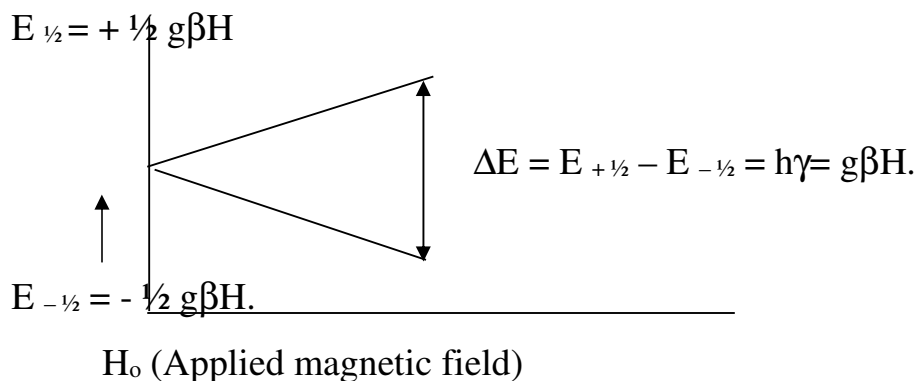


File-1: Electron Spin Resonance (ESR)-PRINCIPLE

Electron Spin Resonance-ESR spectra recorded using suitable microwave and varying magnetic field is shown by molecules, ions, or atoms possessing unpaired electrons.

For an electron $I = \frac{1}{2}$



Zeeman Hamiltonian for the interaction of an electron with the magnetic field is

$$H = g\beta H S_z$$

Where

$$g = 2.0023193 \text{ for free electron}$$

$$\beta = 9.274096 \times 10^{-21} \text{ erg gauss}^{-1}. \text{ (Bohr Magnetron)}$$

$$H = \text{Applied field Strength}$$

$$S_z = \text{Spin Operator.}$$

The EPR experiment is generally carried out at a fixed frequency.

$$\text{X - Band : } 9.5 \text{ GHz, } 3400 \text{ Gauss}$$

$$\text{Q - Band : } 35 \text{ GHz, } 12,500 \text{ Gauss}$$

$$\text{K - Band : } 24 \text{ GHz, } 8,600 \text{ Gauss}$$

Sampling:

Water, alcohols, and other high dielectric constant solvents are **not** the solvents for EPR because they strongly absorb microwave. They can be used when the sample has a strong resonance and is contained in a specially designed narrow cell. EPR measurements on gases, solutions, powders, single crystals and frozen solutions can be carried out.