

**7.36** The amplitudes of an elliptically polarized plane wave traveling in a lossless, nonmagnetic medium with  $\epsilon_r = 4$  are  $H_{y0} = 3$  (mA/m) and  $H_{z0} = 4$  (mA/m). Determine the average power flowing through an aperture in the  $y$ - $z$  plane if its area is  $20 \text{ m}^2$ .

**Solution:**

$$\eta = \frac{\eta_0}{\sqrt{\epsilon_r}} = \frac{120\pi}{\sqrt{4}} = 60\pi = 188.5 \, \Omega,$$

$$S_{\text{av}} = \hat{\mathbf{x}} \frac{\eta}{2} [H_{y0}^2 + H_{z0}^2] = \hat{\mathbf{x}} \frac{188.5}{2} [9 + 16] \times 10^{-6} = 2.36 \quad (\text{mW/m}^2),$$

$$P = S_{\text{av}} A = 2.36 \times 10^{-3} \times 20 = 47.13 \quad (\text{mW}).$$

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