

## Landauer's principle for non-equilibrium quantum processes

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I will discuss the full counting statistics of dissipated heat to explore the relation with Landauer's principle. Combining a two-time measurement protocol for the reconstruction of the statistics of heat with the minimal set of assumptions for Landauer's principle to hold, I will derive a general one-parameter family of upper and lower bounds on the mean dissipated heat from a system to its environment. Furthermore, I will establish a connection with the degree of non-unitality of the system's dynamics and show that if a large deviation function exists, this can be used to witness dynamical phase transitions. For the purpose of demonstration, I will apply these bounds to a three level system coupled to a non-equilibrium finite-size environment.