

Summary of Stern-Gerlach Experiments

Physics II: Modern Physics

College of the Atlantic

The figures below and on the next page are from an early draft of *quantum Mechanics* by David McIntyre, Pearson, 2012.

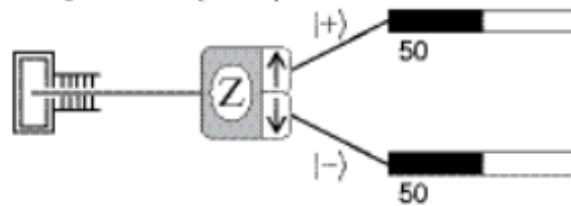


Figure 1.2 Simplified schematic of Stern-Gerlach experiment, depicting source of atoms, Stern-Gerlach analyzer, and counters.

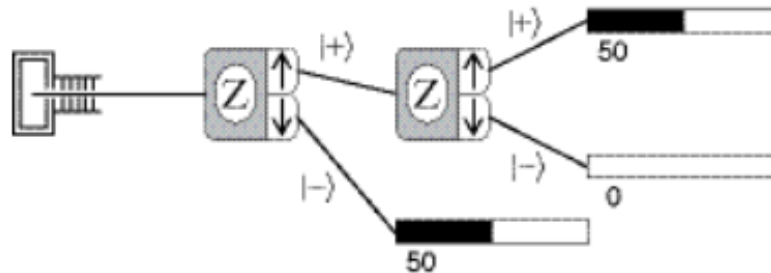


Figure 1.3 Experiment 1 measures the spin component along the z -axis twice in succession.

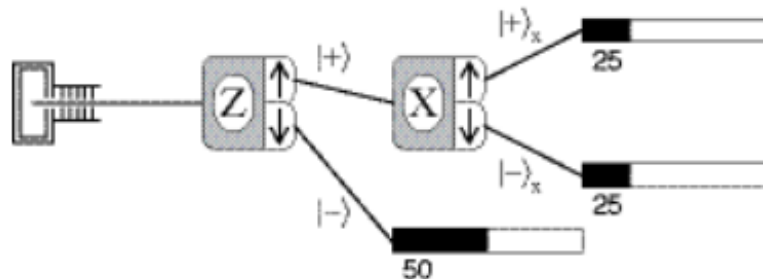


Figure 1.4 Experiment 2 measures the spin component along the z -axis and then along the x -axis.

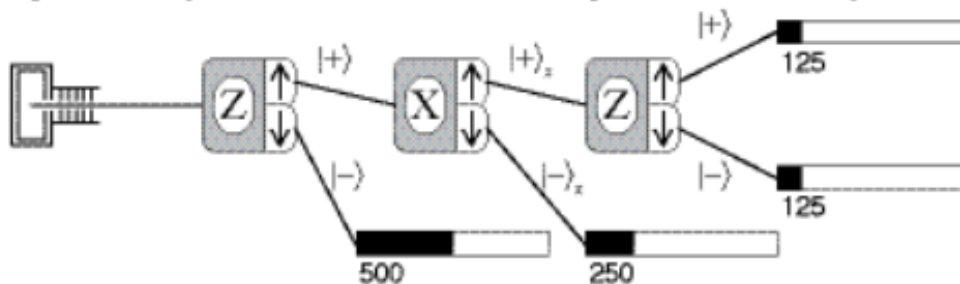


Figure 1.5 Experiment 3 measures the spin component three times in succession.

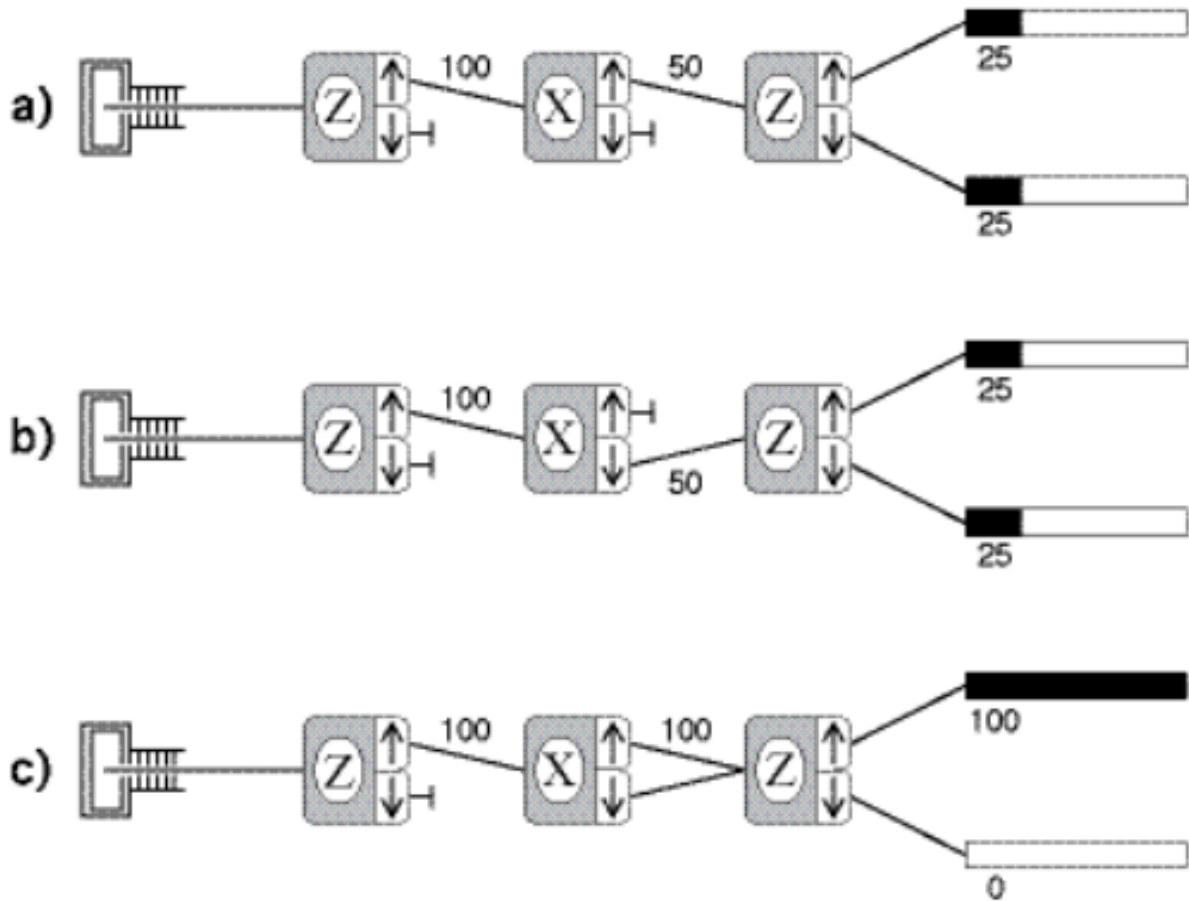


Figure 1.6 Experiment 4 measures the spin component three times in succession and uses one (a and b) or two beams (c) from the middle analyzer.

Some key features of quantum mechanics

1. The outcomes of measurements are described using probabilities.
2. Observables can be incompatible.
3. Quantum interference.

Quantum Mechanics postulate 1: The state of a quantum mechanical system is described mathematically by a normalized ket $|\psi\rangle$ that contains all the information we can know about the state.

In the context of spin-1/2 particles, a ket is a (possibly complex) two-dimensional vector.