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Thermodynamics of precision in quantum non equilibrium steady states

We investigate the fundamental trade-off between current fluctuations and entropy production for systems in non-equilibrium steady states (NESS). We use the technique of non-equilibrium statistical operators of McLennan/Zubarev form in order to illustrate how the entropy production in a NESS can be expressed as a quantum relative entropy. Furthermore,  by exploiting the geometry of the manifold of NESS states, we use parameter estimation in order to bound the co-variance of the currents in the NESS by the entropy production. Since our proof is geometrical, this fundamental result generalizes the thermodynamics of precision and the thermodynamic uncertainly relation beyond the classical Markovian paradigm. This result promises to evolve our understanding of the delicate relationship between fluctuations and quantum coherence in autonomous thermal machines.