Phase diagram and critical behavior of the square-lattice Ising model with competing nearest- and next-nearest-neighbor interactions[1]
JUNQI YIN, DAVID LANDAU, The University of Georgia — Using the parallel tempering algorithm and GPU accelerated techniques, we have performed large-scale Monte Carlo simulations of the Ising (lattice gas) model on a square lattice with antiferromagnetic (repulsive) nearest-neighbor and next-nearest-neighbor interactions of the same strength and subject to a uniform magnetic field. Possibility of the XY-like transition is examined and both transitions from the (2×1) and row-shifted (2×2) ordered phases to the paramagnetic phase turn out to be continuous. From our data analysis, reentrance behavior of the (2×1) critical line and a bicritical point which separates the two ordered phases at T=0 are confirmed. Based on the non-universal critical exponents we obtained along the phase boundary, Suzuki's weak universality seems to hold.

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