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Competition and coexistence between the magnetic and the superconducting state of the iron arsenides[1] RAFAEL FERNANDES, JÖRG SCHMALIAN, Ames Laboratory and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011 — The new iron arsenide superconductors present a very rich phase diagram, displaying superconducting, antiferromagnetic and structural order. Here, we develop a microscopic theory to study the interplay between electronic and magnetic degrees of freedom. In this model, electrons sharing the same bands are responsible for both superconductivity and itinerant magnetism, causing these two states to compete. Then, two distinct outcomes are possible: either these two states are mutually exclusive and phase separate or they can coexist microscopically. Using a mean-field approach, we analyze the relation between these two scenarios and the symmetry of the Cooper-pair wave function. In particular, we show that while the so-called s^{++} state is generally incompatible to the antiferromagnetic phase, the unconventional s^{+-} state can coexist with magnetism depending on the Fermi surface topology. Thus, valuable information about the nature of the superconducting phase can be extracted directly from the phase diagrams of the iron arsenides.

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