Basic Postulates of Quantum Mechanics

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Abstract

This document outlines the basic postulates of quantum mechanics.

1 Introduction

Quantum mechanics is a fundamental theory in physics that describes the physical properties of nature at the scale of atoms and subatomic particles.

2 Postulate 1: State Vector

The state of a quantum mechanical system is completely specified by a function ψ that depends on the coordinates of the particle and on time. This function, called the wave function or state vector, contains all the information about the system.

3 Postulate 2: Observables and Operators

In quantum mechanics, every observable quantity is associated with a linear, Hermitian operator. The possible outcomes of measuring an observable are the eigenvalues of the corresponding operator.

4 Postulate 3: Measurement

The only possible result of the measurement of a physical quantity is one of the eigenvalues of the operator corresponding to that quantity. The probability of obtaining a particular eigenvalue is given by the square of the absolute value of the projection of the state vector onto the eigenvector corresponding to that eigenvalue.

5 Postulate 4: Time Evolution

The time evolution of the state of a quantum mechanical system is governed by the Schrödinger equation:

$$i\hbar\frac{\partial\psi}{\partial t} = \hat{H}\psi$$

where $\hat{H}$ is the Hamiltonian operator of the system.

6 Conclusion

These postulates form the foundation of quantum mechanics and provide a framework for understanding the behavior of quantum systems.