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Quantum Photocell: Using Quantum Coherence to Reduce Radiative Recombination and Increase Efficiency

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Laser and photocell quantum heat engines (QHEs) are powered by thermal light and governed by the laws of quantum thermodynamics. We here show how to use quantum coherence (PRL, 104, 207701 (2010)) induced by quantum noise (PNAS, 108, 15097 (2011)) to improve the efficiency of a laser or photocell QHE. Surprisingly, this coherence can be induced by the same noisy (thermal) emission and absorption processes that drive the QHE. Furthermore, this noise-induced coherence can be robust against environmental decoherence. Application of the ideas to photosynthesis (Nature, 446, 782-786 (2007)) will also be discussed.