

Abstract Submitted
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Two and four particle condensation in fermion systems with multiple internal states ASEEM TALUKDAR, University of Cincinnati, MICHAEL MA, University of Cincinnati, FU-CHUN ZHANG, University of Hong Kong — We investigate two-particle and four-particle condensation in fermion systems with four internal states (a, b, c, d). Possible physical realizations include transition metal oxides (TMO) with a two-fold orbital degeneracy, bi-layered systems with electrons and holes, and a quadra-layer spin-polarized electron hole system. We consider a model with attraction U between a, b and between c, d; and attraction V between a, c and between b, d. For weaker V , we study quasi-particle pairing above two decoupled BCS condensates, and find both even and odd frequency pairing solutions. The former exists for all values of V while the latter exists only above a critical value. We then consider the condensation of such quasi-particle pairs and its destabilization of the underlying condensates, leading to pairing of more complex structure or possibly condensation of quartets. The phase transitions between the various two-particle condensates, and their transition into the quartet condensate close to the $SU(4)$ limit will be discussed.

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