Contribution ID: **76** Type: **Poster**

Thermodynamic effects of inefficient detection in continuously monitored systems

In open quantum systems, in order to establish the impact of quantum fluctuations during the evolution of a system, one needs to continuously monitor it while minimizing disturbance. The thermodynamics of systems which are subjected to continuous quantum measurement can be described using the formalism of quantum trajectories. However, in realistic scenarios, this measurement is not ideal: detectors have finite efficiency and some processes elude monitoring. Therefore the efficiency of the measurement or detector should be considered and introduced in the thermodynamic account. We study how these effects can be added to the system evolution and how they affect main thermodynamic quantities, such as work, heat or entropy production in generic non-equilibrium processes. We focus particularly on the impact over the microreversibility and fluctuation theorems. The results obtained could be used to study more realistic systems and processes often used in quantum technologies to asses their thermodynamic costs.

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