Atelier
« Au-delà de l'intégrabilité : les mathématiques et la physique de l'intégrabilité et sa brisure dans les phénomènes quantiques à basses dimensions fortement corrélés »
13-17 juillet 2015

Workshop
"Beyond integrability: The mathematics and physics of integrability and its breaking in low-dimensional strongly correlated quantum phenomena"
July 13–17, 2015

"Light-cone" dynamics after quantum quenches in spin chains

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Signal propagation in the non equilibrium evolution after quantum quenches has recently attracted much experimental and theoretical interest. A key question arising in this context is what principles, and which of the properties of the quench, determine the characteristic propagation velocity. Here we investigate such issues for a class of quench protocols in one of the central paradigms of interacting many-particle quantum systems, the spin-1/2 Heisenberg XXZ chain. We consider quenches from a variety of initial thermal density matrices to the same final Hamiltonian using matrix product state methods. The spreading velocities are observed to vary substantially with the initial density matrix. However, we achieve a striking data collapse when the spreading velocity is considered to be a function of the excess energy. Using the fact that the XXZ chain is integrable, we present an explanation of the observed velocities in terms of "excitations" in an appropriately defined generalized Gibbs ensemble.

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