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Coexistence of ferromagnetism and superconductivity near[1] ANDRIY NEVIDOMSKYY, Theory of Condensed Matter, Cavendish Laboratory, University of Cambridge, Cambridge CB3 0HE, UK — A microscopic mean-field theory of the phase coexistence between ferromagnetism and superconductivity in the nearly ferromagnetic itinerant electron system is constructed, while incorporating a realistic mechanism for superconducting pairing due to the exchange of critical spin fluctuations. The self-consistent solution of the resulting equations determines the superconducting transition temperature which is shown to depend strongly on the value of exchange splitting. The effect of phase crossover from isotropic (Heisenberg-like) to uniaxial (Ising-like) spin fluctuations near the quantum critical point is analysed and the resulting phase diagram is obtained. This scenario is then applied to the case of itinerant ferromagnet UGe_2, which allows us to explain successfully certain features of the experimentally observed phase diagram.

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