ABSTRACT

Implementing a Pulsed-NMR System for Studying Polarization of ^{3}He Target Cell. DANIEL BANKS (Penn State University, University Park, PA 16802) J.P. CHEN (Thomas Jefferson National Accelerator Facility, Newport News, VA).

Polarized helium-3 (^{3}He) has proven to be an extremely effective neutron target for use in high-energy nuclear physics experiments. The unique quantum properties of ^{3}He cause the spins of its protons to pair up, allowing the neutron to carry the majority of the nucleus spin. Through spin-exchange optical pumping (SEOP), it is possible to achieve high polarization, which can then be measured using pulsed nuclear magnetic resonance (NMR). The focus of this study is to implement a pulsed-NMR system for use with the ^{3}He target. A pulsed-NMR system was developed at Jefferson Lab for the specific purpose of measuring the polarization of ^{3}He inside the target cell. This pulsed-NMR system works by sending out a radio frequency (RF) signal into the target cell, causing the spin of ^{3}He to be knocked off-axis with the magnetic holding field. As ^{3}He relaxes and its spin realigns with that of the magnetic field, an electric current is produced in the NMR pick-up coils. Preliminary results show that we are, in fact, seeing NMR signal being produced. These initial results are encouraging because this is the first time pulsed-NMR signal has been observed at Jefferson Lab. Further testing must first be done to confirm that the signal is accurate and to account for the initial spike in signal. If it is confirmed that pulsed-NMR signal was actually observed, it may be possible to implement the pulsed-NMR system on the new dual-chambered convection cell for 12 GeV experiments.