

Abstract Submitted
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Energetics of a Brownian motor driven by position dependent temperature¹ RONALD BENJAMIN, University of Alabama at Birmingham — We study the energetics of a Brownian motor driven by position dependent temperature, also known as the Büttiker-Landauer motor. Overdamped models fail to predict the energetics when temperature is spatially inhomogeneous. It is found that the irreversible heat transfer via kinetic energy diverges as \sqrt{M} (M being the mass of the Brownian particle) and cannot be accounted for by the overdamped model. The motor can never attain Carnot efficiency as evidenced by our results obtained from numerical solution of the Langevin equation and first principles molecular dynamics simulation. We also show that the motor can be converted into a refrigerator and find that the Coefficient of Performance (COP) of the refrigerator is far below the Carnot COP. Onsager symmetry relationship which links the motor to the refrigerator is confirmed in the presence of inhomogeneous temperature. Mechanisms to enhance the motor efficiency and refrigerator COP are also discussed.

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