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Critical Dynamics of Spontaneous Symmetry Breaking in a Homogeneous Bose Gas NIR NAVON, ALEXANDER GAUNT, ROBERT SMITH, ZORAN HADZIBABIC, University of Cambridge — We explore the dynamics of spontaneous symmetry breaking in a homogeneous system by thermally quenching an atomic gas with short-range interactions through the Bose-Einstein phase transition. Using homodyne matter-wave interferometry to measure first-order correlation functions, we verify the central quantitative prediction of the Kibble-Zurek theory, namely the homogeneous-system power-law scaling of the coherence length with the quench rate. Moreover, we directly confirm its underlying hypothesis, the freezing of the correlation length near the transition due to critical slowing down. Our measurements agree with beyond mean-field theory, and support the previously unverified expectation that the dynamical critical exponent for this universality class, which includes the \lambda-transition of liquid 4He, is z=3/2.

Nir Navon
University of Cambridge

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