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Molecular Kinetic Analysis of a Finite-Time Carnot Heat Engine

YUKI IZUMIDA, KOJI OKUDA, Hokkaido University — We show the first derivation of the efficiency at the maximum power for a finite-time Carnot heat engine of a weakly interacting gas which we can regard as a nearly ideal gas. Using this simple model, we check the celebrated Curzon-Ahlborn (CA) efficiency by performing the event-driven MD simulation as a numerical experiment for the first time[1,2]. This numerical experiment reveals that the CA efficiency is realized only in the limit of the small temperature difference $T_c \rightarrow T_h$ where T_h and T_c are the temperatures of the hot and cold heat reservoirs, respectively. Our molecular kinetic analysis can explain the numerical results theoretically.

[1] F. Curzon and B. Ahlborn, *Am. J. Phys.* **43**, 22 (1975).

[2] Y. Izumida and K. Okuda, *Europhys. Lett.* **83**, 60003 (2008).

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