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Heat Conduction Through a Pair of Quantum Entangled Qubits
THARON HOLDSWORTH, RYOICHI KAWAI, University of Alabama at Birmingham — The second law of thermodynamics states that in the absence of external influence, heat flows spontaneously from a hot body to a cold body. However, when heat flows through a quantum system, the direction of transient heat can be reversed without violating the second law by utilizing internal quantum entanglement as resources. We consider a pair of qubits independently in contact with a hot heat bath and a cold heat bath. An initial state is created such that each qubit is in local thermal equilibrium with the corresponding heat bath and the qubits are quantum mechanically entangled without disturbing this local equilibrium state. The time evolution of the entanglement and heat flow through the qubits is investigated by numerically simulating the dynamics of the total system density matrix using hierarchical equations of motion.

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