

Q- A monochromatic source of wavelength 450 nanometers illuminates a double slit, with 45 micrometer spacing between the slits. If a screen is placed 4 meters from the slits, determine the vertical spacing between the central maximum and the third constructive order.

As the distance of the n th order maxima from the central point of the screen is given by

$$x_n = \frac{n\lambda D}{d}$$

For the central maxima $n = 0$ hence we have $x_0 = 0$ means that the central maxima will be at C.

For the first order maxima substituting the value of $n = 3$ we have

$$x_3 = \frac{3\lambda D}{d}$$

Hence the distance between the central and third order maxima will be

$$x_3 - x_0 = \frac{3\lambda D}{d} = \frac{3 \cdot 450 \cdot 10^{-9} \cdot 4}{45 \cdot 10^{-6}} = 0.12 \text{ m}$$

...The distance on the screen between any two consecutive maxima is same, called fringe width and given by

$$\beta = \frac{\lambda D}{d}$$

