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A $\frac{1}{4}$-filled band model for the organic superconductor κ-$(ET)_2X$[1]

R. TORSTEN CLAY, Mississippi State University, S. MAZUMDAR, University of Arizona — The minimal model usually assumed for the conducting layers of the organic charge transfer solid superconductor κ-$(ET)_2X$ is a $\frac{1}{2}$-filled anisotropic triangular lattice Hubbard model, where a dimer of molecules is replaced with a single effective site. Within this frustrated $\frac{1}{2}$-filled model a metal to antiferromagnetic (AFM) phase transition is found, but calculations beyond the mean field level do not find evidence for superconductivity. Recent dielectric constant measurements suggest that a coupling is present between AFM order and ferroelectric charge ordering. Such a charge order would lead to unequal charge densities on the ET molecules within each dimer and can not be described within the effective model. We present the results of correlated calculations on the full $\frac{1}{4}$-hole-filled κ-$(ET)_2X$ lattice using the Path Integral Renormalization Group (PIRG) method. We show that AFM order does occur within the $\frac{1}{4}$-filled model and investigate the possibility that charge order can cooperatively enhance the AFM state. We further present results for superconducting pair-pair correlations within this model.

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R. Torsten Clay
Mississippi State University

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