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Phase Transitions in 1D Open Quantum Systems and Liouville-space Entropy MICHAEL HOENING, Technische Universität Kaiserslautern, MATTHIAS MOOS, RAZMIK UNANYAN, MICHAEL FLEISCHHAUER — We discuss 1D lattice fermions and bosons coupled to quasi-local reservoirs. In the steady state these systems can undergo a transition to a critical phase for certain values of the reservoir parameters [1]. For free bosons the critical transition is accompanied by a dynamical instability, for free fermions it is associated with a vanishing of the component with long-range order. We discuss the critical transition including critical exponents, purity and entanglement in free and interacting, open fermionic and bosonic systems within a mean-field approach. 1D quantum systems can be efficiently simulated if the many-body state can be written in terms of matrix product states. A good measure for this is the bi-partite von-Neumann entropy. In the case of an open system it is no longer an appropriate measure for simulability. Instead we introduce the Liouville space entropy which quantifies the resources for a representation of the density matrix in terms of tensor product operators.

[1] J. Eisert and T. Prosen, arxiv:1012.501

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