Abstract Submitted
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Critical phenomena in active matter[1] MATTEO PAOLUZZI, M CRISTINA MARCHETTI, Syracuse Univ, CLAUDIO MAGGI COLLABORATION, UMBERTO MARINI BETTOLO MARCONI COLLABORATION, NICOLETTA GNAN COLLABORATION — A collection of active agents can organize in phases with structural properties remarkably similar to those of ordinary materials, such as active gases, liquids and glasses. These phases are formed, however, out of equilibrium, where the machinery of equilibrium statistical mechanics cannot be applied. It has recently been shown that models of particles with Gaussian colored noise can capture some of the nonequilibrium behavior of active Brownian particles, including motility-induced phase separation. By using the Unified Gaussian Colored Noise Approximation (UCNA) it has been possible to obtain an equilibrium-like probability distribution function and an effective free energy for active Brownian particles. Here we employ UCNA to examine the effect of colored noise on mean-field order-disorder transitions. Starting with a φ^4 Landau model that undergoes a second-order phase transition as a function of a tuning parameter, we calculate the shift in transition due to colored noise as a function of the noise amplitude and correlation time τ. We find that the transition line exhibits reentrance as a function of τ. The mean-field theoretical predictions are compared with Molecular Dynamics simulations of active Lennard-Jones particles.

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