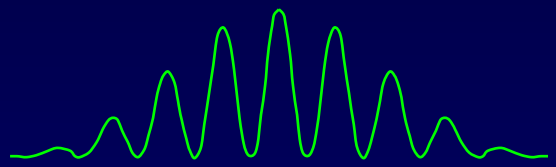
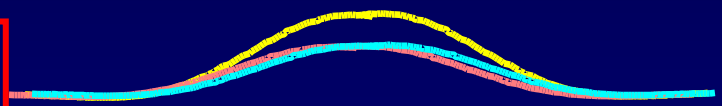
Solution

Suppose we measure with the upper slit covered for half the time and the lower slit covered for the other half of the time. What will be the resulting pattern?

a. $|\psi_1 + \psi_2|^2$



b. $|\psi_1|^2 + |\psi_2|^2$



At any given time, there is only one contributing amplitude (ψ_1 or ψ_2, but not both). Therefore, for half the time pattern P1 will build up, and for the other half we'll get P2. There is no interference. The result will be the sum of the two single-slit diffraction patterns.

In order for waves to interfere, they must both be present at the same time.