

System-environment interaction: information flow and speed limit

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Consider a composite quantum system (finite-dimensional Hilbert space) with many interacting degrees of freedom. However, suppose we do not have access to all of these degrees of freedom; we only have access to a part, a subsystem. In this context, the following questions arise: What are the quantum resources that exist in the subsystem to which we have access? What are the physical processes that can influence the subsystem? How can we determine these details with a bona-fide quantifier? Given resources and processes, what can be done operationally with the subsystem? The goal is to analyze how quantum resources and physical processes help us understand the transformations of systems. In this sense, two perspectives will be taken: One related to quantum speed limits and another related to the information flow between the system and the surrounding environment. We will see how information is transformed by the action of the environment and the impact that the return of information can have on a temperature estimation protocol.