

Help

Double Slit Interference

Visual Quantum Mechanics



STEP 1: Choosing the Particle Source

Move the cursor over the particle sources (white cylinders), the label appears. As soon as you spot the source whose spectra you wish to observe, click on it. The existing source that is in the holder will retreat, and the chosen source appears ready to fire in the holder.

First click on a source and then click on the 'start' button to plot diffraction pattern

Double Slit Diffraction Program



STEP 2: Changing the Energy/Wavelength of the Particles

Drag the slider to change the energy of the chosen particle. If your chosen particle is a photon, you will be presented with a slider that allows you to control the wavelength of the photon rather than its energy.

E=Energy, W=Wavelength, S=Slit Separation, N=# Particles

Particles per Second

1 5 10 15 $\frac{m}{s}$

Trash

Energy

1eV 100eV 200eV 300eV

Slit Separation

0.5nm 5 10 15 20 25nm



STEP 3: Changing the Slit Separation (if necessary)

Drag the slider at the bottom right of the screen to change the slit separation. You will see the slits come together or go apart in the experimental view, as you drag the slider.

The screenshot displays a simulation interface for an electron diffraction experiment. The main experimental view shows a central electron source labeled "Electrons" with a "Start" button below it. Below the source are four vertical slits. Above the slits is a detector screen with a horizontal axis ranging from -5 to 5. To the right of the experimental view is a control panel. At the top of the control panel is a large empty rectangular area. Below it is a legend: "E=Energy, W=Wavelength, S=Slit Separation, N=# Particles". Underneath the legend is a "Particles per Second" slider with a scale from 1 to 15 and a unit of $\frac{m}{s}$. To the right of this slider is a "Trash" icon. At the bottom of the control panel are two sliders: "Energy" with a scale from 1eV to 300eV, and "Slit Separation" with a scale from 0.5nm to 25nm. A blue callout box points to the "Slit Separation" slider.



STEP 4: Changing the Particles Per Second (if necessary)

Control the rate at which particles are emitted by dragging the slider. You can decrease the particle rate to as low as 1 particle per second. .

The simulation interface consists of several components:

- Central View:** A 3D representation of an electron source labeled "Electrons" emitting particles towards two slits. Below the slits are four cylindrical detectors. A "Start" button is located at the bottom center of this view.
- Top Panel:** A horizontal scale from -5 to 5, representing the detector screen.
- Right Panel:** A large empty rectangular area for data collection. Below it, a legend reads "E=Energy, W=Wavelength, S=Slit Separation, N=# Particles".
- Control Panels:**
 - Particles per Second:** A slider with a scale from 5 to 15 $\frac{m}{s}$. A callout box points to this slider.
 - Energy:** A slider with a scale from 1eV to 300eV.
 - Slit Separation:** A slider with a scale from 0.5nm to 25nm.
 - Trash:** A trash can icon.



STEP 5: Observing the Pattern Develop

Click the "Start" button.. The "Start" button changes into the "Stop" button, that can be clicked at any time to stop the simulation.

The simulation interface shows a central display area with a detector screen at the top showing a pattern of particles. Below the detector is a source labeled "Electrons" and four slits. A "Start" button is located below the slits, and a counter shows "# Particles = 1561". To the right of the detector is a large empty box for the diffraction pattern. Below the pattern box is a legend: "E=Energy, W=Wavelength, S=Slit Separation, N=# Particles". Below the legend is a "Particles per Second" counter showing a value of 15. A "Trash" icon is located to the right of the counter. At the bottom of the interface are two sliders: "Energy" (ranging from 1eV to 300eV) and "Slit Separation" (ranging from 0.5nm to 25nm).

You will observe the diffraction pattern develop

A counter will tell you the total number of particles on the screen.



Misbehaving stop button

The source sometimes does not stop for neutrons. If this happens, move the cursor to the interference pattern. When the cursor changes to a hand, click the mouse. Then the source will stop and you can save the pattern or start a new one.

The simulation interface displays an electron double-slit experiment. At the top, a detector screen shows an interference pattern of particles, with a scale from -5 to 5. Below the screen is a source labeled "Electrons" and four slits. A "Start" button is visible with "# Particles = 1561". The right side of the interface has a large empty box for data, a legend "E=Energy, W=Wavelength, S=Slit Separation, N=# Particles", a "Particles per Second" scale (1, 5, 10, 15 m/s), a "Trash" icon, and two sliders for "Energy" (1eV to 300eV) and "Slit Separation" (0.5nm to 25nm).



STEP 6: Comparing Diffraction Patterns

Once a diffraction pattern has been created it may be dragged (with the left mouse held down) to the right where it will be saved. Up to 4 diffraction patterns may be saved and compared at any one time.

The screenshot shows a simulation interface for creating and comparing diffraction patterns. On the left, a 3D scene depicts a particle source labeled "Pions" on a wooden stand, with four cylindrical detectors below it. A "Start" button and "# Particles = 2081" are at the bottom. Above the source is a horizontal axis from -5 to 5. A diffraction pattern is visible on a screen above the source. On the right, a control panel contains two saved diffraction patterns: "Electrons, E=100eV, S=5nm, N=1561" and "Neutrons, E=100eV, S=0.1000nm, N=4028". Below these are sliders for "Energy" (1eV to 300eV) and "Slit Separation" (0.01nm to 0.5nm), and a "Particles per Second" scale (1 to 15) with a "Trash" icon.

The saved pattern will include information about the type of particle, energy or wavelength, slit width, and number of particles.

