

7.3 Wave Interference

1. Monochromatic light falling on two slits 2.6×10^{-5} m apart produces the fourth-order fringe at a 6.4 degree angle. What is the wavelength of the light used?
2. A parallel beam of 600 nm light falls on two small slits 5×10^{-5} m apart. How far apart are the fringes on a screen 5 m away?
3. Light of wavelength 680 nm falls on two slits and produces an interference pattern in which the fourth-order fringe is 0.038 m from the central fringe on a screen 1.0 m away. What is the separation of the two slits?
4. A beam of microwaves of wavelength 3.1 cm is directed normally through a double slit in a metal screen and interference effects are detected in a plane parallel to the slits and at a distance of 40 cm from them. It is found that the distance between the centres of the first maxima on either side of the central maximum in the interference pattern is 70 cm. Calculate an approximate value for the slit separation.
5. Two narrow slits, 0.3 mm apart, are illuminated by a beam of light of wavelength 600 nm. An interference pattern is observed on a screen normal to the beam and 0.5 m from the slits. The distance in mm between adjacent dark lines on the screen is:

6. Fringes of separation w are observed in a plane 1.00 m from Young's slit arrangement illuminated by yellow light of wavelength 600 nm. At what distance from the slits would fringes of the same separation w be observed when using blue light of wavelength 400 nm?
7. Monochromatic light of wavelength 589 nm is incident on a pair of parallel slits 1 mm apart. An interference pattern consisting of equally spaced, parallel, dark and bright bands is observed. The dark bands are 1.18 mm apart. What slit separation, s , would produce a fringe system in which the dark bands were 3.0 mm apart if light of wavelength 640 nm was used?
8. A parallel beam of light of wavelength 500 nm falls on a pair of parallel narrow slits, 0.2 mm apart in an opaque screen (see figure). Regularly spaced bright lines (fringes) are observed on a distant viewing screen. The fringe separation is 2.0 mm. When the wavelength of the light is changed to 600 nm, and the distance from the slits to the viewing screen is halved, the separation, in mm, of the fringes becomes:

