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Integrable many-body Landau-Zener dynamics

Quantum integrability has acquired a new prominence in nonequilibrium many-body physics with direct observation of the signatures of integrable dynamics in cold atom and solid state experiments. Nevertheless, despite great interest in nonequilibrium phenomena, most studies of integrable many-body systems out of equilibrium do not address the situation when one of the couplings or external fields in the Hamiltonian varies in time in a continuous fashion, leaving any nontrivial Landau-Zener dynamics out of the problem.

In this talk, I will outline a way to make the parameters of a quantum integrable model time-dependent without breaking its integrability. Interesting many-body models that emerge from this approach include a superconductor with the interaction strength inversely proportional to time, a Floquet BCS superconductor, and the problem of molecular production in an atomic Fermi gas swept through a Feshbach resonance as well as various models of multi-level Landau-Zener tunneling. We will solve for their dynamics and discuss some interesting physics that emerges at large times