Dynamics of quenched unitary Bose gases

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I will discuss the dynamics of a strongly-interacting Bose gas after an interaction quench [1]. To describe the short-time far-out-of-equilibrium dynamics in a non-perturbative and ergodic way, we develop a cumulant theory based on a hierarchical treatment of two-, three-, and four-body correlations. We show how three-body correlations drive the system away from the universal prethermal state predicted by Hartree-Fock-Bogoliubov theory and characterized by a kinetic temperature and an emergent Bogoliubov dispersion law. We also find signatures of the Efimov effect in the many-body dynamics and make a precise identification between the observed beating phenomenon and the binding energy of an Efimov trimer. We show the appearance of two- and three-body long-range order, which reveal the existence of out-of-equilibrium dimer and trimer condensates. I will also compare our predictions for a uniform gas with experimental results for quenched unitary Bose gases in uniform potentials [2].

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[1] V. E. Colussi, H. Kurkjian, M. Van Regemortel, S. Musolino, J. van de Kraats, M. Wouters, and S. J. J. M. F. Kokkelmans. Cumulant theory of the unitary Bose gas: Prethermal and Efimovian dynamics. *Phys. Rev. A*, 102:063314, December 2020.

[2] Christoph Eigen, Jake A. P. Glidden, Raphael Lopes, Eric A. Cornell, Robert P. Smith, and Zoran Hadzibabic. Universal prethermal dynamics of Bose gases quenched to unitarity. *Nature*, 563(7730):221–224, 2018.

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