

Abstract Submitted
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Dynamics of Nucleation in the Ising model SEUNGHWA RYU,
Physics Department, Stanford University, WEI CAI, Mechanical Engineering Department, Stanford University — While several theories have been developed to describe the kinetics of first order phase transitions, the range of applicability of each theory is not fully understood due to uncertainties in experiments and numerical difficulties in rare event simulations. In this study, we compute the decay rate of meta-stable states of the Ising model to test the validity of several existing nucleation theories. We employ advanced sampling methods to compute the nucleation rate, which spans a range over ten orders of magnitude, as a function of temperature and external field. Investigation of the critical nuclei and the pre-exponential factor reveals that nucleation in the 2d Ising model is well described by the field-theoretic model of Langer (1969). However, discrepancies between theory and numerical results are observed in the 3d Ising model. This discrepancy points to the importance of the shape of the critical nuclei to the nucleation kinetics.

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