

34.29. Model: A radio wave is an electromagnetic wave.

Solve: (a) The energy transported per second by the radio wave is 25 kW, or 25×10^3 J/s. This energy is carried uniformly in all directions. From Equation 34.47, the light intensity is

$$I = \frac{P}{A} = \frac{P}{4\pi r^2} = \frac{25 \times 10^3 \text{ W}}{4\pi(30 \times 10^3 \text{ m})^2} = 2.21 \times 10^{-6} \text{ W / m}^2$$

(b) Using Equation 34.47 again,

$$I = \frac{c\epsilon_0}{2} E_0^2 \Rightarrow 2.21 \times 10^{-6} \text{ W / m}^2 = \frac{(3 \times 10^8 \text{ m / s})(8.85 \times 10^{-12} \text{ C}^2 / \text{N m}^2)}{2} E_0^2 \Rightarrow E_0 = 0.041 \text{ V / m}$$