L. P. Pitaevskii: *First and second sound in Fermi gas at unitarity*

Recent achievements of experimental technique permitted create fluids with odd properties – ultracold Fermi gases near the Feshbach resonance in magnetic field. These gases are dilute and interaction between their atoms is defined by a single parameter – the scattering length. At some values of the magnetic field this length becomes infinite. One obtains a universal fluid – a unitary Fermy gas, a system with strong interaction, which properties does not depend on any parameters.

Experiments with ultracold gases are typically performed in elongated traps. If the viscosity and thermal conductivity are large enough, one can reformulate the Landau two-fluid hydrodynamics as a system of 1D equations. The equations have been applied to description of the first and second sound oscillations at unitary Fermi gas.

Two types of experiments with the unitary Fermi gas were performed in Prof. Grimm group at Innsbruck. Discrete modes of first sound were observed and frequencies coincide with the theoretical predictions with good accuracy. (Data on the equation of state from MIT group were used.) Propagation of the second sound pulse was also observed and temperature dependency of the superfluid density was defined.