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Tomaz Prosen: Diffusive transport in Integrable lattice systems

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Integrable systems, having an extensive number of conserved quantities, are typically associated with ballistic transport. This picture is theoretically justified in terms of Mazur bounds [1], or the emerging field of generalized hydrodynamics [2]. However, for systems posessing parity-type symmetries (such as spin-reversal or parity-hole) there exist generic symmetric states for which ballistic contribution to transport vanishes. Extensive numerical simulations of a parity-symmetric inhomogeneous quench in the Heisenberg XXZ model clearly indicate existence of diffusive transport in the massive regime, and super-diffusive transport with a curiously looking erf-scaling profile at the isotropic point [3]. I will discuss two theoretical approaches to rigorously establishing diffusive transport in integrable lattice systems: (i) either by implementing Mazur-like bounds on the diffusion constant in terms of local conserved quantities in nearly-parity-symmetric states [4], or (ii) exact solutions of simple interacting lattice models, such as reversible, deterministic cellular automata [5].

References

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