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Abstract:	The phenomenon of Indefinite Causal Orders is known to show many strange behaviours such as perfect information communication through noisy channels and activation of free energy of thermal states using thermal baths at the same temperature. The quantum switch can be used to create these strange correlations and has been used to construct advantageous devices such as a quantum refrigerator. Throughout this thesis, we study the thermodynamics of indefinite causal orders with the help of the quantum switch. We will review this phenomenon and analyze the advantages by studying every party involved in the creation of indefinite causal orders. We find that the thermodynamics of quantum measurements play a key role in any advantages seen. We then find bounds and display the role of information and correlations in the energetics of the phenomenon. Finally, we study a stochastic approach to thermodynamics using quasi-probabilities and fluctuation theorems which probe the fluctuations of observables. Here, we separate the "classical" and "quantum" parts of an evolution which relates to incompatibility of measurement of observables. This can be used to separate and study the truly quantum part of the quantum switch setup and hence, probe into the physics of indefinite causal orders.
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