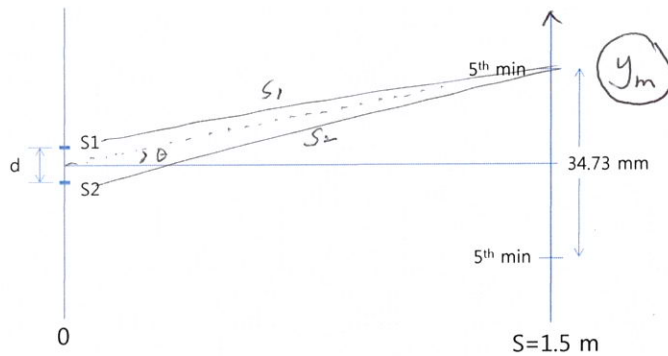


Quiz 3 (EC5103)

April 10, 2017

Name:

In a Young's experiment, narrow double slits (S_1 and S_2) 0.2 mm apart (d) diffract monochromatic light onto a screen (S) 1.5 m away. The distance between the fifth minima on either side of the zeroth-order maximum is measured to be 34.73 mm . Determine the wavelength of the light.



Sol) For minima on the screen S ,

$$s_1 - s_2 \equiv \Delta = (m - \frac{1}{2}) \lambda = d \sin \theta \quad \text{: path length difference}$$

$m = 1, 2, 3, \dots$

For $s \gg d$, $\sin \theta \sim \tan \theta = \frac{y_m}{S}$

\rightarrow Phase difference $\delta = k(s_1 - s_2) = \frac{2\pi}{\lambda} \Delta$

For the 5th minima, $m = 5$:

$$y_m = y_5 = \left(\frac{34.73}{2} \right) 10^{-3} = 17.37 \times 10^{-3} \text{ (m)}$$

$$\Delta = \frac{9}{2} \lambda = \frac{d}{S} y_5 = \frac{2 \cdot 10^{-4}}{1.5} \cdot 17.37 \times 10^{-3} = 2.32 \times 10^{-6}$$

$$\therefore \lambda = 514.7 \text{ (nm)}$$