Entanglement Dynamics in Randomly Kicked Ising Chain

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The kicked 1D Ising model has been an interesting field of study for understanding integrability and also finds applications in quantum information processing and ion trap experiments. Analytic properties of the entanglement entropy of a subsystem in this model has been previously studied by Arul et al.(2015), where they noted interesting properties in the dynamics for a particular time period $\pi/4$.

In this work we have built up on the idea of aperiodically driven systems where the periodicity of the kicks is broken by a random noise component. We find that at particular frequencies of random driving, the bloch vector evolution of the momentum modes obtained after Jordan-Wigner transformation lie on fixed circle and do not entirely thermalize as predicted by Dutta et al.(2018). These effects of non-thermalization can also be observed by examining the entanglement entropy of a subsystem and noticing the fact that the entanglement entropy reaches a saturation value at infinite time that is lower than that of a completely thermalized system.

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