical Society

**High precision multi-band spectroscopy of ultracold atoms in optical lattices** BENNO REM, NICK FLAESCHNER, MATTHIAS TARNOWSKI, DOMINIK VOGEL, KLAUS SENGSTOCK, CHRISTOF WEITENBERG, Institute of Laserphysics - University of Hamburg — Spectroscopic tools are fundamental for the understanding of complex quantum systems. Here we demonstrate high-precision multi-band spectroscopy in a graphene-like lattice using ultracold fermionic atoms. From the measured band structure, we characterize the underlying lattice potential with a relative error of  $1.2 \cdot 10^{-3}$ . Such a precise characterization of complex lattice potentials is an important step towards precision measurements of quantum many-body systems. Furthermore, we explain the excitation strengths into the different bands with a model and experimentally study their dependency on the symmetry of the perturbation operator. This insight suggests the excitation strengths as a suitable observable for interaction effects on the eigenstates.

Benno Rem  
Institute of Laserphysics - University of Hamburg

Date submitted: 27 Jan 2018

Electronic form version 1.4