Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Extracting Entanglement Entropy Via Non-Destructive Imaging of an Ultracold Atomic Gas CRAIG PRICE, QI LIU, NATHAN GEMELKE, Pennsylvania State Univ — Entanglement plays an important role in determining the thermodynamic ground state of many many-body quantum systems, and recent theoretical studies have provided evidence that broad classes of quantum critical and topologically ordered states may be characterized by the scaling properties of their entanglement entropy (EE)[1,2]. We describe how EE can be extracted in a QND imaging process, in which information is transferred from one quantum gas to another using pairwise entangling schemes, and how the subsequent non-local thermal back-action of detection may be used to probe pre-existing entanglement in the sample. We discuss related applications of quantum collisional microscopy, including minimally destructive imaging of non-equilibrium quantum gases, and the algorithmic cooling of a Mott-insulator by non-destructive detection and removal of thermal defects. [1] V. Vedral, M.B. Plenio, M.A. Rippin, P. L. Knight. Quantifying Entanglement. Phys. Rev. Lett 78, 2275 (1997) [2] G. Vidal, J. I. Latorre, E. Rico, and A. Kitaev. Entanglement in quantum critical phenomena. Phys. Rev. Lett. 90, 227902 (2003)

Craig Price
Pennsylvania State Univ

Date submitted: 14 Nov 2014 Electronic form version 1.4