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Marginal fluctuation theorems and local equilibrium[1] MATTEO POLETTINI, BERNHARD ALTANER, MASSIMILIANO ESPOSITO, University of Luxembourg — The celebrated Fluctuation Theorem, quantifying the extent of breakage of time reversibility in nonequilibrium systems, pivots on the fact that all currents contributing to the dissipation rate of a system are known. What instead if only some currents are measurable? In general, the marginal probabilities of fewer currents do not satisfy the full fluctuation symmetry. However, still many claims can be sustained. We provide a general theory of fluctuation relations for the marginal p.d.f. of the currents of a Markov jump process, based on the mathematics of the "marginally time-reversed" generator. At the physical level, the theory has implications regarding the fluctuation-dissipation relations for systems that are only locally at equilibrium, i.e., such that certain currents vanish while all others are arbitrarily far from equilibrium. In particular, we are able to prove nonequilibrium Green-Kubo relations, the violation of the Onsager symmetry, and to provide higher-order signatures of nonequilibrium behavior.

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