NONEQUILIBRIUM STEADY STATE CALORIMETRY: FROM CLASSICAL TO QUANTUM

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Analogously as in equilibrium thermodynamics, systems driven out of equilibrium can be probed by measuring the heat exchange in response to variations in ambient temperature. The corresponding finite "exces" heat is then characterized by the steady state heat capacity [1] and depending on driving conditions it interpolates between its equilibrium value and anomalous features like non-positivity when far from equilibrium. To be specific we consider a quantum dot both incoherently and coherently coupled to leads imposing a current, and we analyze dependence of the steady state heat capacity on the level energy. When the latter approaches the electrochemical potential of either of the leads, the heat capacity is shown to obtain negative values.

[1] E. Boksenbojm, C. Maes, K. Netočný et al, Europhys. Lett. **96**, 40001 (2011).