Quantum Measurement Cooling

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Invasiveness of quantum measurements is a genuinely quantum mechanical feature that is not necessarily detrimental. Here we show how quantum measurements can be used to fuel a cooling engine. We illustrate quantum measurement cooling (QMC) by means of a prototypical two-stroke two-qubit engine which interacts with a measurement apparatus and two heat reservoirs at different temperatures. We show that feedback control is not necessary for operation while entanglement must be present in the measurement projectors. We quantify the probability that QMC occurs when the measurement basis is chosen randomly, and find that it can be very large as compared to the probability of extracting energy (heat engine operation), while remaining always smaller than the most useless operation, namely dumping heat in both baths. These results show that QMC can be very robust to experimental noise.