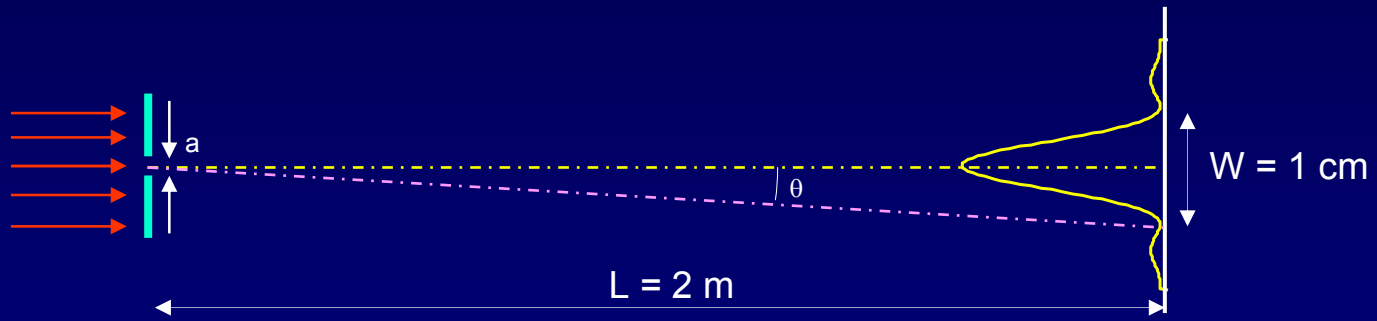
Single-Slit Diffraction Example

Suppose that when we pass red light (λ = 600 nm) through a slit of unknown width a, the width of the spot (the distance between the first zeros on each side of the bright peak) is W = 1 cm on a screen that is L = 2 m behind the slit. How wide is the slit?



The angle to the first zero is: $\theta = \pm\lambda/a$

$W = 2L \tan\theta \cong 2L\theta = 2L\lambda/a$

$a = 2L\lambda/W = (4m)(6\times10^{-7}\ m)\ /(10^{-2}\ m) = 2.4\times10^{-4}\ m = 0.24\ mm$