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Self-duality and shock dynamics in the n -species priority ASEP

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Abstract

We construct all invariant measures of the n -species priority asymmetric simple exclusion process with reflecting boundaries and prove reversibility. Using the symmetry of the generator of the process under the quantum algebra $U_q[\mathfrak{gl}(n+1)]$ we derive self-duality functions. From these we obtain in explicit form the time evolution on \mathbb{Z} of a family of measures with K shocks in terms of the transition probability of a shock exclusion process with K coloured particles with particle-dependent hopping rates and nearest-neighbour colour exchange. This process is a gas of particles that form a bound state, corresponding to shock coalescence on macroscopic scale.

Keywords: Asymmetric simple exclusion process, Duality, Quantum algebras, Shocks

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