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Dynamics of Symmetry Breaking Phase Transitions

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In the course of a non-equilibrium continuous phase transition dynamics ceases to be adiabatic in the vicinity of the critical point as a result of the critical slowing down. Consequently, the choice of the broken symmetry has to be made locally - sonic horizon set by the speed of the relevant sound. The resulting disparate local choices of broken symmetry lead to excitations and often result in the topological defects. The Kibble-Zurek mechanism (KZM) was developed to capture the essence of the associated non-equilibrium dynamics and to estimate the density of defects as a function of the quench rate through the transition. I will review and analyze the KZM focusing in particular on BEC's.

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