**Physics Learning Object 9: Double Slit Interference**

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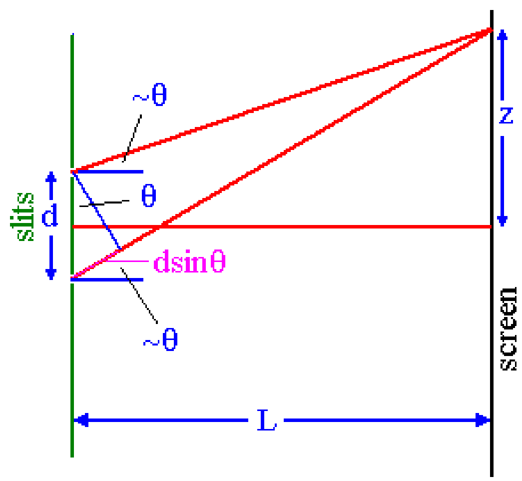
1. A laser beam has a wavelength of 654 nm. This laser beam illuminates a double slit, and, on a screen 7.50 cm away, it produces an interference pattern. Between the m=0 fringe and the m=1 fringe, there is a distance of 1.20 cm. How many bright fringes are there on the screen? An assumption is made that the screen extends a large distance in each direction and that the faint fringes are visible.




Answer:
D= 7.50 cm
λ= 654 nm
y= 1.20 cm for m=1
d=?
θ=?

We must first find θ, and then use θ to help to determine d. Once we have these values, we can finally use the equation for constructive interference, dsinθ = mλ, to determine m.

$$\tan\theta = \frac{1.20\text{X}10^{-2}\text{ m}}{7.50\text{x}10^{-2}\text{ m}} = 0.16\text{ m}$$

θ= 9.09°

$$d = \frac{m\lambda}{\sin\theta} = \frac{(1)(6.54\text{x}10^{-7}\text{ nm})}{\sin(9.09°)} = 4.16\text{x}10^{-6}\text{ m}$$

$$m = \frac{d\sin\theta}{\lambda} = \frac{(4.16x10^{-6}\ m)(\sin 90°)}{6.54x10^{-7}\ nm} = 6.36$$

m= 6.36, however we must round down to the nearest integer, 6. This means that there are 6 bright fringes on each side of the central zero-order maximum. **This makes a total of 13 bright fringes.**

**Bibliography:**


1. Diffraction and Interference. (n.d.). Retrieved March 23, 2015, from http://web.utk.edu/~cnattras/Phys250Fall2012/modules/module 1/diffraction_and_interference.htm