Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Exact calculations of phase separation instabilities and pairing in two-dimensional Betts nanoclusters ARMEN KOCHARIAN, Department of Physics, California State University, Los Angeles, GAYANATH FERNANDO, KUN FANG, Department of Physics, University of Connecticut, Storrs — The energy eigenvalues and eigenstates of the Hubbard model with nearest and next nearest neighbor hoppings are calculated by exact diagonalization and Lanczos (algorithm) techniques in isotropic Betts nanoclusters with the square symmetry and periodic boundary conditions. The electron pairing instabilities and quantum critical points for one hole off half filling are evaluated by monitoring the charge and spin pairing gaps and level crossings instabilities in the ground state and at finite temperatures. The calculated spin and charge energy gaps and quantum critical points in optimized 8 and 10 site Betts clusters of square symmetry pertain universal critical behavior and are fully consistent with the exact results obtained for an "elementary" bipartite square geometry [Kocharian et al., Phys. Rev. B 78, 075431 (2008)]. We found the strong particle-hole assymetry effect in the electron pairing instability due to the presence of the next nearest neighbor hopping term. Correlated lectrons in various contrasting bipartite and non-bipartite two- and three- dimensional cluster topologies display a number of inhomogeneous, coherent and non-coherent nanoscale phases seen by scanning tunneling microscopy in high Tc cuprates, iron pnictides, manganites, etc.

Armen Kocharian
Department of Physics, California State University, Los Angeles

Date submitted: 07 Dec 2010 Electronic form version 1.4