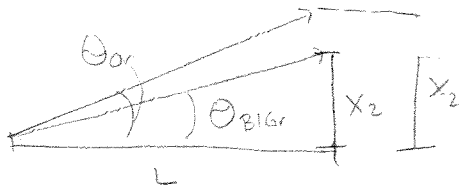
P #39

Ch 24 – p3

$\lambda_{Or} = 610\ nm = 610 \times 10^{-9}\ m$

$\lambda_{BlGr} = 480\ nm = 480 \times 10^{-9}\ m$



$L = 2.00\ m$

$d = \frac{1}{5000\ lines/cm} = 2 \times 10^{-4}\ cm = 2 \times 10^{-6}\ m$

$m = 2$

Find θ's: (Avoid small θ appx)

$m \cdot \lambda = d \cdot \sin\theta$ $\quad (2)(610 \times 10^{-9} m) = (2 \times 10^{-6} m) \cdot \sin\theta$

$\theta_{Or} = 37.6°$

$(2)(480 \times 10^{-9} m) = (2 \times 10^{-6} m) \cdot \sin\theta$

$\theta_{BlGr} = 28.7°$

Find x_2's:

$\tan\theta = \frac{x}{L}$ $\quad \tan(37.6°) = \frac{x_2}{(2.0\ m)}$ $\quad x_2 = 1.54\ m$ (Orange)

$\tan(28.7°) = \frac{x_2}{(2.0\ m)}$ $\quad x_2 = 1.09\ m$ (Blue-green)

Find Δx: $\quad \Delta x = 1.54\ m - 1.09\ m$

$= .45\ m$

$\boxed{\Delta x = 45\ cm}$