

Landauer-Büttiker approach to strongly coupled quantum thermodynamics: inside-outside duality of entropy evolution

F. von Oppen

Dahlem Center for Complex Quantum Systems, FU Berlin, Germany

We develop a Landauer-Büttiker theory of entropy evolution in time-dependent, strongly coupled electron systems. The formalism naturally avoids the problem of the system-bath distinction by defining the entropy current in the attached leads. This current can then be used to infer changes of the entropy of the system which we refer to as the inside-outside duality. We carry out this program in an adiabatic expansion up to first order beyond the quasistatic limit. When combined with particle and energy currents, as well as the work required to change an external potential, our formalism provides a full thermodynamic description, applicable to arbitrary noninteracting electron systems in contact with reservoirs. This provides a clear understanding of the relation between heat and entropy currents generated by time-dependent potentials and their connection to the occurring dissipation.