## **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.

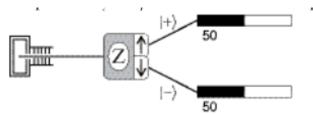


Figure 1.2 Simplified schematic of Stern-Gerlach experiment, depicting source of atoms, Stern-Gerlach analyzer, and counters.

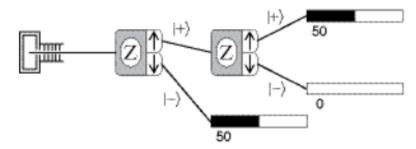


Figure 1.3 Experiment 1 measures the spin component along the z-axis twice in succession.

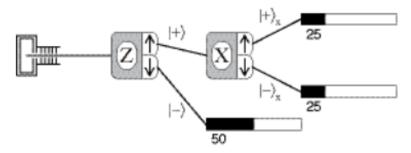


Figure 1.4 Experiment 2 measures the spin component along the z-axis and then along the xaxis.

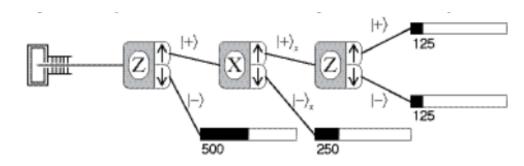


Figure 1.5 Experiment 3 measures the spin component three times in succession.

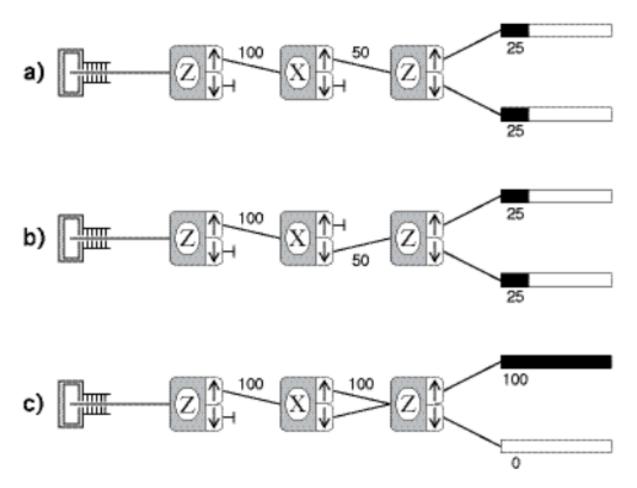


Figure 1.6 Experiment 4 measures the spin component three times in succession and uses one (a and b) or two beams (c) from the middle analyzer.

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, at ket is a (possibly complex) two-dimensional vector.