Squeezed thermal reservoirs for efficient heat engines and cooler computers

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In recent years, highly miniaturized forms of heat engines have been experimentally realized, in which the working medium is represented by a single particle instead of 10^{23} particles as in the macroscopic world. In a proof-of-principle experiment, we have demonstrated that the efficiency of such an engine is unbounded by the standard Carnot efficiency, if the engine is driven by a squeezed thermal reservoir[1]. Furthermore, a cyclic process can be realized that allows to extract mechanical work from a single squeezed thermal reservoir. The physical significance of squeezed thermal environments stems from the fact that they may naturally arise in systems operating in a pulse-driven fashion as is common, e.g., in digital electronics. In such systems, squeezed thermal states can moreover be exploited to significantly lower the Landauer energy cost for erasing one bit of information[2]. In future, this could lead to more energy efficient electronics.

[1] J. Klaers, S. Faelt, A. Imamoglu, and E. Togan *Squeezed thermal reservoirs as a resource for a nano-mechanical engine beyond the Carnot limit*, Phys. Rev. X **7**, 031044 (2017).

[2] J. Klaers *Landauer's erasure principle in a squeezed thermal memory*, Phys. Rev. Lett. **122**, 040602 (2019).