Abstract Submitted
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Turning a strongly correlated Mott insulator into a weakly correlated metal[1] Y. F. KUNG, SIMES, SLAC National Accelerator Laboratory and Stanford University, E. A. NOWADNICK, Cornell University, C. J. JIA, SIMES, SLAC National Accelerator Laboratory and Stanford University, S. JOHNSTON, University of Tennessee, Knoxville, B. MORITZ, SIMES, SLAC National Accelerator Laboratory, T. P. DEVEREAUX, SIMES, SLAC National Accelerator Laboratory and Stanford University — As Mott insulators, such as cuprate superconductors, are doped with charge carriers, strong electron-electron interactions give rise to fascinating novel phenomena. Much of the interesting physics arises in the intermediate doping regime where the system displays metallic behavior strongly renormalized by correlations, in contrast with the naive expectation that the correlations would weaken rapidly away from half filling. To shed light on this issue, we examine the doping evolution of spin and charge excitations in the strongly correlated single-band Hubbard model using determinant quantum Monte Carlo (DQMC). Compared to the behavior predicted by the random phase approximation (RPA), the evolution of the excitations from DQMC shows that significant correlations remain up to relatively high doping levels (40% hole doping and 15% electron doping), near the maximum of what can be achieved in cuprates. The comparison improves with additional doping (up to 75% hole doping) as the system approaches a metallic state in which the spin and charge excitation spectra are essentially the same.

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Yvonne Kung
SIMES, SLAC National Accelerator Laboratory and Stanford University

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