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Zero temperature phase diagram of a 3-D four-fermion model with two flavors of staggered fermions

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We study a strongly interacting lattice field theory model with two massless flavors of staggered fermions in three space-time dimensions. We consider the phase diagram of the model as a function of two couplings: (1) a lattice current-current interaction U, and (2) an on-site four-fermion interaction U'. While individually both these interactions drive second order phase transitions from the massless fermion phase as the couplings are increased (see Phys. Rev.D 88 (2013) 021701, and Phys. Rev.D 91 (2015) 6, 065035), the coupling U' leads to an exotic strong coupling phase where fermions become massive without bilinear chiral condensates. This suggests a rich phase structure in the $U - U'$ plane. In order to study this phase diagram, we construct an efficient fermion bag algorithm by extending the previous algorithms. We show preliminary results from our study on small lattices.

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