

13. How many dark fringes will be produced on either side of the central maximum if light ($\lambda = 651 \text{ nm}$) is incident on a single slit that is $5.47 \times 10^{-6} \text{ m}$ wide?

For single slit, dark fringes follow

$$W \sin(\theta) = m\lambda$$

Solve for m

$$m = \frac{W \sin(\theta)}{\lambda}$$

To maximize m, we make $\sin(\theta)$ as large as possible which would be a 90° angle which makes $\sin(90^\circ)$ is 1

$$m = \frac{W \sin(\theta)}{\lambda} = \frac{W}{\lambda} = \frac{5.47 \times 10^{-6} \text{ m}}{651 \times 10^{-9} \text{ m}} = 8.4$$

Since you cannot have a fractional dark fringe,

$m = 8$

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