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Tetragonal magnetic order in iron pnictides: phase diagram, spin-wave dispersion, and competition with superconductivity XIAOYU WANG, JIAN KANG, ANDREY CHUBUKOV, RAFAEL FERNANDES, University of Minnesota Minneapolis — Recent experiments in hole-doped iron pnictides have found a magnetic state near optimal doping that displays magnetic Bragg peaks at $(\pi, 0)$ and $(0, \pi)$ but no splitting of the lattice Bragg peaks, implying that the system remains tetragonal. Here we use a multi-band itinerant microscopic model to discuss the origin, the phase diagram, and the manifestations of this tetragonal magnetic state. Starting from perfect nesting, we find that increasing the doping concentration leads to a change in the magnetic state from a single-Q orthorhombic (C_2) phase to a double-Q tetragonal (C_4) phase and then back to a single-Q C_2 phase. As temperature is lowered, we find that the C_4 phase is in general unstable towards the C_2 phase. Furthermore, we show that the superconducting state tends to be more strongly suppressed by the C_4 phase due to the interplay between tetragonal symmetry-breaking and the near-degeneracy of the superconducting ground state. We compare our results with the phase diagram of Na- and K-doped Ba122 materials, and discuss the theoretical spin-wave spectrum of the tetragonal magnetic phase, highlighting the features that allow for an unambiguous experimental distinction between the C_4 and C_2 phases.

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