What happens to the interference pattern if we double the momentum of the photons in a double slit experiment?

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C) The bright parts get further apart.

D) The bright parts get closer together.

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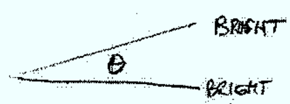
have: $\lambda = \frac{c}{f} = \frac{hc}{E} = \frac{h}{|\vec{p}|}$

$\therefore$ double momentum $\Rightarrow$ half wavelength



$\sin\theta = \frac{\lambda}{d}$ $\therefore \theta \downarrow$ bright areas closer together.

According to the quantum superposition model, what will happen if we remove the middle screen with the two slits?

A) Nothing, the pattern of hits will remain the same
B) The photons will now all hit the screen at the same place
C) The photons will still hit at various locations, but the pattern of hits will be different.
D) The photons will no longer hit at specific locations, but will be absorbed in a more diffuse way, distributing their energy over a larger region.

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We know that each photon is spread out enough to go through both slits. The slits change how these spread out photons move, so if the slits aren't there, the photons will still be spread out, but in a different way. Thus, we expect that the photons will still hit the screen at various specific locations (this is part of the quantum superposition model), but in a different pattern.

A photon is in a state:

$$\frac{1}{\sqrt{2}}|x_1\rangle + \frac{1}{\sqrt{2}}|x_2\rangle,$$

a quantum superposition of two position eigenstates. This state describes:

A) one photon at x_1 and another at x_2.

B) a single photon at a position somewhere in between x_1 and x_2.

C) a single photon at a specific location, but we don't know the location since we haven't measured it yet.

D) a single photon that does not have a definite location.

READING QUIZ

The *de Broglie wavelength* is:

A) the minimum wavelength for a photon to show self-interference in a double slit experiment.

B) the wavelength of a matter particle like an electron.

C) a wavelength at which a resonance phenomenon was observed in de Broglie's X-ray scattering experiments.

D) a hairstyle that enjoyed a brief window of popularity between May and August of 1924.

An electron is in a state

$$\frac{1}{2}|x_1\rangle - \frac{\sqrt{3}}{2}|x_2\rangle$$

If we measure the electron's position, the result that we are most likely to find is

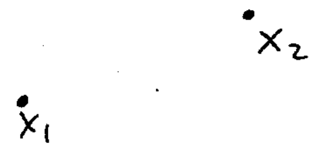
A) x_1

B) x_2

C) $\frac{1}{2}x_1 - \frac{\sqrt{3}}{2}x_2$

D) $\frac{1}{4}x_1 + \frac{3}{4}x_2$

E) None of the above



An electron is in a state

$$\frac{1}{2}|x_1\rangle - \frac{\sqrt{3}}{2}|x_2\rangle$$

If we measure the electron's position, the result that we are most likely to find is

A) x_1 ⟶ Prob. $\frac{1}{4} = \left|\frac{1}{2}\right|^2$

(B) x_2 ⟶ Prob. $\frac{3}{4} = \left|-\frac{\sqrt{3}}{2}\right|^2$

C) $\frac{1}{2}x_1 - \frac{\sqrt{3}}{2}x_2$

D) $\frac{1}{4}x_1 + \frac{3}{4}x_2$ ⟶ this is the average value if we did the experiment a large # of times.

E) None of the above