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Finite-size scaling of the critical temperatures of magnetic thin films with variable range of interactions. TIMOTHY BRAMFELD, The Pennsylvania State University, ROY F. WILLIS, The Pennsylvania State University — Finite-size scaling in magnetic (spin) systems with an arbitrary range of spin interactions was first discussed by Domb and Dalton [1]. These authors explored the effect on the various critical exponents of the thermodynamic quantities of a generalized Ising model in which each spin interacts equally strongly with neighbors within some finite interaction distance beyond which the interaction goes to zero. Such a model was used by Zhang & Willis [2] to explain the thickness dependence of the Curie temperatures of ferromagnetic nickel films. Specifically, they showed that Tc followed a power law, reduced temperature t $\sim L^{-\lambda}$down to a critical thickness Lo = Ro, at which point the critical temperature reduced linearly with further decreasing thickness L. In this talk, we show that the demarcation point Lo = Ro scales with the range of spin interactions in alloy films. This parameter Ro is a function of the changing dimensions of the Fermi surface i.e. related to the period of RKKY oscillations in these itinerant ferromagnets. We examine the ramifications of an increasing range of spin interactions Ro on the finite-size critical behavior of a magnetic system. [1] C. Domb & N.W. Dalton, Proc. Phys. Soc. 89, 859 (1966). [2] R. Zhang & R.F. Willis, Phys. Rev. Lett. 86, 2665 (2001).

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