Assignment 1

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Question 2.2.3

Although it is not shown in Fig. 2.10, alternating current is part of the electromagnetic spectrum. Commercial alternating current in the United States has a frequency of 60 Hz. What is the wavelength in kilometers of this component of the spectrum?

Answer

To find the wavelength, λ, of a 60 Hz electromagnetic wave, we use the relationship (2-1) described at page 55 of the course book:

$$\lambda = \frac{c}{f},$$

where c is the speed of light ($\approx 3 \times 10^8\,\mathrm{m/s}$) and f is the frequency (60 Hz). Thus,

$$\lambda = \frac{3 \times 10^8\,\mathrm{m/s}}{60\,\mathrm{s}^{-1}} = 5 \times 10^6\,\mathrm{m} = 5000\,\mathrm{km}.$$

Therefore, the wavelength is approximately **5000 kilometers**.