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Long-range Interaction Effect on Fractional Magnetization Plateaus in the Shastry-Sutherland Lattice Model TAKAFUMI SUZUKI, YUSUKE TOMITA, NAOKI KAWASHIMA, Institute for Solid State Physics, University of Tokyo — We investigate magnetic properties of the $S=1/2$ Ising-like XXZ model on the Shastry-Sutherland lattices (SSLs) with long-range interactions, using the quantum Monte Carlo method. This model shows magnetization plateau phases at one-half and one-third of the saturation magnetization when additional couplings are considered. We study the finite temperature transition to one-half and one-third plateau phases. The obtained results suggest that the former case is of the first order and the latter case is of the second order. We also find that the system undergoes two successive transitions with the 2D Ising model universality, although there is a single phase transition in the Ising limit case[1]. In recent experiments, a large magnetization plateau has been observed in a rare-earth SSL compound TmB₄[2]. We estimate the coupling ratio to explain the magnetization process. [1] T. Suzuki, Y. Tomita, and N. Kawashima, Phys. Rev. B 80, 180405(R) (2009). [2] K. Siemensmeyer, et al, Phys. Rev. Lett. 101, 037202 (2008).

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