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Antiferromagnetic Heisenberg Spin Layers coupled with Dipolar Interaction – a Monte Carlo study of Rb_2MnF_4[1] CHENGGANG ZHOU, THOMAS C. SCHULTHESS, Computer Science and Mathematics Division, Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN 37831-6164 , DAVID P. LANDAU, Center for Simulational Physics, University of Georgia, Athens GA, 30602 — Rb_2MnF_4 is a quasi-2D antiferromagnetic (AF) system, in which Mn^{2+} ions carrying spin-5/2 occupy square lattices perpendicular to the c-axis of the tetragonal unit cell. These spins interact via mostly nearest neighbor isotropic AF exchanges, while the dipolar interaction contributes to the effective anisotropy that stabilizes the AF phase at low temperatures. In a magnetic field parallel to the c-axis, the AF phase is terminated along a spin-flop line, and a transverse (XY) phase appears. We perform large scale extensive Monte Carlo simulations to map out the phase diagram and investigate the critical behavior along the phase boundaries. A novel reweighting technique is used to efficiently handle the dipolar interaction. Our results suggest that both the AF phase and the XY phase experience continuous transitions across the spin-flop line, which is consistent with a bicritical point at zero temperature. We also found that the effect of the weak inter-planar coupling is not completely negligible for the spin-flop transition and the properties of the XY phase.

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