Hydrodynamics and universality in cold atomic gases ALEXANDER ABANOV, Stony Brook University, MANAS KULKARNI, Princeton University — Recent flurry of experiments on out-of-equilibrium dynamics in cold gases (Bosonic and Fermionic) has raised great interest in understanding collective behaviour of interacting particles. Although the dynamics of interacting gases depends on many details of the system, a great insight can be obtained in a rather universal limit of weak non-linearity, dispersion and dissipation. In this limit, using a reductive perturbation method we map many hydrodynamic models relevant to cold atoms to well known chiral one-dimensional equations such as Korteweg-de Vries (KdV), Burgers, KdV-Burgers, and Benjamin-Ono equations. This mapping [1] of rather complicated hydrodynamic equations to known chiral one-dimensional equations is of great experimental and theoretical interest. For instance, this mapping gives a simple way to make estimates for original hydrodynamic equations and to study phenomena such as shock waves, solitons and the interplay between nonlinearity, dissipation and dispersion. All these phenomena have been observed in experiments and are the hallmarks of nonlinear hydrodynamics.

[1] M. Kulkarni, A. G. Abanov, Phys. Rev. A 86, 033614 (2012)

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