

Chapter 24

Diffraction and Interference

24.1 (a)

24.2 Small differences in the lasers produce slightly different frequencies. Such small differences will be large compared to the period of the light (with red light, the period of the light wave is only 2×10^{-15} s). These small differences thus produce very high-frequency beating, preventing one from seeing a steady interference pattern.

24.3 880 nm

24.4 If by the “second order” you have $m = 2$ (it isn’t clear in the text) then the angle is 0.158° . If you use $m = 1$ then the angle is 0.095° .

24.5 (a) The spacing remains the same, (b) the dots become fainter

24.6 (a) 0.91° , (b) 15.8 cm (twice the distance from the center to the dark fringe; use the tangent to relate the angle with the distance to the screen), (c) 0.70 mm, (c) This should be reasonably close to the actual observation, (d) the formula only provides the “spread” of the beam and, in this case, the aperture is so wide that the spread is very small in comparison to the original beam width.

24.7 0.5 cm