

COORDINATE
AXES



z-direction is
out of the page.

A polarized plane wave is described by

$$E = E_m \sin[(10^{14} \text{ s}^{-1})t - kz]\hat{x}$$

$$B = (10^{-6} \text{ T})\sin[(10^{14} \text{ s}^{-1})t - kz]\hat{y},$$

where \hat{x} and \hat{y} are unit vectors. Notice that I haven't specified numerical values for two of the constants, E_m and k .

- (a) In which direction do these electromagnetic waves propagate?
- (b) What is the numerical value of E_m , in volts per meter? You can figure it out from the information provided.
- (c) What is the wavelength of this radiation, in meters? Could you see it with your eyes?

a) These are waves traveling in the z direction

(Direction of plane wave

$$D(x,t) = A \sin(kz - \omega t)$$

traveling in z dir.)

b) $E_0 = c B_0 = (3 \times 10^8 \text{ m/s})(10^{-6}) = 300 \text{ V/m}$

c) $\omega = \text{coefficient of } t = 10^{14} \text{ s}^{-1}$

$$\lambda = \frac{2\pi v}{\omega}, \text{ where } v = c$$

$$\lambda = \frac{2\pi(3 \times 10^8)}{10^{14}} = \underline{\underline{1.9 \times 10^{-5} \text{ m}}}$$

Visible light: 400 - 700 nm

This is longer... it's infrared
actually (cannot see it)