

paper 53, notes 8a.

## Magnetostatic Ampère Law

We have:

$$\underline{\nabla} \times \underline{B}^a + \underline{\omega}'^a_b \times \underline{B}^b = \mu_0 \underline{J}^{a'} \quad - (1)$$

where

$$\underline{B}^a = \underline{\nabla} \times \underline{A}^a - \underline{\omega}^a_b \times \underline{A}^b \quad - (2)$$

So:

$$\begin{aligned} & \underline{\nabla} \times (\underline{\nabla} \times \underline{A}^a - \underline{\omega}^a_b \times \underline{A}^b) \\ & + \underline{\omega}'^a_b \times (\underline{\nabla} \times \underline{A}^a - \underline{\omega}^a_b \times \underline{A}^b) \\ & = \mu_0 \underline{J}^{a'} \quad - (3) \end{aligned}$$

$$\begin{aligned} & \underline{\nabla} \times (\underline{\nabla} \times \underline{A}^a) - \underline{\nabla} \times (\underline{\omega}^a_b \times \underline{A}^b) \\ & + \underline{\omega}'^a_b \times (\underline{\nabla} \times \underline{A}^a) - \underline{\omega}'^a_b \times (\underline{\omega}^b_c \times \underline{A}^c) \\ & = \mu_0 \underline{J}^{a'} \quad - (4) \end{aligned}$$

$\Rightarrow$

$$\begin{aligned} & \nabla^2 \underline{A}^a - \underline{\nabla} (\underline{\nabla} \cdot \underline{A}^a) + \underline{\omega}'^a_b \times (\underline{\omega}^b_c \times \underline{A}^c) \\ & + \underline{\nabla} \times (\underline{\omega}^a_b \times \underline{A}^b) - \underline{\omega}'^a_b \times (\underline{\nabla} \times \underline{A}^a) \\ & = -\mu_0 \underline{J}^{a'} \end{aligned}$$

- (5)