Dichotomy in the Effect of Chaos on Ergotropy

Contributed Talk

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The maximum unitarily extractable work from a quantum system ergotropy is a useful and emerging idea in quantum thermodynamics. In this work, ergotropy is studied in quantum chaotic systems to illustrate the effects arising from chaotic dynamics. In an ancilla-assisted scenario, chaos enhances ergotropy when the state is known, a consequence of large entanglement production in the chaotic regime. In contrast, when the state is unknown, chaos impedes work extraction. This downside arises from chaos suppressing information gain about the system from coarse-grained measurements. When both entanglement and coarse-grained measurements are present, there is competition between the two, and ergotropy reaches maximum at an optimal value of the chaos parameter, followed by a decrease. The fall in ergotropy is due to chaos impeding measurements in the chaotic regime. These results are illustrated using two quantum chaotic models; the quantum kicked top and the kicked Ising spin chain.