Abstract Submitted
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Cooling by corralling: a route to antiferromagnetism in optical lattices[1] YEN LEE LOH, University of North Dakota — Cold atoms in optical lattices have emerged as a promising tool for emulating condensed matter Hamiltonians. Current experiments have observed "Mott insulating" behavior in the Fermi-Hubbard model at an average entropy $S/N \approx 1k_B$/atom. Our quantum Monte Carlo simulations [1], in agreement with other methods, show that $S/N \approx 0.65k_B$/atom is low enough to produce antiferromagnetism (AF) at the center of a harmonic trap. However, further progress in the field requires even lower entropies that are beyond the reach of traditional cooling techniques. I have proposed a way to attain very low temperatures and entropies ($S/N < 0.03k_B$/atom) by trapping fermions in a corral formed from another species of atoms [2]. This Fermi system can then be evolved into an antiferromagnet by morphing the lattice into a set of double wells, quasi-adiabatically. Quantum dynamics simulations have, so far, given promising results.

[1] Thereza Paiva, Yen Lee Loh, Mohit Randeria, Richard T. Scalettar, and Nandini Trivedi, "Fermions in 3D optical lattices: Cooling protocol to obtain antiferromagnetism," PRL 107, 086401 (2011).
[2] Yen Lee Loh, "Proposal for achieving very low entropies in optical lattice systems," arxiv:1108.0628.

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