**Speed limit for a highly irreversible process and tight finite-time Landauer's bound**

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Landauer's bound is the minimum thermodynamic cost for erasing one bit of information. As this bound is achievable only for quasistatic processes, finite-time operation incurs additional energetic costs. We find a “tight” finite-time Landauer's bound by establishing a general form of the classical speed limit. This tight bound well captures the divergent behavior associated with the additional cost of a highly irreversible process, which scales differently from a nearly irreversible process. We demonstrate the validity of this bound via discrete one-bit and coarse-grained bit systems. Our work implies that more heat dissipation than expected occurs during high-speed irreversible computation.

[1] J. S. Lee, S. Lee, H. Kwon, and H. Park, Phys. Rev. Lett. 129, 120603 (2022).

[2] J. S. Lee, J.-M. Park, and H. Park, Phys. Rev. E 104, L052102 (2021).