

Arbitrary Weak First Order Phase Transitions in the 3D standard Ashkin-Teller model by MC Computer Experiments

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The phase transition line in the vicinity of the tricritical Ising point region is studied in the 3D standard Ashkin-Teller model on a cubic lattice. This model of the multi-component order parameter is one of the most important reference points in statistical physics and it implies the interesting and rich phase diagram. The main motivation to our study are arbitrary weak first order phase transitions signalized by Arnold and Zhang [1] along this line. The large-scale Monte Carlo computer experiments using the Binder and Challa like cumulants [2] modified by Musiał [3] are performed. Specific behavior of the Challa-Musiał cumulants for weak first order phase transitions is discovered and its interpretation is proposed. Using the finite-size-scaling analysis applied for Challa-Musiał cumulants minima values and the Musiał method [3], the latent heat is calculated. The paper unambiguously confirms the arbitrary weak first order character of phase transitions studied when approaching the Ising point.

References:

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- [3] G. Musiał, Phys. Rev. B **69**, 024407 (2004)