

$$\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t} \quad \nabla \times \vec{B} = \mu_0 \varepsilon_0 \frac{\partial \vec{E}}{\partial t} \quad \nabla \cdot \vec{E} = 0 \quad \nabla \cdot \vec{B} = 0$$

$$\begin{aligned} \nabla \times (\nabla \times \vec{E}) &= \nabla(\nabla \cdot \vec{E}) - \nabla^2 \vec{E} = -\nabla^2 \vec{E} = \nabla \times \left(-\frac{\partial \vec{B}}{\partial t} \right) \\ &= -\frac{\partial(\nabla \times \vec{B})}{\partial t} = -\frac{\partial \left(\mu_0 \varepsilon_0 \frac{\partial \vec{E}}{\partial t} \right)}{\partial t} = -\mu_0 \varepsilon_0 \frac{\partial^2 \vec{E}}{\partial t^2} \end{aligned}$$

$$\nabla^2 \vec{E} = \mu_0 \varepsilon_0 \frac{\partial^2 \vec{E}}{\partial t^2}$$

What is this? Wave with a speed of $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$!

$$\nabla^2 \vec{B} = \mu_0 \varepsilon_0 \frac{\partial^2 \vec{B}}{\partial t^2}$$

Wait a second, wave speed relative to what?