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Critical Field and Temperature of a Frustrated Antiferromagnetic Ising Model in the Mean Field Approximation RICHARD KRANTZ, Metropolitan State University of Denver — A long-ranged, one-dimensional, antiferromagnetic Ising model on a two-sublattice Maximally Even (ME) lattice has been developed in the Mean Field Approximation (MFA). Douthett and Krantz [1996] and Krantz, Douthett, and Doty [1998] have shown that an alternative distribution of sites on a one-dimensional lattice, a so-called Maximally Even (ME) Distribution, can be used to describe unusual magnetic orderings of antiferromagnetic Ising systems. When the magnetization of the "down" lattice approaches zero the lattice makes a transition to the paramagnetic state. The magnetic field at which this occurs is the critical field. In the limit of zero applied magnetic field the temperature at which the net magnetization of the lattice goes to zero, the so-called critical temperature, can also be evaluated. Both the critical field and the critical temperature depend on: 1) the structure of the lattice – the distribution of up and down lattice sites, 2) the number of neighboring interactions accounted for, and 3) the strength of the interaction between neighboring spins. The traditional Ising model is limited to only near-neighbor pairings. This work demonstrates that modeling a one-dimensional antiferromagnetic Ising lattice as a two-sublattice ME lattice in the MFA allows us to describe the critical field and critical temperature of frustrated one-dimensional spin systems in terms of long-ranged spin interactions and the distribution of up and down lattice sites.

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