Density Large Deviations of a Nonconserving Driven Model

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We discuss the effect of particle-nonconserving processes on the steady state of driven diffusive systems. We show that in the limit of slow nonconserving dynamics, the large deviation function of the overall particle density can be computed based on the steady-state properties of the conserving system. In this limit, one can define a nonequilibrium chemical potential which unlike the equilibrium case, is dynamics dependent. This approach is demonstrated on the ABC model which is a driven model exhibiting phase separation in one dimension. The approach allows one to identify first order phase transitions via Maxwell's construction, similarly to what is done in equilibrium†.

† O. Cohen and D. Mukamel, Phys. Rev. Lett. 108, 060602 (2012).