

13. The condition for a maximum in the two-slit interference pattern is $d \sin \theta = m\lambda$, where d is the slit separation, λ is the wavelength, m is an integer, and θ is the angle made by the interfering rays with the forward direction. If θ is small, $\sin \theta$ may be approximated by θ in radians. Then, $\theta = m\lambda/d$, and the angular separation of adjacent maxima, one associated with the integer m and the other associated with the integer $m + 1$, is given by $\Delta\theta = \lambda/d$. The separation on a screen a distance D away is given by $\Delta y = D \Delta\theta = \lambda D/d$. Thus,

$$\Delta y = \frac{(500 \times 10^{-9} \text{ m})(5.40 \text{ m})}{1.20 \times 10^{-3} \text{ m}} = 2.25 \times 10^{-3} \text{ m} = 2.25 \text{ mm} .$$