Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

A contractor-renormalization study of Hubbard plaquette clusters DROR ORGAD, SHIRIT BARUCH, Hebrew University of Jerusalem — We implement the contractor-renormalization method to study the checkerboard Hubbard model on various finite-size clusters as function of the inter-plaquette hopping t' and the on-site repulsion U at low hole doping. We find that the pair-binding energy and the spin gap exhibit a pronounced maximum at intermediate values of t' and U, thus indicating that moderate inhomogeneity of the type considered here substantially enhances the formation of hole pairs. The rise of the pair-binding energy for $t' < t'_{\rm max}$ is kinetic-energy driven and reflects the strong resonating valence bond correlations in the ground state that facilitate the motion of bound pairs as compared to single holes. Conversely, as t' is increased beyond $t'_{\rm max}$ antiferromagnetic magnons proliferate and reduce the potential energy of unpaired holes and with it the pairing strength. For the periodic clusters that we study the estimated phase ordering temperature at $t' = t'_{\rm max}$ is a factor of 2–6 smaller than the pairing temperature.

Dror Orgad
Hebrew University of Jerusalem

Date submitted: 03 Nov 2011 Electronic form version 1.4