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A possible paired-electron liquid in a $\frac{1}{4}$-filled band model of κ-$(ET)_2X$[1] R.T. CLAY, Mississippi State University, N. GOMES, S. MAZUMDAR, University of Arizona — A minimal model for the κ-(ET) conducting layers is a $\frac{1}{2}$-filled anisotropic triangular lattice Hubbard model, where a dimer of molecules is replaced with a single effective site. This effective model can explain occurrence of an antiferromagnetic (AFM) phase, but recent results do not find superconductivity in the model. We have shown that in a $\frac{1}{4}$-filled system on a dimerized square lattice, the AFM phase gives way to a Paired Electron Crystal singlet-paired state in the presence of lattice frustration. Here we present results of calculations on the actual $\frac{1}{4}$-filled κ lattice rather than the simplified square lattice. We find not only an AFM-to-singlet transition, but show that the singlet phase may be a Paired Electron Liquid state consisting of a superposition of nearest-neighbor singlets. We show that in the excitation spectrum the lowest singlet excited state occurs below the lowest triplet. This may indicate gapless singlet excitations and gapped spin excitations, which would explain the observed heat capacity versus thermoelectric behavior in κ-$(ET)_2$-$Cu_2(CN)_3$ and $EtMe_3Sb[Pd(dmit)_2]_2$. We further discuss superconducting pair correlation functions.

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