Abstract Submitted
for the NEF11 Meeting of
The American Physical Society

**Comparative exact studies of phase separation instabilities in attractive and repulsive Hubbard models** KALUM PALANDAGE, Trinity College, Hartford, CT 06106, ARMEN KOCHARIAN, California State University, Los Angeles, CA 90032, GAYANATH FERNANDO, University of Connecticut, Storrs, CT 06269 — With the growing interest of unconventional superconductors, it is believed that these materials have spatial inhomogeneities accompanied with the separate pairing of electrons and subsequent condensation. In doped high-Tc cuprate superconductors, iron pnictide and telluride nanomaterials, above properties can be traced from both repulsive and attractive interactions of electrons. The principle differences and similarities of electron coherent and incoherent pairing instabilities are analyzed using ensembles of small clusters under variation of chemical potential (or doping), interaction strength, temperature and magnetic field. The exact calculations of quantum critical points, the charge and spin collective excitations, and corresponding critical transition temperatures display a common mechanism of phase separation transitions, condensation and formation of spatial inhomogeneities in various cluster geometries. The dependence of the gap function on position of the apical oxygen atom near its sign change due to its vibration provides a simple microscopic explanation of supermodulation of the coherent pairing gap in $Bi_2Sr_2CaCu_2O_{8+\delta}$ seen recently at atomic scale in the scanning tunneling microscopy experiments. Some features of band structures obtained using the local spin density approximation for FeTe will be also discussed.

Kalum Palandage
Trinity College, Hartford, Connecticut

Date submitted: 21 Oct 2011 Electronic form version 1.4