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The Upper Bound on Solar Power Conversion Efficiency Through Photonic Engineering[1] YUNLU XU, JEREMY MUNDAY, Univ of Maryland-College Park — The power conversion efficiency is a key parameter by which different photovoltaic devices are compared. The maximum value can be calculated under steady-state conditions where the photon flux absorbed by the device equals the outgoing flux of particles (also known as the principle of detailed balance). The photonic engineering of a solar cell offers a new alternative for boosting efficiency. We show that, for an ideally photonic engineered solar cell, its efficiency is subject to an upper bound dictated by a generalized form of detailed balance equation where nano-concentration is taken into account. Results under realistic operating conditions and recent experimental studies will also be discussed.

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