Joint Condensed Matter and Center for Soft Matter and Biological Physics Seminar

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"Temperature interfaces in the Katz-Lebowitz-Spohn model"

Monday, August 31,2020

4:00pm—5:00pm

Virtual Meeting

Zoom link: https://virginiatech.zoom.us/s/94327605202

We have explored a novel variant of the Katz-Lebowitz-Spohn (KLS) driven lattice gas, where the lattice is split into two regions that are coupled to heat baths with distinct temperatures. The hopping rates in two regions are governed by different temperatures T > Tc and Tc, respectively, where Tc indicates the critical temperature for phase ordering. The geometry of the two temperature regions can be arranged such that the temperature boundaries are oriented either perpendicular or parallel to the external particle drive and resulting net current.

In the case when the temperature boundaries are oriented perpendicular to the drive, in the hotter region, the system behaves like the (totally) a symmetric exclusion processes (TASEP), and experiences particle blockage in front of the interface to the critical region. In analogy with (TASEP) systems containing "slow" bonds, we argue that transport in the high-temperature subsystem is impeded by the lower current in the cooler region, and that results in the particle density accumulation near the interface to the critical region. We observe the density profiles in both high- and low-temperature subsystems to be similar to the well-characterized coexistence and maximal-current phases in(TASEP) models with open boundary conditions, which are respectively governed by hyperbolic and trigonometric tangent functions.

For our other work we arranged the geometry such that the temperature boundaries are oriented parallel to the external particle drive and resulting net current. We have explored the changes in the dynamical behavior that are induced by our choice of the hopping rates across the temperature boundaries. If these hopping rates at the interfaces satisfy particle-hole symmetry, the current difference across them generates a vector flow diagram akin to an infinite flat vortex sheet. We have studied the finite-size scaling of the density fluctuations in both temperature regions and observed that it is controlled by the respective temperature values.

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