Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Hydrodynamic solutions of spatially-varying 1D exclusion processes GREG LAKATOS, Harvard University, TOM CHOU, UCLA — We analyze the open boundary partially asymmetric exclusion process with smoothly varying internal hopping rates in the infinite-size, mean field limit. The mean field equations for particle densities are written in terms of Ricatti equations with the steady-state current J as a parameter. These equations are solved both analytically and numerically. Upon imposing the boundary conditions set by the injection and extraction rates, the currents J are found self-consistently. We find a number of cases where analytic solutions can be found exactly or approximated. Results for J from asymptotic analyses for slowly varying hopping rates agree extremely well with those from extensive Monte Carlo simulations, suggesting that mean field currents are exact as long as the hopping rates vary slowly over the lattice. If the forward hopping rate is greater than or less than the backward hopping rate throughout the entire chain, the three standard steady-state phases are preserved. Our analysis reveals the sensitivity of the current to the relative phase between the forward and backward hopping rate functions.

Tom Chou
UCLA

Date submitted: 19 Nov 2006 Electronic form version 1.4