

Exact description of quantum stochastic models as quantum resistors

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We study the transport properties of generic out-of-equilibrium quantum systems connected to fermionic reservoirs. We develop a new method, based on an expansion of the current in terms of the inverse system size and out of equilibrium formulations such as the Keldysh technique and the Meir-Wingreen formula. Our method allows a simple and compact derivation of the current for a large class of systems showing diffusive/ohmic behavior. In addition, we obtain exact solutions for a large class of quantum stochastic Hamiltonians (QSHs) with time and space dependent noise, using a self consistent Born diagrammatic method in the Keldysh representation. We show that these QSHs exhibit diffusive regimes which are encoded in the Keldysh component of the single particle Green's function. The exact solution for these QSHs models confirms the validity of our system size expansion ansatz, and its efficiency in capturing the transport properties.