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Ordering and Entropy Production Across Qauntum Phase Transitions ROBERT CHERNG, Harvard University, LEONID LEVITOV, MIT — We consider the transverse field Ising spin chain swept through a quantum critical point from the disordered to the ordered phase (and vice versa) and present exact results on the ordering and entropy production. Prepared in the ground state of the initial Hamiltonian, the system evolves to a state characterized by a non-equilibrium distribution of excitations of the final Hamiltonian. We show that the evolved system, while described by a pure many-body state, possesses finite entropy if considered "locally." The notion of local entropy is defined by coarse-graining in momentum space, and is linked to the properties of the system of Kibble-Zureck domain walls. Exact results obtained for the spin correlation functions are presented and used to elucidate the relationship with the Kibble-Zureck theory of critical dynamics. Possible manifestations in ultracold atoms trapped in optical lattices will be discussed.

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