Séminaire de physique mathématique

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A simple symmetric exclusion process driven by an asymmetric tracer particle

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We consider an exclusion process on a periodic one-dimensional lattice where all particles perform simple symmetric exclusion except for a 'tracer particle', which performs partially asymmetric exclusion with forward and backward rates p and q respectively. This process and its variants have been investigated starting with Ferrari, Goldstein and Lebowitz (1985) to understand the validity of the Einstein relation. We prove product formulas for stationary weights and exact formulas for the nonequilibrium partition function in terms of combinatorics of set partitions. We will also compute the current, and the density profile as seen by the test particle. We will then perform asymptotics to understand the thermodynamic limit.One perhaps surprising feature of this process is that the nonequilibrium free energy is not well-defined for this system in the thermodynamic limit. This talk is based on the preprint arXiv:2001.02425.