

7. Degenerate Fermi Gases (DeFG)..... 4 lectures (1hr 30m each)

Speakers: Prof. G. Shlyapnikov

Lecture 1 Ultracold fermions. Scattering properties and statistics

Contents: Ultracold limit. Multi-component and single-component Fermi gases. Resonance scattering. Feshbach resonances. Fermi-Dirac distribution. Quantum degeneracy. Excitations. Cooling of fermionic atoms. Pauli blocking.

Lecture 2 Superfluid phase transition in Fermi gases

BCS theory. Analogy between superfluidity in neutral-atom Fermi gases and superconductivity in metals. Strongly interacting regime and Leggett model. Experiments with strongly interacting Fermi gases. Vortices

Lecture 3 Molecules in Fermi gases. Regime of molecular BEC.

Molecule-molecule interaction and remarkable collisional stability. Experiments with molecular BEC.

Lecture 4 Prospects

Low-dimensional Fermi gases. What is new compared to 3D gases? Fermi gases of dipolar particles. Novel quantum phases