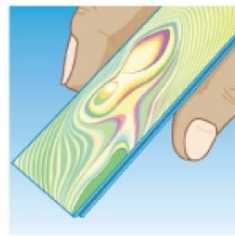
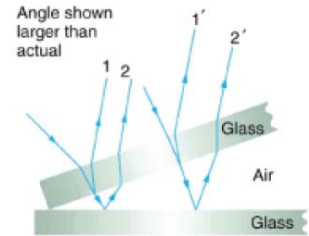


PHY 213 Summer 2016 Class Work
Class 29. Diffraction

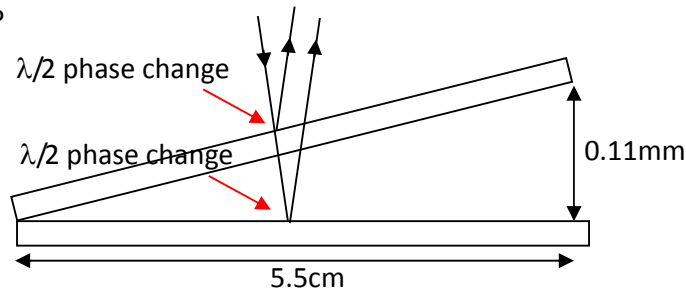
The figure shows two glass slides illuminated by monochromatic light incident perpendicularly. The top slide touches the bottom slide at one end and rests on a 0.11 mm diameter hair at the other end, forming a thin wedge of air. How far apart, in millimeters, are the dark bands seen in the slides, if the slides are 5.5 cm long and 592 nm light is used?



(a)



(b)



Since there is $\lambda/2$ phase change both reflections, so the condition for constructive interference is

$$\Delta = 2t = m\lambda$$

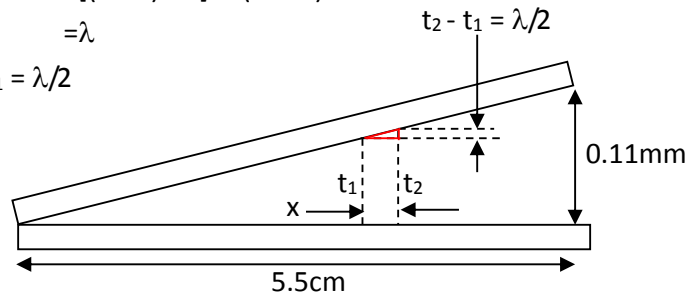
and the condition for destructive interference is

$$\Delta = 2t = (m + \frac{1}{2})\lambda$$

So the difference in height between two dark band is

$$2t_2 - 2t_1 = [(m+1) + \frac{1}{2}]\lambda - (m + \frac{1}{2})\lambda = \lambda$$

$$\Rightarrow t_2 - t_1 = \lambda/2$$



Let the horizontal distance between dark bands be x . By similar triangles, we have

$$\frac{x}{55} = \frac{\lambda/2}{0.11} \quad (\text{note that } 5.5\text{cm} = 55\text{mm})$$

$$\Rightarrow \frac{x}{55} = \frac{592 \times 10^{-9} / 2}{0.11} \Rightarrow x = \frac{592 \times 10^{-9} / 2}{0.11} \times 55 \Rightarrow x = \underline{\underline{1.48 \times 10^{-4} \text{ m}}}$$