Title:	Quantum heat engines with Carnot efficiency at maximum power
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Abstract:	Heat engines constitute the major building blocks of modern technologies. However, conventional heat engines with higher power yield lesser efficiency and vice versa and respect various power-efficiency trade-off relations. This is also assumed to be true for the engines operating in the quantum regime. Here we show that these relations are not fundamental. We introduce quantum heat engines that deliver maximum power with Carnot efficiency in the one-shot finite-size regime. These engines are composed of working systems with a finite number of quantum particles and are restricted to one-shot measurements. The engines operate in a one-step cycle by letting the working system simultaneously interact with hot and cold baths via semilocal thermal operations. By allowing quantum entanglement between its constituents and, thereby, a coherent transfer of heat from hot to cold baths, the engine implements the fastest possible reversible state transformation in each cycle, resulting in maximum power and Carnot efficiency. Finally, we propose a physically realizable engine using quantum optical systems.
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