QUANTUMLABUB

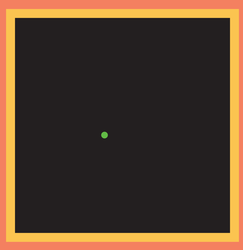
THE DOUBLE SLIT EXPERIMENT

» **What happens if we throw tiny particles, such as electrons, through two slits in a wall and measure their position at the other side?**

» **Why do the results of the experiment resemble those obtained using waves?**

LET US TAKE INTO ACCOUNT SOME PRINCIPLES OF QUANTUM MECHANICS

The brightness at each point represents the probability of observing the particle at that exact point.



A detected particle can be represented as a point in the sensor and it implies the collapse of the wave function.

Heisenberg Uncertainty Principle

This principle doesn't let us know the position and velocity of the particle with precision at the same time.

Probability Distribution & Wave Function

We know the probability of finding the particle in one place and by doing so for each location, we will have its probability distribution. This probability distribution is the square of

Schrödinger Equation - Evolution of Wave Function

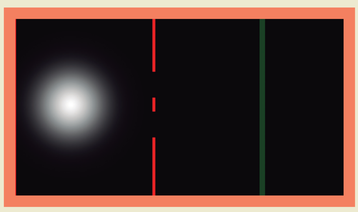
The wave function evolves following the Schrödinger equation and contains all the information of the particle.

Collapse of the Wave Function

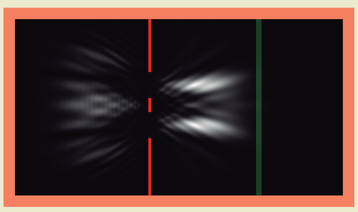
When a sensor detects a particle the wave function collapses: it changes into a specific state that tells us that we are 100% sure that the particle is where the sensor is. We have changed the wave function measuring the system, thus its evolution has also changed.

FOLLOW THE SEQUENCE OF THE EXPERIMENT

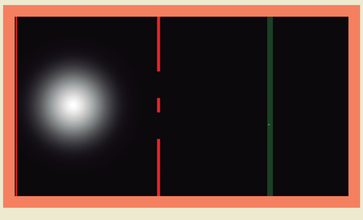
The particle starts its movement towards the wall:



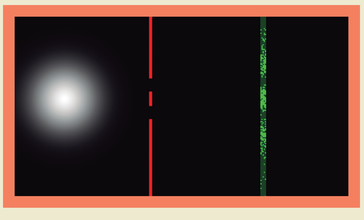
The probability distribution diffracts:



It leaves a mark on the detector:



Repeat the experiment and get a diffraction pattern:



The QuantumLabUB program was developed by Jan Albert Iglesias and Daniel Allepuz Requena under the supervision of professors Montserrat Guilleumas Morell and Bruno Juliá Díaz as an In-Company Placement project in the UB Physics Bachelor's degree.

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