Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Superconductivity mediated by quantum critical antiferromagnetic fluctuations: the rise and fall of hot spots[1] XIAOYU WANG, Univ of Minn - Minneapolis, YONI SCHATTNER, EREZ BERG, Department of Condensed Matter Physics, Weizmann Institute of Science, Rehovot, Israel 76100, RAFAEL FERNANDES, Univ of Minn - Minneapolis — The maximum transition temperature T_c observed in the phase diagrams of several unconventional superconductors takes place in the vicinity of a putative antiferromagnetic quantum critical point. This observation motivated the theoretical proposal that superconductivity in these systems may be driven by quantum critical fluctuations, which in turn can also promote non-Fermi liquid behavior. In this talk, we present a combined analytical and sign-problem-free Quantum Monte Carlo investigation of the spin-fermion model – a widely studied low-energy model for the interplay between superconductivity and magnetic fluctuations. By engineering a series of band dispersions that interpolate between near-nested and open Fermi surfaces, and by also varying the strength of the spin-fermion interaction, we find that the hot spots of the Fermi surface provide the dominant contribution to the pairing instability in this model. We show that the analytical expressions for T_c and for the pairing susceptibility, obtained within a large-N Eliashberg approximation to the spin-fermion model, agree well with the Quantum Monte Carlo data, even in the regime of interactions comparable to the electronic bandwidth.

[1]DE-SC0012336

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Date submitted: 11 Nov 2016 Electronic form version 1.4