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## On the heat flux and entropy produced by thermal fluctuations

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We report an experimental and theoretical analysis of the energy exchanged between two conductors kept at different temperature and coupled by the electric thermal noise. This system is probably the simplest example to test recent ideas of stochastic thermodynamics, but in spite of its simplicity the explanation of the observations is far from trivial.

Experimentally we determine, as functions of the temperature difference, the heat flux, the out-of-equilibrium variance and a conservation law for the fluctuating entropy, which we justify theoretically. The system is ruled by the same equations of two Brownian particles kept at different temperatures and coupled by an elastic force. Our results set strong constraints on the energy exchanged between coupled nano-systems kept at different temperature

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