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Quantum thermodynamics for systems out of equilibrium strongly interacting with their surroundings. MAICOL OCHOA, University of Pennsylvania, MASSIMILIANO ESPOSITO, University of Luxembourg, MICHAEL GALPERIN, University of California - San Diego — The performance of molecular and nanoscopic systems as nanodevices capable of transforming some form of energy into work is greatly determined by their interaction with the surroundings. When the interaction is strong, one may redefine the part of the universe that can be regarded as the system in order to achieve a full dynamic as well as thermodynamic description. In this work we study a single level strongly interacting with a fermionic bath that undergoes slow driving. The dynamics of the system is estimated using Nonequilibrum Green's functions NEGF. We explore different alternatives for the system bath separation under driving, identifying the corresponding terms for heat and energy transferred as well as the dissipation term. We also formulate the problem in terms of the renormalized spectral density. Our investigations indicate that none of the alternatives can fully reproduce the laws of thermodynamics suggesting that the notion of heat, expressed as the expectation value of some part of the Hamiltonian, is responsible for the inconsistency.

Maicol Ochoa
University of Pennsylvania

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