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Nucleation of solitons in a quasi-1D Bose-Einstein condensate: the Kibble-Zurek mechanism GOR NIKOGHOSYAN, Institute of Theoretical Physics, University of Ulm, ADOLFO DEL CAMPO, Institute of Theoretical Physics, Leibniz University of Hannover, ALEX RETZKER, MARTIN PLENIO, Institute of Theoretical Physics, University of Ulm — Finite-rate cooling of a quasi-1D thermal atomic cloud leads to the spontaneous nucleation of solitons during Bose-Einstein condensation (BEC). We study whether the dynamics of the transition can be described in terms of equilibrium properties using the Kibble-Zurek mechanism (KZM), and simulate the process within the stochastic Gross-Pitaevskii equation. We propose a novel method to detect the density of solitons in a quasi-1D BEC. This method is based on the measurement of the second order correlation function which enables the detection of solitons without knowing their location. The dependence of the density of solitons on the cooling rate of the atomic cloud for realistic experimental conditions is numerically analyzed, and agrees with the KZM only when this is extended to account for the inhomogeneous nature of the condensation arising from the external trapping potential.

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