

Carnot efficiency is attainable in an irreversible process

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In thermodynamics, there exists a conventional belief that “the Carnot efficiency is reachable only when a process is reversible.” However, there is no theorem proving that the Carnot efficiency is impossible in an irreversible process. Here, we show that the Carnot efficiency is attainable in an irreversible process through investigation of the Feynman-Smoluchowski ratchet (FSR). Thus, this finding gives us a new possibility to develop a novel design of thermodynamic engines with high efficiency regardless of the reversibility. Our result also answers the long-standing question of whether the Carnot efficiency is possible in the FSR.

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