

Phys 402: Applications of Quantum Mechanics

Lecture 22

ESR---Electron Spin Resonance

Electron spins are exposed to an oscillating magnetic field along the x-direction with frequency Ω and amplitude B_0 . Assume initially the spins are pointing along the z-direction or in “spin-up” states.

- 1) Discuss qualitatively what happens to the electron spins. To have spins “pumped” to the “spin-down” states efficiently, what will be your choice of Ω and amplitude B_0 . i.e., design your “beam”.

- 2) Can you describe the motion of the spin on the Bloch sphere we introduced before. What is your interpretation of the result you obtain using the perturbation theory ?

- 3) Now assume a static field along the z-direction is also present. Repeat your discussions.