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Quantum Photovoltaics via Coherent Drive[1] KONSTANTIN DORFMAN, ANATOLY SVIDZINSKY, MARLAN SCULLY, Texas A&M University — We study the fundamental limit to photovoltaic efficiency that is widely thought to be due to detailed balance between radiative recombination and radiative absorption. Quantum coherence in fact can break the detailed balance yielding vanishing emission of incident resonant radiation with nonzero absorption. This results in the enhancement of the quantum efficiency of the photovoltaic (PV) cell as compared to the "two-level" system. Similar to lasing without inversion and photo-Carnot quantum heat engine, in a quantum dot PV cell with coherently driven doublet in the excited state it is possible to suppress the radiative recombination and increase the quantum limit of photovoltaic operation compare to classical one. Our approach is consistent and does not violate the laws of thermodynamics.

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