1 Abstract

The He(n,2p)2n and He(n,2p)3n reactions may proceed. For a two proton nucleus, the reaction may proceed in one step. Each reaction has a distinguishable kinematic signature allowing the detection of a pre-existing Δ++ component in the nucleus, the reaction may proceed in one step. Each reaction has a distinguishable kinematic signature allowing the detection of a pre-existing Δ++ component in the nucleus. The Δ++ particle in the ground state has a mass of about 1232 MeV, spin and isospin of 3/2, and a +2 electric charge. The Δ++ component might be important in nuclear structure. The Δ++ has a mass of about 1232 MeV, spin and isospin of 3/2, and a +2 electric charge. The Δ++ component might be important in nuclear structure.

2 Motivation

Traditional models of the nucleus that treat it as a non-relativistic system of nucleons do not completely explain the binding energies and the electromagnetic properties of nuclei. By the 1960s, theorists suggested the presence of a pre-existing Δ(1232) particle in the ground-state nuclear wave function and that this Δ++ resonance might be important in nuclear structure. The Δ++ has a mass of about 1232 MeV, spin and isospin of 3/2, and a +2 electric charge. To find a Δ++ component in the nucleus, the He(n,2p)2n and He(n,2p)3n reactions are being measured at the Weapons Nuclear Research (WNR) facility at Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico.

There are two primary ways that the He(n,2p)2n and the He(n,2p)3n reactions may proceed. For a two proton nucleus, the reaction typically proceeds in two steps, as below:

The permanent magnets bend the trajectories of the protons (which are charged particles) in an amount inversely proportional to their momenta.

3 Experimental Apparatus

The experimental apparatus was designed to detect two protons that scatter in coincidence as the neutron beam interacts with the target. The drift chambers are filled with argon gas and contain two perpendicular long wire loops. Parallel plates provide timing for the particle trajectories. Drift chambers before and after the permanent magnet are used to find the change in the trajectory due to the magnet.

The gaseous He and He targets are contained in conventional aluminum gas cylinders at 102.7 and 134.6 bar respectively.

The permanent magnets bend the trajectories of the protons (which are charged particles) in an amount inversely proportional to their momenta.

4 Electronics

The electronics read in and processed the signals from the various detectors before sending them to the computer. A signal in one Δ++ detector and in both sputter barriers triggered the electronics. This ensures that the particles detected are primarily scattered from the target and are in coincidence with another particle. The trigger was sensed if the beam or the CAMAC registers were off.

In order to determine the positions of the drift chambers and scintillators, a code has been written which finds the offsets and distances to the straight track trajectories produced when the magnets were removed. The code uses measured offsets for the first planes of the front and rear drift chamber (a and b). It then fits the offsets and the distances for the second planes of each drift chamber (c and d). Finally, the code finds a, b, c, and d at the fit best measured offsets for the first planes of the front and rear drift chamber (a and b). It then fits the offsets and the Δ++ component in the nucleus wave function.

5 Momentum Analysis

In order to determine the positions of the drift chambers and scintillators, a code has been written which finds the offsets and distances to the straight track trajectories produced when the magnets were removed. The code uses measured offsets for the first planes of the front and rear drift chamber (a and b). It then fits the offsets and the distances for the second planes of each drift chamber (c and d). Finally, the code finds a, b, c, and d at the fit best measured offsets for the first planes of the front and rear drift chamber (a and b). It then fits the offsets and the Δ++ component in the nucleus wave function.

6 Wire Chamber Analysis

The drift chambers must be calibrated to determine the particle trajectories. First, the time differences between signals from each of the delay lines are analyzed to find the time nearest the particle path (Figure 1). The drift distance to the wire can be found because it is proportional to the sum of the times from each end of the delay line. Pulses from the cathode wires are used to veto the beam or the CAMAC registers were off.

The permanent magnets bend the trajectories of the protons (which are charged particles) in an amount inversely proportional to their momenta.

7 Conclusion

The permanent magnets bend the trajectories of the protons (which are charged particles) in an amount inversely proportional to their momenta.