

Abstract Submitted  
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**Coupling of Spin and Charge Degrees of Freedom in a Hydrodynamic Two-Fluid Approach** FABIO FRANCHINI, Stony Brook University, ALEXANDER ABANOV, Stony Brook University — We use a hydrodynamic approach to study correlated quantum one-dimensional systems. One can derive an effective hydrodynamics in the limit of smooth densities and slow velocities. In the limit when gradients of density and velocity can be neglected, one obtains an integrable system. We discuss the origin of this integrability and, as an application, we calculate some non-trivial correlation functions. The Hydrodynamic description is a useful tool to study the dynamics of a system. We introduce a two-fluid hydrodynamic description of one-dimensional spin  $1/2$  fermions with contact interactions. It is known that linearized hydrodynamics (bosonization) exhibits spin-charge separation. In the full *non-linear* theory, the spin and charge degrees of freedom are coupled to each other, therefore spin waves carry charge as well. We discuss the dynamics of such system.

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