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Pairing Instability and Quasiparticle Properties of an Unconventional Superconductor with a Skyrmion Texture of Localized Spins[1] JIAN-XIN ZHU, Theoretical Division and Center for Integrated Nanotechnologies, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA, YUAN-YEN TAI, Theoretical Division, Los Alamos National Laboratory, Los Alamos, New Mexico 87545, USA — Majorana fermions are believed to perform better than regular fermions in keeping quantum coherence, which is an important factor for quantum computation. Recently there has been intensive interest in their realization in solid-state systems. Zero-energy quasiparticle modes in a superconductor serve as a promising candidate. We present a theoretical study on the influence of a two-dimensional (2D) skyrmion texture of localized spins on the pairing instability and quasiparticle properties in an unconventional superconductor. By solving the Bogoliubov-de Gennes equations for an effective BCS model Hamiltonian with nearest-neighbor pairing interaction on a 2D square lattice, we analyze the spatial dependence of superconducting order parameter for varying strength of spin-exchange interaction. The quasiparticle properties are studied by calculating local density of states and its spatial dependence.

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