

A planar electromagnetic wave is propagating through space. Its electric field vector is given by  $\mathbf{E} = E_0 \cos(kz - \omega t) \hat{x}$ . Its magnetic field vector is

- in  $z$  direction
1.  $\mathbf{B} = B_0 \cos(kz - \omega t) \hat{y}$
  2.  $\mathbf{B} = B_0 \cos(ky - \omega t) \hat{z}$
  3.  $\mathbf{B} = B_0 \cos(ky - \omega t) \hat{x}$
  4.  $\mathbf{B} = B_0 \cos(kz - \omega t) \hat{z}$

This wave is propagating in the  $z$  direction

So it must be 1 or 4. The magnetic field

$\vec{B}$  is orthogonal to it, so in the  $\hat{y}$  dir

$$\Rightarrow \vec{B} = B_0 \cos(kz - \omega t) \hat{y}$$