Electromagnetic Plane Wave (3)

Take partial derivatives $\frac{\partial}{\partial x}$(F) and $\frac{\partial}{\partial t}$(A): $\frac{\partial^2 E_y}{\partial x^2} = -\frac{\partial^2 B_z}{\partial t \partial x}$, $-\frac{\partial^2 B_z}{\partial t \partial x} = \mu_0 \epsilon_0 \frac{\partial^2 E_y}{\partial t^2}$.

$\Rightarrow \frac{\partial^2 E_y}{\partial t^2} = c^2 \frac{\partial^2 E_y}{\partial x^2}$ (E) (wave equation for electric field).

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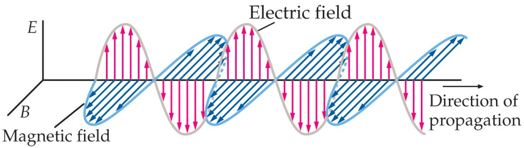
$\Rightarrow \frac{\partial^2 B_z}{\partial t^2} = c^2 \frac{\partial^2 B_z}{\partial x^2}$ (B) (wave equation for magnetic field).

$c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}$ (speed of light).



Sinusoidal solution:

- $E_y(x,t) = E_{max} \sin(kx - \omega t)$
- $B_z(x,t) = B_{max} \sin(kx - \omega t)$