

Ferromagnetic Phase Transition in Charged Spin-1 Bose Gases

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It is indicated that ferromagnetic phase transition occurs in chargeless spinor Bose gases with ferromagnetic couplings, in spite of the magnitude of the ferromagnetic coupling.¹ In an ideal charged spin-1 Bose gas, diamagnetism is introduced by the orbital motion due to charge degree of freedom. We find that diamagnetism is stronger at lower temperature.² Within mean-field theory, we investigate the magnetic properties of charged spin-1 Bose gases with ferromagnetic interactions, and significance is given to diamagnetic effect on the ferromagnetic phase transition. It is shown that the internal field due to spontaneous magnetization can not prevent the occurrence of spontaneous magnetization. There exists a phase transition from paramagnetic phase to ferromagnetic phase, and the critical ferromagnetic coupling value I_c increases with increasing temperature. Our work may provide further insight into the still not fully understood magnetic properties of ferromagnetic superconductors.³

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