

Nonthermal Fixed Points and Superfluid Turbulence in an Ultracold Bose Gas

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Turbulence appears in situations in which, *e.g.*, an energy flux goes from large to small scales where finally the energy is dissipated. As a result the distribution of occupation numbers of excitations follows a power law with a universal critical exponent. The situation can be described as a nonthermal fixed point of the dynamical equations. Single-particle momentum spectra for a dynamically evolving Bose gas are analysed using semi-classical simulations and quantum-field theoretic methods based on effective-action techniques. These give information about possible universal scaling behaviour. The connection of this scaling with the appearance of topological excitations such as solitons and vortices in one-component gases and domain walls and spin textures in multi-component systems is discussed. In addition their relation to those found in a field-theory approach to strong wave turbulence is discussed. In particular for three dimensional systems, the concept of nonthermal fixed points and its connection to transport processes in a turbulent system shows new aspects of the condensation dynamics out of equilibrium. The results open a view on a possibility to study nonthermal fixed points and superfluid turbulence in experiment without the necessity of detecting solitons and vortices in situ.

Section: VT - Vortices and turbulence

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