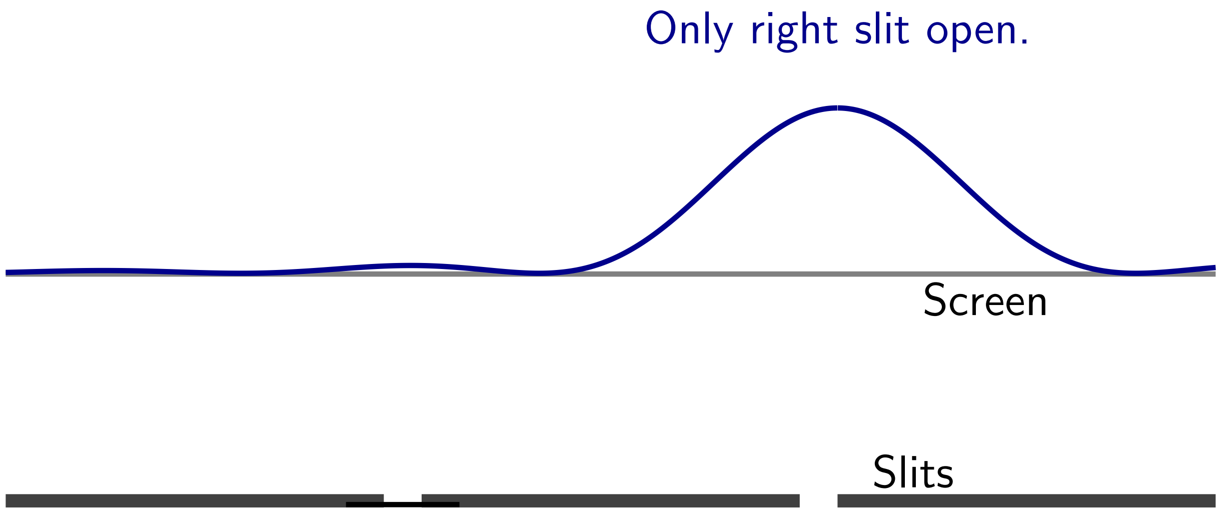
Particle Interference: Double Slits



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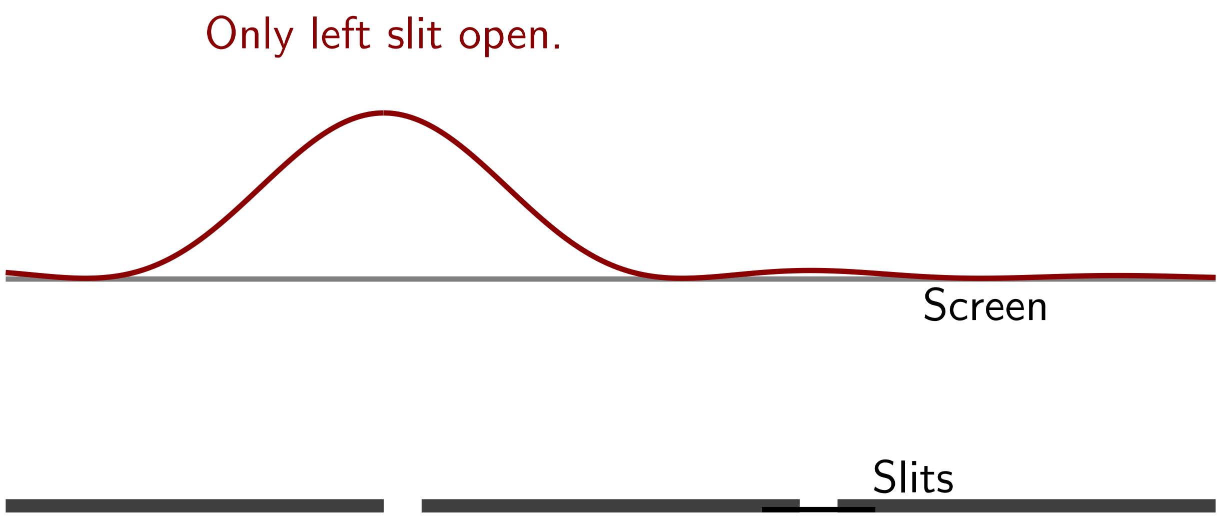

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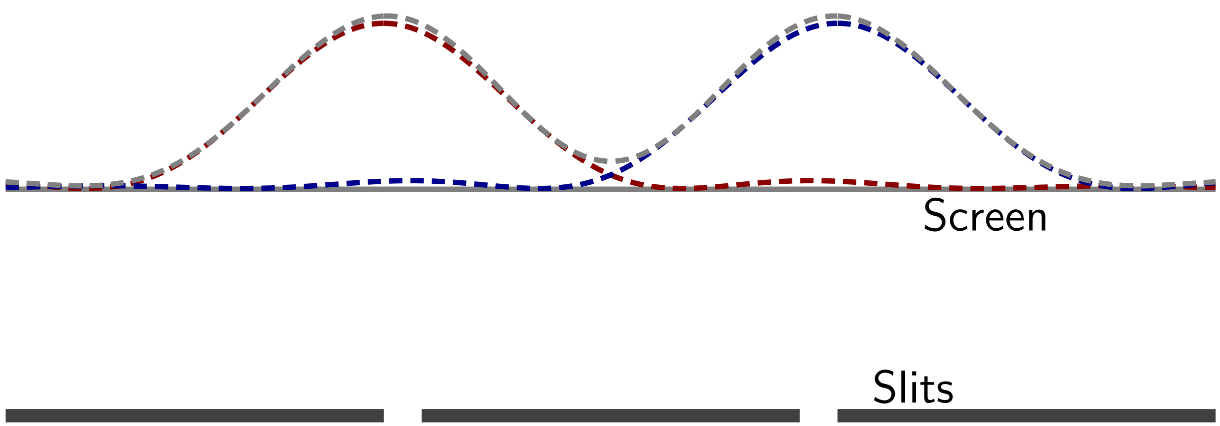
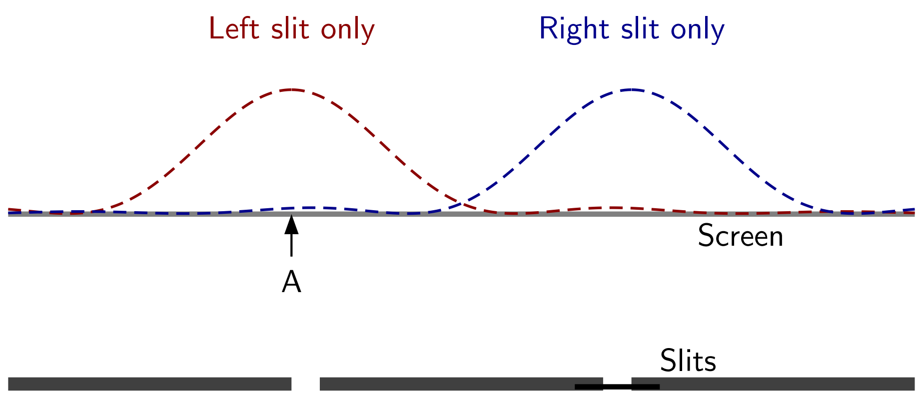
What if both slits are open? Is the overall probability equal to the sum of probabilities for individual slits?



Question 1

Neutrons are fired toward a barrier and slit arrangement. The right slit is initially blocked. Consider the probability with which neutrons can arrive at A.



If the right slit is opened while the left stays open, which of the following is true?

1. Arrival probability at A will definitely increase.
2. Arrival probability at A will definitely decrease.
3. Arrival probability at A might increase or decrease.

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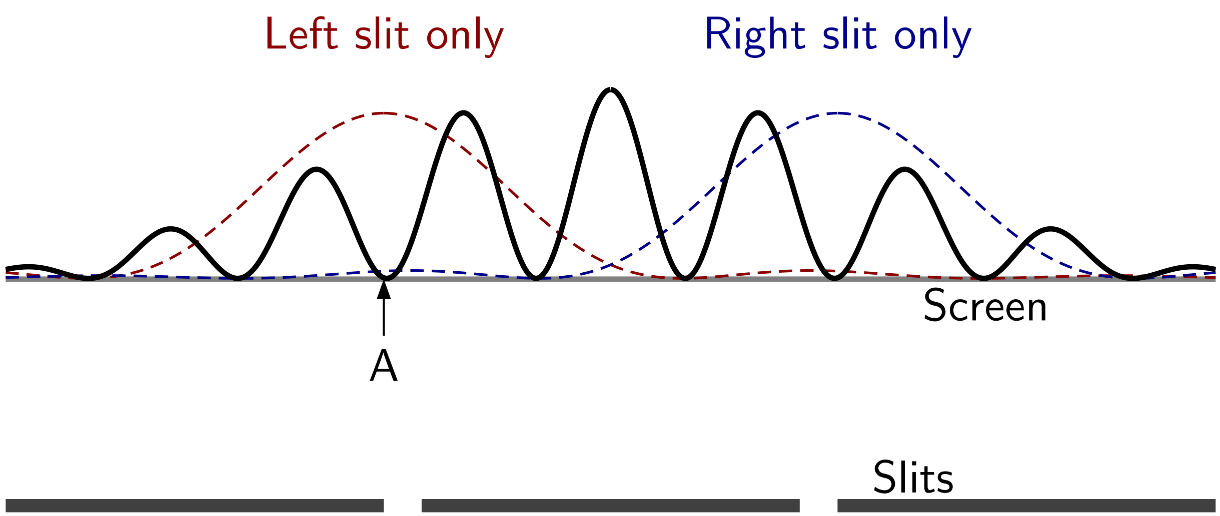

Not the sum of the individual probabilities!

Question 2

Particles are fired toward a single slit with width a. The arrival probability at angle θ is:

$$P(x) = P_0 \left[\frac{\sin\alpha}{\alpha}\right]^2$$

where λ is the wavelength of the waves associated with the particles and

$$\alpha = \frac{\pi a}{\lambda}\sin\theta$$

Which of the following gives the location of the minimum closest to the center?

1. $a\sin\theta = 0$
2. $a\sin\theta = \dfrac{\lambda}{2}$
3. $a\sin\theta = \lambda$
4. $a\sin\theta = 2\lambda$

Question 3

Particles are fired toward a single slit with width a. The arrival probability at angle θ is:

$$P(x) = P_0 \left[\frac{\sin\alpha}{\alpha}\right]^2$$

where λ is the wavelength of the waves associated with the particles and

$$\alpha = \frac{\pi a}{\lambda} \sin\theta$$

As the momentum of the particles fired toward the slit increases which of the following occurs?

1. The width of the central maximum does not change.
2. The width of the central maximum increases.
3. The width of the central maximum decreases.