Magnetism

Föreläsning 7 - Elektromagnetism

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Terminologi på svenska

$\mathbf{E}$ = Elektrisk fältstyrka (“elektriskt fält”) (V/m)

$\mathbf{D}$ = Elektrisk flödestäthet ($\mathrm{C/m^2}$)

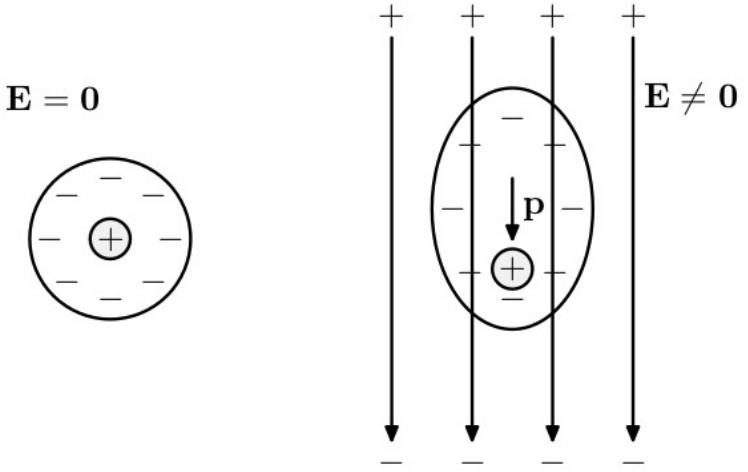
$\mathbf{P}$ = Elektrisk polarisationsdensitet ($\mathrm{C/m^2}$)

$\mathbf{B}$ = Magnetisk flödestäthet (“B-fält”) (T)

$\mathbf{H}$ = Magnetisk fältstyrka (“H-fält”) (A/m)

$\mathbf{M}$ = Magnetisering (A/m)

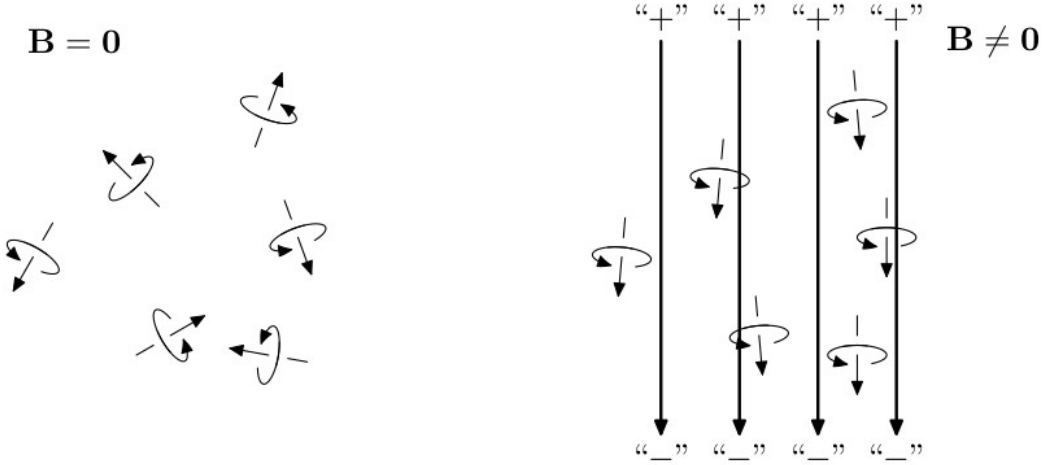
Elektrisk polarisationsdensitet



$$\mathbf{P} \equiv \left\langle \frac{d\mathbf{p}}{dV} \right\rangle = \varepsilon_0 \chi_\mathrm{e} \mathbf{E}$$

$$\mathbf{D} \equiv \varepsilon_0 \mathbf{E} + \mathbf{P}$$
$$= \varepsilon_0 (1 + \chi_\mathrm{e}) \mathbf{E} \equiv \varepsilon_0 \varepsilon_\mathrm{r} \mathbf{E}$$

Magnetism



$$\mathbf{M} \equiv \left\langle \frac{d\mathbf{m}}{dV} \right\rangle = \frac{1}{\mu_0} \left(1 - \frac{1}{\mu_\mathrm{r}} \right) \mathbf{B}$$

$$\mathbf{H} \equiv \frac{\mathbf{B}}{\mu_0} - \mathbf{M} = \frac{\mathbf{B}}{\mu_0 \mu_\mathrm{r}}$$

$$\mathbf{B} = \mu_0 \mu_\mathrm{r} \mathbf{H}$$

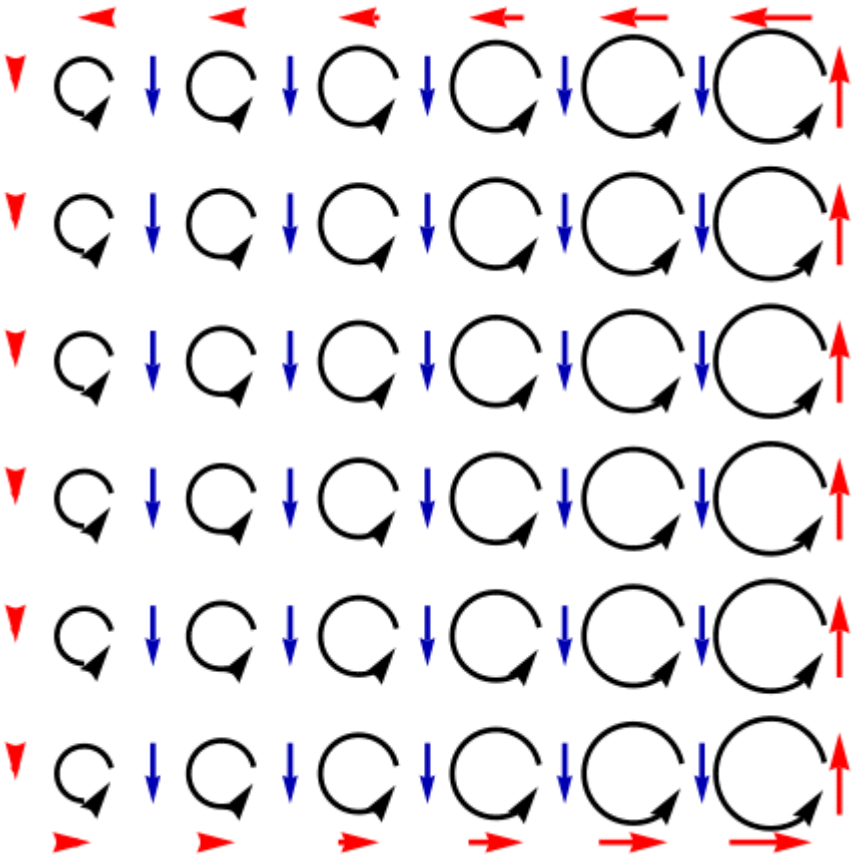
Magnetism och bundna strömmar

Bidrag till volymström från magnetisering:

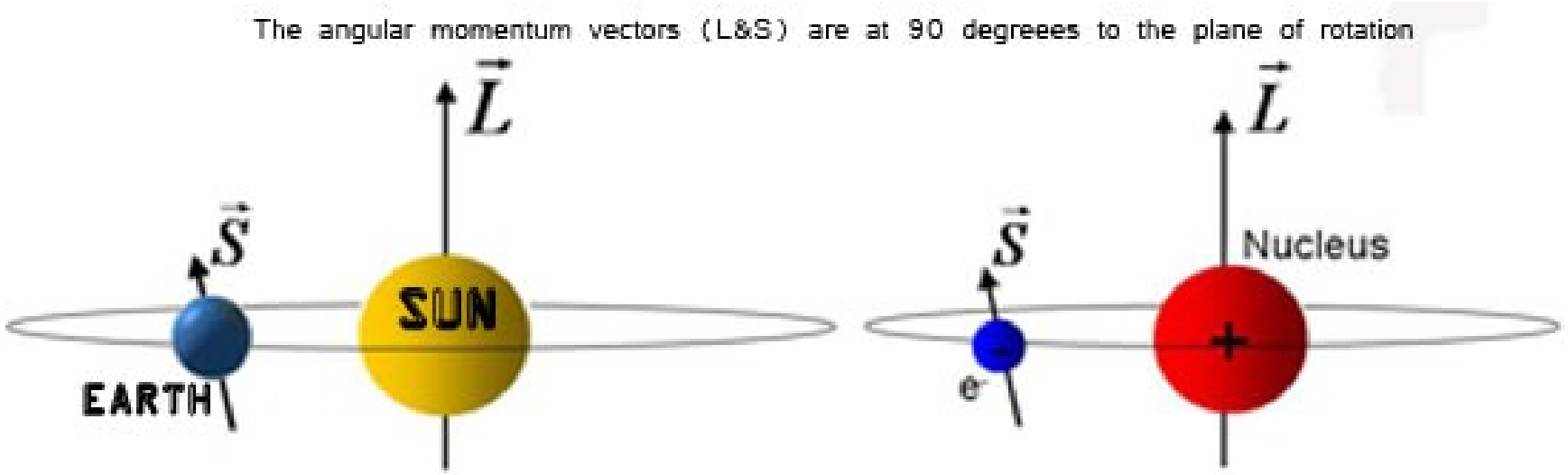
$$\mathbf{J}_\mathrm{b} = \nabla \times \mathbf{M}$$

Bidrag till ytström från magnetisering:

$$\mathbf{K}_\mathrm{b} = \mathbf{M} \times \mathbf{e}_n$$



Orbitalt magnetiskt moment och spinn för elektronen



The rules for determining the net spin of a *nucleus* are as follows; If the number of neutrons and the number of protons are both even, then the nucleus has NO spin. If the number of neutrons plus the number of protons is odd, then the nucleus has a half-integer spin (i.e. 1/2, 3/2, 5/2)

Electron spin explained:

Imagine a ball that's rotating

- Except it's not a ball...
- And it's not rotating.