

56. We denote the two wavelengths as λ and λ' , respectively. We apply Eq. 36-40 to both wavelengths and take the difference:

$$N' - N = \frac{2L}{\lambda'} - \frac{2L}{\lambda} = 2L \left(\frac{1}{\lambda'} - \frac{1}{\lambda} \right) .$$

We now require $N' - N = 1$ and solve for L :

$$\begin{aligned} L &= \frac{1}{2} \left(\frac{1}{\lambda} - \frac{1}{\lambda'} \right)^{-1} \\ &= \frac{1}{2} \left(\frac{1}{589.10 \text{ nm}} - \frac{1}{589.59 \text{ nm}} \right)^{-1} \\ &= 3.54 \times 10^5 \text{ nm} = 354 \mu\text{m} . \end{aligned}$$