SFB/TRR 21 - Seminar

14. März 2014, Stuttgart

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Dynamics of collective excitations in ultra-cold dipolar Bose gases

Recent experiments on ultra-cold atomic gases with large magnetic moments have opened up the possibility of studying the physics of quantum systems with dipolar interactions. Owing to the long range nature of these interactions, the low energy dispersion in a quasi-two dimensional dipolar gas is predicted to be dramatically different from that of a non-dipolar gas. This has surprising consequences on the damping of collective excitations in the dipolar system, and on the non-equilibrium dynamics of a dipolar gas following a sudden quench. In this talk, I will show that at long wave-lengths, damping mechanisms whereby a collective excitation decays by colliding with a condensate atom are strongly suppressed in dipolar gases, giving rise to modes with long lifetimes. I will then discuss how the momentum distribution following a sudden quench develops features that are directly related to the underlying roton excitation spectrum of the gas, and can be thus used to probe the excitation spectrum of the dipolar gas. Finally, motivated by recent experiments in lattice bosons and trapped ions, I will discuss how correlations build up between initially uncorrelated regions in a quasi-2D dipolar Bose gas.

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