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Ferromagnetism of a Repulsive Atomic Fermi Gas in an Optical Lattice: A Quantum Monte Carlo Study SEBASTIANO PILATI, The Abdus Salam International Centre for Theoretical Physics, 34151 Trieste, Italy, ILIA ZINTCHENKO, MATTHIAS TROYER, Theoretische Physik, ETH Zurich, 8093 Zurich, Switzerland — We investigate the ferromagnetic behavior of a two-component repulsive Fermi gas under the influence of a periodic potential that describes the effect of a 3D optical lattice, using continuous-space quantum Monte Carlo simulations. We find that a shallow optical lattice below half-filling strongly favors the ferromagnetic instability compared to the homogeneous Fermi gas. Instead, in the regime of deep optical lattices and weak interactions, where the conventional description in terms of single-band tight-binding models is reliable, our results indicate that the paramagnetic state is stable, in agreement with previous quantum Monte Carlo simulations of the Hubbard model. Our findings shed light on the important role played by multi-band effects and by interaction-induced hopping in the physics of atomic gases trapped in optical lattices.

Sebastiano Pilati
The Abdus Salam International Centre for
Theoretical Physics, 34151 Trieste, Italy

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