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Design Considerations for a Quantum Heat Engine and Work Output

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Quantum thermodynamics is a growing field, especially for experimental physicists. While many concept designs for a quantum heat engine (QHE) have been proposed and discussed, most have not yet been experimentally realized. Here we consider several possible designs for a QHE in the lab, as well as a mechanism to extract or measure the work done by the engine. We use an analogy with artificial magnetic substances to conclude that the work done will result in an increased current through the SQUID loop of the quantum bit (or "qubit"), which is the working substance of the engine. Calculations predicting the effect of the generated work on extra elements coupled to the working substance are shown, along with discussion of how these predictions rely on classical vs. quantum concepts, and how one outlook may change the outcome of the experiment.