

Energetic cost of Hamiltonian quantum gates

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Landauer's principle laid the main foundation for the development of modern thermodynamics of information. However, in its original inception the principle relies on semiformal arguments and dissipative dynamics. Hence, if and how Landauer's principle applies to unitary quantum computing is less than obvious. Here, we prove an inequality bounding the change of Shannon information encoded in the logical quantum states by quantifying the energetic cost of Hamiltonian gate operations. The utility of this bound is demonstrated by outlining how it can be applied to identify energetically optimal quantum gates in theory and experiment. The analysis is concluded by discussing the energetic cost of quantum error correcting codes with non-interacting qubits, such as Shor's code.

[1] [arXiv:2102.05118](https://arxiv.org/abs/2102.05118)