

Free Particle

① *Reflection and Transmission*

Experimental Settings

Potential level: 50

Number of slits: 2

Slit width: 15

Slit center distance: 30

Position: 0

Task


Compare the shape of the reflected and transmitted waves. What differences can you observe in the number of maxima? Which of the two exhibits a more complex pattern — and what might be the reason for that?

② *Non-localizability*

"A particle cannot be precisely localized." Explain this statement in the context of Heisenberg's uncertainty principle. How does the PALGRAP simulation visually demonstrate this concept?

Reset the simulation without starting it. You should then see the Gaussian wave packet. What can you infer about the particle's position at this stage?

Now, start the simulation without adding a potential barrier. After approximately 10,000 iterations, what can you conclude about the location of the particle?

Pressing the button  will save the current status as a PDF file.

③ *Limits of classical concepts*

Experimental Settings

Create a continuous potential barrier (without slots) in the PALGRAP simulation with the following heights

- Run A: Potential Level = 5

- Run B: Potential Level = 95

Task

Observe the behavior of the wave packet when it hits the barrier. Why is the classical idea—a particle passes through or is reflected—not sufficient in quantum mechanics? What new concepts or models of thinking are needed to understand the phenomenon?