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Sensitivity of quantum critical pairing to Fermi surface topology: a Quantum Monte Carlo study XIAOYU WANG, University of Minnesota, YONI SCHATTNER, EREZ BERG, Weizmann Institute of Science, RAFAEL FERNANDES, University of Minnesota — In many iron-based and copper-based materials, unconventional superconductivity appears in close proximity to an antiferromagnetic instability. This fact has motivated intense theoretical investigations of the impact of magnetic fluctuations, particularly those associated with the putative quantum critical point (QCP), on the formation of the Cooper pairs. Although significant advance has been achieved using analytical methods to solve the so-called spin-fermion model, in which low-energy electronic states couple to quantum critical bosonic fluctuations, there remain significant challenges in establishing a perturbative scheme that accounts for both non-Fermi liquid behavior and superconductivity near the QCP. Here we present a sign-problem-free Quantum Monte Carlo (QMC) study of the spin-fermion model for a generic two-band Hamiltonian. We show that properties of the Fermi surface topology beyond the existence of hot spots play a fundamental role in determining the superconducting properties. In particular, we find that proximity to perfect nesting strongly suppresses the enhancement of the pairing susceptibility promoted by the QCP. We also compare our QMC results with an Eliashberg analysis of the quantum critical problem.

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