Abstract Submitted for the MAR12 Meeting of The American Physical Society

Thermal versus quantum fluctuations of optical lattice fermions CHRIS HOOLEY, SUPA, University of St Andrews, UK, VIVALDO CAMPO, Universidade Federal de Sao Carlos, Brazil, KLAUS CAPELLE, Universidade Federal do ABC, Brazil, JORGE QUINTANILLA, SEPnet, University of Kent and STFC Rutherford Appleton Laboratory, UK, VITO SCAROLA, Virginia Tech, USA — We show that, for fermionic atoms in a one-dimensional optical lattice, the fraction of atoms in doubly occupied sites is a highly non-monotonic function of temperature. We demonstrate that this property persists even in the presence of realistic harmonic confinement, and that it leads to a suppression of entropy at intermediate temperatures that offers a clear route to adiabatic cooling. Our interpretation of the suppression is that such intermediate temperatures are simultaneously too high for quantum coherence and too low for significant thermal excitation of double occupancy thus offering a clear indicator of the onset of quantum fluctuations.

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Date submitted: 11 Nov 2011

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