

Correlation energy of the dilute spin-1/2 Fermi gas

Speaker: Emanuela Laura Giacomelli - Università degli Studi di Milano

Time: Wednesday March 4, 13:00-14:00

Location: Room M1, Largo S. Murialdo 1 (Roma)

In 1957, Huang and Yang predicted an asymptotic expansion for the ground state energy of a dilute Fermi gas in the thermodynamic limit, accurate up to third order. Their formula revealed remarkable universality: the correlation energy depends solely on the scattering length of the interaction, regardless of the potential's specific details.

Establishing the Huang–Yang formula requires a precise analysis of the correlation energy, which is defined as the difference between the ground state energy and that of the free Fermi gas.

In this talk we will outline the strategy for proving matching upper and lower bounds on the ground state energy. We will highlight the importance of considering a modified zero-energy scattering equation that takes into account the presence of the Fermi sea when describing the excitations around the Fermi sea, in the spirit of the Bethe–Goldstone equation.

Finally, we will analyse the momentum distribution of the trial state that resolves the ground state energy up to the precision of the Huang–Yang formula. We will discuss a result which is consistent with the formal perturbative argument of Belyakov (Sov. JETP 13: 850–851 (1961)).