

Abstract Submitted
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Entanglement and Standard Thermodynamic Relations INTI SODEMANN, University of South Carolina, ALONSO BOTERO, Universidad de Los Andes and University of South Carolina — We re-examine thermal properties of the standard (Boltzmann) canonical ensemble from the point of view of canonical typicality. In this approach, the thermodynamic system is described by the reduced density matrix of a random pure state from an energy-constrained total Hilbert space for the system and environment, with the entanglement entropy playing the role of thermodynamic entropy. We examine the average and variance of the entanglement entropy over all pure states of the restricted total Hilbert space, and show correspondence with the expected results of standard statistical mechanics in the limit of a large environment. We study the correlation between energy and entropy fluctuations, and show that the temperature can also be defined from a variational principle minimizing deviations from a microscopic version of the first law of thermodynamics, involving energy and entropy fluctuations.

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