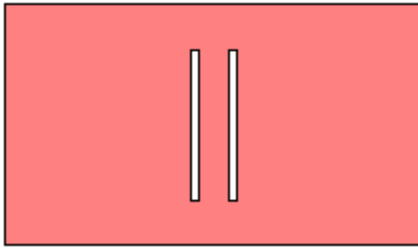
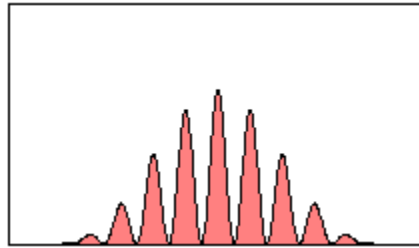


# The Double-Slit Experiment

Slit Screen



Diffraction Pattern



Coordinate wave function:  $|\Psi\rangle = \frac{1}{\sqrt{2}}[|x_1\rangle + |x_2\rangle]$

Momentum wave function for infinitesimally thin slits:  $\langle p|\Psi\rangle = \frac{1}{\sqrt{2}}[\langle p|x_1\rangle + \langle p|x_2\rangle] = \frac{1}{2\sqrt{\pi\hbar}} \left[ \exp\left(-\frac{ipx_1}{\hbar}\right) + \exp\left(-\frac{ipx_2}{\hbar}\right) \right]$

Position of first slit:  $x_1 := 0$       Position of second slit:  $x_2 := 1$       Slit width:  $\delta := .2$

Momentum wave function for finite slits:

$$\Psi(p) := \frac{\int_{x_1 - \frac{\delta}{2}}^{x_1 + \frac{\delta}{2}} \frac{1}{\sqrt{2\pi}} \cdot \exp(-i \cdot p \cdot x) \cdot \frac{1}{\sqrt{\delta}} dx + \int_{x_2 - \frac{\delta}{2}}^{x_2 + \frac{\delta}{2}} \frac{1}{\sqrt{2\pi}} \cdot \exp(-i \cdot p \cdot x) \cdot \frac{1}{\sqrt{\delta}} dx}{\sqrt{2}}$$

Double Slit Diffraction Pattern

