Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Nonequilibrium free-fermion pair correlations in molecular dissociation. KAREN KHERUNTSYAN, MATTHEW DAVIS, MURRAY OLSEN, University of Queensland, ARC Centre of Excellence for Quantum-Atom Optics — We analyze the pair correlations of fermionic atoms formed through the dissociation of a Bose-Einstein condensate of molecular dimers. With bosonic atomic constituents, this would be a direct atom optics analog of optical parametric down-conversion. Known as the best source of squeezed light and entangled photon pairs, down-conversion has led to a number important applications, such as precision measurements and fundamental tests of quantum theory. We envisage that molecular dissociation will play a similarly important role in quantum-atom optics in the near future, with the different possible quantum statistics of the constituent atoms revealing new physics. Here we discuss how the fermionic statistics leads to the new paradigm of fermionic quantum-atom optics. Using a simple theoretical model for molecular dissociation, we analyze the pair correlations between the fermionic atoms in two spin states and quantify the strength of correlations via number-difference squeezing [1]. This is the first step towards a quantitative theoretical analysis of recent experimental measurements of atom correlations in dissociation of potassium dimers performed at JILA [2]. [1] K.V. Kheruntsyan, Phys. Rev. Lett. 96, 110401 (2006). [2] M. Greiner et al., Phys. Rev. Lett. 94, 110401 (2005).

Karen Kheruntsyan
University of Queensland

Date submitted: 29 Jan 2007 Electronic form version 1.4