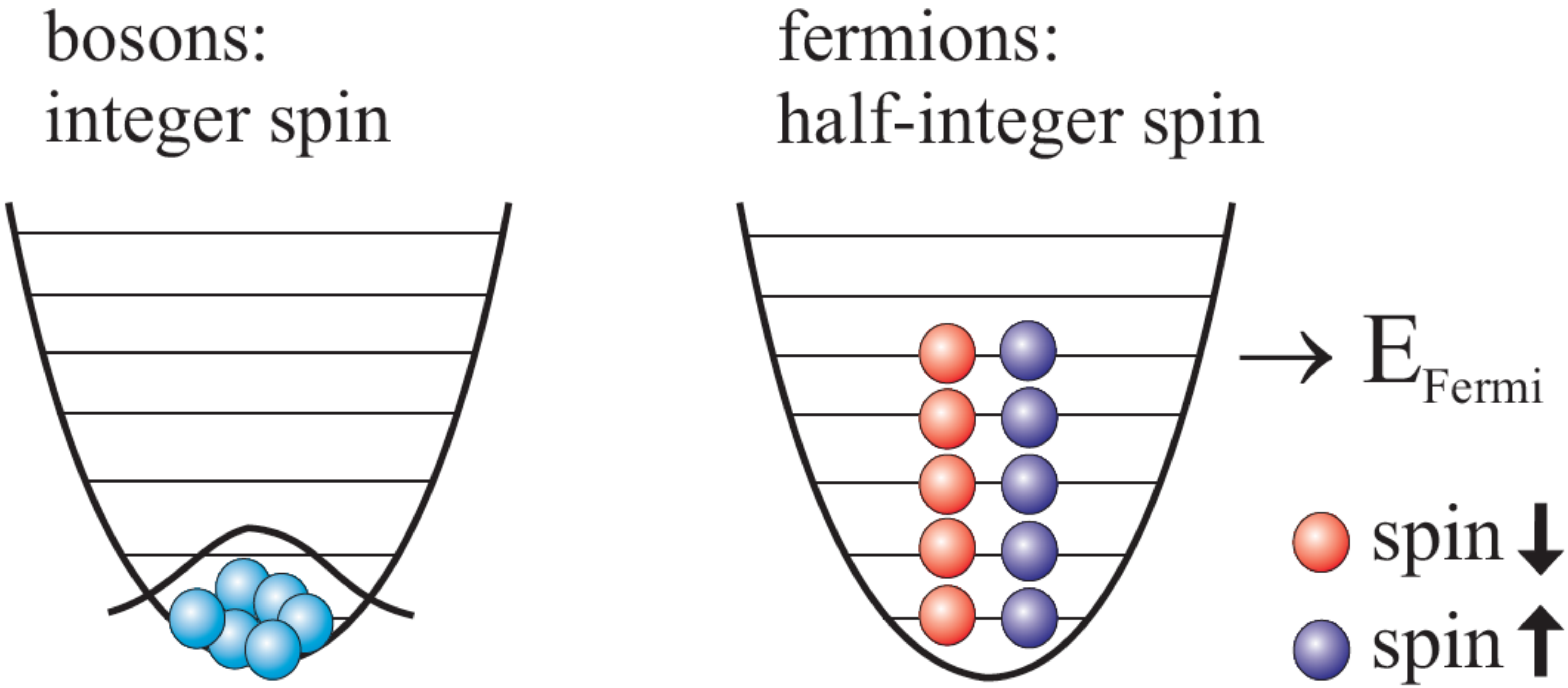
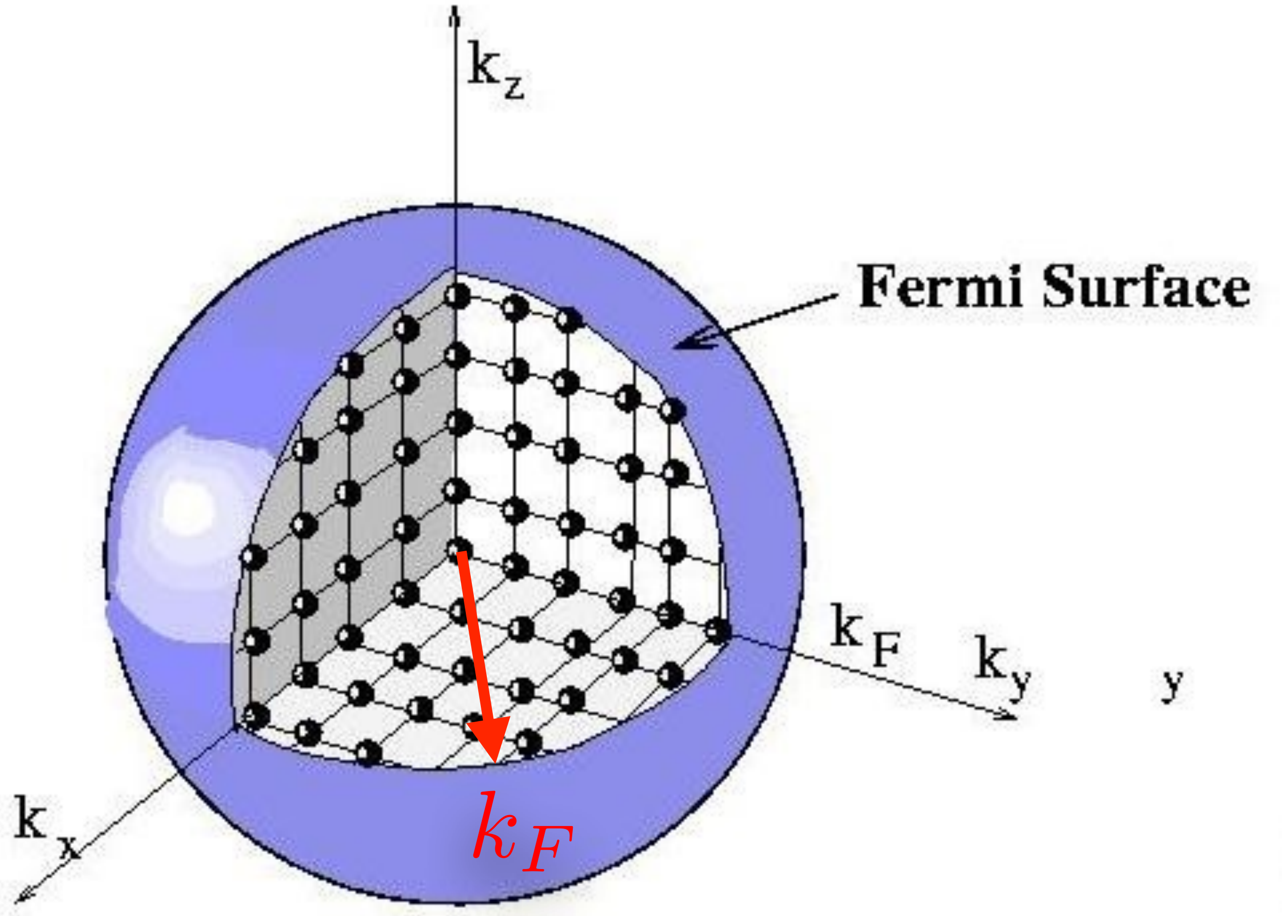
Estado fundamental (T=0)



$$\varepsilon_k = \frac{\hbar^2 k^2}{2m}$$

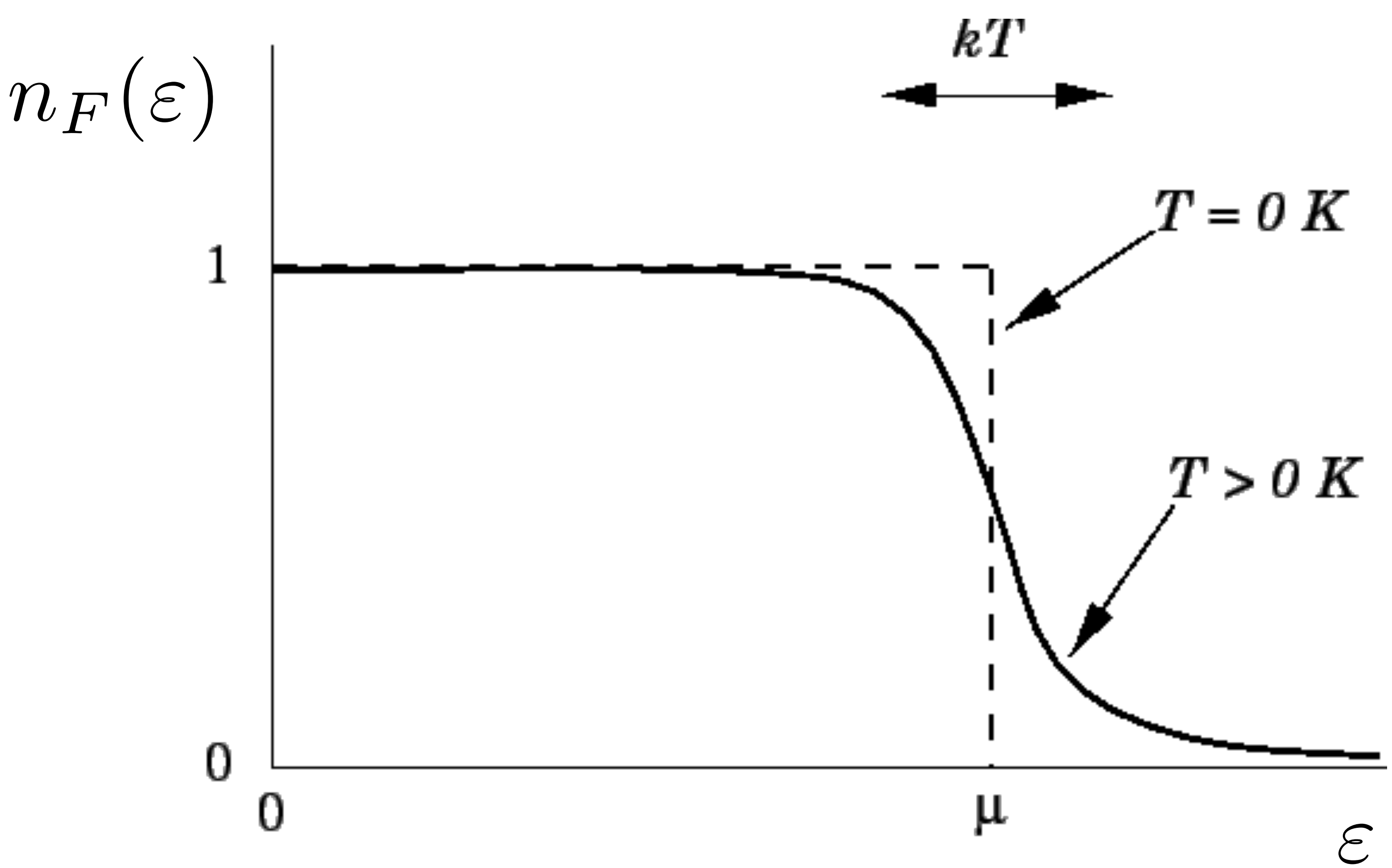


momento de Fermi: $p_F = \hbar k_F$

energia de Fermi: $\varepsilon_F = \mu_0 = \frac{\hbar^2 k_F^2}{2m}$

Distribuição de Fermi-Dirac

$$n_F(\varepsilon) = \frac{1}{e^{\beta(\varepsilon-\mu)} + 1}$$



gás de Fermi degenerado

$$e^{-\beta\mu} \ll 1$$

Onset of Fermi Degeneracy in a Trapped Atomic Gas

B. DeMarco and D. S. Jin*†

An evaporative cooling strategy that uses a two-component Fermi gas was employed to cool a magnetically trapped gas of 7×10^5 ^{40}K atoms to 0.5 of the Fermi temperature T_F. In this temperature regime, where the state occupation at the lowest energies has increased from essentially zero at high temperatures to nearly 60 percent, quantum degeneracy was observed as a barrier to evaporative cooling and as a modification of the thermodynamics. Measurements of the momentum distribution and the total energy of the confined Fermi gas directly revealed the quantum statistics.

Science (1999)

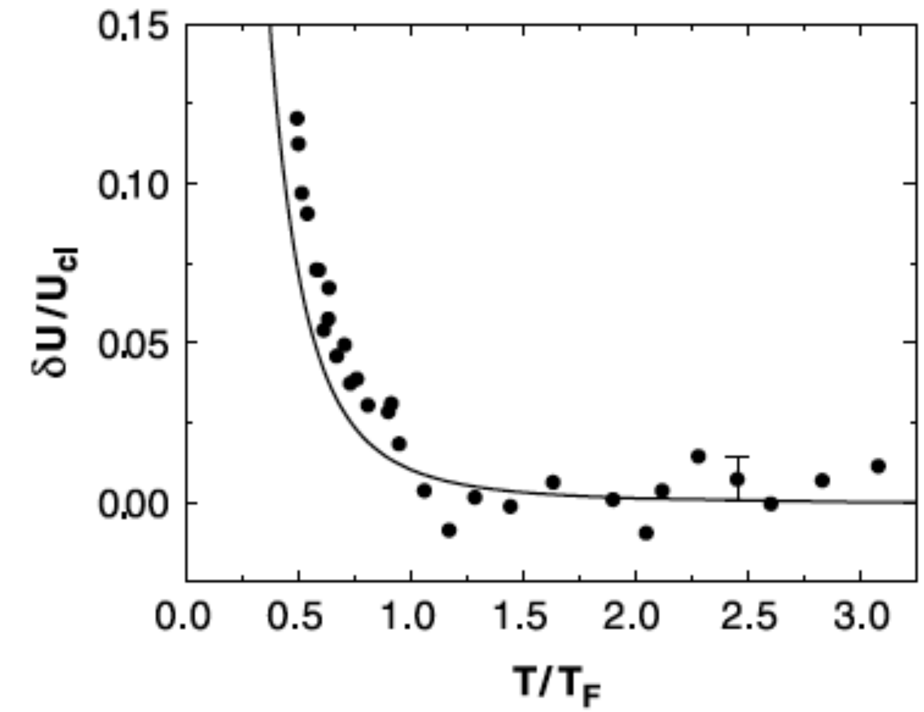


Fig. 4. Emergence of quantum degeneracy as seen in the energy of the trapped Fermi gas. A moment analysis was used to extract the energy of the gas from time-of-flight absorption images. The excess energy $\delta U = U - U_{cl}$ is shown versus T/T_F, where U is the measured energy and $U_{cl} = 3Nk_BT$ is the energy of a classical gas at the same temperature. Each point represents the average of two points from the evaporation trajectory shown in the main part of Fig. 3, and the single error bar shows the typical statistical uncertainty. The measured excess energy at low T/T_F agrees well with thermodynamic theory for a noninteracting Fermi gas (line).