Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Doping evolution of low-energy quasiparticles in the Hubbard model BRIAN MORITZ, YAO WANG, CHUNJING JIA, YU HE, SLAC National Accelerator Laboratory and Stanford University, KRZYSZTOF WOHLFELD, University of Warsaw, CHENG-CHIEN CHEN, Argonne National Laboratory, THOMAS P. DEVEREAUX, SLAC National Accelerator Laboratory and Stanford University — We investigate the single-particle spectra of the two-dimensional, single-band Hubbard model using cluster perturbation theory (CPT), paying considerable attention to low doping with a supercluster construction. At half-filling we find two distinct features: a spin polaron band due to strong coupling of a hole to magnons; and a second feature due to strongly renormalized, but effectively free, next-nearest neighbor hopping from additional delocalization pathways. With light hole-doping a third feature forms which disperses across the Fermi level, rapidly stealing spectral weight from the spin polaron. The doping evolution of this third feature is of particular importance as it constitutes the lowest energy degrees of freedom in the model. The three spectral features appear distinct, up to a relatively modest doping (12.5%) where the spectral weight effectively has been exhausted in the spin polaron. We comment on the similarities, differences, and implications for the spectrum in doped cuprates and on competing interpretations of the spectral properties in the Hubbard model.

Brian Moritz
SLAC National Accelerator Laboratory and Stanford University

Date submitted: 06 Nov 2015 Electronic form version 1.4