

**22.51. Model:** A narrow slit produces a single-slit diffraction pattern.

**Solve:** The dark fringes in this diffraction pattern are given by Equation 22.21:

$$y_p = \frac{p\lambda L}{a} \quad p = 1, 2, 3, \dots$$

We note from Figure P22.51 that the first minimum is 0.50 cm away from the central maximum. Using the above equation, the slit width is

$$a = \frac{p\lambda L}{y_p} = \frac{(1)(500 \times 10^{-9} \text{ m})(1.0 \text{ m})}{0.50 \times 10^{-2} \text{ m}} = 0.10 \text{ mm}$$

**Assess:** This is a typical slit width for diffraction.