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A new and trustworthy formalism to compute entropy in quantum systems MOHAMMAD ANSARI, Forschungszentrum Jlich, Germany — Entropy is nonlinear in density matrix and as such its evaluation in open quantum system has not been fully understood. Recently a quantum formalism was proposed by Ansari and Nazarov[1] that evaluates entropy using parallel time evolutions of multiple worlds. We can use this formalism to evaluate entropy flow in a photovoltaic cells coupled to thermal reservoirs and cavity modes. Recently we studied the full counting statistics of energy transfers in such systems[2]. This rigorously proves a nontrivial correspondence between energy exchanges and entropy changes in quantum systems, which only in systems without entanglement can be simplified to the textbook second law of thermodynamics. We evaluate the flow of entropy using this formalism. In the presence of entanglement, however, interestingly much less information is exchanged than what we expected. This increases the upper limit capacity for information transfer and its conversion to energy for next generation devices in mesoscopic physics.

[1]M.H. Ansari and Y. V. Nazarov, Phys. Rev. B 91, 104303 (2015)
[2]M.H. Ansari and Y. V. Nazarov, Phys. Rev. B 91, 174307 (2015)

Mohammad Ansari
Forschungszentrum Jlich, Germany

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