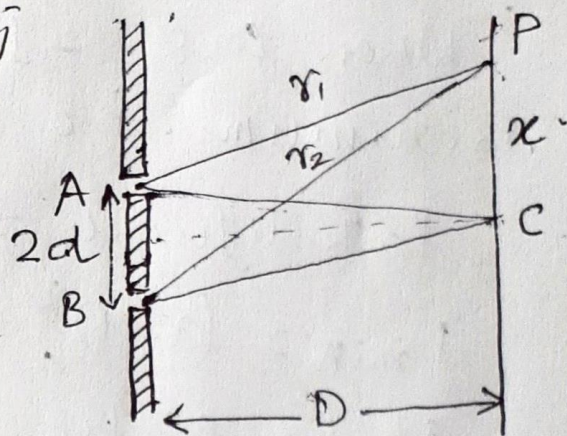


Double slit interference

From the wave nature of light we can obtain interference of waves from two sources. Double slit interference is well known demonstration of such wave nature of light.

Analysis of Double slit interference

At center C the intensity is maximum, because it is equidistant from A and B giving path difference or phase difference zero. At point P path difference of waves from



A and B is $r_2 - r_1 = BP - AP$

From geometry $BP^2 = D^2 + (x+d)^2$ and

$$AP^2 = D^2 + (x-d)^2, \therefore BP^2 - AP^2 = (x+d)^2 - (x-d)^2 = 4xd$$

$$\text{or, } (BP - AP) \times (BP + AP) = 4xd \therefore BP - AP = \frac{4xd}{BP + AP}$$

Consider if D is very large compared to d , then we can write $BP = AP = D$

$$\text{Hence, } BP - AP = \frac{4xd}{2D} = (2xd)/D$$

For n^{th} order maxima (Bright point)

$$\frac{2xd}{D} = n\lambda \text{ or, } x_n = \frac{n\lambda D}{2d}, \text{ the distance from C}$$

For $(n+1)^{\text{th}}$ order bright fringe, $x_{n+1} = \frac{D(n+1)\lambda}{2d}$

The distance between two consecutive bright fringes is

$$x = x_{n+1} - x_n = \frac{\lambda}{2d} [D(n+1) - nD] = (\lambda D)/2d$$