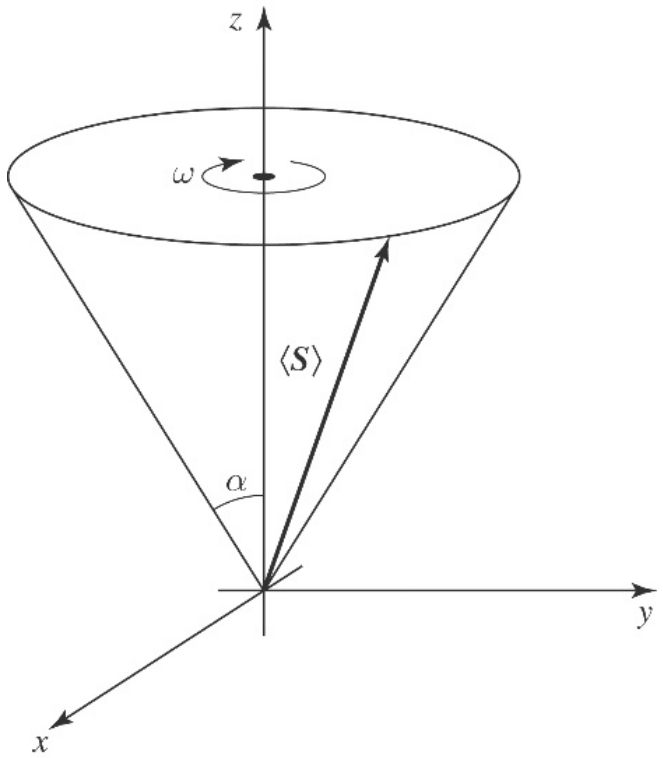
Electron Spin Resonance (ESR)

$$\vec{B} = B_0 \hat{z}$$



$$\mathcal{H} = -\vec{\mu} \cdot \vec{B}$$

$$\widehat{\mathcal{H}} = -\gamma B_0 \frac{\hbar}{2} \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

$$\chi(t) = \begin{pmatrix} \cos(\alpha/2)\ e^{i\omega_L t/2} \\ \sin(\alpha/2)\ e^{-i\omega_L t/2} \end{pmatrix}$$

$$\langle \hat{S}_x \rangle = \chi^\dagger(t)\, \hat{S}_x\, \chi(t) = \frac{\hbar}{2} \sin(\alpha)\ \cos \omega_L t$$

$$\langle \hat{S}_y \rangle = \chi^\dagger(t)\, \hat{S}_y\, \chi(t) = -\frac{\hbar}{2} \sin(\alpha)\ \sin \omega_L t$$

$$\langle \hat{S}_z \rangle = \chi^\dagger(t)\, \hat{S}_z\, \chi(t) = \frac{\hbar}{2} \cos(\alpha)$$

$$\omega_L = \gamma B_0$$

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$$\widehat{\mathcal{H}}_{pert} = -\gamma\hat{\vec{S}} \cdot \vec{B}_{rf} \cos(\omega_{rf} t)$$