**Quartet condensation of fermions.** ASEEM TALUKDAR, MICHAEL MA, University of Cincinnati, FU-CHUN ZHANG, University of Hong Kong — We investigate quartet condensation in fermion systems with four internal states. This is the generalization of the well known BCS superconductor formed by Cooper pair (CP) condensation. Physical examples include spin-3/2 fermionic atoms, bi-layered systems with electrons and holes, quadra-layer spin polarized electron hole system, and two band electronic system. We derive the Landau Ginzberg (LG) free energy for such system in terms of the CP amplitudes. The LG free energy is found to contain attractive interactions among different types of CP's. This will allow them to form bound states of CP's called Cooper quartets (CQ). Using a variational calculation based on the Bogoliubov inequality, we find that CQ condensation may be favored over pair condensation at low temperature. We also study the pairing structures in such systems when pair condensation is preferred.

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