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Critical behavior of the disordered three-color Ashkin-Teller Model – A Monte Carlo study QIONG ZHU, XIN WAN, Zhejiang University, RAJESH NARAYANAN, Indian Institute of Technology, Madras, JOSÉ A. HOYOS, Instituto de Fisica de São Carlos, Universidade de São Paulo, THOMAS VOJTA, Missouri University of Science and Technology — The impact of quenched disorder on systems undergoing first-order phase transitions has received less attention than its effects on critical points. A notable exception is the seminal work by Aizenmann and Wehr[1]. Building on earlier work by Imry, Ma and others, they rigorously proved the vanishing of latent heat in dimensions $d \leq 2$ in the presence of quenched disorder. In this context, we numerically study the critical behavior of a three-color Ashkin Teller (AT) model in the presence of bond randomness. The clean AT model is known to exhibit a fluctuation-driven first-order transition. An analytical renormalization group treatment by Cardy[2] predicted that disorder rounds this transition and leads to a critical point in the clean Ising universality class. However, recent numerical work[3] has questioned the veracity of these results. We therefore use Monte-Carlo techniques to re-examine the role of quenched disorder on the three-color AT model. We determine the order of the phase transition, and we perform a systematic finite-size scaling analysis of various thermodynamic quantities to extract the critical behavior.

[1]M. Aizenman and J. Wehr, PRL 62, 2503 (1989).
[2]J. Cardy, J. Phys. A 29, 1897 (1996).
[3]A. Bellafard et al, PRL 109, 155701 (2012).

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