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Orbital currents in lattice models: a perturbative approach

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The goal of this research is to find a minimal Hubbard-type model for which the ground state exhibits spontaneous orbital current order, as has been conjectured to occur in the pseudogap phase of the high-T_C materials. To this end, we consider a model for interacting fermions moving on an array of plaquettes that are coupled by weak hoping. A pseudospin Hamiltonian is derived using degenerate perturbation theory from which the ordering in the model can be extracted. We look at the effect of the lattice geometry (one-band vs. three-band models) and also examine the effect of correlated hopping and ring exchange processes on the stability of various ordered phases. This work extends the results of Pujari and Henley [PRB **80**, 085116] to a broader class of models.

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